The Environmental Management Plan

of

Thantwe Marine Products Co.,Ltd (TMP)

(Revised Final EMP Report)
Prepared
By
Environmental Quality Management (EQM) Co., Ltd

Acronyms

BOD	Bio-Chemical Oxygen Demand
COD	Chemical Oxygen Demand
CER	Certified Emission Reductions
CGI	Computer-generated Imagery
CPR	Cardiopulmonary Resuscitation
CSR	Cooperate Social Responsibility
DO	Dissolved Oxygen
ECC	Environmental Compliance Certificate
ECD	Environmental Conservation Department
EIA	Environmental Impact Assessment
ELV	Exposure Limit Value
EMP	Environmental Management Plan
EMT	Emergency Management Team
EQEG	Environmental Quality (Emission) Guideline
EQM	Environmental Quality Management Co.,ltd
TMP	Thantwe Marine Products Co.,Ltd
ERP	Emergency Response Plan
FAO	Food and Agriculture Organization
FESR	Framework for Economic and Social Reform
HSE	Health, Safety and Environment
IEE	Initial Environmental Examination
IFC	International Finance Corporation
IUCN	International Union for Conservation of Nature
KBAs	Key Biodiversity Areas
MIC	Myanmar Investment Commission
MONREC	Ministry of Natural Resources and Environmental Conservation
MSDS	Material Safety Data Sheet
MSW	Municipal Solid Waste
NAAQS	National Ambient Air Quality Standards
NCDP	National Comprehensive Development Plan
O&M	Operation and Maintenance
OSHA	Occupational Safety and Health Administration
PM10/PM2.5	Particulate Matter
PPE	Personal Protection Equipment

SIA	Social Impact Assessment
SPSS	Statistical Package for the Social Sciences
SW	Solid Waste
TA	Technical Assistance
TDS	Total Dissolved Solid
TSS	Total Suspended Solid
UK	United Kingdom
UN	United Nations
US EPA	United State Environmental Protection Agency
VOC	Volatile Organic Compound
WARM	Waste Reduction Model
WB	World Bank
WBG EHS	World Bank Group Environmental, Health and Safety Guidelines
WBV	Whole-Body Vibration
WDPA	World Database Protected Area
WHO	World Health Organization
WMP	Waste Management Plan
3Rs	Reduce, Reuse and Recycle

TABLE OF CONTENTS

CHAPTER-1: Executive Summary

CHAPTER-2: Introduction

CHAPTER-3: Policy, legal and institutional framework

CHAPTER-5: Description of the Surrounding Environment

CHAPTER-6: Impact assessment and Mitigation measures

CHAPTER-9: Emergency Response Plan

CHAPTER-10: Public consultation and Disclosure

CHAPTER-11: Conclusions and recommendations

References

ANNEX

TABLES

FIGURES

အခန်း (၁)

အကျဉ်းချုပ်အစီရင်ခံစာ

၁.၁ အကျဉ်းချုပ်အစီရင်ခံစာ (Thantwe Marine Products Co.,Ltd (TMP))

၁.၁ နိဒါန်း

သံတွဲ ရေထွက်ကုန်ပစ္စည်းများ ကုမ္ပဏီလီမိတက်သည် ၁၀၀% ပြည်တွင်းပုဂ္ဂလိကကုမ္ပဏီတစ်ခု ဖြစ်ပါသည်။ အံတော်ကျေးရွာ၊ ဒွါရဝတီ (ခ) ရပ်ကွက် ၊ သံတွဲ မြို့နယ် ၊ ရခိုင်ပြည်နယ်၊ မြန်မာနိုင်ငံတွင် တည်ရှိပြီး ကိုဩဒီနိတ်မှာ 18.471427°N နှင့် 94.373074°E ဖြစ်ပါသည်။ TMP ကုမ္ပဏီ၏ အဏ္ဏဝါထုတ်ကုန်များ ထုတ်လုပ်ခြင်းနှင့် အအေးခန်းသိုလှောင်ခြင်းအတွက် ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်(EMP) ကို ***Environmental Quality Management Co., Ltd (EQM)*** မှ အတိုင်ပင်ခံအဖွဲ့က ဆောင်ရွက်ပါသည်။

ဇယား ၁.၁: ကုမ္ပဏီမှတ်ပုံတင်အသေးစိတ်

၁	သဘာဝပတ်ဝန်းကျင်ကုမ္ပဏီ မှတ်ပုံတင်အမှတ်	2690/2012-2013
၂	ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာန၊ သဘာဝအရင်းအမြစ်၊ ပတ်ဝန်းကျင်ထိန်းသိမ်းရေး နှင့် သစ်တောဝန်ကြီးဌာနမှ EMP လုပ်ဆောင်ရန် အကြံပြုသည့်ရက်စွဲ	၂ ရက်၊ စက်တင်ဘာလ၊ ၂၀၂၀

စီမံကိန်းအဆိုပြုသူအား ဆက်သွယ်ရန် အချက်အလက်အသေးစိတ်မှာ အောက်ပါအတိုင်းဖြစ်ပါသည်။

•စီမံကိန်းအဆိုပြုသူ : ဦးတင်မောင်ဌေး၊095003792၊Tmpmeister.@gmail.com

•ကုမ္ပဏီအမည် :သံတွဲ ရေထွက်ကုန်ပစ္စည်းများ ကုမ္ပဏီလီမိတက် (TMP)
•ရင်းနှီးမြှုပ်နှံသူအမည် : ဒေါ်အေမီဝင်း
•မှတ်ပုံတင်နံပါတ် :SDY / 002 / TMP / DOF
•မှတ်ပုံတင်သည့်ရက် : ၁၃ ရက် ၊ **နိုဝင်**ဘာလ၊ ၂၀၁၉
•သက်တမ်းကုန်ဆုံးရက် : ၃၀ ရက်၊ စက်တင်ဘာလ၊ ၂၀၂၀
•လိပ်စာ : လမ်းသွယ် ၁၊ ရပ်ကွက် ၁၊ ဒွါရဝတီ မြို့သစ်၊ သံတွဲမြို့နယ်၊ ရခိုင်ပြည်နယ်
•လုပ်ငန်းအမျိုးအစား : အအေးခန်းသိုလှောင်ခြင်းနှင့် ရေခဲစက်ရုံ
•ရင်းနှီးမြှုပ်နှံမှုတည်နေရာ : လမ်းသွယ် ၁၊ ရပ်ကွက် ၁၊ ဒွါရဝတီ မြို့သစ်၊ သံတွဲမြို့နယ်၊ ရခိုင်ပြည်နယ်

၁၉၉၆ ခုနှစ်မှစ၍ exporting စတင်လုပ်ကိုင်ပြီး စီမံကိန်း/လုပ်ငန်း စီးပွားဖြစ် စတင်လည်ပတ်သည့်ကာလ မှာ (၁၈.၈.၁၉၉၇)ရက်နေ့တွင် ဖြစ်ပါသည်။

EMPလုပ်ဆောင်ခြင်း၏အဓိကရည်ရွယ်ချက်မှာ ***စက်ရုံ၏ ဆိုးကျိုးသက်ရောက်မှုများ***နှင့် ***ကျန်းမာရေးနှင့်ပတ်ဝန်းကျင်အပေါ် သက်ရောက်မှုများ***ကို ***လျှော့ချ၍ စက်ရုံ၏ရေရှည်တည်တံ့ခိုင်မြဲသော ဖွံ့ဖြိုးတိုးတက်မှုအား မြှင့်တင်ရန်*** ဖြစ်ပါသည်။

၁.၂ ရည်မှန်းချက်များ

TMP စက်ရုံ၏ရည်ရွယ်ချက်မှာ **ကောင်းမွန်သောကုန်ထုတ်နည်းများ *(GMP)*** နှင့် ထုတ်လုပ်ခြင်း၊ ပြုပြင်ခြင်း၊ သိုလှောင်ခြင်း၊ ဖြန့်ဖြူးခြင်း၊ ကုန်ကျစရိတ်နှင့် စားသုံးမှုများပြုလုပ်စဉ် ဖြစ်ပေါ်နိုင်သော အဏုဇီဝဗေဒ၊ ဓာတုဗေဒနှင့်ရုပ်ပိုင်းဆိုင်ရာ အန္တရာယ်များကို ဖော်ထုတ်ခန့်မှန်းရန် အသုံးပြုသော **ဘေးဥပါဒ်ခွဲခြမ်းစိတ်ဖြာခြင်းနှင့် ထိန်းချုပ်နိုင်သောစနစ် *(HACCP) system*** စနစ်တို့အား အကောင်အထည်ဖော်ခြင်းဖြင့် **လုံခြုံ၍ အရည်အသွေးမြင့်မားသော ပင်လယ်စာများ** ပံ့ပိုးပေးရန်ဖြစ်ပါသည်။

ထို့အပြင် တရုတ်၊ ဂျပန်၊ အမေရိကန်၊ ဩစတေးလျနှင့် ဥရောပနိုင်ငံများမှ စံသတ်မှတ်ချက်များနှင့် အညီ တင်သွင်းနိုင်ရန် အစားအစာဘေးကင်းလုံခြုံရေး စီမံခန့်ခွဲမှုစနစ်များကို ထိန်းသိမ်းထားပါသည်။

ရည်မှန်းချက်များကိုအကောင်အထည်ဖော်ရန် အောက်ပါနည်းလမ်းများအား အသုံးပြုခဲ့ပါသည်။

- ပြည်တွင်းနှင့် နိုင်ငံတကာအဆင့် မူဝါဒများ၊ ဥပဒေများနှင့်စည်းမျဉ်းများအတွက် သက်ဆိုင်သည့် စာရွက်စာတမ်းများအား လေ့လာခြင်း
- စက်ရုံနှင့်ပတ်သက်ဆက်နွယ်သည့်သူများ နှင့် သက်ဆိုင်ရာအစိုးရအဖွဲ့များမှတာဝန်ရှိသူများအား တွေ့ဆုံမေးမြန်းခြင်း
- သတင်းအချက်လက်များစုဆောင်းခြင်း
- ပတ်ဝန်းကျင်အခြေခံအချက်အလက်များအား စောင့်ကြည့်လေ့လာခြင်း
- ပတ်သက်ဆက်နွယ်သူများနှင့် တွေ့ဆုံဆွေးနွေးခြင်း နှင့် စီမံကိန်းအကြောင်းထုတ်ဖော်ခြင်း (အဓိကပတ်သက်ဆက်နွယ်သူများနှင့် အုပ်စုဖွဲ့ဆွေးနွေးခြင်း)
- ပြန်လည်အစီရင်ခံတင်ပြခြင်း

၁.၃ မူဝါဒ၊ ဥပဒေနှင့် ဖွဲ့စည်းပုံမူဘောင်

ပတ်ဝန်းကျင် စီမံခန့်ခွဲမှုအစီအစဉ် (EMP)အား **သက်ဆိုင်ရာဥပဒေများ**နှင့်အညီ ပြင်ဆင် ဆောင်ရွက်ပါသည်။ အဆိုပြု သံတွဲ ငါး၊ ပုဇွန် အအေးခန်းလုပ်ငန်းအတွက် တိုက်ရိုက်သက်ဆိုင်သည့် ဥပဒေများအား ကောက်နုတ်၍ အသေးစိတ်ကို စာမျက်နှာ(၃-၂၅) မှ (၃-၃၈) အထိ ဖော်ပြထားပါသည်။ ငါးအအေးခန်း လုပ်ငန်း၌ ငါးဖမ်းခြင်းလုပ်ငန်း တိုက်ရိုက်မပါဝင်သော်လည်း၊ လုပ်ငန်းနှင့် တွဲဘက်ဆက်စပ်လုပ်ကိုင်နေသော ငါးဖမ်းလုပ်ငန်းနှင့် သက်ဆိုင်သော ဥပဒေများကိုလည်း ကောက်နုတ်၍ စာမျက်နှာ(၃-၁၁) မှ (၃-၂၄)အထိ အသေးစိတ် ဖော်ပြထားပါသည်။

အောက်ပါတို့သည် ***သက်ဆိုင်ရာ လမ်းညွှန်ချက်များ၊ စံချိန်စံညွှန်းများနှင့် ဥပဒေများ*** ဖြစ်ပါသည်။

- ပြည်ထောင်စုသမ္မတမြန်မာနိုင်ငံတော် ဖွဲ့စည်းပုံအခြေခံဥပဒေ (၂၀၀၈)မှ အပိုဒ် ၃၇ (က) နှင့် အပိုဒ် (၄၅)
- ကမ္ဘာ့ကျန်းမာရေးအဖွဲ့ (WHO)လမ်းညွှန်ချက်များ၊ အမေရိကန်ပြည်ထောင်စု ပတ်ဝန်းကျင်ထိန်းသိမ်းကာကွယ်ရေး အေဂျင်စီ (USEPA) နှင့် နိုင်ငံတကာငွေကြေးကော်ပိုရေးရှင်း (IFC) စံနှုန်းများကဲ့သို့သော နိုင်ငံတကာ မူဝါဒများ၊ အခြေခံမူများနှင့် စံနှုန်းများ
- သက်ဆိုင်ရာ ဒေသတွင်း လုပ်ငန်းခွင်ကျန်းမာရေးနှင့် လုံခြုံရေးဆိုင်ရာ ဥပဒေများနှင့်စည်းမျဉ်းများ
- သယံဇာတနှင့် ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာန လက်အောက်ရှိ ပတ်ဝန်းကျင်ထိန်းသိမ်းရေး ဦးစီးဌာန မှ သဘောတူလက်မှတ်ရေးထိုးထားသော နိုင်ငံတကာ သဘောတူညီချက်များ
- ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဥပဒေ (၂၀၁၂)
- နိုင်ငံခြားရင်းနှီးမြှုပ်နှံမှုဥပဒေ (၂၀၁၃)
- ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း နည်းဥပဒေမူကြမ်း (၂၀၁၃)
- ပတ်ဝန်းကျင်ထိန်းသိမ်းရေး စည်းမျဉ်းစည်းကမ်းများ (၂၀၁၄)
- ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း လုပ်ထုံးလုပ်နည်းများ (၂၀၁၅)
- အမျိုးသားပတ်ဝန်းကျင်ဆိုင်ရာအရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန် (၂၀၁၅)
- ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း လုပ်ထုံးလုပ်နည်းဆိုင်ရာ အုပ်ချုပ်ရေးညွှန်ကြားချက်မူကြမ်း (၂၀၁၅)
- မြန်မာနိုင်ငံ၏ EIA လုပ်ငန်းစဉ်များ၌ လူထုပါဝင်မှုဆိုင်ရာ လမ်းညွှန်ချက်မူကြမ်း (၂၀၁၇)
- စီမံကိန်း၏ ပတ်ဝန်းကျင်နှင့်လူမှုရေးဆိုင်ရာ စီမံခန့်ခွဲမှုနှင့် တိုက်ရိုက်ဖြစ်စေ သွယ်ဝိုက်၍ ဖြစ်စေ သက်ဆိုင်သည့် အခြားဥပဒေများ

၁.၄ စီမံကိန်းဖော်ပြချက်နှင့် အခြားနည်းလမ်းများ

သံတွဲ ရေထွက်ကုန်ပစ္စည်းများ ကုမ္ပဏီလီမိတက်သည် ပုစွန်နှင့် အခြားရေထွက်ကုန်ပစ္စည်းများကို တင်ပို့သော **ပုဂ္ဂလိကကုမ္ပဏီ**တစ်ခုဖြစ်၍ ဒါရုဝတီ မြို့သစ်၊ သံတွဲမြို့နယ်၊ ရခိုင်ပြည်နယ်၊ ၊ ဘင်္ဂလားပင်လယ်အော်ရှိ ငါးဖမ်းမြေအနီးတွင် တည်ရှိပါသည်။ စက်ရုံတည်ဆောက်မှုကို တင်သွင်းသောနိုင်ငံများ၏ လိုအပ်ချက်၊ နိုင်ငံတကာစံချိန်စံညွှန်းများနှင့်အညီ ဖြည့်ဆည်းနိုင်ရန် မြန်မာနိုင်ငံမှ အင်ဂျင်နီယာများမှ ဒီဇိုင်းထုတ်ထားပါသည်။ စက်ရုံကို ငါးလုပ်ငန်း ဦးစီးဌာနတွင် မှတ်ပုံတင်ထားပြီး **မှတ်ပုံတင်အမှတ်မှာ SD/002/TMP/DOF** ဖြစ်၍ ၁၉၉၆ ခုနှစ်မှစ၍ တင်ပို့မှု ပြုလုပ်ခဲ့ပါသည်။

၁.၄.၁ လက်ရှိနေရာအသုံးပြုမှု

TMP ကုမ္ပဏီ၏ အဓိက အဆောက်အအုံများမှာ အုပ်ချုပ်ရေးရုံးခန်း၊ ၊လုပ်ငန်းလည်ပတ်မှုပြုလုပ်သည့် အဆောက်အအုံ ၊ အလုပ်သမား ထမင်းစားဆောင် ၊ ကုန်လှောင်ရုံများ၊ အခြားအဆောက်အအုံများနှင့် မြေနေရာလွတ်များ ဖြစ်ပါသည်။

ဇယား ၁.၂ စက်ရုံရှိ အဆောက်အဦး များ

အမှတ်	စက်ရုံအဆောက်အဦး များ	ဧရိယာ(m2)	ရာခိုင်နှုန်း
၁	စုစုပေါင်းဧရိယာ	36422	100

၂	ရုံးခန်း၊ အုပ်ချုပ်ရေးခန်းနှင့် အအေးသိုလှောင်ခန်း	1821	5
၃	ရေခဲစက်ရုံ နှစ်ခု	1115	3
၄	မီးဖိုချောင်	223	1
၅	သိုလှောင်ရုံ ၂ခု	149	0.4
၆	မီးစက် ခန်း	37	0.1
၇	အိမ်ရာ ၅ခု	75	0.2

ဒီဇယ်ကန်ကို ရေသိုလှောင်ကန်များနှင့် အနီးကပ်ထားရှိပြီး၊ ဒီဇယ်ဖြန့်ရာတွင် ထိန်းချုပ်ကိရိယာ တပ်ဆင်ထားပါသည်။ ထို့အပြင် ဒီဇယ်ဖိတ်စင်မှု အရေးပေါ် တုန့်ပြန်ရေးအဖွဲ့နှင့် မီးကာကွယ်ရေးနှင့် အရေးပေါ်တုန့်ပြန်ရေးအဖွဲ့ ဖွဲ့စည်းလှုပ်ကျင့်ထားကြောင်းဖော်ပြထားပါသည်။ အသေးစိတ်ကို Chapter (4) တွင် ရှင်းလင်းတင်ပြထားပါသည်။ အဆိုပြုထားသော စက်ရုံစီမံကိန်းသည် ထုတ်လုပ်မှုပြုလုပ်နေသည့် အဆင့်တွင်ရှိပါသည်။

၁.၄.၂ လုပ်ငန်းလည်ပတ်သည့်အဆင့်

(က) စွမ်းအင်လိုအပ်ချက်

TMP စက်ရုံတစ်ခုလုံးတွင် ရေပေးဝေရေးစနစ်၊ အလင်းရောင်ပေးခြင်း နှင့်ထုတ်လုပ်မှုလုပ်ငန်းစဉ် အစရှိသောလုပ်ငန်းများအတွက် လျှပ်စစ်ဓာတ်အား လိုအပ်ချက်ကို **အစိုးရလျှပ်စစ်ဓာတ်အားလိုင်းမှ** အသုံးပြုပါမည်။ TMP စက်ရုံအတွက် စုစုပေါင်း ဓာတ်အားလိုအပ်ချက်မှာ တစ်လလျှင် ***157,080 kWh*** ဖြစ်ပါသည်။ မော်တော်ယာဉ်အတွက် စုစုပေါင်းဒီဇယ်နှင့်ဓာတ်ဆီလိုအပ်သည်မှာ ခန့်မှန်းခြေအားဖြင့် တစ်လလျှင် 8,513.06 လီတာဖြစ်ပါသည်။ ဒီဇယ်နှင့်ဓာတ်ဆီများကို ဒေသတွင်းဈေးကွက်မှ ဝယ်ယူ၍ စီမံကိန်းဧရိယာသို့ မော်တော်ယာဉ်များဖြင့် ပို့ဆောင်ပါသည်။

(ခ) ရေလိုအပ်ချက်

စီမံကိန်းဧရိယာအတွက် အဓိကရေအရင်းအမြစ်မှာ ***ကိုယ်ပိုင်ဆည်နှင့် ရေတွင်း(၄)တွင်း*** တို့မှ ဖြစ်ပါသည်။ စက်ရုံ၏ ထုတ်လုပ်မှုလုပ်ငန်းစဉ်၊ အအေးခန်းသိုလှောင်ခြင်း၊ ရေခဲထုတ်လုပ်ခြင်း၊ ထမင်းစားဆောင်နှင့် သန့်ရှင်းရေးတို့အတွက် ရေလိုအပ်ပါသည်။ စက်ရုံ၏ စုစုပေါင်းရေလိုအပ်ချက်မှာ **တစ်လလျှင် ၈၇၀,၀၀၀ (ခန့်မှန်း) ဂါလံ** ဖြစ်ပါသည်။

(ဂ) လုပ်အားလိုအပ်ချက်နှင့် ဝန်ထမ်းခန့်ထားမှု

အလုပ်သမားအားလုံးသည် လစဉ်လစာရသော အမြဲတမ်းဝန်ထမ်းများ ဖြစ်ကြပါသည်။ အမြဲတမ်းဝန်ထမ်းအုပ်စုတွင် စာရင်းကိုင်များ၊ ပြုပြင်ထိန်းသိမ်းရေး ဝန်ထမ်းများ၊ အင်ဂျင်နီယာများ၊ ဂိုဒေါင်ဝန်ထမ်းများ၊ ထုတ်လုပ်ရေး ဝန်ထမ်းများ၊ ထောက်ပံ့ပို့ဆောင်ရေးဝန်ထမ်းများ ၊ ယာဉ်မောင်းများ၊ ကောင်တာဝန်ထမ်းများ နှင့် အုပ်ချုပ်ရေးဝန်ထမ်းများ စသည်တို့ပါဝင်ကြပါသည်။

ဇယား ၁.၃ TMP ကုမ္ပဏီ၏ ဝန်ထမ်းအင်အား

ဝန်ထမ်းအမျိုးအစား	ဝန်ထမ်းအရေအတွက်
ယာယီ ဝန်ထမ်း	-
အမြဲတမ်း ဝန်ထမ်း	၂၅၆

(ဃ)ကုန်ကြမ်းပစ္စည်းသိုလှောင်မှုနှင့်သုံးစွဲမှု

(Chlorine chemical များကို chemical storage room တွင်အဝင်/အထွက်စာရင်းပြုလုပ်၍ သိမ်းဆည်းထားပါသည်။သုံးစွဲမှုပါအောက်ပါအတိုင်းဖြစ်ပါသည်။)

Sr	Type of usage	Number	Amount and concentration
1	Raw storage bath	1	160 g/day & 200 ppm/ 200L
2	မနက် ခြေဆေးကန်	2ကန်	160 g/day & 200 ppm/ 200L
3	လက်ဆေးရည်	1ကန်	4g/day & 10ppm /200L
4	သန့်ရှင်းရေး ကြမ်းခင်း		80g/day & 200 ppm /200L
5	ကုန်ကြမ်းအဝင်		20g/day & 50ppm/ 200L
6	ကုန်ချော (ဘူးထုတ်)		4g/day/& 10ppm/200L
7	သန့်ရှင်းရေးခြင်း,ပုံး,ဘမ်း,ခုံ		40g/day &100ppm/ 200L
		1kg/day	
		30kg/month	

(c)ကုန်ချောပစ္စည်းထွက်ရှိမှု

2021မှ2022ထိဝနစ်စုစုပေါင်း ပျမ်းမျှတန်ချိန်-1070.5တန်ရှိပါသည်။

(စ) စွန့်ပစ်ပစ္စည်းစီမံခန့်ခွဲမှု

စက်ရုံရှိအစိုင်အခဲစွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှု

အစိုင်အခဲစွန့်ပစ်ပစ္စည်းများမှာ သားငါးကိုင်ခြင်းမှ ထွက်သည့် (**စားသုံးမှုမပြုနိုင်သော ငါးအစိတ်အပိုင်းများနှင့် အခွံများ**) ဖြစ်ပြီး **ငင်းတို့ကို ဘေးထွက်ပစ္စည်းအဖြစ် အသုံးပြုပါသည်**။ ဥပမာ- အခြား တိရစ္ဆာန်များ၏အစာအဖြစ် ထို့အပြင် **ရေဆိုးမှရရှိသော အနယ်အနှစ်အစိုင်အခဲစွန့်ပစ်ပစ္စည်းများ**လည်း ရှိပါသည်။

အိမ်ထွက် အော်ဂဲနစ် အစားအစာစွန့်ပစ်ပစ္စည်းများ၊ စီမံကိန်းလည်ပတ်နေစဉ် ထွက်ရှိသည့် ပိုးသတ်ဆေးဘူးခွံများ၊ ပျက်စီးသွားသော လောင်စာဆီဘူးများ၊ ဖန်၊ ဘူးခွံ၊ ပုလင်းခွံ၊ ထုပ်ပိုးပစ္စည်းများ၊ စက္ကူ၊ စာရေးကိရိယာများ၊ ပျက်စီး/သက်တမ်းကုန်သော ပစ္စည်းများနှင့်အတူ အခြားအထွေထွေ စွန့်ပစ်ပစ္စည်းများလည်း စက်ရုံမှ ထွက်ရှိပါသည်။ **အမှိုက်ပုံးများကို သင့်တော်သောနေရာတွင်** ထားရှိပါမည်။ စွန့်ပစ်ပစ္စည်းများကို **စက်ရုံ၏ကိုယ်ပိုင်အစီအစဉ်ဖြင့် ကောက်ယူ၍ အမှိုက်ပုံများ၌** စွန့်ပစ်မည်ဖြစ်ပါသည်။

စက်ရုံမှထုတ်လွှတ်သော ရေဆိုးများကို **သံတွဲမြစ်အတွင်းသို့ နောက်ဆုံးစွန့်ပစ်ခြင်းမပြုမီ စွန့်ပစ်ရေသန့်စင်သိုလှောင်ကန် ၅ ခုဖြင့် အဆင့်ဆင့် ဖြတ်သန်းစေပါသည်။စွန့်ပစ်ရေသန့်စင်သိုလှောင်ကန်၏အလျား၊အနံ၊အမြင့်တို့မှာကွန်ကရစ်ရေလှောင်ကန်(၃၂ ပေx၁၁ပေx၁၀ပေ၇လက်မ)၊စက်ပိုင်းပုံရေသိုလှောင်ကန်(အချင်း၈ပေxအမြင့်၇ပေ၉လက်မ)နှင့်နောက်ဆုံး**

အဆင့်ရေသိုလှောင်ကန်(၉ပေခွဲx၉ပေခွဲx၉ပေခွဲ)၊ ပထမကန်၌ ထုံးကျောက်ဖြင့် သန့်စင်ပြီးနောက် **ဒုတိယကန်၌ မီးသွေးဖြင့်** သန့်စင်ပါသည်။ ထို့နောက် **တတိယနှင့်စတုတ္ထ ကန်အသီးသီး၌ ထုံးကျောက်နှင့်မီးသွေးတို့**ဖြင့် ထပ်မံသန့်စင်စေပါသည်။

ထို့ကြောင့် TMP စက်ရုံ၏ လည်ပတ်မှုမှထွက်လာသော **စွန့်ပစ်ပစ္စည်းများ၏ အန္တ၊ မျက်စိပသာဒရှိမှုနှင့် ကျန်းမာရေးအပေါ်** အရေးပါသော သက်ရောက်မှုသည် “**အလယ်အလတ်အဆင့်**” ဖြစ်ပါသည်။ သို့သော် စက်ရုံသည် လုပ်ငန်းဆောင်ရွက်မှုများမှစွန့်ပစ်ပစ္စည်းများအား ပြန်လည်အသုံးချခြင်းကဲ့သို့ **သက်ရောက်မှုလျော့ချရေး အစီအစဉ်များကို ကောင်းမွန်သော ကုန်ထုတ်လုပ်မှုကျင့်သုံးမှု (GMP) နှင့် ဘေးအန္တရာယ်ခွဲခြမ်းစိတ်ဖြာခြင်းနှင့် ထိန်းချုပ်ရေးအချက်များ (HACCP) တို့**အရ အစားအစာဘေးကင်းလုံခြုံရေးအစီအစဉ်များနှင့်အညီ လုပ်ဆောင်နေသောကြောင့် ဆိုးကျိုးသက်ရောက်မှုမှာ သိသာထင်ရှားမှု မရှိနိုင်ပါ။

(c) လုံခြုံရေးနည်းလမ်းများ

လုပ်ငန်းလည်ပတ်နေစဉ် ဝန်ထမ်း / အလုပ်သမားများ၏ လုံခြုံရေးအတွက် အောက်ပါတို့အား တပ်ဆင်အသုံးပြုထားရမည်ဖြစ်ပါသည်။

- နားကြပ်များ
- လက်အိတ်များ
- ဘွတ်ဖိနပ်များ
- ဖုန်မှုန့်ကာကွယ်ရန် နှာခေါင်းစည်းများ
- ဦးထုပ်အမာများ
- ကာကွယ်ရေးဝတ်စုံ ယူနီဖောင်းများ

ငါးလုပ်ငန်းဦးစီးဌာနမှ TMP စက်ရုံအား **ဘေးအန္တရာယ်ခွဲခြမ်းစိတ်ဖြာခြင်းနှင့် ထိန်းချုပ်ရေးအချက်များ (HACCP) အသိအမှတ်ပြုလက်မှတ် (Certificates)** နှင့် **EU မှ အတည်ပြုထားသော ငါးနှင့်သားငါးထွက်ကုန်များအတွက် အသိအမှတ်ပြုနံပါတ်များ (SDY/002/TMP/DOF)** ကို ချီးမြှင့်ထားပါသည်။

၁.၅ အခြားရွေးချယ်စရာကဏ္ဍ

ဆောက်လုပ်ရေးနှင့်လည်ပတ်မှုကြောင့် ဖြစ်ပေါ်လာနိုင်သော သဘာဝပတ်ဝန်းကျင်နှင့် လူမှုရေးထိခိုက်မှုများ အားလုံးကိုကာကွယ်ပေးမည့် အဆိုပြုထားသောစက်ရုံအတွက် အခြားရွေးချယ်စရာဖွံ့ဖြိုးရေးစီမံကိန်းမရှိပါ။

အဏ္ဏဝါနှင့် ငါးလုပ်ငန်း စီမံဆောင်ရွက်မှုအားအကောင်အထည်ဖော်ခြင်းသည် **လူသားတို့အတွက် ရေထွက်အစားအစာများကိုထောက်ပံ့ပေးပြီး** နေ့စဉ်အာဟာရအတွက် အရေးပါသောအခန်းကဏ္ဍမှ ပါဝင်ပါသည်။ ပင်လယ်ထွက်ကုန်များသည် **မြင့်တက်လာသော တစ်ကမ္ဘာလုံးဆိုင်ရာ၊ တိုင်း/ပြည်နယ်ဒေသတွင်းနှင့် ဒေသဆိုင်ရာ စားနပ်ရိက္ခာလိုအပ်ချက်များကို ဖြည့်ဆည်းပေးနိုင်**ပါသည်။

ထို့ကြောင့် စီမံကိန်းလုပ်ဆောင်သူသည် လူမှုရေး၊ စီးပွားရေးနှင့် ထုတ်လုပ်မှုစနစ်များ၏ သဘာဝပတ်ဝန်းကျင် ရေရှည်တည်တံ့ရေးကို ***လျော့ချရေးနည်းလမ်းများ၊ ကျန်းမာရေး၊ လုံခြုံရေးနှင့် ပတ်ဝန်းကျင်ဆိုင်ရာစည်းမျဉ်းများ နှင့် EMPတွင်ဖော်ပြထားသော စီမံခန့်ခွဲမှုအစီအစဉ်ကို*** အသိအမှတ်ပြု လိုက်နာပါက စီမံကိန်းလုပ်ငန်းများ(ဆောက်လုပ်ရေး၊ လည်ပတ်မှုနှင့် ဖျက်သိမ်းခြင်းအဆင့်များ)မှ ထိခိုက်လာနိုင်သည့် **အလုံးစုံသက်ရောက်မှုများ**အား ***နိမ့်သောအဆင့်*** အဖြစ် သတ်မှတ်နိုင်မည်ဖြစ်ပါသည်။

ထို့အပြင် ***စီမံကိန်းလုပ်ဆောင်သူနှင့်ရပ်ရွာလူထုအကြား ကောင်းမွန်သောပူးပေါင်းဆောင်ရွက်မှုရှိပါက*** စက်ရုံလည်ပတ်မှုကြောင့် **အလုပ်အကိုင်အခွင့်အလမ်းများတိုးမြှင့်လာခြင်း၊ အခြေခံအဆောက်အအုံအဆင့်တိုးတက်မြင့်မားလာခြင်းများနှင့် အခြားသော ရပ်ရွာအကျိုးကျေးဇူးရရှိခြင်း**များကဲ့သို့ ပတ်ဝန်းကျင်နှင့် လူမှုရေးဆိုင်ရာအကျိုးကျေးဇူးများ ရရှိပါလိမ့်မည်။

၁.၆ ပတ်ဝန်းကျင် အခြေအနေဖော်ပြချက်၊ လျော့ချရေးနည်းလမ်းများ အပါအဝင် သက်ရောက်မှုနှင့် ဘေးအန္တရာယ်အကဲဖြတ်ခြင်း

၁.၆.၁ ဒေသတွင်းရာသီဥတုနှင့် မိုးလေဝသ

စီမံကိန်းဧရိယာတွင် **အပူပိုင်းမုတ်သုံရာသီဥတု** ရှိပါသည်။ **နှစ်စဉ်ပျမ်းမျှအပူချိန်မှာ *29.8°C* ဖြစ်ပြီး နှစ်စဉ်ပျမ်းမျှမိုးရေချိန်မှာ 92 မီလီမီတာ** ရှိပါသည်။ အခြောက်သွေ့ဆုံးလနှင့် အစိုစွတ်ဆုံးလအကြား မိုးရွာသွန်းမှုခြားနားချက်မှာ ၂၉၈ မီလီမီတာဖြစ်သည်။ တစ်နှစ်တာအတွင်း ပျမ်းမျှအပူချိန်ပြောင်းလဲမှုမှာ ၃ ဒီဂရီစင်တီဂရိတ် ဖြစ်ပါသည်။

(၁) မြေပြင်မိုးလေဝသ

မြေပြင်မိုးလေဝသအချက်အလက်များသည် အပူချိန်၊ စိုထိုင်းဆ၊ လေတိုက်နှုန်းနှင့် လေတိုက်ခတ်မှုဦးတည်ရာတို့ကို ညွှန်ပြပါသည်။ **ပျမ်းမျှအပူချိန်မှာ ၂၈ ဒီဂရီစင်တီဂရိတ် ဝန်းကျင်ရှိပြီး စိုထိုင်းဆ (*relative humidity)*** မှာ **၇၉ ရာခိုင်နှုန်း** ရှိပါသည်။

၁.၆.၂ ပတ်ဝန်းကျင်လေထုအရည်အသွေး

ဒေသဆိုင်ရာရာသီဥတု စောင့်ကြည့်စစ်ဆေးမှုနှင့်အတူ လက်ရှိလေထုအရည်အသွေး ကောက်ယူမှုအား **စက်ရုံဝန်းနှင့် စီမံကိန်းဧရိယာ၏ ၂ ကီလိုမီတာအတွင်း လေတင်နှင့်လေညာ အရပ်၌ရှိသော ကျေးရွာ (၂) ရွာအပါအဝင် နေရာ(၃)နေရာ၌** ၂၀၂၁ မေလတွင် ကောက်ယူခဲ့ပါသည်။

ထို့အပြင် နှိုင်းယှဉ်ကြည့်ရန်အတွက် တင်ပြထားသော သက်ဆိုင်ရာစံချိန်စံနှုန်းများကို အသုံးပြုပါသည်။

စောင့်ကြည့်လေ့လာခြင်းတွင် တိုင်းတာသည့်နေရာများ၌ ၂၄ နာရီပျမ်းမျှ ***(PM10) အမှုန်များ ၊ (PM2.5) အမှုန်များ ၊ ကာဗွန်မိုနောက်ဆိုဒ် (CO)၊ Volatile Organic Compounds (VOC)၊ ဆာလ်ဖာဒိုင်အောက်ဆိုဒ် (SO2) ၊ နိုက်ထရိုဂျင်ဒိုင်အောက်ဆိုဒ် (NO2)၊ အမိုးနီးယား (NH3)၊ မီသိန်း (CH4)၊ အိုဇုန်း (O3) နှင့် မိုးလေဝသအခြေအနေ*** တို့အား တိုင်းတာခဲ့ပါသည်။

တိုင်းတာချက်များအရ စက်ရုံ၌ကုန်ထုတ်လုပ်မှုပြုလုပ်စဉ် ထွက်ရှိသော ***PM10 နှင့် PM2.5 အမှုန်များ***သည် အဓိကလေထုညစ်ညမ်းစေသောအရာများ ဖြစ်ပါသည်။ ယေဘုယျအားဖြင့် ပျမ်းမျှ ၂၄ နာရီအတွက် PM10 နှင့် PM2.5 ထုတ်လွှတ်မှုစုစုပေါင်းသည် ***21 µg/m3*** နှင့် ***8 µg/m3*** အသီးသီးရှိကြပါသည်။ PM10 နှင့် PM2.5 ထုတ်လွှတ်မှုသည် ***ကမ္ဘာ့ကျန်းမာရေးအဖွဲ့ (WHO) ၏လမ်းညွှန်ချက်*** (PM10 အတွက်50µg / m3) နှင့် (PM2.5 အတွက် 25µg / m3) ***ထက်လျော့နည်းပါသည်*** ။

နောက်ထပ် တိုင်းတာသောလေထုညစ်ညမ်းမှုမှာ စက်မှုလုပ်ငန်းမှထုတ်လွှတ်သည်ဟု ယူဆရသော ဆာလ်ဖာဒိုင်အောက်ဆိုဒ် (SO2) ဖြစ်၍ ***17 µg/m3*** ရှိကာ ***WHO ၏လမ်းညွှန်ချက်*** (SO2 အတွက် 20ug / m3) ***ထက်လျော့နည်းပါသည်***။
VOC 53 ppb, NH4 28 µg/m³နှင့် ***methane 149 ppm*** တို့အား လက်ရှိ ပမာဏအဆင့်ကိုဖော်ပြရန် နှင့် နောင်အခါတွင် ဆက်လက်စောင့်ကြည့်အကဲဖြတ်၍ နှိုင်းယှဉ်ရန်အလို့ငှာ တိုင်းတာခဲ့ပါသည်။

စီမံကိန်းနေရာ၏ လေတင်ဝိုင်း၌တည်ရှိသော Nan Taw ကျေးရွာ၏ PM10 နှင့် PM2.5 တို့သည် ***10 µg/m³ and 7 µg/m³*** အသီးသီးဖြစ်ကြပါသည်။
စီမံကိန်းနေရာ၏ **လေညာအရပ်၌ တည်ရှိသော အနီတော်ကျေးရွာ**၏ PM10 နှင့် PM2.5 တို့သည် ***6 µg/m³ and 3 µg/m³*** အသီးသီးဖြစ်ကြပါသည်။ **၎င်းတို့နှစ်ခုလုံးသည် WHO လမ်းညွှန်ချက်နှင့် ကိုက်ညီပါသည်။**
Ammonia နှင့် H_2S တို့ကိုလည်းတိုင်းတာခဲ့ပြီးလေအရည်အသွေးလမ်းညွှန်ချက် guideline နှင့် နှိုင်းယှဉ်ခဲ့ပါသည်။Ammonia level မြင့်တက်မှုရှိပြီး၊ H_2S မှာသတ်မှတ်ထားသော guidelineအတွင်း၌ရှိပါသည်။

လေထုညစ်ညမ်းစေသော ထုတ်လွှတ်မှုအားလုံး၏ သက်ရောက်မှုကို စီမံကိန်းအဆင့်များဖြစ်ကြသည့် (ဆောက်လုပ်ရေး လုပ်ဆောင်နေစဉ်၊ လုပ်ငန်းလည်ပတ်နေစဉ် နှင့် ပိတ်သိမ်းခြင်း အဆင့်များ) အတွက် ***သက်ရောက်မှုဆန်းစစ်ချက်အရ အလယ်အလတ်အဆင့်*** သတ်မှတ်ထားသော်လည်း ဖော်ပြထားသော ***လျော့ချရေးအစီအစဉ်များ***ကို လိုက်နာပါက ***သိသိသာသာလျော့နည်းသွား***ပါလိမ့်မည်။

လေထုအရည်အသွေးတွေ့ရှိချက်မှ အသေးစိတ်အချက်အလက်များကို အောက်ပါအခန်းတွင် ဖော်ပြထားပါသည်။ ထို့အပြင် ထွက်ရှိလာသော လေထုညစ်ညမ်းမှုဖြစ်စေသည့် **အမှုန်များနှင့် အမိုးနီးယားဓာတ်ငွေ့**မှကာကွယ်ရန် အလုပ်သမားများနှင့် အခန်းအတွင်း အလုပ်လုပ်သော ဝန်ထမ်းအဖွဲ့များသည် ထုတ်လုပ်မှုလုပ်ငန်းများ ဆောင်ရွက်နေစဉ်အတွင်း ***အလေ့အကျင့်ကောင်းတစ်ခု***အဖြစ် ***သင့်လျော်သော နှာခေါင်းစည်းများ***ကို တပ်ဆင်ရပါမည်။
စက်ရုံတွင်စက်အသစ်များတပ်ဆင်ထားပါက ***စောင့်ကြည့်စစ်ဆေးခြင်းလုပ်ငန်းစဉ်ကို နှစ်စဉ်*** ပြုလုပ်ရပါမည်။ လျှော့ချရေးအစီအစဉ်များကို သက်ဆိုင်ရာကဏ္ဍများတွင် အသေးစိတ်ဖော်ပြထားပါသည်။

လေထုအရည်အသွေးအပေါ် သက်ရောက်နိုင်သော ရာသီဥတုအခြေအနေသည် ယေဘူယျအားဖြင့် ကောင်းမွန်ပါသည်။

၁.၆.၂ ကာဗွန်ထုတ်လွှတ်မှု

TMP ကုမ္ပဏီမှ CO2 ထုတ်လွှတ်မှုနှင့်စပ်လျဉ်း၍ လျှပ်စစ်ကဏ္ဍမှ CO2 နှင့် ဖန်လုံအိမ်ဓာတ်ငွေ့အား တိုက်ရိုက် ထုတ်လွှတ်ခြင်း မရှိပါ။ ဖြစ်နိုင်ခြေရှိသော ဓာတ်ငွေ့ထုတ်လွှတ်အရင်းအမြစ်မှာ အရံအဖြစ်ထားသော မီးစက်များမှဖြစ်သောကြောင့် "လျစ်လျူရှုနိုင်သောအဆင့်" ဟု သတ်မှတ်ပါသည်။

အဆိုပြုထားသောစက်ရုံသည် လျှပ်စစ်ဓာတ်အားပြတ်တောက်သွားမှသာ ***မီးစက်နှစ်လုံးကို အသုံးပြုပါလိမ့်မည်။ ထိုမီးစက်များသည် ဒီဇယ်လောင်စာသုံးမီးစက်များ ဖြစ်ပါသည်။ မီးစက်များမှ*** စုစုပေါင်းCO2 ထုတ်လွှတ်မှု ပမာဏသည် **တစ်နှစ်**လျှင် ***41,272 kg (41.272 metric tons)***ဖြစ်ပါသည်။ ***လျှပ်စစ်ကဏ္ဍမှ*** စုစုပေါင်းCO2 ထုတ်လွှတ်မှုသည် တစ်နှစ်လျှင် ***1341.07 metric tons*** ဖြစ်ပါသည်။

လောင်စာလောင်ကျွမ်းခြင်းနှင့် ပတ်သက်၍ TMP စက်ရုံမှ အဓိကအားဖြင့် ဒီဇယ်အား **ငါးဖမ်းသင်္ဘောများ၊ ငါးအအေးပုံးသယ်သည့်ကုန်တင်ကားများ၊ ဖယ်ရီကြိုပို့ ဘတ်စ်ကားများနှင့် ရုံးကားများ**တွင်အသုံးပြုပါသည်။ သယ်ယူပို့ဆောင်ရေး ကဏ္ဍမှ CO2 စုစုပေါင်းထုတ်လွှတ်မှုသည် တစ်နှစ်လျှင် ***10,208.589*** **မက်ထရစ်တန်** ဖြစ်ပါသည်။

လက်ရှိတွင် စက်ရုံမှစွန့်ပစ်အမှိုက်များကို **စည်ပင်မှ သိမ်းဆည်း၍ ပြန်လည်အသုံးပြု**ပါသည်။
စွန့်ပစ်အမှိုက်အား အမှိုက်ကျင်းတွင်စွန့်ပစ်သည့်အစား ပြန်လည်အသုံးပြုခြင်း အတွက် ပြောင်းလဲခြင်းတန်ဖိုး (conversion factor) ကို ရရှိစေရန် EPA ၏ Waste Reduction Model (WARM) မှ ထုတ်လွှတ်မှုအချက်များ (EPA 2012) ကို အသုံးပြုခဲ့ပါသည်။
စွန့်ပစ်အမှိုက်အား အမှိုက်ကျင်းတွင်စွန့်ပစ်သည့်အစား ပြန်လည်အသုံးပြုခြင်းကြောင့် လျော့နည်းသော CO2 ***ပမာဏ*** သည် **တစ်နှစ်လျှင်** ***817.5*** **မက်ထရစ်တန်** ဖြစ်ပါသည်။

စွန့်ပစ်အမှိုက်အားအမှိုက်ကျင်းတွင်စွန့်ပစ်သည့်အစား ပြန်လည်အသုံးပြုခြင်းကြောင့် **လျော့နည်းသော CO2** ***ပမာဏကို နှုတ်၍အပြီး*** စက်ရုံမှ ***ကဏ္ဍအားလုံး*** (**လျှပ်စစ် နှင့် သယ်ယူပို့ဆောင်ရေး**) မှ **စုစုပေါင်း CO2 ထုတ်လွှတ်မှုမှာ** တစ်နှစ်လျှင် **10,732.159** ***မက်ထရစ်တန်*** ဖြစ်ပါသည်။

၁.၆.၃ ဆူညံသံ

TMP ကုမ္ပဏီ၏ ဆူညံသံပမာဏကို ***အဓိကတည်နေရာ(၄)နေရာတွင် လေထုတိုင်းတာခြင်းနှင့် အတူ***တိုင်းတာခဲ့ပါသည်။ တိုင်းတာခဲ့သောနေရာများမှာ **စက်ရုံဝန်းအတွင်း၊ လုပ်ငန်းလည်ပတ်သောနေရာ၊ နံတော်ရှာနှင့် အံတော်ရွာ** တို့ ဖြစ်ပါသည်။

စက်ရုံဝန်း၏ဆူညံသံပမာဏသည် **နေ့အချိန်** ***(64 dB)*** နှင့် **ည‌အချိန်** ***(60 dB)*** တို့ဖြစ်ပြီး ပတ်ဝန်းကျင်အရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက် (EQEG) အရသတ်မှတ်ထားသော ***ဆူညံသံစံနှုန်း*** နေ့အချိန် ***(55dB) and*** ည‌အချိန် ***(45dB) ထက် ကျော်လွန်ပါသည်။***

နံတော် ကျေးရွာ၏ဆူညံသံသည် **နေ့အချိန်** ***(50 dB)*** နှင့် **ည‌အချိန်** ***(39 dB)*** တို့ဖြစ်ပြီး ပတ်ဝန်းကျင်အရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက် (EQEG) အရသတ်မှတ်ထားသော ***ဆူညံသံစံနှုန်း*** နေ့အချိန် ***(55dB) and*** ည‌အချိန် ***(45dB) ထက် မကျော်လွန်ပါ။***

အံတော်ကျေးရွာ၏ဆူညံသံသည် နေ့အချိန် ***(45 dB)*** နှင့်ည‌အချိန် ***(37 dB)*** တို့ဖြစ်ပြီး ပတ်ဝန်းကျင်အရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက် (EQEG) အရသတ်မှတ်ထားသော ***ဆူညံသံစံနှုန်း*** နေ့အချိန် ***(55dB) and*** ည‌အချိန် ***(45dB) ထက် မကျော်လွန်ပါ။***

ပတ်ဝန်းကျင်အပေါ် ဆူညံမှုသက်ရောက်ခြင်း အကဲဖြတ်ရာတွင် တွင် "**အလယ်အလတ်**" အဆင့်ဖြစ်သည်ကို တွေ့ရှိရပါသည်။ သို့သော်လည်း စက်ရုံလုပ်ငန်းဆောင်ရွက်မှုများမှ မှ ဆူညံသံအားကာကွယ်ရန် အလုပ်သမားများနှင့် ဝန်ထမ်းများသည် ***ကုန်ထုတ်လုပ်မှုဆောင်ရွက်နေစဉ် နားအုပ်များကို အလေ့အကျင့်ကောင်းတစ်ခုအဖြစ်*** ဝတ်ဆင်ရပါမည်။ စက်ရုံတွင် စက်အသစ်များတပ်ဆင်ပါက ***စောင့်ကြည့်လေ့လာခြင်းလုပ်ငန်းစဉ်ကို နှစ်စဉ်*** ပြုလုပ် ရပါမည်။ လျှော့ချရေးအစီအစဉ်များကို သက်ဆိုင်ရာကဏ္ဍများတွင် အသေးစိတ်ဖော်ပြထားပါသည်။

၁.၆.၄ တုန်ခါမှု

TMP ကုမ္ပဏီ၏ တုန်ခါမှု ပမာဏကို ***အဓိကတည်နေရာ(၃)နေရာတွင် လေထုတိုင်းတာခြင်းနှင့် အတူ*** တိုင်းတာခဲ့ပါသည်။
တိုင်းတာခဲ့သောနေရာများမှာ **စက်ရုံဝန်းအတွင်း၊** စက်ရုံ နှင့် အနီးစပ်ဆုံးဖြစ်သည့် **နံတော် ရွာ** နှင့် **အံတော်** ရွာတို့ ဖြစ်ပါသည်။

စက်ရုံဝန်း၏ တုန်ခါမှုအဆင့်များသည် တိုင်းတာနိုင်သော တန်ဖိုး (detection limit) <0.5m/s2 အောက် ဖြစ်ပြီး ခန္ဓာကိုယ် (WBV) သည် နေ့စဉ်ထိတွေ့မှုကန့်သတ်တန်ဖိုး (ELV) (1.15 m/s2) အောက်တွင် ရှိပါသည်။
နံတော်ကျေးရွာ၏ တုန်ခါမှုအဆင့်များသည် တိုင်းတာနိုင်သော တန်ဖိုး (detection limit) <0.5m/s2 အောက် ဖြစ်ပြီး တကိုယ်လုံးတုန်ခါမှု (WBV) နှင့် နေ့စဉ်ထိတွေ့မှုကန့်သတ်တန်ဖိုး (ELV) (1.15 m/s2) အောက်တွင် ရှိပါသည်။
အံတော် ကျေးရွာ၏ တုန်ခါမှုအဆင့်များသည် တိုင်းတာနိုင်သော တန်ဖိုး (detection limit) <0.5m/s2 အောက် ဖြစ်ပြီး တကိုယ်လုံးတုန်ခါမှု (WBV) နှင့် နေ့စဉ်ထိတွေ့မှုကန့်သတ်တန်ဖိုး (ELV) (1.15 m/s2) အောက်တွင် ရှိပါသည်။

ပတ်ဝန်းကျင်အပေါ် တုန်ခါမှုသက်ရောက်ခြင်း အကဲဖြတ်ချက်အရ ယေဘူယျအားဖြင့် "**အလယ်အလတ်**" အဆင့် သတ်မှတ်ပါသည်။ ထို့ကြောင့် စက်ရုံလုပ်ငန်းစဉ်မှ တုန်ခါမှုကာကွယ်ရန် တုန်ခါမှုအရင်းအမြစ် (ဥ ပမာ compressors)များ သို့မဟုတ် အောက်ခြေမျက်နှာပြင်ကို သီးသန့်ခွဲထားခြင်းကဲ့သို့ လျှော့ချရေးနည်းလမ်းများကို အသုံးပြုရပါမည်။

၁.၇ ဘူမိဗေဒ နှင့် ရေမြေသဘာဝ

၁.၇.၁ ဘူမိဗေဒ

သံတွဲဒေသသည် **တောင်ထူထပ်၍ ရခိုင်ရိုးမတောင်တန်းများသည် ကမ်းရိုးတန်းထိ ရှည်လျားပါသည်။** မြောက်ဘက်ရှိ အချို့သောတောင်များသည် **ပေ ၄၀၀၀ ကျော် (၁၂၀၀ မီတာ)** မြင့်မားပါသည်။

ရေဘူမိဗေဒ

မြို့ပြဧရိယာအချို့ကို အများသုံးရေဖြန့်ဖြူးရေးစနစ်ရေပိုက်လိုင်းများမှ အသုံးပြုနိုင်ပါသည်။
မြို့ပြရှိအိမ်ထောင်စုအချို့သည် ရေဖြန့်ဖြူးပေးသောကွန်ယက်ကို ရရှိနိုင်ပါသည်။ သို့သော် **ကျေးလက်လူထုသည်** သောက်ရေနှင့် သုံးရေအတွက် **ရေတွင်း၊ မိုးရေကန်နှင့် စမ်းချောင်းကို** လုံးလုံးလျားလျား မှီခိုနေရပါသည်။

၁.၇ မြေဆီလွှာအရည်အသွေး

သံတွဲမြို့နယ်တွင် တွေ့ရများသော မြေအမျိုးအစားများမှာ (၁) နီအညိုရောင်သစ်တောမြေ၊ (၂) ဝါညိုရောင် သစ်တောမြေ (၃) စားကျက်မြေ နှင့်(၄) ဆားငံစိမ့်တောမြေ တို့ဖြစ်ကြပါသည်။

၁.၈ အခြေခံ ရေအရည်အသွေး

လူ့ကျန်းမာရေးနှင့်ပတ်ဝန်းကျင်အတွက် အရေးကြီးသော **ဓာတုဗေဒ၊ ရုပ်ပိုင်းဆိုင်ရာနှင့် ဘက်တီးရီးယားဆိုင်ရာ စုစုပေါင်း ရေတိုင်းတာမှု (၈) မျိုးကို** စက်ရုံ၏ စွန့်ပစ်ရေ၊ မြေပေါ်ရေနှင့် မြေအောက်ရေတို့အား **EQEG လမ်းညွှန်ချက်နှင့်အညီ** ခွဲခြမ်းစိတ်ဖြာခဲ့ပါသည်။

၁.၈.၁ စက်ရုံလုပ်ငန်းဆောင်ရွက်မှုမှ ထွက်ရှိသော ရေဆိုး

စက်ရုံ၏ ရေဆိုးတိုင်းတာမှု ရလဒ်များအရ COD၊ Total Nitrogen၊ Total Suspended Solid နှင့် Total Coliform မှလွဲ၍ **BOD5၊ Total Phosphorus နှင့် Oil & Grease** အပါအဝင် တိုင်းတာချက်များသည် စံနှုန်းများနှင့် ကိုက်ညီပါသည်။

ဇယား ၁.၄ စက်ရုံမှထွက်ရှိသော ရေဆိုးရလဒ်များ

No.	တိုင်းတာချက်များ	Unit	စွန့်ပစ်ရေ	WHO Guidelines	National Environmental Quality (Emission) Guidelines	IFC effluent guidelines	မှတ်ချက်
1	BOD5	mg/L	37		≤ 50		ပုံမှန်
2	COD	mg/L	454		≤ 250		စံနှုန်းထက် ကျော်လွန်သော
3	Total Nitrogen (mg/L)	mg/L	58.8	N/A	0.01		စံနှုန်းထက် ကျော်လွန်သော
4	Total Phosphorus (mg/L as P)	mg/L	1.305		2		ပုံမှန်
5	TSS	mg/L	51		≤ 50		စံနှုန်းထက် ကျော်လွန်သော
6	Oil & Grease	mg/L	3	-	≤10	-	ပုံမှန်
7	Total coliform count	CFU/100ml	8994	-	400	-	စံနှုန်းထက် ကျော်လွန်သော
8	Escherichia coli	CFU/100ml	467	-	-	-	-

ဇယား ၁.၅ စက်ရုံမှ ရေဆိုးနမူနာ အချက်အလက်များ

No.	Name	Time	pH(pH)	ORP (mvORP)	DO (%)	EC (mS/cm)	Turbidity (FNU)	Temp (Deg C)	TDS (ppm)	Salinity (PSU)	Pressure (Psi)
1.	Effluent Water	15:30	7.84	91.7	39	2.352	49.8	24.65	1176	1.21	14.538

၁ .၈.၂ ရေနူတ်မြောင်းမှရေ

ရေနူတ်မြောင်းမှရေထွက်ရှိမှု အဓိကအရင်းအမြစ်များမှာ **အိမ်တွင်းအသုံးပြုမှုနှင့် ရေခဲပြုလုပ်သည့်လုပ်ငန်းစဉ်မှ** ဖြစ်ပါသည်။

ရလဒ်များအရ စက်ရုံရေနူတ်မြောင်းမှထွက်လာသော ရေဆိုးများသည် Total Nitrogen နှင့် Total Coliform မှလွဲ၍ **BOD5, COD, Total Phosphorus, Total Suspended Solid နှင့် Oil & Grease** အပါအဝင် တိုင်းတာချက် များသည် **စံနှုန်းများနှင့် ကိုက်ညီပါသည်။**

ဇယား ၁.၆: စက်ရုံ၏ ရေနူတ်မြောင်းမှ ရေတိုင်းတာမှုရလဒ်များ

No.	တိုင်းတာချက်များ	Unit	စွန့်ပစ်ရေ	WHO Guidelines	National Environmental Quality (Emission) Guidelines	IFC effluent guidelines	မှတ်ချက်
1	BOD5	mg/L	1		≤ 50		ပုံမှန်
2	COD	mg/L	41		≤ 250		ပုံမှန်
3	Total Nitrogen (mg/L)	mg/L	3.52	N/A	0.01		စံနှုန်းထက်ကျော်လွန်သော
4	Total Phosphorus (mg/L as P)	mg/L	0.362		2		ပုံမှန်
5	TSS	mg/L	< 10		≤ 50		ပုံမှန်
6	Oil & Grease	mg/L	1	-	≤10	-	ပုံမှန်
7	Total coliform count	CFU/100ml	6894	-	400	-	စံနှုန်းထက်ကျော်လွန်သော
8	Escherichia coli	CFU/100ml	2439	-	-	-	-

ဇယား ၁ .၇ စက်ရုံတွင်းရေနူတ်မြောင်းမှ ရေနမူနာ အချက်အလက်များ

No.	Name	Time	pH(pH)	ORP (mvORP)	DO (%)	EC (mS/cm)	Turbidity (FNU)	Temp (Deg C)	TDS (ppm)	Salinity (PSU)	Pressure (Psi)
1.	Storm Water	15:00	7.77	102.2	60.3	1.165	11	29.73	582	0.57	14.530

၁.၈.၃ အံတော်ကျေးရွာမှ မြေအောက်ရေကိုလေ့လာခြင်း

အန်းတောကျေးရွာ၏ မြေအောက်ရေရလဒ်များအရ **BOD5, COD, Total Phosphorus, Total Suspended Solid, Oil & Grease နှင့် Total coliform count** အပါအဝင် သတ်မှတ်ချက်အားလုံးသည် Total Nitrogen မှလွဲ၍ စံနှုန်းများနှင့် ကိုက်ညီပါသည်။

ဇယား ၁.၈: အံတော် ကျေးရွာမှ မြေအောက်ရေရလဒ်များ

No.	တိုင်းတာချက်များ	Unit	စွန့်ပစ်ရေ	WHO Guidelines	National Environmental Quality (Emission) Guidelines	IFC effluent guidelines	မှတ်ချက်
1	BOD5	mg/L	4		≤ 50		ပုံမှန်
2	COD	mg/L	26		≤ 250		ပုံမှန်
3	Total Nitrogen (mg/L)	mg/L	1.31	N/A	0.01		စံနှုန်းထက် ကျော်လွန်သော
4	Total Phosphorus (mg/L as P)	mg/L	0.127		2		ပုံမှန်
5	TSS	mg/L	21		≤ 50		ပုံမှန်
6	Oil & Grease	mg/L	6	-	≤10	-	ပုံမှန်
7	Total coliform count	CFU/100ml	88	-	400	-	ပုံမှန်
8	Escherichia coli	CFU/100ml	88	-	-	-	-

ဇယား ၁.၉: အံတော် ကျေးရွာမှ မြေအောက်ရေနမူနာ အချက်အလက်များ

No.	Name	Time	pH(pH)	ORP (mvORP)	DO (%)	EC (mS/cm)	Turbidity (FNU)	Temp (Deg C)	TDS (ppm)	Salinity (PSU)	Pressure (Psi)
1.	Ground Water	14:00	7.87	88.6	50.5	0.2	0	30.76	83	0.08	14.635

၁.၈.၄ အမှတ် (၈) ရပ်ကွက်၊ သံတွဲမြို့မှ မြေအောက်ရေကိုလေ့လာခြင်း

အမှတ် (၈) ရပ်ကွက်၊ သံတွဲမြို့မှ မြေအောက်ရေကိုလေ့လာခြင်း ရလဒ်များအရ Total Nitrogen မှလွဲ၍ **BOD5, COD, Total Phosphorus, Total Suspended Solid, Oil & Grease နှင့် Total coliform count** အပါအဝင် **တိုင်းတာချက်အားလုံးသည် စံနှုန်းများနှင့်ကိုက်ညီပါသည်။**

ဇယား ၁. ၁၀ အမှတ် (၈) ရပ်ကွက်၊ သံတွဲမြို့မှ မြေအောက်ရေနမူနာ ရလာဒ်များ

No.	တိုင်းတာချက်များ	Unit	စွန့်ပစ်ရေ	WHO Guidelines	National Environmental Quality (Emission) Guidelines	IFC effluent guidelines	မှတ်ချက်
1	BOD5	mg/L	12		≤ 50		ပုံမှန်
2	COD	mg/L	20		≤ 250		ပုံမှန်
3	Total Nitrogen (mg/L)	mg/L	0.79	N/A	0.01		စံနှုန်းထက်ကျော်လွန်သော
4	Total Phosphorus (mg/L as P)	mg/L	0.029		2		ပုံမှန်
5	TSS	mg/L	<10		≤ 50		ပုံမှန်
6	Oil & Grease	mg/L	2	-	≤10	-	ပုံမှန်

ဇယား ၁. ၁၁ အမှတ် (၈) ရပ်ကွက်၊ သံတွဲမြို့မှ မြေအောက်ရေနမူနာ အချက်အလက်များ

No.	Name	Time	pH(pH)	ORP (mvORP)	DO (%)	EC (mS/cm)	Turbidity (FNU)	Temp (Deg C)	TDS (ppm)	Salinity (PSU)	Pressure (Psi)
1.	Ground Water	11:00	7.87	56.7	39.6	0.3	0	28.42	150	0.14	14.661

၁.၈.၅ သံတွဲမြစ်၏ မြေပေါ်ရေကိုလေ့လာခြင်း

သံတွဲမြစ်၏ မြေပေါ်ရေရလဒ်များအရ COD, Total Nitrogen၊ Oil & Grease နှင့် Total coliform count မှလွဲ၍ **BOD5, Total Phosphorus, Total Suspended Solid** အပါအဝင် တိုင်းတာချက်များ အားလုံးသည် **စံနှုန်းများနှင့် ကိုက်ညီပါသည်။**

ဇယား ၁.၁၂ သံတွဲမြစ်မှ မြေပေါ်ရေရလဒ်များ

No.	တိုင်းတာချက်များ	Unit	စွန့်ပစ်ရေ	WHO Guidelines	National Environmental Quality (Emission) Guidelines	IFC effluent guidelines	မှတ်ချက်
1	BOD5	mg/L	0		≤ 50		ပုံမှန်
2	COD	mg/L	1500		≤ 250		စံနှုန်းထက်ကျော်လွန်သော
3	Total Nitrogen (mg/L)	mg/L	<0.5	N/A	0.01		စံနှုန်းထက်ကျော်လွန်သော
4	Total Phosphorus (mg/L as P)	mg/L	0.031		2		ပုံမှန်
5	TSS	mg/L	5		≤ 50		ပုံမှန်
6	Oil & Grease	mg/L	12	-	≤10	-	စံနှုန်းထက်ကျော်လွန်သော
7	Total coliform count	CFU/100ml	250650409	-	400	-	စံနှုန်းထက်ကျော်လွန်သော
8	Escherichia coli	CFU/100ml	850	-	-	-	-

ဇယား ၁.၁၃ မြေပေါ်ရေနမူနာ အချက်အလက်များ (သံတွဲမြစ်)

WHO၏ သောက်ရေစံချိန်စံညွှန်းများအရ ကျေးရွာများ၏ **Total Nitrogen နှင့် Bacteriological** ရလဒ်မှလွဲ၍

No.	Name	Time	pH(pH)	ORP (mvORP)	DO (%)	EC (mS/cm)	Turbidity (FNU)	Temp (Deg C)	TDS (ppm)	Salinity (PSU)	Pressure (Psi)
1.	Ground Water	11:00	7.87	56.7	39.6	0.3	0	28.42	150	0.14	14.661

စံနှုန်းများကိုပြည့်မီပြီး မြေအောက်ရေအား သောက်သုံးရန်အတွက်ဆိုလျှင် ပိုးသတ်ရန်လိုအပ်ပါသည်။ ထို့အပြင် သောက်ရေ၌ (Total Nitrogen) ပမာဏမြင့်မားခြင်းသည် အထူးသဖြင့်မွေးကင်းစနှင့် ကိုယ်ဝန်ဆောင်အမျိုးသမီးများအား **ကျန်းမာရေးအန္တရာယ်**ဖြစ်စေပါသည်။

အဆိုပြုထားသော စီမံကိန်းမှ မြေပေါ်ရေ နှင့် မြေအောက်ရေအပေါ် သက်ရောက်မှုအကဲဖြတ်ချက်အရ ဆောက်လုပ်ရေး၊ လုပ်ငန်းလည်ပတ်ရေးနှင့် ဖျက်သိမ်းရေး ကာလများအတွင်း ယေဘူယျအားဖြင့် “**အလယ်အလတ်**” အဆင့် အဖြစ်သတ်မှတ်ပါသည်။ လျှော့ချရေးနည်းလမ်းများနှင့်အညီ လုပ်ငန်းလည်ပတ်မှုများကို အနီးကပ်စောင့်ကြည့် ဆောင်ရွက်ပါက **သက်ရောက်မှုကို “လျစ်လျူရှုနိုင်သော” အဆင့်**ထိ လျော့နည်းစေပါလိမ့်မည်။ လျှော့ချရေးအစီအမံများကို သက်ဆိုင်ရာကဏ္ဍများတွင် အသေးစိတ်ဖော်ပြထားပါသည်။

၁.၉ မြေဆီလွှာ အရည်အသွေး

အန်တော် ကျေးရွာ နှင့် **အမှတ်(၈) ရပ်ကွက်** မှ ပတ်ဝန်းကျင်ကျန်းမာရေးအတွက် သိသိသာသာအရေးပါသော **ဓာတုဗေဒနှင့်ရုပ်ပိုင်းဆိုင်ရာ မြေဆီလွှာတိုင်းတာချက်(၈) မျိုးအားတိုင်းတာ၍ FAOမှ မြေစံချိန်စံညွှန်းများနှင့်အညီ နှိုင်းယှဉ်ခဲ့ပါသည်။**

တွေ့ရှိချက်များအရ လက်ရှိမြေကြီးသည် အပင်များနှင့်တိရိစ္ဆာန်များကို အန္တရာယ်ဖြစ်စေသော **သတ္တု ညစ်ညမ်းမှု မရှိဟု ယူဆရသည်။** မြေဆီလွှာအရည်အသွေးတွေ့ရှိချက် အသေးစိတ်အချက်အလက်များကို အောက်ပါကဏ္ဍာတွင် ဖော်ပြထားပါသည်။

ဇယား ၁.၁၄ Ann Taw ကျေးရွာမှ မြေအား ခွဲခြမ်းစိတ်ဖြာခြင်း

Sr.no	တိုင်းတာချက်များ	Unit	ရလာဒ်များ	FAO Soil Bulletin 65 & Dutch Standards	Department of Agriculture (Land Use), Mandalay
1	Moisture	%	3.45		
2	pH	1:2.5	6.72		သဘာဝနီးပါး
3	EC	1:5	0.07		အလွန်နိမ့်သော
4	Total N	%	0.09		အလွန်နိမ့်သော
5	Available P	ppm	6.82		နိမ့်သော
6	Available K_2O	mg/100g	8.69		နိမ့်သော
7	Exchangeable K	meq/100g	0.18		နိမ့်သော
8	Texture				
	Sand	%	40.3		နုန်းမြေ
	Silt	%	43.83		
	Clay	%	15.87		

ဇယား ၁.၁၅ အမှတ်(၈)ရပ်ကွက်၊ သံတွဲမြို့မှ မြေအား ခွဲခြမ်းစိတ်ဖြာခြင်း

Sr.no	တိုင်းတာချက်များ	Unit	ရလာဒ်များ	FAO Soil Bulletin 65 & Dutch Standards	Department of Agriculture (Land Use), Mandalay
1	Moisture	%	3.74		
2	pH	1:2.5	5.43		အတန်အသင့် အက်ဆစ်ဓာတ်ရှိသော
3	EC	1:5	0.18		နိမ့်သော
4	Total N	%	0.25		အလယ်အလတ်
5	Available P	ppm	30.51		အလယ်အလတ်
6	Available K_2O	mg/100g	34.26		မြင့်မားသော
7	Exchangeable K	meq/100g	0.73		မြင့်မားသော

8	Texture				
	Sand	%	58.3		သဲဆန်သောနုန်းမြေ
	Silt	%	31.03		
	Clay	%	12.67		

လုပ်ငန်းဆောင်ရွက်စဉ်ကာလအတွင်း အစိုင်အခဲအမှိုက်များ၊ ရေဆိုးများနှင့် ဓာတုဗေဒပစ္စည်းများ မတော်တဆယိုဖိတ်မှုအပေါ် မှားယွင်းသောစီမံခန့်ခွဲမှုသည် **မြေဆီလွှာညစ်ညမ်းမှု**ကို ဖြစ်စေနိုင်ပါသည်။ ထို့ကြောင့် TMP စက်ရုံ၏လည်ပတ်မှုအဆင့်တွင် မြေဆီလွှာအရည်အသွေးအပေါ်သက်ရောက်မှုကို "**အလယ်အလတ်အဆင့်**"ဟု သတ်မှတ်ပါသည်။ သို့သော် **လျော့ချရေးအစီအမံများကို လိုက်နာပါက မြေဆီလွှာအရည်အသွေး အပေါ်သက်ရောက်မှုသည် လျော့နည်းလာ**ပါလိမ့်မည်။

Total Nitrogen များပြားမှု ပမာဏကို လျော့ချနိုင်ရန် Chapter (6) mitigation measure တွင် ထည့်သွင်းဖော်ပြထားပါသည်။ အဓိကအားဖြင့် စွန့်ပစ်ရေသန့်စင်သည့် နောက်ဆုံးအဆင့် ပြီးလျှင် (unsaturated biofilter (nitrification) နှင့်Saturated biofilter (Denitrification) များ ထပ်မံ၍ ထည့်သွင်းသင့်ကြောင်း ဖော်ပြထားပါသည်။

ကျေးရွာများ၏ မြေအောက်ရေအတွက် အော်ဂဲနစ် ကုန်ကြမ်းများ (ဥပမာ- အုန်းခွံ (သို့) ကျောက်မီးသွေး) မှ ပြုလုပ်ထားသည့် Granular activated carbon ကို နိုက်ထရိုဂျင် ဖယ်ရှားရန်အတွက် အသုံးပြုနိုင်ပါသည်။

၁.၁၀ ဇီဝပတ်ဝန်းကျင်နှင့်ယဉ်ကျေးမှုအမွေအနှစ်

ဇီဝမျိုးစုံမျိုးကွဲများ နှင့် ဂေဟစနစ်အား ဖော်ထုတ်ရန် ဇီဝမျိုးစုံမျိုးကွဲဆန်းစစ်ခြင်းကို စီမံကိန်းနေရာအနီးတစ်ဝိုက် (၂) ကီလိုမီတာအတွင်းတွင် ပြုလုပ်ခဲ့ပါသည်။

မျိုးစိတ်ဖွဲ့စည်းမှု၊ သိပ်သည်းဆနှင့် ဖြန့်ဖြူးမှုကို ဖော်ထုတ်ရန် **သစ်ပင်ပန်းမန်စစ်တမ်းကောက်ယူမှု** ကို ***forest inventory method*** ဖြင့် ပြုလုပ်ခဲ့ပါသည်။ စစ်တမ်းတွင် **အပင်မျိုးစိတ် စုစုပေါင်း ၂၁ မျိုးကို** တွေ့ရှိခဲ့ပါသည်။ စီမံကိန်းဧရိယာတွင်အဓိကမျိုးစိတ်များဖြစ်သော ဘုံမဲဇာ၊ သီဟိုဠ်၊ တောင်သရက်၊ အင်ကြင်းနှင့် ပျဉ်းကတိုး တို့ဖြစ်ကြပါသည်။ **တောင်သရက်သစ်ပင်**များ ပြန်လည်အပင်ပေါက်ခြင်းကို သစ်တောဇီနေရာတိုင်းတွင် တွေ့ရပါသည်။

သဘာဝတောရိုင်းတိရစ္ဆာန်စစ်တမ်းနှင့် ပတ်သက်၍ အဆိုပြုထားသော စီမံကိန်းဧရိယာတွင် **အပင်အမျိုးအစားများနှင့် မျိုးသုဉ်းလုနီးပါးမျိုးစိတ်များ** ကိုဖော်ထုတ်ရန် ***sample plotting methods, random transect methods*** နှင့် ရိုးရာဇီဝမျိုးစုံမျိုးကွဲဆန်းစစ်ခြင်းနည်းလမ်းတို့ကို အသုံးပြုခဲ့ပါသည်။

ကွင်းဆင်းစစ်တမ်းများနှင့် လူထုတွေ့ဆုံမေးမြန်းမှုများအရ **နို့တိုက်သတ္တဝါမျိုးစိတ် ၆ မျိုး၊ ငါးမျိုးစိတ် ၂၄ မျိုး၊ ငှက်မျိုးစိတ် ၈ မျိုးနှင့် တွားသွားနှင့် ကုန်းနေရေနေသတ္တဝါမျိုးစိတ် ၁၅ မျိုး** တို့ကို ဖော်ထုတ်ခဲ့ပါသည်။

စီမံကိန်းဧရိယာ၌ ကွင်းဆင်းစစ်တမ်း နှင့် **ဒေသရှိသံတွဲငါးဈေးကွက်စစ်တမ်းနှစ်ခုအရ** ငါးမျိုးစိတ်များအတွက် **မျိုးသုဉ်းလုနီးပါးမျိုးစိတ် နှစ်မျိုး၊ Least Concern မျိုးစိတ် နှစ်ဆယ်** နှင့် **Not Evaluated (NE) မျိုးစိတ် နှစ်ခုကို** တွေ့ရှိရပါသည်။

သံတွဲမြို့အနီးတစ်ဝိုက်တွင် **ယဉ်ကျေးမှုနှင့် သဘာဝအမွေအနှစ်နေရာ များစွာ**ရှိပါသည်။

စီမံကိန်း၏ ၂ ကီလိုမီတာအတွင်းတွင်ရှိသော သမိုင်းဝင်စေတီပုထိုးများမှာ **တန့်တော်မူ ဘုရား နှင့် ရွှေဆံတော် ဘုရား** တို့ ဖြစ်ကြပါသည်။

TMP စက်ရုံ၏ ၂ ကီလိုမီတာ အတွင်းတွင်တည်ရှိသောကြောင့် ဇီဝမျိုးစုံမျိုးကွဲများနှင့် ယဉ်ကျေးမှုအမွေအနှစ်များအပေါ် **သက်ရောက်မှုအရေးပါမှုကို အလယ်အလတ်အဆင့်ဟု** သတ်မှတ်ပါသည်။ သို့သော်လည်း **သက်ရောက်မှု လျှော့ချရေးနည်းလမ်းများကို** လိုက်နာပါက သက်ရောက်မှုများသည် **လျစ်လျူရှုနိုင်သောအဆင့်**ထိ ရောက်ရှိနိုင်ပါသည်။

၁.၁၁ စုပေါင်းသက်ရောက်မှုအကဲဖြတ်ခြင်း

စစ်တမ်းကောက်ယူမှုနှင့် အနီးအနားရှိလူထုနှင့် တွေ့ဆုံမေးမြန်းမှုများအရ TMP စက်ရုံအနီးတစ်ဝိုက်တွင် **အလားတူ ရေထွက်ကုန်ပစ္စည်းများ ထုတ်လုပ်သော လုပ်ငန်းမရှိပါ။**

လေထုအရည်အသွေးအပေါ် စုပေါင်းသက်ရောက်မှု

သို့သော်လည်း စက်ရုံမှအလားအလာရှိသောသက်ရောက်မှုများသည် ဒေသတွင်းသွားလာလှုပ်ရှားမှုများဖြစ်သော **ဈေးများနှင့်စားသောက်ဆိုင်များ (ကော်ဖီဆိုင်များ)၊ ဘတ်စ်ကားဂိတ်၊ ကားဝန်ဆောင်မှုပေးသောနေရာများ နှင့် အခြားစီးပွားရေးလုပ်ငန်းများ** စသည်တို့နှင့် စုပေါင်း၍ လက်ရှိလေထုအရည်အသွေးအပေါ် သက်ရောက်မှု တိုးမြှင့်စေနိုင်ပါသည်။

ဆူညံသံအရည်အသွေးအပေါ် စုပေါင်းသက်ရောက်မှု

TMP စက်ရုံ၏ **compressor များ၊ မီးစက်များနှင့် မော်တော်ယာဉ်များ** အစရှိသည့် လုပ်ငန်းဆောင်ရွက်မှုများသည် စက်ရုံအနီးတစ်ဝိုက်၌ တစ်ပြိုင်နက်လည်ပတ်နေသော **နဂိုရှိပြီးသား အခြားစီးပွားရေး လုပ်ငန်းများ** မှ **ဆူညံသံများနှင့် စုပေါင်းသက်ရောက်မှုများ** ဖြစ်ပေါ်ကာ အခြေခံဆူညံသံအဆင့်ကို တိုးမြှင့်စေနိုင်ပါသည်။

ရေအရည်အသွေးအပေါ် စုပေါင်းသက်ရောက်မှု

TMP စက်ရုံသည်လက်ရှိတွင် ကိုယ်ပိုင်ရေလှောင်ကန်နှင့် ရေတွင်းများမှ ရေများကိုအသုံးပြုနေသည်။ **စက်ရုံလုပ်ငန်းစဉ် သဘောသဘာဝအရ ရေသုံးစွဲမှုပမာဏအပေါ် စုပေါင်းသက်ရောက်မှု ပိုမိုများပြားလာလိမ့်မည်။**

ယာဉ်သွားလာမှုအပေါ် စုပေါင်းသက်ရောက်မှု

စက်ရုံ၏လက်ရှိလုပ်ဆောင်ချက်များ နှင့် **စက်ရုံအနီးရှိဘတ်စ်ကားမှတ်တိုင်**ကြောင့် TMP စက်ရုံ အနီးတစ်ဝိုက်၌ **မော်တော်ယာဉ်နှင့်ကုန်တင်ယာဉ်အသွားအလာ တိုးတက်လာ**လိမ့်မည်။

၇.၆ အစိုင်အခဲစွန့်ပစ်ပစ္စည်းများ နှင့်ရေဆိုးများအပေါ် စုပေါင်းသက်ရောက်မှု

သံတွဲတွင် စည်ပင်အမှိုက်သိမ်းစနစ်မရှိသောကြောင့် **ရေဆိုးသန့်စင်မှုမှ ထွက်ရှိသော အနည်အနှစ်များ၊ စက်ရုံလုပ်ငန်းမှထွက်သောစွန့်ပစ်ပစ္စည်းများ များ**နှင့် **အိမ်ထွက်စွန့်ပစ်ပစ္စည်းများ** ကို စက်ရုံ၏ကိုယ်ပိုင်အစီအစဉ်ဖြင့် စွန့်ပစ်ပါသည်။

ထို့ပြင် စက်ရုံမှစွန့်ပစ်အမှိုက်များနှင့် **စက်ရုံဝန်းတစ်ဝိုက်ရှိ ရပ်ကွက်အသီးသီးမှ ထွက်သော အစိုင်အခဲစွန့်ပစ်ပစ္စည်းများသည်** အထူးသဖြင့် **ကျန်းမာရေး၊ အလှအပနှင့်အနှံ့ဆိုင်ရာပြဿနာများ**ကဲ့သို့ **ပတ်ဝန်းကျင်အပေါ် ဝိုမိုဆိုးရွားစေသော စုပေါင်းသက်ရောက်မှုများ** ဖြစ်ပေါ်စေပါသည်။

စက်ရုံမှစွန့်ပစ်သောရေဆိုးများနှင့် **ဒေသခံလူထုဆီမှထွက်သော အခြားရေဆိုးများ**သည် မြစ်ရေ နှင့် မြစ်ထဲမှအပင်နှင့်သတ္တဝါများအပေါ် သိသာထင်ရှားသော စုပေါင်းသက်ရောက်မှုများ ဖြစ်ပေါ်စေနိုင်ပါသည်။

ဒေသဆိုင်ရာအဆင့်တွင်ဖော်ထုတ်တွေ့ရှိသော **စုပေါင်းသက်ရောက်မှုများသည် အလယ်အလတ်အဆင့် အရေးပါ**ပါသည်။ ထုတ်လွှတ်မှုများနှင့်စွန့်ပစ်ရေများ၏ **သက်ရောက်မှုပမာဏသည် မကြီးမားသောကြောင့် တိုင်း/ပြည်နယ်အဆင့်**နှင့် **နိုင်ငံတော်အဆင့်** သဘာဝပတ်ဝန်းကျင်အပေါ် **သိသာထင်ရှားသော စုပေါင်းသက်ရောက်မှုများ မရှိနိုင်**ဟု ယူဆရပါသည်။

၁.၁၂ ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ် (EMP)

ဆောက်လုပ်ရေး၊ လုပ်ငန်းလည်ပတ်ရေးနှင့် ဖျက်သိမ်းရေးအဆင့်များတစ်လျှောက်လုံး ဆောင်ရွက်ရမည့် အဓိက ပတ်ဝန်းကျင် **စီမံခန့်ခွဲမှုအစီအစဉ်ကို လေထုညစ်ညမ်းမှုထိန်းချုပ်ရေး၊ အသံ၊ တုန်ခါမှု၊ မြေဆီလွှာ၊ ရေသယံဇာတ၊ အစိုင်အခဲစွန့်ပစ်ပစ္စည်း၊ ရေဆိုး၊ ဂေဟစနစ်၊ ကျန်းမာရေးနှင့်လုံခြုံရေး**တို့အတွက် **စောင့်ကြည့်စစ်ဆေးခြင်း၊ အကောင်အထည်ဖော်ခြင်း၊ ကြိုးကြပ်မှုနှင့်အစီရင်ခံမှုစနစ်တို့အပါအဝင် သက်ရောက်မှုလျှော့ချရေးနည်းလမ်းများဖြင့်** အသေးစိတ် ဖော်ပြထားပါသည်။

ရေဆိုးသန့်စင်မှု နှင့် အမိုးနီးယားဓာတ်ငွေ့ယိုစိမ့်မှုမတော်တဆဖြစ်စဉ်တို့အတွက် ပတ်ဝန်းကျင် စီမံခန့်ခွဲမှုအစီအစဉ်ကို အသေးစိတ်ဖော်ပြထားပါသည်။

ထို့ပြင် စက်ရုံ၏မူဝါဒနှင့်အညီ ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်များကို ထိထိရောက်ရောက်ဆောင်ရွက်နိုင်ရန်အတွက် **စီမံခန့်ခွဲမှုမန်နေဂျာ /HSE အရာရှိ၊ စီမံကိန်း စီမံခန့်ခွဲမှုအဖွဲ့၊** သတ်မှတ်ထားသော HSE အဖွဲ့**တို့၏ အခန်းကဏ္ဍနှင့် တာဝန်များ**ကို သတ်မှတ်ထားရပါမည်။
အစီရင်ခံမှုစနစ်နှင့်ပတ်သက်၍ **စောင့်ကြည့်စစ်ဆေးရမည့်အကြိမ်အရေအတွက်**ကို ကဏ္ဍတစ်ဦးချင်းစီအလိုက် **အပတ်စဉ်မှ နှစ်စဉ်** အထိ ခွဲခြားသတ်မှတ်ထားပါသည်။

သက်ရောက်မှုအကဲဖြတ်ခြင်း၏ရလဒ်အနေဖြင့် စီမံကိန်းလျှော့ချရေးအစီအမံများကို လိုက်နာဆောင်ရွက်ပါက အဓိက သဘာဝပတ်ဝန်းကျင်နှင့်လူမှုရေးပြဿနာများ မရှိကြောင်း တွေ့ရှိရပါသည်။

စီမံကိန်းလုပ်ငန်းများ၊ အဓိကသက်ရောက်မှုလျှော့ချရေးနည်းလမ်းများနှင့် စောင့်ကြည့်လေ့လာရေးအစီအစဉ်များကို အကျဉ်းချုပ်၍ **ဇယား ၁.၁၆** တွင် ဖော်ပြထားပါသည်။

ဇယား ၁.၁၆ အဓိကသက်ရောက်မှုလျှော့ချရေးအစီအစဉ်များနှင့် စောင့်ကြည့်လေ့လာရေးအစီအစဉ်များ

သက်ရောက်မှု	စီမံကိန်းလုပ်ငန်းများ/ ပတ်ဝန်းကျင် အပေါ်သက်ရောက်မှုများ	အဆိုပြုထားသော လျှော့ချရေးအစီအစဉ်များ	စောင့်ကြည့်လေ့လာခြင်း		
			အကောင်အထည်ဖော်ခြင်း	ကြီးကြပ်ခြင်း	အစီရင်ခံခြင်း
လေအရည်အသွေး	အော်ဂဲနစ်ပစ္စည်းများ ပျက်စီးခြင်းမှ **အနံ့ဆိုးထုတ်လွှတ်ခြင်း**	• ငါးလုပ်ငန်းဆောင်ရွက်ခြင်းမှ **စွန့်ပစ်ပစ္စည်းများအား ပြန်လည်အသုံးပြုနိုင်ရန် ကောင်းမွန်သော ကုန်ထုတ်လုပ်မှု အလေ့အကျင့် Good Manufacturing Practice**)GMP) ၊ **အန္တရာယ်ဆန်းစစ်ခြင်းနှင့် အရေးပါသောထိန်းချုပ်ရေးအချက်များ Hazard Analysis and Critical Control Points (**HACCP) အရ ဆောင်ရွက်ခြင်းဖြင့် စားနပ်ရိက္ခာလုံခြုံမှုရှိစေခြင်း • **ရေထွက်ပစ္စည်းအပိုင်းအစများနှင့် အညစ်အကြေးများ**ကို ပြန်လည်အသုံးပြုသင့်၍	Operation Manager/ HSE အရာရှိမှ - **• လုပ်ငန်းခွင် စစ်ဆေးမှုကို နေ့စဉ်ပြုလုပ်ခြင်း**	စက်ရုံရှိ စီမံခန့်ခွဲရေး အဖွဲ့ နှင့်/သို့မဟုတ် သတ်မှတ်ထားသည် HSE အဖွဲ့	**အပတ်စဉ် အထွေထွေ လုပ်ငန်း အခြေအနေ အစီရင်ခံစာ** **နှစ်စဉ် လေအရည်အသွေး အစီရင်ခံစာ**

		ယိုယွင်းပျက်စီးခြင်းမှ ကာကွယ်ရန် **ဘေးထွက်ပစ္စည်း စီမံသည့်နေရာသို့** အချိန်မီ ပို့ဆောင်ခြင်း။ • **စွန့်ပစ်ပစ္စည်းမှအနည်များကို အခြောက်ခံ ခြင်း**			
သက်ရောက်မှု	**စီမံကိန်းလုပ်ငန်းများ/ ပတ်ဝန်းကျင် အပေါ်သက်ရောက်မှုများ**	**အဆိုပြုထားသော လျှော့ချရေးအစီအစဉ်များ**	**စောင့်ကြည့်လေ့လာခြင်း**		
			အကောင်အထည်ဖော်ခြင်း	**ကြီးကြပ်ခြင်း**	**အစီရင်ခံခြင်း**
ဆူညံသံ	**စက်ရုံ လုပ်ငန်းများ** (ကွန်ပရက်ဆာများ၊ မီးစက်များ) မော်တော်ယာဉ်မှ ကုန်အတင်အချ ပြုလုပ်ခြင်း	• စက်ကိရိယာများမှ ဆူညံသံများအား လျှော့ချရန် **ပုံမှန်ထိန်းသိမ်းမှု**ကို သေချာပြုလုပ်ခြင်း • ဒီဇယ်/ဓာတ်ငွေ့သုံးစက်ယန္တရားများ၌ **အသံတိတ်ကိရိယာများကို အသုံးပြုရန်။** • **မီးစက်အားလုံး**အတွက် **အကာအကွယ်များ** အသုံးပြုရန် • **ဆူညံသံ နည်းသော စက်ကိရိယာများ**ကို အသုံးပြုရန်။ • စံနှုန်းများထက် ကျော်လွန်ပါက ဆူညံသံ အား **အချိန်နှင့်တပြေးညီ စစ်ဆေးခြင်း၊**	Operation Manager/ HSE အရာရှိမှ - • ဆူညံသံတုန်ခါမှု အနည်းဆုံး ဖြစ်အောင် ဆူညံသံ အရင်းအမြစ် များအား **စနစ်တကျထိန်းသိမ်းခြင်း** • မျှော်လင့်မထားသော အဖြစ်အပျက်များ ရှိလျှင် သတင်းပို့ခြင်း	စက်ရုံရှိ စီမံခန့်ခွဲရေး အဖွဲ့ နှင့်/သို့မဟုတ် သတ်မှတ်ထားသည် HSE အဖွဲ့	**အပတ်စဉ် အထွေထွေ လုပ်ငန်း အခြေအနေ အစီရင်ခံစာ** **နှစ်စဉ် ဆူညံသံ အရည်အသွေး အစီရင်ခံစာ**

		သင့်တော်သော **လျှော့ချရေး အစီအစဉ်များ လုပ်ဆောင်ခြင်း** • ဆူညံသံအား တားဆီးထားရန် အပင်များ ပတ်ပတ်လည် စိုက်ပျိုးထားခြင်း			
သက်ရောက်မှု	**စီမံကိန်းလုပ်ငန်းများ/ ပတ်ဝန်းကျင် အပေါ်သက်ရောက်မှုများ**	**အဆိုပြုထားသော လျှော့ချရေးအစီအစဉ်များ**	**စောင့်ကြည့်လေ့လာခြင်း**		
			အကောင်အထည်ဖော်ခြင်း	**ကြီးကြပ်ခြင်း**	**အစီရင်ခံခြင်း**
ရေ အရင်းအမြစ်များ		• ရေကိုအတတ်နိုင်ဆုံး **ထပ်မံအသုံးပြုခြင်းနှင့် ပြန်လည် အသုံးချခြင်း** အား မြှင့်တင်ခြင်း • ရေပိုက်များနှင့် တိုင်ကီများမှ **ယိုစိမ့်မှုများအား ချက်ချင်း ရှာဖွေပြုပြင်ခြင်း** • ဝန်ထမ်းများအား **ရေထိန်းသိမ်းရေး အသိပညာပေးခြင်း**	Operation Manager/ HSE အရာရှိမှ - • ယိုစိမ့်မှုမှန်သမျှအတွက် **အမြင်အားဖြင့် ပုံမှန်စစ်ဆေးမှု** ပြုလုပ်ခြင်း။ • ကုန်ပစ္စည်းအရည်အသွေး ထိန်းသိမ်းရန် **ရေခဲအလုံအလောက် အသုံးပြုခြင်း**နှင့် ရေခဲထုတ်လုပ်မှုကို လိုအပ်သောပမာဏနှင့် **ကိုက်ညီမှုရှိအောင် ချိန်ညှိထုတ်လုပ်ခြင်း**	စက်ရုံရှိ စီမံခန့်ခွဲရေး အဖွဲ့ နှင့်/သို့မဟုတ် သတ်မှတ်ထားသည် HSE အဖွဲ့	**အပတ်စဉ် အထွေထွေ လုပ်ငန်း အခြေအနေ အစီရင်ခံစာ** **နှစ်စဉ် ရေအရည်အသွေး အစီရင်ခံစာ**
သက်ရောက်မှု	**စီမံကိန်းလုပ်ငန်းများ/ ပတ်ဝန်းကျင် အပေါ်သက်ရောက်မှုများ**	**အဆိုပြုထားသော လျှော့ချရေးအစီအစဉ်များ**	**စောင့်ကြည့်လေ့လာခြင်း**		

			အကောင်အထည်ဖော်ခြင်း	**ကြီးကြပ်ခြင်း**	**အစီရင်ခံခြင်း**
စွန့်ပစ်ပစ္စည်း	အစိုင်အခဲ စွန့်ပစ်ပစ္စည်း ၊ အရည် စွန့်ပစ်ပစ္စည်း နှင့်အန္တရာယ်ရှိသော စွန့်ပစ်ပစ္စည်းများ ထွက်ရှိခြင်း နှင့်စွန့်ပစ်ခြင်း မလျော်ကန်သော စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှု။	• **ဖမ်းရန် ရည်ရွယ်မထားသော** ငါးမျိုးစိတ်များ ဖမ်းဆီးမိခြင်းအား **လျော့ကျစေရန်ငါးဖမ်းသင်္ဘောများ**ကို မှာကြားထားခြင်း • ငါးလုပ်ငန်းဆောင်ရွက်ခြင်းမှ **စွန့်ပစ်ပစ္စည်းများအား ပြန်လည်အသုံးပြုနိုင်ရန် ကောင်းမွန်သော ကုန်ထုတ်လုပ်မှု အလေ့အကျင့် Good Manufacturing Practice**)GMP) ၊ **အန္တရာယ်ဆန်းစစ်ခြင်းနှင့် အရေးပါသောထိန်းချုပ်ရေးအချက်များ Hazard Analysis and Critical Control Points**) HACCP)အရ ဆောင်ရွက်ခြင်းဖြင့် စားနပ်ရိက္ခာလုံခြုံမှုရှိစေခြင်း • ရေနုတ်မြောင်းများကိုပုံမှန်နှင့် အခါအားလျော်စွာ ထိန်းသိမ်းခြင်း	Operation Manager/ HSE အရာရှိမှ - • အမှိုက်စွန့်ပစ်မှု လိုက်နာခြင်းကို စစ်ဆေးရန် log template ထားရှိခြင်း • ထုတ်လုပ်မှုလုပ်ငန်းစဉ် တစ်ခုစီမှ အမှိုက်ထွက်ရှိခြင်းကို မှတ်တမ်းတင်ခြင်း • စွန့်ပစ်ပစ္စည်း မှန်သမျှကို သေချာစစ်ဆေးပါ • နည်းလမ်းမှန်ကန်စွာ အမှိုက်စွန့်ပစ်ရန် သေချာမှုရှိစေခြင်း • စွန့်ပစ်ပစ္စည်းကွန်တိန်နာများအား ကြည့်ရှု စစ်ဆေးပြီး သက်ဆိုင်ရာမှတ်တမ်းတွင် ဖြည့်သွင်းခြင်း။ မှတ်တမ်းများသည် စစ်ဆေးမှုများပြုလုပ်ပြီးကြောင်း အထောက်အထားများဖြစ်ပါသည်။	စက်ရုံရှိ စီမံခန့်ခွဲရေး အဖွဲ့ နှင့်/သို့မဟုတ် သတ်မှတ်ထားသည် HSE အဖွဲ့	**အပတ်စဉ် အထွေထွေ လုပ်ငန်း အခြေအနေ အစီရင်ခံစာ**

		• **ကိုယ်တွင်းအင်္ဂါများ**နှင့် အခြားပစ္စည်းများအား **သီးခြားစီစုဆောင်းခြင်း** • ရေဖြင့်မသန့်ရှင်းမီ **ရှေးဦးစွာ ရေမပါဲ သန့်ရှင်းရေးပြုလုပ်ခြင်း** • ကြမ်းပြင်များနှင့် အညစ်အကြေး စုသော လမ်းကြောင်းများတွင် **အကာများ တပ်ဆင်ထားခြင်း** • **ရေဆိုးထွက်ပေါက်များတွင် ဇကာများ၊** အဆီ ဖယ်ရှားသောအကာများ တပ်ဆင်ခြင်း • **ဆိုင်းကြွ အနယ်များအား** သန့်ရှင်းပေးသော စက် ပစ္စည်များ (သို့) ကန်များဖြင့် အနည်ထိုင်စေ၍ **လျှော့ချခြင်း**	• ဝန်ထမ်းအားလုံး 4Rs တွင်တက်ကြွစွာ ပါဝင်ရန် ပညာပေးခြင်း၊ လေ့ကျင့်ရေး အစီအစဉ်များနှင့် ပြိုင်ပွဲများကျင်းပပေးခြင်း။		

		• **ကုန်ကြမ်းများကို** အမိုးအောက်တွင် **စနစ်တကျသိုလှောင်ခြင်း** • ပတ်ဝန်းကျင်ကိုဆိုးရွားသော သက်ရောက်မှုများမှ ကာကွယ်ရန် သန့်ရှင်းရေးပစ္စည်း များကို **သေချာစွာရွေးချယ်ပြီး မှန်ကန်သော ပမာဏဖြင့်သာ** အသုံးပြုခြင်း • **အစိုင်အခဲ စွန့်ပစ်ပစ္စည်း** များကို ရေစီးဆင်းရာ**မြောင်းများထဲသို့ မစွန့်ပစ်စေခြင်း** • **ပိတ်ဆို့နေသောမြောင်းများ**ကို **စနစ်တကျသန့်ရှင်းရေးလုပ်ပြီး** သတ်မှတ်ထားသော နေရာများတွင် သာ အမှိုက်များကို စွန့်ပစ်ခြင်း • အမှိုက်များလွှင့်ခြင်းနှင့် ပြန့်ကျဲခြင်းကိုကာကွယ်ရန် စက်ရုံရှိ**အမှိုက်ပုံးများအားလုံး**ကို **အမြဲစနစ်တကျဖုံးအုပ်ထားခြင်း**			

		• အစားအစာအမှိုက်၊ သတ္တုနှင့်အခြားအမှိုက်များအတွက် ဝန်ထမ်းဆောင်များနှင့် အခြားနေရာများတွင် သီးခြားအမှိုက်ပုံးများ ထားရှိပေးခြင်း			
စွန့်ပစ်ရေ	စွန့်ပစ်ရေများနှင့် စက်ရုံမှထွက်သော ရေဆိုးများ	• ရေနုတ်မြောင်းပိုက်များ ပိတ်ဆို့ခြင်း (သို့) ပျက်စီးမှုများအား **ပုံမှန်စစ်ဆေးမှုများ**ပြုလုပ်ခြင်းနှင့် သင့်လျော်သလိုပြုပြင်ခြင်း • စက်ရုံဝန်ထမ်းများအားလုံးကို **သင်တန်းများပေး၍**	**သံတွဲမြစ်ထဲသို့ စွန့်ထုတ်ခြင်းမပြုမီ** TMP စက်ရုံရှိ ရေဆိုးကန်များတွင် တစ်လှည့်စီ ထုံးကျောက် နှင့် မီးသွေးကို သုံးသည့် ရေဆိုးသန့်စင်နည်းစနစ်အား **နောက်ဆုံးကန် (ငါးခုမြောက်ကန်) တွင် ကလိုရင်းကို သင့်တော်သောပမာဏဖြင့် ထည့်၍ ရေဆိုးသန့်စင်မှုစနစ်ကို** အဆင့်မြှင့်တင်ခြင်း၊ ပုံမှန်စစ်ဆေးခြင်း	စက်ရုံရှိ စီမံခန့်ခွဲရေး အဖွဲ့ နှင့်/သို့မဟုတ် သတ်မှတ်ထားသည် HSE အဖွဲ့	အနှံ့ဆိုး အခြေအနေများ နှင့် ရေဆင်းပိုက်လိုင်း တစ်လျှောက် နေထိုင်သည့် ရပ်ရွာလူထု၏ မကျေနပ်ချက် တိုင်ကြားမှုများ ပါဝင်သော

		စွန့်ပစ်ပစ္စည်း လျှော့ချရေး နှင့် ပြန်လည် အသုံးပြုရေး နည်းလမ်းများအတွက် ကုမ္ပဏီဌာနများအလိုက် လစဉ်ပြုင်ပွဲများကျင်းပ၍ ဆုများချီးမြှင့်ခြင်း။			အပတ်စဉ် အထွေထွေ လုပ်ငန်း အခြေအနေ အစီရင်ခံစာ
ဂေဟဗေဒ အရင်းအမြစ်များ	စီမံကိန်းလုပ်ငန်း လည်ပတ်မှုများ	• လုပ်ငန်းလည်ပတ်မှုကြောင့် သစ်ပင်များဆုံးရှုံးခြင်းအတွက် စီမံကိန်းဧရိယာအတွင်း ပြန်လည်စိမ်းလန်းစိုပြည်ရေး ဆောင်ရွက်ခြင်း • **ပြန်လည်စိုက်ပျိုး**သောအပင်များတွင် **ဒေသခံ မျိုးရင်းစိတ်များကို** အသုံးပြုခြင်း • ကန်ထရိုက်တာများနှင့် ဝန်ထမ်းများသည် **သန့်ရှင်း၍ သဘာဝပတ်ဝန်းကျင်နှင့် ညီညွတ်သော ပစ္စည်းများ**ကိုသာ အသုံးပြုခြင်း	Operation Manager/ HSE အရာရှိမှ - • စက်ရုံဝန်းအတွင်း **စိမ်းလန်းသောဧရိယာ** ထားရှိခြင်း • **ပတ်ဝန်းကျင်ကို စိမ်ခန့်ခွဲမှုလုပ်ထုံးလုပ်နည်း**များကို ရေးဆွဲကျင့်သုံးခြင်း • ဥပဒေစိုးမိုးရေးကို စနစ်တကျ အကောင်အထည်ဖော်ခြင်း၊ အလုပ်သမားများ၊ ရွာသားများနှင့် ဒေသခံလူထုမှ တရားမဝင်သစ်ပင်များ ခုတ်လှဲခြင်း၊ တိရိစ္ဆာန်များ အမဲလိုက်ခြင်း (သို့) တရားမဝင်	စက်ရုံရှိ စီမံခန့်ခွဲရေး အဖွဲ့ နှင့်/သို့မဟုတ် သတ်မှတ်ထားသည် HSE အဖွဲ့	အဆိုပြုထားသော စီမံကိန်းနှင့် တိုက်ရိုက် မသက်ဆိုင် သော်လည်း ပိတ်သိမ်းခြင်း အဆင့်တွင် အစီရင်ခံစာ တင်ပြရန် လိုအပ်ပါသည်

			ဖမ်းဆီးသတ်ဖြတ်ခြင်းအား ကန့်သတ်၍ သတိပေးချက်များဖြင့် ကြေညာထားခြင်း		
လုပ်ငန်းခွင် ကျန်းမာရေးနှင့် ဘေးကင်း လုံခြုံရေး	**အမိုးနီးယားဓာတ်ငွေ့များ ထွက်ရှိခြင်း** **ယာဉ်**သွားလာမှုများ နိမ့်သောအပူချိန်အား အချိန်ကြာမြင့်စွာထိတွေ့မှုကြောင့် **ကျန်းမာရေးထိခိုက်မှုများ သို့မဟုတ် ဒဏ်ရာများရရှိခြင်း**	• **လုံလောက်သော သဘာဝအလင်းရောင်** သို့မဟုတ် **အလင်းအားကောင်း**အောင် ပံ့ပိုးပေးထားခြင်း • စက်ရုံတွင် **ဘေးကင်းလုံခြုံရေးသုံး** ပစ္စည်းများ၊ လုံခြုံရေးလေ့ကျင့်ရေး ပို့စတာများ နှင့် ပုံများအား ရှင်းလင်းစွာ **ဖတ်နိုင်ရန်နှင့် မြင်သာအောင်** ထားရှိခြင်း	Operation Manager/ HSE အရာရှိမှ - • **အလုပ်မဝင်မီ ကျန်းမာရေး စစ်ဆေးခြင်း**နှင့် ပုံမှန်ကျန်းမာရေး စောင့်ကြည့်စစ်ဆေးခြင်း • အခန်းများအား သေ့မဆတ်မီ အဆောက်အဦးတစ်ခုလုံးအား နှုံစပ်စွာစစ်ဆေးခြင်းနှင့် **စက်ရုံအဝင်အထွက် အချိန်များအား**	စက်ရုံရှိ စီမံခန့်ခွဲရေး အဖွဲ့ နှင့်/သို့မဟုတ် သတ်မှတ်ထားသည် HSE အဖွဲ့	**အပတ်စဉ် အစီရင်ခံစာ**

	အအေးခန်း ၌ **မတော်တဆ ပိတ်လှောင်ခံရခြင်း** **အကြားအာရုံစွမ်းရည်** ချို့ယွင်းခြင်း **မတော်တဆ အမိုးနီးယားယိုစိမ့်မှု** ဖြစ်ပွားခြင်း	• **ဘေးကင်းလုံခြုံရေးပစ္စည်းများ**ကို စက်ခန်းနှင့်သီးခြားခွဲထားသော်လည်း အလုပ်သမားများနှင့် နီးစပ်ရာ အခန်း များတွင် ထားရှိစေခြင်း • **မီးနှင့်လုံခြုံရေးပစ္စည်းများကို သန့်ရှင်းရေး**ပြုလုပ်ထိန်းသိမ်း၍ **အခါအားလျော်စွာ စစ်ဆေးခြင်း** (အနည်းဆုံးလစဉ်) • ဝန်ထမ်းများအား **အမိုးနီးယား၏ ကျန်းမာရေးနှင့်ပတ်ဝန်းကျင်အပေါ် သက်ရောက်မှုများ၊** ဘေးကင်းလုံခြုံစွာ ကိုင်တွယ်ခြင်းနှင့် **အရေးပေါ်တုန့်ပြန်မှုအစီအစဉ်အတွက်** လေ့ကျင့်ပေးထားခြင်း • အအေးခန်းအလုပ်သမားများအား **အအေးဓာတ်ဖိစီးမှု၏လက္ခဏာများကို** သိရှိနိုင်ရန် လေ့ကျင့်ပေးထားခြင်း	**လက်မှတ်ထိုးစာအုပ်တို့တွင် သေချာစွာစစ်ဆေးခြင်း** • **အရေးပေါ်အချက်ပေးစက်များ** နှင့် **အရေးပေါ်မီးများအား ပုံမှန်စစ်ဆေးခြင်း**နှင့် ထိန်းသိမ်းခြင်း • **အရေးပေါ် ထွက်ပေါက်တံခါး** အတွက်ညွှန်ကြားချက်များကို အလင်းပေးဆိုင်းဘုတ်များ ဖြင့် ထွက်ပေါက်နေရာများတွင် ထားရှိခြင်း • ပေးအပ်ထားသော PPE များသည် သက်ဆိုင်ရာလုပ်ငန်းအတွက် **သင့်တော်၍ လုံလောက်မှုရှိ**ကြောင်း သေချာစေခြင်း		

		• အအေးသိုလှောင်ခန်းတွင် အလုပ်လုပ်သော ဝန်ထမ်းများအတွက် **သွေးပူနွေးစေရန် ပုံမှန်အနားယူရမည့် အချိန်များ** စီစဉ်ပေးထားခြင်း • အအေးခန်းအတွင်း လေ့ကျင့်ထား၍ ခွင့်ပြုချက်ရထားသော သူများသာ ဝင်စေ၍ “**အခွင့်မရှိ မဝင်ရ**” ဟူသော **အမှတ်အသားများ ရှင်းလင်းစွာ ရေးသားထားခြင်း** • အလုပ်သမားတစ်ဦးသည် အအေးခန်းထဲသို့ ဝင်စဉ် အခြားတစ်ဦးသည် အပြင်ဘက်တွင် စောင့်ကျန်ရစ်ရမည့် “**အတူတကွအလုပ်လုပ်ကြသည့် သူငယ်ချင်းနှစ်ဦးစနစ်**” ကို တည်ဆောက်ခြင်း အအေးခန်းသို့ ဝင်ရောက်မည်ဆိုလျှင် အချိန်မီမပြန်လာနိုင်ပါက လျင်မြန်စွာ သတိပြုမိနိုင်စေရန် ဝင်ရသည့်			

		ရည်ရွယ်ချက်နှင့် ကြာမည့်အချိန်တို့ကို လုပ်ဖော်ကိုင်ဖက်များအား ကြိုတင် **အကြောင်းကြားထားရမည့်စနစ်** တည်ဆောက်ထားခြင်း • **ပုံမှန်ကျန်းမာရေးစစ်ဆေးခြင်း**			

ဇယား ၁.၁၇ ပတ်ဝန်းကျင်၊ လူမှုရေးနှင့် ကျန်းမာရေးထိခိုက်မှုများအတွက် စောင့်ကြည့်လေ့လာရေး အစီအစဉ်

အချက်များ	တိုင်းတာခြင်းနှင့် ညွှန်ကြားချက်များ	လုပ်ထုံးလုပ်နည်းများ	အဆိုပြုထားသော ကြာချိန်	စောင့်ကြည့်လေ့လာသည့် အကြိမ်အရေအတွက်	နေရာ
လေထုအရည်အသွေး	**အမျိုးသားပတ်ဝန်းကျင်အရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက် (EQEG)** မီးစက်နှင့် ခေါင်းတိုင် နှစ်ခုလုံးအတွက် • PM (PM10, PM2.5) • NOx • SO2 • CO • VOC • O3 • Methane (CH4) • H2S • CO2 • NH3 (Ammonia)	နည်းလမ်း **အမျိုးသားပတ်ဝန်းကျင်အရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက်များ**	**ကာလ** - ၂၄ နာရီ စဉ်ဆက်မပြတ် **ကြိမ်နှုန်း-** စက်ရုံလည်ပတ်စဉ်ကာလအတွင်း ၆လ တစ်ကြိမ် တိုင်းတာသည်။ စီမံကိန်း ပိတ်သိမ်းချိန်တွင် တစ်ကြိမ် တိုင်းတာသည်။ လေထုအရည်အသွေး နှင့် ပတ်သက်၍ တိုင်ကြားချက်ရှိပါက တိကျသောတိုင်ကြားမှုများကို တုံ့ပြန်ရန် အတွက် နောက်ထပ် လေထု အရည်အသွေး တိုင်းတာခြင်းကိုပြုလုပ်နိုင်သည်။	စောင့်ကြည့်လေ့လာရေး အစီရင်ခံစာများကို ဝန်ကြီးဌာနမှ သတ်မှတ်ထားသည့်အတိုင်း ၆လတစ်ကြိမ် (သို့မဟုတ်) အခါအားလျော်စွာ ဝန်ကြီးဌာနသို့ တင်ပြရပါမည်။	စက်ရုံ (တိုင်ကြားခံရသော ဇရိယာ) ကိုဩဒိနိတ်- **18.471427°N** နှင့် **94.373074°E**
ဆူညံသံ	• LA_{eq} 1 hr ≤ 70dBA	နည်းလမ်း မြန်မာနိုင်ငံအမျိုးသားသဘာဝပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေး (ထုတ်လွှတ်မှု)	**ကာလ** - ၂၄ နာရီ စဉ်ဆက်မပြတ် **ကြိမ်နှုန်း-**		စက်ရုံဝန်း

အချက်များ	တိုင်းတာခြင်းနှင့် ညွှန်ကြားချက်များ	လုပ်ထုံးလုပ်နည်းများ	အဆိုပြုထားသော ကြာချိန်	စောင့်ကြည့်လေ့လာသည့် အကြိမ်အရေအတွက်	နေရာ
		လမ်းညွှန်ချက်များ၊ (၂၀၁၅ ခုနှစ်မှစတင်ကာ ထိရောက်သည်) နှင့် ပတ်ဝန်းကျင် ထိန်းသိမ်းရေးဥပဒေ၊ ၂၀၁၂	စက်ရုံလည်ပတ်စဉ်ကာလအတွင်း ဖြစ်တစ်ကြိမ် တိုင်းတာသည်။ စီမံကိန်း ပိတ်သိမ်းချိန်တွင် တစ်ကြိမ် တိုင်းတာသည်။ ဆူညံသံအရည်အသွေး နှင့် ပတ်သက်၍ တိုင်ကြားချက်ရှိပါက တိကျသောတိုင်ကြားမှုများကို တုံ့ပြန်ရန် အတွက် နောက်ထပ် ဆူညံသံ အရည်အသွေး တိုင်းတာခြင်းကိုပြုလုပ်နိုင်သည်။		ကိုဩဒီနိတ်- **18.471427°N** နှင့် **94.373074°E**
စွန့်ပစ်ရေ သန့်စင် စနစ်မှ ရေဆိုး	**အမျိုးသား ပတ်ဝန်းကျင်အရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက် (EQEG)** တစ်နေ့တာ အများဆုံးသောပြင်းအား အတွက် • BOD5 • COD • Oil and Grease • PH • Temperature • Total Coliform	<u>နှည်းလမ်း</u> အမျိုးသား ပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေး (ထုတ်လွှတ်မှု) (NEQG) မှ အကြံပြုထားသော ရေနှင့်ရေဆိုးများကို ဆန်းစစ်ခြင်းအတွက် စံနည်းလမ်းများ အတိုင်း လိုက်နာ၍ ခွဲခြမ်းစိတ်ဖြာသည့်	စက်ရုံလည်ပတ်စဉ်ကာလအတွင်း ဖြစ်တစ်ကြိမ် တိုင်းတာသည်။ စီမံကိန်း ပိတ်သိမ်းချိန်တွင် တစ်ကြိမ် တိုင်းတာသည်။	စောင့်ကြည့်လေ့လာရေး အစီရင်ခံစာများကို ပန်ကြီးဌာနမှ သတ်မှတ်ထားသည့် အတိုင်း ဖြစ်တစ်ကြိမ် (သို့မဟုတ်)	စက်ရုံရှိ စွန့်ပစ်ရေ သန့်စင် စက်မှ ရေဆိုးထွက်ရှိရာ နေရာ

အချက်များ	တိုင်းတာခြင်းနှင့် ညွှန်ကြားချက်များ	လုပ်ထုံးလုပ်နည်းများ	အဆိုပြုထားသော ကြာချိန်	စောင့်ကြည့်လေ့လာသည့် အကြိမ်အရေအတွက်	နေရာ
	• Total Phosphorus • Total Nitrogen • TSS	နည်းလမ်းများဖြင့် တိုင်းတာသည်။		အခါအားလျော်စွာ ဝန်ကြီးဌာနသို့ တင်ပြရပါမည်။	
အန္တရာယ်ရှိသော /အန္တရာယ်မရှိသော စွန့်ပစ်ပစ္စည်း များ	စွန့်ပစ်ပစ္စည်း ရှင်းလင်းမှု စာရင်းနှင့် ခြေရာခံမှု အစီရင်ခံစာ	စွန့်ပစ်ပစ္စည်းပမာဏအား အမျိုးအစားနှင့် စွန့်ပစ်သည့်နေရာအလိုက် နေ့စဉ်စစ်ဆေးခြင်း	စီမံကိန်း တစ်လျှောက် အဆင့်အားလုံး	ပုံမှန်စစ်ဆေးခြင်း၊ မလိုလားအပ်သော ဖြစ်ပွားမှုများ အစီရင်ခံစာ (အကယ်၍ ဖြစ်ပွားမှုရှိပါက)	စီမံကိန်းနေရာ အားလုံး စီမံကိန်း ဧရိယာ၊ စီမံကိန်း ဧရိယာတဝိုက် လူထုအသိုင်းအဝိုင်း နှင့် သယ်ယူ ပို့ဆောင်ရေး လမ်းကြောင်း
လူမှုရေး	စည်ပင်သာယာနှင့် ပတ်ဝန်းကျင်ထိန်းသိမ်းရေး စောင့်ကြည့်ရေးကော်မတီပူးပေါင်း ဆောင်ရွက်ခြင်း တိုင်ကြားချက်များ စောင့်ကြည့် စစ်ဆေးခြင်းနှင့် ဖြေရှင်းခြင်း	တိုင်ကြားမှုအား မှတ်တမ်းတင်ထားခြင်း • စောင့်ကြည့်လေ့လာခြင်း၊ စုံစမ်းစစ်ဆေးခြင်းနှင့် သင့်လျော်သော ဖြေရှင်းနည်းများကို အကောင်အထည်ဖော်ခြင်း			

အချက်များ	တိုင်းတာခြင်းနှင့် ညွှန်ကြားချက်များ	လုပ်ထုံးလုပ်နည်းများ	အဆိုပြုထားသော ကြာချိန်	စောင့်ကြည့်လေ့လာသည့် အကြိမ်အရေအတွက်	နေရာ
ရပ်ရွာလူထုနှင့် လုပ်ငန်းခွင် ကျန်းမာရေး၊ လုံခြုံရေး	• မတော်တဆ ဖြစ်ပွားမှု စာရင်း ဇယား • မတော်တဆ ဖြစ်ပွားရ ခြင်း အကြောင်း အရင်း • လျှော့ချရေး အစီအမံများ	• မတော်တဆမှု စုံစမ်းစစ်ဆေးမှု အတွက် အကျဉ်းချုပ် အစီရင်ခံစာ ရေးသားခြင်း			

၁.၁၃ လျာထားငွေနှင့် ပတ်ဝန်းကျင် စောင့်ကြည့်စစ်ဆေးခြင်းအတွက် တာဝန်များ

ဇယား ၁.၁၈ လျာထားငွေနှင့် ပတ်ဝန်းကျင် စောင့်ကြည့်စစ်ဆေးခြင်းအတွက် တာဝန်များ

ပတ်ဝန်းကျင် အချက်များ	အညွှန်းကိန်း / အတိုင်းအတာ	တာဝန်ရှိသူ	ခန့်မှန်းခြေ လျာထားသော ငွေစာရင်း
လုပ်ငန်းလည်ပတ်ရေးအဆင့်			
လေထုအရည်အသွေး	**အမျိုးသားပတ်ဝန်းကျင်အရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက် (EQEG)** မီးစက်နှင့် ခေါင်းတိုင် နှစ်ခုလုံးအတွက် • PM (PM10, PM2.5) • NOx • SO2 • CO • VOC • O3 • Methane • H2S • CO2	ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးအဖွဲ့ (တတိယ အဖွဲ့အစည်း)	USD 800
ဆူညံသံ	• LA_{eq} 1 hr, 24 hr	ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးအဖွဲ့ (တတိယ အဖွဲ့အစည်း)	USD 200
ရေဆိုးထွက်ရှိခြင်း (စက်ရုံမှရေစီးဆင်းခြင်းနှင့် ရေဆိုးထုတ်လွှတ်ခြင်း)	**အမျိုးသား ပတ်ဝန်းကျင်အရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက် (EQEG)** တစ်နေ့တာ အများဆုံးသောပြင်းအား အတွက် • BOD5 • COD • Oil and Grease • PH	ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးအဖွဲ့ (တတိယ အဖွဲ့အစည်း)	USD 300

	• Temperature • Total Coliform • Total Phosphorus • Total Nitrogen • TSS		
အန္တရာယ် ရှိသော /အန္တရာယ် မရှိသော စွန့်ပစ်ပစ္စည်း များ	စွန့်ပစ်ပစ္စည်း ရှင်းလင်းမှု စာရင်းနှင့် ခြေရာခံမှု အစီရင်ခံစာ	ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးအဖွဲ့ (တတိယ အဖွဲ့အစည်း)	USD 1,000
လူမှုရေး	စည်ပင်သာယာနှင့် ပတ်ဝန်းကျင်ထိန်းသိမ်းရေး စောင့်ကြည့်ရေးကော်မတီပူးပေါင်း ဆောင်ရွက်ခြင်း • တိုင်ကြားချက်များ စောင့်ကြည့် စစ်ဆေးခြင်းနှင့် ဖြေရှင်းခြင်း	ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးအဖွဲ့ (တတိယ အဖွဲ့အစည်း)	
ရပ်ရွာလူထုနှင့် လုပ်ငန်းခွင် ကျန်းမာရေး၊ လုံခြုံရေး	• မတော်တဆ ဖြစ်ပွားမှု စာရင်း ဇယား • မတော်တဆ ဖြစ်ပွားရ ခြင်း အကြောင်း အရင်း • လျော့ချရေး အစီအမံများ	ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးအဖွဲ့ (တတိယ အဖွဲ့အစည်း)	

၁.၁၉ EMP ငွေစာရင်း

ကနဦးEMPအကောင်အထည်ဖော်မှုအတွက် ခန့်မှန်းကုန်ကျစရိတ်ကို ကနဦးသတ်မှတ်ထားမှုအပေါ်အခြေခံ၍ သတ်မှတ်ပါလိမ့်မည်။ EMP ကုန်ကျစရိတ်ကို အောက်ပါပမာဏအတိုင်း စီစဉ်ထားပါသည်။

သံတွဲ ရေထွက်ကုန်ပစ္စည်းများ ကုမ္ပဏီလီမိတက်သည် (TMP) သည် **ရင်းနှီးမြှုပ်နှံမှုပမာဏ၏ ၂ ရာခိုင်နှုန်းကို EMP ကုန်ကျစရိတ်အတွက်** အသုံးပြုပါလိမ့်မည်။

(1)ပညာရေး,ဒေသအတွင်း,စာသင်ကျောင်းများ,လိုအပ်သောသင်ထောက်ကူပစ္စည်းများ,Community Centreမှလိုအပ်သောသင်ထောက်ကူပစ္စည်းများလှူဒါန်းပါသည်။ Chapter (8), section 8.6, page (8-46) တွင် ဖော်ပြထားပါသည်။

(2)ကျန်းမာရေး,1997မှ2019နှစ်အထိသံတွဲပြည်သူဆေးရုံသို့O_2လတိုင်းလှူဒါန်းခဲ့ပါသည်။ဝန်ထမ်းများ အတွက်လိုအပ်သောဆေးဝါးများကိုအခမဲ့ကုသပေးပါသည်။

(3)လူမှုရေး,မီးသတ်,ငါးလုပ်ငန်းဌာန,ရပ်ကွက်အတွင်းလိုအပ်သောသာရေးနာရေးကိစ္စအဝဝကိုသုံးဆွဲ

လျှပ်ဒါန်းပါသည်။ရေဘေး-ဆန်,ဆီလျှပ်ဒါန်းပါသည်။

ခန့်မှန်းလျှပ်ဒါန်းငွေ-သိန်း(100)ကြားရှိပါသည်။

၁.၂၀ ဒေသခံလူမှုဖွံ့ဖြိုးရေး ဆောင်ရွက်မှုများ (Corporate Social Responsibility)

TMPစက်ရုံသည် ဒေသခံ **ဒေသခံလူထုဖွံ့ဖြိုးတိုးတက်ရေး** အတွက် **အသားတင်အမြတ်၏ ၂% အား** အသုံးပြုသင့်ပါသည်။

၁.၂၁ အရေးပေါ်တုံ့ပြန်မှုအစီအစဉ်

ရည်ရွယ်ချက်မှာ စက်ရုံလုပ်ငန်းစဉ်များမှ ဖြစ်ပေါ်လာနိုင်သော အရေးပေါ်အခြေအနေများ၊ မတော်တဆဖြစ်ရပ်များ နှင့် သဘာဝဘေးအန္တရာယ်များကို တုန့်ပြန်နိုင်ရန်အတွက် အရင်းအမြစ်များ (ဝန်ထမ်းများနှင့်ကိရိယာများ) ကိုပြင်ဆင်ထားရန်ဖြစ်ပါသည်။

သံတွဲ ရေထွက်ကုန်ပစ္စည်းများ ကုမ္ပဏီလီမိတက်တွင် အရေးပေါ်အခြေအနေများအတွက် ယေဘုယျအားဖြင့် ***Emergency service in charge*** (သို့မဟုတ်) ***HSE မန်နေဂျာ*** နှင့် ***Response Team*** ရှိသင့်ပါသည်။ အဖွဲ့သည် အောက်ပါတို့ကို ပြင်ဆင်ထားသင့်ပါသည်။

- အဖွဲ့သားများကို အရေးပေါ်ပစ္စည်းများ အသုံးပြုစေကာ ၎င်းတို့တာဝန်နှင့် သက်ဆိုင်သည့် သင်တန်းများပို့ချခြင်း
- အရေးပေါ်နည်းလမ်းများကို ဖော်ဆောင်ရေးသားခြင်းနှင့် ပြဋ္ဌာန်းခြင်း
- အရေးပေါ်တုံ့ပြန်မှုအစီအစဉ် (ERP) ကို ဝန်ထမ်းများနှင့် စက်ရုံအလုပ်သမားများအားလုံး သိရှိနားလည်စေပြီး အသုံးချနိုင်စေရန် စာရွက်စာတမ်းဖြင့်ထုတ်ကာ ကြေငြာထားသင့်ပါသည်။
- အရေးပေါ်ကယ်ဆယ်ရေး muster points များ၏ တည်နေရာများအား သတ်မှတ်ထားခြင်း
- အချက်ပြစနစ်နှင့် မီးငြိမ်းသတ်ကိရိယာများ ထောက်ပံ့ထားခြင်း
- ရှေးဦးသူနာပြု ပစ္စည်းကိရိယာများ ထောက်ပံ့ထားခြင်း
- မတော်တဆဖြစ်ရပ်များ (သို့မဟုတ်) အရေးပေါ် အခြေအနေတွင် ထိရောက်ပြီး အကျိုးရှိသောဆောင်ရွက်မှုများဖြင့် လူ့အသက်၊ ပတ်ဝန်းကျင်၊ ပိုင်ဆိုင်မှုနှင့် စီးပွားရေးလုပ်ငန်းများအပေါ် ထိခိုက်နိုင်မှုများကို လက်တွေ့ကျကျလျော့ချခြင်း
- ကောင်းမွန်သော ဆက်သွယ်ရေးစနစ်ဖြင့် အရေးပေါ် အခြေအနေများတွင်လုံလောက်သော သတင်းအချက်အလက်များကို ရရှိစေခြင်း
- ထိရောက်ပြီးအကျိုးရှိသောတုံ့ပြန်မှုဖြင့် ထိရောက်သောအရေးပေါ်စီမံခန့်ခွဲမှုကို သေချာမှုရှိစေခြင်း
- ဆက်သွယ်ရန် အစိုးရအာဏာပိုင်များ၊ မီဒီယာနှင့် အခြားသက်ဆိုင်သူများကို သတ်မှတ်ထားခြင်း နှင့် ၎င်းတို့အား ဆက်သွယ်ဆောင်ရွက်ရန် လမ်းစဉ်များအား ဖော်ပြထားခြင်း

စက်ရုံတွင်ဖြစ်နိုင်ဖွယ်ရှိသော အရေးပေါ်အခြေအနေများမှာ-

- အမိုးနီးယားဓာတ်ငွေ့ယိုစိမ့်မှု
- မီး / ပေါက်ကွဲခြင်း
- အဆိပ်ငွေ့ပျံ့ခြင်း၊ ဆီယိုဖိတ်ခြင်း

- အမြင့်မှ လူပြုတ်ကျခြင်း
- ပစ္စည်းများပြုတ်ကျခြင်း၊ အဆောက်အအုံများ၊ ဂိုဒေါင်များပြိုကျခြင်း
- ဘိလပ်မြေဖုန်မှုန့်များ ပျံ့လွင့်ခြင်း
- ယာဉ်မတော်တဆမှုနှင့် ထိခိုက်ဒဏ်ရာများရရှိခြင်း

ထို့ပြင် COVID 19 သည် အထူးအာရုံစိုက်ရန်လိုအပ်သော သိသာထင်ရှားသည့်ပြဿနာတစ်ရပ် ဖြစ်ပါသည်။ ဤစီမံကိန်းအားဆက်လက်ဆောင်ရွက်ရန် **COVID19 ကာကွယ်ခြင်းနှင့်တုံ့ပြန်မှုအစီအစဉ်ကို** ရေးဆွဲရပါမည်။

ဇယား ၁.၁၉ Ammonia ဓာတ်ငွေ့ယိုစိမ့်မှုအတွက် အရေးပေါ်တုံ့ပြန်မှုအစီအစဉ်

သက်ရောက်မှု	စီမံကိန်းလုပ်ငန်းများ/ပတ်ဝန်းကျင်အပေါ်သက်ရောက်မှုများ	အဆိုပြုထားသော လျှော့ချရေးအစီအစဉ်များ	စောင့်ကြည့်လေ့လာခြင်း		
			အကောင်အထည်ဖော်ခြင်း	ကြီးကြပ်ခြင်း	အစီရင်ခံခြင်း
အမိုးနီးယား	အမိုးနီးယား အသေးပေးစနစ်ကို အသုံးပြုခြင်းနှင့် မတော်တဆယိုစိမ့်ခြင်း	• စက်ခန်းအတွင်း **လုံလောက်သော လေဝင်လေထွက်ရှိစေခြင်း** • အသေးခန်းသုံးပစ္စည်းများ (ဥ ပမာ- ပိုက်များ၊ အဆို့ရှင်များ၊ အင်ဂျင်ပျံစက်မှုကွိုင်များ၊ ကန်များ၊ သိုလှောင်ကန်များ၊ ယာဉ်များ) ကို **ဘေးကင်းသော အကာအကွယ်များ၊ လုပ်ထုံးလုပ်နည်းများ**ဖြင့် ပံ့ပိုးပေးထားခြင်း • **မီးလောင်လွယ်သော ပစ္စည်းများ နှင့်/သို့မဟုတ် လောင်ကျွမ်းနိုင်သောအရာများ အားစက်ခန်းအတွင်း သိုလှောင်မှုမပြုခြင်း** • မည်သည့်ယိုစိမ့်မှုကိုမဆို စောင့်ကြည့်ရန် စက်ခန်း၌ **အနည်းဆုံး အမိုးနီးယား**	Operation Manager/ HSE အရာရှိမှ - • အသေးခန်းစနစ်တွင် လုံလောက်သော ဘေးကင်းလုံခြုံရေးနှင့် စောင့်ကြည့် ထိန်းချုပ်ရန် ကရိယာများ တပ်ဆင်ထားခြင်းနှင့် အရည်အချင်း ရှိသူများက ထိန်းသိမ်းစစ်ဆေးခြင်း • သိုလှောင်ရေယာဉ်များကို ယိုစိမ့်မှု၊ မီးနှင့်ပေါက်ကွဲမှုများမှ သတိပြုကာကွယ်ခြင်း • ပြုပြင်ထိန်းသိမ်းခြင်းနှင့် စစ်ဆေးခြင်း မှတ်တမ်းများကို သေချာထိန်းသိမ်း ထားခြင်း	စက်ရုံရှိ စီမံခန့်ခွဲရေး အဖွဲ့ နှင့်/သို့မဟုတ် သတ်မှတ်ထားသည် HSE အဖွဲ့	အပတ်စဉ် အစီရင်ခံစာ

		ဓာတ်ငွေ့ဖမ်းစက်နှစ်လုံး တပ်ဆင်ထားခြင်း • လေဝင်လေထွက် ပန်ကာများကို ပွင့်စေပြီး အချက်ပေးသံများ ထွက်ရှိစေသော **အမိုးနီးယား ထောက်လှမ်းမှုစနစ်ကို** တပ်ဆင်ထားခြင်း • အမိုးနီးယားအားသွင်းလိုင်း၌ ပင်မထိန်းချုပ်အဆို့ရှင်နှင့် နီးသောနေရာတွင် **စစ်ဆေးရန် အဆို့ရှင်ကို** တပ်ဆင် ထားခြင်း • အဆို့ရှင်တစ်ခုအား စမ်းသပ်ခြင်း သို့မဟုတ် လဲလှယ် နေစဉ် အအေးခန်းသုံး ပစ္စည်းများကို အခြား PRV တစ်ခုမှ ကာကွယ်ပေးနေရန် **Dual Pressure Relief Valves (PRVs) နှင့် Three Way Way Valve ကိုတပ်ဆင်ထားခြင်း** • PRV များကို **၅ နှစ်တစ်ကြိမ် လဲလှယ်ခြင်း**	• မျှော်လင့်မထားသော အဖြစ်အပျက်များရှိပါက သတင်းပို့ခြင်း		
		• လုပ်ငန်းမစတင်မီ **အမိုးနီးယားအအေးပေးစနစ် နှင့် အကာအကွယ်ပစ္စည်းများကို** စစ်ဆေးခြင်း • အချက်ပေးစနစ်အပါအဝင် ဘေးကင်းလုံခြုံရေး ကိရိယာအားလုံးကို **ပုံမှန်ဖိအားစမ်းသပ်မှုများ**နှင့် လုပ်ဆောင်ချက်စမ်းသပ်မှုများ ပြုလုပ်ခြင်း • ထုတ်လုပ်သူ၏ အကြံပြုချက်အတိုင်း စက်ပစ္စည်းများအား **အခါအားလျော်စွာ ထိန်းသိမ်းခြင်း**			

		• **ပျက်စီးယိုယွင်းနေသော အမိုးနီးယားပိုက်များကို အစားထိုးလဲလှယ်ခြင်း** • သင့်လျော်သော ပြုပြင်ထိန်းသိမ်းမှုစနစ်အတွက် **အအေးပေးစနစ်မှ အဆီများကိုဖယ်ရှားခြင်း**			

၁.၂၂ Covid ကြိုတင်ကာကွယ်ခြင်းနှင့် အရေးပေါ်တုံ့ပြန်မှု အစီအစဉ်

မြန်မာနိုင်ငံ၌ ကမ္ဘာအနှံ့ဖြစ်ပွားလျက်ရှိသော coronavirus 2019 (COVID-19) ကိုရိုနာဗိုင်းရပ်စ် ကူးစက်ပျံ့နှံ့မှုသည် ပြင်းထန်အသက်ရှူလမ်းကြောင်းဆိုင်ရာ ကိုရိုနာဗိုင်းရပ်စ်)SARS-CoV-2) ကြောင့် ဖြစ်ပွားသော ကူးစက်ရောဂါတစ်မျိုး ဖြစ်ပါသည်။

ထို့ကြောင့် သံတွဲမြို့ရှိ TMP စက်ရုံသည် စက်ရုံလုပ်သားများအား ရောဂါကူးစက်မှုမှကာကွယ်ရန်မှာ အရေးပေါ် ဦးစားပေးအချက် ဖြစ်လာခဲ့ပါသည်။ ရောဂါကူးစက်မှုအန္တရာယ်မှာ လူဦးရေများသော နေရာများတွင် အထူးမြင့်မားသဖြင့် **စက်ရုံအလုပ်သမားများမှ ဒေသခံလူထုထဲသို့ပျံ့နှံ့သွားနိုင်သော ရောဂါဖြစ်ပွားမှုများကို ကာကွယ်ရန် စက်ရုံဝိုင်ရှင်များတွင် လူထုကျန်းမာရေးတာဝန်ရှိပါသည်။** အသေးစိတ် အစီအစဉ် များကို အခန်း- ၉ ၌ တင်ပြထားပါသည်။

၁.၂၃ အများပြည်သူတိုင်ပင်ဆွေးနွေးခြင်းနှင့်ထုတ်ဖော်ခြင်း

လူထုတွေ့ဆုံဆွေးနွေးခြင်းနှင့် လူမှုစီးပွားအချက်အလက်များကို May(21-24),2021၌ကောက်ယူခဲ့ပြီး ထိုပွဲ၏အဓိကရည်ရွယ်ချက်မှာ စီမံကိန်းအနီးရှိနေထိုင်သူများ၏ **လူမှုစီးပွား အချက်အလက်များ နှင့် အခြေအနေများ**အား သိရှိရန်၊ စီမံကိန်းအပေါ် **သဘောထားအမြင်များ** နှင့် စီမံကိန်းကြောင့် လူမှုဘဝနေထိုင်မှုအပေါ် သက်ရောက်မှုများကို လေ့လာရန် ဖြစ်ပါသည်။

အဆိုပြုထားသော **စီမံကိန်း၏အနီးစပ်ဆုံးနေရာဖြစ်သည့် အံတော်ကျေးရွာနှင့် (ခ)ရပ်ကွက်၊ လမ်းအမှတ် (၈)၊ သံတွဲမြို့တို့၌** ပြုလုပ်ခဲ့သောစစ်တမ်းသည် စီမံကိန်းလုပ်ငန်းများမှ သက်ရောက်နိုင်သော လူထုအသိုင်းအဝိုင်းမှ သဘောထားအမြင်များနှင့် လူမှုရေးရာသက်ရောက်မှုများကို ဖော်ထုတ်ရန် ဖြစ်ပါသည်။

ရှေးဦးစွာ **ကျေးရွာအကြီးအကဲများ၊ TMPမှ ကိုယ်စားလှယ်များနှင့် သက်ဆိုင်ရာအိမ်ထောင်စုအချို့နှင့်** တွေ့ဆုံပွဲများကျင်းပခဲ့ပြီး **လျှော့ချရေးအစီအမံများနှင့်အတူ** စီမံကိန်း၏အတိုင်းအတာကို အကျဉ်းချုပ်ရှင်းပြခဲ့ပါသည်။

စစ်တမ်းကို **အရေအတွက်နှင့် အရည်အသွေးဆိုင်ရာ မေးခွန်းအမျိုးအစားများ ရောစပ်ထားသော မေးခွန်းလွှာကို အသုံးပြု၍** မေးမြန်းခဲ့ပါသည်။

၁.၂၁ အဓိက သတင်းအချက်အလက်ပေးသူများ နှင့်ဒေသခံအသိုင်းအဝိုင်း အတွက် လူမှုစီးပွားရေးစစ်တမ်း ကောက်ယူခြင်း ရလာဒ်များ (အံတော်ကျေးရွာ)

ကောက်ယူခဲ့သော စစ်တမ်းအရ အနံတော် ကျေးရွာသည် ဖွံ့ဖြိုးတိုးတက်ပါသည်။ ဖြေဆိုသူအားလုံး ၏ ၉၀ ရာခိုင်နှုန်း ကျော်သည် **ရခိုင်လူမျိုးများ** ဖြစ်ကြပြီး ကိုးကွယ်သော ဘာသာတရားမှာ **ဗုဒ္ဓဘာသာ** များ ဖြစ်ကြပါသည်။

အသက်အပိုင်းအခြားကိုကြည့်လျှင် ၃၈ ရာခိုင်နှုန်းသည် အသက် **၂၀နှစ် မှ ၃၀နှစ်** ကြားဖြစ်ပြီး ၂၂ ရာခိုင်နှုန်း သည် အသက် **၄၀နှစ် မှ ၅၀နှစ်** ကြား ဖြစ်ပါသည် ။

စုစုပေါင်းစစ်တမ်းကောက်ယူမှုအရ အနံတော် ကျေးရွာမှ **(၈၀** ရာခိုင်နှုန်း**) အိမ်ထောင်စုများ** နှင့် (ခ)ရပ်ကွက်၊ သံတွဲမြို့မှ **(၈၄** ရာခိုင်နှုန်း**) အိမ်ထောင်စုများသည်** ကိုယ်ပိုင်အိမ်များတွင် နေထိုင်ကြပါသည်။

ထို့ပြင် ဖြေဆိုသူ **၇၇** ရာခိုင်နှုန်း သည် မြေယာပိုင်ဆိုင်မှုအတွက်စာရွက်စာတမ်းများနှင့် နေထိုင်ကြပြီး ကျန် **၂၃** ရာခိုင်နှုန်း သည်စာရွက်စာတမ်းမရှိသော်လည်း နေထိုင်ရန်ခွင့်ပြုချက်ရှိကြပါသည်။

စစ်တမ်းကောက်ယူထားသည့်အိမ်ထောင်စု **၈၅** ရာခိုင်နှုန်း သည် အိမ်ခေါင်မိုးအဖြစ် "***CGI***" ကို အသုံးပြုထားပြီး **၇** ရာခိုင်နှုန်း သာလျှင်" **သက်ကယ်**" ဖြင့်မိုးထားပါသည်။

အလုပ်အကိုင်အားဖြင့်" **ကျွမ်းကျင်လုပ်သားများ**" သည် (၃၂ ရာခိုင်နှုန်း) ဖြစ်ပြီး " **ကျပန်းလုပ်သားများ**" သည် (၂၅ ရာခိုင်နှုန်း) ဖြစ်ပါသည်။

နှစ်စဉ်ဝင်ငွေနှင့်ပတ်သက်၍ ဖော်ပြရလျှင် အိမ်ထောင်စု **၅၈** ရာခိုင်နှုန်း ၏ **ဝင်ငွေသည် ၅၀၀,၀၀၁ မှ ၁,၀၀၀,၀၀၀ ကျပ်** ကြား ဝင်ငွေရှိကြ၍ **၃၀** ရာခိုင်နှုန်း သည် တစ်နှစ်လျှင် **၁,၀၀၀,၀၀၁ မှ ၂,၀၀၀,၀၀၀ ကျပ်** ကြား ဝင်ငွေရှိကြပါသည်။

ပညာရေးရှုထောင့်မှကြည့်လျှင် **ဖြေဆိုသူ ၃၇** ရာခိုင်နှုန်းသည်"**အလယ်တန်းကျောင်း** " အဆင့်ဖြစ်ပြီး **၂၃** ရာခိုင်နှုန်းသည် "**အထက်တန်းကျောင်း"** အဆင့် ရှိကြပါသည်။
မိသားစုအတွင်း အမြင့်ဆုံးပညာရေးအဆင့်နှင့် ပတ်သက်၍ဖော်ပြရလျှင် **ဖြေဆိုသူ ၃၃** ရာခိုင်နှုန်းသည်"**အထက်တန်းကျောင်း** " အဆင့်ဖြစ်ပြီး **၂၇** ရာခိုင်နှုန်းသည် "**အလယ်တန်းကျောင်း"** အဆင့် ရှိပါသည်။

ရောဂါအမျိုးအစားများနှင့်စပ်လျဉ်း၍ဖော်ပြရလျှင် **အဖြစ်အများဆုံး ရောဂါများ** မှာ **အအေးမိခြင်း** ၂၅ ရာခိုင်နှုန်း၊ **တုပ်ကွေးရောဂါ** ၂၃ ရာခိုင်နှုန်း နှင့် **သွေးတိုး** ၂၀ ရာခိုင်နှုန်း တို့ဖြစ်ကြပါသည်။
စစ်တမ်းကောက်ယူထားသောအိမ်ထောင်စုများအနက် ခန့်မှန်းခြေအားဖြင့် ၄၅ ရာခိုင်နှုန်း သည် "**ပုဂ္ဂလိကဆေးခန်းမှ ဆရာဝန်" ၊** ၁၈ ရာခိုင်နှုန်းမှာ **"လက်ထောက်ကျန်းမာရေးမှူး** "နှင့် ၁၄ ရာခိုင်နှုန်း သည် "**အထွေထွေဆေးရုံ**" မှ ကုသမှုကို ခံယူကြပါသည်။

တစ်နှစ်ပတ်လုံးရရှိနိုင်သော သောက်သုံးရေအရင်းအမြစ်အတွက် အန်တော်ကျေးရွာမှ **၅၃** ရာခိုင်နှုန်း နှင့် ခ-ရပ်ကွက်၊ သံတွဲမြို့ မှ **၅၀** ရာခိုင်နှုန်း သည် "**အဝီစိရေတွင်း**" မှရရှိပါသည်။

အမှိုက်များအား သိမ်းဆည်းရန် အန်တော် ကျေးရွာတွင် **၄၉** ရာခိုင်နှုန်းနှင့် (ခ)ရပ်ကွက်၊ သံတွဲမြို့ ၌ **၄၄** ရာခိုင်နှုန်းသည် **အဖုံးပါသောအမှိုက်ပုံးများ** ဖြင့် စုဆောင်းသည်။ ယေဘူယျအားဖြင့် ဖြေဆိုသူအားလုံး၏ **၈၀** ရာခိုင်နှုန်းကျော်က အမှိုက်များကို စည်ပင်မှ **အမှိုက်စွန့်ပစ်သည့်နေရာ/ကွန်တိန်နာများနှင့် အမှိုက်ကားများ** ဆီသို့ စွန့်ပစ်ကြပါသည်။

အင်တာနက် ဆက်သွယ်မှုရှုထောင့်တွင် ဖြေဆိုသူများမှ အိမ်ထောင်စု **၇၈** ရာခိုင်နှုန်း သည် **ဖုန်းများမှ တစ်ဆင့် အင်တာနက်**ကို အသုံးပြုကြပါသည်။
အက်ပလီကေးရှင်းများတွင် "**Facebook**" (**၆၀** ရာခိုင်နှုန်း) သည် **အသုံးအများဆုံး** ဖြစ်ပြီး ဖြေဆိုသူ **၁၇** ရာခိုင်နှုန်း သည် **ဖေ့စ်ဘွတ်ခ်နှင့် Viber နှစ်ခုစလုံး**ကို အသုံးပြုပါသည်။

အဆိုပြုထားသော စီမံကိန်းအပေါ် ရပ်ရွာလူထု၏အသိအမြင်နှင့် ပတ်သက်၍ **အံတော်** ကျေးရွာ မှ အိမ်ထောင်စုအများစု **၇၇** ရာခိုင်နှုန်း နှင့် **(ခ)ရပ်ကွက်၊ သံတွဲမြို့** မှ အိမ်ထောင်စု **၅၆** ရာခိုင်နှုန်း သည် စီမံကိန်းအကြောင်း **အနည်းငယ်သာသိ** သည်ဟု ဖြေဆို ကြပါသည် ။

TMP စက်ရုံကြောင့် **အပြုသဘောသက်ရောက်မှု** များနှင့်စပ်လျဉ်းသော မေးခွန်းတွင် **အံတော်** ကျေးရွာ မှ အိမ်ထောင်စု **၄၈** ရာခိုင်နှုန်း နှင့် **(ခ)ရပ်ကွက်၊ သံတွဲမြို့** မှ အိမ်ထောင်စု **၆၄** ရာခိုင်နှုန်း က "**တိုးတက်လာသော အလုပ်အကိုင်အခွင့်အလမ်း** " ဟုဖြေဆိုကြပါသည်။

TMP စက်ရုံကြောင့် **ဆိုးကျိုးသက်ရောက်မှုများ** နှင့် စပ်လျဉ်း၍ **အံတော်** ကျေးရွာ မှ အိမ်ထောင်စု **၄၆** ရာခိုင်နှုန်း နှင့် **(ခ)ရပ်ကွက်၊ သံတွဲမြို့** မှ အိမ်ထောင်စု **၆၈** ရာခိုင်နှုန်း သည် **စီမံကိန်းကြောင့် ဆိုးကျိုးသက်ရောက်မှုများမရှိ** ဟု တုံ့ပြန်ခဲ့ကြပါသည်။
သို့သော် **အံတော်** ကျေးရွာ မှ အိမ်ထောင်စု **၃၁** ရာခိုင်နှုန်း နှင့် **(ခ)ရပ်ကွက်၊ သံတွဲမြို့** မှ အိမ်ထောင်စု **၁၆** ရာခိုင်နှုန်းသည် "**သဘာဝပတ်ဝန်းကျင်အပေါ် ဆိုးကျိုးသက်ရောက်မှုများ**"အား ဖော်ပြခဲ့ပြီး "**ကျန်းမာရေးအပေါ် ဆိုးကျိုးသက်ရောက်မှုများ**" အပေါ် **အံတော်** ကျေးရွာ မှ အိမ်ထောင်စု **၁၇** ရာခိုင်နှုန်း နှင့် **(ခ)ရပ်ကွက်၊ သံတွဲမြို့** မှ အိမ်ထောင်စု **၄** ရာခိုင်နှုန်းမှ တုန့်ပြန်ခဲ့ပါသည်။

အန်တော် ကျေးရွာ မှ ကျန် **၆** ရာခိုင်နှုန်း က "**ရေရရှိမှု**" အပေါ် ဆိုးကျိုးသက်ရောက်မှုကို ဖြေကြားခဲ့ပါသည်။ (ခ)ရပ်ကွက်၊ သံတွဲမြို့ မှ **၈** ရာခိုင်နှုန်း က "**လူမှုပတ်ဝန်းကျင် အပေါ် ဆိုးကျိုးသက်ရောက်မှုများ**" နှင့် **၄** ရာခိုင်နှုန်း က "**ကုန်ကျစရိတ်မြင့်မားလာမှု**" ကို ဖြေကြားခဲ့ပါသည်။

ရပ်ရွာအတွက်လိုအပ်သောဖွံ့ဖြိုးမှုများ နှင့် စပ်လျဉ်း၍ ဖြေကြားသူအများစု ၅၅ ရာခိုင်နှုန်းသည် **အလုပ်အကိုင်အခွင့်အလမ်း** ကို ပထမဦးစားပေးအဖြစ်၊ စစ်တမ်းဖြေဆိုသူ ၆၀ ရာခိုင်နှုန်းသည် **ကျန်းမာရေးဝန်ဆောင်မှုများ**ကို ဒုတိယ ဦးစားပေးအဖြစ်၊ ၅၃ ရာခိုင်နှုန်းသည် **ပညာရေး**ကို တတိယဦးစားပေး အဖြစ် သတ်မှတ်ခဲ့ကြပါသည်။

လယ်ယာလုပ်ငန်းနှင့်စပ်လျဉ်း၍ ဖြေဆိုသူ **၃၀** ရာခိုင်နှုန်းသာ လယ်ယာလုပ်ငန်းလုပ်ကိုင်ကြပါသည်။
လယ်ယာလုပ်ငန်းလုပ်ကိုင်ကြသူများထဲမှ **၈၈** ရာခိုင်နှုန်း **သည် ၃ ဧကမှ ၅ ဧကထိ ကိုယ်ပိုင်လယ်ယာမြေများ ပိုင်ဆိုင်ကြသည်** ။ လယ်ယာလုပ်ငန်းလုပ်ကိုင်ကြသူ **၇၆** ရာခိုင်နှုန်း သည် ၃နှစ်အတွင်း "**ဆန်နှင့်သီးနှံ အရည်အသွေး ကျဆင်းမှု**" ကိုဖော်ပြခဲ့သည်။
အများစု **၉၄** ရာခိုင်နှုန်း က TMP စက်ရုံကြောင့် **လယ်ယာစိုက်ပျိုးရေး ကဏ္ဍတွင် "ဆိုးကျိုးသက်ရောက်မှုများနှင့် ပြဿနာများ မရှိ"** ဟုဖြေဆိုကြပါသည်။

မြေအများစု သည်"**သီးနှံမြေ** " ဖြစ်ကြပြီး အများဆုံးစိုက်ပျိုးသောသီးနှံ သည် **ဆန်** ၊ **ပဲ၊ ဟင်းသီးဟင်းရွက်၊ သံပယိုသီးနှင့် ရှောက်သီး** ဖြစ်ပါသည်။

စစ်တမ်းဖြေဆိုသူ **၃၄** ရာခိုင်နှုန်းသည် တိရိစ္ဆာန်များကိုမွေးမြူပြီး "**ဝက်** ၁၇% ၊ "**ကြက်** "၁၃%၊ "**နွား** "၁.၇% နှင့် "**မြင်း** ၁.၇% တို့ ဖြစ်ကြပါသည်။

စစ်တမ်းဖြေဆိုသူများထဲတွင် အနောက်ကျေးရွာမှ **၂၃** ရာခိုင်နှုန်း နှင့် (ခ)ရပ်ကွက်၊ သံတွဲမြို့မှ **၅၂** ရာခိုင်နှုန်းသည် ငါးဖမ်းကြသော်လည်း အများစု **၉၅** ရာခိုင်နှုန်း သည် **TMP စက်ရုံအနီးတွင် ငါးဖမ်းခြင်း မရှိကြပါ။**
ရပ်ရွာအတွင်း သဘာဝဘေးအန္တရာယ်နှင့် ပတ်သက်၍ **၉၀** ရာခိုင်နှုန်းသည် **ရေလွှမ်းမိုးမှု** ကိုဖော်ပြ၍ ၎င်းသည် **မိုးရာသီ**တွင်ဖြစ်ပွားလေ့ရှိပါသည်။

TMP စက်ရုံဖွံ့ဖြိုးတိုးတက်မှုအပေါ် **ဖြေကြားသူများ၏သဘောထား** ကိုကြည့်လျှင် **အံတော်** ကျေးရွာ မှ အိမ်ထောင်စု **၉၄** ရာခိုင်နှုန်း နှင့် **(ခ)ရပ်ကွက်၊ သံတွဲမြို့** မှ အိမ်ထောင်စု **၈၈** ရာခိုင်နှုန်း သည် TMP စက်ရုံ**၏ ဖွံ့ဖြိုးတိုးတက်မှုကို သဘောတူညီကြောင်း** ဖြေကြားခဲ့၍ **အံတော် ကျေးရွာ** မှ အိမ်ထောင်စု **၆** ရာခိုင်နှုန်း နှင့် **(ခ)ရပ်ကွက်၊ သံတွဲမြို့** မှ အိမ်ထောင်စု **၁၂** ရာခိုင်နှုန်းသည် ဖွံ့ဖြိုးတိုးတက်မှုအတွက် **သဘောတူမတူအား သေချာမသိ**ကြောင်းပြောကြားခဲ့ပါသည်။

လူထုတွေ့ဆုံဆွေးနွေးပွဲများ၏ မှတ်ချက်များအရ စက်ရုံအတွင်းရှိ သင့်လျော်သော "**စွန့်ပစ်ရေသန့်စင်စနစ်အား ထိန်းသိမ်းရန်**"ဟူသောမှတ်ချက်မှလွဲ၍ **ပတ်ဝန်းကျင်စက်ရုံများမှ ကြီးကြီးမားမား အပျက်သဘော တုံ့ပြန်မှုမရှိ**ကြောင်း တွေ့ရှိခဲ့ပါသည်။

ဤကိစ္စရပ်များနှင့် အကြံပြုချက်များကို ထည့်သွင်းစဉ်းစားပြီး သဘာဝပတ်ဝန်းကျင် စီမံခန့်ခွဲမှုအစီအစဉ်ကို ရေးသားပါမည်။ EMP နောက်ဆုံးအစီရင်ခံစာကို စက်ရုံ ဂက်ဘ်ဆိုက်တွင် ဖော်ပြထားပါလိမ့်မည်။

Chapter 1

Executive summary

1 Executive summary (TMP)

1.1 Introduction

The Thantwe Marine Product (TMP) Company Limited is a (100%) local private company which is situated near the Ann Taw village, Dwar Ya Wati (B) ward, Thandwe township, Rakhine state, the Republic of the Union of Myanmar, at the coordinates of 18.471427°N and 94.373074°E. The Environmental management Plan (EMP) has been conducted by the consultant team of ***Environmental Quality Management Co., Ltd*** for the marine products processing and cold storage facory of the TMP company.

Table 1.1: Company registration details

1	Environmental Company Registration Number	2690/2012-2013
2	Date of Recommendation from Ministry of Natural Resources and Environmental Conservation, to conduct the EMP	2nd, September, 2020

The contact details of the project proponent are as follows:

-The project proponent name: U Tin Maung Htay, 095003792, Tmpmeister.@gmail.com

- Company name : Thantwe Marine Product (TMP) Company Limited
- Investor name : Daw Aye Mi Win
- Registration No : SDY/ 002 / TMP / DOF
- Registration Date : 13/11/2019
- Expiry Date : 30/09/2020
- Address : 1st lane, 1st ward, Dwarwaddy Myo Thit, Thandwe township, Rakhine state
- Type of Business : Cool Storage and making flake ice factory
- Investment location : 1st lane, 1st ward, Dwarwaddy Myo Thit, Thandwe township, Rakhine state

The company started exporting since 1996 and commercially has been operating since August 18,1997.

The main aim of this work is ***to reduce adverse impacts*** of the factory and its activities on the ***health and environment*** together with ***the promotion of factory's sustainable development.***

1.2 Objective

The aim of the TMP factory is ***to provide safe and high-quality seafood by implementing the Good Manufacturing Practices (GMP)*** for the Food Industry as well as the Hazard Analysis and Critical Control Point ***(HACCP) system*** in the factory which is a systematic integral program used to identify and estimate the hazards (microbiological, chemical and physical) and the risks generated during the primary production, processing, storage, distribution, expense and consumption of foods. Furthermore, in order to import countries' requirements like National Standard of the China, Japan, USA, Australia and EU countries, the proposed company maintains sustainably the food safety management systems.

In order to implement the objective, the following materials and methods were used:

- ***Literature review*** on the documents related to policies, laws and regulations of both national and international level

- ***Interviews with people concerned*** with the factory as well as the respective government bodies
- Both ***primary and secondary data*** collection
- ***Environmental baseline*** monitoring
- ***Stakeholders consultation and disclosure*** through focus group meetings
- Reporting back

1.3 Policy, legal and institutional framework

The EMP has been prepared in accordance with the ***respective laws*** accordingly. The detailed laws and regulations directly related to the proposed project are presented in the chapter (3) on the page of (3-25) to (3.38). Although the own process of TMP project does not include the fishing, it is related to the proposed project somehow. Therefore, in order for the fishing to follow, the related laws and regulations are shown on the page (3-11) to (3-24) accordingly.

These are the ***relevant guidelines, standards and regulations***:

- The article 37 (a) and 45 of the Constitution of the Republic of the Union of Myanmar (2008)
- International policies, principles and standards such as WHO guidelines USEPA, IFC Standards
- Relevant local Occupational Health and Safety related laws and regulations
- International conventions, treaties and agreements ratified by Environmental Conservation Department (ECD), Ministry of Natural Resource and Environmental Conservation (MONREC)
- Environmental Conservation Law (2012)
- Foreign Investment Law (2013)
- The draft of Environmental Impact Assessment Rules (2013)
- Environmental Conservation Rules (2014)
- Environmental Impact Assessment Procedure (2015)
- National Environmental Quality (Emission) Guideline (2015)
- Draft Administrative Instruction of Environmental Impact Assessment Procedure (2015)
- Draft Guideline on Public Participation in Myanmar's EIA Processes (2017)
- Project-Relevant Laws including a number of other laws exists which, either directly or indirectly, relate to environmental and social management of the project

1.4 Project description and alternatives selection

The Thantwe Marine Production Co.,Ltd is ***a private company*** leading in the field of exporting especially shrimp and other fishery products located in at the Dwaryawadi Myo Thit, Thandwe township, Rakhine state, in Myanmar, where near fishing ground, bay of Bangol. The factory construction was designed by Myanmar engineers to meet the demand of importing countries and according to the international standards. The factory is registered at department of fisheries and the ***registration No. is SD/002/TMP/DOF***. It has been exporting since 1996.

1.4.1 Current use of the location

The main part of the project of the TMP Company is being occupied by the admin office, operation process building, canteen, storage buildings, other type of building and open space.

Table 1.2: Plant facilities

No.	Factory facility	Area (m2)	Percentage
1	Total area	36422	100
2	Office, Admin and Cold storage	1821	5
3	Two Ice factory	1115	3
4	Kitchen	223	1
5	2 Storage	149	0.4
6	Generators House	37	0.1
7	5 Housing	75	0.2

The proposed factory uses the premium diesel to operate the factory activities and the diesel storage tank is closely set up to the water tanks and there is a flow meter to monitor and control the rate of fuel filling in the control manner.

Furthermore, the factory comprised of a Spill Response Team and a Fire Prevention and Emergency Response Team with the respective duties and responsibilities which are well set up to keep in order in the emergencies effectively and efficiently.

The details are presented in the chapter (4) accordingly.

The proposed factory is at the operation phase.

1.4.2 Operation phase

(a) Power requirement

The main source of electricity supply for this project is the ***national grid line***, which is also utilized by operations including water supply system for the whole project, lighting and production process operation, etc.

The total requirement of electricity supply is a capacity ***of 157,080kWh per month***. The total diesel and gasoline requirement for vehicles is approximately 8,513.06 L per month. That diesel and gasoline are purchased from the local market and transported to the project area by cars.

(b) Water requirement

The main source of water supply of the project area is from the irrigated water from **the own Dam and four tube wells** as well. Water supply is required in the proposed plant for the production process, cool storage processes, the flake ice making plant. In addition, it is used for canteen purpose and sanitation. The total water requirement of the plant is ***870,000 (estimate) gal/month***.

(c) Workforce requirement and staff categories

All workers are permanent staff who is paid monthly. The group of permanent staff includes accountants, maintenance staffs, engineers, warehouse staff, production staffs, logistic, drivers, counter, administration staffs, etc.

Table 1.3: The capacity of staff in the TMP Co., Ltd

Type of Staff	Number of Staff
Temporary Staff	**-**
Permanent Staff	**256**

Chlorine usage

Sr	Type of usage	Number	Amount and concentration
1	Raw storage bath	1	160 g/day & 200 ppm/ 200L
2	Foot washing bath	2	160 g/day & 200 ppm/ 200L
3	Hand washing bath	1	4g/day & 10ppm /200L
4	Floor clean		80g/day & 200 ppm /200L
5	Raw material washing		20g/day & 50ppm/ 200L
6	Final product		4g/day/& 10ppm/200L
7	Baskets, Trays, Chairs cleaning		40g/day &100ppm/ 200L
	Total	**1kg/day**	
		30kg/month	

Total product is 1070.5 tons during 2021-2022.

(d) Waste management

Solid waste management at the factory

In terms of solid wastes, almost ***wastes (inedible fish parts and endoskeleton shell parts etc.)*** released from the processing are ***used as by-products*** e.g., fishmeal. Furthermore***,*** there are ***solid wastes generated from wastewater*** as well.

Domestic solid waste such as food residues (organic wastes) and used disinfectant containers, damaged fuel containers including glasses, tins, bottles, packing materials, papers, stationeries, damaged/expired devices with other miscellaneous will be generated during the operational phase of the factory. The ***waste bins are placed*** at the ***appropriately selected areas around the factory***.

After collecting the wastes, all wastes are ***disposed at the dump sites*** with the ***factory's own arrangement.***

Regarding the wastewater, before final disposal to the Thandwe river, wastewater released from the factory is passed through the ***five-storage waste water treatment tanks serially***. The concrete tank is 32 ft x 11 ft x 10 ft .7in and the circular tank is 8ft diameter and 7ft 9 in height and the final tank is (9 1/2 ft x 9 1/2 ft x 9 1/2 ft). Firstly, treated with ***limestone in the first tank*** and then treated with the ***Charcoal in the second tank***. And then, repeat again with the ***limestone and charcoal*** in the ***third and fourth tanks respectively***.

Therefore, the ***significance of waste impact*** released from the operation phase of TMP factory is rated as "***Medium"*** taking into account ***odour, aesthetic and health.*** However***,*** the factory is operating in accordance with the ***mitigation measures*** as stated particularly designing fish processing operations to enable the recovery of waste streams in accordance with ***Good Manufacturing Practice (GMP)*** and ***Hazard Analysis and Critical Control Points (HACCP)*** food safety programs, the impact cannot be significant.

(e) Safety measures

As ***safety measures for staff / workers*** during operation, employees will be equipped with:

- Ear plugs
- Gloves
- Boots
- Dust Masks
- Helmets
- Protective uniform

The TMP factory has ***obtained the certificates regarding Hazard Analysis and Critical Control Points (HACCP)*** **and EU approved number for Fish and Fishery Products originating in Myanmar awarded by Department of Fisheries.**

1.5 Alternatives selection

There is ***no alternative development option*** for the proposed factory which would prevent all potential environmental and social impacts due to construction and operation.

The implementation of the marine and fisheries processing ***support the supply of aquatic food to people*** which plays a pivotal role in daily nutrition, or provide variety and a few essential nutrients in a healthy and ample diet. Consequently, marine products can ***fulfil the increased food demands at global, regional and local scales.***

Therefore, if the project ***proponent recognises*** social, economic and environmental sustainability of production systems and supply chains along with ***complying the mitigation measures, HSE regulations and management plan described in the EMP accordingly***, the ***overall impacts*** likely affected by the project activities (construction, operation and decommissioning phases) become rated as ***insignificant***.

Furthermore, if there is a good cooperation between the project proponent and the community, there will be specific environmental and social benefits such as ***increased employment opportunities, infrastructure upgrades, and other community benefits*** would occur as a result of the factory development.

1.6 Description of the surrounding environment, impact and risk assessment, and mitigation measures

1.6.1 Local climate and meteorology

The project area has ***a tropical monsoon climate***. It has a warm temperature and none till mediocre rainfall. The ***average annual temperature is 29.8°C*** and the ***average annual rainfall is 92 mm***. The difference in precipitation between the driest month and the wettest month is 298mm. During the year, the average temperature varies by 3°C.

(i) Onsite meteorology

The onsite meteorology data measured indicated temperature, relative humidity, and wind speed and wind direction. The average temperature was ***around 28° C and relative humidity was 79%.***

1.6.2 Ambient air quality

The existing baseline ambient air quality along with the local climate monitoring was conducted at ***(3) locations*** including ***the factory compound*** and ***(2) villages*** which are also located ***upwind and downwind of within 2 km of the vicinity of the project area*** in May, 2021.

Additionally, applicable standards are presented and used for comparison.

The monitoring includes 24-hour average of ***Particulate Matter (PM10), Particulate Matter (PM2.5), Carbon Monoxide (CO), Volatile Organic Compounds (VOC), Sulphur Dioxide (SO2) and Nitrogen Dioxide (NO2), Ammonia (NH3), Methane (CH4)*** and ***Ozone (O3)*** along with ***meteorology*** condition at the monitoring site.

Among these parameters, the major pollutants are particulate matters ***(PM10 and PM2.5)*** which are mostly emitting from the factory activities. Generally, the total emissions of PM10 and PM2.5 for averaged 24-hours were ***21µg/m^3 and 8µg/m^3*** respectively. The emission of ***PM10*** and ***PM2.5 met the WHO guidelines*** (50µg/m^3 for PM10) and (25µg/m^3 for PM2.5).

Another parameter was ***SO2 (17 µg/m^3)*** which is assumed as the emission from the factory machinery process and ***met*** the ***WHO guidelines*** (20ug/m^3 for SO2).

VOC 53 ppb, H2S 18 ug/m3 , NH4 28 µg/m^{3}and ***methane 149 ppm*** were measured to reveal the existing level and as comparison for the post monitoring assessments as well. In this regard, ***NH3 level exceeded the EQEG guideline.***

The (PM10 and PM2.5) of the Nan Taw village which is situated ***upwind of the project site*** were ***10 µg/m^3 and 7 µg/m^3*** respectively and ***(PM10 and PM2.5) of the An Taw village*** (***downwind of the project site)*** were ***6 µg/m^3 and 3 µg/m^3*** respectively. ***Both*** of which ***met the WHO guideline***.

Although the ***impacts of all air pollutants emissions*** throughout the project phase (construction, operation and decommission) were rated as ***medium according to the impact assessment***, it will become ***less significant*** if the ***mitigation measures stated*** are followed accordingly. The detail information of air quality findings is presented in the following section. Moreover, to protect air

pollutants mainly in ***Particulates and Ammonia gas*** from ***the production process***, the workers and a group staff working indoor must wear ***appropriate masks*** *as a* ***good working practice during production process***. ***Monitoring process must be conducted annually*** particularly if the new machineries are installed in the factory. Mitigation measures will be detailed in the respective sections.

The weather condition is generally fine which can affect the air quality situation.

1.6.3 Carbon emission

In terms of the CO_2 emission from the TMP factory, the electricity sector does not directly produce the emission of CO_2 and GHG. The potential gas emissions source from generators which are only standby has been considered as negligible.

The proposed factory will only use two generators when the electricity generation is cut off. These generators are using diesel fuel to generate electricity. Total amount of CO_2 emission from ***generator*** is ***is 41,272 kg of CO2/ year (41.272 metric tons of CO2/ year).*** Total emission of CO2 from ***electricity sector is 1341.07 metric tons of CO2.***

Regarding the ***combustion of fossil fuels*** from the Thantwe Marine Product (TMP) Factory, *diesel* is mainly utilized by ***fishing ships, Cooling box trucks, ferry bus and office cars*** which are for transportation of employees and goods of the proposed factory. The total emission of CO_2 from ***transportation sector*** is ***10,208.589 metric tons of CO2.***

Currently, ***waste released*** from the factory are being ***recycled and collected by CDC***. To develop the conversion factor for recycling rather than landfill waste, emission factors from ***EPA's Waste Reduction Model (WARM)*** were used (EPA 2012). The equivalent of CO2 ***reduction due to recycle instead of landfill*** is ***817.5 metric ton per year.***

Total emission of CO_2 from proposed factory of all of the sectors ***(electricity, transportation) after subtraction of CO2 reduction due to recycle instead of landfill 817.5 metric ton per year***) was
10,732.159 ***metric tons per year.***

1.6.4 Noise

The noise level of the TMP factory was measured at the ***four main different locations along with air monitoring.*** The monitoring sites included Factory compound, the processing area, ***Nan Taw village and Ann Taw village*** which are nearest to the project area.

The noise levels of the factory compound were ***day time (64 dB)*** and ***night time (60 dB)*** which were higher than of ***the noise standard level 55dB (day) and 45dB (night)*** by Environmental Quality (Emission) Guideline (EQEG).

The noise levels of the ***Nan Taw village were day time (50 dB)*** and ***night time (39 dB)*** which do ***not exceed the noise standard level 55dB (day) and 45dB (night)*** by Environmental Quality (Emission) Guideline (EQEG).

The noise levels of the ***Ann Taw village*** were ***day time (45 dB)*** and ***night time (37 dB)*** which do ***not exceed the noise standard level 55dB (day) and 45dB (night)*** by Environmental Quality (Emission) Guideline (EQEG).

According to the ***impact assessment of noise on surrounding***, generally it is rated as ***medium*** Thus, in order to protect noise from factory process, the workers and staff must wear ***ear muffs as a good working practice during production process***. ***Monitoring process must be conducted for annually*** particularly if the new machineries are installed in the factory. Mitigation measures are detailed in the respective sections.

1.6.5 Vibration

The vibration level of the TMP factory was measured at the ***three main different locations along with air monitoring.*** The monitoring sites included Factory compound, ***Nan Taw village and Ann Taw village*** which are nearest to the project area.

The ***vibration levels of the factory*** compound were below the detection limit <0.5m/s^2 against the whole-body vibration (WBV) Daily exposure limit value (ELV) (1.15 m/s^2).

The ***vibration levels of the Nan Taw village*** were below the detection limit <0.5m/s^2 against the whole-body vibration (WBV) Daily exposure limit value (ELV) (1.15 m/s^2).

The ***vibration levels of the Ann Taw village*** were below the detection limit <0.5m/s^2 against the whole-body vibration (WBV) Daily exposure limit value (ELV) (1.15 m/s^2).

According to the ***impact assessment of vibration on surrounding***, generally it is rated as ***medium.*** Thus, in order to protect vibration from factory process, the project activities must be carried in accordance with the mitigation measures particularly mechanically isolate the vibrating source (e.g., compressors) or surface to reduce exposure.

1.7 Geology and hydrogeology

1.7.1 Geology

The area of the Thandwe is ***mountainous, and spurs of the Arakan mountains*** reach the coast. Some of the peaks in the north are over ***4,000 feet (1,200 m) high***.

1.7.2 Hydrogeology

Some urban area is accessible to the public water distribution system through pipe network. Water distribution network is available for some households in urban. However, ***rural communities*** totally depend on ***well, rain water pond and stream*** for both drinking and nondrinking.

1.8 Soil Quality

Types of soil common in Thantwe Township are ***(i) Red Brown Forest Soil; (ii) Yellow Brown Forest Soil; (iii) Meadow Soil and (iv) Saline Swampy Forest Soil***.

The ***total (8) soil parameters*** including ***chemical and physical parameters*** of soil samples collected from the (2) villages including ***Ann Taw and no (8) ward*** were monitored which are significantly important for the environmental health and ***compared with the FAO soil standards*** accordingly.

Based on the findings, the existing soil ***is assumed not been polluted with heavy metals*** which are harmful to the plants and animals. The detail information of soil quality findings is presented in the following section.

Table 1.4: Soil analysis of Ann Taw village

Sr.no	Parameters	Unit	Results	FAO Soil Bulletin 65 & Dutch Standards	Department of Agriculture (Land Use), Mandalay
1	Moisture	%	3.45		
2	pH	1:2.5	6.72		Near Neutral
3	EC	1:5	0.07		Very Low
4	Total N	%	0.09		Very Low
5	Available P	ppm	6.82		Low
6	Available K_2O	mg/100g	8.69		Low
7	Exchangeable K	meq/100g	0.18		Low
8	Texture				
	Sand	%	40.3		Loam
	Silt	%	43.83		
	Clay	%	15.87		

Table 1.5: Soil analysis of No(8) ward, Thantwe

Sr.no	Parameters	Unit	Results	FAO Soil Bulletin 65 & Dutch Standards	Department of Agriculture (Land Use), Mandalay
1	Moisture	%	3.74		
2	pH	1:2.5	5.43		Moderately Acid
3	EC	1:5	0.18		Low
4	Total N	%	0.25		Medium
5	Available P	ppm	30.51		Medium
6	Available K_2O	mg/100g	34.26		High
7	Exchangeable K	meq/100g	0.73		High

8	Texture				
	Sand	%	58.3		Sandy Loam
	Silt	%	31.03		
	Clay	%	12.67		

During ***operation phase***, mismanagement of solid wastes, wastewater and accidental spill of chemicals can lead to ***soil pollution***. Thus, in operation phase of TMP factory, the impact significance on soil quality is considered as "***Medium***". However, ***after mitigation measures***, the ***impact on soil quality*** will become ***less significant***.

1.9 Baseline water quality

The ***total (8) water parameters including chemical, physical and bacteriological*** parameters which are significantly important for the human health and surrounding environment were analyzed from factory effluents including the storm watr , both surface and ground water in accordance with the ***EQEG guideline.***

1.9.1 Effluent released from the processing

According to the results, the effluent water of the proposed factory (significant ***parameters including BOD5, Total Phosphorus and Oil & Grease***) ***met the standards*** except COD, Total Nitrogen, Total Suspended Solid and Total Coliform.

Table 1.6: The results of the factory's effluent from processing

No.	Test Parameters	Unit	Storm Water	WHO Guidelines	National Environmental Quality (Emission) Guidelines	IFC effluent guidelines	Remark
1	BOD5	mg/L	37		≤ 50		Normal
2	COD	mg/L	454		≤ 250		Above the limit
3	Total Nitrogen (mg/L)	mg/L	58.8	N/A	0.01		Above the limit
4	Total Phosphorus (mg/L as P)	mg/L	1.305		2		Normal
5	TSS	mg/L	51		≤ 50		Above the limit
6	Oil & Grease	mg/L	3	-	≤10	-	Normal
7	Total coliform count	CFU/100ml	8994	-	400	-	Above the limit
8	Escherichia coli	CFU/100ml	467	-	-	-	-

Table 1.7: Onsite effluent water sampling data

No.	Name	Time	pH(pH)	ORP (mvORP)	DO (%)	EC (mS/cm)	Turbidity (FNU)	Temp (Deg C)	TDS (ppm)	Salinity (PSU)	Pressure (Psi)
1.	Effluent Water	15:30	7.84	91.7	39	2.352	49.8	24.65	1176	1.21	14.538

1.9.2 The storm water

The main sources of storm water come from the ***domestic usage and the flake ice making process***.

According to the results, the effluent water of the proposed factory (significant ***parameters including BOD5, COD, Total Phosphorus,*** **Total Suspended Solid** ***and Oil & Grease***) ***met the standards*** except Total Nitrogen, and Total Coliform.

Table 1.8: The results of the factory's Storm water

No.	Test Parameters	Unit	Storm Water	WHO Guidelines	National Environmental Quality (Emission) Guidelines	IFC effluent guidelines	Remark
1	BOD5	mg/L	1		≤ 50		Normal
2	COD	mg/L	41		≤ 250		Normal
3	Total Nitrogen (mg/L)	mg/L	3.52	N/A	0.01		Above the limit
4	Total Phosphorus (mg/L as P)	mg/L	0.362		2		Normal
5	TSS	mg/L	< 10		≤ 50		Normal
6	Oil & Grease	mg/L	1	-	≤10	-	Normal
7	Total coliform count	CFU/100ml	6894	-	400	-	Above the limit
8	Escherichia coli	CFU/100ml	2439	-	-	-	-

Table 1.9: Onsite Storm water sampling data

No.	Name	Time	pH(pH)	ORP (mvORP)	DO (%)	EC (mS/cm)	Turbidity (FNU)	Temp (Deg C)	TDS (ppm)	Salinity (PSU)	Pressure (Psi)
1.	Storm Water	15:00	7.77	102.2	60.3	1.165	11	29.73	582	0.57	14.530

1.9.3 Analysis of ground water from Ann Taw village

According to the results of the **ground water** of the Ann Taw village, **all *significant parameters including BOD5, COD, Total Phosphorus,* Total Suspended Solid, *Oil & Grease and Total coliform count met the standards*** except Total Nitrogen.

Table 1.10: The results of the ground water from Ann Taw village

No.	Test Parameters	Unit	Storm Water	WHO Guidelines	National Environmental Quality (Emission) Guidelines	IFC effluent guidelines	Remark
1	BOD5	mg/L	4		≤ 50		Normal
2	COD	mg/L	26		≤ 250		Normal
3	Total Nitrogen (mg/L)	mg/L	1.31	N/A	0.01		Above the limit
4	Total Phosphorus (mg/L as P)	mg/L	0.127		2		Normal
5	TSS	mg/L	21		≤ 50		Normal
6	Oil & Grease	mg/L	6	-	≤10	-	Normal
7	Total coliform count	CFU/100ml	88	-	400	-	Normal
8	Escherichia coli	CFU/100ml	88	-	-	-	-

Table 1.11: Onsite ground water sampling data (Ann Taw village)

No.	Name	Time	pH(pH)	ORP (mvORP)	DO (%)	EC (mS/cm)	Turbidity (FNU)	Temp (Deg C)	TDS (ppm)	Salinity (PSU)	Pressure (Psi)
1.	Ground Water	14:00	7.87	88.6	50.5	0.2	0	30.76	83	0.08	14.635

1.9.4 Analysis of ground water from No (8) ward, Thandwe

According to the results of the **ground water** of the **N0 (8) ward, Thandwe, all *significant parameters including BOD5, COD, Total Phosphorus,* Total Suspended Solid, *Oil & Grease and Total coliform count met the standards*** except Total Nitrogen.

Table 1.12: The results of the ground water from No (8) ward, Thandwe

No.	Test Parameters	Unit	Storm Water	WHO Guidelines	National Environmental Quality (Emission) Guidelines	IFC effluent guidelines	Remark
1	BOD5	mg/L	12		≤ 50		Normal
2	COD	mg/L	20		≤ 250		Normal
3	Total Nitrogen (mg/L)	mg/L	0.79	N/A	0.01		Above the limit
4	Total Phosphorus (mg/L as P)	mg/L	0.029		2		Normal
5	TSS	mg/L	<10		≤ 50		Normal
6	Oil & Grease	mg/L	2	-	≤10	-	Normal

Table 1.13: Onsite ground water sampling data (No (8) ward, Thandwe)

No.	Name	Time	pH(pH)	ORP (mvORP)	DO (%)	EC (mS/cm)	Turbidity (FNU)	Temp (Deg C)	TDS (ppm)	Salinity (PSU)	Pressure (Psi)
1.	Ground Water	11:00	7.87	56.7	39.6	0.3	0	28.42	150	0.14	14.661

1.9.5 Analysis of surface water from Thandwe river

According to the results of the ***surface water*** of the **Thandwe river , all *significant parameters including BOD5, Total Phosphorus,* Total Suspended Solid, *met the standards*** except COD, Total Nitrogen. Oil & Grease and Total coliform count.

Table 1.14: The results of the surface water from Thandwe river

No.	Test Parameters	Unit	Storm Water	WHO Guidelines	National Environmental Quality (Emission) Guidelines	IFC effluent guidelines	Remark
1	BOD5	mg/L	0		≤ 50		Normal
2	COD	mg/L	1500		≤ 250		Above the limit
3	Total Nitrogen (mg/L)	mg/L	<0.5	N/A	0.01		Above the limit
4	Total Phosphorus (mg/L as P)	mg/L	0.031		2		Normal
5	TSS	mg/L	5		≤ 50		Normal
6	Oil & Grease	mg/L	12	-	≤10	-	Above the limit
7	Total coliform count	CFU/100ml	250650409	-	400	-	Above the limit
8	Escherichia coli	CFU/100ml	850	-	-	-	-

Table 1.15: Onsite surface water sampling data (Thandwe river)

No.	Name	Time	pH(pH)	ORP (mvORP)	DO (%)	EC (mS/cm)	Turbidity (FNU)	Temp (Deg C)	TDS (ppm)	Salinity (PSU)	Pressure (Psi)
1.	Surface Water	10:00	7.77	21.6	49.4	0.01	12	31.93	5796	6.53	14.610

According to the WHO drinking water standards, the ground water of the selected villages ***more or less met the standards except Total Nitrogen and Bacteriological*** result indicating that the ***ground water is needed to be disinfected for drinking purpose.*** Furthermore, ***high levels of nitrate in drinking water can be dangerous to health*** *especially* for infants and pregnant women.

According to the ***impact assessment of the proposed project on both surface and ground water quality during the three phases including construction, operation and decommissioning phase,*** in general**,** it is rated as ***medium***. If the operation activities under monitoring closely are carried out in

accordance with the mitigation measure, the ***impact significance*** will be reduced to ***negligible***. Mitigation measures are detailed in the respective sections.

Regarding Total Nitrogen removal from the wastewater, there are two steps for removing nitrogen using biological treatment. They are nitrification and denitrification methods.
For the TMP factory: Maintain the existing wastewater treatment system in order to be effective functioning system and then add another additional two process (unsaturated biofilter (nitrification) and Saturated biofilter (Denitrification) after the final stage of existing system before the final disposal.

For Unsaturated biofilter, Granular Activated Carbon filter (Charcoal) can be used and for the Saturated biofilter, saturated sand filter can be adopted accordingly.

For the ground water of villages, Granular activated carbon which is made from raw organic materials (such as coconut shells or coal) can be used for nitrogen removal

1.10 Biological environment and Cultural Heritage

The baseline biodiversity survey was conducted 2 km within the vicinity of the project site in order to identify biodiversity as well as
ecosystem services.

The ***flora survey*** was carried out by the ***forest inventory method*** to identify the species composition, density and distribution. ***A total of 21 plant species*** were observed during the survey. The unique features of the forests are the ***Bonmelzar, Thiho, Taungthayet, Ingyin and Pyinkado*** which are the dominant species in the project area. The regeneration of ***Taungthayet trees*** is found everywhere in the forests.

Regarding ***fauna survey***, ***sample plotting methods, random transect methods and traditional biodiversity survey method*** were carried out to identify the ***vegetation types and endangered species*** in the proposed project area.

According to both ***field surveys and community interviews***, ***6 species of mammals, 24 species of fishes, 8 species of birds and 15 species of reptiles and amphibians*** were identified.

In terms of fish species, ***two species of Near Threatened (NT) species*** , ***twenty species of Least Concern species*** and ***Not Evaluated (NE) two species*** were identified in the project area by both ***field survey and the local Thandwe fish market survey..***

There are ***several cultural and natural heritage*** sites in the vicinity of Thandwe. Among of these, ***two historic pagodas are situated within 2 kms*** of the project site namely ***Tant Taw Mu Pagoda and Shwe San Daw pagoda.***

Being ***located within 2 km of TMP factory***, the ***impact significance*** on biodiversity and cultural heritage was rated as "***Medium***". However, ***after mitigation measures***, these impacts can be ***Negligible***.

1.11 Cumulative impact assessment

According to the onsite surveys and interviews with the nearby community, there are ***no similar Marine Production services around*** the proposed project site.

Cumulative impact on air quality
However, the potential impacts likely affected by the factory can lead the cumulative effect on the existing air quality which is already affected by local activities of the ANN Taw village including the ***markets and restaurants (coffee shops, cafeteria), bus station, car servicing centre and other business activities*** etc.

Cumulative impact on noise quality
In terms of noise impact, there can be ***cumulative noise impacts*** which are likely affected by the proposed TMP Factory's activities resulting from ***compressors, generators and vehicles*** etc., and other ***existing business activities*** which are simultaneously running in the same vicinity. These activities will increase the baseline noise level.

Cumulative impact on water quality
The TMP Factory is currently utilizing the water from the own water reservoir as well as the tube wells. According to ***the nature of the factory process***, there will be much ***cumulative increase in water usage.***
Cumulative impact on traffic
There will be a ***cumulative increase in automobile and truck traffic in the vicinity of TMP factory*** as a result of not only from the ***factory's existing activities*** also from the ***bus station*** situated near the factory.

1.12 Cumulative impact on solid waste and wastewater
Solid wastes particularly ***sludge released from the wastewater treatment***, wastes generated from the ***processing activities*** and ***domestic wastes*** are currently disposed with the factory's own arrangement since there is no municipal waste collection system yet in Thandwe.

Furthermore, the impact of solid waste disposal from the factory as well as ***solid wastes generated from various activities of nearby community around the factory premises*** would likely to contribute towards the ***incremental deleterious effects on surrounding environment*** particularly ***health, aesthetic and odor issue***.

The ***wastewater discharge by the factory*** can cause more or less significant cumulative impact on the river body and its habitant in which ***other effluents*** are also being released from ***local community.***

At the ***local level, cumulative impacts*** identified were of ***Medium significance.*** It was assumed that there will be ***no significant cumulative impacts*** on the environment at the ***national and regional levels*** since the ***magnitude of impact*** is ***not large enough*** to produce emissions and waste water discharge so as to affect on these levels.

1.13 Environmental Management Plan (EMP)
Major environmental management plan to be conducted ***throughout construction, operation and decommission phase*** were detailed in ***proposed mitigation measures*** along with ***monitoring implementation, supervision and report*** system for ***air pollution control, noise, vibration, soil, water resource, solid waste, wastewater, ecological resource and health and safety*** accordingly.

The EMP for ***Wastewater treatment and Ammonia Gas leakage*** that can be accidentally occurred were detailed.

Furthermore, the ***roles and responsibilities*** of the ***Operation Manager/ HSE officer***, ***Project Management Team*** on site and/or ***Designated HSE Team*** will be identified so that the environmental management plans can be carried out in accordance with the factory's policy effectively.
In regard to reporting system, the ***frequency of monitoring*** is classified ranging from ***weekly to annually*** based on the individual issue.
As a result of the impact assessment undertaken, it appears that no major environmental or social issues are present that would keep the project ding complying the mitigation measures.

A summary of the project activities, key mitigation measures and Monitoring plans are presented in ***Table 1.16***.

Table 1.16: The Key mitigation measure and monitoring plans

Impact	Project Activities/ Environmental Aspects	Proposed Mitigation Measure	Monitoring		
			Implementation	**Supervision**	**Report**
Air Quality	***Odor emission*** by decomposition of organic matter	• Design fish processing operations to enable the ***recovery of waste streams in accordance with Good Manufacturing Practice*** *(GMP)* ***and Hazard Analysis and Critical Control Points*** *(HACCP)* food safety programs. • ***Off-cuts and wastes*** should be recovered and taken to the ***by-product facility in time*** to prevent product deterioration. • ***Sludge dewatering*** on sludge drying beds.	The Operation Manager/ HSE officer will: • Ensure ***daily inspection at the site.***	Project Management Team on site and/or Designated HSE Team	***Weekly*** report on ***general working condition*** ***Yearly air quality*** report
Impact	**Project Activities/ Environmental Aspects**	**Proposed Mitigation Measure**	**Monitoring**		
Noise Quality	***Factory activities*** (compressors, generators), vehicle loading or unloading	• Ensure ***regular maintenance*** of the equipment to minimize the noise level. • Ensure ***usage of mufflers*** /**Ear Plug** on diesel/gas driven machinery. • Using ***enclosure for all***	The Operation Manager/ HSE officer will: • Noise generating sources and their platforms will be ***maintained properly*** to minimize noise vibrations generated by them.	Project Management Team on site and/or Designated HSE Team	Weekly report on general working condition Yearly noise quality report

		generator sets. • Use ***low noise equipment***. • Carry out ***periodic monitoring*** of noise levels, if values exceed the standard limits, suitable mitigation measures to be taken. • Develop ***green belt*** to act as a noise barrier.	• Report the incidents if any.		
Impact	**Project Activities/ Environmental Aspects**	**Proposed Mitigation Measure**	**Monitoring**		
			Implementation	**Supervision**	**Report**
Water Resources		• Promote ***recycling and reuse of water*** as much as possible. • Promptly detect and ***repair of water pipes and tank leaks***. • • Promote ***awareness*** to employees on ***water conservation***	The Operation Manager/ HSE officer will: • Ensure ***regular visual checks f***or any leaks that may be present. • Ensure usage of ***enough ice to secure product quality*** and match ice production to requirements.	Project Management Team on site and/or Designated HSE Team	Weekly report on general working condition Yearly water quality report
Impact	**Project Activities/ Environmental Aspects**	**Proposed Mitigation Measure**	**Monitoring**		
			Implementation	**Supervision**	**Report**

Waste	Waste generation and disposal of the project site including solid waste, liquid waste and hazardous waste. Improper waste management.	• Encourage ***fishing vessels*** to ***reduce*** the capture of "***non-target species".*** • Design fish-processing operations to enable recovery of waste streams in accordance with Good Manufacturing Practice (***GMP***) and Hazard Analysis and Critical Control Points (***HACCP***) food safety programs. • Maintain drains regularly as and when required. • Collect ***internal organs*** and other organic materials ***separately***. • Conduct a ***dry pre-cleaning of equipment*** and production areas before wet cleaning. • Fit and use floor drains and collection ***channels with grids and screens,*** and / or traps. • Equip the ***outlets of wastewater channels with screens*** and fat traps. • ***Reducing suspended solids*** by using clarifiers or settling ponds. • ***Store raw materials properly*** under the roof. • Choose ***cleaning agents*** and	The Operation Manager/ HSE officer will: • Produce the log template for checking the waste disposal compliance. • Waste generation from each production process will be recorded. • Ensure that any waste is disposing correctly way. • -Perform the visual inspection of the waste containers and complete the relevant log. The logs are the proof that the inspections have been performed. • Education and training programs with competitions to encourage all employees to actively participate in 4Rs.	Project Management Team on site and/or Designated HSE Team	Weekly report on general condition

		apply with ***correct dosage*** to prevent adverse impacts on environment. • ***Solid wastes*** should ***not be dumped*** into the drain. • ***Blocked drains*** should be ***cleaned properly*** and debris disposed at approved sites. • Ensure that all ***trash containers*** in the plant are ***properly sealed*** at all times to prevent waste being blown and scattered. • Provide ***separate bins*** for food waste, metal and other wastes at the staff quarters and other facilities on site.			
Wastewater	Wastewater generation including the storm water and discharge from the factory processing	• Conduct ***regular inspections*** for drainage pipe blockages or damages, and fix appropriately. • ***Education and training*** will be offered to all factory employees and, reward for innovative reduction and recovery approaches will be given to company departments in monthly competitions.	• ***Wastewater treatment method*** using Limestone and Charcoal alternatively at each tank in TMP factory should be modified adding ***the chlorine with appropriate dosing at the final tank (5th tank) before releasing into the Thandwe river.***	Project Management Team on site and/or Designated HSE Team ***Regular inspection***	Weekly report on general condition including odor as well as the community complaint throughout the drainage pipeline

Ecological Resource	Project operation activities	• Re-greening within the project site will be carried out to compensate the vegetation loss in the operation phase. • Consider use of ***indigenous species in re-vegetatio***n. • Contractors and personnel will Using ***cleaner and environmentally friendly products***.	The Operation Manager/ HSE officer will: • ***Develop green area*** in the project compound. • Ensure ***environmental management procedures*** shall be developed. • Ensure law enforcement, restrictions and notifications for illegal tree cutting, animal hunting or poaching in the forest by the workers, villagers and community.	Project Management Team on site and/or Designated HSE Team	Not directly applicable to the proposed project, however, during the decommission phase, need to report.

Occupational Health and Safety	***Ammonia Gas emission*** from processing activities. ***vehicle*** movement. ***Health impacts or injuries*** due to prolonged exposure of low temperatures. ***Being locked*** in the cold rom. Impairment of ***hearing capacity***. ***Accidental leakage*** of ammonia.	• Provide ***adequate natural lighting or illumination*** lighting. • Post ***readable and clear safety measures*** including safety appliances, safety training posters, slogans and pictures at the factory. • Place ***safety equipment*** in nearby rooms but separate from machinery room. • Maintain, ***keep clean and examine fire and safety*** equipment at periodic intervals (at least monthly). • Train staff for ***effects of ammonia*** to health and environment, safety aspects during handling system, and ***emergency response plan***. • Train cold store workers to recognize the ***symptoms of cold stress.*** • Manage ***regular warm-up breaks*** for staffs working in cold storage room. • Restrict access to the store for authorized, trained persons only and post ***'No entry' signs clearly***. • Establish ***a buddy system***, where	The Operation Manager/ HSE officer will: • Establish ***pre-employment health screening*** and regular health surveillance. • Ensures thorough check of the building and ***sign-in and sign-out time*** of employee attendance sheet before it is locked. • Regular ***testing and maintaining of alarms and emergency lighting***. • Post ***emergency exit door*** instructions on illuminated board by exit. • Ensure the ***PPE***s provided are ***sufficient / appropriate*** for the particular work. • .	Project Management Team on site and/or Designated HSE Team	Weekly report

		two workers are working together with one entering the cold room while the other stay outside. • Establish ***notification system*** for co-workers including intentions of entry to the cold room and how long it will take. Thus, if someone cannot return in due course, • ***Regular medical check up***			

Table 1.17: Monitoring plan for environmental, social and health impact

Factors	Parameter & Guideline	Procedure	Proposed Duration	Frequency of Monitoring	Location
Air Quality	**National Environmental Quality (Emission) Guideline (EQEG)** For both Generator and Flare, • PM (PM10, PM2.5) • NOx • SO2 • CO • VOC • O3 • Methane (CH4) • H2S • CO2 • NH3 (Ammonia)	Method Myanmar National Environmental Quality (Emission) Guidelines	**Duration:** 24hr continuously **Frequency:** • Every six months during operation and once during decommissioning phase • In case of any complaint regarding air quality, an additional air quality measurement may be conducted in response to specific complaints (if necessary)	Will submit monitoring reports to the Ministry not less frequently than every six (6) months or periodically as prescribed by the Ministry.	The factory (complaint area) at the coordinates of **18.471427°N and 94.373074°E**
Noise	• LA_{eq} 1 hr ≤ 70dBA	Method • Myanmar National Environmental Quality (Emission) Guidelines, Effective since 2015 in accordance with The Environmental Conservation Law, 2012, and	**Duration:** 24hr continuously **Frequency:** • Every six months during operation and once during decommissioning phase • In case of a complaint regarding noise from project site, an additional noise measurement may be conducted (if necessary)		The factory compound **at the coordinates of 18.471427°N and 94.373074°E**

Factors	Parameter & Guideline	Procedure	Proposed Duration	Frequency of Monitoring	Location
Effluent from the waste water treatment	**National Environmental Quality (Emission) Guideline (EQEG)** For Daily Maximum Concentration, • BOD5 • COD • Oil and Grease • PH • Temperature • Total Coliform • Total Phosphorus • Total Nitrogen • TSS	<u>Method</u> • Analytical Methods followed to Standard Methods for eluent levels for municipal landfills, recommended by National Environmental Quality (Emission) Guideline (NEQG)	• Every six months during operation and once during decommissioning phase	Will submit monitoring reports to the Ministry not less frequently than every six (6) months or periodically as prescribed by the Ministry.	Effluent discharge from the waste water treatment at the factory
Hazardous and Non-hazardous waste	• Manifest Disposal and Tracking Report	• Track waste volume by type and disposal location daily	• Throughout all phases	Regular Check-up If any , Incident Report	At the project locations Project area, and community around project area, and transportation route
Social	• Environmental watch committee collaborated by the Municipality • Complaint • Monitoring and solving	• Record complaint • Monitor, investigate and implement suitable solutions			
Public and Occupatio	• Accident statistics • Cause of accidents	• Conduct summary report for			

Factors	Parameter & Guideline	Procedure	Proposed Duration	Frequency of Monitoring	Location
nal health and safety	• Mitigation measures	accident investigation			

1.14 Budgets and responsibilities for environmental monitoring

Table 1.18: Budgets and responsibilities for environmental monitoring

Environmental Factors	Index/ Parameters	Responsibility	Estimated Budget
Operation phase			
Air Quality	**National Environmental Quality (Emission) Guideline (EQEG)** For both Generator and Flare, • PM (PM10, PM2.5) • NOx • SO2 • CO • VOC • O3 • Methane • H2S • CO2	Environmental Team (Third Party)	USD 800
Noise	• LA_{eq} 1 hr, 24 hr	Environmental Team (Third Party)	USD 200
Effluent (site runoff and wastewater discharges)	**National Environmental Quality (Emission) Guideline (EQEG)** For Daily Maximum Concentration, • BOD5 • COD • Oil and Grease • PH • Temperature • Total Coliform • Total Phosphorus • Total Nitrogen • TSS	Environmental Team (Third Party)	USD 300
Hazardous and Non-hazardous waste	• Manifest Disposal and Tracking Report	Environmental Team (Third Party)	USD 1,000
Social	• Environmental watch committee collaborated by the Municipality • Complaint	Environmental Team (Third Party)	

	• Monitoring and solving		
Public and Occupational health and safety	• Accidental statistics • Cause of accidents • Mitigation measures	Environmental Team (Third Party)	

1.15 EMP Budget

The ***estimated costs for the initial implementation of EMP*** will be defined on an initial set up basis. The EMP cost is planned as the following amount:

The Thandwe Marine Product (TMP) Company Limited will use **2% of the investment amount** for ***the EMP cost***.

1.16 Corporate Social Responsibility

The project proponent should contribute ***2% of the net profit*** for Corporate Social Responsibility (***CSR***) for the development of local communities.

The TMP Co. Ltd is contributing towards the following CSR activities throughout the project operation phase:

1) Education support

-Provision of the supportive materials for the schools located at the community centers as well as in the local region.

(2) Health support (1997-2019)

- Monthly donation of oxygen supply to the Thandwe Hospital
- Free Medical Treatment for the employees

(3) Social support

- Regular social welfares donations to the Fire stations, Fishery Department and local community
- Donation to Disaster relief charity
- Regular CSR costs are about MMK 100,000,000 per year.

1.17 Emergency response plan

The objective is ***to prepare the resources (personnel and equipment)*** available to respond emergency situations and accidents which can be resulted by the factory activities and major disasters as well.

In the TMP, in general, there should be either ***Emergency service in charge*** or ***HSE manager*** and ***Response Team*** for the emergencies. The team should be prepared as follows:

- ***Training of the team members*** along with their responsibility and equipped with the emergency materials
- Establishment and provision of the ***written emergency procedures***
- Description and Availability of the ***Emergency Response Plan (ERP***) in all employees and factory workers and there should be ***documented and posted***
- Identification of the locations of the emergency evacuation ***Muster points***

- Provision of ***alarm system and fire fighting equipments***
- Supporting of ***first aid equipment***
- Minimizing that should be ***reasonably practicable the risk*** to human life, the environment, assets and business in the event of an accident or emergency situation by ensuring effective and efficient intervention
- Ensuring the ***availability of adequate information on the emergency situations*** through a good communication system
- Ensuring efficient management of the emergency through the ***effective and efficient response of all dedicated resources***
- Identification of the ***governmental authorities, media and other relevant stakeholders*** to be notified and production of a description of the procedures for communicating with them.

The potential emergencies that likely occur at the factory:

- Ammonia Gas leakage

Fire/ Explosion

- Toxic release, Oil spill
- Person(s) falling from the height
- Collapse of lifting appliances, buildings, sheds
- Cement Dust
- Vehicles accidents and injuries

Furthermore, ***COVID19 is a significant issue*** that requires particular attention. ***A COVID19 Protection and Response Plan*** must be developed to allow this project to proceed.

Table 1.19: Emergency response plan for Ammonia gas Leakage

Impact	Project Activities/ Environmental Aspects	Proposed Mitigation Measure	Monitoring		
			Implementation	**Supervision**	**Report**
Ammonia	Use of ammonia refrigeration system and accidental leakage	• Ensure ***enough ventilation*** in machine room. • Provide ***barriers or establish safety procedures*** to protect refrigeration equipment (e.g., pipes, valves, evaporator coils, tanks, vessels, etc.). • Ensure that ***flammables and/or combustibles are not stored*** in machinery room. • Install ***at least two ammonia detectors*** in the machinery room for monitoring any leaks. • Establish ***ammonia detecting system*** which can also activate ventilation fans and trigger remote alarms. • Install ***a manual check valve*** in the ammonia charging line in a location close to main control valve. • ***Install Dual Pressure Relief Valves (PRVs) and a three-way valve*** which will allow one relief valve to be serviced, tested, or replaced, while the other PRV remains on-line to protect the refrigeration equipment.	The Operation Manager/ HSE officer will: • Ensure that refrigeration system is fitted with adequate safety and monitoring control devices, maintained and tested by competent persons. • Ensure that precautions are taken to prevent leaks, fire and explosion including appropriate protection of storage vessels. • Ensure to maintain records of maintenance and tests. • Report the incidents if any.	Project Management Team on site and/or Designated HSE Team	Weekly report

		• Replace ***PRVs every 5 years***.			
		• Check ***ammonia refrigeration system*** and protection devices every time before starting. • Conduct ***regular pressure tests*** and functional tests for all safety devices including alarm system. • Comply ***periodical maintenance*** according to manufacturer's recommendation. • Ensue ***replacing of damaged and deteriorated ammonia pipes***. • ***Removing refrigeration oil*** from the refrigeration system as needed for proper system maintenance.			

1.18 Covid measures as both prevention and emergency response plan

The ***coronavirus pandemic in Myanmar*** is part of the ongoing global pandemic of coronavirus disease 2019 (COVID-19), a novel infectious disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).

Therefore, the TMP factory located in Thandwe shall keep factory workers safe from infection became an urgent priority. Since the risk of infection was particularly high in crowded indoor spaces, ***factory owners*** need to have ***a public health duty to prevent factory outbreaks that could spread to the rest of community***. The detail measures are presented in the chapter 9 accordingly.

1.19 Public consultation and disclosure

The public consultation meetings and socieco surveys were conducted between ***May (21-24), 2021*** at the Thandwe and nearby community.

The main objectives of the ***public consultation and socio-economic surveys*** are to know the ***current socio-economic situation*** in the region, to investigate ***people perception*** on the proposed project and how it can affect for their lifestyles.

The survey conducted at the ***Ann Taw village*** and ***Ka Ward, 8th Street, Thandwe which are the immediate vicinity*** to the proposed project in order to identify the perception of community likely affected by the project activities as well as their social impacts.

Firstly, meetings with the ***village heads, TMP representatives and some respective household members*** were held and the scope of the project along with ***the mitigation measures*** was briefly explained.

The survey was carried out using the ***preformed questionnaire comprising a mixture of quantitative and qualitative question types.***

1.20 Socio-Economic Surveys on Key Informants and local community (*Ann Taw Village*)

Regarding the demographic feature, the common facilities of the ***Ann Taw*** village community are quite improved. The survey identified that more than 90% of total surveyed respondents are "***Rakhine***" and religion is "***Buddhist***".

Looking at the age ranges, ***38%*** of respondents is between ***20-30*** years followed by ***40-50*** years (***22%***).

Out of total survey, ***80%*** in ***Ann Taw village*** and ***84%*** in ***Ka ward, Thandwe*** live in their own houses. Moreover, ***77%*** of respondents live with ***document for ownership*** of the land and remaining ***23%*** live with ***no document but they have permission*** for residence.

Moreover, "***CGI***" is used as roof for ***85%*** of all respondents and only ***7%*** of surveyed households is roofed with "***Thatch***".

Regarding the occupation, "***Skilled workers***" are (***32%***) and "***Casual workers***" are (***25%***) among surveyed respondents.

Concerning income of surveyed respondents, majority (***58%***) earns between ***500,001 to 1,000,000 kyats*** followed by (***30%)*** which is between ***1,000,001 to 2,000,000 kyats per year***.

In the education aspect, it is observed that ***37%*** of respondents have attended "***Middle school"*** and ***23%*** have "***High school***" education level.
Regarding ***highest education*** in the family, ***33%*** of households have "***High school"*** education level followed by "***Middle School"*** level (***27%***).

Concerning the type of diseases, the ***common sickness*** of household members are ***catching a cold*** (***25%***) and (***23%***) ***Flu*** followed by ***hypertension*** (***20%***).
Among surveyed households, approximately ***45%*** get treatment from "***Private clinic with doctor***", ***18%*** from "***Health Assistant***" which is followed by "***General Hospital***" (***14%)***.

For ***perennial sources*** of ***drinking water***, ***(53%)*** in Ann Taw village and ***(50%)*** in Ka-Ward, Thandwe get from ***"Deep well***".

For collection of wastes, ***49%*** in Ann Daw village and ***44%*** in Ka-Ward, Thandwe collect wastes in ***dustbin with cover.*** In general, more than ***80%*** of all respondents dispose the wastes to ***CDC dumping area/container and trucks.***

For the aspect of online communication, ***78%*** of respondents use internet to communicate with each other.
"*Facebook*" (***60%***) is the most common among surveyed respondents and there are ***17%*** of respondents who use both application, "***Facebook and Viber***".

Regarding awareness of local people about the TMP factory, ***77%*** of surveyed respondents in ***Ann Taw village*** and ***56%*** of surveyed respondents in ***Ka-Ward, Thandwe*** mentioned that they just ***know a little*** about the factory.

Regarding community's perception on positive impacts by TMP factory, ***48%*** in Ann Taw village and ***64%*** in Ka-Ward, Thandwe mentioned about "***Increased employment***".

Regarding negative impacts on community due to the existence of TMP factory, ***46%*** in Ann Taw village and ***68%*** in Ka-Ward, Thandwe answered that they ***do not aware*** any negative impacts.
But ***31%*** in Ann Taw village and ***16%*** in Ka-Ward, Thandwe mentioned ***"Environmental Pollution".*** Moreover, ***17%*** in **Ann Taw village** and ***4%*** in Ka-Ward, Thandwe described negative impacts on "***Health***".
Remaining ***6%*** in ***Ann Taw village*** answered adverse effect on ***"Access to water".***
Remaining respondents in ***Ka-Ward, Thandwe*** mentioned ***Negative social environment*** (***8%***) and ***Increased cost*** (***4%***).

Concerning ***necessary development for the community,*** majority of respondants metioned about improvement of "***Employment***" (***55%***) as first priority, "***Medical service***" (***60%***) as second priority followed by "***Education***" (***53%***) as third priority.

Regarding farming activities, approximately ***30%*** of overall surveyed respondents work in agricultural sector. Among them, ***88% have their own farmlands*** ranging from ***3 to 5 acres*** and ***76%*** mentioned about ***reduced quality of rice and crops*** in ***three years.***
Majority of them (***94%***) answered that there is ***no problem and impact*** on ***agricultural sector*** due to TMP factory.
Types of agricultural land which is owned by surveyed respondents are mainly "***Crop land***". Main types of plants are *Rice, Bean/Pulses, Vegetables, Lemon and Shauk*.

It is observed that ***34%*** of respondents breed animals and those are ***pig*** (***17%***), ***poultry*** (***13%***), ***cow*** (***1.7%***) and ***horse*** (***1.7%***).

Among surveyed respondents, ***23%*** in ***Ann Taw village*** and ***52%*** in ***Ka-Ward, Thandwe*** do fishing but majority of them (***95%***) are ***not fishing near TMP factory.***

Regarding natural disaster in community, ***flood*** (***90%***) is the most common and usually happens in ***rainy season.***

Looking at the ***attitudes of the respondents***, ***94%*** in Ann Taw village and ***88%*** in Ka-Ward, Thandwe said that they ***agree*** with the ***development of TMP factory***.

Remaining 6% in ***Ann Taw village*** and ***12%*** in ***Ka-Ward, Thandwe*** are ***not sure*** for the development of TMP factory.

Based on the comments of public consultation meetings, it was found out that there is ***no major negative response from the surrounding factories*** except the comment which is to maintain the ***proper waste water treatment system*** in the factory.

Taking into account these issues and recommendations, the environmental management plan will be written accordingly. The EMP final report will be notified at the factory website accordingly.

Chapter 2

Introduction

2. Introduction

2.1 Background

This Environmental Management Plan (EMP) has been prepared for the Thandwe Marine Productions (TMP) Company Limited based on the site assessment of the proposed project along with the primary and secondary data. The location of this factory is near the Ann Taw village, Dwar Ya Wati (B) ward, Thandwe township, Rakhine state, the Republic of the Union of Myanmar, at the coordinates of 18.471427°N and 94.373074°E. The proposed project covers the total area of 6.45 acres.

The project has started running

According to the Myanmar Environmental Conservation Law (2012), it requires that the proponents of every development project in the country to conduct either Environmental Management Plan (EMP), Initial Environmental Examination (IEE) or Environmental Impact Assessment (EIA), to the Ministry of Natural Resource and Environmental Conservation (MONREC) depending upon the nature of the project which can impact on the environment.

The proposed project requires an EMP to meet the environmental assessment requirements of Myanmar Environmental Conservation Law. Therefore, the Thandwe Marine Productions (TMP) Company Limited commissioned Environmental Quality Management (EQM) Co., Ltd to conduct the Environmental Management Plan (EMP).

This EMP report is prepared to initially assess the potential impacts of the proposed project on environmental components and communities nearby. It is also necessary to develop adequate and feasible management plan together with the monitoring plan including the budget plan for environmental mitigation measures according to the project proposal as well as cooperate social responsibility (CSR) plan.

This Environmental Management Plan (EMP) is formulated in accordance with the existing environmental policy, laws, rules, regulations and instructions. It is submitted as a partial fulfillment to receive the Environmental Compliance Certificate (ECC) from the Environmental Conservation Department (ECD).

The consultant team of Environmental Quality Management Co., Ltd had carried out Environmental Management Plan (EMP) for this Thandwe Marine Productions (TMP) Company Limited in accordance with the appropriate procedures stated by Environmental Conservation Department (ECD), Ministry of Natural Resources and Environmental Conservation (MONREC).

In terms of the ***government registration/approvals*** for the project is as shown below:

Table 2.1: Company registration details

1	Environmental Company Registration Number	2690/2012-2013
2	Date of Recommendation from Ministry of Natural Resources and Environmental Conservation, to conduct the EMP	2nd, September, 2020

The contact details of the project proponent are as follows:
The project proponent name: U Tin Maung Htay, 095003792, Tmpmeister.@gmail.com
• Company name : Thantwe Marine Productions (TMP) Company Limited

- Investor name : Daw Aye Mi Win
- Registration No : SDY/ 002 / TMP / DOF
- Registration Date : 13/11/2019
- Expiry Date : 30/09/2020
- Address : 1st lane, 1st ward, Dwarwaddy Myo Thit, Thandwe township, Rakhine state
- Type of Business : Cool Storage and making flake ice factory
- Investment location : 1st lane, 1st ward, Dwarwaddy Myo Thit, Thandwe township, Rakhine state

It has been exporting since 1996 and start operating commercially on August 18,1997.

The Consultancy firm is based in Yangon, Myanmar and has got strong background and knowledge in the area of Environmental Assessment, and a track record of over 9 years for conducting studies of Environmental, Social and Health Impact Assessment (ESHIA) for development projects across the country.

The contact detail of the environmental survey team is as follows:
- Environmental Quality Management Co., Ltd
- Dr. Ohnmar May Tin Hlaing, Managing Director & Environmental Consultant
- Ph: (951) 2330291, (951) 2331417, (951) 2332182, (959) 50 16606
- Fax: (951) 23339942-1
- Email – contact@eqmmyanmar.com, ohnmarmay@gmail.com
- www.eqm-myanmar.com
- No 233, Block 23, Sayee Pin Lane, Thuwunna, Thingungyun, Yangon, Myanmar
- Company registration no: 2690 Expiry date: 2.11.2020

2.2 Objectives of the project

In order to be sustainable development, the environmental and social impacts shall be necessarily reduced accordingly. Moreover, along with resources which become limited and polluted, environmental assessment has become of ever-increasing importance as a tool for development and decision making. This role is formally recognized in principle 17 of the Rio Declaration on Environment and Development (UNCED 1992).

As a national instrument, this proposed project needs “Social Impact Assessment (SIA) along with Environmental Management Plan (EMP)” as the project is likely to have adverse impact on the environment.

This EMP can be applied not only to prevent or minimize the adverse effects of major development project but also used as a planning tool to promote sustainable development by integrating environmental considerations.

There are two categories in this EMP objective.
1. To identify the potentially significant environmental impacts likely affected by the Marine Fishery Processing and Cold Storage factory.
2. To promote sustainable development by ensuring that the project activities do not undermine critical resources and ecological functions or the wellbeing, lifestyle and livelihood of the communities and people who depend on them. (Long-term aim)

The main objectives of this project are the following:
1. To reveal the **existing environment and activities** in the area of the factory;

2. To detect the **impacts likely affected by the factory activities on neighboring environment including** air atmosphere, water bodies, soil, people and infrastructure
3. To propose the **mitigation measures** where adverse effects may have occurred;
4. To set up **an environmental management plan** that will govern all activities of the project for the better protection of the environment.
5. To reveal the community perception and impacts by conducting socio-eco surveys.

2.3 Methodology for the study

Based on the EMP procedures issued by the Environmental Conservation Department (ECD), Ministry of Natural Resources and Environmental Conservation (MONREC), the methodology used by the consultants consisted of the followings below:

a) **Literature review**: Documentation on the existing and relevant policies, laws, regulations and guidelines related to environmental assessment process and management, factory service, waste management, land use etc. at the national level as well as the international level have been done.
b) **Interviews**: The consulting team has interviewed the community residing near the proposed project as well as in the administrative personnel related to this project.
c) **Data collection**: Through site visit, required qualitative and quantitative data have been collected
d) **Stakeholder consultation**: the consultants conducted stakeholder meetings and door to door household questionnaire surveys on the neighboring communities, to find out their perception on this project.
e) **Environmental baseline monitoring** on air, water, waste and soil
f) **Environmental impacts assessment along with the mitigation measures on the issues including** air, noise, visual, potable water, waste water, waste, etc.
g) **Environmental Management plan** on the environment likely affected by the project activities was developed accordingly.
h) **Reporting:** the data and information collected were organized and compiled in a report.

Chapter 3

Policy, legal and institutional framework

3. Policy and Legal Framework

This section lists all legislation relevant to the undertaking of industrial projects in Myanmar. The legislation can be divided into two categories as follows:

- Policy & Legal Framework (Section 3.1)
- Contractual and other Commitments (Section 3.2)
- Institutional Framework (Section 3.3)
- Project's Environmental and Social Standards (Section 3.4)

3.1 Policy and Legal Framework

3.1.1 Environmental Policy & Framework

Environmental legislation and arrangements for environmental conservation in Myanmar are developing rapidly. As part of Myanmar's reform process that involves the updating and enforcing environmental policy and legislation. The Framework for Economic and Social Reform (FESR 2013) and the National Comprehensive Development Plan (NCDP 2011-2030) continue Myanmar's goal of environmental conservation.

At present, all laws relating to the environment are being formulated and administered by the sectorial ministries and departments concerned. Section 3.2.2 provides a list of environmental legislation relevant to the Project activities.

3.1.2 National Environmental Legislation

The national legislation applicable to the Project comprises the following sources of law, listed hierarchically in accordance with the Constitution and other laws of Myanmar:

- The Constitution of the Republic of the Union of Myanmar (2008);
- The Myanmar Investment Law (2016);
- Myanmar Environmental Conservation Laws (2012);
- Environmental Conservation Rules (2014);
- Environmental Impact Assessment Procedure (2015);
- National Environmental Quality (Emission) Guideline (2015).
- Draft Administrative Instruction of Environmental Impact Assessment Procedure (2015);
- Draft Guideline on Public Participation in Myanmar's EIA Processes (2017)

3.1.2.1 The Constitution of the Republic of the Union of Myanmar (2008)

The latest enacted Constitution of the Republic of the Union of Myanmar (May 2008) provides the most up to date information on governing laws and regulations in Myanmar. The Constitution prevails over any other national legislation or international agreements.

It guarantees every citizen equal right before the law, and requires enactment of necessary laws that recognize citizens' freedom, equality, rights to liberty and justice, benefits, responsibilities, and restrictions (Article 347, and 21 (a) and (d)).

Article (45) states that The Union shall protect and conserve natural environment. Article 390, calls on the duty of its citizens to assist the Union on the following issues:

- preservation and safeguarding of cultural heritage;
- environmental conservation;
- striving for development of human resources;
- protection and preservation of public property

.

3.1.2.2 Myanmar Investment Law (2016)

The Myanmar Investment Law, enacted in 2016, vastly simplified the process for investment applications and offers a number of tax breaks, incentives, guarantees, rights and protections for

business ventures. The Myanmar Investment Commission (MIC) is a government-appointed body formed under the Myanmar Investment Law.
The law includes provisions to restrict or prohibit investment activities which affect public health, the environment and ecosystems, which produce toxic waste or which engage with toxic chemicals; duties of investors to conduct business in such a way as to avoid environmental damage, air and water pollution, in accordance with existing laws as per the following sections.

Chapter (12) Rights to Use Land, Section 50
(a) An Investor who obtains a Permit or an Endorsement under this Law has the right to obtain a long-term lease of land or building from the private owned or from the relevant government departments, governmental organizations managed by the Government, or owned by the State in accordance with the stipulations in order to do investment. Citizen investors may invest in their own land or building in accordance with relevant laws.
(d) The investor shall register the land lease contract at the Office of Registry of Deeds in accordance with the Registration Act.

Chapter (13), Section 51
(c) shall appoint only citizens for works which does not require skill;
(d) shall appoint skilled citizen and foreign workers, technicians, and staff by signing an employment contract between employer and employee in accordance with the labor laws and rules;
(e) shall ensure to obtain the entitlements and rights in the labor laws and rules, including minimum wages and salaries, leave, holidays, overtime fees, damages, compensation of the workman, social welfare, and other insurance related to workers in stipulating the rights and duties of employers and employees and occupational terms and conditions in the employment contract;
(f) shall settle disputes arising among employers, among workers, between employers and workers, and technicians or staff in the investment in accordance with the applicable laws.

Chapter (16) Responsibilities of Investors, Section 65. The Investor –
(e) shall immediately inform the Commission if it is found that natural mineral resources or antique objects and treasure trove not related to the investment permitted above and under the land on which the investor is entitled to lease or use and not included in the original contracts. If the Commission allows, the investor shall continue to carry out the investment in such land, and if not allowed, the investor shall transfer and carry out, by obtaining the permission, at the substituted place which is selected and submitted by him;
(g) shall abide by the applicable laws, rules, procedures and best standards practiced internationally for this investment so as not to cause damage, pollution, and loss to the natural and social environment and not to cause damage to cultural heritage;
(i) shall close and discontinue the investment only after payment of compensation to employees in accordance with applicable laws for any breach of employment contracts, closure of investment, sale and transfer of investment, discontinuation of investment, or reduction of workforce;
(j) shall pay wages and salaries to employees in accordance with applicable laws, rules, procedures, directives and so forth during the period of suspension of investment for a credible reason;
(k) shall pay compensation and indemnification in accordance with applicable laws to the relevant employee or his successor for injury, disability, disease and death due to the work;
(l) shall supervise foreign experts, supervisors and their families, who employ in its investment, to abide by the applicable laws, rules, orders and directives, and the culture and traditions of Myanmar;
(m) shall respect and comply with the labor laws;
(n) shall have the right to sue and to be sued in accordance with the laws;
(o) shall pay effective compensation for loss incurred to the victim, if there is damage to the natural environment and socioeconomic losses caused by logging or extraction of natural resources which

are not related to the scope of the permissible investment, except from carrying out the activities required to conduct investment in a Permit or an Endorsement.
(p) shall allow the Commission to inspect in any places, when the Commission informs the prior notice to inspect the investment;
(q) shall take in advance a Permit or an Endorsement of the Commission for the investments which need to obtain prior approval under the Environmental Conservation Law and the procedures of environmental impact assessment, before undertaking the assessment. Such investments shall be submitted the situation of environmental and social impact assessment to the Commission during the permitted investment period.
Section 71. In conducting their investment activities, the investor shall carry out health assessments, cultural heritage impact assessments, environmental impact assessments and social impact assessments according to the type of investment activities in accordance with the relevant laws, rules, regulations and procedures.

3.1.2.3 The Environment Conservation Law (2012)

The Environmental Conservation Law (Pyidaungsu Hluttaw Law No. 9 / 2012) has the following objectives:
a) to enable to implement the Myanmar National Environmental Policy;
b) to enable to lay down the basic principles and give guidance for systematic integration of the matters of environmental conservation in the sustainable development process;
c) to enable to emerge a healthy and clean environment and to enable to conserve natural and cultural heritage for the benefit of present and future generations;
d) to reclaim ecosystems as may be possible which are starting to degenerate and disappear;
e) to enable to manage and implement for decrease and loss of natural resources and for enabling the sustainable use beneficially;
f) to enable to implement for promoting public awareness and cooperation in educational programs for dissemination of environmental perception;
g) to enable to promote international, regional and bilateral cooperation in the matters of environmental conservation;
h) to enable to cooperate with Government departments, Government organizations, international organizations, non-government organizations and individuals in matters of environmental conservation.
Section 7 of the law, the rights of the Committee are as follows:
(o) managing to cause the polluter to compensate for environmental impact, cause to contribute fund by the organizations which obtain benefit from the natural environmental service system, cause to contribute a part of the benefit from the businesses which explore, trade and use the natural resources in environmental conservation works;
Chapter V
Environmental Emergency
Section 9(a) If the Committee is aware that an event of environmental emergency has occurred or may occur in the entire Myanmar or any Region or state or any area, it shall immediately report to the Union Government so as to declare the occurrence of such event;
Chapter VI
Environmental Quality Standards
Section 10 The Ministry may, with the approval of the Union of the Government and the Committee, stipulate the following environmental quality standards:
(a) Suitable surface water quality standards in the usage in rivers, streams, canals, springs, swamps, lakes, reservoirs, and other inland water sources of the public;
(c) Underground water quality standards;
(d) Atmospheric quality standards;
(e) Noise and vibration standards;

(f) Emission standards;
(g) Effluents standards;
(h)Solid wastes standards;

Chapter VII

Environmental Conservation

Section 13. The Ministry shall, under the guidance of the Committee, maintain a comprehensive monitoring system and implement by itself or in co-ordination with relevant Government department and organizations in the following matters:

(b) Transport, storage, use, treatment and disposal of pollutants and hazardous substances in industries;
(c) Disposal of wastes come out from exploration, production and treatment of minerals, industrial mineral raw material and gems;
(d) Carrying out waste disposal and sanitation works;
(f) Carrying out other necessary matters relating to environmental pollution.

Section 14 A person causing a point source of pollution shall treat, emit, discharge, and deposit the substances which cause pollution in the environment in accord with stipulated environmental quality standards.

Section 15 The owner or occupier of any business, material or place which causes a point source of pollution shall 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 shall be arranged to dispose the wastes in accord with environmentally sound methods.

Section 16 (a) is responsible to carry out by contributing the stipulated cash or kind in the relevant combined scheme for the environmental conservation including the management and treatment of waste;
(b) shall contribute the stipulated users' charges or management fees for the environmental conservation according to the relevant industrial estate, special economic zone and business organization;
(c) shall comply with directives issued for environmental conservation according to the relevant industrial estate, special economic zone or business.

Chapter VIII

Management of Urban Environment

Section 17 The Ministry shall, for the management of urban environment, advise as may be necessary to the relevant Government departments and Government organizations, private organizations and individuals in carrying out the following matters in accord with the guidance laid down by the Committee:
(a) Land use planning and management including zoning;
(d) Management of wastes;
(e) Pollution control including land, water, air and noise pollution;
(f) Other necessary environmental management

Chapter XII

Prohibitions

Section 28 No one shall, without the prior permission, operate business, work-site or factory, workshop which is required to obtain the prior permission under this Law.

Section 29 No one shall, without violate contained in the rules, notification, orders, directives and procedures issued under this Law.

Section 30. No one shall, without permission of the Ministry, import, export, produce, store, carry or trade any material which causes impact on the environment prohibited by the Ministry.

Chapter XIII

Offences and Penalties

Section 34. Whoever imports, exports, produce, store, carry or trade any material prohibited by the Ministry due to its impact on environment shall, on conviction, be punished with imprisonment

for a term from a minimum of three years to a maximum of five years, or with fine from a minimum of kyats, or with both. Moreover, he shall incur the expenditure for the treatment and disposal of such material until the process that has no impact on the environment.

Chapter XIII

Offences and Penalties

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 year, or with fine from a minimum of one hundred thousand kyats to a maximum of one million kyats, or with both.

Section 32 Whoever violates any prohibition contained in the rules, notifications, orders, directives and procedures 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 33 Whoever shall:

(a) If convicted under section 32, be passed an order to compensate for damage due to such act or omission;

(b) If ordered under sub-section (a), and fails to pay the compensation to be paid, be recovered in accord with the existing revenue laws.

3.1.2.4 Environmental Conservation Rules (June 2014)

The Environmental Conservation Rules relating to the Environmental Conservation Law, were enacted in 2014 which contain specific items relating to IEE and pollution prevention which fall under the powers of the Ministry Natural Resources and Environmental Conservation.

Section 54. The business, department, organization or person who would carry out categories of plan, business or activity stipulated under rule 52:

(a) shall carry out environmental impact assessment for his plan, business or activity;

(b) submit to the Ministry in advance by which organization or person, the environmental impact assessment is intended to be carried out;

(c) submit the environmental impact assessment report to the Ministry.

Section 55. The plan, business or activity which is established before the issue of these rules and responsible to carry out the environmental impact assessment or initial environmental examination shall prepare the environmental management plan in accord with the environmental impact assessment procedure to be issued under the Law and submit to the Ministry. The Ministry shall scrutinize the environmental management plan for approving it. The person who carries out the project, business or activity shall implement the environmental management plan approved by the Ministry and matters stipulated by the Ministry within the time stipulated by the Ministry.

Section 56. The person who carries out any project, business or activity shall arrange and carry out for conducting the environmental impact assessment for any project, business or activity by a qualified third person or organization accepted by the Ministry.

Section 69.

(a) Any person shall not emit, cause to emit, dispose, cause to dispose, pile and cause to pile, by any means, the pollutants and the hazardous waste or hazardous material stipulated by notification under the Law and any of these rules at any place which may affect the public directly or indirectly.

(b) Any person shall not carry out to damage the ecosystem and the natural environment which is changing due to such system, except for carrying out with the permission of the Ministry for the interest of the people.

3.1.2.5 Environmental Impact Assessment Procedure (2015)

Environmental Impact Assessment Procedures have been prepared by MONREC under the Environmental Conservation Law, 2012. It requires that the Project proponent shall include in its evaluation environmental, social and health aspects of the environment, and shall identify and assess all adverse impacts and risks for environment, social issues and, if relevant, health that

potentially could arise from the Project. Therefore, this law shall be effectively considered an ESHIA procedure framework.

CHAPTER VIII. Environmental Compliance Certificate, Conditions and Revisions to Conditions

Section 87. Upon receipt of the written approval from the relevant authority, the Project Proponent shall commence implementation of the Project strictly in accordance with the conditions attached to the ECC and including the EMP, within such time as may be prescribed by the Ministry.

Responsibility for all Adverse Impacts

Section 102. The Project Proponent shall bear full legal and financial responsibility for:

a) all of the Project Proponent's actions and omissions and those of its contractors, subcontractors, officers, employees, agents, representatives, and consultants employed, hired, or authorized by the Project acting for or on behalf of the Project, in carrying out work on the Project; and

b) PAPs until they have achieved socio-economic stability at a level not lower than that in effect prior to the commencement of the Project, and shall support programs for livelihood restoration and resettlement in consultation with the PAPs, related government agencies, and organizations and other concerned persons for all Adverse Impacts.

Section 103. The Project Proponent shall fully implement the EMP, all Project commitments, and conditions, and is liable to ensure that all contractors and subcontractors of the Project comply fully with all applicable Laws, the Rules, this Procedure, the EMP, Project commitments and conditions when providing services to the Project.

Section 104. The Project Proponent shall be responsible for, and shall fully and effectively implement, all requirements set forth in the ECC, applicable Laws, the Rules, this Procedure and standards.

Section 105. The Project Proponent shall timely notify and identify in writing to the Ministry, providing detailed information as to the proposed Project's potential Adverse Impacts.

Section 106. The Project Proponent shall, during all phases of the Project (pre-construction, construction, operation, decommissioning, closure and post-closure), engage in continuous, proactive and comprehensive self-monitoring of the Project and activities related thereto, all Adverse Impacts, and compliance with applicable laws, the Rules, this Procedure, standards, the ECC, and the EMP.

Section 107. The Project Proponent shall notify and identify in writing to the Ministry any breaches of its obligations or other performance failures or violations of the ECC and the EMP as soon as reasonably possible and in any event, in respect of any breach which would have a serious impact or where the urgent attention of the Ministry is or may be required, within not later than twenty-four (24) hours, and in all other cases within seven (7) days of the Project Proponent becoming aware of such incident.

Section 108. The Project Proponent shall submit monitoring reports to the Ministry not less frequently than every six (6) months, as provided in a schedule in the EMP, or periodically as prescribed by the Ministry.

Section 109. The monitoring reports shall include:

a) documentation of compliance with all conditions;

b) progress made to date on implementation of the EMP against the submitted implementation schedule;

c) difficulties encountered in implementing the EMP and recommendations for remedying those difficulties and steps proposed to prevent or avoid similar future difficulties;

d) number and type of non-compliance with the EMP and proposed remedial measures and timelines for completion of remediation;

e) accidents or incidents relating to the occupational and community health and safety, and the environment; and

f) monitoring data of environmental parameters and conditions as committed in the EMP or otherwise required.

Section 110. Within ten (10) days of completing a monitoring report as contemplated in Article 108 and Article 109 in accordance with the EMP schedule, the Project Proponent shall make such report (except as may relate to National Security concerns) publicly available on the Project's website, at public meeting places (e.g., libraries, community halls) and at the Project offices. Any organization or person may request a digital copy of a monitoring report and the Project shall, within ten (10) days of receiving such request, submit a digital copy via email or as may otherwise be agreed upon with the requestor.
Section 113. For purposes of monitoring and inspection, the Project Proponent:
a) shall grant to the Ministry and/or its representatives, at any time during normal working hours, access to the Project's offices and to the Project site and any other location at which the Project activities or activities related to the Project are performed; and
b) from time to time as and when the Ministry may reasonably require, shall grant the Ministry access to the Project's offices and to the Project site and any other location at which the Project activities or activities related to the Project are performed.
Section 115. In the event of an emergency, or where, in the opinion of the Ministry, there is or may exist a violation or risk of violation of the compliance by the Project with all applicable environmental and social requirements, the Project shall grant full and immediate access to the Ministry at any time as may be required by the Ministry.

3.1.2.6 National Environmental Quality (Emission) Guideline (2015)

MONREC has established environmental quality standards, the National Environmental Quality Standard [Legal Reference: ECL 2012 (Article 2c) and EQS 2016].
Section 1. These national Environmental Quality (Emission) Guidelines (hereafter referred to as 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.
Section 4. Unless otherwise indicated, these Guidelines refer to emission sources, and are intended to prevent or minimize adverse impacts to environmental quality or human health by ensuring that pollutant concentrations do not reach or exceed ambient guidelines and standards. The Guidelines apply to projects that generate noise or air emissions, and / or that have either direct or indirect discharge of process water, wastewater from utility operations or storm water to the environment.
Section 5. General and industry-specific Guidelines as set out in Annex 1 – Emissions Guidelines shall apply to any project subject to IEE Procedure, as adopted by the Ministry, in order to protect the environment and to control pollution in the Republic of the Union of Myanmar. These Guidelines specifically apply to all project types listed in the IEE Procedure under 'Categorization of Economic Activities for Assessment Purposes' which sets out projects that are subject to initial environmental examination.
Section 6. Provisions of the general and applicable industry-specific Guidelines shall be reflected in project environmental management plan (EMP) and environmental compliance certificate (ECC) and together constitute a project's commitment to take necessary measures to avoid, minimize and control adverse impacts to human health and safety, and the environment through reducing the total amount of emissions generation; to adopting process modifications, including waste minimization to lower the load of pollutants requiring treatment; and as necessary, to apply treatment techniques to further reduce the load of contaminants prior to release or discharge.
Section 7. Recognizing that these Guidelines are intended to prevent pollution through reducing the mass of pollutants emitted to the environment, dilution of air emissions and effluents to achieve maximum permitted values is not acceptable. Specified guideline values should be achieved, without dilution, at least 95 percent of the time that a project is operating, to be calculated as a proportion of annual operating hours.
Section 9. As specified in the IEE Procedure, all projects are obliged to use, comply with and refer to applicable national guidelines or standards or international standards adopted by the Ministry.

These Guidelines will henceforth be applied by the Ministry in satisfying this requirement until otherwise modified or succeeded by other guidelines or standards.
As specified in the IEE Procedure, following project approval a project shall commence implementation strictly in accordance with the project EMP and any additional requirements set out in the project ECC, which will encompass conditions relating to emissions. In this regard, the Ministry will require that projects adhere to general and applicable industry guidelines as set out in Annex 1.
Section 11. As specified in the IEE Procedure, projects shall engage in continuous, proactive and comprehensive self-monitoring of the project and comply with applicable guidelines and standards. For purposes of these Guidelines, projects shall be responsible for the monitoring of their compliance with general and applicable industry-specific Guidelines as specified in the project EMP and ECC.
Section 12. Air emissions, noise, odor, and liquid / effluent discharges will be sampled and measured at points of compliance as specified in the project EMP and ECC.

3.1.2.7 Draft Administrative Instruction of Environmental Impact Assessment Procedure (2015)

In exercise of the power conferred under Section 42 b) of Myanmar Environmental Conservation Law (Law No. 9,2012), the following Administrative Instruction of Environmental Impact Assessment Procedure:
The objectives of the Instruction are to provide a common framework and formats to project proponent/practitioners of relevant study for IEE type project should be considered as to ensure a minimum quality level of the report sand/or documents to be submitted to the Ministry (i.e. Project Proposal, Scoping Report and TOR, IEE Report, and EMP) for Project Proponents and their Study Team.
Section 4. IEE studies should:
(a) Present the characteristics of a project and its justification;
(b) Describe the environmental and social baseline data of the study area as well as the changes that will occur during and after project implementation;
(c) Analyze project alternatives and define measures that will minimize negative impacts on environmental, social, health and cultural components, and maximize benefits to affected communities; and
(d) Propose environmental, social, health and cultural management and monitoring plans to ensure that the requests from the government and the commitments of the Project Proponent are implemented.
Section 11. The Project Proposal, IEE Report, Scoping Report and TOR, IEE Report, EMP report and the other documents determined in the IEE Procedure shall be written in Myanmar language or in English language. In case where the reports/documents are written in English language, at least the executive summary of the reports/documents shall be translated into Myanmar language.
Section 12. Every material to be distributed to local stakeholders in Public Consultations Meetings shall be in Myanmar language.
Section 15. Prior to commencement of the IEE investigation, the Project Proponent shall carefully select the consultants from the list of registered consultants published by the Ministry and organize the study team, and inform to the Ministry along with the filled Official Application Form A3 of Annex 6 of this Instruction as to identify the study team, in accordance with Article 32 of the IEE Procedure and Article 32 of the Consultant Registration Scheme for the Concerning Organizations or Persons Undertaking Environmental Impact Assessment and Initial Environmental Examination.
Section 16. Prior to commencement of the IEE investigation, the Project Proponent shall carefully select the consultants from the list of registered consultants published by the Ministry and organize the study team, and inform to the Ministry along with the filled Official Application Form A5 of

Annex 6 of this Instruction as to identify the study team, in accordance with Article 45 of the IEE Procedure and Article 32 of the Consultant Registration Scheme for the Concerning Organizations or Persons Undertaking Environmental Impact Assessment and Initial Environmental Examination.

3.1.2.8 Draft Guideline on Public Participation in Myanmar's IEE Processes (2017)

Section 1.2. Objectives and application

a) This Guideline provide an indication of the type, level and approach to public participation expected to give effect to the requirements for meaningful public participation in the EIA Procedure.

b) For the purposes of this Guideline, the term public participation is used to encompass the minimum requirements in the IEE Procedure, and recommendations on good practice that go beyond these minimum requirements, relating to:

(i) information disclosure;
(ii) consultation, including through meetings; and
(iii) the consideration of public views, concerns and inputs at all stages of the IEE process, including the decision-making steps.

c) In accordance with the IEE Procedure, this Guideline applies to the preparation, review, implementation and monitoring of the IEE process, which comprises:

(i) Initial Environmental Examinations (IEEs)
(ii) Environmental Impact Assessments (EIAs) and
(iii) Stand-alone Environmental Management Plans (EMPs)

d) The Guideline has been structured in line with the IEE Procedure and in the following way to enable users to focus on the parts of the IEE process relevant to a particular Project Proposal:

(i) Chapter 1 provides general provisions about the Guideline and its application
(ii) Chapter 2 provides information about planning public participation that should apply to all types of Project Proposals under the IEE Procedure
(iii) Chapter 3 applies to IEE Type Projects
(iv) Chapter 4 applies to IEE Type Projects (v) Chapter 5 applies to Project Proposals requiring a stand-alone EMP
(vi) Chapter 6 applies to the implementation of all projects that are approved following the IEE process.

e) This Guideline promotes public participation as early as possible in the development of project proposals and undertaking of IEE processes possible in order to maximize the benefits of relationship building between Project Proponents and local communities.

(i) In this context, while the IEE Procedure does not mandate public participation at the screening step, Project Proponents are encouraged to undertake public participation before and during screening in accordance with the principles and approaches in this Guideline.
(ii) Public participation is also important at this step because the screening decision may result in no further formal IEE process and therefore this may be the only opportunity for communities to contribute to a government decision in the IEE process.

f) This Guideline is to be adapted by Project Proponents, IEE Consultants and government agencies to the particular circumstances when implementing the public participation requirements under the IEE Procedure.

g) The Guideline is also intended to provide all stakeholders, including project affected people (PAP), with an understanding of the type of public participation that can be expected, subject to adaptation to fit the particular circumstances.

h) The Guideline may also be used to guide public participation processes in circumstances where public participation is not legally required, but is recognized to be beneficial to the development of the project proposal and relationships with PAP and other stakeholders.

i) Throughout this Guideline, a reference to a task or responsibility of the IEE Consultant should be understood as applying ultimately to the Project Proponent as the responsible and accountable party.

3.1.3 Project-Relevant Laws

The Myanmar Environmental Conservation Law, Environmental Conservation Rules, Environmental Quality (Emission) Standards are the first step to address all the complex environmental and social management issues faced by Myanmar. A number of other laws exists which, either directly or indirectly, relate to environmental and social management of the project. The other relevant Myanmar government agencies/ requirements applicable to the Project are summarized below:

- Myanmar Marine Fisheries Law ,1993
- Law Relating to Aquaculture,1989
- The Law Amending the Law Relating to the Fishing Rights of Foreign Fishing Vessels;1993
- Freshwater Fisheries Law,1991.
- The Myanmar Territorial Sea and Maritime Zones Law,2017
- Private Industrial Enterprise Law, 1990
- The Factories Act, 1951
- Myanmar Citizen Investment Law, 2013
- Public Health Law, 1972
- The Prevention and Control of Communicable Disease Law, 1995
- The Control of Smoking and Consumption of Tobacco Product Law, 2006 (Section 9)
- The Myanmar Fire Force Law, 2015 (Section 25)
- The Protection and Prevention of Antique Objective Law, 2015 (Section 12)
- The Protection and Prevention of Ancient Monument Law, 2015 (Section 12, 20(f) (c), 15(c))
- Labor Organization Rule
- Employment and Skill Development Law, 2013 (Section 5, 14, 30)
- Labor Organization Law, 2012
- The Workmen Compensation Act, 1951
- Settlement of Labor Dispute Law, 2012
- Minimums Wages Law, 2013
- Payment of Wages Law, 2016- (3,4,8,7(ii),9,10(a) to e
- Social Security Law, 2012 - 11, 16(a), 48(a), 51(a) (b), 54
- Leaves and Holidays Act, 1951
- Occupational Health and Safety Law (2019)
- The Motor Vehicles Law, 2015 and Rules, 1987
- Myanmar Insurance Law, 1993 (Section 16)
- The Underground Water Act, 1930
- The Prevention of Danger of Hazardous Chemical and related Substances Law, 2013 (Section 16,17,23,27)
- Import and Export Law, 2012 (Section 7)
- Conservation of Rivers, Creeks and Water Resources Law, 2006 (Section 24 (b), 21(a)(b), 19, 11(a) (b))

3.1.3.1 Myanmar Marine Fisheries Law, 1993

Chapter II

Application for Licence

3. A person desiring to carry out inshore fishery, shall apply for a licence to the Officer-i ncharge of the Department of the respective Township in the prescribed application form.

4. A person desiering to carry out offshore fishery, shall apply for licence to the Officer-incharge of the Department of the respective State/Division in the prescribed application form.

5. A person desiring to carry out fishery under the Union of Myanmar Foreign Investment Law or for joint ventures in fishery shall apply for a licence to the Director General in the prescribed application form.

6. A person desiring to collect marine products for sale shall apply for a licence to the Officer-incharge of the Department of the respective Township in the prescribed application form.

7. A person desiring to establish fishery on commercial scale for sport fishing shall apply for a licence to the Officer-in-charge of the Department of the respective Township in the prescribed application form

Chapter III

Payment of Duties and Fees

8. A person who has obtained a licence shall pay the following duties and fees in the manner perscribed by the Department:-

(a) Licence fee;

(b) Registration Fee;

(c) Fines;

(d) Late Fees;

(e) Other duties and fees payable.

9. If the licence holder liable to pay the duties and fees is a citizen shall pay the duties and fees in Myanmar currency and if it is a joint venture carried on with a foreigner they shall be paid in foreign currency as specified by the Department.

Chapter IV

Registration

10. Fishing vessels carrying out offshore fishery in the offshore, shall register in the manner prescribed by the Department.

11. A person desiring to work as a fisherman in a fishing vessel shall register in the manner prescribed by the Department.

12. In registering under Section 10 and Section 11, registration fee shall be paid in the manner prescribed by the Department.

Chapter V

Determination of Fishing Ground

13. Fishing grounds shall be determined as required by the Department and fishing rights shall be granted to citizens .But preference shall be given to citizens in the fishing grounds between the baselines and the coast, as declared in the Territorial Sea Maritime zones Law.

14. Fishing grounds shall be determined as required, in the Myanmar Marine Fisheries Waters beyond the baselines and fishing rights may be granted by the Department in the following order:-

(a) Joint Venture Enterprise formed between State Economic Organization and Foreigner;

(b) Joint Venture Enterprise formed between Citizen and Foreigner.

15. Fishing grounds shall be determined as required, in the Myanmar Marine Fisheries Waters beyond the baselines, and fishing rights shall be granted by the Department for any one of the following purposes:-

(a) carrying out fishery by a foreign fishing vessel after registering in the country;

(b) carrying out fishery by a foreigner, with a hired local fishing vessel;

(c) carrying out joint venture fishery with a foreigner, using a fishing vessel registered in the country.
16. In determining the fishing grounds under Section 14 or Section 15 the Director General in exceptional circumstances may grant fishing rights in the fishing grounds between the baselines and the coast.

Chapter VI
Duties and Rights of a Licence Holder

17. The licence holders:-
(a) shall pay the duties and fees payable, in the manner specified by the Department;
(b) shall comply with the regulations and directives prescribed by the Department;
(c) shall take prior permission from the Director General for carrying out research in fishery in the Myanmar Marine Fisheries Waters, excepting the Exclusive Economic Zone, it is desired to carry out research in fishery in the Exclusive Economic Zone, an application shall be made in accordance with Section 20 of the Territorial Sea and Maritime Zones Law;
(d) shall provide necessary services free of charge to persons who have been assigned duties to conduct research on a fishing vessel, to observers and to trainees;
(e) shall appoint on board his vessel only those fisherman who are registered in the Department.
18. The licence holder has the right to carry out the fishery in accordance with the terms prescribed in the licence.

Chapter IX
Duties of the Master of the Vessel

31. Master of the fishing vessel:-
(a) shall abide by the terms and conditions contained in the licence,
(b) shall hang the licence and registration certificate prominently at the wheel house of the vessel;
(c) shall maintain ship's log-book and fishing data book as prescribed by the Department;
(d) shall hoist the flag of the Union of Myanmar on the fishing vessel, when it is in the Myanmar Marine Fisheries Waters;
(e) shall be responsible for the safety of the inspector, researchers, observers and trainees who are on board the vessel;
(f) shall comply with orders and directives prescribed by the Department from time to time.

Chapter X
Appeals

32. (a) If dissatisfied with the order or decision of the officer-in-charge of the Department, an appeal may be filed with the Director General within 30 days on the receipt of such order;
(b) No further appeal shall lie on the decision of the Director General relating to inshore fishery;
(c) If dissatisfied with the order or decision of the Director General relating to offshore fishery under sub-section (a), except the case mentioned under sub-section (b), an appeal may be filed with the Minister within 30 days of the receipt of the order. The decision of the Minister shall be final.

Chapter XI
Prohibitions

33. No person shall without a licence, engage in inshore fishery.
34. No person shall without a licence, engage in offshore fishery.
35. The holder of the licence shall not violate any of the conditions contained in the licence.
36. The holder of the licence shall not transfer his licence.
37. No person shall engage in the industry with the licence obtained by way of transfer under Section (36)
38. No person shall keep on board the fishing vessel, explosive substances, poisons, chemicals and such other dangerous substances not permitted for use in fishing.

39. No person shall dispose of living aquatic creatures or any material into the Myanmar Marine Fisheries Waters to cause pollution of water or to harass fishes and other marine organisms.
40. No person shall search for and collect any marine products without a licence.
41. No person shall establish a fishery on commercial scale for amateur sport fishing in the Myanmar Marine Fisheries Waters without a licence.
42. No person shall harass, assault the Inspector while discharging his duties.
43. No person shall serve as fisherman on board a fishing vessel registered under this Law, without registering in the Department.

Chapter Xll

Offence and Penalties

44. Whoever is found guilty of violating any of the provisions of Section 33, Section 41 or Section 42 shall be liable to be punished with fine which may extend to kyats 5,000 or with imprisonment which may extend to 6 months or with both.
45. Whoever is found guilty of violating any of the provisions of Section 34, Section 37, Section 39 or Section 40 shall be liable to be punished with fine which may extend to kyats 10,000 or with imprisonment which may extend to 1 year or with both.
46. If a licence holder is found guilty of violating any of the provisions of Section 35 or 36, he shall be liable to be punished with fine which may extend to kyats 5,000 or with imprisonment which may extend to 6 months or with both.
47. Whoever is found guilty of violating any of the provisions of Section 38 shall he liable to be punished with fine which may extend to kyats 50,000 or with imprisonment which may extend to 3 years or with both.
48. Whoever is found guilty of violating any of the provisions of Section 43, shall he liable to be punished with line, which may extend to kyats 500 or with imprisonment which may extend to I month or with both.
49. If the Court finds one guilty of an offence under Section 44, Section 45, Section 46 or Section 47 the exhibit brought before the Court may be administered as may be necessary or it may be confiscated.
50. Whoever abets or attempts or acts in common intention in the commission of an offence under this Law shall be punished with the punishment provided for that offence in this Law.

Chapter XIII

Miscellaneous

51. With respect of rights to carry on fishery under this Law, the Minister, of his own accord may make the following orders:-
(a) permitting to carry on fishing industry in the Myanmar Marine Fisheries Waters;
(b) in the interest of the State suspending, revoking, terminating or cancelling the licence issued by the Department, permitting after scrutiny on re-application, if any.
52. If the master of the vessel rails to keep the fishing implement in the prescribed manner while traversing the waters outside the fishing area shall be deemed to be engaged in fishing.
53. The Department is entitled to appropriate only the amount necessary for research, development and conservation of species of fishes for the fishery, out of the fund not exceeding five per cent of the duties and fees collected from the fishery.
54. In sending up a case for violation of this Law it shall not be necessary to produce the exhibits which are not feasible to be produced before the Court or those exhibits for which the Director General has taken action under Section
25, but shall submit a report to the Court as to the manner the exhibits have been disposed of and other supporting documentary evidence.
55. Provisions contained in sub-section (1) of Section 403 of the Criminal Procedure Code that any offence for which an order for conviction or acquittal has been made shall not be tried again, shall not apply to actions taken by the Director General under this Law.

56. Notwithstanding anything contained in any other law for the time being in force, the order passed by any court under this Law shall not affect any action taken by the Director General under this Law.
57. Prior Sanction shall he obtained from the Department for building a fishing vessel or for importing only from aboard to be used in offshore fishing.
58. Cases sent up for trial under this Law, shall he deemed to be cognizable cases.
59. No prosecution or suit shall lie against any public servant for anything which is done in good faith in pursuance of this Law.
60. Relating to marine fishery, provisions of the Fisheries Act, Rules and Directives shall be in force only in so far as they are not inconsistent with this Law.
61. For implementing the provisions of this Law, the Ministry concerned:-
(a) may with the approval of the Government, issue necessary procedures;
(b) may issue necessary orders and directives.

3.1.3.2 Law Relating to Aquaculture,1989
Chapter II
Application for Lease or Licence
3. A person desiring to carry out aquaculture in the land for aquaculture or in fisheries waters not pertaining to any Government department or in reserved fisheries waters shall apply for a lease to the Department in the prescribed application form.
4. A person who has obtained a lease or a person desiring to carry out aquaculture shall apply for a licence to the Department in the prescribed application form.
5. A person wishing to hatch fish for sale or a person desiring to breed fish for display on a commercial scale shall apply for a licence to the Department in the prescribed application form.
6. A person applying for a licence:-
(a) has the right to carry out aquaculture only after obtaining a licence;
(b) shall comply with the conditions prescribed by the Department;
(c) if the fisheries waters or the land in which fish is to be bred pertains to any Government department, the conditions prescribed by such department shall also be complied.

Chapter III
Payment of Duties and Fees
7. A person who has obtained a lease or a licence for aquaculture shall pay duties and fees payable out of the following duties and fees in the manner prescribed by the Department:-
a) lease rent;
(b) licence fee.
8. The provision of section 7 shall not apply to the following operations:-
(a) aquaculture operations carried out by the Department, works of research relating to aquaculture or extended development works;
(b) works of research relating to aquaculture carried out with the approval of the Department.
9. The Department shall prescribed the term of the lease, term of the licence, lease rent, licence fee and late fee.
10. Payment of fee for fishing implements used in aquaculture shall be exempted.

Chapter V
Cancellation of the Lease or Licence
23. The lease or licence is cancelled on the occurrence of any of the following:-
(a) on the expiry of the term;
(b) on being revoked;
(c) on surrendering the lease or the licence to the Department when the fish breeder does not desire to continue his enterprise.

24. The Department may revoke the lease or the licence if on finding after investigation that the fish breeder has ceased to continue to engage in the aquaculture enterprise.

Chapter VI

Inspection and Action to be taken

25. The Inspector shall carry out the following duties:-

(a) inspecting the aquaculture enterprise within the area assigned to him or any area specially assigned to him;

(b) taking legal action against any person who contravenes any provision of this Law in accordance with the prescribed procedure;

(c) in taking action under sub-section (b) fishes, fishing implements and other implements and other implements in connection with fish breeding seized, be disposed of in accordance with the procedures;

(d) performing other duties regarding aquaculture enterprise assigned by the Director General.

Chapter VII

Appeals

26. If dissatisfied with the decision or order made by the Director General under sections 18, 19, 20 or 22 of this Law, an appeal may be filed with the Minister within 30 days on receipt of such decision or order.

27. The Minister may confirm, reject or alter the decision or order of the Director General.

28. The decision of the Minister shall be final.

Chapter VIII

Prohibitions

29. No person shall do the following:-

(a) breeding of fish without licence;

(b) obstructing navigation and flowing of water or polluting the water within the fisheries waters or abetting such acts;

(c) importing live fish into the country and exporting live fish out of the country, without the prior permission of the Department;

(d) breeding of fish prohibited by the Department.

30. The holder of licence:-

(a) shall not contravene any of the conditions prescribed by the Department;

(b) shall not transfer the fisheries pond without the prior permission of the Department.

Chapter IX

Offences and Penalties

31. Whoever is found guilty of committing any offence contained in section 29, shall be punishable with fine which may extend to kyats 10,000 or with imprisonment for a term which may extend to one year or with both. In addition, exhibits, fishes and fisheries ponds relating to the offence shall be confiscated.

32. If holder of licence is found guilty of committing any offence contained in section 30, he shall be punishable with fine which may extend to kyats 5,000 or with imprisonment for a term which may extend to 6 months or with both. In addition, exhibits, fishes and fish ponds relating to the offence shall be confiscated.

33. If a person convicted under section 31 or section 32 again commits the same offence he shall be punishable with twice the quantum of punishment prescribed.

Chapter x
Miscellaneous

34. Provision under this Law shall be observed by a Government department in fishing on land and fisheries waters relating to any Government department.
35. Prior approval shall be obtained from the Department regarding import and export of fresh fishes into and out of the country.
36. Exemption from applying for a licence is given to families who carry on aquaculture for personal consumption in a pond where water surface does not exceed 25 feet by 50 feet in dimension.
37. Arrears of fees for the grant of lease or licence and damages for delay shall be recovered as if it were arrears of land revenue.
38. Regarding the fishing enterprises already underway on the day this Law is promulgated:-
(a) full particulars shall be submitted to the Department within the period prescribed by the Department;
(b) holders of permit for the purpose of aquaculture under section 39 of the Land Nationalization Act, 1953 and holders of permit from a Government department for the purpose of aquaculture on the land or in the fishery waters relating to such department shall apply for a licence at the Department;
(c) the Director General in matters other than those submitted under sub-section (b) may, after scrutiny, administer and direct as may be necessary;
(d) action will be taken under this Law against those who continue to carry on without submitting the particulars under sub-section (a).
39. For the purpose of carrying out the provisions of this Law, the Ministry concerned:-
(a) may with the approval of the Government, issue necessary procedures;
(b) may issue necessary orders and directives.

3.1.3.3 Freshwater Fisheries Law,1991
CHAPTER III
Application for Lease and license and Issue There of

4. A person desirous of operating a fishery in any leasable fishery shall purchase by a system of competitive bidding in an auction in the manners prescribed.
5. A person desirous of operating a fishery in any freshwater fisheries waters other than a leasable fishery shall operate in the manners prescribed by payment of the fishing implement license fee or in the case of a floated tender by obtained a license after submitting sealed tender price.
6. In a case of selling a leasable fishery by auction and in a case of granting a tender license in any freshwater fisheries waters, the Township Zone Officer-in-charge concerned shall sell by auction or grant a tender license in the manners prescribed.
7. In a case of selling a leasable fishery by auction and in a case of granting a tender license, the Township Zone Officer-in-charge shall obtain the approval of the State or Divisional Officer-in-charge concerned.
8. After obtaining the approval under section 7, the Township Zone Officer-in-charge shall issue a lease or a tender license.
9. If an application is made to operate a fishery with any type of fishing implement in any freshwater fisheries waters, other than a case of granting a lease or a tender license the Township Officer-in-charge may issue a fishing implement license in the manners prescribed.

CHAPTER IV

Application for Permission to Operate a Fishery in Foreign Currency and Permission There to

10. Upon application by the following persons desirous of operating a fishery in the manners prescribed, the Director General may, with the approval of the Minister grant a lease or a tender license:-

(a) a foreigner residing abroad who is desirous of operating a fishery in foreign currency.

(b) any person or any organization desirous of operating with foreign capital in accordance with the Union of Myanmar Foreign Investment Law.

11. If the case applied for under section 10 is permitted, the Director General:-

(a) shall determine the fishery rent, tender fee and license fee in foreign currency;

(b) may stipulate the terms and conditions as may be necessary.

12. A person applying for permission to operate a fishery under section 10 shall comply with the following on obtaining permission:-

(a) paying the fishery rent, tender fee and license fee due;

(b) abiding by the terms and conditions of the lease or license;

(c) abiding by the existing laws of Myanmar.

CHAPTER V

Payment of Fishery Rent, Tender Fee and License Fee

13. A person who has purchased the leasable fishery by auction shall pay the fishery rent which is the auction fee and a person who has been granted a tender license shall pay the tender fee and license fee in full on a cash down basis.

14. The Director General may permit the payment of fishery rent by installment as prescribed in respect of leasable fisheries in remote areas.

15. A person who has obtained a fishing implement license in any freshwater fisheries waters other than a leasable fishery shall pay the license fee due in full on a cash down basis.

16. In a case where the fishery rent is permitted to be paid by installment under section 14, a person who has failed to do so shall pay the fishery rent due and also fine as may be prescribed.

17. The Director General may exempt the payment of fishery rent, tender fee and license fee in respect of the following operations:-

(a) fishery research conducted with the permission of the Department;

(b) fishery operated by any Government department or any Government organization not as an economic enterprise, but for the consumption of the employees of its department or organization.

CHAPTER VI

Duties and Rights of a Person who has obtained Permission to Operate a Fishery

18. The duties of a person who has obtained permission to operate a fishery are as follows:-

(a) Payment in full of the fishery rent, tender fee and license fee due;

(b) abiding by the terms and conditions of the lease or license and directives issued by the Department;

(c) carrying out free of charge in fishery research conducted with the permission of the Department.

19. The rights of a person who has obtained permission to operate a fishery are as follows:-

(a) being entitled to operate the fishery in accordance with the terms and conditions of the lease or license;

(b) being entitled to apply for refund.

CHAPTER IX
Application for Refund

25. If any of the following events occur, a person who has obtained a lease or a person who has been granted a tender license may apply for refund to the Township Zone Officerin-charge concerned in accordance with the manner prescribed:-

(a) having had the lease or tender license suspended or revoked in the interest of the State;

(b) having suffered reverses in the production of fish due to natural disaster or any other valid cause.

26. If application is made under section25, the Township Zone Officer-in-charge concerned shall continue to take measures in accordance with the procedures.

27. If the director General State, Divisional or Township Zone Officer-in-charge finds on investigation that the application made under section 25 is true and correct, he shall pass orders for the amount of refund to be made to the person who has obtained a lease or a person who has been granted a tender license, entitled thereto, in accordance with the power conferred by the Minister under section 21 sub-section (b).

28. The Minister shall give a decision on applications for refund, the amount of which is beyond the pecuniary limit of the Director General and the State, Divisional or Township Zone Officer-in-charge.

29. If an order is passed for the refund to be made under section 27 or section 28, the Township Zone Officer-in-charge concerned shall make a refund in accordance with the procedures to the person who has obtained a lease or the person who has been granted a tender license.

CHAPTER X
Invalidation of Permission to Operate a Fishery

30. When any of the following events occur, permission to operate a fishery is invalidated:-

(a) expiry of the term permitted;

(b) revocation or cancellation of the lease, tender license or fishing implement license;

(c) the Officer-in-charge of the Department finding on investigation that the fishery has been abandoned;

(d) surrender of the lease, tender license or fishing implement license by the person who has been permitted to operate a fishery when he desires to discontinue his operation.

CHAPTER XI
Appeals

31. (a) If dissatisfied with an order or decision passed by the Township Officer-incharge in respect of a fishing implement license, an appeal may be filed with the Township Zone Officer-in-charge within 30days of the receipt of such order or decision;

(b) The Township Zone Officer-in-charge may confirm, set aside or alter the order or decision passed by the Township Officer-in-charge;

(c) If dissatisfied with an order or decision passed by a Township Zone Officer in-charge under sub-section (b), an appeal may be field with the State or Divisional Officer-in-charge concerned within 30days of the receipt of such order or decision;

(d) In an appeal field under sub-section (c), the State or Divisional Officer-incharge may confirm, set aside or alter the order or decision passed by the Township Zone Officer-in-charge. No further appeal shall lie on the order or decision passed by the State or Divisional Officer-in-charge.

32. (a) If dissatisfied with an order or decision passed by the Township Zone, State or Divisional Officer-in-charge in respect of a lease, tender license or administrative matter concerning a fishery, an appeal may be filed with the Director General within 30days of the receipt of such order or decision;

(b) The Director General may confirm, set aside or alter the order or decision passed the Township Zone, State or Divisional Officer-in-charge under subsection (a);

(c) No further appeal shall lie if the order or decision passed by the Director General under sub-section (b) covers any of the following matters:-
(i) administrative matter concerning a fishery;
(ii) a lease or a tender license to the value of up to kyats 300000;
(d) If dissatisfied with an order or decision passed by the Director General concerning a lease or tender license to the value of over kyats 300000, an appeal may be filed with the Minister within 30 days of the receipt of such decision or order;
(e) The decision of the Ministry in respect of the matter contained in sub-section (c) shall be final and conclusive.

CHAPTER XII
Prohibitions

33. No one shall operate a fishery without a lease license or permission issued under this Law.
34. No one shall do the following in any freshwater fisheries waters:-
(a) catching fish or causing mischief with explosive substance, poison, chemicals and dangerous material of a like nature;
(b) catching fish by a prohibited method and fishing implement;
(c) catching fish of a prohibited species and size;
(d) catching fish during a prohibited period and at a prohibited place.
35. No one shall, after purchasing by fishery auction or after being granted tender license fail to pay within the prescribed period fishery rent, tender fee, license fee and fines due, without the permission of the Department.
36. No one shall erect, construct, place, maintain or use any obstruction such as a dam, bank or weir in a fresh water fisheries waters without the permission of the Department.
37. A person who has obtained permission to operate a fishery shall not violate any condition contained in a lease, tender license or fishing implement license.
38. No one shall do the following within the boundary of a fishery or fishery creek:-
(a) cutting undergrowth or setting on fire habitat of fish;
(b) impairing the natural condition of a fishery so as to disrupt the flow of water in the main fishery.
39. No one shall cultivate agricultural crops within the boundary of a fishery creek.
40. No one shall cause harassment of fish and other aquatic organisms or pollution of the water in a freshwater fisheries waters.
41. No one shall alter the quality of water, volume of water or the water-course in a leasable fishery, reserved fishery and creeks contiguous thereto or in water-courses.

CHAPTER XIII
Penalties

42. Whoever violates the provision of section 33 shall, on conviction:-
(a) if it is a case of operating a fishery without a fishing implement license be punished with a fine which may extend to kyats 5000 or with imprisonment for a term which may extend to 6 months or with both;
(b) if it is a case of operating a fishery without a lease or a tender license be punished with a fine which may extend to kyats 20000 or with imprisonment for a term which may extend to 2 years or with both.
43. Whoever violates any provision of sections 35, 36, 38 ,39, 40 or 41 shall, on conviction be punished with fine which may extend to kyats 10000 or with imprisonment for a term which may extend to 1 year or with both.
44. If a person who has obtained a lease or who has been granted a tender licence or who has obtained a fishing implement license violates the provision of section 37,he shall, on conviction:

(a) if it is a case of violation of any condition of the fishing implement licence be punished with fine which may extend to kyats 3000 or with imprisonment for a term which may extend to 3 months or with both;
(b) if is a case of violation of any condition of the lease or tender licence , be punished with fine which may extend to kyats 10000 or with imprisonment for a term which may extend to 1 year or with both.
45. Whoever violates any provision of section 34 shall, on conviction be punished with fine which may extend to kyats 30000 or with imprisonment for a term which may extend to 3 years or with both.
46. Whoever abets, attempts or conspires in the commission of any offence under his Law shall be liable to the punishment provided in this Law for such offence.
47. If a person convicted of any offence under this Law commits the same offence again, he shall be punished with twice the quantum of punishment prescribed.

CHAPTER XIV
Miscellaneous
48. The provision contained in section 403 sub-section (1)of the Code of Criminal procedure to the effect that any offence for which an order for conviction or acquittal has been passed shall not be tried again, shall not apply to action taken by the Director General under this Law.
49. Notwithstanding anything contained in any other Law for the tine being in for the time being in force, an order passed by any court under this Law shall not affect any action taken by the Director General under this Law.
50. Cases sent up for trial under this Law are prescribed as cognizable offences.
51. The Officer-in-charge of the Department may, if necessary request the assistance of the Peoples'police Force concerned in the discharge of his duties and powers.
52. The granting of lease and license and permission to operate a fishery in respect of the freshwater fisheries waters shall only be made by the Department.
53. The Department shall, in consultation with the Government department concerned prepare maps demarcating the limits of the leasable fishery and reserved fishery.
54. The fishery rent, tender fee, license fee and fines due under this Law shall be recovered by the Officer-in-charge of the Department as if they were arrears of land revenue.
55. No suit or prosecution shall lie against any public servant for anything which is done in good faith under this Law.
56. The existing Fisheries Act, Rules and Directives made there under in respect of the freshwater fishery shall be in force only in so far as they are not inconsistent with this Law.
57. For the purpose of carrying out the provisions of this Law, the Ministry concerned :-
(a) may, with the approval of the Government issue such procedures as may be necessary;
(b) may issue such orders and directives as may be necessary

3.1.3.4 The Myanmar Territorial Sea and Maritime Zones Law,2017
Chapter II
Objectives
3. The objectives of this Law are as follows:
(a) to have security, rule of law and tranquility for the interests of the State in the territorial sea, contiguous zone, exclusive economic zone and continental shelf;
(b) to protect and conserve, and excavate natural resources systematically for long term in the territorial sea and maritime zones of the State and to do marine scientific researches;
(c) to protect and conserve from the pollutions on the sea, airspace and impact on marine environment through the territorial sea and maritime zones of the State.

Chapter III
Territorial Sea

4. The territorial sea of the State extends seawards to a distance of twelve nautical miles from the baselines.

5. The sovereignty of the State extends to the territorial sea, to its seabed, subsoil and to the airspace over the territorial sea.

6. (a) Unless it is contrary to the provisions of this Law, vessels of all states other than foreign warships shall enjoy the right of innocent passage through the territorial sea. This passage shall be deemed to be innocent passage so long as it is not prejudicial to the peace, rule of law and tranquility or security of the State;

(b) A foreign warship may pass innocent passage through the territorial sea only if prior permission of the government is obtained;

3This PC/ Data(D)/2017 Law/ Myanmar Territorial Sea and Maritime Zones Law

(c) The relevant government department and government organization has the right to direct foreign warship entering without getting prior permission of the government to leave immediately from the area where they arrive through the territorial sea.

7. During the passage through the territorial sea:

(a) any foreign ship shall observe the existing laws of the State;

(b) any foreign ship shall traverse the territorial sea by the shortest way without stopping or anchoring except by reason of natural disaster or force majeure;

(c) a foreign fishing vessel shall keep systematically its fishing gear and equipment in a secured position for sea;

(d) foreign research vessel shall do research only if prior permission of the Government is obtained;

(e) foreign submarines and other underwater vehicles shall navigate on the surface of the sea and show their flag.

8. If a foreign ship engages in any of the following activities while innocent passage through the territorial sea, it shall be considered to be prejudicial to the peace, rule of law and stability or security of the State:

(a) any threat, use of force or any other act against the sovereignty, territory integrity or political independence of the State or in any other manner in violation of the principles of international law embodied in the Charter of the United Nations;

(b) any exercise or practice or use with weapons of any kind;

(c) collecting information to the prejudice of the security or defense of the State;

(d) act of propaganda that affects the security or defense of the State;

(e) the launching, landing or taking on board of any aircraft;

(f) the launching, landing or taking on board of any military device;

4 This PC/ Data(D)/2017 Law/ Myanmar Territorial Sea and Maritime Zones Law

(g) the loading and unloading of any commodity, currency, person or animal which are not permitted under the existing customs, fiscal, immigration or sanitary laws;

(h) act to pollute and affect the sea, airspace and impact on marine environment;

(i) catching acquatic animals including fishes, by any way, fishing, supporting and preparing for these businesses, and making to damage the natural resources;

(j) the carrying out of research or survey activities;

(k) any act aimed at interfering with any systems of communication, any other facilities or installations or structures of the State;

(l) any other activity not having a direct bearing on innocent passage.

9. The Foreign ship shall observe the relevant existing laws and international rules for protection of collision at the sea in the innocent passage through the territorial sea.

10. (a) Oil tankers, nuclear-powered ships and the ships carrying other inherently dangerous or noxious substances by nuclear or by nature shall pass sea lanes , controlled and designated by the State.
(b) The relevant ship shall, when passing under sub-section (a), carry necessary documents and observe precautionary measures established for such ships by international agreements.
11. The relevant ministry shall take into account the following facts in the designation of sea lanes and the prescription of traffic separation schemes on charts with the approval of government and shall promulgate it to know the public:
(a) the recommendations of the competent international organization for this purpose;
(b) any channels customarily used for international navigation;
(c) the special characteristics of particular ships and channels;
(d) the density of traffic.
5 This PC/ Data(D)/2017 Law/ Myanmar Territorial Sea and Maritime Zones Law
12. The Government:
(a) may take the necessary steps in its territorial sea to prevent passage which is not innocent;
(b) may take the necessary steps to prevent any breach of conditions relating to ships proceeding to internal waters or a call at a port facility outside internal waters;
(c) may suspend temporarily the innocent passage of foreign ships in the territorial sea if such suspension is necessary for the protection of the security of the State. Such suspension shall take effect after having been duly published.
13. No charge shall be levied upon foreign ships by reason only of their passage through the territorial sea. However, the State may levy on specific services rendered to the ship.
14. The relevant government departments and government organizations may, in accordance with the law, stop, investigate, search, arrest and prosecute the vessel relating to the following offences and matters which occur on board foreign ships passing through the territorial sea:
(a) being the consequences of the crime which extends to the State;
(b) being the crime which disturbs the peace, the rule of law, and tranquility of the State;
(c) being the request for assistance of the State by the master of the ship or by a diplomatic agent or consular officer of the flag State;
(d) being necessary measures for the suppression of illicit traffic in narcotic drugs or psychotropic substances;
(e) being necessary measures for the suppression of the act of violence, trafficking in persons, smuggling in persons or arms trafficking or piracy directly or indirectly.
15. The relevant government departments and government organizations may, after the foreign ships violates any existing laws in the internal waters of the State,
6 This PC/ Data(D)/2017 Law/ Myanmar Territorial Sea and Maritime Zones Law take any steps according to the provisions of section 14 while passing through the territorial sea after leaving internal waters.
16. The State may exercise civil jurisdiction in the following matters relating to the innocent passage of foreign ship through the territorial sea:
(a) failure of obligations or liabilities assumed or incurred by the foreign ship in the course or for the purpose of its voyage through the internal waters and territorial sea of the State;
(b) imposition of any liability by a foreign ship for the purpose of civil proceedings in the internal waters.

Chapter IV

Contiguous Zone

17. The contiguous zone of the State is an area beyond and adjacent to the territorial sea and extends to a distance of 24 nautical miles from the baselines.
18. In the contiguous zone, the State has the right to exercise necessary control relating to the following matters:
(a) to safeguard the security of the State; and

(b) to prevent infringement of the customs, fiscal, immigration or sanitary laws of the State and to punish the persons who violate them in accordance with the laws.

Chapter V

Exclusive Economic Zone

19. The exclusive economic zone of the State is an area beyond and adjacent to the territorial sea. Such exclusive economic zone extends to a distance of 200 nautical miles from the baselines.

20. The State has the following rights and jurisdiction to exercise within exclusive economic zone:

(a) sovereign rights and authority for exploring, exploiting, conserving and managing the natural resources on the seabed, the seabed and its subsoil, the waters superjacent to the seabed and the water level in the

7 This PC/ Data(D)/2017 Law/ Myanmar Territorial Sea and Maritime Zones Law exclusive economic zone, and other activities for the economic exploration, exploitation, and aquaculture including the production of energy from the water, currents and winds; (b) exclusive rights and jurisdiction for the establishment, maintenance and use of artificial islands, off-shore terminals, installations and structures, and jurisdiction which can specify the security area for such places;

(c) exclusive jurisdiction to authorize, regulate and control marine scientific research;

(d) rights and jurisdiction to protect and conserve the marine environment sustainability and to prevent and control marine pollution;

(e) other rights provided for in the United Nations Convention on the Law of the Sea, 1982.

21. In the exclusive economic zone, all States may enjoy the right of freedom of navigation, over flight within the air space over the zone and laying of submarine cable, pipelines and its related facilities in accordance with the law. In doing so, it shall not affect the rights and jurisdiction of the State.

22. The relevant government departments and government organizations may, in accordance with the existing laws, search, inquiry, arrest and prosecute any ship for exploring, exploiting, conserving and managing the natural resources in the exclusive economic zone.

Chapter VI

Continental Shelf

23. The continental shelf of the State comprises the seabed and subsoil of the submarine areas that extends beyond the territorial sea throughout the natural prolongation of its land territory to the outer edge of the continental margin.

24. The natural resources of the continental shelf consist of:

(a) the mineral and living and non-living resources. Living and nonliving resources include living organisms belonging to sedentary species and organisms which, at the harvestable stage, either are

8 This PC/ Data(D)/2017 Law/ Myanmar Territorial Sea and Maritime Zones Law

immobile on or under the seabed or are unable to move except in constant physical contact with the seabed or the subsoil;

(b) natural resources notified by the government from time to time.

25. The State has the right to exercise the following rights and jurisdiction in the continental shelf:

(a) exploration, exploitation, conservation and management of the natural resources;

(b) establishment, maintenance and use of artificial islands, off-shore terminals, installations and structures;

(c) jurisdiction to authorize, regulate and control marine scientific research.

(d) conservation and protection of marine environment, and reduction, prevention and control of marine pollution due to submarine cables, pipelines and its related facilities;

(e) underground tunnelling;

(f) prescribing other rights provided from time to time by the international law.

Chapter VII

The Right of Hot Pursuit

26. The State may, in accordance with the stipulations, exercise the right of hot pursuit of a foreign ship which violates or is believed that it has violated this Law and other existing laws. Such right

of hot pursuit ceases if a foreign ship pursued enters its territorial sea or the territorial sea of a third State.

Chapter VIII

Demarcation of sea boundary with neighbouring countries

27. The sea boundary line of Myanmar-Bangladesh is demarcated by the judgment of the International Tribunal on the Law of the Sea issued on 14 March, 2012. The coordinates of sea boundary line of Myanmar-Bangladesh is as mentioned in Annexe (B) and the nautical chart of boundary line is as mentioned in Annexe (C).

9 This PC/ Data(D)/2017 Law/ Myanmar Territorial Sea and Maritime Zones Law

28. The sea boundary line of Myanmar-India is demarcated by the bilateral agreement concluded in 1986. The coordinates of sea boundary line of MyanmarIndia is as mentioned in Annexe (B) and the nautical chart of boundary line is as mentioned in Annexe (C).

29. The sea boundary line of Myanmar - Thailand is demarcated by the bilateral agreement concluded in 1980. The coordinates of sea boundary line of Myanmar Thailand is as mentioned in Annexe (B) and the nautical chart of boundary line is as mentioned in Annexe (C).

Chapter IX

Prohibitions

30. No one shall move any objects, including ancient objects and historic objects at the seabed of the contiguous zone without the prior permission of the Government.

31. No one shall act any of the followings in the exclusive economic zone without the prior permission of the Government:

(a) exploration;

(b) exploitation of natural resources;

(c) doing research;

(d) excavating or drilling for any purpose;

(e) establishing, maintaining or using artificial island, off-shore terminal, installations and structures.

32. No one shall act any of the followings in the continental shelf without the prior permission of the Government:

(a) exploration;

(b) exploitation of natural resources;

(c) doing research;

(d) searching, excavating or drilling for any purpose;

(e) establishing, maintaining or using artificial island, off-shore terminal, installations and structures;

10 This PC/ Data(D)/2017 Law/ Myanmar Territorial Sea and Maritime Zones Law

(f) extending or maintaining submarine cables and pipelines.

Chapter X

Offences and Penalties

33. Whoever violates any prohibitions contained in sections 30, 31 or 32 or any rules issued under this Law shall, on conviction, be punished with imprisonment not exceeding seven years or with a fine or with both. If an offender is a foreigner or a person who relates to the interests of a foreign country, he shall pay a fine determined by the court with foreign currency in accordance with prescribed currency exchange rate.

34. Whoever abets in violation of any prohibitions of sections 30, 31 or 32 or any rules issued under this law shall, on conviction, be punished with a fine as prescribed in original offence. If an offender is a foreigner or a person who relates to the interests of foreign country, he shall pay a fine determined by the court with foreign currency in accordance with prescribed currency exchange rate.

35. Whoever attempts to violate any prohibitions of sections 30, 31 or 32 or any rules issued under this Law shall, on conviction, be punished with imprisonment not exceeding three years or with a

fine or with both. If an offender is a foreigner or a person who relates to the interests of a foreign country, he shall pay a fine determined by the court with foreign currency in accordance with prescribed foreign currency exchange rate.
36. Whoever violates or attempts or abets to violate any prohibitions of sections 7, 8 or 10 shall have action taken under relevant existing laws.
37. The relevant court may confiscate any ship other than warships out of ships which are involved in any offence mentioned in sections 33, 34 and 35. Equipment installed on any part of the ship and instruments on board of that ship may be confiscated.
11 This PC/ Data(D)/2017 Law/ Myanmar Territorial Sea and Maritime Zones Law
Chapter XI
Miscellaneous
38. The State may take action against any offenders for the conservation and protection of marine environment.
39. An action taken against any offender under this Law shall not preclude the right to take action under any other existing laws.
40. The actions taken against any offender under section 36 shall not affect the matters relating to civil jurisdiction contained in section 16.
41. There shall be no prosecution under this Law without the prior sanction of the Government.
42. In implementing the provisions of this Law:
(a) the relevant ministry may issue rules, regulations and bye-laws with the approval of the Union Government;
(b) the relevant ministry may issue notifications, orders, directives and procedures.
43. The Territorial Sea and Maritime Zone Law (The PyithuHluttaw Law No.3, 1977) is hereby repealed by this Law.

3.1.3.5 Private Industrial Enterprise Law, 1990

Section 3. Private Industrial Enterprises shall be conducted in accordance with the following basic principles:
(a) to enhance the higher proportion of the manufacturing value added in the gross national product and value of services, and to increase the production of the respective economic enterprises which are related to the industrial enterprise;
(b) to acquire modern technical know-how for raising the efficiency of industrial enterprises and to establish the sale of finished goods produced by the industrial enterprise not only in the local market, but also in the foreign market;
(c) to cause utilization by relying mainly as local natural resources;
(d) to cause narrowing down of the gap between rural development and urban development by causing the development and improvement of industrial enterprises;
(e) to cause opening up of more employment opportunities;
(f) to cause avoidance of or reduction of the use of technical know-how which cause environmental pollution;
(g) to cause the use of energy in the most-economical manner.

3.1.3.6 The Factories Act, 1951

The Factories Act, 1951 and Law Amending the 1951 Factories Act -Pyidaungsu Hluttaw Law No. 12/2016 contains provisions for the proper disposal of waste and effluents in factories; treatment of waste water; regulations for health and cleanliness in factories, and the prevention of hazards.

Section 23: Fencing of Machinery

(1) In every factory the following shall be securely fenced by safe-guards of substantial construction which shall be constantly maintained and kept in position while the machinery is in operation: -

Section 30: Hoists and Lifts

(1) Every hoist or lift shall be of good mechanical construction, sound material and strength and shall be properly maintained.

(2) Every hoist or lift shall be thoroughly examined by an authorized examiner at least once in every period of six months and a register shall be kept containing the prescribed particulars for every such examination.

(3) Every hoist-way or lift-way shall be sufficiently protected by an enclosure fitted with gates. The hoist or lift and every such enclosure shall be so constructed as to prevent any person or thing from being trapped between any part of the hoist or lift and any fixed structure or moving part.

(4) The maximum safe working load shall be clearly marked on every hoist or lift and no load greater than that shall be carried thereon.

(5) The cage of every hoist and lift used for carrying persons shall be fitted with a gate on each side which provides access to a landing.

Section 32: Revolving Machinery

(1) In every factory in which the process of grinding and abrading is carried on there shall be permanently affixed to or placed near each machine in use a notice indicating the maximum safe working peripheral speed of every grinding of abrading wheel. The speed of the shaft or spindle upon which the wheel is mounted, and the diameter of the pulley necessary to secure such safe working peripheral speed.

(2) The speeds indicated in notice under sub section (1) shall not be exceeded.

(3) Effective measures shall be taken in the factory to ensure that the safe working peripheral speed of every revolving vessel, cage, basket fly wheel, pulley, discs or similar appliance driven by power is not exceeded.

Section 33 (1): Pressure Plant

(1) If in any factory, any part of the machinery or plant used in a manufacturing process is operated at a pressure above atmospheric pressure, effective measures shall be taken to ensure that safe working pressure of such parts is not exceeded.

(2) The President may make rules providing for the examination and testing of any plant or machinery refer to in sub section (1) and prescribing such other safety measures in relation thereto as may in his opinion be necessary in any factory or class of factories.

Section 35: Heavy Lifting

(1) No woman adolescent or child shall be employed in any factory to lid or carry or move any load so heavy as to be likely to cause injury.

(2) The President may make rules prescribing the maximum weights that may be lifted, carried or moved ordinarily by persons employed in factories or in any class or description of factories or in carrying on specified process.

Section 37: Protection of Eyes

In respect of any such manufacturing process carried on in any factory as may be prescribed, being a process, which involves-

(a) risks of injury to the eyes from particles or fragments thrown off in the course

(b) of the process; or

(c) risk to the eyes of exposure to excessive light, the President may make rules that require that effective screens or suitable goggles shall provide for the protection of persons employed on, or in the immediate vicinity of the process.

Section 37: Protection from Fumes

(1) In any factory no person shall enter or be permitted to enter any chamber, tank, vat, pit, pipe, flue or other confined space in which dangerous fumes are liable to be present to such an extent as to asphyxiate persons, unless it is provided with a man-hole of adequate size, or other effective means of egress.

(2) No portable electric light of voltage exceeding 24 volts shall be permitted in any factory for use inside any confined space referred to in sub-section (1), and where the dangerous fumes present

are likely to be inflammable, no lamp or light other than that of flame-proof construction shall be permitted to be used in such confined space.
(3) No person in any factory shall enter or be permitted to enter any such confined space referred to in sub-section (1) unless all possible measures have been taken to remove any fumes which may be present and to prevent any ingress of fumes and unless either,
(a) a certificate in writing has been given by an authorized examiner, based on a test carried out by himself, that the space is free from dangerous fumes and fit for persons to enter; or
(b) the person entering is wearing a suitable breathing apparatus and a belt securely attached to a rope the free end of which is held by a person standing outside the confined space.
(4) In every factory suitable breathing apparatus, reviving apparatus and belts and ropes shall be kept ready for immediate use in the vicinity of any such confined space which any person has entered. All such apparatus shall be examined at regular intervals and certified by an authorized examiner to be fit for use; and a sufficient number of the persons from amongst the employed in every factory shall be trained in the use of all such apparatus and in artificial respiration.
(5) In any factory no person shall be permitted to enter any boiler, boiler furnace, boiler flue, chamber, tank, vat, pipe, or other confined space for the purpose of working or making any of examination therein until it has been sufficiently cooled by ventilation or otherwise so as to be safe for persons to enter.
(6) The President may make rules prescribing the minimum dimensions of the manholes referred to in sub-section (1), and may by order in writing exempt or subject to such conditions as he may think fit, any factory or class or description of factories from compliance with any of the provisions of this section.

Section 39: Explosive or Inflammable Dust, Fume, Etc.

(1) Where in any factory any manufacturing process produces dust, fume or vapor of such nature and to such an extent as to be liable to explode on ignition. All possible measures shall be taken to prevent any such explosion by –
(a) effective enclosure of the plant or machinery used in the manufacturing process;
(b) removal or prevention of accumulation of dust, fume or vapor;
(c) isolation or effective enclosure of all possible sources of ignition
(2) Where in any factory the plant or machinery used in a process referred to in sub-section (1) is not so constructed as to withstand the force of such an explosion, all possible measures shall be taken to prevent the spread of the explosion and to minimize the damage caused thereby, by providing chokes, baffles, vents or other effective appliances in the plant or machine.
(3) Where in any factory any part of a plant or machinery that contains any explosive or inflammable fumes and vapor under pressure greater than atmospheric pressure, such part shall not be opened except in accordance with the following provisions, namely: -
a) before the fastening of any joint of any pipe connected with such part is loosened, any flow of gas or vapor into the part or into any such pipe shall be effectively stopped by a stop-valve or other means;
b) before any such fastening of any joint or any pipe or the firmly fastened cover is removed, all measures shall be taken to reduce the pressure of the fume or vapor in the part or pipe to atmospheric pressure;
c) where any such fastening has been loosened or removed effective measures shall be taken to prevent any explosive or inflammable fume or vapor from escaping from the pipe plant or parts of machinery until such cover or joint has been firmly re-fastened or firmly refaxed.
(4) No plant, tank or vessel which contains, or has contained any explosive or inflammable substance, shall be subjected in any factory to any welding, brazing, soldering or cutting operation involving the application of heat, unless adequate measures have been taken to remove such substance and fumes arising therefrom, or to render such substance and fumes non- explosive or non-flammable, and unless a certificate in writing has been given by a competent examiner after a test carried out by himself that the plant, tank, or vessel is free from explosive or flammable vapor.

No such substance shall be allowed to enter such plant, tank or vessel after any such operation, until the metal has cooled sufficiently to prevent any risk of igniting the substance.

Section 40: Arrangements to be Made in Case of Fire

(1) Every factory shall be provided with such means of escape in case of fire as may be prescribed, and if it appears to the Inspector that any factory is not so provided, he may serve on the manager of the factory an order in writing specifying the arrangements which, in his opinion, should be carried out to bring the factory into conformity with the provisions of this section and any rules made thereunder, and requiring them to be carried out before a date specified in the order.

(2) In every factory the doors affording egress from any room shall not be locked or fastened so that they cannot be easily and immediately opened from the inside while any person is within the room, and all such doors, unless they are of the sliding type, shall be constructed to open outwards.

(3) In every factory, every window, door or other exit affording a means of escape in case of fire, other than the means of exit in ordinary use, shall be distinctively marked in a language understood by the majority of workers and in red letters or by some other effective and clearly understood sign.

(4) In every factory there shall be installed apparatus to give warning in case of fire clearly audible to every person employed in the factory.

(5) A passage - way giving access to such means of escape in case of fire shall be kept clear for the use of all workers in every room of the factory.

(6) Effective measures shall be taken to ensure that in every factory-

(a) where more than twenty workers are ordinarily employed in any place on the lowest floor, or

(b) where explosive or highly flammable materials are stored or used, all the workers are familiar with the means of escape in case of fire and have been adequately trained in the procedure to be followed in such case.

3.1.3.7 Myanmar Citizen Investment Law, 2013

Section 4. The followings are the basic principles under this law:

(a) Supporting the main objectives of the national economic development plan;

(b) Safeguarding the citizen obtained, should obtain economic enterprise and opportunities;

(c) Developing employment opportunities;

(d) Acquisition of high technology and development of manufacturing business by high technology;

(k) Revealing less energy consuming businesses;

(p) Participating investments in local development work, by emigrant citizen, intellectuals, intelligentsia, entrepreneurs;

(q) Developing intellectual property manufacturing and services;

(r) Supporting environmental conservation and protection.

Section 11. The duties of the commission are as follows:

(a) In scrutinizing the proposals of the investment, taking into consideration on the facts such as affecting national security, financial credibility, economic justification of the business, appropriateness of technology, protection and conservation of environment.

Section 15. The duties of an investor are as follows:

(f) Carrying out not to cause environmental pollution, damage in accord with existing laws in respect of investment business;

3.1.3.8 Public Health Law, 1972

Section 3 of the Public Health Law empowers the Government of the Union of Myanmar to carry out measures 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.

Provisions to promote and safeguard public health including measures and prohibitions regarding environmental health

Section 9 of this law empowers the Government to carry out measures 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. However, detailed provisions do not exist to ensure more effective and comprehensive regulation of these areas.

3.1.3.9 The Prevention and Control of Communicable Disease Law, 1995

The Prevention and Control for Communicable Diseases Law (No. 01/1995) (Revised in No. 16/2011) includes Provisions to prevent the outbreak of communicable diseases; regulate environmental sanitation; and measures in the event of a disease epidemic.

Section 8

Aim: For the prevention and control of Communicable Disease.

Under the supervision and guidance of the Health Officer of the relevant area, undertake the responsibility of carrying out the following environmental sanitation measures: -

(a) in-door, out-door sanitation or inside the fence outside the fence sanitation;
(b) well, ponds and drainage sanitation;
(c) proper disposal of refuse and destruction thereof by fire;
(d) construction and use of san1tary latrines; and
(e) other necessary environmental sanitation measures.

3.1.3.10 The Control of Smoking and Consumption of Tobacco Product Law, 2006 (Section 9)

The Control of Smoking and Consumption of Tobacco Product Law (No. 05/2006)

Chapter IV - Non-Smoking Areas

Section 6. The following compounds, buildings, rooms and places are non-smoking areas:

(a) hospital buildings, offices, compounds and other buildings in the compound except staff houses and apartments in the hospital compound;
(b) medical treatment centers and clinics;
(c) stadium and indoor playing fields;
(d) children drill sheds and playgrounds;
(e) teaching buildings, classrooms, offices, compounds and other buildings in the compound except staff houses and apartments in the school compound;
(f) teaching buildings of universities, degree colleges, colleges and institutes, classrooms and offices;
(g) opera houses, cinema halls, video halls and other buildings of entertainment;
(h) marts, department stores, stores and market sheds;
(i) museums, archives, public libraries and reading rooms;
(j) elevators and escalators;
(k) motor vehicles and aircrafts for passenger transport;
(l) air-conditioned public rooms;
(m) public auditoriums;
(n) teaching buildings and classrooms of private tuition classes and training schools;
(o) other public compounds, buildings and places prescribed through notification by the Ministry of Health.

Section 7. Places to which the public have access in the following buildings, vehicles and crafts are non- smoking areas except the private offices and rooms. However, specific places where smoking is allowed, shall be arranged in such areas:

(a) buildings of offices and departments;
(b) buildings of factories and workshops;
(c) buildings of hotels, motels, guest houses and lodging houses;
(d) buildings of railway stations, airports, ports and highway bus terminals;

(e) restaurants;
(f) trains and vessels for passenger transport:
(g) other public buildings, rooms and places prescribed through notification by the Ministry of Health.

3.1.3.11 The Myanmar Fire Force Law, 2015 (Section 25)

The Myanmar fire force law, 2015 covers requirements for firefighting and fire protection as follows)

Chapter (2)	Section (3-a, b, c, d)	It is covered all the issue of man-made disaster to the nations
Chapter (8)	Section (15-a, b, c, d), Section (17- a, b, c, d, e, f)	It is covered all the steps how to protect the fire issues
Chapter (11)	Section (24) Section (25-a, b) Section (26) (27), (28), (29), (30), (31), (32), (33)	Issue of Prohibitions and plan how to manage for firefighting
Chapter (12)	Section (34), (35), (36), (37), (38), (39)	Penalties
Chapter (13)	Section (40), (41), (42), (43), (44), (45), (46), (47)	General Information to protect laws regulations and penalties

3.1.3.12 The Protection and Prevention of Antique Objective Law, 2015 (Section 12)

The Protection and Preservation of Antique Objects Law (No. 43/2015) covers requirements for the finding of antique objects.
Section 12. The person who finds any object which has no owner or custodian, he shall promptly inform the relevant Ward or Village-Tract Administrator if he knows or it seems reasonable to assume that the said object is an antique object.
Section 13.
(a) If the information is received under section 12, the Ward or Village- Tract Administrator shall keep the said object as may be necessary and shall forward the information to the relevant Township Administrative Office within 14 days. The Township Administrator shall promptly carry out the necessities and inform the Department within 7 days from the date on which the information is received;
(b) The Department shall inspect whether it is a real antique object or not and keep or cause to keep as may be necessary in accord with the stipulations when the information is received under sub-section (a).

3.1.3.13 The Protection and Prevention of Ancient Monument Law, 2015 (Section 12, 20(f) (c), 15(c))

The Protection and Preservation of Ancient Monuments Law (No. 51/2015)
Section 12. If a person who finds an ancient monument of over one hundred years old and above or under the ground or above or under the water which has no owner or custodian knows or it seems reasonable to assume that the said monument is an ancient monument, he shall promptly inform the relevant Ward or Village-Tract Administrative Office.
Section 13.
(a) If the information is received under Section 12, the Ward or Village- Tract Administrator shall keep the said monument as may be necessary and shall forward the information to the relevant Township Administrative Office within 14 days. The Township Administrator shall promptly carry out the necessities and inform the Department within 7 days from the date on which the information is received.

(b) The Department shall inspect whether it is a real ancient monument or not and keep or cause to protect as may be necessary in accord with the stipulations when the information is received under sub-section (a).

Chapter VII. Applying for prior Permission, Scrutiny and Issue

Section 14. Any Department, any organization or any person desirous of any of the followings shall abide by the provisions of other existing laws and apply for the prior permission under this Law to the Department in accord with the stipulations:

(a) repairing and maintaining the whole or a part of an ancient monument without altering its original form or its original workmanship or altering the boundary of its enclosure;

(e) surveying, digging and researching places where an ancient monument is situated;

Section 15. A person aiming at realizing any of the followings within the specified area of an ancient monument shall apply to get prior permission to the Department:

(b) constructing or extending or repairing new buildings including hotels, factories and residential buildings or fencing or extending a fence;

(c) digging to search petroleum, natural gas, gem or mineral, piping petroleum and natural gas, constructing factories, connecting national grid, constructing communication tower, constructing or extending infrastructures such as road, bridge, airfield, irrigation and embankment;

(d) connecting underground electric cable, communication cable and other underground works;

(f) gold sieving, digging, burning bricks, digging well, lake, creek, ditch, gully, pit digging, refilling, levelling, mining, quarry, gravel digging and unearth sand, removing the mounds and hills which can damage the physical feature of the land;

Chapter VIII Prohibitions

Section 19. No one shall carry out any of the following acts within the specified campus of an ancient monument without the written permission of the Department:

(a) destroying or damaging an ancient monument;

(b) carrying out to alter the original form or the original workmanship of an ancient monument;

(c) digging to search for remains;

(d) looting and removing original elements and artefacts from an ancient monument.

Section 20. No one shall carry out any of the following acts which are assumed to cause damage to an ancient monument within the specified area of an ancient monument or of a listed ancient monument without a written prior permission:

(b) using machines which causes vibration within the specified place of an ancient monument and running various types of vehicles;

(c) cultivating, gardening, breeding, fencing by blocking nearby an ancient monument or doing any other act which can affect an ancient monument;

(d) emission of gas such as hot-air balloon which can affect an ancient monument;

(e) landing and taking off and, flying aero-plane and helicopter which can directly or indirectly affect an ancient monument;

(f) discarding chemical substance and rubbish which can affect an ancient monument and the environment.

3.1.3.14 Labor Organization Law, 2012

The Labor Organization Law, (No. 07/2011) and The Labor Organization Rules, 2012 were enacted to protect the rights of the workers, to have good relations among the workers or between the employer and the worker, and to enable to form and carry out the labor organizations systematically and independently.

Section 3. Every worker, who has attained the age prescribed in respective existing law to work in any trade or activity shall have the right to:

(a) join as a member in a labor organization and to resign from a labor organization according to their own desire;

(b) join as a member only in a labor organization formed according to the category of trade or activity relating to them.
Section 29. The employer shall recognize the labor organizations of his trade as the organizations representing the workers.
Section 30. The employer shall allow the worker who is assigned any duty on the recommendation of the relevant executive committee to perform such duty not exceeding two days per month unless they have agreed otherwise. Such period shall be deemed as if he is performing the original duty of his work.
Section 31. The employer shall assist as much as possible if the labor organizations request for help for the interest of his workers. However, the employer shall not exercise any acts designed to promote the establishment or functioning of labor organizations under his domination or control by financial or other means.
Section 49. No person shall coerce, threaten, use undue influence or seduce by illegal means any worker to participate or not to participate in a labor organization.
Section 50. No person shall:
(a) interfere or obstruct the executive committees in performing duties and powers contained in this Law;
(b) in respect of labor affairs, carry out demonstrations within 500 yards from hospitals, schools, religious buildings, airports, railways, bus terminals, ports or diplomatic missions and military or police installations.

3.1.3.15 The Development of Employees and Expertise (Skill), 2013 (Section 5, 14, 30)
Employment and Skill Development Law (No 29/2013)
Section 5.
(a) (1) If the employer has appointed the employee to work for an employment, the employment agreement shall be made within 30 days. But it shall not be related with government department and organization for a permanent employment.
(2) If pre-training period and probation period are stipulated before the appointment the said trainee shall not be related with the stipulation of sub-section (1).
(b) The following particulars shall be included in the employment agreement:
(1) the type of employment;
(2) the probation period;
(3) wage, salary;
(4) location of the employment; (5) the term of the agreement; (6) working hour;
(7) day off, holiday and leave; (8) overtime;
(9) meal arrangement during the work hour;
(10) accommodation;
(11) medical treatment;
(12) ferry arrangement to worksite and travelling;
(13) regulations to be followed by the employees;
(14) if the employee is sent to attend the training, the limited time agreed by the employee to continue to work after attending the training;
(15) resigning and termination of service;
(16) termination of agreement;
(17) the obligations in accord with the stipulation of the agreement;
(18) the cancellation of employment agreement mutually made between employer and employee;
(19) other matters;
(20) specifying the regulation of the agreement, amending and supplementing;
(21) miscellaneous.

(c) The worksite regulations contained in the employment agreement shall be in compliance with any existing law and the benefits of the employee shall not be less than those of the any existing law.
(d) According to the employment agreement, the Ministry shall issue the notification for paying the stipulated compensation to the employee by the employer, if the work is completed earlier than the stipulated period or the whole work or any part of it have to be terminated due to unexpected condition or the work has to be terminated due to various conditions.
(e) The employment agreement made under sub-section (a) shall be related with daily wage workers, piece rate workers who are appointed temporarily in the government department and organization.
(f) The worksite regulations and benefits contained in the employment agreement mutually made between the employer and employee or among the employees shall be amended as necessary, in accord with the existing law.
(g) The employer shall send a copy of the employment agreement made between the employer and employee, to the relevant employment and labor exchange office within the stipulated period and shall get the approval of it.
(h) The employment agreement made before the enforcement of this law shall be confirmed up to the end of the term of the original agreement.
Section 14. The employer shall carry out the training program in accord with the work requirement in line with the policy of the skill development team to develop the skill relating to the employment for the workers who are proposed to appoint and working at present.
Section 30.
(a) The employer of the industry and service business shall 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%;
(b) Put in money paid under sub-section (a) shall not be deducted from the wage and salary of the employees.

3.1.3.16 The Workmen Compensation Act, 1951

Workman's Compensation Act (1923) Amended by Law No 4/2005

Section 10 (A): Power to Require from Employers, Statements Regarding Fatal Accidents

(1) Where a commissioner receives information from any source that a workman has died as a result of an accident arising out of, and in the course of, his employment, he may send by registered post a notice to the workman's employer requiring him to submit, within thirty days of the service of the notice, a statement, in the prescribed form, giving the circumstances of the death.
(2) If the employer is of opinion that he is liable to deposit compensation, he shall make the deposit within thirty days of the service of the notice.
(3) If the employer is of the opinion that he is not liable to deposit compensation, he shall in his statement indicate the grounds on which he disclaims liability.
(4) Where the employer has so disclaimed liability, the Commissioner after such inquiry as he may think fit, may inform any of the dependents of the deceased workman that it is open to the dependents to prefer a claim for compensation, and may give them such other further information as he may think fit.

Section 10 (B): Reports of Fatal Accidents

(1) Where, by any law for the time being in force, notice is required to be given to any authority, by or on behalf of an employer of any accident occurring on his premises which results in death, the person required to give the notice shall, within seven days of the death, send a report to the Commissioner, giving the circumstances attending the death;
(2) Provided that, where the President of the Union has so prescribed, the person required to give the notice may, instead of sending such report to the Commissioner. Send it to the authority to whom he is required to give the notice.

(3) The President of the Union, may by notification in the Gazette, extend the provisions of subsection (1) to any class of premises other than those coming within the scope of that sub-section, and may by such notification, specify the persons who shall send the report to the Commissioner.

Section 11: Medical Examination

(a) Where a workman has given notice of an accident, he shall, if the employer, before the expiry of three days from the time at which service of the notice has been effected, offers to have him examined free of charge by a qualified medical practitioner, submit himself for such examination; and any workman who is in receipt of a half-monthly payment under this Act shall, if so required, submit himself for such examination from time to time:

(b) If the commissioner considers it necessary for the settlement of any question arising in any proceedings under this Act, he may require a workman who has given notice of an accident to submit himself for examination by a medical practitioner, and the cost of such medical examination, if any, shall be payable by the employer; Provided that a workman shall not be required to submit himself for examination by a medical practitioner otherwise than in accordance with rules made under this Act or at more frequent intervals than may be prescribed.

(1) If a workman, on being required to do so by the employer under sub-section (I) or by the Commissioner at any time refuses to submit himself for examination by a qualified medical practitioner or in any way obstructs the same, his right to compensation shall be suspended during the continuance of such refusal or obstruction unless, in the case of refusal he was prevented by sufficient cause from so submitting himself.

(2) If a workman, before the expiry of the period within which he is liable under subsection (1) to be required to submit himself for medical examination voluntarily leaves without having been so examined, his right to compensation shall be suspended until he returns and offers himself for such examination.

(3) Where a workman, whose right to compensation has been suspended under sub-section (2) or subsection (3), dies without having submitted himself for medical examination as required by either of those sub-sections, the Commissioner may, if he thinks fit direct the payment of compensation to the dependents of the deceased workman.

(4) Where under sub-section (2) or sub-section (3) a right to compensation is suspended, no compensation shall be payable in respect of the period of suspension.

(5) Where an injured workman has refused to be attended by a qualified medical practitioner whose services have been offered to him by the employer free of charge, or having accepted such offer has deliberately disregarded the instructions of such medical practitioner then if it is thereafter proved that the workman has not been regularly attended by a qualified medical practitioner and that such refusal, failure or disregard was unreasonable in the circumstances of the case, and that the injury has been aggravated thereby, the injury and resulting disablement shall be deemed to be of the same nature and duration as they might reasonably have been expected to be if the workman had been regularly attended by a qualified medical practitioner, and compensation, if any, shall be payable accordingly.

3.1.3.17 Settlement of Labor Dispute Law, 2012

Settlement of Labor Dispute Law (No. 05/2012) Amended by Law No. 40/2014 was enacted for the settlement of labor disputes:

Section 23. A party, employer or worker, may complain individual dispute relating to his grievance to the Conciliation Body and if he is not satisfied with the conciliation of such body in accord with stipulated manners, may apply to the competent court in person or by the legal representative.

Section 38. No employer shall fail to negotiate and coordinate in respect of the complaint within the prescribed period without sufficient cause.

Section 39. No employer shall alter the conditions of service relating to workers concerned in such dispute at the consecutive period before commencing the dispute within the period under

investigation of the dispute before the Arbitration Body or Tribunal, to affect the interest of such workers immediately.
Section 40. No party shall proceed to lock-out or strike without accepting negotiation, conciliation and arbitration by Arbitration Body in accord with this law in respect of a dispute.
Section 41. No person shall carry out lock-out or strike to amend such decision or agreement within the effective period of the decision of the Arbitration Body or the Arbitration Council or any collective agreement.
Section 42. No person shall prohibit the right to work independently of the workers who are not desirous to participate in the strike nor impede the right of a worker to strike.
Section 43. No person shall fail to abide by or carry out any condition contained in agreement concluded before the Conciliation Body in respect of individual dispute or collective dispute.
Section 44. No person, after having informed in advance by the Arbitration Body or Tribunal for settling the dispute, shall fail to arrange to enable to examine the trade under dispute or to produce the documents which is considered by the Arbitration Body or Tribunal that it concerns with the dispute or to appear as a witness when he is so summoned.
Section 45. No person, if he is sent notice for examination before the Arbitration Body or Tribunal, shall fail without sufficient cause to appear in person or to send legal representative within the stipulated period.

3.1.3.18 Minimums Wages Law, 2013
The Minimum Wages Law, No. 07/2013 was enacted on 22nd March 2013 (The Minimum Wages Rules, 2013). Section 12 (d) of the law provides that the employer shall pay the minimum wage to the workers working in the commercial, production business and service in cash.
Section 12. The employer:
(a) shall not pay wage to the worker less than the minimum wage stipulated under this Law;
(b) may pay more than the minimum wage stipulated under this Law;
(c) shall not have the right to deduct any other wage except the wage for which it has the right to deduct as stipulated in the notification issued under this Law;
(d) shall pay the minimum wage to the workers working in the commercial, production and service business in cash. Moreover, if the specific benefits, interests or opportunities are to be paid, it may be paid in cash or partly in cash and partly in property, with prevailing regional price, jointly according to the desire of the worker;
(e) in paying minimum wage to the workers working in the agricultural and livestock business, some cash and some property at prevailing regional price may be paid jointly according to local custom or desire of the majority of workers or collective agreement. Such payment shall be for any personal use and benefit of the worker and his family and the value shall also be considerable and fair.
Section 13. The employer:
(a) shall inform the workers the rates of minimum wage relating to the business among the rates of minimum wage stipulated under this Law and advertise it at the workplace to enable to be seen by the relevant workers;
(b) shall prepare and maintain the lists, schedules, documents and wages of the workers correctly;
(c) shall report the lists, schedules and documents prepared and maintained under sub- section(b) to the relevant department in accord with the stipulations;
(d) shall accept the inspection when summoned by the inspection officer. Moreover, he shall produce the said lists and documents upon asking to submit;
(e) shall allow the entry and inspection of the inspection officer to the commercial, production and service businesses, agricultural and livestock breeding workplaces and give necessary assistances;
(f) if the workers cannot work due to sickness, shall give them holiday for medical treatment in accord with the stipulations;

(g) if the funeral matter of the member of the family of worker or his parent occurs, shall give holiday without deducting from the minimum wage, in accord with the stipulations.

Section 22. Any employer:

(a) shall not fail to pay the workers the minimum wage stipulated under this Law;

(b) shall not pay to the workers less than the minimum wages and other benefits which is entitled by the worker under section 14;

(c) relating to the accounts, schedules, documents and lists of wage of the workers: (i) shall not make false entry, deceitful recording or false and deceitful reporting; (ii) shall not fail to report to the relevant department in accord with the stipulations; (iii) shall not fail to produce when required by the inspection officer;

(d) shall not fail to go and accept inspection when summoned by the inspection officer;

(e) shall not obstruct or interfere with the inspection officer who comes and inspects on duty.

Section 24. Any employer:

(a) shall not violate any term and condition contained in the minimum wage notification;

(b) shall not fail to inform the workers relating to the rates of minimum wage concerning to his workers among the rates of minimum wage stipulated under this Law and announce at the place where the workers are able to see it in the work center and workplace;

The Minimum Wages Rules, 2013 include:

Chapter 9 - The power and obligations of the employers

Section 43.

The employer:

(a) shall increase the remuneration depending on the skill, to promote the productivity and the employment skill of the employees;

(b) shall perform in accord with the factory act 1951, leave and holiday act 1951 under section 13

(b) at the law for the list, schedule and document, remunerations;

(c) when the employees are not able to work due to ill health, injury at work site:

(i) if they are under premium paid insurance to the health and social care fund, the insurance under health and social security care 2012, or

(ii) if they are not entitled to enjoy social security law 2012, they must be arranged to enjoy the leave and holiday act 1951.

(d) in the event of family or parent’s funeral affairs, his entitled remuneration should not be deducted and shall be arranged to enjoy according to leave and holiday act 1951;

(e) before fixing of the minimum wage by the National Committee under this rule, if his remuneration is less than the prescribed amount, he should be paid up to the full amount;

(f) part time, hourly job employees shall be paid the prescribed minimum wage for the working hours;

(g) for the salary employees one day day-off shall be allowed in a week. If he has to work on the off day, overtime wage shall be paid in accord with the existing law;

(h) if the employee has to work less than the prescribed working hour and if it is not due to his will or he has to stop the work due to the shortage of work from the employer, he shall be entitled to enjoy the remuneration as if he has to work full time;

(i) the prescribed minimum wage shall be paid without discrimination of the male or female;

(j) although he has the obligation to pay the minimum wage in cash, separate entitlement, benefit in accord with the stipulation shall be given due to the employee's will, majority of the employees' will, collective consent, in cash or partial in cash or prevailing regional rate or regional tradition;

(k) overtime work shall be allowed according to the law after negotiation with the employees;

(l) the employee who is not capable to fulfill the standard norm or production norm prescribed in accord with the factory, workshop, department, shall be trained to be skillful in the probation period. If necessary, the relevant factory, workshop, departments under this law shall be paid for not less than 50% of the remuneration within three months. In the probation period 75% of the remuneration shall be paid.

3.1.3.19 Payment of Wages Law, 2016- (3, 4, 8, 7(ii), 9, 10 (a) to (e)

Payment of Wages Law (No 17/2016) covers the following requirements:

Chapter (2)	Section (3-a), Section (4-a, b, Cc-i, c-ii, d, e, f, g) Section (5), (6)	It is covered all the issue of strategies for payment and timeline between Employer and Employee.
Chapter (3)	Section (7-a, b, c, d) Section (8) Section (9), Section (10-a, b, c, d, e, f, g, h, i, j,), Section (11- a, b), Section (12-a, b) Section (13)	It is covered all the issue of deducted salary based on different categories.
Chapter (4)	Section (14)	Wages issue related with Overtime
Chapter (6)	Section (19-a, b, c), Section (20-a, b, c), Section (21-a, b, c)	Prosecutions policy issue based on salary and wages
Chapter (7)	Section (22), Section (23)	Prohibitions
Chapter (8)	Section (24), (25), (26), (27), (28), (29), (30)	General Information to protect laws regulations and penalties

3.1.3.20 Social Security Law, 2012 - 11, 16(a), 48(a), 51(a) (b), 54

The objectives of the Social Welfare Law (2012) and accompanying Social Welfare Rules (2014) include providing workers with the right to draw back some of the contributions paid by employers and workers as savings in accordance with the stipulations, and to obtain the right to continue medical treatment, family assistance benefit, superannuation benefit, survivors' benefit, unemployment benefit, the right to residency and ownership of housing after retirement in addition to health care and pecuniary benefit for sickness, maternity, death, employment injury of the workers.

Section 11 of the Social Welfare Law (2012) requires the following establishments to comply with the provisions for compulsory registration with the social security system and benefits (indicated in the Social Welfare Law) if they employ a minimum number of workers as determined by the Ministry of Labor in co-ordination with the Social Security Board: Industries which carry out business whether or not they utilize mechanical power or a certain kind of power; businesses of manufacturing, repairing and servicing; or engineering businesses, factories, warehouses and establishments.

Section 16. (a) The following employers shall affect insurance for the workers working at their establishments by compulsorily registering at the relevant township social security office and contribute to the social security fund contained in clauses (1), (3), (4), and (5) of sub-section (a) of **section 15** in accord with the stipulations to enable to enjoy social security benefits:

(i) employers of establishments;

(ii) employers of establishments employing the number of workers, including the relatives of the employers except at least one worker and their wife, husband, children and parents depending upon them, under sub-section(a) of section 11;

(iii)employers of unpaid apprentices and trainees.

Section 48 (a) The employer shall affect insurance by registering for employment injury benefit insurance system contained in section 45 at the relevant township social security office and pay contribution to employment injury benefit fund in accord with stipulations in order that workers applied to provisions of compulsory registration may obtain the employment injury benefits

Section 51. The employer:
(a) shall pay contribution monthly to Employment Injury Benefit Fund at the rates stipulated under section 50. Moreover, he shall also bear the expenses for paying as such;
(b) shall pay defaulting fee stipulated under section 88, in addition to the contribution if fails to **contribute after effecting insurance for employment injury benefit.**
Section 54
(a) The employer shall report to the relevant township social security office immediately if a serious employment accident occurs to his insured worker. There shall not be any delay without sufficient cause to report as such.
(b) A team of officers and other staff who inspect the establishments, if it is found out the employment injury, death, and contracting disease, shall report to the relevant township social security office in accord with the stipulations.

3.1.3.21 Leaves and Holidays Act, 1951

The Leave and Public Holiday Act, 1951 Amended by Law No. 06/2006 and No. 30/2014 include:
Section 3 (1) Every employee shall be granted by his employer the following public holidays with full wages or pay (as the case may be); namely:

- Independence Day – one day
- Full Moon of TaBuang – one day
- Thingyan – three days
- Burmese New Year – one day
- May Day – one day
- Full Moon of Kason – one day
- Resistance Day – one day
- Beginning of Buddhist lent – one day
- Full Moon of TanSaunMom – one day
- National Day – one day

Section 4 (1) Every employee who has completed a period of twelve months continuous service shall be granted earned leave with average wages or average pay for a period of ten consecutive days by his employer during the subsequent period of twelve months.

3.1.3.22 Occupational Health and Safety Law (2019)

The Occupational Health and Safety Law, 2019 (OHSL) was enacted on March 15, 2019. It aims to implement measures for occupational health and safety across every industry, and it sets out the responsibilities of employers and employees.

Responsibilities of Employers
The OHSL requires employers to appoint occupational health and safety officers and form occupational health and safety committees (OHSCs) subject to a minimum number of workers' representatives set by the Ministry of Labor, Immigration and Population. General obligations on employers include conducting risk assessments on the use of equipment and machinery, arranging medical check-ups by a certified doctor for workers, enforcing the wearing of appropriate safety uniforms/overalls, and appointing registered doctors and nurses for workplaces with minimum thresholds of employees prescribed by the Ministry. Employers that do not comply with these responsibilities will be subject to a term of imprisonment not exceeding three months, a fine from MMK 1 million to 5 million, or both.

The OHSL requires employers to notify the department upon the occurrence of occupational injuries, hazardous occurrences, or employees contracting any prescribed occupational disease due to materials

used in the workplace or a work process. A term of imprisonment for up to one month, a fine of up to MMK 2 million, or both will apply to employers for noncompliance in this regard.

Responsibilities of Employees

General responsibilities of employees under the OHSL include following instructions set by employers or the OHSC or officers, such as regarding the use of machinery and equipment and the wearing of safety uniforms. Current or former employees who contract an occupational disease and were/are being treated by the registered doctor must also notify the employer and Department to this effect.

Enforcement by the OHSC will also be beneficial for employees not covered by the Social Security Law, 2012 (SSL). In the event an employee contracts an occupational disease, his or her employer must cover the medical expenses even if its business is exempt from registration under the SSL. Therefore, enforcement of the OHSL should confer benefits on employees, as the OHSL gives inspectors the authority to inspect workplaces at any time without a warrant to ensure that businesses adhere to its provisions.

3.1.3.23The Motor Vehicles Law, 2015 and Rule 1987

The Motor Vehicle Law No. 55/15. The Union Parliament has enacted this law.

Section 49. No one shall do the following in public places:

(a) Driving above the speed limit or below the minimum speed.

(b) Driving a dangerous motor vehicle.

(c) Driving a motor vehicle under the influence of drugs and intoxicants or alcohol.

Section 54. No one shall do the following:

(c) Driving a motor vehicle loaded above the loading capacity.

(f) Driving a motor vehicle in violation of any provisions of the by-laws related to the pedestrian crossing.

(g) Changing, without legal permission or reasons backed up by evidence, a vehicle to lose its original type and physical appearance, altering parts of machinery equipment, or changing the conditions stated in the motor vehicle inspection certificate.

Section 65. If anyone is found guilty of breaching any provisions stated in the by-laws issued in accordance with this law, he/she shall bare a punishment of a fine worth not more than thirty thousand kyats.

Section 75. The ministry shall include one or all of the following in releasing the by-laws.

(c) Issues relating to the building of a motor vehicle, building of a carriage, installation of parts and equipment, and maintenance.

(d) Specifying the type of motor vehicle, the weight and the maximum load.

(f) Private industry of motor vehicle inspection

(h)Matters to be carried out by the responsible person for the driver and motor vehicle in the event of an accident caused by the motor vehicle.

(j) Matters related to the reduction of the environmental impact caused by the motor vehicle.

3.1.3.24 Myanmar Insurance Law, 1993 (Section 16)

Requires any business which may pollute the environment to effect compulsory general liability insurance.

Section 16

An entrepreneur or an organization operating an enterprise which may cause loss to State-owned property or which may cause damage to the life and property of the public or which may cause pollution to the environment shall affect compulsory general liability insurance with Myanmar government.

3.1.3.25 The Underground Water Act, 1930

The Underground Water Act, 1930 provides measures for systematic and sustainable use of underground water and prohibitions on accessing and using underground water without a license.

Whereas it is expedient to conserve and protect underground sources of water supply in the Union of Burma; it is hereby enacted as follows:

Section 1. This Act extends to such areas as the President of the Union may, by notification,1 direct and shall apply only to tubes exceeding a depth to be prescribed by the President of the Union: Provided that the President of the Union may prescribe different depths for different local areas.

Section 3. No person shall sink a tube for the purpose of obtaining underground water except under and in accordance with the terms of a license granted by the water officer. Every person owning a tube which was in existence before the extension of this Act to the local area concerned shall apply to the water officer for a license for the said tube, and such license shall be granted free of charge.

Section 4.

(1) Any Magistrate taking cognizance of an offence under section 3 may at any time order the tube in respect of which the offence has been or is alleged to have been committed to be forthwith closed until such time as a license for the same has been taken out in accordance with the provisions of the said section.

(2) If the order for the closure of a tube under sub-section (1) is not complied with, the Deputy Commissioner, Sub divisional Officer or Township Officer exercising jurisdiction over the local area concerned may cause the said tube to be closed, and the expense of such closure shall be recoverable from the owner of the tube as if it were an arrear of land-revenue.

Section 5. Every person obtaining or attempting to obtain underground water shall supply the water officer with such information as the President of the Union may by rule prescribe.

3.1.3.26 The Prevention of Danger of Hazardous Chemical and related Substances Law, 2013 (Section 16, 17, 23, 27)

The Prevention of Hazard from Chemicals and Related Substances Law was enacted on 26th August 2013. The objectives of this Law include: protecting natural resources from decrease and loss, and safeguarding living things from endangerment caused by chemical and chemical related substances; and systematically controlling safety in carrying out approved chemical and associated materials businesses. The Law requires continuous development of worksite safety, health and environmental conservation.

The Prevention of Hazard from Chemicals and Related Substances Law (2013) defines Chemical as: imposing danger to the health or life of man or animal or chemical element, chemical compound and chemical mixture which cause bad consequences to the environment naturally or appearing after created by man. This definition includes the vapor, liquid, waste materials of oily and solid which act chemically and technically.

Section 16. A person who has obtained a license: -

(a) shall abide the license regulations;

(b) shall perform to abide strictly the instructions for being safety in using the chemical and related substances by himself and also the persons who serve the work;

(c) shall keep the required safety equipment enough in the chemical and related substances businesses, furthermore shall grant the personal protection equipment and dresses free of charge to the working persons;

(d) shall make the course of training and study and instruction if necessary, to the working persons for using the occupational safety equipment, the personal protection equipment and the dresses systematically in the chemical and related substances business;

(e) shall be inspected by the respective Supervisory Board and Boards of Inspection in respect of whether or not the hazard may impact on the Human Being and Animals' health and the environment;

(f) shall make medical checkup the working persons who will work in the chemical and related substances business and shall permit to serve in that work after obtaining the recommendation that his health is suitable for that work. This medical checkup records shall be kept systematically;
(g) shall send the copy of informative letter of the permission to the respective Department of Township Administration, if the hazardous chemical or related substances are permitted to store;
(h) shall acquire in advance the guidance and agreement of the respective Department of Fire Brigade, if the business that is worried to fire hazard is operated by using the fire hazard substances or the explosive substances;
(i) shall transport only the permitted amount of the chemical and related substances in accordance with the prescriptive stipulations, if they are transported in local;
(j) shall take the permission from the Central Supervisory Board if the chemical and related substance is altered and transferred from one place to any other place which contained in the license;
(k) shall abide and perform in accordance with the related environmental laws not to impact and damage to the environment in operating the chemical and related substances business.
Section 17. A person who has obtained a license, shall put the insurance in accordance with the prescriptive stipulations to be able to pay the compensation, if the impact and damage is occurred on the Human Being and Animals or the environment in respect of the chemical and related substances businesses.
Section 23. A person who has obtained the registration certificate: -
(a) shall apply to register again, to the Central Supervisory Board if the chemical and related substances, which are not contained in the registered list, are used;
(b) shall inform and submit the unused chemical and related substances list to the Central Supervisory Board, although which are contained in the registered list.
Section 27. A person who has obtained the license to be complied the following matters to control and decrease the hazard of the chemical and related substances: -
(a) classifying the hazard level to protect in advance the hazard according to the properties of the chemical and related substances;
(b) expressing the Material Safety Data Sheet and Pictogram;
(c) providing the safety equipment, the personal protection equipment to protect and decrease the accident and attending to the training to be used systematically;
(d) performing in accordance with the stipulations in respect of transporting, possessing, storing, using, discharging the chemical and related substances;
(e) not being imported or exported the chemical and related substances banned by the Central Supervisory Board and the machinery and equipment which are used them.

3.1.3.27 Import and Export Law, 2012 (Section 7)

Chapter IV Prohibitions
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.

3.1.3.28 Conservation of Rivers, Creeks and Water Resources Law, 2006 (Section 24 (b), 21 (a), (b), 19, 11(a) (b))

The Conservation of Water Resources and Rivers Law (2006) was promulgated on 2nd October 2006. The aims of this Law are as follows:

- To conserve and protect the water resources and rivers system for beneficial utilization by the public;
- To ensure smooth and safe waterways navigation along rivers and creeks;

- To contribute to State economic development through improving water resources and river systems; and
- To protect environmental impact.

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.
(b) catch aquatic creatures within river-creek boundary, bank boundary or waterfront boundary with poisonous materials or explosives.
Section 19. No one shall dispose of any substance into the river-creek that may cause damage to waterway or change of watercourse from the bank or vessel which is plying, vessel which has berthed, anchored, stranded or sunk.
Section 21. No one shall:
(a) build lavatories unsuitable to the urban and rural community lifestyle in the bank area and watercourse area.
(b) drill well or pond or dig earth without the permission of the Directorate.
Section 24. No one shall:
(a) violate the conditions relating to navigation of vessels in rivers and creeks prescribed by the Directorate for conservation of water resources, rivers and creeks.
(b) violate the conditions prescribed by the Directorate so as not to cause water pollution and change of watercourse in rivers and creeks.

3.1.3.29 Notification No. 37/2014 for usage and handling of substances that deplete the ozone layer

Order relating to the usage and handling of substances that deplete the ozone layer.
Paragraph 3 of this Order indicates that any individual or organization who intends to import or export ozone-depleting substances or products and/or which are used by ozone-depleting substances must apply to MONREC.

3.1.4 International Environmental Conventions, Protocols and Agreements

Myanmar has ratified several international and regional conventions. Those relevant to the project are provided in **Table 3.1**.

Table 3.1: Relevant International and Regional Agreements and Conventions

No.	Conventions	Year (Ratified/Acceded/ Accepted)
Environment		
1	UN Convention on the Law of the Sea that fisheries law in most countries is based.	1982 (Signed)
2	Vienna Convention for the Protection of the Ozone Layer, Vienna 1985	1993 (Ratification)
3	Montreal Protocol on Substances that Deplete the Ozone Layer, Montreal 1987	1993 (Ratification)
4	London Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer, London 1990	1993 (Ratification)
5	United Nations Framework Convention on Climate Change (UNFCCC), New York 1992	1994 (Ratification)
6	Convention on Biological Diversity, Rio de Janeiro 1992	1994 (Ratification)
7	The Convention Concerning the Protection of the World Cultural and Natural Heritage, Paris 1972	1994 (Acceptance)

No.	Conventions	Year (Ratified/Acceded/ Accepted)
8	United Nations Convention to Combat Desertification in Those Countries Experiencing Serious Drought, Paris 1994	1997 (Accession)
9	Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), Washington DC 1973; and as amended in Bonn, Germany 1979	1997 (Accession)
10	ASEAN Agreement on Conservation of Nature and Nature Resources, Kuala Lumpur, 1985	1997 (Signatory)
11	Kyoto Protocol to the Convention on Climate Change, Kyoto 1997	2003 (Accession)
13	Stockholm Convention on Persistent Organic Pollutants (POPs), 2001	2004 (Accession)
14	Ramsar Convention on Wetlands of International Importance	2005 (Accession)
15	Establishment of ASEAN Regional Centre for Biodiversity	2005 (Signatory)
16	Declaration on ASEAN Heritage Parks	2003 (Signatory)
17	United Nations Convention on the Law of the Sea (UNCLOS), Montego Bay, 1982	1996 (Ratified)
18	Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (1992)	2015 (Acceptance)
Social, Labor and Health		
19	Universal Declaration of Human Rights (UNDHR)	signed
21	Convention on the Rights of the Child	1991 (acceded)
22	Convention on Elimination of All Forms of Discrimination against Women (CEDAW)	1997 (acceded)
23	Relevant ILO Conventions in force in Myanmar: • C1 Hours of Work (Industry) • C14 Weekly Rest (Industry) • C17 Workmen's Compensation (Accidents) • C19 Equality of Treatment (Accident Compensation) • C26 Minimum Wage Fixing Machinery • C29 Forced Labor Convention • C42 Workmen's Compensation (Occupational Diseases) Revised 1934 • C52 Holidays with Pay • C87 Freedom of Association and Protection of the Right to Organize • C182 - Worst Forms of Child Labor	

3.1.5 International Standards & Guidelines

The Project will also follow International Environmental guidelines and standards including World Bank /IFC (International Finance Corporation) Guidelines & Industry Standards as detailed in the following table.

Table 3.2:International Guidelines

Applicable International Standards & Guidelines	
1	Equator Principles (2013)
2	International Financial Cooperation/ World Bank (IFC/WB) General Environmental Health and Safety (EHS) Guidelines (April 30, 2007)
4	IFC Environmental, Health, and Safety Guidelines for Onshore Oil and Gas Development (2017).
6	IFC Performance Standards on Environmental and Social Sustainability (2012);

3.2 Contractual and other Commitments

The Project will comply with the Myanmar Environmental Conservation Law, Environmental Conservation Rules, Environmental Quality (Emission) Standards and all necessary international standards. The company makes the following commitments:

- The project will comply with commitments, mitigation measures and management plans stated in the EMP report.
- The company is responsible for its actions and omissions and those of its contractors, subcontractors, officers, employees, agents, representatives, and consultants employed, hired, or authorized by the company acting for or on behalf of the Project.
- Support programs for livelihood restoration and resettlement in consultation with the PAPs, related government agencies, and organizations and other concerned persons for all Adverse Impacts.
- Fully implement the EMP, all Project commitments, and conditions, and is liable to ensure that all contractors and subcontractors of the Project comply fully with all applicable Laws, the Rules, this Procedure, the EMP, Project commitments and conditions when providing services to the Project.
- Be responsible for, and shall fully and effectively implement, all requirements set forth in the ECC, applicable Laws, the Rules, this Procedure and standards.
- Timely notify and identify in writing to the Ministry, providing detailed information as to the proposed Project's potential Adverse Impacts.
- Respect and comply with the customs, traditions and traditional culture of the ethnic groups in the Union;
- Abide by the terms and conditions, stipulations of special licenses, permits, and business operation certificates issued to them, including the rules, notifications, orders, and directives and procedures issued by the MIC and the applicable laws, terms and conditions of contract and tax obligations;
- Carry out in accordance with the stipulations of the relevant department if it is, by the nature of business or by other need, required to obtain any license or permit from the relevant Union Ministries government departments and governmental organizations, or to carry out registration;
- Immediately inform the Commission if it is found that natural mineral resources or antique objects and treasure trove not related to the investment permitted above and under the land on which the investor is entitled to lease or use and not included in the original contracts.
- To inform the respective industrial zone committee /township administrative department if any historical thing is found during the project operations.
- Abide by the applicable laws, rules, procedures and best standards practiced internationally for this investment so as not to cause damage, pollution, and loss to the natural and social environment and not to cause damage to cultural heritage;
- Close and discontinue the investment only after payment of compensation to employees in accordance with applicable laws for any breach of employment contracts, closure of

investment, sale and transfer of investment, discontinuation of investment, or reduction of workforce;

- Pay wages and salaries to employees in accordance with applicable laws, rules, procedures, directives and so forth during the period of suspension of investment for a credible reason;
- Pay compensation and indemnification in accordance with applicable laws to the relevant employee or his successor for injury, disability, disease and death due to the work;
- Supervise foreign experts, supervisors and their families, who employ in its investment, to abide by the applicable laws, rules, orders and directives, and the culture and traditions of Myanmar;
- Respect and comply with the labor laws;
- Have the right to sue and to be sued in accordance with the laws;
- Pay effective compensation for loss incurred to the victim, if there is damage to the natural environment and socioeconomic losses caused by logging or extraction of natural resources which are not related to the scope of the permissible investment, except from carrying out the activities required to conduct investment in a Permit or an Endorsement.
- Ensure equal rights for local workers and avoid salary bias, i.e. ensure that local and foreign workers have the same salary at the same level.
- Ensure that all foreign employees apply for the proper work permit and visa through the Myanmar Investment Commission (MIC).
- Provide rights and benefits including but not limited to, leave, holidays, overtime pay, compensation and social security. Most of the relevant particulars are in the Myanmar Companies Act.
- Settle disputes, within the law, between workers, employers, consulting experts or any other personnel involved in the business operation.

3.3 Institutional Framework

The aim of this Chapter is to describe the Administrative and political divisions of Myanmar including environmental organizations.

1) Administrative Divisions

Myanmar is a multi-ethnic country composed of over 130 ethnic groups, and viewing macroscopically, in the central part of the country from north to south along Ayeyarwady River resides the largest group covering 70% of the total population, Bama, and in mountainous area in east and west reside most of the minorities.

Myanmar has a three levels administrative structure, as described below.

The first level subdivision includes:

- Seven states;
- Seven regions (regions were previously referred to as “divisions”, prior to August 2010);
- Five self-administered zones;
- One self-administered division;
- One union territory.

States and regions are divided into districts. Districts consist of townships, which are composed of towns, wards and village-tracts, that are groups of adjacent villages. The administrative structure of the states, regions and self-administering bodies is defined in the Constitution.

Each region and state have a Regional/State Government, consisting of a Chief Minister, Ministers and an Advocate General. Legislative authority resides with the State/Regional “Hluttaw” (a parliament or legislative body), which are made up of elected civilian members and representatives of the military.

The Constitution states that Naypyidaw is a Union Territory under the direct administration of the President. The Naypyidaw Council, led by a Chairperson, carries out general functions on behalf

of the President. The Chairpersons of the Naypyidaw Council are appointed by the President, and include civilians and representatives of the military.
Self-Administered Zones and Self-Administered Divisions are administered by a Leading Body, which is headed by a Chairperson, and has executive and legislative powers. The Leading Body consists of elected State/Regional Hlutttaw members and military personnel.
The proposed factory is located in Mingalardon Township in the Yangon Region of Myanmar.
2) Ministry of Natural Resources and Environmental Conservation (MONREC) is mandated to draft the regulations to enact the law, including regulations and standards on environmental safeguards on environmental pollution abatement (i.e., for industrial or urban pollution discharge standards and procedures) and on environmental quality standards for air, water, heavy metals, and toxic substances.
There shall be established a system of environmental impact assessment which shall require any proposed project or business or activity or undertaking in Myanmar by any ministry, government department, corporation, board, development committee, local authority, company, cooperative, institution, enterprise, firm or individual likely to have a significant impact on the environment to obtain approval for its implementation in accordance with these rules (EIA, 2012).

3.4 Project's Environmental and Social Standards

MONREC has established environmental quality standards, the National Environmental Quality Standard [Legal Reference: ECL 2012 (Article 2c) and EQS 2016]. ECD / MONREC have indicated that the discharge standards shown in Table 3-3 are applicable for confectionary activities. These are in accordance with international standards.

Table 3.3: Myanmar Discharge Standards Applicable to fish processing activities

Guideline	Standard
Effluent	Treatment and disposal in accordance with applicable standards provided in the General EHS Guidelines for discharge to surface waters or to land: - 5-day Biochemical oxygen demand 50 mg/L - Chemical oxygen demand 250 mg/L - Chlorine , Total residual 0.2mg/l - Oil and grease 10 mg/L - pH 6-9 - Temperature <3[b] °C - Total coliform bacteria 400 per 100ml - Total nitrogen 10 mg/L - Total phosphorous 2 mg/L - Total suspended solids 50 mg/L - Active ingredients/Antibiotics to be determined on a case specific basis
Air emissions	Treatment as per General EHS Guidelines Emission concentrations as per General EHS Guidelines, and: PM_{10} 50mg/Nm^3 Ammonia 1mg/m^3 Amines and amides 5 mg/m^3 Hydroegn sulfide, Sulfides, and Mercaptans 2 mg/m^3

The Environmental, Health, and Safety (EHS) Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP). They are designed to provide relevant industry background and technical information. This information supports actions aimed at avoiding, minimizing, and controlling EHS impacts during the construction, operation, and decommissioning phase of a project or facility.
The EHS Guidelines contain the performance levels and measures that are generally considered to be achievable in new facilities by existing technology at reasonable costs (Environmental Health and Social Guidelines, IFC 2007).

Table 3.4: Applicable IFC EHS Guidelines

Environmental topic	Applicable EHS Guidelines
Air quality	Section 1.1 provides guideline applies for facilities or projects that generate emissions to air at any stage of the project life-cycle. It presents information about common techniques for emissions management. This guideline provides an approach to the management of significant sources of emissions, including specific guidance for assessment and monitoring of impacts. Additional information on approaches to emissions management in projects located in areas of poor air quality, where it may be necessary to establish project-specific emissions standards are included. These Guidelines include the following key recommendations: • facilities and projects should avoid, minimize, and control adverse impacts to human health, safety, and the environment from emissions to air; • impacts should be estimated through qualitative or quantitative assessments by the use of baseline air quality assessments and atmospheric dispersion models to assess potential ground level concentrations; • the dispersion model applied should be internationally recognized, or comparable (examples of acceptable emission estimation and dispersion modelling approaches for point and fugitive sources are reported in these guidelines); • emissions from point sources should be avoided and controlled according to good international industry practice (GIIP) applicable to the relevant industry sector, depending on ambient conditions, through the combined application of process modifications and emissions controls (examples are provided in these guidelines); • a monitoring system should be implemented. For ambient air quality IFC refers to WHO Guidelines (Air Quality Guidelines Global Update, 2005.)
Noise and vibration emissions	Section 1.7 provides standards for daytime and night time noise emissions (for residential and industrial environments, WHO 1999) and recommends that noise prevention and mitigation measures are implemented with regard to predicted noise levels at sensitive receptors. Noise monitoring may be carried out for the purpose of establishing the existing ambient noise levels in the area of the proposed facility or for verifying operational phase noise levels.

	A key priority should be the implementation of noise control measures at source; the selected methods will depend on the source type and the proximity of sensitive receptors, and can include: equipment selection, acoustic enclosures, vibration isolation, traffic route selection, other.
Wastewater and Liquid effluent quality	Section 1.3 provides guidelines applied for projects that have either direct or indirect discharge of process wastewater or wastewater from utility operations. Section 1.3 provides guidelines for treatment approaches of process wastewater and wastewater from utility operations. These Guidelines include the following key recommendations: • points of discharge, rate of discharge, chemical use, dispersion and environmental risk should be considered in a disposal plan; • discharges should be planned away from environmentally sensitive areas, with specific attention to high water tables, vulnerable aquifers, wetlands, and community receptors, including water wells and intakes.
Waste management	Section 1.6 provides guidelines for projects/facilities that generate, store, or handle any quantity of industrial hazardous or not hazardous waste. Section 1.6 provides appropriate guidelines for hazardous waste storage, transport, treatment and disposal, in order to prevent harm to health, safety and environment. These Guidelines include the following key recommendations: • waste management should be addressed through a Waste management system that addresses issues linked to waste minimization, generation, transport, disposal, and monitoring; • in addition to the implementation of waste prevention strategies, the total amount of waste may be significantly reduced through the implementation of recycling plans; • if waste materials are still generated after the implementation of feasible waste prevention, reduction, reuse, recovery and recycling measures, waste materials should be treated and disposed and all measures should be taken to avoid potential impacts to human health and the environment.

Chapter 4

Description of the Project and Alternatives Selection

4. Project location and description

4.1. Project site location and description

The Thantwe Marine Products (TMP) Company Limited which is situated near the Ann Taw village, Dwar Ya Wati (B) ward, Thandwe township, Rakhine state, the Republic of the Union of Myanmar, at the coordinates of 18.471427°N and 94.373074°E.

Figure 4.1: The topography map of Thantwe Marine Products (TMP) Co.,Ltd

Figure 4.2: Location of Thantwe Marine Products (TMP) Company and surrounding environment

Table 4.1 Area size of plant's different units

No.	Factory facility	Area (m2)	Percentage
1	Total area	36422	100
2	Office, Admin and Cold storage	1821	5
3	Two Ice factory	1115	3
4	Kitchen	223	0.6
5	2 Storage	149	0.4
6	Generators House	37	0.1
7	5 Housings	75	0.2

4.2 Objectives of the proposed project

The aim of the Thantwe Marine Products Co.,Ltd is to provide safe and high quality seafood by implementing the Good Manufacturing Practices (GMP) for the Food Industry as well as the Hazard Analysis and Critical Control Point (HACCP) system in the factory which is a systematic integral program used to identify and estimate the hazards (microbiological, chemical and physical) and the risks generated during the primary production, processing, storage, distribution, expense and consumption of foods.

Furthermore, in order to import countries' requirements like National Standard of the China, Japan, USA, Australia and EU countries, the proposed company maintains sustainably the food safety management systems including GMP/HACCP as well.

according to
The objectives of the proposed company are as follows:

- To produce safe food in accordance with quality standard requirements,
- To achieve customer's satisfaction and to avoid being rejected
- To get market share increasing production annually
- To be inspected by any authorities for the products in any time
- To monitor the production with a well-trained group of staff so as to meet the hygiene standards
- To encourage customer to visit the factory's processing facilities in order to evaluate and implement accordingly

4.3 Project proponent information

The Thantwe Marien Products Co.,Ltd is a private company leading in the field of exporting especially shrimp and other fishery products located in at the Dwaryawadi Myo Thit, Thandwe township, Rakhine state, in Myanmar, where near fishing ground, bay of Bangol. The factory construction was designed by Myanmar engineers to meet the demand of importing countries and according to the international standards. The factory is registered at department of fisheries and the registration No. is SD/002/TMP/DOF. It has been exporting since 1996 and start operating commercially on August 18,1997.

The proposed company owns eleven fishing vessels, one carrier vessel and one shrimp, soft shell crab farm. Fishery products are caught by own fishing vessels and then transfer to the carrier vessel. After that, raw material are carried by the approved refrigerated car to the TMP plant. The

company tries to produce aquatic products including fresh frozen shrimps and fishes for human consumption with international standard premium quality obtaining good reputation in the oversea markets especially EU countries and non-EU countries.

Moreover, in the factory, the HACCP is designed for use in all segments of the industry from raw harvesting to consumption. Prerequisite programs such as current GMP and A Sanitation Standard Operating Procedure (SSOP) which are the essential foundations for the development and implementation of successful HACCP plans. The factory is being monitored by qualified persons who have received training and well known. The system forces checking parameters of critical areas that can control the products within set parameters. The company also abided to produce frozen shrimp and fishery products to achieve the highest standard of food safety for the international market by Directives and regulations which had been laid down by the Department of Fisheries, Ministry of Agriculture, Livestock and Irrigation and food safety related directives issued by importing countries.

Sea water prawns and other fishery products production from Thantwe Marine Products (TMP) Company Limited shall be safe and wholesome in processing change form raw receiving to finish products complying of GMP and HACCP.
In regard to the organization set up there are Managing Director, Director, two Managers including admin and finance manager and factory manager, HACCP Team leader, Officer, Supervisor and various layers of Staff. In the company, total local male and female workers are 75, and 125 respectively. The following chart describes the detail information of the organization structure of Thantwe Marine Products (TMP) company limited.

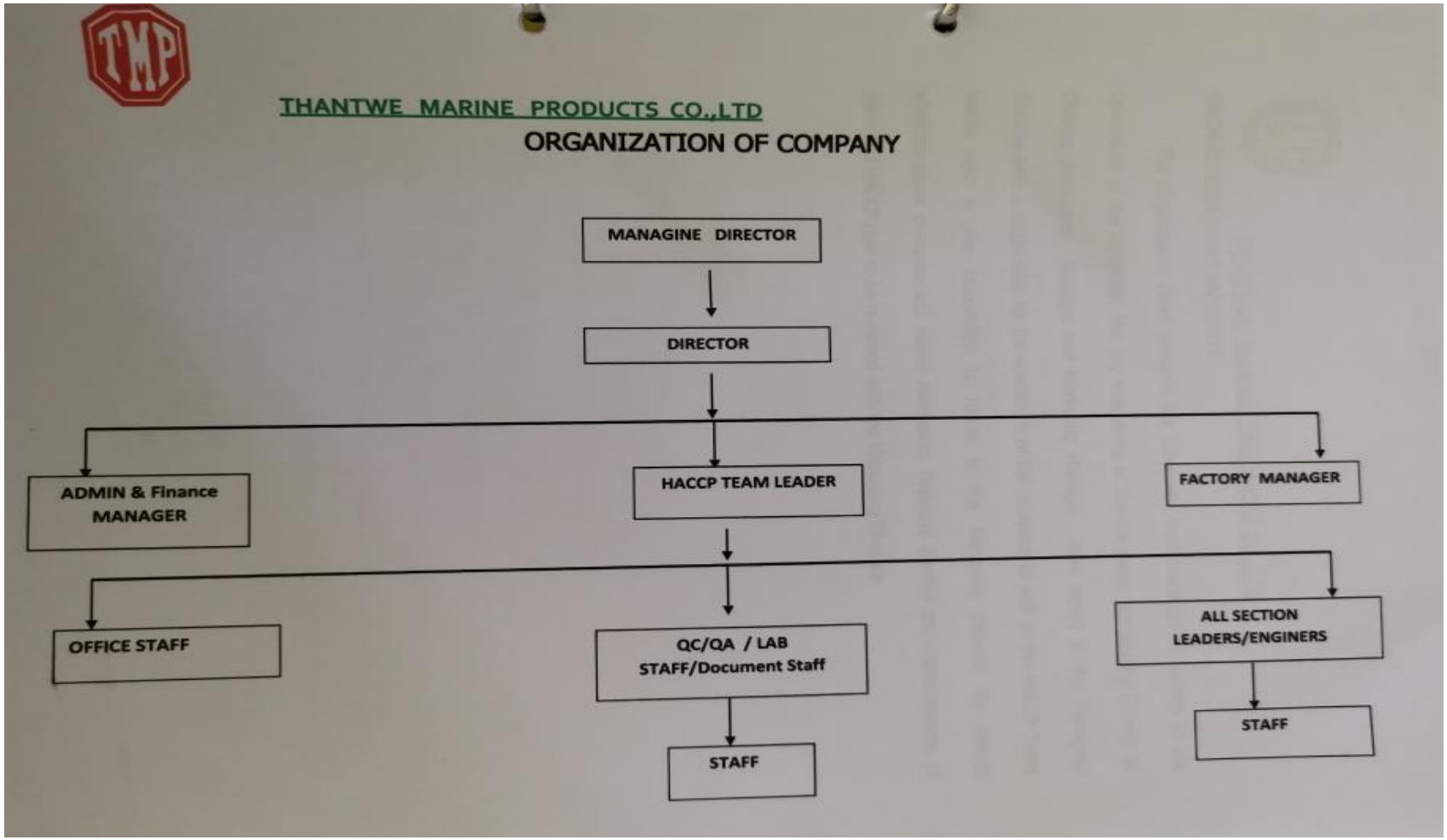


Figure 4.3: The organization chart of the Thantwe Marine Products (TMP) Company Limited

CONFIRMATION OF UNITED STATES
FOOD AND DRUG ADMINISTRATION
REGISTRATION DATA

Department of Fisheries
HACCP CERTIFICATE
For fishery and aquaculture products originating in Myanmar

Country of dispatch : Myanmar
Competent Authority : Department of Fisheries
Inspection Department : Quality Control and Research Section

I. Name and official approval number of establishment approved by the Department of Fisheries
Thantwe Marine Products Co.,Ltd.
Factory Registration No. SDY/002/TMP/DOF
1st Lane, 1st Ward, Dwarwaddy Myothit, Thantwe Township, Rakhine State, Myanmar.

II. Type of Operation
1. Frozen Fresh Water Fish (GGS, Whole Round, Fillet)
2. Frozen Sea Water Fish (GGS, Whole Round, Fillet)
3. Frozen Squid (Whole Round, Whole Cleaned, Flower cut / ring)
4. Frozen Shrimp (HLSO, PUD, PD, HO)

III. Attestation
1. This is to confirm that the above mentioned processor is an approved establishment of Department of Fisheries.
2. The Department regularly inspects manufacturing practices and hygiene control and HACCP program implementation.
3. The Department verify that the processor is operating under the Department's Sanitary Standard Requirements and CODEX Alimentarius's General Principles of Food Hygiene. Including HACCP based Control program in accordance to the Department of Fisheries requirements.
4. The Department also, verify that the processor is operating under HACCP and sanitary programs is accordance with the U.S Food and Drug Administration's seafood HACCP regulation. (21 CFR Part 123) + GMP

Done at Yangon , Myanmar.
On : 8 . 4 . 2018
Valid Until : 31 . 3 . 2019
Soe Myint
Director
(Research and Development Division)
HACCP No. 35-ICS/DOF

GlobalGROUP
local assessment, global certification

Certificate of Registration

This is to certify that the
HAZARD ANALYSIS AND CRITICAL CONTROL POINTS
of
Thantwe Marine Products Co., Ltd.
Dwaryawadi Myo Thit, Thantwe Township, Rakhine, MYANMAR
for
Manufacture and Export of Frozen Sea Water Prawn's Products (Headon, Headless, PUD & PDC)
has been assessed and registered against the provisions of
HACCP

With

Registration Number: 22H16414
Certification Date: 19 April 2018
Recertification Due Date: 18 February 2021
Certification Approved By:
Project: S5-16414-2-H
Category: C
Mahmut Sogukpinar
Chief Operating Officer

Registration is subject to the management system being continually maintained to the above standard under regular surveillance. Should surveillance not take place when required, registration shall be removed.
This certificate is the property of GlobalGROUP of Companies Limited
21 Lansdowne Crescent, Edinburgh, Midlothian, EH12 5EH, Scotland, United Kingdom
00022920

MINISTRY OF AGRICULTURE, LIVESTOCK AND IRRIGATION
DEPARTMENT OF FISHERIES

EU APPROVED NUMBER CERTIFICATE
For Fish and Fishery Products Originating In Myanmar

Country of Dispatch : Myanmar
Competent Authority : Department of Fisheries
Inspection Department : Quality Control and Research Section

hereby certifies that

Thantwe Marine Products Co.,Ltd
1st Lane, 1st Ward, DwarawadiMyoThit, ThantweTownship, Rakhine State,Myamar.

Has been awarded EU Number
for purpose for exportation of Fish and Fishery products to the EU

EU Number : SDY/002/TMP/DOF

HTUN WIN MYINT
Director
(Research and Development Division)

Figure 4.4: Certificates of HACCP and EU approved number

(i) The organization chart

The organization chart presents the schematic representation of control in the operations of the company. The key executives of the company, the Quality Control In Charge, Production Manager and Marketing Manager must report to the Managing Director who is responsible for the operations of the company as well as the HACCP Team Leader who is also responsible to report to the Managing Director for overall administrations overseas and inland marketing, Financial control and maintenances of plant and HACCP plan to be reviewed with the Managing Director.

(ii) Organization responsibilities

(a) Managing Director

The entire company's financial, marketing, administrative works are being controlled by Managing Director, who is also the leader of the HACCP team. Review and implementation of the HACCP plan in the factory is a major plan for the future business. Reviews on the overall HACCP plan are being carries out with Director, HACCP team leader, Production In-Charge, Quality Control In-Charge, Purchasing Manager and other responsible persons. Responsibility of team leader is to conduct the contact with the competent authority and other official sectors.

(b) Director

Assist to Managing Director. Responsible for all financial works and administrative (HR) works. Director checks whether all the department follows the factory operation and fulfill the need in time.

(c) HACCP Team Leader

Responsible for need to assist HACCP Team and need to check document, processing step and machine department. Need to check whether the department follows the system of deviation. Fulfill the need in time. Need to follow the training plan and arrange training for the staff. Fully responsible to produce, control all the workers, Staff affairs and plant sanitation.

(d) Staff/Labours

Responsible to work their respective duties following the guidelines , SPOs GMP and HACCP system accordingly.

4.4 Project site description

4.4.1 Description of the building

The Thantwe Marine Products (TMP) is operating within the vicinity of No. B-1-2 of 26,102 square meter (6.45 acres). The main part of the factory is the production/processing and storage buildings, main office, flake ice making plant, parking yard, canteen, warehouse and open spaces. The factory buildings are planned to be equipped with up-to-date electrical and communication system, fire protection system, water supply and sanitation system also waste water treatment tanks, air conditioning and ventilation system as well.

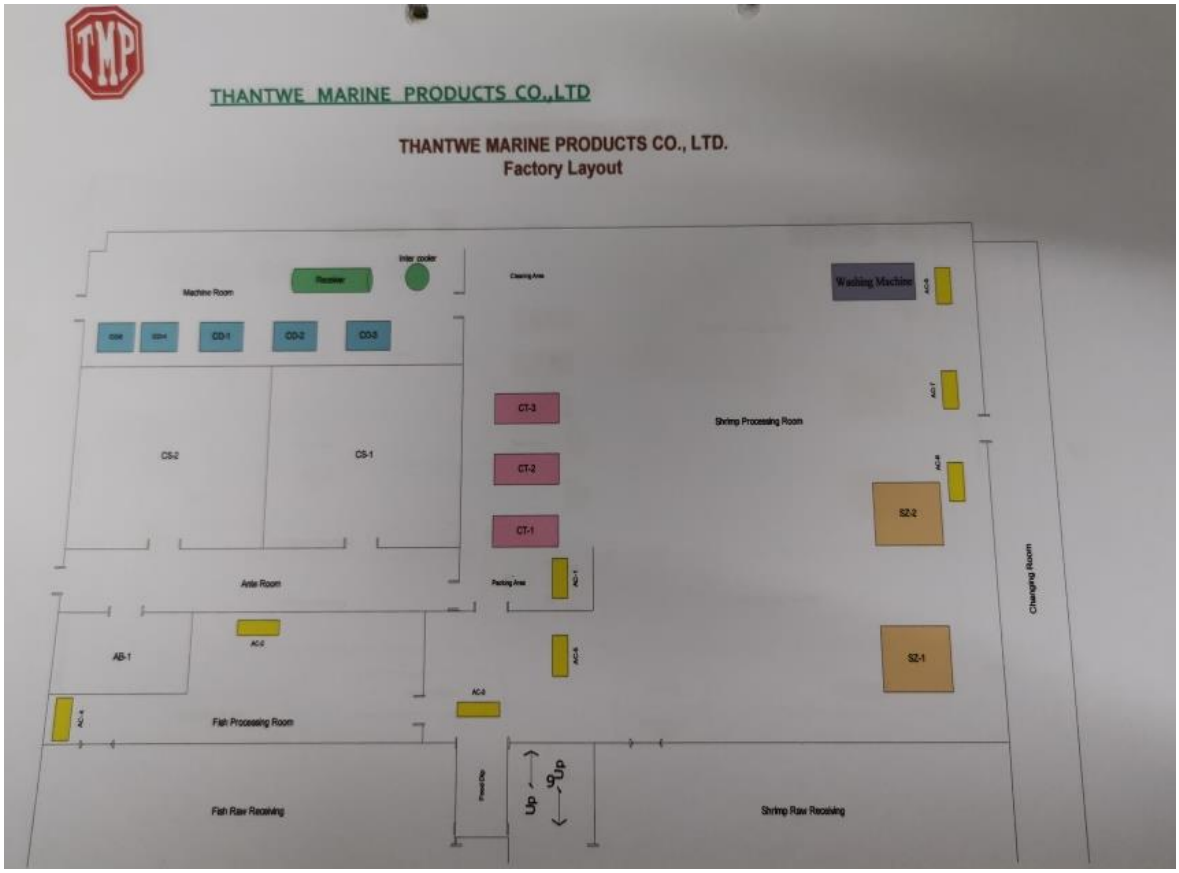


Figure 4.5: Factory layout plan of the proposed project

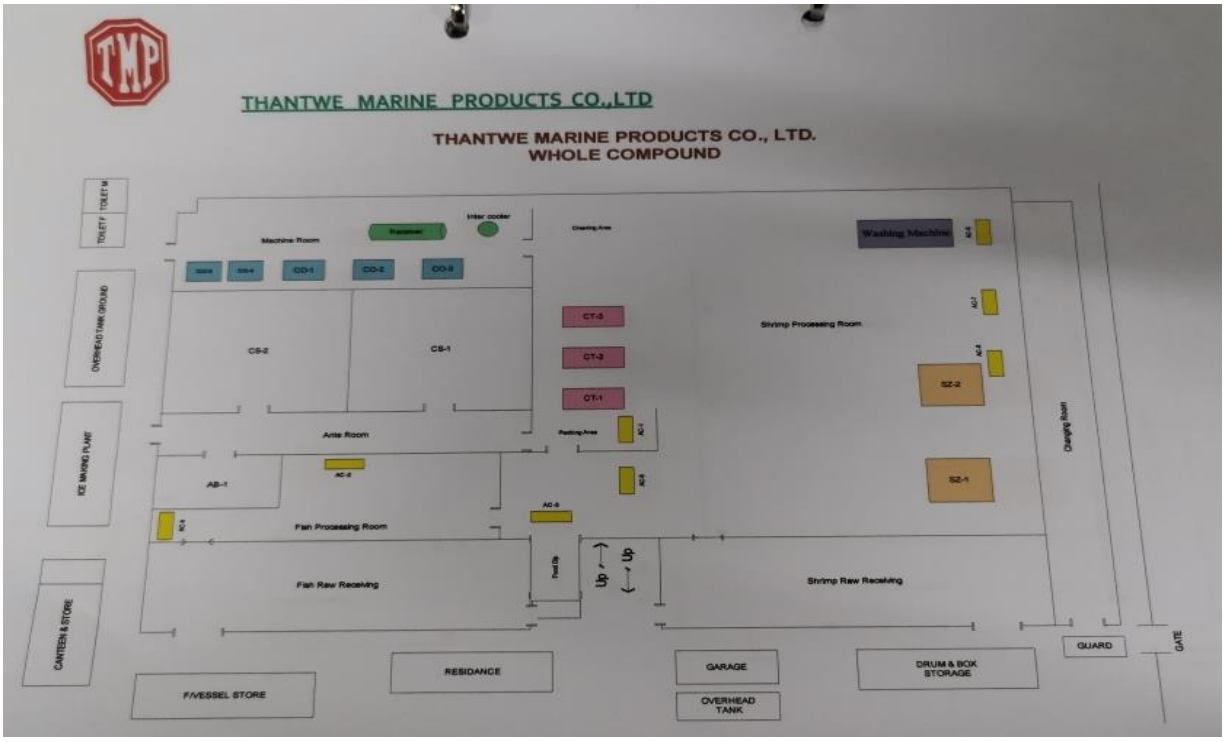


Figure 4.6: Whole compound of the proposed project

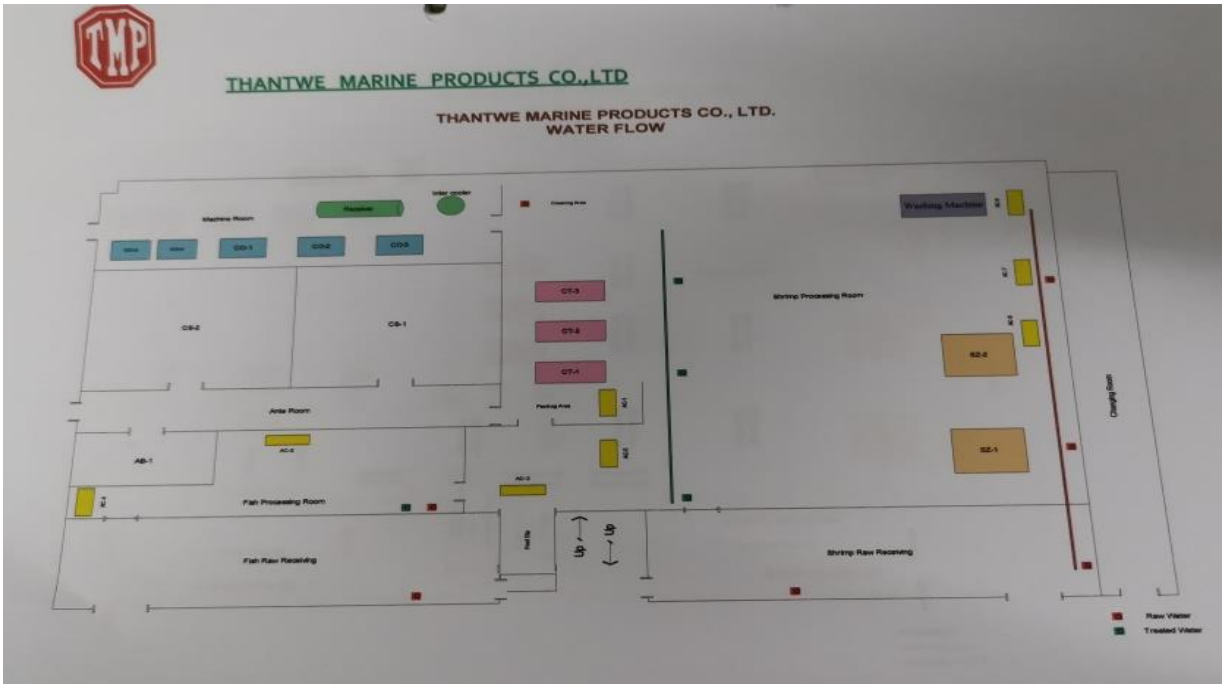


Figure 4.7: Water flow of the proposed project

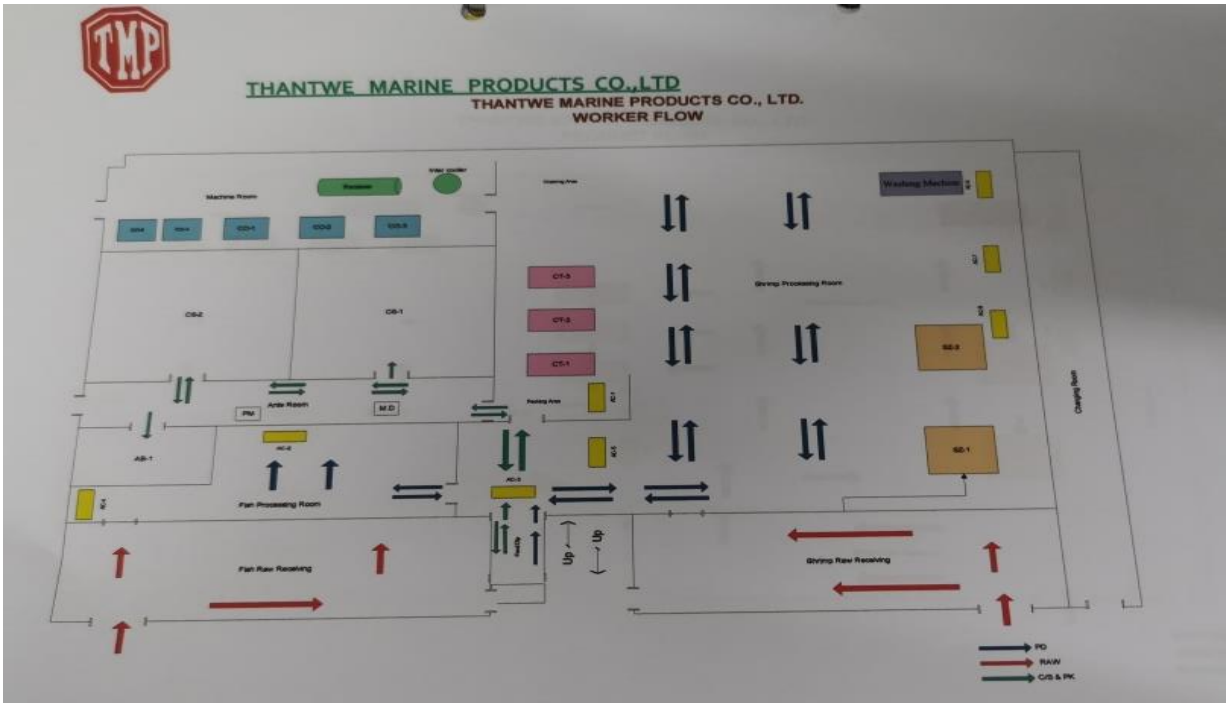


Figure 4.8: Worker flow of the proposed project

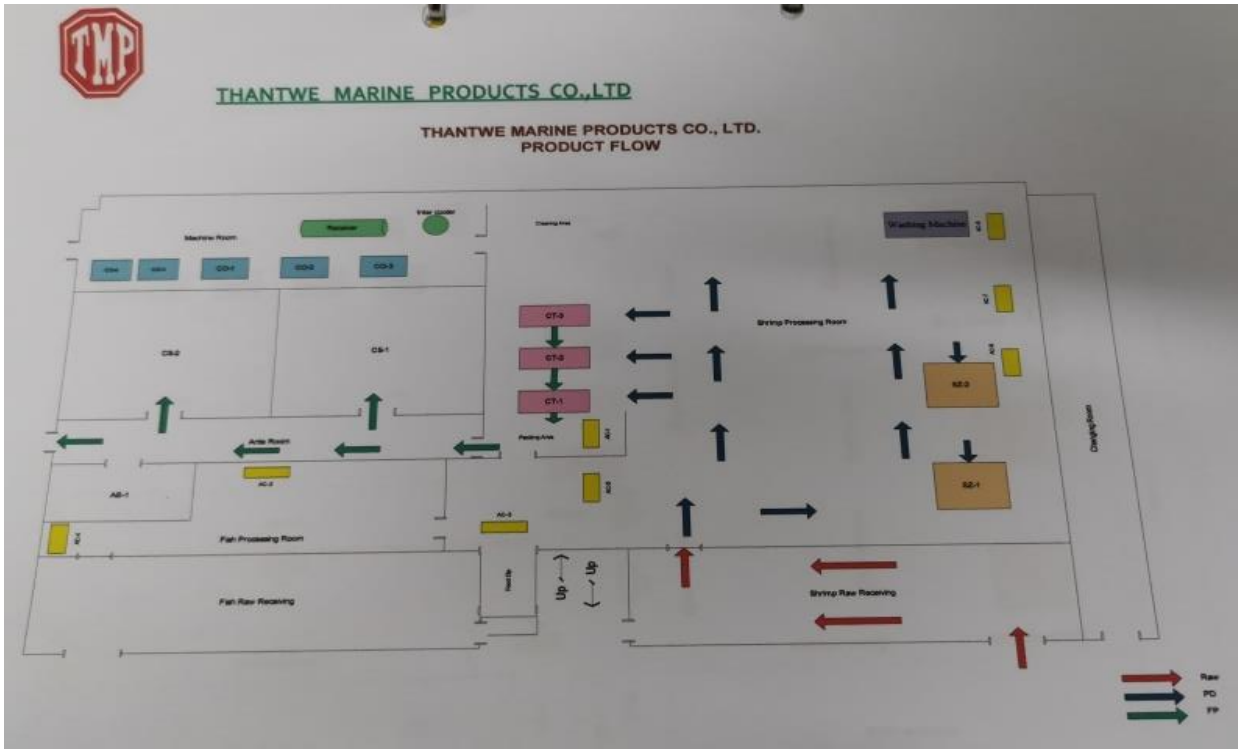


Figure 4.9: Product flow of the proposed project

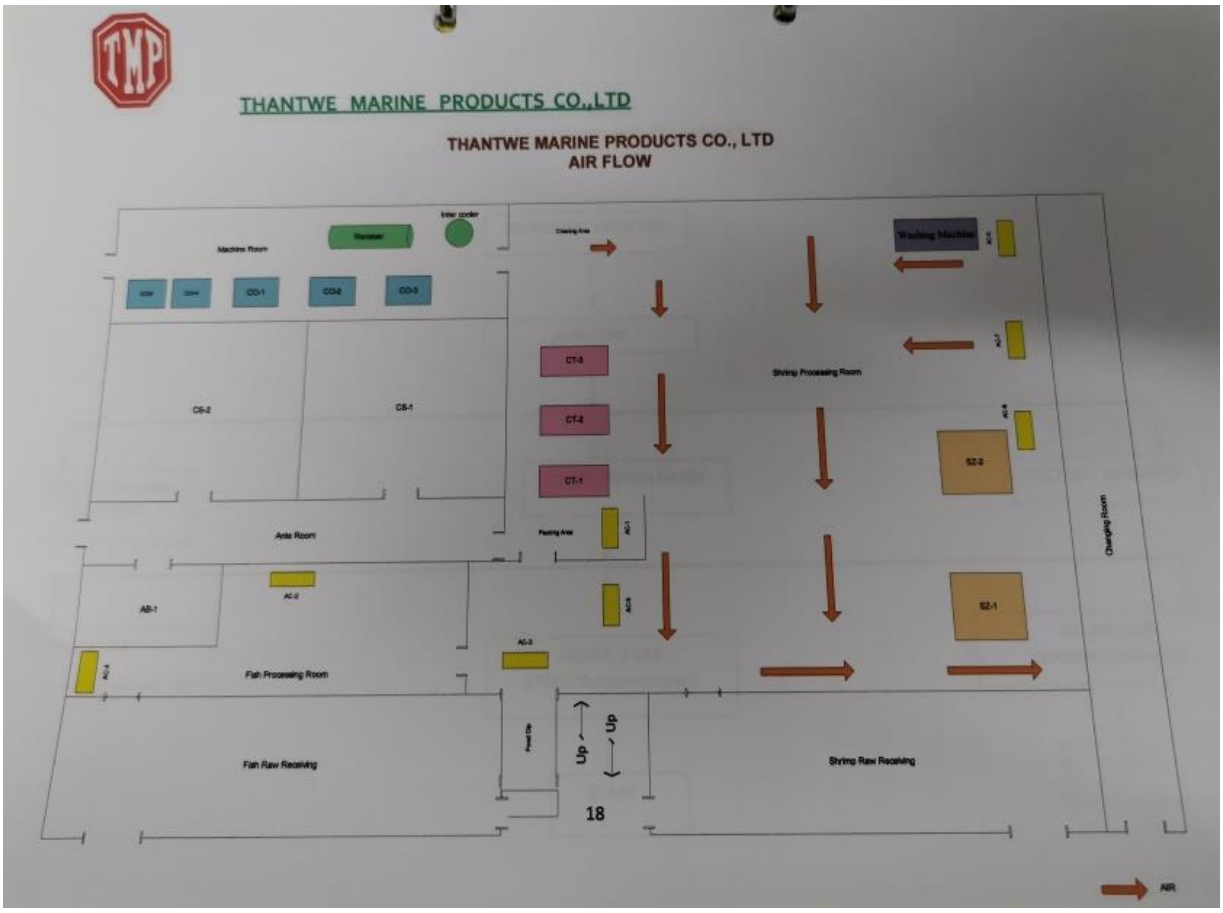


Figure 4.10: Air flow of the proposed project

4.4.2 Water Supply

The main source of water supply of the project area is from the irrigated water from the own Dam. Water supply is required in the proposed plant for the production process, cool storage processes, the flake ice making plant. In addition, it is used for canteen purpose and sanitation. The total water requirement of the plant is 870,000 (estimate) gal/month.

4.4.3 Electricity

The main source of electricity supply for this project is the national grid line, which is also utilized by operations including water supply system for the whole project, lighting and production process operation, etc.

The total requirement of electricity supply is a capacity ***of 157,080kWh per month***. The total diesel requirement for vehicles and ships is approximately 380918 L per month. That diesel is purchased from the local market and transported to the project area by cars.

4.4.4 Diesel storage

The proposed factory uses the premium diesel to operate the factory activities and the diesel storage tank is placed as follows:

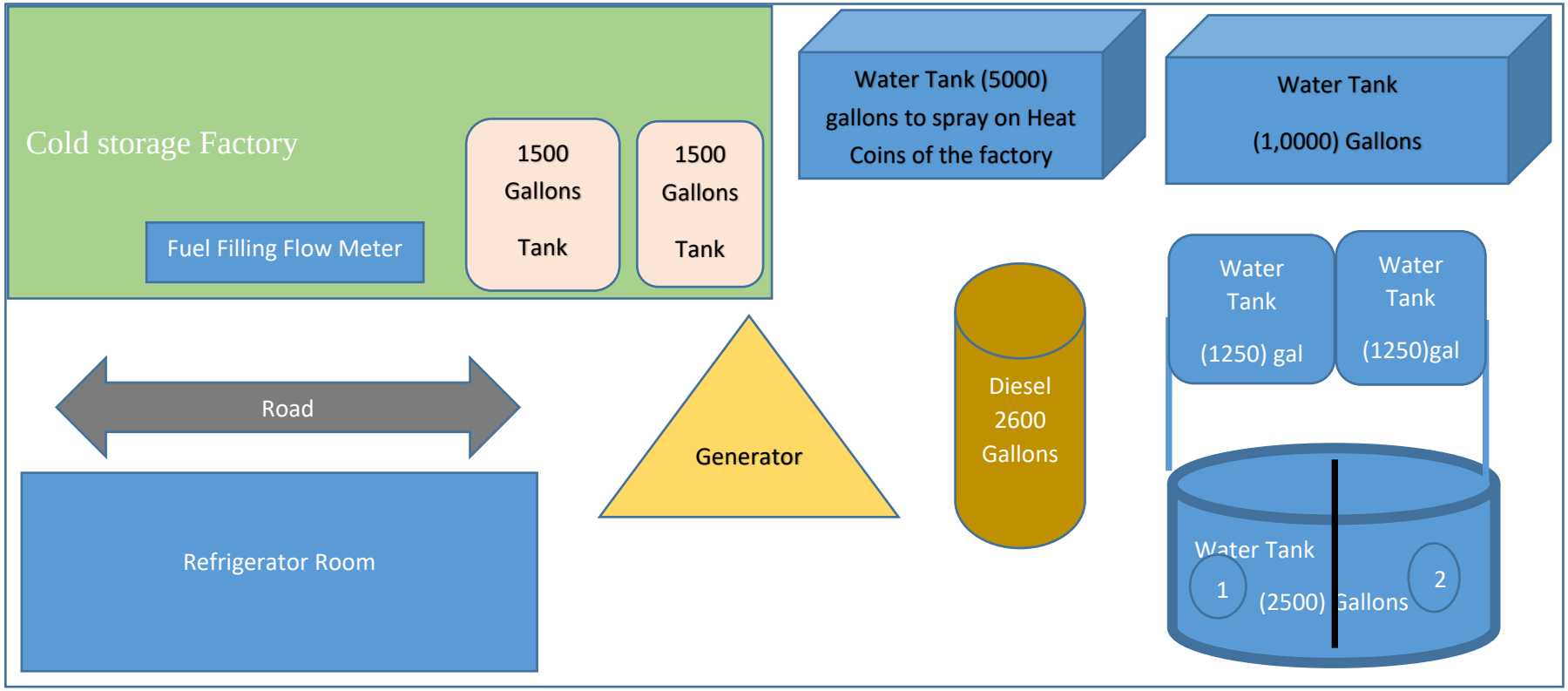


Figure 4.11: The lay out plan of diesel storage tank and water tanks

4.4.5 Diesel Handling

Regarding diesel handling, diesel storage is set up closely to the water tanks and there is a flow meter to monitor and control the rate of fuel filling in the control manner.

At the TMP factory, there is a Spill Response Team with the respective duties and responsibilities of the following:

- First Person On-Scene,
- Spill Response Team 5
- Spill Response Team Leader 1

(i) The responsibilities of First Person On-Scene

1 Assess the initial severity of the spill and safety and environmental concerns.
2. Identify the source of the spill.
3. Determine the size of the spill and stop or contain it, if possible.
4. Notify the Spill Response Team Leader.
5. Immediately stop work, transfer or fuelling operations, control all sources of ignition.
6. If possible and safe to do so, put out any fire and stop any leak that may be present.
7. If possible, prevent access of spilled material to water.

(ii) The responsibilities of Spill Response Team Leader

1. Ensure that all safety measures are taken for the preservation and protection of factory premises , workers and nearby community
2. Identify potential fire hazards and request standby or response from the Fire Response Team.
3. When safe to do so, ensure that the source of the spill is secured.
4. Notify additional trained Spill Response Team personnel, if required.
5. Restrict further operations that may interfere with a sustained response to the spill incident.
6. Evaluate the size of the response to be initiated and make assessments relating to the necessity of calling out response contractors.

Figure 4.12 Diesel Filling flowmeter

Figure 4.13: Diesel Tank

4.4.6 Prevention of fire safety and emergency

As shown above the figure 4.11, the generator and diesel storage sites are placed closely near to the water tanks that can be utilized in case of fire emergency.

The TMP factory organized the following firefighting equipment and facilities:

1)	Halligan Hooks	20
2)	Sh0vels	20
3)	Water Buckets	15
4)	Sand Buckets	6
5)	Fire extinguishers	20
6)	Water Tanks (40000 gallons)	2
7)	Water Tanks (1000 gallons)	2
8)	Water tank (400 gallons)	2

Furthermore, there is a fire safety and emergency teams which are organized as follows:

1) Management Team
2) Security Team
3) Communication team
4) Fire Prevention and Extinguisher Team

(i) Management Team

It is comprised of (6) members lead by the factory Managing Director in order to

- Advice, guide, manage the Fire Safety and Emergency Teams in order to operate as planned
- To guide and monitor the emergency situations
- Review and revise the existing prevention plan as well as the emergency plans accordingly
- Organise the Fire Prevention and Extinguisher Team

(ii) Security Team

It is comprised of (7) members lead by the factory Security Leader in order to

- Inform management team and communication team
- Protect and defend the factory premises,
- Initiate fire alarms and evacuation signals alert the fire emergency
- Assist the firefighters by maintaining clear paths of egress assisting occupants to exits in an orderly manner

(iii) Communication team

It is comprised of (5) members lead by the Manager of the factory in order to

- Inform the Management team and Fire Prevention and Extinguisher Team
- Assist the fire extinguishers directing the water access and electricity supply connections
- Inform the respective contact phone numbers

(iv) Fire Prevention and Extinguisher Team

It is comprised of (14) members lead by the Leader of Cold Storage Packaging in order to

- Demonstrate fire training along with the basic trainings on the factory workers
- Check routinely the firefighting equipment set up in the factory
- Put the fire alert warning signs, non-smoking signs in the factory accordingly
- Extinguish the fire in case of fire incidents with the existing factory's fire equipment in advance before the fire office department arrive at the factory
- Cooperate with the firefighters from the Fire Department

.

4.4.7 Firefighting system

Fire extinguishers are placed next to the exist and special purposed areas for emergency situations. Water for firefighting will be used from the water tank. The fire safety training module is also designed as well as trained to all staff for preventive measures to eliminate causes of fire or fire hazards in the workplace.

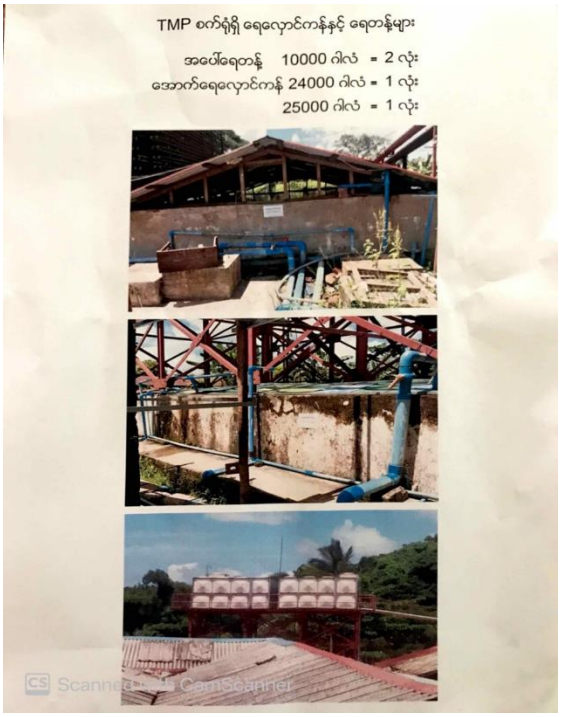


Figure 4.14: The storage water tanks at the TMP factory

Figure 4.15: The fire drill at the TMP factory

Figure 4.16: Training on fire drill at the TMP factory

4.4.8 Requirement of human resources and equipment

All workers are permanent staff including both paid monthly as well as daily. The group of permanent staff includes accountants, maintenance staff, engineers, warehouse staff, production staff, logistic, drivers, counter, administration staff, etc. The details are as follow:

Table 4.2 The capacity of staff in Thantwe Marine Products Co., Ltd (TMP)

Type of Staff		**Number of Staff**
Daily Paid Staff		43
Permanent Staff		213
Total		**256**
Sr	**Particulars**	**Numbers**
1	Office staff	20
2	Cold storage machinery	8
3	Ice factory machinery	8
4	Ice factory team	18
5	Package team leaders	2
6	Package team	24
7	Maintenance team leaders (women)	7
8	Maintenance women labors	

	8.1 Inspection	25
	8.2 Collection and Sorting team	37
	8.3 Laying and Labelling team (A)	18
	8.4 Laying and Labelling team (B)	37
	8.5 Temporary staff	43
9	Security	9
	Total	**256**

4.4.9 Safety measures

As safety measures for staff / workers during operation, employees will be equipped with:

- Gloves
- Boots
- Dust Masks
- Apron
- Helmets

4.4.10 Raw Materials

There are two types of major raw materials which are marine products related including fresh water fish, sea water fish, squid and shrimp group and Chemical related group mainly Chlorine disinfectant.

All chlorines powder packed in the plastic containers are kept in the chemical storage room keeping the logbook with balance sheet for the usage.

Table 4.3: Chlorine usage

Sr	Type of usage	Number	Amount and concentration
1	Raw storage bath	1	160 g/day & 200 ppm/ 200L
2	Foot washing bath	2	160 g/day & 200 ppm/ 200L
3	Hand washing bath	1	4g/day & 10ppm /200L
4	Floor clean		80g/day & 200 ppm /200L
5	Raw material washing		20g/day & 50ppm/ 200L
6	Final product		4g/day/& 10ppm/200L
7	Baskets, Trays, Chairs cleaning		40g/day &100ppm/ 200L
	Total	**1kg/day**	
		30kg/month	

Table 4.4 : The type and amount of product (2021 to 2022)

Sr	Type of product	Amount (Tons)
1	Prawn	353
2	Fish	69

3	Soft- shell Crab	137
4	Squid	529
	Total	89.2/mth
		1070 tons/yr

Table 4.5 : The type and number of machinery

Sr	Type of product	Numbers
1	Generator (Cummin) 500Kva	2
2	Generator (Cummin) 350 Kva	1
3	Compressors (Mycom Contact) for cold storage	3
4	Cold storage compressor	2
5	Screw compressor	1
6	20 tons cold storage compressor	2
7	Refrigerated cold room van truck	4
8	Ice freezer Truck	2

4.4.11 Approved product

The approved products are export product shrimp (black tiger/ sea tiger, white, fresh water prawn (FWP), pink, flower, banana shrimp, baltjade, golden shrimp, horina) and the export product fish (rohu, mrigal, panagash, koral, hillsa, lakka, boal, ayer, katla, shoil/snake head fish, spanish mackerel, grouper, white pomfret/silver pomfret, folly/foly/featherback, puti, black pomfret, read snapper, rita, koral/barramudi, sea eel, chinese pomfret, tuna, red emperor, cuttle fish) , squid, octopus and soft shell crab. .

4.5 Production phase

The Thantwe Marine Products (TMP) is composed of fourteen main steps which are 1) raw receiving, 2) pre washing, 3) weighing, 4) sorting and sizing, 5) HL/PUD/PPV/Cut/Fillet/Ring, 6) washing, 7) weighing, 8) laying in the tray, 9) freezing, 10) glazing, 12) packing, 13) metal detecting, 14) MC packing storage and exporting.

4.5.1 Sanitation Standard Operating Procedure (SSOP)

4.5.1.1 Safety of water and ice (SSOP1)

Both water and ice are commonly used in seafood processing activities otherwise food can be contaminated and not safe for consumption.

(i) The current water usage system

Source of water comes from irrigated water (own reservoir) located near the factory and tube wells which locates inside the factory compound. There are ground tanks receiving water from the tube wells and then potable water transported to water treatment system by passes through vertical

pressure filter (sand filter) in order to remove iron and softener and then delivered to the overhead tank with chlorine dozer which is used to chlorinate water effectively.

The water supply system has no cross contamination because of the supply pipe lines are duly separated in the different areas. There is no chance of back flow. Ground tank is fully covered with fine nylon mosquito net to protect from extraneous materials. Overhead tanks are fully covered with plastic.
Ice flakes are made from the potable water. There is only one flake ice machine with capacity of 15 metric ton per day running at the factory. Flake ice store is cleaned periodically. Ice is being manufactured hygienically and in such a way to protect them from contamination like dust, bits of woods, saw dust and rust that can transfer to finish product. Ice store door is also closed after loading. Ice is transported by the insulated containers with fixed covers.

(ii) Monitoring Procedure

Over-head tank and ground tank are cleaned and sanitized twice a year. Water treatment equipment are cleaned before processing and sanitized twice a year. Also, pipeline system is checked daily for any break-down and adequate deep seal traps and vents for watertightness.

Water and ice samples are usually sent to the Analytical Laboratory under the Department of Fisheries for microbiological investigation twice a year. At the same time, water samples are sent to National Health Laboratory for chemical test twice a year.

(iii) Potable water tank cleaning procedure

- Empty the water tanks to scrub all surfaces with detergent and rinse with water
- Scrub all surfaces with sanitizer (chlorine) and rinse with water
- Final rinse with pipe water to ensure the removal of chlorine residue
- Drain out the water and keep them dry

(iv) Cleaning procedure of ice making room

- Stop ice machine running
- Remaining ice are removed before cleaning
- Floor/drum are cleaned and sanitized with 100ppm chlorine water
- Rinse with pipe water

(v) Corrective action

If a water purity problem is notified and in case of any break-down in the treatment process and water supply, the company will stop process immediately in order to find out the exact time of break-down and retain all products manufactured during that time until finding out the cause and taking measure to bring the production back to normal and to test the products if needed. Only quality assurance products will be shipped.

In case of microbiological test result of water is greater than Standard Criteria. QC In-charge is traced and checked carefully.

(vi) Record

- Water storage tank cleaning record
- Water treatment system cleaning record
- Microbiological test result for water and ice record (DOF laboratory result)
- Chemical test result of water and ice (NHL result)
  All documents are maintained for at least two years.

4.5.1.2 Condition and Cleanliness of Food Contact surfaces (SSOP.2)

All type of surfaces in the processing area are kept clean, maintained and well sanitized to avoid cross contamination to the product. All food contact surfaces are cleaned and disinfected at least three times a day; before start working time, midday break time and at the finish of the evening shift.
All production workers and Process workers including raw material workers are required to wear hair net/hat, mask, boots and gloves and waterproof aprons. All food contact surfaces are made from non-toxic material, smooth and easy to clean surface i.e trays, tables, carts and racks are made from stainless steel; gloves are made by non-toxic rubber, baskets and aprons are made from non-toxic plastic.

All food contact surface are fully cleaned following the Standard Operation Procedure (SOP) at least two times a day: before start working time, and finish of the evening shift. During the production, all food contact surfaces are quick cleaned periodically i.e table are cleaned by rinsing with chlorinated water (100ppm) appropriate frequency; trays and baskets are cleaned by soaking in chlorinated water (100ppm) appropriate time; workers clean their gloves and aprons every hour by dipping hands and rinsing aprons with chlorinated water 10 ppm. Packing and labels which shall contact to the product are kept clean all the time.

(i)Cleaning Procedure

Tables, trays, baskets and other utensils cleaning steps;

- Remove all remaining food particles
- Rinse all surfaces to wash out with water
- Scrub liquid detergents
- Rinse all surfaces with water
- Disinfected with chlorinated water (50 ppm chlorine)
- Rinse with water to ensure the removal of chlorine residue

After cleaning all food contact surfaces are kept in clean and ventilated place. Gloves and aprons are cleaned at finished times daily. Non food contact surfaces such as windows, ceiling, walls and floor are cleaned daily after processing time.

(ii) Monitoring

A post-sanitation or deviation clean-up inspection is performed by the supervision after each clean-up period.

(iii) Corrective action

Food contact surfaces that are not readily cleanable are repaired or replaced.
Adjust sanitizer concentration. Food contact surfaces that are not clean are cleaned and sanitized.
Gloves that become a potential source of contamination are cleaned and sanitized or replaced.
Outer garments that become a potential source of contamination are cleaned and sanitized or replaced.

(iv) Record

- Cleaning and sanitation record.
- Chlorine concentration record.
  All documents are maintained at least two years.

4.5.1.3 Prevention of cross contamination (SSOP-3)

Direct or indirect cross contamination of fishery product are avoided at all stages from raw materials to finished products. Each processing stage is regarded as cleaner than the previous steps.

Plant is strictly prohibited to break out the contamination. Keep the process control by at the stage of the raw materials, process line, weighing, grading, freezing and packing.

If any contaminants come in contact with processing lines or product, the effected lot shall be cleaned, sanitized and inspected before production starts again.

Gloves and uniforms of employees are sanitized prior to transfer from one area to another.

Worker whose hands, gloves, uniforms, utensils, food contact surface that come in contact with waste, floor or other unsanitary object do not touch food product without first being cleaned and sanitized.

Factory is designed and constructed as one way orientation. The raw material receiving area and processing area are clearly separated. Separated storage space is allocated for raw material, finished products, packing material and chemicals, sanitizing agents. Utensils are different by colors. Plastic tray in use in the raw material area and those in the goods area are color coated. All plastic trays in use area always placed on pallets.

Product wastes are gathered and removed continuously from the processing area. Process flow is in straight line, and air flow from clean area to dirty area. All workers have given protective clothes and have been trained the hand washing practices. Workers are only allowed into the establishment as their functions.

Food, food contact surfaces and food packing material are protected from contamination. Clothing and personal belongings are not stored in processing area.

Workers are not allowed to eat food, chew gum, drink beverages, spitting and other bad behaviors in processing area.

Workers sanitize their boots in footbaths containing 200 ppm chlorine sanitize solution before enter or pass-through other processing areas.

(i)Work Procedure

- Gloves and cuter garments of employees must be sanitized prior to transfer form one area to another.
- Workers whose hands, gloves, outer garments, utensils, food contact surface that come in content with wastes, floors or other unsanitary object do not touch food product without first being cleaned and sanitized.
- Food/ human traffic must be designed so as no crossing of workers inside processing area.

(ii) Monitoring

Employee practices do not result in food contamination (hair restraints, glove use, hand washing, personal belongings storage, eating and drinking, boot sanitizing).

(iii) Corrective action

If any contaminates come in contact with the processing line or product, the affected lot must be cleaned, sanitized and inspected before production starts again. If a microbiological problem is notified, the company will retain all finished products will shift.

(iv) Record

- Cleaning and Sanitation Record
- Daily Personal Hygiene Check Record
- Chlorine Concentration Record

All documents are maintained at least two years.

4.5.1.4 Personal Hygiene (Workers Health – SSOP-4)

To ensure that workers are not source of contamination to the products.

There are employees in the processing establishment. Sufficient hand washing facilities are provided with non-hand operated wash taps, liquid detergent and sanitizer, sanitary towel and foot dip. Chlorine level for hand washing is 10ppm and 100ppm for foot dip is prepared.

The company provides cleaned dresses for employees and cleans them after used. All persons entering processing area wear protective clothes in an effective manner and suitable for the

operation. Workers are not allowed to wear jewelries, such as necklace, ring, ear ring and watch in the processing room. Wearing traditional face take is not allowed also.

1. Changing rooms and Toilet are provided for male and female.
2. Adequate suitable and conveniently located toilets are provided.
3. Toilets are designed to ensure hygienic removal of waste matter. These areas have enough lighting, ventilation and not open directly on to food handling area.
4. Hand washing facilities with soap are provide.
5. Have enough restrooms separately for male and female, well-maintained and kept clean at all time cleaned schedule posted.
6. The rest rooms are provided supplies soap, running water, etc. sufficient enough to meet employees need.

(i)Work Procedure

- Hand washing station and hand dips must be located in processing area.
- Hand dips must also be located at every process line. These must be used every time workers contaminates hands and gloves and upon returning back to the process line.
- Hand washing facilities must be checked by the Quality checker for adequate supply of hand sanitizer before operation. The concentration of chlorine must be checked before operation and every one hour during operation by the QC. They are maintaining at 10ppm for reclaim dips. The results must be recorded in the chlorine motoring logbook.
- Separate toilet facilities must be provided for male and female adjacent to processing area. It must be equipped with ventilation.
- Adequate suitable and conveniently located toilets are provided.
- During processing hour, QC must check that toilets are cleaned and sanitary.
- Maintenance team must keep toilet facilities in good order.

(ii) Monitoring

And then, eating, smoking, chewing, coughing, sneezing, spitting and any other such bad behavior that is likely to contaminate the product during handling or processing is strictly prohibited.

Separate toilet facilities are provided for male and female outside the establishment. Hand washing facilities with detergent and sanitizer are provided in the toilet. Toilets are cleaned and sanitized daily.
During processing hour, QC must check that toilets are cleaned and sanitary. Maintenance team must keep toilet facilities in good order.

(iii) Corrective Action

Sanitation supervisor initiates repairs of toilet or hand washing facilities as needed and restocks facilities or adjusts sanitizers.

(iv) Record

- Daily personal hygiene record.
  All documents are maintained at least two years.

4.5.1.5 Protection of contaminants (SSOP-5)

To ensure that the food, food-packing material and food contact surface are protected from various microbiological, chemical and physical contaminants.

If food has been prepared, packed, or held under insanitary conditions whereby it may have become contaminated with filth or whereby it may have been rendered injurious to health. So, food, food packing material and food contact surfaces in establishment are protected from various contamination like that microbiological, Chemical and physical contamination.

Also food, packing materials and food contact surfaces are separated to prevent contamination from non-food grade lubricants and fuel which are considered adulterants, foo, food contact surfaces are washed thoroughly when exposure to contaminants and packing materials are covered with plastic sheet.

Condensation is a common problem in establishment. The establishment prevents condensation dripping to falling on the products, food contact surfaces and packing materials.

(i)Work Procedure

- HACCP Team prepares the chemical list record in approved supplier.
- Store Department must prepare the using chemical segregate in chemical store.
- QC staff must check daily using of chlorine concentration record.
- Chemical containers must be identified as label and chemical name. Chemical containers must be closed.

(ii) Monitoring

Cleaning/ Washing of equipment must be done after processing to prevent floor splash to occur. All food contact surfaces must be cleaned prior to use to ensure that no cleaning/ sanitizing residues are present. All cleaning/ sanitizing agents must be clearly labeled and stored away from the processing area so as with other lubricants and chemicals.
Maintenance must ensure adequate ventilation airflow and air pressure to inhibit the formation of condensate that may contaminate product contact surface and packaging materials. Maintenance department must store and properly label all non-food grade lubricants within the maintenance area.

All gas, fuel must be stored outside processing area. All toxic materials must be labeled and stored properly.

(iii) Corrective Action

Unapproved chemicals are returned or used in non-processing area. Improperly stored chemicals are moved to the correct storage area. Safety of the product is examined and contaminated source is eliminated. Repairs are made as needed to defective equipment. Sanitation supervisor corrects any condensation problems.

(iv) Record

- Cleaning and sanitation record
- Chlorine Record

4.5.1.6 Labeling, storage and use of toxic compounds (SSOP.6)

To ensure that the labelling, storage and use of toxic compound are adequate to prevent food from contamination.

All kind of chemicals using in the factory are packed and labeled properly and stored outside the process area. All chemicals are purchased on the approved suppliers. At receiving, chemicals are checked supplier name, label, instruction, specification, Lot number, expire date and entire situation of chemical containers. All chemicals are received and recorded into chemical Receiving Report with signature of responsible staff who can access and handle toxic chemicals. Daily use quantities are kept segregate location in the processing room during working time.

(i)Monitoring

- Authorized person update the record of Approved Supplier List (Chemical).
- Chemical and food additives are inspected on receipt before storage and usage.
- Chemical and food additives are stored in clean condition correctly separated from detergent and other non food chemical.
- Chemical and food additives on used shall be properly labeled.
- Use picks up and record on log-book.

(ii) Corrective Action

Toxic compounds without proper information are placed on hold until information is obtained. Toxic compounds without documentation are returned to the supplier.

Improperly stored chemicals are moved to the correct storage area. Leaking containers are released or replaced as necessary. Storage cage will be cleaned by the next working day.

Misuse of toxic compounds results in disciplinary action or retraining. Potentially contaminated food is discarded or destroyed. Improper labelling of working containers is corrected.

(iii) Record

- Chemical Receiving Record
- Daily chlorine using record
- Approved chemical supplier list
  All documents are maintained at least two years.

4.5.1.7 Control of employee health conditions that could result in the microbiological contamination of food, food packing materials and food contact surface. (SSOP7)

To ensure that employee are not a source of contamination to products and also not a source of cross contamination to other food handlers.

All persons involved in processing are examined health and medical checkup by township medical officer, Ministry of Health annually. Medical certificates are provided for each worker and keep in the record file. Persons with typhoid, influenza, diarrhea such as infectious disease are not allowed to join establishment.

Any person with open lesions like boils and infected wounds or any other source of microbiological contamination, by which there is a possibility of contact with food contact surface or packing material are excluded from the process area. Unhealthy employee is not allowed to work in processing area.

Production workers are instructed to report any health condition that might result in contamination of food. Before starting time quality Control Staff and supervisor are check up the workers' health condition daily.

(i)Work Procedure

- Workers must be fit to work with no communicable diseases. A medical certificate must be kept on file.
- Line leaders must observe the illness of their workers before work begins. Anybody found to have indication of illness must be sent hone until fit to return back to work.
- Any illness, injury must be reported to the leaders to restrict from contaminating the product.

(ii) Monitoring

No person is allowed to enter in processing room with any kind of communicable diseases of sores, boil, wound and any other type of microbiological contamination. Only medically fit person are allowed to work.
Workers with diseases, injury or wounds must cover them with bright color bandages and gloved to protect cross contamination. Supervisors check workers health condition prior to starting day working.

Production In-charge/ QC In-charge shall responsible for monitoring worker health and makes a decision case by case to allow workers who represent a risk to be sent home or assigned to non-food contact jobs if appropriate.

(iii) Corrective Action

Workers who represent a potential risk are sent home or reassigned to non-food contact jobs. Cover lesion with impermeable bandage, reassign, or send worker home.

(iv) Record

- Daily workers' health control Record
- Medical Check-up Record
  All documents are maintained at least two years.

4.5.1.8 Exclusion of Pests from the Food Plant (SSOP.8)

To control pests that transmitted diseases by preventing undesirable animals and harboring of pest to protect raw-materials and packaging form being contaminated by pathogens.

Establishment is designed and constructed to prevent harborage of pests. At the door of entry and exit are provided with plastics curtains to prevent insects coming in. Also strainers are placed at the end of drain directly outside.

Insect attracting and killing devices are installed at strategic points where there is a likely problem of entry of insects are properly collected and disposed off immediately. The establishment implements pest control by outside pest control service monthly. And then, establishment have own pest control procedure by assigned team.

(i)Work Procedure

(a) Rodents
- Define positions to place rodent traps more than one position could be identified.
- In case of rodents are trapped, discard the traps. Thoroughly clean and disinfect the area.
- In case of no success in 5-7 days, change the position. Renew the trap at every 2 weeks or up to the decision of the Factory Manager.
- Records, Sign and Date on rodent trapping position in factory layout.

(b) Insects
- Use double doors including self-closing door and plastic curtain to protect insect from coming into the processing areas.
- Put insect killer near the entrance at about 2 meters from the ground. Check and discard insect killer once a week. Clean the insect killer must adequacy.

(ii) Monitoring

Pest control is contacted private company. That company has been making pest control monthly.

- Remove all waste regularly prior to start up and after processing operation.
- Clean compound every day.
- Outlet of the drain is properly netted to prevent pest entry and per meter is kept clean and tidy. Waste materials are cleaned regularly and all the waste containers are kept covered.
- Electrical fly killers are kept in the processing and the entrance of the plant.
- Open creaks or holes should be sealed.
- Regular pest and rodent control by insecticide.

(iii) Corrective Action

Conditions that may cause pest problems are corrected. The pest managements firm is notified of any pest problem and treats the problem. Pest treatments are more frequent if problems are identified.

(iv) Record

- Daily Pest control for Insect Control Record
- Pest Control Record by Outside Service

  All documents are maintained at least two years.

4.5.2 Standard Operation Procedure for Cleaning (SOP)

(1) Table Cleaning

- Pick up and remove major solid wastes.
- Rinse all surfaces with raw water.
- Degrease and scrub all surfaces with soap (detergent)
- Rinse all surfaces with raw water again
- Sanitize wit chlorinated water (100ppm)
- Rinse with water again
- Check table clean or unclean
- Broken items are separated and discarded

(2) Wall Cleaning

- Rinse all surfaces with raw water
- Degrease and scrub all surfaces with soap (Detergent)
- Rinse all surfaces with raw water again
- Sanitize with chlorinated water (100ppm)
- Rinse with water again and check wall clean or unclean

(3) Tray Cleaning

- Pick up and remove major solid wastes.
- Rinse all surfaces with raw water
- Degrease and scrub all surfaces with soap (detergent)
- Rinse all surfaces with raw water again

- Sanitize with chlorinated water (100ppm)
- Rinse with water again
- Check tray clean or unclean
- Broken items are separated and discarded

(4) Basket Cleaning

- Pick up and remove major solid wastes
- Rinse with raw water first
- Scrub with soft brush and detergent thoroughly
- Rinse with raw water again
- Sanitize with chlorinated water (100ppm)
- Rinse with water again
- Check basket clean or unclean
- Broken items are separated and discarded

(5) Utensil Cleaning

- Pick up and remove major solid wastes
- Rinse with raw water first
- Scrub with soft brush and detergent thoroughly
- Rinse with raw water again
- Sanitize with chlorinated water (100ppm)
- Rinse with water again
- Check utensil clean or unclean
- Broken items are separated and discarded

(6) Glove & Apron

- Clean all surface with raw water first
- Degrease and scrub all surfaces with soap (detergent)
- Rinse all surfaces with raw water again
- Sanitize with chlorinated water (10ppm)
- Check glove & apron clean or unclean
- Final rinse with raw water and hang it drainage

(7) Floor Cleaning (Receiving, Processing Air Blast Freezer & Cold Store)

- Pick up and remove major solid wastes
- Clean all surface with raw water first
- Degrease and scrub all surfaces with soap (detergent)
- Rinse all surfaces with raw water again
- Sanitize with chlorinated water (200ppm)
- Rinse with water again
- Check floor clean or unclean
- Cold store shall need dry cleaning with chlorinated water (200ppm)
- Cleaning workers are responsible for above duties.

4.5.3 Good Manufacturing Practice (GMP)

4.5.3.1 Description of the processing plant

(i) Primary Production

(a) Environmental Hygiene

- Organization will get raw materials from own vessel, farm and own collecting station purchased from approved supplier who can control that can deliver high quality sea water prawn. Sea water prawns are collected and sent high quality sea water prawns with ice in insulation boxes and carried with own refer trucks and transport to the factory.

(b) Handling, Storage and Transport

- Trucks and containers are evaluated to ensure that the conditions meet our factory requirements for transporting prawn. The incoming prawn must be properly tagged, by supplier name and source of prawns, for factory use and for factory tracking system (traceability). Temperature of in-coming raw materials shall have (<5)˚C and prawn on truck shall keep on ice in all time.

(c) Cleaning, Maintenance and Personal Hygiene at Primary Production

- When raw material coming to the factory its will be sent to raw material section for inspection, weighing and cleaning.

4.5.3.2 Establishment Design and Facilities (Construction)

(i) Location

Establishment shall normally be located away from:

- Environmentally polluted area and industrial activities which pose a serious threat to contamination of food.
- Areas subject to flooding, unless sufficient safeguards are provided.
- Areas prone to infestations of pests.
- Areas where wastes, either solid or liquid, cannot be removed effectively.

(ii) Premises and rooms

(a) Premises

Thantwe Marine Products Co.,Ltd is located at Dwaryadi Myo Thit, Thantwe, Rakhine State, Myanmar. It is constructed in one storey building using iron structure to construct processing plant according to the international standards. The factory and surround area are free from objectionable odors, smoke, dust or other contamination. The surroundings of the factory are constructed with concrete floor, so to prevent accumulation of water, roadways and yards. It is designed to meet the hygiene standard of the HACCP system.

(b) Walls

The exterior walls are made of concrete walls which are waterproof smooth resistant to cracking and easy to clean. The internal walls are ceramic tiles. The ceramic tiles color is white.

(c) Floor

The floor is constructed with taraso floor, water proof, non-absorbent material which easy to clean and disinfect. The floor is enough slopes to facilitate the drainage of the water easily.

(d) Doors

Doors are tight fitting to exclude rodents, insects and dust. All the doors are fitted with plastic curtains to minimize outflow of cold air, dust and protecting from insects.

(e) Drains

Drains are constructed of sufficient quantity and depth. All drains opening have rodent proof covers. Effluent flow out direction is properly designed.

(f) Changing room

The factory has one changing room for the male and female workers. It is also attached with knob for Apron, Mask, Gloves and tall boots rack.

(g) Receiving area

The processing factory has two receiving area. It is separated from processing area.

(h) Processing area

The processing factory has one room especially designed for prawn processing. It is installed with grader machine, sir blast freeze, contact freezer and cold store.

(i) Ante room

Ante room exits connected with cold stores which is applied to (10±2)˚C keep finished product before export loading.

(j) Cold store

In the plant, there are two cold stores with capacity of 150 M/T two cold store normal temperature is (-18±2)˚C which is installed with digital thermometer. Thermometers are installed in all rooms where cooling system is applied.

(iii) Equipment

(a) Lighting

Fluorescent lamps with a cover are fixed at the processing hall. It is designed to easy cleaning of surface where dust and debris may collect and also protecting when it is broken. Bulbs are installed in Cold Store.

(b) Prawn grader

Factory has tow grader machines for prawn sorting and selecting size by size according to the specification.

(c) Air blast freezer

In front of cold store one air blast freezer is stationed. It is taken 8hours to freeze the products. Air blast freezer temperature is (-36 to -40)˚C and capacity is (3) tons each.

(d) Contact freezer

The factory has three contact freezers (660 Kg x 2) (550 Kg x 1) and temperature is (-40)˚C. It is taken 90min to freeze for product.

(e) Spiral Freezer

It can freeze 400~ 500Kg/ hr depends on products sizes. Freezing temperature is (-40)˚C and freezing time is nearly one hour.

(d) Flake ice

It can gets 15 tons/day.

(e) Block ice

The factory has two block ice making machines (20)tons per day each.

(iv) Facilities

(a) Ventilations

The processing factory is fitted with air condition to prevent accumulation of excess heat, vapour, odors and dust. The air floor from the building shall be from the more hygiene area to the less hygienic ones.

(b) Hand washing and foot washing facilities

The entrance for the workers of the processing plant is provided with basin, non-hand operated tap, detergent, chlorine and foot washing bath.

(c) Power supply

The factory uses electrical power form own generators. The factory has three stands by generators which can produce (500 KVA x 2), (300KVA x 1).

(d) Waste disposal facilities

Adequate facilities and equipment are provided and maintained for disposal and storage of wastage are put in plastic bag and plastic bin and subsequently taken to the covered waste storage, away from the building.

(e) Medical facilities

Every worker has to check health by a certified medical officer and kept medical record. The factory has free medication for illness worker. Medical checked room & medicine first aid kit also provided for workers.

(f) Store facilities

The factory is facilitating with two cold stores, having a capacity of 75 M/Ton each. These stores has digital thermometer near the door. All the products are stored on a rack and at least

6" away form the walls to allow case of cleaning and for air circulation. First In First Out (FIFO) system is adapted so as to keep the stock a fresh.

(g) Toilet facilities

Toilets area kept in hygienic condition in all time. Toilet rooms are kept outside of the processing area and wall are smooth washable, light color and floors constructed of impervious and readily cleanable material. The doors are not open directly to the processing areas. Toilet rooms are enough for all the workers. (20 workers pre toilet).

(h) Packing store

The factory has separate store for packing materials. All the packing materials kept on wrack and covered with vinyl sheet to protect them against moisture, dust and other contamination.

(i) Dry storage

All packing materials are stored in a room with well ventilation.

Chemicals are stored separately in chemical store room to avoid hazard. Harmful materials such as cleaning compound and lubricants are kept in a separate and distinctly labeled and identified.

4.5.3.3 Control of operation (Process)

(i)Incoming raw material

(a) Raw receiving

- Raw materials are collected and purchased form approval supplier lost (ASL) (FO-HT-10) and from company's own fishing vessel. Raw materials from own vessel was loading at the Lonethar/Tha Byu Chaing jettyard own farm from there, they carried well iced prawn drums by refer truck to the factory.
- Prawn shall keep on Ice in all time. It is recommended that raw materials must be use daily.
- Qualified rea materials shall purchase at the own purchase center. Placing prawns on the floor is not allowed.
- QC shall check raw materials according to raw inspection standard who shall inspected the raw material at random sample and checked species, size and quality. Raw prawns are also grading.

(b) Washing

- Raw prawns are washed with chilled water and diverted in the basket and drained.

(c) Weighing/Sorting

After raw prawns must be weighing and after that raw prawns are need to sorting (segregated), HO, HL, Peeled prawns.

(d) Sizing & weighing

After sorting it should be done de-heading, peeling, de-vined and after that sizing, weighing according to product types and weight 2Kg, 1.8Kg and put into cans.

(e) Washing

Prawns in the cans are washed with chilled water individually.

(f) Laying & Labelling

After washing prawns all the prawn are laying according to the size in cans and labelling.

(g) Freezing

Chilled water are filled in cans and put into freezer and freezed. The product temperature is brought down at (-36 to -40)˚C for running 90 min.

(h) Metal check

After freezing every block are de-canning and send for metal check. Every frozen blocks are individual passed through metal detector for checking metal. If the frozen prawn block include metal, alarm appeared and conveyor belts stopped. Removed the rejected block and the rejected block is checked and reprocess. After checking frozen blocks are sent for packing.

(i) Packaging

After metal checked frozen prawn blocks are put the plastic bags and packed in master cartoon.

(j) Cold store

- The cold store temperature is maintained at (-18±2)˚C or lower and recorded at every hour.
- The cold store temperature of product is measured before shipment and kept at (-18±2)˚C.
- The cold stores are installed the digital thermometer.

(k) Transport

According to the invoice, products are selected and loaded to the cleaned and sanitized Refer-truck. Loading to the truck need to cool down to 15˚C and if reach to that temperature can start for loading. After finished loading the truck start to cool down and transport to Yangon for export.

(l) Exporting

- The container is pre-cooled to (-18˚C) / (0˚F) using a refrigeration plug point at factory.
- If the required temperature is not attained, the goods are removed and transferred to cold store immediately. Then the cold store temperature of the product is checked to ensure that is -18˚C.
- After finished the loading, container must cool down to (-18˚C) again before the truck departure.

(ii) In-coming reject, In-process reject and Finished product reject

(a) In-coming reject

- In-coming raw-materials are found as non-conforming products, it is rejected and returned to suppliers. All non-conforming material is identified and segregated properly.
- In-coming raw materials check record (FO-QC-02)

(b) In-process reject

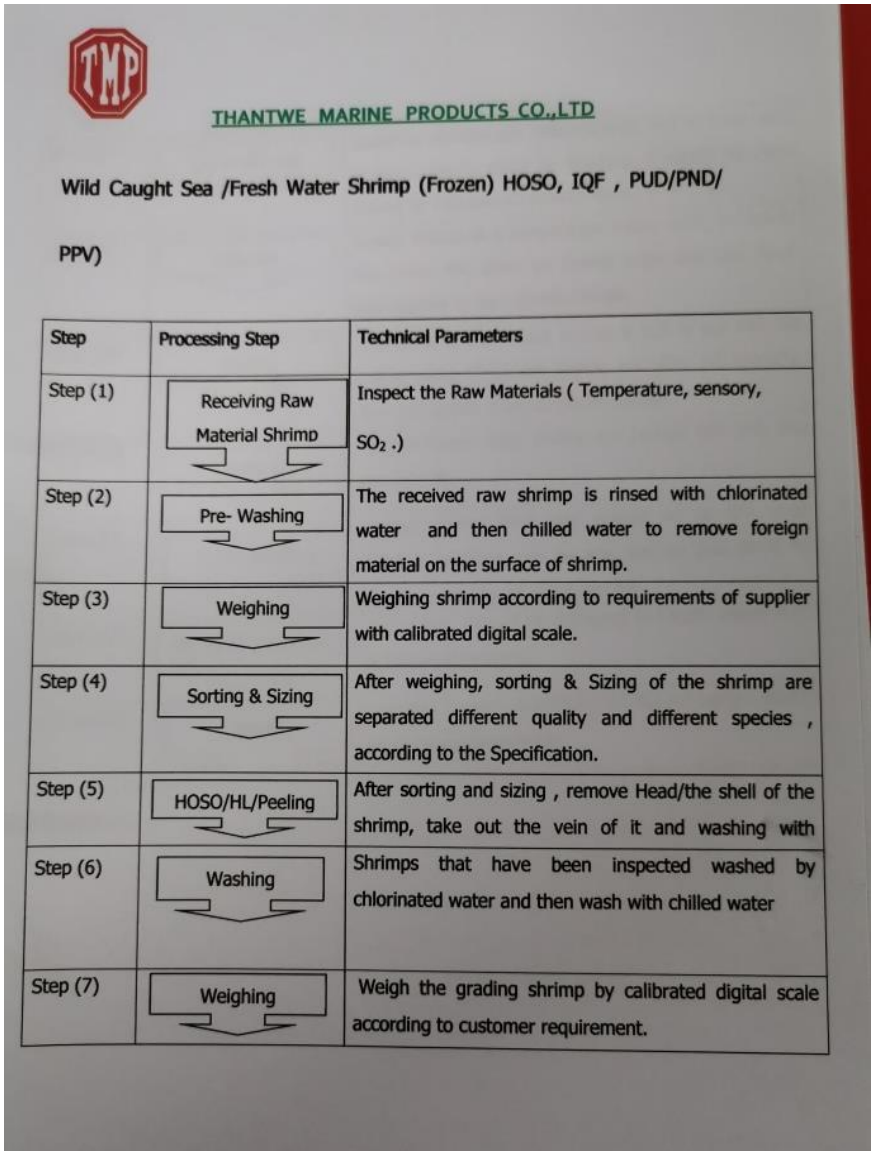
- In-process materials are found as non-conforming products in processing area. It is either rework or scrap. After reworking the product is reprocessed. Spillage taken off the floors is collected frequently and disposed off separately.
- Product temperature record (FO-QC-03)
- Laying product inspection record (FO-PD-01)
- Freezer In/Out record (FO-PD-02)
- Packing quality inspection record (FO-PD-03)

(c) Finished product reject

- Finished products are found as non-conforming products checked by QC, the details are taken the corrective action and report to managing director or top management. If the non-conforming material is reworked or rejected. Depending on the degree of non-conforming. If the non-conforming material is reprocessed, the details of reprocessing are recorded in the report. After reworking the product is re-inspected by QC personnel to ensure that confirms to standard.
- Export container report (FO-QC-18)
- Product temperature record (FO-QC-03)

(iii) Documentation and records

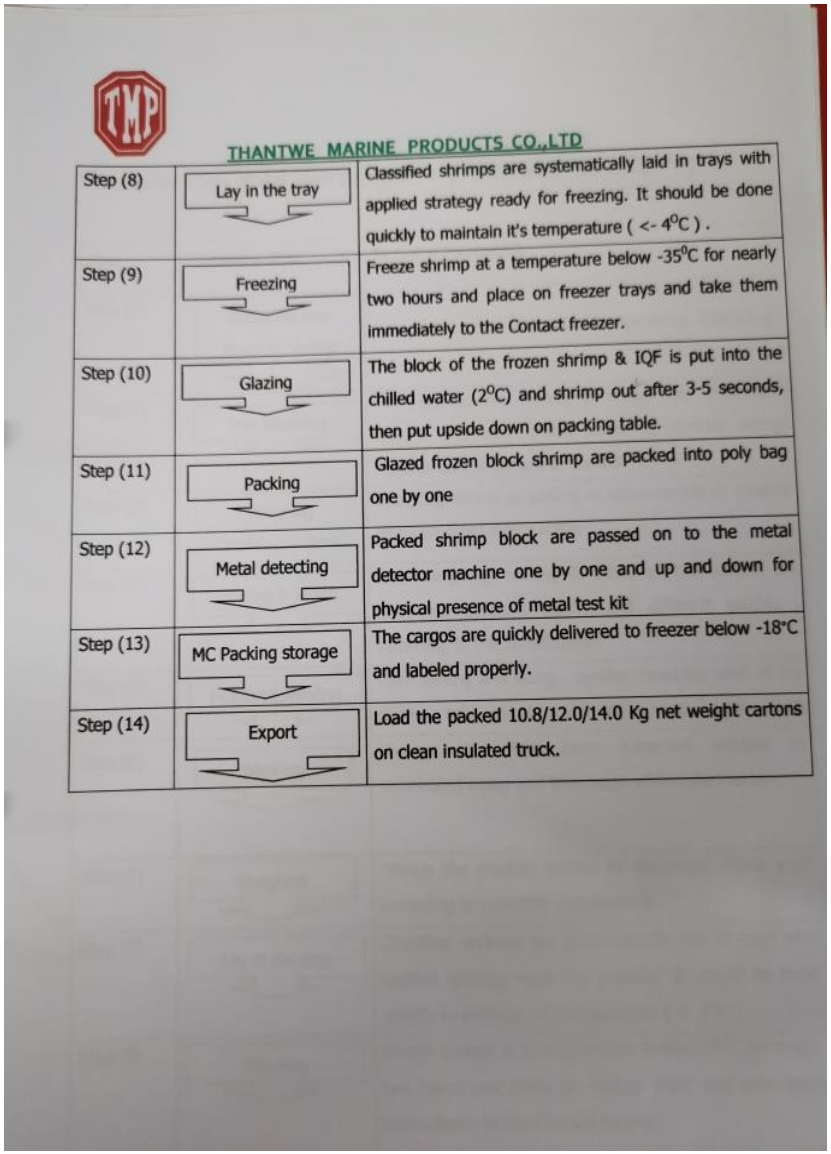
- The DOF laboratory collects once per month samples for analysis and their reports assist the factory as a control measure for the factory's in-house reports.
- Test report for products surveillance program DOF.



THANTWE MARINE PRODUCTS CO.,LTD

Wild Caught Sea /Fresh Water Shrimp (Frozen) HOSO, IQF , PUD/PND/ PPV)

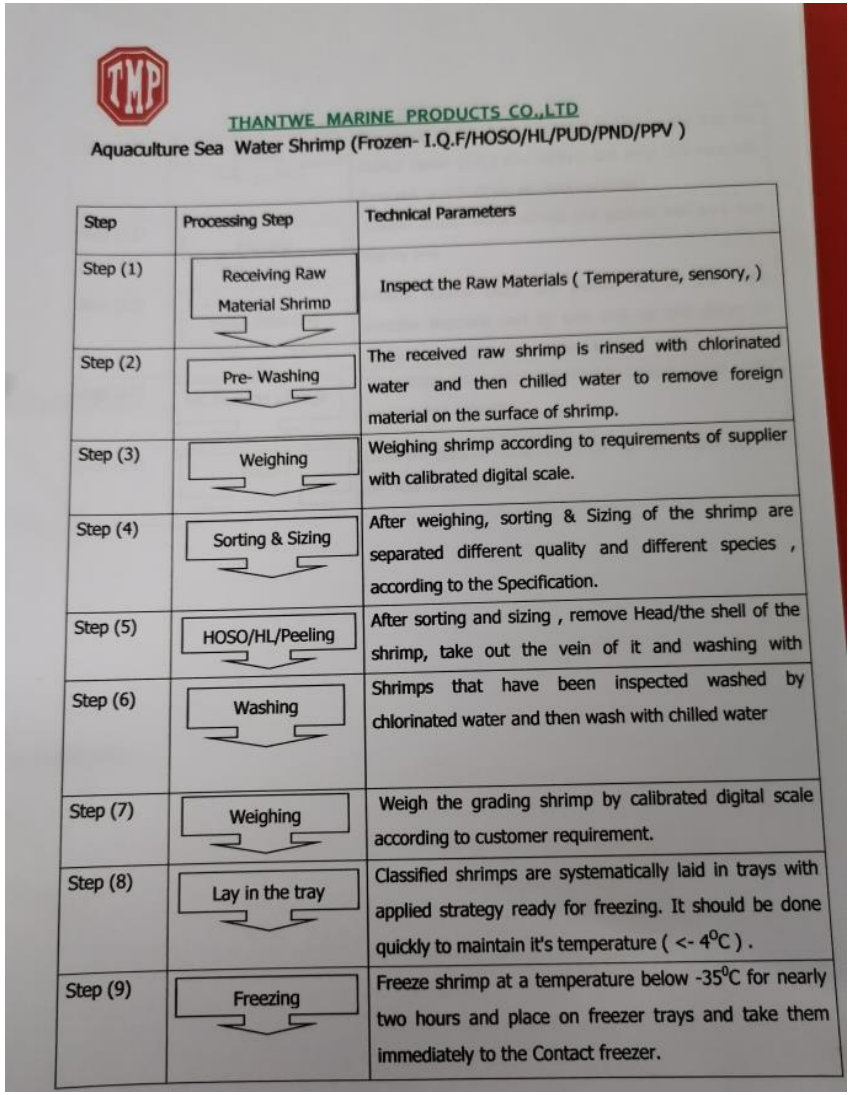
Step	Processing Step	Technical Parameters
Step (1)	Receiving Raw Material Shrimp	Inspect the Raw Materials (Temperature, sensory, SO_2 .)
Step (2)	Pre- Washing	The received raw shrimp is rinsed with chlorinated water and then chilled water to remove foreign material on the surface of shrimp.
Step (3)	Weighing	Weighing shrimp according to requirements of supplier with calibrated digital scale.
Step (4)	Sorting & Sizing	After weighing, sorting & Sizing of the shrimp are separated different quality and different species , according to the Specification.
Step (5)	HOSO/HL/Peeling	After sorting and sizing , remove Head/the shell of the shrimp, take out the vein of it and washing with
Step (6)	Washing	Shrimps that have been inspected washed by chlorinated water and then wash with chilled water
Step (7)	Weighing	Weigh the grading shrimp by calibrated digital scale according to customer requirement.



THANTWE MARINE PRODUCTS CO.,LTD

Step (8)	Lay in the tray	Classified shrimps are systematically laid in trays with applied strategy ready for freezing. It should be done quickly to maintain it's temperature (<- 4^0C) .
Step (9)	Freezing	Freeze shrimp at a temperature below -35^0C for nearly two hours and place on freezer trays and take them immediately to the Contact freezer.
Step (10)	Glazing	The block of the frozen shrimp & IQF is put into the chilled water (2^0C) and shrimp out after 3-5 seconds, then put upside down on packing table.
Step (11)	Packing	Glazed frozen block shrimp are packed into poly bag one by one
Step (12)	Metal detecting	Packed shrimp block are passed on to the metal detector machine one by one and up and down for physical presence of metal test kit
Step (13)	MC Packing storage	The cargos are quickly delivered to freezer below -18°C and labeled properly.
Step (14)	Export	Load the packed 10.8/12.0/14.0 Kg net weight cartons on clean insulated truck.

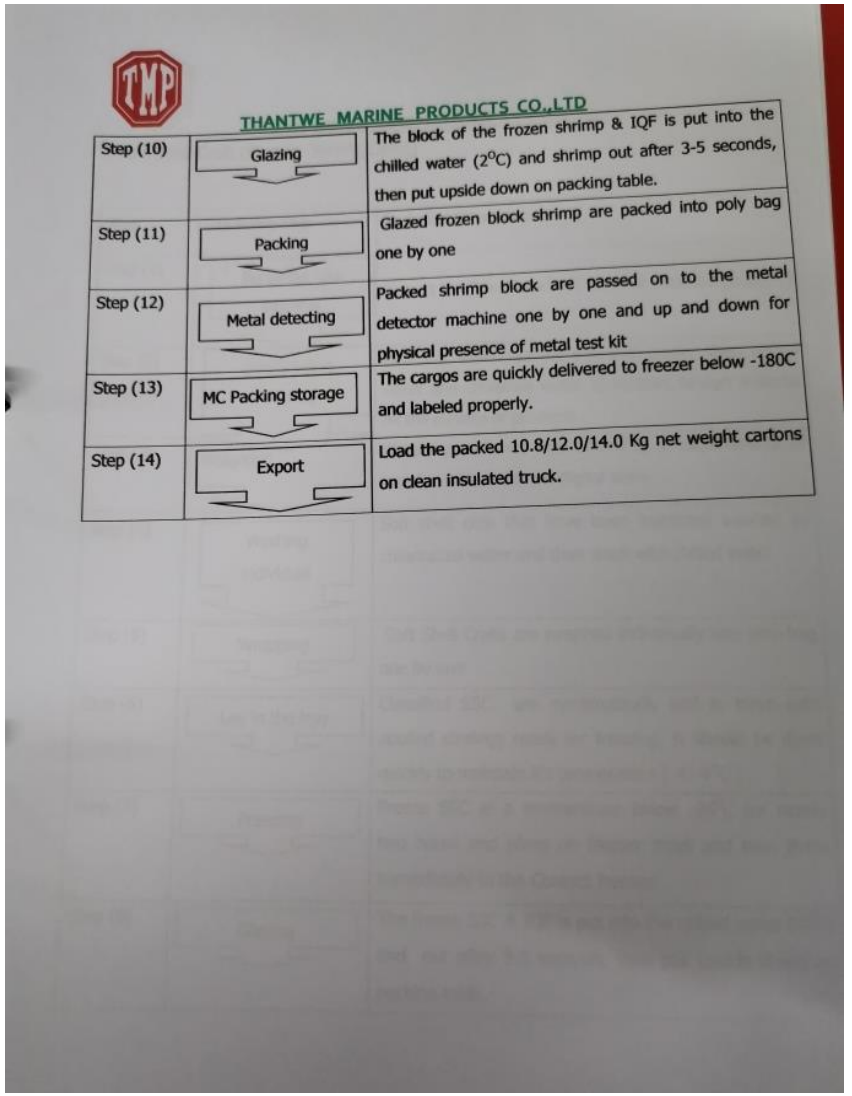
Figure 4.17: The processing steps of Wild Caught Sea/ Fresh Water Shrimp (Frozen) HOSO, IQF, PUD/PND/PPV



THANTWE MARINE PRODUCTS CO.,LTD

Aquaculture Sea Water Shrimp (Frozen- I.Q.F/HOSO/HL/PUD/PND/PPV)

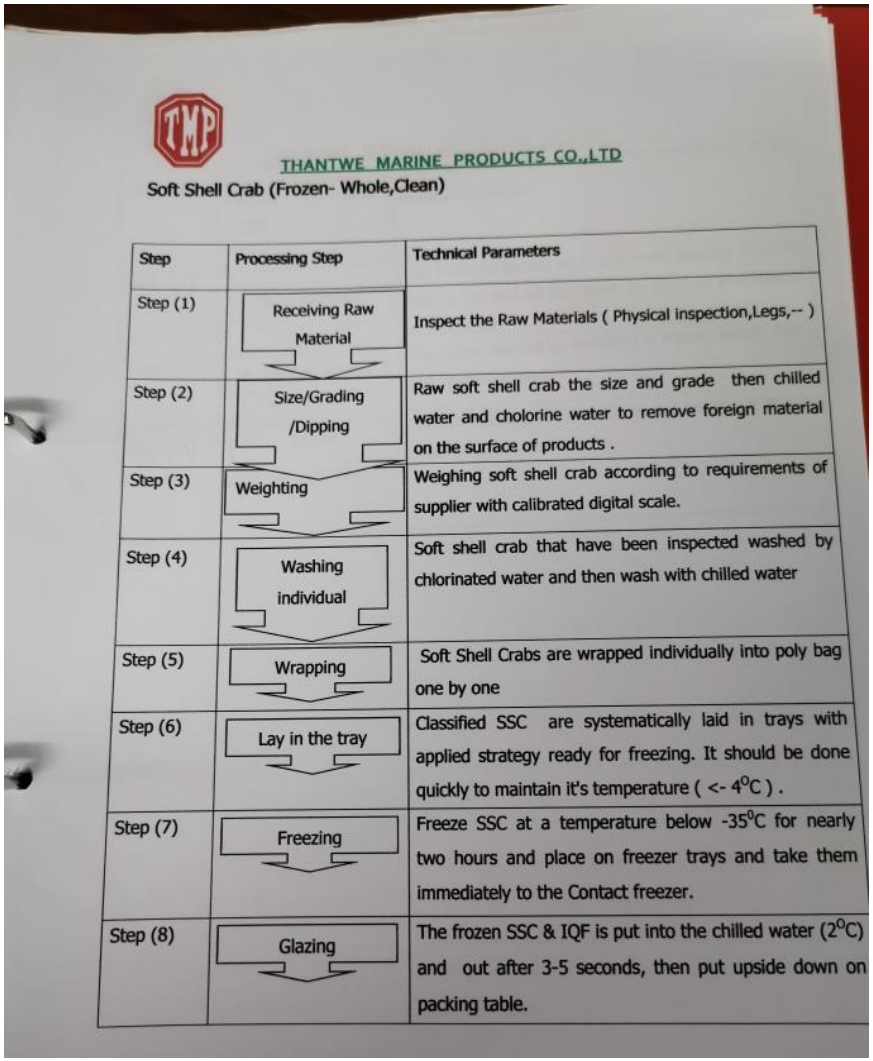
Step	Processing Step	Technical Parameters
Step (1)	Receiving Raw Material Shrimp	Inspect the Raw Materials (Temperature, sensory,)
Step (2)	Pre- Washing	The received raw shrimp is rinsed with chlorinated water and then chilled water to remove foreign material on the surface of shrimp.
Step (3)	Weighing	Weighing shrimp according to requirements of supplier with calibrated digital scale.
Step (4)	Sorting & Sizing	After weighing, sorting & Sizing of the shrimp are separated different quality and different species , according to the Specification.
Step (5)	HOSO/HL/Peeling	After sorting and sizing , remove Head/the shell of the shrimp, take out the vein of it and washing with
Step (6)	Washing	Shrimps that have been inspected washed by chlorinated water and then wash with chilled water
Step (7)	Weighing	Weigh the grading shrimp by calibrated digital scale according to customer requirement.
Step (8)	Lay in the tray	Classified shrimps are systematically laid in trays with applied strategy ready for freezing. It should be done quickly to maintain it's temperature (<- 4^{0}C) .
Step (9)	Freezing	Freeze shrimp at a temperature below -35^{0}C for nearly two hours and place on freezer trays and take them immediately to the Contact freezer.



THANTWE MARINE PRODUCTS CO.,LTD

Step (10)	Glazing	The block of the frozen shrimp & IQF is put into the chilled water (2^{0}C) and shrimp out after 3-5 seconds, then put upside down on packing table.
Step (11)	Packing	Glazed frozen block shrimp are packed into poly bag one by one
Step (12)	Metal detecting	Packed shrimp block are passed on to the metal detector machine one by one and up and down for physical presence of metal test kit
Step (13)	MC Packing storage	The cargos are quickly delivered to freezer below -180C and labeled properly.
Step (14)	Export	Load the packed 10.8/12.0/14.0 Kg net weight cartons on clean insulated truck.

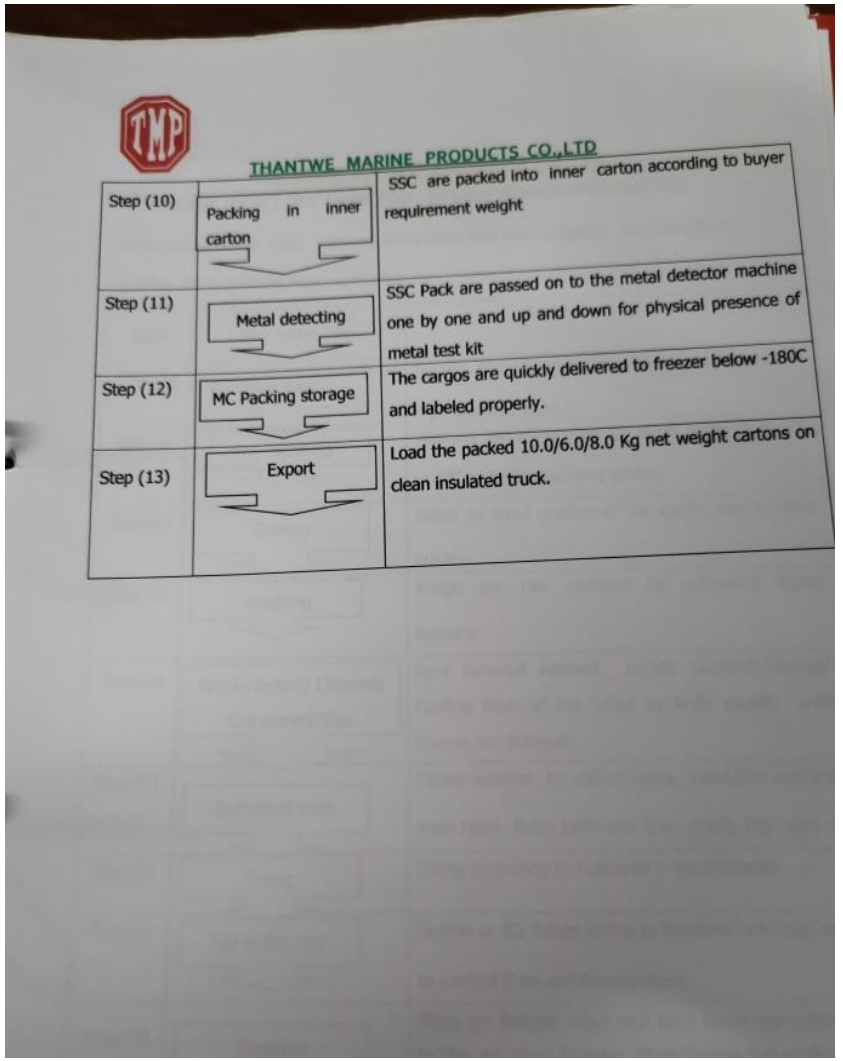
Figure 4.18: The processing steps of Aquaculture Sea Water Shrimp (Frozen- LQF/ HOSO/ HL/ PUD/ PND/ PPV)



THANTWE MARINE PRODUCTS CO.,LTD

Soft Shell Crab (Frozen- Whole,Clean)

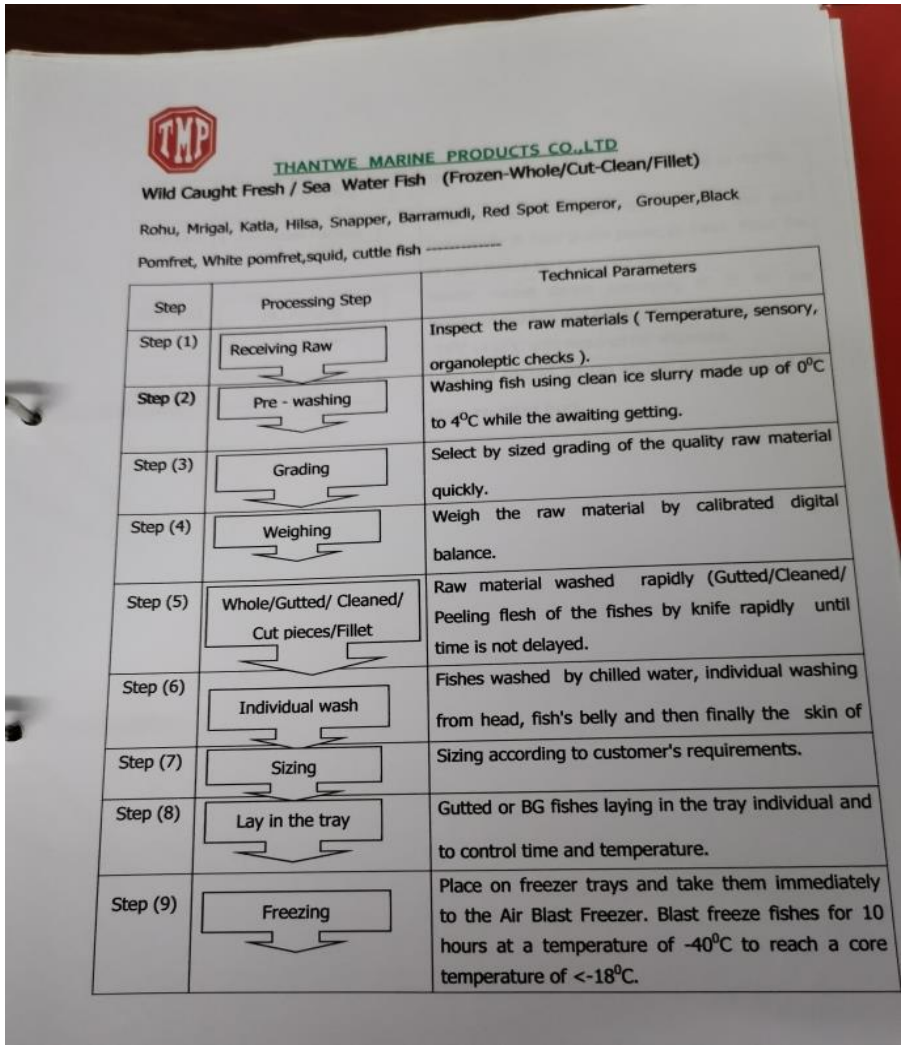
Step	Processing Step	Technical Parameters
Step (1)	Receiving Raw Material	Inspect the Raw Materials (Physical inspection,Legs,--)
Step (2)	Size/Grading /Dipping	Raw soft shell crab the size and grade then chilled water and cholorine water to remove foreign material on the surface of products .
Step (3)	Weighting	Weighing soft shell crab according to requirements of supplier with calibrated digital scale.
Step (4)	Washing individual	Soft shell crab that have been inspected washed by chlorinated water and then wash with chilled water
Step (5)	Wrapping	Soft Shell Crabs are wrapped individually into poly bag one by one
Step (6)	Lay in the tray	Classified SSC are systematically laid in trays with applied strategy ready for freezing. It should be done quickly to maintain it's temperature (<- 4^{O}C) .
Step (7)	Freezing	Freeze SSC at a temperature below -35^{O}C for nearly two hours and place on freezer trays and take them immediately to the Contact freezer.
Step (8)	Glazing	The frozen SSC & IQF is put into the chilled water (2^{O}C) and out after 3-5 seconds, then put upside down on packing table.



THANTWE MARINE PRODUCTS CO.,LTD

Step (10)	Packing in inner carton	SSC are packed into inner carton according to buyer requirement weight
Step (11)	Metal detecting	SSC Pack are passed on to the metal detector machine one by one and up and down for physical presence of metal test kit
Step (12)	MC Packing storage	The cargos are quickly delivered to freezer below -180C and labeled properly.
Step (13)	Export	Load the packed 10.0/6.0/8.0 Kg net weight cartons on clean insulated truck.

Figure 4.19: The processing steps of Soft Shell Crab (Frozen-White,Clean)

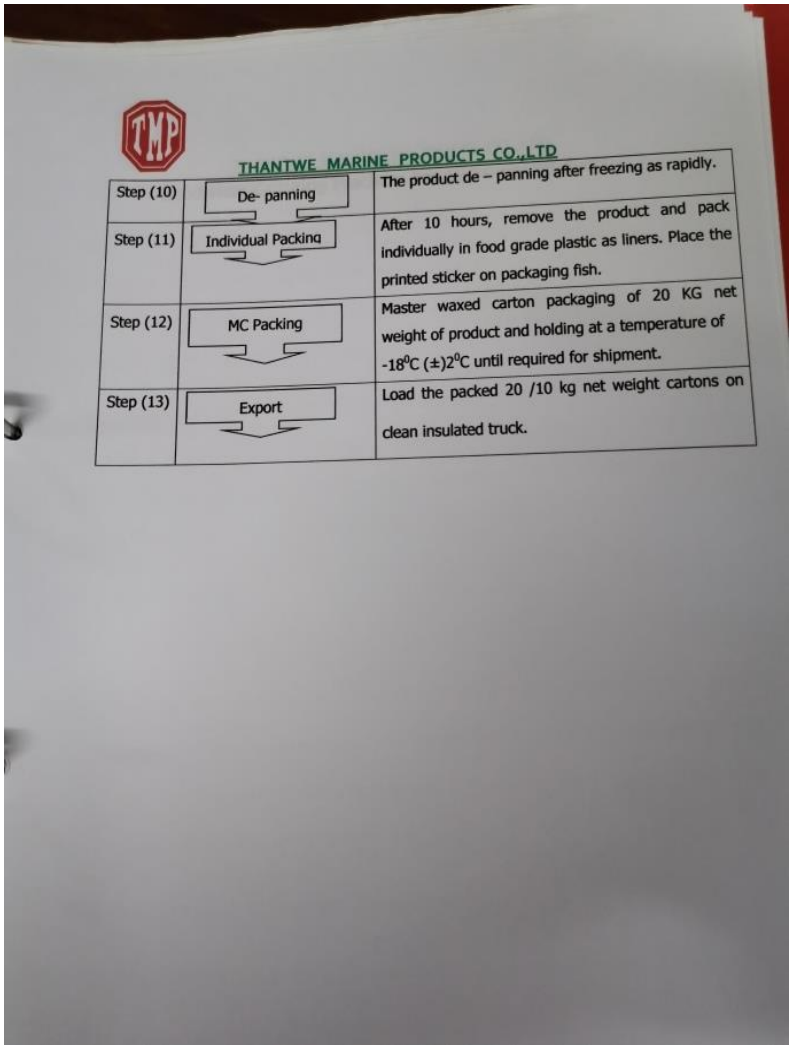


THANTWE MARINE PRODUCTS CO.,LTD

Wild Caught Fresh / Sea Water Fish (Frozen-Whole/Cut-Clean/Fillet)

Rohu, Mrigal, Katla, Hilsa, Snapper, Barramudi, Red Spot Emperor, Grouper,Black Pomfret, White pomfret,squid, cuttle fish ----------

Step	Processing Step	Technical Parameters
Step (1)	Receiving Raw	Inspect the raw materials (Temperature, sensory, organoleptic checks).
Step (2)	Pre - washing	Washing fish using clean ice slurry made up of 0^0C to 4^0C while the awaiting getting.
Step (3)	Grading	Select by sized grading of the quality raw material quickly.
Step (4)	Weighing	Weigh the raw material by calibrated digital balance.
Step (5)	Whole/Gutted/ Cleaned/ Cut pieces/Fillet	Raw material washed rapidly (Gutted/Cleaned/ Peeling flesh of the fishes by knife rapidly until time is not delayed.
Step (6)	Individual wash	Fishes washed by chilled water, individual washing from head, fish's belly and then finally the skin of
Step (7)	Sizing	Sizing according to customer's requirements.
Step (8)	Lay in the tray	Gutted or BG fishes laying in the tray individual and to control time and temperature.
Step (9)	Freezing	Place on freezer trays and take them immediately to the Air Blast Freezer. Blast freeze fishes for 10 hours at a temperature of -40^0C to reach a core temperature of $<-18^0$C.



THANTWE MARINE PRODUCTS CO.,LTD

Step (10)	De- panning	The product de – panning after freezing as rapidly.
Step (11)	Individual Packing	After 10 hours, remove the product and pack individually in food grade plastic as liners. Place the printed sticker on packaging fish.
Step (12)	MC Packing	Master waxed carton packaging of 20 KG net weight of product and holding at a temperature of -18^0C (±)2^0C until required for shipment.
Step (13)	Export	Load the packed 20 /10 kg net weight cartons on clean insulated truck.

Figure 4.20: The processing steps of Wild Caught Fresh/ Sea Water Fresh (Frozen-Whole/ Cut-Clean/ Fillet)

Figure 4.21: Sufficient hand and foot washing facilities (Chlorine level for hand washing is 10ppm and foot dip is 100ppm) at the entrance of the processing area

Figure 4.22: Body temperature measuring and spraying hand sanitizer at the entrance of the processing area

Figure 4.23: Raw materials receiving room

Figure 4.24: Pre-washing the received raw materials

Figure 4.25: Sorting and sizing machines

Figure 4.26: Sorting and sizing manually according to the specification

Figure 4.27: HOSO/HL/Peeling after sorting and sizing

Figure 4.28: Washing with chlorinated water and then chilled water

Figure 4.29: Weighing according to requirement of customers with calibrated digital scale

Figure 4.30: Laying in the tray

Figure 4.31: Freezing at a temperature below - 35˚C

Figure 4.32: Metal detecting

Figure 4.33: MC packing storage holding at a temperature of -18˚C (±)2˚C until required for shipment

4.5.4 Control of processing

4.5.4.1 GMP-1: Raw Receiving

Raw materials, after arriving to the factory either by suppliers or purchaser from approved suppliers and from jetty/farm in term of Tender, shall be checked by raw receiving supervisor, QC in charge of RM and record into RM Receiving Inspection Report.
If customers come and supply raw-shrimps they check its temperature and the raw materials at temperature, Black spots, Soft shells and color changes are found in raw and rejected and rest raw which are qualified and purchased. Sulphite test is done with sulphite test kit papers at an acceptable range.

4.5.4.2 GMP-2: Pre-Washing

Take shrimp into the baskets 3 to 5 kg

- Washing with chilled running water by putting the basket under water and shaking 3 times half clockwise to remove the floating foreign matter and ice into garbage bin. Then one hand keeping shrimp basket and other hand removing remaining foreign matter and ice into garbage bin.
- Shrimps shall be washed with chlorinated water.
- After washing, basket of shrimp shall drain out the water not longer than 3 minutes.

4.5.4.3 GMP-3: Weighing

Shrimp shall be weighted basket by basket after drainage. The quantity of each basket should be recorded. The raw materials are cleaned and separated raw and ice and put them into the baskets as per specification. After draining the water out, weight the raw and clean with chlorinated water. QC is always present while checking and receiving raw materials. He/she inspects the raw materials at random and arrange for size and quality.

4.5.4.4 GMP-4: Sorting and Sizing

To grade shrimp according to company quality specifications.
At this state raw shrimps are separated in different quality grades according to the specification of the shrimps, sorting workers divide such as tiger head on, head less (eg. loosen heads, soft shells, gap joins, tall broken etc.).
Shrimp on the tables shall be covered with flake ice to maintain temperature.
Different grades of shrimp shall be put in different baskets for further processing in different processing lines when the basket is full.

4.5.4.5 GMP-5: HL/PUD/PPV/Cut/Fillet/Ring

In this stage raw shrimps, which are sent from sorting section are checked carefully and if the t shrimp head is found with black spots, head gap they dehead the shrimp and devein it. The shrimp have black spots, black shell gap, which are deheaded devein. Shrimps which are in conditions of

soft shells, broken shells, color- changes and black spots are sent from the peeling of the shells for the PUD (peeled and un deveined) grade.

4.5.4.6 GMP-6: Washing

In this stage after heading or peeling or peeled and un-deveined, shrimps shall be washed chilled water. After washing, basket of shrimp shall drain out the water not longer than 3 minutes.

4.5.4.7 GMP-7: Weighing

After drainage, shrimps are weighted according to buyer requirements and maintain temperature.

4.5.4.8 GMP-8: Laying in the tray

Products which are being covered with ice at this stage is to reduce the growth of the number of micro-organism in the surface and to eliminate any foreign substances.

4.5.4.9 GMP-9: Freezing

To ensure proper freezing and glazing inspections must be done before starting production. Workers should make themselves clean before handling the product of the freezer.

For block products that Controlling freezing time (2-3 hours freezing temperature (-35˚C to -40˚C) and for IFQ products which contact freezer (-35˚C to -40˚C), Time is (2 to 3 hours) after freezing product core temperature -18˚C.

4.5.4.10 GMP-10: Glazing

After freezing frozen blocks are then glazed. Used only chilled and portable running water for glazing. The glaze percentage is adjusted to the required level as per buyer’s specification.

4.5.4.11 GMP-11: Packing

Glaze products are primary packed with plastic bags which all products are identified with the date of production (or) as per buyer’s specification and as per DOF instruction.

4.5.4.12 GMP-12: Metal Detecting

Before operating the metal detector machine must be checked thoroughly for sensitivity test every time by a sample tester Fe(1.0) and SUS (1.2,2.5,3.0,3.5). After block packed products are checked carefully block by block which are passed on to the meta detector machine. If the frozen prawn block include metal, alarm appeared conveyor belts stopped. Removed the reject block and the rejected block is checked and reprocess. After checking frozen blocks are sent for packing. The detection of physical presence in metal existence is 1.0mm diameter sensitivity.

4.5.4.13 GMP-13: MC Packing Storage

After packing, products are transferred to cold store immediately to avoid low temperature and not to be dehydration and break down texture of blocks after that not to be going on bacterial pathogen. To be ensure for that, shall be maintained temperature ≤ -18˚C (±2˚C).

4.5.4.14 GMP-14: Exporting

Export with FIFO (First in First out) method for to prevent shall life and valid date of products.

4.6 Waste water treatment method

Wastewater released from the factory is passed through the concrete tank with the size of 32 ft x 11 ft x 10ft 7inches comprising of (4) serial storage compartments and then to the circular tank (Diameter: 8ft, Height: 7ft 9inches) and finally to the concrete tank (9 '1/2 "x9' ½" x9'1/2 ") before final disposal to the Thandwe river river, wastewater discharged from the factory is firstly treated with limestone in the first tank then treated with the Charcoal in the second tank. And then, repeat again with the limestone and charcoal in the third and fourth tanks respectively.

Therefore, the treatment system is that in the first and third tank, wastewater is mixed with limestone. In the second and fourth tanks, wastewater is mixed with charcoal. The wastewater

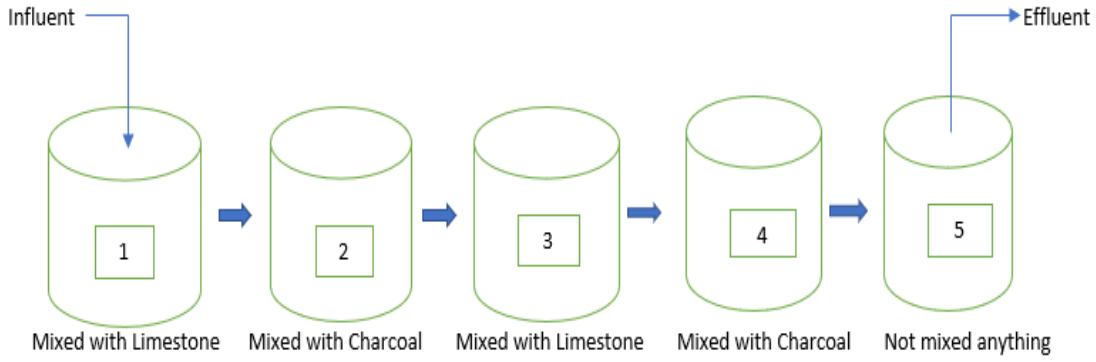


Figure 4.34: Wastewater treatment system using Limestone and Charcoal at the TMP factory

from the final tank does not mix anything and then discharge to the Thandwe river directly.

The project site area is large enough to extend the infrastructures. Therefore, the existing treatment tank will be expended when the storage cannot cover the waste water coming out from the proposed TMP factory.

Size: 32 ft x 11 ft x 10ft 7inches

Diameter: : 8ft, Height: : 7ft 9inches

9ft ½ inch x 9ft ½ inch x 9ft ½ inch

Figure 4.35: Pictures of wastewater treatment tanks and mouth of discharge pipe line

4.7 Solid waste management at the factory

In terms of solid wastes, almost wastes (inedible fish parts and endoskeleton shell parts etc.) released from the processing are used as by-products e.g., fishmeal.

Domestic solid waste such as food residues (organic wastes) and used disinfectant containers, damaged fuel containers including glasses, tins, bottles, packing materials, papers, stationeries, damaged/expired devices with other miscellaneous will be generated during the operational phase of the factory. The waste bins are placed at the appropriately selected areas around the factory. After collecting the wastes, CDCs used to collect and dispose at the dump sites.

4.8 Alternatives Selection

There is no alternative development option for the proposed factory which would prevent all potential environmental and social impacts due to construction and operation.

The implementation of the marine and fisheries processing support the supply of aquatic food to people. In order for a growing human population to meet the demands for daily food, aquatic food may play a pivotal role in daily nutrition, or provide variety and a few essential nutrients in a healthy and ample diet. Consequently, marine products can fulfil the increased food demands at global, regional and local scales.

Therefore, if the project proponent recognises social, economic and environmental sustainability of production systems and supply chains along with complying the mitigation measures, HSE regulations and management plan described in the EMP accordingly, the overall impacts likely affected by the project activities (construction, operation and decommissioning phases) become rated as insignificant.

Furthermore, if there is a good cooperation between the project proponent and the community, there will be specific environmental and social benefits such as increased employment opportunities, infrastructure upgrades, and other community benefits would occur as a result of the factory development.

Chapter 5

Description of the Surrounding Environment

5. Description of the surrounding environment

This chapter reports a description of the project surrounding environment based on a review of the valuable data related to the existing baseline air, water, noise, soil and waste monitored at and around the proposed project site. The more detailed and in-depth analysis will be provided accordingly in the sub sections.

5.1 Existing air quality

5.1.1 Introduction

The baseline ambient air sampling was carried out at and around the Thantwe Marine Products (TMP) factory (Rakhine state) in May, 2021 in order to reveal the existing air quality status at and around the factory.

5.1.2 Objective

The objectives of the monitoring are:

- To reveal the existing baseline ambient air quality of the proposed factory
- To provide the data in order to assess the air impact likely affected by the project activities

5.2 Ambient air monitoring location

Locations of air sampling stations are listed in Table 5.1. The air quality sampling methodology used for this project is described in the subsection which follows,

Table 5.1: Air sampling locations for baseline survey

Points	Locations	Coordinates		Start Date	End Date
1	Factory Compound	18.471427°N	94.373074°E	21.5.2021	22.5.2021
2	Nan Taw Monastery	18.470836°N	94.360302°E	22.5.2021	23.5.2021
3	Ann Taw Monastery	18.470312°N	94.380606°E	23.5.2021	24.5.2021

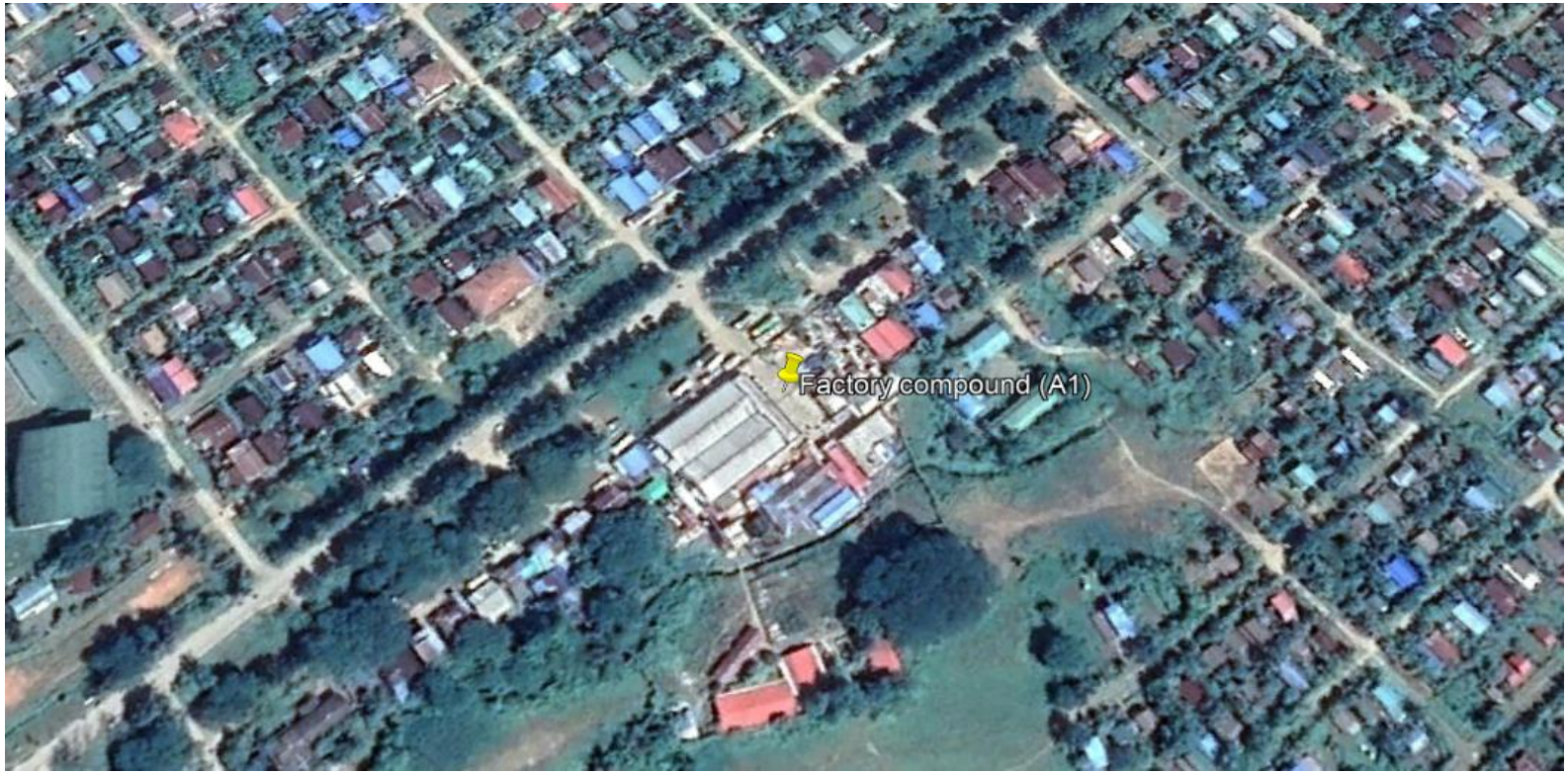


Figure 5.1: Ambient air monitoring at Thantwe Marine Products (TMP) Factory

5.2.1 Existing baseline ambient air quality

The table 5.2 presents the findings which are averaged for all measurements carried out at the different places of the Thantwe Marine Products (TMP) Factory.

Table 5.2: The 24hr average air parameters around the factory

Air Monitoring Location	**CO (µg/m^3)**	**VOC (ppb)**	**NO2 (µg/m^3)**	**SO2 (µg/m^3)**	**NH3 (ppm)**	**CH4 (ppm)**	**O3 (µg/m^3)**	**H2S (ppb)**	**CO2 (ppm)**	**PM10 (µg/m^3)**	**PM2.5 (µg/m^3)**
Thantwe Marine Products (TMP) Factory	**45a±29b 34c(0d-100e)**	**41a±6b 37c (33d-53e)**	**29a±4b 29c (22d-35e)**	**14a±2b 15c (11d-17e)**	**18a±5b 13c (13d-28e)**	**124a±12b 116c (108d-149e)**	**10a±2b 10c (6d-14e)**	**19a±1b 20c (18d-20e)**	**367a±18b 352c (346d-402e)**	**12a±4b 10c (6d-21e)**	**6a±1b 7c (3d-8e)**
National Environmental Air Quality Guideline (ECD) guideline	30,000 (µg/m^3) (one hr) 10,000 (µg/m^3) (8 hr)	NA	40 (µg/m^3) (annual) /200 (µg/m^3) (one hour)	20 (µg/m^3) (24 hour)	NA	NA	100 (µg/m^3) (8hr)	NA	NA	50 (µg/m^3)	25 (µg/m^3)

available a Average b SE c Median d Min e Max ,NA – not availabl

5.2.1.1 Point (1): Factory compound

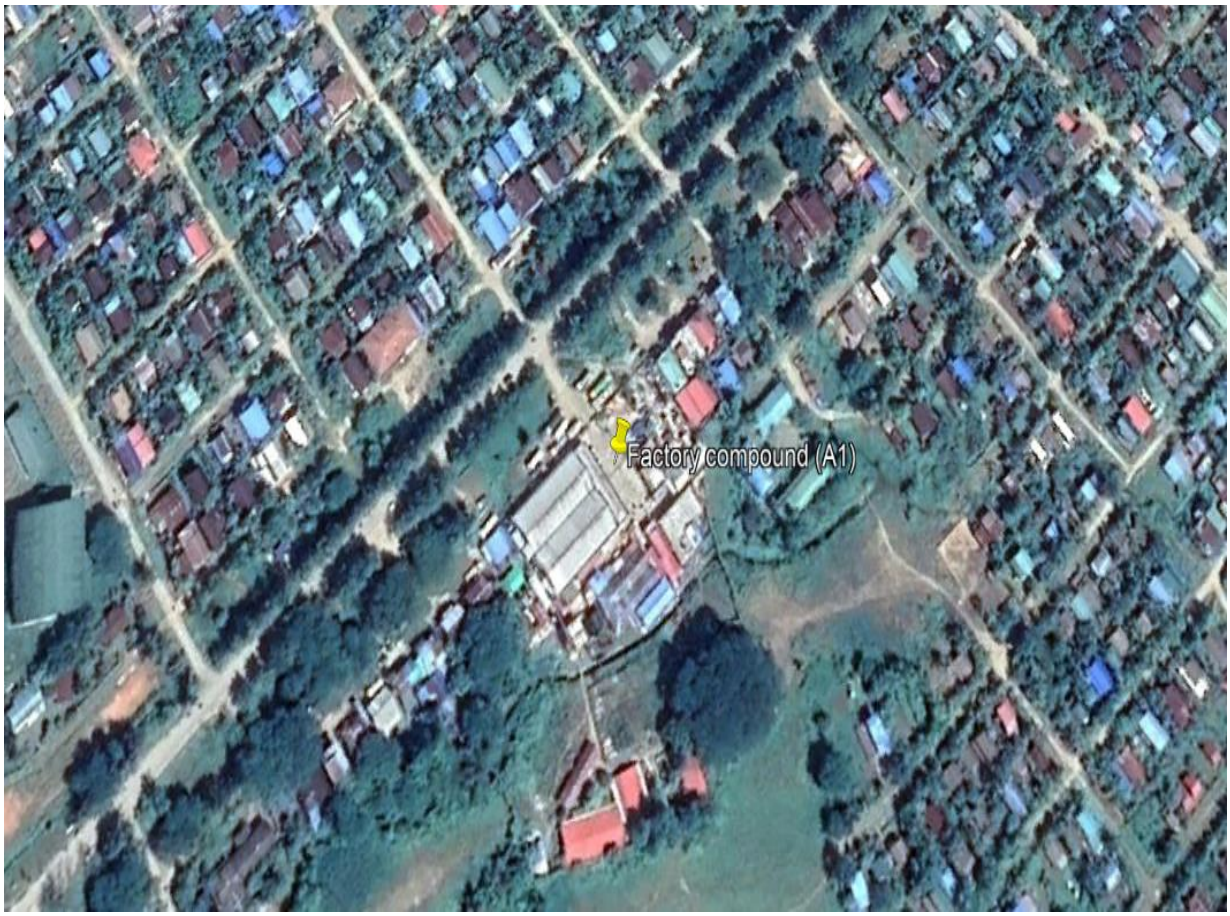


Figure 5.2: Map of ambient air monitoring at the Factory compound

Figure 5.3: Ambient air monitoring at point (1), Factory compound (Day time)

Figure 5.4: Ambient air monitoring at point (1), Factory compound (Night time)

The point 1 is located at the factory compound. Regarding particulates, Table 5.3 presents both the levels of PM10 (21 µg/m^3) and PM 2.5 (8 µg/m^3) were met the National Environmental Air Quality Guideline (ECD) adopted from WHO Guideline. In terms of gases level, one-hour average level of NO2 (48 µg/m3), one hour average level of CO (310 µg/m3), eight hours average level of CO (130 µg/m3), eight hours average level of O_3 (24 µg/m3) and 24hr average level of SO2 (17 µg/m3) met the guidelines.

The meteorology findings (Temperature, Relative Humidity, Wind Speed, Wind Direction) during the monitoring were presented below. (Table 3.2)

Table 5.3: Ambient air monitoring at point (1), Factory compound

Parameters	Concentration (24hr average) except some Gases (NO2, CO and O3)*	National Environmental Air Quality Guideline (ECD)/WHO Guideline (24hr average)
PM10	$21^a(2^b\text{-}115^c)$ µg/m^3	50 µg/m^3
PM 2.5(µg/m^3)	$8^a(1^b\text{-}89^c)$ µg/m3	25 µg/m^3
NO_2*	$35^a(15^b\text{-}60^c)$ µg/m3 (24 hr) 48µg/m^3 (one hr)	40 µg/m^3 (annual) /200 µg/m^3 (one hour)
SO_2	$17^a(7^b\text{-}30^c)$ µg/m3	20 µg/m^3
CO *	$0.1^a(0^b\text{-}1^c)$ mg/m3 / $100^a(0^b\text{-}1000^c)$ µg/m3 (24hr) 0.31 mg/m^3 (one hr)/310 µg/m3 0.13 mg/m^3 (8 hr) /130 µg/m3	30,000 µg/m^3 (one hr) 10,000 µg/m^3 (8 hr)
O_3*	$10^a(1^b\text{-}106^c)$ µg/m3 (24hr) 24 µg/m^3 (8 hr)	100 µg/m^3 (8hr)
H2S	$18^a(0^b\text{-}340^c)$ ppb (0.01 mg/m3)	Air emission level 2 mg/m^3/ Work place 10-15 mg/m^3 (7-10 ppm) (WHO, EHC 19.1981)
CO2	$402^a(385^b\text{-}438^c)$ ppm	NA
VOC	$53^a(40^b\text{-}67^c)$ ppb	NA
NH_3	$28^a(5^b\text{-}43^c)$ ppm/ (20 mg/m^3)	Air emission level 1 mg/m^3/ Urban concentrations are typically in the range of 5 - 25 µg/m^3 (Ammonia (WHO/EHC 54, 1986)
CH_4	$149^a(107^b\text{-}200^c)$ppm	NA
Meteorology		
T (Degree C)		$29^a(25^b\text{-}32^c)$
RH		$85^a(57^b\text{-}100^c)$
Wind Speed (kph)		$.223^a(0^b\text{-}3^c)$
Wind Direction (Degree from North)		73 (ENE)

Remark:
There were vehicles and human activities. There was raining at night.

[a] *Average* [b] *Min* [c]*Max*

Referring to National Environmental Air Quality Guideline (ECD), the color codes are categorized in order to reveal the general air quality status around the of the project area.

Green – meets the standards
Yellow (slightly over and less than double)
Orange (exceeding if more than double)

5.2.1.2 Point (2): Nan Taw Monastery

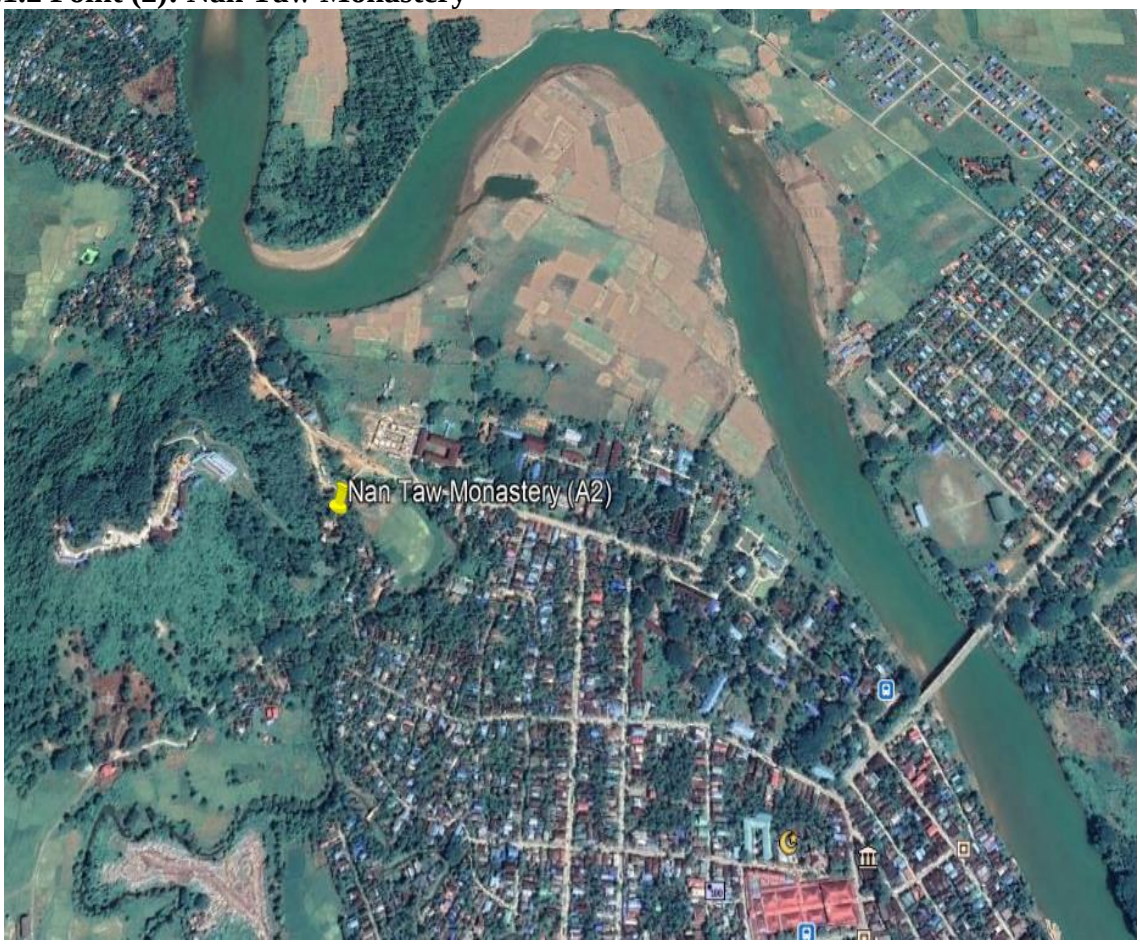


Figure 5.5: Map of ambient air monitoring at Nan Taw Monastery

Figure 5.6: Ambient air monitoring at point (2), Nan Taw Monastery (Day time)

Figure 5.7: Ambient air monitoring at point (2), Nan Taw Monastery (Night time)

The point 2 is located at the Nan Taw monastery. Regarding particulates, Table 5.4 presents both the levels of PM10 (10 µg/m^3) and PM2.5 (7 µg/m^3) were met the National Environmental Air Quality Guideline (ECD) adopted from WHO Guideline. In terms of gases level, one-hour average level of NO2 (40 µg/m3), one hour average level of CO (133 µg/m3), eight hours average level of CO (34 µg/m3), eight hours average level of O_3 (6 µg/m3) and 24hr average level of SO2 (15 µg/m3) met the guidelines.

The meteorology findings (Temperature, Relative Humidity, Wind Speed, Wind Direction) during the monitoring were presented below. (Table 3.3)

Table 5.4: Ambient air monitoring at point (2), Nan Taw Monastery

Parameters	Concentration (24hr average) except some Gases (NO2, CO and O3)*	National Environmental Air Quality Guideline (ECD)/WHO Guideline (24hr average)
PM10	$10^a(2^b\text{-}52^c)$ µg/m^3	50 µg/m^3
PM 2.5(µg/m^3)	$7^a(1^b\text{-}38^c)$ µg/m3	25 µg/m^3
NO_2*	$22^a(2^b\text{-}56^c)$ µg/m3 (24 hr) 40µg/m^3 (one hr)	40 µg/m^3 (annual) /200 µg/m^3 (one hour)
SO_2	$15^a(5^b\text{-}27^c)$ µg/m3	20 µg/m^3
CO *	$0.034^a(0^b\text{-}0.14^c)$ mg/m3 / $34^a(0^b\text{-}140^c)$ µg/m3 (24hr)	30,000 µg/m^3 (one hr) 10,000 µg/m^3 (8 hr)

	0.133 mg/m^3 (one hr) / 133 µg/m3 0.034 mg/m^3 (8 hr) / 34 µg/m3	
O_3*	6[a](0[b]-50[c]) µg/m3 (24hr) 6 µg/m^3 (8 hr)	100 µg/m^3 (8hr)
H2S	20[a](0[b]-80[c]) ppb/ 0.01 mg/m3	Air emission level 2 mg/m^3/ Work place 10-15 mg/m^3 (7-10 ppm) (WHO, EHC 19.1981)
CO2	352[a](279[b]-399[c]) ppm	NA
VOC	37[a](0[b]-719[c]) ppb	NA
NH_3	13[a](4[b]-18[c]) ppm/9mg/m3	Urban concentrations are typically in the range of 5 - 25 µg/m^3 (Ammonia (EHC 54, 1986)
CH_4	116[a](77[b]-187[c]) ppm	NA
Meteorology		
T (Degree C)		28[a](28[b]-29[c])
RH		75[a](59[b]-100[c])
Wind Speed (kph)		0.3[a](0[b]-2[c])
Wind Direction (Degree from North)		46 (NE)
Remark:		
The monitoring station is near the pagoda road. There was heavy raining at the night time.		

[a] Average [b] Min [c]Max

Referring to National Environmental Air Quality Guideline (ECD), the color codes are categorized in order to reveal the general air quality status around the of the project area.

Green – meets the standards
Yellow (slightly over and less than double)
Orange (exceeding if more than double)

5.2.1.3 Point (3): Ann Taw Monastery

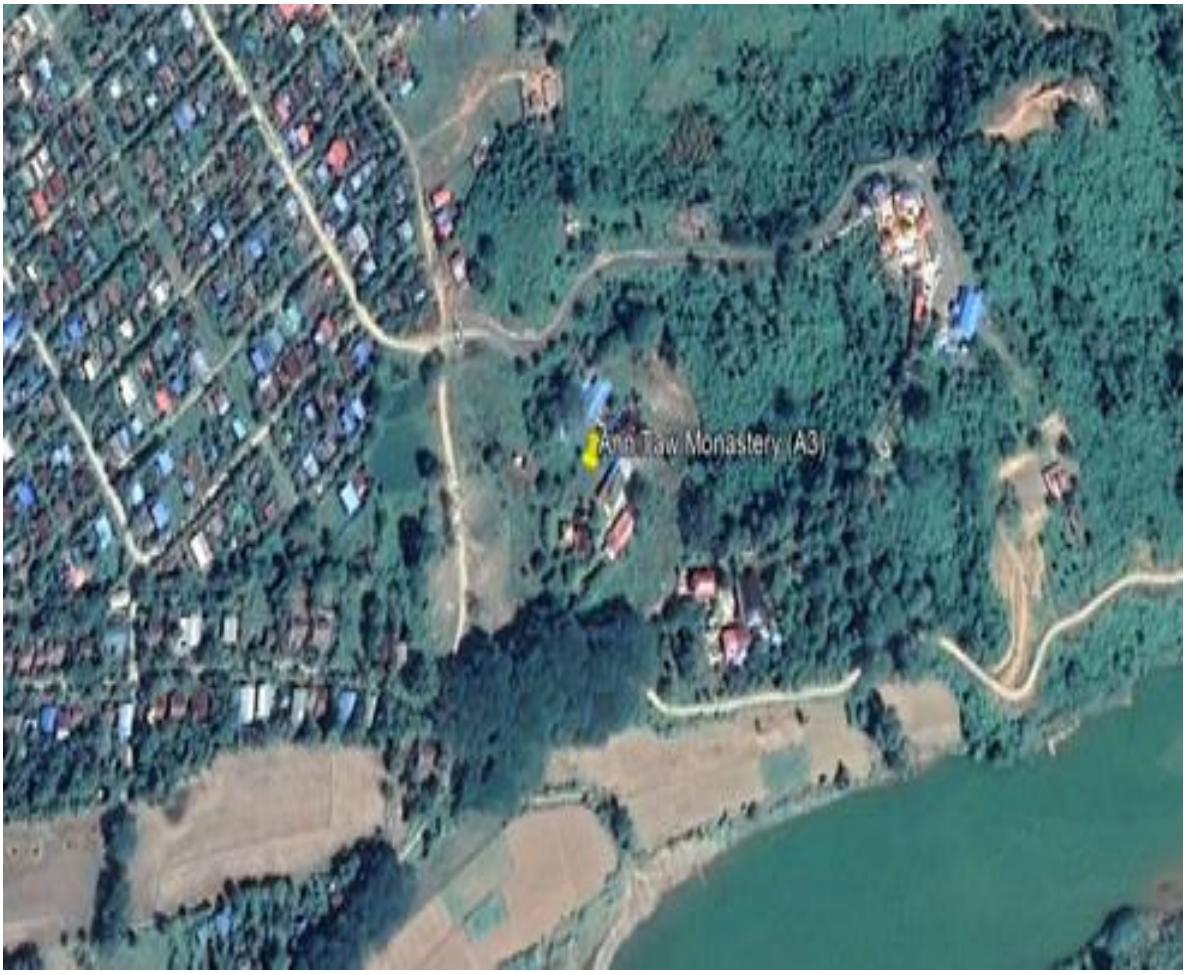


Figure 5.8: Ambient air monitoring at Ann Taw Monastery

Figure 5.9: Ambient air monitoring at point (3), Ann Taw Monastery (Day time)

Figure 5.10: Ambient air monitoring at point (3), Ann Taw Monastery (Night time)

The point 3 is located at the Ann Taw monastery. Regarding particulates, Table 3.4 presents both the levels of PM10 (6 µg/m^3) and PM 2.5 (3 µg/m^3) were met the National Environmental Air Quality Guideline (ECD) adopted from WHO Guideline. In terms of gases level, one-hour average

level of NO2 (44 µg/m3), one hour average level of CO (0 µg/m3), eight hours average level of CO (0 µg/m3), eight hours average level of O_3 (27 µg/m3) and 24hr average level of SO2 (11 µg/m3) met the guidelines.

The meteorology findings (Temperature, Relative Humidity, Wind Speed, Wind Direction) during the monitoring were presented below. (Table 3.4)

Table 5.5: Ambient air monitoring at point (3), Ann Taw Monastery

Parameters	Concentration (24hr average) except some Gases (NO2, CO and O3)*	National Environmental Air Quality Guideline (ECD)/WHO Guideline (24hr average)
PM10	$6^a(2^b\text{-}16^c)$ µg/m^3	50 µg/m^3
PM 2.5(µg/m^3)	$3^a(1^b\text{-}12^c)$ µg/m3	25 µg/m^3
NO_2*	$29^a(2^b\text{-}50^c)$ µg/m3 (24 hr) 44µg/m^3 (one hr)	40 µg/m^3 (annual) /200 µg/m^3 (one hour)
SO_2	$11^a(5^b\text{-}15^c)$ µg/m3	20 µg/m^3
CO *	$0^a(0^b\text{-}0^c)$ mg/m3 (24hr) / $0^a(0^b\text{-}0^c)$ µg/m3 0 mg/m^3 / 0 µg/m3 (one hr) 0 mg/m^3 / 0 µg/m3 (8 hr)	30,000 µg/m^3 (one hr) 10,000 µg/m^3 (8 hr)
O_3*	$14^a(1^b\text{-}80^c)$ µg/m3 (24hr) 27 µg/m^3 (8 hr)	100 µg/m^3 (8hr)
H2S	$20^a(0^b\text{-}80^c)$ ppb/0.01 mg/m^3	Air emission level 2 mg/m3/ Work place 10-15 mg/m3 (7-10 ppm) (WHO, EHC 19.1981)
CO2	$346^a(295^b\text{-}399^c)$ ppm	NA
VOC	$33^a(22^b\text{-}39^c)$ ppb	NA
NH_3	$13^a(3^b\text{-}18^c)$ ppm (9 mg/m3)	Air emission level 1 mg/m3/ Urban concentrations are typically in the range of 5 - 25 µg/m3 (Ammonia (EHC 54, 1986)
CH_4	$108^a(77^b\text{-}247^c)$ppm	NA
Meteorology		
T (Degree C)		$28^a(28^b\text{-}29^c)$
RH		$76^a(59^b\text{-}100^c)$
Wind Speed (kph)		$0.36^a(0^b\text{-}5^c)$
Wind Direction (Degree from North)		6 (N)
Remark:		
There was traditional ceremony preparation in the monastery compound. There was raining at the day and night time.		

[a] *Average* [b] *Min* [c]*Max*

Referring to National Environmental Air Quality Guideline (ECD), the color codes are categorized in order to reveal the general air quality status around the of the project area.

Green – meets the standards

Yellow (slightly over and less than double)

Orange (exceeding if more than double)

5.3 Existing noise quality

5.3.1 Introduction

Industrial noise refers to noise that is created in the factories which is jarring and unbearable. Sound becomes noise only when it becomes unwanted and if it becomes more than that it is referred to as "noise pollution". Noise pollution affects both health and behavior. Unwanted sound (noise) can damage physiological health. Industrial Noise resulting to noise pollution has many reasons such as industries being close to human habitats which prevent the noise from decaying before it reaches human ear. The purpose of this project was to ascertain industrial noise pollution and its impact on the immediate workers and nearby local community.

5.3.2 Objective

It was aimed to reveal the existing baseline ambient noise level.

5.3.3 Ambient noise monitoring locations

Locations of noise sampling stations are listed in **Table 3.1.**

- Point 1 Factory compound
- Point 2 Nan Taw monastery
- Point 3 Ann Taw monastery
- Point 4 Working area

Table 5.6 Noise sampling locations for baseline survey, May, 2021

Points	Locations	Coordinates		Start Date	End Date
		N	E		
1	Factory compound	18.471427°	94.373074°	21.5.2021	22.5.2021
2	Nan Taw monastery	18.470836°	94.360302°	22.5.2021	23.5.2021
3	Ann Taw monastery	18.470312°	94.380606°	23.5.2021	24.5.2021
4	Working area	18.471311°	94.372809°	22.5.2021	23.5.2021

The following tables (3.2 to 3.4) show the noise level measured around the proposed project area. Being situated around the residential area, the findings were compared with the applicable noise level guideline for industrial and residential by National Environmental Quality Guideline by Environmental Conservation Department (ECD).

5.3.3.1 Point (1) The existing baseline ambient noise monitoring location (1), Factory compound

Figure 5.11: Map of ambient noise monitoring at point (1), Factory compound

Figure 5.12: Noise monitoring station at Factory compound (Day time)

Figure 5.13: Noise monitoring station at Factory compound (Night time)

Table 5.7: The 24hr average noise level at point 1, Factory compound

Area	Whole Day Average Noise Level (dB)	Day Time Noise Level (dB)	Noise standard value of EQG for Industrial (Day Time)
Factory compound	64[a]±0.2[b] 58[c](44[d]-83.3[e])	65[a]±0.2[b] 60.8[c](45[d]-83[e])	55
		Night Time Noise Level (dB)	**Noise standard value of EQG for Industrial (Night Time)**
		60[a]±0.3[b] 55.5[c](44[d]-76.7[e])	45

[a]Average[b] Standard Error [c]Median [d]Min [e]Max

Based on the findings, the average noise levels (both day and night time) at the point 1 slightly over the EQEG guideline. Generally, these levels were mainly captured from vehicles (Cars and Trucks), machine and people activities. There was heavy raining in the midnight.

5.3.3.2 Point (2) The existing baseline ambient noise monitoring location (2), Nan Taw monastery

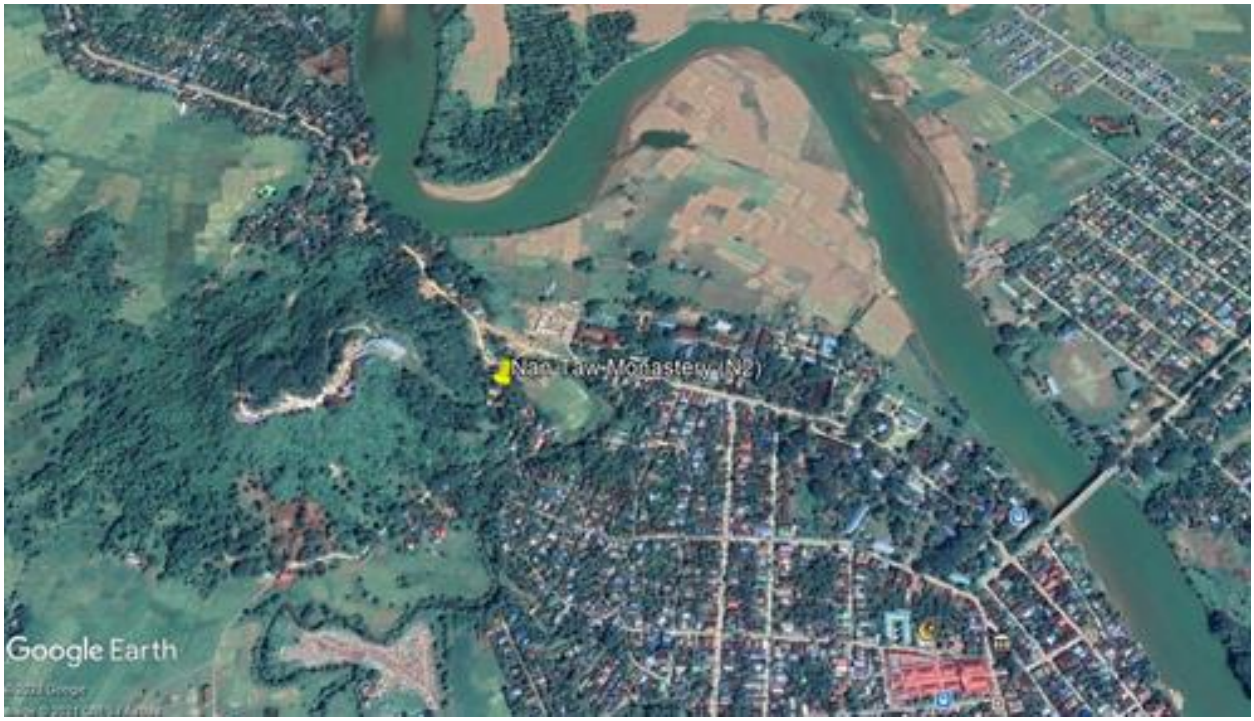


Figure 5.14: Map of ambient noise monitoring at point (2), Nan Taw Monastery

Figure 5.15: Noise monitoring station at Nan Taw monastery (Day time)

Figure 5.16: Noise monitoring station at Nan Taw monastery (Night time)

Table 5.8: The 24hr average noise level at point 2, Nan Taw Monastery

Area	Whole Day Average Noise Level (dB)	Day Time Noise Level (dB)	Noise standard value of EQG for Residential (Day Time)
Nantaw monastery	46[a]±0.2[b] 45[c](31.5[d]-97.6[e])	50[a]±0.3[b] 49.3[c](31.8[d]-97.6[e])	55
		Night Time Noise Level (dB)	**Noise standard value of EQG for Residential (Night Time)**
		39[a]±0.2[b] 38.9[c](31.5[d]-65.4[e])	45

[a]Average[b] Standard Error [c]Median [d]Min [e]Max

Based on the findings, the average noise levels (both day and night time) at the point 2 met EQEG. Generally, these levels were mainly captured from cars, motor cycle and people activities. There was raining in the evening and midnight.

5.3.3.3 Point (3) The existing baseline ambient noise monitoring location (3), Ann Taw monastery

Figure 5.17: Map of ambient noise monitoring at point (3), Ann Taw Monastery

Figure 5.18: Noise monitoring station at Ann Taw monastery (Day time)

Figure 5.19: Noise monitoring station at Ann Taw monastery (Night time)

Table 5.9: The 24hr average noise level at point 3, Ann Taw Monastery

Area	Whole Day Average Noise Level (dB)	Day Time Noise Level (dB)	Noise standard value of EQG for Residential (Day Time)
Ann Taw Village	$43^{a}\pm0.2^{b}$ $40.2^{c}(25^{d}\text{-}78^{e})$	$45^{a}\pm0.2^{b}$ $44.3^{c}(25^{d}\text{-}78^{e})$	55
		Night Time Noise Level (dB)	**Noise standard value of EQG for Residential (Night Time)**
		$37^{a}\pm0.1^{b}$ $38.4^{c}(25^{d}\text{-}57.2^{e})$	45

[a]Average[b] Standard Error [c]Median [d]Min [e]Max

Based on the findings, the average noise levels (both day and night time) at the point 3 met EQEG. Generally, these levels were mainly captured from car, motor cycle and people activities. There was heavy raining in the midnight.

5.3.3.4 Point (4) The existing baseline ambient noise monitoring at Location (4), Working area

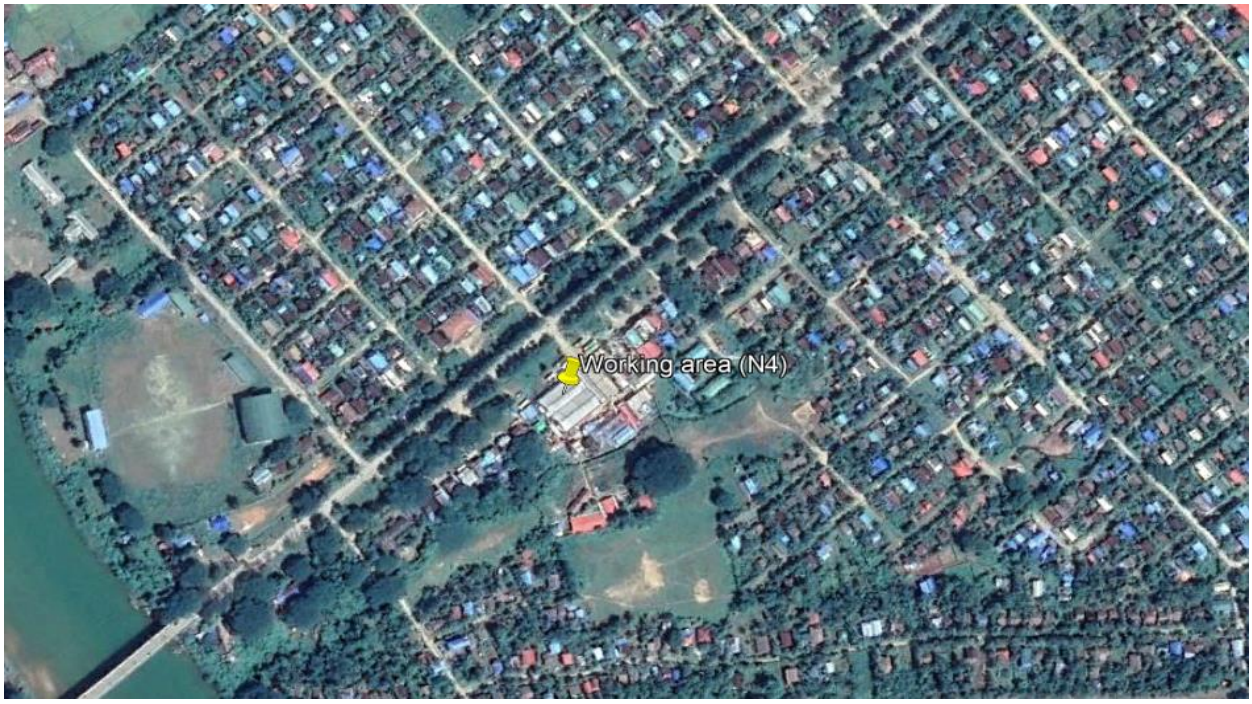


Figure 5.20: Map of ambient noise monitoring at point (4), working area

Figure 5.21: Noise monitoring station at working area

Table 5.10: The 8hr average noise level at point 4, working area

Area	Day Time Noise Level (dB)	Noise standard value of EQG for Industrial (Day Time)
Storage area	65[a]±0.4[b] 62[c](49.7[d]-89.6[e])	55

[a]Average[b] Standard Error [c]Median [d]Min [e]Max

Based on the findings, the average noise levels (day time) at the point 4 slightly over the EQEG guideline. Generally, these levels were mainly captured from machine and people activities.

5.4 Existing Vibration quality

5.4.1 Introduction

The ambient vibration level monitoring was carried out for 24hr continuously at each selected point located at the Thntwe township, Rakhine state, Myanmar, where people are spending several hours working in weekdays and weekend.

5.4.2 Objective

It was aimed to reveal the existing baseline ambient vibration level.

5.4.3 Ambient vibration monitoring locations

Locations of vibration sampling stations are listed in **Table 3.1.**

- Point 1 Factory compound
- Point 2 Nan Taw monastery
- Point 3 Ann Taw monastery

Table 5.11 Vibration sampling locations for baseline survey, May, 2021

Points	Locations	Coordinates		Start Date	End Date
		N	E		
1	Factory compound	18.471427°	94.373074°	21.5.2021	22.5.2021
2	Nan Taw monastery	18.470836°	94.360302°	22.5.2021	23.5.2021
3	Ann Taw monastery	18.470312°	94.380606°	23.5.2021	24.5.2021

5.4.3.1 Point (1) The existing baseline ambient vibration monitoring location (1), Factory compound

Figure 5.22: Map of ambient vibration monitoring at point (1)

Figure 5.23: Vibration monitoring station at Factory compound (Day time)

Figure 5.24: Vibration monitoring station at Factory compound (Night time)

Table 5.12: The 24hr average vibration level at point 1, Factory compound

Area	**24hr Average Vibration Level (m/s^2)**	**whole-body vibration (WBV) Daily exposure limit value (ELV) (ms2) A (8).**
Factory compound	Below the detection limit <0.5m/s^2	1.15 m/s^2

Speed measurement range: 0.5 ~ 199.9m / s2
Accelerometer area: 0.5 ~ 199.9 m /s2 (Peak)

5.4.3.2 Point (2) The existing baseline ambient vibration monitoring at Location (2), Nan Taw monastery

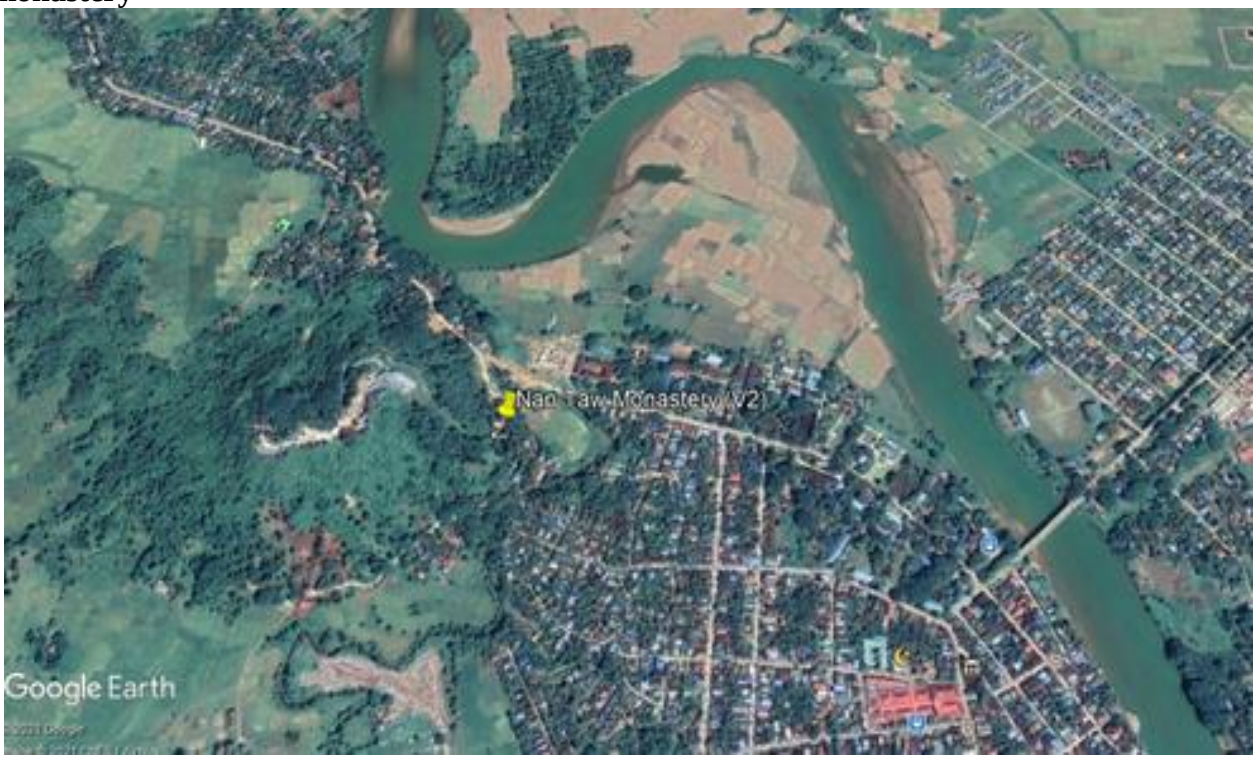


Figure 5.25: Map of ambient vibration monitoring at point (2)

Figure 5.26: Vibration monitoring station at Nan Taw monastery (Day time)

Figure 5.27: Vibration monitoring station at Nan Taw monastery (Night time)

Table 5.13: The 24hr average vibration level at point 2, Nan Taw village

Area	**24hr Average Vibration Level (m/s^2)**	**whole-body vibration (WBV) Daily exposure limit value (ELV) (ms2) A (8).**
Storage area	Below the detection limit <0.5m/s^2	1.15 m/s^2

[a]Average[b] Standard Error [c]Median [d]Min [e]Max
Speed measurement range: 0.5 ~ 199.9m / s
Accelerometer area: 0.5 ~ 199.9 m /s2 (Peak)

5.4.3.3 Point (3): The existing baseline ambient vibration monitoring at Location (3), Ann Taw monastery

Figure 5.28: Map of ambient vibration monitoring at point (3)

Figure 5.29: Vibration monitoring station at Ann Taw monastery (Day time)

Figure 5.30: Vibration monitoring station at Ann Taw monastery (Night time)

Table 5.14: The 24hr average vibration level of point 3, Ann Taw village

Area	24hr Average Vibration Level (m/s^2)	whole-body vibration (WBV) Daily exposure limit value (ELV) (ms2) A (8).
Production area	Below the detection limit <0.5m/s^2	1.15 m/s^2

[a]Average[b] Standard Error [c]Median [d]Min [e]Max
Speed measurement range: 0.5 ~ 199.9m / s
Accelerometer area: 0.5 ~ 199.9 m /s2 (Peak)

5.5 Geology and Hydrology

5.5.1 Geology

The area of the Thandwe is mountainous, and spurs of the Arakan mountains reach the coast. Some of the peaks in the north are over 4,000 feet (1,200 m) high. The streams are only mountain torrents to within a few miles of the coast; the mouth of the Khwa forms a good anchorage for small boats. The rocks in the Arakan Range and its spurs are metamorphic, and include clay, slates, ironstone and indurated sandstone, towards the south, ironstone, trap and rocks of basaltic character are common, veins of steatite and white fibrous quartz are also found.

Metamorphic rocks are formed when existing rock is transformed physically or chemically at elevated temperature, without actually melting to any great degree.

The type and density of the native soil is also important. In generally, very fine soils (clays and silts) typically have lower capacities than coarse granular soils (sands and gravels). However, some clays or silts have higher bearing capacity than the values. Mechanically compacting the soil can also raise its bearing capacity. The soil compaction is the process in which stress is applied to a soil causes densification as air is displaced from the pores between the soil grains.

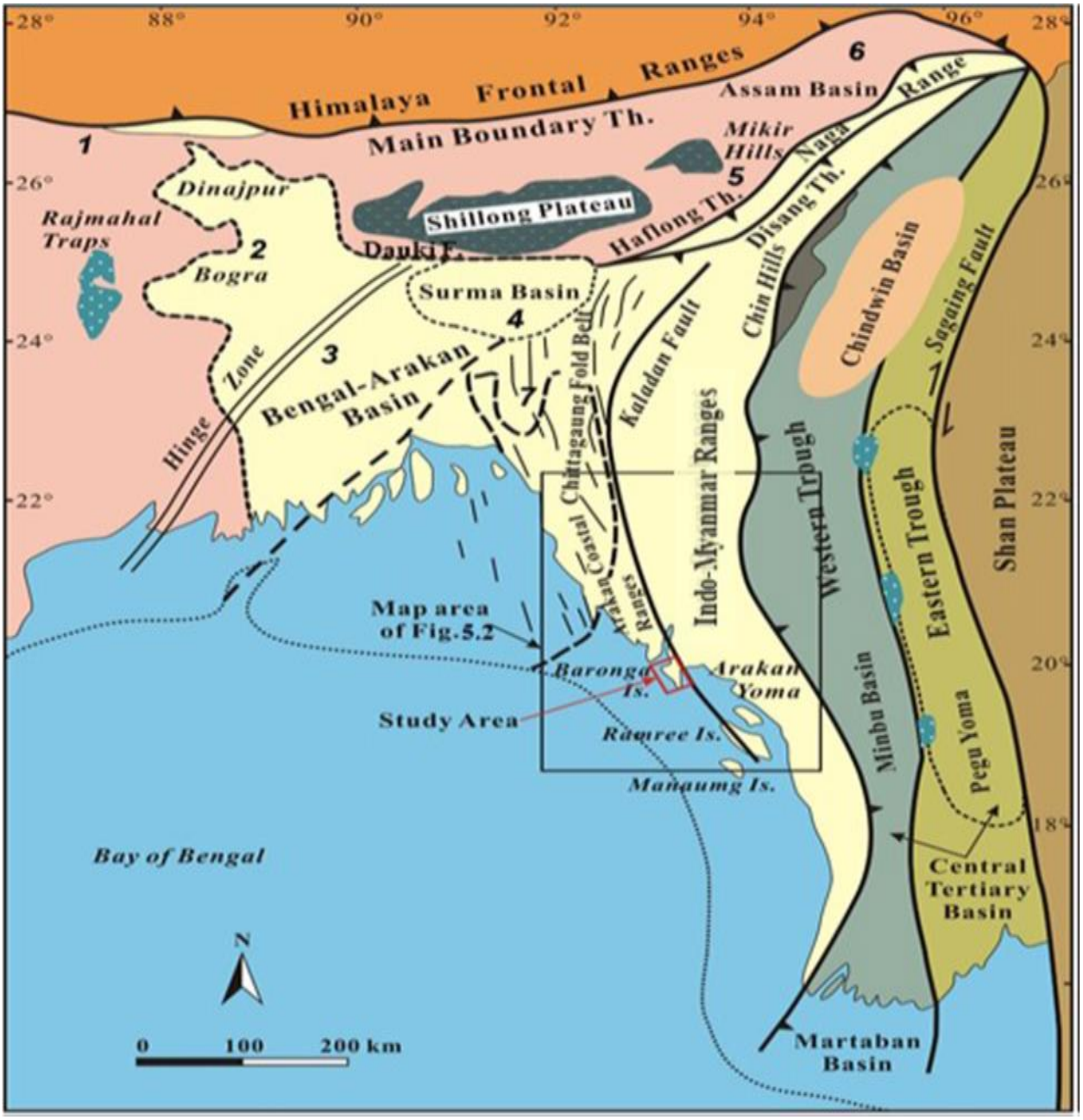


Figure 5.31: Geology map (1)

AGE		Arakan Coastal Ranges (Myanmar)	Lithology	Surma Valley (Bangladesh)
Pleistocene to Recent		Kyauktan Formation (500-762 m)	Alternation of sand and clay with rounded pebbles of quartzite. Coarse ferruginous sandstones	Tipam Group
Pliocene		Unconformity		
Miocene	U	Ngasanbaw Fm. (200-700 m)	Sandy shales and sandstones	Boka Bil Formation
		Mayu Fm. (1000-1908 m)	Ferruginous sandstones, sandy shales and thin sandstones	Upper Bhuban Fm.
	M	Yezaw Fm. (1500-1700 m)	Shales with subordinate sandstones	Middle Bhuban Fm.
	L	Laung Fm. (2000-3200 m)	Mainly shales with more sandstones near the top	Lower Bhuban Fm.
		Unconformity		
Eocene		(Type section as yet unestablished)	Top- mainly massive sandstones with thin shales	Disang Fm. / Barail Group
			Lower- Bluish grey splintery shales and calcareous sandstones	Sylhet Fm.
		?		
Cretaceous			Grey shales, with thin hard calcareous sandstones containing calcite veins, including Ma-i Beds of Sandoway (Thandwe) District	

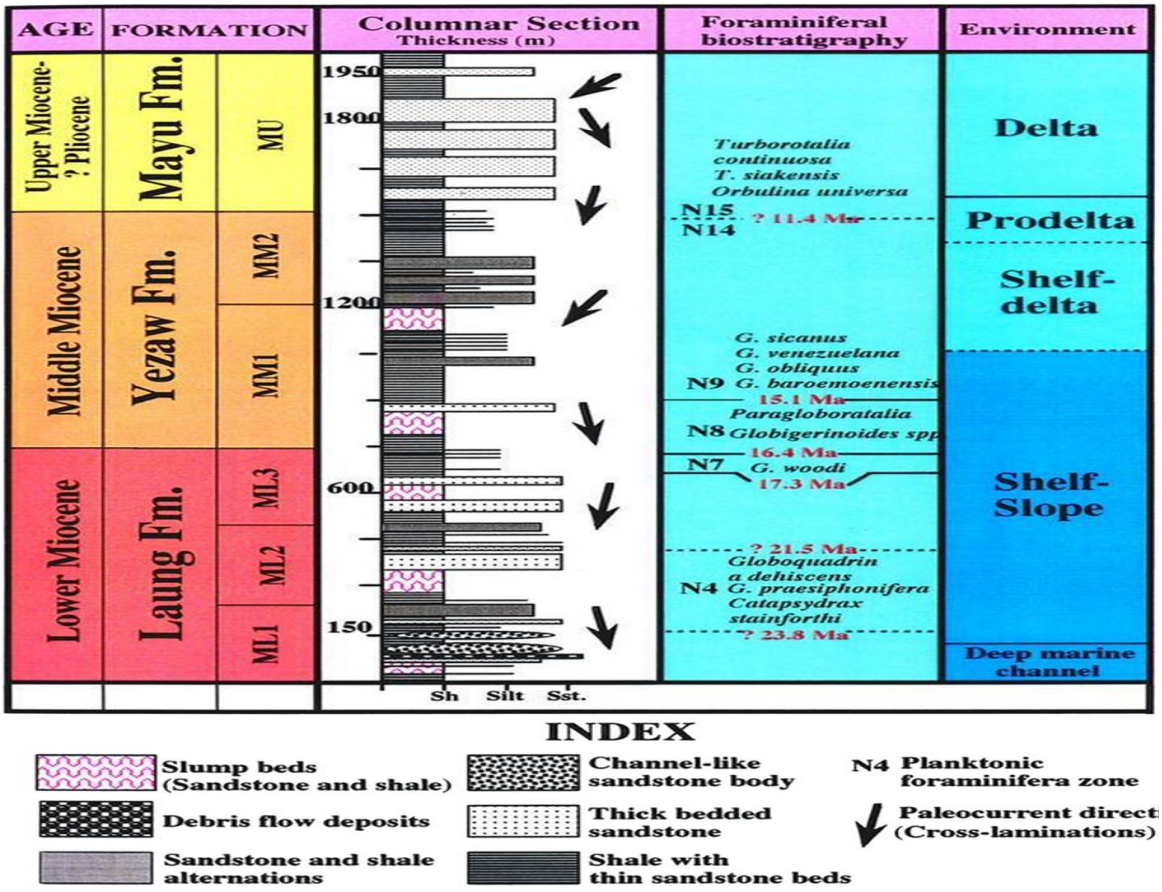


Figure 5.32: Geology map (2)

5.5.2 Hydrogeology

Some urban area is accessible to the public water distribution system through pipe network . Water distribution network is available for some households in urban. However, rural communities totally depend on well, rain water pond and stream for both drinking and nondrinking.

5.6 Existing Soil quality

5.6.1 Importance of soil

Types of soil common in Thantwe Township are (i) Red Brown Forest Soil; (ii) Yellow Brown Forest Soil; (iii) Meadow Soil and (iv) Saline Swampy Forest Soil.

Soil Type	Description
Red Brown Forest Soil	These soils cover 32 percent of the watershed area. These soils are found under various types of vegetation cover in the eastern part of the watershed area. They are found on the well-drained hill slopes. The upper foothill zone of Rakhine Yoma is occupied by red brown forest soil. These soils possess a good crumby structure and good drainage. They are well-developed and thick in soil column. Usually they are medium to heavy loam. These soils are characterized by the predominating red brown colour of the profile. In the topsoil, the colour is darker due to the presence of humus, but it becomes brighter to lighter with depth. The soil colour varies in the different profiles from dark red brown to bright orange. These soil are friable and well-structured, but often stony. They have poor humus and slightly acid with pH value of 5. 5 to 6. 5 but its acidity increases somewhat with the depth, which is rather unusual. These soils are quite suitable for silviculture and can be used for plantations and gardens in topographically favorable location.
Yellow Brown Forest Soil	These soils cover 39 percent of the watershed area. These soils are found at the lower part of the Rakhine Yoma in the middle part of the watershed area. They occur in the low foothills at the elevation of 92 to 957 meters above sea level, running from east to west between the Red brown forest soil of the eastern region and meadow soils on the plain. These soils are characterized by yellowish brown to brown colour, darker in the topsoil and each other gradually. These soils are light loamy in

	texture. These soils are slightly acid and the pH value is 5 to 6. 5.
Meadow Soil	These soils cover 10 percent of the watershed area. These type of soils are found along the Taungup Chaung which is located lower part of watershed area. They occupy the places that lie 15 and 30 meters above the sea level. The alluviums are variable in particle composition ranging from clay in the lower place to loamy in higher place. These soils are best suited for different kind of crops such as chilies, vegetables and sugarcane
Saline Swampy Forest Soil	These soils are found at the mouth of rivers and coastal region in the western part of watershed area. It is subject to undulation and becomes swampy soils. If it is well drained, it could be reclaimed as paddy land.

According to the field survey, the proposed project is near the residential area and near by surrounding have the practice of cultivation and farming.

5.6.1.1 Soil Quality

Soil sampling was carried out at the nearest villages firm in accordance with the sampling methodology in order to reveal the existing soil quality status in May 2021.

5.6.1.2 Objectives

To reveal the baseline situation of soil quality of the village firm nearest to the proposed project site.

The total (10) soil parameters for each point including chemical and physical parameters which are significantly important for the environmental health were analyzed and compared with the the FAO soil standards accordingly.

Based on the findings, the existing soil is not polluted with heavy metals which are harmful to the plants and animals. (Table 5.15 and 5.16)

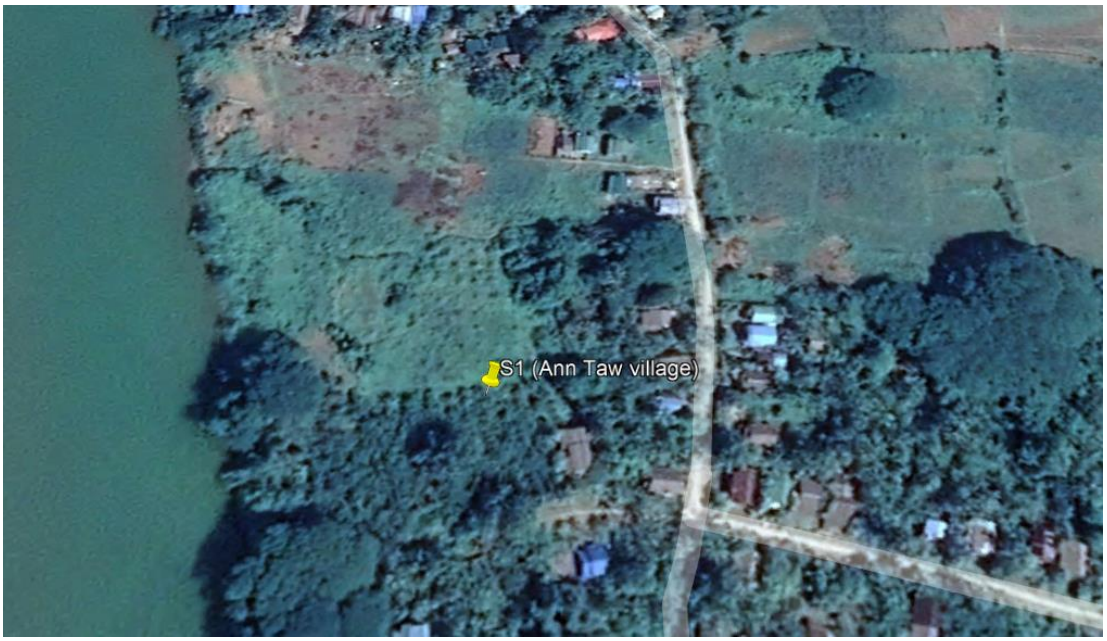


Figure 5.33: Google map of soil sampling from the Ann Taw village

Figure 5.34: Soil sampling at Ann Taw village

Table 5.15: Soil analysis of Ann Taw village

Sr.no	Parameters	Unit	Results	FAO Soil Bulletin 65 & Dutch Standards	Department of Agriculture (Land Use), Mandalay
1	Moisture	%	3.45		
2	pH	1:2.5	6.72		Near Neutral
3	EC	1:5	0.07		Very Low
4	Total N	%	0.09		Very Low
5	Available P	ppm	6.82		Low
6	Available K_2O	mg/100g	8.69		Low
7	Exchangeable K	meq/100g	0.18		Low
8	Texture				
	Sand	%	40.3		Loam
	Silt	%	43.83		
	Clay	%	15.87		

Figure 5.35: Google map of soil sampling from the No.(8) ward, Thantwe

Figure 5.36: Soil sampling at No.(8) ward, Thantwe

Table 5.16: Soil analysis of No(8) ward, Thantwe

Sr.no	Parameters	Unit	Results	FAO Soil Bulletin 65 & Dutch Standards	Department of Agriculture (Land Use), Mandalay
1	Moisture	%	3.74		
2	pH	1:2.5	5.43		Moderately Acid
3	EC	1:5	0.18		Low
4	Total N	%	0.25		Medium
5	Available P	ppm	30.51		Medium
6	Available K_2O	mg/100g	34.26		High
7	Exchangeable K	meq/100g	0.73		High
8	Texture				
	Sand	%	58.3		Sandy Loam
	Silt	%	31.03		
	Clay	%	12.67		

5.6.2 Rainfall and Temperature

Study area has a tropical monsoon climate. It has a warm temperature and none till mediocre rainfall. The average annual temperature is 29.8°C and the average annual rainfall is 92 mm. The difference in precipitation between the driest month and the wettest month is 298mm. During the year, the average temperature varies by 3°C.

5.7 Carbon emission

5.7.1 Introduction

Carbon dioxide (CO2) is the primary greenhouse gas emitted through human activities. Many industrial processes emit CO2 through fossil fuel combustion. Several processes also produce CO2 emissions through chemical reactions that do not involve combustion, for example, the production and consumption of mineral products such as cement, the production of metals such as iron and steel, and the production of chemicals. The main human activity that emits CO2 is the combustion of fossil fuels (coal, natural gas, and oil) for energy and transportation, although certain industrial processes and land-use changes also emit CO2.

In terms of the CO2 emission from the Thantwe Marine Products (TMP) Factory, the electricity sector of Thantwe Marine Products (TMP) Factory does not directly produce the emission of CO2 and GHG. The proposed factory is directly consuming electricity from government. However, when the electricity cut off, the proposed factory has to use two generators to generate electricity. This generation of electricity produces CO2 and GHG by using diesel fuel for generators.

Transportation sector is one of the major sources of emission of CO2 and GHG by using diesel fuel for transportation trucks and ships which carry raw materials to proposed factory and distribute products to consumers. Waste recycling practice instead of landfill is to reduce the CO2emission from the proposed factory.

5.7.2 Emission from electricity

Electricity is a significant source of energy and is used to power homes, business, and industry. The combustion of fossil fuels and fuel wood to generate electricity is the largest single source of CO2 emissions. The type of fossil fuel used to generate electricity by using generator which will emit different amounts of CO2 and other gas impact on human health and environment.
This Thantwe Marine Products (TMP) Factory is based on the government electricity and therefore indirectly causes the greenhouse gas emissions (GHG) emissions from the electricity production. Emissions from the proposed factory increase substantially when emissions from electricity are included, due to their relatively large share of electricity consumption (e.g., production, lighting and air conditioning). Total annual electricity usages of the proposed factory are 1885 MWh.

Carbon dioxide (CO2) makes up the vast majority of greenhouse gas emissions from the sector, but smaller amounts of methane (CH4) and nitrous oxide (N2O) are also emitted. These gases are released during the combustion of fossil fuels, such as coal and oil to produce electricity. The proposed factory uses the diesel generators as standby when the current is cut off. Total usage of diesels for the generator is around 15,400 **liters (4,068) gallons per year and 339 gallons per month. The diesel fuel is stored in the two steel fuel with 3,000 gallons and 2,000 gallons sized tanks.**

(a) Plant and equipment power requirement

Carbon emissions from the proposed factory would be predominantly associated with the electrical energy required for the operation of the production and equipment. Electricity also would be used on site to operate processing and equipment.

The electrical energy is required to operate the production, conveyers, machinery and air conditioning in the proposed factory. Values of electrical energy usage were estimated form the electrical bills of government sector and the usage of generator to produce the electric when power source was not available from government support. The power required for production and equipment was based on the following assumptions.

- All plant and equipment would operate 16 hours per day.
- The plant would operate for 4,688 hours per year with a corresponding annual electricity consumption of approximately **1,585 *MWh.***

(b) Lighting power requirements

Lighting systems:

The electricity required for lighting was calculated based on the following assumptions:

- The typical lighting requirement for industrial or factory buildings, of 2 W/m2 of floor area.
- Total floor area of proposed factory is approximately 36,422 m^2 which consists of office, raw material receiving room, production room, storage room, flake ice making area, toilets and wastewater treatment tanks, machine rooms, kitchen, canteen, labours apartment and open space.
- The open space area is 27690.1 m^2 which is not required to use electricity.
- The net area of electricity require is only 8731.9 m^2.
- There had floors in the building would require lighting at any given time.
- That lighting would be required during maintenance shut downs.

The operation of lighting on one floor for 24 hours per day, 293 days per year equates to a total of 7,032 hours annually, with an electricity requirement of close to ***123 MWh*** calculated as:

Lighting Power (MWh) = (Floor area x lighting requirement x hours/year) / 1,000,000
= (8731.9 m^2 x 2 W/m^2x 7,032 hrs/year) / 1,000,000
= 123 MWh

Another major electricity annual usage for proposed factory is air conditioning. The production processes and some raw material storages are being processed under 24 hour air conditioning system. The amount of air conditioning system usage for proposed factory is assumed as ***177 MWh.***

(c) Carbon emission of electricity energy usage from plant and equipment power requirement and lighting and air-condition power requirement

To convert reductions of kilowatt-hours into avoided units of carbon dioxide emissions, the Greenhouse Gas Equivalencies Calculator uses the Emissions & Generation Resource Integrated Database (eGRID) U.S. annual non-baseload CO2 output emission rate.

Total electricity usage = 1,585 MWh + 123 MWh + 177 MWh
=1885 *MWh (1,885,000 kWh)*

kWh = 6.89551×10-4 metric tons CO2 ---------- eq (1)

(eGRID, U.S. annual non-baseload CO2 output emission rate, year 2010 data)

CO2 emission (metric tons) = *1,885,000* kWh x (6.89551×10-4)
= 1,299.8 metric tons of CO2

The annual emission of CO2from electricity usage of lighting system, other usage of proposed factory and plant equipment are 1,299.8 metric tons of CO2.

1 Liters of Diesel = 2.68 kg of CO2 ---------- eq (2)

CO2 emission (kg) = 15,400 Liters x 2.68

= 41,272 kg of CO2 (41.272 metric tons of CO2)

Total amount of CO2 emission from generator is 41,272 kg of CO2/ year (41.272 metric tons of CO2/ year).

Total emission from electricity sector = (Electricity energy usage from plant and equipment power requirement and lighting and air-condition power requirement) +(Generator usage)
= *1,299.8* metric tons + *41.272* metric tons
= 1341.07 metric tons
Total emission of CO2 from electricity sector is 1341.07 metric tons of CO2.

5.7.3 Emission from transportation

Regarding the combustion of fossil fuels from the Thantwe Marine Products (TMP) Factory, diesel is mainly utilized by fishing ships, Cooling box trucks, ferry bus and office car which are for transportation of employees and goods of the proposed factory. These are the largest sources of transportation-related greenhouse gas emissions of the factory. Transportation and distribution systems of the proposed factory are maximized in a given geographic area – private cars for usage of staff, the fishing ships which sail to the sea to catch the marine products and go back to the port after collecting the marine products and trucks which deliver raw materials to a plant, pick up finished product and then transport the products to either the distribution center or directly to the customers. This strategy optimizes network efficiency and allows ships and trucks to run in a

continuous loop with a high level of fuel utilization. Types and amounts of fuel usage (diesel) is based on the type of the ship and car.

Table 5.17: Characteristics of distribution trucks from Thantwe Marine Products (TMP) Factory

No	Type of car/ship	Type of fuel	Quantity of car	Fuel usage per year (liter)
1	Fishing Ship	Premium diesel	11	3777538
2	Cooling box trucks	Premium diesel	4	26,801
4	Ferry	Premium diesel	2	3881
	Office car	Premium diesel	2	955
Total			19	3,809,175

The amount of fuel consumption for sailing of the fishing ships is 3777538 liter per annual. Total amount of fuel consumption from transportation sector is 3,809,175 liter per year.
To obtain the number of grams of CO2 emitted per gallon of gasoline combusted, the heat content of the fuel per gallon is multiplied by the kg CO2 per heat content of the fuel.

1Litre of Diesel = 2.68 kg of CO2

CO2 emission (diesel usage) = 3,809,175 liters x 2.68
= 10,208,589 kg of CO2 (10208.589 metric tons of CO2)

The ***total emission of CO2 from transportation sector is 10208.589 metric tons of CO2.***

5.7.4 Emission from waste

Currently, waste released from the factory are being recycled and dispose to CDC. To develop the conversion factor for recycling rather than landfill waste, emission factors from EPA's Waste Reduction Model (WARM) were used (EPA 2012). These emission factors were developed following a life-cycle assessment methodology using estimation techniques developed for national inventories of greenhouse gas emissions.
According to WARM, the net emission reduction from recycling mixed recyclables (e.g., paper, metals, plastics), compared with a baseline in which the materials are landfilled, is 0.76 metric tons of carbon equivalent per short ton. This factor was then converted to metric tons of carbon dioxide equivalent by multiplying by 44/12, the molecular weight ratio of carbon dioxide to carbon. Total tons of waste instead of landfill from the proposed factory is 293 ton/year.

Ton of waste recycled instead of landfill = 0.76 metric tons of **CO2 E** × 44 kg CO2/12 kg C
Ton of waste recycled instead of landfill = 2.79 metric tons CO2 equivalent
The equivalent of CO2 from waste recycled = 293 x 2.79 metric tons CO2
Instead of landfill
= 817.5 metric tons

The equivalent of CO2 from waste recycled instead of landfill is 817.5 metric ton per year.

5.7.5 Total CO2 emission from all sectors

Total emission of CO2 from proposed factory =(Total emission of CO2 from electricity sector + Total emission of CO2 from transportation sector) – The equivalent of CO2 from waste recycled instead of landfill
= (*1341.07 metric tons +10208.589 metric tons) - 817.5 metric tons*
= 10,732.159 metric tons

Total emission of CO2 from proposed factory of all of the sectors (electricity, transportation and waste recycle) are* 10,732.159 *metric tons.

5.8 Existing situation of solid waste generation

5.8.1 Introduction

One of the great benefits of using a cold storage is that the low temperature helps in lowering the rate of chemical changes and growth of microorganism enzymes in foods. In simple words, the rate of food spoiling is lowered down to a great extent.

5.8.2 Current waste generation from Thantwe Marine Products Co.,Ltd (TMP)

(a) Domestic solid waste (DSW) generation from the Thantwe Marine Products (TMP) Factory

Looking at domestic Solid waste generation from the Thantwe Marine Products (TMP) Factory cool storage process was measured by both automatically and manually weighing the waste from entire compound for a day at the final stage which is send to the CDC.

The type of domestic solid waste from the proposed factory is personal left over, food residues (organic wastes), glasses, tins, bottles, papers. According to the manual weighting analysis, domestic solid waste generation from the proposed factory is 52kg/day which is approximately 15 tonnes per year which come from the operation areas. Thus, from the total population nearly 200 total from one shift staff, waste generation per capital per day is (0.25) kg per person per day. When it is compared with the waste generation per capital in the developing countries which is 0.5 to 1.5 kg per person per day, this indicated that it was significantly less than the national rate of waste generation from developing country. Therefore, it is noted that in the operation system, there has some systematic waste generation.

(b) Industrial solid waste generation from the Thantwe Marine Products (TMP) Factory

Estimated industrial waste generation from the Thantwe Marine Products (TMP) Factory is 1000 kg per day which is proximately 293 tonnes per year, some of them are being sent to the waste recycler. According the analysis, some waste is ended in the recycling action. Some of them are ended in disposing system to the Municipal. Mostly, all the waste from the manufacturing are

being recycled, when it is analyzed, it is the result of recycling within the Manufacturing Compound.

(c) Physical composition of domestic solid waste from the Thantwe Marine Products (TMP) Factory

Physical composition analysis of solid waste in Thantwe Marine Products (TMP) Factory was carried out randomly. Individual components that typically make up most of the municipal solid wastes were categorized into 10 categories: food waste, yard waste, plastic, paper, leather/textile/rubber (LTR), glass, metal and aluminum (can), sanitary napkins, and others. The following figure 5.26 shows the physical composition of domestic solid waste that produce from the compound.

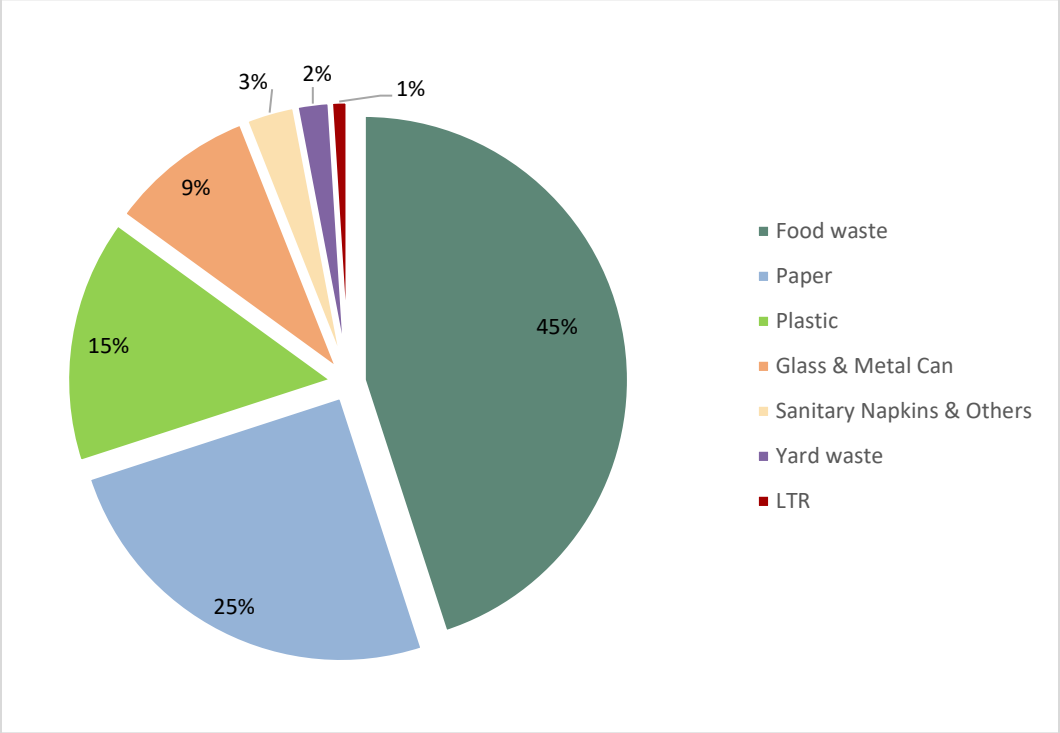


Figure 5.37: Physical composition of domestic solid waste

Figure: 5.26 shows percentage (%) of Domestic Solid Waste from the Thantwe Marine Products (TMP) Factory Weight Basis.
The top waste components is identified as; Food waste (45%), paper 25%, plastic 15% and the combination of others waste are less than 15% of the total domestic waste. Among 15%, glass and metal can is around 9%, sanitary napkins and other is 3%, yard waste is 2% and LTR(Leather, textile and rubber) is 1%.

(d) Physical Composition of industrial solid waste from Thantwe Marine Products (TMP) Factory

Like the domestic solid waste, physical composition of industrial solid waste was also carried randomly. According to the survey and analysis, there are two types of waste has been sent to the

Municipal. Others are ended in the recycling activities. The two main types of waste are heads of fish and shrimp and waste water. The heads of fish and shrimp are sent to the local recycle agent and the waste water is treated by traditional method and them discharge to the Thantwe river.

5.8.3 Existing waste handling in the factory

Thantwe Marine Products (TMP) Factory is combined with two sections which is industrial and residential parts. Thus, from this industry, both industrial and domestic solid wastes are generated every day. Within the industry, all the waste that generated is cleaned everyday by the workers.
According to observation within the industry, all the wastes (head of fish and shrimp) generating from the industry have been taken by the local recycle agents.
For domestic waste, it has been disposed to the CDC tanks four times per month. For industrial waste, waste recycle agents collect the waste daily. Before wastes were collected from the municipal, all the wastes were disposed in the five bins and the domestic waste and industrial waste are disposed separately. The proposed factory applies recycle system from 3R method. Since the factory open, they started the recycle activities. They contacted to the recycle agent to sell out the heads of fish and shrimp.

Table 5.18: Weight of waste recycling rate % and sent to recycling agent

No.	Types	% by wieght
1.	Total amount of Recycling waste (head of fish and shrimp)	100
2.	Total waste generated from the factory	100

As the total, the total amount of waste that generate from the recycling nearly 100% of the total waste. As the regarding result, it is significantly seen that the recycling activities in this factory is happened.

5.9 Existing situation of effluent water, storm water, ground water and surface water quality

5.9.1 Introduction

Water is not only necessary for Man's survival on Earth but also is an essential component for the improvement of the quality of life of the people living in developing countries (Biswas and Asce, 1980). Water is one of the essential needs for the industrialization process and human health. Industrialization has become an important factor to the development of a country's economy, through the establishment of plants and factories. However, the waste or by-products discharged from them are severely disastrous to the environment consists various kinds of contaminants which contaminate the surface water, ground water and soil.

Cold storage is a highly profitable business, in both developing and developed countries. In this factory, from the Marine Fishery processing and Cold Storage process, both solid wastes, wastewater and others environmental problems come out day to day in the surrounding. The wastewater from the Marine Fishery processing and Cold Storage factory has high concentration of organic pollutants. So it can impact on for the surrounding water bodies along with aquatic life and, human health if discharged directly into the surface water. The proposed factory has the waste

water treatment method. Therefore it will discharge waste water to the Thandwe river after treatment.

5.9.2 Objectives of the study

a. To reveal the baseline situation of water usage and wastewater production rate in the factory
b. To recommend suitable management plan both potable water and effluent waste water to reduce environment impact

5.9.3 Effluent water analysis

According to the observation, water is one of the essential raw materials for the process. It is used in both industrial process and domestic usage. In the process of Thandwe Marine Products (TMP) factory, according to the information provided by the factory, the water usage in this manufacturing process is around 29,000 (estimate) gallon per day. It is from the two different main sources including manufacturing process and others activities. Based on the analysis, 70% of water usage is for the manufacturing process and 30% of the water usage is for the domestic. The factory installs wastewater treatment method in the project site. The main sources of potable water come from the factory's own dam.
In terms of the effluent water sources, there is wastewater storage tank in the factory. From that storage tank, one sample was taken for effluent water analysis**.** That sample was analyzed for 7parameters each including chemical and physical parameters which are significantly important for the human health and surrounding environment.

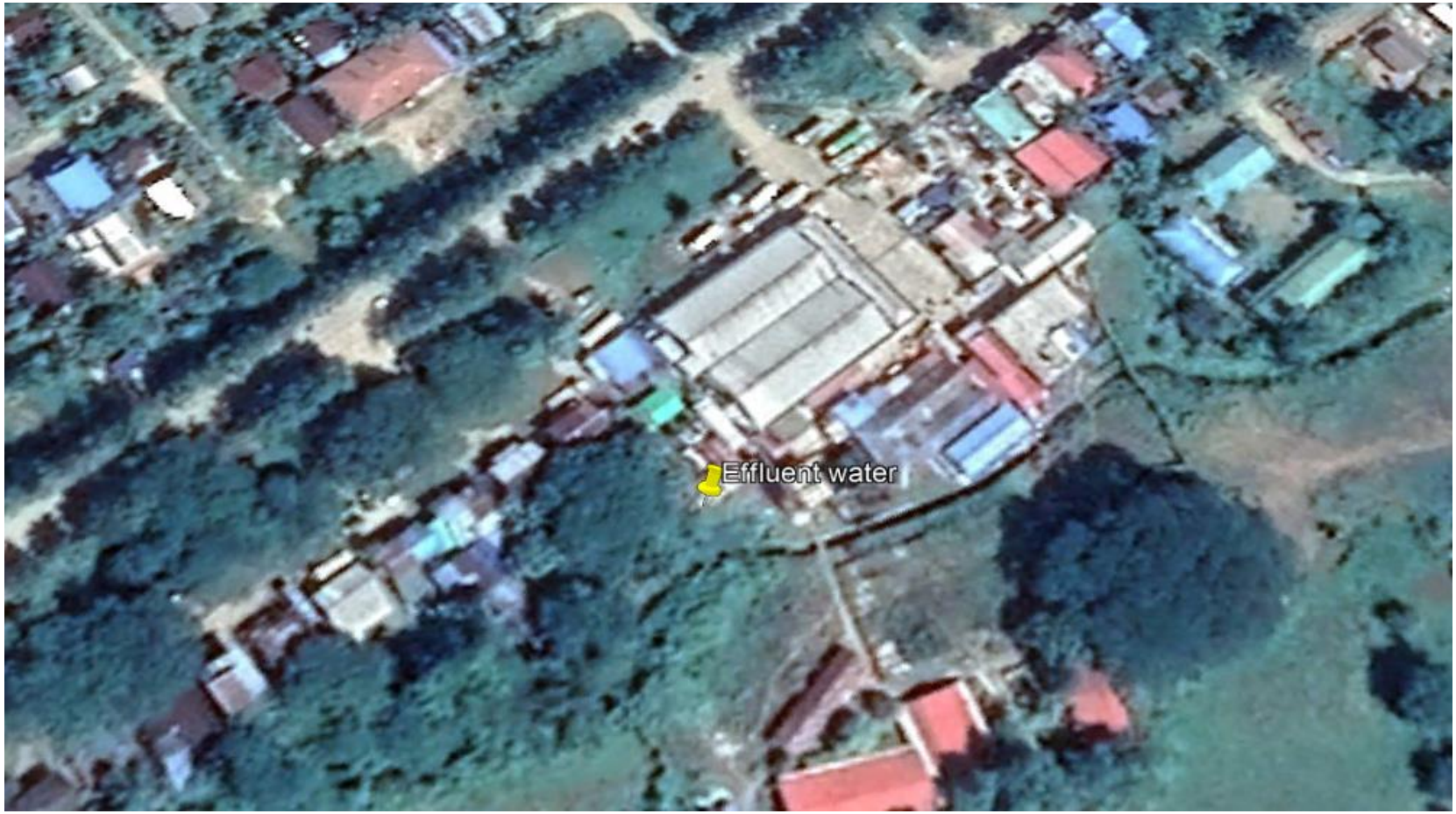


Figure 5.38: Google map of effluent water sampling

Figure 5.39: Effluent water sampling

Table 5.19: The results along with the permissible limits of the factory's effluent water

No.	Test Parameters	Unit	Storm Water	WHO Guidelines	National Environmental Quality (Emission) Guidelines	IFC effluent guidelines	Remark
1	BOD5	mg/L	37		≤ 50		Normal
2	COD	mg/L	454		≤ 250		Above the limit
3	Total Nitrogen (mg/L)	mg/L	58.8	N/A	0.01		Above the limit
4	Total Phosphorus (mg/L as P)	mg/L	1.305		2		Normal
5	TSS	mg/L	51		≤ 50		Above the limit
6	Oil & Grease	mg/L	3	-	≤10	-	Normal
7	Total coliform count	CFU/100ml	8994	-	400	-	Above the limit

8	Escherichia coli	CFU/100ml	467	-	-	-	-

Table 5.20: Onsite effluent water sampling data

No.	Name	Time	pH(pH)	ORP (mvORP)	DO (%)	EC (mS/cm)	Turbidity (FNU)	Temp (Deg C)	TDS (ppm)	Salinity (PSU)	Pressure (Psi)
1.	Effluent Water	15:30	7.84	91.7	39	2.352	49.8	24.65	1176	1.21	14.538

All the analytical results were compared with three different guidelines namely WHO guidelines, National Environmental Quality (Emission) Guidelines and IFC Effluent Guidelines.

According to the drinking water guidelines, there are around 7 parameters of effluent water was analyzed for the effluent water of the factory. All of parameters are the important parameters such as both physical and chemical parameter which can effect on not only human health but also environment. These are BOD5, COD, Total Nitrogen, Total Phosphorus, Total Suspended Solid, Oil & Grease and Total Coliform Count.
According to the results, the effluent water of the proposed factory meets the standards, except from the COD, Total Nitrogen, Total Suspended Solid and Total Coliform. However, the significant parameters, such as BOD5, Total Phosphorus and Oil & Grease meet the standards.

5.9.4 Storm water analysis

The main sources of storm water come from the domestic usage and the rest comes from the flake ice making process. According to the existing system, there are two drain systems in the whole compound and all the wastewater from different sources are flowing through those drainage system. All the combination of storm water from different sources finally flows into public drainage system. In the manufacturing process, the factory installs wastewater treatment tanks in the project site.

Looking at storm water analysis, both physical and chemical characteristics were analyzed. The parameters were selected mainly based on National Environmental Quality (Emission) Guidelines by Environmental Conservation Department (ECD). These are BOD5, COD, Total Nitrogen, Total Phosphorus, Total Suspended Solid, Oil & Grease and Total Coliform Count. The following table shows the results and the permissible limits for water discharges. The sample was taken from final drainage area of the proposed factory.

Figure 5.40: Google map of storm water sampling

Figure 5.41: Storm water sample collection from drainage area

Table 5.21: The results along with the permissible limits of the factory's Storm water

No.	Test Parameters	Unit	Storm Water	WHO Guidelines	National Environmental Quality (Emission) Guidelines	IFC effluent guidelines	Remark
1	BOD5	mg/L	1		≤ 50		Normal
2	COD	mg/L	41		≤ 250		Normal
3	Total Nitrogen (mg/L)	mg/L	3.52	N/A	0.01		Above the limit
4	Total Phosphorus (mg/L as P)	mg/L	0.362		2		Normal
5	TSS	mg/L	< 10		≤ 50		Normal
6	Oil & Grease	mg/L	1	-	≤10	-	Normal
7	Total coliform count	CFU/100ml	6894	-	400	-	Above the limit
8	Escherichia coli	CFU/100ml	2439	-	-	-	-

Table 5.22: Onsite Storm water sampling data

No.	Name	Time	pH(pH)	ORP (mvORP)	DO (%)	EC (mS/cm)	Turbidity (FNU)	Temp (Deg C)	TDS (ppm)	Salinity (PSU)	Pressure (Psi)
1.	Storm Water	15:00	7.77	102.2	60.3	1.165	11	29.73	582	0.57	14.530

According to the results, the storm water of the proposed factory, all parameters meet the standards except from the Total Nitrogen and Total coliform. Especially, the significant parameters, such as BOD5, COD, Total Phosphorus, Total Suspended Solid (TSS) and Oil & Grease meet the standards. Total Coliform count is exceeded over the National Environmental Quality (Emission) Guidelines. To reduce the Total Coliform, it is needed to turn off the taps and leave the system alone for 12 hours so the chlorine has enough time to kill the bacteria. To remove the bleach, pump the well water out through a hose attached to a tap (inside or out, but away from the septic system) until you can't smell the chlorine.

5.9.5 Analysis of ground water from Ann Taw village

The ground water is collected from the tube well of Ann Taw village. It can be used both in portable and domestic.

Looking at ground water analysis, both physical and chemical characteristics were analyzed. The parameters were selected mainly based on National Environmental Quality (Emission) Guidelines by Environmental Conservation Department (ECD). These are BOD5, COD, Total Nitrogen, Total Phosphorus, Total Suspended Solid, Oil & Grease and Total Coliform Count. The following table shows the results and the permissible limits for the ground water of Ann Taw village.

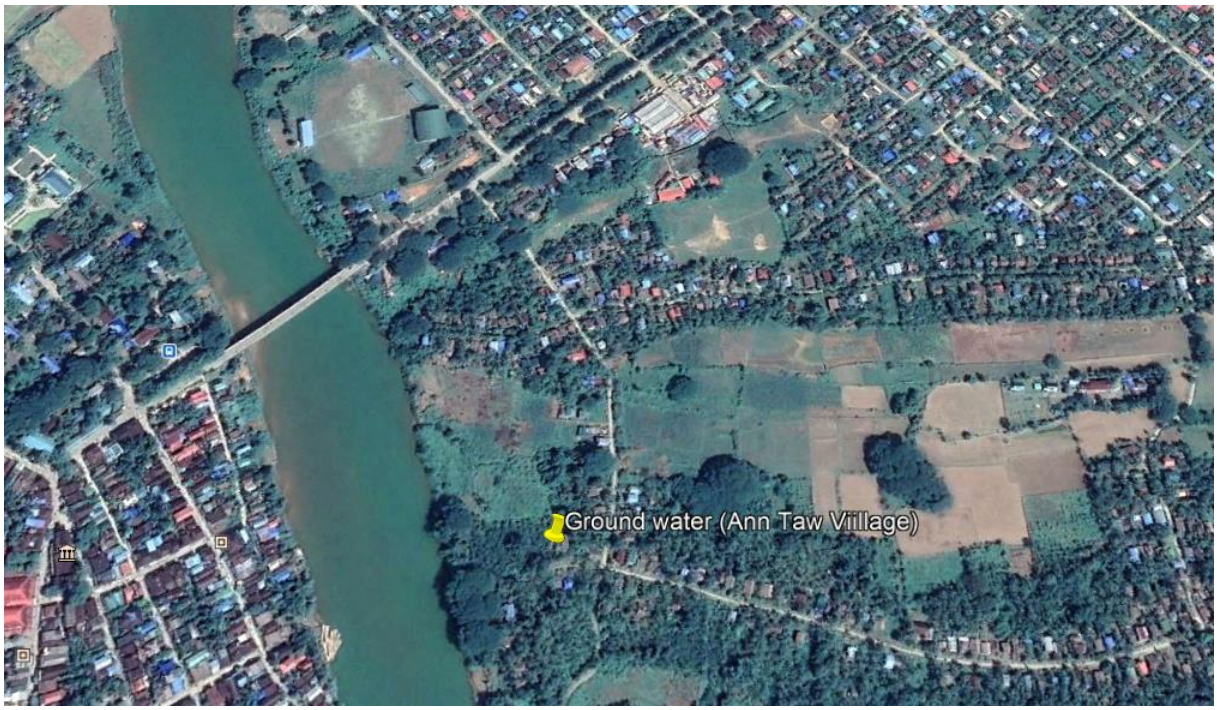


Figure 5.42: Google map of ground water sampling from Ann Taw village

Figure 5.43: Ground water sample collection from Ann Taw village

Table 5.23: The results along with the permissible limits of the ground water from Ann Taw village

No.	Test Parameters	Unit	Storm Water	WHO Guidelines	National Environmental Quality (Emission) Guidelines	IFC effluent guidelines	Remark
1	BOD5	mg/L	4		≤ 50		Normal
2	COD	mg/L	26		≤ 250		Normal
3	Total Nitrogen (mg/L)	mg/L	1.31	N/A	0.01		Above the limit
4	Total Phosphorus (mg/L as P)	mg/L	0.127		2		Normal
5	TSS	mg/L	21		≤ 50		Normal
6	Oil & Grease	mg/L	6	-	≤10	-	Normal
7	Total coliform count	CFU/100ml	88	-	400	-	Normal
8	Escherichia coli	CFU/100ml	88	-	-	-	-

Table 5.24: Onsite ground water sampling data (Ann Taw village)

No.	Name	Time	pH(pH)	ORP (mvORP)	DO (%)	EC (mS/cm)	Turbidity (FNU)	Temp (Deg C)	TDS (ppm)	Salinity (PSU)	Pressure (Psi)
1.	Ground Water	14:00	7.87	88.6	50.5	0.2	0	30.76	83	0.08	14.635

According to the results, the ground water of the Ann Taw village, all parameters meet the standards except from the Total Nitrogen. Especially, the significant parameters, such as BOD5, COD, Total Phosphorus, Total Suspended Solid (TSS), Oil & Grease and Total Coliform meet the standards. Total Nitrogen is slightly over the National Environmental Quality (Emission) Guidelines. To reduce the Total Nitrogen, there are two steps for removing nitrogen in biological treatment. They are nitrification and denitrification methods.

5.9.6 Analysis of ground water from No(8) ward, Thandwe

The ground water is collected from the tube well of No (8) ward, Thandwe. It can be used both in portable and domestic.

Looking at ground water analysis, both physical and chemical characteristics were analyzed. The parameters were selected mainly based on National Environmental Quality (Emission) Guidelines by Environmental Conservation Department (ECD). These are BOD5, COD, Total Nitrogen, Total Phosphorus, Total Suspended Solid and Oil & Grease. The following table shows the results and the permissible limits for the ground water of No (8) ward, Thandwe.

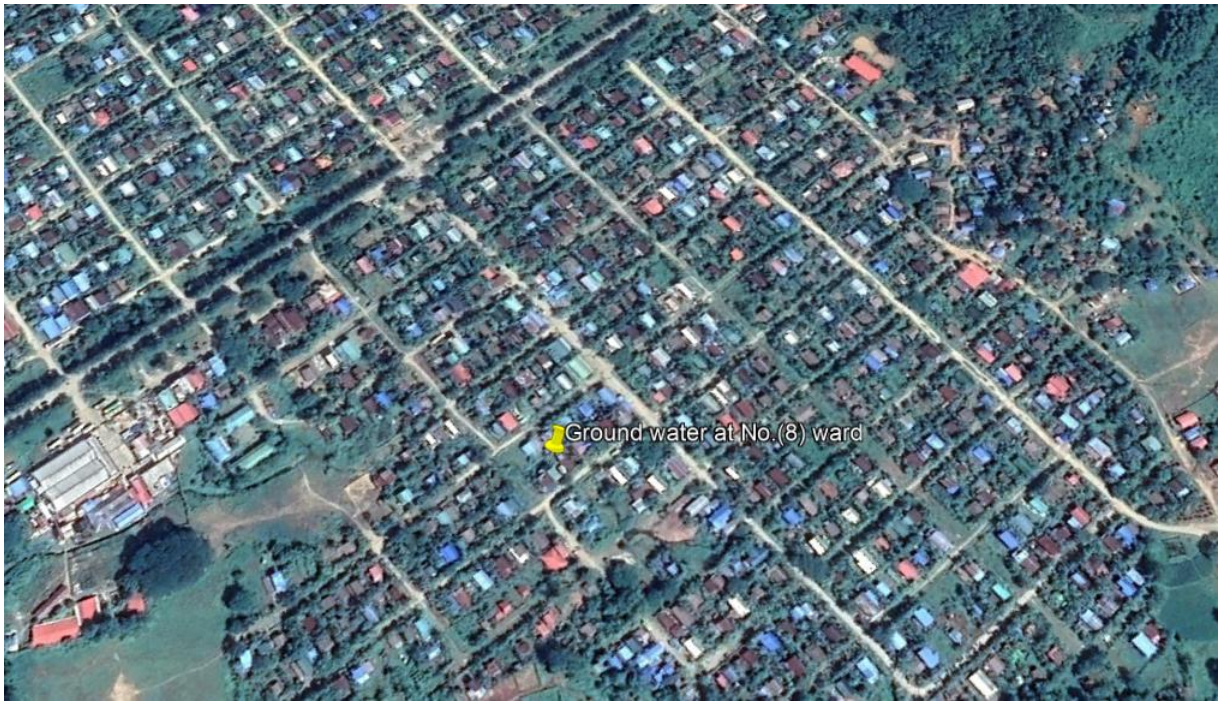


Figure 5.44: Google map of ground water sampling from No(8) ward, Thandwe

Figure 5.45: Ground water sample collection from No (8) ward Thandwe

Table 5.25: The results along with the permissible limits of the ground water from No (8) ward, Thandwe

No.	Test Parameters	Unit	Storm Water	WHO Guidelines	National Environmental Quality (Emission) Guidelines	IFC effluent guidelines	Remark
1	BOD5	mg/L	12		≤ 50		Normal
2	COD	mg/L	20		≤ 250		Normal
3	Total Nitrogen (mg/L)	mg/L	0.79	N/A	0.01		Above the limit
4	Total Phosphorus (mg/L as P)	mg/L	0.029		2		Normal
5	TSS	mg/L	<10		≤ 50		Normal
6	Oil & Grease	mg/L	2	-	≤10	-	Normal

Table 5.26: Onsite ground water sampling data (No (8) ward, Thandwe)

No.	Name	Time	pH(pH)	ORP (mvORP)	DO (%)	EC (mS/cm)	Turbidity (FNU)	Temp (Deg C)	TDS (ppm)	Salinity (PSU)	Pressure (Psi)
1.	Ground Water	11:00	7.87	56.7	39.6	0.3	0	28.42	150	0.14	14.661

According to the results, the ground water of the No (8) ward, Thandwe, all parameters meet the standards except from the Total Nitrogen. Especially, the significant parameters, such as BOD5, COD, Total Phosphorus, Total Suspended Solid (TSS) and Oil & Grease meet the standards. Total Nitrogen is slightly over the National Environmental Quality (Emission) Guidelines. To reduce the Total Nitrogen, there are two steps for removing nitrogen in biological treatment. They are nitrification and denitrification methods.

5.9.7 Analysis of surface water from Thandwe river

The surface water is collected from the Thadwe river. It can be used as domestic water.

Looking at surface water analysis, both physical and chemical characteristics were analyzed. The parameters were selected mainly based on National Environmental Quality (Emission) Guidelines by Environmental Conservation Department (ECD). These are BOD5, COD, Total Nitrogen, Total Phosphorus, Total Suspended Solid, Oil & Grease and Total Coliform. The following table shows the results and the permissible limits for the surface water of Thandwe river.

Figure 5.46: Google map of surface water sampling from Thandwe river

Figure 5.47: Surface water sample collection from the Thadwe river

Table 5.27: The results along with the permissible limits of the surface water from Thandwe river

No.	Test Parameters	Unit	Storm Water	WHO Guidelines	National Environmental Quality (Emission) Guidelines	IFC effluent guidelines	Remark
1	BOD5	mg/L	0		≤ 50		Normal
2	COD	mg/L	1500		≤ 250		Above the limit
3	Total Nitrogen (mg/L)	mg/L	<0.5	N/A	0.01		Above the limit
4	Total Phosphorus (mg/L as P)	mg/L	0.031		2		Normal
5	TSS	mg/L	5		≤ 50		Normal
6	Oil & Grease	mg/L	12	-	≤10	-	Above the limit
7	Total coliform count	CFU/100ml	250650409	-	400	-	Above the limit

8	Escherichia coli	CFU/100ml	850	-	-	-	-

Table 5.28: Onsite surface water sampling data (Thandwe river)

No.	Name	Time	pH(pH)	ORP (mvORP)	DO (%)	EC (mS/cm)	Turbidity (FNU)	Temp (Deg C)	TDS (ppm)	Salinity (PSU)	Pressure (Psi)
1.	Surface Water	10:00	7.77	21.6	49.4	0.01	12	31.93	5796	6.53	14.610

According to the results, the surface from the Thandwe river, all parameters meet the standards except from the COD, Total Nitrogen, Oil & Grease and Total Coliform. Especially, the significant parameters, such as BOD5, Total Phosphorus and Total Suspended Solid (TSS) meet the standards. Total Nitrogen is slightly over the National Environmental Quality (Emission) Guidelines. To reduce the Total Nitrogen, there are two steps for removing nitrogen in biological treatment. They are nitrification and denitrification methods. Total Coliform count and COD are exceeded over the National Environmental Quality (Emission) Guidelines. To reduce the Total Coliform, it is needed to turn off the taps and leave the system alone for 12 hours so the chlorine has enough time to kill the bacteria. To remove the bleach, pump the well water out through a hose attached to a tap (inside or out, but away from the septic system) until you can't smell the chlorine.

5.10 Biological environment

5.10.1 Executive summary

The project area is situated in the Thandwe Township, Rakhine State which is in the Western part of Myanmar. The biodiversity field survey was carried out starting in May 2021. The baseline studies were conducted in order to identify biodiversity as well as ecosystem services.

The flora survey was carried out by the forest inventory method to identify the species composition, density and distribution. A total of 21 plant species were observed during the survey.

Regarding fauna survey, sample plotting methods, random transect methods and traditional biodiversity survey method were carried out to identify the vegetation types and endangered species in the proposed project area.

According to both field surveys and community interviews, 6 species of mammals, 24 species of fishes, 8 species of birds and 15 species of reptiles and amphibians were identified.

5.10.2 Introduction

The Rakhine State, situated on the western coast of the Republic of the Union of Myanmar and has unique historical background among the States and Regions. Rakhine State is bordered by Chin State to the north, Magway Region, Bago Region and Ayeyarwady Region to the east, the Bay of Bengal to the west, and the Chittagong Division of Bangladesh to the northwest. It is located between latitudes 17°30' north and 21°30' north and longitudes 92°10' east and 94°50' east. The Rakhine Yoma (Mountains) rising to 3,063 meters (10,049 ft) at Victoria Peak, separate Rakhine State from central Myanmar. Rakhine State has an area of 36,762 square kilometers (14,194 square mile).

The Arakan Mountains or Rakhine Yoma separated Rakhine State from central Burma from North to South.

5.10.2.1 Protected Area across the country

According to the World Database Protected Area (WDPA, February 2018), there are 11 National designations and 2 International designations are being observed in Myanmar. The name and number of National designations are Nature Reserve (2), National Park (6), Protected Area (4), National Park and ASEAN Heritage Park (4), Wildlife Sanctuary (27), Bird Sanctuary (3), Wildlife Park (1), Mountain Park (1), Wildlife Sanctuary and ASEAN Heritage Park (2), Elephant Range (1) and Wildlife Sanctuary (1).

.

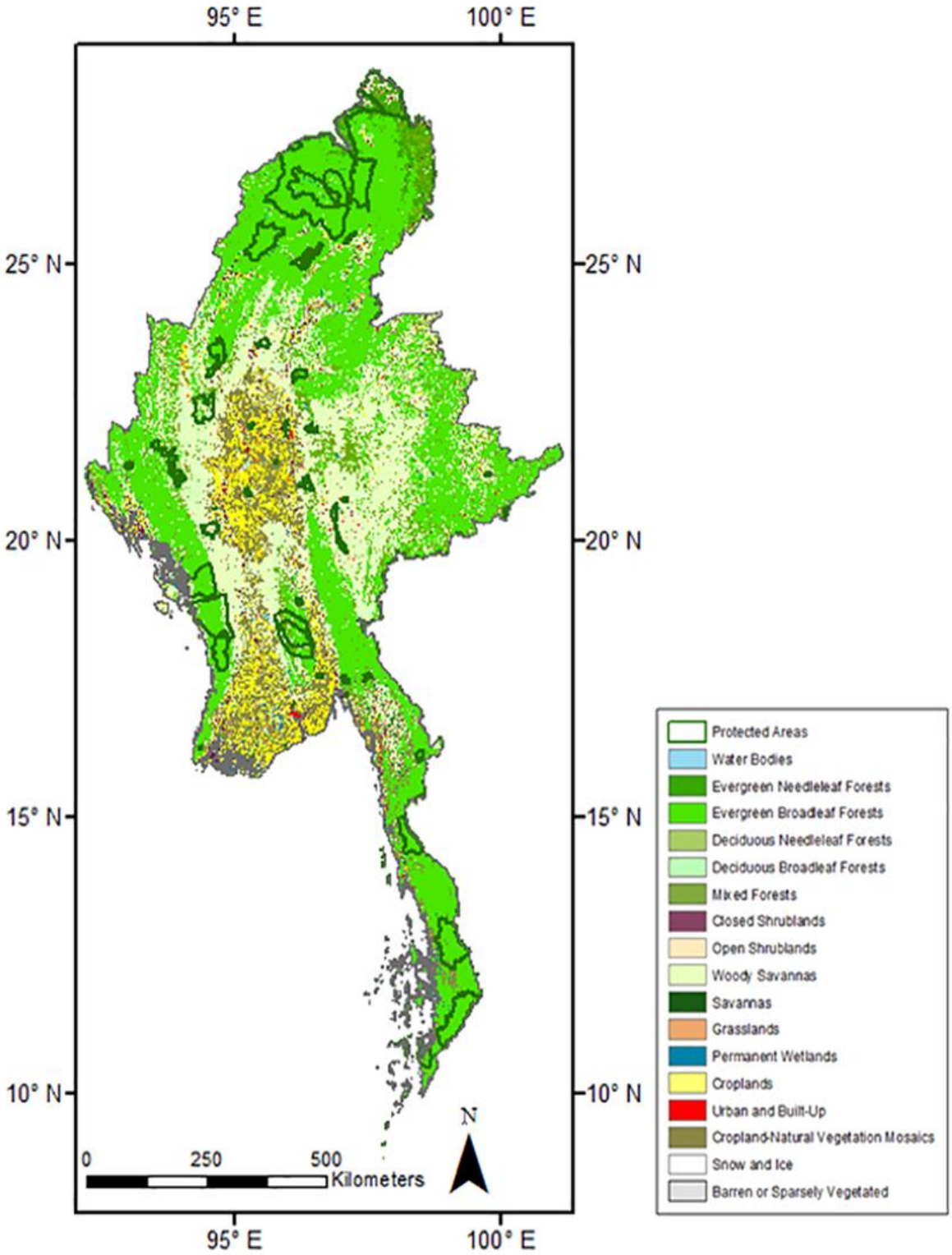


Figure 5.48: Protected Area in Myanmar (1)

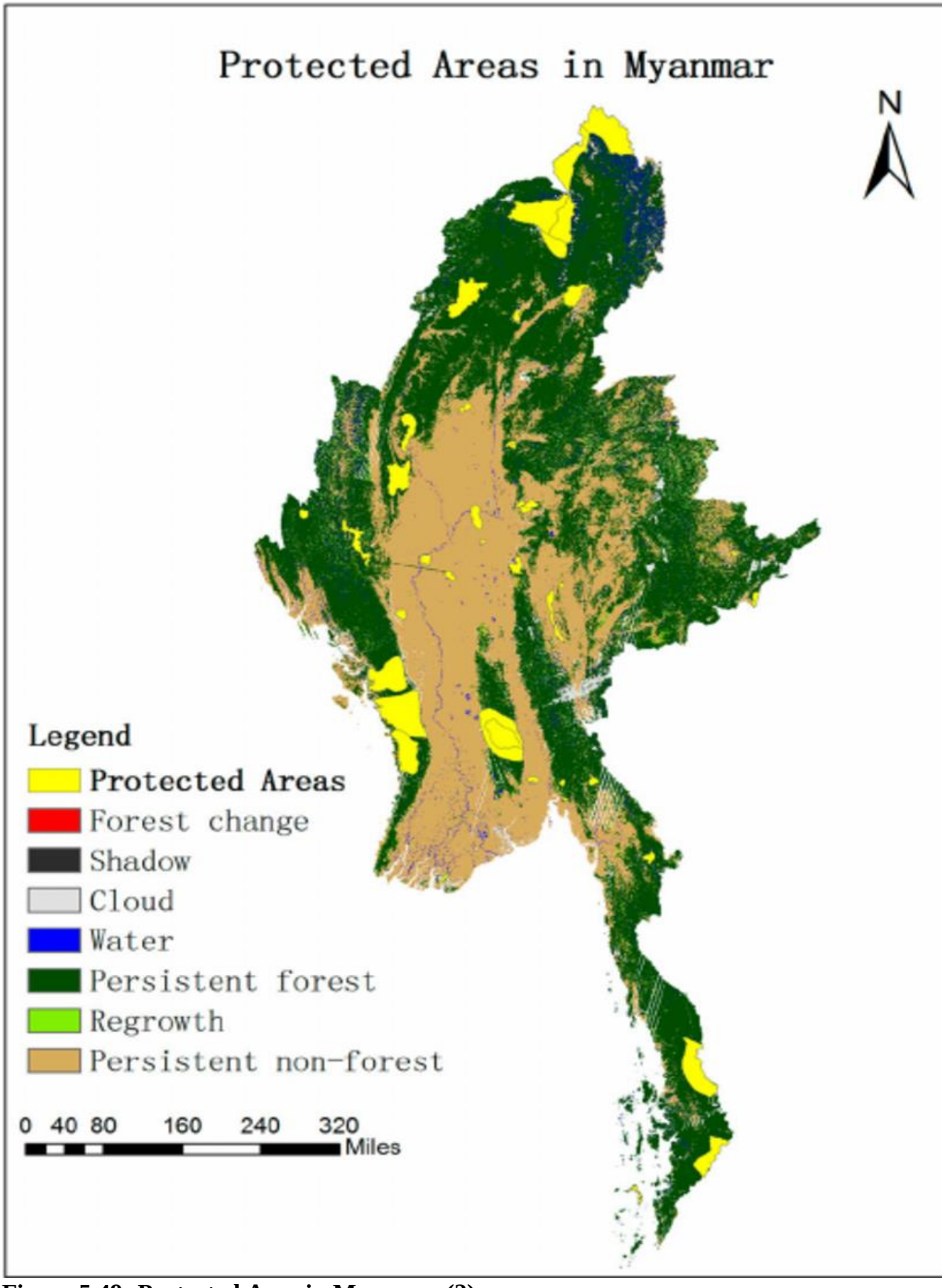


Figure 5.49: Protected Area in Myanmar (2)

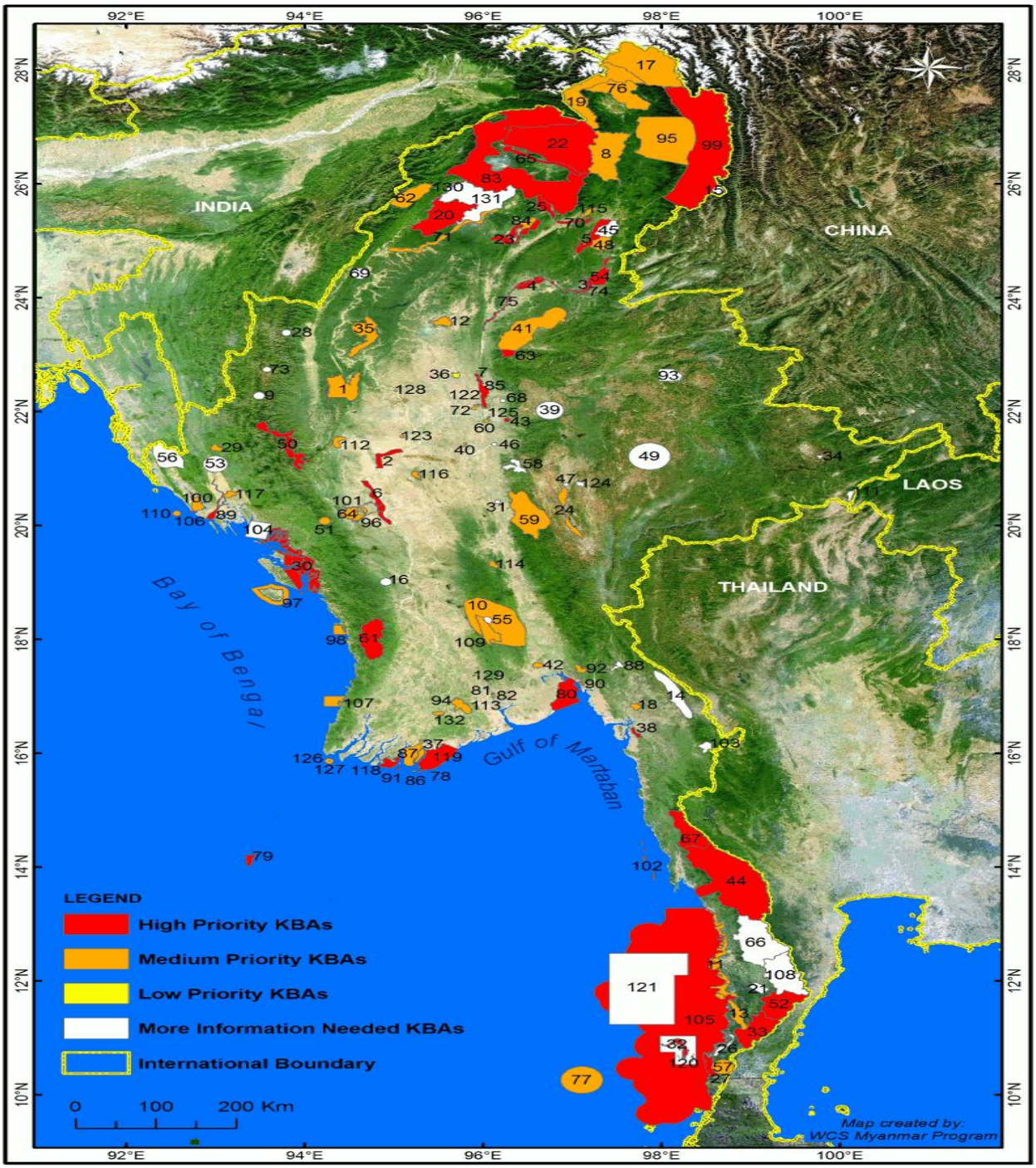


Figure 5.50: Protected Areas and Key Biodiversity Areas (KBAs) in Myanmar

5.10.2.2 Thandwe Township

The Thandwe Township is situated in the south of Rakhine State. From east to west, it is 28.33 miles wide and from south to north it is 48 miles wide. The area is 1360.16 square miles or 870,504 acres. There are surrounded by hill and above sea level is 18 feet.

5.10.2.3 The project area

The project area is located in the Thandwe Township which is the western part of the Rakhine State.

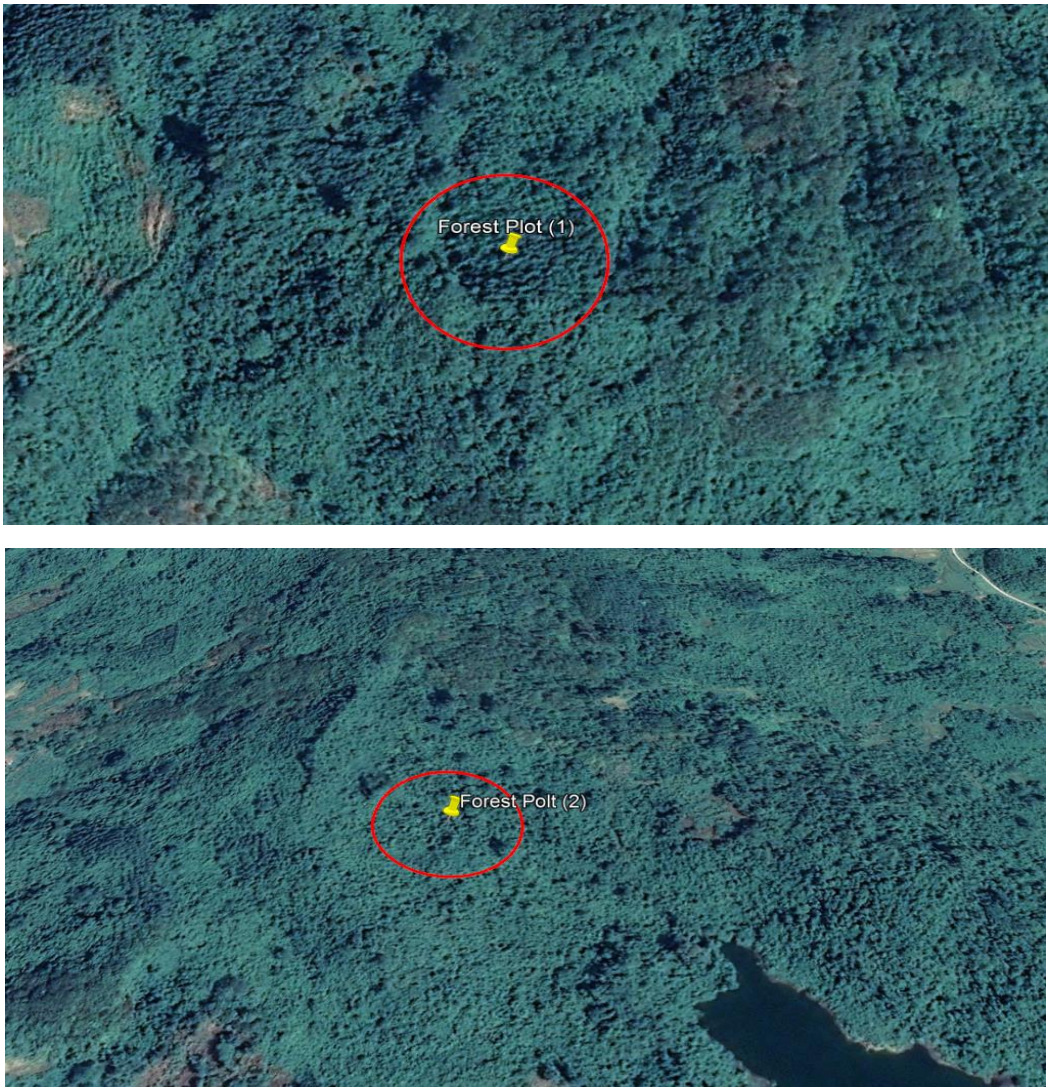


Figure 5.51: The location maps of project area

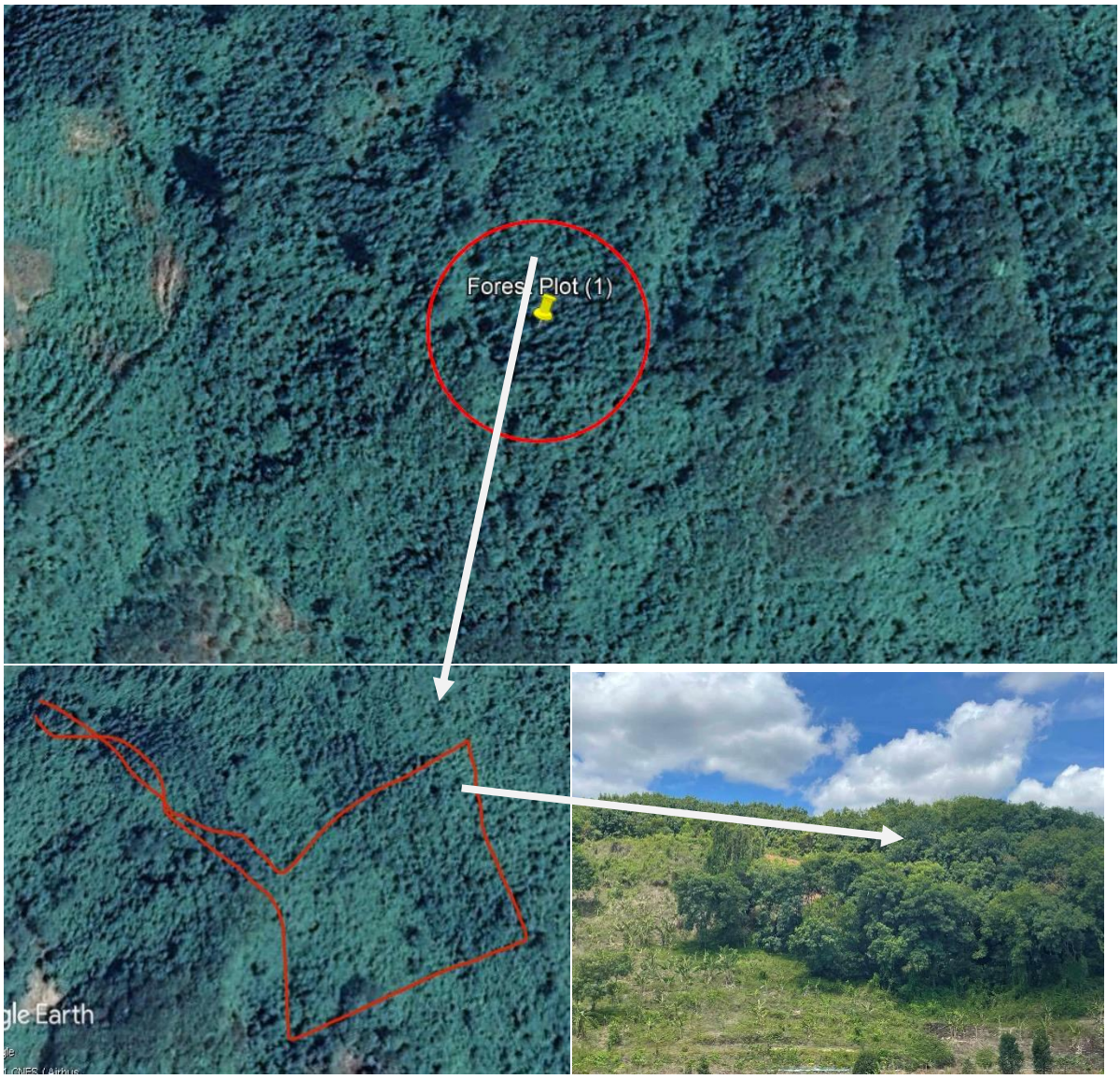


Figure 5.52: Forest Plot 1 for flora and fauna survey

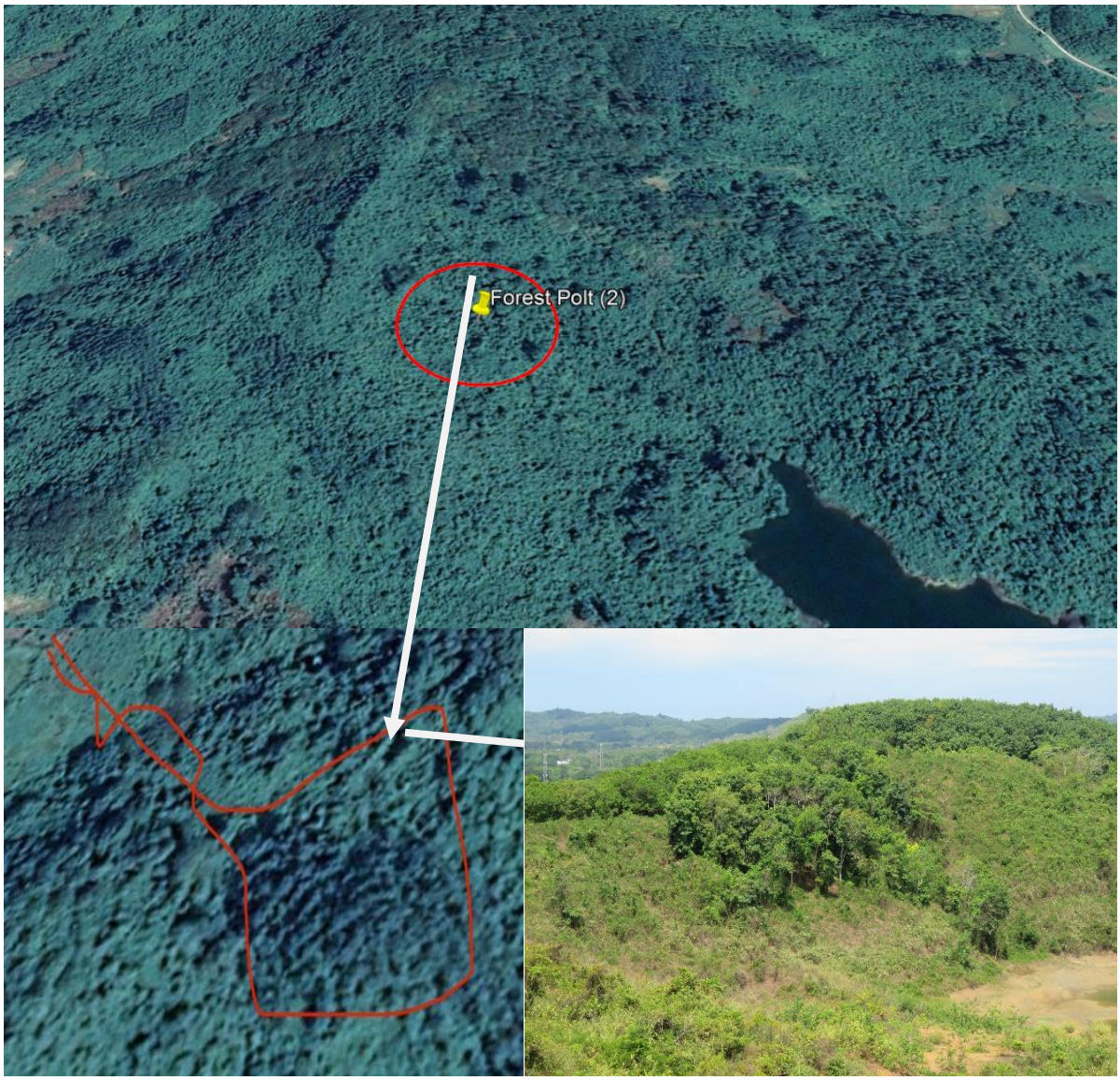


Figure 5.53: Forest Plot 2 for flora and fauna survey

5.10.3 The Vegetation

Plot 1 is located near to the TMP factory's Dam and plot 2 is near to the protected public forest where 21 plant species are being grown. The unique features of the forests are the ***Bonmelzar, Thiho, Taungthayet, Ingyin and Pyinkado*** which are the dominant species in the project area. The regeneration of Taungthayet trees is found everywhere in the forests.

The dominant tree species in this area are ***Albizia chinensis (Bonmelzar)*** followed by ***Oroxylum indicum (kyaungshar), Elaeocarpus ganitrus (Thiho) and Xylia xylocarpa (Pyin Ka Doe).***

5.10.4 Aim and objective

1. To collect, identify and list the plants and animals (Biodiversity data) in the area.
2. To record the dominant tree species and evaluate the vegetation types (forest type).
3. To record the animal species and determine the habitat type.
4. To collect the ecological data and evaluate the existing ecosystems in the project area.
5. To identify and record the endanger species according to IUCN Red List.
6. To record and list the Myanmar protected species in the area.

5.10.5 Material and method

5.10.5.1 Flora

5.10.5.1.1 Method

Both the floristic data and ecological data collection were conducted by the following methods in the study area.

5.10.5.1.2 Sample plotting

The Global Positioning System was used to navigate and mark the coordinates of the sample plots. In order to obtain the essential data for predicting tree species composition in the forest and vegetation types, 30x30 meter quadrants were set up. And then, tree species in the plot were collected as well as population of each species were also counted.

5.10.5.1.3 Random transecting

To achieve the representative checklists of the tree species and bamboo species, plant collection was also carried out by random transect lines along the road side and between one plot and another wherever possible. Specimen collection was done within 10 meter on each side of the transect line.

5.10.5.1.4 Materials

Materials used for recording are strings for sample plotting and transecting, digital camera for recording, wildlife night cameras , GPS, maps and field note books.

5.10.5.1.5 Data analysis

After the field survey, data entry was carried out in the excel work sheet. Analysis of population per hectare percentage was conducted using excel work 2010.

5.10.5.1.6 How to calculate for the population of individual species (per hectare)

The population of species will show not only the composition of species but also the richness of the species in the study area. The population of individual species (per hectare) is determined by following formula. (Ref: R.He'dl, M Sva'tek, M. Dancak, Rodzay A.W., M. Salleh A.B., Kamariah A.S.(2009).

$$\text{Population of Individual Species} = \frac{\text{Total Individual Species}}{\text{Total Plot Area } (m^2)} \times 10000\ m^2\ (1ha)$$

5.10.5.1.7 How to calculate for the relative density of tree species

The density of a species refers to the numerical representation of its individual and the availability of space in a unit area. The density index shows not only the richness of the texa but also the relative distribution of the individuals. According to Curtis (1959), the density index is determined by the following formula.

$$\text{Relative Density of Tree species} = \frac{\text{No. of Individual species}}{\text{Total No. of all Individual species}} \times 100$$

5.10.5.1.8 How to calculate for the relative frequency of tree species

The relative frequency of a species refers to the percentage occurrence of its individuals and shows the frequency of different species growing in the study area. The species which fall in high frequency class can be considered as the most common species in the study area. According to Curtis (1959), the relative frequency is determined by the following formula.

$$\text{Relative Frequency of tree species} = \frac{\text{No. of sample plot occurs}}{\text{Total No. of all species occurs}} \times 100$$

5.10.5.1.9 How to calculate for the species distribution by frequency class

According to Raunkiaer's Law of frequency (1934), each species was grouped into one of five frequency class (FC); Frequency range (1-20%) represents rare species, (20 - 40%) represents seldom species, (40 - 60%) represents often species, (60 - 80%) represents mostly species, and (80 - 100%) represents constantly present species. This frequency class will also clarify the homogeneity or heterogeneity of the floristic distribution in the study area.

5.10.5.1.10 How to calculate for the tree species in DBH class interval

Tree species in DBH class interval is calculated by

$$\text{Population of DBH class interval} = \frac{\text{No. of species}}{\text{Total no. of all species}} \times 100$$

Low DBH class interval shows the degraded and secondary forest height DBH class interval shows the primary forest.

5.10.5.1.11 How to calculate for the tree species in height class interval

Tree species in Height class interval is calculated by

$$\text{Population of Height class interval} = \frac{\text{No. of species}}{\text{Total no. of all species}} \times 100$$

Low height class interval shows the degraded and secondary forest and high height class interval shows the primary forest.

5.10.6 Field findings

5.10.6.1 Observation of flora

A forest inventory of 30 m x 30 m flora plots was completed by the survey team at two locations in which plot 1 is located near to the TMP Dam and plot 2 is near to the protected public forest. In order to cover up the whole area, secondary data was examined in light of habitat conditions present in the project site.

In Myanmar, there are estimated 50 threatened plant species, out of which, 18 critically endangered, 16 Endangered and 16 Vulnerable based on the classification from IUCN Red List. Native vegetation covers near to the Thantwe Marine Products Cold storage factory has been subject to a prolonged period of alteration and human activity. Timber harvesting, clearing for agriculture and plantations and livestock grazing have occurred near the project area. A list of tree species noted during the reconnaissance of each sample areas is provided in table 5.1.

Figure 5.54: Mixed Deciduous Forest located within 2 km of the Thantwae Marine Products factory

5.10.6.2 Endemic Species

Myanmar is reportedly home to over 1,071 endemic species of flora. The project area was dense forest in the past. During the field reconnaissance, the endemic ***Swintonia floribunda*** was noted. Confirmation of the presence of uncommon local endemics would require intensive potentially multi-season surveys.

5.10.6.3 Iconic Species

The main iconic floras nearby the project site are the more mature ***Swintonia spp***.

5.10.6.4 Alien Invasive Species

During the biodiversity reconnaissance, local community representatives were asked whether they had any unusual weed problems and found out any new species of plant or animal in their area. In all cases, the community representatives reported that they did not have any major weed problems, nor had they noticed any new species in their areas.

Significant invasive plant species previously reported for Myanmar include ***Prosopis spp., Acacia auriculiformis, Ageratum conyzoides, Leucaena leucocephala, Eucalyptus spp,Casurina equisetifolia, Chromolaena odorata, Hyptis suaveolens, Lantana camara, Mimosa diplotricha, Mikania micrantha, Sorghum halepense, Paspalum conjugatum, Imperata cylindrica, Echinochloa crus-galli, Eleusine indica*** and ***Pennisetum polystachion*.**

Globally threatened status of Flora species was categorized using The IUCN Red List of Threatened Species as shown in below:

Status	**Code**
Critically Endangered	(CR)
Endangered	(EN)
Vulnerable	(VU)
Near Threatened	(NT)
and Least Concern	(LC)

Source: IUCN Red List of Threatened species, Version 3.1. Accessed from www.iucnredlist.org on 01 November 2016

Table 5.29: List of tree species noted during the biodiversity survey

No	**Local Name**	**Scientific Name**	Habitat	IUCN Status
1	Sit	Albizia procera	T	NE
2	kyaung Shar	Oroxylum indicum	Medicinal plant	NE
3	Taung Panenel	Artocarpus chaplasha	T	NE
4	Nabe	Lannea coromandelica	T	NE
5	Thapyay Gyi	Syzygium grande	T	NE
6	Bone Melzar	Albizia chinensis	T	NE
7	Thi Ho	Elaeocarpus ganitrus	T	NE
8	Thityar	Shorea obtusa	T	NE
9	Kyet Yoe	Premna latifolia	T	NE
10	Yone	Annogeissus acuminata1	ST	NE
11	Thitkado	Tricoccum Allium	T	NE

12	Thitseint	Terminalia bellerica	T	NE
13	Outchinsarni	Amoora wallichii	ST	NE
14	Chin Yoke	Garuga pinnata	T	NE
15	Leza	Lagestroemia tomentosa	T	NE
16	Taungthayet	Swintonia floribunda	T	NE
17	Htein	Mitragyna parvifolia	T	NE
18	Myayar	Microcos paniculata	T	NE
19	Ngu	Cassia fistula	ST	NE
20	Pyinkado	Xylia xylocarpa	T	VU
21	Ingyin	Shorea siamensis	T	VU
Note: [1]Aq F=Aquatic Fern, Aq H= Aquatic Herb, B= Bamboo, CL= Climber, E=Epiphyte, F=Fern, G= Grass, H=Herbs, Mo=Moss, Mu=Mushroom, S=Shrubs, ST=Small Tree, T=Tree, LC = Least Concern, NE = Not Evaluated, EN = Endangered Species, VU = Vulnerable, NT = Near Threatened, DD = Data Deficient, CR = Critically Endangered				

5.10.6.5 Floristic composition

The total number of tree species collected in the flora sample plots in this area is 21 species. The dominant tree species in this area are ***Swintonia floribunda*** followed by ***Oroxylum indicum, Albizia chinensis, Elaeocarpus ganitrus, Premna latifolia and Albizia procera.***

Table 5.30: Tree species population

No	Scientific Name	No of Individual	Total no. of individual per ha	Total no. of population per ha(%)
1	*Albizia procera*	1	6	3.57
2	*Oroxylum indicum*	2	11	7.14
3	*Artocarpus chaplasha*	1	6	3.57
4	*Lannea coromandelica*	1	6	3.57
5	*Syzygium grande*	1	6	3.57
6	*Albizia chinensis*	2	11	7.14
7	*Elaeocarpus ganitrus*	2	11	7.14
8	*Shorea obtusa*	1	6	3.57
9	*Premna latifolia*	2	11	7.14
10	*Annogeissus acuminata1*	1	6	3.57
11	*Tricoccum Allium*	1	6	3.57
12	*Terminalia bellerica*	1	6	3.57
13	*Amoora wallichii*	1	6	3.57
14	*Garuga pinnata*	1	6	3.57
15	*Lagestroemia tomentosa*	1	6	3.57
16	*Swintonia floribunda*	2	11	7.14

17	*Mitragyna parvifolia*	1	6	3.57
18	*Microcos paniculata*	1	6	3.57
19	*Cassia fistula*	1	6	3.57
20	*Xylia xylocarpa*	2	11	7.14
21	*Shorea siamensis*	2	11	7.14
	Total	**28**	**156**	**100.00**

5.10.6.6 Relative Density

Among the sample plots, species density per hectare is varied and the highest density was observed the ***Swintonia floribunda***, ***Oroxylum indicum***, ***Albizia chinensis*** and followed by ***Albizia procera***, ***Artocarpus chaplasha***, ***Shorea obtusa*** and ***Cassia fistula***.This shows that these seven species are abundant in this area.

Tabel 5.31: Relative Density

No	Scientific Name	Density	Relative Density (R.D%)
1	*Albizia procera*	0.04	3.57
2	*Oroxylum indicum*	0.07	7.14
3	*Artocarpus chaplasha*	0.04	3.57
4	*Lannea coromandelica*	0.04	3.57
5	*Syzygium grande*	0.04	3.57
6	*Albizia chinensis*	0.07	7.14
7	*Elaeocarpus ganitrus*	0.07	7.14
8	*Shorea obtusa*	0.04	3.57
9	*Premna latifolia*	0.07	7.14
10	*Annogeissus acuminata1*	0.04	3.57
11	*Tricoccum Allium*	0.04	3.57
12	*Terminalia bellerica*	0.04	3.57
13	*Amoora wallichii*	0.04	3.57
14	*Garuga pinnata*	0.04	3.57
15	*Lagestroemia tomentosa*	0.04	3.57
16	*Swintonia floribunda*	0.07	7.14
17	*Mitragyna parvifolia*	0.04	3.57
18	*Microcos paniculata*	0.04	3.57
19	*Cassia fistula*	0.04	3.57
20	*Xylia xylocarpa*	0.07	7.14
21	*Shorea siamensis*	0.07	7.14

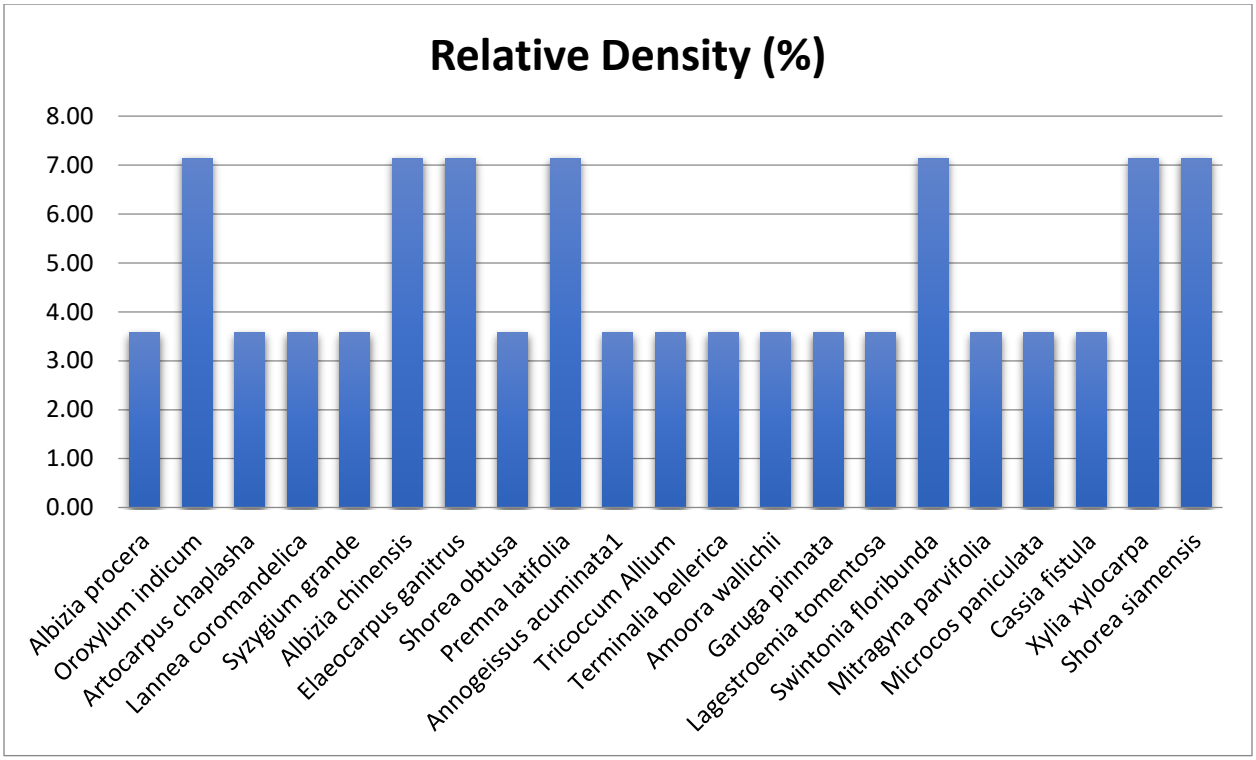


Figure 5.55 Relative Density of tree species

5.10.6.7 Relative frequency of Tree species

Relative frequency is the frequency of one species compared to the total frequency of all the species. According to the results***, Swintonia floribunda*** *(*7.14*%), **Oroxylum indicum*** *(*7.14*%)and **Albizia chinensis*** *(*7.14*%)*are high relative frequency class, followed by ***Albizia procera***, ***Artocarpus chaplasha*** and ***Shorea obtusa*** *(*3.57*%)* are equally same. Therefore, the highest frequency species and the lowest frequency species are nearly the same in the project area.

Table 5.32: Relative frequency of tree species

No	Scientific Name	Frequency (No of Sample plot occure)	Relative Frequency(%)
1	*Albizia procera*	1	50.00
2	*Oroxylum indicum*	2	100.00
3	*Artocarpus chaplasha*	1	50.00
4	*Lannea coromandelica*	1	50.00
5	*Syzygium grande*	1	50.00
6	*Albizia chinensis*	2	100.00
7	*Elaeocarpus ganitrus*	1	50.00
8	*Shorea obtusa*	1	50.00
9	*Premna latifolia*	1	50.00

10	*Annogeissus acuminata1*	1	50.00
11	*Tricoccum Allium*	1	50.00
12	*Terminalia bellerica*	1	50.00
13	*Amoora wallichii*	1	50.00
14	*Garuga pinnata*	1	50.00
15	*Lagestroemia tomentosa*	1	50.00
16	*Swintonia floribunda*	2	100.00
17	*Mitragyna parvifolia*	1	50.00
18	*Microcos paniculata*	1	50.00
19	*Cassia fistula*	1	50.00
20	*Xylia xylocarpa*	2	100.00
21	*Shorea siamensis*	2	100.00

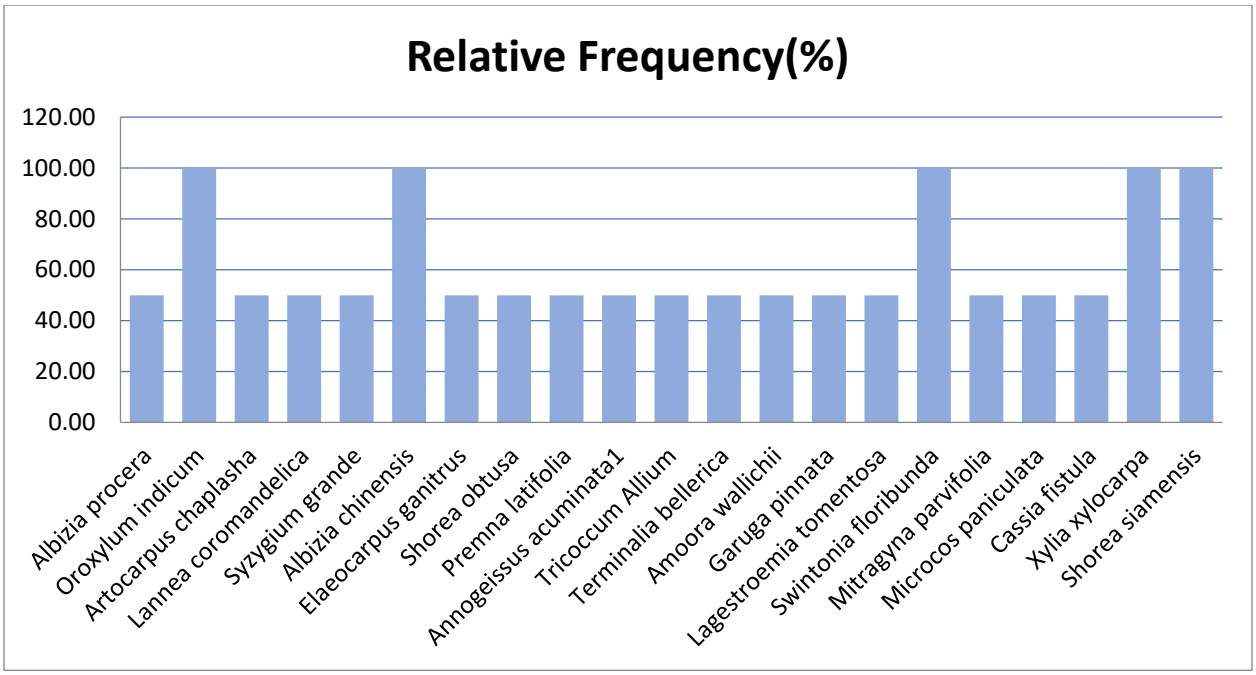


Figure 5.56: Relative Frequency of Tree Species

5.10.6.8 Species distribution by frequency class

In order to clarify the homogeneity and heterogeneity of the floristic distribution in the area, the species distribution by frequency class was examined. According to the outcome of the frequency classes, 7 species is in high frequency class and 14 species are in low frequency class. This shows that this area is floristically high degree of homogeneity.

Table 5.33: Species distribution by frequency class

Frequency Class	No. of species
1-50%	16
51-100%	5

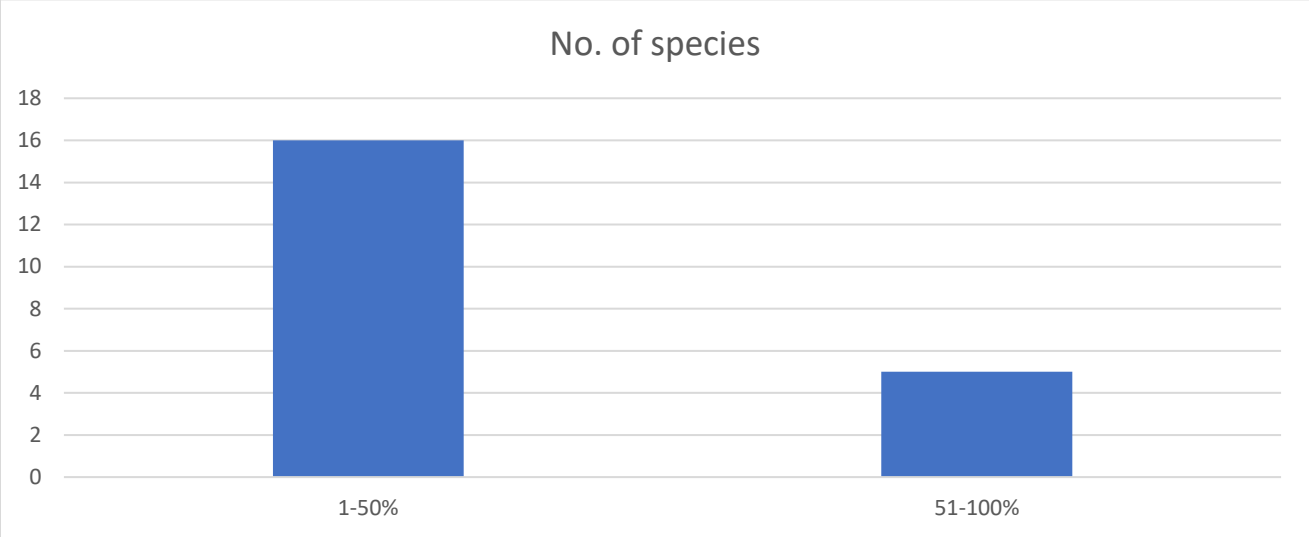


Figure 5.57: Frequency Class of Tree Species

5.10.6.9 Tree species in DBH class interval

The distribution of DBH interval class reveals that the dominant of small stem individuals in the area is 7.14% of the tree (156 trees) which are less than 40cm DBH. Large stem individuals with DBH more than 40cm are of 92.86 %. Majority of the trees are more than 40cm in girth which indicates that the forests primary types.

Table 5.34: Tree species and DBH interval class

DBH Class	No. of species	Total number of individual	% of total population
<40cm	2	11	7.14
41-60cm	3	17	10.71
61-80cm	11	61	39.29
81-100cm	5	28	17.86
>101cm	7	39	25.00
Total	28	156	100.00


Figure 5.58: Biodiversity survey (DBH measuring)

5.10.6.10 Tree species in height class interval

The distribution of Height shows that 122 individuals are less than 15 meter, comprising 78.6% and of the total population and 33 individuals are more than 15meter, comprising the 21.4%. Since most canopy height classes are less than 15m, the forests in the area could be classified as secondary forests.

Table 5.35: Tree species in height class interval

Height Class Interval	No. of species	Total number of individual	% of total population
<5m	**1**	**6**	**3.57**
6-10m	**8**	**44**	**28.57**
11-15m	**13**	**72**	**46.43**
16m	**6**	**33**	**21.43**
Total	**28**	**156**	**100.00**

Table 5.36: Vegetation in the study area

No	Sample Quadrant	Vegetation type	Latitude/ Longitude	Altitude	Dominant species
1	PQ I	Mixed Deciduous Forest	18.475453°N 94.387402°E	155 ft	***Swintonia floribunda Oroxylum indicum, Albizia chinensis, Elaeocarpus ganitrus, Premna latifolia ,Albizia procera.***
2	PQ II	Mixed Deciduous Forest	18.486483°N 94.380609°E	140 ft	

5.10.7 Field findings and observation of fauna

May 23-24, 2021 biodiversity focused on the community interviews identifying potentially 6 species of mammals, 24 species of fish, 8 species of birds and 15 species of reptiles and amphibians.

Suitable habitat for a number of these species was noted in the area; however, confirmation of the actual occurrence of these species would require extensive, multi-season investigation.


Figure 5.59: Biodiversity survey (Community Interviews)


Figure 5.60: Biodiversity survey (Camera Trapping – Plot 1)

Figure 5.61: Biodiversity survey (Camera Trapping – Plot 2)

5.10.7.1 Mammals

Protection of mammals from impacts potentially affected by the development relies on avoidance of critical habitats and implementation of designs and practices which reduce the potential project specific hazards which may impact wildlife species.

The threatened mammal species that were identified in the biodiversity site assessment and interviews included the Kway-aa (***Cuon alpinus*** – **EN**), Taw-wet (***Sus Scrofa*** – **EN*)***, Taw Kyaung (***Felis chaus* – LC*).*** Three species of Vulnerable (VU) species ***(Cervus unicolor), (Panthera pardus)*** and (***Muntiacus feae)*** were identified during the site visit and interviews.

Table 5.37: Field findings/Interviewing mammal species list during biodiversity survey

No	Local name	Scientific name	Common name	IUCN list
1	Da Yel	***Cervus unicolor***	Sambar Deer	VU
2	Kway-aa	***Cuon alpinus***	Dhole	EN
3	Gyi	***Muntiacus feae***	Fea's muntjac	VU
4	Taw Kyaung	***Felis chaus***	Jungle cat	LC
5	Kyar-thit	***Panthera pardus***	Leopard	VU
6	Taw-wet	***Sus Scrofa***	Wild boar	EN
Note: LC = Least Concern, NE = Not Evaluated, EN = Endangered Species, VU = Vulnerable, NT = Near Threatened, DD = Data Deficient, CR = Critically Endangered				

Figure 5.62: ***Cervus unicolor***

Figure 5.63: ***Cuon alpinus***

Figure 5.64: ***Muntiacus feae***

Figure 5.65: ***Felis chaus***

Figure 5.66: ***Panthera pardus***

Figure 5.67: ***Sus Scrofa***

5.10.7.2 Fish

No specific references were identified for Rakhine state and the project area; however, given the patterns of human exploitation, any species of fish present in these areas would be very vulnerable.

Fish is important food source of the local people. Two species of Near Threatened (NT) species (**Ablennes hians, Aesopia cornuta**) , twenty species of Least Concern species (**Lates calcarifer** , **Nemipterus peronii** , **Pampus argenteus** , **Pampus chinensis** , **Pangasius pangasius** , **Psettodes erumei** , **Stolephorus indicus** , **Tenualosa ilisha** , **Xenetondon cancila** , **Cirrhinus mrigala** , **Neolissochilus hexagonolepis, Notopterus notopterus, Charybdis feriata** , **Ranina ranina** , **Penaeus merguiensis** , **Penacus monodon , Loligo devauceli , Sepia aculeata, Pastinachus sephen, Octopus** and Not Evaluated (NE) two species (**Alepes djedaba *and* Auxis thazard thazard**) were identified in the project area by both field survey and the local Thandwe fish market survey..

Table 5.38: Field findings/Interviewing fish species list during biodiversity survey

No	Local name	Scientific name	Common name	IUCN list
1	Nga Phaun Yoe Gyi	Ablennes hians	Flat Needlefish	NT
2	Nga Pha Yone	Aesopia cornuta	Zebra Sole	NT
3	Pann Zinn	Alepes djedaba	Shrimp Scad	NE
4	Nga kyee kann	Auxis thazard thazard	Frigate Tuna	NE
5	Ka Ka Tit	Lates calcarifer	Giant Seabass	LC
6	Shwe Nga	Nemipterus peronii	Notchedfin Threadfin bream	LC
7	Nga Moke Phyu	Pampus argenteus	Silver pomfret	LC
8	Onn Nga Moke	Pampus chinensis	Chinese Silver pomfret	LC
9	Nga Tan	Pangasius pangasius	Yellowtail catfish	LC
10	Nga Khwaye	Psettodes erumei	Indian Spiny Turbot	LC
11	Nga Ne Tu	Stolephorus indicus	Indian Anchovy	LC
12	Nga Tha Lauk	Tenualosa ilisha	Hilsa Shad	LC
13	Nga Phaun Yoe	Xenetondon cancila	Freshwater Garfish	LC
14	Nga Gyin	Cirrhinus mrigala	Mrigal	LC
15	Nga Ni	Neolissochilus hexagonolepis	Copper mahseer	LC
16	Thin Paung Htoe	Congresox talabonoides	Indian Pike Conger	LC
17	Ga Nann	Charybdis feriata	Coral crab	LC
18	Wa Thoe lone Ga Nann	Portunus sanquinolentus	Redspot swimming crab	LC

19	Pa Zun Phyu	Penaeus merguiensis	Banana Shrimp	LC
20	Pa Zun Kyar	Penacus monodon Fabricus 1798	Giant Tiger Shrimp	LC
21	Kinn Mon	Loligo devauceli d'Orbigny, 1848	Squid	LC
22	Pyi Gyi Nga	Sepia aculeata	Needle Cuttle Fish	LC
23	Nga Leik Kyauk	Pastinachus sephen	Cowtail Stingray	LC
24	Yae Ba Wae	Octopus	Octopus	LC
Note: LC = Least Concern, NE = Not Evaluated, EN = Endangered Species, VU = Vulnerable, NT = Near Threatened				

Figure 5.68: ***Ablennes hians***

Figure 5.69: ***Aesopia cornuta***

Figure 5.70: ***Alepes djedaba***

Figure 5.71: ***Auxis thazard thazard***

Figure 5.72: ***Lates calcarifer***

Figure 5.73: ***Nemipterus peronii***

Figure 5.74: ***Pampus argenteus***

Figure 5.75: ***Pampus chinensis***

Figure 5.76: ***Pangasius pangasius***

Figure 5.77: ***Psettodes erumei***

Figure 5.78: ***Stolephorus indicus***

Figure 5.79: ***Tenualosa ilisha***

Figure 5.80: ***Xenetondon cancila***

Figure 5.81: ***Cirrhinus mrigala***

Figure 6.82: ***Neolissochilus hexagonolepis***

Figure 5.83: ***Congresox talabonoides***

Figure 5.84: ***Charybdis feriata***

Figure 5.85: ***Portunus sanquinolentus***

Figure 5.86: ***Penaeus merguiensis***

Figure 5.87: ***Penacus monodon***

Figure 5.88: ***Loligo devauceli***

Figure 5.89: ***Sepia aculeata***

Figure 5.90: ***Pastinachus sephen***

Figure 5.91: ***Octopus***

5.10.7.3 Birds

Protection of bird species from unnecessary development impacts relies on avoidance of important habitats and creation of hazards that attract or otherwise place birds at risk (e.g., contaminated waste water pits, spills, unshielded or higher risk lighting, garbage etc.)

The threatened bird species that were identified in the biodiversity site assessment and interviews identified 3 Least Concern bird species (***Passer domesticus, Gracula breligiosa, Corvous corone)*** and 2 Vulnerable bird species (***Aquila clanga, Otus sagittatus)***. And also, two Endanger species (***Pavo muticus, Columbidae colombiform*****)** and one near threatened species (***Acriditheres tristis*****)** during the survey. .

Table 5.39: Field finding/ interviewing bird species during the biodiversity survey

No	Local name	Scientific name	Common name	IUCN list
1	Daung	***Pavo muticus***	Green Peafowl	EN
2	Thein-nget	***Aquila clanga***	Greater spotted eagle	VU
3	Sar-kalay	***Passer domesticus***	House sparrow	LC
4	Zee-gwet	***Otus sagittatus***	White fronted scops owl	VU
5	Thar-li-kar	***Gracula breligiosa***	Common hill myna	LC
6	Kyi kan	***Corvous corone***	Crow	LC
7	Joe	***Columbidae colombiform***	Dove	EN
8	Zayat	***Acriditheres tristis***	N/A	NE
Note: LC = Least Concern, NE = Not Evaluated, EN = Endangered Species, VU = Vulnerable, NT = Near Threatened				

Figure 5.92: ***Pavo muticus***

Figure 5.93: ***Aquila clanga***

Figure 5.94: ***Passer domesticus***

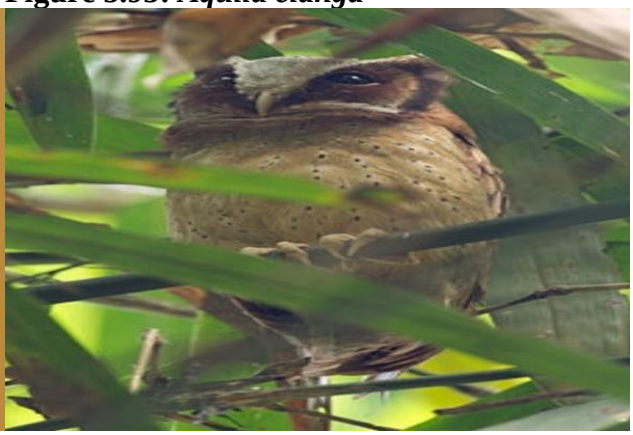


Figure 5.95: ***Otus sagittatus***

Figure 5.96: ***Gracula breligiosa***

Figure 5.97: ***Otus sagittatus***

Figure 5.98: ***Columbidae colombiform***

Figure 5.99: ***Acriditheres tristis***

5.10.7.4 Amphibians and reptiles

Most of the tortoises are being threatened to some extent by a combination of subsistence and commercial harvesting, over-collection for the pet trade, and to a lesser extent, habitat destruction. Conversion of natural vegetation to agricultural land is primarily a threat to tortoises.

The threatened amphibian and reptile species that were identified in the biodiversity site assessment and interviews included 3 Endangered Species (***Indotestudo elongate, Manouria emys and Batagur trivittata)*** and 7 Not Evaluated ***species (Clinotarsus alticola, Python reticulates, Dendrelaphis pictus, Daboia russelii, Lycodon capucinus, Xenochrophis piscator, Ptyas korros)*** 2 Vulnerable species ***(Ophiophagus hannah, Python bivittatus)*** and 3 Near Threatened species (***Limnonectes (Rana) blythii, Bufo melanostictus, Naja kaouthia).***

Table 5.40: Field finding/ interviewing amphibian and reptile species during the biodiversity survey

No	Local name	Scientific name	Common name	IUCN list
1	Kyauk-lake	***Indotestudo elongata***	Elongate tortoise	EN
2	Yae Lake	***Manouria emys***	Asian Forest Tortoise	EN
3	Kyae Lake	***Batagur trivittata***	Burmese roofed turtle	EN
4	Sar-far	***Limnonectes (Rana) blythii***	Giant river frog	NT
5	Phar Pyote	***Bufo melanostictus***	Asian Common Toad	NT

6	Far-pyan	***Clinotarsus alticola***	Assan hill frog	NE
7	Sa-ba-gyi	***Python reticulates***	Reticulated python	NE
8	Ngan-taw-gyar	***Ophiophagus hannah***	Kind cobra	VU
9	Mway-hauk	***Naja kaouthia***	Monocled cobra	NT
10	Myet-shaw	***Dendrelaphis pictus***	Painted bronzeback	NE
11	Ma-bway	***Daboia russelii***	Russels viper	NE
12	Sa-ba-own	***Lycodon capucinus***	Island wolf snake	NE
13	Burmese Sa Ba Own	***Python bivittatus***	Burmese Python	VU
14	Yay-mway	***Xenochrophis piscator***	Checkered keelback	NE
15	Lin-mway	***Ptyas korros***	Javan rat snake	NE
Note: LC = Least Concern, NE = Not Evaluated, EN = Endangered Species, VU = Vulnerable, NT = Near Threatened				

Figure 5.100: ***Indotestudo elongata***

Figure 5.101: ***Manouria emys***

Figure 5.102: ***Limnonectes (Rana) blythii***

Figure 5.103: ***Bufo melanostictus***

Figure 5.104: ***Xenochrophis piscator***

Figure 5.105: ***Python bivittatus***

5.10.8 Cultural Heritage

There are several cultural and natural heritage sites in the vicinity of Thandwe. Among of these, two historic pagodas are situated within 2 kms of the project site namely Tant Taw Mu Pagoda and Shwe San Daw pagoda.

5.10.8.1 Tant Taw Mu Pagoda

The pagoda is one of the Historical landmarks of Myanmar and is known as an important place of pilgrimage for Buddhist worshippers in the region.

Figure 5.106: Tant Taw Mu Pagoda

5.10.8.2 Shwe San Daw pagoda

Shwe Sandaw Pagoda was built in 784 AD and named after a hair relic of the Buddha enshrined within. The pagoda is located at the southern end of town near the Thandwe River.

Figure 5.107: Shwe San Daw Pagoda

Chapter 6

Impact and Risk Assessment and Mitigation Measures

6. Identification and assessment of potential environmental impacts

All potential environmental and social impacts from construction phase, operation phase and decommissioning phase are identified to develop preventive mechanisms and management plans. While short term impacts are assessed, compulsory regular monitoring and evaluation procedures by qualified independent body will address long term issues. This chapter comprises pollution types, sources, issues, affected parties, and finally, classifications of impacts. The objectives of this assessment are to assess the impacts of the Thantwe Marine Products project developments and operation on the natural environment and human beings and to develop a proper management plan which is to eliminate or reduce adverse impacts on the surrounding environment.

The impacts on the environment from various project activities can be categorized as follow;

(i) Impacts on Environmental Resource

- Impact on Air Quality
- Impact on Noise and Vibration Levels
- Impact on Surface Water Quality
- Impact on Ground Water Quality
- Impact on Soil due to solid and wastewater and Spills and leakage

(ii) Impacts on Ecological Resources

- Forest
- Wildlife
- Aquatic Animal/ Fish

(iii) Impacts on Human Environment

- Health and Safety of Workers
- Socio- economics Impacts
- Community Health and Safety

6.1 Pre-operation phase (Construction phase)

6.1.1 Impact assessment and mitigation measures for air quality

6.1.1.1 Potential impacts on air

Air quality impacts associated with construction of the TMP project included fugitive dust and emissions from fossil-fuel-fired construction equipment, open burning and temporary fuel transfer systems and associated storage tanks. Atmospheric emissions are primarily associated with emissions of combustion by-products—including carbon dioxide (CO2), sulfur dioxide (SO2), nitrogen oxide (NOx), and particulate matter (PM) —resulting from the operation of mechanized equipment or from combustion by-products.

There may also be gaseous (NO2 (Nitrogen Dioxide), CO2 (Carbon Dioxide), SO2 (Sulfur Dioxide), VOC (Volatile Organic Compounds), Methane (CH4), Ozone (O3) etc).and particle emissions including PM10, PM 2.5, from diesel generators and combustion of fuel for vehicle movements. Moreover, there would be persistent organic pollutants (POPs) by usage of pesticides. Generally, this will adversely affect localized air quality for a short period and may

lead to health risks associated with air pollution. Causes of pollutant and air emissions that would arise from the pre-operation phase of TMP project are quantified and summarized below.

- Land clearing, excavation, leveling and earth work
- Heavy construction equipment/vehicles such as diesel-powered bulldozers and loaders would be used throughout the entire construction phase
- Vehicle traffic on paved and unpaved roads
- Construction activities, concrete work
- Burning of slash materials such as hay, grass, trees, etc.
- Temporary fuel transfer systems and storage tanks have the potential to release VOC emissions
- Worker accommodation, including cooking operations

Adjacent to the construction site and along the transportation route, natural habitats and construction crew will be potentially affected.

6.1.1.2 Impact significance on air quality

a) Impact significance on air quality by particulates

The construction activities and land excavation may lead to abundant of particulate matters. As an example, the dusts from the transportation of materials, concrete particles used in construction, and cutting down and transportation of trees during land excavation.

The magnitude of impact on air quality by particulates is "***Medium***".
The area of impact is not only within the area of construction activities but also in the vicinity area according to wind direction. Therefore, the extent of the air quality impact from particulates is "***Medium***".
The period of impact occurrence is within the construction period and the duration of the impact by particulate matters is considered as "***Low***".
According to magnitude, extent and duration of the impact, the impact characteristics is "***Medium***".
Particulate matter is directly linked to potential health problems. The importance of the impact on air is considered as "***Medium***".
Therefore, the impact from particulate matters by TMP project construction is moderate and the significance of the impact is "***Medium***".

Table 6.1 Impact significance on particulates during pre-operation phase

Characteristics					
Magnitude	Extent	Duration			
2 (Medium)	2 (Medium)	1 (Low)	Equivalent Characteristics	Importance	
Characteristics = 2+2+1 = 5			2 (Medium)	2 (Medium)	Significance
			Significance = Characteristics x Importance		4 (Medium)

b)Impact significance on air quality by gas emission

Emission from machines and equipment, generator and emission from vehicles transporting construction materials would be occurred and they would affect ambient air quality during

construction of TMP project. Air quality degradation can be the main source of health effect on people.

The magnitude of impact on air quality by gas emission is "***Medium***".
The area of impact is within the area of factory compound and vicinity area. Therefore, the extent of the impact on air quality is "***Medium***".
The period of impact occurrence is within the project period and this impact affect along the working hours. The duration of the impact of gas emission is considered as "***Low***".
According to magnitude, extent and duration of the impact, the impact characteristics is set as "***Medium***".
Air quality degradation can have adverse effect on human health and can also have damage to animal life and vegetation depending on volume of emission. Therefore, the importance of the impact on air quality by gas emission is considered as "***Medium***".
Therefore, the impact of gas emission by the TMP project is moderate and the significance of the impact is "***Medium***".

Table 6.2 Impact significance on gas emission during pre-operation phase

Characteristics					
Magnitude	Extent	Duration			
2 (Medium)	2 (Medium)	1 (Low)	Equivalent Characteristics	Importance	
Characteristics = 2+2+1 = 5			2 (Medium)	2 (Medium)	Significance
			Significance = Characteristics x Importance		4 (Medium)

6.1.1.3 Mitigation measures for air quality
During the construction phase, the following mitigation measures are recommended to minimize ambient air quality impacts.

i) Construction site

- Avoid conversion of high-carbon stock areas, such as natural forest and peatlands/wetlands.
- Identify sources of on-farm GHG emissions and establish a GHG management plan that includes methods of mitigating emissions and a monitoring program.
- Reduce fossil energy use through adopting energy-efficient production and management practices.
- Fuel efficient stoves and cooking equipment shall be provided to reduce emission from food processing at the site during construction activities.
- Wind breaks should be constructed around the main construction activities and in the locality of potentially dusty works.
- Avoid excavation works in extremely dry weathers.
- Construction materials on site to be covered to prevent to be blown off by wind.
- Prohibit open burning of any waste at project site.

ii) Stockpiles

- Stockpiling of material, for example, rocks, sand and soils should be minimized.
- Stockpiles should be located as far away from receptors as possible.
- Vegetation of stockpiles should be used where a stockpile is not to be used for a month to stabilize the surface and prevent dust generation.
- Pave, apply water when necessary, or apply (non-toxic) soil stabilizers on all unpaved access roads, parking areas and staging areas at construction sites.
- Visual monitoring of dust deposition onto surfaces on and off-site should be regularly conducted.

iii) Soil Management

- Protect soils from the loss of organic matter by implementing good soil conservation management practices.
- Maintain and rehabilitate degraded areas and vegetative buffer zones to increase carbon stocks.
- Soil erosion and dust control management measures also assist in the management of air pollution from construction operations.

iv) Transportation

- Air pollution from vehicles shall be minimized by using low emission equipment and vehicles.
- Ensure that all construction equipment and vehicles are maintained in accordance with the manufacture's recommendations.
- Turn equipment off when not in use.
- Vehicle idling time shall be minimized.
- Minimizing the movement of vehicles and construction machineries particularly outside the premise of the project site to avoid further destruction.
- Ensure strict enforcement of on-site speed limit regulations.
- Sprinkle water on graded access routes when necessary to reduce dust generation by construction vehicles.

After mitigation measure, the impact on air quality will become less significant.

Table 6.2.1 After mitigation measures, impact significance on air quality during pre-operation phase

Characteristics					
Magnitude	Extent	Duration			
1 (Low)	1 (Low)	1 (Low)	Equivalent Characteristics	Importance	
Characteristics = 1+1+1 = 3			1 (Low)	2 (Medium)	Significance
			Significance = Characteristics x Importance		2 (Low)

6.1.2 Impact assessment and mitigation measures for noise and vibration level

6.1.2.1 Potential impacts on noise and vibration

The construction works on site will most likely result in noise nuisance and vibration due to mobilization and operation of construction machines (mixers, tippers, cranes, backhoe), incoming vehicles to deliver construction materials, and communicating workers.
Construction noise levels are rarely steady in nature, but instead fluctuate depending on the number and type of equipment in use at any given time. There would be times when no large equipment is operating and noise would be at or near ambient levels.
Earthworks, pounding and impacting, shouting, loud radios, foundation and other normal construction activities all cause noise and vibration. Construction noise impact is short-term to local ambient noise quality. Noise and vibration would affect natural vegetation, animals, workforce, and communities in the areas.

Noise impacts would be considered significant if the project would result in the following:

- Exposure of person to, or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.
- Exposure of person to, or generation of, excessive ground-borne vibration or ground-borne noise levels.
- A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project. A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project.

6.1.2.2 Impact significance on noise and vibration

Noisy activities on construction sites include use of jackhammers, dump trucks, cement mixers, cement cutters, electric saws, tamping machines and welding machines, as well as noise and vibration generated from hand tools such as sledgehammers and drills. The magnitude of impact from noise and vibration is "***Medium***".
The area of impact is not only within the project area but also in the vicinity area. Therefore, the extent of the impact on noise and vibration is "***Medium***".
The period of impact occurrence is within the construction period. The construction workers and people in the vicinity area have impact from noise and vibration of the proposed project and the duration of the impact from noise and vibration are considered as "***Low***".
According to magnitude, extent and duration of the impact, the impact characteristics is "***Medium***". Loud and persistent noise can have adverse effect on human health and can also disturb to animal life and vegetation depending on time and intensity. The importance of the impact is "***Medium***".
Therefore, the impact noise and vibration by the TMP project will be medium during the construction and the significance of the impact is "***Medium***".

Table 6.3 Impact significance on noise and vibration during pre-operation phase

Characteristics					
Magnitude	Extent	Duration			
2 (Medium)	2 (Medium)	1 (Low)	Equivalent Characteristics	Importance	
Characteristics = 2+2+1 = 5			2 (Medium)	2 (Medium)	Significance
			Significance = Characteristics x		4 (Medium)

	Importance	

6.1.2.3 Mitigation measures for noise and vibration

During TMP project construction, the following mitigation measures are recommended to minimize noise and vibration impact on individuals, sensitive areas and livestock.

- Locate noisy machines as far away from receptors as practicable.
- Orientate equipment known to emit noise strongly in one direction so that the noise is directed away from receptors as far as practicable.
- Use quiet equipment (i.e. equipment designed with noise control elements)
- Careful handling of material loading and unloading.
- Ensure use of silencers or mufflers on heavy construction equipment engines.
- Turn equipment off when not in use.
- Taking consideration to be careful sequencing and scheduling times.
- Schedule noisy construction activities and transportation during day-time hours.
- Combine noisy operations at the same time, but avoid combination of vibration.
- Provide PPE particularly hearing protection devices for those working in noisy areas.
- Construction machinery and vehicles shall undergo periodic maintenance to keep them in good working condition.
- Limit pickup trucks and other small equipment to an idling time of five minutes, observe a common-sense approach to vehicle use, and encourage workers to shut off vehicle engines whenever possible.
- Perform regular inspection and maintenance of preparation vehicles and equipment.
- Construction activities must be carried out in such a way that vibrations arising shall not cause damage to adjacent structures, residents and passers-by.
- Apply noise and vibration control technologies along with silencers or mufflers in waste compactor and construction machineries.
- Design construction activities to reduce vibration.
- Maximizing the distance between the source and receiver.
- Mechanically isolate the vibrating source or surface to reduce exposure.
- Faulty tools should not be used and tools should be maintained properly. Tools which are worn, blunt or out of alignment will vibrate more.
- Ensure that construction machines, equipment and vehicles are well maintained to avoid excessive vibration.
- Maintaining wheels of vehicles and rail smoothness for transportation.
- Specifying vehicles with low unsprung weight, soft primary suspension, minimum metal-to-metal contact between moving parts of the truck, and smooth wheels.
- Install vibration damping seats.
- Perform regular inspection and maintenance of vehicles.
- Limit vehicles to an idling time and shut them off whenever possible. Schedule transportation during day-time hours.
- Preventing workers from the effects of vibration by selecting appropriate vehicles and tool, by using of appropriate vibration-absorbing materials (in gloves, for example) and by providing good work practices with education programs.
- Training to workers is necessary to control exposure eg, selection, use, maintenance of equipment and restriction of duration of exposure.

- Limit the time spent by workers on a vibrating surface.
- Provide appropriate PPE to workers for those working in vibrating areas.
- Schedule work to reduce adverse effects.
- Consider and employ vibration monitoring and measurements if appropriate.
- Notify nearby residents and property owners that vibration-generating activity is imminent.
- Monitor and record vibration from the project activity.
- Respond to and investigate complaints by nearby community.

After mitigation measure, the impact on noise and vibration will become less significant.

Table 6.3.1 After mitigation measures, impact significance on noise and vibration during pre-operation phase

Characteristics					
Magnitude	Extent	Duration			
1 (Low)	1 (Low)	1 (Low)	Equivalent Characteristics	Importance	
Characteristics = 1+1+1 = 3			1 (Low)	2 (Medium)	Significance
			Significance = Characteristics x Importance		2 (Low)

6.1.3 Impact assessment and mitigation measures for water quality

6.1.3.1 Potential impacts on water quality

In pre-operation phase, removal of vegetation, top soil level and ground surface for the plantation facilities and labours camps can cause sedimentation, and erosion to the nearby water courses. Sedimentation as a result of the erosion would reduce to water clarity and quality. In addition, potential sources of impacts to water during the construction phase include:

- Clearing land for pre-operation purposes
- Constructing landforms that change water flow paths
- Increased water demand during construction phase for site preparation, dust spraying, construction activities, curing, domestic and other water requirements for labor and staff onsite.
- Improper solid waste and wastewater management in the construction site
- Improper wastewater disposal from cleaning vehicles and equipment and
- Poor sanitation facilities that may result into surface water pollution through improper sewage management.
- Leaks from on-site power generation facilities
- Chemicals/Oil spills from the storage, use of diesel and hazardous materials such as inorganic fertilizers and pesticides that lead to contamination of water resources
- Release of suspended soil to the water flows and soil erosion
- Increased risk of flooding as sediment loading also reduces storage and flow capacities of streams, lakes, and reservoirs; may adversely affect water supplies.

6.1.3.2 Impact significance on water quality

a) Impact significance on surface water quality

The magnitude of the impact of physical, chemical and biological result of the surface water is considered as "***Medium***".

The extent of impacts are considered as "***Medium***" level.

The period of potential impact duration can be short-term duration. The duration of the impact for surface water is set as "***Low***".

Therefore, the characteristic of surface water impact by TMP factory during pre-operation phase is rated as "***Medium***".

The impact is expected to cause some disturbances potentially affecting communities locally and surrounding water bodies. The importance of the impact on surface water is set as "***Medium***". The significant rating of impact is set as "***Medium***".

Table 6.4 Impact significance on surface water during pre-operation phase

Characteristics					
Magnitude	Extent	Duration			
2 (Medium)	2 (Medium)	1 (Low)	Equivalent Characteristics	Importance	
Characteristics = 2+2+1 = 5			2 (Medium)	2 (Medium)	Significance
			Significance = Characteristics x Importance		4 (Medium)

b) Impact significance on ground water quality

The magnitude of the impact on ground water during construction phase is considered as "***Medium***". The area of impact is not only within the area of construction activities but also in the vicinity area. The extent of impact on ground water is set as "***Medium***".

The period of potential impact duration can be short-term. The duration of the impact for ground water is "***Low***".

Therefore, the characteristic of ground water impact by the proposed project is rated as "***Medium***".

The impact is expected to cause some disturbances potentially affecting communities locally and surrounding water bodies. The importance of the impact on ground water is set as "***Medium***".

The significant rating of impact is "***Medium***".

Table 6.5 Impact significance on ground water during pre-operation phase

Characteristics					
Magnitude	Extent	Duration			
2 (Medium)	2 (Medium)	1 (Low)	Equivalent Characteristics	Importance	
Characteristics = 2+2+1 = 5			2 (Medium)	2 (Medium)	Significance
			Significance = Characteristics x Importance		4 (Medium)

6.1.3.3 Mitigation for water resources

The pre-operation phase of TMP factory does generate insignificant amount of wastewater that bring damage to the surface and ground water sources and soils.

The following mitigation measures should be practiced and used to reduce potential impacts for water resources from construction.

- Limit water withdrawal to the amount that shall not adversely affect the groundwater balance and the demand of the local community by developing and conserving own source of water.
- Implement road drainage system and smooth road to limit erosion.
- Promptly detect and repair of water pipe and tank leaks.
- Ensure taps are not running when not in use.
- Promote recycling and reuse of water as much as possible.
- Proper recycling of water from other uses for sprinkling dusty pavements.
- Provide measures to prevent the washing away of construction materials, soil, silt or debris into any drainage system of open stockpiles of construction materials.
- Open stockpiles of construction materials or construction wastes on-site should be covered with tarpaulin or similar fabric during rainstorms.
- All chemicals, paint, and fuel containers shall be properly sealed and rigorous spill prevention mechanisms shall be employed.
- Hazardous-materials handling procedures to reduce the potential for a spill during construction, and shall include an emergency response program to ensure quick and safe cleanup of accidental spills.
- Conducting regular training, monitoring, and inspection schemes together with keeping track of water uses minimizes waste and leaks from faulty connections and faucets.
- Soil erosion and sediment control mechanisms will add positive effects on mitigation matters for water pollution.

After mitigation measure, the impact on water quality will become less significant.

Table 6.5.1 After mitigation measures, impact significance on water quality during pre-operation phase

Characteristics					
Magnitude	Extent	Duration			
1 (Low)	1 (Low)	1 (Low)	Equivalent Characteristics	Importance	
Characteristics = 1+1+1 = 3			1 (Low)	2 (Medium)	Significance
			Significance = Characteristics x Importance		2 (Low)

6.1.4 Impact assessment and mitigation measures for soil quality

6.1.4.1 Potential impacts on soil quality

During pre-operation phase, it may cause impact to soil system and its quality due to soil erosion, clearing and preparation of project area. Earth moving, excavation activities and construction of infrastructures would affect the natural surface flow regime of water.

Improper disposal of the excavated earth during installation of structures/equipment may result into temporary loss of topsoil of that particular area. Further, clearing of vegetation and scarifying the site of topsoil with soil compaction during site preparation will result in reduced capacity of the land to retain water and increase surface water run-off during periods of rainfall. Accidental spillage of construction materials/chemicals during handling and leakage from the storage area may lead to soil contamination.
Physical and chemical degradation of soils may result from unsuitable management techniques, such as use of inappropriate machinery or earthworks, and infrastructure development.

6.1.4.2 Impact significance on soil quality

In construction period, it may cause impact to soil system because the existing soil and vegetation had to be removed and consequently soil erosion can take place.
The magnitude of impact on soil quality is "***Medium***".
The area of impact can be within 2 km radius of proposed project area. Therefore, the extent of the impact on soil quality and structure is "***Medium***".
The period of impact occurrence will be remained after the project period and the duration of the impact on soil quality and structure is considered as "***Medium***".
According to magnitude, extent and duration of the impact, the impact characteristic is rated as "***Medium***".
The importance of the impact is considered as "***Medium***".
Therefore, the impact on soil quality and structure by the TMP project during construction of the factory and roads is medium and the significance of the impact is **"*Medium*".**

Table 6.6 Impact significance on soil quality and structure during pre-operation phase

Characteristics					
Magnitude	Extent	Duration			
2 (Medium)	2 (Medium)	2 (Medium)	Equivalent Characteristics	Importance	
Characteristics = 2+2+2 = 6			2 (Medium)	2 (Medium)	Significance
			Significance = Characteristics x Importance		4 (Medium)

6.1.4.3 Mitigation measures for soil

Mitigation measures should be applied to minimize soil pollution and waste management impacts of a project depending upon site and project-specific conditions. Many impacts can be reduced or avoided when considered during the design and construction phase. The following mitigation measures should be used.

- All chemicals, paint, and fuel containers shall be properly sealed and rigorous spill prevention mechanisms shall be employed. Spills must be immediately treated to stop subsequent soil pollution.
- Careful planning to establish work zones, defining phases of construction, and active management of daily activities shall be employed to minimize soil disturbance during the construction phase.

- The project area shall be divided into smaller sectors and vegetation from the smaller sectors shall be cleared sequentially to minimize soil exposure during construction.
- When required, topsoil shall be carefully removed and saved for reuse.
- Frequent water sprinkling and appropriate scheduling for truck and heavy equipment movements shall also be arranged throughout the construction period.
- A waste management plan (WMP) starting from waste reduction, waste separation, proper waste collection and transportation for the project should be developed that sets out plans and actions for construction wastes.
- Hazardous-materials handling procedures to reduce the potential for a spill during construction, and shall include an emergency response program to ensure quick and safe cleanup of accidental spills.
- Avoiding heavy machinery usage.
- Minimize soil compaction, damage, or disturbance by using appropriate land preparation machinery at the right time of year.
- Considering erosion management practices.
- Avoid clearing of primary forest and implementing conservation buffer.

Table 6.6.1 After mitigation measures, impact significance on soil quality and structure during pre-operation phase

Characteristics					
Magnitude	Extent	Duration			
1 (Low)	1 (Low)	1 (Low)	Equivalent Characteristics	Importance	
Characteristics = 1+1+1 = 3			1 (Low)	2 (Medium)	Significance
			Significance = Characteristics x Importance		2 (Low)

6.1.5 Impact assessment and mitigation measures for waste disposal

6.1.5.1 Potential impacts by waste disposal

The construction activities generate substantial amounts of solid wastes including excavated materials from the earth work, bricks, concrete and other masonry materials, rock, wood, paints, treated and coated wood and wood products, land clearing debris and plaster.

In addition, lubricants and petroleum wastes, containers, cement paper bags and other packaging materials, scrap metal, glass, plastic containers and food remains shall be created due to the construction activities. Filth generation can occur if waste/garbage generated during construction period is not handling.

6.1.5.2 Impact assessment on waste disposal

In construction phase of TMP project, the magnitude of waste during construction phase is "***Medium***".

The area of impact may be outside the safety zone. Therefore, the extent of the impact by waste during construction phase is set as "***Medium***".

The period of impact occurrence is within pre-operation phase and the duration of the impact by waste is considered as "***Low***".

According to magnitude, extent and duration of the impact, the impact characteristics is "***Medium***". The importance of the impact is considered as "***Medium***".

Therefore, waste impact by TMP project during construction phase is medium and the significance of the impact is considered as "***Medium***"

Table 6.7 Impact significance on waste disposal during pre-operation phase

Characteristics					
Magnitude	Extent	Duration			
2 (Medium)	2 (Medium)	1 (Low)	Equivalent Characteristics	Importance	
Characteristics = 2+2+1 = 5			2 (Medium)	2 (Medium)	Significance
			Significance = Characteristics x Importance		4 (Medium)

6.1.5.3 Mitigation measures for waste disposal

Mitigation measures should be applied to reduce hazardous materials and waste management impacts of a project depending upon site and project-specific conditions. Many impacts can be reduced or avoided when considered during the design and construction phase. The following mitigation measures should be used for proper waste disposal.

- Use of durable, long-lasting materials that will not need to be replaced as often, thereby reducing the amount of construction waste generated over time.
- Construction materials shall be managed in a way to avoid over-ordering, poor storage and maintenance, mishandling as well as improper operation procedures.
- Construction wastes shall be separated into reusable items and materials to be disposed of or recycled whenever possible.
- Waste suitable for reuse shall be stored on site and reintroduced to the construction process as and when required.
- Provision of facilities for proper handling and storage of construction materials to reduce the amount of waste caused by damage or exposure to the elements.
- A hazardous waste management system covering waste classification, separation, collection, storage, transfer and disposal should be set up and operated. The waste management system shall comply with applicable regulation of the government, if any, or in its absence, good international practice.
- The waste management plan shall identify disposal routes (including transport options and disposal sites) for all wastes generated during the construction phase.
- Hazardous waste shall be stored in such a way as to prevent and control accidental release to the environment (e.g. secondary containment, sealed containers).
- Carefully select less hazardous materials and use the necessary amount only.
- Establish a designated hazardous waste collection site and make it secure.
- Do not clean the used hazardous material containers and mix wastes.
- Recyclables such as scrap steel, metals, plastics, and paper items shall be collected for recycling wherever possible.
- Packaging materials, cans, and containers would be hauled back to manufactures for reuse in next shipments where economically feasible. Or sell back in local in which these shall be recycled or reused for other commercial use.

- Use of building materials that have minimal packaging to avoid the generation of excessive packaging waste.
- Use of plastic bags shall be discouraged and explained to the workforce and local communities.
- Disposal of construction waste in or off the construction site should be prohibited.
- Prohibit open burning of any waste at project site.
- Regular collection times shall be arranged to prevent overflow in waste collection bins.
- Chain of custody documents should be used for construction waste to monitor disposal.
- Waste segregation should be practiced at the workers camps with an emphasis placed on reducing, reusing and recycling of waste streams as appropriate.

After mitigation measure, the impact on waste disposal will become less significant.

Table 6.7.1 After mitigation measures, impact significance on waste disposal during pre-operation phase

Characteristics					
Magnitude	Extent	Duration			
1 (Low)	1 (Low)	1 (Low)	Equivalent Characteristics	Importance	
Characteristics = 1+1+1 = 3			1 (Low)	2 (Medium)	Significance
			Significance = Characteristics x Importance		2 (Low)

6.1.6 Impact assessment and mitigation measures for ecological resources

6.1.6.1 Potential Impact on Forest

Development of TMP in the forest will have negative impact on forest ecosystem and biodiversity.

Land excavation for construction of factory compound including roads will seriously impact on forest and nearby environment.

Construction and land development would cause direct impact on forest by following concerns:

- Forest fragmentation
- Habitat fragmentation causing biodiversity loss
- Inhibiting wildlife movement

Construction and land development would cause indirect impact on forest by following concerns:

- Air pollution
- Water pollution
- Soil pollution

Moreover, noise pollution can disturb the natural cycles of animals.

6.1.6.2 Impact assessment on Forest

In pre-operation phase of TMP factory, the magnitude of activities such as land excavation, construction of infrastructures and roads would be "***High***".

The area of impact would be beyond factory compound. Therefore, the extent of the impact on forest during pre-operation phase is set as "***Medium***".
The period of impact occurrence will be remained after construction period and the ***duration*** of impact on the forest is considered as "***High***".

According to magnitude, extent and duration of the impact, the impact characteristics is rated as "***High***". The importance of the impact is considered as "***High***".
Therefore, impact on the forest by TMP factory during construction phase is high and the significance of the impact is considered as "***High***".

Table 6.8 Impact significance on forest during pre-operation phase

Characteristics					
Magnitude	Extent	Duration			
3 (High)	2 (Medium)	3 (High)	Equivalent Characteristics	Importance	
Characteristics = 3+2+3 = 8			3 (High)	3 (High)	Significance
			Significance = Characteristics x Importance		9 (High)

6.1.6.3 Mitigation measures for forest during pre-operation phase

i) Air Pollution

- ***Prohibit open burning*** for all type of wastes including forest residues.
- Using ***renewable or sustainable*** materials.
- Using ***local materials***, whenever possible, to avoid transportation for long distance.
- Using ***greener fuel source*** such as low sulphur diesel to power equipment and vehicles.
- Limit and keep records for ***fuel usage*** and develop ***emergency management plan*** for any incidents.
- Provide ***fugitive dust suppression*** such as using water sprays or sprinklers to control dust and prevent from spreading.
- Using properly ***taped or sealed containers***.

ii) Water Pollution

- Keep ***construction materials*** such as sand or cement ***secure***.
- ***Prevent*** materials, fuel and chemicals being ***washed into waterways or drains***, and ***cover up*** all drains.
- Keep ***construction site and road clean at all times*** in order to prevent silt and other pollutants ***running off into any bodies of water***.
- Provide ***proper drainage system*** and enable a ***strong drain protection***.
- Using ***rock or other appropriate materials*** to ensure the ***storm drain to filter out*** trash and debris.
- Keep ***clean and maintain filters*** regularly.
- Properly ***collect and treat any wastewater***.
- Improve ***management and disposal of site wastes*** including forest residues.

iii) Noise Pollution

- Use ***quiet equipment and techniques*** to manage noise pollution.
- If possible, use ***modern construction equipment*** which is designed to reduce noise.
- Put ***movable noise barriers*** in place to manage the levels of noise pollution.
- Ensure ***equipment and vehicles*** are properly ***maintained and operated.***

iv) Soil Pollution

- Ensure ***erosion control measures*** and apply measures to ***stabilize the soil***.
- Apply ***sediment control practices*** before site grading starts.
- Ensure ***the soil is not exposed for long time*** during construction period.
- Provide ***containment*** and ***safe equipment fuelling***.
- ***Identify and protect areas where existing vegetation***, such as trees, will not be disturbed.
- ***Protect streams, stream barriers, wild wood lands, wetlands, or other sensitive areas*** from any disturbance.
- Using ***concrete washout facilities***, especially when construction activities are near water resources.
- Adopt ***eco -friendly house keeping practices*** during construction period by using bio-degradable products.
- Develop ***waste segregation and recycling***.
- ***Protect and provide Vegetative Buffers*** along water bodies which slow and filter the storm water run-off.
- ***Vegetate and stabilize all exposed areas*** as soon as ***land alterations have been completed***.
- ***Law enforcement***, ***restrictions and notifications*** for ***illegal tree cutting, animal hunting*** or ***poaching*** in the forest by the workers, villagers and community living in the vicinity of project area.

After mitigation measure, the impact on the forest will become less significant.

Table 6.8.1 after mitigation measures, impact significance on forest during pre-operation phase

Characteristics					
Magnitude	Extent	Duration			
1 (Low)	1 (Low)	2 (Medium)	Equivalent Characteristics	Importance	
Characteristics = 1+1+2 = 4			2 (Medium)	1 (Low)	Significance
			Significance = Characteristics x Importance		2 (Low)

6.1.7.1 Potential Impact on Wildlife

Development of TMP factory cause negative impacts on wildlife by ***habitat destruction, habitat fragmentation and habitat degradation*** due to construction processes, pollution, invasive species, and disruption of ecosystem. Various activities during construction period cause a serious threat to wildlife at the construction site. ***Badgers, bats, great crested newts, and birds*** are the most commonly affected species.

Onsite and off-site disturbance to wildlife are as follows:

- Pollution of air, water and soil
- Noise
- Disturbances to the natural behavior of wildlife
- Risk of fire

6.1.7.2 Impact assessment on Wildlife

In pre-operation phase of TMP factory, the magnitude of activities such as land excavation, construction of infrastructures and roads is considered "***High***".
The area of impact may be beyond the factory area. Therefore, the extent of the impact on wildlife during pre-operation phase is set as "***Medium"***.
The period of impact occurrence will be remained after pre-operation period and the duration of the impact on the wildlife is considered as "***Medium***".

According to magnitude, extent and duration of the impact, the impact characteristics is rated as ***"High***". The importance of the impact is considered as "***Medium***".
Therefore, impact on the wildlife by TMP factory during construction phase is medium and the significance of the impact is considered as "***Medium***"

Table 6.9 Impact significance on wildlife during pre-operation phase

Characteristics					
Magnitude	Extent	Duration			
3 (High)	2 (Medium)	2 (Medium)	Equivalent Characteristics	Importance	
Characteristics = 3+2+2 = 7			3 (High)	2 (Medium)	Significance
			Significance = Characteristics x Importance		6 (Medium)

6.1.7.3 Mitigation measures for wild life during pre-operation phase

i) Avoiding Sensitive Areas

Identifying wildlife species and construction plans formulated accordingly.

- Identifying areas where the most vulnerable species are known to occur.
- Identifying areas inhabited by species requiring large tracts of habitat.
- Identifying areas inhabited by species with low reproductive pedigree.

Construction and development activities in the following types of areas should generally be avoided.

- Areas where key habitats would suffer a direct impact, leading to a ***complete loss of habitat and damage to the abundance, distribution, and diversity of species*** present.
- Areas which would suffer indirect impact in the form of ***increased ecological imbalance and stress***.
- Areas where in construction activities impact ecological quality and reduce its ability to support ***migration and genetic exchange of wild species***.

ii) Restoring and Enhancing the Habitats

- Restore and link together existing habitats and land features which could support wildlife.
- Compensate for damage to natural habitats by recreating similar features, restoring, and improving the surrounding landscape.
- Creation of new or additional buffer areas to reduce impacts.
- Manage and monitor restoration and compensating measures to fulfill the needs of existing flora and fauna.

iii) Preventing environmental Pollution

Strictly follow the prevention and mitigation measures for air, water and soil pollution which are stated in respective sectors including the followings:

- Establishing effective Waste Management Plan and train employees to follow waste segregation and proper disposal.
- Prohibit open burning of any wastes on site.
- Proper storage of chemicals and comply with Emergency Response Plan if any incident occurs.

After mitigation measure, the impact on the wildlife will become less significant.

Table 6.9.1 after mitigation measures, impact significance on wildlife during pre-operation phase

Characteristics					
Magnitude	Extent	Duration			
1 (Low)	1 (Low)	2 (Medium)	Equivalent Characteristics	Importance	
Characteristics = 1+1+2 = 4			2 (Medium)	1 (Low)	Significance
			Significance = Characteristics x Importance		2 (Low)

6.1.8.1 Potential Impact on Aquatic animal/ fish

Development of TMP factory in the forest will have negative impact to aquatic animal/ fish by altering forest ecosystem leading biodiversity loss.

Construction of factory, roads and land excavation will seriously impact on aquatic animal/ fish.

Factory development will negatively impact on the aquatic animal/ fish by following concerns:

- Air and Water pollution
- Soil pollution and soil erosion
- Improper waste management
- Introducing synthetic chemicals
- Contamination of hazardous materials by leakage or improper handling
- Fishing by the workers of the project, villagers and community living in the vicinity of project area.

6.1.8.2 Impact assessment on aquatic animal/ fish

In pre-operation phase of TMP factory, the magnitude of activities such as land excavation, construction of infrastructures and roads is "***Medium"***.

The area of impact may be outside the factory area. Therefore, the extent of the impact on aquatic animals during pre-operation phase is set as "***Medium***".
The period of impact occurrence will be remained after pre-operation period and the duration of the impact on the aquatic animal/ fish is considered as "***Medium***".

According to magnitude, extent and duration of the impact, the impact characteristics is rated as "***Medium***". The importance of the impact is considered as "Medium".
Therefore, impact on the aquatic animal/ fish by TMP factory during construction phase is medium and the significance of the impact is considered as ***"Medium"***

Table 6.10 Impact significance on aquatic animal/ fish during pre-operation phase

Characteristics					
Magnitude	Extent	Duration			
2 (Medium)	2 (Medium)	2 (Medium)	Equivalent Characteristics	Importance	
Characteristics = 2+2+2 = 6			2 (Medium)	2 (Medium)	Significance
			Significance = Characteristics x Importance		4 (Medium)

6.1.8.3 Mitigation measures for aquatic animal/ fish during pre-operation phase

i) Avoiding Sensitive Areas

Identifying aquatic animal species and construction plans formulated accordingly.

- Identifying areas where the most vulnerable species are known to occur.
- Identifying areas inhabited by species with low reproductive pedigree.

ii) Preventing environmental Pollution

Strictly follow the prevention and mitigation measures for air, water and soil pollution which are stated in respective sectors including the followings:

- Using ***cleaner and environmental friendly products*** for various purposes of construction phase.
- Prevention, management and establishing monitoring system for ***soil erosion***.
- Proper ***storage of chemicals*** and comply with ***Emergency Response Plan*** if any incident occurs.
- Establishing ***sedimentation pond/basin*** which will prevent the polluted water pass to the river directly.
- Establishing effective ***Waste Management Plan*** and train employees to follow waste segregation and proper disposal.
- ***Law enforcement, restrictions and notifications for fishing*** in the forest by the workers, villagers and community living in the vicinity of project area.

After mitigation measure, the impact on the aquatic animal/ fish will become less significant.

Table 6.10.1 after mitigation measures, impact significance on aquatic animal/ fish during pre-operation phase

Characteristics				
Magnitude	Extent	Duration		
1 (Low)	1 (Low)	2 (Medium)	Equivalent Characteristics	Importance

Characteristics = 1+1+2 = 4	2 (Medium)	1 (Low)	Significance
	Significance = Characteristics x Importance		2 (Low)

6.1.9 Impact assessment and mitigation measures on human environment

6.1.9.1 Impacts on occupational health and safety

During Pre-operation phase of TMP project, there will be

- Construction of the factory
- Construction of the access roads

Occupational health and safety (OHS) issues associated project include the following:

- Physical hazards
- Operational and workplace hazards
- Machinery and vehicles
- Confined and restricted space entry
- Risk of fire and explosion
- Biological Hazards
- Chemical hazards

Thus, it is expected that construction workers are likely to have accidental injuries and hazards as a result of accidental occurrences, handling of hazardous waste, lack or negligence of the use of protective wear etc.

Significant hazards can be occurred due to the potential fall of materials or tools as well as temporary hazards such as physical hazards, dust emission and noise pollution. Moreover, accidents and injuries to workers can be caused by the heavy vehicle movement for the transport of construction materials and equipment. Workers are also likely to be exposed to diseases from contact with potentially harmful building materials and other communicable/ infectious diseases including TB, Diarrhea, dysentery etc.

A potential social impact both during construction and operation of the project will be on the occupational health and Safety of the staff.

Mitigation measures are described in the next sections and on their working conditions. Before the construction activities, there is need for the materials to be well inspected and harmonized to the occupational health and safety standards.

6.1.9.2 Impact significance on occupational health and safety

The impact on health and safety and the magnitude of impact during pre-operation phase of the TMP project is "***Medium***".

The impact of the project can affect health and safety of the workers and the extent of the impact is "***Medium***".

The period of impact occurrence is within the pre-operation phase and the duration of the impact is considered as "***Low***".

According to magnitude, extent and duration of the impact, the impact characteristics is "***Medium***". The importance of the impact is considered as "***Medium***".

Therefore, the impact on occupational health and safety by TMP project is medium and the significance of the impact is "***Medium***".

Table 6.11 Impact significance on occupational health and safety during pre-operation phase

Characteristics					
Magnitude	Extent	Duration			
2 (Medium)	2 (Medium)	1 (Low)	Equivalent Characteristics	Importance	
Characteristics = 2+2+1 = 5			2 (Medium)	2 (Medium)	Significance
			Significance = Characteristics x Importance		4 (Medium)

6.1.9.3 Mitigation measures for occupational health and safety

The project shall implement the following mitigation measures for Occupational Health and Safety:

- Suitable overalls, safety footwear, dust masks, gas masks, respirators, gloves, ear protection equipment etc. should be made available and construction personnel must be trained to use the equipment.
- Necessary health and safety rules shall be enforced by the site foreman to ensure that all staff members adhere to the standards and are thus safe.
- All workers shall be provided with personal protection equipment (PPE) and shall be obliged to wear them in work zones.
- Training to personnel shall be imparted to generate awareness about effects of noise and importance of using PPEs.
- Adequate collection and storage of waste on site and safe transportation to the disposal sites and disposal methods at designated areas shall be provided.
- Particular works shall strictly follow work permit scheme.
- Promote safe and healthy working environment, health, and well-being of all employees.
- Implement all necessary measures to ensure health and safety of workers.
- Preventing workers from the effects of vibration by selecting appropriate vehicles and tool, by using of appropriate vibration-absorbing materials (in gloves, for example) and by providing good work practices with education programs.
- Training to workers is necessary to control exposure. E.g., selection, use, maintenance of equipment and restriction of duration of exposure.
- Limit the time spent by workers on a vibrating surface.
- Well stocked first aid box which is easily available and accessible should be provided.
- Proper placement of appropriate fire suppression equipment.
- Training of staff and contractors in fire prevention and suppression actions.

After mitigation measure, the impact on occupational health and safety will become less significant.

Table 6.11.1 After mitigation measures, impact significance on occupational health and safety during pre-operation phase

Characteristics				
Magnitude	Extent	Duration		
1 (Low)	1 (Low)	1 (Low)	Equivalent	Importance

			Characteristics		
Characteristics = 1+1+1 = 3			1 (Low)	2 (Medium)	Significance
			Significance = Characteristics x Importance		2 (Low)

6.1.9.4 Impacts on Socio- economic

One of the main positive impacts during pre-operation phase is the availability of employment opportunities especially to casual workers and several other specialized workers. Employment opportunities are of benefit both economically and in a social sense.

Several workers including casual laborers, masons, carpenters, joiners, electricians and plumbers are expected to work on the site from start to the end. Apart from casual labor, semi-skilled and unskilled labor and formal employees are also expected to obtain gainful employment during the period of construction of access roads and base camp.

Through the use of locally available materials during the construction phase of the project including cement, concrete , timber, sand, ballast electrical cables etc., the project will contribute towards growth of the economy by contributing to the gross domestic product.

6.1.9.5 Impact significance on socio- economic

The local people can get job opportunities as construction labour and unskilled workers, therefore the impact by the proposed project on socio- economic may be positive impact.

6.1.9.6 Impacts on Community Health and Safety

Community health and safety issues during the construction phase of the project includes:

- Potential exposure to air emissions from fires, burning residues, or solid waste (e.g., packaging).
- Potential exposure to muddy water and wastewater.
- Increased risk of vehicle or machinery injuries on roads and access routes around the community.

6.1.9.7 Impact significance on Community Health and Safety

There is impact on Community Health and Safety and the magnitude of impact during pre-operation phase of the TMP project is "***Medium***".

The impact of the project can affect health and safety of people in the vicinity of the project area. Therefore, the extent of the impact is "***Low***".

The period of impact occurrence is within the pre-operation phase and the duration of the impact on residential area is considered as "***Low***".

According to magnitude, extent and duration of the impact, the impact characteristics is "***Medium***". The importance of the impact is considered as "***Medium***".

Therefore, the impact on Community Health and Safety by TMP project is medium and the significance of the impact is be "***Medium***".

Table 6.12 Impact significance on community health and safety during pre-operation phase

Characteristics				
Magnitude	Extent	Duration		

2 (Medium)	2 (Medium)	1 (Low)	Equivalent Characteristics	Importance	
Characteristics = 2+2+1 = 5			2 (Medium)	2 (Medium)	Significance
			Significance = Characteristics x Importance		4 (Medium)

6.1.9.8 Mitigation measures for community health and safety

Specific recommendations to minimize risks to communities include:

- Monitor and record all potentially harmful products and activities and manage them to minimize the risk to communities.
- Implement best practice guidelines for management of potentially harmful products.
- Use biological or lower-risk-profile products, if available.
- Ensure that animals and unauthorized people are not present in the areas where chemicals or other potentially harmful products are handled, stored, or applied.
- Apply proper solid waste and wastewater management systems.

After mitigation measure, the impact on community health and safety will become less significant.

Table 6.12.1 after mitigation measures, impact significance on community health and safety during pre-operation phase

Characteristics					
Magnitude	Extent	Duration			
1 (Low)	1 (Low)	1 (Low)	Equivalent Characteristics	Importance	
Characteristics = 1+1+1 = 3			1 (Low)	2 (Medium)	Significance
			Significance = Characteristics x Importance		2 (Low)

6.2 Operation phase

6.2.1 Environmental and social impacts during the operation phase

The operation phase of the sea food processing and cold storage factory uses generators for electricity resulting air emission as well as generates solid wastes, wastewater, hazardous wastes and other substances contributing to air and water pollution with a certain degree of noise and vibration. Despite the factory's optimum efforts to keep the pollutants at the lowest level by employing the best available technologies and management mechanisms, it continues to have lesser degree of footprint on the environment***. Waste minimization procedures, careful selection of raw materials and less polluting chemicals, compliance with solid waste management and wastewater treatment system, reuse of all possible resources, recovery of recycle materials, and energy efficient methods*** are needed to be carried out as a part of the factory's drive to further reduce the environmental footprint, the following will be activated:

6.2.1.1 Impacts on air quality

The factory for processing marine products and cold storage has impacts in terms of production process along with energy consumption as well as greenhouse gas emissions.

(a) Gases emission

GHG emissions including Carbon dioxide (CO_2), Nitrogen oxides (NO_x), Carbon Monoxide (CO), Ammonia (NH_3), fugitive Methane (CH_4) emissions would arise from energy consumption for the
production process, generator operations and transportation.

To reduce air pollution impacts, the facility shall adopt and implement the policy of maximum energy efficiency and manage well-coordinated traffic flows. These will serve as the facility's drive to minimize air pollution issues.

(b) Odour

In seafood-processing factories, odor is caused by the decomposition of the organic matter which emits volatile amines, diamines, and sometimes ammonia. When wastewater becomes septic, the characteristic odor of hydrogen sulfide may develop as well.
The odour will be emitted from the following:

- Fish and prawn processing areas
- Spoiled raw materials
- By- products
- Receiving and storage areas
- Filling and emptying containers and vehicles
- Solid wastes and wastewater

(c) Particulate Matters Emission

Among these activities, the potential sources of particulate matters during the operation phase include:

- Using generators for electricity
- Handling and storage of raw materials and fuels
- Transportation of materials by trucks and other vehicles
- Storage, packing, bagging and delivery activities

6.2.1.2 Impact assessment on air quality

a) Impact significance on air quality by gas emission

In operation phase of TMP factory, generators and machines used for processing raw materials and refrigeration will emit gases which can impact on ambient air quality.
The magnitude of impact on air quality by gas emission is "***Medium***".
The area of impact will be beyond the area of factory compound. Therefore, the extent of the impact on air quality is "***Medium***".
The period of impact occurrence will be throughout the project period and the duration of the impact of gas emission will be "***High****"*.

According to magnitude, extent and duration of the impact, the impact characteristics is rated as

"***High***".
These impacts will affect the workers and community in the vicinity of the factory. The importance of the impact on air is considered as "***Medium***".
Therefore, the impact air quality by gas emission by the TMP factory operation will be medium and the significance of the impact would be "***Medium***".

Table 6.13 Impact significance on gas emission during operation phase

Characteristics					
Magnitude	Extent	Duration			
2 (Medium)	2 (Medium)	3 (High)	Equivalent Characteristics	Importance	
Characteristics = 2+2+3 = 7			3 (High)	2 (Medium)	Significance
			Significance = Characteristics x Importance		6 (Medium)

b) Impact significance by odour
Odors emitted from the marine cold storage are very critical issue for the community perception and acceptance of the any marine processing and storage plant. Even though it is relatively harmless on the environment, its nuisance may affect nearby community by inducing stress and nausea. Moreover, odours in the marine product wastewaters are resulting from organic matter decomposition which emits volatile amines, diamines and sometimes ammonia. Moreover, if the wastewater becomes septic, the characteristic odour of hydrogen sulphide may also develop.

Thus, there will have a moderate impact by odour during the operation phase of the TMP factory.
The magnitude of impact by odour from spoiled materials and waste water will be "***Medium***".
The area of impact will be in the vicinity the production area. Therefore, the extent of the air quality impact by odour is considered as "***Medium***".
The period of impact occurrence will be throughout the project period and the duration of the impact by odour will be considered as "***High***".

According to magnitude, extent and duration of the impact, the impact characteristics will be "***High***". The importance of the impact on environment by odour is considered as "***Medium***".
Therefore, the impact of odour by the operation phase of TMP factory will be moderate and the significance of the impact will be "***Medium***".

Table 6.14 Impact significance on odour during operation phase

Characteristics				
Magnitude	Extent	Duration		
2 (Medium)	2 (Medium)	3 (High)	Equivalent Characteristics	Importance

Characteristics = 2+2+3 =7	3 (High)	2 (Medium)	Significance
	Significance = Characteristics x Importance		6 (Medium)

c) Impact significance on air quality by particulates

By using generators, there will have an impact of particulate matter during the operation phase of the TMP factory. The magnitude of impact by particulate matter will be "***Medium***".

The area of impact will be in the vicinity of factory area. Therefore, the extent of the air quality impact by particulates will be considered as "***Medium***".

The period of impact occurrence will be throughout the operation period and the duration of the impact by particulate matters will be considered as "***High***.

According to magnitude, extent and duration of the impact, the impact characteristics is rated as "***High***". The importance of the impact on air is considered as "***Medium***".

Therefore, the significance of impact by particulate matters during operation phase of TMP factory would be "***Medium***".

Table 6.15 Impact significance on particulate matters during operation phase

Characteristics					
Magnitude	Extent	Duration			
2 (Medium)	2 (Medium)	3 (High)	Equivalent Characteristics	Importance	
Characteristics = 2+2+3 = 7			3 (High)	2 (Medium)	Significance
			Significance = Characteristics x Importance		6 (Medium)

6.2.1.3 Mitigation measures for air quality

During the operation phase, the following mitigation measures are recommended to minimize the impact on the ambient air quality.

- Avoid processing ***batches of raw material*** that are of considerably ***lower than average quality*** in order to reduce odor.
- ***Reduce the stock of raw materials, waste, and by-products*** and store this stock for short periods of time only in a cold, closed, well-ventilated place.
- Seal by-products in covered, leak-proof containers.
- Keep all working and storage areas clean and remove waste products immediately from the production line.
- ***Empty and clean fat traps*** on a regular basis.
- ***Cover all transfer systems, wastewater canals, and wastewater treatment facilities*** to reduce the escape of foul odors.

- Storage of crushed raw materials in covered or closed bays.
- No use of wood in the facility.
- Accurate temperature devices are correctly installed.
- Temperatures are automatically recorded and measured.
- Ensure that store-room has a ***temperature-related alarm***.
- Prohibit open burning of any waste at project site.
- Careful use of energy efficient equipment and tools.
- Actively seeking cleaner technologies and investing in less polluting technologies.
- Collecting dust and other impurities from the air by using dust filter or filter-cleaning system.
- Ensure that all generators, machines and equipment are maintained in accordance with manufacturer's recommendations.
- Consider the use of low-emission generator engines.
- Spray water onto the ground to control dust.
- Plant long trees around the factory area to control air pollution (a green belt).
- Storage of waste-derived fuels in areas protected from wind and other weather conditions.
- Careful selection and use of environmentally friendly and low emission vehicles.
- Appropriate management of project traffic.
- Systematic arrangement of delivery operation schedules and times.
- Educating drivers and vehicle operators to stop engine idling.
- Education and training programs with competitions to encourage all employees to actively
  participate in energy saving.
- Discouraging the common practice of burning any waste in the field, and encouraging biodegradation.
- Placing a buffer zone with a garden or with a man-made forest between residential areas and project operation zones.
- Periodical monitoring of air pollutants and if values exceed the standard limits, suitable mitigation measures will be taken.

After mitigation measure, the impact on air quality will become less significant.

Table 6.15.1 After mitigation measures, impact significance on air quality during operation period

Characteristics					
Magnitude	Extent	Duration			
1 (Low)	1 (Low)	3 (High)	Equivalent Characteristics	Importance	
Characteristics = 1+1+3 =5			2 (Medium)	1 (Low)	Significance
			Significance = Characteristics x Importance		2 (Low)

6.2.2 Impact assessment and mitigation measures on noise and vibration

6.2.2.1 Potential impacts on noise and vibration

During the operational phase of the TMP factory, noise and vibration will be generated from the factory operations and transportation.

The potential sources of noise pollution include:

- Handling materials and equipment
- Proximity to noisy machinery
- Transportation

The potential sources of vibration include:

- Machines and equipment used in the factory
- Operating activities and vehicles

6.2.2.2 Impact significance on noise and vibration

Generally, noise at work can cause hearing damage that can lead to permanent and disabling. In operation phase of TMP factory, some processing activities and machines such as generators and compressors can have noise and vibration impact on workers.
The magnitude of noise and vibration during the operation period is "***Medium***".
The area of impact will be only within the area of production. Therefore, the extent of the impact of noise and vibration is "***Low***".
The duration of the impact of noise and vibration during operation phase will be considered as "***High***".

According to magnitude, extent and duration of the impact, the impact characteristics will be "***Medium***". The importance of the impact is considered as "***Medium***".
Therefore, the impact of noise and vibration by the TMP factory is moderate and the significance of the impact is "***Medium***".

Table 6.16 Impact significance on noise and vibration during operation period

Characteristics					
Magnitude	Extent	Duration			
2 (Medium)	1 (Low)	3 (High)	Equivalent Characteristics	Importance	
Characteristics = 2+1+3= 6			2 (Medium)	2 (Medium)	Significance
			Significance = Characteristics x Importance		4 (Medium)

6.2.2.3 Mitigation measures on noise and vibration

Following precautionary measures should be adopted to control the noise level.

- The workers and employees working particularly nearby the operation emitting noise should use ear plugs and ear muffs for protection against the noise.
- Provide appropriate PPEs including ear muffs and make sure to wear these PPEs during working hours.
- Training for general awareness about impacts of noise and importance of using PPEs.
- Use low noise equipment.
- Using enclosure for all generator sets.
- Ensure use of mufflers on diesel/gas driven machinery.
- Reduce the working hours of operating noisy machines.
- Schedule noisy operation activities and transportation during day-time hours.
- Turn equipment off when not in use.
- Carryout regular maintenance of the equipment to minimize the noise level.
- Carry out periodic monitoring of noise levels, if values exceed the standard limits, suitable
  mitigation measures needed to be taken.
- Traffic control measures to be enforced strictly.
- Develop green belt to act as a noise barrier.
- Project activities must be carried out in such a way that vibrations arising will not cause damage to adjacent structures, residents and passers-by.
- Apply vibration reducing technologies in operation activities.
- Maximizing the distance between the source and receiver.
- Mechanically isolate the vibrating source (e.g., compressors) or surface to reduce exposure.
- Faulty tools should not be used and tools should be maintained properly. Tools which are worn, blunt or out of alignment will vibrate more.
- Ensure that operating machines, equipment and vehicles are well maintained to avoid excessive vibration.
- Maintaining wheels of vehicles and rail smoothness for transportation.
- Specifying vehicles with low unsprung weight, soft primary suspension, minimum metal-to-metal contact between moving parts of the truck, and smooth wheels.
- Training to workers is necessary to control exposure eg, selection, use, maintenance of equipment and restriction of duration of exposure.
- Limit the time spent by workers on a vibrating surface.
- Provide appropriate PPE to workers for those working in vibrating areas.
- Schedule work to reduce adverse effects.
- Respond to and investigate complaints by nearby community.

After mitigation measure, the impact on noise and vibration will become less significant.

Table 6.16.1 After mitigation measure, impact significance on noise and vibration during operation Phase

Characteristics

Magnitude	Extent	Duration			
1 (Low)	1 (Low)	3 (High)	Equivalent Characteristics	Importance	
Characteristics = 1+1+3 = 5			2 (Medium)	1 (Low)	Significance
			Significance = Characteristics x Importance		2 (Low)

6.2.3 Impact assessment and mitigation measures for water quality

6.2.3.1 Potential impacts on water quality

Regarding water usage, the nature of seafood processing factory uses a large amount of water for cleaning and producing ice for optimum maintenance of fish and prawn. Other types of water consumption are cleaning utensils, equipment and for residential units including kitchen, toilets for workers.

In the operation phase, the daily required water volume for processing purpose and other purposes will be provided by the tube wells as well as own water reservoir.
The impact of water consumption can affect the underground water pattern as the process use water as a major consumption. Thus, water consumption of TMP factory can affect both surface water and ground water and the impact is likely to be moderate.

Water is used for the following purposes:

a) Ice manufacturing
b) Cleaning raw materials (fish, prawn, etc.)
c) Washing and sanitizing facilities and equipment
d) Hand washing

Looking at the water pollution aspect, fish processing wastewater has a high organic content, and subsequently a high biochemical oxygen demand (BOD), because of the presence of blood, tissue, and dissolved protein. It also typically has a high content of nitrogen (especially if blood is present) and phosphorus.
After facility cleaning activities, detergents and disinfectants (e.g., chlorine compounds, hydrogen peroxide, and formaldehyde) may also be contaminated in the wastewater stream.
Moreover, accidental spills and leakage of fuel and chemicals (e.g., ammonia leaks) can cause water pollution.
Settleable solids may cause reduction capacity of the wastewater duct; when the solids
settle in the receiving water body, they may affect the bottom-dwelling flora and the food chain. When they float, they may affect the aquatic life by reducing the amount of light that enters the water.

6.2.3.2 Impact significance on water quality

a) Impact significance on surface water quality

Magnitude of the impact for surface water by TMP factory is considered as "***High***".

The area of the potential impact is beyond the immediate area of factory. So, the extent of the impact is "***Medium***".
The period of potential impact duration can be a long period of time. The duration of the impact for surface water quality due to the operation phase of TMP factory is considered as "***High***".
Therefore, the characteristic of surface water quality impact is rated as "***High***".

Although the wastewater does not include many hazardous chemicals, the impact is expected to cause some disturbances potentially affecting health of communities and pollution to surrounding water bodies. The importance of the impact on surface water quality is set as "***Medium***". The significant rating of impact is set as "***Medium***".

Table 6.17 Impact significance on surface water quality during operation phase

Characteristics					
Magnitude	Extent	Duration			
3 (High)	2 (Medium)	3 (High)	Equivalent Characteristics	Importance	
Characteristics = 3+2+3 = 8			3 (High)	2 (Medium)	Significance
			Significance = Characteristics x Importance		6 (Medium)

b) Impact significance on ground water quality **during operation phase**
The magnitude of impact for ground water by TMP factory is considered as "***High***".
The area of the potential impact will be throughout the immediate area of project activities and community, and the extent of the impact is "***Medium***".
The period of potential impact can be long-term. The duration of the impact for ground water quality during operation phase is set as ***"High".***
Therefore, the characteristic of ground water quality impact by TMP factory is rated as "***High***".

The impact is expected to cause some disturbances potentially affecting communities locally and surrounding water bodies. The importance of the impact on water quality is considered as "***Medium***".
The significant rating of impact is set as "***Medium***".

Table 6.18 Impact significance on ground water quality during operation phase

Characteristics					
Magnitude	Extent	Duration			
3 (High)	2 (Medium)	3 (High)	Equivalent Characteristics	Importance	
Characteristics = 3+2+3 = 8			3 (High)	2 (Medium)	Significance

	Significance = Characteristics x Importance	6 (Medium)

6.2.3.3 Mitigation measures for water resources

a) Minimizing Impact by Wastewater

The following methods are recommended to enhance the ***removal of solid waste prior to entry into the wastewater stream***:

- Collect internal organs and other organic materials separately, for processing into by-products.
- Design the production line so that cooling water, storm water, and process effluents can be kept separate to permit appropriate treatment options.
- Conduct a dry pre cleaning of equipment and production areas before wet cleaning (e.g. rubber scraping of work tables and plant floor before hosing).
- Establish procedures for the dry removal of offal, using dry vacuum systems where feasible.
- Fit and use floor drains and collection channels with grids and screens, and / or traps, to reduce the amount of solids entering the wastewater.
- Equip the outlets of wastewater channels with screens and fat traps to recover and reduce the concentration of coarse material and fat in the combined wastewater stream.
- Avoid submersion of open products (e.g. fillets) in water, as soluble protein may leak out and enter the wastewater effluent stream.
- Ensure that tanks are effectively bunded and provide overfilling protection on bulk storage tanks.
- Choose cleaning agents that do not have adverse impacts on the environment in general, or on wastewater treatment processes and sludge quality.
- Optimize their use through correct dosage and application.
- Avoid cleaners that contain active chlorine and prohibited, banned, or restricted chemicals.
- Dry clean with a scraper or broom before cleaning with water.
- Using grease traps, skimmers or oil water separators for separation of floatable solids; flow and load equalization.
- Sediment reduction for suspended solids by using clarifiers or settling ponds.
- Biological treatment, typically anaerobic (if high in organic content) followed by aerobic treatment, for reduction of soluble organic matter (BOD).
- Biological nutrient removal for reduction in nitrogen and phosphorus.
- Disinfection of effluent when it is required.
- Dewatering and disposal of residuals.
- Composting or land application of wastewater treatment residuals with acceptable quality.
- Proper controls to contain and neutralize nuisance odors.

b) Utilization for processing seafood and producing ice

- Raw materials should be properly stored under the roof to prevent dumping into the water courses in the rainy season.

- Using enough ice to secure product quality and matching ice production to requirements.
- Avoid recycling contact process water.
- Recycling of cooling water and rinse water may be feasible as long as hygiene considerations are observed.

c) Utilization of Infrastructure and Transportation

Specific measures that should be implemented include the followings:

- Promptly detect for quick repairing of water pipes and tank leaks.
- Ensure taps are not running when not in use.
- Install water conserving taps that turn-off automatically when water is not being used.
- Installing water efficient toilets and shower heads.
- Users to conserve water e.g by avoiding unnecessary toilet flushing.
- Limit water withdrawal to the amount that will not adversely affect the groundwater balance and the demand of the local community, by developing and conserving own source of water.
- Conducting regular training, monitoring, and inspection schemes together with keeping track of water uses, minimizing waste and leakage from faulty connections or faucets.
- Preventing leaks and spills of chemicals, fuels and hazardous wastes.
- All chemicals and fuel containers will be properly sealed and rigorous spill prevention mechanisms will be employed.
- Store, dispose and clean up all diesel and hazardous materials according to the procedures.
- Proper management of storm water and drainage system for sediment control.
- Promote recycling and reuse of water as much as possible.

***d*) To reduce the Total Nitrogen from the wastewater**, there are two steps for removing nitrogen using biological treatment. They are nitrification and denitrification methods.
For the TMP factory: Maintain the existing wastewater treatment system in order to be effective functioning system and then add another additional two process (unsaturated biofilter (nitrification) and Saturated biofilter (Denitrification) after the final stage of existing system before the final disposal.

For Unsaturated biofilter, Granular Activated Carbon filter (Charcoal) can be used and for the Saturated biofilter, saturated sand filter can be adopted accordingly.

For the ground water of villages, Granular activated carbon which is made from raw organic materials (such as coconut shells or coal) can be used for nitrogen removal.

After mitigation measure, the impact on water quality will become less significant.

Table 6.18.1 After mitigation measures, impact significance on water quality during operation phase

Characteristics

Magnitude	Extent	Duration			
1 (Low)	1 (Low)	3 (High)	Equivalent Characteristics	Importance	
Characteristics = 1+1+3= 5			2 (Medium)	1 (Low)	Significance
			Significance = Characteristics x Importance		2 (Low)

6.2.4 Impact assessment and mitigation measures for soil quality

6.2.4.1 Potential impacts on soil quality

During operation phase, mismanagement of solid wastes, wastewater and accidental spill of chemicals can lead to soil pollution. As the factory is close to river, polluted soil can lead to water pollution as a consequence especially in rainy season.

Efficient and environmental friendly practices for processing seafood and cleaning techniques are important to conserve soil and reduce water pollution in the river which runs nearby the TMP factory.

Accidental spillage of chemicals, disinfectants and fuels during handling or leakage from the operating and storage area ***(e.g., ammonia leakage)*** may lead to soil contamination.

Furthermore, physical and chemical degradation of soils may result from unsuitable management techniques, such as use of inappropriate machinery in loading/unloading of products and transportation.

6.2.4.2 Impact significance on soil quality

In operation phase of TMP factory, the magnitude of impact on soil quality is considered as "***Medium***".

The area of impact will be only within project area. Therefore, the extent of the impact on soil quality and structure is "***Low***".

The period of impact occurrence will be remained after the project period and the duration of the impact on soil quality and structure is considered as "***High***".

According to magnitude, extent and duration of the impact, the impact characteristic was considered as "***Medium***". The importance of the impact is considered as "***Medium***".

Therefore, significance of the impact for soil quality by the TMP factory is set as "***Medium***".

Table 6.19 Impact significance on soil quality during operation phase

Characteristics					
Magnitude	Extent	Duration			
2 (Medium)	1 (Low)	3 (High)	Equivalent Characteristics	Importance	
Characteristics = 2+1+3 = 6			2 (Medium)	2 (Medium)	Significance

	Significance = Characteristics x Importance	4 (Medium)

6.2.4.3 Mitigation measures for soil

Mitigation measures should be applied to minimize soil pollution depending upon type of processing in the factory and case-specific conditions such as emergency spills or leakage. The following mitigation measures should be used.

- All chemicals and fuel containers will be properly sealed and rigorous spill prevention mechanisms will be employed.
- Spills will be immediately treated to stop subsequent soil pollution.
- Diesel storage tank shall be installed with spillage containment.
- Frequent water sprinkling and appropriate scheduling for truck and heavy equipment movements will also be arranged throughout the operation period.
- Minimize the use of pesticides by implementing a pest and disease early warning system, by using biological pest and disease control methods, and by implementing control measures before outbreaks require large-scale control.
- Comply proper solid waste management and wastewater treatment systems.
- Avoiding heavy machinery usage.
- Considering erosion management practices.
- Avoid clearing primary forest if the factory area will be expanded in the future.

After mitigation measure, the impact on soil quality will become less significant.

Table 6.19.1 After mitigation measures, impact significance on soil quality during operation phase

Characteristics					
Magnitude	Extent	Duration			
1 (Low)	1 (Low)	3 (High)	Equivalent Characteristics	Importance	
Characteristics = 1+1+3 = 5			2 (Medium)	1 (Low)	Significance
			Significance = Characteristics x Importance		2 (Low)

6.2.5 Impact assessment and mitigation measures for waste disposal

6.2.5.1 Potential impacts on waste disposal

During operation phase of TMP factory, it is expected for large quantities solid wastes generation by seafood processing activities. Those are potentially large quantities of organic waste and by-products from inedible fish parts and endoskeleton shell parts. Fish waste is a rich source of essential amino acids, and all inedible fish waste should be converted into by-products (e.g. fishmeal or silage).

Domestic solid waste such as food residues (organic wastes) and used disinfectant containers, damaged fuel containers including glasses, tins, bottles, packing materials, papers, stationeries,

damaged/expired devices with other miscellaneous will be generated during the operational phase of the factory.

6.2.5.2 Impact significance on waste disposal

In operation phase of TMP factory, solid wastes are generated from operation activities and there are domestic solid wastes of workers as well.
The magnitude of waste disposal during operation phase is considered as "***High***".
The area of impact is in the factory compound. Therefore, the extent of the impact by waste during operation phase is "***Low***".
The period of impact occurrence can be long-term and some wastes can be remained after the project. Thus, the duration of the impact by waste is considered as "***High***".
According to magnitude, extent and duration of the impact, the impact characteristics is assumed as "***High***". The importance of the impact is considered as "***Medium***".
Therefore, there will be negative waste impact by the TMP factory during operation phase and the significance of the impact is "***Medium***".

Table 6.20 Impact significance on solid waste during operation period

Characteristics					
Magnitude	Extent	Duration			
3 (High)	1 (Low)	3 (High)	Equivalent Characteristics	Importance	
Characteristics = 3+1+3 = 7			3 (High)	2 (Medium)	Significance
			Significance = Characteristics x Importance		6 (Medium)

6.2.5.3 Mitigation measures for waste disposal

General mitigation practices and principles that could apply to the operation phase of project include:

a) Management of Solid Waste from Processing Area

- For reducing waste quantity, encourage fishing vessels to reduce the capture of "non-target species".
- Design fish processing operations to enable the recovery of waste streams in accordance with Good Manufacturing Practice (GMP) and Hazard Analysis and Critical Control Points (HACCP) food safety programs.
- Off-cuts and wastes should be recovered and taken to the by-product facility in time to prevent product deterioration.
- Sludge dewatering on sludge drying beds.
- Land application (as fertilizer) of wastes from on-site wastewater treatment in agricultural production.
- Disposal of wastes in landfill if not used for biogas production or combustion.

b) Management of Solid Waste from Processing Area and Factory Compound

- Maintain drains regularly and when required.
- Solid wastes should not be dumped into the drain.
- Blocked drains should be cleaned properly and debris disposed at approved sites.
- Conduct regular inspections and fix appropriately for drainage pipe blockages or any damages.
- Ensure regular monitoring of the sewage discharged from the factory.
- Provide separate bins for food waste, metal and other wastes at the staff quarters and other facilities on site.
- Waste segregation should be practiced at the workers camps with an emphasis placed on reducing, reusing and recycling of waste streams as appropriate.
- All wastes stored at the premises shall be held in leak proof containers, which shall be fitted with a weather proof and animal resistant cover. The cover shall be used at all times when waste is held in the container. These containers shall be clearly marked "waste product only".
- Regular collection times will be arranged to prevent overflow in waste collection bins.
- Regular cleaning and replacing of waste collectors.
- Collect non-hazardous solid wastes for recycling or disposal at landfill.
- Solid wastes that cannot be recycled must be treated appropriately before final disposal.
- Avoid contamination of the surrounding environment by maintaining machines equipment and vehicles regularly and handling of fuel and lubricants with caution.
- Avoid leaks, spills or accidental releases into the soil, surface water and ground water resources by proper storage, handling and transport of hazardous materials.
- Develop a hazardous materials management plan addressing storage, use, transportation and disposal for each item.
- All chemicals including disinfectants will be stored separately and handled under strict supervision of QC Officer/Manager. All chemicals will be suitably labelled with warnings of toxicity, and directions for use in premises.
- Using Grease Trap for wastes generated from kitchen.
- Education and training will be offered to all employees.
- Train employees to promptly clean up any oil or hazardous material spill.
- Use of plastic bags will be discouraged and explained to the workforce and local communities.
- Solid waste generation from each department will be recorded.
- Reward for innovative reduction and recovery approaches will be given to company departments in monthly competitions.
- Ensure all packaging for chemicals and disinfectants are properly disposed.
- Prohibit open burning of any waste at project site.

After mitigation measure, the impact on waste disposal will become less significant.

Table 6.20.1 after mitigation measures, impact significance on waste disposal during operation phase

Characteristics				
Magnitude	Extent	Duration		

1 (Low)	1 (Low)	3 (High)	Equivalent Characteristics	Importance	
Characteristics = 1+1+3 = 5			2 (Medium)	1 (Low)	Significance
			Significance = Characteristics x Importance		2 (Low)

6.2.6 Impact assessment and mitigation measures for Ammonia impact

6.2.6.1 Ammonia impact

Ammonia has been used as a refrigerant in industries for more than 150 years.

It is used in industrial refrigeration systems because of its ***superior thermodynamic properties*** and ***low cost***. Ammonia is environmentally benign, having ***zero direct global warming potential*** (GWP) and ***zero ozone depleting potential*** (ODP).

However, ammonia has hazardous toxicity if it is released in large quantities. Leakage of Ammonia can cause serious health risk to humans. Anhydrous ammonia is very corrosive, and exposure to it may result in chemical-type burns to skin, eyes, and lungs. It may also result in frostbite as its ***boiling point*** is ***-28ºF***.

Ammonia is ***hygroscopic*** meaning ***high affinity for water***, it migrates to moist areas like the eyes, nose, mouth, throat, and moist skin. Ammonia is ***colourless, lighter than air*** and ***chemically reactive***. It has a distinctive pungent odour which can ***normally be detected by smell*** at concentrations as low as ***5 parts per million*** (ppm).

Although the odour of ammonia can be detected by smell at concentrations above 5 to 10ppm, ***people who are used to it*** can work ***without discomfort*** in concentrations of approximately 100ppm. Concentrations between approximately ***150ppm and 200ppm*** will cause ***irritation of the mucous membranes and the eyes***, but normally with no lasting consequences. Exposure to concentrations of approximately ***1500ppm and above will damage or destroy tissue***. Concentrations of approximately ***2500 ppm and above*** will rapidly ***increase the risk of fatality***.

The chart below shows the ***effects of various concentrations*** of ammonia.

Concentration	Effect
5 ppm	Average odor threshold (well below harmful health effects)
100-200 ppm	Irritated eyes
300 ppm	Respiratory Protection Required above this level
400 ppm	Immediate throat irritation
500 ppm and below	No permanent eye damage to even chronic exposure
1,700 ppm	Cough
2,400 ppm	Threat to life after 30 minutes
5,000+ ppm (vapor)	Full body chemical suit required
5,000+ ppm (pure liquid)	Second degree burns with blisters

7,338 ppm One Hour LC50, lethal concentration (rat)

Especially in the presence of moisture, it reacts with and corrodes ***copper, zinc, and many alloys***. For ***anhydrous ammonia containers, fittings and piping***, the materials which are resistant to ammonia should be used. (e.g., iron, steel, certain rubbers, plastics, and specific non-ferrous alloys)
Ammonia will combine with ***mercury and form a fulminate*** which is an unstable explosive compound.
Anhydrous ammonia is non-flammable material. However, ***ammonia vapour in high concentrations*** (16 to 25 percent by weight in air) will ***burn***. The fire hazard from ammonia is increased by the presence of ***oil or other combustible materials***. Although ammonia will ***burn in a narrow range of high concentrations***, it is difficult to ignite and will not support combustion after the ignition source is withdrawn.

6.2.6.2 Impact significance on Ammonia
Leakage of Ammonia can cause negative health impacts on workers when it is inhaled and comes in contact with eyes or skin. Therefore, the impact of Ammonia can be serious if it is not controlled properly.
The magnitude of impact by ammonia will be considered as "***Medium***".
Ammonia can spread to the vicinity of factory compound depending on the wind direction. Therefore, the extent of the impact by ammonia will be considered as "***Medium***".
The duration of the impact by ammonia will be considered as ***"High"***.

According to magnitude, extent and duration of the impact, the impact characteristics is rated as ***"High"***. High concentration and improper management can lead to serious health effects and increased mortality rate. Thus, the importance of impact by Ammonia will be ***"Medium".***
Therefore, the significance of impact by ammonia which is used in refrigeration system of TMP factory will be "***Medium***".

Table 6.21 Impact significance on Ammonia during operation period

Characteristics					
Magnitude	Extent	Duration			
2 (Medium)	2 (Medium)	3 (High)	Equivalent Characteristics	Importance	
Characteristics = 2+2+3 = 7			3 (High)	2 (Medium)	Significance
			Significance = Characteristics x Importance		6 (Medium)

6.2.6.3Mitigation measures on Ammonia impact (leakage/high concentration)
a) Machine Room Design

- The machine room should have ***enough ventilation***.
- Ventilation fans shall be added ***for emergency ammonia leakage*** or ***for insufficient ventilation***.

- ***Providing barriers*** or establishing safety procedures to protect refrigeration equipment (e.g., pipes, valves, evaporator coils, tanks, vessels, etc.) likely to be damaged.
- ***Flammables*** and/or combustibles ***must not be stored*** in the machinery room.
- There must be a ***clear, unobstructed approach and space*** to the machinery for inspection, service, and emergency shutdown.

b) Installation (Operation Phase)

- The ammonia refrigeration system shall be designed by, and installed under the supervision of, persons whose training and experience are competent for the tasks.
- The refrigeration system installer shall be equipped with the ***necessary drawings*** and ***relevant diagrams,*** including a ***refrigeration circuit, flow diagram*** and ***electrical circuit diagram***.
- Install ***at least two (2) ammonia detectors*** in the machinery room to monitor for leaks.
- Ammonia detectors shall be installed to ***activate ventilation fans*** and ***trigger remote alarms*** for notifying accidental releases of ammonia and ***protecting against explosion risks***.
- Perform regular maintenance of ***ammonia gas detectors***.
- Consider installation of a ***manual check valve*** in the ammonia charging line in a location close to main control valve.
- Installing ***Dual Pressure Relief Valves*** (PRVs) and a ***three-way valve*** which will allow one relief valve to be serviced, tested, or replaced, while the other PRV remains on-line to protect the refrigeration equipment.
- Refrigeration PRVs are recommended for ***replacement every 5 years.***

c) Checking and Testing

- Ensure that all ammonia vessels and storage areas are ***well lit***.
- All piping, electrical equipment and insulation shall be ***correctly*** installed.
- Ammonia refrigeration system shall be checked ***every time before starting***.
- ***Inspecting*** all vessels and cylinders ***every morning*** (especially after weekends or other periods when the facility has been unoccupied).
- ***All protection devices*** shall be tested and set.
- ***Pressure tests*** shall be performed.
- ***Functional tests*** are regularly carried out to confirm the ***correct operation of safety equipment***.
- ***Functional tests*** of all safety devices including the ***warning and alarming system*** shall be conducted.

d) Handling

- Providing ***training to ammonia handler***.
- To ensure that any certificated machinery has a ***valid Certificate of Fitness***.
- Establishing a ***Safe Operating Procedure*** for ***ammonia filling activities***.
- To ensure that the trained person carries out periodic maintenance and inspection according to manufacturer requirement, preferably every month.

e) Maintenance

- The refrigeration system must be ***properly maintained*** and ***operate efficiently*** without any serious risk to safety and health.
- Refrigeration system with ***compressors, condensers, evaporators and associated components*** are regularly maintained and periodically inspected.
- ***Periodical maintenance*** should comply with manufacturer recommendations.
- ***Trained person*** with sufficient ***experience, knowledge, training and skills*** shall do any maintenance work to ensure any faults from each stage of the process can be ***identified and rectified before serious consequences*** occur.
- When ***replacement*** for any component is required, ***original equipment manufacturer*** (OEM) parts shall be used or parts that at least meet with ***manufacturer's original specifications***.
- ***Damaged*** and ***deteriorated*** ammonia piping shall be ***replaced***.
- ***Refrigeration oil should be removed*** from the refrigeration system as needed for proper system maintenance.
- ***Planned Preventative Maintenance*** (PPM) procedures are in line with the manufacturer's recommendations.
- All ***safety equipment*** is correctly installed and well-functioning.
- ***Maintenance and operational records*** are properly kept and readily available for request of the authority.
- All uninsulated piping should be ***cleaned, primed, and painted*** with an appropriate coating to protect the pipe from corrosion as well as being consistent with the color coding scheme.

After mitigation measure, Ammonia impact will become less significant.

Table 6.21.1 after mitigation measures, impact significance by Ammonia during operation period

Characteristics					
Magnitude	Extent	Duration			
1 (Low)	1 (Low)	3 (High)	Equivalent Characteristics	Importance	
Characteristics = 1+1+3 = 5			2 (Medium)	1 (Low)	Significance
			Significance = Characteristics x Importance		2 (Low)

6.2.7 Impact assessment and mitigation measures for ecological resources

6.2.7.1 Potential Impact on Forest

There is a forest within 2 km of TMP factory and operation activities of the factory will negatively impact on forest ecosystem and biodiversity. Environmental pollution due to various processes of the factory will negatively impact on forest and nearby environment.

Processing activities of TMP factory would cause indirect impact on forest by following concerns:

- Air pollution
- Water pollution
- Soil pollution
- Noise pollution which can disturb the natural cycles of animals.

Moreover, accidental leakage of chemicals and fire/explosion hazards can seriously impact on forest and biodiversity.

6.2.7.2 Impact assessment on Forest

In operation phase of TMP factory, the magnitude of impact on forest by processing activities is "***Medium***".

The area of impact is beyond factory compound. Therefore, the extent of the impact on forest during operation phase is set as "***Medium***".

The period of impact occurrence is considered as "***High***".

According to magnitude, extent and duration of the impact, the impact characteristics is rated as "***High***". The importance of the impact is considered as "***Medium***".

Therefore, impact on the forest by TMP factory during operation phase is moderate and the significance of the impact is considered as "***Medium***".

Table 6.22 Impact significance on forest during operation phase

Characteristics					
Magnitude	Extent	Duration			
2 (Medium)	2 (Medium)	3 (High)	Equivalent Characteristics	Importance	
Characteristics = 2+2+3 = 7			3 (High)	2 (Medium)	Significance
			Significance = Characteristics x Importance		6 (Medium)

6.2.7.3 Mitigation measures for forest during operation phase

i) Air Pollution

- ***Prohibit open burning*** for all type of wastes including forest residues.
- Using ***renewable or sustainable*** materials.
- Using ***local materials***, whenever possible, to avoid transportation for long distance.
- Using ***greener fuel source*** such as low sulphur diesel to power equipment and vehicles.
- Limit and keep records for ***fuel usage*** and develop ***emergency management plan*** for any incidents.
- Provide ***fugitive dust suppression*** such as using water sprays or sprinklers to control dust and prevent from spreading.
- Using properly ***taped or sealed containers***.

ii) Water Pollution

- ***Prevent*** materials, fuel and chemicals being ***washed into waterways or drains***, and ***cover up*** all drains.
- Provide ***proper drainage system*** and enable a ***strong drain protection***.
- Using ***rock or other appropriate materials*** to ensure the ***storm drain to filter out*** trash and debris.
- Keep ***clean and maintain filters*** regularly.
- Properly ***collect and treat any wastewater***.
- Improve ***management and disposal of wastes.***

iii) Noise Pollution

- Use ***quiet equipment and techniques*** to manage noise pollution.
- If possible, use ***modern equipment*** which is designed to reduce noise.
- Put ***movable noise barriers*** in place to manage the levels of noise pollution.
- Ensure ***equipment and vehicles*** are properly ***maintained and operated.***

iv) Soil Pollution

- Ensure ***erosion control measures*** and apply measures to ***stabilize the soil***.
- Apply ***sediment control practices.***
- Provide ***containment*** and ***safe equipment fuelling***.
- ***Identify and protect areas where existing vegetation***, such as trees, will not be disturbed.
- ***Protect streams, stream barriers, wild wood lands, wetlands, or other sensitive areas*** from any disturbance.
- Adopt ***eco -friendly house keeping practices*** during operation phase by using bio-degradable products.
- Develop ***waste segregation and recycling***.
- ***Protect and provide Vegetative Buffers*** along water bodies which slow and filter the storm water run-off.
- ***Law enforcement***, ***restrictions and notifications*** for ***illegal tree cutting, animal hunting*** or ***poaching*** in the forest by the workers, villagers and community living in the vicinity of project area.

After mitigation measure, the impact on the forest will become less significant.

Table 6.22.1 after mitigation measures, impact significance on forest during operation phase

Characteristics					
Magnitude	Extent	Duration			
1 (Low)	1 (Low)	3 (High)	Equivalent Characteristics	Importance	
Characteristics = 1+1+3 = 5			2 (Medium)	1 (Low)	Significance

Significance = Characteristics x Importance	2 (Low)

6.2.8.1 Potential Impact on Wildlife

Operation phase of TMP factory may cause negative impacts on wildlife by ***habitat destruction, habitat fragmentation and habitat degradation*** due to various processing activities, pollution, invasive species, and disruption of ecosystem.

Onsite and off-site disturbance to wildlife are as follows:

- Pollution of air, water and soil
- Noise
- Disturbances to the natural behavior of wildlife
- Risk of fire/explosion

6.2.8.2 Impact assessment on Wildlife

In operation phase of TMP factory, the magnitude of processing activities is considered "***Medium***".

The area of impact is beyond the factory area. Therefore, the extent of the impact on wildlife during operation phase is set as "***Medium"***.

The period of impact occurrence will be remained after prolonged operation period and the duration of the impact on the wildlife is considered as "***High***".

According to magnitude, extent and duration of the impact, the impact characteristics is rated as ***"High***". The importance of the impact is considered as "***Medium***".

Therefore, impact on the wildlife by TMP factory during operation phase is medium and the significance of the impact is considered as "***Medium***".

Table 6.23 Impact significance on wildlife during operation phase

Characteristics					
Magnitude	Extent	Duration			
2 (Medium)	2 (Medium)	3 (High)	Equivalent Characteristics	Importance	
Characteristics = 2+2+3 = 7			3 (High)	2 (Medium)	Significance
			Significance = Characteristics x Importance		6 (Medium)

6.2.8.3 Mitigation measures for wild life during operation phase

i) Restoring and Enhancing the Habitats

- Creation of new or additional buffer areas to reduce impacts.
- Compensate for damage to natural habitats by recreating similar features, restoring, and improving the surrounding landscape.
- Restore and link together existing habitats and land features which could support wildlife.

- Manage and monitor restoration and compensating measures to fulfill the needs of existing flora and fauna.
- ***Law enforcement***, ***restrictions and notifications*** for ***illegal tree cutting, animal hunting*** or ***poaching*** in the forest by the workers, villagers and community living in the vicinity of project area.

ii) Preventing environmental Pollution

Strictly follow the prevention and mitigation measures for air, water and soil pollution which are stated in respective sectors including the followings:

- Establishing effective Waste Management Plan and train employees to follow waste segregation and proper disposal.
- Prohibit open burning of any wastes on site.
- Proper storage of chemicals and comply with Emergency Response Plan if any incident occurs.

After mitigation measure, the impact on the wildlife will become less significant.

Table 6.23.1 after mitigation measures, impact significance on wildlife during operation phase

Characteristics					
Magnitude	Extent	Duration			
1 (Low)	1 (Low)	3 (High)	Equivalent Characteristics	Importance	
Characteristics = 1+1+3 = 5			2 (Medium)	1 (Low)	Significance
			Significance = Characteristics x Importance		2 (Low)

6.2.9.1 Potential Impact on Aquatic animal/ fish

Operation phase TMP factory will have negative impact to aquatic animal/ fish.

Operation activities will negatively impact on the aquatic animal/ fish by following concerns:

- Air and Water pollution
- Soil pollution and soil erosion
- Improper waste management
- Introducing synthetic chemicals
- Contamination of hazardous materials by leakage or improper handling.
- Fishing by the workers of the project, villagers and community living in the vicinity of project area.

6.2.9.2 Impact assessment on aquatic animal/ fish

In operation phase of TMP factory, the magnitude of activities is considered as "***Medium"***.

The area of impact is beyond the factory area. Therefore, the extent of the impact on aquatic animals during operation phase is set as "***Medium***".

The period of impact occurrence will be remained after operation period and the duration of the impact on the aquatic animal/ fish is considered as "***High***".

According to magnitude, extent and duration of the impact, the impact characteristics is rated as "***High***". The importance of the impact is considered as "***Medium***".
Therefore, impact on the aquatic animal/ fish by TMP factory during operation phase is medium and the significance of the impact is considered as ***"Medium"***

Table 6.24 Impact significance on aquatic animal/ fish during operation phase

Characteristics					
Magnitude	Extent	Duration			
2 (Medium)	2 (Medium)	3 (High)	Equivalent Characteristics	Importance	
Characteristics = 2+2+3 = 7			3 (High)	2 (Medium)	Significance
			Significance = Characteristics x Importance		6 (Medium)

6.2.9.3 Mitigation measures for aquatic animal/ fish during operation phase
TMP factory needs to strictly follow the prevention and mitigation measures for air, water and soil pollution which are stated in respective sectors including the followings:

- Using ***cleaner and environmental friendly products*** for various purposes of operation phase.
- Prevention, management and establishing monitoring system for ***soil erosion***.
- Proper ***storage of chemicals*** and comply with ***Emergency Response Plan*** if any incident occurs.
- Establishing ***sedimentation pond/basin*** which will prevent the polluted water pass to the river directly.
- ***Treatment of wastewater*** from various processing activities.
- Establishing effective ***Waste Management Plan*** and train employees to follow waste segregation and proper disposal.
- ***Law enforcement, restrictions and notifications for fishing*** in the forest by the workers, villagers and community living in the vicinity of project area.

After mitigation measure, the impact on the aquatic animal/ fish will become less significant.
Table 6.24.1 after mitigation measures, impact significance on aquatic animal/ fish during operation phase

Characteristics					
Magnitude	Extent	Duration			
1 (Low)	1 (Low)	3 (High)	Equivalent Characteristics	Importance	
Characteristics = 1+1+3 = 5			2 (Medium)	1 (Low)	Significance
			Significance = Characteristics x		2 (Low)

			Importance		

6.2.10 Impact assessment and mitigation measures on human environment

6.2.10.1 Potential impact on human environment

a) Potential impact on occupational health and safety

Raw materials such as fishery products and shrimps are processed and exported by TMP Factory. Employees may suffer ill health or injuries (e.g. frostbite) due to prolonged exposure to low temperatures (particularly those with certain pre-existing medical conditions). Extreme cold may also lead to gradual loss of awareness of risk.

One concern is that if someone is accidentally locked in the cold store which may be the confined space, he/she may suffer the death or serious injury from prolonged exposure to cold temperatures of the storage room.

By using large amount of water for processing, cleaning and making ice for quality maintenance of products, there will be moderately significant adverse environmental impacts by waste water generated by TMP factory.

Disposal of unqualified raw materials and solid wastes generation during processing, the factory will also have adverse impacts on ambient air quality, odours and solid wastes.
If those are not properly managed, employees' health conditions will be affected.
Moreover, ***accidental leakage of ammonia*** which is used in refrigeration system of TMP factory can cause ***serious damage and life threatening crisis***.
Unguarded machinery used in the manufacturing process can lead to worker injuries. Improper lifting, awkward postures and repetitive motions can lead to sprains and other musculoskeletal disorders. Poorly maintained or improperly handled vehicles can lead to crushing injuries.

6.2.10.2 Impact significance on occupational health and safety

There will be impact on health and safety and the magnitude of impact during operation phase is ***"Medium".***
The impact of the project can affect health and safety of the workers. Therefore, the extent of the impact is set as ***"Medium".***
The period of impact occurrence will be within the operation period and the duration of the impact is considered as ***"High".***
According to magnitude, extent and duration of the impact, the impact characteristics will be ***"High"***. The importance of the impact is considered as ***"Medium".***
Therefore, the impact on occupational health and safety by TMP factory is moderate and the significance of the impact is ***"Medium".***

Table 6.25 Impact significance on occupational health and safety during operation phase

Characteristics				
Magnitude	Extent	Duration		
2 (Medium)	2	3 (High)	Equivalent	Importance

	(Medium)		Characteristics		
Characteristics = 2+2+3 = 7			3 (High)	2 (Medium)	Significance
			Significance = Characteristics x Importance		6 (Medium)

6.2.10.3 Mitigation measures for occupational health and safety during operation phase

Employees' health hazard will be high if proper training and protective devices are not provided to them. Following measures should be adopted in the factory to prevent any hazards and accidents:

i) Specific mitigation measures for workers in cold storage room

- ***Pre-employment health screening*** and regular health surveillance.
- Training for ***cold store working*** and to ***recognize symptoms of cold stress***.
- Managing to have ***regular warm-up breaks*** for staffs working in cold storage room.
- Access to the store restricted to ***authorized, trained persons only*** and ***'No entry' signs*** clearly posted.
- Establishing a ***buddy system***, where two workers are working together with one entering the cold room while the other stay outside. The outside stand by person should only left when the 'buddy' exit the cold room.
- Establishing ***notification system for co-workers*** including intentions of entry to the cold room and how long it will take. Thus, if someone cannot return in due course, his/her co-workers are fully aware of and check for safety.
- Ensure that the cold store room is capable of being ***opened from the inside***.
- ***Anti-freeze door nope*** should be installed on ***the inside of the room***, to enable the entrant person to open the door from within ***in case the door is accidentally closed***.
- Providing ***at least two emergency exit doors*** which are ***fitted with strip heaters*** to ensure it does not freeze.
- Installing ***two trapped worker alarms (battery operated, mains back-up)*** next to both exits.
- Installing an ***alarm outside the cold room with the panic bottom on the inside***. Beware that if cold room is ***not humidity controlled***, it can get very moist and will ***damage the circuit for the panic bottom***.
- Providing ***audible and visible signal*** systems ***inside the room*** that are ***tested daily***.
- Providing ***a tool to open the door*** or create an opening on the wall in case the inner door nope fail. (e.g., a crow bar or an axe)
- Supervisor ensures thorough ***check of the building and sign-in and sign-out time*** of employee attendance sheet before it is locked.
- ***Regular testing and maintaining*** alarms and emergency lighting by competent person.
- Posting ***emergency exit door instructions on illuminated board by exit***.
- Checking emergency exit door daily to ***ensure it is not frozen shut***.
- Providing ***drying facilities for wet PPE***.

ii) General mitigation measures for workers in factory compound

- Boots cleaning with water with antiseptic before entering into the processing areas.
- ***Adequate natural lighting or illumination lighting*** should be provided.

- Lighting and cables should be ***covered for protection***.
- Keep floor surfaces ***free of slippery substances*** and provide ***slip resistant floor surfaces***.
- Chemical products, fuel, lubricants and other non-food-grade and/or toxic substances shall be securely ***stored in locked containers*** and shall be placed away from kitchens, employee rest areas, food production, packing and storage areas.
- Used chemical containers shall not be reused.
- Fuel, oil and lubricant storage shall include ***secondary containment areas*** to contain possible spills.
- Regular inspection and maintenance of ***pollution control systems.***
- Well-designed ***waste management system and storm water drainage systems*** have to be put in place so as to ensure that breeding grounds of disease carrying vectors such as rats, flies, mosquitoes, cockroaches etc. are effectively controlled in work area.
- ***Personal protective equipment and clothing*** provided to employees (such as smocks, eye protection, gloves, insulated wear for refrigerated areas, boots for wet areas, etc.) should be ***fit for purpose*** and workers should be trained for correct selection, use and maintenance. (Due to the current covid situation, COVID measures and vaccinations should be mainly encouraged.)
- The workers exposed to noisy sources should be provided with ***ear muffs/plugs***.
- ***Adequate*** facilities for ***drinking water and toilets*** should be provided to the employees.
- The health of the workers should be ***regularly checked by a well-qualified doctor*** and proper records will be kept for each worker.
- Be sure that ***trucks and other vehicles*** are in ***good working order***.
- Installing a ***visual*** and ***audible alarm*** to switch on ventilation and/or emergency lighting.
- Installing ***a windsock*** above the machinery room (or another suitable adjacent location) ***to determine the wind direction***.
- ***Adequate eye wash*** areas should be available in all locations where ammonia is handled.
- The facility shall maintain a ***list of first aid items*** kept on hand and regularly check the expiration date.
- ***Expired items*** shall be ***replaced*** promptly.
- All measures related to safety including safety appliances, training safety posters, Slogans, pictures should be ***posted readable clearly at the factory***.
- ***Safety equipment*** should be placed in nearby rooms but ***separate from machinery room***.
- ***Fire and Safety equipment*** shall be maintained, kept clean and examined at periodic intervals (at least monthly).
- Training of staffs shall contain the ***effect of ammonia to health and environment,*** the ***safety aspects during handling the system, safety and health management*** and ***emergency response plan***.

After mitigation measure, the impact on occupational health and safety will become less significant.

Table 6.25.1 after mitigation measures, impact significance on occupational health and safety during operation phase

Characteristics		
Magnitude	Extent	Duration

1 (Low)	1 (Low)	3 (High)	Equivalent Characteristics	Importance	
Characteristics = 1+1+3 = 5			2 (Medium)	1 (Low)	Significance
			Significance = Characteristics x Importance		2 (Low)

6.2.10.4 Impacts on Socio- economic

One of the main positive impacts during operation phase is the availability of employment opportunities especially to casual workers and other specialized workers. Employment opportunities are of benefit both economically and in a social sense.

Both permanent and temporary workers gain economic benefits from various jobs of TMP factory.

Employment income from TMP factory will have a substantial role for social livelihood improvement in the area.

Therefore, the impact by TMP factory on socioeconomic leads positive impact rather than negative impact on socioeconomic status of the nearby community

6.2.10.5 Impact significance on socio- economic during operation phase

As local people can get job opportunities as factory workers and skilled labours, economic income will be increased. Therefore, the impact by the TMP factory on socio- economic is positive impact.

6.2.10.6 Impacts on Community Health and Safety

Community health and safety issues during operation phase of the factory includes:

- Potential exposure to ***odors*** from ***solid wastes and wastewater***.
- Increased risk of ***vehicle or machinery injuries*** on roads and access routes around the community.
- Potential ***exposure to ammonia*** gas during ***accidental leakage*** and can cause health impacts.

6.2.10.7 Impact significance on Community Health and Safety

There will be impact on Community Health and Safety and the magnitude of impact during operation phase of the TMP project will be ***"Medium"***.

The impact of the project can affect health and safety of people in the vicinity of the project area. Therefore, the extent of the impact is ***"Medium"***.

The period of impact occurrence will be within the operation phase and the duration of the impact on residential area is considered as ***"High"***.

According to magnitude, extent and duration of the impact, the impact characteristics will be ***"High".*** The importance of the impact is considered as ***"Medium".***

Therefore, the impact on Community Health and Safety by TMP project is medium and the significance of the impact is be ***"Medium"***.

Table 6.26 Impact significance on community health and safety during operation phase

Characteristics

Magnitude	Extent	Duration			
2 (Medium)	2 (Medium)	3 (High)	Equivalent Characteristics	Importance	
Characteristics = 2+2+3 = 7			3 (High)	2 (Medium)	Significance
			Significance = Characteristics x Importance		6 (Medium)

6.2.10.8 Mitigation measures for community health and safety

Specific recommendations to minimize risks to communities include:

- Apply proper solid waste and wastewater management systems which are critical important for the health and safety of the nearby community.
- Monitoring and recording all potentially harmful products and activities, and manage them to minimize the risk to communities.
- Implement best practice guidelines for management of potentially harmful products.
- Using biological or lower-risk-profile products, if available.
- Ensure that animals and unauthorized people are not present in the areas where chemicals or other potentially harmful products are handled, stored, or applied.
- Establishing "Emergency Response Plan" especially for accidental ammonia leakage including ***communication system for delivering information and guidelines*** to residents near factory compound during emergency situations.

After mitigation measure, the impact on community health and safety will become less significant.

Table 6.26.1 after mitigation measures, impact significance on community health and safety during operation phase

Characteristics					
Magnitude	Extent	Duration			
1 (Low)	1 (Low)	3 (High)	Equivalent Characteristics	Importance	
Characteristics = 1+1+3 = 5			2 (Medium)	1 (Low)	Significance
			Significance = Characteristics x Importance		2 (Low)

6.3 Environmental and social impacts during the decommissioning phase

The activity of Decommissioning/Closure Phase is related to the use of decommissioning equipment. Decommissioning/Closure Phase includes site clearing and some earth work activities.

6.3.1 Impacts assessment and mitigation measures on air quality

6.3.1.1 Potential impact on air quality

During this phase, the operation of vehicles for facilities and decommissioning activities can also release dust particles and gaseous emissions which can affect the ambient air quality for the short

periods. There may also be gaseous emissions from diesel generators and combustion of fuel for vehicle movements. Generally, this will adversely affect localized air quality for a short period. Criteria air pollutant and air emissions that would arise from the demolition of the proposed project
are quantified and summarized below.

- Heavy machinery /vehicles such as diesel-powered bulldozers and loaders would be used throughout the entire decommissioning phase
- Vehicle traffic on paved and unpaved roads
- Demolition activities, earth work
- Worker accommodation

Adjacent to the demolition site and along the transportation route, natural habitat, residents, and construction crew will be potentially affected by the air pollution.

6.3.1.2 Impact significance on air quality

In demolition phase, there may have temporary impacts on air quality. The breaking down of the building can emit large amount of dusts but can vary depending on activities. There may also have
gaseous emissions from diesel generators and fuel combustion.
The magnitude of impact on air quality will be ***"Medium".***
The area of impact will be not only within the area but also in the vicinity area according to wind direction. Therefore, the extent of the air quality impact from particulates will be ***"Medium".***
The period of impact occurrence will be within the demolition phase and the duration of the impact
by demolition activities will be considered as ***"Low".***
According to magnitude, extent and duration of the impact, the impact characteristics will be ***"Medium"***. The importance of the impact on air will be considered as ***"Medium"***.
Therefore, the impact from particulate matters and gaseous emission by the demolition phase of TMP factory will be moderate and the significance of the impact would be ***"Medium"***.

Table 6.27 Impact significance on air quality during decommissioning phase

Characteristics					
Magnitude	Extent	Duration			
2 (Medium)	2 (Medium)	1 (Low)	Equivalent Characteristics	Importance	
Characteristics = 2+2+1 = 5			2 (Medium)	2 (Medium)	Significance
			Significance = Characteristics x Importance		4 (Medium)

6.3.1.3 Mitigation measures for air quality

The following mitigation measures should be practiced to reduce potential dust and gaseous emissions into the environment.

- Prepare adequate demolition plan for TMP factory to enhance environmental and human safety.
- Establishing proper management and transportation systems for disposal of machines, generators, various equipment, hazardous products and containers.

- Avoid excavation and demolitions works in extremely dry weathers.
- Sprinkle water on graded access routes when necessary to reduce dust generation by machines.
- Demolished materials on site to be covered to prevent to be blown off by wind.
- Minimizing dust from material handling sources by using covers.
- Minimization of exhaust emissions.
- Air pollution from vehicles will be minimized by using low emission equipment and vehicles.
- Vehicle idling time shall be minimized.
- Truck drivers should avoid unnecessary running of vehicle engines at loading/ offloading points and parking areas, and to switch off vehicle engines at these points.
- Ensure strict enforcement of on-site speed limit regulations.
- Optimize vehicle movements to eliminate unnecessary vehicle movements.
- Spraying water to minimize dust from vehicle movements.
- Ensure strict enforcement of on-site speed limit regulations.
- Prohibit burning of domestic waste on site.

After mitigation measure, the impact on air quality will become less significant.

Table 6.27.1 after mitigation measures, impact significance on air quality during decommissioning period

Characteristics					
Magnitude	Extent	Duration			
1 (Low)	1 (Low)	1 (Low)	Equivalent Characteristics	Importance	
Characteristics = 1+1+1 = 3			1 (Low)	2 (Medium)	Significance
			Significance = Characteristics x Importance		2 (Low)

6.3.2 Impact assessment and mitigation measures for noise and vibration

6.3.2.1 Potential impacts on noise and vibration level

The demolition works will lead to significant deterioration of the acoustic environment within the
project site and the surrounding areas. It will involve less noise generation due to the absence of operational equipment. But there will be some noise generated from heavy machineries running for dismantling activities. The decommissioning noise impact is the short term pollution to local ambient noise quality. Noise and vibration affect natural vegetation, animals, workforce, and communities from the areas. This will be as a result of the noise and vibration that will be experienced as a result of demolishing the proposed project.

6.3.2.2 Impact significance on noise and vibration

In decommissioning phase, noise and vibration will be experienced as a result of demolishing the proposed project. The demolition works will lead to significant deterioration of the acoustic environment within the project site and the surrounding area.

The magnitude of impact from noise and vibration will be ***"Medium"***.

The area of impact will be not only within the factory but also in the vicinity area. The construction workers and people in the vicinity area will have impact from noise and vibration of the demolition processes. Therefore, the extent of the impact noise and vibration will be ***"Medium".***
The period of impact occurrence will be within the demolition period. Thus, the duration of the impact from noise and vibration will be considered as ***"Low"***.

According to magnitude, extent and duration of the impact, the impact characteristics will be ***"Medium"***. The importance of the impact will be considered as ***"Medium"***.
Therefore, the impact noise and vibration by demolition of the TMP factory will be moderate and the significance of the impact would be ***"Medium"***.

Table 6.28 Impact significance on noise and vibration during decommissioning phase

Characteristics					
Magnitude	Extent	Duration			
2 (Medium)	2 (Medium)	1 (Low)	Equivalent Characteristics	Importance	
Characteristics = 2+2+1 = 5			2 (Medium)	2 (Medium)	Significance
			Significance = Characteristics x Importance		4 (Medium)

6.3.2.3 Mitigation measures on noise and vibration
The following mitigation measures should be used to reduce noise pollution.

- Use of well-functioning demolition equipment, machineries and vehicles.
- Machinery drivers and machinery operators should switch off engines of vehicles or machinery not being used.
- Schedule noisy decommission activities and transportation during day-time hours.
- Combine noisy operations at the same time, but avoid combinations of vibration.
- Design decommissioning activities to reduce vibration.
- Decommissioning activities must be carried out in such a way that vibrations arising will not cause damage to adjacent structures, residents and passers-by.
- Apply vibration control technologies during decommissioning period.
- Maximizing the distance between the source and receiver.
- Mechanically isolate the vibrating source or surface to reduce exposure.
- Faulty tools should not be used and tools should be maintained properly. Tools which are worn, blunt or out of alignment will vibrate more.
- Ensure that decommissioning machines, equipment and vehicles are well maintained to avoid excessive vibration.
- Maintaining wheels of vehicles and rail smoothness for transportation.
- Specifying vehicles with low unsprung weight, soft primary suspension, minimum metal-to-metal contact between moving parts of the truck, and smooth wheels.
- Install vibration damping seats.
- Perform regular inspection and maintenance of preparation vehicles.
- Limit vehicles to an idling time and shut them off whenever possible. Schedule transportation during day-time hours.

- Preventing workers from the effects of vibration by selecting appropriate vehicles and tool, by using of appropriate vibration-absorbing materials (in gloves, for example) and by providing good work practices with education programs.
- Training to workers is necessary to control exposure eg, selection, use, maintenance of equipment and restriction of duration of exposure.
- Schedule work to reduce adverse effects.
- Limit the time spent by workers on a vibrating surface.
- Provide PPE, particularly hearing protection devices for those working in noisy areas.
- Provide appropriate PPE to workers for those working in vibrating areas.
- Consider and employ vibration monitoring and measurements if appropriate.
- Regular monitoring and keeping record for vibration by the project activity.
- Notify nearby residents and property owners that vibration-generating activity is imminent.
- Respond to and investigate complaints by nearby community.

After mitigation measure, the impact on noise and vibration will become less significant.

Table 6.28.1 after mitigation measure, impact significance on noise and vibration during decommissioning period

Characteristics					
Magnitude	Extent	Duration			
1 (Low)	1 (Low)	1 (Low)	Equivalent Characteristics	Importance	
Characteristics = 1+1+1 = 3			1 (Low)	2 (Medium)	Significance
			Significance = Characteristics x Importance		2 (Low)

6.3.3 Impact assessment and mitigation measures on water quality

6.3.3.1 Potential impacts on water quality

In the decommissioning phase, the materials generated by the decommissioning activities such as clay, plaster, limestone, concrete, mercury containing light bulbs, old batteries and chemical containers can be accumulated in nearby water courses due to runoff of these materials during the rainy season. It may lead to degradation of groundwater quality.

6.3.3.2 Impact significance on water quality

In decommissioning phase, the magnitude of the impact on water will be considered as ***"Medium"***.

The area of the potential impact will be beyond the immediate area of decommissioning activities, and the extent of the impact would be ***"Medium"***.

The period of potential impact duration can be short term duration. The duration of the impact for

water quality during decommissioning will be set as ***"Low"***.

Therefore, the characteristic of water quality impact by the proposed project decommissioning phase is rated as ***"Medium"***. The impact is expected to cause some minor disturbances potentially affecting communities locally and surrounding water bodies. The importance of the impact on water quality is set as ***"Medium"***. The significant rating of impact is ***"Medium"***.

Table 6.29 Impact significance on water quality during decommissioning phase

Characteristics					
Magnitude	Extent	Duration			
2 (Medium)	2 (Medium)	1 (Low)	Equivalent Characteristics	Importance	
Characteristics = 2+2+1 = 5			2 (Medium)	2 (Medium)	Significance
			Significance = Characteristics x Importance		4 (Medium)

6.3.3.3 Mitigation measures for water resources

The following mitigation measures should be practiced and used to reduce potential impacts for water resources.

- Prepare adequate demolition plan of TMP factory to enhance environmental and human safety.
- Prevent washing away open stacks of demolition waste or debris into any drainage system along with covering with waterproof materials during rainstorms.
- Store non-hazardous and hazardous waste in a safe manner using impermeable waste containers in order to prevent from passing through by run-off.
- Implement regular maintenance of water storage and piping systems.
- Enforce to reuse water as much as possible e.g. spraying used-water over dusty areas.
- Water should be used efficiently at the site by the workers carrying out decommissioning activities in order to avoid irresponsible water use.
- Soil erosion and sediment control mechanisms will add positive effects on mitigation matters for water pollution.
- Ensure that construction machineries and vehicles have no leakage of oil or lubricants by maintaining regularly not to combine with surface runoff especially during the monsoon season.
- Use leak proof containers for storage and transportation of oil and grease.
- Collect and manage solid waste and hazardous waste along with using impermeable waste containers.
- Collect solid wastes in containers and disposed of properly.

After mitigation measure, the impact on water quality will become less significant.

Table 6.29.1 Impact significance on water quality during decommissioning phase

Characteristics					
Magnitude	Extent	Duration			
1 (Low)	1 (Low)	1 (Low)	Equivalent Characteristics	Importance	
Characteristics = 1+1+1 = 3			1 (Low)	2 (Medium)	Significance
			Significance = Characteristics x Importance		2 (Low)

6.3.4 Impact assessment and mitigation measures for soil quality

6.3.4.1 Potential impacts on soil quality

In decommissioning phase of proposed project, it may cause impact to soil system and its quality due to improper management for solid waste, waste water, hazardous waste, spills/ leaks of oil and lubricants from fuel equipment and vehicles in demolition site, and soil erosion.
Clearing, earth moving and excavation activities will affect the natural surface flow regime of water. Accidental spillage of materials/chemicals during handling and leakage from decommissioning process may lead to soil contamination.

6.3.4.2 Impact significance on soil quality

In decommissioning phase of proposed project, it may cause impact to soil system because buildings and infrastructures will be removed.
Thus, the magnitude of impact on soil quality will be "***Medium***"
The area of impact will be only within the area of project compound. Therefore, the extent of the impact on soil quality and structure is "***Low***".
The period of impact will be remained after the project and the duration of the impact on soil quality and structure is considered as "***Medium"***.

According to magnitude, extent and duration of the impact, the impact characteristic is "***Medium***". The importance of the impact is considered as "***Medium***". Therefore, the impact on soil quality and structure by the TMP factory during decommissioning phase is moderate and the significance of the impact would be "***Medium***".

Table 6.30 Impact significance on soil quality during decommissioning period

Characteristics					
Magnitude	Extent	Duration			
2 (Medium)	1 (Low)	2 (Medium)	Equivalent Characteristics	Importance	
Characteristics = 2+1+2= 5			2 (Medium)	2 (Medium)	Significance
			Significance = Characteristics x Importance		4 (Medium)

6.3.4.3 Mitigation measures for soil

Mitigation measures should be applied to minimize soil pollution and waste management impacts of a project depending upon site and project-specific conditions. Many impacts can be reduced or avoided when considered during the design and construction phase. The following mitigation measures should be used.

- Prepare adequate demolition plan of TMP factory to enhance environmental and human safety.
- When required, topsoil will be carefully removed and saved for reuse.
- Recycle of excavated earth materials if possible.
- Reuse of treated grey water for dust control and plant watering.

- Frequent water sprinkling and appropriate scheduling for truck and heavy equipment movements will also be arranged throughout the decommissioning period.
- A waste management plan (WMP) starting from waste reduction, waste separation, proper waste collection and transportation for the project should be developed that sets out plans and actions for wastes by decommissioning phase.
- Hazardous-materials handling procedures to reduce the potential for a spill during decommissioning, and will include an emergency response program to ensure quick and safe cleanup of accidental spills.
- Ensure that any waste is disposing correctly way without open-dumping.
- Manage non-hazardous and hazardous waste from demolition site in a safe manner using impermeable waste containers.
- Ensure that chemicals, oil and lubricants are stored in leak-proof storage tanks with proper handling.
- All chemicals, paint, and fuel containers will be properly sealed and rigorous spill prevention mechanisms shall be established.
- Spills will be immediately treated to stop subsequent soil pollution.
- Ensure only well-maintained equipment and vehicles used for the demolition phase.
- Arrange heavy machineries/vehicles movement and strict enforcement of on-site speed limit regulations.
- Ensure that construction machineries and vehicles have no leakage of oil or lubricants into soil by maintaining regularly.

After mitigation measure, the impact on soil quality will become less significant.

Table 6.30.1 after mitigation measures, impact significance on soil quality during decommissioning period

Characteristics					
Magnitude	Extent	Duration			
1 (Low)	1 (Low)	1 (Low)	Equivalent Characteristics	Importance	
Characteristics = 1+1+1=3			1 (Low)	2 (Medium)	Significance
			Significance = Characteristics x Importance		2 (Low)

6.3.5 Impact assessment and mitigation measures on waste disposal

6.3.5.1 Impacts on waste disposal

Demolition of TMP factory and related infrastructure will result in large quantities of solid waste. The waste will contain the various materials including concrete, drywall, wood, glass, paints, pipe and metals, garbage, containers, fluorescent light, carpeting, furniture, tires, drums, and any containers with residues remaining on the bottom and fuel tanks.

In addition to solid waste, lubricants and fuel from vehicles and machines and liquid wastes can cause contamination into the surrounding environment particularly air, water and soil.

6.3.5.2 Impact significance on waste disposal

Solid Wastes from demolition include concrete, brick and clay tile, steel, drywall and wood products. Although some of these wastes have the potential to recycle in other construction, solid waste generation in demolition phase may still remain as large amount than other phases, construction and operation phase.

The magnitude of impact from solid waste during demolition phase will be ***"High"***.

The area of impact will be only within the area of factory compound. Therefore, the extent of the impact by solid waste during demolition will be ***"Low".***

The period of impact occurrence will be within the demolition period and the duration of the impact will be considered as ***"low".***

According to magnitude, extent and duration of the impact, the impact characteristics will be ***"Medium".*** The importance of the impact is considered as ***"Medium".***

Therefore, solid waste impact by TMP factory demolition will be moderate and the significance of the impact would be ***"Medium".***

Table 6.31 Impact significance on waste disposal during decommissioning phase

Characteristics					
Magnitude	Extent	Duration			
3 (High)	1 (Low)	1 (Low)	Equivalent Characteristics	Importance	
Characteristics = 3+1+1 = 5			2 (Medium)	2 (Medium)	Significance
			Significance = Characteristics x Importance		4 (Medium)

6.3.5.3 Mitigation measures on waste disposal

The following mitigation measures should be used to reduce potential impacts for waste disposal:

- Prepare adequate demolition plan of TMP factory to enhance environmental and human safety.
- Develop a hazardous materials management plan addressing storage, use, transportation and disposal for each item.
- Manage non-hazardous and hazardous waste in a separate way without mixing and use leak proof containers/areas for waste management covering waste classification, separation, collection, storage, transfer and disposal.
- Do not wash hazardous materials containers and not mix with other wastes.
- The hazardous wastes should be disposed with proper disposal method and caution.
- Train employees to promptly clean up any oil or hazardous material spill.
- Ensure that chemicals, oil and lubricants are stored in leak-proof storage tanks with proper handling.
- Check regularly waste containers to avoid overspill of waste containers.
- Fuel storage facilities should be removed immediately upon completion of the decommissioning phase.
- Perform waste segregation applying 3Rs method (Reduce, Reuse and Recycle).
- Provide separate bins for food waste, metal and other waste at the temporary camp and other facilities on site.

- Collect recyclable wastes such as paper, metal, and plastic to support partly recycle mechanism.
- Solid wastes should not be dumped into the drain.
- Prohibit open-dumping or direct discharge of any waste to the drainage system on/off site. Solid wastes should not be dumped into the drain.

After mitigation measure, the impact on waste disposal will become less significant.

Table 6.31.1 after mitigation measure, impact significance on waste disposal during decommissioning period

Characteristics					
Magnitude	Extent	Duration			
1 (Low)	1 (Low)	1 (Low)	Equivalent Characteristics	Importance	
Characteristics = 1+1+1 = 3			1 (Low)	2 (Medium)	Significance
			Significance = Characteristics x Importance		2 (Low)

6.3.6 Impact assessment and mitigation measures for ecological resources

6.3.6.1 Potential Impact on Forest

Decommissioning phase of TMP factory will have negative impact on forest ecosystem and biodiversity.
Site clearing and some earth work activities will negatively impact on forest and nearby environment.

Demolition activities will cause indirect impact on forest by following concerns:

- Air pollution
- Water pollution
- Soil pollution
- Noise pollution which can disturb the natural cycles of animals.

6.3.6.2 Impact assessment on Forest

In decommissioning phase of TMP factory, the magnitude of activities such as site clearing and demolition activities will be "***High***".
The area of impact will be beyond factory compound. Therefore, the extent of the impact on forest during decommissioning phase is set as "***Medium***".
The period of impact occurrence will be remained after decommissioning phase and the duration of impact on the forest is considered as "***Medium****"*.

According to magnitude, extent and duration of the impact, the impact characteristics is rated as "***High***". The importance of the impact is considered as "***High***".
Therefore, impact on the forest by TMP factory during decommissioning phase is ***high*** and the significance of the impact is considered as "***High***".

Table 6.32 Impact significance on forest during decommissioning phase

Characteristics					
Magnitude	Extent	Duration			
3 (High)	2 (Medium)	2 (Medium)	Equivalent Characteristics	Importance	
Characteristics = 3+2+2 = 7			3 (High)	3 (High)	Significance
			Significance = Characteristics x Importance		9 (High)

6.3.6.3 Mitigation measures for forest during decommissioning phase

i) Air Pollution

- ***Prohibit open burning*** for all type of wastes including demolition wastes.
- Using ***greener fuel source*** such as low sulphur diesel to power equipment and vehicles.
- Limit and keep records for ***fuel usage*** and develop ***emergency management plan*** for any incidents.
- Provide ***fugitive dust suppression*** such as using water sprays or sprinklers to control dust and prevent from spreading.

ii) Water Pollution

- Keep ***demolition wastes secure and covered***.
- ***Prevent*** materials, fuel and chemicals being ***washed into waterways or drains***, and ***cover up*** all drains.
- Keep ***demolition site and road clean at all times*** in order to prevent silt and other pollutants ***running off into any bodies of water***.
- Provide ***proper drainage system*** and enable a ***strong drain protection***.
- Using ***rock or other appropriate materials*** to ensure the ***storm drain to filter out*** trash and debris.
- Keep ***clean and maintain filters*** regularly.
- Properly ***collect and treat any wastewater***.
- Improve ***management and disposal of site wastes*** including demolition wastes**.**

iii) Noise Pollution

- Use ***quiet equipment and techniques*** to manage noise pollution.
- If possible, use ***modern demolition equipment*** which is designed to reduce noise.
- Put ***movable noise barriers*** in place to manage the levels of noise pollution.
- Ensure ***equipment and vehicles*** are properly ***maintained and operated.***

iv) Soil Pollution

- Ensure ***erosion control measures*** and apply measures to ***stabilize the soil***.
- Apply ***sediment control practices***.
- Ensure ***the soil is not exposed for long time*** during decommissioning phase.
- Provide ***containment*** and ***safe equipment fuelling***.
- ***Identify and protect areas where existing vegetation***, such as trees, will not be disturbed.
- ***Protect streams, stream barriers, wild wood lands, wetlands, or other sensitive areas*** from any disturbance.

- Using ***concrete washout facilities***, especially when demolition activities are near water resources.
- Adopt ***eco -friendly house keeping practices*** during decommissioning period by using bio-degradable products.
- Develop ***waste segregation and recycling***.
- ***Protect and provide Vegetative Buffers*** along water bodies which slow and filter the storm water run-off.
- ***Vegetate and stabilize all exposed areas*** as soon as ***land alterations have been completed***.
- ***Law enforcement***, ***restrictions and notifications*** for ***illegal tree cutting, animal hunting*** or ***poaching*** in the forest by the workers, villagers and community living in the vicinity of project area.

After mitigation measure, the impact on the forest will become less significant.

Table 6.32.1 after mitigation measures, impact significance on forest during decommissioning phase

Characteristics					
Magnitude	Extent	Duration			
1 (Low)	1 (Low)	2 (Medium)	Equivalent Characteristics	Importance	
Characteristics = 1+1+2 = 4			2 (Medium)	1 (Low)	Significance
			Significance = Characteristics x Importance		2 (Low)

6.3.7.1 Potential Impact on Wildlife

Decommissioning phase of TMP factory cause negative impacts on wildlife by ***habitat destruction and habitat degradation*** due to demolition processes, pollution, invasive species, and disruption of ecosystem.

Onsite and off-site disturbance to wildlife are as follows:

- Pollution of air, water and soil
- Noise
- Disturbances to the natural behavior of wildlife
- Risk of fire

6.3.7.2 Impact assessment on Wildlife

In decommissioning phase of TMP factory, the magnitude of demolition activities such as site clearing is considered "***High***".
The area of impact will be beyond the factory area. Therefore, the extent of the impact on wildlife during decommissioning phase is set as "***Medium"***.
The period of impact occurrence will be remained after decommissioning period and the duration of the impact on the wildlife is considered as "***Medium***".

According to magnitude, extent and duration of the impact, the impact characteristics is rated as ***"High***". The importance of the impact is considered as "***Medium***".
Therefore, impact on the wildlife by TMP factory during decommissioning phase is medium and the significance of the impact is considered as "***Medium***"

Table 6.33 Impact significance on wildlife during decommissioning phase

Characteristics					
Magnitude	Extent	Duration			
3 (High)	2 (Medium)	2 (Medium)	Equivalent Characteristics	Importance	
Characteristics = 3+2+2 = 7			3 (High)	2 (Medium)	Significance
			Significance = Characteristics x Importance		6 (Medium)

6.3.7.3 Mitigation measures for wild life during decommissioning phase

i) Restoring and Enhancing the Habitats

- Restore and link together existing habitats and land features which could support wildlife.
- Compensate for damage to natural habitats by recreating similar features, restoring, and improving the surrounding landscape.
- Creation of new or additional buffer areas to reduce impacts.
- Manage and monitor restoration and compensating measures to fulfill the needs of existing flora and fauna.

iii) Preventing environmental Pollution

Strictly follow the prevention and mitigation measures for air, water and soil pollution which are stated in respective sectors including the followings:

- Establishing effective Waste Management Plan and train workers to follow waste segregation and proper disposal.
- Prohibit open burning of any wastes on site.
- Proper storage of chemicals and comply with Emergency Response Plan if any incident occurs.

After mitigation measure, the impact on the wildlife will become less significant.

Table 6.33.1 after mitigation measures, impact significance on wildlife during decommissioning phase

Characteristics					
Magnitude	Extent	Duration			
1 (Low)	1 (Low)	2 (Medium)	Equivalent Characteristics	Importance	
Characteristics = 1+1+2 = 4			2 (Medium)	1 (Low)	Significance
			Significance = Characteristics x Importance		2 (Low)

6.3.8.1 Potential Impact on Aquatic animal/ fish

Decommissioning phase of TMP factory will have negative impact to aquatic animal/ fish by altering forest ecosystem.

Demolition of factory compound will negatively impact on the aquatic animal/ fish by following concerns:

- Air and Water pollution
- Soil pollution and soil erosion
- Improper waste management
- Introducing synthetic chemicals
- Contamination of hazardous materials by leakage or improper handling
- Fishing by the workers of the project, villagers and community living in the vicinity of project area.

6.3.8.2 Impact assessment on aquatic animal/ fish

In decommissioning phase of TMP factory, the magnitude of activities is set as "***Medium"***.

The area of impact will be outside the factory area. Therefore, the extent of the impact on aquatic animals during decommissioning phase is considered as "***Medium***".

The period of impact occurrence will be remained after decommissioning phase and the duration of the impact on the aquatic animal/ fish is considered as "***Medium***".

According to magnitude, extent and duration of the impact, the impact characteristics is rated as "***Medium***". The importance of the impact is considered as "Medium".

Therefore, impact on the aquatic animal/ fish by TMP factory during decommissioning phase is medium and the significance of the impact is considered as ***"Medium"***

Table 6.34 Impact significance on aquatic animal/ fish during decommissioning phase

Characteristics					
Magnitude	Extent	Duration			
2 (Medium)	2 (Medium)	2 (Medium)	Equivalent Characteristics	Importance	
Characteristics = 2+2+2 = 6			2 (Medium)	2 (Medium)	Significance
			Significance = Characteristics x Importance		4 (Medium)

6.3.8.3 Mitigation measures for aquatic animal/ fish during decommissioning phase

i) Preventing environmental Pollution

Strictly follow the prevention and mitigation measures for air, water and soil pollution which are stated in respective sectors including the followings:

- Using ***cleaner and environmental friendly products*** for various purposes of decommissioning phase.
- Prevention, management and establishing monitoring system for ***soil erosion***.
- Proper ***storage of chemicals*** and comply with ***Emergency Response Plan*** if any incident occurs.

- Establishing ***sedimentation pond/basin*** which will prevent the polluted water pass to the river directly.
- Establishing effective ***Waste Management Plan*** and train workers to follow waste segregation and proper disposal.
- ***Law enforcement, restrictions and notifications for fishing*** in the forest by the workers, villagers and community living in the vicinity of project area.

After mitigation measure, the impact on the aquatic animal/ fish will become less significant.

Table 6.34.1 after mitigation measures, impact significance on aquatic animal/ fish during decommissioning phase

Characteristics					
Magnitude	Extent	Duration			
1 (Low)	1 (Low)	2 (Medium)	Equivalent Characteristics	Importance	
Characteristics = 1+1+2 = 4			2 (Medium)	1 (Low)	Significance
			Significance = Characteristics x Importance		2 (Low)

6.3.9 Impact assessment and mitigation measures on human environment

6.3.9.1 Potential impacts on occupational health and safety

Significant hazards can be occurred due to potential fall of materials or tools as well as temporary
hazards such as physical hazards, dust emission and noise pollution. Moreover, accidents and injuries to workers can be caused by heavy vehicle movement for transport of materials and equipment in the demolition phase.

The proposed project will appoint some workers in decommissioning phase. A potential social impact during the decommissioning phase of the project will be on the occupational health and safety of the staff. Mitigation measures are described in the next sections and on their working conditions.

6.3.9.2 Impact significance on human environment

a) Impact significance on occupational health and safety

During decommissioning phase, there may have impact on occupational health and safety for breaking down the infrastructure or some other decommissioning activities. The magnitude of the
impact will be ***"Medium***".

The area of impact will be only within the decommissioning area and therefore, the extent of the impact on occupational health and safety will be ***"Low"***.

The period of impact occurrence will be within the demolition process and the duration of the impact will be considered as ***"Low"***.

According to magnitude, extent and duration of the impact, the impact characteristics will be ***"Medium"***. The importance of the impact will be considered as ***"Medium"***.

Therefore, the significance of the impact on occupational health and safety by the TMP factory during decommissioning phase would be ***"Medium"***.

Table 6.35 Impact significance on occupational health and safety during decommissioning phase

Characteristics					
Magnitude	Extent	Duration			
2 (Medium)	1 (Low)	1 (Low)	Equivalent Characteristics	Importance	
Characteristics = 2+1+1 = 4			2 (Medium)	2 (Medium)	Significance
			Significance = Characteristics x Importance		4 (Medium)

6.3.9.3 Mitigation measures for occupational health and safety

The project will implement the following mitigation measures for Occupational Health and Safety:

- Prepare adequate demolition plan of TMP factory to enhance environmental and human safety.
- Provide workers with PPEs and trainings to avoid fugitive emission in severe winds/ weather during decommissioning phase.
- All workers will be provided with personal protection equipment (PPE) and will be obliged to wear them in work zones.
- Minimize threats by bacteria, insects, germs and chemicals by providing workers with PPE and hygiene facilities as well as mask, glove, footwear, hand sanitizer and anti-bacterial solvent.
- Apply adequate waste handling and disposal on site in compliance with the relevant regulations.
- Strictly enforce that workers adhere to the HSE manuals and specific PPE use to avoid slips, falls, hits and confined space threat.
- Designate restricted areas for danger zones with caution signs if necessary.
- Promote safe and healthy working environment, health, and well-being of all employees.
- Provide adequate eye wash stations to rinse off dust and chemicals.
- The fire and safety equipment should be properly utilized and maintained regularly.
- Well stocked first aid box which is easily available and accessible should be provided.
- Initial job trainings relevant to the assignments should be offered for the relevant staff.
- Particular works shall strictly follow work permit scheme.
- Providing proper job opportunities to community living near the TMP factory.

After mitigation measure, the impact on occupational health and safety will become less significant.

Table 6.35.1 after mitigation measure, impact significance on occupational health and safety during decommissioning period

Characteristics				
Magnitude	Extent	Duration		
1 (Low)	1 (Low)	1 (Low)	Equivalent Characteristics	Importance

Characteristics = 1+1+1 = 3	1 (Low)	2 (Medium)	Significance
	Significance = Characteristics x Importance		2 (Low)

6.3.9.4 Potential impacts on social benefits

In order to take place demolition properly and in good time, several people will be involved. As a result, several employment opportunities will be created for the workers in demolition phase of the TMP factory. Therefore, the impact on socioeconomic by TMP factory during decommissioning phase may be positive impact.

6.3.9.5 Impact significance on socio- economic during operation phase

As local people can get job opportunities during decommissioning phase, economic income will be increased. Therefore the impact by the TMP factory on socio- economic is positive impact.

6.3.9.6 Potential Impacts on Community Health and Safety

Community health and safety issues during decommissioning phase of TMP factory includes:

- Potential exposure to ***odors*** from ***solid wastes and wastewater***.
- Increased risk of ***vehicle or machinery injuries*** on roads and access routes around the community.

6.3.9.7 Impact significance on Community Health and Safety

There will be impact on Community Health and Safety and the magnitude of impact during decommissioning phase of the TMP project will be ***"Medium"***.
The impact of the project can affect health and safety of people in the vicinity of the project area. Therefore, the extent of the impact is ***"Medium"***.
The period of impact occurrence will be within decommissioning phase and the duration of the impact on residential area is considered as ***"Medium"***.

According to magnitude, extent and duration of the impact, the impact characteristics will be ***"Medium".*** The importance of the impact is considered as ***"Medium".***
Therefore, the impact on Community Health and Safety by TMP project is medium and the significance of the impact is be ***"Medium"***.

Table 6.36 Impact significance on community health and safety during decommissioning phase

Characteristics					
Magnitude	Extent	Duration			
2 (Medium)	2 (Medium)	2 (Medium)	Equivalent Characteristics	Importance	
Characteristics = 2+2+2 = 6			2 (Medium)	2 (Medium)	Significance
			Significance = Characteristics x Importance		4 (Medium)

6.3.9.8 Mitigation measures for community health and safety

Specific recommendations to minimize risks to communities include:

- Monitoring and recording all potentially harmful products and activities, and manage them to minimize the risk to communities.
- Implement best practice guidelines for management of potentially harmful products.
- Using biological or lower-risk-profile products, if available.
- Ensure that animals and unauthorized people are not present in the areas where chemicals or other potentially harmful products are handled, stored, or applied.
- Apply proper solid waste and wastewater management systems.
- Establishing "Emergency Response Plan" especially for accidental ammonia leakage including ***communication system for delivering information and guidelines*** to residents near factory compound during emergency situations.

After mitigation measure, the impact on community health and safety will become less significant.

Table 6.36.1 after mitigation measures, impact significance on community health and safety during decommissioning phase

Characteristics					
Magnitude	Extent	Duration			
1 (Low)	1 (Low)	1 (Low)	Equivalent Characteristics	Importance	
Characteristics = 1+1+1 = 3			1 (Low)	2 (Medium)	Significance
			Significance = Characteristics x Importance		2 (Low)

Chapter 7

Cumulative Impacts Assessment

7. Cumulative impacts

7.1 Cumulative impact assessment

Cumulative impacts typically refer to those effects on local communities and ecosystems which result from incremental direct and indirect effects from the proposed project as well as added contributed effects from other projects or actions at and around the same projected site area. The cumulative effects in relation to existing activities at the local environment were reviewed and assessed for significance.

According to the onsite surveys and interviews with the nearby community, there are no similar Marine Production services around the proposed project site. Thus, the cumulative effects of the same marine processing activities cannot be found around its vicinity, however, as the proposed project is located near the community comprising of mainly Ann Taw village, the potential impacts likely affected by the factory can lead the cumulative effect on the existing air quality which is already affected by local activities including the markets and restaurants (coffee shops, cafeteria), bus station, car servicing centre and other business activities etc.

The following **Figure 7.1** shows the Thantwe Marine Production (TMP) factory located near the Ann Taw village, Dwar Ya Wati (B) ward, Thandwe township, Rakhine state.

Figure 7.1 TMP factory with nearby surroundings

7.2 Cumulative impact on air quality

The air pollution generated by the activities of the TMP factory will result in cumulative impact on the existing air quality which is affected by other local activities including the markets and restaurants (coffee shops, cafeteria), bus station, car servicing centre and other business activities. Cumulative impacts refer to the incremental effect of several activities that may have an individually minor, but collectively significant, impact on air quality.

7.3 Cumulative impact on noise quality

The cumulative noise impact at a residence is the noise received at that residence when two or more of the industries or business activities are operating simultaneously

In terms of noise impact, there can be cumulative noise impacts which are likely affected by the proposed TMP Factory's activities resulting from compressors, generators and vehicles etc., and other existing business activities which are simultaneously running in the same vicinity. These activities will increase the baseline noise level.

7.4 Cumulative impact on water quality

The TMP Factory is currently utilizing the water from the own water reservoir as well as the tube wells. Water supply is required in the proposed plant for the production process, cool storage processes and the flake ice making plant. In addition, it is also used for canteen purpose and sanitation. The total water requirement of the plant is 870,000 (estimate) gal/month. Whilst about 60% of total water usage is for the manufacturing process and 40% of the water usage is for the general/domestic use. According to the nature of the factory process, there will be much cumulative increase in water usage.

7.5 Cumulative impact on traffic

There will be a cumulative increase in automobile and truck traffic in the vicinity of TMP factory as a result of not only from the factory's existing activities also from the bus station situated near the factory.

It is expected that there will be an increase number of vehicles at the main road during the hours of 8:00 a.m. to 5:00 p.m.

7.6 Cumulative impact on solid waste and wastewater

Solid wastes particularly sludge released from the wastewater treatment, wastes generated from the processing activities and domestic wastes are currently disposed with the factory's own arrangement since there is no municipal waste collection system yet in Thandwe.

Furthermore, the impact of solid waste disposal from the factory as well as solid wastes generated from various activities of nearby community around the factory premises would likely to contribute towards the incremental deleterious effects on surrounding environment particularly health, aesthetic and odor issue.

The cumulative effect of wastewater disposal into the Thandwe river is one of the major impacts on the environment especially for local community who is relying for their daily life of livingbeing. The wastewater discharge by the factory can cause more or less significant

cumulative impact on the river body and its habitant in which other effluents are also being released from local community.

Chapter 8

Environmental Management Plan

8. Environmental management plan (EMP)

8.1 Introduction

Proper implementation of a comprehensive Environmental Management plan (EMP) will ensure that TMP factory meets regulatory and operational performance (technical) criteria. This section describes the modalities provided in the project for the implementation of the proposed mitigation measures to its potential negative impacts.

It proposes the institutional responsibilities for the implementation of the mitigation measures, the implementation indicators, and the time frame for monitoring and follow-up for the implementation activities. Environmental Management Plan for each phase (Construction phase, operation phase and demolition phase) provides specific environmental guidance for each activity of a project. The intention of the Environmental Management Plan is to ensure that activities borne from the construction, operation and demolition phase of the project are managed and mitigated in order to ensure that the impacts will be within applicable national standards.

8.2 Objectives of the environmental management plan

Environmental Management Plan (EMP) for all the identified environmental impacts during construction and operational stages of TMP factory is prepared to ensure that sufficient procedural measures are in place to reduce and minimize associated adverse impacts to acceptable or manageable levels.

This environmental management plan aims at recommending improvements to management structures and procedures to ensure that future management recognizes the impacts assessed in this.

The strict implementation of the EMP and project management's strict enforcement of the adequate construction practices and standards will greatly reduce the negative impacts of the project.

Environmental and social consultants, if necessary, will be engaged to support EMP implementation including monitoring. Mitigation measures presented in the following tables [**Table 8.1** for construction phase, **Table 8.2** for operational phase, **Table 8.3** for decommissioning phase] for all three phases are recommended for the impacts specified for the project.

8.3 Environmental and social management plan

Environmental and Social Management Plan Measures are prepared by the following three tables: **Table 8.1** for construction phase, **Table 8.2** for operational phase, **Table 8.3** for decommissioning phase.

8.3.1 Environmental and Social Management Plan for Construction Phase

The necessary objectives, activities, mitigation measures, and allocation of costs and responsibilities pertaining to prevention, minimization and monitoring of significant negative impacts and maximization of positive impacts associated with the construction phase.

Table 8.1: Environmental and Social Management Plan Measures for the Construction Phase

Impact	Project Activities/ Environmental Aspects	Proposed Mitigation Measure	Monitoring		
			Implementation	**Supervision**	**Report**
Air Quality	Vehicles movements and equipment transportation. Construction activities emitting particulate and toxic gas, including cutting and welding activities. Earth works including excavation and site levelling.	• Wind breaks should be constructed around the main construction activities and in the locality of potentially dusty works. • Avoid excavation works in extremely dry weathers. • Prohibit open burning of any waste at project site. • Soil erosion and dust control management measures also assist in the management of air pollution from construction operations. • Air pollution from vehicles will be minimized by using low emission equipment and vehicles. • Ensure that all construction equipment and vehicles are maintained in accordance with the manufacture's recommendations. • Minimizing movement of vehicles and construction machineries particularly outside the premise of project site to avoid further destruction. • Fuel efficient stoves and cooking	The Site Manager / HSE Officer will: • Ensure weekly inspects the site and the housekeeping of the area. • Make sure that safe working conditions are provided for the workers. • Ensure that all trucks hauling soil are adequately protected. • Inspect and evaluate all the safety aspects of the welding. • Ensure the PPE provided are appropriate for the activity and meets the standards specifically mentioned for the activities. • Keep records of all the incidents and maintenance history of the equipment. • Ensure that regular dust	Project Management Team on site and/or Designated HSE Team	Weekly report on general working condition Yearly air quality report

		equipment will be provided to reduce emission from food processing at the site during construction activities. • Turn equipment off when not in use. • Vehicle idling time shall be minimized. • Alternatively, fueled construction equipment shall be used where feasible. • Sprinkle water on graded access routes when necessary to reduce dust generation by construction vehicles. • Construction materials on site to be covered to prevent to be blown off by wind. • Stockpiling of material, for example, rocks, sand and soils should be minimized. • Stockpiles should be located as far away from receptors as possible. • Vegetation of stockpiles should be used where a stockpile is not to be used for a month to stabilize the surface and prevent dust generation. • Pave, apply water when necessary, or apply (non-toxic) soil stabilizers on all unpaved access roads, parking areas and staging areas at	suppression activities are performed on a regular basis. The Construction Team will: • Ensure proper working condition of vehicles. • Report the incidents to The Site Manager / HSE Officer if any.		

		construction sites. • Visual monitoring of dust deposition onto surfaces on and off-site should be regularly conducted. • Ensure strict enforcement of on-site speed limit regulations.			
Impact	**Project Activities/ Environmental Aspects**	**Proposed Mitigation Measure**	**Monitoring**		
			Implementation	**Supervision**	**Report**
Noise Quality	Construction activities, vehicles movement and machinery operations.	• Use quiet equipment (i.e. equipment designed with noise control elements), • Limit pickup trucks and other small equipment to an idling time of five minutes, observe a common-sense approach to vehicle use, and encourage workers to shut off vehicle engines whenever possible. • Careful handling of material loading and unloading. • Ensure use of silencers or mufflers on heavy construction equipment engines. • Construction machinery and vehicles will undergo periodic maintenance to keep them in good working condition. • Perform regular inspection and	The Site Manager / HSE Officer will: • Ensure proper working condition of vehicles. • Report the incidents. • Ensure that noise levels meet guidelines and if necessary, put in place noise control measures. • Ensure weekly inspects the site and the housekeeping of the area.	Project Management Team on site and/or Designated HSE Team	Weekly report on general working condition Yearly noise quality report

		maintenance of preparation vehicles and equipment. • Turn equipment off when not in use. • Taking consideration to be careful sequencing and scheduling times. • Schedule noisy construction activities and transportation during day-time hours. • Combine noisy operations at the same time, but avoid combination of vibration. • Provide PPE particularly hearing protection devices for those working in noisy areas. • Locate noisy plant as far away from receptors as practicable. • Orientate equipment known to emit noise strongly in one direction so that the noise is directed away from receptors as far as practicable. • Avoid institutions sensitive to noise such as settlement, schools, health institution or other offices close to the project site.			
Impact	**Project Activities/ Environmental Aspects**	• **Proposed Mitigation Measure**	**Monitoring**		
			Implementation	**Supervision**	**Report**

Water Quality/ Resources	Solid waste, liquid waste and hazardous waste release and water usage.	• Limit water withdrawal to the amount that will not adversely affect the groundwater balance and the demand of the local community, by developing and conserving own source of water. • Promote recycling and reuse of water as much as possible. Implement road drainage system and smooth road to limit erosion. • Promptly detect and repair of water pipe and tank leaks. • Ensure taps are not running when not in use. • Proper recycling of water from other uses for sprinkling dusty pavements. • Soil erosion and sediment control mechanisms will add positive effects on mitigation matters for water pollution. • All chemicals, paint, and fuel containers will be properly sealed and rigorous spill prevention mechanisms will be employed. Spills will be immediately treated to stop subsequent water pollution. • Conducting regular training, monitoring, and inspection schemes together with keeping	The Site Manager/ HSE officer will: • Ensure that all storm drains are cleared of debris so as to ensure free flow of water. • Ensure regular visual checks for any leaks that may be present. • Ensure that waste management plan is implemented. • Ensure that all septic tanks' capacity is adequate and impervious to leaks.	Project Management Team on site and/or Designated HSE Team	Weekly report on general working condition Yearly water quality report

		track of water uses minimizes waste and leaks from faulty connections and faucets. • Open stockpiles of construction materials or construction wastes onsite should be covered with tarpaulin or similar fabric during rainstorms. • Provide measures to prevent the washing away of construction materials, soil, silt or debris into any drainage system of open stockpiles of construction materials. • Comply hazardous-materials handling procedures to reduce the potential for a spill during construction, and will include an emergency response program to ensure quick and safe cleanup of accidental spills.			
Impact	**Project Activities/ Environmental Aspects**	• **Proposed Mitigation Measure**	**Monitoring**		
			Implementation	**Supervision**	**Report**
Soil Quality	Improper storage, handling and disposal of fuels, lubricants, chemicals and hazardous liquid onsite, and potential	• All chemicals, paint, and fuel containers will be properly sealed and rigorous spill prevention mechanisms will be employed. Spills will be immediately treated to stop subsequent soil pollution.	The Site Manager/ HSE officer will: • Inspect weekly the storage areas for the assurance of the spill/leak proof system. • Complete the incident report should any leak occur.	Project Management Team on site and/or Designated HSE Team	Yearly report on general condition

	spills from these liquid materials. Earth works such as excavation, site levelling and clearance, and runoffs.	• Careful planning to establish work zones, defining phases of construction, and active management of daily activities will be employed to minimize soil disturbance during the construction phase. • The project area will be divided into smaller sectors and vegetation from the smaller sectors will be cleared sequentially to minimize soil exposure during construction. • When required, topsoil will be carefully removed and saved for reuse. • Frequent water sprinkling and appropriate scheduling for truck and heavy equipment movements will also be arranged throughout the construction period. • A waste management plan (WMP) for the project should be developed that sets out plans and actions for construction wastes. • Hazardous-materials handling procedures to reduce the potential for a spill during construction, and will include an emergency response	• Perform visual inspections and complete the relevant log. • The logs are the proof that the inspections have been performed. • Maintain all the records of the logs.		
			• Make sure proper housekeeping is done throughout the site. • Ensure containers only stored in designated areas, completion of log. • Ensure empty / full containers are only stored in designated areas, completion of log. • Ensure that all site boundaries are strategically installed around the construction site. • Waste generation from each activity will be recorded. • Produce the log template for checking the waste disposal compliance.		

		program to ensure quick and safe cleanup of accidental spills. • Ensure site boundaries will be strategically placed in order to minimize surface runoffs especially during the monsoon season.			
Impact	**Project Activities/ Environmental Aspects**	• **Proposed Mitigation Measure**	**Monitoring**	**Impact**	**Project Activities/ Environmental Aspects**
			Implementation		
Waste Generation	Improper storage and handling of fuels, lubricants, chemicals and hazardous liquid on-site, and potential spills from these liquid materials solid waste, liquid waste and hazardous waste generation and disposal.	• Use of durable, long-lasting materials that will not need to be replaced as often, thereby reducing the amount of construction waste generated over time. • Construction materials will be managed in a way to avoid over-ordering, poor storage and maintenance, mishandling as well as improper operation procedures. • Construction wastes will be separated into reusable items and materials to be disposed of or recycled whenever possible. • Waste suitable for reuse will be stored on site and reintroduced to the construction process as and when required. • Provision of facilities for proper handling and storage of construction	The Site Manager/ HSE officer will: • Waste generation from each activity will be recorded. • Produce the log template for checking the waste disposal compliance. • Ensure all the hazardous waste are in secured area followed by the instruction showed in label. • Perform the visual inspection of the waste containers and complete the relevant log. • The logs are the proof that the inspections have been performed.	Project Management Team on site and/or Designated HSE Team	Weekly Report

		materials to reduce the amount of waste caused by damage or exposure to the elements. • A hazardous waste management system covering waste classification, separation, collection, storage, transfer and disposal should be set up and operated. The waste management system will comply with applicable regulation of the government, if any, or in its absence, good international practice. • The waste management plan will identify disposal routes (including transport options and disposal sites) for all wastes generated during the construction phase. • Hazardous waste will be stored in such a way as to prevent and control accidental release to the environment (e.g. secondary containment, sealed containers). • Carefully select less hazardous materials and use the necessary amount only. • Establish a designated hazardous waste collection site and make it secure. • Do not clean the used hazardous			

		material containers and mix wastes. • Recyclables such as scrap steel, metals, plastics, and paper items will be collected for recycling wherever possible. • Packaging materials, cans, and containers would be hauled back to manufactures for reuse in next shipments where economically feasible. • Use of building materials that have minimal packaging to avoid the generation of excessive packaging waste. • Use of plastic bags will be discouraged and explained to the workforce and local communities. • Disposal of construction waste in or off the construction site should be prohibited. • Prohibit open burning of any waste at project site. Regular collection times will be arranged to prevent overflow in waste collection bins. • Chain of custody documents should be used for construction waste to			

		monitor disposal. • Waste segregation should be practiced at the workers camps with an emphasis placed on reducing, reusing and recycling of waste streams as appropriate.			
Impact	**Project Activities/ Environmental Aspects**	**Proposed Mitigation Measure**	**Monitoring**		
			Implementation	**Supervision**	**Report**
Ecological Resource	Construction activities emitting particulate and toxic gas, including cutting and welding activities. Earth works such as excavation and site levelling.	• High valued habitat to be avoided where practicable in the design process. • Remove vegetation in project areas only (roads, factory site). • Limit vegetation removal to a minimum. • Re-greening of the project area will be carried out to compensate the vegetation loss in the construction. • Where possible, topsoil will be saved and used as backfill later. • Contractors and personnel will not be allowed off site where they could cause unnecessary disturbance to vegetation or wildlife.	The Site Manager/ HSE officer will: • Ensure Environmental management procedures shall be developed before the start of the work.	Project Management Team on site and/or Designated HSE Team	Not directly applicable to the proposed project, however, during the decommiss ion phase, need to report
Impact	**Project Activities/**	**Proposed Mitigation Measure**	**Monitoring**		

	Environmental Aspects				
			Implementation	**Supervision**	**Report**
Occupational Health and Safety	Dust from soil disturbances and vehicle movement. Impairment of hearing capacity due to the exposure to high noise levels. Exposure to a number of health risk factors, (e.g. noise, dust, chemicals, construction material, solid waste, waste water, vector transmitted diseases), risk factors resulting from human behavior (e.g. STD, HIV etc.) and road accidents from construction traffic.	• Suitable overalls, safety footwear, dust masks, gas masks, respirators, gloves, ear protection equipment etc. should be made available and construction personnel must be trained to use the equipment. • Necessary health and safety rules shall be enforced by the site foreman to ensure that all staff members adhere to the standards and are thus safe. • All workers will be provided with personal protection equipment (PPE) and will be obliged to wear them in work zones. • Training to personnel will be imparted to generate awareness about effects of noise and importance of using PPEs. • Adequate collection and storage of waste on site and safe transportation to the disposal sites and disposal methods at designated areas shall be provided.	The Site Manager/ HSE officer will: • Ensure the PPEs provided are sufficient / appropriate for the particular work. • Ensure that regular dust suppression activities are performed on a regular basis. • No unnecessary blowing of horns at any time. • Ensure PPEs are in stock. • Ensure proper working schedule for all employees.	Project Management Team on site and/or Designated HSE Team	Weekly Report

		• Particular works shall strictly follow work permit scheme. • Promote safe and healthy working environment, health, and well-being of all employees. Implement all necessary measures to ensure health and safety of workers. • Well stocked first aid box which is easily available and accessible should be provided.			

8.3.2 Environmental and Social Management Plan for Operational Phase

The necessary objectives, activities, mitigation measures, and allocation of costs and responsibilities pertaining to prevention, minimization and monitoring of significant negative impacts and maximization of positive impacts associated with the operational phase.

Table 8.2: Environmental and Social Management Plan Measures for the Operational Phase

Impact	Project Activities/ Environmental Aspects	Proposed Mitigation Measure	Monitoring		
			Implementation	Supervision	Report
Air Quality	Fugitive emissions from various operations activities. Gaseous and particulate emission from vehicles, backup generator, etc.	• Ensure that the materials from the whole factory are suitably covered to limit / prevent the windblown dusts from dispersing. • Regular cleaning should be performed in order to remove dust	The Operation Manager/ HSE officer will: • Ensure proper working condition of vehicles and equipment.	Project Management Team on site and/or Designated HSE Team	Weekly report on general working condition Yearly air quality report

	Odor emission by decomposition of organic matter	that have accumulated within the factory. • An air pollution control system shall be installed in areas where the source of the emissions has been identified. • Prohibit open burning of any waste at project site. • Careful use of energy efficient equipment and tools. • Actively seeking cleaner technologies and investing in less polluting technologies. • Storage of crushed raw materials in covered or closed bays. • Collecting dust and other impurities from the air by using dust filter or filter-cleaning system. • Use of dust extraction and recycling systems to remove dust from work areas. • Use of air ventilation in processing and packing areas. • Ensure that all machines are maintained in accordance with manufacturer's recommendations. • Consider the use of low-emission generator engines. • Spray water onto the ground to control dust.	• Ensure daily inspection at the site. • Ensure filters and grease traps are cleaned regularly and well-maintained. • Ensure that regular dust suppression activities are performed on a regular basis. • Educating drivers and vehicle operators to stop engine idling. • Education and training programs with competitions to encourage all employees to actively participate in energy saving. • Ensure that all trucks hauling soil are adequately protected. • Keep records of all the incidents and maintenance history of the equipment. • Make sure that safe working conditions are provided for the workers. • Ensure daily inspection for housekeeping of the area. • Systematic arrangement of delivery operation schedules and times.		

		• Plant long trees around the project area to control air pollution (a green belt) • Storage of waste-derived fuels in areas protected from wind and other weather conditions. • Use of enclosed belt conveyors for materials transportation and emission controls at transfer points. • Careful selection and use of environmentally friendly and low emission vehicles. • Appropriate management of project traffic. • Systematic arrangement of delivery operation schedules and times. • Educating drivers and vehicle operators to stop engine idling. Education and training programs with competitions to encourage all employees to actively participate in energy saving. • Discouraging the common practice of burning any waste in the field, and encouraging biodegradation. • Placing a buffer zone with a garden or with a man-made	• Storage of waste-derived fuels in areas protected from wind and other weather conditions. • Inspect and evaluate all the safety aspects of the production activities. • Ensure the PPE provided are appropriate for the activity and meets the standards specifically mentioned for the activities. • Assure the provision of proper PPE for the workers. • Report the incidents if any.		

		forest between residential areas and project operation zones. • Periodical monitoring of air pollutants and if values exceed the standard limits, suitable mitigation measures will be taken. • Ensure that batches of raw materials meet standard quality to reduce odor emission. • Reduce the stock of raw materials, waste, and by-products. • Empty and clean fat traps on a regular basis. • Cover all transfer systems, wastewater canals, and wastewater treatment facilities for reducing foul odors. • Install accurate temperature devices correctly. • Measure and record temperatures automatically. • Ensure that store-room has a temperature-related alarm.			
Impact	**Project Activities/ Environmental Aspects**	**Proposed Mitigation Measure**	**Monitoring**		
			Implementation	**Supervision**	**Report**
Noise Quality	Industrial activities, vehicle loading or unloading	• Ensure regular maintenance of the equipment to minimize the noise level. • Ensure usage of mufflers on	The Operation Manager/ HSE officer will: • Noise generating sources and their platforms will be	Project Management Team on site and/or	Weekly report on general working condition Yearly noise

		diesel/gas driven machinery. • Using enclosure for all generator sets. • Use low noise equipment. • Carry out periodic monitoring of noise levels, if values exceed the standard limits, suitable mitigation measures to be taken. • Develop green belt to act as a noise barrier. • Establish a grievance mechanism as part of stakeholder engagement plan. • Schedule operation of noisy equipment at different times. • Schedule noisy operation and transportation activities during day-time hours. • Turn equipment off when not in use. • Training to personnel will be imparted to generate awareness about effects of noise and importance of using PPEs. • Traffic control measures to be enforced strictly. • Vehicular trips should be performed only during daytime hours in order to limit the impacts of any increased noise generated. • Consultation with nearby	maintained properly to minimize noise vibrations generated by them. • Report the incidents if any.	Designated HSE Team	quality report

		residential areas if extreme levels of noise are predicted. • Respond to and investigate complaints by nearby community.			
Impact	**Project Activities/ Environmental Aspects**	**Proposed Mitigation Measure**	**Monitoring**		
			Implementation	**Supervision**	**Report**
Water Resources	Spills/ leaks of oils and lubricants from fuel equipment and vehicles. Spills from the use of cleaning materials and water used. Ice manufacturing, cleaning raw materials, washing equipment and hand washing activities. Improper management of waste, sewage water and storm water/rainwater.	• If any machines/ vehicles/ equipment are found to have any leaks, they should not be used. • No maintenance of equipment should be performed onsite that can potentially contaminate the soil and groundwater. • Promote recycling and reuse of water as much as possible. • Proper recycling of water from other uses for sprinkling dusty pavements. • Promptly detect and repair of water pipes and tank leaks. • Quick fixing of leaking pipes. • Ensure taps are not running when not in use. • Promote awareness to employees on water conservation and reducing water wastage. • Materials should be properly stored under the roof to prevent dumping into the water courses in the rainy season.	The Operation Manager/ HSE officer will: • Ensure regular visual checks for any leaks that may be present. • Promptly detect and repair of water pipes and tank leaks. • Quick fixing of leaking pipes. • Ensure usage of enough ice to secure product quality and match ice production to requirements. • Ensure that all storm drains are cleared of debris so as to ensure free flow of water. • Ensure that all septic tanks' capacity is adequate and impervious to leaks. • Ensure that waste management plan is implemented.	Project Management Team on site and/or Designated HSE Team	Weekly report on general working condition Yearly water quality report

		• Installing water efficient toilets and shower heads. • Users to conserve water e.g. by avoiding unnecessary toilet flushing. • Treat drainage system for sediment control. • Store, dispose and clean up all diesel and hazardous materials according to the procedures. • Preventing leaks and spills. • Install water conserving taps that turn-off automatically when water is not being used. • Proper management of storm water. • Limit water withdrawal to the amount that will not adversely affect the groundwater balance and the demand of the local community, by developing and conserving own source of water. • Conducting regular training, monitoring, and inspection schemes together with keeping track of water uses minimizes waste and leaks from faulty connections and faucets. • The storage of fuel should be in a dedicated area provided with drip trays / walls with impermeable	• Report the incidents if any.		

		flooring. • Good and adequately maintained drainage to facilitate run-off and minimize the likelihood of flooding. • Collect internal organs and other organic materials separately. • Conduct a dry pre-cleaning of equipment and production areas before wet cleaning. • Fit and use floor drains and collection channels with grids and screens, and / or traps. • Equip the outlets of wastewater channels with screens and fat traps. • Dry clean with a scraper or broom before cleaning with water. • Reducing suspended solids by using clarifiers or settling ponds. • Store raw materials properly under the roof. • Choose cleaning agents and apply with correct dosage to prevent adverse impacts on environment.			
Impact	**Project Activities/ Environmental Aspects**	**Proposed Mitigation Measure**	**Monitoring**		
			Implementation	**Supervision**	**Report**

Soil Quality	Spills/ leaks of oils and lubricants from fuel equipment and vehicles. Improper waste management from industrial activities.	• Ensure only well-maintained equipment and vehicles used for the operation phase. • Hygienic sanitary facilities and sewerage system. The toilets and domestic waste water will be collected through a common sewerage. The minimum number of toilet facilities required is one toilet for every ten persons. • Store inorganic wastes in a safe place within the site and clear organic wastes on daily basis to waste collector or compost the waste. • Daily inspection of the project site and completion of logs. • Ensure liners are placed under fuel storage tanks. • Ensure the stored wastes are properly collected and handled by the authorized personnel daily.	The Operation Manager/ HSE officer will: • Daily visual inspection of storage areas for any leaks from containers and completion of log. • Perform the visual inspections and complete the relevant log. The logs are the proof that the inspections have been performed. • Waste generation from each project activities will be recorded. • Ensure all the hazardous wastes are in secured area followed by the instruction showed in label. • Train employees to promptly clean up any oil or hazardous material spill.	Project Management Team on site and/or Designated HSE Team	Yearly report on general condition

		• Hazardous-materials handling procedures to reduce the potential for a spill and will include an emergency response program to ensure quick and safe cleanup of accidental spills. • Water based chemicals are preferred. • Vegetate in some areas immediately to avoid soil erosion. • Waste management for the project should be developed that sets out plans and actions for operational wastes.	• Ensure site boundaries will be strategically placed in order to minimize surface runoffs especially during the monsoon season. • Daily visual inspection for incorrectly stored containers. • Make sure proper housekeeping is done throughout the site. • Inspect weekly at storage areas for assurance of the spill/leak proof system. • Complete the incident report if any leak occurs. • Maintain all records of the logs. • Report the incidents if any.		

Impact	Project Activities/ Environmental Aspects	Proposed Mitigation Measure	Monitoring		
			Implementation	Supervision	Report
Waste	Waste generation and disposal of the project site including solid waste, liquid waste and hazardous waste. Improper waste management.	• Encourage fishing vessels to reduce the capture of "non-target species". • Design fish-processing operations to enable recovery of waste streams in accordance with Good Manufacturing Practice (GMP) and Hazard Analysis and Critical Control Points (HACCP) food safety programs. • Maintain drains regularly as and when required. • Solid wastes should not be dumped into the drain. • Blocked drains should be cleaned properly and debris disposed at approved sites. • Ensure regular monitoring of the sewage discharged from the project. • Ensure sufficient number of proper sanitary facilities provided for employees. • Ensure that all trash containers in the plant are properly sealed at all times to prevent waste being blown and scattered.	The Operation Manager/ HSE officer will: • Ensure the capture of target species only and comply Good Manufacturing Practice (GMP) and Hazard Analysis and Critical Control Points (HACCP) food safety programs. • Ensure all the hazardous waste are in secured area followed by the instruction showed in label. • Produce the log template for checking the waste disposal compliance. • Waste generation from each production process will be recorded. • Ensure that any waste is disposing correctly way. Perform the visual inspection of the waste containers and complete the relevant log. The logs are the proof that the inspections have been performed.	Project Management Team on site and/or Designated HSE Team	Weekly report on general condition

		Encourage waste sorting by facility users. • Provide separate bins for food waste, metal and other wastes at the staff quarters and other facilities on site. • Collect non-hazardous solid wastes for recycling or disposal at landfill. • Setting up of separate waste collectors at different points. • Regular cleaning and replacing of waste collectors. • Avoid contamination of the surrounding environment by maintaining machines equipment and vehicles regularly and handling of fuel and lubricants with caution. • Avoid leaks, spills or accidental releases into the soil, surface water and ground water resources by proper storage, handling and transport of hazardous materials.	• Education and training programs with competitions to encourage all employees to actively participate in 4Rs.		
Impact	**Project Activities/ Environmental Aspects**	**Proposed Mitigation Measure**	**Monitoring**		
			Implementation	**Supervision**	**Report**

Wastewater	Wastewater generation including the storm water and discharge from the factory processing	• Conduct regular inspections for drainage pipe blockages or damages, and fix appropriately. • Education and training will be offered to all factory employees and, reward for innovative reduction and recovery approaches will be given to company departments in monthly competitions. • Train employees to promptly clean up any oil or hazardous material spill.	• Wastewater treatment method using Limestone and Charcoal alternatively at each tank in TMP factory should be modified adding the chlorine with appropriate dosing at the final tank (5th tank) before releasing into the Thandwe river. • Train employees to promptly clean up any oil or hazardous material spill.	Project Management Team on site and/or Designated HSE Team	Weekly report on general condition including odor as well as the community complaint throughout the drainage pipeline
Impact	**Project Activities/ Environmental Aspects**	**Proposed Mitigation Measure**	**Monitoring**		
			Implementation	**Supervision**	**Report**
Ecological Resource	Project operation activities	• Re-greening within the project site will be carried out to compensate the vegetation loss in the operation phase. • Consider use of indigenous species in re-vegetation. • Contractors and personnel will not be allowed off site where they could cause unnecessary disturbance to vegetation or wildlife. • Creation of buffer areas and compensate for any damage to natural habitats by recreating	The Operation Manager/ HSE officer will: • Develop green area in the project compound. • Ensure environmental management procedures shall be developed. • Ensure law enforcement, restrictions and notifications for illegal tree cutting, animal hunting or poaching in the forest by the workers, villagers and community.	Project Management Team on site and/or Designated HSE Team	Not directly applicable to the proposed project, however, during the decommission phase, need to report.

		similar features, restoring, and improving the surrounding landscape. • Using cleaner and environmental friendly products.			
Impact	**Project Activities/ Environmental Aspects**	**Proposed Mitigation Measure**	**Monitoring**		
			Implementation	**Supervision**	**Report**
Occupational Health and Safety	Fugitive emissions within factory compound . Gas emission from processing activities. Exposure to solid waste, liquid waste and hazardous waste. Dust from soil disturbances and vehicle movement. Health impacts or injuries due to prolonged exposure of low temperatures. Being locked in the cold rom. Impairment of	• Provide adequate natural lighting or illumination lighting. • Replace expired first aid items promptly. • Post readable and clear safety measures including safety appliances, safety training posters, slogans and pictures at the factory. • Place safety equipment in nearby rooms but separate from machinery room. • Maintain, keep clean and examine fire and safety equipment at periodic intervals (at least monthly). • Train staff for effects of ammonia to health and environment, safety aspects during handling system, and emergency response plan. • Train cold store workers to recognize the symptoms of cold stress.	The Operation Manager/ HSE officer will: • Establish pre-employment health screening and regular health surveillance. • Ensures thorough check of the building and sign-in and sign-out time of employee attendance sheet before it is locked. • Regular testing and maintaining of alarms and emergency lighting. • Post emergency exit door instructions on illuminated board by exit. • Check emergency exit door daily to ensure it is not frozen shut. • Provide drying facilities for wet PPE.	Project Management Team on site and/or Designated HSE Team	Weekly report

	hearing capacity. Accidental leakage of ammonia.	• Manage regular warm-up breaks for staffs working in cold storage room. • Restrict access to the store for authorized, trained persons only and post 'No entry' signs clearly. • Establish a buddy system, where two workers are working together with one entering the cold room while the other stay outside. The outside stand by person should only left when the 'buddy' exit the cold room. • Establish notification system for co-workers including intentions of entry to the cold room and how long it will take. Thus, if someone cannot return in due course, his/her co-workers are fully aware of and check for safety. • Ensure that the cold store room is capable of being opened from the inside. • Install anti-freeze door nope inside of the room, to enable the entrant person to open the door from within, in case the door is accidentally closed. • Provide at least two emergency exit doors which are fitted with strip heaters to ensure it does not freeze.	• Ensure the PPEs provided are sufficient / appropriate for the particular work. • Ensure that regular dust suppression activities are performed on a regular basis. • No unnecessary blowing of horns at any time. • Ensure PPEs are in stock. • Ensure proper working schedule for all employees.		

		• Install two trapped worker alarms (battery operated, mains back-up) next to both exits. • Install an alarm outside the cold room with the panic bottom on the inside. • Provide audible and visible signal systems inside the room and ensure to be tested daily. • Provide a tool to open the door or create an opening on the wall in case the inner door nope fail. (e.g., a crow bar or an axe). • All measures related to safety such as safety appliances, safety training posters, slogans, pictures should be posted readable clearly at the factory. • The workers exposed to noisy sources should be provided with ear muffs/plugs. • Adequate facilities for drinking water and toilets should be provided to the employees. • The health of the workers should be regularly checked by a well qualified doctor and proper record will be kept for each worker. • Rinse eyes with water if they come into contact with dust and consult a physician.		

		• Use soap and water to wash off dust to avoid skin damage. • Wear gloves, coveralls with long sleeves and fulllength pants, waterproof boots and eye protection. • Avoid working beneath conveyor belts and stacker machinery. • Provide PPEs (Personal Protective Equipment), particularly masks to protect dust, pathogens and air particulate matters from the atmosphere. • Be sure that trucks and other vehicles are in good working order. • Regular inspection and maintenance of pollution control systems. • The fire and safety equipment should be properly utilized and maintained regularly. • Well stocked first aid box which is easily available and accessible should be provided within the building. • Well-designed waste management system and storm water drainage systems have to be put in place so as to ensure that breeding grounds of disease carrying vectors such as rats, flies, mosquitoes, cockroaches			

		etc. are effectively controlled in work area. • Regular medical hearing ability test should be done for the employees working near the high noise level equipment.			
Impact	**Project Activities/ Environmental Aspects**	**Proposed Mitigation Measure**	**Monitoring**		
			Implementation	**Supervision**	**Report**
Ammonia	Use of ammonia refrigeration system and accidental leakage	• Ensure enough ventilation in machine room. • Provide barriers or establish safety procedures to protect refrigeration equipment (e.g., pipes, valves, evaporator coils, tanks, vessels, etc.). • Ensure that flammables and/or combustibles are not stored in machinery room. • Install at least two ammonia detectors in the machinery room for monitoring any leaks. • Establish ammonia detecting system which can also activate ventilation fans and trigger remote alarms. • Install a manual check valve in the ammonia charging line in a location close to main control valve.	The Operation Manager/ HSE officer will: • Ensure that refrigeration system is fitted with adequate safety and monitoring control devices, maintained and tested by competent persons. • Ensure that precautions are taken to prevent leaks, fire and explosion including appropriate protection of storage vessels. • Ensure to maintain records of maintenance and tests. • Report the incidents if any.	Project Management Team on site and/or Designated HSE Team	Weekly report

		• Install Dual Pressure Relief Valves (PRVs) and a three-way valve which will allow one relief valve to be serviced, tested, or replaced, while the other PRV remains on-line to protect the refrigeration equipment. • Replace PRVs every 5 years. • Check ammonia refrigeration system and protection devices every time before starting. • Conduct regular pressure tests and functional tests for all safety devices including alarm system. • Comply periodical maintenance according to manufacturer's recommendation. • Ensue replacing of damaged and deteriorated ammonia pipes. • Removing refrigeration oil from the refrigeration system as needed for proper system maintenance.			

8.3.3 Environmental and Social Management Plan for Decommissioning Phase

The necessary objectives, activities, mitigation measures, and allocation of costs and responsibilities pertaining to prevention, minimization and monitoring of significant negative impacts and maximization of positive impacts associated with the decommissioning phase.

Table 8.3:Environmental and Social Management and Monitoring Measures for the decommissioning Phase

Impact	Project Activities/ Environmental Aspects	Proposed Mitigation Measure	Monitoring		
			Implementation	**Supervision**	**Report**
Air Quality	Fugitive emissions from decommissioning activities. Emissions from decommissioning vehicles and equipment usage.	• Ensure strict enforcement of on-site speed limit regulations. • Avoid demolitions works in extremely dry weathers. • Sprinkle water on graded access routes when necessary to reduce dust generation by machines. • Demolished materials on site to be covered to prevent to be blown off by wind. • Minimization of exhaust emissions. • Air pollution from vehicles will be minimized by using low emission equipment and vehicles. • Vehicle idling time shall be minimized. • Alternatively, fueled equipment shall be used where feasible equipment shall be properly maintained.	The Site Manager/HSE officer will: • Ensure that regular dust suppression activities are performed on a regular basis. • Ensure that all trucks hauling soil are adequately protected. • Ensure proper working condition of vehicles and report the incidents to the Site Manager if any. • Ensure inspects the site and the housekeeping of the area.	Project Management Team on site and/or Designated HSE Team	Weekly report on general working condition Quarterly air quality report

		• Truck drivers should avoid unnecessary running of vehicle engines at loading/ offloading points and parking areas, and to switch off or keep vehicle engines at these points. • Minimizing dust from material handling sources by using covers. • Optimize vehicle movements to eliminate unnecessary vehicle movements. • Spraying water to minimize dust from vehicle movements. • Prohibit burning of domestic waste on site. • Ensure strict enforcement of on-site speed limit regulations. • Avoid excavation works in extremely dry weathers. • Sprinkle water on graded access routes when necessary to reduce dust generation by vehicles. • Decommissioning waste on site to be covered to prevent to be blown off by wind.			

Impact	Project Activities/ Environmental Aspects	Proposed Mitigation Measure	Monitoring		
			Implementation	**Supervision**	**Report**
Noise Quality	Noise from vehicles and demolition equipment usage.	• Machinery drivers and machinery operators should switch off engines of vehicles or machinery not being used. • Schedule noisy decommission activities and transportation during day-time hours. • Used good condition and insulated demolition machineries and other equipment should be used in good condition and insulated. • Combine noisy operations at the same time, but avoid combinations of vibration.	The Site Manager/HSE officer will: • Ensure no noisy activity to be carried out during nighttime. • Ensure that noise levels meet guidelines and if necessary, put in place noise control measures. • Ensure inspection the site and the housekeeping of the area.	Project Management Team on site and/or Designated HSE Team	Weekly report on general working condition Quarterly noise quality report

Water Quality/Resource	Improper management for solid waste, waste water and hazardous waste. Spills/ leaks of oil and lubricants from fuel equipment and vehicles.	• Water should be used efficiently at the site by decommissioning workers to avoid irresponsible water use. • Soil erosion and sediment control mechanisms will add positive effects on mitigation matters for water pollution. • Grey water (spent water from washing and shower) and water used for wheel washing will be recycled after removing sediments. Primary treatment may be used to treat the grey water. • Use leak proof containers for storage and transportation of oil and grease. • Collect solid wastes in containers and disposed of properly. • Septic tanks and soakage pits will be constructed having adequate capacity. • Remaining sludge will be disposed as instructed by the • environmental regulations.	The Site Manager/HSE officer will: • Ensure all grey water will be reused, where practicable. • Ensure that all storm drains are cleared of debris so as to ensure free flow of water. • Ensure that waste management plan is implemented.	Project Management Team on site and/or Designated HSE Team	Weekly report on general working condition Yearly water quality report
Impact	**Project Activities/ Environmental Aspects**	**Proposed Mitigation Measure**	**Monitoring**	**Impact**	**Project Activities/ Environmental Aspects**

Soil Quality	Spills/ leaks of oil and lubricants from fuel equipment and vehicles. Improper management for solid waste, waste water and hazardous waste.	• Ensure proper liners are under fuel storage tanks. • Ensure only well-maintained equipment and vehicles used for the demolition phase. • Ensure boundaries will be strategically placed in order to minimize surface run-offs. • Careful planning process with regards to establishing work zones, minimize soil disturbance during the demolition phase. • Develop an erosion control and re-vegetation plan to delineate measures to minimize soil loss.	The Site Manager/HSE officer will: • Inspect the storage areas for the assurance of the spill/leak proof system; • Complete the incident report if any leak occurs. • Ensure that all site boundaries are strategically installed around the site. • Ensure that any waste is disposing correctly way.	Project Management Team on site and/or Designated HSE Team	Yearly report on general condition
Impact	**Project Activities/ Environmental Aspects**	**Proposed Mitigation Measure**	**Monitoring**		
			Implementation	**Supervision**	**Report**
Waste Disposal	Waste generation and disposal from demolition site including solid waste, liquid waste and hazardous waste.	• Clean and maintain drainage systems regularly. • Recycle of excavated earth materials. • Disposal of demolition debris to landfill sites. • Daily inspection of the project site and completion of logs. • Ensure that any waste is disposing correctly way. • Fuel storage facilities should be	The Site Manager/HSE officer will: • Ensure all the hazardous waste are in secured area. • Perform the visual inspection of the waste containers and complete the relevant log. • Ensure that any waste is disposing correctly way.	Project Management Team on site and/or Designated HSE Team	Weekly Report

		removed immediately upon completion of the decommissioning phase. • The hazardous wastes should be disposed with proper disposal method and caution. • Train employees to promptly clean up any oil or hazardous material spill. • Segregation of hazardous waste from solid waste shall be performed. • Solid wastes should not be dumped into the drain. • Encourage waste sorting by the facility users. • Provide separate bins for food waste, metal and other waste at the temporary camp and other facilities on site. • Wastes can be recycled or disposed at the landfill. • Ensure that any waste is disposing in correct way.		

Ecological Resource	Dust from decommissioning activities and vehicle movements.	• Re-greening of the project area will be carried out to compensate the vegetation loss in the decommissioning phase. • Replacement of topsoil. • Consider use of indigenous species in re-vegetation. • Avoid the spread of invasive nonnative plants by keeping vehicles and equipment clean and reseeding disturbed areas with native plants. • Maintain natural drainage paths and restore them if they are disturbed. • Minimize the amount of land disturbance and develop and implement erosion and dust control practices. • Educate workers regarding the importance of resources in the area and importance of protection.	The Site Manager/HSE officer will: • Ensure environmental management procedures shall be developed before the start of the demolition work.	Project Management Team on site and/or Designated HSE Team	Final status report
Occupational Health and Safety	Fugitive emissions from decommissioning activities. Impairment of hearing capacity due to the	• Initial job trainings relevant to the assignments should be offered for staffs. • All workers will be provided with personal protection equipment (PPE) and will be obliged to wear them in work zones. • Particular works shall strictly	The Site Manager/HSE officer will: • Ensure the PPEs provided are sufficient / appropriate for the particular work. • Ensure that regular dust suppression activities are	Project Management Team on site and/or Designated HSE Team	Weekly report

	exposure to high noise levels	follow work permit scheme. • Promote safe and healthy working environment, health, and well-being of all employees. • Rinse eyes with water if they come into contact with dust and consult a physician. • Use soap and water to wash off dust to avoid skin damage. • The fire and safety equipment should be properly utilized and maintained regularly. • Well stocked first aid box which is easily available and accessible should be provided.	performed on a regular basis. • No unnecessary blowing of horns at any time. • Ensure PPEs are in stock. • Ensure proper working schedule for all employees.		

8.4 Environmental monitoring Plan

8.4.1 Monitoring plan for environmental, social and health impact

Table 8.4 : Monitoring plan for environmental, social and health impact

Factors	Parameter & Guideline	Procedure	Proposed Duration	Frequency of Monitoring	Location
Air Quality	**National Environmental Quality (Emission) Guideline (EQEG)** For both Generator and Flare, • PM (PM10, PM2.5) • NOx • SO2 • CO • VOC • O3 • Methane (CH4) • H2S • CO2 • NH3 (Ammonia)	Method Myanmar National Environmental Quality (Emission) Guidelines	**Duration:** 24hr continuously **Frequency:** • Every six months during operation and once during decommissioning phase • In case of any complaint regarding air quality, an additional air quality measurement may be conducted in response to specific complaints (if necessary)	Will submit monitoring reports to the Ministry not less frequently than every six (6) months or periodically as prescribed by the Ministry.	The factory (complaint area) at the coordinates of **18.471427°N and 94.373074°E**
Noise	• LA_{eq} 1 hr ≤ 70dBA	Method • Myanmar National Environmental Quality (Emission) Guidelines, Effective since 2015 in accordance with The Environmental Conservation Law, 2012, and	**Duration:** 24hr continuously **Frequency:** • Every six months during operation and once during decommissioning phase • In case of a complaint regarding noise from project site, an additional noise measurement may be conducted (if necessary)		The factory compound **at the coordinates of 18.471427°N and 94.373074°E**

Factors	Parameter & Guideline	Procedure	Proposed Duration	Frequency of Monitoring	Location
Effluent from the waste water treatment	**National Environmental Quality (Emission) Guideline (EQEG)** For Daily Maximum Concentration, • BOD5 • COD • Oil and Grease • PH • Temperature • Total Coliform • Total Phosphorus • Total Nitrogen • TSS	<u>Method</u> • Analytical Methods followed to Standard Methods for eluent levels for municipal landfills, recommended by National Environmental Quality (Emission) Guideline (NEQG)	• Every six months during operation and once during decommissioning phase	Will submit monitoring reports to the Ministry not less frequently than every six (6) months or periodically as prescribed by the Ministry.	Effluent discharge from the waste water treatment at the factory
Hazardous and Non-hazardous waste	• Manifest Disposal and Tracking Report	• Track waste volume by type and disposal location daily	• Throughout all phases	Regular Check-up If any , Incident Report	At the project locations
Social	• Environmental watch committee collaborated by the Municipality • Complaint • Monitoring and solving	• Record complaint • Monitor, investigate and implement suitable solutions			Project area, and community around project area,
Public and Occupational health and safety	• Accident statistics • Cause of accidents • Mitigation measures	• Conduct summary report for accident investigation			Project area, community around project area, and transportation route

8.4.2 Budgets and responsibilities for environmental monitoring

Table 8.5: Budgets and responsibilities for environmental monitoring

Environmental Factors	Index/ Parameters	Responsibility	Estimated Budget
Operation phase			
Air Quality	**National Environmental Quality (Emission) Guideline (EQEG)** For both Generator and Flare, • PM (PM10, PM2.5) • NOx • SO2 • CO • VOC • O3 • Methane • H2S • CO2	Environmental Team (Third Party)	USD 800
Noise	• LA_{eq} 1 hr, 24 hr	Environmental Team (Third Party)	USD 200
Effluent (site runoff and wastewater discharges)	**National Environmental Quality (Emission) Guideline (EQEG)** For Daily Maximum Concentration, • BOD5 •COD •Oil and Grease •PH •Temperature •Total Coliform •Total Phosphorus •Total Nitrogen •TSS	Environmental Team (Third Party)	USD 300
Hazardous and Non-hazardous waste	• Manifest Disposal and Tracking Report	Environmental Team (Third Party)	USD 1,000
Social	• Environmental watch committee collaborated by the Municipality • Complaint	Environmental Team (Third Party)	

	• Monitoring and solving		
Public and Occupational health and safety	• Accidental statistics • Cause of accidents • Mitigation measures	Environmental Team (Third Party)	

8.5 EMP Budget

The estimated costs for the initial implementation of EMP will be defined on an initial set up basis. The EMP cost is planned as the following amount:

The Thantwe Marine Products (TMP) Company Limited will use **2% of the investment amount** for the EMP cost.
The company will revise these costs and develop annual operating costs for the EMP. These include the following costs:

a) Supervision on environment (includes sampling for environmental quality)
b) Engineering supervision cost
c) Institutional Strengthening, Training and Capacity Building
d) Development of Manual of functions and procedures including HSE procedures
e) Equipment and logistics
f) The social welfare programs for the employees and the nearby community who needs

8.6 Corporate Social Responsibility

The Thantwe Marine Products (TMP) Company Limited implements Corporate Social Responsibility (CSR) plan together with EMP during the operation period. The objective of CSR plan is to conduct the business in a way that is ethical, society friendly and beneficial to community in terms of development.

The project proponent should contribute 2% of the net profit for Corporate Social Responsibility (CSR) for the development of local communities including living standards, their health, religious organizations and local's education. Among the 2% of the net profit of the project, 0.5% amount should be used for the community development such as waste management, 1% should be intended for the local's health and education and the remaining 0.5% should be for the donation of pagodas and monasteries.

The TMP Co. Ltd is contributing towards the following CSR activities throughout the project operation phase:

1) Education support

-Provision of the supportive materials for the schools located at the community centers as well as in the local region.

(2) Health support (1997-2019)

- Monthly donation of oxygen supply to the Thandwe Hospital

- Free Medical Treatment for the employees

(3) Social support

- Regular social welfares donations to the Fire stations, Fishery Department and local community
- Donation to Disaster relief charity
- Regular CSR costs are about MMK 100,000,000 per year.

Chapter 9

Emergency Response Plan

9. Emergency response plan

9.1 Introduction

This chapter describes the strategy how to manage all possible emergencies along with actions required and written procedures to be carried out in order to respond the major hazards. Thus, an Emergency Response Plan (ERP) will be established for emergency situations that may arise during the production phase of TMP Factory. Moreover, it will give guidance on actions and lines of communication in the event of an emergency and outline the respective responsibilities of the TMP Factory and Health and Safety (HSE) contractor/Manager.

The objective is to prepare the resources (personnel and equipment) available to respond accidents all which can be likely caused by the TMP Factory's activities, emergency situations (leaks, spill, fire, security incident, medical evacuation) and major disasters as well. This will lead to identification of potential accidents along with limitation of its consequences as well as high level of prevention of the potential negative consequences on humans and environment.

In the TMP Factory, in general, there should be either Emergency response in charge or HSE manager and Response Team for the emergencies. The team should be prepared as follows:

- Training of the team members along with their responsibility and equipped with the emergency materials.
- Establishment and provision of the written emergency procedures.
- Description and availability of the Emergency Response Plan (ERP) in all employees and factory workers, and there should be documented and posted.
- Identification of the locations of the emergency evacuation Muster points.
- Provision of alarm system and firefighting equipment.
- Supporting of first aid equipment.
- Minimizing that should be reasonably practicable the risk to human life, the environment, assets and business in the event of an accident or emergency situation by ensuring effective and efficient intervention.
- Ensuring the availability of adequate information on the emergency situations through a good communication system.
- Ensuring efficient management of the emergency through the effective and efficient response of all dedicated resources.
- Identification of the governmental authorities, media and other relevant stakeholders to be notified and production of a description of the procedures for communicating with them.

The potential emergencies that likely occur at the TMP Factory:

- Ammonia gas leak
- Fire/ Explosion
- Chemical (disinfectants e,g chlorine etc.) exposure
- Workplace accidents/ Injury

9.2 Emergency policy

The TMP factory needs to establish policies and oversee all matters of operation of the factory's activities. If as an emergency may occur at any time and, in all likelihood, without warning, it is essential to have policies and procedures in place to assure the orderly operation and recovery of the factory.

The established policies and procedures will be set up together with roles and responsibility for making decisions and taking actions.

Thus, emergency management plans described in the above sections should be in line with either the responsibility of an emergency service in charge or the factory's designee and the onsite response team.

9.3 Organization of emergency team

Phase I	***Emergency management team*** shall be organized with senior persons available in shift and/or trained or experienced with environmental management issues. This team shall be constituted with Factory Shift- In charge (for factory emergencies) as Emergency response in charge/Site Incident Controller and pilot on duty. The numbers of the in charge will depend on the factory's decision and its capacity. The Workplace Health and Safety representative shall be designated.
Phase II	Emergency team lead by emergency service in charge shall be set up with the emergency ***response team*** occupying action group.
Phase III	Emergency response team shall be organized immediately in order to be well prepared to respond the emergency events that can happen either unexpectedly or accidently.

9.3.1 Key Activities and Processes of Emergency Management Team (EMT)

The EMT is responsible for providing support and assistance to EMT Leader & on-site Emergency Response Team (ERT) and ensuring that all tasks assigned are tracked, followed up & completed in a safety & efficient manner.

The following table shall be utilized by EMT during planning process.

Phase	**Activity**
Evaluate the situation and progress of the response	Gather, record, analyses and display situation and resource information. Obtain a clear picture of the scale and complexity of the incident, and assess the incident potential. Assess worst-case potential. Determine resources required to implement the Incident Action Plan.
Establish and refresh incident objectives	Formulate and prioritize response objectives. Identify analyses and evaluate reasonable response strategies to accomplish the overall objectives of the response.

and strategy	
Develop the Incident Action Plan	Determine the tactical direction (i.e. what, why, who, when, where and how) and the resources, logistics and strategies for the next operational period. Define operational periods. Identify resource status and availability. Configure organizational structure to implement tactics, and determine work assignments and specific resource requirements. As needed, develop and prioritize Incident Action Plan.
Prepare and disseminate the Incident Action Plan	Format the Incident Action Plan in accordance with the level of complexity of the incident, and produce a well-prepared outline for an oral briefing or written plan. Obtain Incident Action Plan attachments and review for completeness and approval. Ensure the Incident Action Plan is up-to-date and complete in relation to the incident situation. Reproduce the Incident Action Plan and distribute before the start of the next operational period.
Evaluate and revise the Incident Action Plan	Compare planned progress with actual progress on a regular basis, and identify deviations or changes in resource availability, mission failure or unexpected success, and new safety and environmental considerations. Input new information and changes in the situation into the first step of the planning process as necessary to modify the Incident. Action Plan for the current or subsequent operational period.

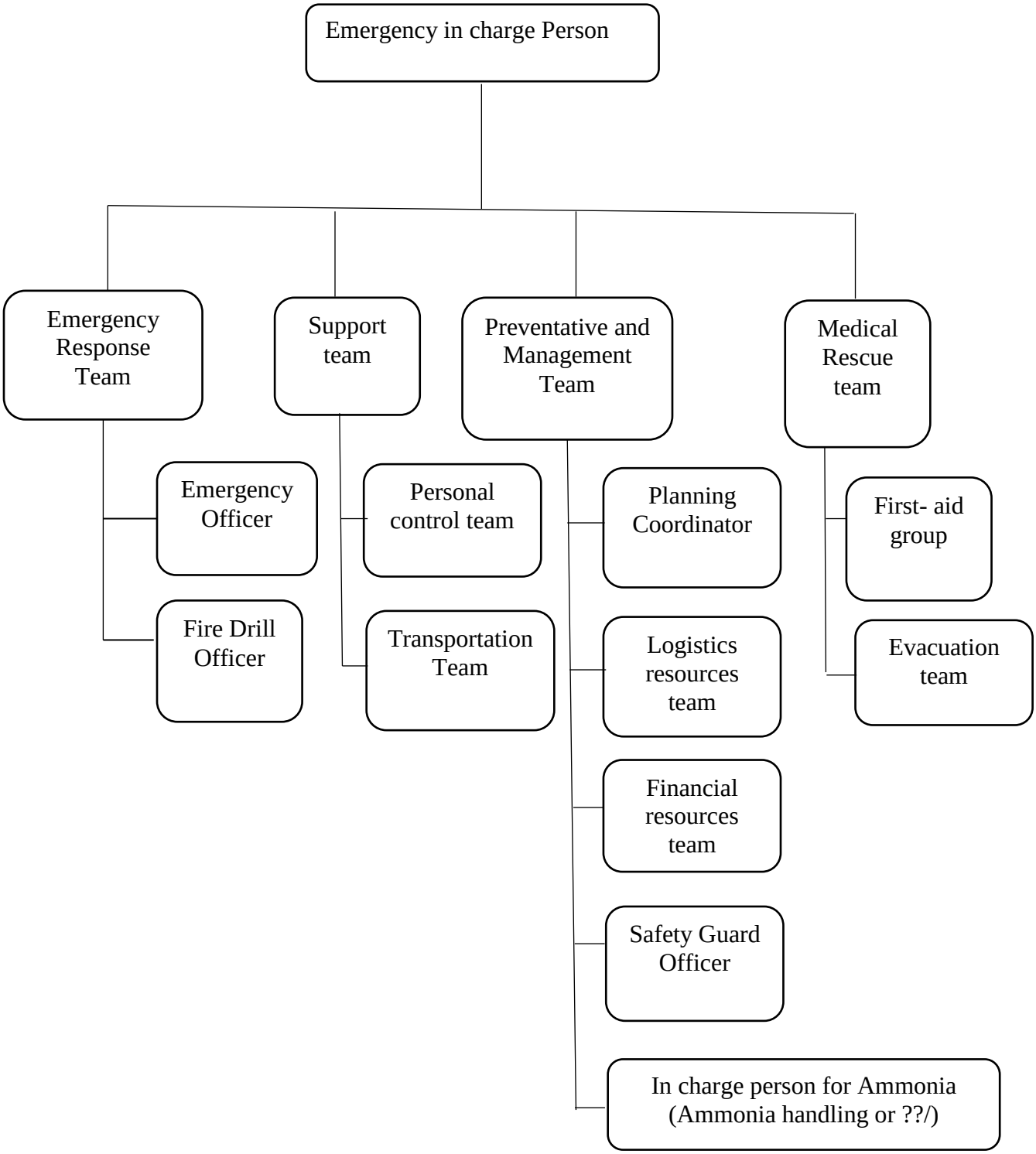


Figure 9.1: Organization chart for emergency team

9.4 Emergency response procedure

Before preparing a procedure, a risk assessment will be carried out for estimating how likely it is for an emergency event to occur and if it does, how serious or damaging the consequences would be. The emergency procedure should provide an appropriate and proportionate response to this situation.

9.4.1 Reporting an emergency

The person who discovered an emergency case shall immediately inform the Factory Manager. Whenever there is an imminent or emergency situation, the building must immediately:

1. Activate facility alarms or communications systems to notify personnel to evacuate the building.
2. Notify the relevant department using the following outline:
    a. ***Your name and name of company***
    b. ***Location of factory***, i.e. Kha 1, No.8 Quarter, Dwaryawadi Myo Thit, Thantwe, Rachine State, Myanmar.
    c. ***Describe nature of the case***, i.e. fire, chemical spill, ammonia leak or workplace accident.
    d. ***Any other requested information***
3. Go to the parking lot or send someone to the parking lot to direct the relevant department to the emergency area.
4. Contact Electricity Supply Enterprise to secure electrical service to the affected area.
    Electricity Supply Enterprise, Rakhine State -
    Address: Kan Ner Street & Corner of Akyauk Rom Street, Kay Bin Gyi Quarter, Sittwe, Rakhine State, Myanmar.
    Phone numbers: 098503015, 043-2022591
5. Assist in assessing the extent of damage caused.
6. Assess the adequacy of the Emergency Plan and the response by personnel to determine if the plan is adequate and if additional training is needed.

Careful and complete details of all emergencies should be recorded in the appropriate log book, with each entry giving at least the following information:

- Date of incident,
- Item of equipment
- Details of emergency
- Details of immediately previous maintenance work carried out to the equipment
- Previous evidence or warnings of trouble
- Any special circumstances or other relevant details
- Action taken to affect both temporary and permanent repairs.

9.5 Emergency response plan for Ammonia leakage

Ammonia is colourless, lighter than air and chemically reactive. Leakage of Ammonia can cause serious health risk to humans. Minor leaks are usually from shaft seals, pipe flanges or valve

stems. The rooms which have ammonia equipment have to be fitted with ammonia sensing alarms which automatically start ventilation systems that vent ammonia gas to atmosphere.

It has a distinctive pungent odour which can normally be detected by smell at concentrations as low as 5 parts per million (ppm). Although the odour of ammonia can be detected by smell at concentrations above 5 to 10ppm, people who are used to it can work without discomfort in concentrations of approximately 100ppm. Ammonia is hygroscopic meaning high affinity for water, it migrates to moist areas like the eyes, nose, mouth, throat, and moist skin.

Concentrations between approximately 150ppm and 200ppm will cause irritation of the mucous membranes and the eyes, but normally with no lasting consequences. Exposure to concentrations of approximately 1500ppm and above will damage or destroy tissue. Concentrations of approximately 2500 ppm and above will rapidly increase the risk of fatality.

The chart below shows the effects of various concentrations of ammonia.

Concentration	Effect
5 ppm	Average odor threshold (well below harmful health effects)
100-200 ppm	Irritated eyes
300 ppm	Respiratory Protection Required above this level
400 ppm	Immediate throat irritation
500 ppm and below	No permanent eye damage to even chronic exposure
1,700 ppm	Cough
2,400 ppm	Threat to life after 30 minutes
5,000+ ppm (vapor)	Full body chemical suit required
5,000+ ppm (pure liquid)	Second degree burns with blisters
7,338 ppm	One Hour LC50, lethal concentration (rat)

Anhydrous ammonia is very corrosive, and exposure to it may result in chemical-type burns to skin, eyes, and lungs. It may also result in frostbite as its boiling point is -28ºF.
Especially in the presence of moisture, it reacts with and corrodes copper, zinc, and many alloys. For anhydrous ammonia containers, fittings and piping, the materials which are resistant to ammonia should be used (e.g., iron, steel, certain rubbers, plastics, and specific non-ferrous alloys).
Ammonia will combine with mercury and form a fulminate which is an unstable explosive compound. The halogens (fluorine, chlorine, bromine and iodine), hypochlorite and ethylene oxide may cause an explosion when mixed with ammonia. Ammonia may also form explosive compounds with gold, silver and mercury as well as their compounds.

Anhydrous ammonia is non-flammable material but ammonia vapour in high concentrations (16 to 25 percent by weight in air) will burn. Fire hazard from ammonia is increased by the presence of oil or other combustible materials.

A clearly documented emergency procedure should be drawn up which details the precise duties of all staff and arrangements for evacuation, rescue, first aid, resuscitation, plant isolation etc. If seasonal or casual workers are employed, they should be properly trained as well.
Workers should be aware of the danger of ammonia leakage and informed not to approach any vapour clouds.

Released anhydrous ammonia will rapidly absorb moisture from air and form a dense, visible white cloud. The dense cloud tends to travel along the ground on a cool day. Clouds of vapour may often look like steam because of the cooling effect of the released gas. Workers should be warned not to enter a visible cloud of ammonia as it can damage lungs.

The quantity of ammonia released may affect communities several kilometers downwind. The impact is depended by:

- Quantity of ammonia released
- Mitigation measures applied
- Wind speed and direction
- Time of day
- Ambient temperature
- Topography

Specific actions needed for ammonia leakage are:

- Initiating mechanical ventilation systems
- Initiating electrical isolation of an enclosed area
- Initiating evacuation procedures
- Calling external emergency services
- Wearing specifically identified personal protective equipment
- Initiating community protection actions

The following requirements are needed for Emergency Response Plan.

- Pre-emergency planning and coordination with outside parties
- Personnel roles, lines of authority, training, and communication
- Emergency recognition and prevention
- Safe distances and places of refuge
- Site security and control
- Evacuation routes and procedures
- Decontamination
- Emergency medical treatment and first aid
- Emergency alerting and response procedures
- Critique of response and follow-up
- PPE and emergency equipment

The plan should cover the potential impact on local communities:

- Neighbors at risk
- Methods for contacting
- Crisis communication arrangements

Factory should prepare written emergency procedures and make available to all workers. Specific details shall be included the following procedures:

- Notifying workers of the emergency location.
- Controlling materials that may become dangerous during the emergency.
- Using and locating emergency personal protective equipment.
- Locating the system's emergency discharge valve.
- Using and accessing emergency lighting.
- Using evacuation procedures and a person-check system to ensure all personnel are evacuated.
- Using the search and rescue process.
- Notifying police, fire department, hospital, and other emergency response units (such as suppliers).
- Notifying adjacent worksites and private homes about the emergency.

Moreover, the factory should prepare the following:

- A written health and safety policy that:
  - states the employer's commitment to health and safety
  - states the program's objectives
  - defines the responsibilities and roles of the employer, supervisors, and workers
- Written safe working procedures and emergency response procedures
- Training for supervisors and workers
- Regular worksite inspections
- Regular health and safety meetings
- Incident investigations
- Records and statistics
- Health and safety committee

9.5.1 Prevention for ammonia leakage

- Establish ***training programs*** to ensure that the ammonia refrigeration system is operated and maintained by knowledgeable personnel.
- Consider using a ***spring-loaded ball valve*** (dead-man valve) in conjunction with the oil drain valve on all oil out pots (used to collect oil that migrates into system components) as an emergency stop valve.
- Ensure refrigeration maintenance personnel to ***follow written, standard procedures for maintaining*** the system including ***routine procedures such as oil draining***.
- Developing ***checklists to guide maintenance*** personnel while executing these procedures.
- ***Remove refrigeration oil*** from the refrigeration system ***regularly***.
- Ensure ***not to remove oil directly*** from the refrigeration system ***without pumping down and properly isolating*** that component.
- ***Provide barriers to protect refrigeration equipment*** i.e., lines, valves, and refrigeration coils, from impact in areas where forklifts are used.

- Consider integrating ***ammonia refrigeration awareness and discussion of the risks of forklift accidents*** that can lead to ammonia releases as part of a formal forklift driver training program.
- Develop and maintain a ***written preventive maintenance program*** and schedule based on the manufacturers recommendations for all of the refrigeration equipment. The preventive maintenance program should include, but not be limited to:
    a) Compressors
    b) Pumps
    c) Evaporators
    d) Condensers
    e) Control valves
    f) All electrical safety(s), including
        - high pressure cutouts
        - high temperature cutouts
        - low pressure cutouts
        - low temperature cutouts
        - low oil pressure cutouts
        - automatic purge systems
    g) Ammonia detectors
    h) Emergency response equipment, including,
        - air monitoring equipment
        - self-contained breathing apparatus (SCBA)
        - level A suit
        - air- purifying respirators.
- ***Installing ammonia detectors*** in areas where a substantial leak could occur.
- Ensure that ***the ammonia detection system is calibrated*** and check operation of ammonia sensors and alarms ***regularly***.
- Consider using the ***compressor room ammonia detector to control the ventilation fans***.
- Replace ***pressure relief valves*** (PRVs) on a regular schedule.
- ***Replace single PRVs with dual relief valve installations***. A dual relief valve installation consists of one three-way shut-off valve with two pressure safety relief valves. The use of dual relief valve installations may facilitate the replacement, servicing, or testing of PRVs on a regular schedule – a three-way valve allows one PRV to be isolated while the other remains on-line to protect the vessel. This setup allows each PRV to be serviced, tested or replaced on a regular basis without the need to pump down the system.
- Identify the ***king valve and other emergency isolation valves*** with a large ***placard*** so that they can easily be identified by emergency responders, in case of an emergency.
- These ***valves should be clearly indicated*** on the piping and instrumentation diagrams (P&IDs) and/or process flow diagrams.
- Ensure that ***the ammonia refrigeration system is routinely monitored***. Consider using a daily engine room log, recording process parameters (e.g., temperature and pressure levels) and reviewing the log on a regular basis.
- ***Periodically inspect*** all ammonia refrigeration piping for failed insulation/ vapor barrier, rust, and corrosion. Inspect any ammonia refrigeration piping ***underneath*** any failed insulation systems for rust and corrosion.

- ***Replace all deteriorated refrigeration piping*** as needed.
- ***Protect all un-insulated refrigeration piping*** from rust and/or corrosion by cleaning, priming, and painting with an appropriate coating.
- ***Perform vibration testing*** on compressors regularly.
- Perform regular testing of ***ammonia alarm and fire alarm***.
- Maintain a ***leak-free ammonia refrigeration system***.
- ***Investigate all reports*** of an ammonia odor and ***repair all leaks*** immediately.
- ***Leak test*** for all piping, valves, seals, flanges, etc., ***at least four times a year***.
- ***Leak testing with specific methods*** by using sulfur sticks, litmus paper, or a portable monitor equipped with a flexible probe.
- Carry out ***regular inspections of emergency equipment*** and keep respirators, including air-purifying and self-contained breathing apparatus (SCBA), and other equipment in good shape.
- Ensure that workers are ***trained in proper use of this equipment***. For using SCBA, it is important to ensure that air is bone dry. For air-purifying respirators, replace cartridges as needed and check expiration dates.
- Place ***windsocks in appropriate places*** and incorporate their use into the facility emergency response plan.
- Establish ***emergency shutdown procedures*** and instructions for during and after a power failure.
- Establish ***written emergency procedures and instructions for emergency ammonia leakage***.
- Regularly conduct ***emergency response drills***.
- Developing ***additional materials (posters, signs, etc.) in dual language*** to provide useful information to employees and emergency responders.

9.5.2 Action plan for ammonia gas leak

9.5.2.1 Emergency procedures and principles

1. Alarm sequence
2. Emergency action. If ammonia leakage occurs, immediately:
    - ***Notify, isolate and secure*** the spill area.
    - Notify the emergency response team with information such as ***location and extent*** of spill or leak.
    - Cordon off the area around the ***spill with barrier tapes***. Ensure that the area is safe before the emergency response team enters and reacts to the situation.
    - Once evacuated to a safe distance (preferably upwind of leakage), observe the area where vapor clouds travel to using ***windsock***.
    - ***Keep away*** all persons not involved in the clean-up. Close doors to other areas near the leakage. Post warning signs and barriers to prevent entry to the spillage or leakage area by unauthorized persons.
    - ***Turn off any ventilating or air conditioning*** system that circulates air from the spill area to ***other parts of the workplace.***
    - Assemble ***trained emergency response members*** outside the cordoned area.
    - Initiate ***ammonia level measurements***.

- ***Determine ammonia levels*** in and around the leakage area using an ammonia direct reading instrument.
- ***Extend the restriction zone*** as appropriate depending on ammonia levels.
- Strictly follow ***emergency shutdown procedures***. The refrigeration plant shall automatically shut down whilst the ***extract fan will continue to operate***.
- Closing valves to isolate the system into smaller sections and to prevent further escape.
- ***Equipment shutdown*** and dealing with ***power outages***.
- System ***start-up after an emergency shutdown***.
- ***Isolating electrical appliances*** where required.
- Emergency procedures must detail specific duties of all staff and the arrangements for:
    - Evacuation
    - Rescue
    - First aid
    - Resuscitation
    - Plant isolation

a) Actions for Emergency Response Team (ERT)

- ERT should decide on the most appropriate course of action and determine the wind direction without any person being put at risk.
- Depending on wind direction, allocate the person handling communications to inform the relevant neighboring properties of the ammonia alarm & any risks.
- Continuous checking of wind direction, as it can be changed during emergency situation, for informing the route of evacuation to respective team member promptly.
- Identify potentially exposed populations including:
    -Workers
    -Neighbours
    -Downwind communities
- Call emergency services if required depending on the nature of the incident.
- The ERT must ensure that clear instructions are given to areas managers regarding the process & route to use e.g. which evacuation route/assembly point will be used.
- Monitor the evacuation and ensure that emergency services are informed about any missing persons/casualties.
- Continuous cooperation with engineers and crisis team, taking action as appropriate and passing relevant information to respective person/team.

b) Actions for area managers

- Ensure all persons are inside the building and go back to their usual work area.
    - Ensure all external doors in the area are securely closed e.g. dock doors, emergency exits etc.
    - Take a roll call in your area of responsibility to ensure all team members are accounted for.
    - If any person is missing, inform a member of the emergency response team immediately.

- Wait in your department until you receive a message from the emergency response team for the next course of action - if ammonia is smelt in your area, then you should take all persons to different room and inform the emergency response team about ammonia smell and location inside the building.
- If there are external drivers in your area, alert them to come inside the building, inform the ERT of their presence and determine with the ERT if they should be directed to assembly area via internal route.
- Ensure that nobody goes outside the building as doing so can make them exposed to a gas cloud.
- Strictly follow the direction, route and exit which is informed by emergency team member.
- If there is no contact with emergency team member, strictly follow Emergency escape procedures and emergency escape route assignments. (e.g., upwind and uphill).
- Ensure that everyone is kept calm and controlled.

c) Actions for employee

- Do not approach the ammonia plant or go outside the building as that could expose you to a gas cloud.
- If you are outside, enter the building and return to your usual work area.
- Close all doors & windows, if appropriate, in your area.
- Make yourself known to your area manager / team leader when the roll call is taken.
- If you smell ammonia, inform your manager / team leader so that they can arrange for relocation to different part of the building.
- If the site needs evacuation, you will be informed of the precautions and exit route. It is important to listen carefully and follow the instructions given by the site management team.
- It is important that everyone keeps calm during emergency situation.
- If you have any concerns during the emergency, inform to manager so that they can communicate with the emergency response team.

d) Actions for security

- Inform the key contacts and communities.
- Prevent additional personnel and vehicles coming to the site.
- Respond to any instructions from the Crisis Team or an Emergency Response team member.
- If out of hours and reception is closed, put out a tannoy message informing that it is not a test and to go indoors.
- If the tannoy is not working for any reason, inform the senior person on site so they can do internal communication via radios or transmitting messages.
- Maintaining clear access at the gate for the Emergency Services.
- Staying within the security hut and closing all windows and doors.
- Communicating with drivers arriving at the gate.
- Turning away all arrivals to site until the emergency is officially stood down.

- In the event of a significant leak and the wind direction heading towards the security cabin, the emergency response team will arrange for relocation of the security guards to a safe area.

9.5.2.2 Decontamination of the area

The ventilation of rooms should be started during ammonia leaks. After the release of ammonia has stopped, all the rooms where ammonia may have entered by ventilation, must be ventilated. Part of the liquid in a contained spill can be pumped to a container with a submersible or hose pump. The remaining liquid can be allowed to evaporate under control. The evaporation rate can be reduced by covering the spill with plastic sheets or similar material.

9.5.2.3 Environmental considerations

Emergency plans and procedures shall need to cover potential environmental impacts such as pollution control. In case of ammonia leaks, large quantities of contaminated water will be generated as water fogging or spray is used to reduce the airborne ammonia levels. Ammonia dissolved in water is toxic to aquatic ecosystems.

In order to prevent environmental pollution, ammonia-contaminated run-off water shall be directed into the wastewater treatment tank, existing catchment ponds, bunded areas, or traps. The contaminated water must be prevented from directly entering into storm water drains and local water courses.

When large airborne concentrations of ammonia are exhausted from a plant room through the emergency ventilation system and workplace is in close proximity to built-up areas, wet-scrubbing of the exhausted air should be considered.

9.5.2.4 Record Keeping

1. Designer's/manufacturer's/supplier's approved documents relating to parts of the system, system design and plant design.
2. Maintenance programme developed by the manufacturer of the system.
3. Safe Working Procedures related to operation, maintenance, refrigerant handling etc.
4. Risk Assessment Report on the activities related to the refrigeration system.
5. Chemical Health Risk Assessment Report on any chemicals which is used in factory and hazardous to health.
6. Agreement between the owner and the supplier/manufacturer, trained person etc. regarding the system periodical inspection and maintenance.
7. Certificates of Fitness for any certificated machineries.
8. Record of maintenance and operation throughout the service of the system.
9. Record of modification and repair works done throughout the service of the system.
10. Piping and Instrumentation Diagram of the refrigerant system.
11. Legal register including logbook for any findings on the system that were recorded by authorities, workers, trained persons etc.
12. Record of Training involving the owner or the workers.
13. All documents related to the Emergency Response Plan.
14. All documents related to Occupational Safety and Health.

9.6 Emergency fire/ explosion response plan

Ammonia is explosive in the air at concentrations of 16 to 27 percent (by volume).

The presence of oil or other combustible materials increases ammonia's fire hazard. Moreover, when it comes into contact with strong oxidizers, such as chlorine, bromine, iodine, and hypochlorite bleaches, ammonia can form explosive mixtures.

The major risk is the rupture of tanks which is heated by the fire. The rupture of ammonia tanks is a hazard to firemen.

In the case of fire emergency, the refrigeration system should be stopped with an emergency stop device. The isolation valves of all pipes leading to the fire area should be closed to prevent the leaks generated by the fire.

In a fire, the firemen should wear compressed air breathing apparatus, firefighting gear, rubber boots and protective gloves. A gas-tight chemical protective suit cannot be worn in the hot environment.

The possibility of fire occurrence is mostly associated with "low". However, the probability of a fire cannot be ruled out completely. Thus, the firefighting equipment should be available at all work areas and warehouses of the factory and should be kept in good working state. The use of this fire-fighting equipment should be one of the key points during the training of the ERP team, workers and staff. The personnel technician in charge of the maintenance and plant management should regularly check this equipment and ensure that they are always ready to be used.

Moreover, the fire alarm system should be installed both at the factory and admin office. Floor plan along with the emergency exits should be allocated.

Figure 9.2 Fire alarm and firefighting equipment

9.6.1 Action plan for fire/ explosion

Responsible Person	Action Item
Anyone who notices fire	Immediately Inform project manager available in shift and/or trained or experienced with environmental management issues along with the details of the information: fire source, the nature of fire etc. OR Inform directly to relevant department, such as Police Station or Fire Force near TMP factory. **Nearest police station** **Thandwe Police Station** (Thandwe Township) – Address : Bogyoke street, Madaya 07171 Phone : 04365246
	Nearest Fire Station 1. Fire Station Thandwe 2. Ngapali Fire Station Address: Ngapali Main Road
Emergency in charge person	On receiving the information of an emergency, the Project Manager shall immediately proceed to the scene of the incident to assess the seriousness of the emergency. If an emergency is confirmed, he shall: ➢ Immediately raise the alarm and inform all employees as follows: • Location of fire • Type of fire • Seriousness of fire ➢ Immediately inform emergency service in charge

Onsite emergency response team **&** **Nearest township fire station**	• Start the actions and activate Emergency Action Plan in consultation with Emergency response in charge and use proper personnel protective equipment • Carry out the required firefighting emergency action as directed by Emergency Response Team leader/ in charge person. • Water borne firefighting equipment such as firefighting tugs with fire monitors, lifesaving equipment and medical equipment shall be available. • Use proper personal protection and extinguishing media • Assess the situation from time to time and use appropriate strategy. • Remove unaffected containers/goods from the area if possible. • Medical rescue team must be stand by for personal injury in case. **Important** ***For substances, which becomes dangerous when wet/ violently react with water*** • Use dry chemical for small fire. • Use smother with dry inert material and dispose them off using relevant safety precautions for large fire

9.6.2 Fire extinguishers and fire drills

Fire extinguishers: In the event fire, extinguishers are used to fight a fire only when it is safe for the employee to do so and the employee has been trained on how to properly use a fire extinguisher, the project manager should contact the service supplier to have the extinguisher(s) serviced and recharged.

Fire drills: Fire drills will be held at least once per year to determine effectiveness of this emergency procedure. A written record of the drill will be kept on file at the facility by human resources.

9.7 Power failure

In case of power failure, processing should be stopped and store all raw materials into cool rooms.

It is important not to open cool rooms until power returns and when the power comes back, raw materials should be monitored in accordance with food Safety Standards.

9.8 Workplace accident

All of the workers for the operation of TMP Factory are well trained through the capacity building and training program provided by the factory. However, workplace accident is inestimable and can happen accidently.

Employees have to work in low temperature and can experience with cold stress and health related problems. Employees may suffer ill health or injuries (e.g. frostbite) from prolonged exposure to low temperatures (particularly those with certain pre-existing medical conditions). Extreme cold may also lead to gradual loss of awareness of risk.

In order to maintain the cold temperature, air flow from the outside is restricted making the cold storage room air tight. Moreover, insulation is very good and cold storage room is sound proved. If someone is accidently being locked in the cold storage room which may be the confined space, the workers from the outside can't be heard his/her call for help. He/she may suffer death or serious injury from prolonged exposure to cold temperatures.

Therefore, it is necessary for all employees to get training and become familiar with the safety measures which are also indicated in the mitigation measures prescribed in the operation phase of the chapter (6).

Factory provides first aid training for the workers, and medicines and materials needed in case of emergency.
The factory shall establish a workplace policy, where all unplanned or undesired occurrence which may or may not result in injury to person and or damage to property, must be reported immediately.

9.8.1 Action plan for workplace accidents

Responsible Person	Action Item
Nearby person (or) Colleague	Immediately inform the emergency service in charge. In serious case, call doctor at once or transport to doctor or hospital. Hospitals near the project are as follows (Open 24 hours) 1. Thandwe District Hospital Address: Corner of Hospital street & Bayint Naung Street 2. Hospital Ngapali Address: Zi Phyu Kone Take actions i n consultation with Emergency service in charge/ Shift In Charge and activate Emergency Action Plan.
The Emergency response in charge	Clearing employees from the area. Cut off electrical supply if necessary. Controlling or eliminating sources of imminent danger. Cure the injured person with provided first aid kit by a trained first aider before the ambulance arrives.

9.9 Medical emergency response plan

The TMP factory shall provide ***First Aid, Emergency Treatment***, and ***administration of medication*** for the factory workers during the working activities.

9.9.1 General provisions

1) The provisions of this policy are intended to meet workers health which needs during minor and major injuries or medical emergencies.
2) To ensure workers safety, the factory shall adopt the position that workers shall administer medications at home whenever possible.
3) The factory shall recognize that accidents and medical emergencies can happen during working hours; therefore, factory shall adopt guidelines to prepare staff members to provide first aid and emergency care during these unexpected events.

9.9.2 First aid emergency treatment

1. First aid shall be provided to factory admin staff, and workers.
    - Either any factory staff member or licensed medical professional designated by the factory to render care that should complete training in CPR and First Aid provided by the nationally recognized training organization.
    - First aid supplies shall be kept in central locations in the factory where they will remain clean, dry, and available to all personnel.
2. When an emergency exists, factory staff members will implement appropriate emergency procedures, "activating the factory's Emergency Response Plan (ERP)."
    - Any worker can contact the Emergency medical treatment place.
    - Either factory member or licensed medical professional at the factory should be trained to administer emergency procedures needed in life-threatening situations.

9.9.3 Work field trips

For field trips that are considered an extension of the work activities, first aid supplies shall be available on all vehicles during work trips.

Figure 9.3 First aid kit

9.10 Emergency response plan for chemical exposure

Regarding the chemical exposure issue, if the factory uses some types of chemicals such as ammonia, disinfectants and pesticides, the factory shall keep A Material Safety Data Sheet (MSDS) which is able to represent the chemicals that are being used in the factory. It will include information of the chemicals on the potential hazards (health, fire, exploration, reactivity and environmental) and how to work safely with the chemical product. Emergency eye wash station should be kept at the factory for emergency cases. Moreover, the factory shall install a windsock above the machinery room and other reliable points to determine the direction of ammonia spreading according to wind direction.

Figure 9.4 Emergency eye wash station

9.10.1 Safety and Personal Protective Equipment for emergency

The gas detectors should also be arranged to give a visual and audible alarm and to switch on equipment for ventilation and/or emergency lighting.

Safety equipment should be located in nearby rooms but separate from the machinery room. Adequate eye wash bottles and/or warm water showers should be available in all locations where ammonia is handled and stored.

Workers must be properly trained about Respiratory protective equipment in its use and limitations. The equipment must be maintained, kept clean and examined at periodic intervals (at least monthly). It is recommended that a windsock is installed above the machinery room and at suitable locations so that, in case of emergency, the wind direction can be readily determined.

Factory employees may need personal protective equipment to evacuate during an emergency.

Personal protective equipment must be based on the potential hazards in the workplace and the appropriate controls and protective equipment for those hazards. Personal protective equipment may include items such as the following:

- Safety glasses, goggles, or face shields for eye protection
- Hearing protection
- Hard hats and safety shoes for head and foot protection
- Proper respirators
- Any other special equipment or warning devices necessary for emergency ammonia case

Table 9.1 Personal protective equipment (PPE) and their functions

Function of PPE	Feature and Characteristics
Protective goggles	
Goggles with direct vents are not suitable for protection from chemical splattering or smoke.	
Hearing	
Cotton earplugs: disposable earplugs for short-term use – not suitable for high noise levels	
Elastic earplugs: washable, reusable earplugs	
Earmuffs: They offer a high level of sound reduction and are suitable for high noise levels. They can be used in combination with safety helmet.	 
Respiratory Protection	
Dust mask: lightweight mask that is fitted over the nose and mouth and secured behind the head with elastic Gas Mask Respirator: Gas masks are also known as "air-purifying respirators" because they filter or **clean chemical gases and possibly particles** out of the air as you breathe. This respirator includes a face piece or mask, and a filter/cartridge (if the filter is in a metal shell it is called a "canister"). Straps secure the face piece to the head.	   
Head Protection	
Use head gear which conforms to recognized safety standards	
Hand and Arm Protection	
Gloves for common tasks (cotton/ leather)	
Heat- resistant gloves	
Foot Protection	

Select footwear that fits the purpose and conforms to recognized safety standards.	
Body Protection	
Reflective clothing: For working in busy traffic: brightly- colored reflective clothing can increase the visibility of employees and reduce their chances of being struck by vehicles or machinery	

9.11 Natural Disaster

9.11.1 Flooding

1. Periodic checking and maintaining stream, ditches, drainage areas, and other low-lying areas around the factory.
2. Training staffs with the evacuation plan and alternate routes.
3. Updating employee contact lists with alternate contact information for emergency evacuation.
4. Training workers to secure the premises, equipment, machineries, chemical tanks, containers and cooperate emergency shutdown procedures.
5. Especially in rainy season, perform continuous monitoring about the flood via various media outlets and weather tracking.
6. If there is a risk of flooding in factory area, ensure that gas and electric services are turned off.
7. Implement developed data backup procedures.
8. Ensure clean-up equipment and Personal Protective Equipment (PPE) are available, adequate, and maintained.
9. Evaluate the accessibility of necessary equipment (such as valves, storage sheds, regulators, relief sets, etc.)
10. Ensure to unplug all electrical devices prior to flooding.
11. If applicable, determine if flooding can expose or undermine pipelines as a result of erosion or scouring.
12. Conduct a post-incident review and identify mitigation opportunities to prevent future flooding impacts.

9.12 Emergency evacuation plan

TMP Factory shall prepare the emergency evacuation outlines basic procedures to follow in the event of an emergency such as fire or explosion, chemical spill, incident, or natural disaster that may require evacuation of the building.

9.12.1 Evacuation procedures

There is air horn method for notifying occupants and they may indicate an emergency or a test of the emergency systems. Both ***visual*** and ***audible alarm*** should be installed to notify the workers and switch on ventilation and/or emergency lighting.
Alarm sound for ammonia leaks must be different from the fire alarm.

a) Evacuation procedures for Ammonia Leaks

For emergency ammonia leaks, unlike emergency fire case, safe evacuation depends on the direction of the wind.

The assembly point for workers will depend on the wind direction because ammonia is a gas. Emergency team have to check ventilation systems, wind directions, doors and windows.

Several emergency assembly areas can be specified and the most suitable one will be selected, based on the prevailing wind direction.

The announcement will tell you exactly which assembly point you have to go to. Please remember that the direction of the wind will not always be the same, so the workers shall obtain sufficient and continuous information for the exit route.

Once evacuated to a safe distance (preferably upwind of leakage), observe the area where vapour clouds travel to using windsock.

b) Evacuation procedures for Fire emergency

When an alarm sounds, all personnel must immediately evacuate the building in accordance to the emergency evacuation procedure.

All departments will adhere to the following instructions in an emergency:

1. In the event of an evacuation, everyone should use the nearest exit if safe to do so. If an emergency situation prevents the use of the emergency exit nearest to your work station, proceed to the nearest alternate exit.
2. If safe to do so, zone marshals will walk through their zones to make sure all staff have left and to close all doors.
3. The receptionist will take the visitor log book and the staff itinerary for a roll call.
4. All personnel should stay calm and proceed in an orderly fashion to prevent any injuries to themselves or other employees.
5. Once outside the building, assemble in the parking lot, keeping a safe distance away from
   the building. Immediately report to the factory manager or designate who will be taking headcount to ensure everyone is out of the building.
6. All personnel must await further instructions.

c) Evacuation procedures for locked or trapped in the cold storage room

1 Anti-freeze door nope should be installed on the inside of the room, to enable the entrant person to open the door from within in case the door is accidentally closed.

2 Providing at least two emergency exit doors which are fitted with strip heaters to ensure it does not freeze.

3 Installing two trapped worker alarms (battery operated, mains back-up) next to both exits.

4 Installing an alarm outside the cold room with the panic bottom on the inside. Beware that if cold room is not humidity controlled, it can get very moist and will damage the circuit for the panic bottom.

5 Providing audible and visible signal systems inside the room that are tested daily.

6 Providing a tool to open the door or create an opening on the wall in case the inner door nope fail. (e.g., a crow bar or an axe)

9.13 Reporting Procedures

Reports shall be produced through the course of implementation of monitoring programs and collecting incident/emergency response forms as well and then submitted to respective authorized person.

The either Emergency response in charge or HSE manager will be responsible for ensuring that reporting and management procedures are being followed and documented accordingly.

Incident details to be reported include:

- How the incident occurred
- Monitoring (current and additional)
- Remedial actions
- Triggers for ceasing remedial actions
- Photographs (where possible)
- Any findings of experts consulted
- Preventative actions

9.13.1 Air quality report

The onsite response team is needed to report any excessive emissions from the site to the emergency response in charge. A community complaints register shall be maintained in order to identify areas where dust management is a significant problem.

Moreover, the data of 24 hour continuous ambient air monitoring {Preferable period (***dry weather***) once a year} will be reported to the relevant regulatory agencies.

9.13.2 Noise quality report

All operational phase complaints are to be reported to the emergency response in charge and a record of any noise complaints along with the corrective action shall be placed in a log book.

Moreover, the data of 24 hour continuous noise monitoring (once a year) will be reported to the relevant regulatory agencies.

9.13.3 Water Quality report

9.13.3.1 Ground water and surface water quality

Annual report based on quarterly analysis along with the corrective actions will be reported through the emergency service in charge to the relevant regulatory agencies.

9.13.3.2 Waste water

Annual report based on quarterly analysis along with the corrective actions of point sources of negative impact will be reported through the emergency service in charge to the relevant regulatory agencies.

9.13.3.4 Waste management

Waste generation rate, waste auditing and bulk density will be reported once a week for the first parameter (waste generation) and once a month for the rest two to the emergency response in charge and shall be placed in a log book.

9.13.4 Emergency response plan

Immediately notify the emergency response in charge in the event of an unexpected emergency cases. Weekly reports (as appropriate) will be completed on-site and reviewed by the emergency

service in charge.
In the event of a leak, the emergency response in charge is responsible for the preparation of an Environmental Incident Report, Corrective Action Report and for provision to the related authority.
The Workplace Health and Safety representative will be responsible for enforcing all occupational and public health directives and keeping all related records and communications regarding this.

9.14 Documentation/Logbooks/ Environmental management file
The following documentation must be kept on site in order to record compliance with the EMP.
An Environmental File which includes:

- Copy of the EMP
- Copy of the Environmental Approval
- Copy of the health and safety regulations and measures
- Copy of all other licenses/permits
- Copy of the respective Emergency response Plans
- Copy of relevant legislation
- Environmental Method statements compiled by the Contractor
- Non-conformance Reports
- Environmental register which shall include:
  - Communications Register–including records of Complaints, and, minutes and attendance registers of all environmental meetings.
  - Monitoring Results including environmental monitoring reports, register of audits.
  - Incident book including copies of notification of Emergencies and Incidents, this must be accompanied by a photographic record.
- Waste manifests
  - Waste Documentation such as waste generation, waste audit, waste water disposal and Sewerage Disposal Receipts
- Material Safety Data Sheets for all hazardous substances
- Air, Noise and Water Quality Monitoring reports
- Written Corrective Action Instructions; and
- Notification of Emergencies and Incidents

Furthermore, the following information shall be posted at the office and working environment:
Important Phone Numbers

1. FIRE station
2. MEDICAL emergency
3. AMBULANCE
4. SECURITY - Township Police, Industrial zone security
   - Factory Control room
   - Arrangement of assembly points

9.15 Actuating of Siren

1. ***Siren for declaring Emergency:*** Siren to be sounded continuously for 30 Seconds with an interval of 5 Seconds to be repeated 10 times.
2. ***Siren declaring Evacuation from the factory area:*** Siren to be sounded for 5 seconds till the area is evacuated by people or for ½ hour whichever is less.
3. ***Siren declaring All Clear and returning to the work:*** Siren to be sounded continuous for 5 minutes.

9.16 Covid measures as emergency response plan

The coronavirus pandemic in Myanmar is part of the ongoing global pandemic of coronavirus disease 2019 (COVID-19), a novel infectious disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). MOHS is working to upgrade and expand capacity at state and region-level hospitals around the country (of 200 beds and above).

Thandwe, A Rakhine State town next to Myanmar's most famous beach resort Ngapali is also suffering from COVID -19 with the virus spreading fast in town. Therefore, the TMP factory located in Thandwe shall keep factory workers safe from infection became an urgent priority. Since the risk of infection was particularly high in crowded indoor spaces, factory owners need to have a public health duty to prevent factory outbreaks that could spread to the rest of community.

Therefore, the following measures are needed to be followed by all factory staff.

1) Firstly, Supervisors need to monitor the temperature of every employee at the entrance before starting their work shift and quickly isolate those with a high fever, and implement full contact tracing for anyone testing positive for COVID-19.

2) Second, need to monitor that worker are wearing the required protective gear, such as masks and visors accordingly.

3) Workers need to wash the hands before starting their tasks as well as follow periodically hand washing appropriately.

4) Workers need to work following social distancing rules.

5) Require employees to report daily whether they are unwell, or have visited a containment zone

6) The factory should be well ventilated installing the ventilators

7) The factory employees should have access covid 19 vaccination as quickly as possible.

The factory workers shall be assigned in shift hours (8 hrly etc) to ensure the COVID 19 measures are complied with comfort and need to wear the following protective equipment properly:

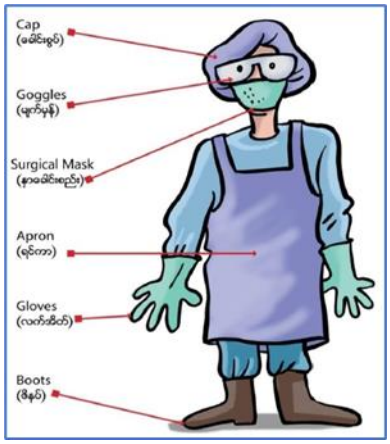


Figure 9.5: The personal protective equipment to be used by the factory workers

Table 9.2: MOHS guidance on used personal protective equipment (PPE) management

Items	Instruction	Remarks
N 95 or Surgical mask (Non-reusable/ Use for one time only)		Dispose according to Hospital Waste Management Guideline
HEPA (P100 mask)	Remove the filter and dispose it. Firstly, cleanse it with water and disinfectant and allow to dry before disinfecting with alcohol.	Dispose according to Hospital Waste Management Guideline systematically.
Goggles and Face shield	For reusing, wash it with water or detergent and let it dry. Place it in 70% alcohol or 1% Hypochlorite solution for 20 minutes. Please reuse it after completely dried.	If it is non-reusable, dispose it according to Hospital Waste Management Guideline.
Gown	Wash thoroughly before reusing. Instruction for washing:	If it is non-reusable, dispose it according to Hospital Waste Management Guideline.

	• Place it in 70-80 ^{0} C hot water or place it in 0.5% hypochlorite solution for 30 minutes. • Wash again with water	In order to reuse, gown must be dried under the sun or by drying machine (dryer).
Apron	For reusing, wash it with water and detergent. Then, let it dry. Disinfect with 70% alcohol.	If it is non-reusable, dispose it according to Hospital Waste Management Guideline.
Cap and Shoe Cover	For reusing, wash it thoroughly and let it dry. Then, place it in 0.5% hypochlorite solution for 30 minutes and disinfect it with plenty of water or detergent.	If it is non-reusable, dispose it according to Hospital Waste Management Guideline. In order to reuse, "Cap and Shoe Cover" must be dried under the sun or by drying machine (dryer).
Glove (Non-reusable)		Dispose it according to Hospital Waste Management Guideline.
Reusable Boots	Dry after cleansing with water and detergent. Then, disinfect with 70% alcohol.	

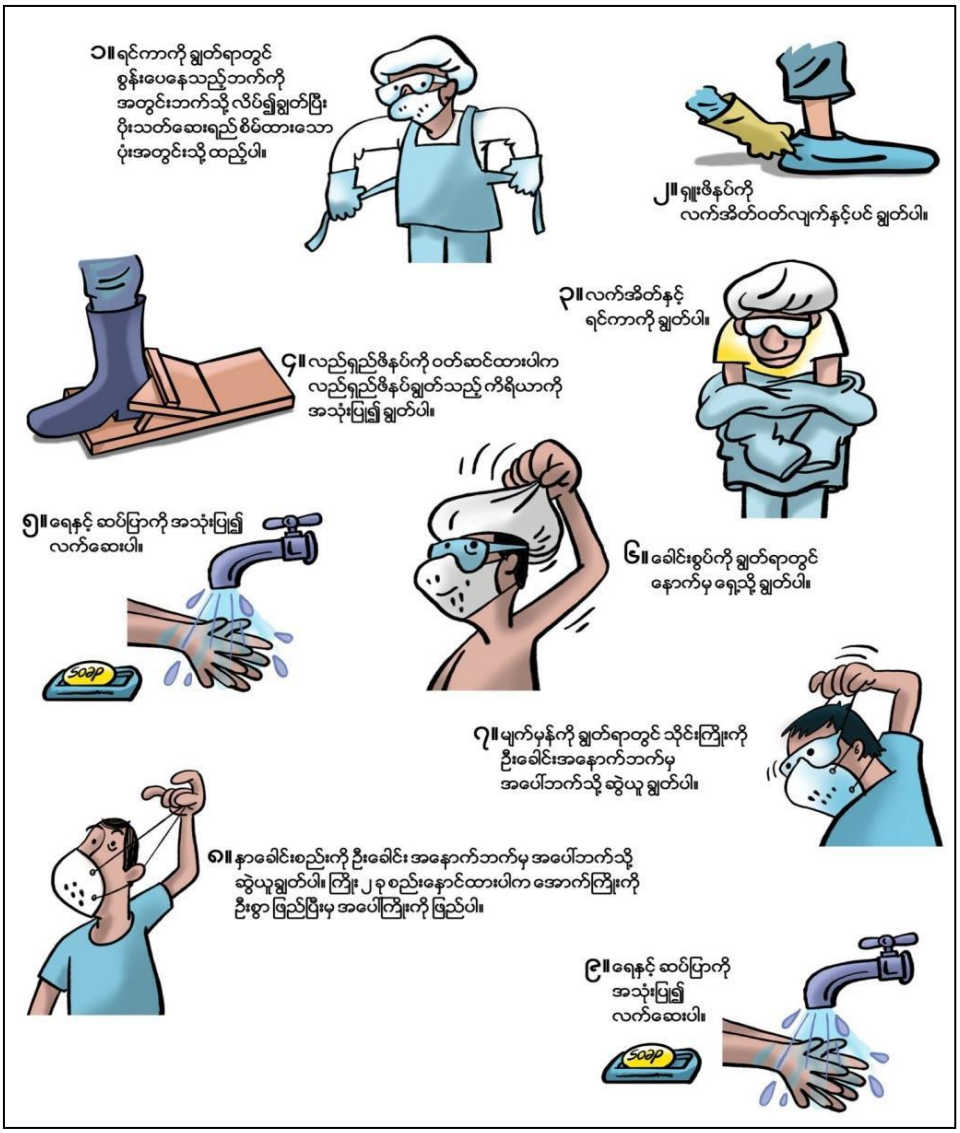


Figure 9.6: Safely removal stages of PPE

9.17 Review of the EMP

The factory environmental personnel shall review the EMP to assess its effectiveness and relevance as follows:

- The full EMP shall be reviewed at least annually

Relevant parts of the EMP shall be reviewed periodically following a reportable incident, an addition, up-date or change or a sub-plan, reporting; non-compliances; and corrective actions implemented.

9.18 Capacity building and training program

TMP Factory will educate the factory employees about the types of emergencies that may occur and train them in the proper course of action; such as awareness disaster training, firefighting training and first aid training.

The size of the workplace and workforce, processes used, materials handled, and the availability of onsite or outside resources will determine the training requirements. Factory employees will be sure to understand the function and elements of the emergency action plan, including types of potential emergencies, reporting procedures, alarm systems and evacuation plans.
Training may include practicing evacuations, identifying assembly points, location of emergency equipment, first aid arrangements and how to safely shut down machinery.

In determining training requirements, the following should be considered:

- Inclusion of emergency procedure training in induction courses for new workers
- Provision of refresher training for existing workers
- Provision of training for short-term contractors or visitors at the workplace (this may not need to be as extensive as may be required for workers), and
- Provision of specific training for individuals who have a formal role in an emergency (*e.g. fire wardens, floor wardens, first aid officers etc.*)

General training for factory employees should address the following:

- Individual roles and responsibilities
- Threats, hazards, and protective actions
- Notification, warning, and communications procedures
- Means for locating employee/ workers in an emergency
- Emergency response procedures
- Evacuation, shelter, and accountability procedures
- Location and use of common emergency equipment; and

The employee will be trained in first-aid procedures, including protection against blood borne pathogens; respiratory protection, including use of an escape-only respirator; and methods for preventing unauthorized access to the site.
A good idea is to hold practice drills as often as necessary to keep employees prepared. After each drill, gather management and employees to evaluate the effectiveness of the drill. Identify the strengths and weaknesses of the plan and work to improve it.

9.19 Preliminary EMP Costs

Estimated costs for the initial implementation of the EMP will be defined on an initial set up basis. The factory will revise these costs and develop annual operating costs for the EMP. These include the following costs:

a. Supervision on environment (includes sampling for environmental quality)
b. Engineering supervision cost
c. Institutional Strengthening, Training and Capacity Building
d. Costs of salaries, administration and function of the environmental unit of factory
e. Technical assistance to factory environmental unit
f. Development of Manual of functions and procedures including HSE procedure
g. Equipment and logistics

Chapter 10

Public Consultation and Disclosure

10 Public consultation and disclosure

10.1 Introduction

The public consultation meeting with the respective government bodies including mainly general administrative departments (Both District Head and Township Head), the Environmental Conservation Department, DISI, Forestry, Fishery department, Health Department and local communities etc, under the COVID 19 measures stated by Ministry of Health.

And then the survey conducted at the ***Ann Taw village*** and ***Ka Ward, 8th Street, Thandwe***, which are immediate areas to TMP factory, in order to identify the perception of community likely affected by the project activities as well as their social impacts. The survey was carried out using the preformed questionnaire comprising a mixture of ***quantitative*** and ***qualitative*** question types.
The survey was carried out starting from 21to 25 of May, 2021 by EQM socio-economic survey Team. The set of questionnaire form used in the survey is attached in Appendix .

10.2 Objectives of the study

The main objectives of the socio economic survey are as follows:

1. To collect the data on current socio-economic status including livelihoods and existing environmental conditions in the project area.
2. To reveal community perception on the proposed project and how it can effect on their lifestyles.
3. To assess the condition of the positive and negative impact on the socio-economic status along with better suggestions to minimize the negative effects.

10.3 Social Survey Instruments

Regarding household surveys, questionnaires were delivered to each household by the Village Tract Administrator /Head of the respective wards and then collected after two weeks. During that time, interviewers were contacting the selected participants whether they can understand the questions in order to obtain the reliable responses.
Generally, the household questionnaire consists of sections on household member characteristics, household economics, health condition, education, transportation system, cultural aspect, usage of internet, electricity utilization as well. Among the sections, one section focused solely on respondents' experiences with and awareness of climate and ecosystem changes. The data entry, data analysis as well as interpretation were conducted by using SPSS 21.
In two study areas which are ***Ann Taw village*** and ***Ka-Ward, 8th Street, Thandwe***, ***35*** and ***25*** households (***Total 60 households***) were conducted respectively for socio-economic surveys.

10.4 Socio-Economic Surveys on Key Informants and local community

10.4.1 Socio-Economic Surveys on Key Informants and local community

Total (***60***) households including household leaders and community surveys were conducted using the socio-economic and attitude questionnaire.

10.4.1.1 Current situation of infrastructure, resources and services

From the key informant survey, firstly it focused on infrastructure, resources and services including health, education, water sanitation, hygiene and transportation. According to the findings, majority can access healthcare and education. In the usage of electricity, public electricity is mainly for lighting; however, but, not only electricity but also, charcoal and firewood are still being used for cooking.
For water supply, the main source of drinking water is from deep well. Most households, they disinfected water before use either boiling or sedimentation.

10.4.1.2 Analysis of climate condition and environmental aspects

(a) Air, water and soil quality analysis

As the results of socio-eco surveys, climate becomes warmer and air quality is not negatively changed. All the conditions of the natural environment are normal situation.

10.4.1.3 Analyzing result for the information related to project

Regarding awareness and attitude on the TMP factory, most of the respondents know a little information about the factory.

10.5 Socio-Demographic of the community

(i) Distribution of population responding questionnaires

In the respective study areas, total 60 respondents (***35*** households from ***Ann Taw village*** and and ***25*** household from ***Ka Ward, 8th Street, Thandwe***) were randomly selected and questionnaires were given. Among all survey respondents, both ***male and female*** are ***50%*** each. Most respondents comprise of ***heads of households*** (***38%***), ***sons and daughters*** (***35%***) and ***Spouse*** (***27%***). The ethic occupied by the population lived around the TMP factory is Rakhine (***93%***). According to the results, majority of respondents are Buddhist (***96%***), Christian ***2%*** and Hindu ***2%***.

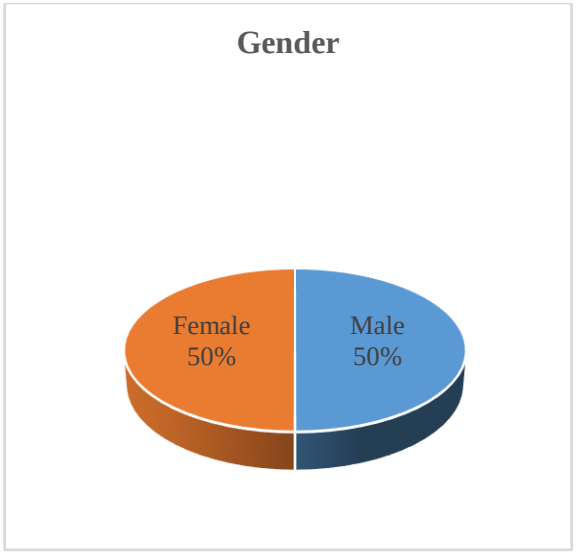


Figure 10.1.1: Gender Distribution

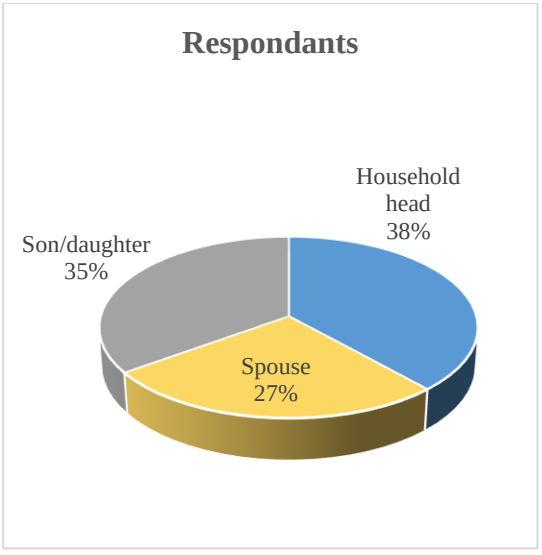


Figure 10.1.2: Relationship to household head

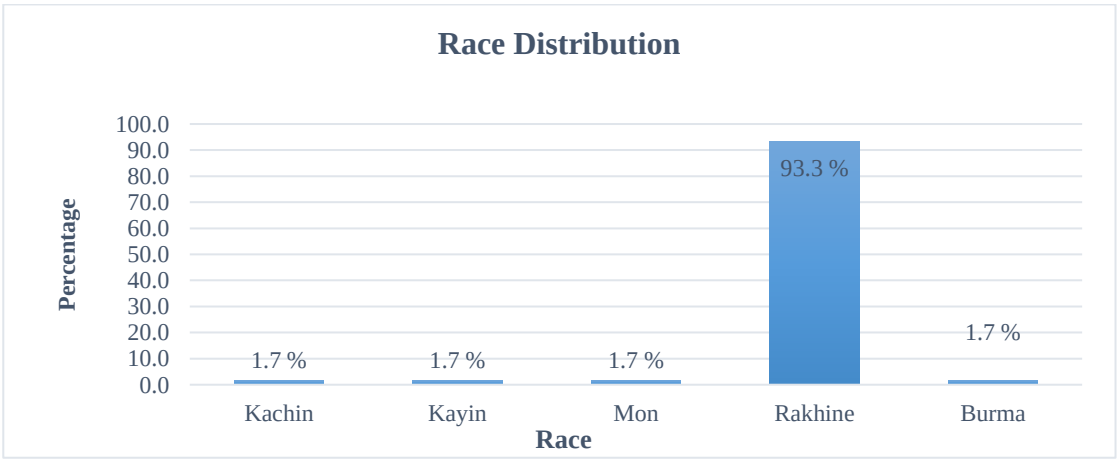


Figure 10.1.3: Distribution of race among survey respondents

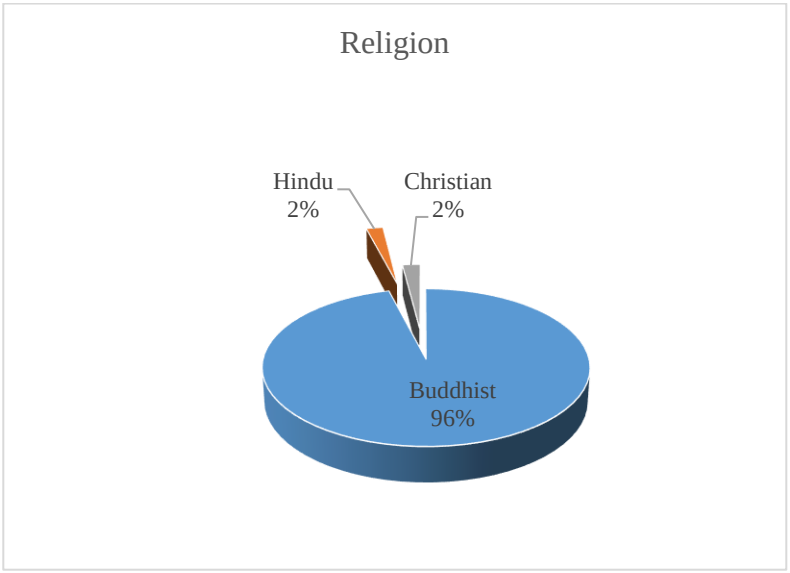


Figure 10.1.4: Distribution of religion among survey respondents

(ii) Age distribution

The survey identified that majority (***38%***) is between ***20-30*** years followed by ***40-50*** years (***22%***).

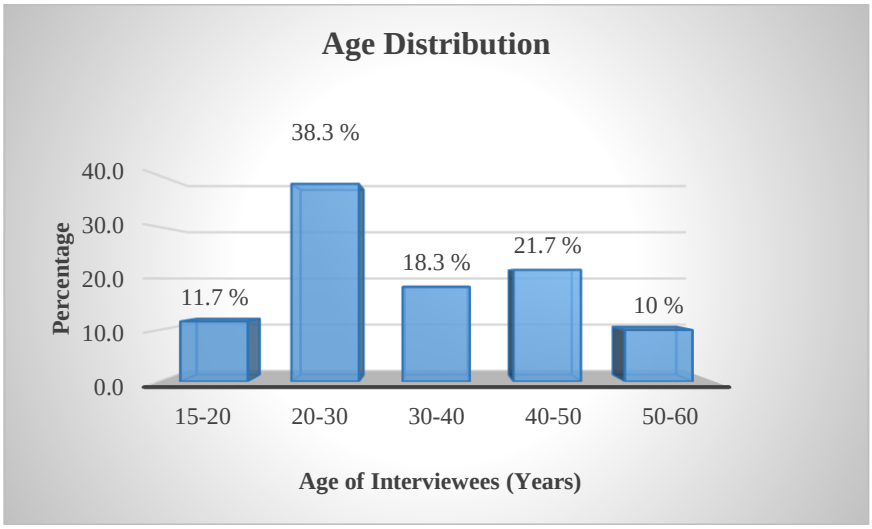


Figure 10.1.5: Age distribution

(iii) Occupation status

The following chart summarizes the information on the pattern of occupation status of surveyed respondents. According respondents, there are "***Skilled workers***" (***32%***) and "***Casual workers***" (***25%***).

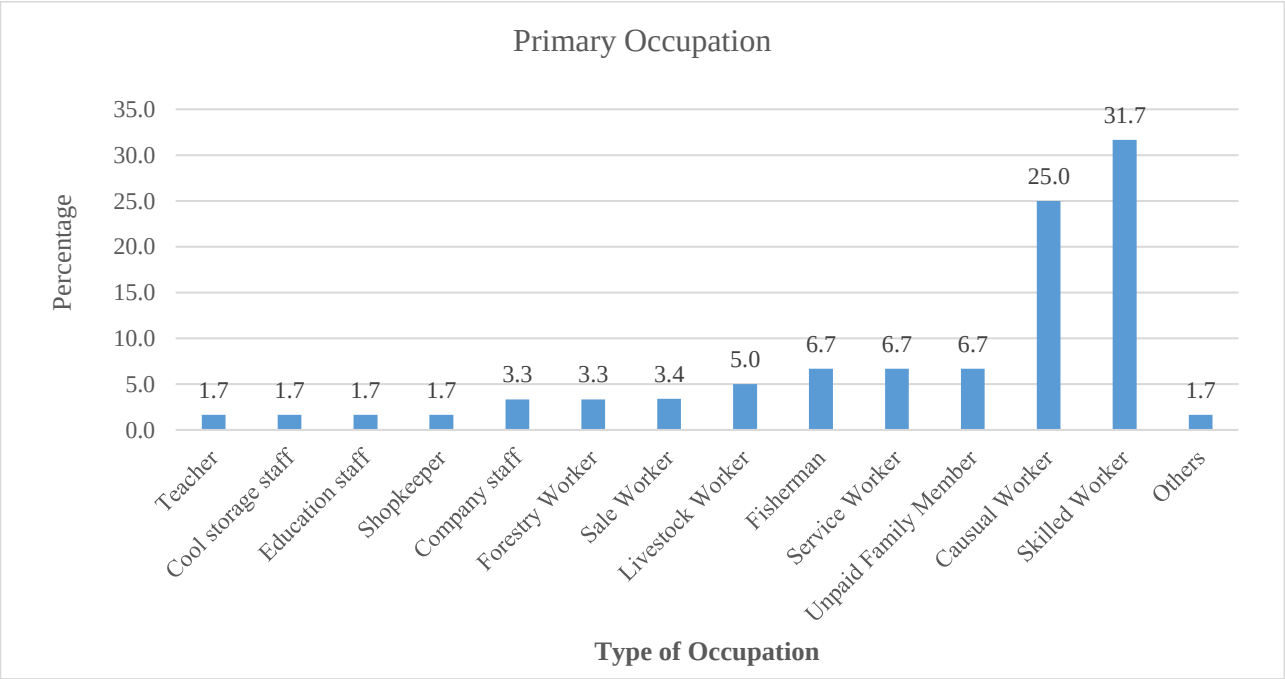


Figure 10.1.6: Different types of occupation

(iv) Income level

The annual income of households was assessed and following figure shows the percentage of annual income among respondents.

The majority (***58%***) is between ***500,001 to 1,000,000 kyats*** followed by (***30%)*** which is between ***1,000,001 to 2,000,000*** kyats per year.

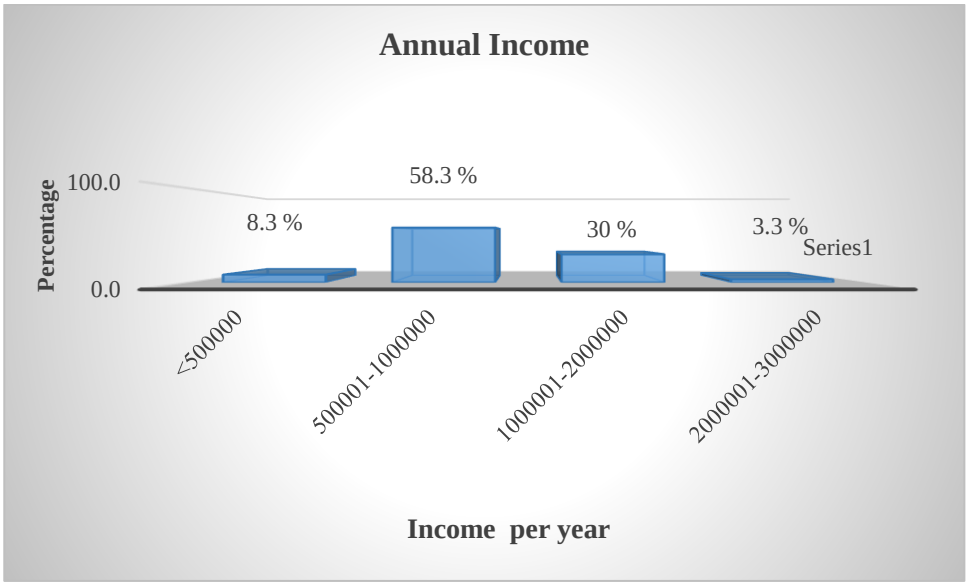


Figure 10.1.7: Percentage of income level at community

(v) Education

It is observed that ***37%*** of respondents have attended "***Middle school"*** and ***23%*** have "***High school***" education level.

Regarding ***highest education*** in the family, ***33%*** of households have ***High school*** education level followed by ***Middle School*** Level (***27%***).

Only ***20%*** of respondents have ***graduate*** members in their families.

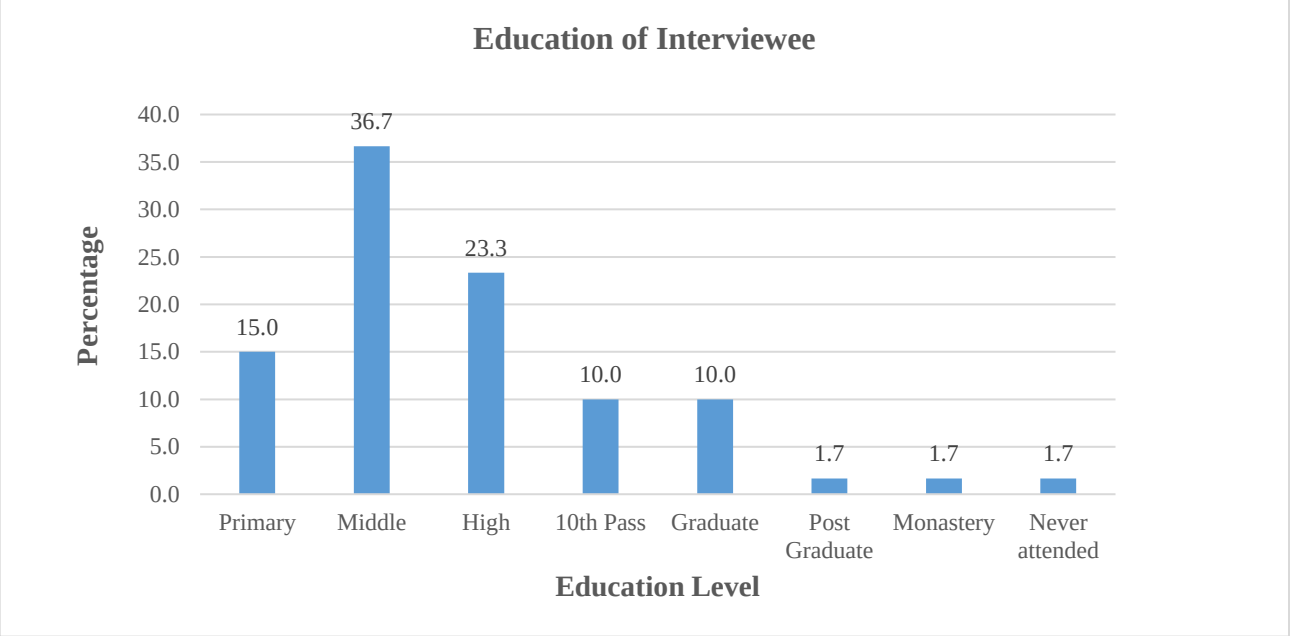


Figure10.1.8: Education level of respondents

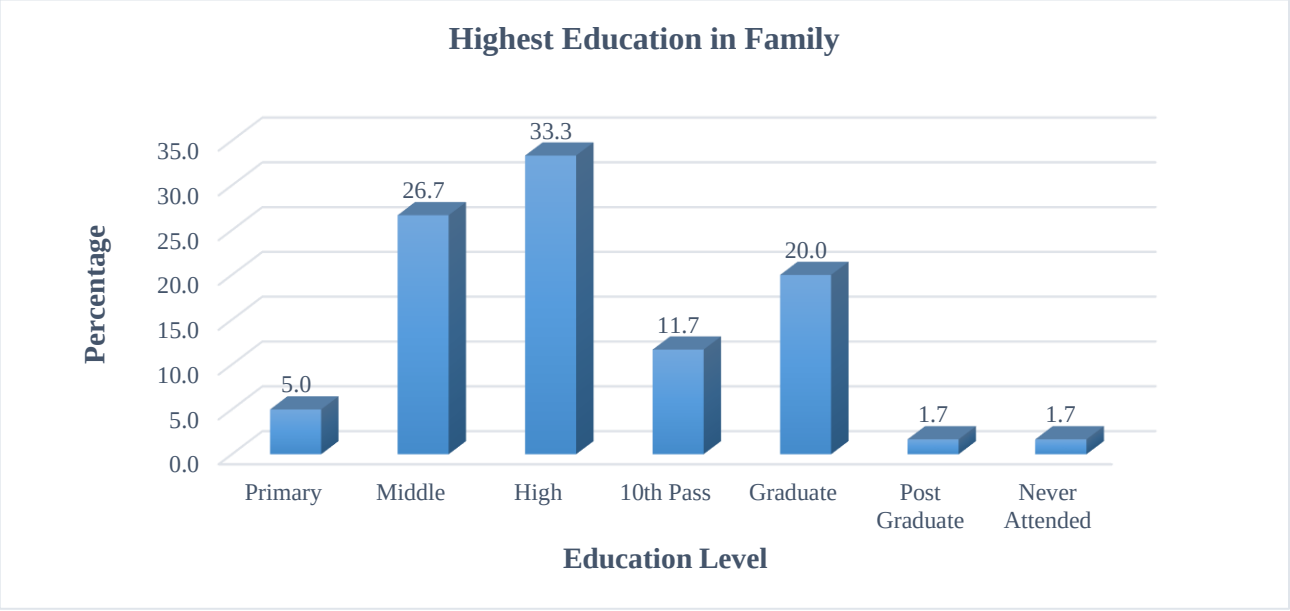


Figure 10.1.9: Highest Education level in Family

(vi) Household Expenditures

The household expenditure of local people including:

1) Education
2) Usage of fuel (diesel/petrol)
3) Transportation
4) Communication (telephone/mobile)
5) Entertainment
6) Healthcare/medical expenditure
7) Input investment
8) Annual maintenance of house

9) Loan repayment
10) Cultural/religious expenses
11) Food expenditures
12) Cooking fuel were analyzed.

In ***Ann Taw village***, total household expenditures per month range from ***199,000 MMK*** to ***405,000 MMK***.

In ***Ka-Ward, Thandwe***, total household expenditures per month range from ***159,000 MMK*** to ***724,000 MMK***.

Table1.1: Total household expenditures per month

Study Areas	Mean	Median	Mode
	Currency (MMK/month)		
Ann Taw Village	290,242	295,000	237,000
Ka-Wards, Thandwe	358,200	335,000	347,000

(vii) Household health condition

According to the survey, the common sickness of household members are ***catching a cold*** (***25%***) and (***23%***) ***Flu*** followed by ***hypertension*** (***20%***). Some people suffer malaria, muscle pain and heart diseases.

For incidence of ***diarrhea within three months***, majority (***98%***) did not experience that disease.

Among the surveyed households, approximately ***45%*** get treatment from "***Private clinic with doctor***", ***18%*** from "***Health Assistant***" which is followed by "***General Hospital***" (***14%)***.

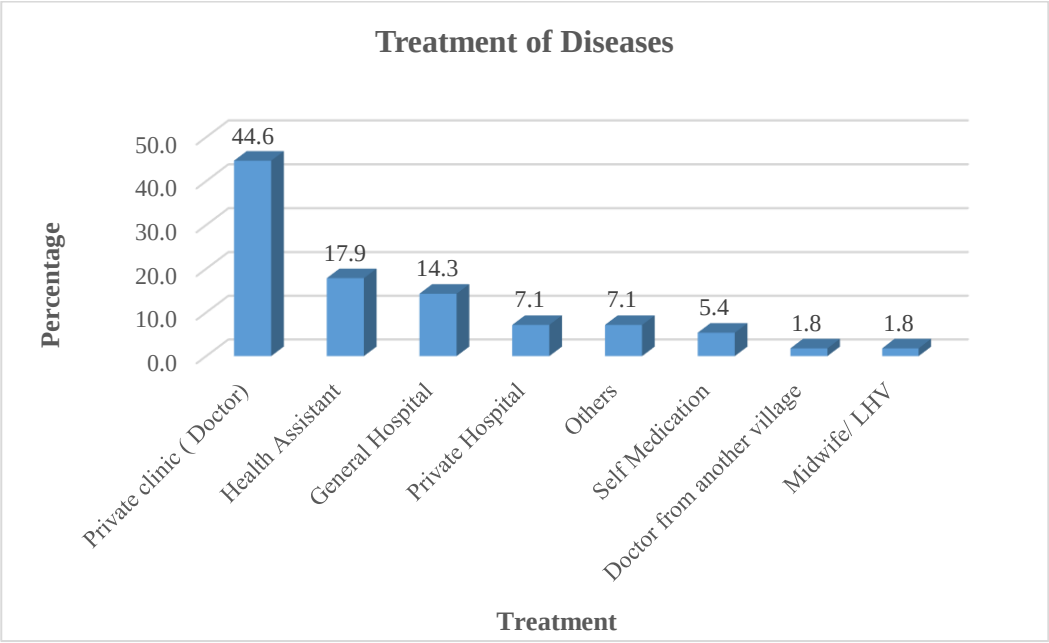


Figure 10.1.10: Treatment of Diseases

(viii) Household structure

It is observed that ***80%*** in ***Ann Taw village*** and ***84%*** in ***Ka ward, Thandwe*** live in their own houses. Moreover, ***77%*** of respondents live with ***document for ownership*** of the land and remaining ***23%*** live with ***no document but they have permission*** for residence.

In Ann Taw village, type of house for ***64%*** of respondents is ***one storey house***, ***30%*** live in ***two-storey and above*** and ***6%*** live in ***huts***.
In Ka Ward, Thandwe, type of house for ***88%*** of respondents is ***one storey house***, ***8%*** live in ***two-storey and above*** and ***4%*** live in ***huts***.

Moreover, "***CGI***" is used as roof for ***85%*** of all respondents and only ***7%*** of surveyed households is roofed with "***Thatch***". Each ***3.3%*** of surveyed respondents use "***Bamboo***" or "***Tarpaulin***".

(ix) Residence and Migration

Regarding duration of residence, ***62%*** of local people in this area has been ***more than 10 years*** and ***28%*** are the people who live between ***three to ten years*** ago.

Moreover, household member migration and reasons of migration are analyzed.
Most of the surveyed households (***86%***) have no family member who has migrated to different area. ***Female over 15 years*** (7%), ***male over 15 years*** (5%) and ***male under 15 years*** (2%) have migrated to other places for the reason of ***working***.

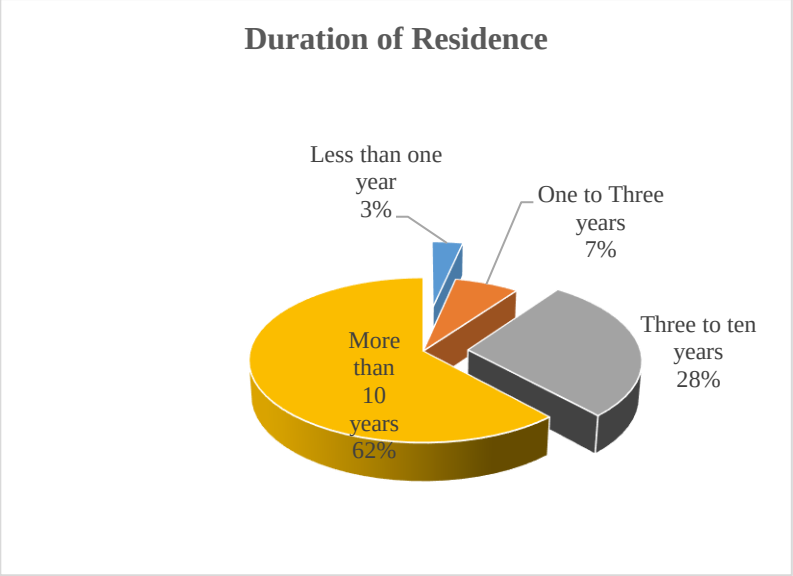
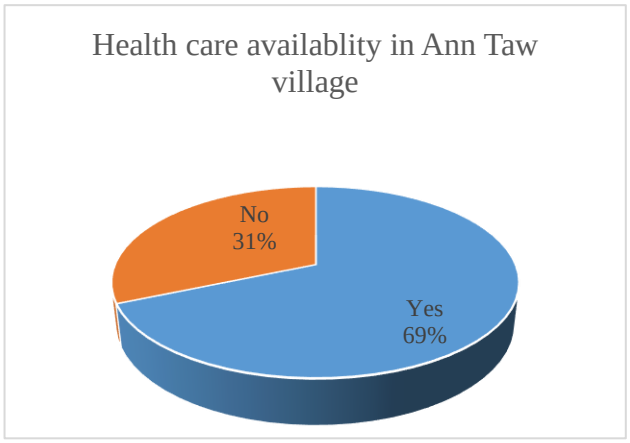


Figure 10.1.11: Duration of residence

(x) Health care availability and access to education

The availability of facilities for health and education sectors among surveyed households were analyzed. For these different categories, the following figures present outcomes of the respondents.



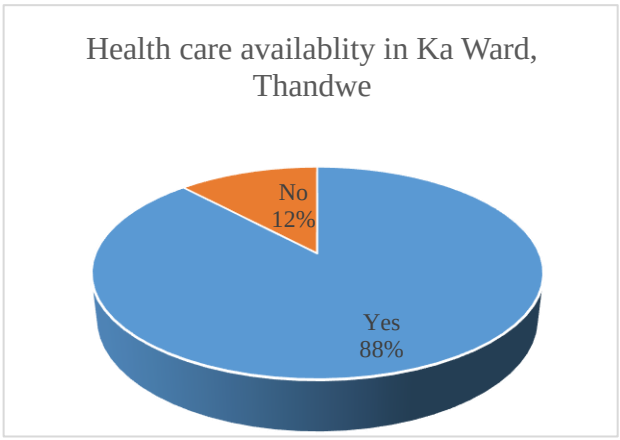
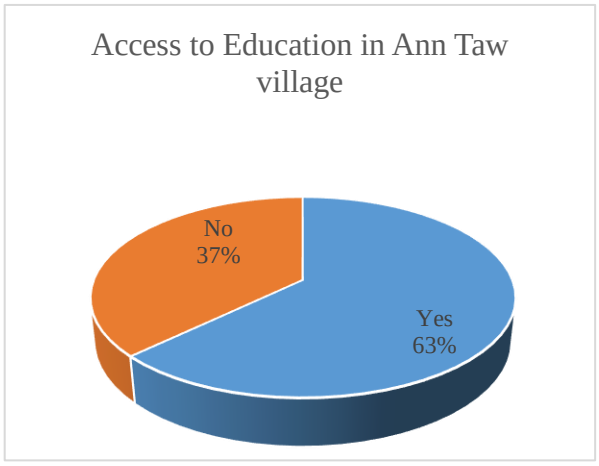


Figure 10.1.12: Health Care Availability



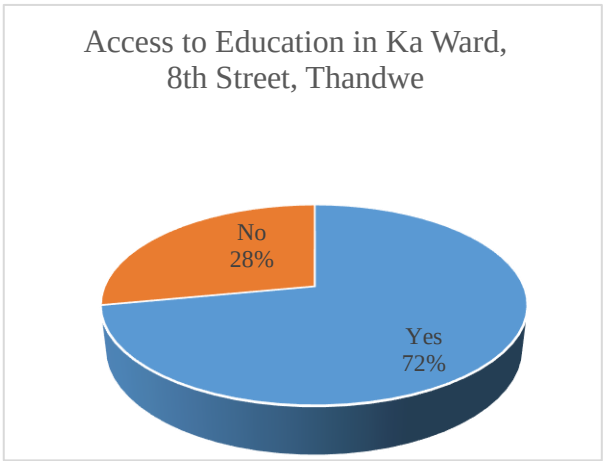
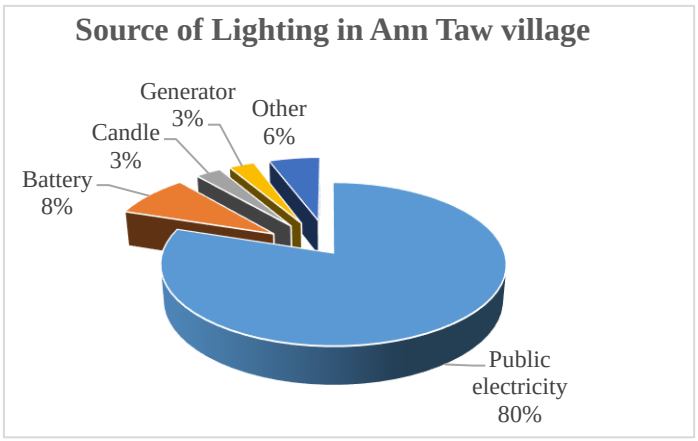


Figure 10.1.13: Access to Education

(xi) Sources of Lighting

In Ann Taw village, it was observed that ***80%*** of the respondents use ***Electricity from National Grid*** and ***8%*** uses ***Battery*** for source of lighting.

In Ka-Ward, Thandwe, it was observed that ***68%*** of the respondents use ***Electricity from National Grid*** for source of lighting.



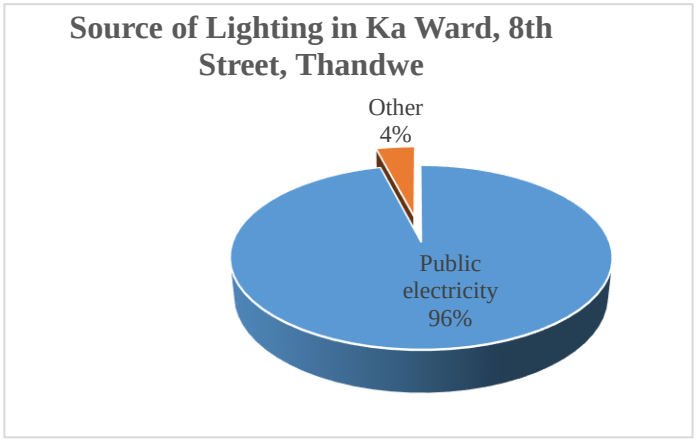


Figure 10.1.14: Source of Lighting

(xii) Energy usage in cooking

The survey results showed that in Ann Taw village, ***70%*** of participant uses ***electricity*** for cooking and remaining participants uses ***charcoal/fuel wood substitute*** (15%) and ***firewood*** (15%).

In Ka-Ward, Thandwe, ***68%*** of respondents uses ***electricity*** for cooking and ***20%*** uses ***charcoal/fuel.*** Remaining participants use ***firewood (8%)*** and ***Gas/Kerosene/Diesel (4%).***

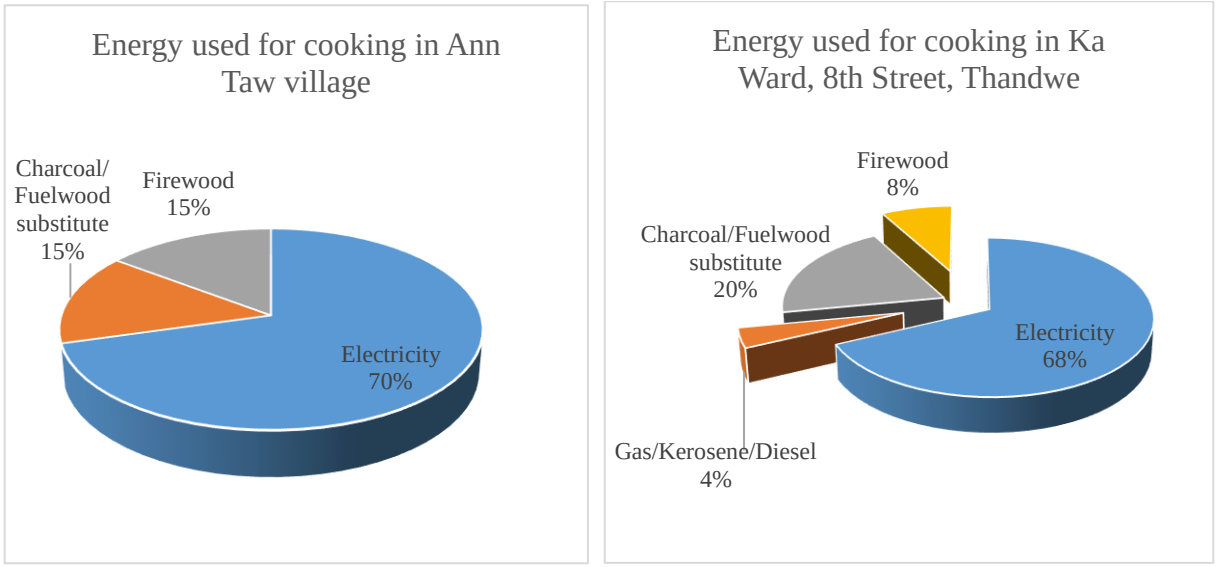


Figure 10.1.15: Energy used for cooking

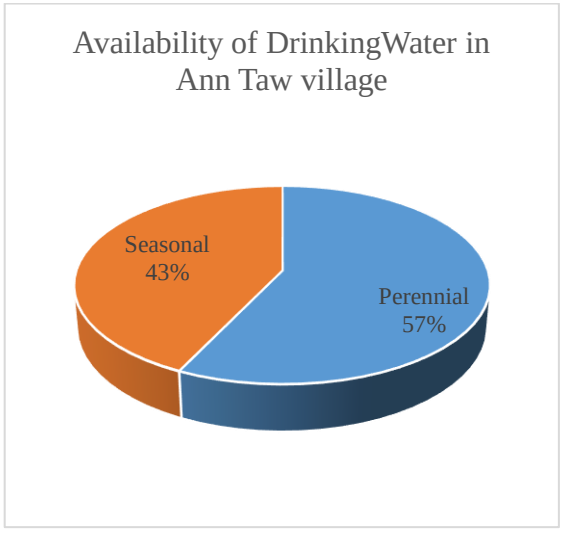
(xiii) Different sources of drinking water

Concerning drinking water availability, most households ***(57%)*** in Ann Taw village and ***(72%)*** in Ka-Ward, Thandwe get from ***perennial sources***.
For ***perennial sources*** of ***drinking water***, ***(53%) in Ann Taw village*** and ***(50%) in Ka-Ward, Thandwe*** get from deep well.
For ***seasonal sources*** of ***drinking water***, ***(68%) in Ann Taw village*** and ***(56%) in Ka-Ward, Thandwe*** get from ***public piped water***.

It is observed that ***distance to drinking water source*** is ***household level*** for majority of respondents (***78%)***.
Among remaining respondents, ***12%*** has access to drinking water within ***1 mile*** followed by ***within ¼ mile*** (***5%***) and ***more than one mile (5%)***.

Regarding quality of water, ***majority*** of surveyed respondents (***89%***) from Ann Taw village and (***92%***) from Ka-Ward, Thandwe answered that the water is ***good***.

Majority of respondents (**60%**) mentioned that they face ***scarcity*** of drinking and household water from ***April to June***.



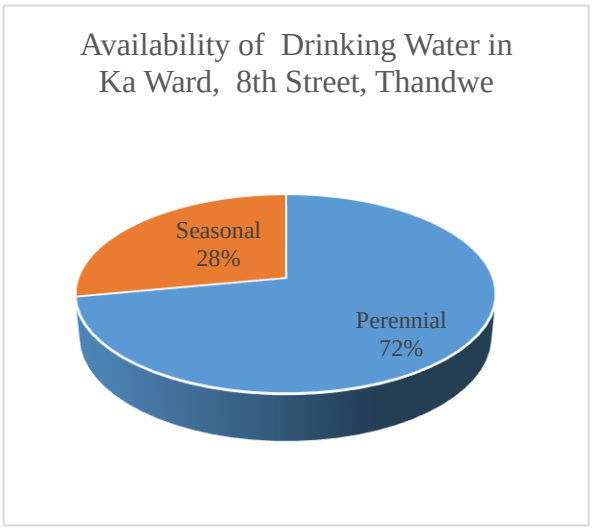
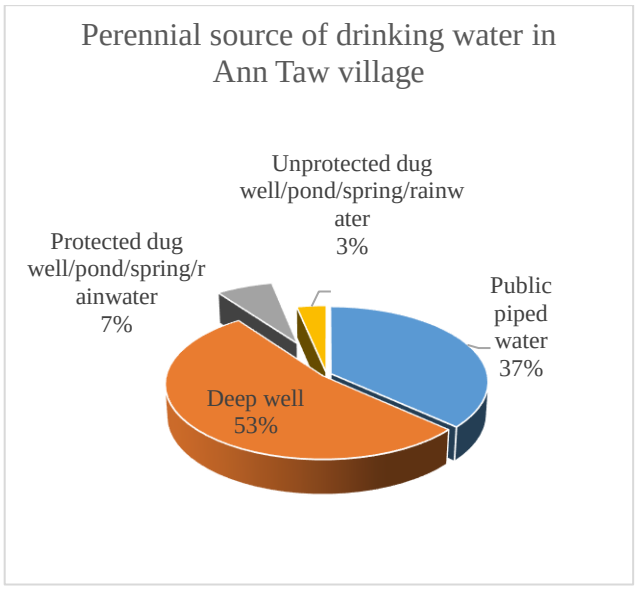


Figure 10.1.16: Availability of drinking water



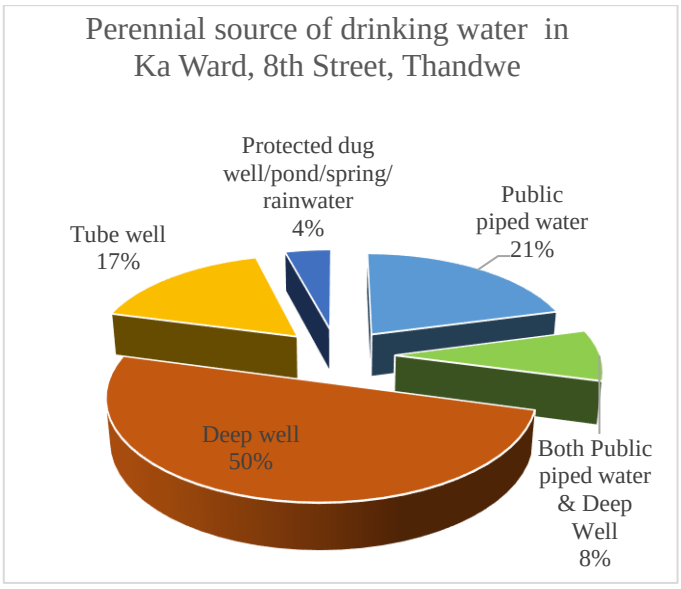
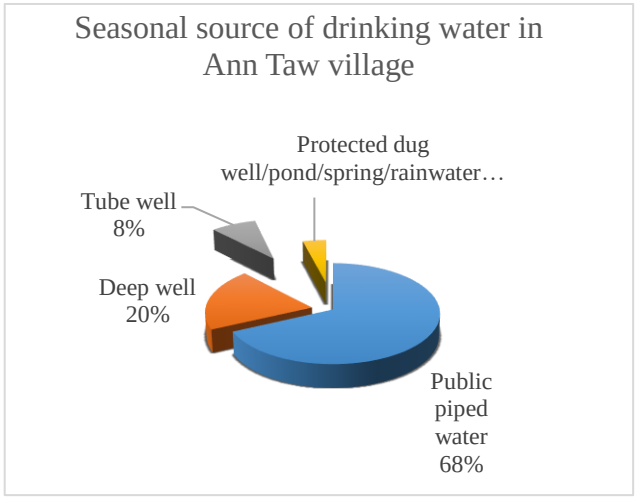


Figure 10.1.17: Perennial source of drinking water



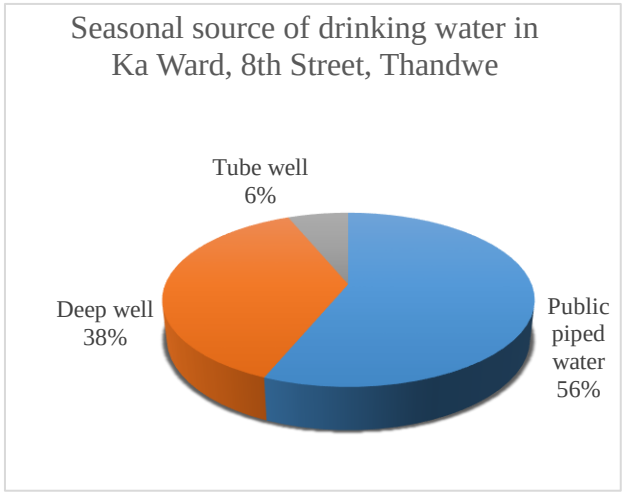


Figure 10.1.18: Seasonal source of drinking water

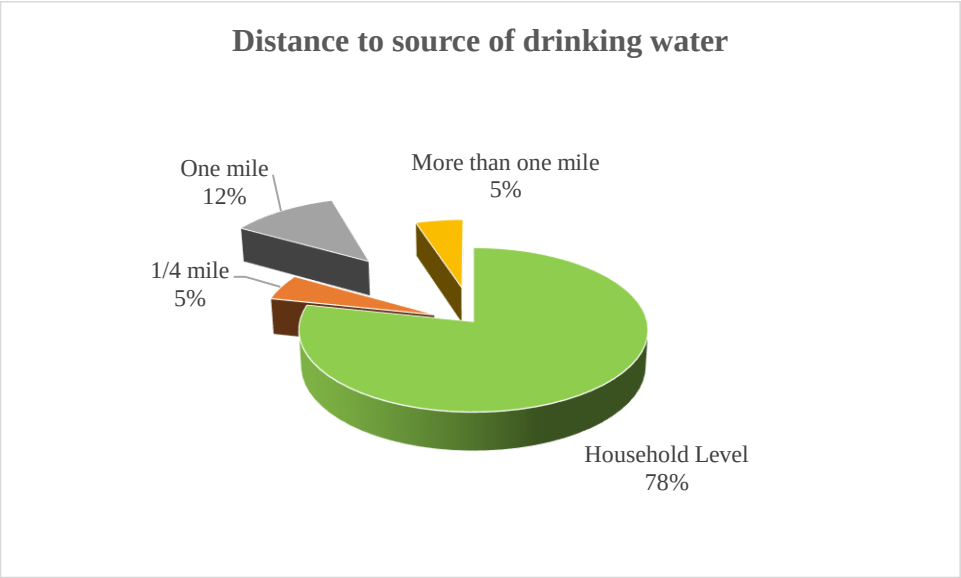


Figure 10.1.19: Distance to source of drinking water

(xiv) Drinking water disinfection

Among the outcomes of the respondents, ***all*** respondents ***treated drinking water*** and the following figures show the various types of making drinking water safe.

Moreover, ***76%*** of respondents said that the ***quality of water has not changed*** while remaining respondents answered that the quality has changed. ***Water quality changes*** due to "***Poor management of ponds***" and ***water quantity changes*** due to "***Climate change***" are mentioned as well.

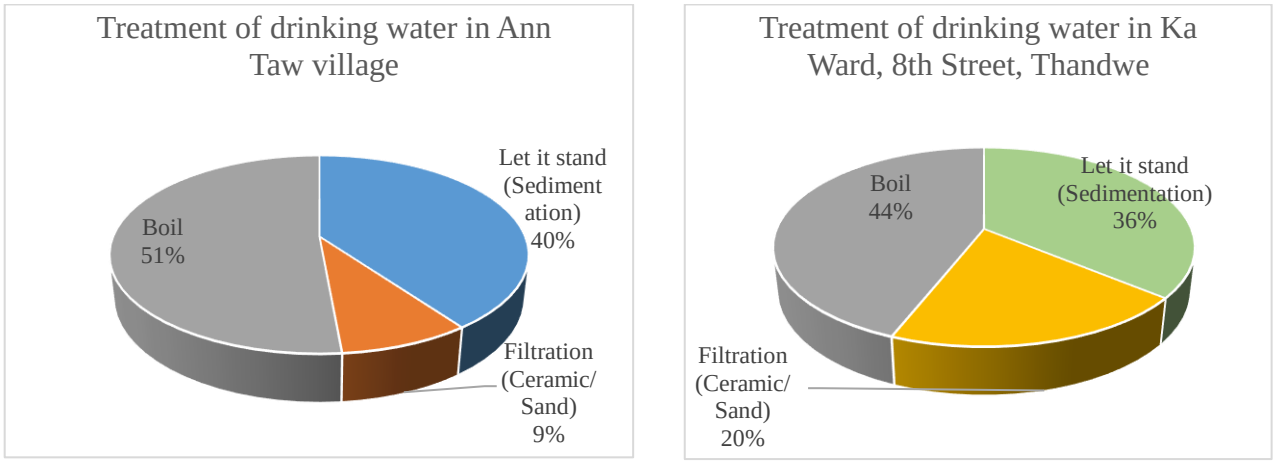


Figure 10.1.20: Treatment of drinking water

(xv) Household water availability

Regarding household water availability, most households ***(57%) in Ann Taw village*** and ***(75%) in Ka-Ward, Thandwe*** get from ***perennial sources***.

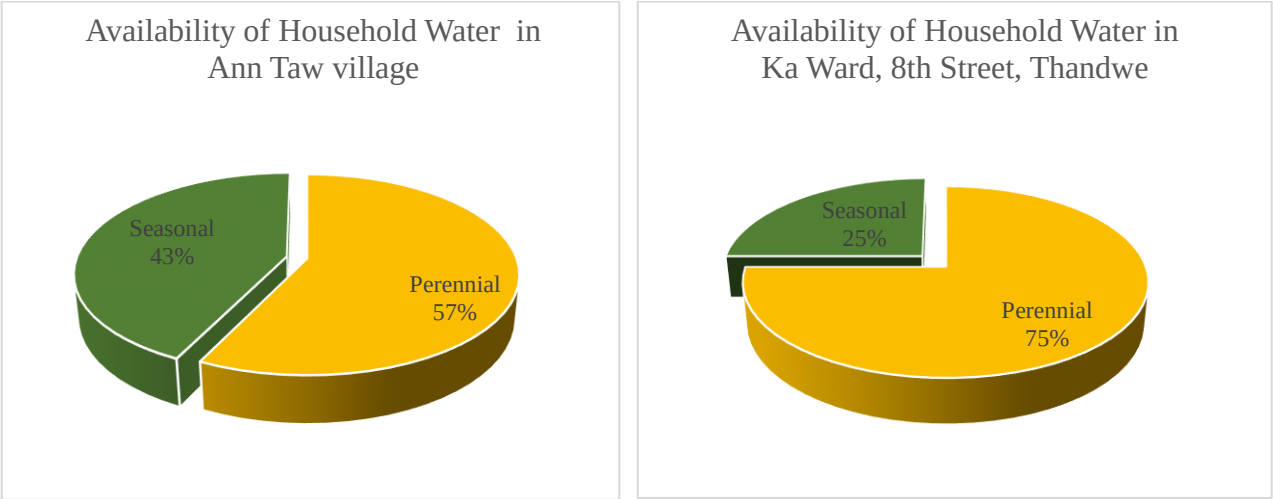


Figure 10.1.21: Availability of household water

(xvi) Type of Latrine
Regarding to type of latrine, there are ***97%*** of respondents who use ***Pour Flush Latrine*** and only *3%* use ***Flush Latrine***.

(xvii) Waste Collection and Disposal
The study has identified the "Waste Collection and Disposal method" in the surrounding community of TMP factory. It was found out that ***85%*** of respondents ***collect wastes*** for disposal.

For collection of wastes, ***49%*** in Ann Daw village and ***44%*** in Ka-Ward, Thandwe collect the wastes in ***dustbin with cover.***
Remaining respondents use ***dustbin without covers***, ***plastic bags/woven PP bags*** and ***baskets*** for waste collection.

Majority of respondents, ***(83%)*** in Ann Taw village and ***(92%)*** in Ka-Ward, Thandwe do not dump wastes on the ground.
Moreover, majority of respondents, ***(86%)*** in Ann Taw village and ***(88%)*** in Ka-Ward, Thandwe do ***not bury*** wastes.
But, ***(40%)*** in Ann Taw village and ***(20%)*** in Ka-Ward, Thandwe practice ***burning of wastes.***
It is also found out that ***(31%)*** in Ann Taw village and ***(12%)*** in Ka-Ward, Thandwe throw the wastes into ***river.***

In general, more than ***80%*** of all respondents dispose the wastes to ***CDC dumping area/container and trucks.***
Only 12% in Ka-Ward, Thandwe ***sell the garbage to recycle shop*** and other respondents do not sell the wastes.
All respondents do ***not practice decomposing wastes*** for fertilizer.
Regarding ***waste separation***, only (***18%***) in Ann Taw village and ***(44%)*** in Ka-Ward, Thandwe separate the wastes before disposal**.**

Type of wastes generated are mostly ***kitchen wastes (65%)*** and other type of wastes are generated infrequently.
Regarding type of wastes generated from households, 27% for "***Plastic***", 22% for "***Garden wastes***", 8% for "***Metal***", 3% for "***Paper***", 3% for "***Hazardous wastes***", 2% for "***Construction wastes***", 2% for "***Glass***" and 2% for "***Clothes"*** are mentioned among overall respondents.

For the knowledge of 3Rs (*Reduce, Reuse and Recycle*), only ***40%*** of overall respondents have ever heard about that.
Moreover, ***72%*** of respondents who ***have heard*** about 3Rs and ***40%*** of respondents who ***have not heard*** would like to practice 3Rs in the future.

(xviii) Internet usage and Communication
Concerning online communication, ***78%*** of respondents are using internet and communicate with each other.
"*Facebook*" is most common (***60%***) among surveyed respondents and there are ***17%*** of respondents who use both application, "***Facebook and Viber***". Other ***2%*** use only ***Viber***.

It is observed that only ***16%*** of respondents can use internet "***Very well***", ***40%*** can use it "***Well***" and ***45%*** can use "***Just a little***".
Regarding communication about project activities and project information via Facebook application, ***48%*** said that it is available to do so while ***30%*** answered that they cannot be connected via Facebook. Among surveyed respondents, ***22%*** stated that communication via Facebook application can be possible if the technology how to communicate via that application is explained by a family member.

(xix) Cultural aspect
The ***important decisions*** in the community are made by the ***village leader*** (***92%***).
There are ***43%*** of respondents who answered religious sites around proposed project and ***56%*** said that those sites are adequately protected.

(xx) Air quality and climate changes
The study has identified the environmental changes of surrounding area of TMP factory.
In Ann Taw village, majority of respondents (***69%***) answered that air quality is not changed while ***20%*** thinks that it is improved and ***11%*** stated that air quality is declined. They mentioned about the causes of air quality changes due to ***Industry (60%)*** and ***Forest Fire (40%)***.

In Ka-Ward, Thandwe, majority of respondents (***56%***) answered that air quality is not changed while ***28%*** thinks that it is improved and ***16%*** stated that air quality is declined. They mentioned about the causes of air quality changes due to ***Livestock Industry (50%), Industry (33%)*** and ***Forest Fire (17%).***

Among the respondents, ***57%*** of stakeholders said that the weather becomes "***warmer***", ***40%*** said that the weather condition is "***unchanged***" and the remaining ***3%*** said "***cooler***".
Furthermore, ***60%*** of total respondents described that ***local climate*** becomes "***Drier***".

(xxi) Awareness on TMP factory
Regarding awareness of local people about the TMP factory, ***77%*** of surveyed respondents in ***Ann Taw village*** and ***56%*** of surveyed respondents in ***Ka-Ward, Thandwe*** mentioned that they just ***know a little*** about the factory.

(xxii) Perception on the importance of project
The following bar charts describe the level of importance to community by TMP factory.

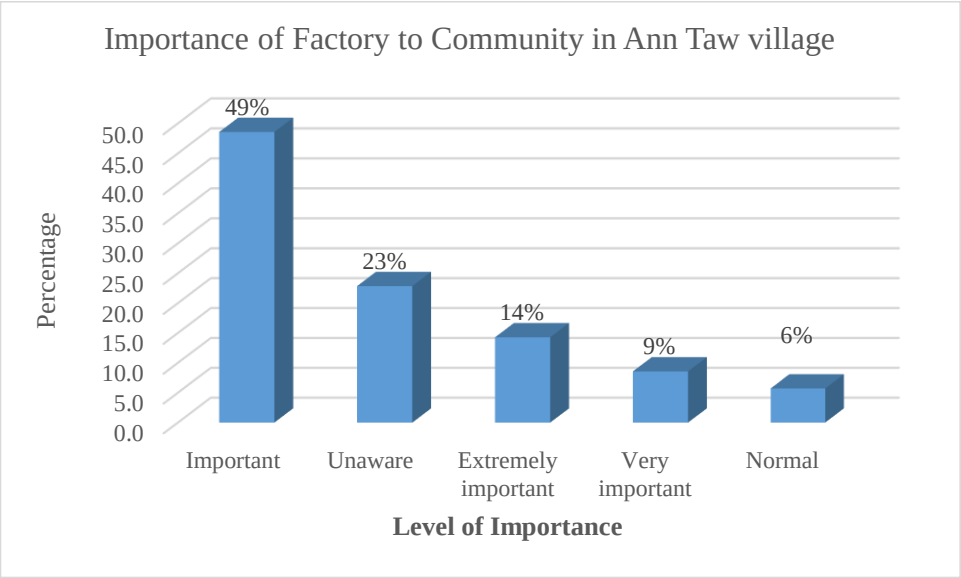


Figure 10.1.22: Importance of TMP factory to community in Ann Taw village

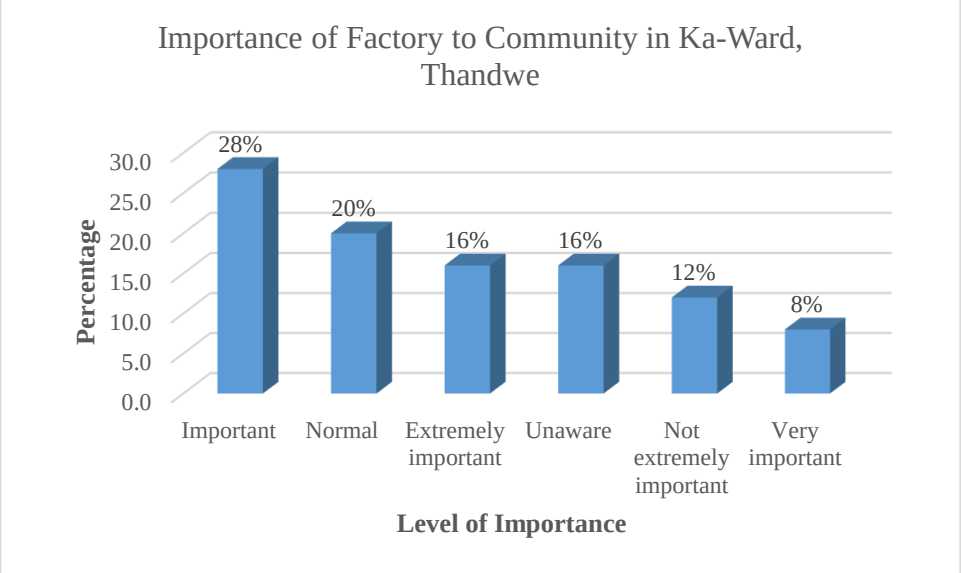


Figure 10.1.23: Importance of TMP factory to community in 8-Ward, Thandwe

(xxiii) Experience of the previous projects

Regarding previous projects in community, ***67%*** of surveyed respondents mentioned that they ***did not experience*** any project while other ***33%*** have experience with "***Bridge"*** construction. Among all respondents, only ***8%*** mentioned about the "***Dam project"*** and ***1.7%*** for "***Road/Railways"***.

(xxiv)Attitude about positive and negative impacts by previous projects

Regarding respondents' attitudes for the impact on community caused by the previous projects, ***60%*** of respondents said that there are ***positive impacts*** by those projects. However, ***7%*** of the households said that they have some ***negative impacts***. Then, ***33%*** of respondents mentioned that there is neither positive nor negative impact. Furthermore, ***95%*** of respondents answered that there was ***no discussion*** about the compensation for those projects.

(xxv) Community's perception on positive impacts by TMP factory

Regarding community's perception on positive impacts due to the existence of TMP factory, ***48%*** in Ann Taw village and ***64%*** in Ka-Ward, Thandwe mentioned about "***Increased employment***".
Moreover, ***20%*** in Ann Taw village and ***4% in*** Ka-Ward, Thandwe responded ***"Increased Annual Income"*** by TMP factory.
Other ***26%*** in Ann Taw village and ***32%*** in Ka-Ward, Thandwe said that they have no idea about positive impact by TMP factory.

(xxvi) Community's perception on negative impacts by TMP factory

Regarding negative impacts on community due to the existence of TMP factory, ***46%*** in Ann Taw village and ***68%*** in Ka-Ward, Thandwe answered that they ***do not aware*** any negative impacts.

But ***31%*** in Ann Taw village and ***16%*** in Ka-Ward, Thandwe mentioned ***"Environmental Pollution".***
Moreover, ***17%*** in **Ann Taw village** and ***4%*** in Ka-Ward, Thandwe described negative impacts on "***Health***".

Remaining ***6%*** in ***Ann Taw village*** answered adverse effect on ***"Access to water".***
Remaining respondents in ***Ka-Ward, Thandwe*** mentioned ***Negative social environment*** (***8%***) and ***Increased cost*** (***4%***).

Among surveyed respondents, approximately ***54%*** in Ann Taw village and ***28%*** in Ka-Ward, Thandwe are worried about negative impacts on "***Both women and children***".
Approximately ***11%*** in Ann Taw village and ***40%*** in Ka-Ward, Thandwe said that ***"Children"*** are likely to be negatively impacted by the factory. Nearly ***20%*** in both surveyed areas do not worried about any specific groups. Fewer persons (***3%*** in Ann Taw village and ***8%*** in Ka-Ward, Thandwe) mentioned "***Unskilled workers***" to be negatively impacted.

(xxvii) Priotization for improvement of community

Majority of respondants metioned about improvement of "***Employment***" (***55%***) as first priority, "***Medical service***" (***60%***) as second priority followed by "***Education***" (***53%***) as third priority.

(xxviii) Agricultural sector, livestock and fishing

Regarding farming activities, approximately ***30%*** of overall surveyed respondents work in agricultural sector. Majority of them (***88%***) ***have their own farmlands*** ranging from ***3 to 5 acres.***
Among them, ***76%*** mentioned about ***reduced quality of rice and crops*** in ***three years.***
Majority of them (***94%***) answered that there is ***no problem and impact*** on ***agricultural sector*** due to TMP factory.

(xxix) Type of agricultural land and main crops

Types of agricultural land which is owned by surveyed respondents are mainly "***Crop land***". Only one respondent has agricultural land for ***perennial plantation***.
Main types of plants are *Rice, Bean/Pulses, Vegetables, Lemon and Shauk.*

(xxx) Previous land acquisition

There is ***no experience for previous land acquisition*** in all surveyed respondents.

(xxxi) Livestock breeding and Fishing

It is observed that ***34%*** of respondents breed animals and ***pig*** (***17%***) is the most common animal for breeding in the community. Other respondents breed ***poultry*** (***13%***) which is followed by ***cow*** (***1.7%***) and ***horse*** (***1.7%***).

Majority of respondents breed animals for ***selling*** (***90%***) and others for ***self-consumption*** and ***renting of horse***.

According to the surveyed respondents, ***23%*** in ***Ann Taw village*** and ***52%*** in ***Ka-Ward, Thandwe*** do fishing but majority of them (***95%***) are ***not fishing near TMP factory.***

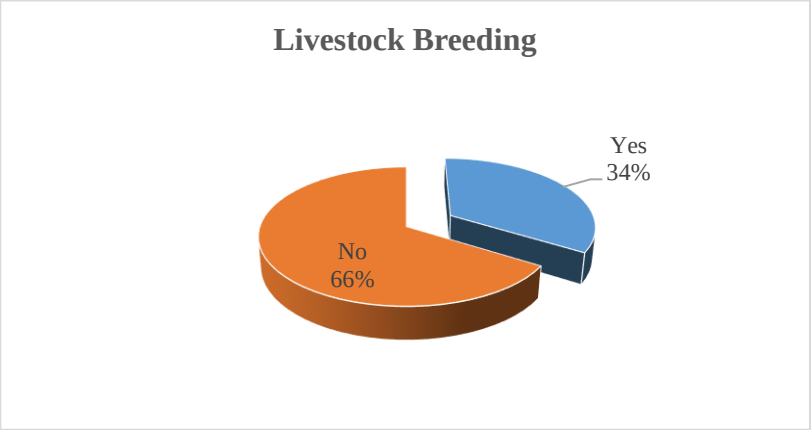


Figure 10.1.24: Livestock breeding

(xxxii) Natural Disaster in community

Regarding natural disaster in community, ***flood*** (***90%***) is the most common and usually happens in ***rainy season.*** There are other disasters such as *Landslide, Strong Wind, Lightning, Soil Erosion, Forest Fire and Drought* in the surveyed community.

Surveyed respondents had ***flooding*** in year ***2004*** and year ***2014*** as well.

Surveyed respondents answered that causes of flooding are mostly due to ***heavy raining.*** Other reasons such as ***deforestation*** and ***climate change*** are also mentioned.

Regarding ***landslide***, ***81%*** of respondents mentioned "***Debris Fall***" and "***Rock Fall***" (***19%***).

(xxxiii) Perception on the development of the project

Looking at the attitudes of the respondents, ***94%*** in ***Ann Taw village*** and ***88%*** in ***Ka-Ward, Thandwe*** said that they ***agree*** with the development of TMP factory.

Remaining 6% in ***Ann Taw village*** and ***12%*** in ***Ka-Ward, Thandwe*** are ***not sure*** for the development of TMP factory.

(xxxiv) Community perception on environmental and socio-economic impacts by TMP factory

1. The effect on physical resources

Regarding the effect on physical resources including soil quality, surface water quality, ground water quality, air quality and noise, the following figure shows the outcomes of the respondents. It is found out that most resources have slightly negative impacts by activities of TMP factory.

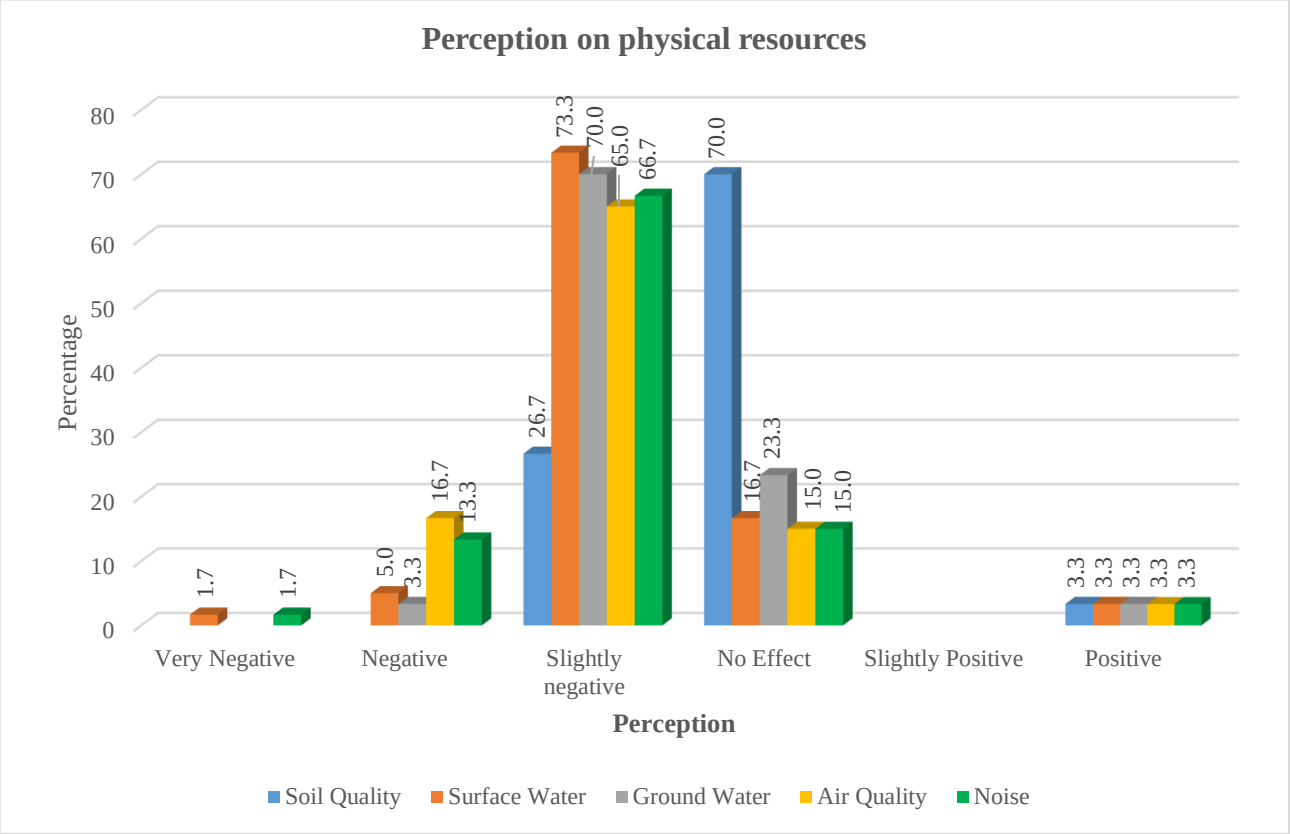


Figure 10.1.25: Perception on environmental impacts by TMP factory

10.6 The effect on biological resources

In summary, the following figure presented the community perception on effect of the project development on biological resources especially forestry, agriculture, local animals, pasture and aquatic animals.

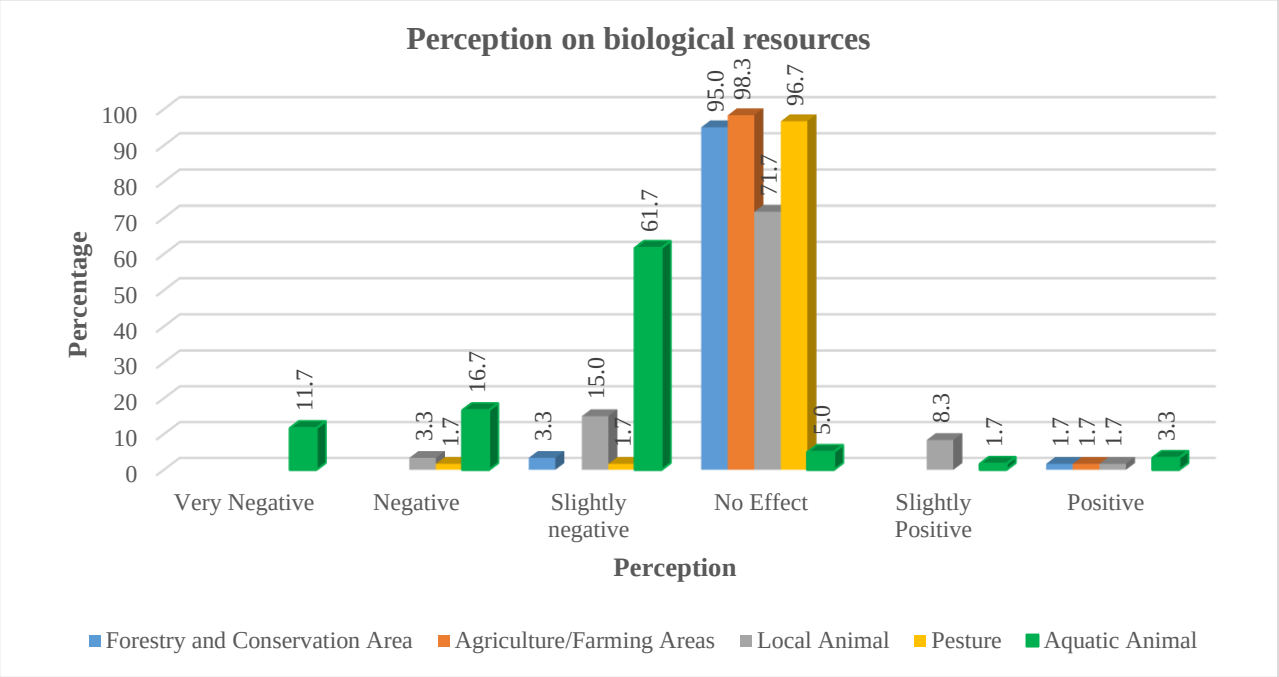


Figure 10.1.26: Perception on biological impacts by the project

10.7 The effect on human use

The following figure shows the effect on human use including local fisheries, local livestock, local vegetation, local industry, local transportation, local price, recreation and local economy.

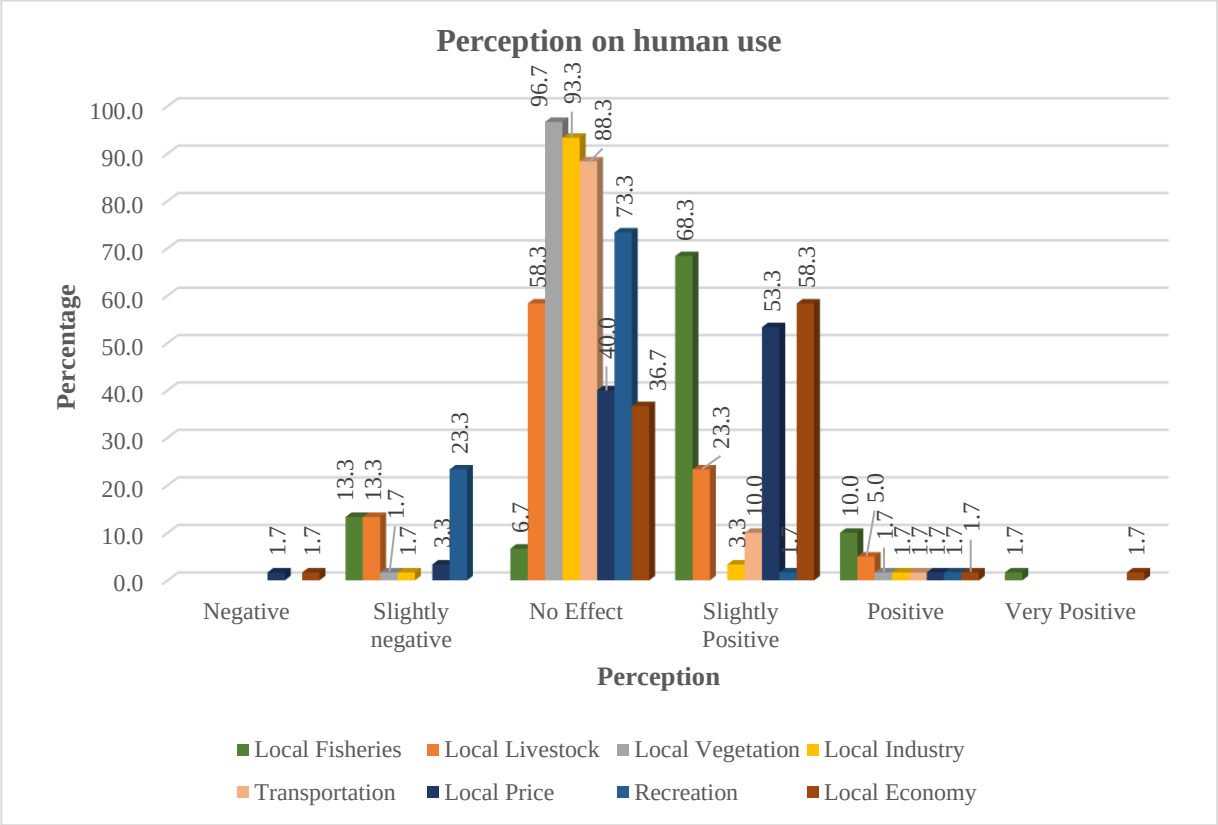


Figure 10.1.27: Perception on impacts on human use by the project

10.8 Effect on the quality of life

The quality of life is also considered as the main issue in the social impact assessment. In this regard, there are different categories divided for the analysis of the quality of life as shown in the following figure. According the survey, there is no significant negative impact on the quality of life.

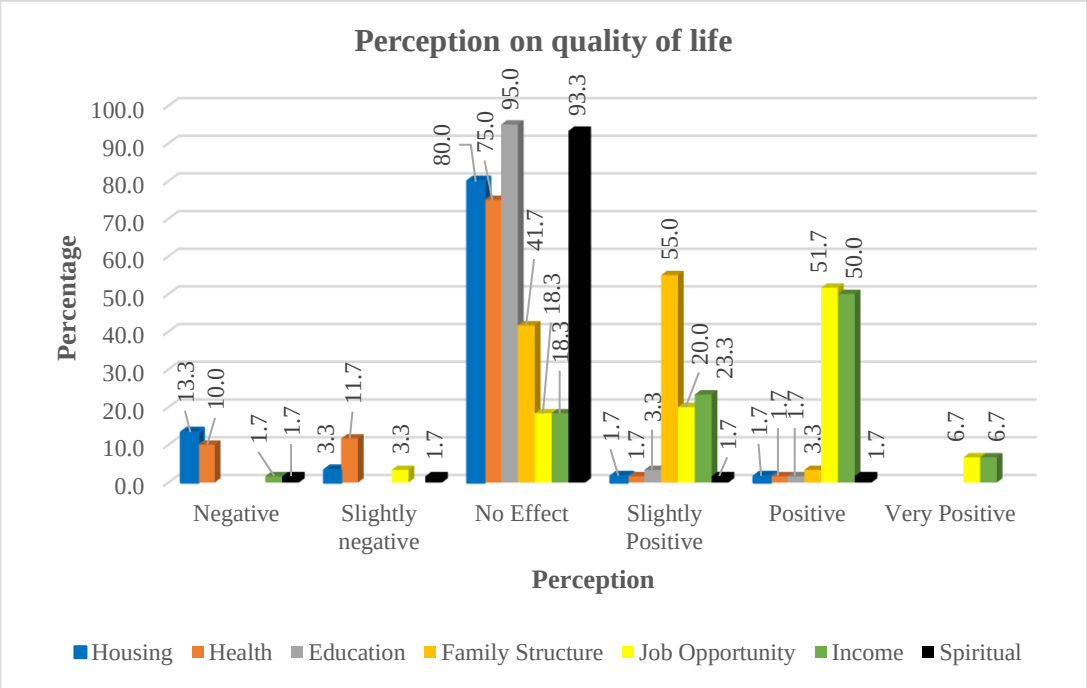


Figure 10.1.28: Perception on impact of the quality of life

10.9 Effect on safety and cultural heritage

The effect on safety and cultural heritage is also considered as a common factor for the impact by the industry. In the issue of the cultural heritage, the main three different parameters including religious building, cemetery and historical buildings were analyzed.

It was found out that there is no major negative impact.

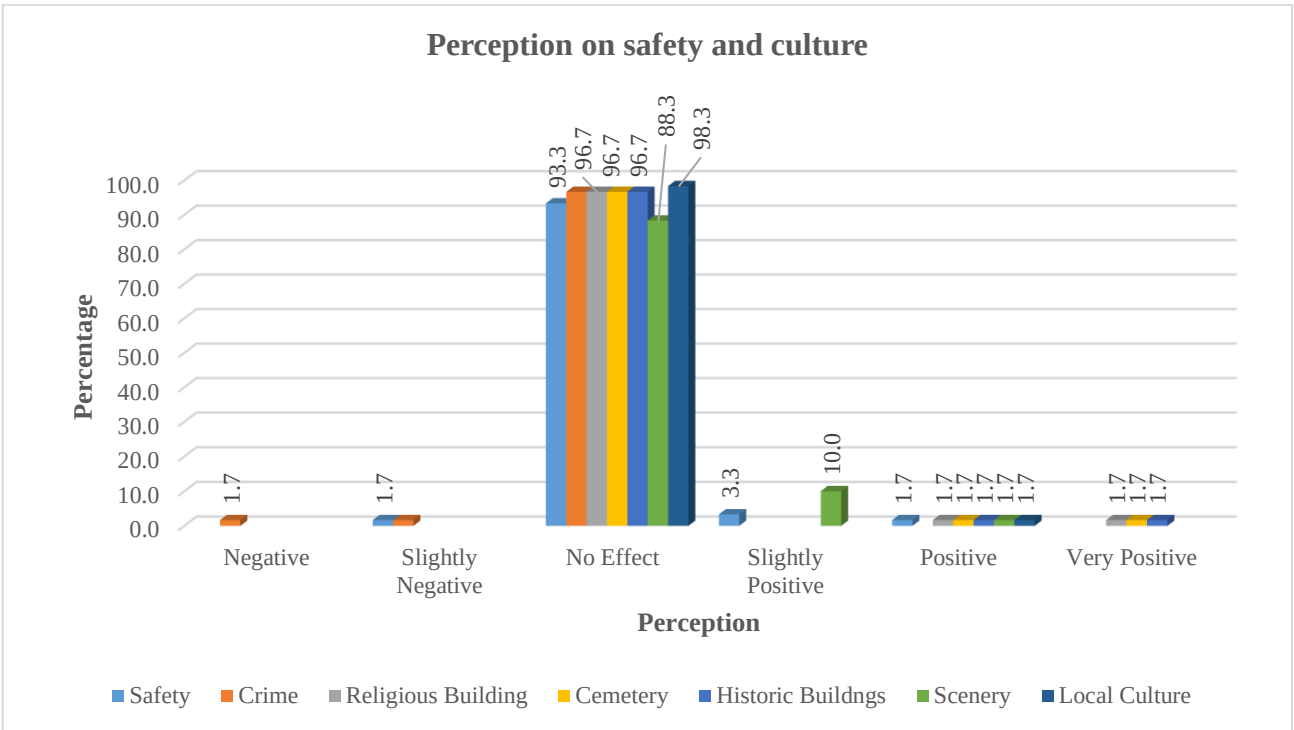


Figure 10.1.29: Perception on impact of cultural heritage

10.10 Estimation of socio-economic impact likely affected by the project operation

The following methodology has been applied to assess the socio-economic impacts of the project during construction, operation and decommissioning phases mainly on livelihoods, education, infrastructure, water quality, physical resources, biological resources, human use, quality of life and cultural heritage. Each source of impacts has been assessed by two parameters namely magnitude and probability along with five scores assessment as well. Detail methodology can be seen in annex (A).

Table 10.2: Impact Assessment Parameters and its scores

Assessment	Score				
	1 (very low)	2 (Low)	3 (Medium)	4 (High)	5 (Very High)
Magnitude	Insignificant	Small and will have on the Socio-economic environment	Moderate and will result in minor changes on community	High and will result in significant changes on community	Very high and will result permanent changes on community
Probability	Insignificant	Little socio-economic challenges	Indirect Socio-economic challenges	Direct socio-economic challenges	Direct and significance socioeconomic challenges

Then, significant rating is calculated by the following formula.

Significant point = Magnitude x Probability

Impact Significance Level: Based on the calculated significant point, impact significance can be categorized as follows;

Table 10.3: Impact Significance Levels

Risk level	Rating	Definition
Very low	1-3	No impacts occur.
Low	4-9	Acceptable level without controlling impacts/ does not require additional management.
Medium	10-16	Acceptable level/but must be controlled to prevent increased risk to unacceptable levels.
High	17-25	Unacceptable level/ the impact must be managed/must be reduced to an acceptable level.
Very High	Above 25	Unacceptable level/ the impact must be managed/ reduced to an acceptable level immediately.

Table 10.4: Analysis of Socio-economic Impact
(a) Construction phase

No.	Socio-economic impacts	Significance of potential socioeconomic impacts			Impact significance
		Magnitude	Probability	Impact significance	
The effect on Physical Resources					
1	Soil quality	3	4	12	Medium
2	Surface water quality	2	3	6	Medium
3	Ground water quality	2	3	6	Medium
4	Air quality	3	3	12	Medium
5	Noise	3	4	12	Medium
Effect on Biological Resources					
6	Forestry and conservation Areas	2	3	6	Medium
7	Agriculture/Farming areas	3	4	9	Medium
8	Local animals	1	2	2	Medium
9	Pasture	1	2	2	Medium
10	Aquatic animals	1	2	2	Medium
Effect on human use					
11	Local fisheries	1	2	2	Very low
12	Local livestock	1	2	2	Very low
13	Local vegetation	3	3	9	Low
14	Local industry	1	2	2	Very low
15	Local transportation	3	3	9	Low
16	Local price	1	2	2	Very low
17	Recreation	1	2	2	Very low
18	Local economy	1	2	2	Very low
Effect on Quality of life					
19	Housing	1	2	2	Very low
20	Health	1	2	2	Very low
21	Education	1	2	2	Very low
22	Spiritual	1	2	2	Very low
23	Safety	3	3	9	Low
24	Crime	3	3	9	Low
25	Family Structure	1	2	2	Very low
26	Job opportunities	3	4	12	Medium
27	Income	3	3	9	Low
28	Scenery	1	2	2	Very low
29	Local culture	1	2	2	Very low
Effect on Cultural Heritage					
30	Religious building	1	2	2	Very low
31	Cemetery	1	2	2	Very low
32	Historic buildings	1	2	2	Very low

(b) Operation phase

No.	Socio-economic impacts	Significance of potential socioeconomic impacts			Impact significance
		Magnitude	Probability	Impact significance	
The effect on Physical Resources					
1	Soil quality	3	3	9	Low
2	Surface water quality	2	2	4	Medium
3	Ground water quality	2	2	4	Medium
4	Air quality	3	4	12	Medium
5	Noise	3	3	9	Medium
Effect on Biological Resources					
6	Forestry and conservation Areas	1	2	2	Low
7	Agriculture/Farming areas	1	2	2	Low
8	Local animals	1	2	2	Low
9	Pasture	1	2	2	Low
10	Aquatic animals	1	2	2	Low
Effect on human use					
11	Local fisheries	1	2	2	Very low
12	Local livestock	1	2	2	Very low
13	Local vegetation	1	2	2	Very Low
14	Local industry	1	2	2	Very low
15	Local transportation	3	3	9	Low
16	Local price	1	2	2	Very low
17	Recreation	1	2	2	Very low
18	Local economy	1	2	2	Very low
Effect on Quality of life					
19	Housing	1	2	2	Very low
20	Health	2	2	4	Low
21	Education	1	2	2	Very low
22	Spiritual	1	2	2	Very low
23	Safety	3	3	9	Low
24	Crime	3	3	9	Low
25	Family Structure	1	2	2	Very low
26	Job opportunities	3	4	12	Medium
27	Income	3	3	9	Low
28	Scenery	1	2	2	Very low
29	Local culture	1	2	2	Very low
Effect on Cultural Heritage					
30	Religious building	1	2	2	Very low
31	Cemetery	1	2	2	Very low
32	Historic buildings	1	2	2	Very low

(c) Decommission phase

No.	Socio-economic impacts	Significance of potential socioeconomic impacts			Impact significance
		Magnitude	Probability	Impact significance	
The effect on Physical Resources					
1	Soil quality	3	3	9	Medium
2	Surface water quality	2	2	4	Medium
3	Ground water quality	2	3	6	Medium
4	Air quality	3	4	12	Medium
5	Noise	3	4	12	Medium
Effect on Biological Resources					
6	Forestry and conservation Areas	2	3	6	Low
7	Agriculture/Farming areas	3	3	9	Low
8	Local animals	1	2	2	Low
9	Pasture	1	2	2	Low
10	Aquatic animals	1	2	2	Medium
Effect on human use					
11	Local fisheries	1	2	2	Very low
12	Local livestock	1	2	2	Very low
13	Local vegetation	3	3	9	Low
14	Local industry	1	2	2	Very low
15	Local transportation	3	3	9	Low
16	Local price	1	2	2	Very low
17	Recreation	1	2	2	Very low
18	Local economy	1	2	2	Very low
Effect on Quality of life					
19	Housing	1	2	2	Very low
20	Health	1	2	2	Very low
21	Education	1	2	2	Very low
22	Spiritual	1	2	2	Very low
23	Safety	3	3	9	Low
24	Crime	3	3	9	Low
25	Family Structure	1	2	2	Very low
26	Job opportunities	3	4	12	Medium
27	Income	3	3	9	Low
28	Scenery	1	2	2	Very low
29	Local culture	1	2	2	Very low
Effect on Cultural Heritage					
30	Religious building	1	2	2	Very low
31	Cemetery	1	2	2	Very low
32	Historic buildings	1	2	2	Very low

10.11 Socio-Economic Impact Assessment on the community

The primary data (survey data) was used to assess socio-economic impacts on the local communities. According to the analysis of socio-economic data, most of the impacts on socioeconomic is not significant. . The effect on physical resources namely soil quality, surface water and ground water quality have medium impacts due to TMP factory. There will be very low effect on human use, quality of life and cultural heritage.

As the result of analysis, most of the project activities have no significant impact on the environment, livelihood and cultural heritage.

During pre-operation and decommissioning phase, there will be negative medium impacts on air quality, by particulate matters, and water quality due to construction and decommissioning activities.

However, all these impacts can be mitigated accordingly. The mitigation measures are detailed in the chapter (6): ***Impact Assessment and Mitigation Measures*** and chapter (8): ***Environmental Management Plan*** accordingly.

Meeting of Minutes: Environmental Management Plan (EMP) Stakeholder Consultation of Thantwe Marine Products (TMP)

Detail			
Project	Thantwe Marine Products (TMP)	**Region / State**	Rakhine
Venue	Thantwe Marine Products' office	**Township**	Thandwe
District	Thandwe		
Objective	To present and explain about company information and the upcoming project. To inform about an Environmental Management Plan (EMP). To inform the future plans. To answer the questions and obtain suggestions from the attendees.		
Date	21st May 2021		
Time	2:00 PM		

- Dr. Kyi Win, Director of TMP presented the company information and upcoming future plans.
- Daw Ohnmar May Tin Hlaing presented about an Environmental Management Plan (EMP), environmental impacts and mitigation measures.

Suggestion from U Soe Myint (Head of District/*General Administrative Department *)

He is transferred from the Mon state. There are 4 alcohol factories, 4 cool storage factories and 17 rubber factories. The minister directs him to supervise all of these factories. He checked the factories whether they follow or not the EMP rules. He has experiences about the EMP process. He is interested in the presentation of EMP process. When the factory operate, EMP must do. Other factories will perform the EMP as the TMP factory did.

There is unpleasant odour from the rubber factories. The local people from the Mon state complained about the chemical usage of rubber factories. We audited together with Dr. Khin Pa Pa Soe form DISI to the rubber factories and Dr. Khin Pa Pa Soe contacted the local company to carry out EMP process. And then, the company operated the EMP process.

The main impacts likely affected by the TMP factory are the wastewater and unpleasant odour. EQM company will conduct many things to complete EMP including baseline monitoring. After that it will be submitted to the Environmental Conservation Department (ECD). The main point of EMP he wanted is wastewater and unpleasant odour.

The Thanlwin cool storage factory in the Mawlamyine occurred covid 19 pandemic. The factory was shut down because this incidence happened at the cool storage area. The infection started from the two staff and then increased to 17 in number. The positive staff were transferred to the quarantine center. The third wave of covid 19 pandemic begins now. After the quarantine process had been done, he permitted the factory to operate. Therefore, he stressed on to take care this problem and guided to write the preventive covid 19 procedures in the EMP procedures.

Response from Dr. Ohmmar May Tin Hlaing (Managing Director/EQM)

Yes. Dr. Kyi Win needs to follow the protection of covid 19 pandemic measures and I will also add the preventive covid 19 procedures in the EMP.

Suggestion from U Soe Myint (Head of District/*General Administrative Department *)

The cool storage factory is not difficult to follow the EMP rules. The main problem factories are the alcohol and rubber factories. He audited the factories together with DISI in Mawlamyine once a month. All of these factories are using chemical and emitting the unpleasant odour. He notices TMP factory also use Ammonia.

Response from Dr. Ohmmar May Tin Hlaing (Managing Director/EQM)

Yes. She advised Dr. Kyi Win to post the material safety data sheet (MSDS) in the factory particularly Ammonia and chlorine. He will have to explain as well as train as well as the employers about the MSDS list and its contents. She is thankful to Head of District for guidance on these essential measures.

Suggestion from U Soe Myint (Head of District/*General Administrative Department *)

The cool storage factory from the Mawlamyine is bigger than the TMP factory. When the covid 19 virus was found, the factory owner and the works lost their income. In the EMP, there is need to write how to protect the covid 19 virus. He has the EMP books of alcohol factory, rubber factory, cool storage factory and the mining factory. There were 1,300 mining sites in the Mon state. He ordered them to do EMP. He has experience about the EMP. The mining permit is 2,000 mining holes per one acre. There are mining owners who have permits to mine 30000 mining holes. They do EMP for each mining site. Covid 19 virus must be considered in case of cool storage factory. There are many workers who can transfer the virus. The alcohol factories in Mawlamyine, they do not discharge wastewater systematically. Therefore, he did not permit them to operate the factories. The TMP factory also needs to discharge wastewater systematically.

Response from Dr. Ohmmar May Tin Hlaing (Managing Director/EQM)

After checking the wastewater discharge system, we will write in the EMP process to follow the wastewater discharge guidelines of ECD as well as the proper system to be carried out by the factory.

Suggestion from U Soe Myint (Head of District/*General Administrative Department *)

There is an important role of DISI in the EMP process of factories. He organized the team for EMP when he served in Mawlamyine. The EMP team leader is the professor of Mawlamyine university. The team members are from Forest Department and chemistry department from the Mawlamyine university. He requested them to read EMP books. He took advise from them about the EMP books. EMP becomes important because most of the projects are facing complaints from the local people. When the projects stop, the owners lost their income. He got experiences from that team. He is not environmental technician but he can give advice about the EMP.

Response from Dr. Ohmmar May Tin Hlaing (Managing Director/EQM)

Ye. We do agree that because the Head of District/ General Administrative Department is the decision maker.

In the EIA meeting, there were DIC, DISI, ECD and other government departments. The DIC checked the restricted chemicals from their lists. Although the EMP is not big as EIA, we have to submit this EMP to the Rakhine state government, ECD at Thantwe and ECD at Nay Pyi Taw and also GAD. The EMP procedure was written since 2015. There was no covid 19 virus when the procedure wrote. We must write the protection of covid 19 virus rules in the EMP.

In the section of Occupational Health and Safety, we will write to follow covid 19 measures and to support covid 19 vaccines for the factory workers. She also asked the Environmental Conservation Department (ECD) attending the meeting where will she submit the EMP report to the Thandwe ECD or the main office at Nay Pyi Taw.

Suggestion from Htay Khine (Staff Officer/ Environmental Conservation Department)

Firstly, the EMP report is submitted to their department and then they will submit to the main office at Nay Pyi Taw.

Response from Dr. Ohmmar May Tin Hlaing (Managing Director/EQM)

If the MOHS staff attends in this presentation, the requirements can be advised.

Suggestion from U Htoo Win (Range Officer/ Environmental Conservation Department)

He found out that the mitigation measures and how to dispose the waste in the presentation. In his opinion, he wants to know who is the monitoring person of the EMP. He also wants to know the members of the EMP monitoring team. How many times will audit in a year? He wants to add monitoring plan in the EMP report.

Response from Dr. Ohmmar May Tin Hlaing (Managing Director/EQM)

In Chapter 8 (Environmental Management Plan) of this report, I used to emphasize environmental monitoring plan. The proposed factory will award the monitoring company with the registration certificate from the ECD. If the baseline results come out, we will advise the proposed factory to monitor the EMP process by yearly or quarterly depending on the findings. Moreover, we will add the budget plan for the monitoring process in the EMP report. When the EMP starts, the proposed factory writes the commitment letter how much they can invest 2% or something for the EMP report.

Suggestion from U Htoo Win (Range Officer/ Environmental Conservation Department)

2% is for Corporate Social Responsibility (CSR).

Response from Dr. Ohnmar May Tin Hlaing (Managing Director/EQM)

We will also add the CSR. The proposed factory will be responsible for the cost of their impact to the environment.

Suggestion from U Htoo Win (Range Officer/ Environmental Conservation Department)

The monitoring budget and the CSR budget are not same. This was mentioned by the ECD.

Response from Dr. Ohnmar May Tin Hlaing (Managing Director/EQM)

We will write like that. CSR means the social benefits of the local people around the factory.

Response from Dr. Kyi Win (Director/TMP)

The Thantwe Marine Production factory is a factory that was established since 1996 and has been living in harmony with the community around the factory. The factory began with the 50 tons flake ice production and fishing with small boats. And then, the factory becomes slowly bigger to 150 tons flake ice production, fishing ships and soft crabs and shrimps farming at Abay located at the Taung Gote with the workers number of (170-180). The problem started from the bridge near the market. The market disposed the wastes to the drainage channel which leads bad smell but the surrounding people said that the waste is disposed from the factory. And then they submitted the complaint letter to the authorized persons.

The two ministers officially inspected the factory and thought that the factory was disposing the heads of shrimps and fishes to the dumping site near the market. Actually, there is a collector for heads of shrimps and fishes from the factory and the waste from the factory is being disposed to the dumping site where is directed by the city development committee (CDC). The workers from the factory are staying inside of the factory compound and Ann Taw ward. Whenever they go to market and the people saw them there. They thought that the factory's workers are disposing the wastes at the dump site near the market. They thought that the bad smell is emitted from the factory's waste.

Actually, the factory's wheel loader was helping to clear the waste from the illegal dumping site near the market. We helped the CDC staff for clearing those kinds of wastes. There is a drainage channel near the illegal dumping site. The water from the channel flows in the rainy season. Now there is no water. The surrounding people confuse that the bad smell is from the factory's waste. They came to the factory to complain that situation and said the security at the main gate that the factory must collect the waste. We are very busy when receiving the large number of raw materials. We planned the fisher men to go back their village not to overdue the raw materials. So, we cannot hear their voice. By happening that they were angry at us.

The CDC collects the waste from the illegal dumping site near the market and the waste collection system is good enough. The surrounding people dispose the wastes to the dust bin systematically. After that there is no bad smell. After that we went to the ward's head office and discussed that case. The main problem is the people from the other places. They hired near the market and they submitted the letter to the authorized persons and then the moved to the other places. There was no problem with the local people. Another problem is the drainage channel system which is not good enough. The water is not flowing well in the summer. So the bad smell was emitted from it. In the rainy season, the smell is good. So there is need to clean up around each own places. The factory wastewater

pipeline passes through the wards and then discharges at the Ann Taw River. The wastewater is treated with a series of limestone and charcoal by filtering through five storage tanks before discharge at the river. The local people thought that we discharged wastewater to the nearest drainage channel. The elders of the ward said that they want us to clean up the factory. They do not aim to shut down the factory. On the side of the factory, there is a bus station. When they carry the seasonal fishes, they clean up the fish boxes. And then the cleaning water is discharging into the drainage channel. There are also the mobile people near the drainage channel. They farm the pigs which emits bad smell as well. The factory covers the sides of bridge with high fence not to be disposed buy the people. When we are working together with the ward, there is no bad smell in the summer. In the rainy season, there will be no smell anymore.

Suggestion from U Soe Myint (Head of District/*General Administrative Department *)

The main problem is the bad smell.

Response from Dr. Kyi Win (Director/TMP)

There is a misunderstanding. He did not know when the letter was submitted to the authorized persons. We were helping with our wheel loader to clear those wastes. This situation is aware by some elders of the ward. But some did not notice. This factory is not in the industrial zone so that the EMP process is required. Normally, the factory is organizing the training and workshop together with the Fisheries Department, DISI and ECD in quarterly or by yearly. The state and district officers used to come and attend those trainings and workshops. The factory got GMP and HACCP certificates. Although this factory is a not big factory in region, we got the ISO. To get ISO, we tried about two years. We obtained the ISO certificate by the hardly effort of the factory staff. We got EC and USSPA certificates by the direction of the Fisheries Department as well. The Union Minister ordered to write the EMP. He said that to work with the community keeping good relationship and also said that we will check the factory in every six months. We will write the EMP by the assistance of EQM.

Suggestion from U Myint Oo (Elder of the Ann Taw village)

The aim is to get the good smell not to shut down the factory. We discussed with U Kyi Win at the village head office. The factory covered the sides of bridge with sunshade as high fence near the illegal dumping site. They supported the dust bins. There was bad smell at this time in the last year. Now, there is no bad smell near the drainage channel.

Response from Dr. Ohnmar May Tin Hlaing (Managing Director/EQM)

We will focus on the solid waste and wastewater of the factory. We will check the waste recycling and discharge way of waste water. The environmental problem can be solved by operating the EMP process.

Response from Dr. Kyi Win (Director/TMP)

During the covid 19 case, we tested the body temperature and the main focus is information. When the staff is ill, we asked him or her to stay at home not to go outside. We gave him to leave from work. At the work site, we take body temperature of all staffs and ordered them to wash their hands before coming into the workplace. Actually. we only need to add one thing during the covid 19 case which is social distancing because being the nature of the work, our workers always wash their hands and wear the masks before they work. We have no covid 19 outbreak. We had suspect persons. We gave them to leave from the work and let them to rest at the quarantine center. After they had been cleared covid 19 virus, we let them to work. We follow the covid 19 rules not to spread out the others. When the covid 19 virus protection vaccine found out, the factory arranged vaccination to the workers. The number of workers who already received vaccines are (280-290). Moreover, we provided the vaccine to the car drivers.

Suggestion from U Soe Myint (Head of District/*General Administrative Department *)Does the DISI inspect their chemical usage?

Suggestion from Daw Hla Hla Win (Staff Officer/ Directorate of Industrial Supervision and Inspection Thandwe)

We had inspected the chemical usage of the factory two years ago. The result was satisfactory at that time.

Response from Dr. Ohnmar May Tin Hlaing (Managing Director/EQM)

She found out three chemicals namely chlorine, sodium binical sulphate and ammonia. They use them in disinfected, preservative and cold storage respectively. About the toxicity, when the dosage amount is larger than the limit, there will be toxic. So that she wants Dr. Kyi Win to keep the MSDS chart. There is the dosage in the MSDS list. We will add emergency setting for the safety of workers in the EMP report.

Response from U Tin Maung Htay (Managing Director/TMP)

Chlorine is weak when we mixed with water. Our products are sold in super markets. They stored them at the -15degree centigrade. When they do not store like that, the black spots are appeared on the products. In this case we use sodium binical sulphate to remove black spots. The two drops can maintain the products for four days. It is not cheap. It can be eaten with little dosage.

Response from Dr. Ohnmar May Tin Hlaing (Managing Director/EQM)

We can monitor ammonia concentration in the air from monitoring by the air device (EPAS). EPAS is recognized by the USEPA. After monitoring, we will check the ammonia gas. If the gas amount is more than the guidelines, we will write the mitigation measure.

Suggestion from U Thura Aung (Assistant Staff Officer/ Department of Fisheries)

We tested the water sample at the Thar Kay Ta Lab. They have certificates.

Response from Dr. Ohnmar May Tin Hlaing (Managing Director/EQM)

Yes, I found that.

Suggestion from U Thura Aung (Assistant Staff Officer/ Department of Fisheries)

We gave HACCP certificate to the factory for the processing. We trained them the protection ways for every step.

Response from Dr. Ohnmar May Tin Hlaing (Managing Director/EQM)

I found out water sample results from the processing and disinfection. She does not found microorganisms in the results. I will test effluent water before which are not discharged to the Ann Taw River. By testing this, we will know the effective of the wastewater treatment. I will test BOD, COD, Total Coliform, etc..

Suggestion from U Thura Aung (Assistant Staff Officer/ Department of Fisheries)

EQM should test the wastewater.

Response from Dr. Ohnmar May Tin Hlaing (Managing Director/EQM)

She will test waste water and storm water which are discharged from the drainage channel of the factory.

Suggestion from U Thein Win Aung (Staff Officer/ Forest Department)

He transferred from Mawlamyine and then moved to Kyauk Phyu and now is Thandwe. He found out that the factory catches the fishes and shrimps by 12 ships. He also found out that the products of shrimps and fishes which are 5 to 10 tons per day. So, there will be more raw materials leading to degradation of fishes and shrimps resources in the Rakhine offshore. The origin of the resource of fishes and shrimps is the mangrove forests. He advised that to conserve the mangrove forests. When he served in Kyauk Phyu, the mining companies conserve the forests depending their mining capacities.

Response from Dr. Ohnmar May Tin Hlaing (Managing Director/EQM)

Yes, she will write that in the environmental management plan.

Response from Dr. Kyi Win (Director/TMP)

According to the fishing plan, the fishing processes will stop 100% for three months. It was started from 75%, 50%, 25% and now 100%. The 100% stop fishing plan was started for two years. The fishing companies are operating under the directions of fishing department.

Response from Dr. Ohnmar May Tin Hlaing (Managing Director/EQM)

According to the scope of work for cool storage, the EMP cannot completely cover the fishing processes. But thanks for your comments. We will write to follow the EMP rules to the contractors of the TMP. Although fishing processes does not include in the EMP scope of work, we will add your comments in the report as much as we can.

Response from Dr. Kyi Win (Director/TMP)

We had submitted the soft crab and shrimp farming proposal to the government. The farming site is near the mangrove forest. When we work at the mangrove forest, we can conserve it from illegal logging. If there is no one, the mangrove forests are degraded due to the illegal logging. In our proposal, we will farm by using nature semi intensive ways to get the mangrove friendly family. We will dig small ponds and then will farm. Our proposal is at the state level now. We will dig the channel and then will farm at the Abay situated at Taung Gote. Unless we work in the mangrove forests, it will be lost in the future. If we work in the mangrove forests, it will be still long time. Forest department wants us to do that farming. When our project starts, we will submit the pictures of working processes to the forest department.

Response from Dr. Ohnmar May Tin Hlaing (Managing Director/EQM)

The proposed factory is discharging the effluent water to the Ann Taw river. There will be oxygen shortage because algae bloom becomes rapid due to the increased amount of nitrogen, phosphorous in the effluent water. It can cause the death of aquatic animals. We want the biodiversity data of the Ann Taw river if your department and fishing department have that data. We will refer to the secondary data in the EMP. The scope of work of EMP is not broad like EIA. So that we want secondary data. If you have secondary data, we will collect it from your office. We will go to the Thandwe market to know the local aquatic animals. We will also collect the water sample from the Ann Taw river.

Response from U Tin Maung Htay (Managing Director/TMP)

The mentioned products (5-10) tons means the production capacity of the factory. Normally, we will not produce to get that amount. It will get sometimes. The shrimp fishing ships will concern with the mangrove forests.

Suggestion from U Soe Myint (Head of District/*General Administrative Department *)

Does the factory get all types of grantees?

Response from Dr. Kyi Win (Director/TMP)

Yes, we have.

A***ttendance Lists***

No	Name	Position	Department/ Organization/ Address
1.	U Soe Myint	Head of District	General Administrative Department
2.	U Maung Thar Sein	Head of Township	General Administrative Department
3.	U Htay Khine	Staff Officer	Environmental Conservation Department
4.	U Thein Win Aung	Staff Officer	Forest Department
5.	Daw Khin Khin Saw	Assistant Director	City Development Committee
6.	U Tun Than	Assistant Director	Department of Fisheries
7.	U Thaw Zin Maung	Assistant Director	Department of Agriculture (District)
8.	Daw Hla Hla Win	Staff Officer	Directorate of Industrial Supervision And Inspection Thantwe
9.	U Myint Oo	Elder of the Ann Taw village	Ann Taw Ward
10.	Daw Thin Thit Thit Thaw	Junior Engineer	Citiy Development Committee Thantwe
11.	U Myint Shwe	Head of ward	No. (8) ward
12.	U Mg Mg Kyawe	Head of 100 households	No. (8) ward

13.	U Mg Tun	Head of 100 households	No. (8) ward
14.	U Mg Oo	Head of 100 households	No. (8) ward
15.	U Htoo Win	Range Officer	Environmental Conservation Department
16.	U Than Tun Aung	Staff Officer	Natural Hazards and Disaster (District) Mangement
17.	Daw Hein Thu Zin	Staff Officer	Environmental Conservation Department
18.	U Thura Aung	Assistant Staff Officer	Department of Fisheries
19.	Daw Su Lay Naing	Supervisor (2)	Public Health (District)
20.	Daw Khin Sandar Htwe	Assistant Staff Officer	Department of Fisheries
21.	Daw Myint Myint Zaw	Range Officer	Department of Fisheries
22.	U Tin Maung Htay	Managing Director	TMP
23.	Daw Amy Win	Director	TMP
24.	Dr. Kyi Win	Director	TMP
25.	Daw Khin Hla Ye	Factory Manager	TMP
26.	Dr. Ohmmar May Tin Hlaing	Managing Director	EQM

*Suggestion from U Soe Myint (Head of District/ **General Administrative Department**)*

Suggestion from U Thein Win Aung (Staff Officer/ Forest Department)

*Suggestion from U Thura Aung (Assistant Staff Officer/ **Department of Fisheries**)*

Suggestion from U Myint Oo (Elder of Ann Taw Village)

Response from Dr. Kyi Win (Director/TMP)

*Suggestion from U Htoo Win (Range Officer/ **Environmental Conservation Department**)*

*Suggestion from U Htay Khine (Staff Officer/ **Environmental Conservation Department**)*

Response from Daw. Ohnmar May Tin Hlaing (Managing Director/EQM)

	
Suggestion from Daw Hla Hla Win (Staff Officer/ Directorate of Industrial Supervision And Inspection Thantwe)	***Registration***






Figure 10.1.30: Public consultation and socioeco surveys conducted in the local community (Ann Taw village and No.(8) ward, Thantwe)

Chapter 11

Conclusions and recommendations

11.Conclusions and recommendations

The EMP for the Thandwe Marine Production (TMP) Company Limited was carried out based on the extensive literature surveys, existing baseline environmental monitoring, public consultation meetings with the respective stakeholders including administrative personnel, local community, interested persons etc. and socioeco surveys along with consultation with the community.

As defined in chapter (5), in-depth environmental existing baseline situations were assessed. This project has defined all environmental and social impacts associated with the construction, operation and decommission phase of the proposed project.

The characteristics of the proposed marine processing, storage and production factory particularly its medium significance of the potential environmental impacts (air, noise, vibration, water, soil, waste and biodiversity) on the working community and the nearest environment can be reduced and prevented by complying with the mitigation measures.

Based on the impact assessment made in chapter (6), the environmental management plan in chapter (8) together with the significant appropriate mitigation measures and plans on environmental monitoring along with emergency response plans chapter (9) were developed accordingly.

In conclusion, EQM has considered that:

- The prevention and mitigation measures defined are capable of providing the appropriate environmental management system to ensure that environmental and social impacts are prevented or minimized.

- As explained in chapter (8) and (9), the EMP on the various environmental issues are capable of detecting and solving the potential emergencies including

In terms of recommendations,

EQM has suggested the Environmental Management Plan that is designed to:

- Provide the framework for the compliance auditing and monitoring programmes that will lead the proposed marine production project to carry out its operation activities in accordance with the Myanmar environmental rules and regulations; International practices, and Health and safety regulations.

- In conclusion, this report gives the proposed project's employers the guidance and framework in order to maintain the sustainable green development, provide their employees with a workplace free from recognized hazards and review the compliance with Myanmar environmental rules and regulations; environmental management plans, mitigation measures and monitoring programmes accordingly.

References

References

1. Example risk assessment: Cold storage warehousing [Internet]. Health and Safety Executive; 2008. Available from: https://www.hse.gov.uk/risk/casestudies/pdf/coldstorage.pdf

2. Emergency planning for ammonia-based refrigeration systems guide [Internet]. The State of Queensland; 2018. Available from: https://www.worksafe.qld.gov.au/__data/assets/pdf_file/0020/20954/ammonia-based-refrigeration-systems.pdf

3. Maher S, Monge M, Hall C, Adams C. Ammonia Refrigeration System Emergency Action Plans vs. Emergency Response Plans (Requirements and Ramifications) [Internet]. [cited 25 July 2021]. Available from: https://www.ammonia21.com/files/ammonia-emergency-action-response-plans.pdf

4. Saladworks Ammonia Procedure [Internet]. 5th ed. 2019 [cited 25 July 2021]. Available from: https://consult.environment-agency.gov.uk/psc/le3-3jz-samworth-brothers-limited/supporting_documents/Ammonia%20Procedure.pdf

5. Hazards of Ammonia Releases at Ammonia Refrigeration Facilities (Update) [Internet]. United States Environmental Protection Agency; 2001. Available from: https://www.epa.gov/rmp/chemical-safety-alert-hazards-ammonia-releases-ammonia-refrigeration-facilities

6. Ammonia in Refrigeration Systems [Internet]. British Columbia: Workers' Compensation Board of British Columbia; 2018. Available from: https://www.worksafebc.com/en/resources/health-safety/books-guides/ammonia-in-refrigeration-systems?lang=en

7. ACCIDENT PREVENTION AND RESPONSE MANUAL For Anhydrous Ammonia Refrigeration System Operators [Internet]. 4th ed. U.S. Environmental Protection Agency Region 7; 2015. Available from: https://www.epa.gov/rmp/accident-prevention-and-response-manual-anhydrous-ammonia-refrigeration-system-operators

8. Cooling with ammonia [Internet]. Drägerwerk AG & Co. KGaA;. Available from: https://www.draeger.com/Library/Content/ammoniak-fa-pdf-8110-en.pdf

9. Lamberg S, Lautkaski R, Virolainen K. Safety Guide of Ammonia Refrigerating Systems [Internet]. 2015. Available from: https://pdf4pro.com/amp/download?data_id=2a3edf&slug=safety-guide-of-ammonia-refrigerating-systems

10. Safe management of ammonia refrigeration systems Guidance for the food and drinks industries and other workplaces Photograph: [Internet]. Food Storage and Distribution Federation's Technical and Safety Committee, British Engineering Services, Institute of Refrigeration and other stakeholders, with support from the Health and Safety Executive; 2016.

Available from: https://www.refcom.org.uk/media/1160/ammonia-guide-smars-2016_copy-0023_stephen-crocker.pdf

11. Ammonia as a Refrigerant [Internet]. 2017. Available from: https://www.ashrae.org/file%20library/about/position%20documents/ammonia-as-a-refrigerant-pd-2017.pdf

12. Guideline on Safe Management of Ammonia Refrigeration System [Internet]. Available from: https://www.dosh.gov.my/index.php/list-of-documents/eparticipation/2020-1/3672-draft-ammonia-guideline-200807/file

13. Ammonia Site Evacuation [Internet]. Institution of Occupational Safety and Health; [cited 25 July 2021]. Available from: https://www.iosh.co.uk/~/media/Documents/Networks/Group/Food%20and%20Drink/Presentations/Ammonia%20Site%20Evacuation.pdf?la=en

14. Environmental, Health, and Safety Guidelines FISH PROCESSING [Internet]. International Finance Corporation, World Bank Group; 2007. Available from: http://www.dl.edi-info.ir/Environmental,health,and%20safety%20guideline%20for%20fish%20processing.pdf

15. Tay J, Show K, Hung Y. Handbook of Industrial and Hazardous Wastes Treatment: Seafood Processing Wastewater Treatment [Internet]. 2nd ed. Taylor & Francis Group, LLC; 2006. Available from: https://www.academia.edu/23284820/Industrial_and_Hazardous_Wastes_Treatment

16. Fish Processing Plant: Environmental effects Report [Internet]. Tasmania: Sustainable Environmental Assessment and Management [SEAM] Consulting for Poulos Brothers Seafoods Pty Ltd.; 2009. Available from: https://dokument.pub/fish-processing-plant-epa-tasmania-flipbook-pdf.html

17. Best Aquaculture Practices: SEAFOOD PROCESSING PLANT STANDARDS [Internet]. Global Aquaculture Alliance (GAA); 2015. Available from: https://www.aquaculturealliance.org/wp-content/uploads/2019/08/PI-Standard-Seafood-Processing-Plant-Standards-Issue-4.2-31-December-2015.pdf

18. Goulding I. Manual on Assuring Food Safety Conditions in Fish Landing and Processing [Internet]. CRFM Special Publication; 2016. Available from: https://repositorio.iica.int/bitstream/handle/11324/4208/BVE17099220i.pdf;jsessionid=1D328F6CE8590C1040C21EE196276766?sequence=1

19. National Standard of the People's Republic of China: Code of Hygienic Practice for Fish and Fishery Products Processing Establishment [Internet]. General Administration of Quality Supervision, Inspection and Quarantine of P.R.C. and Standardization Administration of P.R.C; 2009. Available from: https://www.seafish.org/document/?id=d3432414-5d32-4986-a72b-41e04611204b

20. CODE OF PRACTICE FOR FISH AND FISHERY PRODUCTS [Internet]. Rome: Food and Agriculture Organization of the United Nations, World Health Organization; 2020. Available

from: http://www.fao.org/documents/card/en/c/cb0658en/#:~:text=The%20Code%20of%20Practice%20for,%E2%80%8BFAO%20and%20WHO.

21.The Facts About Ammonia [Internet]. Department of Health, NY. 2004. Available from: https://www.health.ny.gov/environmental/emergency/chemical_terrorism/ammonia_tech.htm

22. Example risk assessment for cold storage warehousing [Internet]. Health and Safety Executive; 2010. Available from: https://www.hse.gov.uk/risk/casestudies/pdf/coldstorage.pdf

23. Dangers of Cold Storages [Internet]. 2017. Available from: https://www.coolingindia.in/dangers-of-cold-storage-warehousing-facilities-safety-measures-precautions-coldstorage-magazine-news-article/

24. How to avoid getting locked in the walk-in freezer [Internet]. MTCSS Cold Storage and Solution. 2015. Available from: https://mtcss.co.uk/how-to-avoid-getting-locked-in-the-walk-in-freezer-2/

25. Chapter 5 Arakan Coastal Ranges in western Myanmar, geology and provenance of Neogene siliciclastic sequences: implications for the tectonic evolution of the Himalaya–Bengal System

https://www.researchgate.net/publication/321078448_Chapter_5_Arakan_Coastal_Ranges_in_western_Myanmar_geology_and_provenance_of_Neogene_siliciclastic_sequences_implications_for_the_tectonic_evolution_of_the_Himalaya-Bengal_System

26. FAO/WFG_Rakhine state Myanmar

http://www.fao.org/3/ca5330en/ca5330en.pdf

27. TOWARDS A PEACEFUL, FAIR AND PROSPEROUS FUTURE FOR THE PEOPLE OF RAKHINE

https://www.rakhinecommission.org/app/uploads/2017/08/FinalReport_Eng.pdf

28. Commercial Agriculture Expansion in Myanmar: Links to Deforestation, Conversion Timber, and Land Conflicts

https://forest-trends.org/wp-content/uploads/2018/04/Conversion_Timber_in_Myanmar.pdf

29. The Geology of Burma (Myanmar): An Annotated Bibliography of Burma's Geology, Geography and Earth Science.

https://apps.dtic.mil/sti/pdfs/ADA487552.pdf

30. Taungup Township Evironment Assessment Report Nov2017.pdf
https://themimu.info/sites/themimu.info/files/documents/Taungup_Township_Environment_Assessment_Report_Nov2017.pdf

31. Soil type data set open develop mekong

https://data.opendevelopmentmekong.net/en/dataset/soil-types-of-myanmar?type=dataset

32. Fishing ship diesel consumption
https://www.google.com/search?q=diesel+cost+in+fishing+ship&oq=diesel+cost+in+fishing+ship&aqs=chrome..69i57j33i22i29i30.12473j0j15&sourceid=chrome&ie=UTF-8

33. 16ft Cooling box turcks diesel consumption
https://www.google.com/search?q=fuel+consumption+of+16+ft+cooling+box+trucks+in+one+mile&sxsrf=ALeKk03iz5Tq7vugTUrAhDojuu8w2Uwow%3A1629273296673&ei=0LwcYYKxKPSzmgfsupf4Cg&oq=fuel+consumption+of+16+ft+cooling+box+trucks+in+one+mile&gs_lcp=Cgdnd3Mtd2l6EAM6BwgAEEcQsANKBAhBGABQrqQHWO6B2DoxwdoAnACeACAAakBiAGzBpIBAzEuNpgBAKABAcgBCMABAQ&sclient=gwswiz&ved=0ahUKEwiC2duAjLryAhX0meYKHWzdBa8Q4dUDCA4&uact=5

34. Fuel consumption of trucks
https://www.google.com/search?q=fuel+consumption+of+16+ft+trucks+in+one+mile&oq=fuel+consumption+of+16+ft+trucks+in+one+mile&aqs=chrome..69i57j33i160.38817j0j15&sourceid=chrome&ie=UTF-8

35. IUCN Red List of Threatened species, Version 3.1. Accessed from www.iucnredlist.org on 01 November 2016

https://www.google.com/search?q=IUCN+Red+List+of+Threatened+species%2C+Version+3.1.+Accessed+from+www.iucnredlist.org+on+01+November+2016&oq=IUCN+Red+List+of+Threatened+species%2C+Version+3.1.+Accessed+from+www.iucnredlist.org+on+01+November+2016&aqs=chrome..69i57.1893j0j7&sourceid=chrome&ie=UTF-8

Annex (A)

Methodology for Environmental Sampling

Environmental
Quality
Management

No.233,Block 23,Sayee Pin Lane,Thuwanna,Thingungyun Township,Yangon.
Ph:(95)1 2330291,(95) 1 2331417,(95) 9 5016606,Fax:(95) 1 2333994
E-mail : contact@eqm-myanmar.com,onhmarmay@eqm-myanmar.com
Website:www.eqm- myanmar.com

THANTWE MARINE PRODUCTS CO., LTD.

No. 170, U Tayoke Gyi Street, Industry Zone (4), Hlaing Tharyar Township, Yangon, Myanmar.
Tel : (95-1) 3685778, 3685144 Fax : (95-1) 3685778, 3685144
E-mail : thantwemarine@icloud.com , tmpmeister@gmail.com

The Letter of Commitment

As per the Administrative Instruction of Environmental Impact Assessment procedure, the Thantwe Marine Product Company Limited required the Environmental Management Plan (EMP) for the shrimp and other fishery products production with the cold storage factory project to be prepared and submitted to the Environmental Conservation Department, Ministry of Natural Resources and Environmental Conservation Department (MONREC) for approval.

The proposed project is located near the Ann Taw village, Dwar Ya Wati (B) ward, Thantwe township, Rakhine state.

This EMP study has been completed in accordance with Article 8, 9, 10, 1, 23, 24, 25 and 26 of the Myanmar EIA procedure (2015) by the Myanmar registered consultant company Environmental Quality Management Co. Ltd. (EQM).

The Thantwe Marine Product Company Limited endorses and confirms to the Environmental Conservation Department, Ministry of Natural Resource and Environmental Conservation the following:

- The accuracy and completeness of the EMP
- The EMP has been prepared in compliance with applicable Environmental Conservation Law, Rules and Procedures, and
- That all the information contained in the report is accurate and a truthful representation of all findings as relating to the Project.
- Will comply fully with the commitments and obligations including all laws and regulations as detailed in the EMP determined to be relevant with the planned project, mitigation measures and plans set out in the EMP.

The undersigned is authorized to issue this Letter of Commitment on behalf of the Thantwe Marine Product Company Limited.

Yours sincerely,

Managing Director
THANTWE MARINE PRODUCTS CO.,LTD.

Environmental
Quality
Management

No.233,Block 23,Sayee Pin Lane,Thuwanna,Thingungyun Township,Yangon.
Ph:(95)1 2330291,(95) 1 2331417,(95) 9 5016606,Fax:(95) 1 2333994
E-mail : contact@eqm-myanmar.com,onhmarmay@eqm-myanmar.com
Website:www.eqm- myanmar.com

The Letter of Commitment

As per the Administrative Instruction of Environmental Impact Assessment procedure, the Thantwe Marine Production (TMP) Company Limited required Environmental Management Plan (EMP) for the shrimp and other fishery products production with the cold storage factory project to be prepared and submitted to the Environmental Conservation Department, Ministry of Natural Resources and Environmental Conservation Department (MONREC) for approval.

The proposed project is located near the Ann Taw village, Dwar Ya Wati (B) ward, Thandwe township, Rakhine state.

Thus, this EMP study has been completed in accordance with the following articles:
Chapter (2) Article 8, 9, 10, 11,
Chapter (3) Article 23, 24, 25, 26
Chapter (7) Article 76,77, 82 of the Myanmar EIA procedure (2015) by the Myanmar registered consultant company Environmental Quality Management Co. Ltd. (EQM).

Environmental Quality Management Co. Ltd. (EQM) endorses and confirms to the Environmental Conservation Department, Ministry of Natural Resource and Environmental Conservation the following:

- The accuracy and completeness of the EMP
- The EMP has been prepared in compliance with applicable Environmental Conservation Law, Rules and Procedures, and
- That all the information contained in the report is accurate and a truthful representation of all findings as relating to the project.
- The commitments and obligations including all laws and regulations as detailed in the EMP determined to be relevant with the planned project, mitigation measures and plans set out in the EMP has been prepared in compliance with the respective Laws and Regulations.

The undersigned is authorized to issue this Letter of Commitment on behalf of the Environmental Quality Management Co. Ltd. (EQM), Yangon.

Yours sincerely,

Dr Ohnmar May Tin Hlaing
Managing Director/Environmental Health Consulant

1. Ambient air monitoring instrument

The air monitoring survey will use the HAZ-SCANNER EPAS Wireless Environmental Perimeter Air Monitoring Station. (EPAS).

(i) Principles

The EPAS, manufactured by EDC/SKC (USA), is a light scattering photometer equipped with a filter sampling system. This dual capability allows for simultaneous real-time and filter measurement. Single-jet impactors are used for particulate size selection and the TSPM, PM10 and PM2.5 impactors would be used for air quality survey.

The highly sensitive EPAS provides real-time determinations and data recordings of airborne particle concentration in $\mu g/m^3$. It provides the minimum, maximum and time-weighted average (TWA) monitoring of gases as well.

This instrument is factory calibrated with the appropriate USEPA certified target gas and correlated with USEPA methods. (Ref: Code of Federal Regulation 40CFR part 53). The EPAS is annually calibrated and does not require laboratory analysis to determine concentrations. It operates maximum automation of data collection, uses the optional data logger including Dust Comm Pro Software for PC that provides statistical analysis, graphs, and detailed reports that can be printed for record keeping.

(ii) System check

Prior to the survey, calibration span and system checks (system flow rate, sensor baseline levels for all parameters, etc.) will be performed on the EPAS to ensure it is operational and ready for monitoring.

The air monitoring instrument will be operated in accordance with the manufacture's guidelines.

2 Ambient air monitoring

(i) The sensor intakes

The survey would deploy the sensor intakes based on the sitting criteria as specified. The survey will comply with the following guidelines as follows;

• Particulates and gas sensor intakes will be located between 2-3 meters above the ground level
• Keep unrestricted airflow located away from obstacles so that the distance from the sensor intake is at least twice the height that the obstacle protrudes above the probe
• Keep unrestricted airflow in an arc of at least 270 degrees around the inlet probe, or 180 degrees if the probe is on the side of a building
• Would be clear of optical obstructions, including potential obstructions that may move due to wind, human activity, growth of vegetation, etc.
- Spacing from trees (10-20 m)
- Spacing from roadways (10-250 m) depending on the traffic
• Observe temporary optical obstructions, such as rain, particles, fog, or snow

(ii) Location of the monitoring sites

The monitoring sites were selected based on their being broadly distributed within the project area and in proximity to the most sensitive receptors i.e. communities. Operating activities of the project would impact local air quality. Air pollution both on site and in the surrounding locality may result from release of dust and gases to the atmosphere from handling or processing of its by-products.

(iii) Sampling time and frequency of measurements

The survey will monitor 24hr continuously.

(iv) Ambient air parameters to be measured

1) Particulates: PM10, PM2.5 } USEPA Criteria air pollutants
2) Gases: NO2, SO2, CO, VOC, NH3, CH4, O3, CO2, H2S
3) Meteorology: Temperature, Relative Humidity, Wind Speed, Wind Direction which can have the influence on both local and regional air quality

(I) Particulates

Sr	Parameters	Sensors	Detection limit
1	**TSPM, PM10, PM2.5**	**90 degree Infra Red Light Scattering**	0 to 5000 µg/m3

Calibration: Gravimetric reference NIST Traceable - SAE fine dust- ISO12103-1
Accuracy (± 10% to filter gravimetric SAE fine test dust which falls under the ACGIH/ ISO/CEN criteria.

(II) Gases
Calibration: ppm equivalent change/year in lab air (24month warranted)

Sr	Parameters	Sensors	Detection limit
1	NO2	Electrochemical	(0-5000) ppb
2	SO2	Electrochemical	(0-5000) ppb
3	CO	Electrochemical	(0 -10,000) ppb
4	NH3	Electrochemical	(0 -100) ppm
5	H2S	Electrochemical	(0 -25) ppm
6	VOC	Photoionization	0 to 50,000 ppb
7	CO2	NDIR	0 to 5000 ppm
8	Methane	NDIR	0 to 1% Vol,0 to 10,000 ppm,0 to 20% LEL
9	O3	Metal oxide semiconductor (MOS),	(0 -150) ppb

(III) Meteorology (EPAS Meters)

Sr	Parameters	Sensors	Detection limit
1	Temperature,	NTC	(-20 to 60 C)/ (-4º to 140ºF

	Detection limit -)/ (-20ºC - 60ºC)		
2	Relative Humidity	CAP	(0-100)%
3	Wind Speed (sensor:), Detection limit -	3-cup anemometer a	(0 – 125 mph)
4	Wind Direction	Continuous rotation potentiometric wind direction vane	(5 – 355)degrees

References:

Air Emissions from Municipal Solid Waste Landfills - Background Information for Proposed Standards and Guidelines, Office of Air Quality Planning and Standards, EPA-450/3-90-011a, Chapters 3 and 4, U. S. Environmental Protection Agency, Research Triangle Park, NC, March 1991.

ENVIRONMENTAL PROTECTION AGENCY (US EPA), 40 CFR Appendix E to Part 58, Probe and Monitoring Path Siting Criteria for Ambient Air Quality Monitoring https://www3.epa.gov/ttnamti1/files/ambient/longpath/fropenph.pdf

Noel De Nervers, (2000), Air Pollution Control Engineering, 2nd edition, McGraw-Hill International Editions, Civil Engineering Series

General principles of Health risk assessment of air pollution, WHO , 2016

Sendai Framework for Disaster Risk Reduction 2015 – 2030, UN.

Solid Waste Management and Climate Change https://www.researchgate.net/publication/46212886_Capacity_building_of_disaster_waste_management_for_disaster_risk_reduction [accessed Sep 29, 2017].

Technical Guidance Note (Monitoring), M17, Monitoring Particulate Matter in Ambient Air around Waste Facilities, Environment Agency Version 2 July 2013

The Impact on Health of Emissions to Air from Municipal Waste Incinerators, Health Protection Agency, September 2009

2. Check lists

Sr.	Description	Remarks
1	Measuring equipment can be used (specification, calibration certificate)	Mentioned above
2	Maximum number of equipment can be	One set up

	mobilized for each Site	
3	Number and qualification of the personnel	(3) in number
4	Maximum number of qualified personnel can be mobilized for Site	(3) in number
5	Number of measuring points required per each Site (minimum and average)	(4 and 2)
6	Measurements Protocol for each pollutant (see 2.2.1)	Mentioned above
7	Monitoring frequency (Day/Night, 24h)	24 hr continuously
8	Maintenance of the equipment during the mission	Keep the instrument one day off along with battery charging for the next run after (2) days continuously monitoring.

2 Ambient Noise monitoring

At each site, Baseline Sound Pressure Levels (SPLs) for (daytime (LAeq 90 D), night time (LAeq 90 N)), and 24-hour (LAeq 90) will be monitored using the Sound level Meter (Model: SL-4023SD) along with SD card real time data recorder (USB/RS232) in order to determine background ambient noise levels within the study area. This SLM meets IEC61672 class 2 with the tolerance is +/- 1.4dB.

(i) Principles

Noise monitoring on LAeq which is the A-weighted equivalent continuous sound level in decibels db(A) measured over the certain period of time (24hr continuously) will be conducted at the selected location that is considered to best represent the most affected location and also can reflect the exposure of the nearest local community and sensitive locations in accordance with the procedures described below.

Sampling location

Sampling locations will be selected according to the site visit at the operation sites and nearby sensitive receptors in order to be the representative location of the noise exposure.

Site setting

Sound level meter (SLM including microphone) will be mounted on the tripod which is the standard methodology for most noise measurements taking into account not to make noises while observing the meter and ensuring the least amount of reflective surface from the observer's body is exposed to the meter.

The device will be set up more than 3.5m away from a reflective surface (building) at minimum and a noise reading will be taken at the average height of the receptor.

Monitoring

The baseline noise surveys will be conducted for the Project site including:
Sound statistical descriptors (L10, L50, L90); and Time varying noise: LAeq,T is used to quantify the noise where the Lp varies over time. In most situations, the LAeq,T is the most appropriate descriptor used to investigate environmental noise complaints.

Along with the deployment of a meteorological station to measure wind speed data for the purpose of excluding noise measurements affected by periods of high winds (>5m/s) and/or rain.

Calibration

Calibration of the SLM is to be carried out before and after each set of noise measurements using the Lutron SC-942 which generates 94dB and 114dB at 1000Hz – and this [especially 94dB] is a very common reference point for sound level meters. The Lp shown on the meter should match the stated Lp for the calibrator being used. Standard calibration is generally 94 dB(A) but can vary slightly due to the microphone sensitivity e.g. 93.8 dB(A).

The calibration level should be confirmed with the SLM manufacturer's specifications. The variation before and after the calibrations should be no more or less than 1 dB(A). If the deviation

of the calibration is greater than 1 dB(A) then the results obtained during the assessment are invalid.
The monitoring procedures, data analysis and interpretation were carried out in accordance with USEPA operating procedure as well as the operational manufacture.

Figure 3: Baseline noise level monitoring

2.1Features and Specification of the Equipment;

(i) SOUND LEVEL METER

Model No : **SL-4023SD**

Description :

SD Card real time data recorder

SOUND LEVEL METER,
Model : SL-4023SD

* Real time data recorder, save the data into the SD memory card and can be download to the Excel, extra software is no need.

* Meet IEC61672 class 2
*Frequency 31.5 to 8,000 Hz
* Auto range : 30 to 130 dB.
* Manual range : 3 ranges 30 to 80 dB, 50 to 100 dB, 80 to 130 dB .
* A/C frequency weighting.
* Fast/slow time weighting,
* Peak hold, Data hold.
* Record (Max., Min.).
* RS232/USB computer interface.
* Optional wind shield ball, SB-01.
* Patented. * Patent: Taiwan, China, Japan, Germany, USA pending.

2.2 Certificate of Calibration Regarding calibration, the external calibration adjustment is used before each and every monitoring starts.

Sound Calibrator (Lutron SC 942)

2.2 Comparison of Results with Applicable Guideline

Being the environmental sound level measurement, the A-weighted sound level expressed in the A scale decibel (dBA) unit which gives greater weight to the frequencies of sound to which the human ear is most sensitive.

The baseline equivalent sound pressure levels monitored will be compared accordingly with the following Noise level guideline value under National Environmental Quality (Emission) Guidelines stated by Environmental Conservation Department, Dec 29, 2015.

Receptor	**One Hour LAeq (dBA)** [a]	
	Daytime/ 07:00 -22:00 **(10:00 -22:00 for Public Holidays)**	**Nighttime /22:00-07:00** **(22:00 – 10:00 for Public Holidays)**
Residential, Institutional. Educational	55	45
Industrial, Commercial	70	70

[a] Equivalent continuous sound level in decibels

2.3 Proposed Team

EQM technician team comprising of (2) members who have been experienced with noise monitoring, data entry, analysis and reporting for years will conduct the project.

2.4 Reporting

The background ambient noise level will be described in terms of an average level which is LAeq (dBA) as the summation of all the time-varying events. Generally, the report is used to presented in average, min and max with L90 considering the background or ambient level of a noise environment.

If necessary, the report will be prepared with percentile dB (A) level (L90, L50, L10).
While determining the daily measure of environmental noise, surrounding activities will be observed and incorporated into the report to reveal the potential sources of noise emission.
The final report used to be submitted in accordance with the EQM format. If the format is available from the proponent side, it will be prepared accordingly.

References:

Noise measurement methodologies, https://www.ehp.qld.gov.au/licences-permits/.../noise-measurement-manual-em1107.p.
U.S. EPA BASE STUDY STANDARD OPERATING PROCEDURE, Environmental Health & Engineering, Inc. 60 Wells Avenue Newton, MA 02159-3210
US EPA, https://www.epa.gov/sites/production/files/2014-08/documents/indoor.pdf

3 Ambient vibration monitoring

Determination of Natural vibration which can be expressed in metric units (m/s^2) will be monitored using the vibration meter DIGICON TV 120SD having size: 68x177x45 mm with SD card data logger within the study area.

(i) Principles

Measurements of vibration accelerations is carried out using the vibration meter DIGICON TV 120SD with SD card data logger measurement system under ambient conditions.

Accelerometer area: 0.5 ~ 199.9 m / s2 (Peak)
Speed measurement range: 0.5 ~ 199.9m / s
Vibration range: 199.9 mm

Sampling location

Sampling locations will be selected according to the site visit at the operation sites and nearby sensitive receptors in order to be the representative location of the vibration exposure.

Site setting

The vibration meter is mounted on the tripod and vibration sensor with cable and magnetic base is attached to the ground on the recorded level of vibration acceleration. Accelerometers is mounted to the ground using various mounting bases anchored in the ground with one, three and four rods accordingly. The device will be set up more than 3-5m away from a reflective surface (building) at minimum.

Monitoring

The monitoring is over the certain period of time (24hr continuously) at the selected location that is considered to best represent the most affected location and also can reflect the exposure of the nearest local community and sensitive locations in accordance with the procedures described above.

Calibration

The device is factory calibrated along with the manufacturer's specifications.

Figure 4: Natura vibration level monitoring

3.1 Features and Specification of the Equipment;

DIGICON TV-120SD can measure both acceleration (Acceleration), velocity (Velocity) and vibration distance (Displacement)
Measure the vibrations of machinery and motors in order to inspect maintenance conditions
Wide frequency range: 10Hz ~ 1kHz, corresponding sensitivity according to ISO 2954
Vibration sensor and magnetic base included
Data is maintained the highest-lowest values are recorded. And can be called up to view
The data from the SD card is an Excel file with time data (year / month / day / hour / minute / second). No need to use the program when storing data via SD CARD.
Can connect to the computer via RS232 / USB port (order more cable)

3.2 Comparison of Results with Applicable Guideline

A complete assessment of exposure to vibration requires the measurement of vibration acceleration in meters per second squared (m/s^2). Vibration exposure direction is also important and is measured in defined directions.

Currently, there is no national vibration guideline or standard values yet in Myanmar.

Therefore, the following standard values are adopted to analyse the natural vibration,
For whole-body vibration (WBV), the daily exposure limit value (ELV) is 1.15 m/s2 A (8).

The daily exposure to vibration is measured by a formula known as an A(8) value. This is the average (A) exposure over an eight-hour (8) day.

Receptor	**Daily exposure limit value (ELV) (ms^2) A (8).**
whole-body vibration (WBV),	1.15 m/s^2

Safety, Health and Welfare at Work (General Application. Regulations 2007 (S.I. No. 299 of 2007) www.hsa.ie

3.3 Proposed Team

EQM technician team comprising of (2) members who have been experienced with vibration monitoring, data entry, analysis and reporting will conduct the project.

3.4 Reporting

The background ambient vibration level will be described in terms of an average level which is the daily ELV (ms^2). While determining the daily measure of environmental vibration, surrounding activities will be observed and incorporated into the report to reveal the potential sources of vibration.
The final report used to be submitted in accordance with the EQM format. If the format is available from the proponent side, it will be prepared accordingly.

References:

Ground-Borne Noise and Vibration in Buildings Caused by Rail Transit (2010) https://www.nap.edu/read/22951/chapter/9

Guide to the Safety, Health and Welfare at Work,(General Application) Regulations 2007 https://www.hsa.ie/eng/Publications_and_Forms/Publications/General_Application_Regulations/Control_of_Vibration_at_Work.pdf

Huan vibration, Briiel & Kjcer,1989

Measuring Vibration with Accelerometers, Updated Mar 14, 2019, https://www.ni.com/en-us/innovations/white-papers/06/measuring-vibration-with- accelerometers.html

Rail Vibration Assessment Stirling Alloa Kincardine Railway Line, Clackmannanshire Council October 2009, https://www.clacks.gov.uk/document/2464.pdf

Simplified Method of Determination of Natural-Vibration Frequencies of Prestressed Suspension Bridge, Vadims Goremikinsa,*, Karlis Rocensb, Dmitrijs Serdjuksc, Janis Sliserisd, Institute of Structural Engineering and Reconstruction, Riga Technical University, Azenes Str. 16, LV-1048, Riga, Latvia. Available online at www.sciencedirect.com

VIBRATION ANALYSIS OF A RESIDENTIAL BUILDING, Regina Augusta Sampaio and Remo Magalhâes de Souza, 2015, https://www.matec-conferences.org

4 Groundwater Sampling Methodology

4.1 Preparation before leaving for the field site.

Sample bottles and sampling dipper were washed and cleaned with purified water as well as deionized water for three times, filled preservatives if needed and capped securely. These procedures were unnecessary for the sample bottles sent by the international lab as all bottles were already prepared and sealed.

Prepare the one page check list for the list of water parameters to be tested, label sample parameters, site identification code and a field date and time on the bottles.

Special care must be taken not to contaminate samples. This includes storing samples in a secure location to preclude conditions which could alter the properties of the sample. Samples shall be custody sealed during long-term storage or shipment.

Collected samples are in the custody of the sampler or sample custodian until the samples are relinquished to another party.

Chain-of-custody documents shall be filled out and remain with the samples until custody is relinquished.

4.2 Sampling procedure and sampling device

Groundwater samples will typically be collected from the discharge line of a pump or from a bailer, either from the pour stream of an up-turned bailer or from the stream from a bottom-emptying device. Efforts should be made to reduce the flow from either the pump discharge line or the bailer during sample collection to minimize sample agitation. During sample collection, make sure that the pump discharge line or the bailer does not contact the sample container.

Sampling is the process of obtaining, containerizing, and preserving (if required) a ground water sample after the purging process is complete. Non-dedicated pumps for sample collection generally should not be used. Many pumps are made of materials such as brass, plastic, rubber, or other elastomer products which may cause chemical interferences with the sample. Their principle of operation may also render them unacceptable as a sample collection device. It is recognized that there are situations, such as industrial or municipal supply wells or private residential wells, where a well may be equipped with a dedicated pump from which a sample would not normally be collected. Discretion should always be used in obtaining a sample.

One member of the field sampling team should take all the notes and photographs, fill out tags, etc., while the other members collect the samples.

Gloves and sampling dipper

In general, water samples were collected using clean sampling dipper in order to avoid sample contamination from other sources according to the standard operation procedures.

Before sample collection, appropriate measures including wearing a clean pair of new, non-powdered, disposable gloves will be worn each time a different location is sampled and the gloves should be donned immediately prior to sampling. The gloves should not come in contact with the media being sampled and should be changed any time during sample collection when their cleanliness is compromised and rinsing of sampling dipper with native water were carried out so as to condition, or equilibrate to the sample environment and make sure that all cleaning-solution residues have been removed.

Ground-water-sampling is mainly based on site-specific conditions.

(a) Dug well
Firstly, dug well water was collected by a bucket being currently used in the well (metal, plastic, wood). Then water in the bucket was collected by sampling dipper and transferred into sample bottles.

(b) Tube well (Shallow well Deep well)
The sample was taken at the closest access to water from the well before the water enters any treatment and the distribution system. Water was collected at the outflow of a pressure and flushed (hand pump and compressor pump for shallow well and deep well respectively) for few minutes prior to sampling in order to remove any stagnant water in the well casing and to ensure that at least 95 percent of the water sample originates from the aquifer formation being sampled.
Then water was transferred to sampling plastic bucket and then filled into the bottles by using sampling dipper.

A hand-held, narrow mouth bottles
The sample bottles were partially filled and rinsed with the water to be sampled (rinse water).
For bacteriological analysis, the preconditioned sterile glass bottles directly from the analytical laboratory were used.

Onsite water quality monitoring
Total dissolved solid (TDS), Conductivity, Chlorine, Salt, PH value, Temperature were measured on-site at the sampling locations according to the standard operation procedures.

Transportation (shipping) and storage of samples through cold chain till laboratory
After sample collection, sample bottles were kept in a cooling box with ice/ice packs/ice chests until the laboratory.

4.3 Water sample to be measured

Table-1.2 Laboratory services for water analysis provided to project

Laboratory	Parameters
Public Health Laboratory	pH, Color. Turbidity, Total solids, Total Hardness, Total Alkalinity, Calcium, Magnesium, Chloride, Sulphate, Iron, Total Coliforms

References

Bartram, J., & Balance, R. (1996). Water Quality Monitoring - A Practical Guide to the Design and Implementation of Freshwater Quality Studies and Monitoring Programmes: CH 5 - Field Work and Sampling. United Nations Environment Programme & the World Health Organization ISBN 0 419 22320 7 (Hbk) 0 419 21730 4 (Pbk). Retrieved from http://www.who.int/water_sanitation_health/resourcesquality/waterqualmonitor.pdf

U.S. Geological Survey Techniques of Water-Resources Investigations: Book 9Handbooks for Water-Resources Investigations: CH A4.Collection of Water Samples (2006).US Geological Survey. Retrieved from http://pubs.water.usgs.gov/twri9A/

Water sampling and analysis - World Health Organization, www.who.int/water_sanitation_health/dwq/2edvol3d.pdf

Yeskis, D. * & Zavala, B. **, May 2002, Ground-Water Sampling Guidelines for Superfund & RCRA Project Managers: GROUND WATER FORUM ISSUE PAPER, EPA 542-S-02-001United States Environmental Protection Agency (USEPA). Retrieved from https://www.epa.gov/sites/production/files/2015-06/documents/gw_sampling_guide.pdf

Groundwater Sampling https://www.epa.gov/foia/groundwater-sampling

5 Surface Water Sampling Methodology

5.1 Preparation before leaving for the field site.

Sample bottles and sampling dipper were washed and cleaned with purified water as well as deionized water for three times, filled preservatives if needed and capped securely. These procedures were unnecessary for the sample bottles sent by the international lab as all bottles were already prepared and sealed.

Prepare the one page check list for the list of water parameters to be tested, label sample parameters, site identification code and a field date and time on the bottles.

Special care must be taken not to contaminate samples. This includes storing samples in a secure location to preclude conditions which could alter the properties of the sample. Samples shall be custody sealed during long-term storage or shipment.

Collected samples are in the custody of the sampler or sample custodian until the samples are relinquished to another party.

Chain-of-custody documents shall be filled out and remain with the samples until custody is relinquished.

5.2 Sampling procedure and sampling device

The physical location of the investigator when collecting a sample may dictate the equipment to be used. If surface water samples are required, direct dipping of the sample container into the stream is desirable. Collecting samples in this manner is possible when sampling from accessible locations such as stream banks or by wading or from low platforms, such as small boats or piers. Wading or streamside sampling from banks, however, may cause the re-suspension of bottom deposits and bias the sample. Wading is acceptable if the stream has a noticeable current (is not impounded), and the samples are collected while facing upstream. If the stream is too deep to wade, or if the sample must be collected from more than one water depth, or if the sample must be collected from an elevated platform (bridge, pier, etc.), supplemental sampling equipment must be used.
To collect a surface water sample from a water body or other surface water conveyance, a variety of methods can be used:

- Dipping Using Sample Container
- Scoops
- Peristaltic Pumps
- Submersible Pumps
- Discrete Depth Samplers
- Bailers
- Buckets

Regardless of the method used, precautions should be taken to insure that the sample collected is representative of the water body or conveyance. These methods are discussed in the following sections.

One member of the field sampling team should take all the notes and photographs, fill out tags, etc., while the other members collect the samples.

Gloves and sampling dipper

In general, water samples were collected using clean sampling dipper in order to avoid sample contamination from other sources according to the standard operation procedures.

Before sample collection, appropriate measures including wearing a clean pair of new, non-powdered, disposable gloves will be worn each time a different location is sampled and the gloves should be donned immediately prior to sampling. The gloves should not come in contact with the media being sampled and should be changed any time during sample collection when their cleanliness is compromised and rinsing of sampling dipper with native water were carried out so as to condition, or equilibrate to the sample environment and make sure that all cleaning-solution residues have been removed.

Onsite water quality monitoring
Total dissolved solid (TDS), Conductivity, Chlorine, Salt, PH value, Temperature were measured on-site at the sampling locations according to the standard operation procedures.

A hand-held, narrow mouth bottles
The sample bottles were partially filled and rinsed with the water to be sampled (rinse water). In order to avoid suspended sand particles, water for rinsing was collected at the edge of the stream in an area of low-flow turbidity and then drained the rinse water.

Transportation (shipping) and storage of samples through cold chain till laboratory
After sample collection, sample bottles were kept in a cooling box with ice/ice packs untill the laboratory.

5.3 Water sample to be measured

Table-1.2 Laboratory services for water analysis provided to project

Laboratory	Parameters
Public Health Laboratory	pH, Color. Turbidity, Total solids, Total Hardness, Total Alkalinity, Calcium, Magnesium, Chloride, Sulphate, Iron, Total Coliforms

References:

Bartram, J., &Balance, R. (1996). Water Quality Monitoring - A Practical Guide to the Design and Implementation of Freshwater Quality Studies and Monitoring Programmes:CH 5 - Field Work and Sampling. United Nations Environment Programme & the World Health Organization ISBN 0 419 22320 7 (Hbk) 0 419 21730 4 (Pbk). Retrieved from http://www.who.int/water_sanitation_health/resourcesquality/waterqualmonitor.pdf

Franceska D. W. (2004). U.S. Geological Survey Techniques of Water-Resources Investigations: Book 9Handbooks for Water-Resources Investigations: CH A3.Cleaning of equipment for water Sampling (Ed).US Geological Survey. Retrieved from http://pubs.water.usgs.gov/twri9A/

U.S. Geological Survey Techniques of Water-Resources Investigations: Book 9Handbooks for Water-Resources Investigations: CH A4.Collection of Water Samples (2006).US Geological Survey. Retrieved from http://pubs.water.usgs.gov/twri9A/

Surface Water Sampling
https://www.epa.gov/foia/surface-water-sampling

6 Soil Sampling Methodology

6.1 Soil Sampling Location

Baseline soil sampling was conducted at at the nearest village firm. In the area approximately 1 acre of land, (5) soil samples were collected at four corner of land and the center of the land respectively in accordance with the standard operation procedures. The locations of monitoring sites are presented as follows:

6.2 Manual soil sampling method

(i) Hand Augers

Hand augers may be used to advance boreholes and collect soil samples in the surface and shallow subsurface intervals. Typically, 6-inch stainless steel auger buckets with cutting heads are used. The bucket is advanced by simultaneously pushing and turning using an attached handle with extensions (if needed).

(ii) Surface soil sampling

When conducting surface soil sampling with hand augers, the auger buckets may be used with a handle alone or with a handle and extensions. The bucket is advanced to the appropriate depth and the contents are transferred to the homogenization container for processing.

(ii) Special Considerations for Soil Sampling with the Hand Auger

• Because of the tendency for the auger bucket to scrape material from the sides of the auger hole while being extracted, the top several inches of soil in the auger bucket should be discarded prior to placing the bucket contents in the homogenization container for processing.
• Power augers, may be used to advance boreholes to depths for subsurface soil sampling with the hand auger. They may not be used for sample collection. When power augers are used to advance a borehole to depth for sampling, care must be taken that exhaust fumes, gasoline and/or oil do not contaminate the borehole or area in the immediate vicinity of sampling.
• When moving to a new sampling location, the entire hand auger assembly must be replaced with a properly decontaminated hand auger assembly.

6.3 General

These methods are used primarily to collect shallow and deep subsurface soil samples. If gravel, concrete, etc. is present at or near the surface, it should be removed before the sample is collected. The depth measurement for the sample begins at the top of the soil horizon, immediately following any removed materials. Turf grass is not typically removed prior to sampling with these devices.
.

6.4 Soil sampling procedure

Soil samples were collected from drill -holes dug approximately 0.2m depth by soil auger (hand auger drill). During sample collection, wear the glove, rinse glove and soil auger with clean water. Samples were transferred into wide-mouth glass bottles and sent to an accredited laboratory. Parameters tested included basic soil chemistry as well as metals. Soil samples were collected according to the standard procedure and kept in a cooling box at 4˚C till the respective laboratory.

6.5 Soil sample to be measured

Table 1.2: Laboratory services for soil analysis provided to project

Laboratory	Parameters
Department of Agriculture (Land Use)	Moisture, pH, EC, Total N, Available P, Available K_2O, Exchangeable K, Texture (Sand, Silt, Clay)

References

CarterM.R.,& GregorichE.G. (2006). Soil Sampling and Methods of analysis (2nded.). Taylor & Francis Group, LLC. Retrieved from http://www.niordc.ir/uploads%5C86_106_Binder1.pdf

Midwest Laboratories, Inc. Soil Sampling. Omaha: 13611 B Street. Retrieved from http://agrienergy.net/docs/lab-information/soil-sampling.pdf

United States Department of Agriculture: Natural Resources Conservation Service. Sampling Soils for Nutrient Management. Retrieved from https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs144p2_051273.pdf

U.S. Environmental Protection Agency Laboratory Services and Applied Science Division Athens,Georgia.

(1) Air Monitoring Raw Data

Main | Preferences | Header | Data | Report

Environmental Report

Record Cnt 2812

Start Date 5/21/2021 1:30:00 PM

End Date 5/22/2021 1:00:00 PM

	NH3 ppm	ARad CPM	CO2 ppm	CO mg/m3	H2S ppb	CH4 ppm	NO2 ug/m3	O3 ug/m3	PM10 uG/m3	PM25 uG/m3	RH %	SO2 ug/m3	TmpC Deg. C	VOCS ppb	WDir Deg.	WSpM kph	Pwr V
Ave	**28.2164**	**0**	**402.041**	**.095670**	**17.5979**	**149.402**	**34.9793**	**9.82474**	**20.5876**	**8.49484**	**84.9278**	**17.0309**	**28.6701**	**53.0268**	**72.5670**	**.223711**	**12.1226**
Max	43.4	0	438	1.06	340	200	60	106	115	89	100	30	32	66.5	359	2.7	12.3
Min	5.7	0	385	0	0	107	15	1	2	1	57	7	25	40	4	0	11.5

Comments

Environmental Report

Start: 5/21/2021 1:30 PM End: 5/22/2021 1:30 PM

Collected by:

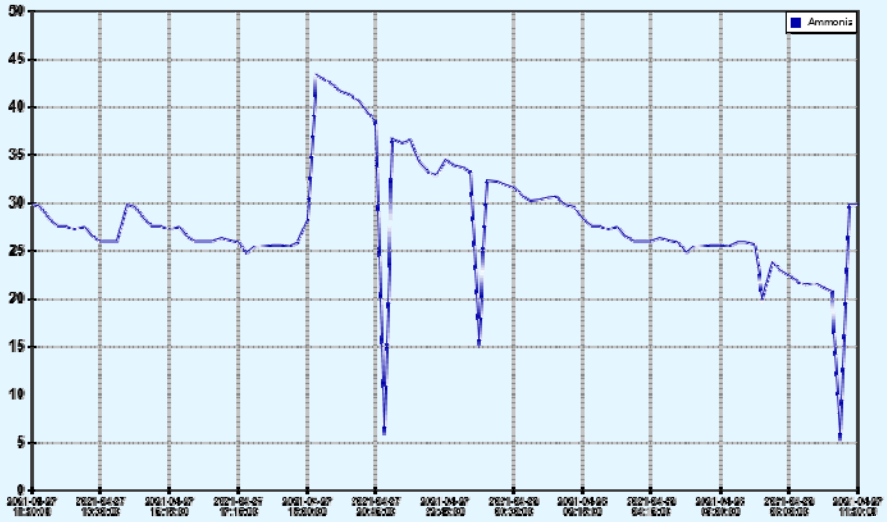
Logger ID 912005 Record Count 97

Ammonia

Sensor ID

Range: 0 to 100 ppm

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
5.7	28.2164	43.4	ppm				

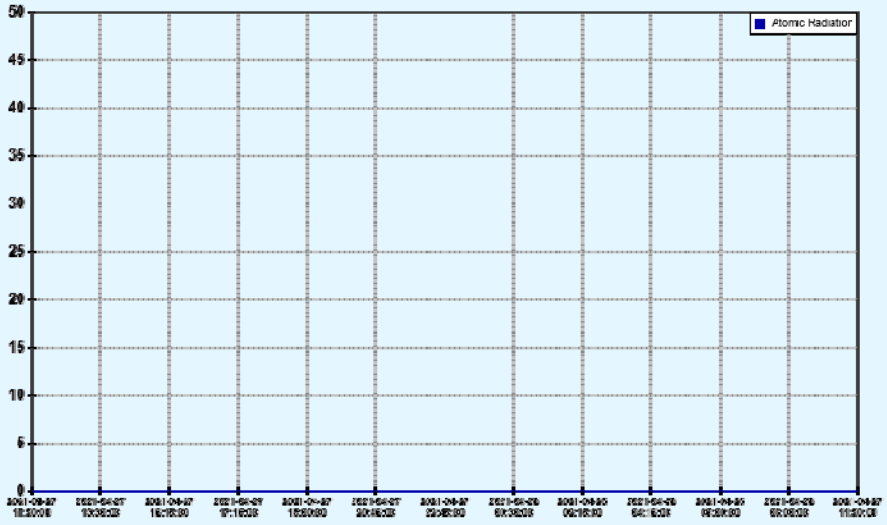


Atomic Radiation

Sensor ID

Range: 0 to 20000 CPM

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
0	0	0	CPM				



Environmental Report

Start: 5/21/2021 1:30 PM End: 5/22/2021 1:30 PM

Collected by:

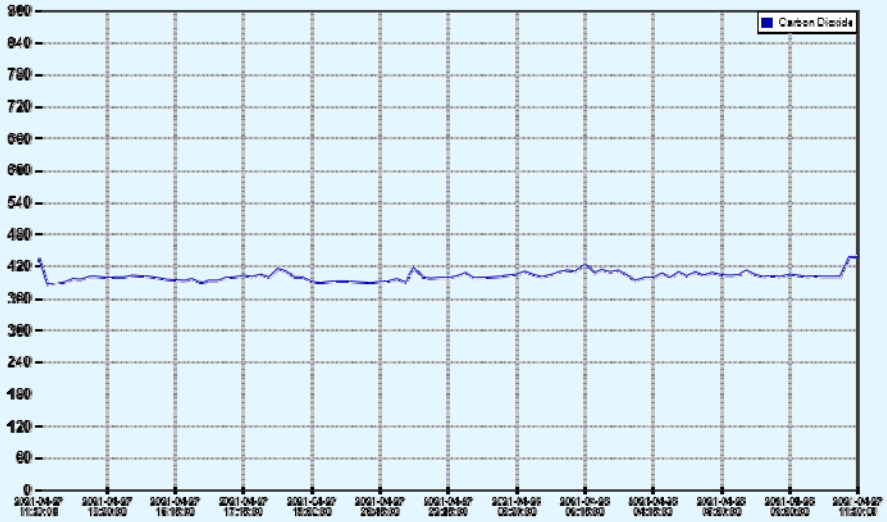
Logger ID 912005 Record Count 97

Carbon Dioxide

Sensor ID

Range: 0 to 5000 ppm

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
385	402.041	438	ppm				

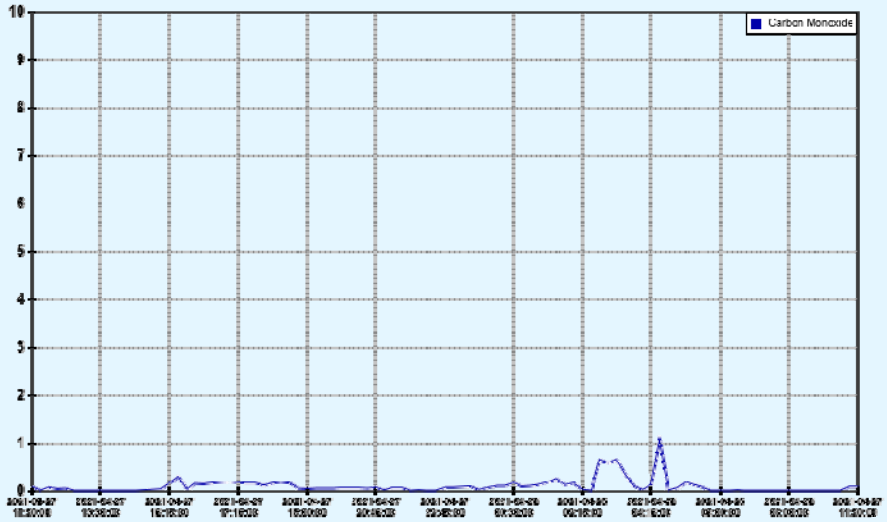


Carbon Monoxide

Sensor ID

Range: 0 to 114.5 mg/m3

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
0	.095670	1.06	mg/m3				



Environmental Report

Start: 5/21/2021 1:30 PM End: 5/22/2021 1:30 PM

Collected by:

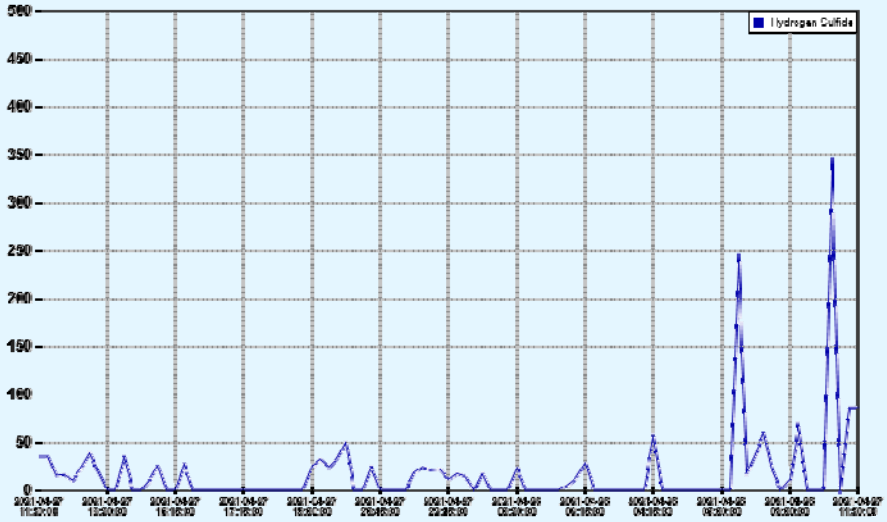
Logger ID 912005 Record Count 97

Hydrogen Sulfide

Sensor ID

Range: 0 to 5000 ppb

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
0	17.5979	340	ppb				

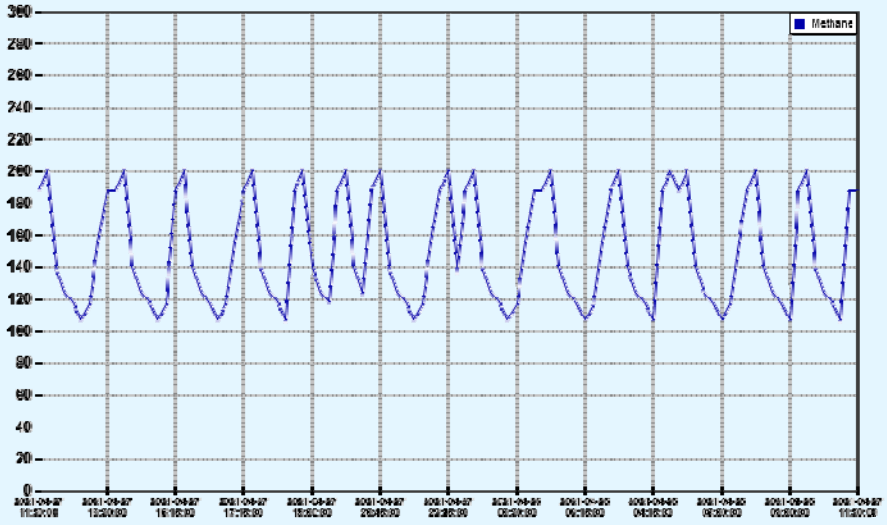


Methane

Sensor ID

Range: 0 to 10000 ppm

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
107	149.402	200	ppm				



Environmental Report

Start: 5/21/2021 1:30 PM End: 5/22/2021 1:30 PM

Collected by:

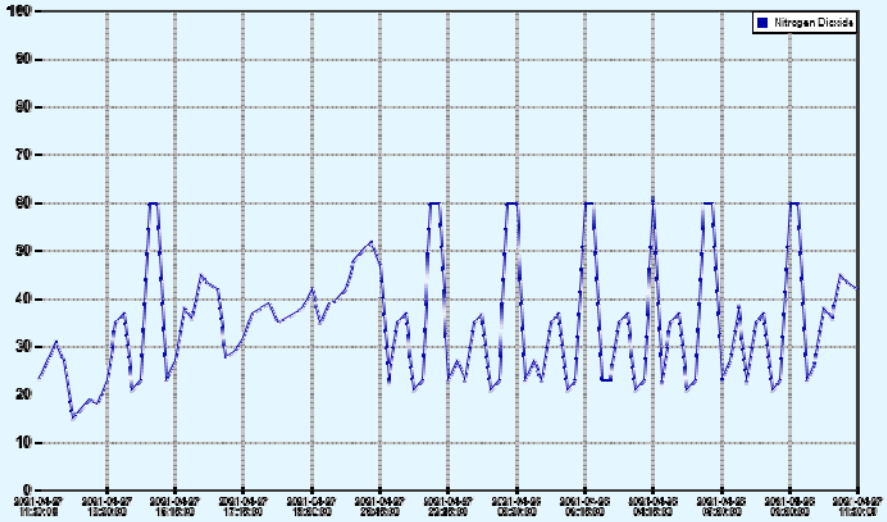
Logger ID 912005 Record Count 97

Nitrogen Dioxide

Sensor ID

Range: 0 to 18810 ug/m3

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
15	34.9793	60	ug/m3				

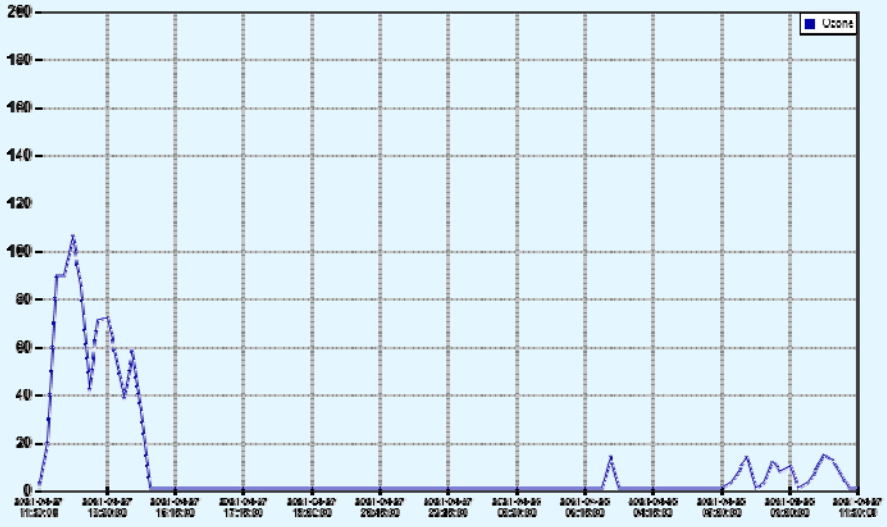


Ozone

Sensor ID

Range: 0 to 294.3 ug/m3

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
1	9.82474	106	ug/m3				



Environmental Report

Start: 5/21/2021 1:30 PM End: 5/22/2021 1:30 PM

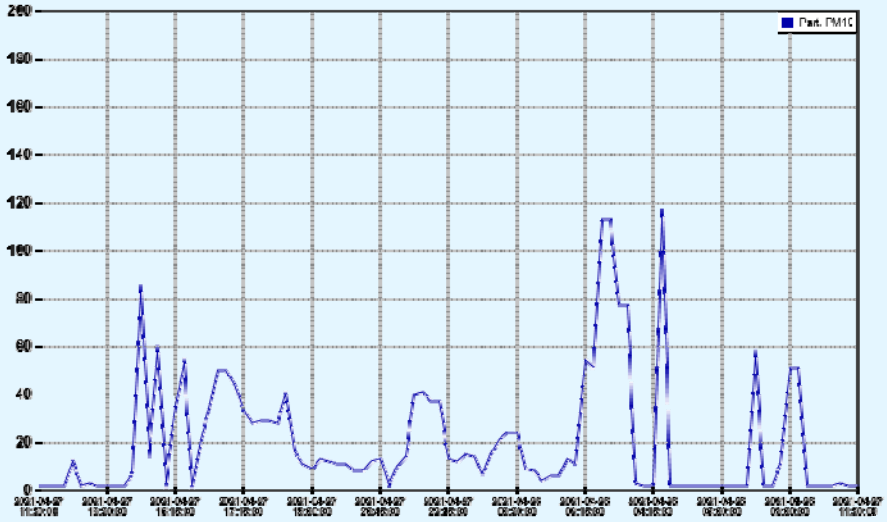
Collected by:

Logger ID 912005 Record Count 97

Prt10 **Part. PM10** Prt10 Sensor ID

Range: 0 to 20000 uG/m3

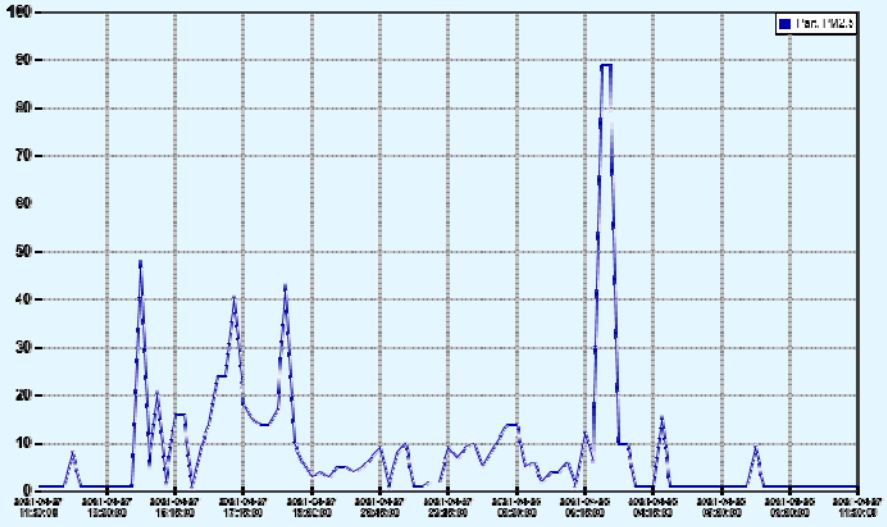
Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
2	20.5876	115	uG/m3				



Prt10 **Part. PM2.5** Prt10 Sensor ID

Range: 0 to 20000 uG/m3

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
1	8.49484	89	uG/m3				



Environmental Report

Start: 5/21/2021 1:30 PM End: 5/22/2021 1:30 PM

Collected by:

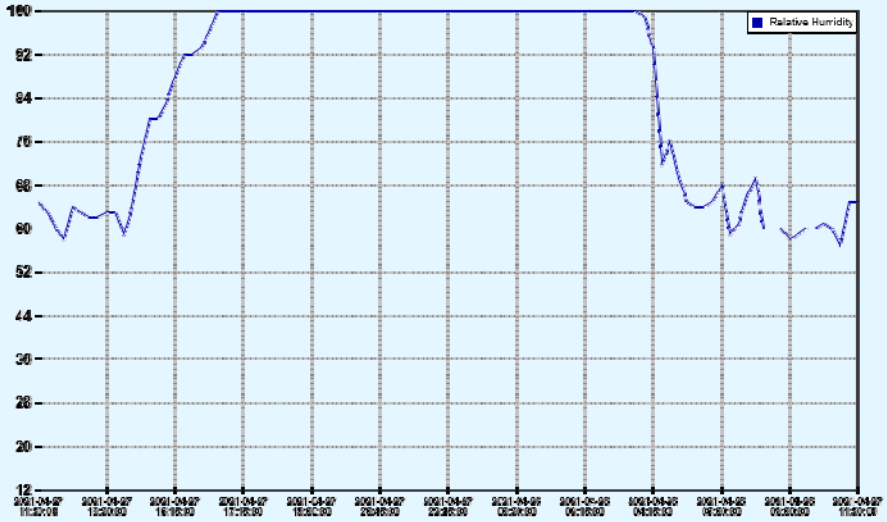
Logger ID 912005 Record Count 97

Relative Humidity

Sensor ID

Range: 0 to 100 %

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
57	84.9278	100	%				

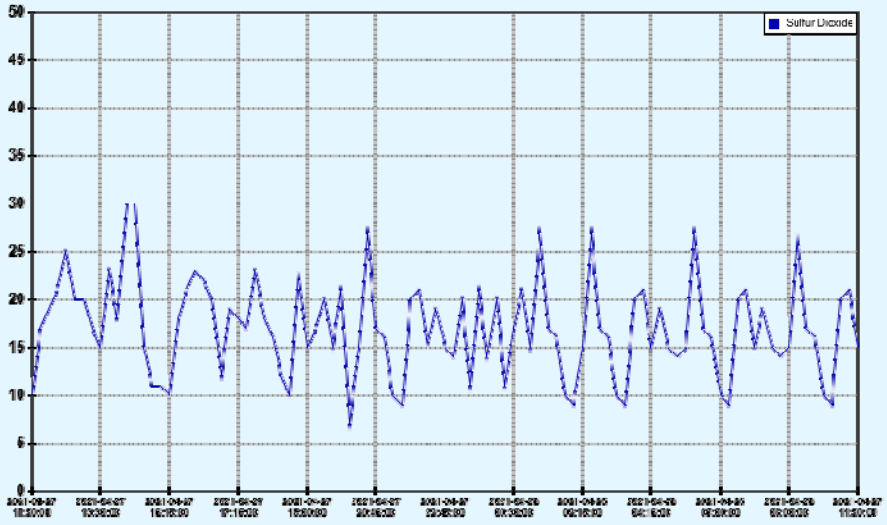


Sulfur Dioxide

Sensor ID

Range: 0 to 26190 ug/m3

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
7	17.0309	30	ug/m3				



Environmental Report

Start: 5/21/2021 1:30 PM End: 5/22/2021 1:30 PM

Collected by:

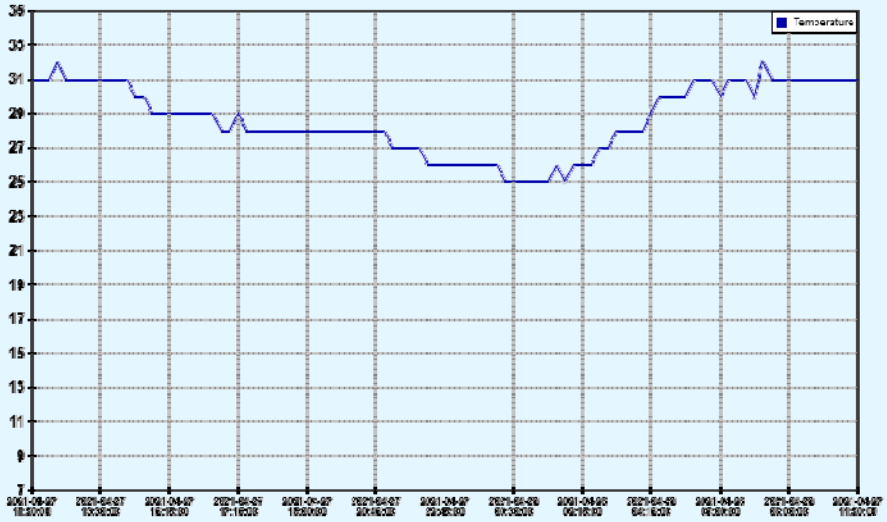
Logger ID 912005 Record Count 97

Temperature

Sensor ID

Range: -20 to 60 Deg. C

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
25	28.6701	32	Deg. C				

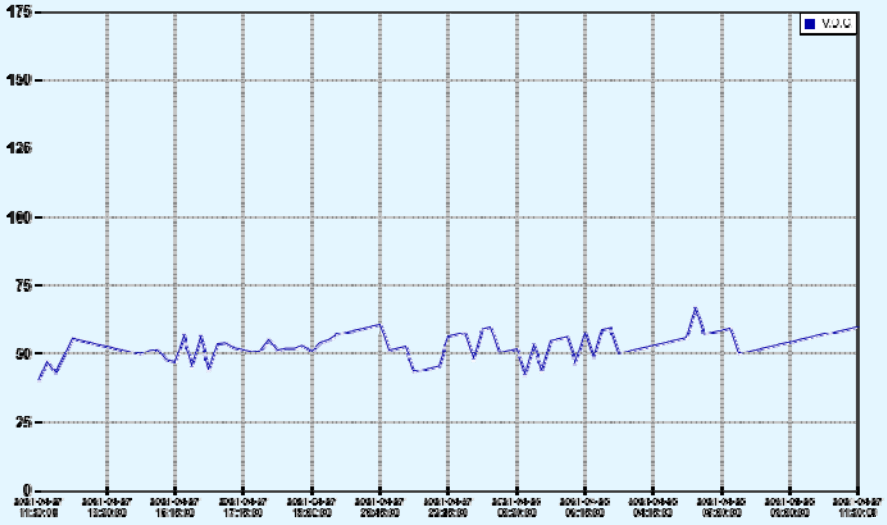


V.O.C.

Sensor ID

Range: 0 to 50000 ppb

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
40	53.0268	66.5	ppb				



Environmental Report

Start: 5/21/2021 1:30 PM End: 5/22/2021 1:30 PM

Collected by:

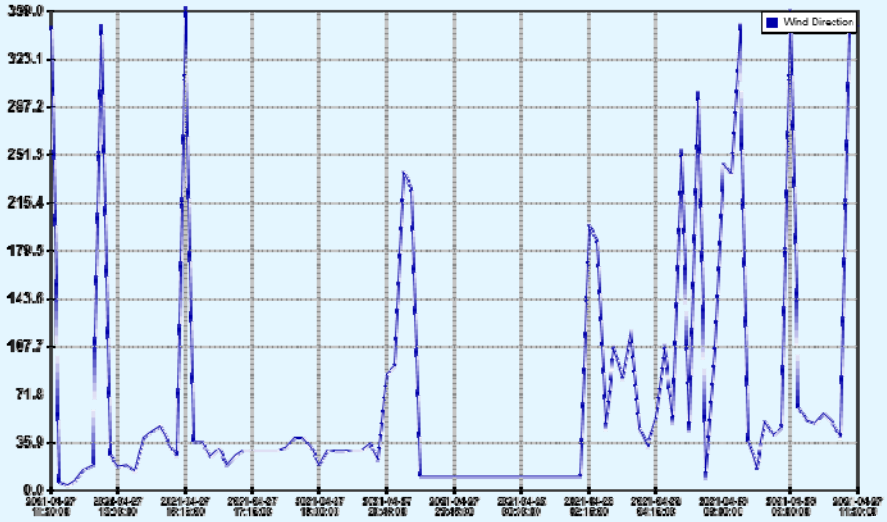
Logger ID 912005 Record Count 97

Wind Direction

Sensor ID

Range: 0 to 359 Deg.

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
4	72.5670	359	Deg.				

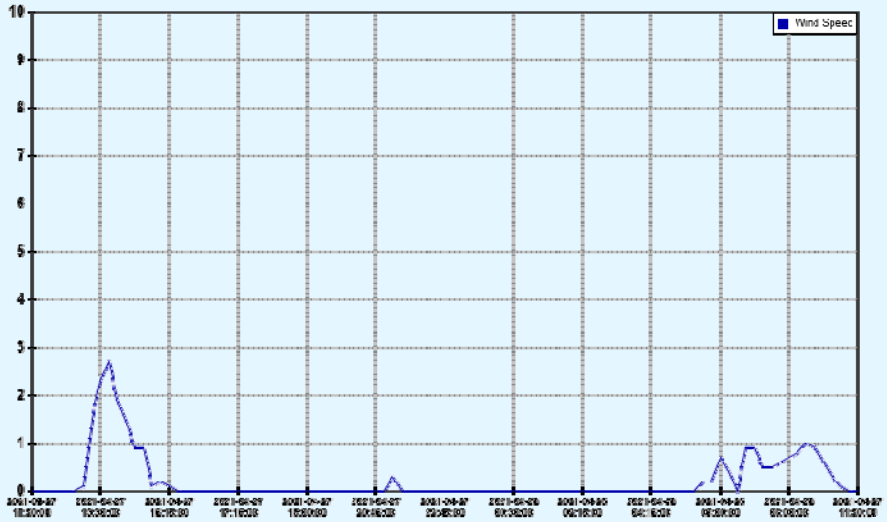


Wind Speed

Sensor ID

Range: 0 to 160 kph

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
0	.223711	2.7	kph				



Environmental Report

Start: 5/21/2021 1:30 PM End: 5/22/2021 1:30 PM

Collected by:

Logger ID 912005

Record Count 97

Batt.

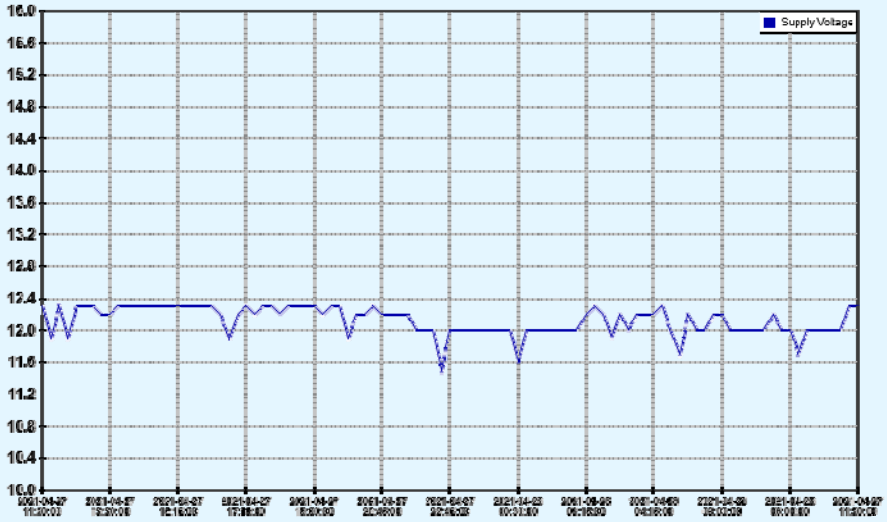
Supply Voltage

Batt.

Sensor ID

Range: 10 to 16 V

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
11.5	12.1226	12.3	V				



Main | Preferences | Header | Data | Report

Environmental Report

Record Cnt 2909

Start Date 5/22/2021 2:30:00 PM

End Date 5/23/2021 2:30:00 PM

	NH3 ppm	ARad CPM	CO2 ppm	CO mg/m3	H2S ppb	CH4 ppm	NO2 ug/m3	O3 ug/m3	PM10 uG/m3	PM25 uG/m3	RH %	SO2 ug/m3	TmpC Deg. C	VOCS ppb	WDir Deg.	WSpM kph	Pwr V
Ave	**13.2340**	**0**	**352.268**	**.034432**	**20.4432**	**116.350**	**22.0618**	**5.76288**	**10.3917**	**6.89690**	**75.5670**	**15.1030**	**28.4329**	**36.5567**	**46.3505**	**.295876**	**12.2515**
Max	18.2	0	399	.14	80	187	56	50	52	38	100	27	29	719	345	1.6	12.5
Min	4.8	0	279	0	0	77	2	0	2	1	59	5	28	0	0	0	11.7

Comments

Environmental Report

Start: 5/22/2021 2:30 PM End: 5/23/2021 2:30 PM

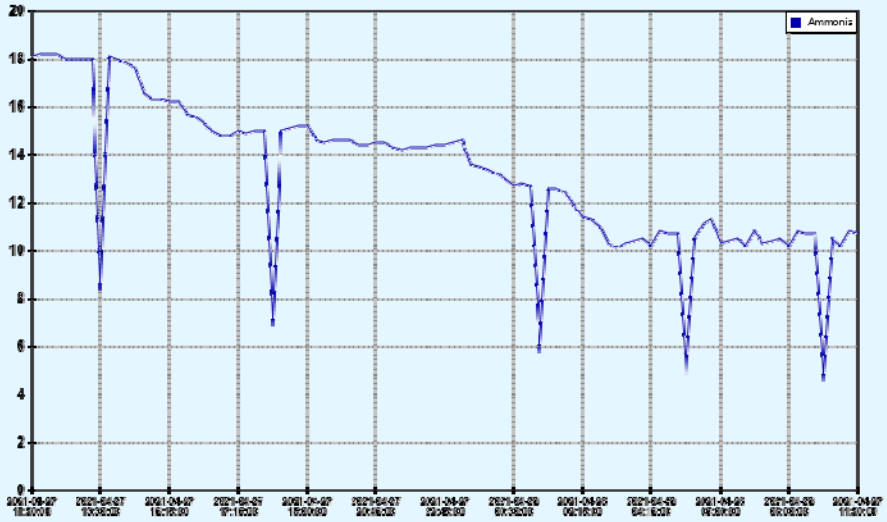
Collected by:

Logger ID 912005 Record Count 97

NH3 **Ammonia** NH3 Sensor ID

Range: 0 to 100 ppm

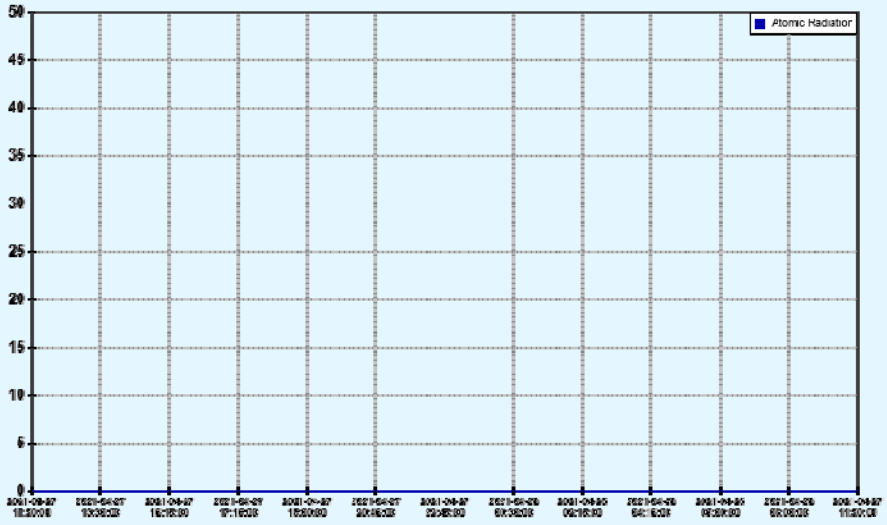
Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
4.8	13.2340	18.2	ppm				



A.RAD **Atomic Radiation** A.RAD Sensor ID

Range: 0 to 20000 CPM

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
0	0	0	CPM				



Environmental Report

Start: 5/22/2021 2:30 PM End: 5/23/2021 2:30 PM

Collected by:

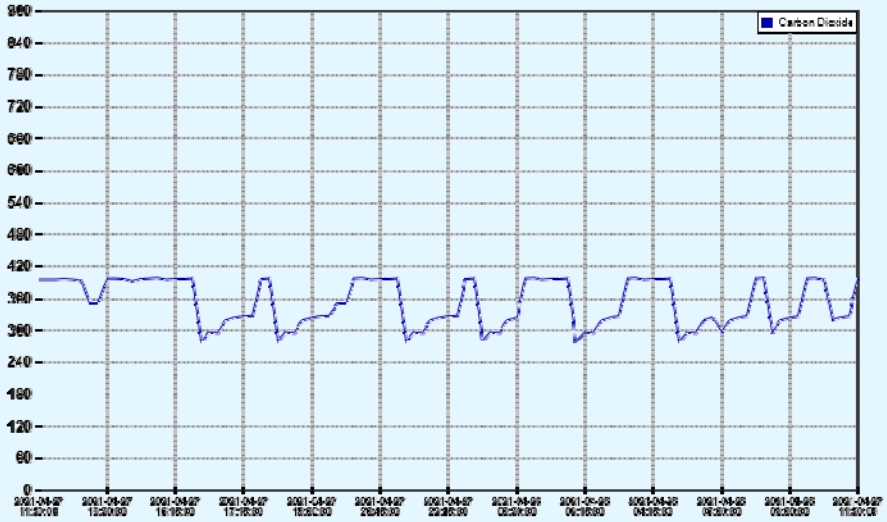
Logger ID 912005 Record Count 97

Carbon Dioxide

Sensor ID

Range: 0 to 5000 ppm

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
279	352.268	399	ppm				

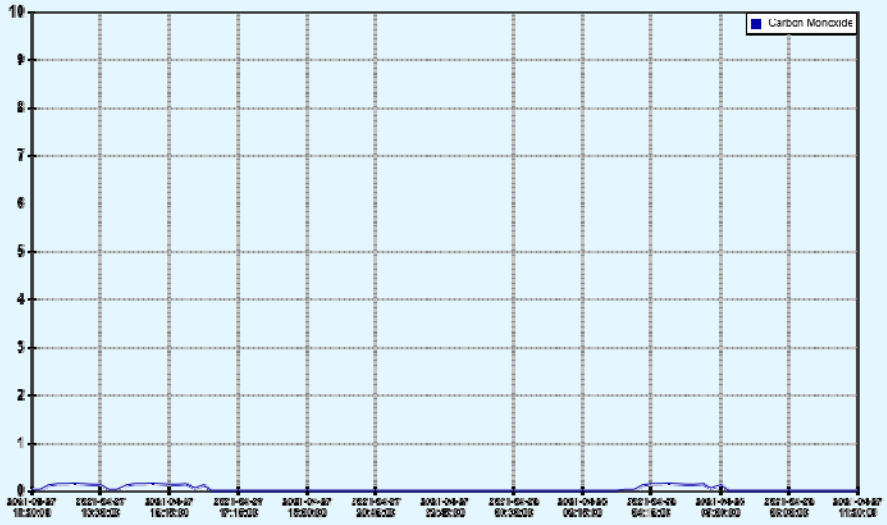


Carbon Monoxide

Sensor ID

Range: 0 to 114.5 mg/m3

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
0	.034432	.14	mg/m3				



Environmental Report

Start: 5/22/2021 2:30 PM End: 5/23/2021 2:30 PM

Collected by:

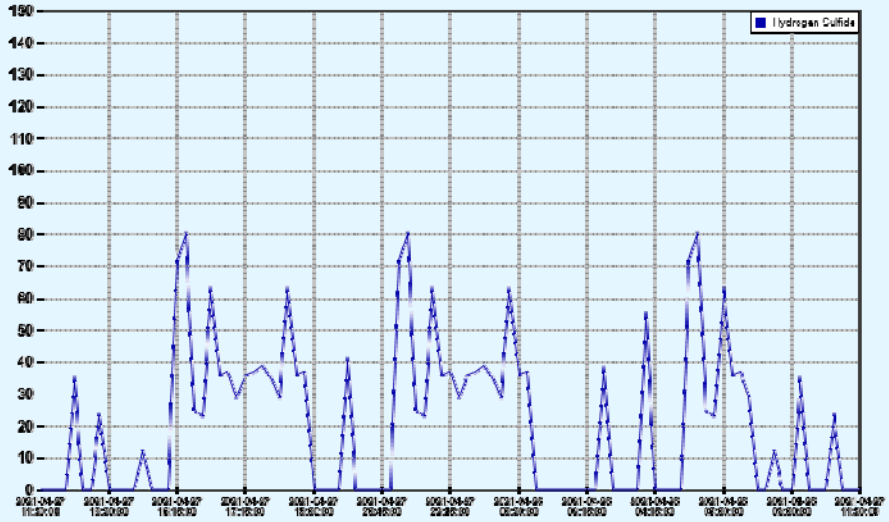
Logger ID 912005 Record Count 97

Hydrogen Sulfide

Sensor ID

Range: 0 to 5000 ppb

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
0	20.4432	80	ppb				

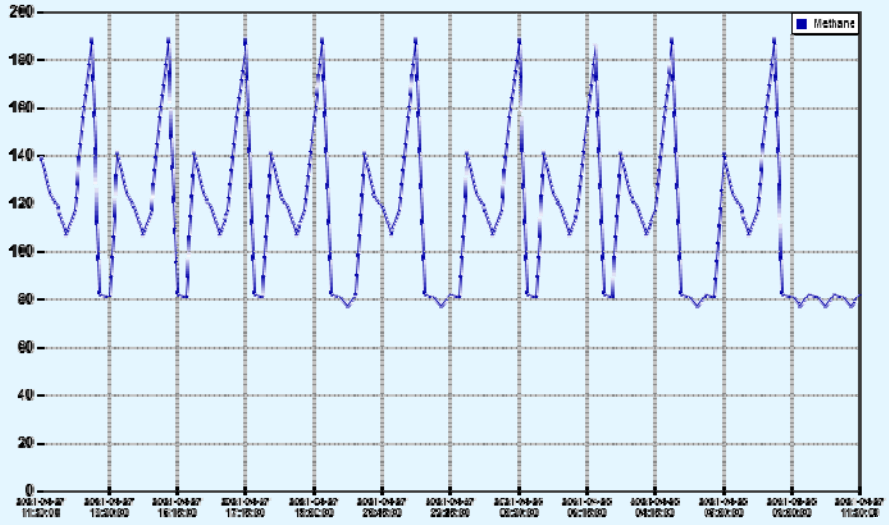


Methane

Sensor ID

Range: 0 to 10000 ppm

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
77	116.350	187	ppm				



Environmental Report

Start: 5/22/2021 2:30 PM End: 5/23/2021 2:30 PM

Collected by:

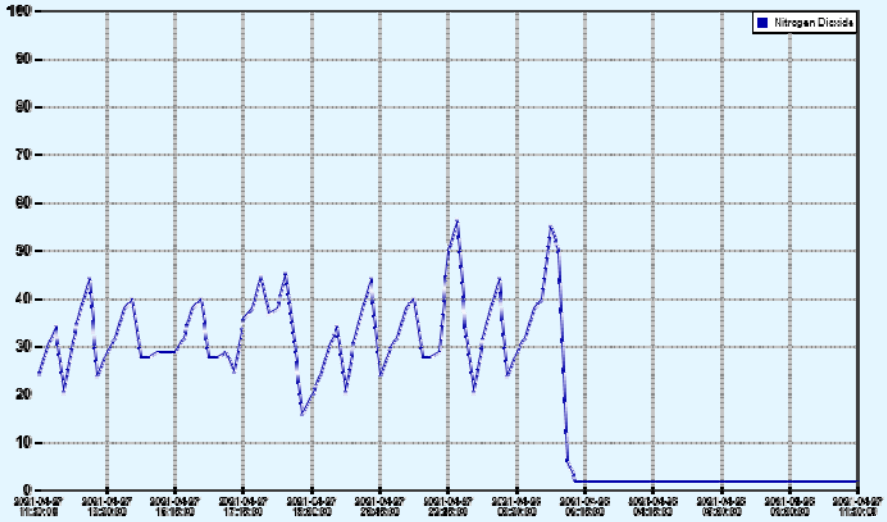
Logger ID 912005 Record Count 97

Nitrogen Dioxide

Sensor ID

Range: 0 to 18810 ug/m3

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
2	22.0618	56	ug/m3				

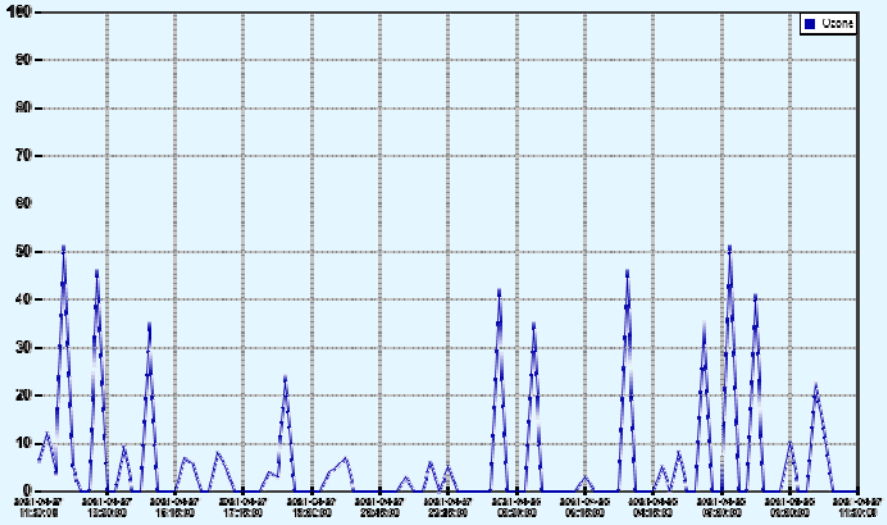


Ozone

Sensor ID

Range: 0 to 294.3 ug/m3

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
0	5.76288	50	ug/m3				



Environmental Report

Start: 5/22/2021 2:30 PM End: 5/23/2021 2:30 PM

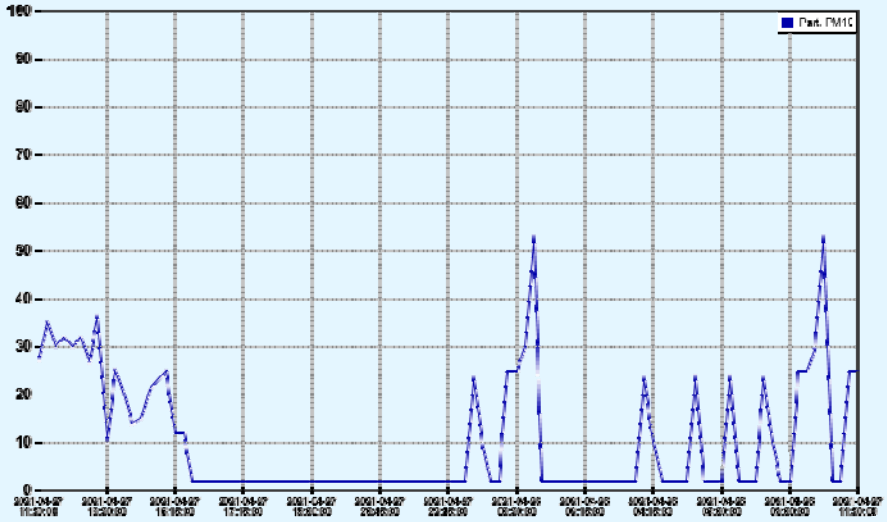
Collected by:

Logger ID 912005 Record Count 97

Prt10 **Part. PM10** Prt10 Sensor ID

Range: 0 to 20000 uG/m3

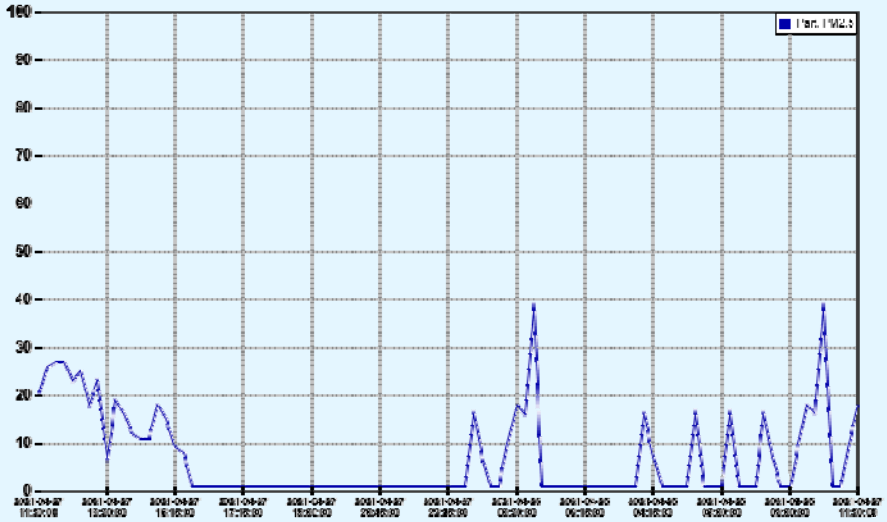
Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
2	10.3917	52	uG/m3				



Prt10 **Part. PM2.5** Prt10 Sensor ID

Range: 0 to 20000 uG/m3

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
1	6.89690	38	uG/m3				



Environmental Report

Start: 5/22/2021 2:30 PM End: 5/23/2021 2:30 PM

Collected by:

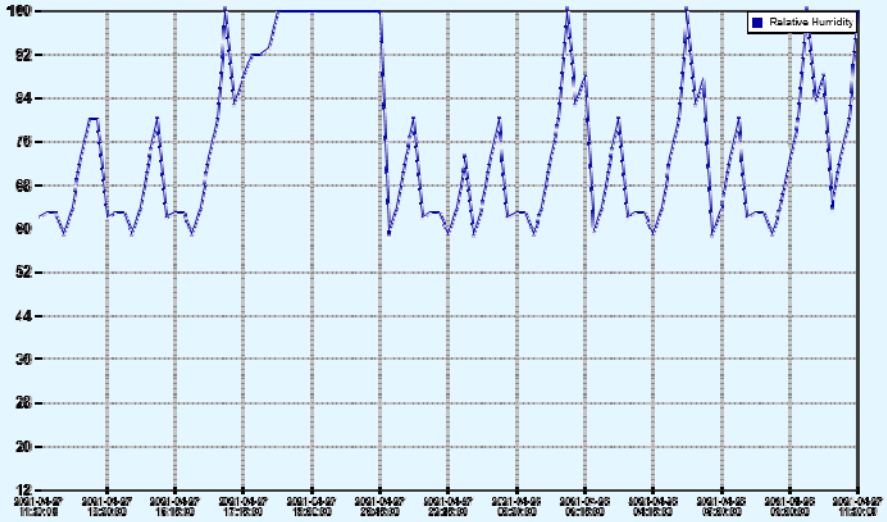
Logger ID 912005 Record Count 97

Relative Humidity

Sensor ID

Range: 0 to 100 %

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
59	75.5670	100	%				

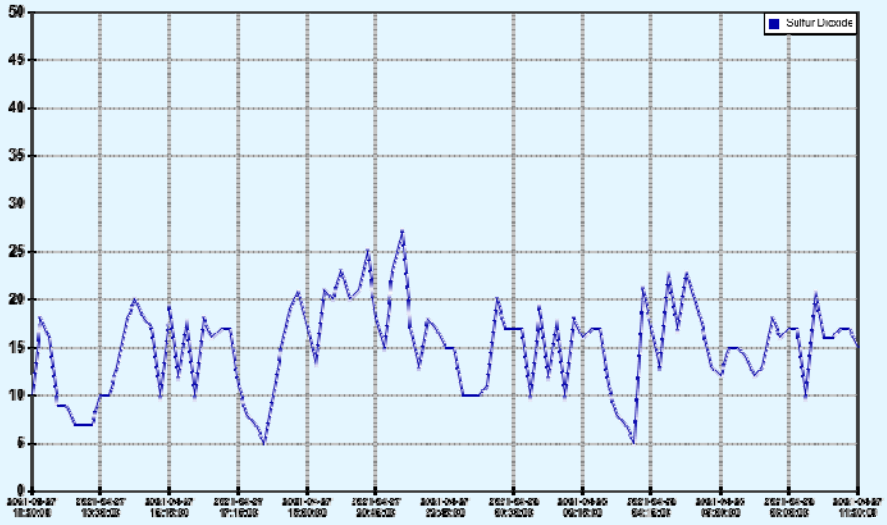


Sulfur Dioxide

Sensor ID

Range: 0 to 26190 ug/m3

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
5	15.1030	27	ug/m3				



Environmental Report

Start: 5/22/2021 2:30 PM End: 5/23/2021 2:30 PM

Collected by:

Logger ID 912005 Record Count 97

TEMP

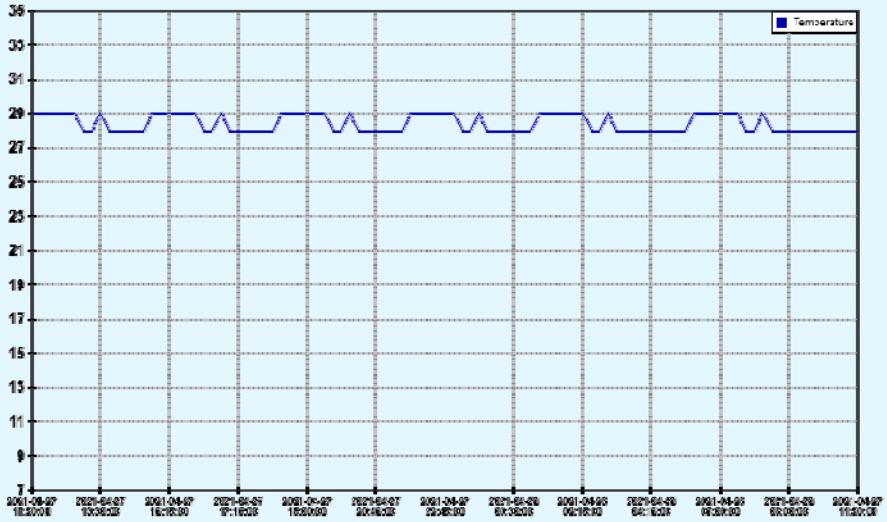
Temperature

TEMP

Sensor ID

Range: -20 to 60 Deg. C

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
28	28.4329	29	Deg. C				



VOCS

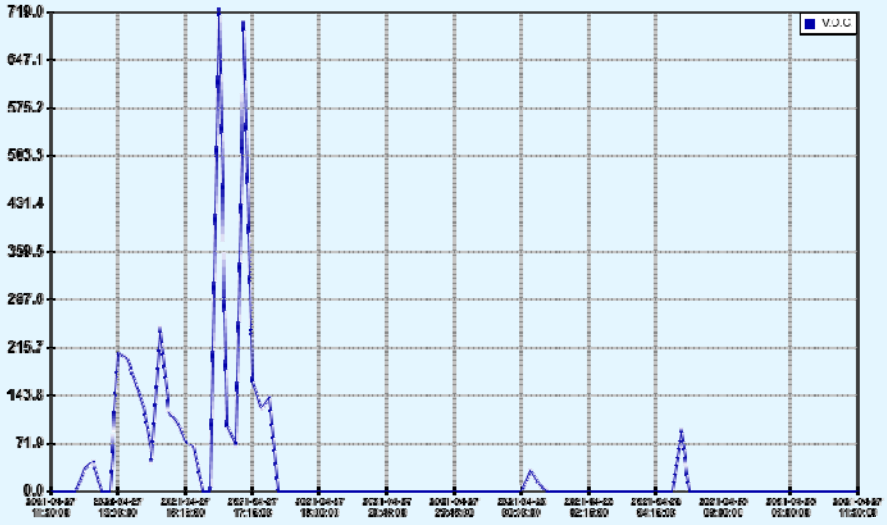
V.O.C.

VOCS

Sensor ID

Range: 0 to 50000 ppb

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
0	36.5567	719	ppb				



Environmental Report

Start: 5/22/2021 2:30 PM End: 5/23/2021 2:30 PM

Collected by:

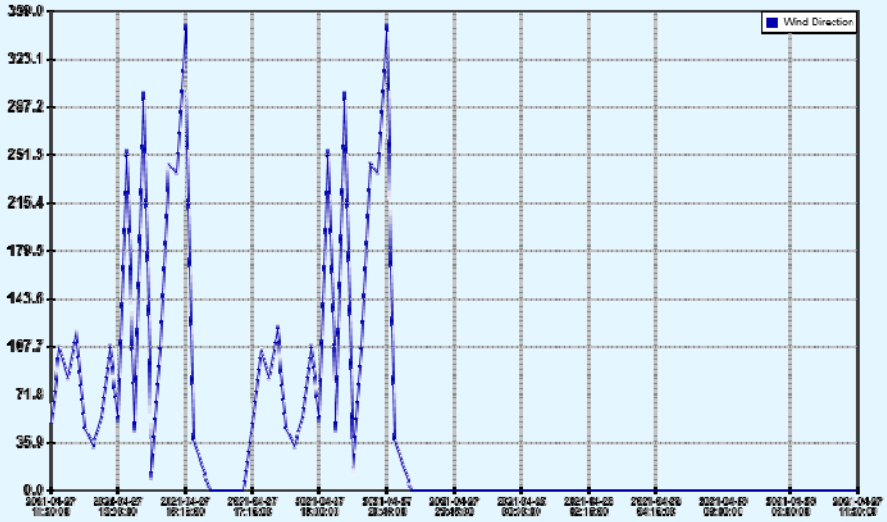
Logger ID 912005 Record Count 97

Wind Direction

Sensor ID

Range: 0 to 359 Deg.

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
0	46.3505	345	Deg.				

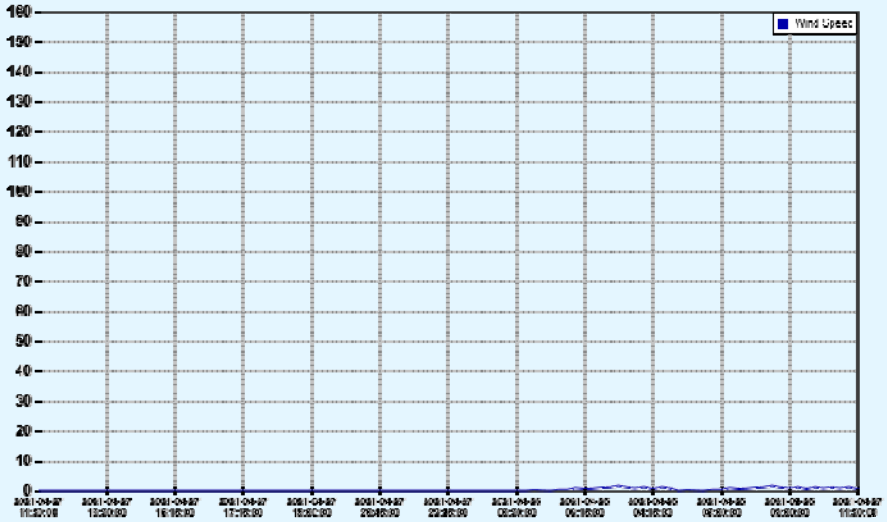


Wind Speed

Sensor ID

Range: 0 to 160 kph

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
0	.295876	1.6	kph				



Environmental Report

Start: 5/22/2021 2:30 PM End: 5/23/2021 2:30 PM

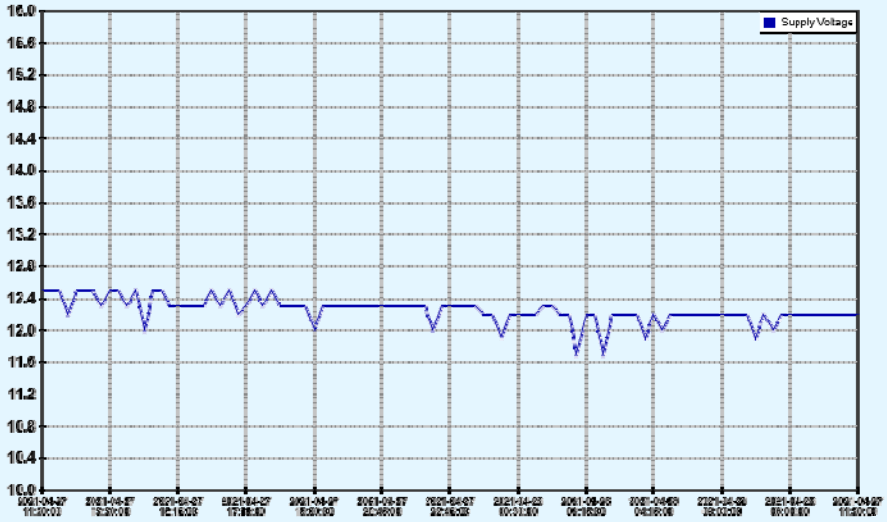
Collected by:

Logger ID 912005 Record Count 97

Batt. Supply Voltage Batt. Sensor ID

Range: 10 to 16 V

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
11.7	12.2515	12.5	V				



Main | Preferences | Header | Data | Report

Environmental Report

Record Cnt 3006

Start Date 5/23/2021 3:30:00 PM

End Date 5/24/2021 3:30:00 PM

	NH3 ppm	ARad CPM	CO2 ppm	CO mg/m3	H2S ppb	CH4 ppm	NO2 ug/m3	O3 ug/m3	PM10 uG/m3	PM25 uG/m3	RH %	SO2 ug/m3	TmpC Deg. C	VOCS ppb	WDir Deg.	WSpM kph	Pwr V
Ave	**13.3938**	**0**	**346.195**	**0**	**20.4020**	**107.639**	**28.6907**	**13.7835**	**5.93814**	**3.38144**	**26.6185**	**11.0309**	**28.5051**	**33.3608**	**6.47422**	**.364948**	**11.9288**
Max	17.5	0	399	0	80	247	50	80	16	12	100	15	29	39	49	5	12.2
Min	3.6	0	295	0	0	77	2	1	2	1	0	5	28	22	0	0	11.5

Comments

Environmental Report

Start: 5/23/2021 3:30 PM End: 5/24/2021 3:30 PM

Collected by:

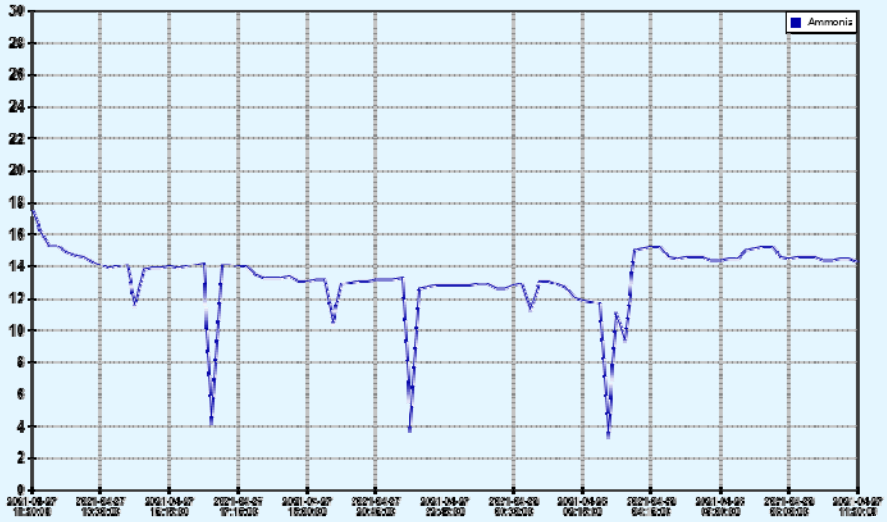
Logger ID 912005 Record Count 97

Ammonia

Sensor ID

Range: 0 to 100 ppm

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
3.6	13.3938	17.5	ppm				

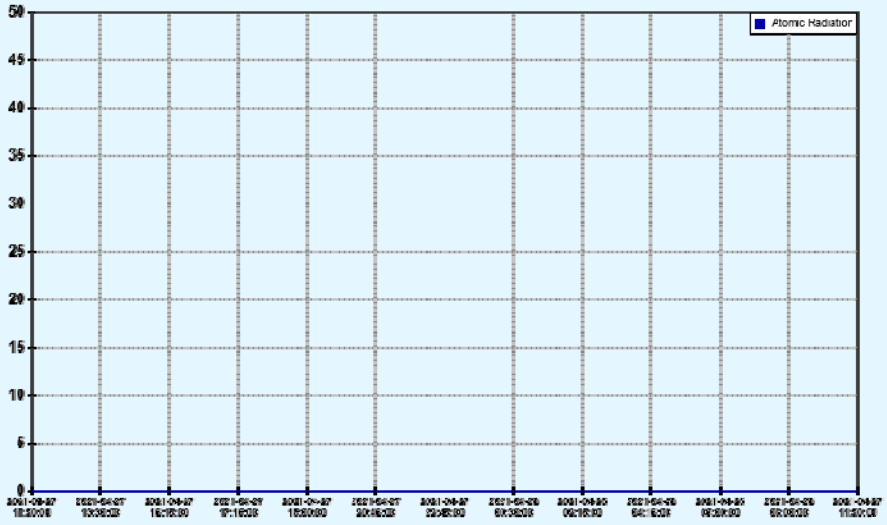


Atomic Radiation

Sensor ID

Range: 0 to 20000 CPM

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
0	0	0	CPM				



Environmental Report

Start: 5/23/2021 3:30 PM End: 5/24/2021 3:30 PM

Collected by:

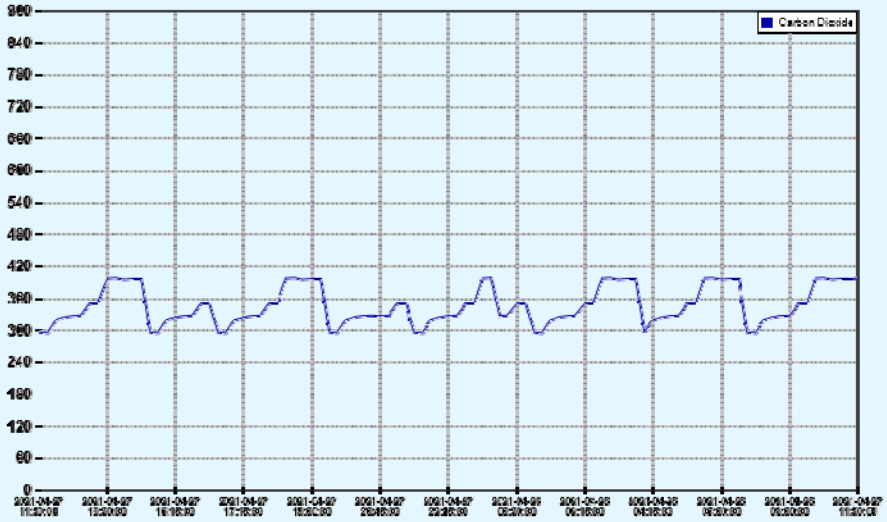
Logger ID 912005 Record Count 97

Carbon Dioxide

Sensor ID

Range: 0 to 5000 ppm

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
295	346.195	399	ppm				

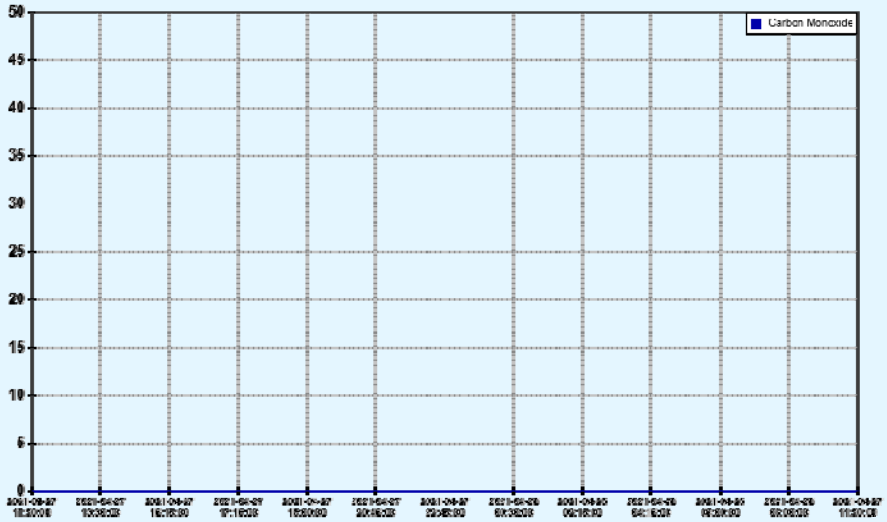


Carbon Monoxide

Sensor ID

Range: 0 to 114.5 mg/m3

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
0	0	0	mg/m3				



Environmental Report

Start: 5/23/2021 3:30 PM End: 5/24/2021 3:30 PM

Collected by:

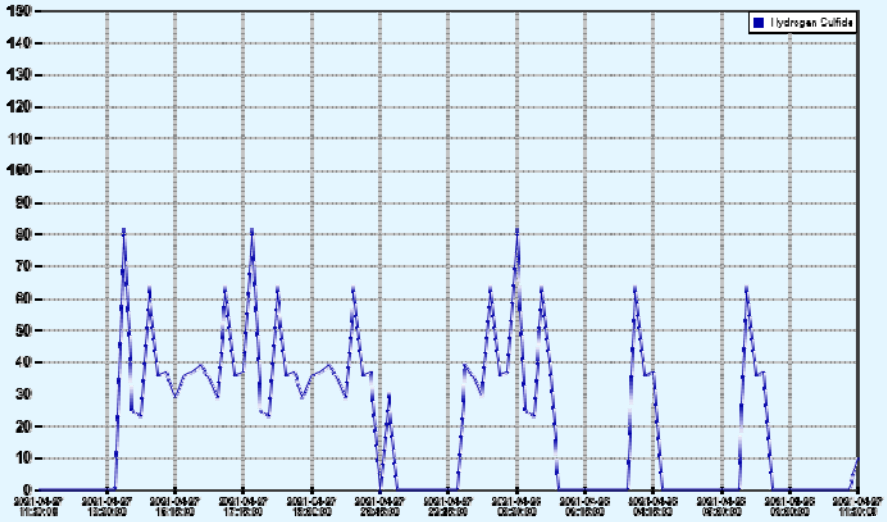
Logger ID 912005 Record Count 97

Hydrogen Sulfide

Sensor ID

Range: 0 to 5000 ppb

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
0	20.4020	80	ppb				

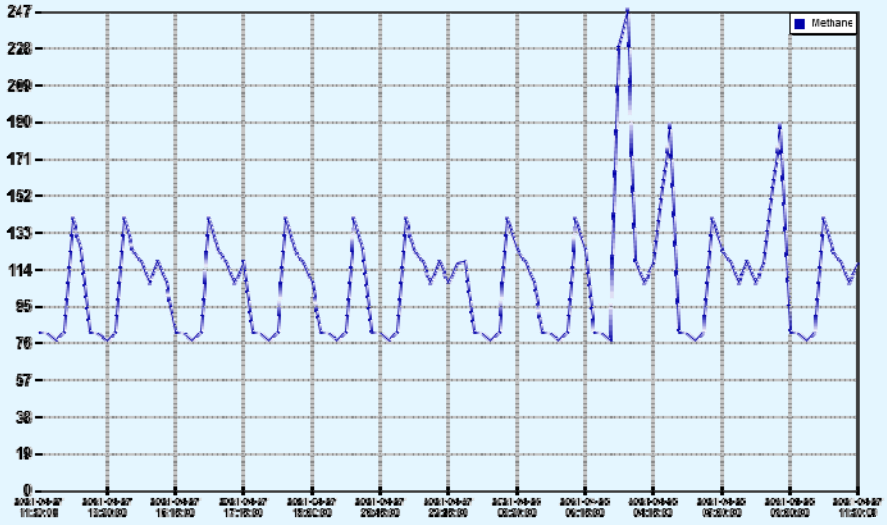


Methane

Sensor ID

Range: 0 to 10000 ppm

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
77	107.639	247	ppm				



Environmental Report

Start: 5/23/2021 3:30 PM End: 5/24/2021 3:30 PM

Collected by:

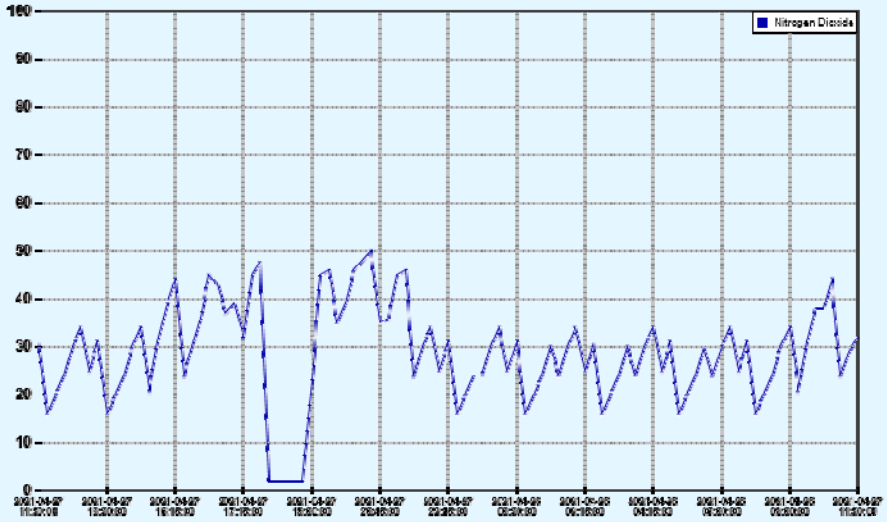
Logger ID 912005 Record Count 97

Sensor ID

Nitrogen Dioxide

Range: 0 to 18810 ug/m3

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
2	28.6907	50	ug/m3				

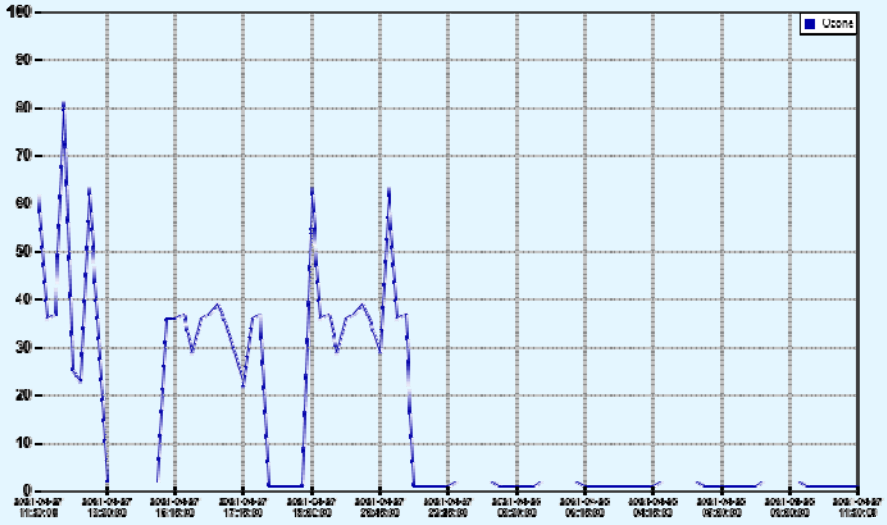


Sensor ID

Ozone

Range: 0 to 294.3 ug/m3

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
1	13.7835	80	ug/m3				



Environmental Report

Start: 5/23/2021 3:30 PM End: 5/24/2021 3:30 PM

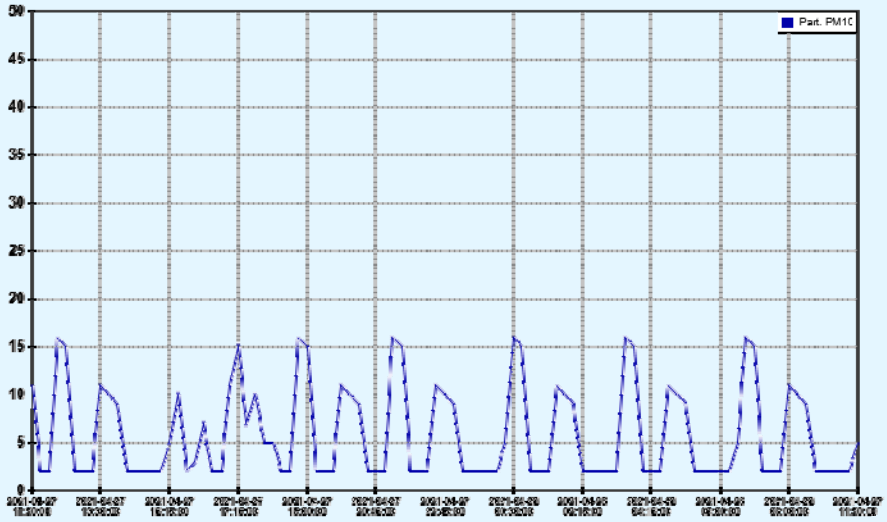
Collected by:

Logger ID 912005 Record Count 97

Prt10 **Part. PM10** Prt10 Sensor ID

Range: 0 to 20000 uG/m3

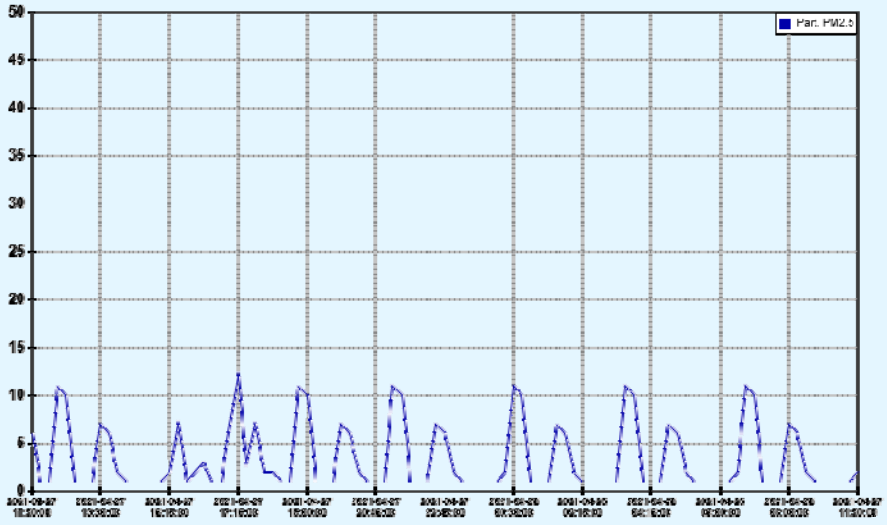
Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
2	5.93814	16	uG/m3				



Prt10 **Part. PM2.5** Prt10 Sensor ID

Range: 0 to 20000 uG/m3

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
1	3.38144	12	uG/m3				



Environmental Report

Start: 5/23/2021 3:30 PM End: 5/24/2021 3:30 PM

Collected by:

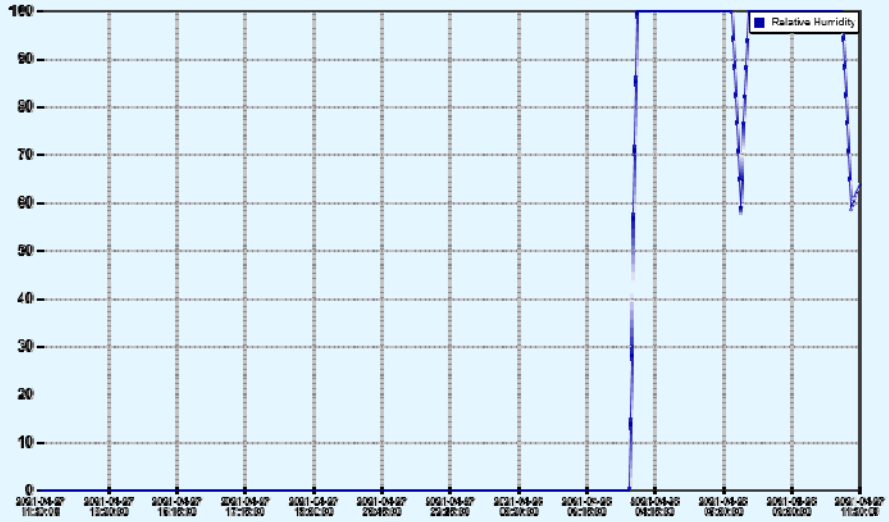
Logger ID 912005 Record Count 97

Relative Humidity

Sensor ID

Range: 0 to 100 %

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
0	26.6185	100	%				

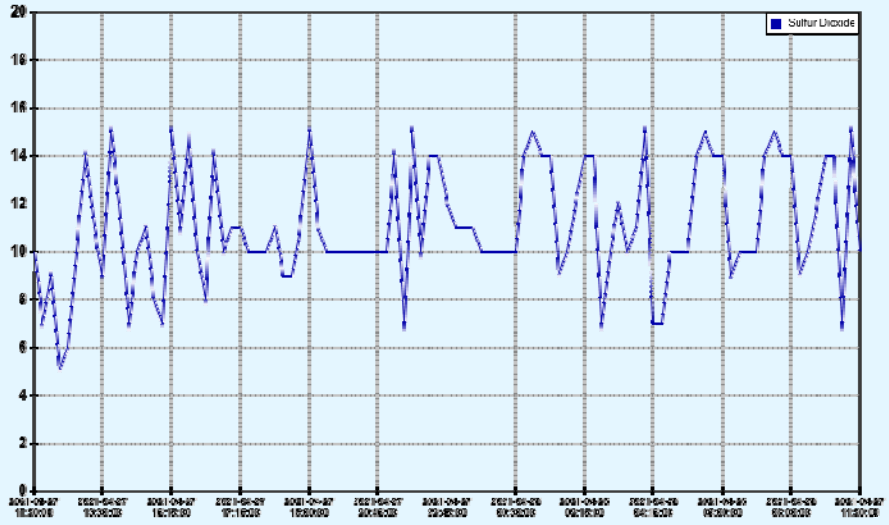


Sulfur Dioxide

Sensor ID

Range: 0 to 26190 ug/m3

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
5	11.0309	15	ug/m3				



Environmental Report

Start: 5/23/2021 3:30 PM End: 5/24/2021 3:30 PM

Collected by:

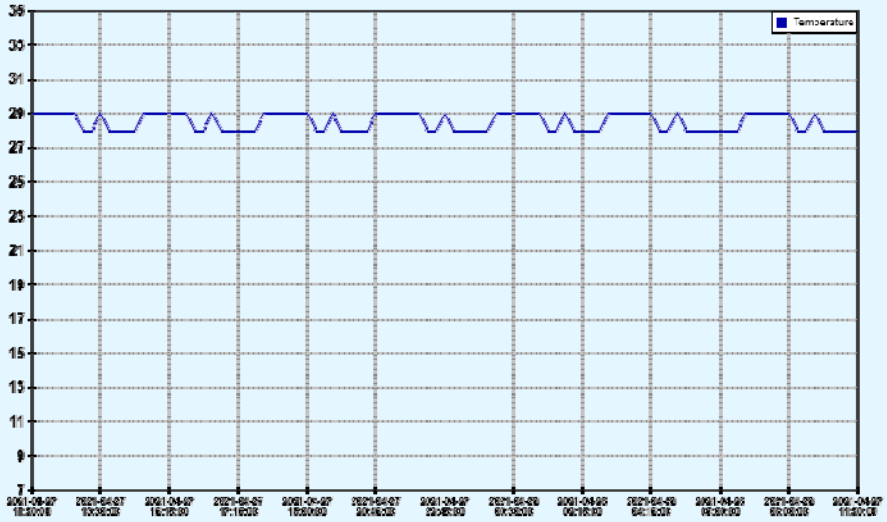
Logger ID 912005 Record Count 97

Temperature

Sensor ID

Range: -20 to 60 Deg. C

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
28	28.5051	29	Deg. C				

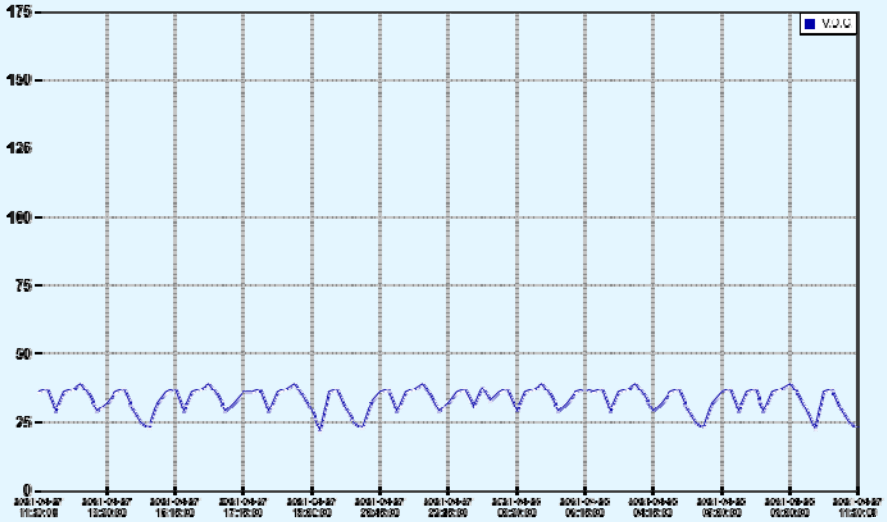


V.O.C.

Sensor ID

Range: 0 to 50000 ppb

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
22	33.3608	39	ppb				



Environmental Report

Start: 5/23/2021 3:30 PM End: 5/24/2021 3:30 PM

Collected by:

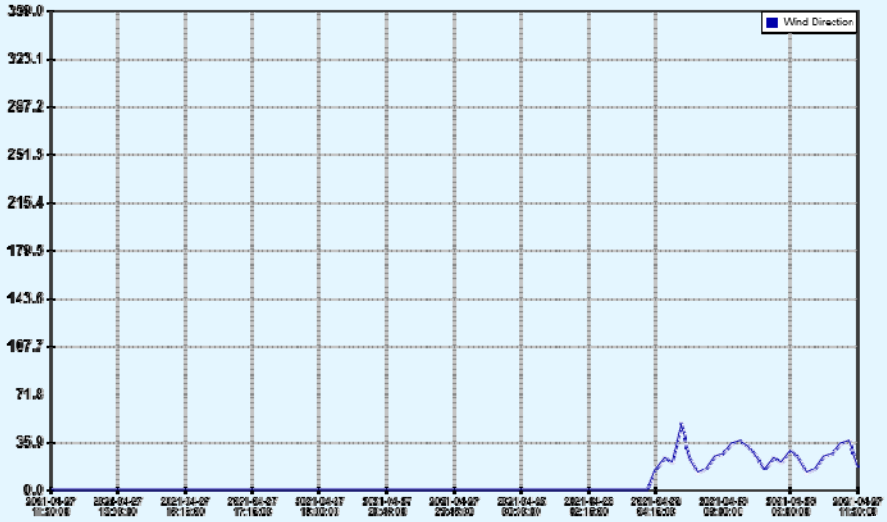
Logger ID 912005 Record Count 97

Wind Direction

Sensor ID

Range: 0 to 359 Deg.

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
0	6.47422	49	Deg.				

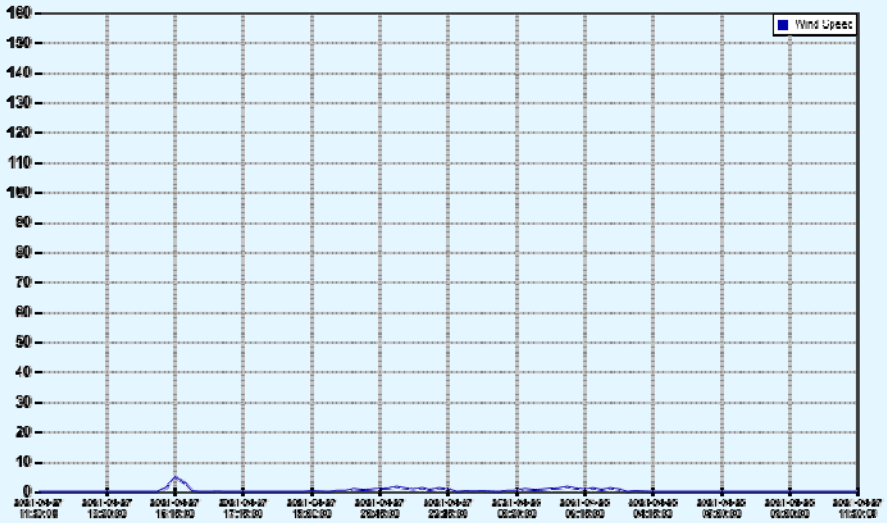


Wind Speed

Sensor ID

Range: 0 to 160 kph

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
0	.364948	5	kph				



Environmental Report

Start: 5/23/2021 3:30 PM End: 5/24/2021 3:30 PM

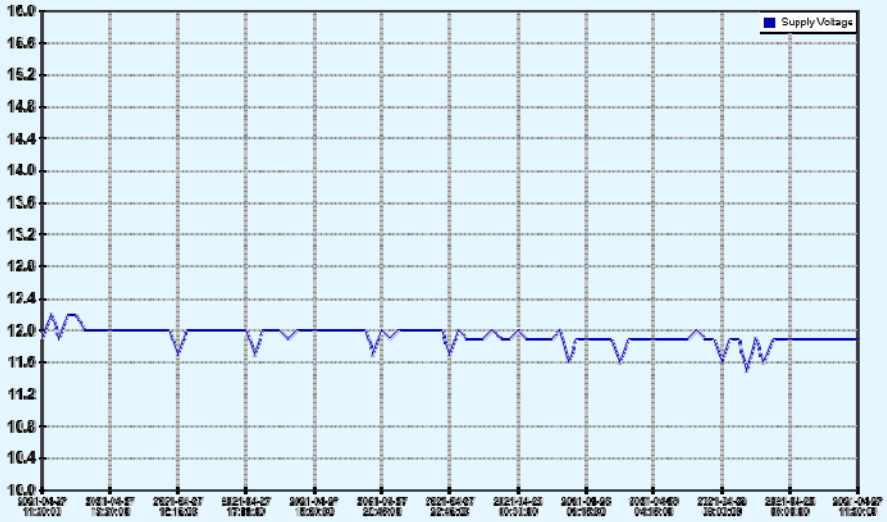
Collected by:

Logger ID 912005 Record Count 97

Batt. Supply Voltage Batt. Sensor ID

Range: 10 to 16 V

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
11.5	11.9288	12.2	V				



(2) Laboratory Result Data

Laboratory results for the water

Environmental Quality Management

No.233,Block 23,Sayee Pin Lane,Thuwanna,Thingungyun Township,Yangon.
Ph:(95)1 2330291,(95) 1 2331417,(95) 9 5016606,Fax:(95) 1 2333994
E-mail : contact@eqm-myanmar.com,onhmarmay@eqm-myanmar.com
Website:www.eqm- myanmar.com

Certificate of Analysis

Report Number: EQM-	**Date:**
Client Information Client Name: **International Environmental Management Co., Ltd** Client ID : Registration Time: Contact : **9964254801** Testing Purpose : -	**Sample Information** Sample ID : Sample Name **: Effluent Water** Sample Type/ Source : Sampling Date & Time : Sample Location :

Sr.	Quality Parameters	Results	Units	Emission Standard	Remark
1.	BOD	37	mg/L	≤ 50	Normal
2.	COD	454	mg/L	≤ 250	Above the limit
3.	Total Nitrogen	58.8	mg/L	0.01	Above the limit
4.	Total Phosphorus	1.305	mg/L	2	Normal
5.	TSS	51	mg/L	≤ 50	Above the limit
6.	Oil and grease	3	mg/L	≤ 10[d]	Normal
7.	pH	7.84	pH		
8.	ORP	91.7	mvORP		
9.	DO	39	%		
10	EC	2.352	mS/cm		
11.	Turbidity	49.8	FNU		
12.	Temp	24.65	Deg C		
13.	TDS	1176	ppm		
14.	Salinity	1.21	PSU		
15.	Pressure	14.538	Psi		

Tested by	Checked by	Approved by
Soe Thu Aung Lab Technician	Tin Nwe Htwe Lab Consultant	Dr. Ohnmar May Tin Hlaing Environmental Consultant

NG = No Guideline LOD = Limit of detection ND = Not Detected

Environmental Quality Management

No.233,Block 23,Sayee Pin Lane,Thuwanna,Thingungyun Township,Yangon.
Ph:(95)1 2330291,(95) 1 2331417,(95) 9 5016606,Fax:(95) 1 2333994
E-mail : contact@eqm-myanmar.com,onhmarmay@eqm-myanmar.com
Website:www.eqm- myanmar.com

Certificate of Analysis

Report Number: EQM-	**Date:**
Client Information Client Name :**International Environmental Management Co., Ltd** Client ID : Registration Time: Contact : **9964254801** Testing Purpose : -	**Sample Information** Sample ID : Sample Name : **Storm water** Sample Type/ Source : Sampling Date & Time : Sample Location :

Sr.	Quality Parameters	Results	Units	Emission Standard	Remark
1.	BOD	1	mg/L	≤ 50	Normal
2.	COD	41	mg/L	≤ 250	Normal
3.	Total Nitrogen	3.52	mg/L	0.01	Above the limit
4.	Total Phosphorus	0.362	mg/L	2	Normal
5.	TSS	< 10	mg/L	≤ 50	Normal
6.	Oil and Grease	1	mg/L	≤ 10^{d}	Normal
7.	pH	7.77	pH		
8.	ORP	102.2	mvORP		
9.	DO	60.3	%		
10	EC	1.165	mS/cm		
11.	Turbidity	11	FNU		
12.	Temp	29.73	Deg C		
13.	TDS	582	ppm		
14.	Salinity	0.57	PSU		
15.	Pressure	14.530	Psi		

Tested by	Checked by	Approved by
Soe Thu Aung Lab Technician	Tin Nwe Htwe Lab Consultant	Dr. Ohnmar May Tin Hlaing Environmental Consultant

NG = No Guideline LOD = Limit of detection ND = Not Detected

Environmental Quality Management

No.233,Block 23,Sayee Pin Lane,Thuwanna,Thingungyun Township,Yangon.
Ph:(95)1 2330291,(95) 1 2331417,(95) 9 5016606,Fax:(95) 1 2333994
E-mail : contact@eqm-myanmar.com,onhmarmay@eqm-myanmar.com
Website:www.eqm- myanmar.com

Certificate of Analysis

Report Number: EQM-	**Date:**
Client Information Client Name :**International Environmental Management Co., Ltd** Client ID : Registration Time: Contact : **9964254801** Testing Purpose : -	**Sample Information** Sample ID : Sample Name : **Thantwe river** Sample Type/ Source : Sampling Date & Time : Sample Location :

Sr.	Quality Parameters	Results	Units	Emission Standard	Remark
1.	BOD	0	mg/L	≤ 50	Normal
2.	COD	1500	mg/L	≤ 250	Above the limit
3.	Total Nitrogen	<0.5	mg/L	0.01	Above the limit
4.	Total Phosphorus	0.031	mg/L	2	Normal
5.	TSS	5	mg/L	≤ 50	Normal
6.	Oil and grease	12	mg/L	≤ 10^{d}	Above the limit
7.	pH	7.77	pH		
8.	ORP	21.6	mvORP		
9.	DO	49.4	%		
10	EC	0.01	mS/cm		
11.	Turbidity	12	FNU		
12.	Temp	31.93	Deg C		
13.	TDS	5796	ppm		
14.	Salinity	6.53	PSU		
15.	Pressure	14.610	Psi		

Tested by	Checked by	Approved by
		
Soe Thu Aung Lab Technician	Tin Nwe Htwe Lab Consultant	Dr. Ohnmar May Tin Hlaing Environmental Consultant

NG = No Guideline LOD = Limit of detection ND = Not Detected

Environmental Quality Management

No.233,Block 23,Sayee Pin Lane,Thuwanna,Thingungyun Township,Yangon.
Ph:(95)1 2330291,(95) 1 2331417,(95) 9 5016606,Fax:(95) 1 2333994
E-mail : contact@eqm-myanmar.com,onhmarmay@eqm-myanmar.com
Website:www.eqm- myanmar.com

Certificate of Analysis

Report Number: EQM-	**Date:**
Client Information Client Name :**International Environmental Management Co., Ltd** Client ID : Registration Time: Contact : **9964254801** Testing Purpose : -	**Sample Information** Sample ID : Sample Name : **Ann Taw village** Sample Type/ Source : Sampling Date & Time : Sample Location :

Sr.	Quality Parameters	Results	Units	Emission Standard	Remark
1.	BOD	4	mg/L	≤ 50	Normal
2.	COD	26	mg/L	≤ 250	Normal
3.	Total Nitrogen	1.31	mg/L	0.01	Above the limit
4.	Total Phosphorus	0.127	mg/L	2	Normal
5.	TSS	21	mg/L	≤ 50	Normal
6.	Oil and grease	6	mg/L	≤ 10^{d}	Normal
7.	pH	7.87	pH		
8.	ORP	88.6	mvORP		
9.	DO	50.5	%		
10	EC	0.2	mS/cm		
11.	Turbidity	0	FNU		
12.	Temp	30.76	Deg C		
13.	TDS	83	ppm		
14.	Salinity	0.08	PSU		
15.	Pressure	14.635	Psi		

Tested by	Checked by	Approved by
Soe Thu Aung Lab Technician	Tin Nwe Htwe Lab Consultant	Dr. Ohnmar May Tin Hlaing Environmental Consultant

NG = No Guideline LOD = Limit of detection ND = Not Detected

Environmental Quality Management

No.233,Block 23,Sayee Pin Lane,Thuwanna,Thingungyun Township,Yangon.
Ph:(95)1 2330291,(95) 1 2331417,(95) 9 5016606,Fax:(95) 1 2333994
E-mail : contact@eqm-myanmar.com,onhmarmay@eqm-myanmar.com
Website:www.eqm- myanmar.com

Certificate of Analysis

Report Number: EQM-	**Date:**
Client Information Client Name :**International Environmental Management Co., Ltd** Client ID : Registration Time: Contact : **9964254801** Testing Purpose : -	**Sample Information** Sample ID : Sample Name : **No.(8) ward, Thantwe** Sample Type/ Source : Sampling Date & Time : Sample Location :

Sr.	Quality Parameters	Results	Units	Emission Standard	Remark
1.	BOD	12	mg/L	≤ 50	Normal
2.	COD	20	mg/L	≤ 250	Normal
3.	Total Nitrogen	0.79	mg/L	0.01	Above the limit
4.	Total Phosphorus	0.029	mg/L	2	Normal
5.	TSS	< 10	mg/L	≤ 50	Normal
6.	Oil and Grease	2	mg/L	≤ 10[d]	Normal
7.	pH	7.87	pH		
8.	ORP	56.7	mvORP		
9.	DO	39.6	%		
10	EC	0.3	mS/cm		
11.	Turbidity	0	FNU		
12.	Temp	28.42	Deg C		
13.	TDS	150	ppm		
14.	Salinity	0.14	PSU		
15.	Pressure	14.661	Psi		

Tested by	Checked by	Approved by
Soe Thu Aung Lab Technician	Tin Nwe Htwe Lab Consultant	Dr. Ohnmar May Tin Hlaing Environmental Consultant

NG = No Guideline LOD = Limit of detection ND = Not Detected

Environmental
Quality
Management

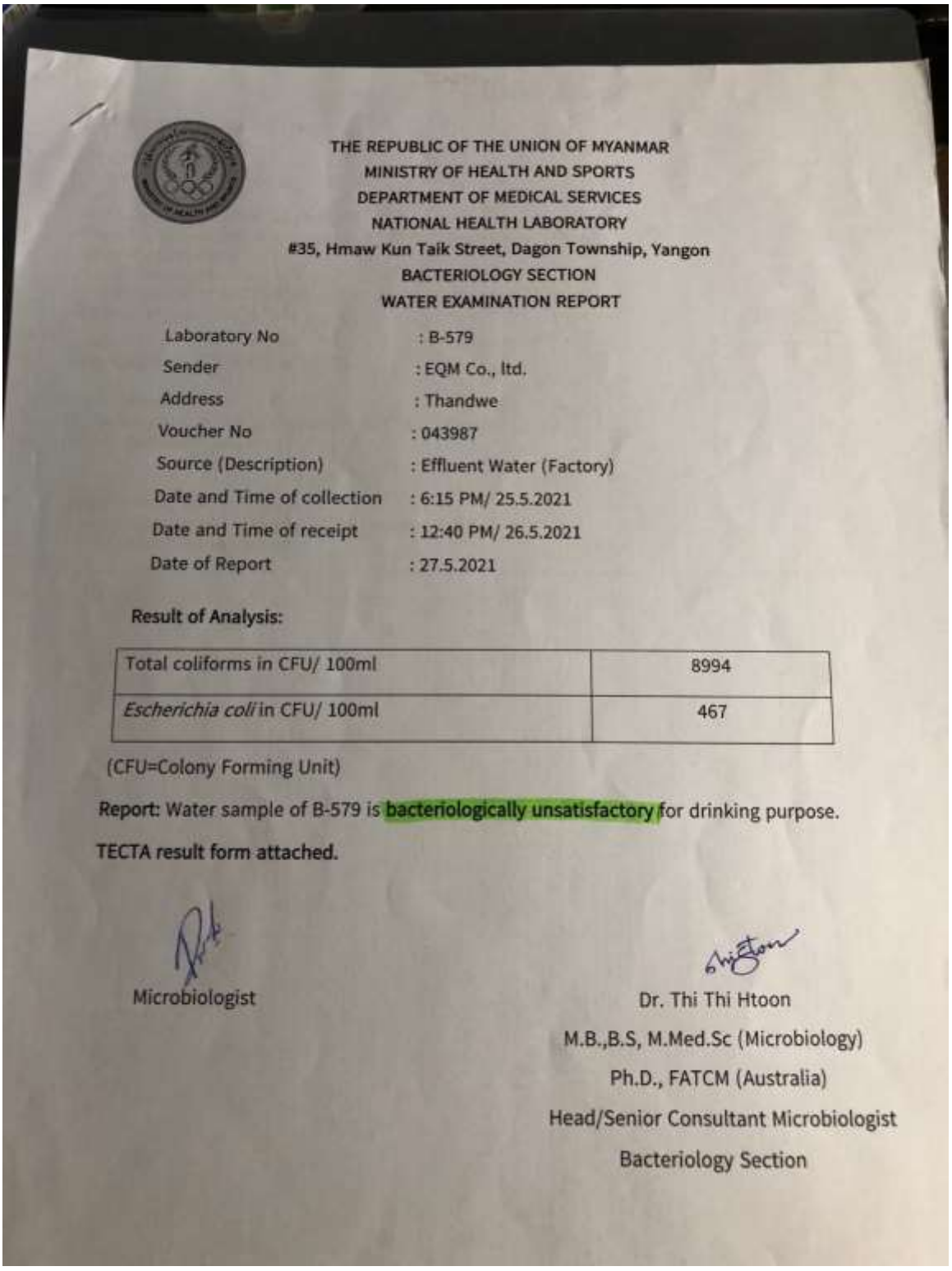
No.233,Block 23,Sayee Pin Lane,Thuwanna,Thingungyun Township,Yangon.
Ph:(95)1 2330291,(95) 1 2331417,(95) 9 5016606,Fax:(95) 1 2333994
E-mail : contact@eqm-myanmar.com,onhmarmay@eqm-myanmar.com
Website:www.eqm- myanmar.com

Certificate of Analysis

Guideline Reference

Guidelines for drinking-water quality, fourth edition, WHO, 2011
https://www.who.int/water_sanitation_health/publications/2011/dwq_guidelines/en/

The Drinking Water Standards and Health Advisories, USEPA, 2018 March
https://www.epa.gov/sites/production/files/2018-03/documents/dwtable2018.pdf



THE REPUBLIC OF THE UNION OF MYANMAR
MINISTRY OF HEALTH AND SPORTS
DEPARTMENT OF MEDICAL SERVICES
NATIONAL HEALTH LABORATORY
#35, Hmaw Kun Taik Street, Dagon Township, Yangon
BACTERIOLOGY SECTION
WATER EXAMINATION REPORT

Laboratory No	: B-579
Sender	: EQM Co., ltd.
Address	: Thandwe
Voucher No	: 043987
Source (Description)	: Effluent Water (Factory)
Date and Time of collection	: 6:15 PM/ 25.5.2021
Date and Time of receipt	: 12:40 PM/ 26.5.2021
Date of Report	: 27.5.2021

Result of Analysis:

Total coliforms in CFU/ 100ml	8994
Escherichia coli in CFU/ 100ml	467

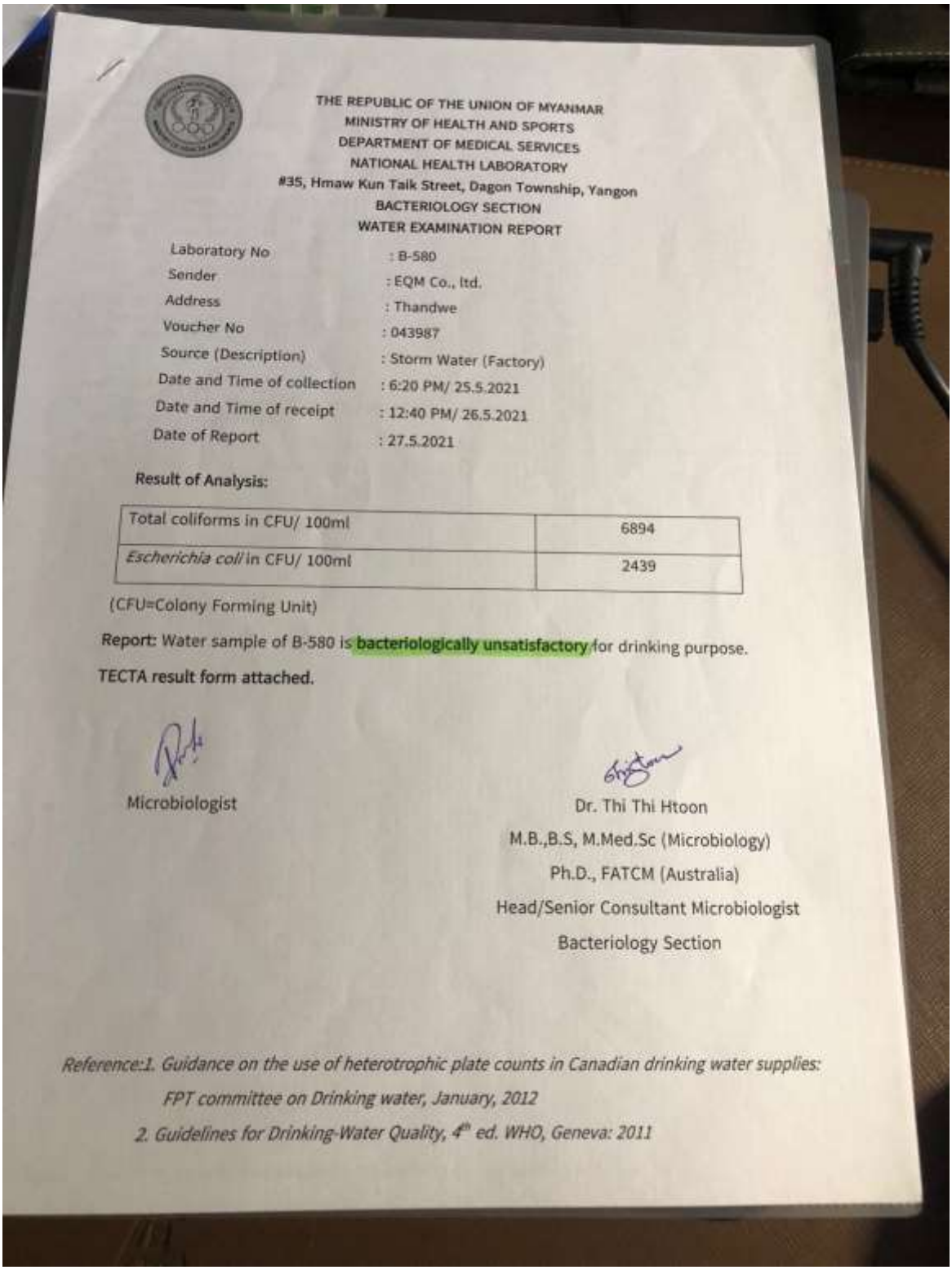
(CFU=Colony Forming Unit)

Report: Water sample of B-579 is bacteriologically unsatisfactory for drinking purpose.

TECTA result form attached.

Microbiologist

Dr. Thi Thi Htoon
M.B.,B.S, M.Med.Sc (Microbiology)
Ph.D., FATCM (Australia)
Head/Senior Consultant Microbiologist
Bacteriology Section



THE REPUBLIC OF THE UNION OF MYANMAR
MINISTRY OF HEALTH AND SPORTS
DEPARTMENT OF MEDICAL SERVICES
NATIONAL HEALTH LABORATORY
#35, Hmaw Kun Taik Street, Dagon Township, Yangon
BACTERIOLOGY SECTION
WATER EXAMINATION REPORT

Laboratory No	: B-580
Sender	: EQM Co., ltd.
Address	: Thandwe
Voucher No	: 043987
Source (Description)	: Storm Water (Factory)
Date and Time of collection	: 6:20 PM/ 25.5.2021
Date and Time of receipt	: 12:40 PM/ 26.5.2021
Date of Report	: 27.5.2021

Result of Analysis:

Total coliforms in CFU/ 100ml	6894
Escherichia coli in CFU/ 100ml	2439

(CFU=Colony Forming Unit)

Report: Water sample of B-580 is **bacteriologically unsatisfactory** for drinking purpose.

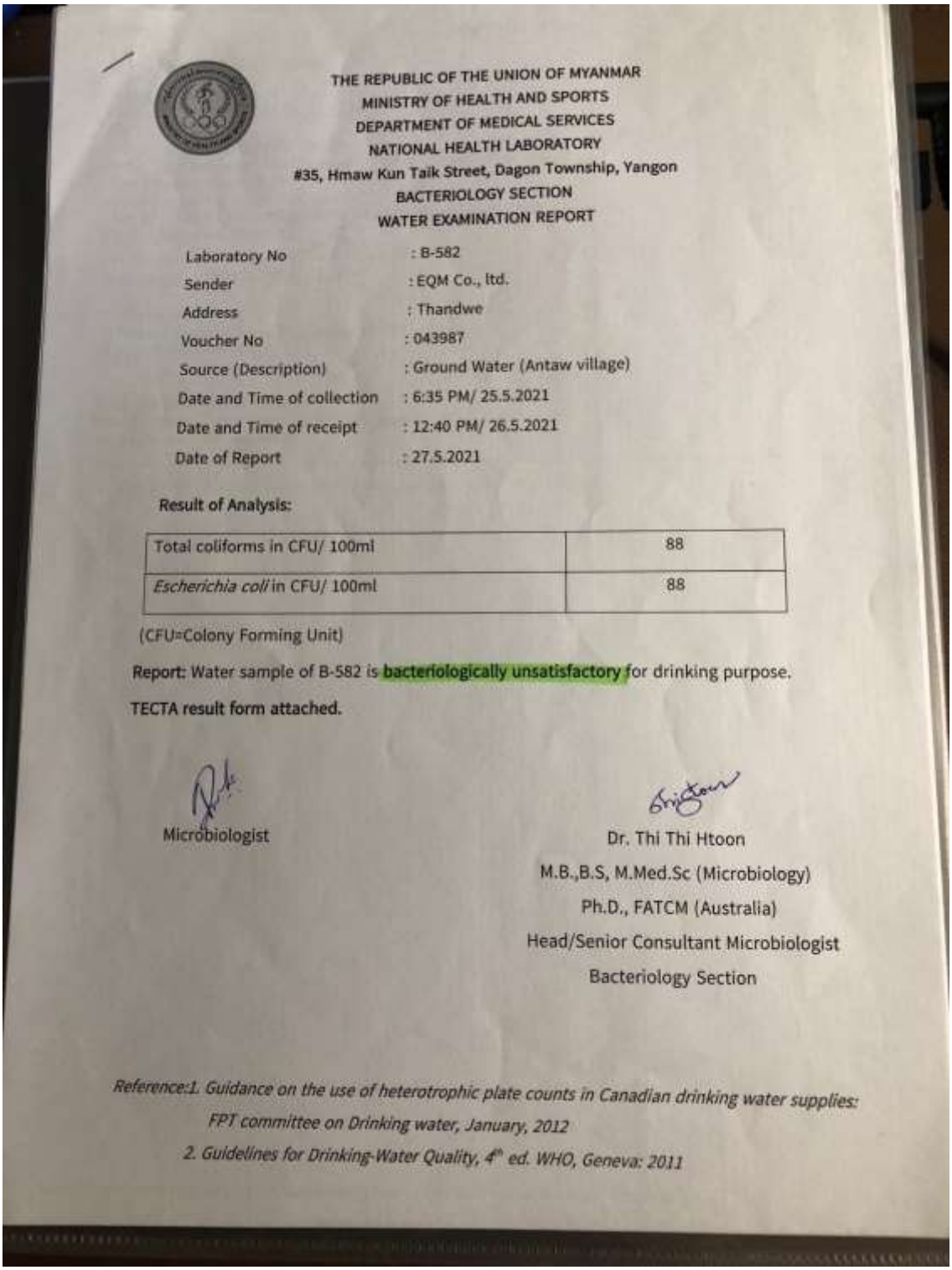
TECTA result form attached.

Microbiologist

Dr. Thi Thi Htoon
M.B.,B.S, M.Med.Sc (Microbiology)
Ph.D., FATCM (Australia)
Head/Senior Consultant Microbiologist
Bacteriology Section

Reference:1. Guidance on the use of heterotrophic plate counts in Canadian drinking water supplies: FPT committee on Drinking water, January, 2012

2. Guidelines for Drinking-Water Quality, 4th ed. WHO, Geneva: 2011



THE REPUBLIC OF THE UNION OF MYANMAR
MINISTRY OF HEALTH AND SPORTS
DEPARTMENT OF MEDICAL SERVICES
NATIONAL HEALTH LABORATORY
#35, Hmaw Kun Taik Street, Dagon Township, Yangon
BACTERIOLOGY SECTION
WATER EXAMINATION REPORT

Laboratory No	: B-582
Sender	: EQM Co., ltd.
Address	: Thandwe
Voucher No	: 043987
Source (Description)	: Ground Water (Antaw village)
Date and Time of collection	: 6:35 PM/ 25.5.2021
Date and Time of receipt	: 12:40 PM/ 26.5.2021
Date of Report	: 27.5.2021

Result of Analysis:

Total coliforms in CFU/ 100ml	88
Escherichia coli in CFU/ 100ml	88

(CFU=Colony Forming Unit)

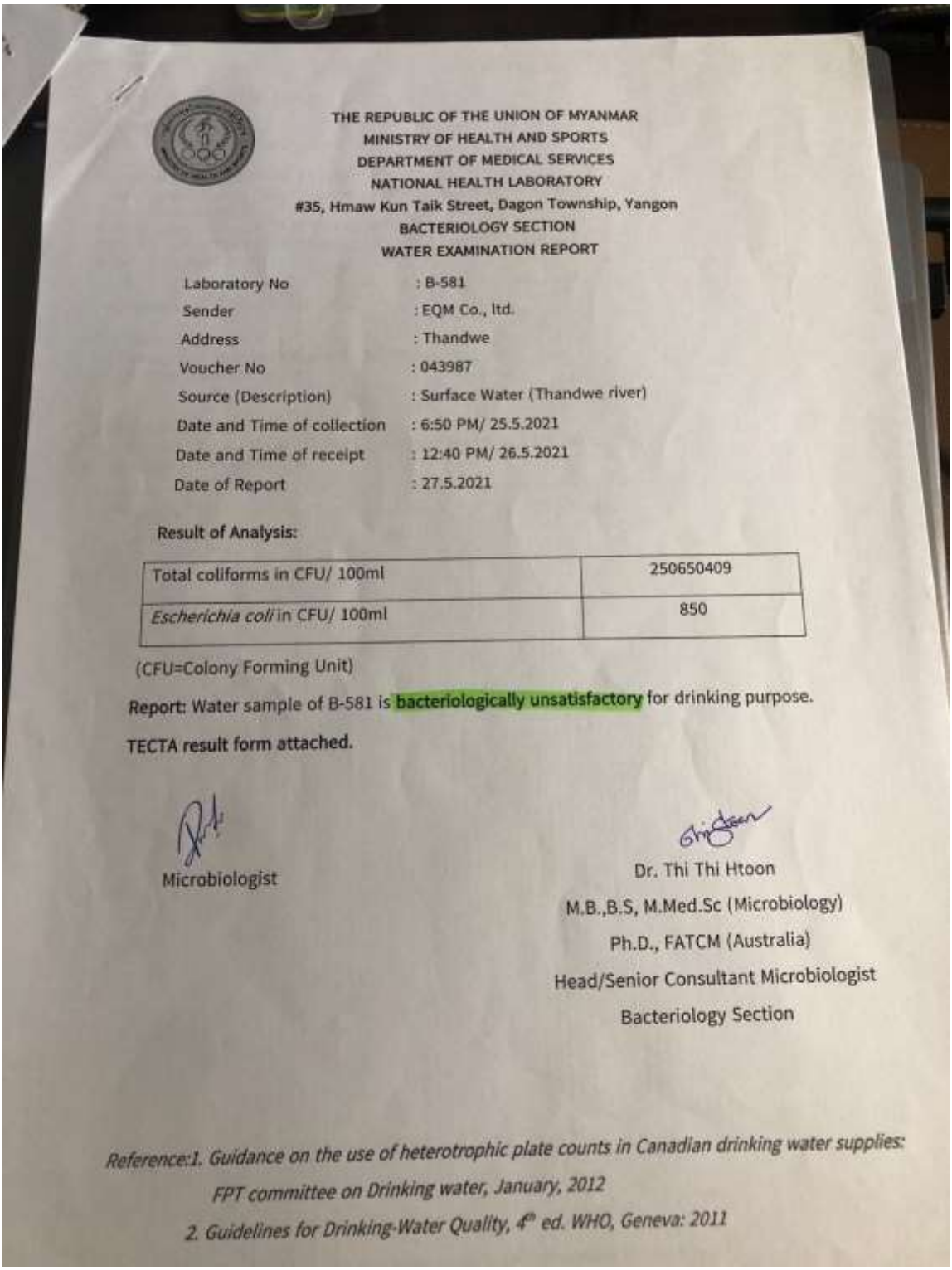
Report: Water sample of B-582 is **bacteriologically unsatisfactory** for drinking purpose.

TECTA result form attached.

Microbiologist

Dr. Thi Thi Htoon
M.B.,B.S, M.Med.Sc (Microbiology)
Ph.D., FATCM (Australia)
Head/Senior Consultant Microbiologist
Bacteriology Section

Reference:1. Guidance on the use of heterotrophic plate counts in Canadian drinking water supplies: FPT committee on Drinking water, January, 2012
2. Guidelines for Drinking-Water Quality, 4th ed. WHO, Geneva: 2011



THE REPUBLIC OF THE UNION OF MYANMAR
MINISTRY OF HEALTH AND SPORTS
DEPARTMENT OF MEDICAL SERVICES
NATIONAL HEALTH LABORATORY
#35, Hmaw Kun Taik Street, Dagon Township, Yangon
BACTERIOLOGY SECTION
WATER EXAMINATION REPORT

Laboratory No	: B-581
Sender	: EQM Co., ltd.
Address	: Thandwe
Voucher No	: 043987
Source (Description)	: Surface Water (Thandwe river)
Date and Time of collection	: 6:50 PM/ 25.5.2021
Date and Time of receipt	: 12:40 PM/ 26.5.2021
Date of Report	: 27.5.2021

Result of Analysis:

Total coliforms in CFU/ 100ml	250650409
Escherichia coli in CFU/ 100ml	850

(CFU=Colony Forming Unit)

Report: Water sample of B-581 is **bacteriologically unsatisfactory** for drinking purpose.

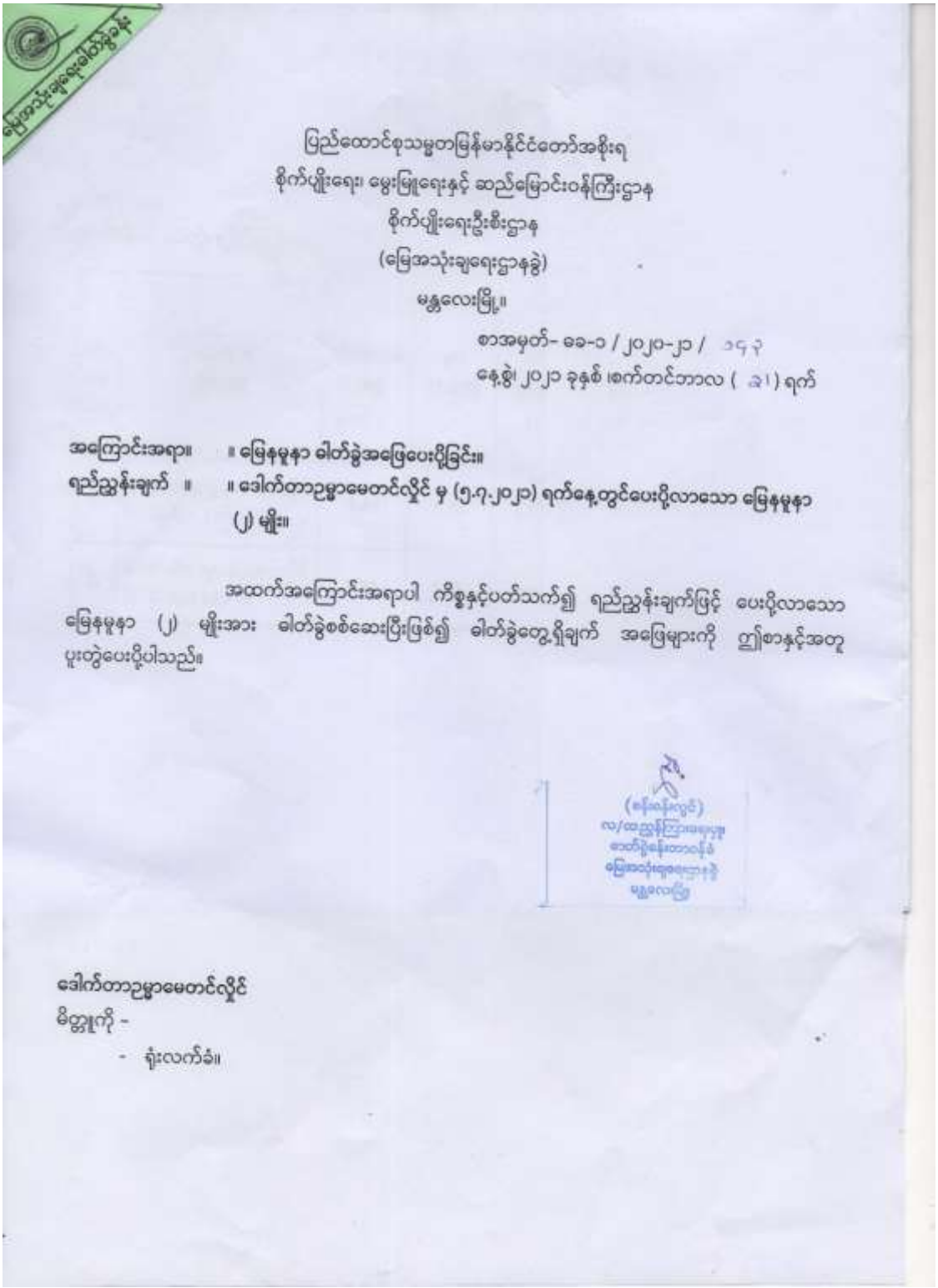
TECTA result form attached.

Microbiologist

Dr. Thi Thi Htoon
M.B.,B.S, M.Med.Sc (Microbiology)
Ph.D., FATCM (Australia)
Head/Senior Consultant Microbiologist
Bacteriology Section

Reference:1. Guidance on the use of heterotrophic plate counts in Canadian drinking water supplies:
FPT committee on Drinking water, January, 2012
2. Guidelines for Drinking-Water Quality, 4th ed. WHO, Geneva: 2011

Laboratory results for the soil



ပြည်ထောင်စုသမ္မတမြန်မာနိုင်ငံတော်အစိုးရ
စိုက်ပျိုးရေး၊ မွေးမြူရေးနှင့် ဆည်မြောင်းဝန်ကြီးဌာန
စိုက်ပျိုးရေးဦးစီးဌာန
(မြေအသုံးချရေးဌာနခွဲ)
မန္တလေးမြို့။

စာအမှတ်- ခခ-၁ / ၂၀၂၀-၂၁ / ၁၄၃
နေ့စွဲ၊ ၂၀၂၁ ခုနှစ် ၊စက်တင်ဘာလ (၃၊) ရက်

အကြောင်းအရာ။ ။ မြေနမူနာ ဓါတ်ခွဲအဖြေပေးပို့ခြင်း။
ရည်ညွှန်းချက် ။ ။ ဒေါက်တာဥမ္မာမေတင်လှိုင် မှ (၅.၇.၂၀၂၁) ရက်နေ့တွင်ပေးပို့လာသော မြေနမူနာ (၂) မျိုး။

အထက်အကြောင်းအရာပါ ကိစ္စနှင့်ပတ်သက်၍ ရည်ညွှန်းချက်ဖြင့် ပေးပို့လာသော မြေနမူနာ (၂) မျိုးအား ဓါတ်ခွဲစစ်ဆေးပြီးဖြစ်၍ ဓါတ်ခွဲတွေ့ရှိချက် အဖြေများကို ဤစာနှင့်အတူ ပူးတွဲပေးပို့ပါသည်။

(စန်းစန်းလွင်)
လ/ထ ညွှန်ကြားရေးမှူး
ဒေတိုခွဲနေရာဝန်ထမ်း
မြေအသုံးချရေးဌာနခွဲ
မန္တလေးမြို့

ဒေါက်တာဥမ္မာမေတင်လှိုင်
မိတ္တူကို -
- ရုံးလက်ခံ။

DEPARTMENT OF AGRICULTURE (LAND USE)

SOIL ANALYTICAL DATA SHEET

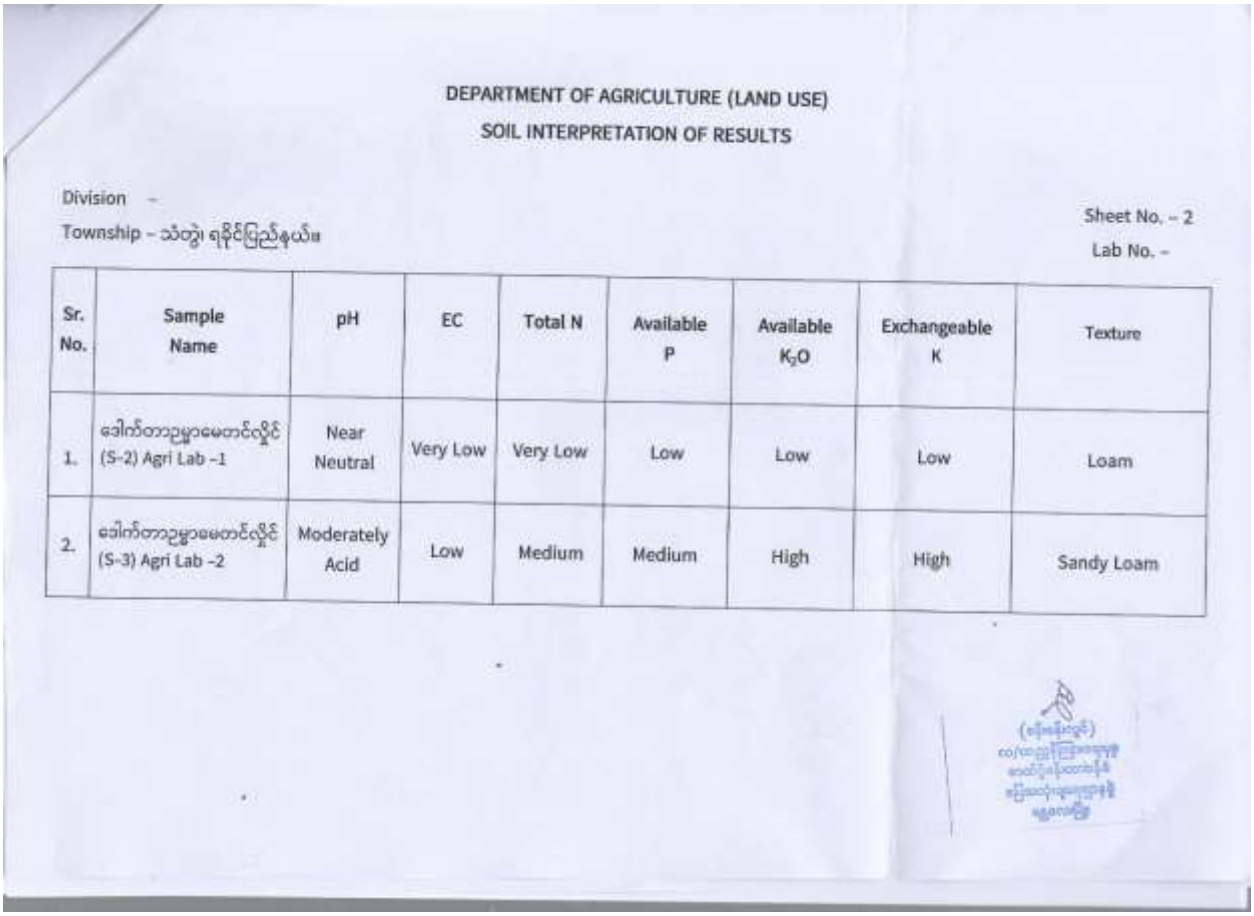
Division –

Township – သံတွဲ၊ ရခိုင်ပြည်နယ်

Sheet No. – 1

Lab No. –

Sr. No.	Sample Name	Moisture (%)	pH (1:2.5)	EC (1:5)	Total N (%)	Available P(ppm)	Available K_2O (mg/ 100g	Exchangeable Cations K^+(meq / 100 g)	Texture		
									Sand (%)	Silt (%)	Clay (%)
1.	ဒေါက်တာဥမ္မာမေတင်လှိုင် (S-2) Agri Lab –1	3.45	6.72	0.07	0.09	6.82	8.69	0.18	40.3	43.83	15.87
2.	ဒေါက်တာဥမ္မာမေတင်လှိုင် (S-3) Agri Lab –2	3.74	5.43	0.18	0.25	30.51	34.26	0.73	58.3	31.03	12.67



DEPARTMENT OF AGRICULTURE (LAND USE)

SOIL INTERPRETATION OF RESULTS

Division –

Township – သံတွဲ၊ ရှိုင်ဖြည်နယ်။

Sheet No. – 2

Lab No. –

Sr. No.	Sample Name	pH	EC	Total N	Available P	Available K_2O	Exchangeable K	Texture
1.	ခေါက်တာဥမ္မာမေတာင်ရှိုင် (S-2) Agri Lab –1	Near Neutral	Very Low	Very Low	Low	Low	Low	Loam
2.	ခေါက်တာဥမ္မာမေတာင်ရှိုင် (S-3) Agri Lab –2	Moderately Acid	Low	Medium	Medium	High	High	Sandy Loam

ANNEX (B)

Impact Assessment Methodology

1 Environmental Aspect Identification

The ISO's standard for Environmental Management Systems (EMS), ISO 14001 defines an environmental aspect as:

'*An element of an organization's activities, products or services that can interact with the environment or social make-up of nearby communities.*'

This definition has been used in the identification of the proposed project's environmental, health, socio-economic, and legal aspects. To identify project aspects, all proposed activities, have been considered in terms of their direct or indirect potential to:

- Breach relevant policy, legal and administrative frameworks including Government Agreement and national legislation, relevant international legislation, standards and guidelines, and corporate environmental policy and management systems
- Interact with the existing natural environment including its physical and biological elements
- Interact with the existing socio-economic environment

1.1 Environmental Impact Assessment

An impact may result from any of the project activities identified during the screening process. The potential impacts will be assessed for their significance level (high, medium, low) based on standard criteria as outlined below.

1.1.1. Criteria for Environmental Impact Assessment

Identify criteria to specify the impact significance level (high, medium, and low) by considering magnitude, extent, duration, reversibility/irreversibility, and likelihood of impact.

1.1.2 Method for Environmental Impact Assessment

The assessment of environmental impacts for key issues consists of 3 main stages as shown below:

1. Identification of impact source and receptor
2. Impact prediction
3. Assessment of the impact significance level

Stage 1: Identification of Impact Source and Receptor

1. Identify project activities that are impact sources and explain details of these activities.
2. Identify the impact receptors and explain environmental settings of impact receptors.

Stage 2: Impact Prediction

Impact prediction is the assessment of the characteristics and magnitude of expected impacts. There are many methods used for impact assessment, and the selection of a method for impact assessment for the proposed project depends on the type of environment and resources, time, existing technology, and experience of the assessor.

Stage 3: Assessment of Impact Significance Level

Once project impacts have been predicted it is important to assess the potential significance of the impact. Impact significance is rated as insignificant, low, medium, or high. The rating of impact

significance is based on both objective and subjective criteria. The following criteria in **Table 1.1**will be considered when rating impact significance:

Table 1.1: Impact Significance Criteria

Criteria	Significance
Extent	This is the extent to which the potential impact may eventually extend (e.g., local, regional, national, global), as well as to geographical location. Regional impacts, those impacts that extend beyond the project area, are generally considered more significant than local impacts that are limited to the project area. Extent should also consider the people affected, such as how pervasive will the impact be across the population? This criterion should be used to assess both the percentage of the population affected and the extent to which it will affect different social or demographic groups, particularly the vulnerable groups (e.g. children, elderly, pregnant women, indigenous population, etc.).
Local sensitivity	To what extent is the local population aware of the impact? Is it perceived to be significant? Has it been a source of previous concern in the community? Are there any organized interest groups likely to be mobilized by the impact?
Expense	Costs and expenses required to reduce or clean up impacts, the responsible person or entity who has to bear the expenses, and whether the expense has to be paid immediately or not.
Potential of related organizations	Current potential of related organizations to manage impacts, whether supporting laws and regulations exist, and whether local governmental organizations can handle the impacts.
Risk	The probability/predictability of an impact occurring. For many environmental impacts, qualitative assessments would be appropriate (high, medium, low).
Duration and Frequency	The length of time (day, year, decade) for which an impact may be discernible, and the nature of that impact over time (is it intermittent and/or repetitive?). Long-term impacts, those impacts that may last for an extended period of time are considered more significant than short-term impacts that are limited to a few days or months.
Reversibility	How long will it take to mitigate the impact by natural or man-induced means? Reversible impacts, those impacts that will be fully reversed after the activity that causes the impact ceases, are considered less significant than irreversible impacts.

Criteria	Significance
Magnitude	The probable severity of each potential adverse impact, in the sense of degree, extensiveness or scale. Magnitude takes into account numerous factors related to the environmental resource and socio-cultural values. This is largely subjective based upon values of society. Another important factor in determining the magnitude of an impact is the degree of variation from baseline conditions.
Uncertainty	In addition, the level of confidence of impact predictions reflects the quality and quantity of available site-specific data, experience from implementation of similar projects, and the expertise of the EIA project team. Where all else is similar, assessments that are more speculative in nature for any particular project activity are generally given a higher impact rating than ones based on a higher level of confidence.
Cumulative Impacts	Whether occurring impacts will be added on existing impacts or not, which will be used to consider whether the cumulative impacts exceed the maximum acceptable level or not.
Overall Impacts	Based on the above, each impact is rated as low, medium or high. Medium or high impacts are ones that require specific mitigation and/or monitoring measures.
Residual Impact	Impacts that remain after mitigation measures have been applied.
Mitigation Measure	An action that prevents, eliminates, reduces or compensates for a negative impact.

The significance of an impact is evaluated using Scaling and Matrix methods. Each impact is assessed based on its "characteristics" and "importance".

Significance = Characteristics x Importance

Characteristic is determined using magnitude, extent, and duration of impacts. Importance of impact is determined using the values of resources and environment that are lost or decreased as a result of the project activities.

There are three stages for evaluation of impact significance level.

Stage 1: Analysis of Impact Characteristics

Analysis of impact characteristics is determined using the sum of magnitude, extent, and duration of the impact. The criteria for impact assessment are shown in

Table 1.2.

Impact Characteristics = Magnitude + Extent + Duration

Table 1.2: General Criteria and Scoring for Environmental Impact Characteristics (1)

Level	Definition	Score
Magnitude		
High	• Exceed the standard values	3

	• Major change in the original structure of environmental system, ecosystem or baseline.	
Medium	• Less than the standard values • Change some factors in environmental system, ecosystem or baseline, but does not change the structure.	2
Low	• Less than the standard values • Small change in some factors of the environmental system, ecosystem, or baseline but does not change the structure.	1
Insignificant	• Less than the standard values • No change in the environmental system, ecosystem, from baseline.	0

Extent		
High	• Area of impact is beyond the 2-km radius of associated facilities/stations. • Impact extends to regional and national level.	3
Medium	• Area of impact is beyond the project area but is in a limited area, for example the area of impact is outside a safety zone but within the 2-km radius of associated facilities.	2
Low	• Area of impact is in the immediate area of the project activity or within a safety zone	1
Insignificant	• Area of impact is not discernible	0
Duration		
High (long-term duration)	• Permanent impact • Impact will remain after well abandonment. • Impact occurs in long-term duration	3
Medium	• Impact can be reversible overtime. • Period of impact occurrence is within the project period. • Impact occurs over mid-term duration	2
Low (short-term duration)	• Impact can be quickly reversible. • Period of impact occurrence is less than the project period. • Impact occurs in short-term duration	1
Total Score for Impact Characteristics = Magnitude + Extent + Duration		

Source: Adapted from Nigel Rossouw (2003); Sippe (1999); and United Nations University (2007)

Total score for impact characteristics (Magnitude + Extent + Duration) will be compared with the criteria and scoring as shown in **Table 1.3**.

Table 1.3: Example of Criteria and Scoring for Environmental Impact Characteristics (2)

Total Score for Impact Characteristics[1]	Impact Level	Definition	Score
7-9	High	Have impact or cause large changes.	3
4-6	Medium	Have impact or cause medium changes.	2
1-3	Low	Have impact or cause small changes.	1
0	Insignificant	No impact	0

Stage 2: Analysis of Importance of Impact

Importance of impact is determined from the values of resources and environment that are lost or decreased from the project activities by comparison with criteria and scoring for importance of impact as shown in **Error! Reference source not found..**

Table 1.4: Example of Criteria and Scoring for Importance of Impact

Impact Level	Definition	Score
High	• Impact disturbs pristine area which has conservation value. • Impact damages rare/endangered species. • Impact is significant on a national or international level.	3
Medium	• Impact disturbs the area which has a value for conservation. • Impact causes a significant change in species and diversity. • Impact is important at a local or regional level.	2
Low	• Impact disturbs degraded area or causes a small disturbance in the area which has a value for conservation. • Impact causes a small change in species and diversity.	1

Stage 3: Impact Significance Evaluation

The significance of environmental impact will be evaluated by using Matrix Method as shown in **Table 1.5**. The calculation of impact significance is shown below:

Significance = Characteristics x Importance

Table 1.5: Evaluation of Significance Level of Environmental Impact

Significance Level of Environmental Impact			Characteristic		
			Low	Medium	High
			1	2	3
Importance	Low	1	Low (1)	Low (2)	Low (3)
	Medium	2	Low (2)	Medium (4)	Medium (6)
	High	3	Low (2)	Medium (6)	High (9)

The results from the evaluation of impact significance will be further used to specify mitigation measures. Examples of definition of impact significance level are shown in **Table 1.6**.

Table 1.6: Example for Definition of Impact Significance Level

Significance Level	Score	Definition
High	7-9	Impact is classified as severe and can cause other effects. Impact can not be protected and resolved by any mitigation measures or scarcely protected or resolved.
Medium	4-6	Impact causes a change that affects values of resources and environment. It needs to have mitigation measures for protecting or decreasing the impacts and include monitoring measures.
Low	1-3	Impact causes a change in resources and environment but this change does not decrease values of these resources and environment. Impact can be protected and resolved by implementation of general measures.

Source: Adapted from Nigel Rossouw (2003) and Sippe (1999)

2. Socio-eco and Health aspect

2.1Socio-economic Baseline

EQM social scientists will define socio-economic baseline conditions. The survey begins with an introductory statement providing background on the proposed project. Interviews with the stakeholders will be then carried out using a pro-forma questionnaire. The questionnaires covered the following main topics:

- Population and Demographics
- Culture, local administration, decision making and planning
- Livelihoods
- Labor and working conditions
- Employment
- Energy
- Health and nutrition
- Water, sanitation and hygiene
- Household structure and migration
- Household assets
- Land ownership
- Infrastructure, resources and services
- Transportation
- Communication
- Environmental and cultural heritage
- Experiences with previous projects
- Awareness, attitudes, and perceptions on four categories: physical resources, ecological resources, human use values, quality-of-life values and cultural heritage.

2.2 Sample Size

The social survey team used to choose a two-stage stratified random sampling for the sampling population. The first-stage unit is ‘village’ and the second- stage unit is ‘household’. At the first stage, the sampled villages will be allocated proportionately to stratum size in each of the selected townships and the primary sampling units (PSU) will be chosen from each township. At the second stage, the households will be selected by using systematic random sampling**.**

The TARO YAMANE formula will be used to determine the correct number of households to be surveyed in the project area with rural household (Population) as shown below. The sample size will reach a standard deviation of less than 3% and confidence interval will be higher than 95% at aggregate level.

$$N = \frac{N}{(1+Ne^2)}$$

n=sample size, N=population, e=error

Socio-economic Environment Survey Method

- Secondary data
- Site Visit
- Focus group meeting (closed and open ended questionnaire)
- Key informant interview (closed and open ended questionnaire)
- Household surveys

2.3 Social Impact Assessment

The evaluation of socio-economic impacts is based on quantitative and qualitative data, and the use of professional judgment. Factors used to analyze for scale of social impacts are similar to the criteria used for environmental impact analysis such as likelihood of impact, direct/indirect impact, duration, reversibility, and magnitude of impact which also takes into consideration threats perceived as significant by the affected communities.

Additional criteria factors include consideration for changes to the assets that households depend upon for their livelihoods, manageability of the change and potential for it to lead to further changes beyond the control of the project, and whether the effects are acute or chronic.

2.1 Social Impact Significance

Significance of social impact is ranked Beneficial, Low, Medium or High using criteria below (**Table 2-1**).

Table 2-1: Social Impact Category

Impact Category	Social Impact
Beneficial	Improvement in the ability of household or settlement to maintain or improve its livelihood/store of assets Enhancement in quality or availability of resource leading to improvement in quality of life. For example: • Enhancement in physical capital including availability of infrastructure • Enhancement in social capital, including skills for future employment • Enhancement of relationship between the Thantwe Marine Products Co.,Ltd (TMP) project developer and communities • Enhancement in health and safety of local population
Low	Possible short term decrease in availability of resource or access to infrastructure not affecting livelihood Possible short term decrease in quality of life of household or settlement not affecting long term outcomes No effect on human health No discernable long term effect of the local economy Impacts which are long lasting but to which the community is able to adapt, such as increased access to information/possible slow cultural change/changes in economic structure

Impact Category	Social Impact
Medium	Potential effect or perceived effect on ability of household to maintain livelihood/store of assets in short term Potential reduction in quality of life in short term Potential disruption to lifestyle in short term Perception of missed opportunity to improve Possible decrease or perceived decrease in access to infrastructure to which community is unable to adapt in the short term Negative effect on human health which can be contained and is therefore short term with no increased mortality Impacts which may result in high levels of complaint in the short term
High	Negative effect on safety of humans or animals Negative effect on human health which cannot be contained or results in increased mortality Effect or perceived effect on ability of household to maintain livelihood/store of assets to an extent not acceptable to affected people Permanent or perceived permanent reduction in quality of life Permanent cultural change to which the communities are unable to adapt Widespread perception of missed opportunity to improve quality of life, resulting in frustration and disappointment Result in tensions with communities which lead to sabotage by local communities, or outbreaks of violence between workers and communities

3 Health Impact Assessment

Potential impact on health is assessed for both project workers and nearby community. Factors used to analyze for scale of health impacts are similar to the criteria used for environmental and social impact analysis, such as extent, duration, reversibility, and magnitude of impact.

Additional factors unique to health aspects are considered as provided in **Table 3.1**

Table 3.1: Factors for Determining Scope and Type of Health Impact

Factor	Detail
Hazardous Chemicals or Health Threats	• Chemicals: heavy metals, toxic organic compounds. • Physical: noise and vibration • Biological: viruses, bacteria • Ergonomic: lifting of heavy material and/or inappropriate posture • Psychological: stress, annoyance, and nuisance • Social: lack of community relationship
Environment	• Change of environmental quality: water quality, air quality • Change of utilization or acquiring resources: water use • Physical: noise, dust, radiation, vibration
Factors of Exposure	• Exposure pathway: eating or skin exposure • Risk group: worker(s) or people around the project area
Health Impact	• Death rate • Injury rate from infectious diseases or non-infectious diseases, acute or chronic effects • Rate of emotional impact, stress • Injuries and accidents • Impacts on the next generation • Impacts to high-risk groups • Stimulate or enhance the severity of the disease • Cumulative impacts
Impacts on Medical Services	• Overall increase in the demand for health care • Demand for special health care • Changes to existing medical services
Impacts on Society and Human well being	• Impacts on income, employment, and socio-economics • Impacts on local income, industrial sector, and local agriculture • Impacts on migration and settlement • Impacts on environmental health • Impacts on society, culture, and lifestyle • Impacts on education • Impact on social support network • Benefits to health from project operations

Source: World Health Organization

3.1 Health Impact Significance

Method of assessing the significance of health impact is similar to a risk assessment method. The procedure involves setting criteria for analysis of probability/likelihood of health impact occurring and the severity of impact on health.

3.2 Probability of Occurrence

Likelihood is presented in the form of the probability that the impact might affect health. Considerations are based on past data, the probability of exposure or threat from the environment, and the previous data both at a domestic or international level (**Table 3.2**).

Table 3.2: Criteria for Likelihood of Causing Health Impact

Incident Potential Rating	Score	Definition
Very low	1	No evidence that the situation occurs
Low	2	Can occur by theory, but no report of occurrence in the region or abroad
Medium	3	1 time occurrence in Myanmar or abroad from the development of a similar project
High	4	Occurred more than 1 time in Myanmar or abroad from the development of a similar project
Very high	5	Have evidence of situation occurring during project operation in the same project, and occurred in Myanmar or abroad

Note: The definition might be adjusted depending on discretion of expertise and project characteristic.
Source: Adaptation from Department of Health, Philippines, available from http://doh.gov.ph/ehia.htm (2009)

3.3 Severity of Consequence

Severity of consequences is set by analysis of the severity of heath impacts, considering the worst case scenario (**Table 3-4**).

Table 3-4: Criteria for Severity of Consequences on Health

Severity of Consequences	Score	Definition
No significance	1	**No injuries or illness:** no effect on work or lifestyle and does not cause illness in the community
Low	2	**Minor injuries or illnesses**: effect on work or lifestyle: requires 2-3 days for recovery - Cause(s) of disease has a slight or short-term effect (skin irritation, food poison from bacteria)
Medium	3	**Medium injuries or illness:** effect on work or lifestyle: long-term/continued effect on the community - Causes of disease have moderate effects on health (loud noises or disturbances, hazards from environmental performance).
High/serious	4	**Permanent illness: (large of population exposure group)**

Severity of Consequences	Score	Definition
		- Causes severe disease, which can cause loss or death of workers or at-risk groups (such as cancer from some chemical).
Very high/deadly	5	**The multiplied effect** (large of population exposure group/ over local governmental organizations can handle impacts) - Cause(s) of disease(s) enhance the severity of impact (toxic chemical are cause of cancer, especially if the contaminate is in air and water, i.e. heavy metals).

Note: The definition might be adjusted depending on discretion of expertise and project characteristic.
Source: Adaptation from Department of Health, Philippines, available from http://doh.gov.ph/ehia.htm (2009)

3.4 Health Assessment Matrix

The significance level of health impact is rated by comparing the likelihood and severity of impact using a Matrix Method (from very low to very high) as shown in **Table 3.5**. The meanings of the significance levels are described in **Table 3.6**.

Table 3.5: Significance Rating of Health Impact

Health Impact Significance Matrix			Likelihood				
			Very low	Low	Medium	High	Very high
			1	2	3	4	5
Severity of Consequences	Insignificant	1	Low (1)	Low (2)	Low (3)	Medium (4)	Medium (5)
	Low	2	Low (2)	Medium (4)	Medium (6)	Medium (8)	High (10)
	Medium	3	Low (3)	Medium (6)	Medium (9)	High (12)	High (15)
	High/ Crisis	4	Medium (4)	Medium (8)	High (12)	High (16)	Very high (20)
	Very high/death	5	Medium (5)	Hig h (10)	High (15)	Very high (20)	Very high (25)
			Significance Rating				

Note: 1. Significance Rating = Likelihood x Severity of Consequences
1.The definition might be adjusted depending on the discretion of expertise and project characteristics.
Source: Adaptation from the Department of Health, Philippines, available from http://doh.gov.ph/ehia.htm (2009)

Table 3.6: Health Impact Significance Levels

Risk Level	Rating	Definition
Low	1-3	Acceptable level without controlling impacts/ does not require additional management.
Medium	4-9	Acceptable level/but must be controlled to prevent increased risk to unacceptable levels.
High	10-16	Unacceptable level/ the impact must be managed/must be reduced to an acceptable level.
Very High	17-25	Unacceptable level/ the impact must be managed/ reduced to an acceptable level immediately.

Note: The definition of risk significance might be adjusted depending on the discretion of expertise and project characteristics following the HIA guideline criteria in the HIA guidelines (ONEP, 2008).
Source: Adaptation from the Department of Health, Philippines, available from http://doh.gov.ph/ehia.htm (2009)

3.5 Impacted and Vulnerable Groups

As the length of the proposed gas pipeline is substantial crossing over four divisions/states in Myanmar covering different ethnographic regions with varying economic and social conditions, any resulting impacts are expected to be non-homogenous. Therefore, it will be important to assess potential impacts and provide specific community level mitigation measures based on local conditions as well as individual household conditions.

4 Environmental and Social Risk Assessments

Environmental, social, and health risk assessment includes a qualitative and, where appropriate, a quantitative evaluation of risks to help further define the probability and potential consequences of potentially major hazardous events, and to evaluate the significance of areas that might be impacted by events. The main objective is to find the most acceptable method of undertaking the project while minimizing the risk to people and the environment.

4.1 Determination of Risk

Risk associated with the PTTEP MOGE-3 project will be determined by assessing the probability of an event occurring and the significance of its occurrence. An “event” is identified as unplanned or accidental activity. The methodology used in risk assessment is described below.

4.2 Probability of Occurrence

The probability of a specific event occurring can be determined either in terms of historical precedence or by calculation. Probability has been categorized as shown in **Table 4.1**.

Table 4.1: Recommended Categories for Probability/Frequency Screening

Probability of Occurrence						
Likelihood	<1 in 100,000	1 in 5,000 – 100,000	1 in 100 – 5000	1 in 10 – 100	1 in 1 – 10	1 in 1
Frequency	<Once in 100 Projects	Once in 50-100 Projects	Once in 10-50 Projects	Once in 1-10 Projects	Once per Project	> Once per project
	Remote	Unlikely	Quite Likely	Likely	Very Likely	Definite
	0	1	2	3	4	5

4.3 Consequence of Occurrence

The consequence of an event occurring is determined according to a number of themes:

- Environment (physical and ecological)
- Society (including socio-economic)
- Health and Safety
- Company Reputation

Each of these has a set of pre-defined criteria associated with them which classify the level of consequence (**Table 4.2**).

Table 4.2: Categories for Consequence of Occurrence

	Issues				**Level of Consequence**
	Environment	**Society**	**Health and Safety**	**Reputation**	
Consequence	Regional scale, long-term impact	Civil unrest; closure of plant	Multiple off-site and on-site fatalities or permanent disabilities	International concerns; major ventures terminated	A+
	Large scale, long-term (decades) impact	Public protest; disruption of production; loss of livelihood to sector	Multiple on site fatalities or permanent disabilities	Persistent national concerns; long-term impact	A
	Medium scale, medium term (years) impact	Official complaints; loss of livelihood > 10 persons	Major illness/ disability	Medium term national concerns; operations curtailed	B
	Medium scale, short-term (months) impact	Long-term nuisance; loss of income > 10 persons	Illness or injury leading to lost time > 4 days	Short-term regional concerns; close scrutiny	C

	Short-term (weeks) impact	Temporary nuisance; > 5 third party complaints	Illness or injury leading to lost time < 4 days	Short-term local concern; some impact on asset	D
	Localised (immediate area), temporary impact	Temporary nuisance; < 5 third party complaints	Illness or injury requiring first aid or medication	Local mention only; freedom to operate unaffected	E
	No measurable impact	No complaints	No injury or illness	No mention	F

4.4 Risk Matrix

The level of risk can then be identified by use of a matrix comparing probability with consequence (**Table 4.3**). The matrix consists of:

Scale of Consequence (column) from A+ to F to indicate increasing severity of the consequence if such risk occurred.

Scale of Probability (row) from zero to 5 on the basis of historical evidence, or calculation.

The intersection of the chosen column and rows determine the significance, or acceptability, of the risk as being "Low", "Medium", "High" or "Severe". If the risk is determined to be "Medium" or "High", it needs to be managed to reduce the frequency of occurrence or to mitigate any consequences to achieve a risk which is "As Low As Reasonably Possible" (ALARP). If the risk is determined to be "Severe" (i.e. unacceptable), specific actions must be developed to reduce the risk to an acceptable level, which may involve a full Quantified Risk Assessment (QRA).

Based on the results, specific systems for management of risks were recommended, as appropriate. It is also important to note that existing mitigation measures used by the Client in similar projects were considered throughout the risk assessment process.

Table 4.3: Environmental Hazard Assessment Matrix

						Frequency/Likelihood					
					Likelihood	<1 in 100,000	1 in 5,000 – 100,000	1 in 100 – 5000	1 in 10 – 100	1 in 1 - 10	1 in 1
					Frequency	<Once in 100 Projects	Once in 50-100 Projects	Once in 10-50 Projects	Once in 1-10 Projects	Once per Project	> Once per project
Consequence	**Environment**	**Society**	**Health and Safety**	**Reputation**		0 ***Remote***	1 ***Unlikely***	2 ***Quite***	3 ***Likely***	4 ***Very***	5 ***Definite***
	Regional scale, long-term impact	Civil unrest; closure of plant	Multiple off-site and on-site fatalities or permanent disabilities	International concerns; major ventures terminated	**A+**						**Severe**
	Large scale, long-term (decades) impact	Public protest; disruption of production; loss of livelihood to sector	Multiple on-site fatalities or permanent disabilities	Persistent national concerns; long-term impact	**A**						
	Medium scale, medium term (years) impact	Official complaints; loss of livelihood > 10 persons	Major illness/ disability	Medium term national concerns; operations curtailed	**B**				**High**		
	Medium scale,	Long-term nuisance; loss	Illness or injury	Short-term	**C**			**Medium**			

	short-term (months) impact	of income > 10 persons	leading to lost time > 4 days	regional concerns; close scrutiny							
	Short-term (weeks) impact	Temporary nuisance; > 5 third party complaints	Illness or injury leading to lost time < 4 days	Short-term local concern; some impact on asset	**D**						
	Localised (immediate area), temporary impact	Temporary nuisance; < 5 third party complaints	Illness or injury requiring first aid or medication	Local mention only; freedom to operate unaffected	**E**	**Low**					
	No measurable impact	No complaints	No injury or illness	No mention	**F**						

5 Mitigation of Potential Impacts

Mitigation is an integral component of the ESHIA process. Environmental Impact and Mitigation, and Social Impact and Mitigation, potentially significant impacts will be identified. For each of these impacts, mitigation measures will be defined to prevent and/or reduce the likelihood or magnitude of a negative impact and to enhance a positive impact.

The proposed mitigation measures take into account applicable guidelines, industry practices, expert judgement, design techniques and operational control. The project team, community and relevant stakeholders will be consulted to ensure that the mitigation measures are both practical and appropriate.

Examples of mitigation measures include:

- Avoiding areas of high sensitivity
- Measures in the original project design
- Engineering design solutions
- Alternative solutions to processes and methods to achieving objectives (i.e. methods of transporting materials, or recruitment of unskilled workers)
- Timing restrictions (i.e. near villages and schools)
- Operational control procedures
- Conservation management
- Management systems (i.e. reporting mechanisms for Community Liaison officers)
- Compliance and monitoring of contractors
- Development of policies and procedures (i.e. compensation plans for land/livelihoods)

Following assignment of mitigation measures, any impact that remains is termed a **residual impact**, as described below.

5.1 Residual Impacts

Any impacts remaining after mitigation measures are considered residual impacts. The significance level of the residual impact is reassessed using the same impact criteria applied to the environmental, social and health impact assessment above and re-rated (insignificant, low, medium, or high) as described in detail below.

5.2 Likelihood

To assign likelihood of residual impact, five criteria will be defined and ranked. This five-tiered likelihood ranking criteria are in line with international practices (e.g. Australian/New Zealand Risk Management Standard AS/NZS: 4360). The criteria for likelihood are shown in **Table** .

Table 5.1: Likelihood Categories and Rankings for Environmental, Social and Health Impacts

Ranking	Definition
5	The impact will occur under normal operating conditions.
4	The impact is very likely to occur under normal operational conditions.
3	The impact is likely to occur at some time under normal operating conditions.
2	The impact is unlikely to but may occur at some time under normal operating conditions.
1	The impact is very unlikely to occur under normal operating conditions but may occur in exceptional circumstances.

5.3 Residual Environmental Impact

The residual environmental impacts are assigned a level of significance based on the likelihood of the impact and the consequence of that impact. For each residual impact a consequence/severity ranking between 0 and 3 (insignificant, low, medium or high) has been assigned using the impact criteria used in environmental impact assessment above. The likelihood is assigned using **Table** . The significance level of residual environmental impact is then determined using the matrix below where L denotes a Low-level of impact, M a Medium-level and H a High-level (**Table 5.2**).

Table 5.2: Level of Residual Environmental Impact

Likelihood	0	1	2	3
5	L	M	H	H
4	L	L	M	H
3	L	L	M	M
2	L	L	L	M
1	L	L	L	L

Consequence/Severity

5.4 Residual Social and Health Impacts

As per environmental impacts, residual social and health impacts are any potential impacts remaining once mitigation measures have been implemented. However, in the case of socio-economic impacts, these may not be directly related to the aspects of the project, but may arise from unmet expectations or difficulties in communication (i.e. access to energy, or in relation to employment opportunities).

Once identified, these residual impacts will be assigned a level of significance for individuals or communities. Residual social and health impacts will be ranked, High, Medium, Low, according to the criteria used to evaluate social impact significance above in **Table 5.2.**

5.5 Addressing Residual Impacts

The following approach is applied to addressing environmental, social and health residual impacts.

High (H)

- Check that the residual impact has been subject to feasible and cost effective mitigation where possible
- Where no further reduction in impact levels can be made, it remains a High-level impact and which may therefore be subject to compensation or offsets

Medium (M)

- Check that the residual impact has been subject to feasible and cost effective mitigation and that no further measures are practicable

Low (L)

- Not mitigated further

6.7 Cumulative Impacts

The December 1998 IFC “Procedure for Environmental and Social Review of Projects” states that that an environmental assessment should also address cumulative impacts.

Cumulative Effects Assessment (CEA) is the process of assessing the incremental effects resulting from the combined influences of various actions. These actions can refer to either the

combined effects of discrete aspects of a project (e.g., effects on community health from cumulative exposure to air emissions, noise, traffic) and/or to the combined effects of other industries and developments, either existing or planned for in the future (e.g., cumulative impacts of air emissions from other activities or projects in the area). These incremental effects may be significant even though the effects of each action, when independently assessed, are considered insignificant.

The potential for cumulative impacts is of greatest concern for those aspects of the project where residual impacts are rated as medium or high.

6. Methodology for Socio-economic impact assessment

The following methodology has been applied to assess the socio-economic impacts of the project during construction, operation and decommissioning phases mainly on livelihoods, education, infrastructure, water quality, physical resources, biological resources, human use, quality of life and cultural heritage. Each source of impacts has been assessed by two parameters namely magnitude and Probability along with five scores assessment as well. Detail methodology can be seen in annex (A).

Table 6.1: Impact Assessment Parameters and its scores

Assessment	**Score**				
	1 (very low)	**2 (Low)**	**3 (Medium)**	**4 (High)**	**5 (Very High)**
Magnitude	Insignificant	Small and will have on the socio-economic environment	Moderate and will result in minor changes on community	High and will result in significant changes on community	Very high and will result permanent changes on community
Probability	Insignificant	Little socio-economic challenges	Indirect Socio-economic challenges	Direct socio-economic challenges	Direct and significance socioeconomic challenges

Then, significant rating is calculated by the following formula.
Significant point = Magnitude x Probability
Impact Significance Level: Based on the calculated significant point, impact significance can be categorized as follows;

Table 6.2: Impact Significance Levels

Risk level	Rating	Definition
Very low	1-3	No impacts occur.

Low	4-9	Acceptable level without controlling impacts/ does not require additional management.
Medium	10-16	Acceptable level/but must be controlled to prevent increased risk to unacceptable levels.
High	17-25	Unacceptable level/ the impact must be managed/must be reduced to an acceptable level.
Very High	Above 25	Unacceptable level/ the impact must be managed/ reduced to an acceptable level immediately.

Table 6.3: Analysis of Socio-economic Impact
(a) Construction phase

No.	Socio-economic impacts	Significance of potential socioeconomic impacts			Impact significance
		Magnitude	Probability	Impact significance	
The effect on Physical Resources					
1	Soil quality	3	4	12	Medium
2	Surface water quality	2	3	6	Low
3	Ground water quality	2	3	6	Low
4	Air quality	3	3	12	Medium
5	Noise	3	4	12	Medium
Effect on Biological Resources					
6	Forestry and conservation Areas	2	3	6	Low
7	Agriculture/Farming areas	3	4	9	Medium
8	Local animals	1	2	2	Very low
9	Pasture	1	2	2	Very low
10	Aquatic animals	1	2	2	Very low
Effect on human use					
11	Local fisheries	1	2	2	Very low
12	Local livestock	1	2	2	Very low
13	Local vegetation	3	3	9	Low
14	Local industry	1	2	2	Very low
15	Local transportation	3	3	9	Low
16	Local price	1	2	2	Very low
17	Recreation	1	2	2	Very low
18	Local economy	1	2	2	Very low
Effect on Quality of life					
19	Housing	1	2	2	Very low
20	Health	1	2	2	Very low
21	Education	1	2	2	Very low
22	Spiritual	1	2	2	Very low
23	Safety	3	3	9	Low
24	Crime	3	3	9	Low
25	Family Structure	1	2	2	Very low
26	Job opportunities	3	4	12	Medium
27	Income	3	3	9	Low
28	Scenery	1	2	2	Very low

29	Local culture	1	2	2	Very low
Effect on Cultural Heritage					
30	Religious building	1	2	2	Very low
31	Cemetery	1	2	2	Very low
32	Historic buildings	1	2	2	Very low

(b) Operation phase

No.	Socio-economic impacts	Significance of potential socioeconomic impacts			Impact significance
		Magnitude	Probability	Impact significance	
The effect on Physical Resources					
1	**Soil quality**	**3**	**3**	**9**	**Low**
2	**Surface water quality**	**2**	**2**	**4**	**Low**
3	**Ground water quality**	**2**	**2**	**4**	**Low**
4	**Air quality**	**3**	**4**	**12**	**Medium**
5	**Noise**	**3**	**3**	**9**	**Low**
Effect on Biological Resources					
6	**Forestry and conservation Areas**	**1**	**2**	**2**	**Very Low**
7	**Agriculture/Farming areas**	**1**	**2**	**2**	**Very Low**
8	**Local animals**	**1**	**2**	**2**	**Very low**
9	**Pasture**	**1**	**2**	**2**	**Very low**
10	**Aquatic animals**	**1**	**2**	**2**	**Very low**
Effect on human use					
11	**Local fisheries**	**1**	**2**	**2**	**Very low**
12	**Local livestock**	**1**	**2**	**2**	**Very low**
13	**Local vegetation**	**1**	**2**	**2**	**Very Low**
14	**Local industry**	**1**	**2**	**2**	**Very low**
15	**Local transportation**	**3**	**3**	**9**	**Low**
16	**Local price**	**1**	**2**	**2**	**Very low**
17	**Recreation**	**1**	**2**	**2**	**Very low**
18	**Local economy**	**1**	**2**	**2**	**Very low**
Effect on Quality of life					
19	**Housing**	**1**	**2**	**2**	**Very low**
20	**Health**	**2**	**2**	**4**	**Low**
21	**Education**	**1**	**2**	**2**	**Very low**
22	**Spiritual**	**1**	**2**	**2**	**Very low**
23	**Safety**	**3**	**3**	**9**	**Low**
24	**Crime**	**3**	**3**	**9**	**Low**
25	**Family Structure**	**1**	**2**	**2**	**Very low**
26	**Job opportunities**	**3**	**4**	**12**	**Medium**
27	**Income**	**3**	**3**	**9**	**Low**
28	**Scenery**	**1**	**2**	**2**	**Very low**
29	**Local culture**	**1**	**2**	**2**	**Very low**
Effect on Cultural Heritage					
30	**Religious building**	**1**	**2**	**2**	**Very low**
31	**Cemetery**	**1**	**2**	**2**	**Very low**
32	**Historic buildings**	**1**	**2**	**2**	**Very low**

(c) Decommission phase

No.	Socio-economic impacts	Significance of potential socioeconomic impacts			Impact significance
		Magnitude	Probability	Impact significance	
The effect on Physical Resources					
1	Soil quality	3	3	9	Low
2	Surface water quality	2	2	4	Low
3	Ground water quality	2	3	6	Low
4	Air quality	3	4	12	Medium
5	Noise	3	4	12	Medium
Effect on Biological Resources					
6	Forestry and conservation Areas	2	3	6	Low
7	Agriculture/Farming areas	3	3	9	Low
8	Local animals	1	2	2	Very low
9	Pasture	1	2	2	Very low
10	Aquatic animals	1	2	2	Very low
Effect on human use					
11	Local fisheries	1	2	2	Very low
12	Local livestock	1	2	2	Very low
13	Local vegetation	3	3	9	Low
14	Local industry	1	2	2	Very low
15	Local transportation	3	3	9	Low
16	Local price	1	2	2	Very low
17	Recreation	1	2	2	Very low
18	Local economy	1	2	2	Very low
Effect on Quality of life					
19	Housing	1	2	2	Very low
20	Health	1	2	2	Very low
21	Education	1	2	2	Very low
22	Spiritual	1	2	2	Very low
23	Safety	3	3	9	Low
24	Crime	3	3	9	Low
25	Family Structure	1	2	2	Very low
26	Job opportunities	3	4	12	Medium
27	Income	3	3	9	Low
28	Scenery	1	2	2	Very low
29	Local culture	1	2	2	Very low
Effect on Cultural Heritage					
30	Religious building	1	2	2	Very low
31	Cemetery	1	2	2	Very low
32	Historic buildings	1	2	2	Very low

Annex (C)

Public Consultation Questionnaires

Socio-Economic, Health and Environment Household Data Baseline and Attitude Survey

မေးခွန်းများဖြေဆိုရာတွင် အဖြေများအား ဝိုင်းရှင်းဖြေကြားပေးပါ။
အချို့ မေးခွန်းများအတွက်ကွက်လပ်ဖြည့်ရန် လေးထောင့်ကွက်ထားသောနေရာတွင် ဖြည့်ပေးပါ။

Introduction

Intro description

- **Thandwe Marine Production (TMP)**သည် ၁၉၉၆/၁၉၉၇ ခုနှစ်မှ ၂၀၂၁ ခုနှစ် ယနေ့ထိ ရခိုင်ပြည်နယ် **သံတွဲခရိုင်၊ သံတွဲမြို့၊ အံတော်ရေပင်ကွက်အတွင်းတွင်** ငါး၊ ပုစွန်လုပ်ငန်းများ လုပ်ကိုင်ဆောင်ရွက်သည့် **အဖွေးခန်းစက်ရုံ** ဖြစ်ပါသည်။ ဤစီမံကိန်းအတွက် စက်ရုံနှင့် နီးစပ်ရာဒေသခံများ မှ အိမ်ထောင်စု အချက်အလက်များ၊ စီးပွားရေးဆိုင်ရာ အခြေအနေ၊ အိမ်ထောင်စု ကျန်းမာရေး အခြေအနေ၊ အခြေခံအဆောက်အဦး၊ သယံဇာတနှင့် ဝန်ဆောင်မှုများ ၊ စီမံကိန်းအပေါ် သဘောပေါက်နားလည်မှုနှင့် သဘောထားအမြင်များ ကောက်ယူခြင်း ဖြစ်ပါသည်။

The purpose of this questionnaire is to collect general socio economic information and to obtain your perception and understanding of Proposed Project.

The main objective of the project is to review the community perception in **TMP**.

The survey will be carried out in the households, which are located approximately **2** km from **TMP**.

The Survey will focus on gaining household member information and attitudes including:

- The structure and demographics of the household
- Household living standard, employment, income and social and economic condition
- Household and individual health
- Information on the natural environment and human use of the environment
- Attitudes on the prospective positive and negative impacts of

I. HOUSEHOLD IDENTIFICATION

11. STATE/ DIVISION(ပြည်နယ်/တိုင်း)		| |
	1	| | |
	2	
	3	
	4	
	5	
	6	
	7	
	8	
13. SURVEY/HOUSEHOLD SAMPLE NUMBER _____		
14. NAME Of HOUSEHOLD HEAD အိမ်ထောင်ဦးစီး အမည်		
15. NAME OF RESPONDENT ဖြေဆိုသူ အမည်		| | | | |

I6	DATE OF VISITS:	| / | / |20
I7	ENUMERATOR: _____	SUPERVISOR _____

Enumerator's Remark: :.....

** indicates the question has skip (>>).

Module A: Household Member Characteristics

အခန်း-(၁) အိမ်ထောင်စု အချက်အလက်များ

	Q	Response categories	Response
Household Member Characteristics			
A1	Relationship to household head အိမ်ထောင်ဦးစီးနှင့် တော်စပ်ပုံ	Household head ဦးစီး ..... ၁ Spouse ဇနီး/ခင်ပွန်း ..... ၂ Son/daughter သား/သမီး ..... ၃ Parents/ parents in law မိဘ/ ယောကျ္ဖမ ..... ၄ Other relatives အခြား/တော်စပ်ပုံ ..... ၅ Not related မတော်စပ်ပါ ၆	| | |
A2	Gender ကျား/မ	Male ကျား ..... ၁ Female မ ၂	
A3	Age (of the last birthday) အသက် (ပြည့်ပြီး)	၁၅ -၂၀ ..... ၁ ၂၀ -၃၀ ..... ၂ ၃၀ - ၄၀ ..... ၃ ၄၀ - ၅၀ ..... ၄ ၅၀ - ၆၀ ..... ၅ ၆၀ - ၇၀ ..... ၆ ၇၀ နှင့် အထက်..... ၇	| |_|
A4	Race လူမျိုး	Kachin ကချင် ..... ၁ kayah ကယား ..... ၂ kayin ကရင် ..... ၃ Chin ချင်း ..... ၄ Mon မွန် ..... ၅ Rakhine ရခိုင် ..... ၆ Shan ရှမ်း ..... ၇ Burma ဗမာ ..... ၈ Indigenous ဒေသခံ တိုင်းရင်းသားများ ..... ၉ Others အခြား ၁၀	| |_|
A5	Religion ဘာသာ	Buddhist ဗုဒ္ဓဘာသာ..... ၁ Hindu ဟိန္ဒူဘာသာ..... ၂ Christian ခရစ်ယာန်ဘာသာ..... ၃ Muslim အစ္စလာမ်ဘာသာ..... ၄ Others အခြား ၅	| |_|
A6	How many family members do you have in your household including you? စုစုပေါင်း မိသားစုဝင် အရေအတွက်	☐ ဦး	

Vulnerable Persons in Family			
A7	Anybody over the age of 65 years? အိမ်တွင် အသက်၆၅ နှစ်အထက် လူကြီး ရှိပါသလား။	i. Yes ရှိပါသည်။	ii. No မရှိပါ။
A8	Any Disabled in the Household? (Adult) အိမ်တွင် မသန်စွမ်းသူ ရှိပါသလား။ (၁၆ နှစ်အထက်)	**(a)** i. Yes ရှိပါသည်။ ii. No မရှိပါ။	**(b) Type of Disability** Mobility/walking လမ်းမလျှောက်နိုင် ..... ၁ Loss of limb ခြေလက်အင်္ဂါ မစုံ ..... ၂ Blindness မျက်စိမမြင် ..... ၃ Loss of hearing နားမကြား ..... ၄ Other အခြား (***Please Specify***) ၅

** indicates the question has skip (>>).

A9	Any child who needs special care in the Household? အိမ်တွင် မသန်စွမ်းသူ ရှိပါသလား။ (၁၆ နှစ်အောက်)	**(a)** i. Yes ရှိပါသည်။ ii. No မရှိပါ။	**(b) Type of Disability** Mobility/walking လမ်းမလျှောက်နိုင် ..... ၁ Loss of limb ခြေလက်အင်္ဂါ မစုံ ..... ၂ Blindness မျက်စိမမြင် ..... ၃ Loss of hearing နားမကြား ..... ၄ Other အခြား (***Please Specify***) ၅

Occupation and Education				
A10	What is your primary occupation? အဓိကလုပ်ငန်းအမည်နှင့်တကွ ဖေါ်ပြပါ။	Farmer လယ်သမား.....၁ Livestock worker မွေးမြူရေး သမား.....၂ Fisherman ငါးဖမ်းသမား..... ၃ Forestry worker သစ်တော လုပ်ငန်း..... ၄ Sale worker အရောင်းဝန်ထမ်း..... ၅ Service worker ဝန်ဆောင်မှု လုပ်ငန်း ..... ၆ Skilled worker ကျွမ်းကျင် အလုပ်သမား..... ၇ Casual worker ကျပန်း အလုပ်သမား ..... ၈ Unpaid family worker မိသားစု အလုပ်သမား ..... ၉ Other (Specify) အခြား (ဖော်ပြပေးပါ)..... ၁၀		
A11	How much income do you earn per year? (kyats) သင်၏ တစ်နှစ်ဝင်ငွေ (ကျပ်)	Below 500,000 ငါးသိန်းအောက် .....၁ 500,001 – 1,000,000 ငါးသိန်းမှ ဆယ်သိန်း .....၂ 1,000,001 – 2,000,000 ဆယ်သိန်း မှ သိန်းနှစ်ဆယ် .....၃ 2,000,001 – 3,000,000 သိန်းနှစ်ဆယ် မှ သိန်းသုံးဆယ် .....၄ 3,000,001 - 5,000,000 သိန်းသုံးဆယ် မှ သိန်းငါးဆယ် .....၅ Above 5,000,000 သိန်းငါးဆယ် အထက် ၆		
A12	What education have you completed? ဖြေဆိုသူ၏ပြီးဆုံခဲ့သော ပညာရေး	KG သူငယ်တန်း ..... ၀ မူလတန်း ..... ၁ အလယ်တန်း ..... ၂ အထက်တန်း ..... ၃ 10th std. passed ဆယ်တန်းအောင် ..... ၄ Graduate (ဘွဲ့ရ) .....၅ Post Graduate ဘွဲ့လွန် .....၆ Under grad.Diploma ဒီပလိုမာ .....၁၃ Vocational certificate သင်တန်းဆင်းလက်မှတ်.....၁၄ Monastery ဘုန်းကြီးကျောင်းသင် ..... ၁၅ Never attended school ကျောင်းမနေ ၁၆		

** indicates the question has skip (>>).

A13	What is the highest level of education achieved in your household? မိသာစုအတွင်း အမြင့်မားဆုံး ပညာရေး	KG သူငယ်တန်း ..... ၀ မူလတန်း ..... ၁ အလယ်တန်း ..... ၂ အထက်တန်း ..... ၃ 10th std. passed ဆယ်တန်းအောင် ..... ၄ Graduate (ဘွဲ့ရ) .....၅ Post Graduate ဘွဲ့လွန် .....၆ Under grad.Diploma ဒီပလိုမာ .....၁၃ Vocational certificate သင်တန်းဆင်းလက်မှတ်.....၁၄ Monastery ဘုန်းကြီးကျောင်းသင် ..... ၁၅ Never attended school ကျောင်းမနေ ၁၆		| |_|

Module B: Agriculture and Livestock

Land and Agriculture		
B1	Total land holding size of Household လယ်ဧက မည်မျှပိုင်ဆိုင်ပါသနည်း။	
B2	What kind of agricultural land do you have? ပိုင်ဆိုင်သောလယ်ဧက အမျိုးအစား	Pasture Land စားကျက်မြေ ..... ၁ Fallow Land ဖုန်းဆိုးမြေ ..... ၂ Perennial Plantation နှစ်ရှည်ပင်စိုက်ပျိုးသော မြေ ..... ၃ Crop Land သီးနှံပင်စိုက်ပျိုးသော မြေ ..... ၄ Forest Land သစ်တောမြေ..... ၅ Other(Specify) အခြား (ဖော်ပြပေးပါ)..... ၆
B3	What is the main crop you grow? လွန်ခဲ့သောနှစ်က အဓိကသီးနှံ ထုတ်လုပ်မှု ဖော်ပြပေးပါ။	Rice: စပါးပင်..... ၁ Beans/Pulses: ပဲပင်..... ၂ Corn: ပြောင်းဖူးပင်..... ၃ Sesame: နမ်းပင်..... ၄ Vegetables:ဟင်းသီးဟင်းရွက်ပင် ..... ၅ Other: အခြား (ဖော်ပြပေးပါ) ၆
B4	Is any plot of land affected because of the project? စီမံကိန်းကြောင့် ပိုင်ဆိုင်သော လယ်ဧက မည်မျှ ထိခိုက်နိုင်ပါသနည်း။	☐ ဧက

Previous Land Acquisition (If applicable)			
B5	Any previous instances of land acquisition (in which you lost lands) လယ်ဧကဆုံးရှုံး ဖူးပါသလား။	i. Yes ဆုံးရှုံးဖူးပါသည်။ In case of the answer is "No", skip to the next section မဆုံးရှုံးဖူးပါက **တိရိစ္ဆာန်မွေးမြူရေး** မေးခွန်းသို့ ခုတြေပါ။	ii. No မဆုံးရှုံးဖူးပါ။
B6	Area of land lost in previous acquisition ဆုံးရှုံး သွားသော လယ်ဧက အရေအတွက် ကိုဖော်ပြပေးပါ။		
B7	Tentative year of acquisition မြေယာဆုံးရှုံးခဲ့သောနှစ်		
B11	Are you satisfied with the compensation for the affected land/assess ? If "No", could you please state the reason? လျော်ကြေးကိစ္စ နှင့်ပတ်သက်၍	i. Yes ရှိပါသည်။ ii. No မရှိပါ။	အဘယ့်ကြောင့်နည်း။

** indicates the question has skip (>>).

	ကျေနပ်မှုရှိပါသလား။ အကယ်၍ ကျေနပ်မှုမရှိပါက အဘယ့်ကြောင့်နည်း။		

Livestock တိရိစ္ဆာန်မွေးမြူရေး				
B12	Does Household own any livestock? တိရိစ္ဆာန်မွေးမြူ ပါသလား။		(a) Yes မွေးမြူ ပါသည်။	(b) No မမွေးမြူ ပါ။
	Type အမျိုးအစား	How many? အရေအတွက်	(a) For self-consumption ကိုယ်တိုင်စားသုံးရန် (b) For selling ရောင်းရန် (c) For rent ငှားရန် i. Agriculture စိုက်ပျိုးရေးအတွက်ငှားရန် ii. Ceremonies ပွဲတော်များအတွက်ငှားရန်	
i	Cow နွား			
ii	Buffalo ကျွဲ			
iii	Goats ဆိတ်			
iv	Poultry ကြက် ဘဲ ငန်း မန်ဒါလီ			
v	Pigs ဝက်			
vi	Horse မြင်း			
vii	Other **(Please specify)** အခြား (ဖော်ပြပေးပါ)			

Module C: Household Expenditures အခန်း-(၂) အိမ်ထောင်စု အသုံးစရိတ်များ

	Expenditure Items သုံးစွဲမှု အမျိုးအစားများ	(a)expenditure(kyats) (က)အသုံးစရိတ်(ကျပ်)	(b)unit (week/month/year) (တစ်ပတ် သို့မဟုတ် တစ်လ သို့မဟုတ် တစ်နှစ်လျှင်)	တစ်နှစ်အတွင်း ပုံမှန်မရှိသော အသုံးစရိတ်
C1	Tax အခွန်			____
C2	Cooking Fuel ထင်းမီးသွေး၊လောင်စာ			
C3	Education ပညာရေး			____
C4	Diesel/Petrol ဒီဇယ်၊ ဓာတ်ဆီ			
C5	Transport (when public transport) သယ်ယူပို့ဆောင်ရေး			____
C6	Telephone/Mobile phone တယ်လီဖုန်း/မိုဘိုင်းဖုန်း			____
C7	Entertainment ဖျော်ဖြေရေး			
C8	Healthcare/Medical Expenditure ကျန်းမာရေးစောင့်ရှောက်မှု၊ ဆေးဝါးကုန်ကျစရိတ်			
C9	Input Investment သွင်းအားစု/အရင်းအနှီး			
C10	Annual maintenance of house နှစ်စဉ် အိမ်ပြင်ဆင်ထိန်းသိမ်းခြင်း			____
C11	Loan repayment ချေးငွေ၊အတိုး			
C12	Cultural /religious expenses ယဉ်ကျေးမှု၊ဘာသာရေးဆိုင်ရာများ			
C13	Food ရိက္ခာ(စားစရိတ်)			
C14	Other (specify) အခြား			
C15	Total (system generated) စုစုပေါင်း			

Module D: Household Health Condition
မိသားစု ကျန်းမာရေး အခြေအနေ

Question		Response categories	Response
D1	In any day of the last month, did anyone in the family get diarrhea at least 3 times per day? လွန်ခဲ့သောလ က မိသားစု အတွင်း ၃ ကြိမ်နှင့် အထက် ဝမ်းလျှောမှု ရှိပါသလား။	i. Yes ရှိပါသည်။ ii. No မရှိပါ။	|

D2	In the last month, did anyone in your household get sick or ill? လွန်ခဲ့သော လ က မိသာစု အတွင်း နေမကောင်း ဖြစ်ပွားမှုရှိခဲ့ပါသလား။	i. Yes ရှိပါသည်။ ii. No မရှိပါ။	|
D3	What types of sickness are most common in your family? သင် မိသားစုအတွင်း အဖြစ်များဆုံး ရောဂါများအား အမည်နှင့်တကွ ဖော်ပြပါ	None မရှိပါ ... . **1** Malaria ငှက်ဖျား .... **2** Flu တုပ်ကွေး ..... **3** Diseases of digestive system အစာအိမ် ... **4** Muscle pain ကြွက်သားနာကျင် ..... **5** Diseases of the skin အရေပြားရောဂါ ..... **6** Hypertension သွေးတိုး .... **7** Ear, eye ,tooth disease မျက်စိ၊နား၊နှာခေါင်း ..... **8** Heart Disease) နှလုံးရောဂါများ **.....** 9 Cancer ကင်ဆာ ..... **10** Catch a cold အအေးမိ ..... **11** Sexually Transmitted Diseases လိင်မှတဆင့်ကူးစက်နိုင်သောရောဂါ ..... **12** Dengue Fever သွေးလွန်တုပ်ကွေး ရောဂါ ..... **13** COVID-19 ကိုဗစ် ရောဂါ..... **14**	| |
D4	Who did you see for the treatment/health services? ကျန်းမားရေး စောင့်ရှောက်မှု မည်သူနှင့် ခံယူပါသလဲ။	Government Hospital အစိုးရဆေးရုံ ..... **1** Private Hospital ပုဂ္ဂလိက ဆေးရုံ ..... **2** Private clinic (Doctor) ဆေးခန်း (ဆရာဝန် ထိုင်သော) ..... **3** Doctor (from other village) တခြားရွာမှ ဆရာဝန် ..... **4** Health Assistant ကျန်းမာရေးမှူး ....**5** Midwife/ LHV သာဖွား ..... **6** Traditional healer ရိုးရာကုသမှု ..... **9** Quack အပ်ပုန်း/ရမ်းကု .... **10** Self medication ကိုယ်တိုင်ကုသ ... **11** Other (Specify) အခြား **12**	| |__|

D5 No	Health Impacts	No. of affected persons in your family မိသားစုတွင်ဖြစ်ပွားသော လူအရည်အတွက်	Treatment (ကုသမှု ခံယူခြင်း) 1. Yes ခံယူပါသည်။ 2. No မခံယူပါ။	Condition (ရောဂါ အခြေအနေ) 1. Mild (အခြေအနေ သိပ်မဆိုး) 2.Moderate (အခြေအနေ အတော်အသင့်) 3. Severe (အခြေအနေ ဆိုးရွား)
Pregnancy and Birth Defects				
1	Miscarriage ကိုယ်ဝန်ပျက်ကျခြင်း			
2	Infertility ကလေးမရခြင်း			
3	Premature Birth လမစေ့ခင် ကလေးမွေးခြင်း			
4	Still Birth ကလေးအသေမွေးဖွားခြင်း			

** indicates the question has skip (>>).

5	Perinatal Death မွေးကင်းစကလေးသေဆုံးခြင်း			
6	Low Birth Weight ပေါင်ချိန်မပြည့်ဘဲမွေးဖွားခြင်း			
7	Complications after Birth မွေးဖွားပြီး နောက်ဆက်တွဲ ရောဂါများဖြစ်ပွားခြင်း			
8	Heart Defects of newborn မွေးကင်းစကလေးတွင် နှလုံးရောဂါ ပါလာခြင်း			
9	Oral Cleft နှုတ်ခမ်းကွဲ အာခေါင်းကွဲ ဖြစ်ခြင်း			
10	Chromosomal Abnormality (e.g., Down Syndrome) မျိုးရိုးဗီဇဆိုင်ရာ ရောဂါများ ဖြစ်ပွားခြင်း			
11	Disability (Deaf, Inability to speech, Blindness .. etc) မသန်စွမ်းဖြစ်ခြင်း			
Malignancy ကင်ဆာရောဂါများ				
12	Lung Cancer အဆုတ် ကင်ဆာ			
13	Liver Cancer အသည်း ကင်ဆာ			
14	Bladder Cancer ဆီးအိမ် ကင်ဆာ			
15	Gastrointestinal Cancer အစာအိမ်နှင့် အူလမ်းကြောင်း ကင်ဆာ			
16	Leukemia သွေး ကင်ဆာ			
17	Non- Hodgkin Lymphoma ခွန်နာကိုယ်တွင် အကျိတ် အဖုများထွက်သော ကင်ဆာ			
18	Others (***Please Specify***) အခြား (ဖော်ပြပေးပါ)			
Neurological Problems အာရုံကြောဆိုင်ရာ ပြဿနာများ				
19	Loss of Coordination ရွေ့လျားမှုကိုင်တွယ်မှု ပုံမှန်မဟုတ်ခြင်း			
20	Nausea ပျို့ခြင်း			
21	Vomiting အန်ခြင်း			
22	Memory Disturbance မှတ်ဉာဏ်ချို့ယွင်းခြင်း			
23	Sleep Disorders အနားယူ အိပ်စက်မှု ပုံမှန် မဟုတ်ခြင်း			
24	Anger ဒေါသထွက်လွယ်လာခြင်း			
25	Fatigue မောပန်း လွယ်ခြင်း			
26	Head Tremors ဦးခေါင်း တုန်လှုပ်ခြင်း			
27	Blurred Vision အမြင်အာရုံဝေဝါးခြင်း			
28	Slurred Speech ဝလုံးဗထွေး စကားပြောတတ်ခြင်း			
29	Seizures တက်ခြင်း			
30	Sleepiness အမြဲ အိပ်ချင်နေခြင်း			
31	Ataxia ခြေလှမ်း ပုံမှန်မဟုတ်ခြင်း			
32	Paralysis အကြောဆွဲခြင်း			
33	Psychological Disorders စိတ်ပိုင်းဆိုင်ရာရောဂါများ			
Respiratory System, Digestive System, Musculoskeletal System and Immunity အသက်ရှူလမ်းကြောင်း၊ အစာအိမ် ၊ အရိုးနှင့် ကြွက်သား၊ ကိုယ်ခံအား စနစ်				
34	Cough ချောင်းဆိုးခြင်း			
35	Lung Infection အဆုတ်ရောဂါများ			
36	Breathlessness အသက်ရှူမဝခြင်း			
37	Asthma ရင်ကျပ်ခြင်း			
38	Recurrent Flu တုတ်ကွေးဖြစ်လွယ်ခြင်း			
39	Diarrhea ဝမ်းလျှောခြင်း			
40	Cholera ကာလ ဝမ်းရောဂါ ဖြစ်ခြင်း ဆန်ဆေးရည်ကဲ့သို့ ဝမ်းသွားခြင်း			

** indicates the question has skip (>>).

41	Weakness of body အားမရှိခြင်း အားပျော့ခြင်း			
42	Back Pain ကျောနာခြင်း			
Vascular System သွေးကြောဆိုင်ရာ ရောဂါများ				
43	Anemia သွေးအားနည်းခြင်း			
44	Heart Diseases (Angina, Myocardial Infarction, etc.,) နှလုံးရောဂါများ			
45	Hypertension သွေးတိုးခြင်း			
Irritations ယားယံခြင်း				
47	Eyes မျက်လုံး			
48	Nose နှာခေါင်း			
49	Throat လည်ချောင်း			
50	Skin အရည်ပြား			
Nutrition အဟာရ ပြည့်ဝမှု				
51	Malnutrition အရိုးပေါ် နေအောင် ပိန်လွန်းခြင်း (သို့) ဖောနေခြင်း			
Communicable Diseases ကူးစက်တတ်သောရောဂါများ				
52	Malaria ငှက်ဖျား			
53	Tuberculosis တီဘီ			
54	Sexually Transmitted Diseases လိင်မှ တစ်ဆင့်ကူးစက်တတ်သောရောဂါများ (ဥပမာ .. အေအိုင်ဒီအက်စ်၊ ဆီးပူညောင်းကျ၊)			

Module E: Household structure, migration and Population Influx

အခန်း-(၅) အိမ်ထောင်စု ဖွဲ့စည်းပုံ နှင့် ပြောင်းရွှေ့နေထိုင်ခြင်း

	Question	Response categories	Response
House Structure			
E1	What type of house do you have? သင်နေထိုင်သောအဆောက်အအုံအမျိုးအစား	Two storey and above နှစ်ထပ်နှင့်အထက် ..... ၁ One storey house တစ်ထပ်အိမ် ..... ၂ Hut တဲ ..... ၃ Other (Specify) အခြား ၄	___ | | | ___
E2	What is the primary construction material of the roof of the dwelling? အိမ် အမိုးကို မည်သည့် ပစ္စည်းဖြင့် တည်ဆောက်ထားသနည်း။	Thatch/ large leaves/ Palm သက်ကယ်..... ၁ Bamboo ဝါး ..... ၂ CGI သွပ် .....၃ Tarpaulin မိုးကာဖျင် .....၄ Other (Specify) အခြား ၅	___ | |__|
Migration ရွှေပြောင်းနေထိုင်မှုပုံစံ			
E3	How long has your family lived in this place? သင့်၏ မိသားစု ဒီနေရာမှာနေတာ ဘယ်လောက်ကြာပြီလဲ။	Less than one year တစ်နှစ်အောက် .....၁ One to three years ၁ နှစ်မှ- ၃ နှစ် ..... ၂ Three to ten years ၃ နှစ်မှ - ၁၀ နှစ် ..... ၃ More than ten year ၁၀ နှစ် အထက် ၄	

** indicates the question has skip (>>).

E4	Has any household member migrated for work due to job scarcity in the past 12 months? Who are they? လွန်ခဲ့သော (၁၂)လအတွင်းက အလုပ်ရှားပါးမှုကြောင့် အခြားဒေသသို့ သွားရောက်အလုပ်လုပ်သူရှိပါသလား။ (အမည်ဖြင့် တကွ ဖော်ပြပေးပါ)	မရှိပါ ..... ၀ အိမ်ထောင်ဦးစီး ..... ၁ အရွယ်ရောက် ကျား (၁၅ နှစ် အထက်)..... ၂ အရွယ်ရောက် မ (၁၅ နှစ် အထက်) ..... ၃ ကျား (၁၅ နှစ် အောက်) .....၄ မ (၁၅ နှစ် အောက်) ၅		| | |
E7	For what reason did he/she migrate? မည်သည့်အတွက် ကြောင့် သွားရောက်ခဲ့သလဲ။	Work အလုပ် ..... ၁ Education ပညာရေး .....,..... ၂ Marriage/ or live with other family အိမ်ထောင်ပြုခြင်း(သို့)မိသားစုနှင့်နေထိုင်ရန် ..... ၃ Other အခြား ၄		| | |
Population Influx (Labor and Working condition) အလုပ်သမားနှင့် လုပ်ငန်းအခြေအနေ				
E10	Do you employ laborers as a part of your business or Farming activities? ကူညီလုပ်ကိုင်ပေမည့်လုပ်သားများလွယ်ကူစွာရနိုင်ပါသလား။ (မိသားစုဝင်မဟုတ်သည့်အခြားအလုပ်သမား)	i. Yes ရနိုင်ပါသည်။ ii. No မရနိုင်ပါ။		| | |
E11	Where do laborers come from? မည်သည့်နေရာမှလာရောက်လုပ်ကိုင်ပါသနည်း။	By hiring from other village အခြားကျေးရွာများမှငှားရမ်းခြင်း ၁ Substitute with machine စက်မှု အစားထိုး ၂ Other(Specify) အခြား ၃		| ||
Impact on Local Business ဒေသခံ အလုပ်အကိုင်များ အပေါ် သက်ရောက်မှု				
E12	Have the activities of larger projects affected labor availability for traditional business? စီမံကိန်းကြီးများ၏ လုပ်ငန်းဆောင်ရွက်မှုများကြောင့် ဒေသတွင်း ရှိရင်းစွဲလုပ်ငန်းငယ်များအတွက် လုပ်သားရရှိနိုင်မှုကို သက်ရောက်မှုရှိဖူးပါသလား။	i. Yes ရှိဖူးပါသည်။ ii. No မရှိဖူးပါ။		

Module F: Land Ownership

အခန်း-(၆) မြေပိုင်ဆိုင်မှု

Question		Response categories	Skip	Response
Land Ownership				
F1	Does your household own land? မြေပိုင်ဆိုင်မှု / နေထိုင်မြေ ပိုင်ဆိုင်မှုရှိပါသလား။	i. Yes ရှိပါသည်။ ii. No မရှိပါ။		| | |
F2	How does your household show ownership or user rights of this land? ပိုင်ဆိုင်မှု အထောက်အထား ရှိပါသလား။	With document အထောက်အထား နှင့် နေထိုင် ..... ၁ No document With permission အထောက်အထားမရှိသော်လည်းနေထိုင်ရန်ခွင့်ပြုချက်ရှိ ..... ၂ No Document No permission အထောက်အထားမရှိသည့်အပြင် နေထိုင်ရန်ခွင့်ပြုချက်လည်းရရှိမထားပါ ... ၃		| | |

** indicates the question has skip (>>).

Module G: Infrastructure, Resource and Services

အခန်း-(၇) အခြေခံအဆောက်အဦ၊ သယ်ဇာတနှင့် ဝန်ဆောင်မှုများ

Question		Response categories	Skip	Response
Health and Education (ကျန်းမာရေး နှင့် ပညာရေး)				
G1	Is Health care available for members of your household? ကျန်းမာရေးစောင့်ရှောက်ရန်ဆေးရုံဆေးခန်း ၊ ဆေးပေးခန်း ရှိပါသလား။	i. Yes ရှိပါသည်။ ii. No မရှိပါ။		| |__|
G3	Do you have access to education for members of your household? အိမ်ထောင်စုအတွင်း ကျောင်းတက်နိုင်သူ ရှိပါသလား။	i. Yes ရှိပါသည်။ ii. No မရှိပါ။		
G4	If the answer is "No", why he/she does not attend school? အကယ်၍ ကျောင်းမတက်နိုင်သူရှိပါက အခက်အခဲအား ဖော်ပြပေးပါ။			

Energy (စွမ်းအင်)				
G5	What source of lighting does your household primarily use? လျှပ်စစ် (အလင်းစွမ်းအင်) ဘယ်ကရရှိပါသလဲ။	Public electricity အများသုံးလျှပ်စစ် ..... ၁ Community hydro power အစုအဖွဲ့ ရေအားလျှပ်စစ် ..... ၂ Battery ဘက်ထရီ ..... ၃ Kerosene ရေနံဆီ ..... ၄ Candle ဖယောင်းတိုင် ..... ၅ Solar ဆိုလာ ..... ၆ Generator မီးစက် ..... ၇ Other အခြား ၈		___ | |__|
G6	What is the main fuel source used by your household for cooking? ဟင်းချက်ရာတွင်မည်သည့်(အဓိက)လောင်စာကအသုံးပြုသနည်း။	Electricity လျှပ်စစ် ..... ၁ Gas/kerosene/diesel ဂက်စ်၊ရေနံဆီ၊ဒီဇယ် ..... ၂ Charcoal/fuelwood substitute မီးသွေး၊ထင်းအစားထိုး..... ၃ Firewood ထင်း ..... ၄ Other အခြား ၅		| |__|
G7	If **firewood** is used, please mention number of sources with direction from the village အကယ်၍ ထင်းအသုံးပြု ပါက မည်သည့်နေရာများမှ ထင်းခုတ်ယူပါသနည်း။ (မိမိဒေသ၏ အရှေ့ အနောက်တောင်မြောက် လမ်းညွှန်မှုနှင့် အကွာအဝေး အားဖော်ပြပေးပါ။)			

Question		*Response categories*	*Skip*	*Response*
Water, Sanitation and Hygiene (ရေ၊ ရေဆိုးနုတ်စနစ်၊ တစ်ကိုယ်ရေ နှင့် ပတ်ဝန်းကျင် သန့်ရှင်းရေး)				
G8	Availability of Water for Drinking Purpose သောက်သုံးရေ ရရှိနိုင်မှု အခြေအနေ	i. Perennial တစ်နှစ်ပတ်လုံးရရှိ .... ၁ ii. Seasonal တစ်နှစ်ပတ်လုံးမရရှိ ၂		

** indicates the question has skip (>>).

G9	Availability of Household Water Consumption သုံးရေ ချိူးရေ ရရှိနိုင်မှု အခြေအနေ	i. Perennial တစ်နှစ်ပတ်လုံးရရှိ .... ၁ ii. Seasonal တစ်နှစ်ပတ်လုံးမရရှိ ၂	
G10	If, the answer is "Perennial", What is the source of drinking water used by your household for in the past 12 months? သောက်ရေ တစ်နှစ်ပတ်လုံးရရှိပါက မည်သည့် အရင်းအမြစ်မှ ရရှိပါသနည်း။	Public piped water အများသုံးရေပိုက် ..... ၁ Deep well အဝီစိရေတွင်း ..... ၂ Tube well အဝီစိ မဟုတ်သောရေတွင်း ..... ၃ Protected dug well/pond/spring/rainwater ကာကွယ်ထားသော ရေတွင်းရေကန်၊မိုးရေ ..... ၄ Unprotected dug well/pond/spring/rainwater ကာကွယ်မထားသော ရေတွင်း၊ရေကန်၊မိုးရေ ..... ၅ River/stream မြစ်၊ချောင်း ၆	
G11	If, the answer is "Seasonal", What is the source of drinking water used by your household for in the past 12 months? သောက်ရေ တစ်နှစ်ပတ်လုံး **မရရှိပါက** မည်သည့် အရင်းအမြစ်မှ ရရှိပါသနည်း။	Public piped water အများသုံးရေပိုက် ..... ၁ အဝီစိရေတွင်း ..... ၂ Tube well အဝီစိ မဟုတ်သောရေတွင်း ..... ၃ Protected dug well/pond/spring/rainwater ကာကွယ်ထားသော ရေတွင်း၊ရေကန်၊မိုးရေ ..... ၄ Unprotected dug well/pond/spring/rainwater ကာကွယ်မထားသော ရေတွင်း၊ရေကန်၊မိုးရေ ..... ၅ River/stream မြစ်၊ချောင်း ၆	a) Summer နွေရာသီတွင်ရရှိသောနေ့ ☐ b) Rainy မိုးရာသီတွင်ရရှိသောနေ့ ☐ c) Winter ဆောင်းရာသီတွင်ရရှိသောနေ့ရာ ☐
G12	What is the distance to this source of drinking water? ရေရရှိဖို့အတွက် အကွာအဝေး မည်မျှ ရှိပါသနည်း။	Household Level ..... ၁ ¼ mile ၀.၂၅ မိုင် ..... ၂ 1 mile ၁ မိုင် ..... ၃ More than one mile ၁ မိုင်ထက်ပို ၄	Remarks:
G13	Quality ရေ အရည်အသွေး	**(a)** Good **ကောင်း** **(b)** Bad **ဆိုး** (ဆိုးပါက အောက်ဖော်ပြပါနေရာများအား ဝိုင်းပေးပါ) i. Color အရောင် ii. Smelly အနံ့ iii. Taste အရသာ iv. Turbid ရေနောက် v. Hard ရေသွက် **(c)** No Complaint (**မကောင်းမဆိုး အဆင်ပြေရုံ**)	Remarks:
G14	Water treatment for water is "Yes", what do you usually do to make it safe to drink? ရေသောက်သုံး ရာတွင် သန့်ရှင်းစေရန် မည်ကဲ့သို့ ဆောင်ရွက်ပါသနည်း ။	Let it stand (sedimentation)အနည်ချ .....၁ Filtration (ceramic, sand)သဲဖြင့်စစ်ခြင်း ..... ၂ Boil ကျိုချက်ခြင်း ....၃ Chlorineကလိုရင်းဖြင့်သန့်စင်.....၄ Other (specify) အခြား (ဖော်ပြပေးပါ) ၅	Remarks:

** indicates the question has skip (>>).

G15	Does the capacity of water used change in current? အခြိန်နှင့်အမျှ ရေ၏အရည်အသွေး ပြောင်းလဲမှုရှိပါသလား။	i. Yes ရှိပါသည်။ ii. No မရှိပါ။	| | |
G16	Time period in which you face scarcity of drinking water? လအလိုက် **သောက်ရေ** ရှားပါးသော အခြိန်များအားဖော်ပြပေးပါ။	**a.** Months လ ၁ ၂ ၃ ၄ ၅ ၆ ၇ ၈ ၉ ၁၀ ၁၁ ၁၂	**b.** From to (မည်သည့်လ **မှ** မည်သည့်လ **သို့**) _____ **မှ** _____ **သို့**
G17	Time period in which you face scarcity of water for Household Consumption? လအလိုက် **သုံးရေ ချိုးရေ** ရှားပါးသော အခြိန်များအားဖော်ပြပေးပါ။	**a.** Months လ ၁ ၂ ၃ ၄ ၅ ၆ ၇ ၈ ၉ ၁၀ ၁၁ ၁၂	**b.** From to (မည်သည့်လ **မှ** မည်သည့်လ **သို့**) _____ **မှ** _____ **သို့**

G18	Has water availability changed over time? **သောက်ရေ ရရှိနိုင်မှု အခြေအနေ သည် တစ်နှစ်ထက် တစ်နှစ်**	**Improved** **ပိုမိုကောင်းမွန်လာပါသည်**	**Declined** **ပိုမိုဆိုးဝါးလာပါသည်**	**Not changed** **မပြောင်းလဲပါ။**
G19	*If water **quality** is changed, please state the cause of change.* ရေ **အရည်အသွေး** ပြောင်းလဲပါက အဘယ့်ကြောင့်နည်း။			
G20	*If water **quantity** is changed, please state the cause of change.* ရေ **ပမာဏ** ပြောင်းလဲပါက အဘယ့်ကြောင့်နည်း။			
G21	Are you concerned about water quantity change and water quality change? ရေ **အရည်အသွေး နှင့်** ရေ **ပမာဏ** ပြောင်းလဲမှုအပေါ် စိတ်ပူပန်မှုရှိပါသလား။			
G22	Is there sanitation nearby household? ရေဆိုးမြောင်း အိမ်အနီးတွင်းရှိသလား။?	i. Yes ရှိပါသည်။ ii. No မရှိပါ။		
G23	Type of Latrine အိမ်သာ အမျိုးအစား	a. Dry pit latrine ကျင်းတူးထားသော **ရေ မသုံးသော** အိမ်သာ b. Pour flush latrine ကျင်းတူးထား၍ **ရေ သုံးသော** အိမ်သာ **(ရေလွှက်ဖြင့်သုံး)** c. Flush latrine ကျင်းတူးထား၍ **ရေ သုံးသော** အိမ်သာ **(ခလုတ်နှိပ်၍ ရေဆွဲရသော)** d. Open latrine **ရေ့ တိုးခြင်း**		
Communication ဆက်သွယ်မှု				
G24	Is any phone in your Household connected to Internet? အိမ်တွင် အင်တာနက်ဖြင့် ချိတ်ဆက်နိုင်သော ဖုန်းရှိပါသလား။	i. Yes ရှိပါသည်။ ii. No မရှိပါ။		
G25	Which application is installed? အောက်ဖော်ပြပါများနှင့် ချိတ်ဆက်ထားပါသလား။ 1. Facebook ဖေ့စ်ဘုတ် 2. Viber ဗိုင်ဘာ 3. Whatsapps ဝှက်စ်အပ် 4. Other (***Please Specify***) အခြား (ဖော်ပြပေးပါ)			

** indicates the question has skip (>>).

G26	Can any household member use internet very well? အတူနေမိသားစုတွင် အင်တာနက် ကောင်းကောင်းအသုံးပြု တတ်သူရှိပါသလား။	i. Very Well အလွန်ကျွမ်းကျင်စွာ ii. Well ကောင်းမွန်စွာ iii. Just a little အနည်းငယ်မျှသာ
G27	Is Communication via Facebook available? သင့်အား စီမံကိန်းနှင့် ပတ်သက်၍ Facebook မှ တစ်ဆင့် ဆက်သွယ်နိုင်ပါသလား။ (ဗီဒီယို ဖြင့် ဖုန်းခေါ် ဆက်သွယ်ခြင်း ၊ စီမံကိန်း အကြောင်းအရာများအား အဖွဲ့ ဖွဲ့၍ မျှဝေခြင်း စသည်ဖြင့် ...)	i. Yes ရပါသည်။ ii. No လုံးဝ ရနိုင်ပါ။ iii. Can communicate if the technology will be explained by a family member. အတူနေမိသားစုဝင် မှ နည်းစနစ်အား ရှင်းပြပေးပါက ရနိုင်ပါသည်။

Module H: Cultural Aspect

အခန်း-(၈) ယဉ်ကျေးမှုဆိုင်ရာရှုထောင့်

Question		Response categories	Skip	Response
Cultural Heritage (ယဉ်ကျေးမှု အမွေအနှစ်)				
H1	Who makes decisions in the community? ရပ်ရွာတွင် အရေးပါသော ဆုံဖြတ်ချက်များအား မည်သူက ချမှတ်ပါသနည်း။	Village Leader အုပ်ချုပ်ရေးမှူး .....၁ ReligiousLeader ဘာသာရေးခေါင်းဆောင် ..... ၂ Elder People အကြီးအကဲ၊နာယက.... ၃ SmallGroupLeaderအသင်းအဖွဲ့ခေါင်းဆောင် ..... ၄ Others(Specify) အခြား..... ၅		| | |
H2	Do you know the important cultural, historic or religious sites around your community? ရှေးဟောင်းအမွေအနှစ်နယ်မြေ များရှိပါသလား။	i. Yes ရှိပါသည်။ ii. No မရှိပါ။		| __ |
H3	Are those cultural, historic or religious sites adequately protected? ၄င်းနေရာ ကိုလုံလောက်သော ကာကွယ် စောင့်ရှောက်မှုပြုပြင်မွမ်းမံမှုများရှိပါသလား။	i. Yes ရှိပါသည်။ ii. No မရှိပါ။		| __ |

Module I: Air and Climate

အခန်း-(၉) လေ၊ ရာသီဥတု

Question		Response categories	Sk	Response
Air, Water and Soil (လေ၊ ရေ နှင့် ရာသီဥတု)				
I1	Have you noticed any changes to Air Quality as long as you have been in the household? လေအရည်အသွေးပြောင်းလဲမှုရှိပါသလား။	Improved: ကောင်းမွန်..... 1 Declined ကျဆင်း..... 2 No Change ပြောင်းလဲမှုမရှိ 3		|
I2	Cause of change in air quality: အရည်အသွေးပြောင်းလဲမှုရှိခဲ့လျှင် မည်သည့် ကိစ္စကြောင့် ဖြစ်ခဲ့ရပါသနည်း။	Industry စက်ရုံ ..... 1 Livestock Industry မွေးမြူရေး ..... 2 Brush-burning/ Forest fire တောမီး 3		| |

I3	Has the climate changed since you have been living in this area? အရင်ကနှင့်ယှဉ်ရင် ရာသီဥတု ပြောင်းလဲခဲ့မှု ရှိပါသလား။	Warmerပူနွေးလာ .....1 Cooler အေးလာ .....2 Unchanged... ပြောင်းလဲမှုမရှိ 3		
I4	Is the local climate changed to be မည်သို့ပြောင်လဲသွားပါသနည်း။	Wetter... စိုစွတ်လာ..... 4 Drier...ခြောက်သွေ့လာ..... 5		

Module J: Fishing

အခန်း-(၁၀) ငါးဖမ်းခြင်း

Question		Response categories	Skip to	Response
J1	Are you or your family a fisherman? သင် သို့မဟုတ် သင့်မိသားစုသည် ရေလုပ်ငန်းလုပ်ကိုင်ပါသလား။	1 Yes လုပ်ကိုင်ပါသည်။ 2 No မလုပ်ကိုင်ပါ။ If no skip questions.		|__|__|
J2	Do you or your family fish in the Factory area? သင် သို့မဟုတ် သင့်မိသားစုသည် စက်ရုံအနီးတွင် ငါးဖမ်းကြပါသလား။	1 Yes ဖမ်းပါသည်။ 2 No မဖမ်းပါ		|__|__|

Module K: Disasters

Various Disasters			
K1	Have you experienced any of these disasters before? (If yes, please Circle O the related alphabet **a.b.c.d.,etc**) ဖော်ပြပါ သဘာဝဘေးအန္တရာယ်များ ဖြစ်ပွားဖူးပါသလား။ ဖြစ်ပွားဖူးပါက သက်ဆိုင်သောအဖြေများအား ဝိုင်း၍ဖြေကြားပေးပါ။	a. Flood b. Cyclone c. Earthquakes d. Landslide e. Tsumanis f. Strong Wind g. Lightning h. Soil Erosion i. Forest Fire j. Drought	က။ ရေကြီးမှု ခ။ ဆိုင်ကလုန်း ဂ။ ငလျင် ဃ။ မြေပြိုခြင်း င။ ဆူနာမီ စ။ လေပြင်း ဆ။ မိုးကြိုးပစ်ခြင်း ဇ။ မြေတိုက်စားခြင်း စျ။ တောမီးလောင်ခြင်း ည။ မိုးခေါင်ခြင်း
K2	When did it happen? Please fill the related alphabet **a.b.c.d.,etc** in **{ }.** **မည်သည့် ခုနှစ်၊ ရာသီတွင်** ဖြစ်ပွားခဲ့ပါသနည်း။**{ } နေရာတွင်** သက်ဆိုင်သောဘေးအန္တရာယ်အလိုက် (က၊ ခ၊ စသည်ဖြင့်) အဖြေများအား ထည့်၍ဖြေကြားပေးပါ။ ***Season Code*** i. Summer ii. Rainy iii. Winter	***ရာသီကုဒ်*** i ။ နွေရာသီ ii ။ မိုးရာသီ iii ။ ဆောင်းရာသီ	**Disaster { }** 1. Year ခုနှစ် ( ) ( ) ( ) 2. Season ရာသီ ( ) ( ) ( ) **Disaster { }** 1. Year ခုနှစ် ( ) ( ) ( ) 2. Season ရာသီ ( ) ( ) ( ) **Disaster { }** 1. Year ခုနှစ် ( ) ( ) ( ) 2. Season ရာသီ ( ) ( ) ( )
K3	In your view, what is the cause of disaster? Please state with related alphabet **a.b.c.d.,etc** . အဘယ်ကြောင့် ဖြစ်ပွားရသနည်း။ သင်ဖြေသောထား ထင်မြင်ချက်အား ဖော်ပြပေးပါ။ **{ } နေရာတွင်**	**{ }** **{ }** **{ }** ( ) ( ) ( )	

** indicates the question has skip (>>).

	သက်ဆိုင်သောဘေးအန္တရာယ်အလိုက် (က၊ ခ၊ စသည်ဖြင့်) အဖြေများအား ထည့်၍ဖြေကြားပေးပါ။ **Code** 1. Deforestation 2. Road Construction 3. Mining ***ကုဒ်*** ၁။ သစ်တောပြုန်းတီးခြင်း ၂။ လမ်းတည်ဆောက်ခြင်း ၃။ သတ္တုတွင်း တူးဖော်ခြင်း	
K4	Do you know if there is anyone who is affected by disaster? Please state with related alphabet **a.b.c.d.,etc** . ထိခိုက်မှု ၊ သေဆုံးမှုများရှိပါလား။ သက်ဆိုင်သောဘေးအန္တရာယ်အလိုက် (က၊ ခ၊ စသည်ဖြင့်) အဖြေများအား ထည့်၍ဖြေကြားပေးပါ။	{ } ( ) { } ( ) { } ( ) 1. Yes ရှိပါသည် 2. No မရှိပါ
K5	If yes, how many times have you heard of such cases? Please state with related alphabet **a.b.c.d.,etc** . ထိခိုက်မှု ၊ သေဆုံးမှုများရှိပါက သင်ကြားခဲ့ဖူးသော အကြိမ်များအား ဖော်ပြပေးပါ။ သက်ဆိုင်သောဘေးအန္တရာယ်အလိုက် (က၊ ခ၊ စသည်ဖြင့်) အဖြေများအား ထည့်၍ဖြေကြားပေးပါ။	{ } ( ) { } ( ) { } ( )
K6	If Landslide happens, what kind of Landslide did you occur? မြေပြို မှုဖြစ်ပွားခဲ့လျှင် အမျိုးအစားအား ဖော်ပြပေးပါ။	1. Rock Fall 2. Debris Fall ၁။ ကျောက်တုံးကျောက်ခဲများပြိုခြင်း ၂။မြေ၊ ရေ နှင့်ကျောက်ခဲများရောရွှေပြိုခြင်း

Module L: Social Groups

အခန်း(၁၂) လူမှုရေးအဖွဲ့များ

Social Support Group (လူမှုရေးကူညီမှုအဖွဲ့)					
Are there any **Social Support Groups** in your community? မိမိ ရပ်ရွာအနီးဝန်းကျင်တွင် **လူမှုရေးကူညီမှုအဖွဲ့** များ ရှိပါသလား။				1. Yes (ရှိ)	2. No (မရှိ)
L1	a) Social Groups **က) လူမှုရေးအဖွဲ့များ**	b) i. Active (အဖွဲ့ရှိသေးသည်) ii.Not Active(အဖွဲ့မရှိတော့ပါ)	c) Total Strength အဖွဲ့ဝင်စုစုပေါင်း	d) Major Activity အဓိကလုပ်ဆောင်ချက်	e) Nature of Support received from Group မည်သည်တို့ကို ထောက်ပံ့ပေးသနည်း။
1	Saving and Loan Association ငွေစုငွေချေးအဖွဲ့				
2	Youth Group ပရဟိတလူငယ်အသင်း				
3	Fishing Group ငါးဖမ်းလုပ်ငန်းအုပ်စု				
4	Farming Group တောင်သူလယ်သမားအုပ်စု				
5	Community Group လူမှုအဖွဲ့အစည်း				
6	Religious Group ဘာသာရေးအဖွဲ့				
7	Low interest Microcredit အသေးစားချေးငွေလုပ်ငန်း				
8	Others (***Please Specify***) အခြားအဖွဲ့များ				

** indicates the question has skip (>>).

Non-governmental Organizations Operational in the community အစိုးရမဟုတ်သောအဖွဲ့အစည်းများရှိပါသလား။ အဖွဲ့အစည်း အမည်၊ လုပ်ငန်းသဘာ နှင့် အကျိုးပြုလုပ်ငန်းများအားဖော်ပြပေးပါ။		
NGO Name (အဖွဲ့အစည်း အမည်) ၁။	၂။	၃။ ၄။
	Nature of Work (လုပ်ငန်းသဘာဝ) 1. Health (ကျန်းမာရေး) 2. Sanitation (သန့်ရှင်းမှု) 3. Education (ပညာရေး) 4. Livelihood (အသက်မွေးဝမ်းကြောင်း) 5. Water Supply (ရေပေးဝေရေး) 6. Micro-credit (ချေးငွေ) 7. Others (အခြား) (***Please Specify***)	**Benefits Received (အကျိုးပြုလုပ်ငန်းများ)** 1. Technical Training (နည်းပညာသင်တန်း) 2. Medical Supplies (ဆေးဘက်ဆိုင်ရာအထောက်အပံ့များ) 3. Other Capacity Building(အခြား စွမ်းရည်ဖွံ့ဖြိုးမှုသင်တန်း) 4. Credit Group Formation(ချေးငွေဖွဲ့သင်တန်း) 5. Other (အခြား) ((***Please Specify***)

Module M: Habit of Waste Collection and Disposal အိမ်ထောင်စုတွင် အမှိုက်သိမ်းဆည်းခြင်း၊ အမှိုက်စွန့်ပစ်ခြင်း အလေ့အကျင့်

How do you collect the Household Waste? (Can select multiple answers) သင့်အိမ်မှ ထွက်သော အမှိုက်များကို သင် ဘယ်လို သိမ်းဆည်းပါသလဲ။ (အဖြေ တစ်ခုထက်မက ဖြစ်နိုင်ပါသည်)						
q21001	q21002	q21003	q21004	q21005	q21006	q21007
Collection of Waste **အမှိုက်သိမ်းဆည်း ခြင်းပြုလုပ်ပါသည် ..... ၁** No Collection of Waste **အမှိုက်သိမ်းဆည်း ခြင်းမပြုလုပ်ပါ ၂**	Dust Bin without Cover အဖုံးမပါသော အမှိုက်ပုံး သုံးပါသည် .....၁ မသုံးပါ ၂	Dust Bin with Cover အဖုံးပါသော အမှိုက်ပုံး သုံးပါသည် .....၁ မသုံးပါ ၂	Plastic Bag, Woven PP Bag ပလပ်စတစ် အိတ်၊ ပိန်းအိတ် သုံးပါသည် .....၁ မသုံးပါ ၂	Basket တောင်း သုံးပါသည် .....၁ မသုံးပါ ၂	Dump on the ground မြေကွက်လပ်တွင် စုပုံထားခြင်း လုပ်ဆောင်ပါသည် .....၁ မလုပ်ဆောင်ပါ ၂	Others (***Please Specify***) အခြားသိမ်းနည်း (ဖော်ပြပါ)
Code	Code	Code	Code	Code	Code	

How do you dispose the Household Waste? (Can select multiple answers) သင့်အိမ်က ထွက်တဲ့ အမှိုက်တွေကို ဘယ်နေရာမှာ သင် ပစ်ပါသလဲ။ (အဖြေ တစ်ခုထက်မက ဖြစ်နိုင်ပါသည်)						
q21008	q21009	q21010	q21011	q21012	q21013	q21014
Burning မီးရှို့သည် မီးရှို့ပါသည် .....၁ မီးမရှို့ပါ ၂	Burying မြေမြှုပ်သည် မြေမြှုပ်ပါသည် .....၁ မြေမမြှုပ်ပါ ၂	Throw Garbage into River မြစ်ထဲသို့ ပစ်ပါသည် .....၁ မပစ်ပါ ၂	Waste Dumping သွားပုံသည်			
			Stream, Drainage area, Pond, Bank of river ချောင်း/မြောင်း ကန် ကမ်းနဘေး ပစ်ပါသည် .....၁ မပစ်ပါ ၂	Empty Compound ခြံဝင်းကွက်လပ် ပစ်ပါသည် .....၁ မပစ်ပါ ၂	Beside the street, open space area လမ်းဘေး/မြေကွက်လပ်ရှိရာ ပစ်ပါသည် .....၁ မပစ်ပါ ၂	Municipal dumping area or Municipal garbage container စည်ပင်အမှိုက်ပုံအမှိုက်ကန် ပစ်ပါသည် .....၁ မပစ်ပါ ၂
Code	Code	Code	Code	Code	Code	Code

** indicates the question has skip (>>).

q21015	q21016	q21017	q21018	q21019
Send garbage to Municipal Truck စည်ပင်အမှိုက်ကားသို့ ပို့သည် ပို့ပါသည် .....၁ မပို့ ပါ ၂	Send garbage to Private waste collectors ပုဂ္ဂလိက အမှိုက်သိမ်းသို့ ပေးသည် ပို့ပါသည် .....၁ မပို့ ပါ ၂	Sell garbage to Recycle shop ရီဆိုက်ကယ် သမားသို့ ရောင်းချသည် ရောင်းပါသည် .....၁ မရောင်း ပါ ၂	Decomposing for fertilizer မြေဆွေးလုပ်သည် လုပ်ပါသည် .....၁ မလုပ်ပါ ၂	Others (***Please Specify***) အခြား (ဖော်ပြပါ)
Code	Code	Code	Code	

QCode	မေးခွန်း	တုန့်ပြန်မှု	ကျော်ရန်	Code
q21020	How do you throw your Household waste? (*Only one answer*) သင့်အိမ်က ထွက်တဲ့ အမှိုက်တွေကို သင် ဘယ်လို ပစ်ပါသလဲ။ (အဖြေတစ်ခုတည်း)	Separated အမှိုက်တွေကို ခွဲခြားပြီးမှ ပစ်သည်..... 1 Not Separated အမှိုက်တွေကို မခွဲခြား၊ အကုန် ရောပစ်သည်..... 2	>> q31001	
q21021	What is your reason of waste separation? အမှိုက်ခွဲရတဲ့ သင့် ရည်ရွယ်ချက်ကို ပြောပြပါ။ (အဖြေ တစ်ခုထက်မက ဖြစ်နိုင်ပါသည်)	Sell to recycle shops ရောင်းချရန် ..... 1 Reuse ပြန်လည်အသုံးပြုရန် ..... 2 To dispose separately သီးခြား စွန့်ပစ်ရန် .....3 Others (***Please specify***) အခြား(ဖော်ပြပါ)..... 4		
q21022	How many types of waste separation? အမှိုက်တွေကို အုပ်စုမည်မျှ ခွဲပါသလဲ။ (အဖြေတစ်ခုတည်း)	Two နှစ်စု ..... 1 Threeသုံးစု ..... 2 Fourလေးစု ..... 3 More than Fourလေးစုအထက် 4		

Type of Waste from Household စွန့်ပစ်အမှိုက်အမျိုးအစားများ

Please state the type of your (daily) Household waste. သင့်အိမ်က (နေ့စဉ်ပုံမှန်) ထွက်တဲ့ အမှိုက်အမျိုးအစားများကို ပြောပြပါ။				
q31001	q31002	q31003	q31004	q31005
Kitchen Garbage မီးဖိုချောင်ထွက်အမှိုက် Regularly ပုံမှန်ထွက်သည် ..... 1 Irregularly ပုံမှန်မထွက်ပါ..... 2	Garbage from Garden ဥယျာဉ်ခြံထွက်အမှိုက် Regularly ပုံမှန်ထွက်သည် ..... 1 Irregularly ပုံမှန်မထွက်ပါ..... 2	Paper, Books, Paper Board စက္ကူ၊ စာအုပ်၊ ဂျပ် Regularly ပုံမှန်ထွက်သည် ..... 1 Irregularly ပုံမှန်မထွက်ပါ..... 2	Plastic bag and other Plastic stuffs ပလပ်စတစ်၊ ထုပ်ပိုး ပလပ်စတစ်အမျိုးမျိုး Regularly ပုံမှန်ထွက်သည် ..... 1 Irregularly ပုံမှန်မထွက်ပါ..... 2	Glassware, Glass Bottles and Broken glass pieces ဖန်၊ မှန် ပုလင်းများ၊ ပူးများနှင့် အကွဲအစများ Regularly ပုံမှန်ထွက်သည် ..... 1 Irregularly ပုံမှန်မထွက်ပါ..... 2
Code	Code	Code	Code	Code

q31006	q31007	q31008	q31009	q31010
Metal, Empty Metal bottles and containers သတ္တု၊ သတ္တုဗူးခွံ/ခွက်ခွံ Regularly ပုံမှန်ထွက်သည် ..... 1 Irregularly ပုံမှန်မထွက်ပါ..... 2	Clothes/ Fabrics အဝတ်အထည်/အစများ Regularly ပုံမှန်ထွက်သည် ..... 1 Irregularly ပုံမှန်မထွက်ပါ..... 2	Hazardous Wastes ဘေးအန္တရာယ်ရှိ အမှိုက် Regularly ပုံမှန်ထွက်သည် ..... 1 Irregularly ပုံမှန်မထွက်ပါ..... 2	Construction Wastes ဆောက်လုပ်ရေးအမှိုက်များ Regularly ပုံမှန်ထွက်သည် ..... 1 Irregularly ပုံမှန်မထွက်ပါ..... 2	Others (***Please Specify***) Regularly ပုံမှန်ထွက်သည် ..... 1 Irregularly ပုံမှန်မထွက်ပါ..... 2
Code	Code	Code	Code	Code

Knowledge about 3Rs (Reduce **လျော့ချ**, Reuse **ပြန်သုံး**, Recycle **ပြန်လည်ပြုပြင်သုံးစွဲ ခြင်း**) အကြောင်း သိရှိမှု အခြေအနေ

QCode	Questions မေးခွန်း	Responses တုန့်ပြန်မှု	Skip ကျော်ရန်	Code
q51001	Have you ever heard of 3Rs? **3Rs** ဟုခေါ်သော (Reduce **လျော့ချ**, Reuse **ပြန်သုံး**, Recycle **ပြန်လည်ပြုပြင်သုံးစွဲ ခြင်း**) အကြောင်းကို သင် ကြားဖူးပါသလား။	Yes ကြားဖူးပါ....1 No ကြားဖူးပါ....2		
Interviewer- Please explain about 3Rs with related examples whether their response is "Yes" or "No". အင်တာဗျူးမေးမြန်းသူ - 3Rs ကို ဖြေဆိုသူ ကြားဖူးသည်ဖြစ်စေ၊ မကြားဖူးသည်ဖြစ်စေ 3Rs အကြောင်း ဥပမာများပေး၍ နားလည်သဘောပေါက်အောင် ပြောပြပေးပါ။				
q51002	Would you like to practise 3Rs? **3Rs** ဟုခေါ်သော (Reduce **လျော့ချ**, Reuse **ပြန်သုံး**, Recycle **ပြန်လည်ပြုပြင်သုံးစွဲ ခြင်း**)ကို သင် လက်ခံကျင့်သုံးလိုပါသလား။	Yes ကျင့်သုံးလိုပါ....1 No မကျင့်သုံးလိုပါ....2	>> q51005	
q51003	Do you think that you may face difficulties if you practice 3Rs? **3Rs** ဟုခေါ်သော (Reduce **လျော့ချ**, Reuse **ပြန်သုံး**, Recycle **ပြန်လည်ပြုပြင်သုံးစွဲ ခြင်း**) ကို သင် လက်ခံကျင့်သုံးပါက သင့် အတွက် အခက်အခဲများ ကြုံတွေ့နိုင်မည် ဟု သင် ထင်ပါသလား။	Yes ထင်ပါသည် ....1 No မထင်ပါ 2		
q51004	Please mention your difficulties which you may face if you practice 3Rs. (Can select multiple answers) **3Rs** ဟုခေါ်သော (Reduce **လျော့ချ**, Reuse **ပြန်သုံး**, Recycle **ပြန်လည်ပြုပြင်သုံးစွဲ ခြင်း**) ကို သင် လက်ခံကျင့်သုံးပါက သင် တွေ့ကြုံနိုင်မည့် အခက်အခဲများကို ပြော ပြပါ။ (အဖြေ တစ်ခုထက်မက ဖြစ်နိုင်ပါသည်)	No time to practice ကျင့်သုံးရန် အချိန်မရှိပါ ..... 1 Difficult to practice ကျင့်သုံးရန် မလွယ်ကူ၊ ကရိကထများလွန်းသည် ..... 2 No space for separation အမှိုက်များကို ခွဲခြား ထားသိုရန် နေရာ မရှိပါ..... 3 Does not know how to start မည်သို့ စလုပ်ရမှန်း မသိပါ ..... 4 Others (***Please Specify***) အခြား (ဖော်ပြပါ) 5		

** indicates the question has skip (>>).

q51005	Please state the reason if you don't want to practice 3Rs. (Can select multiple answers) **3Rs** ဟုခေါ်သော (Reduce **လျော့ရန်**, Reuse **ပြန်သုံး**, Recycle **ပြန်လည်ပြုပြင်သုံးစွဲ ခြင်း**) ကို သင် မကျင့်သုံးလိုပါက အဘယ့်ကြောင့် မကျင့်သုံးလိုပါသနည်း။ (အဖြေ တစ်ခုထက်မက ဖြစ်နိုင်ပါသည်)	No time to practice ကျင့်သုံးရန် အချိန်မရှိပါ ..... 1 Difficult to practice ကျင့်သုံးရန် မလွယ်ကူ၊ ကရိကထများလွန်းသည် ..... 2 No space for separation အမှိုက်များကို ခွဲခြား ထားသိုရန် နေရာ မရှိပါ..... 3 Does not know how to start မည်သို့ စလုပ်ရမှန်း မသိပါ ..... 4 Others (***Please Specify***) အခြား (ဖော်ပြပါ) 5		

Module N: Awareness and Attitudes about the project

အခန်း-(၁၄) (စီမံကိန်းအပေါ် သဘောပေါက်နားလည်မှုနှင့် သဘောထားအမြင်)

	Question	Response categories	Ski	Response
N1	How much do you know about this project? ယခုစက်ရုံ အကြောင်းကို သင်မည်မျှ သိပါသနည်း။	Nothing at all လုံးဝမသိပါ ..... ၁ A little အနည်းငယ်သိ ..... ၂ Some အချို့သိ ..... ၃ A lot တော်တော်များများသိ ၄		|
N2	How did you know about this project? ယခုစက်ရုံ ကို မည်သူဆီမှ သင်သိရှိပါသနည်း။	Government agencies အစိုးရ ဌာနများ ..... ၁ Community leaders အစုအဖွဲ့ခေါင်းဆောင်များ .... ၂ Media သတင်းမီဒီယာ ..... ၃ Family members/friends မိသားစုဝင်များ၊ မိတ်ဆွေများ .....၄ Surveyors/Interviewers မေးမြန်းစုံစမ်းသူ ..... ၅ Other(specify) အခြား .....၆ Unware မသိပါ ၇		|
N3	How important will this project be to this Community? ယခုစက်ရုံ သည် လူမှု ပတ်ဝန်းကျင် အတွက် မည်မျှအရေးကြီးပါသနည်း။	Not extremely important (အလွန်အလွန်အရေးမကြီးပါ).....၁ Not very important (အလွန်အရေးမကြီးပါ).....၂ Not important (အရေးမကြီးပါ) ..... ၃ Normal(သာမာန်)..... ၄ Important (အရေးကြီးပါသည်) ..... ၅ Very important(အလွန်အရေးကြီးပါသည်).....၆ Extremely important(အလွန်အလွန်အရေးကြီးပါသည်).....၇ Unaware(မသိပါ)..... ၈		|
N4	What other projects did you experience before? ယခင်က မည်ကဲ့သို့သော စီမံကိန်းများ တွေ့ကြုံဖူးပါသနည်း။	Road/ railways (လမ်း၊မီးရထား) .... ၁ Bridge(တံတား) ..... ၂ Dam(ရေကာတာ)..... ၃ Industrial project(စက်မှုစီမံကိန်း).. ၄ Oil/Gas/Pipeline project (ရေနံ၊ဓါတ်ငွေ့၊ပိုက်လိုင်းစီမံကိန်း) .....၅ Other(အခြား)(Specify) ..... ၆ No experience (မကြုံဖူးပါ).....၇		

** indicates the question has skip (>>).

N5	How did it affect your community? ထို စက်ရုံ(သို့)စီမံကိန်း ကြောင့်လူမှုပတ်ဝန်းကျင်တွင် အကျိုးသက်ရောက်မှု(ကောင်း ကျိုး/ဆိုးကျိုး)ရှိခဲ့ပါသလား။	Positive ကောင်း .....၁ Negative ဆိုး .....၂ No effect သက်ရောက်မှုမရှိပါ ၃		| | |
N6	Have you been discuss about compensation from project? ထို စက်ရုံ (သို့)စီမံကိန်း များမှနစ်နာကြေးနှင့်ပက်သက်ပြီးဆွေးနွေးဖူး ပါသလား	ဆွေးနွေးဖူးပါသည်.....၁ မဆွေးနွေးဖူးပါ.....၂		| | |
N7	What are the most positive impacts of the project that you anticipate? ယခုစက်ရုံ၏ကောင်းသော အကျိုးသက်ရောက်မှုများကြောင့် သင်တို့အပေါ်မည်သည့်အရာများ စွမ်းဆောင်ပေး နိုင်မည်ဟု ထင်ပါသနည်း။	Unware မသိပါ ..... ၁ Increase employment အလုပ်အကိုင် တိုးတက်လာခြင်း..... ၂ Increase annual income ဝင်ငွေ တိုးတက်လာခြင်း.....၃ Improve living condition လူနေမှုအဆင့်အတန်းမြင့်မားလာခြင်း.....၄ Improved transport/infrastructureအခြေခံအဆောက်အဦများတိုး ၅ Compensation for land used မြေယာ လျော်ကြေးများရခြင်း...၆ Improved environment ပတ်ဝန်းကျင်တိုးတက်ကောင်းမွန်လာခြင်း....၇ Other (specify) အခြား (ဖော်ပြပေးပါ)..... ၈		
N8	What are the most negative impacts of the project that you are concerned about? ယခုစက်ရုံ၏ ဆိုးသော အကျိုးသက်ရောက်မှုကြောင့်သင် တို့ အပေါ် မည်သည့်အရာ သက်ရောက်နိုင်မည်ဟု ထင်ပါသနည်း။	Unaware မသိ ..... ၁ Transport and infrastructure သယ်ယူပို့ဆောင်/အခြေခံအဆောက်အဦများ ....၂ Negative social environment ဆိုးသောလူမှုပတ်ဝန်းကျင် .....၃ House damaged အိုးအိမ် ပျက်စီးခြင်း .....၄ Increased costs စရိတ်မြင့်တက်ခြင်း ..... ၅ Environmental pollution ပတ်ဝန်းကျင် ညစ်ညမ်းခြင်း ... ၆ Safety လုံခြုံမှု .....၇ Damaged environment ပတ်ဝန်းကျင်ပျက်စီးခြင်း .....၈ Employment/income disruption အလုပ်အကိုင်၊ဝင်ငွေနည်းပါးခြင်း....၉ Crime ပြစ်မှုများ ၁၀ Health ကျန်းမာရေး ၁၁ Discrimination ခွဲခြားဆက်ဆံခြင်း ၁၂ Access to water ရေရရှိမှု ၁၃ Loss of land မြေယာဆုံးရှုံးမှု ၁၄ Other(specify) အခြား ၁၅		
N9	Are you concerned about outside people coming to your community to work on the construction and maintenance of the project? လုပ်ငန်းခွင်သို့ အခြားဒေသမှ လူများလာရောက် အလုပ်လုပ်ခြင်းနှင့် ပတ်သက်ပြီး စိုးရိမ်ပူပန်မှုများ ရှိပါသလား။	Very worried အလွန်စိုးရိမ်ပါသည် .... ၁ A little worried အနည်းငယ်စိုးရိမ်ပါသည် .....၂ Not worried မစိုးရိမ်ပါ ၃		
N 10	What is the development priority for your community? မိမိတို့ ဒေသတွင် မည်သည့်အရာများ လိုအပ်ပါသနည်း။ (အရေးကြီးဆုံး ဦးစားပေး)	Road transport (လမ်းပန်းဆက်သွယ်မှု).....၁ Electricity(လျှပ်စစ်)..... ၂ Telecommunication (ဖုန်းဆက်သွယ်မှု).....၃ Water/Sanitation/Hygiene ရေ၊သန့်ရှင်းမှု၊တကိုယ်ရေကျန်းမာရေး)...၄ Access to credit(ချေးငွေရရှိမှု) ..... ၅ Education(ပညာရေး) ..... ၆ Health(ကျန်းမာရေး) ..... ၇ Livelihood(သက်မွေးဝမ်းကြောင်း)... ၈ Jobs(အလုပ်အကိုင်)..... ၉		| | |

** indicates the question has skip (>>).

N 11	Which three groups or categories are likely to be most negatively affected from the project? မည်သည်. အုပ်စု အမျိုးအစားသောသူတို.တွင် ထိခိုက်နစ်နာမှုပိုပြီးများပြားသည်ဟု သင်ထင်သနည်း။	Women(အမျိုးသမီး) ....၁ Children(ကလေး)....၂ Unskilled workers(ကျပန်းအလုပ်သမား)....၃ Religious minorities (ကိုးကွယ်မှုဆိုင်ရာ လူနည်းစု)...၄ Ethnic minorities (လူမျိုးဆိုင်ရာ လူနည်းစု)...၅ Other (အခြား) ...၆ Not worried(မစိုးရိမ်ပါ)...၇		| | |
N 12	Do you agree with the proposed project? ယခုစက်ရုံ၏တိုးတက်ဖွံ့ဖြိုးမှုအတွက် သဘောတူညီမှု ရှိပါသလား။	Yes (သဘောတူညီပါသည်)... ၁ No(သဘောမတူညီပါ)..... ၂ Not sure (မသေချာပါ)..... ၃		

N13 Priority Development Initiative (s) in the Community (ဒေသဖွံ့ဖြိုးစေရေးအတွက်ဦးစားပေးအရာများ)

	Services (အထောက်အပံ့)	Priority(ဦးစားပေး)		Services(အထောက်အပံ့)	Priority(ဦးစားပေး)	
a.	Education Services/ Facilities (ပညာရေး အထောက်အပံ့)		b.	Drinking Water (သောက်သုံးရေရရှိမှု)		1. First Priority (ပထမဦးစားပေး) 2. Second Priority (ဒုတိယဦးစားပေး) 3. Third Priority (တတိယဦးစားပေး) 4. Not Required (မလိုအပ်ပါ)
c.	Medical Services/ Facilities (ကျန်းမာရေးအထောက်အပံ့)		d.	Sanitation (Toilets) သန့်ရှင်းမှု(အိမ်သာများ)		
e.	Road/ Transport (လမ်းပန်းဆက်သွယ်မှု)		f.	Solid Waste Disposals (အမှိုက်ကျင်းများ)		
g.	Electricity (လျှပ်စစ်မီးရရှိမှု)		h.	Law and Order (ဥပဒေနှင့်အမိန့်)		
i.	Telecommunication (ဖုန်းဆက်သွယ်မှု)		j.	Employment (အလုပ်အကိုင်ရရှိမှု)		

Module O: Perceptions on Impacts of the Project

အခန်း-(၁၅) စက်ရုံကြောင့် သက်ရောက်မှုများအပေါ် သိမြင်နားလည်မှုများ

		Very negative အလွန်ဆိုး	Negative ဆိုး	Slightly negative အနည်းငယ်ဆိုး	No effect ပြောင်းလဲမှု မရှိ	Slightly positive အလွန်ကောင်း	Positive ကောင်း	Very positive အလွန်ကောင်း	
The effect on Physical Resources (ရုပ်ပိုင်းဆိုင်ရာ သယံဇာတများအပေါ် သက်ရောက်မှု)									
1	Soil quality (မြေအရည်အသွေး)	1	2	3	4	5	6	7	
2	Surface water quality (မြေပေါ်ရေ) မြစ် ရေချောင်း	1	2	3	4	5	6	7	
3	Ground water quality (မြေအောက်ရေ) အဝိစိတွင်း	1	2	3	4	5	6	7	
4	Air quality (လေအရည်အသွေး)	1	2	3	4	5	6	7	
5	Noise (ဆူညံမှု)	1	2	3	4	5	6	7	
Effect on Biological Resource(ဇီဝသယံဇာတများအပေါ် သက်ရောက်မှု)									
6	Forestry and conservation areas (သစ်တောနှင့်ထိန်းသိမ်းရေး နေရာများ)	1	2	3	4	5	6	7	
7	Agriculture/ Farming areas (စိုက်ပျိုးရေးနှင့် လယ်ယာနေရာများ)	1	2	3	4	5	6	7	
8	Local animals (ဒေသဆိုင်ရာတိရိစ္ဆာန်များ)	1	2	3	4	5	6	7	
9	Pasture (စားကျက်နေရာများ)	1	2	3	4	5	6	7	
10	Aquatic animals (ရေနေသတ္တဝါများ)	1	2	3	4	5	6	7	

** indicates the question has skip (>>).

Effect on Human Use(လူသားတို့အသုံးပြုမှုအပေါ် သက်ရောက်မှု)									
11	Local Fisheries (ဒေသခံငါးဖမ်းလုပ်ငန်းများ)	1	2	3	4	5	6	7	
12	Local Livestock(ဒေသခံမွေးမြူရေးလုပ်ငန်း)	1	2	3	4	5	6	7	
13	Local Vegetation(ဒေသဆိုင်ရာပေါက်ပင်)	1	2	3	4	5	6	7	
14	Local Industry(ဒေသဆိုင်ရာစက်ရုံလုပ်ငန်း)	1	2	3	4	5	6	7	
15	Local Transportation (ဒေသဆိုင်ရာဆက်သွယ်ရေး)	1	2	3	4	5	6	7	
16	Local Price (ဒေသဆိုင်ရာကုန်ဈေးနှုန်း)	1	2	3	4	5	6	7	
17	Recreation (အပန်းဖြေမှု)	1	2	3	4	5	6	7	
18	Local Economy(ဒေသဆိုင်ရာစီးပွားရေး)	1	2	3	4	5	6	7	
Effect on Quality of Life(လူနေမှုဘဝ အရေအနေအပေါ် သက်ရောက်မှု)									
19	Housing (အိမ်ရာ)	1	2	3	4	5	6	7	
20	Health (ကျန်းမာရေး)	1	2	3	4	5	6	7	
21	Education (ပညာရေး)	1	2	3	4	5	6	7	
22	Spiritual (စိတ်ခံစားမှု)	1	2	3	4	5	6	7	
23	Safety (ဘေးကင်းလုံခြုံမှု)	1	2	3	4	5	6	7	
24	Crime (ပြစ်မှု)	1	2	3	4	5	6	7	
25	Family Structure(မိသားစုပုံစံ)	1	2	3	4	5	6	7	
26	Job opportunities(အလုပ်အကိုင်အခွင့်ရေး)	1	2	3	4	5	6	7	
27	Income (ဝင်ငွေ)	1	2	3	4	5	6	7	
28	Scenery (မျက်စိပသာဒ ဖြစ်မှု)	1	2	3	4	5	6	7	
29	Local Culture (ဒေသဆိုင်ရာ ဓလေ့ထုံးတမ်း)	1	2	3	4	5	6	7	
Effect on Cultural Heritage(ယဉ်ကျေးမှုဆိုင်ရာ အမွေအနှစ်များအပေါ် သက်ရောက်မှု)									
30	ReligiousBuilding(ဘာသာရေးအဆောက်ဦ)	1	2	3	4	5	6	7	
31	Cemetery (သုတ္တုန်)	1	2	3	4	5	6	7	
32	Historic buildings/sites (သမိုင်းဝင်နေရာ)	1	2	3	4	5	6	7	

"CHECK the whole questionnaire AGAIN, THANK the respondent and FINISH interview."

"ကျေးဇူးတင်ပါသည်"

Impacts on Agriculture due to TMP
စိုက်ပျိုးရေး အပေါ် သက်ရောက်မှု

If you Household grow rice and other plants,
အကယ်၍ မိသားစု အတွင်း စပါးနှင့် အခြားသီးနှံစိုက်ပျိုးရေး ပြုလုပ်ပါက

Q1	Do you grow rice and plants on farmland of your own or owned by other people? စပါးနှင့် အခြားသီးနှံစိုက်ပျိုးရေး အားမည်သည့်မြေပေါ်တွင်စိုက်ပျိုးပါသနည်း။	1. Own Farmland ကိုယ်ပိုင်မြေ 2. Owned by others သူတစ်ပါး ပိုင်ဆိုင်သောမြေ 3. Both အထက်ပါ နှစ်မျိုးလုံး
Q2	Are there any changes in productivity of rice and other crops? စပါးနှင့် အခြားသီးနှံများ **အထွက်နှုန်းပြောင်းလဲမှု** ရှိပါသလား။	1. Increased အထွက်နှုန်းတိုးလာပါသည်။ 2. Decreased အထွက်နှုန်းကျဆင်းလာပါသည်။ 3. Same အထွက်နှုန်းပြောင်းလဲမှု မရှိပါ။
Q3	If there are changes in productivity, please state the estimated duration. **အထွက်နှုန်းပြောင်းလဲမှု** ရှိပါက လွန်ခဲ့သော မည်သည့်နှစ်အပိုင်းအခြားမှစတင်၍ ပြောင်းလဲပါသနည်း။	Three years ago လွန်ခဲ့သော**သုံးနှစ်မှ** စတင်ပြောင်းလဲပါသည် ..... ၁ Five years ago လွန်ခဲ့သော**ငါးနှစ်မှ** စတင်ပြောင်းလဲပါသည် ..... ၂ Ten years and above လွန်ခဲ့သော**ဆယ်နှစ်** နှင့် **ဆယ်နှစ်အထက်မှ** စတင်၍ ပြောင်းလဲပါသည် ၃
Q4	Are there any changes in quality of rice and other crops? စပါးနှင့် အခြားသီးနှံများ **အရည်အသွေး ပြောင်းလဲမှု** ရှိပါသလား။	1. Increased အရည်အသွေး ကောင်းမွန်လာပါသည်။ 2. Decreased အရည်အသွေး ကျဆင်းလာပါသည်။ 3.Same အရည်အသွေး ပြောင်းလဲမှု မရှိပါ။
Q5	If there are changes in quality, please state the estimated duration. **အရည်အသွေး ပြောင်းလဲမှု** ရှိပါက လွန်ခဲ့သော မည်သည့်နှစ်အပိုင်းအခြားမှစတင်၍ ပြောင်းလဲပါသနည်း။	Three years ago လွန်ခဲ့သော**သုံးနှစ်မှ** စတင်ပြောင်းလဲပါသည် ..... ၁ Five years ago လွန်ခဲ့သော**ငါးနှစ်မှ** စတင်ပြောင်းလဲပါသည် ..... ၂ Ten years and above လွန်ခဲ့သော**ဆယ်နှစ်** နှင့် **ဆယ်နှစ်အထက်မှ** စတင်၍ ပြောင်းလဲပါသည် ၃
Q6	Are there any problems and impacts on agriculture due to factory? စက်ရုံကြောင့် စိုက်ပျိုးရေးလုပ်ငန်း အပေါ် အခြား သက်ရောက်မှု များရှိပါသလား၊ i. Yes **ရှိပါသည်။** ii. No **မရှိပါ။**	If "Yes". Please mention about those issues. စက်ရုံကြောင့် စိုက်ပျိုးရေးလုပ်ငန်း အပေါ် သက်ရောက်မှု များရှိပါက ဖော်ပြပေးပါ။ --- ---

Q7	Compared to last 25 years ago, your farmland acres လွန်ခဲ့သော ၂၅ နှစ်ကနှင့်ယှဉ်လျှင် သင်ပိုင်ဆိုင်သော လယ်ယာမြေများမှာ	1. Increased ၁. လယ်ဧက ပမာဏ **ပိုမိုများပြားလာသည်။** 2. Decreased ၂. လယ်ဧက ပမာဏ**လျော့နည်း** သွားပါသည်။ 3. Same ၃. လယ်ဧက ပမာဏ မပြောင်းလဲပါ။	If decreased, how many acres? လယ်ဧက ပမာဏ**လျော့နည်း** သွားပါက ယခင်နှင့် ယခုလက်ရှိ ဧက အရည်အတွက်အား ဖော်ပြပေးပါ။ **Before** ယခင် **After** ယခု
Q8	Please state the reason of decreased farmland. (You can answer more than one.) လယ်ဧက ပမာဏ**လျော့နည်း** သွားပါက အဘယ်ကြောင့်နည်း။	1. Reduced quality of rice and plants ၁. စပါးနှင့် သီးနှံ **အရည်အသွေး ကျဆင်း**သွားသောကြောင့် 2. Give farmland to family members/relatives or others ၂.လယ်ယာအား မိသားစု၊ ဆွေမျိုး နှင့် အခြားသူများအား **ပေးလိုက်သော**ကြောင့် 3. Sell to others ၃. **ရောင်းချလို**က်သောကြောင့်	

Survey questionnaire for Biodiversity

Biodiversity Questionnaire

	Questions	Response
1.Crops	a. What **crops** do you plant? မည့်သည့်ကောက်ပဲသီးနှံများစိုက်ပျိုးပါသနည်း။	List Crops 1.rice ဆန် 2.sugar cane ကြံ 3.beans ပဲ 4.sesame နှမ်း 5.ground nut မြေပဲ
	b. Which is the most valuable **crop** that you grow? မည့်သည့်သီးနှံက ဈေးကောင်းအရဆုံး ဖြစ်သနည်း။	List Crops 1.rice ဆန် 2.sugar cane ကြံ 3.beans ပဲ 4.sesame နှမ်း 5.ground nut မြေပဲ
	c. Do you use **fertilizer**? အသီးအပင် အားတိုးဆေး သုံးပါသလား။	Yes No
	d. Do you use **pesticide**? ပိုးသတ်ဆေး သုံးပါသလား။	Yes No
	e. Over the last 10 years has **crops** yield? ၁၀ နှစ်အတွင်း အထွက်နှုန်း မည့်သို့ရှိ သနည်း။	A. Increased, တက်သလား B. Decreased or ကျသွားသလား C. Remained stable နဂိုအတိုင်းမပြောင်းမလဲရှိသလား
	f. What is the cause of change? အဘယ့်ကြောင့် ထိုသို့ ပြောင်းလဲမှု ရှိသနည်း။	List Causes of possible change 1 not enough water ရေမလုံလောက်ခြင်း 2 too much water ရေများလွန်းခြင်း 3 too hot ပူလွန်းခြင်း

		4 Change in ecosystem ဂေဟစနစ် ပြောင်းလဲမှု ဖြစ်ပေါ်ခြင်း
	g. Are you crops an important food source? i.e. or are they sold စိုက်ပျိုးထားသော ကောက်ပဲသီးနှံများကို ရောင်းချပါသလား။	Yes No
2. Honey	a. Is honey produced in this area? ပျားရည် ဤဒေသတွင် ရပါသလား။	Yes No
	b. Has honey production in the past 10 years? ပျားရည် အထွက်နှုန်း ၁၀ နှစ်အတွင်း မည်သို့ရှိသနည်း။	A. Increased, တက်သလား B. Decreased or ကျသွားသလား C. Remained stable နဂိုအတိုင်းမပြောင်းမလဲရှိသလား
	c. What in your opinion is the reason for the change in honey production? ပျားရည် အထွက်နှုန်း ပြောင်းလဲခြင်း အတွက် မည်သို့ထင်မြင် ပါသနည်း။	List Causes of possible change 1. Less Harvesting မွေးမြူခြင်း လျော့နည်းလာခြင်း 2. More Harvesting ပို မွေးမြူခြင်း 3. Change in ecosystem ဂေဟစနစ် ပြောင်းလဲလာခြင်း 4. Climate change ရာသီဥတု ပြောင်းလဲခြင်း
	d. Is honey an important source of **food/medicine** ပျားရည်က အစာနဲ့ဆေး အတွက် အရေးပါ ပါသလား။	Yes No
3. Palm **Sugar/Sap(Jackeri)**	a. Over the past 10 years has **palm sugar/sap(Jackeri)** Production ၁၀ နှစ်အတွင်း ထန်းလျက်/ထန်းရည် အထွက်နှုန်း မည်သို့ရှိသနည်း။	A. Increased, တက်သလား B. Decreased or ကျသွားသလား C. Remained stable နဂိုအတိုင်းမပြောင်းမလဲရှိသလား
	b. What is the reason for any observed change in **palm sugar/sap?** ထန်းလျက်/ထန်းရည် အထွက်နှုန်း ပြောင်းလဲခြင်း အတွက်	List Reasons for observed change 1. Less Harvesting စိုက်ပျိုးခြင်း လျော့နည်းလာခြင်း 2. More Harvesting ပို စိုက်ပျိုး ခြင်း

	သိသာသော အကြောင်းပြချက်ကို ပြောပြပါ။	3. Change in ecosystem ဂေဟစနစ် ပြောင်းလဲလာခြင်း 4. Climate change ရာသီဥတု ပြောင်းလဲခြင်း
	c. Is palm sugar/sap and important source of **food/medicine?** ထန်းလျက်/ထန်းရည် သည် အစာနဲ့ဆေး အတွက် အရေးပါပါသလား။	Yes No
4. Wild Plants **တောရိုင်းပင်များ**	a. Over the past 10 years has the abundance or distribution of **wild plants**? ၁၀ နှစ်အတွင်း အပင်ရိုင်း များ ပေါများမှုမှာ မည့်သို့ရှိသနည်း။	A. Increased, တက်သလား B. Decreased or ကျသွားသလား C. Remained stable နဂိုအတိုင်းမပြောင်းမလဲရှိသလား
	b. Over the past 10 years has the diversity/type of **wild plants**? လွန်ခဲ့သော ၁၀ နှစ်အတွင်း တောရိုင်းအပင် အမျိုးအစားများ မည်သို့ ပြောင်းလဲသနည်း။	A. Increased, တက်သလား B. Decreased or ကျသွားသလား C. Remained the same နဂိုအတိုင်းမပြောင်းမလဲရှိသလား
	c. If there has been a change in number and or diversity of **wild plants**, why do you think this change has occurred? တောရိုင်းအပင်၏ အရေအတွက်/အမျိုးအစား ပြောင်းလဲလျှင် မည့်သည့်အချက် ကြောင့်ပြောင်းလဲသနည်း။	1. Less Harvesting စိုက်ပျိုးခြင်း လျော့နည်းလာခြင်း 2. More Harvesting ပိုစိုက်ပျိုးခြင်း 3. Change in habits/ecosystem ဂေဟစနစ် ပြောင်းလဲလာခြင်း 4. Climate change ရာသီဥတု ပြောင်းလဲခြင်း
	d. Over the past 10 years has the timing of **flowering** changed in any plants ၁၀ နှစ်အတွင်း အပင်များ၏ ပန်းပွင့်သော အချိန် ပြောင်းလဲပါသလား	Yes No
	e. Are these **wild plants an important source of food/medicine**?	Yes No

	တောရိုင်းပင်များသည် အစာနဲ့ဆေး အတွက် အရေးပါပါသလား။	
5. Birds General **ငှက်**	a. Over the past 10 years has the number of wild **birds**? ၁၀ နှစ်အတွင်း ငှက်အရေအတွက် ပြောင်းလဲပါသလား။	A. Increased, တက်သလား B. Decreased or ကျသွားသလား C. Remained the same နဂိုအတိုင်းမပြောင်းမလဲရှိသလား
	b. Over the past 10 years has the diversity/type of wild **birds**? ၁၀ နှစ်အတွင်း ငှက်မျိုးစိတ် ပြောင်းလဲပါသလား။	A. Increased, တက်သလား B. Decreased or ကျသွားသလား C. Remained the same နဂိုအတိုင်းမပြောင်းမလဲရှိသလား
	c. If there has been a change in number and or diversity of wild **birds**, why do you think this change has occurred? ငှက်အမျိုးအစားနှင့်အရေအတွက် ပြောင်းလဲမှုဖြစ်ပေါ်ပါလျှင် မည်သည့်အချက်ကြောင့် ပြောင်းလဲပါသနည်း။	1. Less Hunting အမဲလိုက်ခြင်း လျော့နည်းလာခြင်း 2. More Hunting ပို အမဲလိုက်ခြင်း 3. Change in habits/ecosystem ဂေဟစနစ် ပြောင်းလဲလာခြင်း 4. Climate change ရာသီဥတု ပြောင်းလဲခြင်း
	d. Are wild birds and important source **food/medicine**? ငှက်များသည် အစာနဲ့ဆေး အတွက် အရေးပါ ပါသလား။	Yes No
6. **Hawks** **သိမ်းငှက်**	a. Have you ever seen a **hawk/bird of prey in this area**? ဤဒေသတွင် သိမ်းငှက် ကို မြင်ဖူးပါ သလား။	Yes No
	b. Are hawks common? ဤဒေသတွင် သိမ်းငှက် ပေါများပါသလား။	Yes No
	c. Has the number of **hawks** increased, decreased or	A. Increased, တက်သလား

	remain stable over the past 10 years? ၁၀ နှစ်အတွင်း သိမ်းဌက် အရေအတွက် ပြောင်းလဲပါသလား။	B. Decreased or ကျသွားသလား C. Remained the same နဂိုအတိုင်းမပြောင်းမလဲရှိသလား
	d. Has the diversity/type of **hawks** increased, decreased or remain stable over the past 10 years? ၁၀ နှစ်အတွင်း သိမ်းဌက် မျိုးစိတ် ပြောင်းလဲပါသလား။	A. Increased, တက်သလား B. Decreased or ကျသွားသလား C. Remained the same နဂိုအတိုင်းမပြောင်းမလဲရှိသလား
	e.If there has been a change in number and or diversity of **hawks**, why do you think this change has occurred? သိမ်းဌက်အမျိုးအစားနှင့်အရေအတွက် ပြောင်းလဲမှုဖြစ်ပေါ်ပါလျှင် မည်သည့်အချက်ကြောင့် ပြောင်းလဲပါသနည်း။	1. Less Hunting အမဲလိုက်ခြင်း လျော့နည်းလာခြင်း 2. More Hunting ပို အမဲလိုက်ခြင်း 3. Change in habits ကျက်စားရာဒေသ ပြောင်းလဲခြင်း 4. Climate change ရာသီဥတု ပြောင်းလဲခြင်း
	f. Are hawks a source of foods? သိမ်းဌက် ကိုစားပါသလား။	Yes No
7. Vultures **လင်းတ**	a. Have you ever seen a **vultures in this area**? ဤဒေသတွင် လင်းတကို မြင်ဖူးပါ သလား။	Yes No
	b. Are vultures common? ဤဒေသတွင် လင်းတ ပေါများပါသလား။	Yes No
	c. Has the number of **vultures** increased, decreased or remain stable over the past 10 years? ၁၀ နှစ်အတွင်း ဌက်အရေအတွက် ပြောင်းလဲပါသလား။	A. Increased, တက်သလား B. Decreased or ကျသွားသလား C. Remained the same နဂိုအတိုင်းမပြောင်းမလဲရှိသလား
	d.If there has been a change in number and or diversity of wild **vultures**, why do you think this change has occurred? လင်းတ အမျိုးအစားနှင့်အရေအတွက် ပြောင်းလဲမှုဖြစ်ပေါ်ပါလျှင် မည်သည့်အချက်ကြောင့် ပြောင်းလဲပါသနည်း။	1. Less Hunting အမဲလိုက်ခြင်း လျော့နည်းလာခြင်း 2. More Hunting ပို အမဲလိုက်ခြင်း 3. Change in habits ကျက်စားရာဒေသ ပြောင်းလဲခြင်း 4. Climate change ရာသီဥတု ပြောင်းလဲခြင်း

	e. Are vultures a source of foods/medicine? လင်းတများသည် အစာနဲ့ဆေး အတွက် အရေးပါ ပါသလား။	Yes No
8. Owls **ဇီးကွက်**	a. Have you ever seen a **owls in this area**? ဤဒေသတွင် ဇီးကွက်ကို မြင်ဖူးပါ သလား။	Yes No
	b. Are owls common? ဤဒေသတွင် ဇီးကွက် ပေါများပါသလား။	Yes No
	c. Has the number of **owls** increased, decreased or remain stable over the past 10 years? ၁၀ နှစ်အတွင်း ဇီးကွက် အရေအတွက် ပြောင်းလဲပါသလား။	A. Increased, တက်သလား B. Decreased or ကျသွားသလား C. Remained the same နဂိုအတိုင်းမပြောင်းမလဲရှိသလား
	d. Has the diversity/type of **owls** increased, decreased or remain stable over the past 10 years? ၁၀ နှစ်အတွင်း ဇီးကွက် မျိုးစိတ် ပြောင်းလဲပါသလား။	A. Increased, တက်သလား B. Decreased or ကျသွားသလား C. Remained the same နဂိုအတိုင်းမပြောင်းမလဲရှိသလား
	e.If there has been a change in number and or diversity of wild **owls**, why do you think this change has occurred? ဇီးကွက် အမျိုးအစားနှင့်အရေအတွက် ပြောင်းလဲမှုဖြစ်ပေါ်ပါလျှင် မည်သည့်အချက်ကြောင့် ပြောင်းလဲပါသနည်း။	1. Less Hunting အမဲလိုက်ခြင်း လျော့နည်းလာခြင်း 2. More Hunting ပို အမဲလိုက်ခြင်း 3. Change in habits ကျက်စားရာဒေသ ပြောင်းလဲခြင်း 4. Climate change ရာသီဥတု ပြောင်းလဲခြင်း
	f. Are owls a source of foods/medicine? ဇီးကွက်များသည် အစာနဲ့ဆေး အတွက် အရေးပါ ပါသလား။	Yes No
9. Wild Cats **တောကြောင်**	a. Have you ever seen a **wild (non-domestic) cats in this area**? ဤဒေသတွင် တောကြောင်ကို မြင်ဖူးပါ သလား။	Yes No

	b. Are wild cats common? ဤဒေသတွင် တောကြောင် ပေါများပါသလား။	Yes No
	c. Has the number of **wild cats** increased, decreased or remain stable over the past 10 years? ၁၀ နှစ်အတွင်း တောကြောင်အရေအတွက် ပြောင်းလဲပါသလား။	A. Increased, တက်သလား B. Decreased or ကျသွားသလား C. Remained the same နဂိုအတိုင်းမပြောင်းမလဲရှိသလား
	d. Has the diversity/type of **wild cats** increased, decreased or remain stable over the past 10 years? ၁၀ နှစ်အတွင်း တောကြောင်မျိုးစိတ် ပြောင်းလဲပါသလား။	A. Increased, တက်သလား B. Decreased or ကျသွားသလား C. Remained the same နဂိုအတိုင်းမပြောင်းမလဲရှိသလား
	e.If there has been a change in number and or diversity of **wild cats**, why do you think this change has occurred? တောကြောင်အမျိုးအစားနှင့်အရေအတွက် ပြောင်းလဲမှုဖြစ်ပေါ်ပါလျှင် မည်သည့်အချက်ကြောင့် ပြောင်းလဲပါသနည်း။	1. Less Hunting အမဲလိုက်ခြင်း လျော့နည်းလာခြင်း 2. More Hunting ပို အမဲလိုက်ခြင်း 3. Change in habits ကျက်စားရာဒေသ ပြောင်းလဲခြင်း 4. Climate change ရာသီဥတု ပြောင်းလဲခြင်း
	f. Are wild cats a source of foods/medicine? တောကြောင်များသည် အစာနဲ့ဆေး အတွက် အရေးပါပါသလား။	Yes No
10. Bats **လင်းနို**	a. Have you ever seen a **bats in this area**? ဤဒေသတွင် လင်းနိုကို မြင်ဖူးပါ သလား။	Yes No
	b. Are bats common? ဤဒေသတွင် လင်းနို ပေါများပါသလား။	Yes No
	c. Has the number of **bats** increased, decreased or remain stable over the past 10 years? ၁၀ နှစ်အတွင်း လင်းနိုအရေအတွက် ပြောင်းလဲပါသလား။	A. Increased, တက်သလား B. Decreased or ကျသွားသလား C. Remained the same နဂိုအတိုင်းမပြောင်းမလဲရှိသလား

	d. Has the diversity/type of **bats** increased, decreased or remain stable over the past 10 years? ၁၀ နှစ်အတွင်း လင်းနို့မျိုးစိတ် ပြောင်းလဲပါသလား။	A. Increased, တက်သလား B. Decreased or ကျသွားသလား C. Remained the same နဂိုအတိုင်းမပြောင်းမလဲရှိသလား
	e.If there has been a change in number and or diversity of wild **bats**, why do you think this change has occurred? လင်းနို့အမျိုးအစားနှင့်အရေအတွက် ပြောင်းလဲမှုဖြစ်ပေါ်ပါလျှင် မည့်သည့်အချက်ကြောင့် ပြောင်းလဲပါသနည်း။	1. Less Hunting အမဲလိုက်ခြင်း လျော့နည်းလာခြင်း 2. More Hunting ပို အမဲလိုက်ခြင်း 3. Change in habits ကျက်စားရာဒေသ ပြောင်းလဲခြင်း 4. Climate change ရာသီဥတု ပြောင်းလဲခြင်း
	f. Are bats a source of foods/medicine? လင်းနို့များသည် အစာနဲ့ဆေး အတွက် အရေးပါ ပါသလား။	Yes No
11. Rats and Mice ကြွက်	a. Have you ever seen a **Rats and Mice in this area**? ဤဒေသတွင် ကြွက်ကို မြင်ဖူးပါ သလား။	Yes No
	b. Are **Rats and Mice** common? ဤဒေသတွင် ကြွက် ပေါများပါသလား။	Yes No
	c. Has the number of **Rats and Mice** increased, decreased or remain stable over the past 10 years? ၁၀ နှစ်အတွင်း ကြွက် အရေအတွက် ပြောင်းလဲပါသလား။	A. Increased, တက်သလား B. Decreased or ကျသွားသလား C. Remained the same နဂိုအတိုင်းမပြောင်းမလဲရှိသလား
	d. Has the diversity/type of **Rats and Mice** increased, decreased or remain stable over the past 10 years? ၁၀ နှစ်အတွင်း ကြွက်မျိုးစိတ် ပြောင်းလဲပါသလား။	A. Increased, တက်သလား B. Decreased or ကျသွားသလား C. Remained the same နဂိုအတိုင်းမပြောင်းမလဲရှိသလား
	e.If there has been a change in number and or diversity of wild **Rats and Mice**, why do you think this change has occurred? ကြွက်အမျိုးအစားနှင့်အရေအတွက် ပြောင်းလဲမှုဖြစ်	1. Less Hunting အမဲလိုက်ခြင်း လျော့နည်းလာခြင်း 2. More Hunting ပို အမဲလိုက်ခြင်း 3. Change in habits ကျက်စားရာဒေသ ပြောင်းလဲခြင်း

	ပေါ်ပါလျှင် မည့်သည့်အချက်ကြောင့် ပြောင်းလဲပါသနည်း။	4. Climate change ရာသီဥတု ပြောင်းလဲခြင်း
	f. Are **Rats and Mice** a source of foods/medicine? ကြွက်များသည် အစာနှဲ့ဆေး အတွက် အရေးပါ ပါသလား။	Yes No
12. Frogs and Toads ဖားနှင့်ဖားပြုတ်	a. Have you ever seen a **Frogs and Toads in this area**? ဤဒေသတွင် ဖားနှင့်ဖားပြုတ်ကို မြင်ဖူးပါ သလား။	Yes No
	b. Are **Frogs and Toads** common? ဤဒေသတွင် ဖားနှင့်ဖားပြုတ် ပေါများပါသလား။	Yes No
	c. Has the number of **Frogs and Toads** increased, decreased or remain stable over the past 10 years? ၁၀ နှစ်အတွင်း ဖား/ဖားပြုတ်အရေအတွက် ပြောင်းလဲပါသလား။	A. Increased, တက်သလား B. Decreased or ကျသွားသလား C. Remained the same နဂိုအတိုင်းမပြောင်းမလဲရှိသလား
	d. Has the diversity/type of **Frogs and Toads** increased, decreased or remain stable over the past 10 years? ၁၀ နှစ်အတွင်း ဖား/ဖားပြုတ်မျိုးစိတ် ပြောင်းလဲပါသလား။	A. Increased, တက်သလား B. Decreased or ကျသွားသလား C. Remained the same နဂိုအတိုင်းမပြောင်းမလဲရှိသလား
	e.If there has been a change in number and or diversity of wild **Frogs and Toads**, why do you think this change has occurred? ဖား/ဖားပြုတ်အမျိုးအစားနှင့်အရေအတွက် ပြောင်းလဲမှုဖြစ်ပေါ်ပါလျှင် မည့်သည့်အချက်ကြောင့် ပြောင်းလဲပါသနည်း။	1. Less Hunting အမဲလိုက်ခြင်း လျော့နည်းလာခြင်း 2. More Hunting ပို အမဲလိုက်ခြင်း 3. Change in habits ကျက်စားရာဒေသ ပြောင်းလဲခြင်း 4. Climate change ရာသီဥတု ပြောင်းလဲခြင်း
	f. Are **Frogs and Toads** a source of foods/medicine? ဖား/ဖားပြုတ်များသည် အစာနှဲ့ဆေး အတွက် အရေးပါ ပါသလား။	Yes No

13. Scorpions **ကင်းမြီးကောက်**	a. Have you ever seen a **Scorpions in this area**? ဤဒေသတွင် ကင်းမြီးကောက် မြင်ဖူးပါ သလား။	Yes No
	b. Are **Scorpions** common? ဤဒေသတွင် ကင်းမြီးကောက် ပေါများပါသလား။	Yes No
	c. Has the number of **Scorpions** increased, decreased or remain stable over the past 10 years? ၁၀ နှစ်အတွင်း ကင်းမြီးကောက်အရေအတွက် ပြောင်းလဲပါသလား။	A. Increased, တက်သလား B. Decreased or ကျသွားသလား C. Remained the same နဂိုအတိုင်းမပြောင်းမလဲရှိသလား
	d. Has the diversity/type of **Scorpions** increased, decreased or remain stable over the past 10 years? ၁၀ နှစ်အတွင်း ကင်းမြီးကောက်မျိုးစိတ် ပြောင်းလဲပါသလား။	A. Increased, တက်သလား B. Decreased or ကျသွားသလား C. Remained the same နဂိုအတိုင်းမပြောင်းမလဲရှိသလား
	e.If there has been a change in number and or diversity of wild **Scorpions**, why do you think this change has occurred? ကင်းမြီးကောက်အမျိုးအစားနှင့်အရေအတွက် ပြောင်းလဲမှုဖြစ်ပေါ်ပါလျှင် မည့်သည့်အချက်ကြောင့် ပြောင်းလဲပါသနည်း။	1. Less Hunting အမဲလိုက်ခြင်း လျော့နည်းလာခြင်း 2. More Hunting ပို အမဲလိုက်ခြင်း 3. Change in habits ကျက်စားရာဒေသ ပြောင်းလဲခြင်း 4. Climate change ရာသီဥတု ပြောင်းလဲခြင်း
	f. Are **Scorpions** a source of foods/medicine? ကင်းမြီးကောက်များသည် အစာနဲ့ဆေး အတွက် အရေးပါပါသလား။	Yes No
14. Turtles & Tortoise **ရေလိပ်/ကုန်းလိပ်**	a. Have you ever seen a **Turtles &Tortoise in this area**? ဤဒေသတွင် ရေလိပ်/ကုန်းလိပ် မြင်ဖူးပါ သလား။	Yes No
	b. Are **Turtles & Tortoise** common? ဤဒေသတွင် ရေလိပ်/ကုန်းလိပ် ပေါများပါသလား။	Yes No

	c. Has the number of **Turtles &Tortoise** increased, decreased or remain stable over the past 10 years? ၁၀ နှစ်အတွင်း ရေလိပ်/ကုန်းလိပ်အရေအတွက် ပြောင်းလဲပါသလား။	A. Increased, တက်သလား B. Decreased or ကျသွားသလား C. Remained the same နဂိုအတိုင်းမပြောင်းမလဲရှိသလား
	d. Has the diversity/type of **Turtles &Tortoise** increased, decreased or remain stable over the past 10 years? ၁၀ နှစ်အတွင်း ရေလိပ်/ကုန်းလိပ် မျိုးစိတ် ပြောင်းလဲပါသလား။	A. Increased, တက်သလား B. Decreased or ကျသွားသလား C. Remained the same နဂိုအတိုင်းမပြောင်းမလဲရှိသလား
	e. If there has been a change in number and or diversity of wild **Turtles &Tortoise**, why do you think this change has occurred? ရေလိပ်/ကုန်းလိပ်အမျိုးအစားနှင့်အရေအတွက်ပြောင်းလဲမှုဖြစ်ပေါ်ပါလျှင် မည့်သည့်အချက်ကြောင့် ပြောင်းလဲပါသနည်း။	1. Less Hunting အမဲလိုက်ခြင်း လျော့နည်းလာခြင်း 2. More Hunting ပို အမဲလိုက်ခြင်း 3. Change in habits ကျက်စားရာဒေသ ပြောင်းလဲခြင်း 4. Climate change ရာသီဥတု ပြောင်းလဲခြင်း
	f. Over the past 5 years have you ever seen a **Star Tortoise**/jai lek? လွန်ခဲ့သော ၅နှစ်ခန့်က ကြယ်လိပ်ကိုတွေ့ဖူးပါသလား။	Yes No
	g. Are **Turtles &Tortoise** a source of foods/medicine? ရေလိပ်/ကုန်းလိပ်များသည် အစာနဲ့ဆေး အတွက် အရေးပါပါသလား။	Yes No
15. Bees **ပျား**	a. Have you ever seen a **Bees in this area**? ဤဒေသတွင် ပျားများကို မြင်ဖူးပါ သလား။	Yes No
	b. Are **Bees** common? ဤဒေသတွင် ပျားများ ပေါများပါသလား။	Yes No

	c. Has the number of **Bees** increased, decreased or remain stable over the past 10 years? ၁၀ နှစ်အတွင်း ပျားအရေအတွက် ပြောင်းလဲပါသလား။	A. Increased, တက်သလား B. Decreased or ကျသွားသလား C. Remained the same နဂိုအတိုင်းမပြောင်းမလဲရှိသလား
	d. Has the diversity/type of **Bees** increased, decreased or remain stable over the past 10 years? ၁၀ နှစ်အတွင်း ပျားမျိုးစိတ် ပြောင်းလဲပါသလား။	A. Increased, တက်သလား B. Decreased or ကျသွားသလား C. Remained the same နဂိုအတိုင်းမပြောင်းမလဲရှိသလား
	e.If there has been a change in number and or diversity of wild **Bees**, why do you think this change has occurred? ပျားအမျိုးအစားနှင့်အရေအတွက် ပြောင်းလဲမှုဖြစ်ပေါ်ပါလျှင် မည်သည့်အချက်ကြောင့် ပြောင်းလဲပါသနည်း။	1. Less Hunting အမဲလိုက်ခြင်း လျော့နည်းလာခြင်း 2. More Hunting ပို အမဲလိုက်ခြင်း 3. Change in habits ကျက်စားရာဒေသ ပြောင်းလဲခြင်း 4. Climate change ရာသီဥတု ပြောင်းလဲခြင်း
	f. Are **Bees** a source of foods/medicine? ပျားများသည် အစာနှံ့ဆေး အတွက် အရေးပါ ပါသလား။	Yes No
16. Butterflies **လိပ်ပြာ**	a. Have you ever seen a **Butterflies in this area**? ဤဒေသတွင် လိပ်ပြာများကို မြင်ဖူးပါ သလား။	Yes No
	b. Are **Butterflies** common? ဤဒေသတွင် လိပ်ပြာများ ပေါများပါသလား။	Yes No
	c. Has the number of **Butterflies** increased, decreased or remain stable over the past 10 years? ၁၀ နှစ်အတွင်း လိပ်ပြာအရေအတွက် ပြောင်းလဲပါသလား။	A. Increased, တက်သလား B. Decreased or ကျသွားသလား C. Remained the same နဂိုအတိုင်းမပြောင်းမလဲရှိသလား
	d. Has the diversity/type of **Butterflies** increased, decreased or remain stable over the past 10 years? ၁၀ နှစ်အတွင်း လိပ်ပြာမျိုးစိတ် ပြောင်းလဲပါသလား။	A. Increased, တက်သလား B. Decreased or ကျသွားသလား C. Remained the same နဂိုအတိုင်းမပြောင်းမလဲရှိသလား
	e.If there has been a change in number and or	1. Less Hunting အမဲလိုက်ခြင်း လျော့နည်းလာခြင်း

	diversity of wild **Butterflies**, why do you think this change has occurred? လိပ်ပြာအမျိုးအစားနှင့်အရေအတွက် ပြောင်းလဲမှုဖြစ်ပေါ်ပါလျှင် မည့်သည့်အချက်ကြောင့် ပြောင်းလဲပါသနည်း။	2. More Hunting ပို အမဲလိုက်ခြင်း 3. Change in habits ကျက်စားရာဒေသ ပြောင်းလဲခြင်း 4. Climate change ရာသီဥတု ပြောင်းလဲခြင်း
	f. Are **Butterflies** a source of foods/medicine? လိပ်ပြာများသည် အစာနှံ့ဆေး အတွက် အရေးပါ ပါသလား။	Yes No
17. Mosquitoes **ခြင်**	a. Have you ever seen a **Mosquitoes in this area**? ဤဒေသတွင် ခြင်များကို မြင်ဖူးပါ သလား။	Yes No
	b. Are **Mosquitoes** common? ဤဒေသတွင် ခြင်များ ပေါများပါသလား။	Yes No
	c. Has the number of **Mosquitoes** increased, decreased or remain stable over the past 10 years? ၁၀ နှစ်အတွင်း ခြင်အရေအတွက် ပြောင်းလဲပါသလား။	A. Increased, တက်သလား B. Decreased or ကျသွားသလား C. Remained the same နဂိုအတိုင်းမပြောင်းမလဲရှိသလား
	d. Has the diversity/type of **Mosquitoes** increased, decreased or remain stable over the past 10 years? ၁၀ နှစ်အတွင်း ခြင်မျိုးစိတ် ပြောင်းလဲပါသလား။	A. Increased, တက်သလား B. Decreased or ကျသွားသလား C. Remained the same နဂိုအတိုင်းမပြောင်းမလဲရှိသလား
	e.If there has been a change in number and or diversity of wild **Mosquitoes**, why do you think this change has occurred? ခြင်အမျိုးအစားနှင့်အရေအတွက် ပြောင်းလဲမှုဖြစ်ပေါ်ပါလျှင် မည့်သည့်အချက်ကြောင့် ပြောင်းလဲပါသနည်း။	1. Less Hunting အမဲလိုက်ခြင်း လျော့နည်းလာခြင်း 2. More Hunting ပို အမဲလိုက်ခြင်း 3. Change in habits ကျက်စားရာဒေသ ပြောင်းလဲခြင်း 4. Climate change ရာသီဥတု ပြောင်းလဲခြင်း
	f. Are **Mosquitoes** a source of foods/medicine? ခြင်များသည် အစာနှံ့ဆေး အတွက် အရေးပါ ပါသလား။	Yes No

18. Snakes **မြွေ**	a. Have you ever seen a **Snakes in this area**? ဤဒေသတွင် မြွေများကို မြင်ဖူးပါ သလား။	Yes No
	b. Are **Snakes** common? ဤဒေသတွင် မြွေများ ပေါများပါသလား။	Yes No
	c. Has the number of **Snakes** increased, decreased or remain stable over the past 10 years? ၁၀ နှစ်အတွင်း မြွေအရေအတွက် ပြောင်းလဲပါသလား။	A. Increased, တက်သလား B. Decreased or ကျသွားသလား C. Remained the same နဂိုအတိုင်းမပြောင်းမလဲရှိသလား
	d. Has the diversity/type of **Snakes** increased, decreased or remain stable over the past 10 years? ၁၀ နှစ်အတွင်း မြွေမျိုးစိတ် ပြောင်းလဲပါသလား။	A. Increased, တက်သလား B. Decreased or ကျသွားသလား C. Remained the same နဂိုအတိုင်းမပြောင်းမလဲရှိသလား
	e.If there has been a change in number and or diversity of wild **Snakes**, why do you think this change has occurred? မြွေအမျိုးအစားနှင့်အရေအတွက် ပြောင်းလဲမှုဖြစ်ပေါ်ပါလျှင် မည်သည့်အချက်ကြောင့် ပြောင်းလဲပါသနည်း။	1. Less Hunting အမဲလိုက်ခြင်း လျော့နည်းလာခြင်း 2. More Hunting ပို အမဲလိုက်ခြင်း 3. Change in habits ကျက်စားရာဒေသ ပြောင်းလဲခြင်း 4. Climate change ရာသီဥတု ပြောင်းလဲခြင်း
	f. Are **Snakes** a source of foods/medicine? မြွေများသည် အစာနှံ့ဆေး အတွက် အရေးပါ ပါသလား။	Yes No
19. General Environment	a. Over the past 10 years has natural habitat decreased by over25% ၁၀ နှစ်အတွင်း ကျက်စားရာ ဒေသ ၂၅% ထက်ပို၍ လျော့ကျပါသလား။	Yes No
	b. Over the past 10 years has the amount of wildlife decreased significantly? ၁၀နှစ်အတွင်း တောရိုင်းတိရစ္ဆာန်များ သိသိသာသာ	Yes No

	လျော့နည်းပါသလား။	
	c. Over the past 10 years are there significantly more people in this area? ဝဂနှစ်အတွင်း ဤဒေသတွင် သိသိသာသာ လူပိုများလာပါသလား။	Yes No
	d. Over the past 10 years has the weather changed significantly? ဝဂနှစ်အတွင်း ရာသီဥတု သိသိသာသာ ပြောင်းလဲလာပါသလား။	Yes No
	e. Are the wild plant and animals in this local environment a significant important source of food or medicine? တောရိုင်းအပင် နှင့် တိရစ္ဆာန်များ သည်ဤဒေသတွင် အစာနဲ့ဆေး အတွက် အရေးပါ ပါသလား။	Yes No
	f. Are the wild plant and animals in this local environment a significant important source of income? တောရိုင်းအပင် နှင့် တိရစ္ဆာန်များ သည်ဤဒေသတွင် အရေးပါသော ဝင်ငွေရနိုင်သည့် အလုပ်ဖြစ်ပါသလား။	Yes No

Cultural Heritage

	Cultural Heritage	Response
1	Name အမည်၊	
2	Age အသက်၊	
3	Ethnic လူမျိုး၊	
4	Religion ဘာသာ၊	
5	Education ပညာရေး၊	
6	Job အလုပ်၊	
7	Address လိပ်စာ၊	
8	Marital Status အိမ်ထောင်ရှိ/မရှိ	
9	Respect in god အခြား (နတ်/ တန်ခိုးရှင်)ကိုးကွယ်ပါသလား	
10	Respect in Guardian Spirit တော၊ တောင်၊ ရေ၊ မြေ၊ ရွာစောင့်နတ်များယုံကြည်ကိုးကွယ်ပါသလား	
11	Location of Pagodas/ Monasteries and the histories ဘုရား/ ဘုန်းကြီးကျောင်းတို့ ၏ တည်နေရာနှင့် သမိုင်းကြောင်းများ	
12	Cultural Heritage places in your village/ township area ရွာ/ မြို့ အနီးပတ်ဝန်းကျင်တွင် ရှေးဟောင်းသမိုင်းဝင်နေရာများရှိ/ မရှိ	

13	If there is cultural heritage areas in your places, please mention the villagers view about them ရှိလျှင် ထိုနေရာများအပေါ်ဒေသခံများ၏ သဘောထား	
14	School location and type in your village/township စာသင်ကျောင်း တည်နေရာ/ အမျိုးအစား:	
15	Fairy Tale ပုံပြင်ဒဏ္ဍာရီများ	
16	Any Believe in your job လုပ်ကိုင်နေသော အလုပ်အကိုင်နှင့်ဆိုင်သော ယုံကြည်မှု	

17	Dos and Don'ts in your village/ township သင့်ရွာ/မြို့တွင် ဒေသခံများကျင့်သုံးသော ရှောင်ဓလေ့နှင့် ဆောင်ဓလေ့များ	
18	History of your village/ township ရွာ/မြို့ ၏ ရွာဇဝင်-သမိုင်းကြောင်း	
19	Location of cemetery ရွာသင်္ချိုင်း၏ တည်နေရာ	
20	Any idea/view for the proposed project လုပ်ငန် ; အပေါ် ထင်မြင်ချက်	

THANTWE MARINE PRODUCTS CO., LTD.
No. 170, U Tayoke Gyi Street, Industry Zone (4), Hlaing Tharyar Township, Yangon, Myanmar.
Tel : (95-1) 3685778, 3685144 Fax : (95-1) 3685778, 3685144
E-mail : thantwemarine@icloud.com , tmpmeister@gmail.com

၈။ နိဒါန်း

Thandwe Marine Product Co.,Ltd အဖွေးခန်းစက်ရုံရှိ ဌာနအသီးသီးတွင်တာဝန်ထမ်းဆောင်နေသော ဝန်ထမ်းများအားလုံးသည် တာဝန်ချိန်နှင့်တာဝန်ချိန်ပြင်ပတွင် မီးလောင်မှုမဖြစ်ပေါ်စေရန်နှင့် သံတွဲမြို့၊ ဒွါရာဝတီမြို့သစ်အတွင်း မီးဘေးအန္တရာယ်ကြောင့် ပျက်စီးဆုံးရှုံးမှုမရှိစေရန် ရေးဆွဲထားသောစီမံချက်နှင့် အညီတာဝန်ကျေပွန်စွာဆောင်ရွက်သွားမည်ဖြစ်ပါသည်။

ဦးတင်မောင်ဌေး
မန်နေးဂျင်းဒါရိုက်တာ
Thandwe Marine Product Co.,Ltd

THANTWE MARINE PRODUCTS CO., LTD.
No. 170, U Tayoke Gyi Street, Industry Zone (4), Hlaing Tharyar Township, Yangon, Myanmar.
Tel : (95-1) 3685778, 3685144 Fax : (95-1) 3685778, 3685144
E-mail : thantwemarine@icloud.com , tmpmeister@gmail.com

(၅)	ဒေါ်ခင်လှရီ	-	တာဝန်ခံ
(၆)	ဦးဝင်းကို	-	မန်နေဂျာ
(၇)	ဦးမောင်မောင်	-	လှေပ်စစ်စက်ပြင်

(ဃ) ကြိုတင်ကာကွယ်ရေး မီးငြိမ်းသတ်အဖွဲ့

(၁)	ဦးတင်အေး	ပါကင်(အအေးခန်း)	ခေါင်းဆောင်
(၂)	ဦးရွှေထွန်း	ပါကင်(အအေးခန်း)	ဒု-ခေါင်းဆောင်
(၃)	ဦးအောင်ဖုန်းကြိုင်	ပါကင်(အအေးခန်း)	အဖွဲ့ဝင်
(၄)	ဦးမြတ်မင်း	စက်မောင်း	အဖွဲ့ဝင်
(၅)	ဦးအောင်သက်ပိုင်	ပါကင်(အအေးခန်း)	အဖွဲ့ဝင်
(၆)	ဦးထွန်းထွန်းနိုင်	ပါကင်	အဖွဲ့ဝင်
(၇)	ဦးရန်ပိုင်	ပါကင်	အဖွဲ့ဝင်
(၈)	ဦးထွန်းလင်း	ပါကင်	အဖွဲ့ဝင်
(၉)	ဒေါ်စောနန်းခိုင်	အအေးခန်း(ဝန်ထမ်း)	အဖွဲ့ဝင်
(၁၀)	ဒေါ်မြင့်မြင့်စိုး	အအေးခန်း(ဝန်ထမ်း)	အဖွဲ့ဝင်
(၁၁)	ဒေါ်မြင့်မြင့်သန်း	အအေးခန်း(ဝန်ထမ်း)	အဖွဲ့ဝင်
(၁၂)	ဒေါ်ချိုပြုံး	အအေးခန်း(ဝန်ထမ်း)	အဖွဲ့ဝင်
(၁၃)	ဒေါ်ဝင်းဝင်းလှိုင်	အအေးခန်း(ဝန်ထမ်း)	အဖွဲ့ဝင်
(၁၄)	ဒေါ်သီတာအေး	အအေးခန်း(ဝန်ထမ်း)	အဖွဲ့ဝင်

တာဝန်များ

(က) မြို့နယ်မီးသတ်တပ်ဖွဲ့၏ စီစဉ်မှုဖြင့် မီးငြိမ်းသတ်ခြင်းသရုပ်ပြအစီအစဉ်များဆောင်ရွက်ခြင်းနှင့် အခြေခံမီးသတ်သင်တန်းများဆောင်ရွက်ခြင်း။

(ခ) မီးသတ်စက်နှင့် မီးသတ်ဆေးပူး ၊ မီးချိတ် ၊ မီးကဒ် ၊ သဲပုံး ၊ ရေပုံးများအား မကြာခဏ စစ်ဆေးခြင်း။

(ဂ) လိုအပ်သည့်နေရာများတွင် မီးသတိပြု ၊ ဆေးလိပ်မသောက်ရ ဆိုင်းဘုတ်များစိုက်ထူသတိပေးခြင်း။

(ဃ) မီးလောင်မှုဖြစ်ပွားသည့်အခါ မီးသတ်တပ်ဖွဲ့များမရောက်မီ မီးသတ်ဆေးပူး ၊ မီးချိတ်၊ မီးကဒ် ၊ သဲပုံး ၊ ရေပုံးများဖြင့် မီးငြိမ်းသတ်ခြင်း။

(င) မီးသတ်တပ်ဖွဲ့များရောက်လာပါက အမြန်ဆုံးဆက်သွယ်ပြီးပူးပေါင်းဆောင်ရွက်ခြင်း။

THANTWE MARINE PRODUCTS CO., LTD.
No. 170, U Tayoke Gyi Street, Industry Zone (4), Hlaing Tharyar Township, Yangon, Myanmar.
Tel : (95-1) 3685778, 3685144 Fax : (95-1) 3685778, 3685144
E-mail : thantwemarine@icloud.com , tmpmeister@gmail.com

(၁)	မီးခိုတ်	-	၂၀	ခု
(၂)	မီးကတ်	-	၂၀	ခု
(၃)	ရေပုံး	-	၁၅	ပုံး
(၄)	သဲပုံး	-	၆	ပုံး
(၅)	မီးသတ်ဆေးဘူး	-	၂၀	ဘူး
(၆)	ရေဂါလံ(၄၀၀၀)ဆန့်ရေကန်	-	၂	ကန်
(၇)	ရေဂါလံ(၁၀၀၀)ဆန့်ရေစင်	-	၂	ခု
(၈)	ရေဂါလံ(၄၀၀)ဆန့်ရေစင်	-	၂	ခု

၅။ ဖွဲ့စည်းပုံ

(က) စီမံကွပ်ကဲရေးအဖွဲ့

(ခ) လုံခြုံရေး

(ဂ) ဆက်သွယ်ရေး

(ဃ) ကြိုတင်ကာကွယ်ရေး မီးငြိမ်းသတ်အဖွဲ့

(က) **စီမံကွက်ကဲရေးအဖွဲ့**

အရေးပေါ်ဖြစ်ပွားလာပါက ဆောင်ရွက်ရန် အောက်ပါအတိုင်းဖွဲ့စည်းထားပါသည်-

(၁)	ဦးတင်မောင်ဌေး	အုပ်ချုပ်မှုဒါရိုက်တာ	အဖွဲ့ဝင်
(၂)	ဦးမျိုးအောင်အောင်ဇော်	မန်နေဂျာ	အဖွဲ့ဝင်
(၃)	ဒေါ်ခင်လှရီ	စာရင်းကိုင်	အဖွဲ့ဝင်
(၄)	ဒေါ်မျိုးပပလင်း	စာရင်းကိုင်	အဖွဲ့ဝင်
(၅)	ဦးကျော်စိုး	စက်မောင်း	အဖွဲ့ဝင်
(၆)	ဦးတင်အေး	အအေးခန်းပါကင်	အဖွဲ့ဝင်

တာဝန်များ

(က) အဖွဲ့မှားအားကြိုတင်သတ်မှတ်ပေးထားသည့်အတိုင်းလုပ်ဆောင်ရန်တာဝန်များကိုစနစ်တကျအချိန်မီဆောင်ရွက်နိုင်ရေးအတွက်စီမံထိန်းသိမ်းပေးခြင်း။

(ခ) အဖွဲ့မှားမှ သတင်းရယူသုံးသပ်ပြီး မီးဘေးအန္တရာယ်ကြိုတင်ကာကွယ်နိုင်ရန်လမ်းညွှန်မှုပေးခြင်း။

(ဂ) မီးဘေးကြိုတင်ကာကွယ်ရေးလုပ်ငန်း မီးငြိမ်းသတ်ရေးလုပ်ငန်းများဆောင်ရွက်ပြီးတိုင်းလုပ်ငန်းအပေါ်သုံးသပ်ချက် ၊ ချွတ်ယွင်းမှုများကိုပြုပြင်ပေးရန်။

(ဃ) ကြိုတင်ကာကွယ်ရေး မီးငြိမ်းသတ်အဖွဲ့

THANTWE MARINE PRODUCTS CO., LTD.
No. 170, U Tayoke Gyi Street, Industry Zone (4), Hlaing Tharyar Township, Yangon, Myanmar.
Tel : (95-1) 3685778, 3685144 Fax : (95-1) 3685778, 3685144
E-mail : thantwemarine@icloud.com , tmpmeister@gmail.com

၁။ နိဒါန်း

ဒွါရာဝတီမြို့သစ်(၁)လမ်း ၊ သံတွဲမြို့ရှိ Thandwe Marine Product Co.,Ltd အားအေးခန်းစက်ရုံသည် ရေထွက်ပစ္စည်းများဖြစ်သော ငါး ၊ ပုစွန် ၊ ဂဏန်း ၊ ရေလှေးများကို စားသောက်ကုန်ပစ္စည်းအဖြစ် နိုင်ငံခြားထုတ် ကုန်လုပ်ငန်းနည်းစနစ်နှင့်အညီ အအေးခန်းနှင့်လျှပ်စစ်ပိုင်းဆိုင်ရာများဖြင့် နေ့စဉ် လုပ်ငန်းဆောင်ရွက် လျက်ရှိပါသည်။

၂။ ရည် ရွယ် ချက်

မီးဘေးအန္တရာယ်ကြောင့် သံတွဲမြို့နယ်အတွင်း နိုင်ငံပိုင်အဆောက်အဦနှင့် ပုဂ္ဂလိကပိုင်ကုမ္ပဏီများ မဆုံးရှုံးစေရန် ဤစီမံချက်အားရေးဆွဲပါသည်။

၃။ မီးလောင်ကျွမ်းမှုဖြစ်ပွားပေါ်ပေါက်နိုင်သည့်အခြေအနေ

(က) လူသားများပေါ့ဆမှုကြောင့် မီးလောင်ကျွမ်းနိုင်ပါသည်။

(ခ) စက်၏ပွတ်တိုက်မှုကြောင်းလည်းကောင်း၊ ချွတ်ယွင်းမှုကြောင့်လည်းကောင်း မီးလောင်ကျွမ်း နိုင်ပါသည်။

(ဂ) လျှပ်စစ်ဝါယာရှော့ဖြစ်၍ မီးလောင်ကျွမ်းနိုင်ပါသည်။

(ဃ) အမှုက်သရိုက်များစနစ်တကျမသိမ်းဆည်းမှုကြောင့် မီးလောင်ကျွမ်းနိုင်ပါသည်။

(င) ဓာတုပစ္စည်းများတစ်ခုနှင့်တစ်ခုဓာတ်ပြုမှုကြောင့်မီးလောင်ကျွမ်းနိုင်ပါသည်။

(စ) ပတ်ဝန်းကျင်မီးလောင်မှုမှ ကူးစက်လောင်ကျွမ်းနိုင်ပါသည်။

(ဆ) အဖျက်သမားများ၏ အဖျက်လုပ်ရပ်ကြောင့်မီးလောင်ကျွမ်းနိုင်ပါသည်။

၄။ မီးဘေးကြိုတင်ကာကွယ်ရေးအစီအစဉ်

(က) မီးဘေးအန္တရာယ်ကိုကာကွယ်တားဆီးရန်အတွက်ကြိုတင်ကာကွယ်ရေးနှင့် မီးငြိမ်းသတ်ရေး အဖွဲ့ဖွဲ့စည်းထားပါသည်။

(ခ) မသမာသူ အဖျက်လုပ်ရပ်များအား ကြိုင်ကာကွယ်နိုင်ရန်အတွက် လုံခြုံရေးများအား (၂၄)နာရီ တာဝန်ချထားပါသည်။

(ဂ) ကုမ္ပဏီစက်ရုံအတွင်း ပတ်ဝန်းကျင်မီးလောင်မှုဖြစ်ပွားပါက အချိန်မီတားဆီးနိုင်ရန်အတွက် အောက်ပါအတိုင်း စီစဉ်ထားပါသည်-

THANTWE MARINE PRODUCTS CO., LTD.
No. 170, U Tayoke Gyi Street, Industry Zone (4), Hlaing Tharyar Township, Yangon, Myanmar.
Tel : (95-1) 3685778, 3685144 Fax : (95-1) 3685778, 3685144
E-mail : thantwemarine@icloud.com , tmpmeister@gmail.com

(ခ) လုံခြုံရေး

(၁)	ဦးထွန်းရွှေ	လုံခြုံရေး	ခေါင်းဆောင်
(၂)	ဦးဝင်းကို	မန်နေဂျာ	ဒု-ခေါင်းဆောင်
(၃)	ဦးထွန်းမြင့်	ရေခဲစက်	အဖွဲ့ဝင်
(၄)	ဦးတင်အေး	အအေးခန်းပါကင်	အဖွဲ့ဝင်
(၅)	ဦးကျော်စိုး	စက်မောင်း	အဖွဲ့ဝင်
(၆)	ဦးခိုင်နေလင်း	စက်မောင်း	အဖွဲ့ဝင်
(၇)	ဦးချမ်းငြိမ်းအောင်		အဖွဲ့ဝင်

တာဝန်များ

(က) အရေးပေါ်ဖြစ်ပွားပါက စီမံခန့်ခွဲရေးအဖွဲ့နှင့်ဆက်သွယ်ရေးအဖွဲ့သို့ အမြန်ဆုံး သတင်းပို့ရန်။

(ခ) စက်ရုံဝင်းအတွင်း/အပြင်အား တာဝန်ယူစောင့်ရှောက်ခြင်း။

(ဂ) မီးလောင်မှုဖြစ်ပွားပါက မီးလှုံ့အချက်ပေးရန်။

(ဃ) မီးငြိမ်းသတ်ရေးအဖွဲ့များ လွယ်ကူချောမွေ့စွာလုပ်ကိုင်နိုင်ရန်လူများရှင်းလင်းပေးခြင်း။

(၈) ဆက်သွယ်ရေး

(၁)	ဦးမျိုးအောင်အောင်ဇော်	မန်နေဂျာ	အဖွဲ့ခေါင်းဆောင်
(၂)	ဦးတင်ဇော်ဦး	ယာဉ်မောင်း	အဖွဲ့ဝင်
(၃)	ဒေါ်မြသုမွန်	စာရင်းကိုင်	အဖွဲ့ဝင်
(၄)	ဒေါ်ယုနန္ဒာအောင်	စာရင်းကိုင်	အဖွဲ့ဝင်
(၅)	ဦးဖြိုးသူအောင်	ယာဉ်မောင်း	အဖွဲ့ဝင်

တာဝန်များ

(က) စီမံကွပ်ကဲရေးအဖွဲ့နှင့် မီးငြိမ်းသတ်ရေးအဖွဲ့သို့ အမြန်ဆက်သွယ်သတင်းပို့ရမည်။

(ခ) မီးသတ်အဖွဲ့များလာရောက်ပါက အမြန်ဆုံးဆက်သွယ်ပြီး ရေရရှိရေးနှင့်လျှပ်စစ်မီး အဆက်အသွယ်များညွှန်ပြခြင်း။

(ဂ) အရေးပေါ်ဖြစ်ပွားလာပါက အောက်ဖော်ပြပါပုဂ္ဂိုလ်များထံသို့ ဖုန်း(သို့မဟုတ်) ဆက်သား ဖြင့်အကြောင်းကြားရမည်။

(၁)	သံတွဲခဃက	-	၀၄၃-၆၅၂၁၄
(၂)	သံတွဲရဲစခန်း	-	၀၄၃-၆၅၂၄၆ , ၆၅၂၄၄ , ၆၅၂၄၅
(၃)	သံတွဲမီးသတ်	-	၀၄၃-၆၅၃၅၁
(၄)	ဦးတင်မောင်ဌေး	-	မန်နေးဂျင်းဒါရိုက်တာ ၀၉၅၀၀၃၇၉၂
(၅)	ဦးမျိုးအောင်အောင်ဇော်-		၀၉၅၅၂၀၄၆၇၈၊၀၉၄၀၈၂၉၆၆၀၀
(၆)	ဦးချမ်းငြိမ်းအောင် -		၀၉၄၀၄၁၆၈၈၅၇