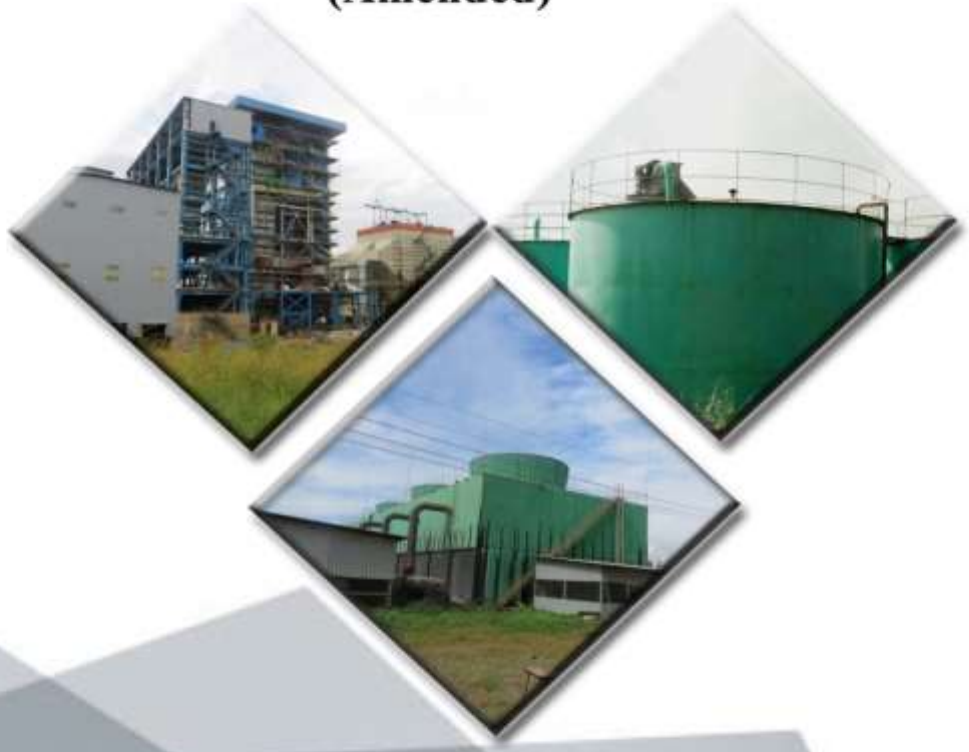
NGWE YI PALE GROUP OF COMPANIES
NGWE YI PALE CEMENT COMPANY LIMITED

ENVIRONMENTAL IMPACT ASSESSMENT
of
The Construction and Operation of a Coal-fired Power Plant
by
Ngwe Yi Pale' Cement Co., Ltd
(Amended)



(Myanmar Environment Sustainable Conservation)

March, 2022

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ACRONYMS AND ABBREVIATION

ADB	Asian Development Bank
AOAC	Association of Official Analytical Collaboration, International
AOI	Area of Influence
ASEAN	Association of South-East Asian Nations
BAT	Best Available Technology
BOD	Biochemical Oxygen Demand
CFBCB	Circulating Fluidized Bed Combustion Boiler
CGM	Complaints and Grievances Mechanism
CITIES	Convention on International Trade in Endangered Species of Wild Fauna & Flora
CMP	Congestion Management Programme
COPD	Chronic Obstructive Pulmonary Disease
COD	Chemical Oxygen Demand
CPR	Cardiopulmonary Resuscitation
CSR	Corporate Social Responsibility
dBA	Decibel A- weighting
ECD	Environmental Conservation Department
EHS	Environmental Health and Safety
EIA	Environmental Impact Assessment
EITI	Extractive Industry Transparency Initiative
EMF	Electric and Magnetic Field
EMP	Environmental Management Plan
EPP	Emergency Prepardeness Plan
EPS	Environmental Performance Standards
ERP	Emergency Response Plan

ESP	Electro Static Precipitator
EU	European Union
FD	Forest Department
FD Fan	Forced Draft Fan
FGD	Flue Gas Desulphurization
FGD	Focal Group Discussion
GDP	Gross Domestic Products
GHGs	Green House Gases (Glass House Gases)
GIIP	Good International Industry Practices
GRM	Grievances Redress Mechanism
HAVS	Hand-Arm Vibration Syndrone
HMP	Health Managment Plan
ID	Identity Card
ID Fan	Induced Draft Fan
IEA	International Energy Agency
IEE	Initial Environmental Examination
IFC	International Finance Corporation
IRMP	Industrial Risk Managment Plan
ISO	International Standard Organization
IUCN	International Union for Conservation of Nature and Natural Resources
KII	Key Informant Interview
kWh	Kilo Watt Hour
LEL	Lower Exposure Limit
LOS	Level of Service
MEAA	Myanmar Environmental Assessment Association
MESC	Myanmar Environment Sustainable Conservation

MOECAF	Ministry of Environmental Conservation and Forestry
MONREC	Ministry of Natural Resources and Environmental Conservation
MP	Monitoring Plan
NCEA	National Commissions of Environmental Affairs
NECC	National Environmental Conservation Committee
NECCCCC	National Environmental Conservation and Climate Change Central Committee
NEQEG	National Environmental Quality Emission/Effluent Guideline
NGO	Non-Government Organization
NO_2	Nitrogen Dioxide
NOAA	National Oceanic Atmostheric Administration (USA)
OHS	Occupational Health and Safety
OSHA	Occupational Safety and Health Administration (USA)
PEB	Payment for Ecosystem Benefits
PEL	Permisible Exposure Level
PES	Payment for Ecosystem Services
PHMP	Public Health Managment Plan
PM	Particulate Matter
$PM_{2.5-10}$	Particulate Matter between 2.5-10 microns
PPE	Personnel Protection Equipment
RO	Reverse Osmosis
RSPM	Respiratory Suspended Particulate Matter
5Rs	Reduce, reuse, recover, recycle and redesign
SCBA	Self-contained Breathing Apparatus
SCR	Selective Catalytic Reduction
SFCW	Solid Fuel Combustion Waste
SIA	Social Impact Assessment

SO_2	Sulphur Dioxide
SPM	Suspended Particulate Matter
SS	Secondary Source
STD	Sexually Transmitted Diseases
TDS	Total Dissolved Solids
TSS	Total Suspended Solid
US, NEPA	US National Environmental Protection Agency
TSPM	Total Suspended Particulate Matter
UXO	Unexploded Ordnance
WGS	World Geodectic System
WHO	World Health Organization
WIMP	Water Intake Managment Plan
YCDC	Yangon City Development Committee

အခန်း(၁)

အကျဉ်းချုပ် အစီရင်ခံစာ

ဤဒုတိယအကြိမ် ပြင်ဆင်ရေးသားထားသော ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း(EIA) အစီရင်ခံစာသည် ငွေရည်ပုလဲ ဘိလပ်မြေကုမ္ပဏီလီမိတက်၏ ကျောက်မီးသွေးသုံး လျှပ်စစ်ဓါတ်အားပေးစက်ရုံတစ်ခု တည်ဆောက်ခြင်းနှင့် စီမံကိန်းလည်ပတ်ခြင်းအတွက် ဖြစ်သည်။

ငွေရည်ပုလဲ ဘိလပ်မြေကုမ္ပဏီလီမိတက်သည် ကျောက်မီးသွေးသုံး လျှပ်စစ်ဓါတ်အားပေးစက်ရုံ တစ်ခုတည်ဆောက်ခြင်းနှင့် စီမံကိန်းလည်ပတ်ခြင်းအတွက် အဆိုပြုတင်ပြခြင်း ဖြစ်သည်။

ထိုအချိန်တွင် စီမံကိန်းအဆိုပြုသူသည် အဆိုပြုတင်ပြခြင်းကို မလုပ်ခဲ့ပေ။

အဆိုပြုထားသော စီမံကိန်း သည် အထူးသဖြင့် လျှပ်စစ်ထုတ်လုပ်နိုင်မှု ပမာဏကို စိစစ်ခြင်း၊ အဆိုပြုထားသော စီမံကိန်းသည် ပတ်ဂန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း (EIA) လိုအပ်ကြောင်း ထင်ရှားပါသည်။

ပတ်ဂန်းကျင်ထိန်းသိမ်းရေး ဦးစီးဌာန (ECD) မှ ချမှတ်ထားသော ပတ်ဂန်းကျင်ထိခိုက်မှု ဆန်းစစ်ခြင်း လုပ်ထုံးလုပ်နည်း အမိန့်ကြော်ငြာစာအမှတ် ၆၁၆/၂၀၁၅ အရ ≥ 1 MW မှ < 10 MW အထိ ကျောက်မီးသွေးသုံး လျှပ်စစ်ဓါတ်အားပေးစက်ရုံတစ်ခု သည် IEE လိုအပ်ချက် ဖြစ်ပြီး ≥ 10 MW အထက်သည် EIA လိုအပ်ချက်ဖြစ်သည်။

ဤ အဆိုပြုတင်ပြထားသော စီမံကိန်း၏ လျှပ်စစ်ထုတ်လုပ်နိုင်မှု ပမာဏမှာ 60 MW ဖြစ်သည်။ ထို့ကြောင့် EIA ပြုလုပ်ရန် မဖြစ်မနေ လိုအပ်သည်။

ငွေရည်ပုလဲဘိလပ်မြေ ကုမ္ပဏီလီမိတက်သည် ၃-၃-၂၀၁၄ တွင် တရားဝင်မှတ်ပုံတင်ထား သော ကုမ္ပဏီတစ်ခု ဖြစ်သည်။ (ကုမ္ပဏီမှတ်ပုံတင်လက်မှတ်အမှတ်- ၅၆၆၆/၂၀၁၃-၂၀၁၄၊ ရင်းနှီးမြှုပ်နှံမှုနှင့် ကုမ္ပဏီများ ညွှန်ကြားမှုဦးစီးဌာန၊ အမျိုးသားစီမံကိန်းနှင့် စီးပွားရေးဖွံ့ဖြိုးတိုးတက်မှု ဝန်ကြီးဌာန)။ ကုမ္ပဏီမှတ်ပုံတင်အမှတ်အသစ်မှာ ၁၃၀၇၉၉၀၂၇ ဖြစ်သည်။

ကုမ္ပဏီ၏ အကြောင်းအရာအချက်အလက်များကို ဤအစီရင်ခံစာ၏ မိတ်ဆက်ခြင်းအခန်းတွင် ဖော်ပြထား ပါသည်။

အဆိုပြုတင်ပြသော စီမံကိန်းနေရာသည် လောက်ဖန်းကျေးရွာအနီး၊ လုံရုံးကျေးရွာအုပ်စု၊ နောင်ချိုမြို့နယ်၊ ကျောက်မဲခရိုင်၊ ရှမ်းပြည်နယ်တွင် တည်ရှိပါသည်။ ကိုဩဒိနိတ်များမှာ မြောက်လတ္တီတွဒ် ၂၂° ၂၁' ၃၁.၁" နှင့် အရှေ့လောင်ဂျီတွဒ် ၉၆° ၄၂' ၃၃.၆" နှင့် ပင်လယ်ရေမျက်နှာပြင်အထက် ၇၉၆ မီတာတွင် ရှိသည်။

အဆိုပြုနေရာသည် လောက်ဖန်းကျေးရွာ၏ အနောက်တောင် (၁)မိုင်ခန့်တွင် တည်ရှိသည်။ ၎င်းသည် ငွေရည်ပုလဲဘိလပ်မြေကုမ္ပဏီလီမိတက်မှပိုင်သော ကရောင်းဘိလပ်မြေစက်ရုံ၏ အဝန်းအဝိုင်းထဲတွင် တည်ရှိသည်။ ကရောင်းဘိလပ်မြေစက်ရုံ၏ စုစုပေါင်းဧရိယာသည် ၂၈၊ ဧက ဖြစ်ပြီး အဆိုပြုကျောက်မီးသွေးသုံး လျှပ်စစ်ဓါတ်အားပေးစက်ရုံသည် ကရောင်းဘိလပ်မြေစက်ရုံထဲတွင်ရှိပြီး ၁၂.၃ ဧက ရှိပါသည်။

ခန့်မှန်းဘတ်ဂျက်မှာ အမေရိကန်ဒေါ်လာ ၁၈ မီလီယံ ဖြစ်ပြီး တည်ဆောက်ရေးကာလသည် ၂ နှစ် ဖြစ်သည်။ စီမံကိန်းလည်ပတ်မည့်ကာလသည် နှစ် ၃၀ ဖြစ်သည်။ ခန့်မှန်းထုတ်လွှတ်နိုင်မည့် လျှပ်စစ်ပမာဏမှာ ၆၀ မဂ္ဂါဝပ် ဖြစ်သည်။ ရိုးရှင်းသော အဓိကလုပ်ငန်းစဉ်များတွင် လျှပ်စစ်မီး ထုတ်လုပ်ခြင်းအတွက်-

- အမှုန့်ခြေထားသော ကျောက်မီးသွေးအမှုန့်ကို ဘွိုင်လာထဲတွင် မီးရှို့ပြီး ရေနွေးငွေ့ ထုတ်လွှတ်ခြင်း၊
- ရေနွေးငွေ့တွန်းအားဖြင့် တာဘိုင်ကိုလည်စေပြီး လျှပ်စစ်မီးထုတ်လွှတ်ခြင်း စသည်တို့ ပါဝင်ပါသည်။

စီမံကိန်းတွင်ပါဝင်သော အဓိက အဆောက်အဦများမှာ-

- လျှပ်စစ်ဓါတ်အားပေးစက်ရုံ၏ အဓိကအဆောက်အဦများနှင့် တည်ဆောက်မှု၊
- အုပ်ချုပ်ရေးရုံးနှင့်
- အခြားဆက်စပ်အဆောက်အဦများ ဖြစ်သည်။

တည်ဆောက်ရေးကာလအတွင်းတွင် တရုတ်ပညာရှင် (၂၃)ဦးအပါအဝင် ဝန်ထမ်း (၉၂)ဦး ခန့်အပ်မည်။ စီမံကိန်းလည်ပတ်စဉ်ကာလတွင် တရုတ်ပညာရှင် (၁၄)ဦး အပါအဝင် ဝန်ထမ်း (၁၅၀)ဦး ခန့်အပ်မည်။

တည်ဆောက်ရေးကာလအတွင်းတွင် လျှပ်စစ်ကို တည်ရှိပြီးဖြစ်သော ဘိလပ်မြေစက်ရုံမှ ရယူသုံးစွဲမည်။ အဆိုပြုကျောက်မီးသွေးသုံး လျှပ်စစ်ဓါတ်အားပေးစက်ရုံမှ ထုတ်လွှတ်မည့် လျှပ်စစ်ကို ဘိလပ်မြေစက်ရုံအသစ် တစ်နေ့တန် ၄၀၀၀ ကျ စက်ရုံအတွက်နှင့် ရွာမီးလင်းရေးအတွက် အသုံးပြုမည်။

ကုန်ကြမ်းဖြစ်သော ကျောက်မီးသွေးကို ရပ်စောက်၊ သီပေါနှင့် နမ့်စန်မြို့များရှိ စီမံကိန်း အဆိုပြုတင်ပြသူမှ ပိုင်ဆိုင်သော ကျောက်မီးသွေးတွင်းများမှ ရယူသုံးစွဲမည်။

အခြားကုန်ကြမ်းဖြစ်သော ထုံးကျောက်ကို အနည်းငယ်သာအသုံးပြုပြီး ကရောင်းဘိလပ်မြေစက်ရုံ (ကုမ္ပဏီတူ ပိုင်သော)မှ မျှဝေသုံးစွဲမည်။

လိုအပ်သောရေကို စက်ရုံဝန်းထဲရှိ ၁,၅၀၀,၀၀၀ ဂါလန် ဆန့် ရေကန်မှ ရယူမည်ပါသည်။

စီမံကိန်း အဆိုပြုသူ၏ ရှင်းလင်းချက်

ငွေရည်ပုလဲဘိလပ်မြေကုမ္ပဏီလီမိတက်သည် ကုမ္ပဏီ၏ ငွေရည်ပုလဲ လုပ်ငန်းခွဲဖြစ်ပြီး လုပ်ငန်း ကြီးကြီးမားမားအမျိုးအမျိုးတွင် ပါဝင်သည့် လုပ်ငန်းစုဖြစ်သည်။ ဥပမာအားဖြင့် ကျောက်မီးသွေး၊ ဂေါ်ဒန်ကျောက်၊ သံကျောက်၊ ထုံးကျောက် တူးဖော်ခြင်း နှင့် ဘိလပ်မြေ နှင့် သကြားထုတ်လုပ်ရေး၊ ရေအားလျှပ်စစ် ထုတ်လုပ်ရေး နှင့် သစ်ပင်များ ပြန်လည်စိုက်ပျိုးခြင်းနှင့် သစ်တောပြန်လည်ထူထောင်ရေး တို့ဖြစ်သည်။

ငွေရည်ပုလဲဘိလပ်မြေကုမ္ပဏီလီမိတက် ခ.ခ.၂၀၁၄ တွင် တရားဝင် မှတ်ပုံတင်ထားသော ကုမ္ပဏီတစ်ခုဖြစ်ပါသည်။ (စာအမှတ်- ကုမ္ပဏီမှတ်ပုံတင်လက်မှတ်အမှတ်- ၅၆၆၆/ ၂၀၁၃-၂၀၁၄ ရင်းနှီးမြှုပ်နှံမှုနှင့် ကုမ္ပဏီများညွှန်ကြားမှုဦးစီးဌာန၊ အမျိုးသားစီမံကိန်းနှင့် စီးပွားရေးဖွံ့ဖြိုးတိုးတက်မှု ဝန်ကြီးဌာန)

စီမံကိန်း အဆိုပြုသူ၏ အမည်	: ငွေရည်ပုလဲဘိလပ်မြေကုမ္ပဏီလီမိတက်
လိပ်စာ (ရုံးချုပ်)	: အမှတ် ၁၅၇၊ ၃၃ လမ်း၊ ၇၅ လမ်း နှင့် ၇၆ လမ်းကြား၊ ချမ်းအေးသာဇံ မြို့နယ်၊ မန္တလေးမြို့၊ မြန်မာ
ဖုန်းနံပါတ်	: ၀၂-၇၃၉၄၁၊ ၀၂-၃၀၈၃၈၊ ၀၉-၉၇၇၁၅၀၃၇၊ ၀၉၉၇၇၁၅၀၄၄၊ ၀၉- ၉၇၇၁၅၀၃၉၈၊ ၀၉- ၉၇၇၁၅၀၃၀၈၊ ၀၉- ၉၇၇၁၅၀၃၁၃
Fax	: ၀၂ ၇၁၄၂၄
E-mail	: info@ngweyipale.com
Webiste	: www.ngweyipale.com
ဆက်သွယ်ရမည့် ပုဂ္ဂိုလ်	: ဦးလင်းသိန်းအောင် (အုပ်ချုပ်မှု မန်နေဂျာ)
ဖုန်း	: ၀၉-၉၇၇၁၅၀၃၃၆၊ ၀၉- ၄၄၄၀၀၂၆၀၀
E-mail	: lintheinaung777@gmail.com
စက်ရုံလိပ်စာ	: လောက်ဖန်းကျေးရွာ နောင်ချိုမြို့နယ်၊ ရှမ်းပြည်နယ်
ရည်ရွယ်ချက်	: ခရောင်း ဘိလပ်မြေ စက်ရုံအသစ် နှင့် ဒေသ၏ ကျေးရွာ လျှပ်စစ်မီး ရရှိရေး အတွက် လုံလောက်သော လျှပ်စစ်မောတ်အား ထုတ်လုပ်ခြင်း

အုပ်ချုပ်ရေး နှင့် အုပ်ချုပ်ရေး အဖွဲ့ အစိတ်အပိုင်းများ

အမည်	နိုင်ငံသားနှင့် နိုင်ငံသားမှတ်ပုံတင် အမှတ်	လိပ်စာ	ရာထူး
ဦးသိန်းမြင့် @ ချောင်ဖင်း	မြန်မာ ၁၃/ နခန (Ei) ၀၀၀၀၁၇	အမှတ် (၄၁၅) S2 ၊ ပြေကြီးရန်လုံ ရပ်ကွက် ချမ်းအေးသာဇံ မြို့နယ်၊ မန္တလေး	အုပ်ချုပ်မှုဒါရိုက်တာ
ဦးမောင်ရွှေ @ ခင်မောင်ရွှေ	မြန်မာ ၉/ မခန (နိုင်) ၀၄၇၇၃၇	အမှတ် ၁၀၁/၂ ဘုကုန် ကျေးရွာ၊ ပုသိမ်ကြီးမြို့နယ်၊ မန္တလေး	ဒါရိုက်တာ
ဦးထွန်းဝင်း	မြန်မာ ၉/ မယမ (နိုင်) ၀၅၃၉၁၁	အမှတ် ၇၆၊ ပြေကြီးရန်လုံ ရပ်ကွက် ချမ်းအေးသာဇံ မြို့နယ်၊ မန္တလေး	ဒါရိုက်တာ
ဦးကျော်ရှိန်	မြန်မာ ၉/ မနမ (Ei) ၀၀၀၀၄၈	အမှတ် ၁/၇၊ သိပ္ပံလမ်း၊ မဟာမြိုင် ရပ်ကွက်၊ မဟာအောင်မြေ မြို့နယ်၊ မန္တလေး	ဒါရိုက်တာ
ဦးမျိုးမြင့်အောင်	မြန်မာ ၁၃/ လယန (Ei) ၀၀၀၆၀၈	တိုက်နံပတ် (A) ၊ အခန်း နံပတ် (G-3)၊ ရွှေဂုံသူ အိမ်ယာ၊ ပန်းလှိုင် ရပ်ကွက်၊ ကြည့်မြင်တိုင်မြို့နယ်၊ ရန်ကုန်	ဒါရိုက်တာ
ဦးလှဝင်း @ ရှင်စိ	မြန်မာ ၉/ မနမ (နိုင်) ၁၂၂၈၀၄	အမှတ် ၅၄၊ ၇၈ လမ်း၊ ၂၉ လမ်း နှင့် ၃၀ လမ်းကြား၊ ဟေမာဇလ ရပ်ကွက်၊ ချမ်းအေးသာဇံ မြို့နယ်၊ မန္တလေးမြို့	ဒါရိုက်တာ
ဦးဇော်ခိုင်မြင့် @ ကျောက်ကျားချန်	မြန်မာ ၁၃/ ခမန (နိုင်) ၀၃၇၂၉၄	အမှတ် ၇၃၊ ၃၃ လမ်း၊ ၇၁ လမ်း နှင့် ၇၂ လမ်းကြား၊ ရန်မျိုးလုံ ရပ်ကွက်၊ ချမ်းအေးသာဇံ မြို့နယ်၊ မန္တလေးမြို့	ဒါရိုက်တာ
ဦးအောင်သူရ	မြန်မာ ၁၄/ ဟသတ (နိုင်) ၀၁၃၃၀၀၉	အမှတ် (၈/၄၄)၊ ရပ်ကွက်ကြီး (၈)၊ ပြင်ဦးလွင်မြို့နယ်၊ မန္တလေးမြို့	ဒါရိုက်တာ မှ နှုတ်ထွက် (w.e.f 28-1-2015)
ဦးစိန်မျိုးအောင်	မြန်မာ ၉/ မနမ (နိုင်) ၀၉၈၅၇၈	၀(၁၀-၃၅)၊ သာယာဝတီ မင်းကြီး လမ်း၊အေ ရပ်ကွက်၊ ပြည်ကြီး တန်ခွန် ရပ်ကွက်၊ မန္တလေးမြို့	ဒါရိုက်တာ အဖြစ် တာဝန်ထမ်း (w.e.f 28-1-2015)

ကုမ္ပဏီသည် ၁၈၀ ရာခိုင်နှုန်း နိုင်ငံသားရင်းနှီးမြှုပ်နှံမှုဖြင့် ပြုလုပ်သော လုပ်ငန်းဖြစ်ပြီး ရှယ်ယာရှင်များသည် နိုင်ငံသားများဖြစ်ကြသည်။

ငွေသားဖြင့် ပေးချေထားသော အစုရှယ်ယာ အရေအတွက်	-	၁၄၃,၃၈၅	ရှယ်ယာ
အစုရှယ်ယာ၏ အမည်ခံ ပမာဏကို ခွဲဝေခြင်း	-	၁၄,၃၃၈,၅၀၀,၀၀၀	ကျပ်
ပေးဆောင်ရမည့် ပမာဏ သို့မဟုတ် ငွေသားဖြင့် ပေးဆောင်ရမည် ရှယ်ယာ	-	၁၀၀,၀၀၀	ကျပ်

ပတ်ဝန်းကျင်နှင့် လူမှုရေးဆိုင်ရာ ကျွမ်းကျင်သူများ၏ ရှင်းလင်းချက်

မြန်မာ့ပတ်ဝန်းကျင် ရေရှည်တည်တံ့ရန်ထိန်းသိမ်းရေး ကုမ္ပဏီလီမိတက် (MESC)သည် အမျိုးသား စီမံကိန်းနှင့် စီးပွားရေးဖွံ့ဖြိုး တိုးတက်မှုပန်ကြီးဌာနတွင် (စာအမှတ်။ ရက-၈(၀)၀၀၁/၂၀၁၄ (၀၀၄၇၂၀)၊ ရက်စွဲ။ ၆-၆-၂၀၁၄၊ မှတ်ပုံတင်လက်မှတ်အမှတ် ၈၃၀/၂၀၁၄-၂၀၁၅ (၂၀-၅-၂၀၁၄)ဖြင့် ၂၀၁၄ ခုနှစ်၌ တရားဝင်မှတ်ပုံတင်ထားသော အတိုင်ပင်ခံအဖွဲ့အစည်းတစ်ခု ဖြစ်သည်။ ကုမ္ပဏီမှတ်ပုံတင်အမှတ်အသစ်မှာ ၁၁၀၆၄၉၁၉၃ ဖြစ်သည်။

အတိုင်ပင်ခံအဖွဲ့အစည်း မြန်မာ့ပတ်ဝန်းကျင် ရေရှည်တည်တံ့ရန် ထိန်းသိမ်းရေးကုမ္ပဏီလီမိတက် (MESC)၏ ကြားကာလ အကြံပေးလိုင်စင်အမှတ်သည် ၀၀၀၃ ဖြစ်သည်။ (ရက်စွဲ။ ၁-၇-၂၀၁၇၊ ECD)

ဆက်သွယ်ရန်လိပ်စာ : အခန်း(၅-ခ)၊ တိုက်အမှတ်(၆၇/၆၉)၊ ပါရမီလမ်း၊ (၁၆)ရပ်ကွက်၊ လှိုင်မြို့နယ်၊ ရန်ကုန်တိုင်းဒေသကြီး

ဆက်သွယ်ရန် ပုဂ္ဂိုလ် : ဦးမြင့်ကျော်သူရ

ဆက်သွယ်ရန်ဖုန်းနံပတ် : +၉၅ ၉ ၄၂၀၁၅၀၇၀၁

: +၉၅ ၉ ၇၃၀၄၄၉၀၃

အီးမေးလ်လိပ်စာ : myanmar.esc@gmail.com

Facebook website : www.myanmar environment sustainable conservation.com

ဤ IEE/EIA စီမံကိန်းတွင်ပါဝင်သော MESC ၏ အဖွဲ့ဝင်များ IEE/EIA appraisers, သို့မဟုတ် IEE/EIA practitioner မှာ အောက်ပါအတိုင်း ဖြစ်သည်-

အမည်	နိုင်ငံသားနှင့် နိုင်ငံသား မှတ်ပုံတင် အမှတ်	ECD မှတ်ပုံတင် အမှတ်	ကျွမ်းကျင်ဘာသာရပ်
ဦးမြင့်ကျော်သူရ M.Sc (သတ္တဗေဒ)	မြန်မာ ၁၂/ ဒဂတ(နိုင်) ၀၂၈၃၄၉	၀၀၀၆	အုပ်ချုပ်မှုဒါရိုက်တာ၊ ဇီဝမျိုးစုံမျိုးကွဲပညာရှင်၊ (Fauna), EIA practitioner ၊EIA Appraiser
ဦးစောဟန်ရှိန် B.Sc (ရုက္ခဗေဒ) M.Sc (အဏ္ဏဝါ ဇီဝဗေဒ)	မြန်မာ ၁၀/ မလမ(နိုင်) ၀၀၈၁၇၃	၀၀၀၇	အငြိမ်းစားပါမောက္ခ EIA Practitioner and Appraiser
ဒေါက်တာ သီရိဒေဂီအောင် Ph.D (သတ္တဗေဒ)	မြန်မာ ၁၂/ ဒလန(နိုင်) ၀၂၉၄၃၃၃	၀၀၀၈	ဇီဝမျိုးစုံမျိုးကွဲပညာရှင် (Ornithologist)
ဦးတင်ထွန်းအောင် B.Sc (Engineering)	မြန်မာ ၁၂/ ဥတမ(နိုင်) ၁၇၂၁၁၁	၀၀၀၉	အင်ဂျင်နီယာ၊ EIA practitioner
ဒေါ်ခင်နွေနိုင် M.Sc (ရုက္ခဗေဒ)	မြန်မာ ၉/ ပခက(နိုင်) ၀၀၁၂၅၂	၀၀၀၁၀	ဇီဝမျိုးစုံမျိုးကွဲပညာရှင်(အပင်)၊ ပတ်ဝန်းကျင်သုတေသနလေ့လာရေး ပညာရှင်
ဦးသန်းစိုးဦး M.Sc (သစ်တော)	မြန်မာ ၉/ မနမ (နိုင်) ၀၅၀၈၀၈	၀၀၀၁၁	EIA ပညာရှင်
ဦးဥက္ကာကျော်သူ B.Sc (ဘူမိဗေဒ)	မြန်မာ ၇/ ရတရ (နိုင်) ၀၉၀၃၇၁၁	၀၀၀၁၂	ဘူမိဗေဒပညာရှင်
ဒေါ်သင်းသင်းရီ B.Sc (ဓာတုဗေဒ)	မြန်မာ ၁၂/ သဃက(နိုင်) ၀၃၉၂၉၂	၀၀၀၁၃	ဓာတုပတ်ဝန်းကျင်ဆိုင်ရာသုတေသန ပညာရှင်၊ ကွန်ပျူတာ

- ဦးမြင့်ကျော်သူရသည် တိရစ္ဆာန်များ လေ့လာခြင်း နှင့် EIA လေ့ကျင့်ခြင်း နှင့် အကဲဖြတ်ခြင်း နှင့် အစီရင်ခံစာ ရေးသားခြင်း အပိုင်းတွင် ပါဝင်ပါသည်။
- ဦးစောဟန်ရှိန် သည် EIA လေ့ကျင့်ခြင်း နှင့် အကဲဖြတ်ခြင်း နှင့် အစီရင်ခံစာ ရေးသားခြင်း (အစီရင်ခံစာ ရေးသားခြင်း ခေါင်းဆောင်) အပိုင်းတွင် ပါဝင်ပါသည်။
- ဒေါက်တာ သီရိဒေဂီအောင် သည် avifauna လေ့လာခြင်း အစီရင်ခံစာ ရေးသားခြင်း အပိုင်းတွင် ပါဝင်ပါသည်။
- ဦးတင်ထွန်းအောင် သည် EIA လေ့ကျင့်ခြင်း နှင့် အစီရင်ခံစာ၏ အပိုင်းများ၊ သတင်း အချက်အလက်များ၊ အချက်အလက်များ ပံ့ပိုးပေးခြင်း နှင့် အစီရင်ခံစာ ရေးသားခြင်း အပိုင်းတွင် ပါဝင်ပါသည်။
- ဒေါ်ခင်နွေနိုင် သည် အပင်များ လေ့လာခြင်း နှင့် EIA အစီရင်ခံစာ ရေးသားခြင်း အပိုင်းတွင် ပါဝင်ပါသည်။
- ဦးသန်းစိုးဦး သည် EIA လေ့ကျင့်ခြင်း နှင့် အစီရင်ခံစာ ရေးသားခြင်း အပိုင်း အထူးသဖြင့် လူမှုစီးပွား အခြေအနေ ရေးသားခြင်း အပိုင်းတွင် ပါဝင်ပါသည်။
- ဦးဥက္ကာကျော်သူ သည် ဘူမိဗေဒ နှင့် ပထဝီဝင် ရှုထောင့်များ တွင် ပါဝင်သော desktop survey နှင့် ဒေသ ဘူမိဗေဒ ဆိုင်ရာ တစ်ဆင့်ခံ အချက်အလက်များကို စုဆောင်ခြင်းတို့ပါဝင်ပါသည်။
- ဒေါ်သင်းသင်းရီ သည် ရုပ်ပိုင်းဆိုင်ရာ အထူးသဖြင့် ပတ်ဝန်းကျင် လေထု၊ ရေအရည်အသွေး၊ ဆူညံသံနှင့် တုန်ခါမှု နှင့် မြေအရည်အသွေး စသည်ဖြင့် နှင့် မိုးလေဝသ တစ်ဆင့်ခံ အချက်အလက်များ အပါအဝင် ရုပ်ပိုင်းဆိုင်ရာ အချက်အလက်များ စုစည်းမှုများ တွင် ပါဝင်ပါသည်။

MESC တွင် အချိန်ပိုင်း ၀န်ထမ်းများလည်း ရှိသည်။

အဖွဲ့အစည်းသည် အချိန်ပိုင်း အဖွဲ့ဝင်အားလုံးကို အမြဲတမ်း ဝန်ထမ်း အဖြစ် ငှားရမ်းနိုင်သည့် အခြေအနေ မဟုတ်ပါ။

ဤအတိုင်ပင်ခံအဖွဲ့အစည်းနှင့်အတူ ရုက္ခဗေဒပညာရှင်များ၊ သတ္တဗေဒပညာရှင်များ၊ ငှက်ပညာရှင်များ၊ ဂေဟဗေဒဆိုင်ရာ ပညာရှင်များ၊ ရေနေဂေဟဗေဒဆိုင်ရာ ပညာရှင်များ၊ လူမှုရေးဆိုင်ရာ ပညာရှင်များ၊ ကျန်းမာရေး ဝန်ထမ်းများ (ဆရာဝန်)၊ အင်ဂျင်နီယာများနှင့် ဘူမိဗေဒပညာရှင်များ ပါ၀င်လုပ်ကိုင် ကြသည်။

ပတ်၀န်းကျင်၏ ရုပ်ပိုင်းဆိုင်ရာနှင့် ဓါတုပိုင်းဆိုင်ရာ လေ့လာမှုများကို ဥပမာ- ကျန်းမာရေးဌာနနှင့် ရန်ကုန်တွင် မှတ်ပုံတင်ထားသော ဓာတ်ခွဲခန်းမှ ပညာရှင်များကို ငှားရမ်းအသုံးပြု ပါသည်။ သယ်ယူရ လွယ်ကူသော စမ်းသပ်ကိရိယာသည် လေထုအရည်အသွေးတိုင်းတာခြင်းအတွက် တိကျမှန်ကန်မှု နည်းပါးသောကြောင့် ကျန်းမာရေးဌာနမှ ပညာရှင်များ ငှားရမ်းရသည်။ ရေစစ်ခြင်းအတွက် ရေနမူနာ ယူဆောင်လာပြီး မှတ်ပုံတင်ထားသော ဓာတ်ခွဲခန်းသို့ ပို့ဆောင်စစ်ဆေး ပါသည်။

အမှန်တကယ်မှာ MESC ၏ အဖွဲ့ဝင်များသည် EMP/IEE/EIA အစီရင်ခံစာ တစ်ခုချင်းစီတိုင်း၏ ရေးသားခြင်း အပိုင်းအတွက် ဖွဲ့စည်းထားသော အဖွဲ့ဖြစ်ပြီး အမြဲတမ်း အလုပ် အတူတကွ လုပ်ဆောင်ပါသည်။ ဆွေးနွေးမှု၊ သဘောတူညီချက် တည်ဆောက်မှု၊ ပူပေါင်းဆောင်ရွက်မှု နှင့် ညှိနှိုင်းဆောင်ရွက်မှုများသည် အတိုင်ပင်ခံ အဖွဲ့အစည်း၏ နိယာမ နှင့် စံနှုန်းများ ဖြစ်ပါသည်။

MESC တွင် အချိန်ပိုင်း ဂန်ထမ်းများလည်း ရှိသည်။

ဤအတိုင်ပင်ခံအဖွဲ့အစည်းနှင့်အတူ ရုက္ခဗေဒပညာရှင်များ၊ သတ္တဗေဒပညာရှင်များ၊ ငှက်ပညာရှင်များ၊ ဂေဟဗေဒဆိုင်ရာ ပညာရှင်များ၊ ရေနေဂေဟဗေဒဆိုင်ရာ ပညာရှင်များ၊ လူမှုရေးဆိုင်ရာ ပညာရှင်များ၊ အင်ဂျင်နီယာများနှင့် ဘူမိဗေဒပညာရှင်များ ပါဂင်လုပ်ကိုင် ကြသည်။

ပတ်ဂန်းကျင်၏ ရုပ်ပိုင်းဆိုင်ရာနှင့် ဓါတုပိုင်းဆိုင်ရာ လေ့လာမှုများကို ဥပမာ- ကျန်းမာရေးဌာနနှင့် ရန်ကုန်တွင် မှတ်ပုံတင်ထားသော ဓာတ်ခွဲခန်းမှ ပညာရှင်များကို ငှားရမ်းအသုံးပြု ပါသည်။ သယ်ယူရ လွယ်ကူသော စမ်းသပ်ကိရိယာသည် လေထုအရည်အသွေးတိုင်းတာခြင်းအတွက် တိကျမှန်ကန်မှု နည်းပါးသောကြောင့် ကျန်းမာရေးဌာနမှ ပညာရှင်များ ငှားရမ်းရသည်။ ရေစစ်ခြင်းအတွက် မှတ်ပုံတင်ထားသော ဓာတ်ခွဲခန်းမှ ပညာရှင်များ ငှားရမ်းခြင်း (ရေနမူနာကို ဓာတ်ခွဲခန်းသို့ ပို့ဆောင်စစ်ဆေးခြင်း)များ ပြုလုပ်ပါသည်။

MESC မှ အဖွဲ့ဝင်များသည် IEE, EIA နှင့် SIA အလုပ်များ နှင့် ပတ်သက်၍ အတွေ့အကြုံ အတော်လေး ရှိပါသည်။ MESC သည်

၂၀၁၄ မှ စတင်၍ ယခု အချိန်အထိ ထုံးကျောက် တူးဖော်ခြင်း/ ကျောက်မိုင်းများ၊ ရွှေနှင့် ကြေးနီ တူးဖော်ခြင်း၊ ခဲမဖြူနှင့် အဖြိုက်နက် တူးဖော်ခြင်း၊ ကျောက်မီးသွေး တူးဖော်ခြင်း၊ ဘိလပ်မြေ စက်ရုံ၊ သံ နှင့် သံမဏိ စက်ရုံ၊ ဟိုတယ်နှင့် အိမ်ယာ စီမံကိန်းများ၊ လောင်စာဆီ သိုလှောင်ကန်များ၊ လောင်စာဆီ သိုလှောင်မှု နှင့် ဖြန့်ဖြူးခြင်း ဂိတ်များ၊ စီးကရက် စက်ရုံ၊ စက္ကူ စက်ရုံ၊ လျှပ်စစ် အစိတ်အပိုင်း စက်ရုံ၊ နားကြပ် စက်ရုံ၊ လွှစက်/ သစ်ခွဲစက် စီမံကိန်း၊ မော်တော်ဆိုင်ကယ် နှင့် အပိုပစ္စည်း အစိတ်အပိုင်းများ စက်ရုံ၊ သကြား စက်ရုံ၊ရေအားလျှပ်စစ် စီမံကိန်း၊ ကျောက်မီးသွေးသုံး လျှပ်စစ်ဓါတ်အားပေးစက်ရုံ ရေပန်းဥယျာဉ်၊ ဇစ်လိုင်း စီမံကိန်း၊ မျိုးစေ့ ထုတ်လုပ်ခြင်း စက်ရုံ၊ အပင်၊ တိရစ္ဆာန်မျိုးကွဲများ၏ သီးခြား အစီအစဉ် နှင့် ဂေဟဗေဒ လေ့လာရေး ဇီဝ မျိုးစုံမျိုးကွဲများ နှင့် သစ်တော အစရှိသည့် ဂေဟဗေဒ ဆိုင်ရာ စစ်တမ်းများ အစရှိသော IEE, EIA, SIA နှင့် EMP စီမံကိန်း များတွင် ပါဝင်ခဲ့ပါသည်။

MESC သည် ယခုအခါ ပုဂ္ဂလိက ဆေးရုံ ပရောဂျက်၊ ဇီဝလောင်စာသုံး ဓာတ်အားပေး စက်ရုံ၊ဓာတ်လှေကားများ နှင့် စက်လှေကားများ တပ်ဆင်ခြင်း၊ လိုင်းများ သွယ်တန်းခြင်း၊ ဈေးဝယ် စင်တာ စီမံကိန်း၊ ဇီလာ စီမံကိန်း၊ ငါးပုစွန် စီမံကိန်း၊ စက်မှု စက်ရုံ စီမံကိန်း၊ကားများ တပ်ဆင်ခြင်း / ရောင်းချခြင်း စီမံကိန်း၊ ကွန်ကရစ် သွယ်တန်း တိုင်များ၊ အချို့ရည်နှင့် သောက်ရေသန့် နှင့် သကြားစက်ရုံများ အစရှိသော လက်ရှိလုပ်ဆောင်ဆဲ စီမံကိန်း များတွင် ပါဝင်ခဲ့ပါသည်။ အချို့သော အဖွဲ့ဝင်များသည်

စီမံကိန်းဆိုင်ရာ အခြားဆောင်ရွက်နိုင်သော နည်းလမ်းများ

အဆိုပြုစီမံကိန်းနေရာသည် ကရောင်းဘိလပ်မြေစက်ရုံ၏ ဧက ၂၈၀ အဝန်းအဝိုင်းထဲတွင် တည်ရှိသည်။ ဤစီမံကိန်းကို ဆောင်ရွက်ခြင်း၏ ရည်ရွယ်ချက်သည် ဘိလပ်မြေစက်ရုံအသစ်ကို လုံလောက်သော လျှပ်စစ်ထောက်ပံ့ပေးရန် ဖြစ်သည်။ ထို့ကြောင့် ဤစီမံကိန်းဆောင်ရွက်ခြင်းအတွက် အခြားသင့်လျော်သော နေရာမရှိပေ။ ဤကျောက်မီးသွေးသုံး လျှပ်စစ်ဓါတ်အားပေးစက်ရုံသည် တစ်နေ့တန် ၄၀၀၀ ကျ အခြားတည်ဆောက်နေသော ကရောင်းဘိလပ်မြေစက်ရုံအတွက် ထုတ်လုပ်ခြင်းအတွက် လုံလောက်သော လျှပ်စစ်ထောက်ပံ့ရန် ဖြစ်သည်။

အခြားဆောင်ရွက်နိုင်သော နည်းလမ်းများမှာ နည်းပညာဆိုင်ရာ ဆောင်ရွက်နိုင်သော နည်းလမ်း၊ လိုအပ်ချက်အရ အခြားဆောင်ရွက်နိုင်သော နည်းလမ်း၊ ထောက်ပံ့ခြင်းအတွက် အခြားဆောင်ရွက်နိုင်သော နည်းလမ်း၊ ဆောင်ရွက်မှုအတွက် အခြားဆောင်ရွက်နိုင်သော နည်းလမ်း၊ ဖြေလျော့နိုင်မှုအတွက် အခြားဆောင်ရွက်နိုင်သော နည်းလမ်းများနှင့် နောက်ဆုံးတွင် "ဘာမှမလုပ်လျှင် ဘာမှမရဘူး"ဟူ၍လည်းပဲ အခန်း(၃)တွင် အကျဉ်းချုပ်ဖော်ပြထားပါသည်။

စီမံကိန်းကြောင့် သက်ရောက်နိုင်သော ပတ်ဝန်းကျင်

အနီးနှင့် ပတ်ဝန်းကျင်တွင် ကျေးရွာ ၃ ရွာ ရှိပါသည်- အရှေ့မြောက် ၁ မိုင် တွင် လောက်ဖန်း၊ အရှေ့တောင် ၂.၁ မိုင် တွင် ခဲဆန် ကျေးရွာ၊ နှင့် အရှေ့တောင် ၂.၂ မိုင် တွင် လယ်ကြီးတော ကျေးရွာ တို့ရှိပါသည်။

နောင်ချိုမြို့၏ မြေအသုံးချမှုမှာ အောက်ပါအတိုင်း ဖြစ်ပါသည်-

(က) အသားတင်စိုက်ပျိုးမြေ	-	၁၇၄,၄၇၃ ဧက
လယ်မြေ	-	၁၄,၉၂၅ ဧက
ယာမြေ	-	၁၄၄,၂၉၅ ဧက
ကိုင်း/ကျွန်းမြေ	-	၁,၃၉၉ ဧက
ဥယျာဉ်မြေ	-	၁၃,၈၅၄ ဧက
(ခ) လှပ်ထားမြေ	-	၁၆,၈၂၉ ဧက
(ဂ) စက်မှုလုပ်ငန်းသုံးမြေ	-	၉၂၅ ဧက
(ဃ) မြို့မြေ	-	၈၀၁ ဧက
(င) ရွာမြေ	-	၆,၀၁၂ ဧက

(စ) အခြားမြေ - ၁၉,၂၆၅ ဧက

(ဆ) ကြိုးဝိုင်း/ကြိုးပြင်

ကာကွယ်တောမြေ - ၁၄၅,၉၇၀ ဧက

တောရိုင်းမြေ - ၄၂၅,၀၆၆ ဧက

မြေရိုင်း - ၁,၅၆၉ ဧက

(ဇ) စိုက်ပျိုးခြင်းမပြုနိုင်သောမြေ - ၁၉,၀၀၂ ဧက

နောင်ချို သစ်တောကြိုးဝိုင်းသည် လုပ်ကွက်၏ အရှေ့တောင် ၁.၄၃ မိုင် အကွာ ခန့်တွင် ရှိပါသည်။ သစ်တောသည် ကြီးမားစွာ ခုင်ထွင်ရှင်းလင်းထားပါသည်။

ဤဇရိယာ အတွက် ဒေသန္တရ တိုင်းဒေသကြီး/ပြည်နယ် နှင့် ပြည်ထောင်စု အဆင့်များတွင် လယ်ယာ ဖွံ့ဖြိုးတိုးတက်ရေး စီမံကိန်း၊ အခြေခံအဆောက်အဦ ဖွံ့ဖြိုးတိုးတက်ရေး အစီအစဉ်၊ ကျေးလက်ဒေသ ဖွံ့ဖြိုးတိုးတက်ရေး စီမံကိန်း အစရှိသည်တို့ မရှိပါ။ အချို့ INGO များ နောင်ချိုမြို့နယ်သို့ လာရောက်ကြသော်လည်း ၎င်း ဇရိယာ တွင် မရှိပါ။

<u>အခြေခံ အဆောက်အဦ နှင့် ဝန်ဆောင်မှုများ၊ လူမှု စီးပွားဆိုင်ရာများ၊ အသက်မွေးဝမ်းကြောင်း နှင့် ဝင်ငွေ နှင့် ကျန်းမာရေးအကျဉ်းချုပ်</u>

ကျေးရွာ သုံးရွာ လုံးသည် မန္တလေး-လာရှိုး အဝေးပြေးလမ်းမကြီး နှင့် မန္တလေး-လာရှိုး မီးရထားလမ်းမကြီးမှ ၇-၈ မိုင် အတွင်း ရှိပါသည်။ စီမံကိန်း လုပ်ကွက်၏ အရှေ့မြောက် ၁ မိုင် တွင် လောက်ဖန်း၊ အရှေ့တောင် ၂.၁ မိုင် တွင် ခဲဆန် ကျေးရွာ၊ နှင့် အရှေ့တောင် ၂.၂ မိုင် တွင် လယ်ကြီးတော ကျေးရွာ တို့ရှိပါသည်။

ကျေးရွာ သုံးရွာ ၏ အခြေခံ အဆောက်အဦ နှင့် ဝန်ဆောင်မှုများ၊

စဉ်	**အခြေခံ အဆောက်အဦ နှင့် ဝန်ဆောင်မှုများ၊**	လောက်ဖန်း	လယ်ကြီးတော	ခဲဆန်
၁	မော်တော်ယာဉ် လမ်း သွားလာရရှိမှု	√	√	√
၂	လျှပ်စစ်မီး ရရှိမှု (ငွေရည်ပုလဲ ကုမ္ပဏီ လီမိတက်မှ ထောက်ပံ့ပေးခြင်း)	√	√	√
၃	ရေ (အရင်းအမြစ်များ)	ရေတွင်း ၃ တွင်း (လူထု၊ ကုမ္ပဏီမှ ရေကန်)	သဘာဝ စမ်း ၃ ခုမှ	အများစုမှာ လက်ယက်တွင်းများ ရေတွင်း ၁၂ တွင်း

၄	ပညာရေး အဆောက်အအုံ (ကျောင်း)	တွဲဖက် အလယ်တန်း ကျောင်း	မူလတန်းကျောင်း	မူလတန်း ကျောင်း
၅	ကျန်းမာရေး အဆောက်အအုံ ဆေးခန်း	ကျေးရွာ ဆေးခန်း ၁ ခန်း	×	ကျေးရွာ ဆေးခန်း ၁ ခန်း
၆	ကျေးရွာ စာကြည့်တိုက်	×	×	×
၇	အစိုးရ အဆောက်အအုံ / အများပိုင် အဆောက်အအုံ	×	×	×
၈	ရဲစခန်း / ဌာနခွဲ	×	×	×

မှတ်ချက်: လျှပ်စစ်မီး မရရှိပါ။ ကျေးရွာ လျှပ်စစ်မီး ရရှိရေး အတွက် ကုမ္ပဏီမှ ထောက်ပံ့ပေးထား ပါသည်။ လောက်ဖန်း ကျေးရွာ၏ အိမ်ထောင်စု ၁၀၀% သည် လျှပ်စစ်မီးကို ချက်ပြုတ်ခြင်း အတွက် အသုံးပြုပြီး ကျန် ကျေးရွာ ၂ ရွာမှာ လျှပ်စစ်မီး အသုံးပြုမှု နှင့် လောင်စာထင်း အသုံးပြုမှု မှာ ၅၀% စီ ဖြစ်ပါသည်။

ကျေးရွာ သုံးရွာ လုံးသည် မော်တော်ယာဉ် လမ်း သွားလာနိုင်သော်လည်း ယာဉ် အနည်းငယ်သာ ဖြစ်ပါသည်။ (လောက်ဖန်း ကျေးရွာ တွင် ၉ စီး ၊ လယ်ကြီးတော ကျေးရွာ တွင် ၈ စီး နှင့် ခဲဆန် ကျေးရွာ တွင်၄၀ စီး ဖြစ်ပြီး အများစုမှာ light trucks များ ဖြစ်ကြသည်။)ငင်းဇရိယာ ရှိ တစ်ခုထဲသော မြို့မှာ နောင်ထိုမြို့ဖြစ်ပြီး အရှေ့တောင် ၆ မိုင် ခန့် အကွာ တွင် ရှိပါသည်။

အခြေခံ လူမှု စီးပွားဆိုင်ရာများ

စဉ်	**လူမှု စီးပွားဆိုင်ရာများ**	လောက်ဖန်း	လယ်ကြီးတော	ခဲဆန်
၁	လူဦးရေ	၅၄၈	၂၈၀	၄၅၅
	ကျား	၂၂၂	၁၃၇	၂၁၉
	မ	၃၂၆	၁၄၃	၂၃၆
၂	အိမ်ထောင်စု	၁၂၄	၆၂	၉၆
	အိမ်	၁၁၈	၅၇	၉၁
၃	ကိုးကွယ်မှု (%)			
	ဗုဒ္ဓဘာသာ	၁၀၀%	၁၀၀%	၁၀၀%
	ခရစ်ယာန်	-	-	-
	အခြား	-	-	-
၄	လူမျိုးစု %			
	ဗမာ	၅%	၂၀%	-
	ရှမ်း	၉၀%	-	၁၀၀%
	ရှမ်း (ဓနု)	-	၈၀%	-
	Gurkhas (ရှမ်း နှင့် ရှမ်း ဓနု မှာ အဓိက ဖြစ်ပါသည်။)	၅%	-	-

၅	ပညာရေး စာတတ်မြောက်နှုန်း (အရွယ်ရောက်) %	၈၀%	၆၀%	၈၅%
	ကျောင်းများ	အလယ်တန်း ကျောင်း	မူလတန်း ကျောင်း	မူလတန်း ကျောင်း
	ဆရာ/ဆရာမများ	၁၂	၃ (၂ ဦးကို ကုမ္ပဏီမှ ခန့်အပ်ပေးထား)	၅
	ကျောင်းသား/ သူများ	၆၀	၂၆	၅၇
၆	လူနေမှု အခြေအန			
	သစ်သားအိမ်	အများစုမှာ သစ်သားအိမ်များ (သွပ်မိုးကာ)	အများစုမှာ သစ်သားအိမ်များ (၁၅- သက်ကယ်မိုး)	အများစုမှာ သစ်သားအိမ်များ (သွပ်မိုးကာ)
	အုတ်အိမ် (၂ ထပ်)	၁၇ အိမ်	၁ အိမ်	၃၀ အိမ်
	ဝါးအိမ်	×	×	×
၇	ပစ္စည်းပိုင်ဆိုင်မှု (% အိမ်ထောင်စု)			
	ကား (ကိုယ်ပိုင်)	၄ စီး	၂ စီး	၁၀ စီး
	ကုန်တင်ကား (pick up သို့မဟုတ် light truck)	၅ စီး	၆ စီး	၃၀ စီး
	ထော်လ၅ီ	-	၃ စီး	-
	မော်တော်ဆိုင်ကယ် (% အိမ်ထောင်စု)	၁၀၀%	၁၀၀%	၉၅%
	တီဗွီ (% အိမ်ထောင်စု)	၉၀%	၉၀%	၈၅%
	Hand phone(% အိမ်ထောင်စု)	၁၀၀%	၁၀၀%	၁၀၀%

မှတ်ချက်: အမြင်အာရုံဖြင့် ကွင်းဆင်ခြင်း နှင့် KII တစ်ဆင့်ခံ အချက်အလက်များ

အသက်မွေးဝမ်းကြောင်း နှင့် ဝင်ငွေ

စဉ်	**အသက်မွေးဝမ်းကြောင်း နှင့် ဝင်ငွေ**	လောက်ဖန်း	လယ်ကြီးတော	ခဲဆန်
၁	အသက်မွေးဝမ်းကြောင်း /အလုပ်အကိုင် (% အိမ်ထောင်စု)	၈၀%	၇၅%	၇၅%
	လယ်သမား (အများစုမှာ တောင်ယာ သို့မဟုတ် ယာတော- အနည်းကယ်မှာ စပါးစိုက်ခင်း)			

	အဓိက စိုက်ပျိုးသီးနှံ ပြောင်း	√	√	√
၂	ကြံ	√	√	√
	ဆန် (တောင်ယာဆန်)	√	√	√
	မြေပဲ	√	√	√
	နှမ်း	√	√	√
	မုန်ညင်း	√	√	√
၃	ရာသီအလိုက် အလုပ်အကိုင်/odd job	၂၀%	၂၅%	၂၅%
	ကုမ္ပဏီမှ အလုပ်အကိုင် ခန့်အပ်ထားမှု (အရေအတွက်)	၂	၁	၂
	အစိုးရ ဝန်ဆောင်မှုများ (အရေအတွက်)	၁(ဆရာမ)	-	၁ (သူနာပြု)
၄	အိမ်ထောင်စု အလိုက် ရာသီအလိုက် ဝင်ငွေ			
	အိမ်ထောင်စု အလိုက် အနိမ့်ဆုံး ဝင်ငွေ (အပိုင်းအခြား)	၁၀-၁၅ သိန်း	၁၀-၁၅ သိန်း	၁၀-၁၅ သိန်း
	အိမ်ထောင်စု အလိုက် အမြင့်ဆုံး ဝင်ငွေ (အပိုင်းအခြား)	၉၀-၁၅၀ သိန်း	၈၀-၁၀၀ သိန်း	၁၀၀-၁၅၀ သိန်း
	နေ့စဉ် (ဝင်ငွေ)	၄၀၀၀ ကျပ် (မ) ၅၀၀၀ ကျပ် (ကျား)	၅၀၀၀ ကျပ် (မ) ၆၀၀၀ ကျပ် (ကျား)	၄၀၀၀ ကျပ် - ၅၀၀၀ ကျပ်

ကျန်းမာရေး အကျဉ်းချုပ်

ကျန်းမာရေးဆိုင်ရာ

စဉ်	**ကျန်းမာရေး အခြေအနေ (parameter)**	လောက်ဖန်း	လယ်ကြီးတော	ခဲဆန်
၁	ကျန်းမာရေး အခြေအနေ (ယေဘူလျှ)	နိမ့်	နိမ့်	နိမ့်
၂	ကျန်းမာရေး အဆောက်အအုံ ကျေးရွာ ဆေးခန်း	√	×	√

	ကိုယ်ပိုင် ဆေးခန်း (ကုမ္ပဏီ ဆေးခန်း)	√	×	×
	ကျန်းမာရေး ဝန်ဆောင်မှု ပုဂ္ဂိုလ်			
	- သူနာပြု	×	×	×
	- mid wife	၁	×	၁
	- အခြား ကျန်းမာရေး အကူ	×	×	၂
၃	<u>အချက်အလက်</u>			
	- သေဆုံးနှုန်း	NA	NA	NA
	- ရောဂါ ဖြစ်နှုန်း	NA	NA	NA
	- HIV/AIDS	NA	NA	NA
၄	<u>ကျန်းမာရေး ပြဿနာ</u>			
	ငှက်ဖျား (ယခုအချိန်အထိ လုံးဝ မပျောက်သေးပါ)	√	√	√
	ကာလဝမ်းရောဂါ	√	√	√
	ရာသီအလိုက် ရောဂါများ (အများစုမှာ- ချောင်းဆိုးခြင်း၊ အအေးမိခြင်း၊ ခေါင်းကိုက်ခြင်း အစရှိသည်ဖြင့်)	√	√	√

မှတ်ချက်: အရေးပေါ် အခြေအနေများ အတွက် တုံဆယ်ကျေးရွာတွင် မြို့နယ်ခွဲ ဆေးရုံ နှင့် နောင်ချို မြို့တွင် မြို့နယ်ဆေးရုံ ရှိပါသည်။ ပြင်းထန်သော ငှက်ဖျားရောဂါသည် ၂၀၁၆ အထိ ပြန့်နှံ့ခဲ့သော်လည်း ယခု အခါ လုံးလုံးလျားလျား အမြစ်မပြတ်သေးပါ။

လောက်ဖန်း၊ ခဲဆန် နှင့် ကုမ္ပဏီ ဆေးခန်းများတွင် ဆေးကုသမှု ခံယူသော လူနာမှတ်တမ်းများမှာ-

- လောက်ဖန်း၊ ကျေးရွာ ဆေးခန်းတွင် ၉၈၄ ခု (ကုမ္ပဏီ သည် ငွေသား နှင့် အမျိုးအစားများကို လှူဒါန်းခဲ့ပါသည်။)
- ခဲဆန် ကျေးရွာ ဆေးခန်းတွင် ၃၇၂ ခု (ကုမ္ပဏီ သည် ငွေသား နှင့် အမျိုးအစားများကို လှူဒါန်းခဲ့ပါသည်။)
- ကုမ္ပဏီ ဆေးခန်းတွင် ၃၃၈၁ ခု (လူနာအားလုံး၊ လုပ်သားများ နှင့် ဒေသခံများကို အခမဲ့ ကုသပေးပါသည်။)

ထိုင်း ဆေးခန်း သုံးခန်း တွင် ဆေးကုသမှု ခံယူသော မတူညီသော ကျေးရွာငယ်များမှ ဒေသခံများ ဥပမာ- ပန်တီ၊ နမ့်ကယ်အိုက် အစရှိသည်ဖြင့် ကို အခမဲ့ ကုသပေးပါသည်။ မှတ်တမ်းတင်ထားသော လူနာစုစုပေါင်း (လုပ်သား+ ဒေသခံ) မှာ- ၆၄၄၃ ဦးဖြစ်ပါသည်။ လူနာများသည် ထိုင်း စီမံကိန်း ၃ ခုမှ သက်ရောက်ခြင်းကြောင့် ဖြစ်ခြင်း ဟုတ် မဟုတ် ဆုံးဖြတ်ရန် မဖြစ်နိုင်ပါ။ စီမံကိန်း ကြောင့် သက်ရောက်သော ကောက်ပဲသီးနှံများကို စားသုံးခြင်း သို့မဟုတ် သောက်သုံးရေများ သောက်သုံးခြင်းကြောင့် ရောဂါများ ဖြစ်ခြင်း ဟုတ် မဟုတ် ဆုံးဖြတ်ရန် မဖြစ်နိုင်ပါ။

အဖြစ်များသော ဗျားနာမှုများ /ဝေဒနာများမှာ-

အအေးမိခြင်း၊ ချောင်းဆိုးခြင်း၊ ခေါင်းကိုက်ခြင်း၊ ကိုယ်လက်ကိုက်ခဲခြင်း၊ ကျောနာခြင်း၊ အလုပ်ခွင် တွင် ထိခိုက်ဒဏ်ရာရခြင်း (လယ်ကွင်း အလုပ်များတွင်)၊ ဝမ်းလျောခြင်း၊ ဝမ်းပိုက်နာခြင်း၊ မျက်စိနာခြင်း၊ သွားနာခြင်း၊ ကိုယ်ဝန်ဆောင်ခြင်း၊ ဆီးချို၊ အရေပြားရောဂါ၊ ဓာတ်မတည့်မှု၊ အစာ အဆိပ်သင့်ခြင်း၊ ခေါင်းမူးခြင်း၊ ယေဘူယျ အားနည်းခြင်း အစရှိသည်ဖြင့် လယ်ယာ လုပ်ငန်းခွင် အများစုတွင် အတွေ့အများဆုံး ရောဂါများ ဖြစ်သည်။ ကုမ္ပဏီ ဆေးခန်း တွင် အဖြစ်အများဆုံး ရောဂါများမှာ- အအေးမိခြင်း၊ ချောင်းဆိုးခြင်း၊ ခေါင်းကိုက်ခြင်း တို့ဖြစ်ပါသည်။

အဆိုပြုတင်ပြသော ကျောက်မီးသွေးသုံးဓါတ်အားပေးစက်ရုံသည် တည်ရှိပြီးသော ကရောင်း ဘိလပ်မြေစက်ရုံ ဇရိယာအတွင်းတွင် တည်ရှိသောကြောင့် နေရာအသစ်ရွေးချယ်ခြင်းနှင့် နေရာအတွက် မြေနေရာနှင့် သစ်တောရှင်းလင်းစရာ မလိုပေ။ သဘာဝဇီဝမျိုးစုံမျိုးကွဲအပေါ်တွင် သက်ရောက်မှုသည် မရှိသလောက် နည်းပါးသည်။

တည်ဆောက်ရေးကာလ (သို့မဟုတ်) စီမံကိန်းလည်ပတ်စဉ်ကာလအတွင်းတွင် စီမံကိန်းကြောင့် ပတ်ဝန်းကျင်ဆိုင်ရာ သက်ရောက်မှုများသည် ထူးထူးခြားခြား (သို့မဟုတ်) နဂိုအတိုင်းပြန်မဖြစ်နိုင်ရန် သက်ရောက်မှု မရှိပေ။

တည်ဆောက်ရေးကြောင့် သက်ရောက်မှုသည် အကြီးစားတည်ဆောက်ရေးလုပ်ငန်းများ အားလုံးကြောင့် ဖြစ်ပေါ်သော တိုတောင်းပြီး မတည်မြဲသော ပုံမှန်သက်ရောက်မှုဖြစ်သည်။

ရှည်လျားသော စီမံကိန်းကာလအတွင်းတွင် သက်ရောက်မှုများသည် အဓိကအားဖြင့် လေပတ်ဝန်းကျင်အပေါ်နှင့် ဒေသ၏မြေပတ်ဝန်းကျင်အပေါ်တွင် ပျံ့လွင့်သောပြာ၊ အောက်မှထွက်သော ပြာနှင့် အနည်အနှစ်များ ထွက်ရှိမည်။ သို့ပေမယ့် ဤအရာကို အကျိုးသက်ရောက်အောင် ဖြေလျော့နိုင်ပါသည်။ ဘွိုင်လာမှထွက်သော ဂတ်စ်များသည် လေးလံသော သတ္တုဓါတ်များ၊ Doxin, furans, PM, NO_x, SO_2, HCL, CO, CO_2 အစရှိသည်တို့ ပါဝင်ပါသည်။ သို့ပေမယ့် ယခုခေတ်နည်းပညာသည် ဤညစ်ညမ်းစေသောအရာများကို ဖြေလျော့(သို့မဟုတ်) ဖယ်ရှားနိုင် ပါသည်။ ယနေ့ခေတ်တွင် ခေတ်မီသော လျှပ်စစ်ဓါတ်အားပေးစက်ရုံများသည် အိမ်နောက်ဖေးတွင် အကင် ကင်ခြင်းမှထွက်သော လေညစ်ညမ်းမှုထက် ပိုသန့်ရှင်းသည်ဟု ပြောဆိုကြပါသည်။ တိကျသော နည်းစနစ်တွေကြောင့် မီးရှို့သည့် ကိရိယာများသည် Doxin, ဖုန်နှင့် လေးလံသော သတ္တုဓါတ်များထုတ်လွှတ်မှုသည် မထင်ရှားပေ။

ပတ်ဝန်းကျင် ဆိုင်ရာ မူဝါဒ၊ ဥပဒေနှင့် အဖွဲ့အစည်းဆိုင်ရာ မူဘောင်များ

ဤအခန်းသည် ပတ်ဝန်းကျင်ဆိုင်ရာ မူဝါဒ၊ တရားရေးရာဆိုင်ရာ အဖွဲ့အစည်းမူဘောင် အကြောင်း ဖြစ်သည်။ ဤအခန်းတွင် အမျိုးသားပတ်ဝန်းကျင်ဆိုင်ရာ မူဝါဒ၊ ကုမ္ပဏီမှ လိုက်နာရမည့် သင့်လျော်သော မြန်မာ့ဥပဒေများ၊ ပတ်ဝန်းကျင်နှင့်ဆက်နွယ်သော အပြည်ပြည်ဆိုင်ရာနှင့် ဒေသဆိုင်ရာ ကွန်ဗင်းရှင်းများ၊ အမျိုးသားရေးရာ ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးနှင့် ရာသီဥတုပြောင်းလဲခြင်းဆိုင်ရာ ဗဟိုကော်မတီ (NECCCCC)၏ အဖွဲ့အစည်းဆိုင်ရာမူဘောင်နှင့် ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း (EIA)အတွက် ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာန(ECD)၏ တာဝန်များ၊ ပတ်ဝန်းကျင်ဆိုင်ရာနှင့် လူမှုရေးဆိုင်ရာ ရေရှည်စဉ်ဆက်မပြတ်စေရန်အတွက် အပြည်ပြည်ဆိုင်ရာ ဘဏ္ဍာရေးကော်ပိုရေးရှင်း၏ စံချိန်စံနှုန်းများ၊ ပတ်ဝန်းကျင်ကျန်းမာရေးနှင့် ဘေးအန္တရာယ်ကင်းရှင်းရေး စံချိန်စံညွှန်းနှင့် လမ်းညွှန်ချက်များ၊ ပတ်ဝန်းကျင် ထိန်းသိမ်းရေးဦးစီးဌာန(ECD)မှ ချမှတ်ထားသော အမျိုးသားပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေး ထုတ်လွှတ်မှု(NEQEG) လမ်းညွှန်ချက်များနှင့် ကျောက်မီးသွေးလျှပ်စစ်ဓါတ်အားပေး စက်ရုံအတွက် အပြည်ပြည်ဆိုင်ရာ စံချိန်စံညွှန်းများနှင့် လမ်းညွှန်ချက်များ ပါဝင်သည်။

ဥပဒေ၊ နည်းဥပဒေနှင့် စည်းမျဉ်းစည်းကမ်းများ အခု (၄၀) ကို စာရင်းပြုစုထားပါသည်။ ဤအကြောင်းအရာများကို အတော်အသင့်အသေးစိတ် ဖော်ပြထားပါသည်။ မြန်မာနိုင်ငံ၏ ပတ်ဝန်းကျင်ဆိုင်ရာ မူဝါဒ၊ သက်ဆိုင်သောဥပဒေများ၊ ကောက်နုတ်ချက်အချို့များနှင့် အမျိုးသား ပတ်ဝန်းကျင်ဆိုင်ရာ ထုတ်လွှတ်မှုလမ်းညွှန်ချက်နှင့် စီမံကိန်းနှင့်သက်ဆိုင်သော ပတ်ဝန်းကျင်ဆိုင်ရာ ကျန်းမာရေးနှင့် ဘေးအန္တရာယ်ကင်းရှင်းရေးတို့ကို အလေးပေးဖော်ပြထားပါသည်။

စီမံကိန်းအကြောင်းအရာအသေးစိတ်

စီမံကိန်းအသေးစိတ်အကြောင်းအရာကို **အခန်း(၃)**တွင် အတော်အသင့် ဖော်ပြထားပါသည်။ ဤအခန်းသည် စီမံကိန်း နောက်ခံသမိုင်း၊ ရည်ရွယ်ချက်များ၊ စီမံကိန်းခေါင်းစဉ်၊ စီမံကိန်းတည်နေရာ၊ လွှမ်းခြုံမြေပုံ၊ အဆောက်အဦ အပြင်အဆင်၊ စီမံကိန်းဆောင်ရွက်ခြင်းအချိန်ဇယား၊ အခြေခံအဆောက်အဦ တည်ဆောက်ခြင်းပါဝင်သော စီမံကိန်း၏အသေးစိတ်အချက်အလက်များ၊ အဓိကအခန်းကဏ္ဍများ၊ စက်ယန္တရားနှင့် ကိရိယာ တန်ဆာပလာ၊ ဆောင်ရွက်မည့်နည်းပညာနှင့် ထုတ်လုပ်မည့်လုပ်ငန်းစဉ်နှင့် အခြားကဏ္ဍများဖြစ်သော ဘတ်ဂျတ်၊ ဝန်ထမ်းအင်အား၊ အလုပ်လုပ်ချိန်၊ ရေ၊ လျှပ်စစ်နှင့် လောင်စာဆီသုံးစွဲမှု အစရှိသည်တို့ ပါဝင်ပါသည်။ စီမံကိန်းအခြားဆောင်ရွက်နိုင်သောနည်းလမ်းများကို ဤအခန်း(၃)၏ အဆုံးတွင် ဖော်ပြ ထားပါသည်။

နည်းပညာ၊ အထူးသဖြင့်လျှပ်စစ်စွမ်းအင်ထုတ်လွှတ်မှုလုပ်ငန်းစဉ်၊ ရေအအေးခံခြင်းနှင့် ပြန်လည် သုံးစွဲခြင်း၊ ထုတ်လွှတ်အခိုးအငွေ့နှင့် စွန့်ပစ်ပစ္စည်းများ စီမံခန့်ခွဲမှု၊ ကုန်ကြမ်းပစ္စည်းများသုံးစွဲခြင်း အရင်းအမြစ်နှင့် သူတို့အတွက် စီမံကိန်းခန့်ခွဲမှုများကို အလေးထားဖော်ပြ ထားပါသည်။

အစိုင်အခဲလောင်စာ(အမှုန့်ခြေထားသော ကျောက်မီးသွေး)နှင့် ဆာလဖာဖယ်ထားသော ထုံးမှုန့်တို့ အသုံးပြုပါသည်။ CFB ဘွိုင်လာအမျိုးအစားဖြစ်ပြီး ၂၄၀ တန် ဖြစ်သည်။ ရေနွေးငွေ့တာဘိုင်(၆၀ မဂ္ဂါဝပ်)၊ တာဘိုင်မီးစက်(၆၀ မဂ္ဂါဝပ်)နှင့် FD ပန်ကာများလည်း ပါဝင်ပါသည်။ PM အတွက် ဖြေလျော့နိုင်မည့် နည်းလမ်းများမှာ ESP နှင့် ဇကာအိတ် (၇)လုံး တပ်ဆင်ထားပါသည်။ SO_2 နှင့် NO_x တို့အတွက် ဖြေလျော့နိုင်မည့် နည်းလမ်းများကိုလည်း ဖော်ပြထားပါသည်။

ရေအအေးခံခြင်းနှင့် ပြန်လည်အသုံးပြုခြင်းအတွက် အပိတ်စီးကြောင်းနည်းစနစ်ကို အသုံးပြုပြီး အအေးခံတာဝါမှာ ဆန့်အား ၅၀၀ တန်၊ ဆက်စပ်ပစ္စည်းများနှင့် တာဘိုင်ကွန်ဒင်ဆာတို့ ပါဝင်ပါသည်။

ရေသန့်စင်ခြင်း၌ ပထမအဆင့်တွင် သတ္တုဖယ်ရှားခြင်း၊ စက်နှင့်ဆိုင်သော ရေစစ်အသုံးပြုသော Softener များနှင့် RO စနစ်ဖြင့် သန့်စင်ခြင်းတို့ ပါဝင်ပါသည်။ (သဘာဝရေကို အသုံးမပြုပေ။)

နောက်ထပ် ကွင်းဆင်းဆောင်ရွက်ခြင်းကို ၉-၃-၂၀၁၉ ရက်နေ့မှ ၁၃-၃-၂၀၁၉ ရက်နေ့အထိ ဆောင်ရွက် ခဲ့ပါသည်။

ဤအကြောင်းအရာများကို အခန်း(၃)တွင် အတော်အသင့် အသေးစိတ်ဖော်ပြထားပါသည်။

ပတ်ဝန်းကျင်ဆိုင်ရာအသေးစိတ်အခြေအနေ

အခန်း(၄)သည် အနီးအနားပတ်ဝန်းကျင် အသေးစိတ်အကြောင်းအရာနှင့်အတူ နည်းစနစ်၊ ပတ်ဝန်းကျင်၏ ရုပ်ပိုင်းဆိုင်ရာ (ရာသီဥတု၊ မိုးလေဝသ၊ အခြေခံဘူမိဗေဒ၊ မြေဆီလွှာ၊ ထိတွေ့ဝန်းကျင်ဆိုင်ရာ ရေအရည်အသွေး အစရှိသော) ပတ်ဝန်းကျင်၏ ဇီဝပိုင်းဆိုင်ရာ (အပင်နှင့် သားရဲတိရစ္ဆာန်)၊ လူမှုစီးပွားရေးဆိုင်ရာ (မြေယာ၊ အခြေခံသန်းခေါင်းစာရင်း၊ ဒေသစီးပွားရေး၊ ပညာရေး၊ ကျန်းမာရေးနှင့် အခြားကဏ္ဍများ)၊ ယဉ်ကျေးမှုဆိုင်ရာနှင့် ပတ်ဝန်းကျင်၏ မျက်စိပဒေသာဖြစ်သော ရှုခင်းရှုကွက်များအကြောင်း ပါဝင်ပါသည်။

အဆိုပြုတင်ပြသော စီမံကိန်းနေရာသည် ကရောင်းဘိလပ်မြေစက်ရုံ၏ အဝန်းအဝိုင်းထဲတွင် တည်ရှိပြီး ၂၀၁၃ ခုနှစ်ကတည်းက မြေနေရာရှင်းလင်းထားပြီးဖြစ်သောကြောင့် ဇီဝမျိုးစုံမျိုးကွဲအပေါ် သက်ရောက်မှုသည် မပြောပလောက်ပေ။

ဇလဗေဒနှင့်ဆိုင်သော သတင်းအချက်အလက် (အပူချိန်၊ မိုးရေချိန်၊ စိုထိုင်းဆ)ကို မြို့နယ် မိုးလေဝသနှင့်ဇလဗေဒဦးစီးဌာနမှ ရယူခဲ့ပါသည်။ ဘူမိဗေဒအချက်အလက်ကိုလည်း တစ်ဆင့်ခံ အချက်အလက်မှ ရရှိပါသည်။

လေ၊ ရေ၊ မြေနှင့် ဇီဝပိုင်းဆိုင်ရာ အချက်အလက်အားလုံးမှာ ကွင်းဆင်းဆောင်ရွက်ချိန်အတွင်းတွင် ကောက်ယူထားသော မူရင်းအချက်အလက်များ ဖြစ်သည်။ လေ၊ ရေနှင့် ဆူညံသံ အချက်အလက်များကို NEQEG လမ်းညွှန်ချက်တန်ဖိုးများဖြင့် နှိုင်းယှဉ်ဖော်ပြ ထားပါသည်။

လူမှုစီးပွားရေးနှင့် ယဉ်ကျေးမှုဆိုင်ရာအချက်အလက်များမှာ တဆင့်ခံနှင့်မူရင်းအချက်အလက်များ ပါဝင်ပါသည်။ ဤအချက်အလက်များကို ကောက်ယူရာတွင် KII နှင့် FGD အင်တာဗျူးများဖြင့် မေးမြန်းကောက်ယူထားပါသည်။ SIA အစီရင်ခံစာမဟုတ်သောကြောင့် HHI အင်တာဗျူးကို မဆောင်ရွက်ခဲ့ပေ။

မျက်စိပဒေသာဖြစ်သော ရှုခင်းရှုကွက်ဆိုင်ရာ အချက်အလက်ကို မျက်မြင်လှည့်လည်ကြည့်ရှု စစ်ဆေးပြီး ကောက်ယူခဲ့ပါသည်။

ဇီဝမျိုးစုံမျိုးကွဲအချက်အလက်များမှာ သဘာဝအပင် (၂၁၂) မျိုး၊ စိုက်ပျိုးပင် (၆၈)မျိုး၊ ငှက်မျိုးစိတ် (၁၀၉)မျိုး၊ ကုန်းနေရေနေတွားသွားသတ္တဝါမျိုးစိတ် (၈)မျိုးနှင့် နို့တိုက်သတ္တဝါမျိုးစိတ် (၅)မျိုး (အများအားဖြင့် ကြွက်နှင့် ရှဉ့်များ)တို့ကို ကောက်ယူမှတ်တမ်းတင်နိုင်ခဲ့ပါသည်။

ဧရိယာ၏ အပင်(သစ်တော)အပေါ်တွင် ထင်ရှားသောသက်ရောက်မှုရှိမည်။ ဤစီမံကိန်းနှင့်တော့ မဆိုင်ပေ (ၿငိးသည် ဘိလပ်မြေစက်ရုံနှင့် တောင်ဘက်တွင် ထုံးကျောက်တောင်လုပ်ကွက် မြေဧက(၂၈၀) ရှင်းလင်းခြင်းကြောင့် ဖြစ်သည်)။

ဆန်းစစ်ခြင်း နှင့် သက်ရောက်မှု အကဲဖြတ်ခြင်း

ဆန်းစစ်ခြင်းနှင့် သက်ရောက်မှု အကဲဖြတ်ခြင်း ကို အောက်ပါ လက်တွေ့ကျကျ ချဉ်းကပ်နည်းဖြင့် ပြုလုပ်ခဲ့ပါသည်။

ဆန်းစစ်အကဲဖြတ်ခြင်း သည် အတွေ့အကြုံ၊ သုံးသပ်ဉာဏ်များ၊ စာရင်းအင်း ပညာရှင်များ၊ ကွန်ပျူတာ ပရိဂရမ်မာများ နှင့် အထူးပြုများ၊ ဆေးသိပ္ပံ ပညာရှင်များ၊ အင်ဂျင်နီယာများ အစရှိသည်တို့၏ အလုပ်များ ဖြစ်ပြီး မော်ဒယ် အသုံးပြုမှုများ၊ သုံးသပ် မော်ဒယ်များ၊ ကွန်ပျူတာ မော်ဒယ်များ၊ ရှုပ်ထွေးသော ညီမျှခြင်းများနှင့် ဖော်မြူလာများ အစရှိသည့် အလုပ်များ ပါဝင်ပါသည်။ တစ်နည်းအားဖြင့် သဘာဝ ပညာရပ်သပ်သပ် သို့မဟုတ် သဘာဝ သုတေသန ပြုခြင်းဖြစ်ပါသည်။ ထို့ကြောင့် ပတ်ဝန်းကျင် ဆိုင်ရာ အပေါ် အလေးပေးထားသော EIA လေ့လာမှု အတိုင်းအတာထက် ကျော်လွန်နေပါသည်။

အစောပိုင်း ဇယား ပုံစံဖြင့် ဖော်ပြထားသော ဆန်းစစ်ခြင်း နှင့် သက်ရောက်မှု များအတွက် နည်းလမ်းသည်တစ်မျိုးဖြစ်ပြီး အခြားလက်တွေ့ကျသော နည်းဖြင့် အမှန်တကယ် သို့မဟုတ် ဖြစ်နိုင်ခြေ ရှိသော သက်ရောက်မှုမှုများကို ဘေးအန္တရာယ်များ နှင့် ဆန်းစစ် အကဲဖြတ်ခြင်းအဖြစ် ဖော်ပြနိုင်သည်။

တင်ပြထားသော စီမံကိန်း တွင် Experts Judgement Method/Experts Consensus Method သို့မဟုတ် Ad hoc method အမည်ရသော လက်တွေ့ကျကျ နည်းလမ်း များကို အသုံးပြုပါသည်။ အန္တရာယ် အကဲဖြတ်ခြင်း၏ IFC ဇယားမှ (အကျိုးဆက်များနှင့် ဆန့်ကျင်ဘက် ဖြစ်နိုင်ခြေ တို့ကို) အခြေခံထားပါသည်။

တနည်းအားဖြင့် ဖြစ်နိုင်ခြေ x အကျိုးဆက် ၏ ရိုးရှင်းသော မက်ထရစ် နည်းလမ်း ကို အသုံးပြုထားပြီး အန္တရာယ် အဆင့်သတ်မှတ်ချက် (ရလဒ်)ကို ပညာရှင်များ၏ သဘောတူညီမှုဖြင့် အကဲဖြတ်ထားပါသည်။

ဖြစ်နိုင်ခြေ (၁-၅) x အကျိုးဆက် (၁-၅) = အန္တရာယ် အဆင့်သတ်မှတ်ချက် (ပညာရှင်များ၏ သဘောတူညီမှုဖြင့် လိုအပ်သည့် အချိန်/ လိုအပ်သည့်နေရာ တွင် စိစစ်ခြင်း)

ဆန်းစစ်ခြင်း အဆင့်သတ်မှတ်ခြင်းဇယား

အမှန်တကယ် ဘေးအန္တရာယ် ရလဒ်					
နိမ့် (၁-၃)	အလယ်အလတ် (၄-၆)		မြင့် (၈-၁၂)	အလွန်မြင့် (၁၅-၂၅)	
နောက်ဆက်တွဲ	ဖြစ်နိုင်ခြေ				
	ရှားပါး ၁	မဖြစ်နိုင် ၂	ဖြစ်နိုင် (အလယ် အလတ်) ၃	ဖြစ်နိုင် ၄	သေချာသ လောက် နီးပါး ၅
ကပ်ဘေး (အလွန်အကျွံ) ၅	၅	၁၀	၁၅	၂၀	၂၅
အဓိက (မြင့်) ၄	၄	၈	၁၂	၁၆	၂၀
အလယ်အလတ် (အလယ်) ၃	၃	၆	၉	၁၂	၁၅
အသေးအဖွဲ (နိမ့်) ၂	၂	၄	၆	၈	၁၀
လျစ်လျူရှုနိုင် ၁	၁	၂	၃	၄	၅

မှတ်ချက်: - နောက်ဆက်တွဲ x ဖြစ်နိုင်ခြေ = အမှန်တကယ် ရလဒ်

ရမှတ် ၁၅-၂၅	အလွန်အကွဲ၊ အနီ: ရှောင်ရှားခြင်း၊ ထိန်းချုပ်ခြင်း၊ လျော့ချခြင်း
ရမှတ် ၈-၁၂	မြင့်၊လိမ္မော် : ထိန်းချုပ်ခြင်း၊ လျော့ချခြင်း
ရမှတ် ၄-၆	အလယ်အလတ်၊ အဝါ: ထိန်းချုပ်ခြင်း၊ လျော့ချခြင်း
ရမှတ် ၁-၃	နိမ့်၊ အစိမ်း: လက်ခံနိုင်/ ယူဆချက်

မှတ်ချက်: ဤရိုးရှင်းပြီး လက်တွေ့ကျသော နည်းလမ်းကို သက်ရောက်မှု နှင့် ဆန်းစစ်ခြင်းအတွက် ရွေးချယ်ပါသည်။

အကြိုတည်ဆောက်ရေးကာလအတွင်းတွင် ဖြစ်နိုင်ခြေရှိသောသက်ရောက်မှု (၂)ချက် ရှိပါသည်။ ထိုအရာများမှာ-

- တက်ကြွလှုပ်ရှားသူများကြောင့် ဒေသခံများအကြား ထောက်ခံသောအဖွဲ့နှင့် ကန့်ကွက်သော အဖွဲ့ဟူ၍ နှစ်ဖွဲ့ကွဲနိုင်ခြင်း၊
- အချောင်လိုချင်သောသူများကြောင့် မြေဈေးအဆမတန်တက်ခြင်း တို့ဖြစ်သည်။

အမှန်တကယ်တွင် ဤသက်ရောက်မှုများကို မတွေ့ပေ။

တည်ဆောက်ရေးကာလအတွင်းတွင် ဖြစ်နိုင်ခြေရှိသော သက်ရောက်မှု (၈)ချက်ကို အမျိုးအစား ခွဲခြားနိုင်ပါသည်။ ထိုအရာများမှာ-

- သယ်ယူပို့ဆောင်ရေးပြင်ဆင်ခြင်း လုပ်ဆောင်ချက်နှင့် အဆောက်အဦပစ္စည်းများ သိုလှောင်ခြင်း၊
- လေပတ်ဝန်းကျင်အပေါ် သက်ရောက်မှု
- ဆူညံသံနှင့်တုန်ခါမှု
- မြေဆီလွှာအပေါ် သက်ရောက်မှု
- စွန့်ပစ်ပစ္စည်းများကြောင့် သက်ရောက်မှု
- အလုပ်ခွင်တွင် မတော်တဆမှု
- ဖြစ်နိုင်ခြေရှိသော လူမှုရေးပြဿနာနှင့်
- ဖြစ်နိုင်ခြေရှိသော လုံခြုံရေးပြဿနာများ ဖြစ်သည်။

အမှန်တကယ်တွင် ဤသက်ရောက်မှုများသည် ခဏတာဖြစ်ပြီး တည်ဆောက်ရေးကာလပြီးလျှင် ရပ်ဆိုင်းသွားမည် ဖြစ်သည်။

စီမံကိန်းလည်ပတ်စဉ်ကာလအတွင်းတွင် ဖြစ်နိုင်ခြေရှိသောသက်ရောက်မှုများမှာ (၈)ချက် ဖြစ်သည်။ ထိုအရာများမှာ-

- လေပတ်ဝန်းကျင်အပေါ် သက်ရောက်မှု
- ဆူညံသံနှင့်တုန်ခါမှု
- စွန့်ပစ်ပစ္စည်းများကြောင့် သက်ရောက်မှု (အစိုင်အခဲနှင့်အရည်)
- လုပ်ငန်းခွင်ကျန်းမာရေးနှင့် ဘေးအန္တရာယ်ကင်းရှင်းရေး
- ဖြစ်နိုင်ခြေရှိသော ယာဉ်ကြောပိတ်ဆို့မှု
- ဖြစ်နိုင်ခြေရှိသော လူမှုရေးသက်ရောက်မှု
- ဖြစ်နိုင်ခြေရှိသော လုံခြုံရေးပြဿနာ
- ဖြစ်နိုင်ခြေရှိသော အမြင်သက်ရောက်မှုတို့ ဖြစ်သည်။

စီမံကိန်းပိတ်သိမ်းချိန်ကာလအတွင်းတွင် ဖြစ်နိုင်ခြေရှိသော သက်ရောက်မှုများမှာ (၃)ချက် ဖြစ်သည်။

- ရှင်းလင်းခြင်း၊ ဖြိုဖျက်ခြင်း သက်ရောက်မှု (စီမံကိန်းပိတ်သိမ်းခြင်းကာလ)
- ဖြစ်နိုင်ခြေရှိသော ကြွင်းကျန်သက်ရောက်မှုနှင့်
- ဖြစ်နိုင်ခြေရှိသော လေပတ်ဝန်းကျင်အပေါ် သက်ရောက်မှု တို့ ဖြစ်သည်။

ဖြေလျော့နိုင်မည့်နည်းလမ်းများ

တည်ဆောက်ရေးကာလ၊ စီမံကိန်းလည်ပတ်ခြင်းကာလနှင့် စီမံကိန်းပိတ်သိမ်းခြင်းကာလ အတွင်းတွင် လုပ်ဆောင်မည့်ဖြေလျော့နိုင်သည့် နည်းလမ်းများကို အောက်တွင် ဇယားဖြင့်ဖော်ပြထားပါသည်။

(EMP အဖွဲ့ခေါင်းဆောင်၊ အဖွဲ့ဝင်များနှင့် အထူးသင်ကြားပေးထားသော ဝန်ထမ်းများ သည် ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှု အစီအစဉ် ဆောင်ရွက်ခြင်းနှင့် ဖြေလျော့နိုင်မည့်နည်းလမ်းများ လုပ်ဆောင်ခြင်းအတွက် တာဝန်ရှိပါသည်။)

တည်ဆောက်ရေးကာလအတွင်းတွင်

စဉ်	သက်ရောက်မှု	ဖြေလျော့နိုင်မည့် နည်းလမ်းများ (အနှစ်ချုပ်)
၁	လမ်းဖောက်ခြင်းကြောင့် ဖြစ်ပေါ်နိုင်သော သက်ရောက်မှု	- အပင်များကို လိုအပ်သည်ထက် ပိုမရှင်းပါ။ - ယာဉ်များကို ရွှေ့လျားခြင်းကို ကန့်သတ်ထားခြင်း၊ စက်ယန္တရားများကို အတွက်လည်း ရွှေ့လျားခြင်း အစီအမံများကို လုပ်ဆောင်ထားခြင်း - စီမံကိန်းအပြင်နေရာတွင် ဆောက်လုပ်ရေးသုံးပစ္စည်းများ ပြုတ်ကျခြင်းကို ရှောင်ရှားခြင်း - စက်ရုံ သို့မဟုတ် ရုံးခန်းကို ခြံစည်းရိုးခတ်ထားခြင်း
၂	သက်ရောက်မှုများ- ဖုန်မှုန့် နှင့် မီးခိုးများ	- ဖုန်မှုန့် နှင့် မီးခိုးများ စီမံခန့်ခွဲခြင်း - ပတ်ဂန်းကျင်ထိန်းသိမ်းရေး ဦးစီးဌာန၏ အမျိုးသား ပတ်ဂန်းကျင်ဆိုင်ရာ အရည်အသွေး ထုတ်လွှတ်မှု လမ်းညွှန်ချက်တန်ဖိုးများကို လိုက်နာခြင်း - လိုအပ်သည်ထက် မြေပြင်ကို မရှင်းလင်းခြင်း - အမှိုက်များ ဟင်းလင်းပွင့် မီးပုံရှို့ခြင်းများကို ရှောင်ရှားခြင်း၊ - ဖုန်ထခြင်းအတွက် ရေဖြန်းခြင်း - အမှုန်အမွှားလျော့ချရန်အတွက် ယာဉ်များ သွားလာမှုနှင့် အရှိန်ကို ကန့်သတ်ခြင်း - လေပြင်းတိုက်ချိန်တွင် မြေကြီး အတင်အချလုပ်ငန်းများကို ရပ်နားထားခြင်း - မြေကြီး၊ သဲနှင့် ထုံးမှုန့်များကို ဟင်းလင်းပွင့် တွင် စုပုံခြင်းကို သတ်မှတ်ခြင်း - မြေကြီးနှင့် အခြားပစ္စည်းများ အတင်အချလုပ်သော အခါတွင် အမြင့်ကို လျော့ချခြင်း - ဖုန်မှုန့်များကို စုပ်ယူနိုင်ရန်ကြီးမြန်သစ်ပင်များကို စိုက်ပျိုးခြင်း - လေတိုက်ခြင်းကြောင့်ဖြစ်နိုင်သော ဘေးကိုလျော့ချရန်နှင့် အမှုန်များ တည်ငြိမ်နေစေရန် မြေစာပုံ၏ အပေါ်ယံ မြေဆီလွှာပေါ်တွင် အပင်များ သဘာဝအတိုင်း ပေါက်ရောက်စေခြင်း

		- ပတ်ဝန်းကျင်နှင့် လိုက်လျောညီထွေမှု ရှိသော ယာဉ်များ စက်ပစ္စည်း ကိရိယာများကို အသုံးပြုခြင်း (မီးခိုးများ ထုတ်လွှတ်မှု နည်းပြီး ဆီစားသက်သာသော စက်များ) - မီးခိုးထုတ်လွှတ်မှု လျော့ချရန်အတွက် ယာဉ်များ စက်ပစ္စည်း ကိရိယာများ ကို ပုံမှန် ထိန်းသိမ်းခြင်း (ကောင်းစွာ လည်ပတ်ခြင်း နှင့် ကောင်းစွာ ထိန်းသိမ်းခြင်း နှင့် ယာဉ်များ မီးခိုးများ ထုတ်လွှတ်မှု နည်းခြင်းနှင့် ဆီစားသက်သာ စေခြင်း) - လုပ်သားများကို လုံလောက်သော PPE ထောက်ပံ့ခြင်း။
၃	သက်ရောက်မှု- ဆူညံသံ နှင့် တုန်ခါမှု	- ပတ်ဝန်းကျင်နှင့် လိုက်လျောညီထွေမှု ရှိသော ဆူညံသံ ထုတ်လွှတ်မှု နည်းပြီး တုန်ခါမှု နည်းသော ယာဉ်များ စက်ပစ္စည်း ကိရိယာများကို အသုံးပြုခြင်း - အလုပ်ချိန်ကို သတ်မှတ်ထားခြင်း (ညအချိန်တွင် တည်ဆောက်ရေး အလုပ်မလုပ်ခြင်း) - ဆူညံသံ နှင့် တုန်ခါမှု အတွက် လမ်းညွှန်ချက်တန်ဖိုးများနှင့် လိုအပ်ချက်များကို တွေ့စေရန် ကြိုးစားခြင်း - ဆူညံသံကို နေစထွက်ချိန်နှင့် နေဝင်ချိန်အတွင်း အချိန်ကန့်သတ်ခြင်း၊ နေဝင်ချိန် နောက်ပိုင်းတွင် ပြင်ပ အလုပ်များ မလုပ်ကိုင်ခြင်း - silencers ကို ဆူညံသံ ထုတ်လွှင့်မှု မြင့်သော စက်ပစ္စည်းများတွင် တပ်ဆင်ခြင်း၊ - အလုပ်မလုပ်သော အချိန်တွင် စက်ကိရိယာများကို ရပ်နားထားခြင်း - ဆူညံသံ နှင့် တုန်ခါမှု ကို လျော့ချရန် ယာဉ်ကြီးများ သွားလာမှု ကန့်သတ်ခြင်း - ဆူညံသံ နှင့် တုန်ခါမှု ကို လျော့ချရန် ယာဉ်ကြီးများ စက်ပစ္စည်း ကိရိယာများကို ကောင်းစွာ လည်ပတ်ခြင်း နှင့် ကောင်းစွာ ထိန်းသိမ်းခြင်း - တုန်ခါမှု ကို လျော့ချရန် သင့်တော်သော အောက်ခံဒီဇိုင်းကို ရွေးချယ်ခြင်း၊ တုန်ခါမှုကို လျော့ချရန် လမ်းများကို မျက်နှာပြင် ညီညာစေခြင်း - လုပ်သားများကို PPE ထောက်ပံ့ပေးခြင်း

၄	မြေဆီလွှာအပေါ် သက်ရောက်မှု	- မြေပြင်ကို လိုအပ်သည်ထက် မရှင်းလင်းပါ။ - မလိုအပ်ပဲ မြေဆီလွှာပျက်စီးခြင်းကို ရှောင်ရှားခြင်း - အပေါ်ယံမြေဆီလွှာကို ခွဲခြားစုပုံခြင်း (အပင်ပြန်လည် စိုက်ပျိုးခြင်း အတွက်၊ တည်ဆောက်ရေးအတွက်) - အမြင်မကောင်းသော စုပုံခြင်းကို ရှောင်ရှားခြင်း (လေတိုက်၊ ရေ) - မြေတိုက်စားခြင်းနှင့် မြေပြိုကျခြင်းကို ရှောင်ရှားခြင်း - ပစ္စည်းများ မြောင်းအတွင်းသို့ စွန့်ပစ်ခြင်းကို ရှောင်ရှားခြင်း - တည်ဆောက်ရေးလုပ်ငန်းပြီးနောက် မြေပြင်ကို ပြန်လည် ညီပေးခြင်း - မိုးရာသီတွင် မြေပြင်အလွတ်အတိုင်း အချိန်ကြာမြင့်စွာ ထားရှိမှုကို ရှောင်ရှားခြင်း - စက်ယန္တရားများဖြင့် မြေဆီလွှာ သိပ်သည်းအောင်ပြုလုပ်ခြင်း - မြေဆီလွှာထဲသို့ လောင်စာဆီ လျှံကျခြင်းကို ရှောင်ရှားခြင်း၊ လျှံကျခဲ့လျှင် ချက်ချင်းလျင်မြန်စွာ ဖယ်ရှားခြင်း၊ ရေနှင့်မဆေးပဲ စုပ်ယူသည့်အရာဖြင့် ပြုလုပ်ခြင်း၊ အသုံးပြုပြီးသော ဆီများကို ဆီတိုင်ကီအဟောင်းများတွင် ထည့်သွင်းသိမ်းဆည်းခြင်းနှင့် စွန့်ပစ်ခြင်း - လောင်စာဆီကိုင်တွယ်ခြင်းနှင့် လျှံကျလျှင် သန့်စင်ခြင်းကို အလုပ်သမားများကို သင်တန်းပေးထားခြင်း
၅	စွန့်ပစ်ပစ္စည်းများ (အစိုင်အခဲစွန့်ပစ်ပစ္စည်း၊ တည်ဆောက်ရေး အမှိုက်သရိုက်များ)	- ဟင်းလင်းပွင့် မီးရှို့ခြင်းကို ရှောင်ရှားခြင်း - သတ်မှတ်ထားသော အမှိုက်ပုံတွင် စွန့်ပစ်ပစ္စည်းများကို စွန့်ပစ်ခြင်း - သန့်ရှင်းသပ်ရပ်စေရန် အလုပ်သမားများကို သင်တန်းပေး ထားခြင်း - ကျန်ရစ်ခဲ့သော တည်ဆောက်ရေးလုပ်ငန်းပစ္စည်းများကို ရောင်းချခြင်း - တည်ဆောက်ရေးလုပ်ငန်းပြီးနောက် စီမံကိန်းနေရာကို သန့်ရှင်းသပ်ရပ်စေရန် ကန်ထရိုက်တာ ဌာနမှ်းခြင်း - အလုပ်သမားများကို သန့်ရှင်းသပ်ရပ်စေရန် စည်းကမ်း သတ်မှတ်ထားခြင်း

၆	ဖြစ်နိုင်ခြေရှိသော လုပ်ငန်းခွင်တွင် မတော်တဆမှု	- ဘေးအန္တရာယ်ကင်းရှင်းသော လုပ်ငန်းခွင် အခြေအနေ ဖန်တီးပေးခြင်း - မတော်တဆမှု မဖြစ်စေရန် ကြိုးစားခြင်း - "ဘေးအန္တရာယ်ကင်းရှင်းရေးသည် ပထမ" ဟု ဆိုင်းဘုတ်များ ထားရှိပေးခြင်း - လုပ်ငန်းခွင်တွင် သန့်ရှင်းသပ်ရပ်စေရန် အလုပ်သမားများကို သင်ကြားပေးထားခြင်း - ကောင်းမွန်သောကျန်းမာရေးနှင့် သန့်ရှင်းရေးအတွက် ပညာပေးထားခြင်း - အလုပ်ချိန်တွင် အရက်သောက်ခြင်းကို တားမြစ်ထားခြင်း - အရေးပေါ်တုန့်ပြန်မှု အတွက် အစီအစဉ်ရေးဆွဲခြင်း - အရေးပေါ်သူနာပြုသင်တန်း၊ မီးသတ်သင်တန်း တို့ ပေးထားခြင်း - အဆောက်အဦမှ ပစ္စည်းများ ပြုတ်ကျခြင်းကို တားဆီးရန် ပိုက်ကွန်ဖြင့်ကာရန်ထားခြင်း - လုံလောက်သော PPE ထောက်ပံ့ပေးခြင်း - လုံလောက်သော ရေးဦးသူနာပြုဆေးပုံးနှင့် ဆေးများ ထောက်ပံ့ပေးထားခြင်း - လုံလောက်သော မီးသတ်ကိရိယာများ ထောက်ပံ့ပေး ထားခြင်း - အစမ်းလေ့ကျင့်မှုများ ပြုလုပ်ထားခြင်း - ကြတ်ခြေနီ၊ အရေးပေါ်ဝန်ဆောင်မှု၊ မီးသတ်၊ ရဲစခန်း၊ နောင်ချိုမြို့နယ် ဆေးရုံတို့၏ ဖုန်းနံပါတ်များကို ထားရှိထားခြင်း - ကုမ္ပဏီအတွက်အာမခံထားရှိခြင်းနှင့် မီးဘေးအန္တရာယ် အတွက် အာမခံထားရှိခြင်း
၇	ဖြစ်နိုင်ခြေရှိသော လူမှုရေးပြဿနာများ	- ဒေသခံများ၏ လူမှုစီးပွားရေး အပေါ် ဖြစ်နိုင်ခြေရှိသော သက်ရောက်မှုများကို ရှောင်ရှားခြင်း - ဒေသခံများနှင့် ကောင်းမွန်သော ဆက်ဆံရေး ထားရှိခြင်း - အချိန်နှင့်အမျှ လူထုတွေ့ဆုံပွဲများကို ကျင်းပ၍ သူတို့၏အသံများကို နားထောင်ခြင်း

		- ဒေသခံများနှင့် ဆက်ဆံသည့်အခါ သင့်တော်သော အပြုအမူများဖြင့် ဆက်ဆံရန် အလုပ်သမားများကို ပညာပေးခြင်း - အလုပ်သမား၏ အဆင်မပြေသော လူမှုရေးဆိုင်ရာများကို စီမံခန့်ခွဲခြင်း - ယောကျ်ားလေးနှင့် မိန်းကလေးဂန်ထမ်းအဆောင်များကို သီးသန့်ခွဲထားခြင်း - တည်ဆောက်ရေးကန်ထရိုက်တာ အား သူ့အလုပ်သမားများကို စည်းကမ်းချမှတ်ထားခိုင်းခြင်း - အမှားလုပ်ဆောင်ခြင်းအတွက် ပြစ်ဒဏ်ချမှတ်ခြင်း - လုပ်ငန်းချိန်အတွင်းတွင် အရက်သောက်ခြင်းနှင့် ဆေးသုံးစွဲခြင်းကို တားမြစ်ထားခြင်း - ရန်ဖြစ်ခြင်းနှင့်ရန်ပွဲများကို တားမြစ်ခြင်း - အလုပ်သမားများကို သန့်ရှင်းသပ်ရပ်စွာထားရှိစေရန် သင်တန်းပေးထားခြင်း - ဒေသခံများ၏အဆောက်အဦပျက်စီးခြင်း၊ ရေအရင်းအမြစ်နှင့် ဖြစ်နိုင်ခြေရှိသော နှောက်ယှက်မှုများကို ရှောင်ရှားခြင်း
၈	ဖြစ်နိုင်ခြေရှိသော လုံခြုံရေးပြဿနာများ	- စီမံကိန်းနေရာ၏လုံခြုံရေးကို စီမံခန့်ခွဲခြင်း - စီမံကိန်းနေရာကို ခြံစည်းရိုးခတ်ခြင်း - ဂိတ်များတွင် အစောင့်များထားရှိခြင်း - ခွင့်ပြုချက်မရပဲ အနီးနားရှိကျေးရွာများကို အလုပ်သမားများ ဂင်ရောက်ခြင်းကို တားမြစ်ခြင်း - ဒေစခံများနှင့် ရောနှေမနေစေခြင်း(တည်ဆောက်ရေးကာလအတွင်းတွင်) - ပစ္စည်းထားရှိသည့်နေရာများကို သော့များသေချာခတ်ခြင်း - တည်ဆောက်ရေးကန်ထရိုက်တာ အား သူ့အလုပ်သမားများကို စည်းကမ်းချမှတ်ထားခိုင်းခြင်း - အမှားလုပ်ဆောင်ခြင်းအတွက် ပြစ်ဒဏ်ချမှတ်ခြင်း

စီမံကိန်းလည်ပတ်ခြင်းအတွင်းတွင်

စဉ်	သက်ရောက်မှု	ဖြေလျော့နိုင်မည့် နည်းလမ်းများ (အနှစ်ချုပ်)
၁	သက်ရောက်မှုများ- ဖုန်မှုန့် နှင့် မီးခိုးများ	- ဖုန်မှုန့် နှင့် မီးခိုးများ စီမံခန့်ခွဲခြင်း - အမျိုးသား ပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေး ထုတ်လွှတ်မှု လမ်းညွှန်ချက်တန်ဖိုးများကို လိုက်နာခြင်း (PM_{10}: ၅၀, $PM_{2.5}$: ၂၅, NO_x: ၂၀၀, SO_2: ၂၀ µg/m^3) <u>ထုတ်လွှတ်အခိုးအငွေ့အတွက်</u> - အမှိုက်များ ဟင်းလင်းပွင့် မီးပုံရှို့ခြင်းများကို ရှောင်ရှားခြင်း၊ - ဖုန်ထခြင်းအတွက် ရေဖြန်းခြင်း - ယာဉ်များ သွားလာမှု ကန့်သတ်ခြင်း - ကားများဖြင့် သယ်ယူပို့ဆောင်စဉ်တွင် မိုးကာဖြင့် အုပ်ထားခြင်း - လေပြင်းတိုက်ချိန်တွင် ကျောက်မီးသွေးနှင့် ထုံးများကို အတင်အချပြုလုပ်ခြင်းကို ရှောင်ရှားခြင်း - အထက်မှာပြောထားသော ပစ္စည်းများကို အတင်အချ ပြုလုပ်ရာတွင် အမြင့်ကို လျော့ချခြင်း - ဖုန်မှုန့်များကို စုပ်ယူနိုင်ရန်ကြီးမြန်သစ်ပင်များကို စိုက်ပျိုးခြင်း - မီးခိုးထုတ်လွှတ်မှုနည်းသော စက်ပစ္စည်းကိရိယာများကို ဂယ်ယူအသုံးပြုခြင်း - မီးခိုးထုတ်လွှတ်မှု လျော့ချရန်အတွက် ယာဉ်များ စက်ပစ္စည်း ကိရိယာများ ကို ပုံမှန် ထိန်းသိမ်းခြင်း၊ ပုံမှန်ပြုပြင်ခြင်း၊ ပုံမှန်ဆီထိုးခြင်း) - ဆာလဖာနည်းသော လောင်စာဆီကို အသုံးပြုခြင်း - လုံလောက်သော PPE များကို ထောက်ပံ့ခြင်း - ဖုန်မှုန့်နှင့်မီးခိုးများနှင့်ပတ်သပ်သော ဒေသခံများ၏ မကျေနပ်မှုများကို လိုက်နာဆောင်ရွက်ပေးခြင်း <u>မီးခိုးထွက်ရှိသည့်အရင်းအမြစ်များအတွက်</u> - အမှုန်အမွှားအတွက် လျှပ်စစ်စနစ်ဖြင့် အမှုန်ဖမ်းခြင်း (ESP ဖြင့်) - အမှုန်ဖမ်းအိတ်များ တပ်ဆင်ခြင်း (ဘွိုင်လာအနီးနားတွင် ၇ လုံး)

		- လုံးဂလောင်ကျွမ်းသော နည်းစနစ်ကို လုပ်နောင်ခြင်း (NO_x အတွက်) - အဆက်မပြတ် စောင့်ကြပ်ကြည့်ရှုခြင်းအတွက် Flue Gas Analayser တပ်ဆင်ခြင်း - CO_2 စုပ်ယူခြင်းအတွက် အပင်များစိမ်းလန်းစေရန် ဖန်တီးပေးခြင်း
၂	သက်ရောက်မှု- ဆူညံသံ နှင့် တုန်ခါမှု	- ပတ်ဂန်းကျင်ထိန်းသိမ်းရေး ဦးစီးဌာနမှချမှတ်ထားသော အမျိုးသား ပတ်ဂန်းကျင်ဆိုင်ရာ အရည်အသွေး ထုတ်လွှတ်မှု လမ်းညွှန်ချက်တန်ဖိုးများကို လိုက်နာခြင်း (၇၀ dBA နေ့၊ ည) - ဆူညံမှုနည်းသော စက်ကိရိယာနှင့် ယာဉ်ယန္တရားများကို ဂယ်ယူအသုံးပြုခြင်း - ယာဉ်ရွေ့လျားခြင်းများကို ကန့်သတ်ခြင်း - ဖြစ်နိုင်လျှင် အလုပ်လုပ်ချိန်တွင် ဆူညံမှု ကန့်သတ်ထားခြင်း - silencers ကို ဆူညံသံ ထုတ်လွှင့်မှု မြင့်သော စက်ပစ္စည်းများတွင် တပ်ဆင်ခြင်း၊ - ဆူညံသံကို စုပ်ယူစေရန် အစိမ်းရောင်အပင် တန်းများ ဖြစ်စေရန် ဖန်တီးပေးခြင်း (၁၃၇၂၅၇ ပင် စိုက်ပျိုးပြီး) - ဆူညံသံနှင့် ဖုန့်မှုန့်လျော့နည်းစေရန် ကြိတ်ခွဲစက်ကို မြေအောက်တွင် ဆောက်လုပ်ခြင်း - ဖြစ်နိုင်လျှင် စက်ကိရိယာများအားလုံးကို တစ်ချိန်တည်းတွင် အသုံးပြုမှုကို ရှောင်ရှားခြင်း - ယာဉ်အိုယာဉ်ဟောင်းများနှင့် ကိရိယာအဟောင်းများကို ဆူညံသံလျော့ချနိုင်ရန် ပြန်လည်ပြုပြင်ခြင်း - ယာဉ်ကိုပုံမှန်ပြုပြင်ထိန်းသိမ်းခြင်းသည် ဆူညံမှုကို ၅၀ ရာခိုင်နှုန်း လျော့ချနိုင်သဖြင့် ပုံမှန်ပြုပြင်ထိန်းသိမ်းရန် ညွှန်ကြားမှုထားရှိခြင်း - တုန်ခါမှုကို လျော့ချရန် ယာဉ်ယန္တရားများ၏ အောက်ခံ ဒီဇိုင်းကို ရွေးချယ်ခြင်း၊ - ယာဉ်ကြီးများ၏ အရှိန်ကို လျော့ချခြင်း၊ တုန်ခါမှုကို လျော့ချရန် လမ်းများကို မျက်နှာပြင် ညီညာစေခြင်း - လုပ်သားများကို PPE ထောက်ပံ့ပေးခြင်း (ဥပမာ ear muffs၊ ear plugs) ထောက်ပံ့ခြင်း၊ (အမှန်တစ်ကယ်တွင် မလိုအပ်ပေ-ကြိတ်ခွဲခြင်း လုပ်ငန်းစဉ်တွင် ခလုတ်ဖြင့် ထိန်းချုပ်ပါသည်)

၃	စွန့်ပစ်ပစ္စည်းများ (အစိုင်အခဲစွန့်နှင့် အရည်)	- ပတ်ဝန်းကျင်ထိန်းသိမ်းရေး ဦးစီးဌာနမှ ချမှတ်ထားသော အမျိုးသား ပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေး ထုတ်လွှတ်မှု လမ်းညွှန်ချက်တန်ဖိုးများကို လိုက်နာခြင်း - စွန့်ပစ်ပစ္စည်းများ (အစိုင်အခဲနှင့် အရည်) ကိုင်တွယ်ခြင်းကို အလုပ်သမားများအား သင်တန်းပေးထားခြင်း - လုံခြုံမှုနှင့် စနစ်ကျသော စွန့်ပစ်ခြင်းကို စီမံခန့်ခွဲခြင်း - ဟင်းလင်းပွင့်တွင် အစိုင်အခဲနှင့် အရည်စွန့်ပစ်ပစ္စည်းများကို စွန့်ပစ်ခြင်းအား အမြဲရှောင်ကြဉ်ခြင်း - ဟင်းလင်းပွင့်တွင် စွန့်ပစ်ပစ္စည်းများ မီးရှို့ခြင်းကို အမြဲရှောင်ကြဉ်ခြင်း၊ တက်နိုင်သမျှ စွန့်ပစ်ပစ္စည်းများ လျော့ချခြင်းအတွက် အစီအစဉ်ရေးဆွဲခြင်း <u>(က) စွန့်ပစ်ပစ္စည်း (စက်မှုဆိုင်ရာ)</u> - ပြာများကို စက်ဖြင့် (ရွှေ့လျားစက်) ပုံမှန် စုဆောင်းခြင်း (အပေါ်ပြာနှင့်အောက်ပြာ) နှင့် silo ထဲတွင်သိုလှောင်ခြင်း - အုတ်၊ ဘိလပ်မြေနှင့် တည်ဆောက်ရေးလုပ်ငန်းများတွင် ပြန်လည်အသုံးပြုခြင်း (ကုမ္ပဏီသည်ပြုလုပ်နေသည်) - စွန့်ပစ်ပစ္စည်းများကို အမျိုးအစား (၂) ခုခွဲခြားထားခြင်း (ပြန်လည်အသုံးပြုနိုင် နှင့် ပြန်လည်အသုံးမပြုနိုင်) - မီးရှို့ခြင်းကို ရှောင်ကြဉ်ခြင်း၊ သတ်မှတ်ထားသော အမှိုက်စွန့်ပစ်နေရာတွင်သာ စွန့်ပစ်ခြင်း၊ မဆင်မခြင်စွန့်ပစ်ခြင်းကို ရှောင်ကြဉ်ခြင်း <u>(ခ) အရည်စွန့်ပစ်ပစ္စည်း (စက်မှုဆိုင်ရာ)</u> - အသုံးပြုပြီးသော ရေအားလုံးကို ပြန်လည်အသုံးပြုခြင်း၊ ရေအေးပေးပြီး ရေပြန်လည်အသုံးပြုသောစနစ်တပ်ဆင်ခြင်း ဥပမာ-ရေအေးစင်၊ အခိုးကိုအရည်ဖြစ်စေသည့်ကိရိယာ အစရှိသော (ကုမ္ပဏီသည် ဤအရာကိုပြုလုပ်ပြီးပါသည်) - တိကျသေချာစွာ စွန့်ပစ်ရေကို သန့်စင်ခြင်းပြုလုပ်ခြင်း (အသုံးပြုပြီးသော ရေအများစုကို ပြန်လည်အသုံးပြုခြင်း) - စီမံကိန်းသည် ရေရရှိမှုအတွက် ပြဿနာမဖြစ်ခြင်း (ဤပြဿနာကို ရေပြန်လည်အသုံးပြုခြင်းဖြင့် ဖြေရှင်းပြီးသားဖြစ်ပါသည်) - ရေသုံးစွဲမှုကို ပုံမှန်သတ်မှတ်ခြင်း (ရေထိန်းသိမ်းခြင်းအတွက်) - လိုအပ်လျှင် မိုးရေစုဆောင်း၍ သုံးစွဲခြင်း

		<u>စွန့်ပစ်ရေ (လူသုံး)</u> - ရေသုံးစွဲမှုကို ချွေတာသုံးစွဲရန် အလုပ်သမားများကို ပညာပေးခြင်း - ရေကိုမစွန့်ပစ်မီ သန့်စင်ခြင်း၊ လူသုံးရေသည် ကြီးမားသော စွန့်ပစ်ရေစီးဂင်သည့် ကန်ထဲသို့ စီးဂင်ပါသည်။ - အိမ်သာမှ ထွက်ရှိသော စွန့်ပစ်ရေသည် မိလ္လာကန်ထဲသို့ စီးဂင်ခြင်း - လူသုံးစွန့်ပစ်ရေများကို မြေပေါ် သို့မဟုတ် ရေထဲသို့ ရှောင်ကြဉ်ခြင်း - ယာဉ်၊ ယန္တရားများကို သတ်မှတ်နေရာတွင်သာ ဆေးကြောခြင်း
၄	လုပ်ငန်းခွင်ကျန်းမာရေးနှင့် ဘေးအန္တရာယ် ကင်းရှင်းရေး ပြဿနာ	- ဘေးအန္တရာယ်ကင်းရှင်းသော လုပ်ငန်းခွင်နေရာဖန်တီးပေးခြင်း - အလုပ်သမားများကို ကောင်းမွန်သော အလုပ်လုပ်ခြင်းအလေ့အထနှင့် ကောင်းမွန်သော ဘေးအန္တရာယ်ကင်းရှင်းခြင်း အလေ့အထများကို လေ့ကျင့်သင်ကြားပေးခြင်း - စက်၊ ယန္တရားများကို ဘေးအန္တရာယ်ကင်းရှင်းစွာ ကိုင်တွယ်အလုပ်လုပ်ပုံများကို အလုပ်သမားများအား သင်တန်းပေးထားခြင်း ဥပမာ-ဘွိုင်လာနှင့်အခြားစက်ယန္တရားများ ရေရှည်လည်ပတ်ခြင်း - အရေးပေါ်တုန့်ပြန်မှုအတွက် အစီအမံကောင်းများရေးဆွဲထားရှိခြင်း - လုံလောက်သော ရှူးဉီးသူနာပြုနှင့် မီးဘေးအန္တရာယ် သင်တန်းများ ထောက်ပံ့ပေးခြင်း - လုံလောက်သော ရှူးဉီးသူနာပြုပုံများ ထောက်ပံ့ပေးခြင်း - လုံလောက်သော မီးဘေးအန္တရာယ် ကိရိယာများ ထောက်ပံ့ပေးခြင်း - မီးဘေးအန္တရာယ်ကိရိယာများကို ယိုစိမ့်ခြင်း၊ ပြင်ဆင်ခြင်းများကို ပုံမှန်စစ်ဆေးခြင်း - လောင်စာဆီနှင့် ဓါတုပစ္စည်းများကို ဘေးအန္တရာယ်ကင်းရှင်းစွာ သိုလှောင်ခြင်းနှင့် ကိုင်တွယ်ခြင်းများကို လုပ်ဆောင်ခြင်း

		- စီမံကိန်းအတွက် အာမခံထားရှိခြင်း၊ မီးဘေးအန္တရာယ် အာမခံထားရှိခြင်း၊ အလုပ်သမားများ အတွက် အာမခံထား ရှိခြင်း - မတော်တဆမီးလောင်ခြင်း၊ ပေါက်ကွဲခြင်းများကို ရှောင်ကြဉ်ခြင်း - မီးအတွက် အချက်ပေးစနစ်တပ်ဆင်ခြင်း (အပူနှင့်မီးခိုးငွေ့) - အလုပ်သမားများအားလုံးကို ဆေးစစ်ပေးခြင်း - အရေးပေါ်တုန့်ပြန်မှု၊ အရေးပေါ်ကယ်ဆယ်မှု များအတွက် အစမ်းလေ့ကျင်ထားခြင်း - မီးသတ်ဌာန၊ အရေးပေါ်ဝန်ဆောင်မှု၊ ဆေးရုံ၊ ရဲစခန်းအစရှိသော ဖုန်းနံပါတ်များကို လူတိုင်းမြင်သာစေရန် ထားရှိခြင်း
၆	ယာဉ်ကြောပိတ်ဆို့မှုအပေါ် သက်ရောက်မှု	- တက်နိုင်သလောက်လမ်းမတော်တဆမှု မရှိစေရန် လုပ်ဆောင်ခြင်း - ယာဉ်ကြောနှင့်ပတ်သပ်သော ဥပဒေများနှင့် စည်းမျဉ်းများကို လိုက်နာခြင်း - ရန်လိုသော မောင်းနှင်ခြင်းများကို မမောင်းနှင်ရန် ယာဉ်မောင်းများကို ပညာပေးခြင်း၊ မတော်တဆမှု ကာကွယ်ခြင်းသင်တန်းများကို သင်တန်းပေးခြင်း၊ ကျောင်းများနှင့် ကလေးရှိသော နေရာများတွင် အထူးဂရုစိုက် မောင်းနှင်ခြင်း - ယာဉ်သွားလာမှုများကို မှတ်တမ်းထားရှိခြင်း၊ ဖြစ်နိုင်လျှင် အချိန်ကြာမြင့်စွာမောင်းနှင်ခြင်းနှင့် အန္တရာယ်ရှိသောလမ်းများကို ရှောင်ကြဉ်ခြင်း၊ ယာဉ်ကြောပိတ်ဆို့မှုကို လျော့ချခြင်း - လမ်းမကြီးနှင့် ကျောင်းနီးသောလမ်းဆုံများတွင် အရှိန်လျော့ ဆိုင်းဘုတ်များကို တပ်ဆင်ထားခြင်း - သယ်ယူပို့ဆောင်စဉ်တွင် ပစ္စည်းများ လျှံကျခြင်းကို ရှောင်ကြဉ်၍ မိုးကာစအုပ်ခြင်း - မတော်တဆမှုဖြစ်ခြင်းလျော့ကျစေရန် ယာဉ်များကို ပုံမှန် ထိန်းသိမ်းပြုပြင်ခြင်း - ယာဉ်တစ်စီးစီတိုင်းအတွက် မှတ်စုစာအုပ်ထားရှိခြင်း၊ ယာဉ်အားလုံးကို အဂင်အထွက် မှတ်တမ်းထားရှိခြင်း

		- အဂင်တွင် ယာဉ်ကြောပိတ်ဆို့မှုမရှိစေရန်နှင့် စနစ်တကျ ကားပါကင်ထိုးခြင်းကို ဂန်ထမ်းတစ်ယောက်ကို ခိုင်းစေခြင်း - ယာဉ်အားလုံးအတွက် ကားပါကင်နေရာထားရှိခြင်း
၇	ဖြစ်နိုင်ခြေရှိသော လူမှုရေးပြဿနာများ	- ဒေသခံများ၏လူမှုစီးပွားရေး အပေါ် သက်ရောက်မှုကို လျော့နည်းစေရန် ပြုလုပ်ခြင်း - ဒေသခံများနှင့် ကောင်းမွန်သော ဆက်ဆံရေး ထားရှိခြင်း - ကုမ္ပဏီနှင့် ဒေသခံများအကြားဆက်ဆံရန် ဆက်ဆံရေးအရာရှိ တစ်ဦးခန့်ထားခြင်း - လူထုတွေ့ဆုံပွဲများကို အချိန်နှင့်အမျှ ကျင်းပပြုလုပ်ခြင်း - သက်ရောက်မှုများကို အကျိုးသက်ရောက်စွာ ဖြေရှင်းရန် ဆွေးနွေးခြင်းကော်မတီ ထားရှိခြင်း - ဒေသခံများ၏ ဓလေ့၊ ထုံးတမ်း၊ ရိုးရာများကို လိုက်နာရန် အလုပ်သမားများကို ပညာပေးခြင်း - အလုပ်သမားများကို လူမှုရေးမကောင်းသော အပြုအမူများကို မပြုလုပ်ရန် ပညာပေးခြင်း - ယောကျ်ားလေးနှင့် မိန်းကလေးဂန်ထမ်းအဆောင်များကို သီးသန့်ခွဲထားခြင်း (ကုမ္ပဏီသည် ကောင်းမွန်သော အစီအစဉ်တစ်ခုပြုလုပ်ထားပါသည်) - လုပ်ငန်းခွင်နှင့်သက်ဆိုင်ပြီး သင့်တော်သောသင်တန်းများကို ထောက်ပံ့ပေးခြင်း - အလုပ်သမားများကို စည်းကမ်းတကျလိုက်နာရန် ပညာပေးခြင်း - အလုပ်သမားများကို အလုပ်အရမ်းမခိုင်းရန်နှင့် လစာပေးမှုမနည်းစေရန် ညှိနှိုင်းခြင်း - အမှားလုပ်လျှင် အပြစ်ပေးခြင်း - အလုပ်လုပ်ချိန်အတွင်းတွင် အရက်သောက်ခြင်းနှင့် ဆေးသုံးခြင်းကို တားမြစ်ခြင်း - အလုပ်သမားများနှင့်ဒေသခံများအကြား ရန်မဖြစ်စေရန် တားမြစ်ထားခြင်း - ဒေသခံများကို ဌားရမ်းသုံးစွဲခြင်း၊ အစားအသောက်များကို ဒေသစျေးမှဂယ်ယူခြင်း - ဒေသရေအရင်းအမြစ်နှင့် အခြားရေအရင်းအမြစ်များအား သက်ရောက်မှုမဖြစ်စေရန် ရှောင်ကြဉ်ခြင်း - တက်နိုင်သလောက် အမျိုးသမီးများလည်း အလုပ်ခန့်ထားခြင်း - ကလေးအလုပ်သမားများ ပြဿနာမရှိစေရန် လုပ်ဆောင်ခြင်း

		- လုံလောက်သော အိမ်သာ၊ ရေချိုးခန်းအစရှိသည်တို့ ထောက်ပံ့ခြင်း - တက်နိုင်သလောက် CSR အစီအစဉ်များကို ဆောင်ရွက်ခြင်း
၇	ဖြစ်နိုင်ခြေရှိသော လုံခြုံရေးပြဿနာများ	- စီမံကိန်းနေရာ၏လုံခြုံရေးကို စီမံခန့်ခွဲခြင်း - စီမံကိန်းနေရာကို ခြံစည်းရိုးခတ်ခြင်း - ဂိတ်များတွင် အစောင့်များထားရှိခြင်း - ဒေသခံများနှင့် အလုပ်သမားများကို ရောရောနှောနှော မနေစေခြင်း - ခွင့်ပြုချက်မရပဲ အနီးနားရှိကျေးရွာများကို အလုပ်သမားများ ဝင်ရောက်ခြင်းကို တားမြစ်ခြင်း - ပစ္စည်းထားရှိသည့်နေရာများကို သော့များသေချာခတ်ခြင်း - အမှားလုပ်ဆောင်ခြင်းအတွက် ပြစ်ဒဏ်ချမှတ်ခြင်း - အလုပ်သမားများအားလုံးကို လွယ်ကူစွာ ခွဲခြားနိုင်ရန် ID ကဒ်များ ထောက်ပံ့ပေးထားခြင်း - အလုပ်သမားများအားလုံးကို တူညီယူနီဖောင်းများ ထောက်ပံ့ထားခြင်း
၈	မျက်စိပဒေသာဖြစ်သော ရှုခင်းရှုကွက်အပေါ် သက်ရောက်မှု	- တက်နိုင်သလောက် စီမံကိန်းလည်ပတ်ခြင်းအစီအစဉ် အတွက် မျက်စိပဒေသာဖြစ်စေရန် လုပ်ဆောင်ခြင်း - ပြန်လည်ရှင်သန်ခြင်းအတွက် အပင်များကို စိုက်ပျိုးခြင်း၊ အစိမ်းရောင် အတန်းများဖန်တီးခြင်း (ကုမ္ပဏီပြုလုပ်ပြီးဖြစ်ပါသည်) - အဆောက်အဦများကို မျက်စိပဒေသာဖြစ်စေသော အရောင်များ သုတ်ခြင်း - တက်နိုင်သလောက် အစိမ်းရောင်ဇရိယာ ဖန်တီးပေးခြင်း၊ စီမံကိန်းနေရာအပြင်ဘက်၌လည်း ဖန်တီးပေးခြင်း (ကုမ္ပဏီပြုလုပ်ပြီးဖြစ်ပါသည်) - လုံခြုံရေးအတွက် သာလျှင် သင့်တော်သော မီးအရောင် ထောက်ပံ့ပေးခြင်း၊ ညအချိန်တွင် များပြားသော အလင်းရောင်ထွန်းခြင်းကို ရှောင်ရှားခြင်း - ညအချိန်တွင် အင်းဆက်များကို အန္တရာယ်ဖြစ်စေသော မီးအဖြူရောင်အစား မီးအပါရောင် ကိုအသုံးပြုခြင်း

စီမံကိန်းပိတ်သိမ်းချိန်အတွင်းတွင်

စဉ်	သက်ရောက်မှု	ဖြေလျော့နိုင်မည့် နည်းလမ်းများ (အနှစ်ချုပ်)
၁	ဖြိုဖျက်ခြင်းနှင့် ရှင်းလင်းခြင်းကြောင့် သက်ရောက်မှု (စီမံကိန်းပိတ်သိမ်းချိန် သက်ရောက်မှု)	- အဆိုပါ ဖြိုဖျက်ခြင်းအလုပ်လုပ်ဆောင်ရန် ကန်ထရိုက်တာဌားရမ်းခြင်း - အသုံးမလိုသော ပစ္စည်းများကို ပြန်လည်ရောင်းချခြင်း - အသုံးမလိုသော သံချောင်းများကို သံအရည်ကျိုစက်ရုံသို့ ပို့ဆောင်ခြင်း - မြေပြင်နှင့်မြေဆီလွှာကို ပြန်လည်ထိန်းသိမ်းခြင်း - မြေပြင်တွင် အပင်မျိုးစုံပြန်လည်စိုက်ပျိုးခြင်း
၂	ဖြစ်နိုင်ခြေရှိသော ကြွင်းကျန်သက်ရောက်မှုများ	- ကြွင်းကျန်ပစ္စည်းများအားလုံးကို ရှင်းလင်းဖယ်ရှားခြင်း - လောင်စာဆီကြောင့် မြေဆီလွှပေါ် ညစ်ညမ်းခြင်းကို ဖယ်ရှားခြင်း - ညစ်ညမ်းမှု မကျန်စေရန် မြေဆီလွှာ ကို စမ်းသပ်ခြင်း - အနီးနားတွင် လေနှင့် ရေကို စမ်းသပ်ခြင်း - တက်နိုင်သလောက် မြေဆီလွှာကို သဘာဝအတိုင်းဖြစ်စေရန် ပြန်လည်ထိန်းသိမ်းခြင်း - ဇရိယာကို ပြန်လည်စိုက်ပျိုးခြင်းနှင့် ပြန်လည်ရှင်သန်ခြင်း
၃	ဖြစ်နိုင်ခြေရှိသော လေပတ်ဝန်းကျင်အပေါ် သက်ရောက်မှု	- ယာဉ်ယန္တရားများကို ပုံမှန်ထိန်းသိမ်း၊ ပြင်ဆင်၊ ဆီးထိုးခြင်း - ယာဉ်ရွေ့လျားမှုကို ကန့်သတ်ခြင်း - မည်သည့် အစိုင်အခဲစွန့်ပစ်ပစ္စည်းများကို ဟင်းလင်းပွင့်တွင် မီးရှို့ခြင်းအား ရှောင်ရှားခြင်း - လုံလောက်သော PPE များထောက်ပံ့ပေးခြင်း

ဆက်စပ်သက်ရောက်မှု

ပတ်ဝန်းကျင် ထိန်းသိမ်းရေးသမားဇ၏ အမြင်တွင် ဤစီမံကိန်းမှ သန့်စင်ထားသော စွန့်ပစ်ပစ္စည်း(အရည်၊ အခဲ)နှင့် စနစ်တကျ ပုံမှန်စွန့်ပစ်ခြင်းသည် ဆက်စပ်သက်ရောက်မှုများအနေဖြင့် မပြောပလောက်ပေ။ ကျန်းမာရေးအနေဖြင့် အလုပ်သမားများသည် နာရီကြာမြင့်စွာ မီးခိုး၊ ဖုန်နှင့် ဆူညံသံ ခံစားရလျှင် သက်ရောက်မှုရှိလာနိုင်သည်။ ကုမ္ပဏီသည် ဝန်ထမ်းများအား လုံလောက်သော PPE ထောက်ပံ့ပေးခြင်းနှင့် နှစ်စဉ်ဆေးစစ်ခြင်းများ ပြုလုပ်ပေးပါသည်။

(တည်ရှိပြီးသော ဘိလပ်မြေစက်ရုံနှင့် အဆိုပြုစက်ရုံ) နှစ်ခုပေါင်းခြင်းကြောင့် ဆက်စပ်သက်ရောက်မှုသည် လုံးဝဖြစ်လာနိုင်ပါသည်။

တစ်ပြိုင်တည်း ဆက်စပ်သက်ရောက်မှု (တန် ၁၀၀၀ ဘိလပ်မြေစက်ရုံ၊ တန် ၄၀၀၀ ဘိလပ်မြေစက်ရုံနှင့် ဤအဆိုပြုကျောက်မီးသွေးစက်ရုံတို့မှ)သည် အကျိုးသက်ရောက်စွာ ဖြေလျော့မှုမပြုလုပ်လျှင် အမှန်တကယ် ထင်ရှားနိုင်ပါသည်။ ဘိလပ်မြေစက်ရုံနှစ်ရုံမှ သက်ရောက်မှုသည် ပိုကြီးမားပါသည်။

ကုမ္ပဏီသည် စက်ရုံအားလုံးအတွက် ဖြေလျော့နိုင်မည့်နည်းလမ်းများကို တပ်ဆင်ထားပါသည်။ ဥပမာ- ESP (၆)လုံး၊ စက်ရုံ (၃)ရုံတွင် ဇကာအိတ်အလုံး(၁၀၀)။ (၎င်း ကျောက်မီးသွေးသုံး လျှပ်စစ်ဓါတ်အားပေးစက်ရုံတစ်ခုအတွက် စစ်ထုတ်အိတ် ၇ အိတ် နှင့် ESP တစ်ခု)

သဘာဝအရင်းအမြစ်ကို ထုတ်ယူသုံးစွဲခြင်းကြောင့် တိုးလာသော ဆက်စပ်သက်ရောက်မှုကိုလည်း အကျဉ်းချုပ်ဖော်ပြ ထားပါသည်။ အရင်းအမြစ်အမျိုးမျိုးမှ ထွက်ရှိလာသော ယာဉ်ကြောပိတ်ဆို့သော ဆက်စပ်သက်ရောက်မှုကိုလည်း အကျဉ်းချုပ်ရှင်းပြ ထားပါသည်။

ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ် (EMP)

ဤအခန်းကဏ္ဍသည် အစီရင်ခံစာ၏ မရှိမဖြစ်အရေးပါသော အကြောင်းအရာဖြစ်၍ အတော်အသင့် အသေးစိတ်ဖော်ပြ ထားပါသည်။ ဤအခန်းသည် အမျိုးမျိုးသော ခေါင်းစဉ်များဖြစ်သော အကျဉ်းချုပ်အစီရင်ခံစာ၊ စီမံကိန်း အကြောင်းအရာအကျဉ်းချုပ်၊ ကျန်းမာရေးမူဝါဒများနှင့် ကတိကဝတ်၊ တရားရေးရာလိုအပ်ချက်နှင့် ဖွဲ့စည်းပုံ၊ သက်ရောက်မှုအနှစ်ချုပ်နှင့် ဖြေလျော့နိုင်မည့်နည်းလမ်းများ၊ (EMP)အတွက် ဘတ်ဂျက်၊ အမျိုးအစားခွဲခြားထားသော သက်ရောက်မှုတစ်ခုစီအတွက် စီမံခန့်ခွဲမှုနှင့် စောင့်ကြပ်ကြည့်ရှုလေ့လာခြင်း အစီအစဉ်ခွဲများကို အသေးစိတ်ပြင်ဆင်တင်ပြ ထားပါသည်။

ဤအရာသည် ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်(EMP) သီးသန့်အစီရင်ခံစာ မဟုတ်သောကြောင့် စီမံကိန်းအသေးစိတ်အချက်အလက်နှင့် သက်ရောက်မှုများ အနှစ်ချုပ်ကို အလွန်အကျဉ်းချုပ်(ECD ပုံစံအရ)မျှသာ ရှင်းပြထားပါသည်။ ကျန်ရှိသောအခန်းများကို ဇယားဖြင့် အသေးစိတ်ဖော်ပြ ထားပါသည်။ စီမံခန့်ခွဲမှုနှင့် စောင့်ကြပ်ကြည့်ရှုလေ့လာခြင်းအစီအစဉ်ခွဲ (MMSP) အထူးသဖြင့် အစီအစဉ်ခွဲတစ်ခုစီအတွက် ဖြေလျော့နိုင်မည့် နည်းလမ်းများကို အလေးပေးဖော်ပြထားပါသည်။

ဘတ်ဂျက်၏ ၀.၅ % ကို ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှု အစီအစဉ် (EMP)၊ စောင့်ကြပ်ကြည့်ရှုခြင်း အစီအစဉ် (MP) ကို ထိထိရောက်ရောက် လုပ်ဆောင်ရန် အတွက် EMP ရန်ပုံငွေ အဖြစ်ထားရှိပါမည်။ (USD ၅၀,၀၀၀ ကို EMP ရန်ပုံငွေ အတွက် ထားရှိပါမည်။

ထို့ကြောင့် ကုမ္ပဏီသည် EMP ရန်ပုံငွေကို အစီအစဉ်၄ ခု အတွက် အောက်ပါအတိုင်း ထားရှိသည်။

- ရန်ပုံငွေ ၏ ၃၅ % (USD$ ၁၇,၅၀၀) ကို ၊ စောင့်ကြပ်ကြည့်ရှုခြင်း အစီအစဉ် (MP) အကောင်အထည်ဖော်ရန် အတွက် ထားရှိမည်။ (ထိုအရာသည် အများစုမှာ ပညာရှင်များကို ငှားရမ်း ခြင်း အတွက် ဖြစ်သည်။)

- ရန်ပုံငွေ ၏ ၁၀ % (USD$ ၅,၀၀၀) ကို ၊ အစီရင်ခံစာ တင်ပြခြင်း လုပ်ငန်းများ အတွက် ထားရှိမည်။ (ထိုအရာတွင် စာရေးကိရိယာများ ဝယ်ယူခြင်း ပါဝင်ပါသည်။)
- ရန်ပုံငွေ ၏ ၂၀ % (USD$ ၁၀,၀၀၀) ကို ၊ စွမ်းရည်မြှင့်တင်ခြင်းနှင့် သင်တန်းပေးခြင်း များ အတွက် ထားရှိပါမည်။ (ထိုအရာများတွင် သင်တန်းဆရာများ ငှားရမ်း ခြင်း နှင့် သင်ကြားခြင်း သို့မဟုတ် သင်ကြားရေး ဆိုင်ရာ ပစ္စည်းများ ဝယ်ယူခြင်း အတွက် ဖြစ်သည်။)
- ရန်ပုံငွေ ၏ ၃၀ % (USD$ ၁၅,၀၀၀) ကို ကို အရေးပေါ်အစီအစဉ်များအတွက် အသုံးပြုရန် ဖယ်ထားပါမည်။ (ထိုအရာများတွင် သင်တန်းဆရာများ ငှားရမ်း ခြင်း ပါဝင်ပါသည်။)
- ရန်ပုံငွေ ၏ ၅ % (USD$ ၂,၅၀၀) ကို အထွေထွေ ကုန်ကျစရိတ်အတွက် ထားရှိပါမည်။

Electrostatic Precipitator၊ စစ်ထုတ်အိတ်နှင့် အခြား သဘာဝ ပတ်ဝန်းကျင် နှင့် လိုက်လျောညီထွေ ရှိသော စက်ပစ္စည်း အစရှိသည် တို့ ဝယ်ယူခြင်း ကဲ့သို့သော လျော့ပါးစေရေး နည်းလမ်းများ အတွက် ကုန်ကျစရိတ်ကို စီမံကိန်း ၏ အဓိက ဘတ်ဂျက်မှ ပထမ အဆင့် ကတည်းက ကျခံပါမည်။

မှတ်ချက်: EMP အဖွဲ့ဝင်များနှင့် လုပ်သားများ လုပ်ဆောင်မည့် လျော့ပါးစေရေး နည်းလမ်းများကို ၎င်း တို့ကိုယ်တိုင် ကြီးကြပ်သောကြောင့် လျော့ပါးစေရေး နည်းလမ်းများ လုပ်ဆောင်ခြင်းမှာ အခမဲ့ ဖြစ်ပါသည်။ လုပ်သားအားလုံးမှာ ကောင်းစွာ ပေးချေထားသော ဝန်ထမ်းများ နှင့် လုပ်သားများ ဖြစ်ပြီး ၎င်းတို့ကို ငှားရမ်းရန် မလိုပါ။

စောင့်ကြပ်ကြည့်ရှုလေ့လာခြင်းအစီအစဉ်(MP)သည် ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်(EMP)၏ ပြည့်စုံသွားစေသော အပိုင်းဖြစ်သည်။ စောင့်ကြပ်ကြည့်ရှုလေ့လာရန် ပါရာမီတာများနှင့် အကြိမ်ရေများကို ဇယားဖြင့် ရေးဆွဲထားပါသည်။ စောင့်ကြပ်ကြည့်ရှုလေ့လာခြင်းအစီအစဉ်တွင် အကျိုးသက်ရောက်သော ဖြေလျော့နိုင်မည့်နည်းလမ်းများ ပါဝင်ပါသည်။

EIA ပုံစံ ဖြင့် ရေးသားထားသော အလုံးစုံ နှင့် ပြည့်စုံသော စောင့်ကြပ်ကြည့်ရှုရေး အစီအစဉ်ကို အခန်း-၆ အဆုံးတွင် ပြသထားပါသည်။ တိကျသော စောင့်ကြပ်ကြည့်ရှုရေး အစီအစဉ်ကို (အခန်း-၈) အောက်တွင် ဇယားပုံစံဖြင့် ဖော်ပြထားပါသည်။ (EMP အဖွဲ့ ခေါင်းဆောင်၊ EMP အဖွဲ့ဝင် နှင့် အထူးသင်ကြားထားသော ဝန်ထမ်းများသည် အစီအစဉ်များကို လုပ်ဆောင်ရန် တာဝန်ရှိပါသည်။ ပညာရှင်များကို လေ၊ ဆူညံသံ အဆင့် နှင့် လေ နှင့် မြေ အရည်အသွေး တိုင်းတာရန် အတွက် အခါအားလျော်စွာ ငှားရမ်းပါမည်။)

စောင့်ကြပ်ကြည့်ရှုရေး အစီအစဉ်

ပုံမှန် စောင့်ကြပ်ကြည့်ရှုခြင်းကို တည်ဆောက်ခြင်း၊ စီမံကိန်းလည်ပတ်ခြင်း နှင့် စီမံကိန်းပိတ်သိမ်းခြင်း ကာလများတွင် လုပ်ဆောင်ပြီး အစီရင်ခံစာကို ECD ကို ပုံမှန် (ခြောက်လ တစ်ကြိမ် အတိုချုပ် အစီရင်ခံစာ) တင်ပြပါမည်။

တည်ဆောက်ခြင်းကာလ အတွင်း စောင့်ကြပ်ကြည့်ရှုခြင်း အစီအစဉ် အကျဉ်းချုပ်

စဉ်	အစိတ်အပိုင်း/ ပြဿနာများ	စောင့်ကြပ်ကြည့်ရှု မည့် ပါရာမီတာများ	NEQEG လမ်းညွှန်ချက် တန်ဖိုးများ	စောင့်ကြပ်ကြည့်ရှုမည့် နေရာ/ လုပ်ကွက်	အကြိမ်ရေ	တာဝန်ရှိသူ	ခန့်မှန်းကုန်ကျစရိတ် (တစ်ကြိမ်အတွက်)	မှတ်ချက်
၁	လေ အရည်အသွေး	NO_2 O_3 PM_{10} $PM_{2.5}$ SO_2 VOC	၂၀၀ µg/m^3 ၁၀၀ µg/m^3 ၅၀ µg/m^3 ၂၅ µg/m^3 ၂၀ µg/m^3 ၄၀၀ µg/m^3	ဆောက်လုပ်ရေး နေရာ ကိုဩဒိနိတ်: မြောက်လတ္တီတွဒ် ၂၂ ဒီဂရီ ၂၁ မိနစ် ၃၂ စက္ကန့်၊ အရှေ့လတ္တီတွဒ် ၉၆ ဒီဂရီ ၄၂ မိနစ် ၁၀ စက္ကန့်	ခြောက်လ တစ်ကြိမ်	EMP အဖွဲ့ဝင်များ နှင့် ဌာနရမ်းထားသော ပညာရှင်များ	ကျပ် ၁,၇၀၀,၀၀၀	နည်းပညာရှင်များ ဌာနရမ်းရမည်
				လောက်ဖန်းကျေးရွာ ကိုဩဒိနိတ်: မြောက်လတ္တီတွဒ် ၂၂ ဒီဂရီ ၂၁ မိနစ် ၅၈.၂၉ စက္ကန့်၊ အရှေ့လတ္တီတွဒ် ၉၆ ဒီဂရီ ၄၂ မိနစ် ၄၈.၁၇ စက္ကန့်	ခြောက်လ တစ်ကြိမ်	EMP အဖွဲ့ဝင်များ နှင့် ဌာနရမ်းထားသော ပညာရှင်များ	ကျပ် ၁,၇၀၀,၀၀၀	နည်းပညာရှင်များ ဌာနရမ်းရမည်
				ခဲဆန်ကျေးရွာ ကိုဩဒိနိတ်: မြောက်လတ္တီတွဒ် ၂၂ ဒီဂရီ ၂၀ မိနစ် ၅၀.၆ စက္ကန့်၊ အရှေ့လတ္တီတွဒ် ၉၆ ဒီဂရီ ၄၀ မိနစ် ၃၁.၇ စက္ကန့်	ခြောက်လ တစ်ကြိမ်	EMP အဖွဲ့ဝင်များ နှင့် ဌာနရမ်းထားသော ပညာရှင်များ	ကျပ် ၁,၇၀၀,၀၀၀	နည်းပညာရှင်များ ဌာနရမ်းရမည်

				လယ်ကြီးတော မြောက်လတ္တီတွဒ် ၂၂ ဒီဂရီ ၂၀ မိနစ် ၁၃.၈၃ စက္ကန့်၊ အရှေ့လတ္တီတွဒ် ၉၆ ဒီဂရီ ၄၃ မိနစ် ၃၁.၂၉ စက္ကန့်	ခြောက်လတစ်ကြိမ်	EMP အဖွဲ့ဝင်များနှင့် ဌာနရမ်းထားသောပညာရှင်များ	ကျပ် ၁,၇၀၀,၀၀၀	နည်းပညာရှင် များဌာနရမ်းရမည်
၂	ရေအရည်အသွေး	ရေပေါ်အရည်အသွေး BOD COD pH Total nitrogen Total phosphorus Dissolved solid Oil and grease Total coliform	 ၅၀ mg/l ၁၂၅ mg/l ၆-၉ STU ၁၀ mg/l ၂ mg/l ၅၀ mg/l ၁၀ mg/l ၄၀၀ mg/l	စမ်းချောင်း ကိုဩဒိနိတ်: မြောက်လတ္တီတွဒ် ၂၂ ဒီဂရီ ၂၂ မိနစ် ၂၉.၉ စက္ကန့်၊ အရှေ့လတ္တီတွဒ် ၉၆ ဒီဂရီ ၄၂ မိနစ် ၀၇.၇ စက္ကန့် လောက်ဖန်း ကိုဩဒိနိတ်: မြောက်လတ္တီတွဒ် ၂၂ ဒီဂရီ ၂၂ မိနစ် ၂၉.၉ စက္ကန့်၊ အရှေ့လတ္တီတွဒ် ၉၆ ဒီဂရီ ၄၂ မိနစ် ၄၅.၅ စက္ကန့် ခဲဆန်ကျေးရွာတွင် ကိုဩဒိနိတ်: မြောက်လတ္တီတွဒ် ၂၂ ဒီဂရီ ၂၁ မိနစ် ၀၈.၇ စက္ကန့်၊ အရှေ့လတ္တီတွဒ် ၉၆ ဒီဂရီ ၄၀ မိနစ် ၂၄.၀ စက္ကန့်	ခြောက်လတစ်ကြိမ် ခြောက်လတစ်ကြိမ် ခြောက်လတစ်ကြိမ်	EMP အဖွဲ့ဝင်များနှင့် ဌာနရမ်းထားသောပညာရှင်များ EMP အဖွဲ့ဝင်များနှင့် ဌာနရမ်းထားသောပညာရှင်များ EMP အဖွဲ့ဝင်များနှင့် ဌာနရမ်းထားသောပညာရှင်များ	ကျပ် ၈၀,၀၀၀ ကျပ် ၈၀,၀၀၀ ကျပ် ၈၀,၀၀၀	နည်းပညာရှင်များဌာနရမ်းရမည် နည်းပညာရှင်များဌာနရမ်းရမည် နည်းပညာရှင်များဌာနရမ်းရမည်

၃	ဆူညံသံ အဆင့်	dB(A) day and night	၇၀ dB(A)	ဆောက်လုပ်ရေး နေရာ ကိုဩဒိနိတ်: မြောက်လတ္တီတွဒ် ၂၂ ဒီဂရီ ၂၁ မိနစ် ၃၂ စက္ကန့်၊ အရှေ့လတ္တီတွဒ် ၉၆ ဒီဂရီ ၄၂ မိနစ် ၁၀ စက္ကန့်	၃ လ တစ်ကြိမ် သို့မဟုတ် ခြောက်လ တစ်ကြိမ်	EMP အဖွဲ့ဝင်များ နှင့် ဌားရမ်းထားသော ပညာရှင်များ	ကျပ် ၇၀,၀၀၀	နည်းပညာရှင်များ ဌားရမ်းရမည်
				လောက်ဖန်းကျေးရွာ ကိုဩဒိနိတ်: မြောက်လတ္တီတွဒ် ၂၂ ဒီဂရီ ၂၁ မိနစ် ၅၈.၂၉ စက္ကန့်၊ အရှေ့လတ္တီတွဒ် ၉၆ ဒီဂရီ ၄၂ မိနစ် ၄၈.၁၇ စက္ကန့်	၃ လ တစ်ကြိမ် သို့မဟုတ် ခြောက်လ တစ်ကြိမ်	EMP အဖွဲ့ဝင်များ နှင့် ဌားရမ်းထားသော ပညာရှင်များ	ကျပ် ၇၀,၀၀၀	နည်းပညာရှင်များ ဌားရမ်းရမည်
				ခဲဆန်ကျေးရွာ ကိုဩဒိနိတ်: မြောက်လတ္တီတွဒ် ၂၂ ဒီဂရီ ၂၀ မိနစ် ၅၀.၆ စက္ကန့်၊ အရှေ့လတ္တီတွဒ် ၉၆ ဒီဂရီ ၄၀ မိနစ် ၃၁.၇ စက္ကန့်	၃ လ တစ်ကြိမ် သို့မဟုတ် ခြောက်လ တစ်ကြိမ်	EMP အဖွဲ့ဝင်များ နှင့် ဌားရမ်းထားသော ပညာရှင်များ	ကျပ် ၇၀,၀၀၀	နည်းပညာရှင်များ ဌားရမ်းရမည်
				လယ်ကြီးတော မြောက်လတ္တီတွဒ် ၂၂ ဒီဂရီ ၂၀ မိနစ် ၁၃.၈၃ စက္ကန့်၊ အရှေ့လတ္တီတွဒ် ၉၆ ဒီဂရီ ၄၃ မိနစ် ၃၁.၂၉ စက္ကန့်	၃ လ တစ်ကြိမ် သို့မဟုတ် ခြောက်လ တစ်ကြိမ်	EMP အဖွဲ့ဝင်များ နှင့် ဌားရမ်းထားသော ပညာရှင်များ	ကျပ် ၇၀,၀၀၀	နည်းပညာရှင်များ ဌားရမ်းရမည်

၄	အစိုင်အခဲ စွန့်ပစ်ပစ္စည်းများ	- ဆောက်လုပ်ရေး စွန့်ပစ်ပစ္စည်းများ နှင့် အမှိုက်များကို စောင့်ကြပ်ကြည့်ရှု ခြင်း - အမှိုက်များ/ အမှိုက်များ ထွက်ရှိခြင်း နှင့် စွန့်ပစ်ခြင်းကို စောင့်ကြပ်ကြည့်ရှု ခြင်း	- -	ဆောက်လုပ်ရေး နေရာ ကိုဩဒိနိတ်: မြောက်လတ္တီတွဒ် ၂၂ ဒီဂရီ ၂၁ မိနစ် ၃၂ စက္ကန့်၊ အရှေ့လတ္တီတွဒ် ၉၆ ဒီဂရီ ၄၂ မိနစ် ၁၀ စက္ကန့်	အပတ်စဉ်	EMP အဖွဲ့ဝင်	အခမဲ့	-
၅	မြေ	- မြေညစ်ညမ်းမှုကို စောင့်ကြပ်ကြည့်ရှု ခြင်း၊ မြေအရည်အသွေး ကို စစ်ဆေးခြင်း	-	စွန့်ပစ်ကန် ကိုဩဒိနိတ်: မြောက်လတ္တီတွဒ် ၂၂ ဒီဂရီ ၂၁ မိနစ် ၄၇.၆ စက္ကန့်၊ အရှေ့လတ္တီတွဒ် ၉၆ ဒီဂရီ ၄၂ မိနစ် ၄၀.၆ စက္ကန့်	ခြောက်လ တစ်ကြိမ်	EMP အဖွဲ့ဝင်များ နှင့် ဌာနရမ်းထားသော ပညာရှင်များ	ကျပ် ၁၄၀,၀၀၀	နည်းပညာရှင်များ ဌာနရမ်းရမည်
				လောက်ဖန်းကျေးရွာ ကိုဩဒိနိတ်: မြောက်လတ္တီတွဒ် ၂၂ ဒီဂရီ ၂၂ မိနစ် ၀၈.၂ စက္ကန့်၊ အရှေ့လတ္တီတွဒ် ၉၆ ဒီဂရီ ၄၂ မိနစ် ၃၂.၃ စက္ကန့်	ခြောက်လ တစ်ကြိမ်	EMP အဖွဲ့ဝင်များ နှင့် ဌာနရမ်းထားသော ပညာရှင်များ	ကျပ် ၁၄၀,၀၀၀	နည်းပညာရှင်များ ဌာနရမ်းရမည်
				ခဲဆန်ကျးရွာ ကိုဩဒိနိတ်: မြောက်လတ္တီတွဒ် ၂၂ ဒီဂရီ ၂၁ မိနစ် ၀၁.၀ စက္ကန့်၊	ခြောက်လ တစ်ကြိမ်	EMP အဖွဲ့ဝင်များ နှင့် ဌာနရမ်းထားသော ပညာရှင်များ	ကျပ် ၁၄၀,၀၀၀	နည်းပညာရှင်များ ဌာနရမ်းရမည်

		- မြေတိုက်စားခံရခြင်း ရှိပါက စောင့်ကြပ်ကြည့်ရှုခြင်း (မိုးရာသီ)	-	အရှေ့လတ္တီတွဒ် ၉၆ ဒီဂရီ ၄၀ မိနစ် ၄၅.၉ စက္ကန့် လယ်ကြီးတော ကိုဩဒိနိတ်: မြောက်လတ္တီတွဒ် ၂၂ ဒီဂရီ ၂၀ မိနစ် ၅၀.၈ စက္ကန့်၊ အရှေ့လတ္တီတွဒ် ၉၆ ဒီဂရီ ၄၃ မိနစ် ၂၀.၁ စက္ကန့်	ခြောက်လတစ်ကြိမ် လစဉ်	EMP အဖွဲ့ဝင်များနှင့် ဌာနရမ်းထားသော ပညာရှင်များ EMP အဖွဲ့ဝင်များ	ကျပ် ၁၄၀,၀၀၀ အခမဲ့	နည်းပညာရှင်များ ဌာနရမ်းရမည် -
၆	လုပ်ငန်းခွင် ကျန်းမာရေး နှင့် ဘေးအန္တရာယ် ကင်းရှင်းရေး	- OHS အစီအမံများ ကို စောင့်ကြပ်ကြည့်ရှု ခြင်း - ရှေးဦးသူနာပြုပစ္စည်းများ ထောက်ပံ့ပေးထားခြင်း နှင့် ဆေးနှင့် ဆေးဝါး ပစ္စည်းများ သိုလှောင်ထားရှိမှုကို စောင့်ကြပ်ကြည့်ရှု ခြင်း - အရေးပေါ် ပြင်ဆင်ခြင်း နှင့် တုန့်ပြန်မှု အစီအစဉ် + လုပ်ဆောင်မှုများကို စောင့်ကြပ်ကြည့်ရှု ခြင်း	- - -	ဆောက်လုပ်ရေး နေရာ ကိုဩဒိနိတ်: မြောက်လတ္တီတွဒ် ၂၂ ဒီဂရီ ၂၁ မိနစ် ၃၄.၀၀ စက္ကန့်၊ အရှေ့လတ္တီတွဒ် ၉၆ ဒီဂရီ ၄၂ မိနစ် ၈.၅၇ စက္ကန့်	လစဉ်	EMP အဖွဲ့ဝင်များ	အခမဲ့	-

၇	လူမှုရေး ပြဿနာများ၊ လူမှုရေး ကျင့်ဝတ်ဆိုးများ	- လူမှုရေး ပြဿနာများ/ လူမှုရေး ကျင့်ဝတ်ဆိုးများ ကို စစ်ဆေးခြင်း - လုပ်သားများ၏ အကျင့် စာရိတ္တများကို စောင့်ကြပ်ကြည့်ရှု ခြင်း - စည်းကမ်းမဲ့ လုပ်ဆောင်ချက် များ ကို စစ်ဆေးခြင်း	- - -	ဆောက်လုပ်ရေး နေရာ ကိုဩဒိနိတ်: မြောက်လတ္တီတွဒ် ၂၂ ဒီဂရီ ၂၁ မိနစ် ၃၁.၄၈ စက္ကန့်၊ အရှေ့လတ္တီတွဒ် ၉၆ ဒီဂရီ ၄၂ မိနစ် ၉.၃၂ စက္ကန့်	အပတ်စဉ် နှင့် လစဉ်	EMP အဖွဲ့ဝင်များ	အခမဲ့	-

စီမံကိန်းလည်ပတ်ခြင်းကာလ အတွင်း စောင့်ကြပ်ကြည့်ရှုခြင်း အစီအစဉ် အကျဉ်းချုပ်

စဉ်	အစိတ်အပိုင်း/ ပြဿနာများ	စောင့်ကြပ်ကြည့်ရှုမည့် ပါရာမီတာများ	NEQEG လမ်းညွှန်ချက် တန်ဖိုးများ	စောင့်ကြပ်ကြည့်ရှုမည့် နေရာ/ လုပ်ကွက်	အကြိမ်ရေ	တာဝန်ရှိသူ	ခန့်မှန်းကုန်ကျစရိတ် (တစ်ကြိမ်အတွက်)	မှတ်ချက်
၁	လေ အရည်အသွေး နှင့် ထုတ်လွှတ်မှု များ	လေအရည်အသွေး NO_2 O_3 PM_{10} $PM_{2.5}$ SO_2 VOC	၂၀၀ µg/m^3 ၁၀၀ µg/m^3 ၅၀ µg/m^3 ၂၅ µg/m^3 ၂၀ µg/m^3 ၄၀၀ µg/m^3	ကျောက်မီးသွေးသုံး လျှပ်စစ်ဓါတ်အားပေး စက်ရုံ ကိုဩဒိနိတ်: မြောက်လတ္တီတွဒ် ၂၂ ဒီဂရီ ၂၁ မိနစ် ၃၂ စက္ကန့်၊ အရှေ့လတ္တီတွဒ် ၉၆ ဒီဂရီ ၄၂ မိနစ် ၁၀ စက္ကန့် လောက်ဖန်းကျေးရွာ ကိုဩဒိနိတ်: မြောက်လတ္တီတွဒ် ၂၂ ဒီဂရီ ၂၁ မိနစ် ၅၈.၂၉ စက္ကန့်၊ အရှေ့လတ္တီတွဒ် ၉၆ ဒီဂရီ ၄၂ မိနစ် ၄၈.၁၇ စက္ကန့်	ခြောက်လ တစ်ကြိမ် ခြောက်လ တစ်ကြိမ်	EMP အဖွဲ့ဝင်များ နှင့် ငှားရမ်းထား သော ပညာရှင်များ EMP အဖွဲ့ဝင်များ နှင့် ငှားရမ်းထား သော ပညာရှင်များ	ကျပ် ၁,၇၀၀,၀၀၀ ကျပ် ၁,၇၀၀,၀၀၀	နည်းပညာရှင် များ ငှားရမ်းရမည် နည်းပညာရှင် များ ငှားရမ်းရမည်

				ခဲဆန်ကျေးရွာ ကိုဩဒိနိတ်: မြောက်လတ္တီတွဒ် ၂၂ ဒီဂရီ ၂၀ မိနစ် ၅၀.၆ စက္ကန့်၊ အရှေ့လတ္တီတွဒ် ၉၆ ဒီဂရီ ၄၀ မိနစ် ၃၁.၇ စက္ကန့်	ခြောက်လတစ်ကြိမ်	EMP အဖွဲ့ဝင်များနှင့် ပူးရမ်းထားသော ပညာရှင်များ	ကျပ် ၁,၇၀၀,၀၀၀	နည်းပညာရှင် များပူးရမ်းရမည်
				လယ်ကြီးတောာ မြောက်လတ္တီတွဒ် ၂၂ ဒီဂရီ ၂၀ မိနစ် ၁၃.၈၃ စက္ကန့်၊ အရှေ့လတ္တီတွဒ် ၉၆ ဒီဂရီ ၄၃ မိနစ် ၃၁.၂၉ စက္ကန့်	ခြောက်လတစ်ကြိမ်	EMP အဖွဲ့ဝင်များနှင့် ပူးရမ်းထားသော ပညာရှင်များ	ကျပ် ၁,၇၀၀,၀၀၀	နည်းပညာရှင် များပူးရမ်းရမည်
		ထုတ်လွှတ်မှုများ (ကျောက်မီးသွေး လောင်စာ / ဘွိုင်လာ) NO_2 PM_{10} SO_2	၅၁၀ mg/Nm^3 ၅၀ mg/Nm^3 ၉၀၀ mg/Nm^3	တပ်ဆင်ထားသော စဉ်ဆက်မပြတ် flue gas ခွဲခြမ်းစိတ်ဖြာသည့် စက်ကို စစ်ဆေးခြင်း နှင့် စောင့်ကြပ်ကြည့်ရှု ခြင်း	အပတ်စဉ်/ လစဉ်	EMP အဖွဲ့ဝင်များ	အခမဲ့	-

၂	ရေအရည် အသွေး / စွန့်ထုတ်မှုများ	ရေအရည် အသွေး BOD COD pH Total nitrogen Total phosphorus Dissolved solid Oil and grease Total coliform	50 mg/l 125 mg/l 6-9 STU 10 mg/l 2 mg/l 50 mg/l 10 mg/l 400 mg/l	စမ်းချောင်း ကိုဩဒိနိတ်: မြောက်လတ္တီတွဒ် ၂၂ ဒီဂရီ ၂၂ မိနစ် ၂၉.၉ စက္ကန့်၊ အရှေ့လတ္တီတွဒ် ၉၆ ဒီဂရီ ၄၂ မိနစ် ၀၇.၇ စက္ကန့် လောက်ဖန်း ကိုဩဒိနိတ်: မြောက်လတ္တီတွဒ် ၂၂ ဒီဂရီ ၂၂ မိနစ် ၂၉.၉ စက္ကန့်၊ အရှေ့လတ္တီတွဒ် ၉၆ ဒီဂရီ ၄၂ မိနစ် ၄၅.၅ စက္ကန့် ခဲဆန်ကျေးရွာတွင် ကိုဩဒိနိတ်: မြောက်လတ္တီတွဒ် ၂၂ ဒီဂရီ ၂၁ မိနစ် ၀၈.၇ စက္ကန့်၊ အရှေ့လတ္တီတွဒ် ၉၆ ဒီဂရီ ၄၀ မိနစ် ၂၄.၀ စက္ကန့်	ခြောက်လတစ်ကြိမ် ခြောက်လတစ်ကြိမ် ခြောက်လတစ်ကြိမ်	EMP အဖွဲ့ဝင်များနှင့် ပူးရမ်းထားသော ပညာရှင်များ EMP အဖွဲ့ဝင်များနှင့် ပူးရမ်းထားသော ပညာရှင်များ EMP အဖွဲ့ဝင်များနှင့် ပူးရမ်းထားသော ပညာရှင်များ	ကျပ် ၈၀,၀၀၀ ကျပ် ၈၀,၀၀၀ ကျပ် ၈၀,၀၀၀	နည်းပညာရှင် များ ပူးရမ်းရမည်

		<u>Effluent</u> Arsenic Cadmium Chromium (total) Copper Iron Lead Mercury Oil and grease P^H Temperature increase Total residual chlorine Total suspended solids Zinc	0.5 mg/l 0.1 mg/l 0.5 mg/l 0.5 mg/l 1 mg/l 0.5 mg/l 0.005 mg/l 10 mg/l 6-9 SU <3ºC 0.2 mg/l 50 mg/l 1 mg/l	ဘွိုင်လာစွန့်ထုတ်နေရာကိုဩဇိန်တ်: မြောက်လတ္တီတွဒ် ၂၂ ဒီဂရီ ၂၁ မိနစ် ၃၂.၉ စက္ကန့်၊ အရှေ့လတ္တီတွဒ် ၉၆ ဒီဂရီ ၄၂ မိနစ် ၁၇.၆ စက္ကန့်	ခြောက်လတစ်ကြိမ်	EMP အဖွဲ့ဝင်များနှင့် ဌာနဆိုင်ရာ ပညာရှင်များ	ကျပ် ၂၀၀,၀၀၀	နည်းပညာရှင် များ ဌာနဆိုင်ရာများ
				ရေအေးပေးကန်ကိုဩဇိန်တ်: မြောက်လတ္တီတွဒ် ၂၂ ဒီဂရီ ၂၁ မိနစ် ၃၂.၉ စက္ကန့်၊ အရှေ့လတ္တီတွဒ် ၉၆ ဒီဂရီ ၄၂ မိနစ် ၁၆.၄ စက္ကန့်	ခြောက်လတစ်ကြိမ်	EMP အဖွဲ့ဝင်များနှင့် ဌာနဆိုင်ရာ ပညာရှင်များ	ကျပ် ၂၀၀,၀၀၀	နည်းပညာရှင် များ ဌာနဆိုင်ရာများ
				စွန့်ထုတ်နေရာကိုဩဇိန်တ်: မြောက်လတ္တီတွဒ် ၂၂ ဒီဂရီ ၂၁ မိနစ် ၂၈ စက္ကန့်၊ အရှေ့လတ္တီတွဒ် ၉၆ ဒီဂရီ ၄၂ မိနစ် ၁၇ စက္ကန့်	ခြောက်လတစ်ကြိမ်	EMP အဖွဲ့ဝင်များနှင့် ဌာနဆိုင်ရာ ပညာရှင်များ	ကျပ် ၂၀၀,၀၀၀	နည်းပညာရှင် များ ဌာနဆိုင်ရာများ

၃	ဆူညံသံ အဆင့်	dB(A) day and night	၇၀ dB(A)	ကျောက်မီးသွေးသုံး လျှပ်စစ်ဓါတ်အားပေး စက်ရုံ ကိုဩဒိနိတ်: မြောက်လတ္တီတွဒ် ၂၂ ဒီဂရီ ၂၁ မိနစ် ၃၂ စက္ကန့်၊ အရှေ့လတ္တီတွဒ် ၉၆ ဒီဂရီ ၄၂ မိနစ် ၁၀ စက္ကန့် လောက်ဖန်းကျေးရွာ ကိုဩဒိနိတ်: မြောက်လတ္တီတွဒ် ၂၂ ဒီဂရီ ၂၁ မိနစ် ၅၈.၂၉ စက္ကန့်၊ အရှေ့လတ္တီတွဒ် ၉၆ ဒီဂရီ ၄၂ မိနစ် ၄၈.၁၇ စက္ကန့် ခဲဆန်ကျေးရွာ ကိုဩဒိနိတ်: မြောက်လတ္တီတွဒ် ၂၂ ဒီဂရီ ၂၀ မိနစ် ၅၀.၆ စက္ကန့်၊ အရှေ့လတ္တီတွဒ် ၉၆ ဒီဂရီ ၄၀ မိနစ် ၃၁.၇ စက္ကန့်	ခြောက်လတစ်ကြိမ် ခြောက်လတစ်ကြိမ် ခြောက်လတစ်ကြိမ်	EMP အဖွဲ့ဝင်များနှင့် ငှားရမ်းထားသော ပညာရှင်များ EMP အဖွဲ့ဝင်များနှင့် ငှားရမ်းထားသော ပညာရှင်များ EMP အဖွဲ့ဝင်များနှင့် ငှားရမ်းထားသော ပညာရှင်များ	ကျပ် ၇၀,၀၀၀ ကျပ် ၇၀,၀၀၀ ကျပ် ၇၀,၀၀၀	နည်းပညာရှင် များငှားရမ်းရမည်

				လယ်ကြီးတော မြောက်လတ္တီတွဒ် ၂၂ ဒီဂရီ ၂၀ မိနစ် ၁၃.၈၃ စက္ကန့်၊ အရှေ့လတ္တီတွဒ် ၉၆ ဒီဂရီ ၄၃ မိနစ် ၃၁.၂၉ စက္ကန့်	ခြောက်လတစ်ကြိမ်	EMP အဖွဲ့ဝင်များနှင့် ပူးရမ်းထားသော ပညာရှင်များ	ကျပ် ၇၀,၀၀၀	နည်းပညာရှင် များ ပူးရမ်းရမည်
၄	အစိုင်အခဲစွန့်ပစ်ပစ္စည်း များ	- စက်မှု စွန့်ပစ်အမှိုက်များ အထူးသဖြင့် ပြာများကိုစုဆောင်ခြင်း နှင့် silos တွင် သိုလှောင်ခြင်းနှင့် ပြန်လည် အသုံးပြုခြင်းကို စောင့်ကြပ်ကြည့်ရှုခြင်း - အိမ်တွင်း စွန့်ပစ်အမှိုက်များ စုဆောင်ခြင်း နှင့် စွန့်ပစ်ခြင်းကို စောင့်ကြပ်ကြည့်ရှုခြင်း	- -	ကျောက်မီးသွေးသုံး လျှပ်စစ်ဓါတ်အားပေး စက်ရုံ ကိုဩဒိနိတ်: မြောက်လတ္တီတွဒ် ၂၂ ဒီဂရီ ၂၁ မိနစ် ၃၂ စက္ကန့်၊ အရှေ့လတ္တီတွဒ် ၉၆ ဒီဂရီ ၄၂ မိနစ် ၁၀ စက္ကန့်	အပတ်စဉ်	EMP အဖွဲ့ဝင်များ	အခမဲ့	-
၅	မြေ	- မြေညစ်ညမ်းမှုကို စောင့်ကြပ်ကြည့်ရှု ခြင်း၊ မြေအရည်အသွေး ကို စစ်ဆေးခြင်း	-	စွန့်ပစ်ကန် ကိုဩဒိနိတ်: မြောက်လတ္တီတွဒ် ၂၂ ဒီဂရီ ၂၁ မိနစ် ၄၇.၆ စက္ကန့်၊ အရှေ့လတ္တီတွဒ် ၉၆ ဒီဂရီ ၄၂ မိနစ်	ခြောက်လတစ်ကြိမ်	EMP အဖွဲ့ဝင်များနှင့် ပူးရမ်းထားသော ပညာရှင်များ	ကျပ် ၁၄၀,၀၀၀	နည်းပညာရှင် များ ပူးရမ်းရမည်

				၄၀.၆ စက္ကန့်				
				လောက်ဖန်းကျေးရွာ ကိုဩဒိနိတ်: မြောက်လတ္တီတွဒ် ၂၂ ဒီဂရီ ၂၂ မိနစ် ၀၈.၂ စက္ကန့်၊ အရှေ့လတ္တီတွဒ် ၉၆ ဒီဂရီ ၄၂ မိနစ် ၃၂.၃ စက္ကန့်	ခြောက်လတစ်ကြိမ်	EMP အဖွဲ့ဝင်များနှင့် ပူးရမ်းထားသော ပညာရှင်များ	ကျပ် ၁၄၀,၀၀၀	နည်းပညာရှင် များပူးရမ်းရမည်
				ခဲဆန်ကျေးရွာ ကိုဩဒိနိတ်: မြောက်လတ္တီတွဒ် ၂၂ ဒီဂရီ ၂၁ မိနစ် ၀၁.၀ စက္ကန့်၊ အရှေ့လတ္တီတွဒ် ၉၆ ဒီဂရီ ၄၀ မိနစ် ၄၅.၉ စက္ကန့်	ခြောက်လတစ်ကြိမ်	EMP အဖွဲ့ဝင်များနှင့် ပူးရမ်းထားသော ပညာရှင်များ	ကျပ် ၁၄၀,၀၀၀	နည်းပညာရှင် များပူးရမ်းရမည်
				လယ်ကြီးတော ကိုဩဒိနိတ်: မြောက်လတ္တီတွဒ် ၂၂ ဒီဂရီ ၂၀ မိနစ် ၅၀.၈ စက္ကန့်၊ အရှေ့လတ္တီတွဒ် ၉၆ ဒီဂရီ ၄၃ မိနစ် ၂၀.၁ စက္ကန့်	ခြောက်လတစ်ကြိမ်	EMP အဖွဲ့ဝင်များနှင့် ပူးရမ်းထားသော ပညာရှင်များ	ကျပ် ၁၄၀,၀၀၀	နည်းပညာရှင် များပူးရမ်းရမည်

		- မြေတိုက်စားခံရခြင်း ရှိပါက စောင့်ကြပ်ကြည့်ရှုခြင်း (မိုးရာသီ)	-		လစဉ်	EMP အဖွဲ့ဝင်များ	အခမဲ့	-
၆	လုပ်ငန်းခွင် ကျန်းမာရေး နှင့် ဘေးအန္တရာယ် ကင်းရှင်းရေး	- OHS အစီအမံများ ကို စောင့်ကြပ်ကြည့်ရှုခြင်း - ရှေးဦးသူနာပြုပစ္စည်း များ ထောက်ပံ့ပေး ထားခြင်း နှင့် ဆေးနှင့် ဆေးဝါး ပစ္စည်းများ သိုလှောင်ထားရှိမှုကို စောင့်ကြပ်ကြည့်ရှုခြင်း - အရေးပေါ် ပြင်ဆင်ခြင်း နှင့် တုန့်ပြန်မှု အစီအစဉ် + လုပ်ဆောင်မှုများကို စောင့်ကြပ်ကြည့်ရှုခြင်း - ဆေးခန်း ကုသမှု မှတ်တမ်းကို စစ်ဆေးခြင်း	- - - -	ကျောက်မီးသွေးသုံး လျှပ်စစ်ဓါတ်အားပေး စက်ရုံ ကိုဩဒိနိတ်: မြောက်လတ္တီတွဒ် ၂၂ ဒီဂရီ ၂၁ မိနစ် ၃၄.၀၀ စက္ကန့်၊ အရှေ့လတ္တီတွဒ် ၉၆ ဒီဂရီ ၄၂ မိနစ် ၈.၅၇ စက္ကန့် ဆေးခန်း ကိုဩဒိနိတ်: မြောက်လတ္တီတွဒ် ၂၂ ဒီဂရီ ၂၁ မိနစ် ၃၁.၆၅ စက္ကန့်၊ အရှေ့လတ္တီတွဒ် ၉၆ ဒီဂရီ ၄၂ မိနစ် ၄၃.၉၁ စက္ကန့်	လစဉ် လစဉ်	EMP အဖွဲ့ဝင်များ EMP အဖွဲ့ဝင်များ	အခမဲ့ အခမဲ့	- -
၇	လူမှုရေး ပြဿနာများ၊ လူမှုရေး ကျင့်ဝတ်ဆိုးများ	- လူမှုရေး ပြဿနာများ/ လူမှုရေး ကျင့်ဝတ်ဆိုးများ ကို စစ်ဆေးခြင်း - လုပ်သားများ၏ အကျင့် စာရိတ္တများကို စောင့်ကြပ်ကြည့်ရှုခြင်း	- - -	ကျောက်မီးသွေးသုံး လျှပ်စစ်ဓါတ်အားပေး စက်ရုံ ကိုဩဒိနိတ်: မြောက်လတ္တီတွဒ် ၂၂ ဒီဂရီ ၂၁ မိနစ် ၃၁.၄၈	အပတ်စဉ် နှင့် လစဉ်	EMP အဖွဲ့ဝင်များ	အခမဲ့	-

		- စည်းကမ်းမဲ့ လုပ်ဆောင်ချက် များ ကို စစ်ဆေးခြင်း		စက္ကန့်၊ အရှေ့လတ္တီတွဒ် ၉၆ ဒီဂရီ ၄၂ မိနစ် ၉.၃၂ စက္ကန့် ဆေးခန်း ကိုဩဒိနိတ်: မြောက်လတ္တီတွဒ် ၂၂ ဒီဂရီ ၂၁ မိနစ် ၃၁.၆၅ စက္ကန့်၊ အရှေ့လတ္တီတွဒ် ၉၆ ဒီဂရီ ၄၂ မိနစ် ၄၃.၉၁ စက္ကန့်	အပတ်စဉ် နှင့် လစဉ်	EMP အဖွဲ့ဝင်များ	အခမဲ့	-

စီမံကိန်းပိတ်သိမ်းခြင်းကာလ အတွင်း စောင့်ကြပ်ကြည့်ရှုခြင်း အစီအစဉ် အကျဉ်းချုပ်

စဉ်	အစိတ်အပိုင်း/ ပြဿနာများ	စောင့်ကြပ်ကြည့်ရှုမည့် ပါရာမီတာများ	NEQEG လမ်းညွှန်ချက် တန်ဖိုးများ	စောင့်ကြပ်ကြည့်ရှုမည့် နေရာ/ လုပ်ကွက်	အကြိမ်ရေ	တာဝန်ရှိသူ	ခန့်မှန်းကုန်ကျစရိတ် (တစ်ကြိမ်အတွက်)	မှတ်ချက်
၁	လေ အရည်အသွေး	NO_2 O_3 PM_{10} $PM_{2.5}$ SO_2 VOC	၂၀၀ µg/m^3 ၁၀၀ µg/m^3 ၅၀ µg/m^3 ၂၅ µg/m^3 ၂၀ µg/m^3 ၄၀၀ µg/m^3	စက်ရုံဟောင်းနေရာ ကိုဩဒိနိတ်: မြောက်လတ္တီတွဒ် ၂၂ ဒီဂရီ ၂၁ မိနစ် ၃၂ စက္ကန့်၊ အရှေ့လတ္တီတွဒ် ၉၆ ဒီဂရီ ၄၂ မိနစ် ၁၀ စက္ကန့်	နှစ်စဉ်	EMP အဖွဲ့ဝင်များ နှင့် ဌာနရမ်းထားသော ပညာရှင်များ	ကျပ် ၁,၇၀၀,၀၀၀	တစ်နှစ်လျှင် တစ်ကြိမ် နည်းပညာရှင် များ ဌာနရမ်းရမည်

				လောက်ဖန်းကျေးရွာ ကိုဩဒိနိတ်: မြောက်လတ္တီတွဒ် ၂၂ ဒီဂရီ ၂၁ မိနစ် ၅၈.၂၉ စက္ကန့်၊ အရှေ့လတ္တီတွဒ် ၉၆ ဒီဂရီ ၄၂ မိနစ် ၄၈.၁၇ စက္ကန့် ခဲဆန်ကျေးရွာ ကိုဩဒိနိတ်: မြောက်လတ္တီတွဒ် ၂၂ ဒီဂရီ ၂၀ မိနစ် ၅၀.၆ စက္ကန့်၊ အရှေ့လတ္တီတွဒ် ၉၆ ဒီဂရီ ၄၀ မိနစ် ၃၁.၇ စက္ကန့် လယ်ကြီးတော မြောက်လတ္တီတွဒ် ၂၂ ဒီဂရီ ၂၀ မိနစ် ၁၃.၈၃ စက္ကန့်၊ အရှေ့လတ္တီတွဒ် ၉၆ ဒီဂရီ ၄၃ မိနစ် ၃၁.၂၉ စက္ကန့်	နှစ်စဉ် နှစ်စဉ်	EMP အဖွဲ့ဝင်များနှင့် ပူးရမ်းထားသော ပညာရှင်များ EMP အဖွဲ့ဝင်များနှင့် ပူးရမ်းထားသော ပညာရှင်များ	ကျပ် ၁,၇၀၀,၀၀၀ ကျပ် ၁,၇၀၀,၀၀၀	တစ်နှစ်လျှင် တစ်ကြိမ် နည်းပညာရှင်များ ပူးရမ်းရမည် တစ်နှစ်လျှင် တစ်ကြိမ် နည်းပညာရှင်များ ပူးရမ်းရမည်

၂	ရေအရည်အသွေး	BOD COD pH Total nitrogen Total phosphorus Dissolved solid Oil and grease Total coliform	၅၀ mg/l ၁၂၅ mg/l ၆-၉ STU ၁၀ mg/l ၂ mg/l ၅၀ mg/l ၁၀ mg/l ၄၀၀ mg/l	စမ်းချောင်း ကိုဩဒိနိတ်: မြောက်လတ္တီတွဒ် ၂၂ ဒီဂရီ ၂၂ မိနစ် ၂၉.၉ စက္ကန့်၊ အရှေ့လတ္တီတွဒ် ၉၆ ဒီဂရီ ၄၂ မိနစ် ၀၇.၇ စက္ကန့် လောက်ဖန်း ကိုဩဒိနိတ်: မြောက်လတ္တီတွဒ် ၂၂ ဒီဂရီ ၂၂ မိနစ် ၂၉.၉ စက္ကန့်၊ အရှေ့လတ္တီတွဒ် ၉၆ ဒီဂရီ ၄၂ မိနစ် ၄၅.၅ စက္ကန့် ခဲဆန်ကျေးရွာတွင် ကိုဩဒိနိတ်: မြောက်လတ္တီတွဒ် ၂၂ ဒီဂရီ ၂၁ မိနစ် ၀၈.၇ စက္ကန့်၊ အရှေ့လတ္တီတွဒ် ၉၆ ဒီဂရီ ၄၀ မိနစ် ၂၄.၀ စက္ကန့်	နှစ်စဉ် နှစ်စဉ် နှစ်စဉ်	EMP အဖွဲ့ဝင်များ နှင့် ပူးရမ်းထားသော ပညာရှင်များ EMP အဖွဲ့ဝင်များ နှင့် ပူးရမ်းထားသော ပညာရှင်များ EMP အဖွဲ့ဝင်များ နှင့် ပူးရမ်းထားသော ပညာရှင်များ	ကျပ် ၈၀,၀၀၀ ကျပ် ၈၀,၀၀၀ ကျပ် ၈၀,၀၀၀	တစ်နှစ်လျှင် တစ်ကြိမ် နည်းပညာရှင်များ ပူးရမ်းရမည် တစ်နှစ်လျှင် တစ်ကြိမ် နည်းပညာရှင်များ ပူးရမ်းရမည် တစ်နှစ်လျှင် တစ်ကြိမ် နည်းပညာရှင်များ ပူးရမ်းရမည်
၃	ဆူညံသံ အဆင့်	dB(A) day and night	၇၀ dB(A)	စက်ရုံဟောင်းနေရာ ကိုဩဒိနိတ်: မြောက်လတ္တီတွဒ် ၂၂ ဒီဂရီ ၂၁ မိနစ် ၃၂ စက္ကန့်၊ အရှေ့လတ္တီတွဒ် ၉၆ ဒီဂရီ ၄၂ မိနစ် ၁၀ စက္ကန့်	နှစ်စဉ်	EMP အဖွဲ့ဝင်များ နှင့် ပူးရမ်းထားသော ပညာရှင်များ	ကျပ် ၇၀,၀၀၀ ကျပ် ၇၀,၀၀၀	တစ်နှစ်လျှင် တစ်ကြိမ် နည်းပညာရှင်များ ပူးရမ်းရမည် တစ်နှစ်လျှင်

				လောက်ဖန်းကျေးရွာ ကိုဩဒိနိတ်: မြောက်လတ္တီတွဒ် ၂၂ ဒီဂရီ ၂၁ မိနစ် ၅၈.၂၉ စက္ကန့်၊ အရှေ့လတ္တီတွဒ် ၉၆ ဒီဂရီ ၄၂ မိနစ် ၄၈.၁၇ စက္ကန့်	နှစ်စဉ်	EMP အဖွဲ့ဝင်များနှင့် ပူးရမ်းထားသော ပညာရှင်များ		တစ်ကြိမ် နည်းပညာရှင်များ ပူးရမ်းရမည်
				ခဲဆန်ကျေးရွာ ကိုဩဒိနိတ်: မြောက်လတ္တီတွဒ် ၂၂ ဒီဂရီ ၂၀ မိနစ် ၅၀.၆ စက္ကန့်၊ အရှေ့လတ္တီတွဒ် ၉၆ ဒီဂရီ ၄၀ မိနစ် ၃၁.၇ စက္ကန့်	နှစ်စဉ်	EMP အဖွဲ့ဝင်များနှင့် ပူးရမ်းထားသော ပညာရှင်များ	ကျပ် ၇၀,၀၀၀	တစ်နှစ်လျှင် တစ်ကြိမ် နည်းပညာရှင်များ ပူးရမ်းရမည်
				လယ်ကြီးတောင် မြောက်လတ္တီတွဒ် ၂၂ ဒီဂရီ ၂၀ မိနစ် ၁၃.၈၃ စက္ကန့်၊ အရှေ့လတ္တီတွဒ် ၉၆ ဒီဂရီ ၄၃ မိနစ် ၃၁.၂၉ စက္ကန့်	နှစ်စဉ်	EMP အဖွဲ့ဝင်များနှင့် ပူးရမ်းထားသော ပညာရှင်များ	ကျပ် ၇၀,၀၀၀	တစ်နှစ်လျှင် တစ်ကြိမ် နည်းပညာရှင်များ ပူးရမ်းရမည်
၄	အစိုင်အခဲ စွန့်ပစ်ပစ္စည်း များ (ပိတ်သိမ်းခြင်း စွန့်ပစ်ပစ္စည်း များ၊ အမှိုက်များ)	- ပိတ်သိမ်းခြင်း လုပ်ငန်းများကို စောင့်ကြပ်ကြည့်ရှုခြင်း monitor decommissioning works (ဖျက်သိမ်းခြင်း၊	-	စက်ရုံ အဟောင်း အထူးသဖြင့် ယခင် ကျောက်မီးသွေး ဟင်းလင်းပွင့် သို့လှောင်သည့် နေရာ ကိုဩဒိနိတ်:	အပတ်စဉ်/ လစဉ်	EMP အဖွဲ့ဝင်များ	အခမဲ့	- - -

		ဖြိုဖျက်ခြင်း) နှင့် အမှိုက် ပမာဏ အများ ထွက်ရှိခြင်း နှင့် စနစ်တကျ စွန့်ပစ်ခြင်း နှင့် လုပ်ကွက်ကို ရှင်းလင်းခြင်း		မြောက်လတ္တီတွဒ် ၂၂ ဒီဂရီ ၂၁ မိနစ် ၂၉.၀၈ စက္ကန့်၊ အရှေ့လတ္တီတွဒ် ၉၆ ဒီဂရီ ၄၁ မိနစ် ၅၇.၁၃ စက္ကန့်				
၅	မြေ	မြေအရည်အသွေးကို စစ်ဆေးခြင်း၊ မြေဆီလွှာ တည်ဆောက်ခြင်းကို စစ်ဆေးခြင်း (အထူး သဖြင့် ကျောက်မီးသွေး ဟင်းလင်းပွင့် သိုလှောင်သည့် ခြံ အဖြစ် အသုံးပြုခဲ့ဖူးသည့် နေရာရှိ မြေ)	-	စက်ရုံ အဟောင်း အထူးသဖြင့် ယခင် ကျောက်မီးသွေး ဟင်းလင်းပွင့် သိုလှောင်သည့် နေရာ ကိုဩဒိနိတ်: မြောက်လတ္တီတွဒ် ၂၂ ဒီဂရီ ၂၁ မိနစ် ၂၉.၀၈ စက္ကန့်၊ အရှေ့လတ္တီတွဒ် ၉၆ ဒီဂရီ ၄၁ မိနစ် ၅၇.၁၃ စက္ကန့် လောက်ဖန်းကျေးရွာ ကိုဩဒိနိတ်: မြောက်လတ္တီတွဒ် ၂၂ ဒီဂရီ ၂၂ မိနစ် ၀၈.၂ စက္ကန့်၊ အရှေ့လတ္တီတွဒ် ၉၆ ဒီဂရီ ၄၂ မိနစ် ၃၂.၃ စက္ကန့်	နှစ်စဉ် နှစ်စဉ်	EMP အဖွဲ့ဝင်များ နှင့် ပံ့ပိုးထားသော ပညာရှင်များ EMP အဖွဲ့ဝင်များ နှင့် ပံ့ပိုးထားသော ပညာရှင်များ	ကျပ် ၁၄၀,၀၀၀ ကျပ် ၁၄၀,၀၀၀	နည်းပညာရှင်များ ပံ့ပိုးရမ်းရမည် -

				ခဲဆန်ကျးရွာ ကိုဩဒိနိတ်: မြောက်လတ္တီတွဒ် ၂၂ ဒီဂရီ ၂၁ မိနစ် ၀၁.၀ စက္ကန့်၊ အရှေ့လတ္တီတွဒ် ၉၆ ဒီဂရီ ၄၀ မိနစ် ၄၅.၉ စက္ကန့် လယ်ကြီးတော ကိုဩဒိနိတ်: မြောက်လတ္တီတွဒ် ၂၂ ဒီဂရီ ၂၀ မိနစ် ၅၀.၈ စက္ကန့်၊ အရှေ့လတ္တီတွဒ် ၉၆ ဒီဂရီ ၄၃ မိနစ် ၂၀.၁ စက္ကန့်	နှစ်စဉ် နှစ်စဉ်	EMP အဖွဲ့ဝင်များ နှင့် ဌာနရမ်းထားသော ပညာရှင်များ EMP အဖွဲ့ဝင်များ နှင့် ဌာနရမ်းထားသော ပညာရှင်များ	ကျပ် ၁၄၀,၀၀၀ ကျပ် ၁၄၀,၀၀၀	
၆	လုပ်ငန်းခွင် ကျန်းမာရေး နှင့် ဘေးအန္တရာယ် ကင်းရှင်းရေး	- OHS အစီအမံများ ကို စောင့်ကြပ်ကြည့်ရှုခြင်း - ရှုးဦးသူနာပြုပစ္စည်းများ ထောက်ပံ့ပေးထားခြင်း နှင့် ဆေးနှင့် ဆေးဝါးပစ္စည်းများ သိုလှောင်ထားရှိမှုကို စောင့်ကြပ်ကြည့်ရှုခြင်း	- - -	စက်ရုံ အဟောင်း လုပ်ကွက် ကိုဩဒိနိတ်: မြောက်လတ္တီတွဒ် ၂၂ ဒီဂရီ ၂၁ မိနစ် ၃၄.၀၀ စက္ကန့်၊ အရှေ့လတ္တီတွဒ် ၉၆ ဒီဂရီ ၄၂ မိနစ် ၈.၅၇ စက္ကန့်	လစဉ်	EMP အဖွဲ့ဝင်များ	အခမဲ့	

		- ဆေးရုံ တွင် ကုသမှု မှတ်တမ်းကို စစ်ဆေး ခြင်း - အရေးပေါ် တုန့်ပြန်မှု အစီအစဉ်ကို စောင့်ကြပ်ကြည့်ရှုခြင်း						
၇	လူမှုရေး ပြဿနာများ၊ လူမှုရေး ကျင့်ဝတ်ဆိုးများ	- လူမှုရေး ပြဿနာများ/ လူမှုရေး ကျင့်ဝတ် ဆိုး များကို စစ်ဆေး ခြင်း - လုပ်သားများ၏ အကျင့် စာရိတ္တများကို စောင့်ကြပ်ကြည့်ရှုခြင်း - စည်းကမ်းမဲ့ လုပ်ဆောင်ချက် များ ကို စစ်ဆေးခြင်း	- - -	စက်ရုံ အဟောင်း လုပ်ကွက် ကိုဩဒိနိတ်: ကိုဩဒိနိတ်: မြောက်လတ္တီတွဒ် ၂၂ ဒီဂရီ ၂၁ မိနစ် ၃၁.၄၈ စက္ကန့်၊ အရှေ့လတ္တီတွဒ် ၉၆ ဒီဂရီ ၄၂ မိနစ် ၉.၃၂ စက္ကန့်	အပတ်စဉ် နှင့် လစဉ်	EMP အဖွဲ့ဝင်များ	အခမဲ့	

စီမံကိန်း ရန်ပုံငွေ နှင့် တာဝန်ဝတ္တရားများ

EMP အကောင်အထည်ဖော်ရန်အတွက် စုစုပေါင်း ရန်ပုံငွေကို အခန်း-၈ (၈.၄) ၏ အစောပိုင်းတွင် ဖော်ပြထားပြီး စီမံကိန်း ဘတ်ဂျက်၏ ၀.၅ % (အမေရိကန်ဒေါ်လာ ၅၀,၀၀၀) ကို EMP အကောင်အထည်ဖော်ခြင်း အတွက် ထားရှိပါမည်။ အစီအစဉ် တစ်ခုချင်းစီအတွက် ဘတ်ဂျက်ခွဲဝေခြင်းကိုလည်း အောက်တွင် ဖော်ပြထားပါသည်-

EMP ဘတ်ဂျက်၏ ၃၅ %၊ အမေရိကန်ဒေါ်လာ ၁၇,၅၀၀ စောင့်ကြပ်ကြည့်ရှုခြင်း အစီအစဉ် (MP) လုပ်ဆောင်ရန် အတွက် ထားရှိမည်။ ရန်ပုံငွေ သည် စီမံကိန်း ကာလ တစ်ခုလုံးကို မခြုံငုံမိပါ။ (လည်ပတ်ခြင်း ကာလ နှစ် ၃၀ ပင် မဟုတ်ပါ။) ရန်ပုံငွေသည် ဘဏ္ဍာငွေများသာ ဖြစ်ပြီး အချိန်ကြာလာသည် နှင့် အမျှ ရန်ပုံငွေ ထပ်မံ၍ ထည့်ဝင်ပါမည်။

အဓိက ကုန်ကျစရိတ်များမှာ- လေအရည်အသွေး/ ထုတ်လွှတ်ခြင်း၊ ဆူညံသံနှင့် တုန်ခါမှု၊ ရေအရည်အသွေး/ စွန့်ထုတ်ခြင်း နှင့် မြေအရည်အသွေးများ စောင့်ကြပ်ကြည့်ရှုခြင်း အတွက် ကျွမ်းကျင်သူများ၊ နည်းပညာရှင်များကို ငှားရမ်းခြင်း အတွက် ဖြစ်ပါသည်။

ဖွံ့ဖြိုးပြီး နိုင်ငံများတွင် EMP ကန်ထရိုက်တာများ ရှိကြပြီး EMP လုပ်ငန်းတာဝန် အားလုံးကို လုပ်ဆောင်ရန် အတွက် ၎င်းတို့ကိုငှားရမ်းကြသည်။ မြန်မာနိုင်ငံတွင် EMP ကန်ထရိုက်တာများ ယခုထိ မရှိခြင်းကြောင့် အခြားဌာန သို့မဟုတ် ကိုယ်ပိုင် ဓာတ်ခွဲခန်းများမှ ကျွမ်းကျင်သူများ/ ပညာရှင်များ ကို ၆ လ ပြည့်တိုင်း ပုံမှန် ငှားရမ်းရပါသည်။ ၎င်းတို့ကိုငှားရမ်းခြင်းသည် အမှန်တကယ် ကုန်ကျစရိတ်များပြီး စောင့်ကြပ်ကြည့်ရှုခြင်း လုပ်ငန်းများ၏ အဓိက ကုန်ကျစရိတ် ဖြစ်ပါသည်။

နိုင်ငံတွင် EMP ကန်ထရိုက်တာများ ယခုထိ မရှိခြင်းကြောင့် ငွေရည်ပုလဲဘိလပ်မြေ ကုမ္ပဏီလီမိတက် မှ တာဝန်ရှိသူများသည် ရရှိနိုင်သော ဝန်ထမ်းများ နှင့် အရင်းအမြစ်များနှင့် ရရှိအောင် လုပ်ဆောင်ရမည် ဖြစ်ပါသည်။ EMP အဖွဲ့ဝင်များ နှင့် အထူးလေ့ကျင့်ထားသော ဝန်ထမ်း (၂၀ ဦး) ကို EMP လုပ်ငန်းတာဝန်ကို လုပ်ဆောင်ရန်ထားရှိပါမည်။ ဝန်ထမ်း ၂၅ ဦး သည် လစာကောင်းသော ဝန်ထမ်းများ ဖြစ်ကြပြီး ၎င်း တို့၏ သီးခြား အခကြေးငွေ အဖြစ် အပိုကုန်ကျစရိတ် မရှိပါ။ စောင့်ကြပ်ကြည့်ရှုခြင်း လုပ်ငန်းများကို အခမဲ့ ဆောင်ရွက်မည် ဖြစ်ပါသည်။

လျှော့ပါးစေရေး နည်းလမ်းများကို ဝန်ထမ်း ၂၅ ဦး ဖြင့် အခမဲ့ ဆောင်ရွက်မည် ဖြစ်ပါသည်။ (လိုအပ်ပါ အချိန်နှင့်အမျှ ဝန်ထမ်းများကို ထပ်မံ ခန့်အပ်ထားပါမည်။) ထို့ကြောင့် လျှော့ပါးစေရေး လုပ်ဆောင်မှုများ လုပ်ဆောင်ခြင်း အတွက် အပိုကုန်ကျစရိတ် မရှိပါ။

လျှော့ပါးစေရေး နည်းလမ်းများအတွက် စက်ကိရိယာများ သို့မဟုတ် ပစ္စည်းများ ဝယ်ယူခြင်း အတွက် ကုန်ကျစရိတ် ဥပမာ- ရေဖြန်းခြင်း (ဖုန်ထခြင်း) အတွက် ရေပိုက်များ ဝယ်ယူခြင်း၊ ပူ၍ ခြောက်သွေ့သော လအတွင်း တစ်နေ့လျှင် တစ်ကြိမ် လုပ်ဆောင်ရန် ရေဖြန်းခြင်း၊ PPE ဥပမာ-

မျက်နှာဖုံးများ၊ နှာခေါင်းစည်းများ၊ နှာခေါင်းဖုံးများ၊ နားကြပ်များ၊ ဘွတ်ဖိနပ်များ၊ ဦးထုတ်များ၊ လက်အိတ်များ အစရှိသည်ဖြင့် ကို ဝယ်ယူခြင်း အတွက် ကုန်ကျစရိတ်များ ဖြစ်ပါသည်။ ဖုန်မှုန့်များနှင့် မြင့်မားသော ဆူညံသံ အဆင့် နှင့် ထိတွေ့နေရသော လုပ်သားများကို ထောက်ပံ့ပေးရန် ဖြစ်သည်။ လျှော့ပါးစေရေး စက်ကိရိယာများကို အဓိကဘတ်ဂျက်မှ ဝယ်ယူပါမည်။

ESP၊ စစ်ထုတ်အိတ်များ နှင့် အခြား လျှော့ပါးစေရေး စက်ကိရိယာများ ဥပမာ- noise abatour/silencers၊ vibration absorber များကို ဝယ်ယူခြင်း နှင့် တပ်ဆင်ခြင်း ကို စီမံကိန်း၏ အဓိက ဘတ်ဂျက်မှ အသုံးပြုပါမည်။ မီးသတ်စက် (မီးသတ်ကား)၊ မီးသတ်ဆေးဘူး၊ ရေပိုက်ခေါင်းများ၊ hoses၊ jet အစရှိသည်တို့ကို ဝယ်ယူခြင်းသည် အဓိက ဘတ်ဂျက်မှ ဖြစ်ပြီး EMP ဘတ်ဂျက်မှ အသုံးပြုခြင်း မဟုတ်ပါ။

ထို့ကြောင့် အမှန်တကယ် ကုန်ကျစရိတ်မှာ- လေအရည်အသွေး၊ ဆူညံသံအဆင့်၊ ရေနှင့် မြေအရည်အသွေး စောင့်ကြပ်ကြည့်ရှုခြင်း အတွက် ပညာရှင်များ ငှားရမ်းခြင်း အတွက်သာ ဖြစ်ပါသည်။ တစ်ကြိမ် ကုန်ကျစရိတ် နှင့် နှစ်စဉ် ကုန်ကျစရိတ် ကို အောက်ပါ ဇယားတွင် ဖော်ပြထားပါသည်။-

<u>စောင့်ကြပ်ကြည့်ရှုခြင်း လုပ်ဆောင်ခြင်းအတွက် ကုန်ကျစရိတ်များ</u>

အစိတ်အပိုင်း/ ပြဿနာများကို ခြုံငုံမိသော စောင့်ကြပ်ကြည့်ရှုခြင်း အစီအစဉ်၊ စောင့်ကြပ်ကြည့်ရှုမည့် ပါရာမီတာများ၊ စောင့်ကြပ်ကြည့်ရှုမည့်နေရာ/ လုပ်ကွက်၊ အကြိမ်ရေ / အချိန်၊ တာဝန်ယူရမည့် ပုဂ္ဂိုလ်၊ တစ်ကြိမ် ကုန်ကျစရိတ် နှင့် မှတ်ချက် များကို အစောပိုင်း ၈.၆.၆ (ဇယားပုံစံဖြင့်) ဖော်ပြထားပြီး ဖြစ်ပါသည်။

၎င်း ဇယားကို အခြေခံ၍ စောင့်ကြပ်ကြည့်ရှုခြင်း အတွက် နှစ်စဉ် ကုန်ကျစရိတ်ကို တွက်ချက်ထားပြီး အောက်ပါ ဇယားတွင် ဖော်ပြထားပါသည်-

<u>ဆောက်လုပ်ရေး ကာလအတွင်း</u>

စဉ်	အစိတ်အပိုင်း / ပါရာမီတာ	စောင့်ကြပ်ကြည့်ရှုမည့်နေရာ	တစ်ကြိမ် ကုန်ကျ စရိတ်	အကြိမ်ရေ / အချိန်	နှစ်စဉ် ကုန်ကျ စရိတ်	မှတ်ချက်
၁	လေအရည်အသွေး	- တည်ဆောက်ရေး လုပ်ကွက် - လောက်ဖန်းကျေးရွာ - ခဲဆန်ကျေးရွာ - လယ်ကြီးတော	ကျပ် ၁,၇၀၀,၀၀၀ ကျပ် ၁,၇၀၀,၀၀၀ ကျပ် ၁,၇၀၀,၀၀၀ ကျပ် ၁,၇၀၀,၀၀၀	ခြောက်လ တစ်ကြိမ် ခြောက်လ တစ်ကြိမ် ခြောက်လတစ်ကြိမ် ခြောက်လတစ်ကြိမ်	ကျပ် ၃,၄၀၀,၀၀၀ ကျပ် ၃,၄၀၀,၀၀၀ ကျပ် ၃,၄၀၀,၀၀၀ ကျပ် ၃,၄၀၀,၀၀၀	နည်းပညာရှင်များ ငှားရမ်းရမည်

၂	ရေအရည်အသွေး	- တည်ဆောက်ရေးလုပ်ကွက် - လောက်ဖန်းကျေးရွာ - ခဲဆန်ကျေးရွာ	ကျပ် ၈၀,၀၀၀ ကျပ် ၈၀,၀၀၀ ကျပ် ၈၀,၀၀၀	ခြောက်လတစ်ကြိမ် ခြောက်လတစ်ကြိမ် ခြောက်လတစ်ကြိမ်	ကျပ် ၁၆၀,၀၀၀ ကျပ် ၁၆၀,၀၀၀ ကျပ် ၁၆၀,၀၀၀	နည်းပညာရှင်များ ငှားရမ်းရမည်
၃	ဆူညံသံအဆင့်	- တည်ဆောက်ရေးလုပ်ကွက် - လောက်ဖန်းကျေးရွာ - ခဲဆန်ကျေးရွာ - လယ်ကြီးတော	ကျပ် ၇၀,၀၀၀ ကျပ် ၇၀,၀၀၀ ကျပ် ၇၀,၀၀၀ ကျပ် ၇၀,၀၀၀	ခြောက်လတစ်ကြိမ် ခြောက်လတစ်ကြိမ် ခြောက်လတစ်ကြိမ် ခြောက်လတစ်ကြိမ်	ကျပ် ၁၄၀,၀၀၀ ကျပ် ၁၄၀,၀၀၀ ကျပ် ၁၄၀,၀၀၀ ကျပ် ၁၄၀,၀၀၀	နည်းပညာရှင်များ ငှားရမ်းရမည်
၄	မြေ	- တည်ဆောက်ရေးလုပ်ကွက် - လောက်ဖန်းကျေးရွာ - ခဲဆန်ကျေးရွာ - လယ်ကြီးတော	ကျပ် ၁၄၀,၀၀၀ ကျပ် ၁၄၀,၀၀၀ ကျပ် ၁၄၀,၀၀၀ ကျပ် ၁၄၀,၀၀၀	ခြောက်လတစ်ကြိမ် ခြောက်လတစ်ကြိမ် ခြောက်လတစ်ကြိမ် ခြောက်လတစ်ကြိမ်	ကျပ် ၂၈၀,၀၀၀ ကျပ် ၂၈၀,၀၀၀ ကျပ် ၂၈၀,၀၀၀ ကျပ် ၂၈၀,၀၀၀	နည်းပညာရှင်များ ငှားရမ်းရမည်
				စုစုပေါင်း =	**ကျပ် ၁၅,၇၆၀,၀၀၀**	

မှတ်ချက် – လေ၊ ရေ၊ ဆူညံသံ အတွက် အသေးစိတ် ပါရာမီတာများကို အစောပိုင်း တွင် ဖော်ပြထားပြီး ဖြစ်ပါသည်။ (NEQEG လမ်းညွှန်ချက် တန်ဖိုးများ နှင့် အတူ)

ကိုသြဒိနိတ်: စောင့်ကြပ် ကြည့်ရှုမည့်နေရာ တစ်ခုခြင်း စီ အတွက် ကိုလည်း အစောပိုင်း တွင် ဖော်ပြထားပြီး ဖြစ်ပါသည်။

မှတ်ချက် – EMP အဖွဲ့ဝင်များမှ စစ်ဆေးသော/ စောင့်ကြပ်ကြည့်ရှုသော အခြား ပါရာမီတာများမှာ အခမဲ့ဖြစ်ပါသည်။ (အားလုံးသည် ဝင်ငွေကောင်းသော ဝန်ထမ်းများဖြစ်ပါသည်။)

လည်ပတ်ခြင်း ကာလအတွင်း

စဉ်	အစိတ်အပိုင်း / ပါရာမီတာ	စောင့်ကြပ်ကြည့်ရှုမည့် နေရာ	တစ်ကြိမ် ကုန်ကျစရိတ်	အကြိမ်ရေ / အချိန်	နှစ်စဉ် ကုန်ကျစရိတ်	မှတ်ချက်
၁	လေအရည်အသွေး	- ကျောက်မီးသွေးသုံး လျှပ်စစ်ခါတ်အားပေးစက်ရုံ တွင် - လောက်ဖန်းကျေးရွာ - ခဲဆန်ကျေးရွာ - လယ်ကြီးတောင်	ကျပ် ၁,၇၀၀,၀၀၀ ကျပ် ၁,၇၀၀,၀၀၀ ကျပ် ၁,၇၀၀,၀၀၀ ကျပ် ၁,၇၀၀,၀၀၀	ခြောကလတစ်ကြိမ် ခြောက်လတစ်ကြိမ် ခြောက်လတစ်ကြိမ်	ကျပ် ၃,၄၀၀,၀၀၀ ကျပ် ၃,၄၀၀,၀၀၀ ကျပ် ၃,၄၀၀,၀၀၀ ကျပ် ၃,၄၀၀,၀၀၀	နည်းပညာရှင်များ ငှားရမ်းရမည်
	ထုတ်လွှတ်မှုများ	- ခေါင်းတိုင်တွင် စဉ်ဆက်မပြတ် flue gas ခွဲခြမ်းစိတ်ဖြာသည့် စက်တပ်ဆင်ခြင်း	အခမဲ့	လစဉ်	အခမဲ့	LCD နှင့် မှတ်တမ်းများကို စစ်ဆေးခြင်းနှင့် စောင့်ကြပ်ကြည့်ရှုခြင်းသာ
၂	ရေအရည်အသွေး	- ကျောက်မီးသွေးသုံး လျှပ်စစ်ခါတ်အားပေးစက်ရုံ - လောက်ဖန်းကျေးရွာ	ကျပ် ၈၀,၀၀၀ ကျပ် ၈၀,၀၀၀	ခြောက်လတစ်ကြိမ် ခြောက်လတစ်ကြိမ်	ကျပ် ၁၆၀,၀၀၀ ကျပ် ၁၆၀,၀၀၀	နည်းပညာရှင်များ ငှားရမ်းရမည် နည်းပညာရှင်များ ငှားရမ်းရမည်

		- ခဲဆန်ကျေးရွာ	ကျပ် ၈၀,၀၀၀	ခြောက်လတစ်ကြိမ်	ကျပ် ၁၆၀,၀၀၀	နည်းပညာရှင်များ ငှားရမ်းရမည်
	စွန့်ထုတ်မှုများ	- ကျောက်မီးသွေးသုံး လျှပ်စစ်ခါတ်အားပေးစက်ရုံ	ကျပ် ၈၀,၀၀၀	ခြောက်လတစ်ကြိမ်	ကျပ် ၁၆၀,၀၀၀	နည်းပညာရှင်များ ငှားရမ်းရမည်
၃	ဆူညံသံအဆင့်	- ကျောက်မီးသွေးသုံး လျှပ်စစ်ခါတ်အားပေးစက်ရုံ	ကျပ် ၇၀,၀၀၀	ခြောက်လတစ်ကြိမ်	ကျပ် ၁၄၀,၀၀၀	နည်းပညာရှင်များ ငှားရမ်းရမည်
		- လောက်ဖန်းကျေးရွာ	ကျပ် ၇၀,၀၀၀	ခြောက်လတစ်ကြိမ်	ကျပ် ၁၄၀,၀၀၀	
		- ခဲဆန်ကျေးရွာ	ကျပ် ၇၀,၀၀၀	ခြောက်လတစ်ကြိမ်	ကျပ် ၁၄၀,၀၀၀	
		- လယ်ကြီးတောင်	ကျပ် ၇၀,၀၀၀	ခြောက်လတစ်ကြိမ်	ကျပ် ၁၄၀,၀၀၀	
၄	မြေ	- ကျောက်မီးသွေးသုံး လျှပ်စစ်ခါတ်အားပေးစက်ရုံ	ကျပ် ၁၄၀,၀၀၀	ခြောက်လတစ်ကြိမ်	ကျပ် ၂၈၀,၀၀၀	နည်းပညာရှင်များ ငှားရမ်းရမည်
		- လောက်ဖန်းကျေးရွာ	ကျပ် ၁၄၀,၀၀၀	ခြောက်လတစ်ကြိမ်	ကျပ် ၂၈၀,၀၀၀	
		- ခဲဆန်ကျေးရွာ	ကျပ် ၁၄၀,၀၀၀	ခြောက်လတစ်ကြိမ်	ကျပ် ၂၈၀,၀၀၀	
		- လယ်ကြီးတောင်	ကျပ် ၁၄၀,၀၀၀	ခြောက်လတစ်ကြိမ်	ကျပ် ၂၈၀,၀၀၀	
				စုစုပေါင်း =	**ကျပ် ၁၅,၉၂၀,၀၀၀**	

မှတ်ချက် – လေ၊ ရေ၊ ဆူညံသံ အတွက် အသေးစိတ် ပါရာမီတာများကို အစောပိုင်း တွင် ဖော်ပြထားပြီး ဖြစ်ပါသည်။ (NEQEG လမ်းညွှန်ချက် တန်ဖိုးများ နှင့် အတူ)

ကိုဩဒိနိတ်: စောင့်ကြပ် ကြည့်ရှုမည့်နေရာ တစ်ခုခြင်း စီ အတွက် ကိုလည်း အစောပိုင်း တွင် ဖော်ပြထားပြီး ဖြစ်ပါသည်။

မှတ်ချက် – EMP အဖွဲ့ဝင်များမှ စစ်ဆေးသော/ စောင့်ကြပ်ကြည့်ရှုသော အခြား ပါရာမီတာများမှာ အခမဲ့ဖြစ်ပါသည်။ (အားလုံးသည် ဝင်ငွေကောင်းသော ဝန်ထမ်းများဖြစ်ပါသည်။)

<u>ပိတ်သိမ်းခြင်း ကာလအတွင်း</u>

စဉ်	အစိတ်အပိုင်း / ပါရာမီတာ	စောင့်ကြပ် ကြည့်ရှုမည့်နေရာ	တစ်ကြိမ် ကုန်ကျ စရိတ်	အကြိမ်ရေ / အချိန်	နှစ်စဉ် ကုန်ကျ စရိတ်	မှတ်ချက်
၁	လေအရည် အသွေး	- ကျောက်မီး သွေးသုံး လျှပ်စစ် ခါတ်အားပေး စက်ရုံ တွင် - လောက်ဖန်း ကျေးရွာ - ခဲဆန်ကျေးရွာ - လယ်ကြီးတော	ကျပ် ၁,၇၀၀,၀၀၀ ကျပ် ၁,၇၀၀,၀၀၀ ကျပ် ၁,၇၀၀,၀၀၀ ကျပ် ၁,၇၀၀,၀၀၀	နှစ်စဉ် နှစ်စဉ် နှစ်စဉ်	ကျပ် ၁,၇၀၀,၀၀၀ ကျပ် ၁,၇၀၀,၀၀၀ ကျပ် ၁,၇၀၀,၀၀၀ ကျပ် ၁,၇၀၀,၀၀၀	တစ်နှစ်လျှင် တစ်ကြိမ် နည်းပညာရှင်များ ငှားရမ်းရမည်
၂	ရေအရည် အသွေး	- ကျောက်မီး သွေးသုံး လျှပ်စစ် ခါတ်အားပေး စက်ရုံ တွင် - လောက်ဖန်း ကျေးရွာ - ခဲဆန်ကျေးရွာ	ကျပ် ၈၀,၀၀၀ ကျပ် ၈၀,၀၀၀ ကျပ် ၈၀,၀၀၀	နှစ်စဉ် နှစ်စဉ်	ကျပ် ၈၀,၀၀၀ ကျပ် ၈၀,၀၀၀ ကျပ် ၈၀,၀၀၀	တစ်နှစ်လျှင် တစ်ကြိမ် နည်းပညာရှင်များ ငှားရမ်းရမည်

၃	ဆူညံသံအဆင့်	- ကျောက်မီးသွေးသုံး လျှပ်စစ်ဓါတ်အားပေးစက်ရုံ - လောက်ဖန်းကျေးရွာ တွင် - ခဲဆန်ကျေးရွာ - လယ်ကြီးတောာ	ကျပ် ၇၀,၀၀၀ ကျပ် ၇၀,၀၀၀ ကျပ် ၇၀,၀၀၀ ကျပ် ၇၀,၀၀၀	နှစ်စဉ် နှစ်စဉ် နှစ်စဉ် နှစ်စဉ်	ကျပ် ၇၀,၀၀၀ ကျပ် ၇၀,၀၀၀ ကျပ် ၇၀,၀၀၀ ကျပ် ၇၀,၀၀၀	တစ်နှစ်လျှင် တစ်ကြိမ် နည်းပညာရှင်များ ငှားရမ်းရမည်
၄	မြေ	- ကျောက်မီးသွေးသုံး လျှပ်စစ်ဓါတ်အားပေးစက်ရုံ - လောက်ဖန်းကျေးရွာ - ခဲဆန်ကျေးရွာ - လယ်ကြီးတောာ	ကျပ် ၁၄၀,၀၀၀ ကျပ် ၁၄၀,၀၀၀ ကျပ် ၁၄၀,၀၀၀ ကျပ် ၁၄၀,၀၀၀	နှစ်စဉ် နှစ်စဉ် နှစ်စဉ် နှစ်စဉ်	ကျပ် ၁၄၀,၀၀၀ ကျပ် ၁၄၀,၀၀၀ ကျပ် ၁၄၀,၀၀၀ ကျပ် ၁၄၀,၀၀၀	တစ်နှစ်လျှင် တစ်ကြိမ် နည်းပညာရှင်များ ငှားရမ်းရမည်
စုစုပေါင်း =					**ကျပ် ၇,၈၀၀,၀၀၀**	
နှစ်စဉ် စုစုပေါင်း =					**ကျပ် ၃၉,၅၆၀,၀၀၀**	

စောင့်ကြပ်ကြည့်ရေးအတွက် ခွဲဝေထားသော ရန်ပုံငွေ (အမေရိကန်ဒေါ်လာ ၁၇,၅၀၀) သည် တစ်နှစ်စာ အတွက် လုံလောက်ပါသည်။ အချိန်ကြာလာသည်နှင့် ရန်ပုံငွေတွင် ထပ်မံ၍ ထည့်ဝင်ပါမည်။

<u>တာဝန်ဝတ္တရားများ</u>

စောင့်ကြပ်ကြည့်ရေး လုပ်ဆောင်မှု အစီအစဉ် လုပ်ဆောင်ခြင်းအတွက် တာဝန်ရှိသူမှာ EMP အဖွဲ့ခေါင်းဆောင် နှင့် အဖွဲ့ဝင် ၅ ဦး ဖြစ်ပါသည်။ ထို့အပြင် အထူးလေ့ကျင့်ထားသော ဝန်ထမ်းများ ၂၀ ဦးသည် စောင့်ကြပ်ကြည့်ရေး လုပ်ငန်းများကို လုပ်ဆောင်ပါသည်။ နည်းပညာရှင်များကို နှစ်ဝက် တစ်ကြိမ် ငှားရမ်းထားပြီး EMP အဖွဲ့ဝင်များနှင့် ဝန်ထမ်းများ ၂၀ ဦးသည် အထူးသဖြင့် ပတ်ဝန်းကျင် နှင့် လူမှုရေး

အစိတ်အပိုင်းများ အပေါ် မျက်လုံးအမြင်ဖြင့် စစ်ဆေးခြင်း /စစ်ဆေးခြင်း လုပ်ငန်းများကို ပုံမှန် အပတ်စဉ် နှင့် လစဉ် စောင့်ကြပ်ကြည့်ရှုခြင်းကို လုပ်ဆောင်ပါသည်။

အမှန်တကယ်မှာ တာဝန်ရှိသူမှာ EMP အဖွဲ့ခေါင်းဆောင် အဖွဲ့ဝင် နှင့် လေ့ကျင့်ထားသော ဝန်ထမ်းများ ၂၀ ဦး သည် စောင့်ကြပ်ကြည့်ရှုခြင်းသာမက EMP လုပ်ငန်းစဉ်များကို လုပ်ဆောင်ရန် တာဝန်ရှိပါသည်။

၎င်းတို့သည် လျှော့ပါးစေရေး နည်းလမ်းများ လုပ်ဆောင်ခြင်း လုပ်ငန်းများကို ကြီးကြပ်ခြင်းများကို လည်း လုပ်ဆောင်ပါမည်။

ငွေရည်ပုလဲဘိလပ်မြေကုမ္ပဏီလီမိတက်သည် EMP အဖွဲ့ဝင်များကို အောက်ပါအတိုင်းဖွဲ့စည်းထားပါသည်။

၁။ ဦးခင်မောင်အေး	မန်နေဂျာ	EMP အဖွဲ့ခေါင်းဆောင်
၂။ ဦးအေးမင်းစိုး	အင်ဂျင်နီယာ	EMP အဖွဲ့ဝင်
၃။ ဦးချစ်ကိုကို	အင်ဂျင်နီယာ	EMP အဖွဲ့ဝင်
၄။ ဦးဝင်းအောင်	ပညာရှင်	EMP အဖွဲ့ဝင်
၅။ ဦးမောင်မောင်ဦး	ပညာရှင်	EMP အဖွဲ့ဝင်
၆။ ဦးလှမြင့်	ရာအိမ်မှူး	EMP အဖွဲ့ဝင်
၇။ ဦးရဲလူ	ဒေသခံ	EMP အဖွဲ့ဝင်

လူထုတွေ့ဆုံပွဲနှင့် သတင်းအချက်အလက်ထုတ်ဖော်ခြင်း

လူထုတွေ့ဆုံပွဲအကြောင်းအရာသည် ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း(EIA)၊ ကနဦး ပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း(IEE)၊ ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်(EMP)တို့၏ ပြည့်စုံစေသောအပိုင်း ဖြစ်ပြီး ဤအခန်းကိုလည်း အတော်အသင့် ပြည့်စုံစွာဖော်ပြထားပါသည်။

နယ်ပယ်အတိုင်းအတာသတ်မှတ်ချိန် ကွင်းဆင်းဆောင်ရွက်ခြင်းတွင် လောက်ဖန်းကျေးရွာ၌ ၂၀၁၁-၂၀၁၇ တွင် တွေ့ဆုံမှုတစ်ခု ကျင်းပခဲ့ပါသည်။

ပထမ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း ကွင်းဆင်းဆောင်ရွက်ချိန်အတွင်းတွင် ပထမ အစည်းအဝေးကို ဖေဖော်ဝါရီလ၊ ၂၀၁၈ ခုနှစ်တွင် လောက်ဖန်းကျေးရွာ၌ ကျင်းပခဲ့ပါသည်။

ဒုတိယကွင်းဆင်းဆောင်ရွက်ချိန်အတွင်းတွင် မတ်လ၊ ၂၀၁၉ ခုနှစ်တွင် လောက်ဖန်းကျေးရွာ၊ ခဲဆန်ကျေးရွာနှင့် လယ်ကြီးတောကျေးရွာတို့၌ လူထုတွေ့ဆုံပွဲ (၃)ပွဲကို ကျင်းပပြုလုပ် ခဲ့ပါသည်။

လူထုတွေ့ဆုံဆွေးနွေးပွဲ၏ ရလဒ်နှင့် အထူးသဖြင့် အစည်းအဝေးမှတ်တမ်း တစ်ခုစီကို ဤအခန်းတွင် အတော်အသင့်အသေးစိတ်ဖော်ပြ ထားပါသည်။

<u>လူထုတွေ့ဆုံဆွေးနွေးပွဲ၏ ရလဒ်များ (လောက်ဖန်း ကျေးရွာ ၂၀၁၇ နှင့် ၂၀၁၈)</u>

လူထုတွေ့ဆုံဆွေးနွေးပွဲ ၂ ခု၏ ရလဒ်များကို ခြုံငုံသုံးသပ်ချက်အရ ဒေသခံများ စိမံကိန်းကို လက်ခံနှုန်းမှာ မြင့်မားကြောင်း ထင်ရှားပါသည်။ ကုမ္ပဏီ သည် ၎င်း ဇရိယာတွင် ၂၀၁၄ ခုနှစ်မှ စ၍ တည်ရှိနေပြီး ဒေသခံ လူထု နှင့် ကောင်းမွန်သော ဆက်ဆံရေးကို ထိန်းသိမ်းထားသောကြောင့် ဖြစ်ပါသည်။

ကုမ္ပဏီ၏တာဝန်ရှိသူများ၏ စိတ်သည် "ပရဟိတ စိတ်" ဟု သတ်မှတ်နိုင်ပါသည်။ ကုမ္ပဏီသည် လူထု ထိရောက်ပြီး အဓိပ္ပါယ် ပြည့်ဝသော CSR အစီအစဉ်ကို အကောင်အထည်ဖော် လုပ်ဆောင်ရေး အတွက် ကျပ် ၆,၇၆၄,၃၉၀,၆၃၃ ကျပ်ကို အသုံးပြုခဲ့ပြီး ဖြစ်ပါသည်။ (ကုမ္ပဏီသည် အမြတ်မရသေးခင် အချိန်မှစ၍ CSR အစီအစဉ်ကို လုပ်ဆောင်ခဲ့ခြင်း ဖြစ်ပါသည်။)

ဒေသခံ တစ်ဦး, <u>ဦးရဲလူ</u> မှ ရွာမီးတိုင်များကို မီးသီး/မီးလုံး ကောင်းများတပ်ဆင်ပေးရန် တောင်းဆိုခဲ့ပါသည်။ ကျေးရွာဘက်မှ ထိန်းသိမ်းမှု အားနည်းသောကြောင့် ဖြစ်ပုံရပါသည်။ ထို့ကြောင့် ဒုတိယ မန်နေဂျာသည် မီးသီး/မီးလုံး များကို ထပ်မံ၍ ထောက်ပံ့ပေးမည်ဟု ပြောကြားခဲ့သော်လည်း မီးသီး/မီးလုံး များအတွက် ကျေးရွာသားများမှ တာဝန်ယူသင့်သည်ဟု ပြောကြားခဲ့ပါသည်။

ဖြတ်သန်းသွားသော လမ်းများ ဖုန်ထခြင်း အတွက် ကုမ္ပဏီမှ ပုံမှန် ရေဖြန်းပေးခြင်းဖြင့် ၎င်း ပြဿနာကို ဖြေရှင်းပေးမည် ဖြစ်ပါသည်။

<u>ဦးလှမြင့်၊ ရာအိမ်မှူး</u> သည် ကျေးရွာနှင့် ဆေးပေးခန်းကြား၌ လမ်းကို ကွန်ကရစ်ခင်းပေးရန် တောင်းဆိုခဲ့ပါသည်။

ထို့ကြောင့် ဒုတိယ မန်နေဂျာသည် ၎င်းကို လုပ်ဆောင်နိုင်သည့် ရာထူးမဟုတ်သည့် အတွက် ခွင့်ပြုချက်အတွက် ကုမ္ပဏီမှ တာဝန်ရှိသူများကို မေးမြန်း၍ လမ်းခင်းခြင်းကို လုပ်ဆောင်ပေးပါမည်ဟု ပြောကြားခဲ့ပါသည်။ (ဆောင်ရွက်ပြီးစီး)

<u>ဦးကြီးဝမ်း၊</u> ဒေသခံတစ်ဦးသည် ဘိလပ်မြေစက်ရုံသည် ကျေးရွာအတွက် အမှန်တကယ် အကျိုးပြုသည့် အတွက် တင်ပြထားသော စီမံကိန်းကို သဘောတူညီကြောင်း ပြောကြားခဲ့ပါသည်။

ငွေရည်ပုလဲဘိလပ်မြေကုမ္ပဏီလီမိတက် သည် ၎င်းဒေသတွင် နှစ်ပေါင်းများစွာ လည်ပတ် လုပ်ဆောင်လာသောကြောင့် ဒေသခံများသည် ကုမ္ပဏီ၏ လုပ်ဆောင်ချက်များနှင့် အကျွမ်းတဝင် ရှိကြပါသည်။ အများစုကို စက်ရုံတွင် အလုပ်ခန့်အပ်ထားပါသည်။

ဒေသခံ၏ နာမည်	တောင်းဆိုသည့် အရာ သို့မဟုတ် ပေါ်ပေါက်လာသည့် ပြဿနာ	ကုမ္ပဏီမှ လုပ်ဆောင်ပေးမည့် လုပ်ဆောင်မှုများ
ဦးရဲလူ	- ရွာမီးတိုင်များကို မီးသီး/ မီးလုံး ကောင်းများတပ်ဆင်ပေးရန် တောင်းဆိုခဲ့ပါသည်။ - ယာဉ်များ ရွေ့လျားခြင်းကြောင့် ထွက်ရှိလာသော ဖုန်မှုန့်များ	- လုပ်ဆောင်ပြီး (ၿငိုးပြင်ဆင်ထားသော EIA တင်ပြနေစဉ် အတွင်း) - ဖြေရှင်းပြီး(ၿငိုးပြင်ဆင်ထားသော EIA တင်ပြနေစဉ် အတွင်း)
ဦးလှမြင့်	- ကျေးရွာနှင့် ဆေးပေးခန်းကြားရှိ လမ်းကို ကွန်ကရစ်ခင်းပေးရန် တောင်းဆိုခဲ့ပါသည်။	- လုပ်ဆောင်ပြီး (ၿငိုးပြင်ဆင်ထားသော EIA တင်ပြနေစဉ် အတွင်း)

ကုမ္ပဏီသည် ဒေသခံ လူထုနှင့် ကောင်းမွန်သော ဆက်ဆံရေး ရှိကြောင်း သံသယ ဖြစ်ဖွယ် မရှိပါ။ တင်ပြထားသော စီမံကိန်းကို လက်ခံသည့် နှုန်းမှာ မြင့်မှာ အလွန်မြင့် ထိ ဖြစ်ပါသည်။

၂၀၁၉ ခုနှစ် မတ်လ အတွင်း ကျေးရွာ ၃ ရွာရှိ လူထုတွေ့ဆုံ ဆွေးနွေးပွဲ ၃ ခု၏ ရလဒ် အကျဉ်းချုပ်မှာ-

<u>လူထုတွေ့ဆုံဆွေးနွေးပွဲ၏ ရလဒ်များ</u>

စဉ်	တောင်းဆိုသည့် အရာ/ ပေါ်ပေါက်လာသည့် ပြဿနာ	ကုမ္ပဏီမှ အကြောင်းပြန်ကြားချက်
၁	<u>ခဲဆန်ကျေးရွာတွင်</u> - ကျေးရွာလမ်းများ ကောင်းမွန်လာပြီး ကျေးရွာလျှပ်စစ် ယခု အချိန်အထိ မရရှိသေးပါ။	- ကုမ္ပဏီသည် လာမည့် ဇွန်လမှ အောက်တိုဘာလ အတွင်း လုပ်ဆောင်ပေးပါမည်။
၂	- ကျေးရွာအုပ်ချုပ်ရေးမှူး ရုံးခန်းကို ပြုပြင် မွန်းမံပေးရန်	- ကုမ္ပဏီသည် အုတ်နှင့် ဘိလပ်မြေကို လျှဒါန်းပါမည်။
၃	<u>လောက်ဖန်း ကျေးရွာတွင်</u> - ကျေးရွာ ဘုန်းကြီးကျောင်းကို ပြုပြင် မွန်းမံပေးရန်	- လာမည့် အောက်တိုဘာလ တွင် လုပ်ဆောင်ပေးပါမည်။
၄	- စက်ရုံနားရှိ လယ်ကွင်းများမှ ပြောင်း အထွက် နှုန်း သိသိသာသာ လျော့ကျသွားမှုကို ထည့်သွင်းစဉ်းစားပေးရန်	- စိုက်ပျိုးရေး ပညာရှင်များ၏ အကြံဉာဏ်ကို ရယူပြီး ဆောလျင်စွာ ဖြေရှင်းပေးပါမည်။

၅	- ကျေးရွာ၏ တောင်ဘက်ပိုင်းရှိ အမှိုက်ပုံကို ဖယ်ရှားပေးရန်	- စက်ပစ္စည်းကြီးများ၏ အကူအညီဖြင့် အမှိုက်ပုံ အသစ်ကို ချက်ချင်း ဆောက်လုပ်ပါမည်။
၆	<u>လယ်ကြီးတော ကျေးရွာတွင်</u> - ကုမ္ပဏီကုန်ကားမောင်းများကို ကျောင်းသား ကလေးများ ဘေးကင်းရေး အတွက် အရှိန်လျော့ပေးရန်	- ယာဉ်မောင်းများကို ထပ်မံ၍ သတိပေးခြင်း သို့မဟုတ် ၎င်းတို့ကို အပြစ်ပေးခြင်းများ လုပ်ဆောင်ပါမည်။
၇	- ယခင်က ချောင်း ၅ ခုရှိခဲ့သော်လည်း ယခုအခါ ချောင်း ၃ ချောင်း သာ ကျန်ရှိနေသောကြောင့် ခြောက်သွေ့သော လများ အတွင် ရေပြဿနာ ရှိပါသည်။	- ရေကားများသည် ရေကို ဖြန့်ချိပါမည်။ (ကာလတို အစီအစဉ်) - နှစ်ရှည် စမ်းရေကန်များကို ရွေးချယ်ပြီး ကျေးရွာအတွက် ရပ်ရွာရေကန်ကို ထပ်မံ၍ တည်ဆောက်ပါမည်။
၈	- ဘုန်းကြီးကျောင်းကို တည်ဆောက်ရန်	- ပြည်ထဲရေး ဝန်ကြီးဌာန၏ ခွင့်ပြုမိန့် လိုအပ်ဆဲ ဖြစ်ပါသည်။
၉	နေအိမ် တစ်ချို့သည် ယခု အထိ လျှပ်စစ်မီး မရရှိသေးပါ။	- ကြိုးအဟောင်းများသည် ဝန်ပိုကို ခံနိုင်စွမ်း မရှိပါ။ ကြိုးအဟောင်းများကို ပိုမိုကောင်းမွန်သော အသစ်များဖြင့် လဲလှယ်ရန် အစီအစဉ် ရှိပါသည်။ ၎င်းသည် ကျောက်မီးသွေး လျှပ်စစ်ဓါတ်အားပေးစက်ရုံ လည်ပတ်ပြီးနောက်ဖြစ်ပါသည်။

နိဂုံးချုပ်အနေဖြင့် ကုမ္ပဏီသည် ၎င်းကျေးရွာများ၏ ကျေးရွာသားများနှင့် အလွန်ကောင်းမွန်သော ဆက်ဆံရေး ရှိပါသည်။ အကြောင်းပြချက်မှာ ရိုးစင်းပါသည်။ ကုမ္ပဏီသည် ၎င်းဇရိယာ တစ်ခုလုံးအတွက် CSR အစီအစဉ်ကို အကောင်အထည်ဖော် လုပ်ဆောင်ရန် ကျပ် ၉၈၉,၀၈၉,၇၅၀ သုံးစွဲခဲ့ပြီး ဖြစ်ပါသည်။

အစည်းအဝေး အတွင်း ကျေးရွာသား အများစုသည် ၎င်းတို့၏ ကျေးရွာ အခြေခံ အဆောက်အအုံ လမ်းပန်း ဆက်သွယ်ရေး၊ ကျေးရွာ လျှပ်စစ်မီး ရရှိရေး နှင့် ရပ်ရွာရေကန် အစရှိသဖြင့် ၎င်းတို့၏ အမြင်များကို ဖော်ပြခဲ့ပါသည်။

ဒေသခံများ စီမံကိန်းများ (ဘိလပ်မြေ စက်ရုံ ၂ ရုံ နှင့် ကျောက်မီးသွေး လျှပ်စစ်ဓါတ်အားပေးစက်ရုံ) လက်ခံသည့် နှုန်းမှာ မြင့်ပါသည်။ ကုမ္ပဏီနှင့် ဒေသခံ လူထုကြား ကောင်းမွန်သော ဆက်ဆံရေး ရှိပါသည်။ အမှန်တကယ်မှာ ၎င်းတို့၏ အမြင်တွင် ကုမ္ပဏီသည် ၎င်းတို့၏ ကြီးမားသော အကျိုးပြုသူအဖြစ် ရှုမြင်ကြပါသည်။

နိဂုံး

ဤစီမံကိန်း၏ ကောင်းကျိုးဆိုးကျိုးများအားလုံးကို ထည့်သွင်းစဉ်းစားပြီး နိဂုံးချုပ်ရေးသားခြင်း ဖြစ်သည်။ ဤစီမံကိန်းသည် တိုင်းပြည်၏ GDP တိုးလာခြင်းနှင့် အခွန်ရရှိမှုမြင့်တက်လာနိုင် ပါသည်။ အခြေခံ အဆောက်အအုံ တိုးတက်လာမှုနှင့် အလုပ်အကိုင်ရရှိရေး အခွင့်အလမ်းများလည်း တိုးလာနိုင်ပါသည်။ နည်းဥပဒေများ၊ စည်းမျဉ်းများနှင့် မဖြစ်မနေဆောင်ရွက်ရမည့် လိုအပ်ချက်များနှင့် ဖြေလျော့နိုင်မည့် နည်းလမ်းများအားလုံးကို သေချာလိုက်နာလျှင် စီးပွားရေးအလားအလာနှင့် ပတ်ဝန်းကျင်ဆိုင်ရာ စဉ်ဆက်မပြတ်စေရန် ထိန်းသိမ်းထားနိုင်ပါသည်။

ငွေရည်ပုလဲဘိလပ်မြေကုမ္ပဏီလီမိတက်သည်-

- နည်းဥပဒေများ၊ စည်းမျဉ်းများနှင့် မဖြစ်မနေဆောင်ရွက်ရမည့် လိုအပ်ချက်များကို လိုက်နာပါမည်။
- အစီရင်ခံစာထဲတွင် ဖော်ပြထားသော ဖြစ်နိုင်ခြေရှိသော သက်ရောက်မှုအားလုံးကို လေ့လာရန်နှင့် အာရုံစိုက်ပြီး အစီရင်ခံစာထဲတွင် ဖော်ပြထားသော ဖြေလျော့နိုင်မည့် နည်းလမ်းများအားလုံးကို လိုက်နာဆောင်ရွက် ပါမည်။
- အစီရင်ခံစာထဲတွင် ဖော်ပြထားသော စီမံခန့်ခွဲမှုနှင့် စောင့်ကြပ်ကြည့်ရှုလေ့လာမှု အစီအစဉ်ခွဲများပါဝင်သော ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်(EMP)ကို ဆောင်ရွက်ပါမည်။
- စီမံကိန်းပြီးစီးဆောင်ရွက်ပြီးနောက် ပြန်လည်ရှင်သန်ခြင်း အစီအစဉ်ကို တာဝန်ယူ ဆောင်ရွက် ပါမည်။

1. EXECUTIVE SUMMARY

This is the second amended Environmental Impact Assessment (EIA) report for the construction and operation of a coal-fired thermal power plant by Ngwe Yi Pale' Cement Co., Ltd.

Ngwe Yi Pale' Cement Co., Ltd has proposed for the construction and operation of a coal-fired power plant.

At the time the project proponent was not aware of submission of proposal.

A screening on the magnitude of the proposed project, particularly its production capacity of electricity, reveals that the proposed project is in the category type that required EIA.

According to Environmental Impact Assessment Procedures, Notification No.616/2015 as prescribed by the Environmental Conservation Department (ECD) stated that coal-fired thermal plants with installed capacity $\geq$ 1 MW – to < 10 MW are in IEE criteria while those with installed capacity $\geq$ 10 MW are in EIA criteria.

In this proposed project context the production capacity for electricity will be 60 MW. Therefore, mandatory EIA is required.

Ngwe Yi Pale' Cement Co., Ltd was registered as a limited company on 3-3-2014 (Document: Certificate of Incorporation No. 5666/2013-2014; Directorate of Investment and Company Administration, Ministry of National Planning and Economic Development). The new Registration No is 130799027.

Particulars of the company are shown in the introduction of this report.

The proposed project site is located near Lauk Hpan village, Lone Yone Village Tract, Naunghkio Township, Kyauk-me District, Shan State. The coordinates are: N. Lat. 22˚ 21' 31.1"; E. Long 96˚ 42' 33.6" and the elevation is 796 masl.

The proposed site is about 1 mile south-west of Lauk Hpan village. It is inside the premise (compound) of Crown Cement Plant (Lauk Hpan) owned by Ngwe Yi Pale' Cement Co., Ltd. The total area of the Crown Cement Plant is 280 acres while the area of the proposed coal-fired thermal power plant inside the Crown Cement Plant premise is 12.3 acres.

The estimated budget is USD 10 million; the estimated construction period is 2 years. The Operation Phase is 30 years. The estimated electricity to be generated is 60 MW. The simplified main process for generation of electricity involves:

- The burning of pulverized coal powder in boiler furnace to produce steam.
- The steam at high pressure spins the turbine which is connected to the electrical generator which create electricity.

The main components of the project include:

- the main buildings and structures of the thermal plant
- administrative office and
- other associated buildings.

During the Construction Phase 92 workers including 23 Chinese technicians will be deployed. During the Operation Phase 150 employees including 14 Chinese technicians will be employed.

During the Construction Phase electricity will be sourced from existing electricity from the cement plant. The electricity generated from this proposed coal fired thermal power plant will be used for the new cement plant with a capacity of 4,000 tons/day and for the villages electrification.

The raw material coal will be procured from coal mines owned by the project proponent at Yatsaunk, Thibaw and Nantsan Township.

Limestone, another raw material to be used in small quantity will be shared with the Crown Cement factory.

Water required will be sourced from a 1,500,000 gallons water pond in the factory compound.

Presentation of the project proponent

Ngwe Yi Pale' Cement Co., Ltd is a subsidiary of Ngwe Yi Pale' Group of Companies, a conglomerate that involves in various big businesses, eg. the mining of coal, gypsum, iron bauxite, limestone and production of cement, sugar, hydroelectricity production and trees plantation and forest restoration.

Ngwe Yi Pale' Cement Co., Ltd was registered as a limited company on 3-3-2014 (Document: Certificate of Incorporation No. 5666/2013-2014; Directorate of Investment and Company Administration, Ministry of National Planning and Economic Development).

Name of the project proponent	:	Ngwe Yi Pale' Cement Co., Ltd
Address (Head office)	:	No. 157, 33rd Street, between 75th and 76th Street, Chan Aye Thar Zan Township, Mandalay Region, Myanmar
Telephone	:	02 73941, 02 30838, 09 977150337, 09 977150304, 09 977150398, 09 977150308, 09 977150313
Fax	:	02 71424

E-mail : info@ngweyipale.com

Webiste : www.ngweyipale.com

Contact person : U Lin Thein Aung (Admin Manager)

Phone : 09 977150336, 09 444002600

E-mail : lintheinaung777@gmail.com

Factory address : Lauk Hpan village, Naunghkio Township, Shan State

Objective : The production of adequate electricity for the new crown cement plant and for village electrification of the region.

Particulars of executive and administrative body

Name	Nationality & National Registration Card No.	Address of resident	Designation
U Thein Myint @ Chaung Hpin	Myanmar 13/Na Kha Na (Ei)000017	No.(415), S2, Pyay Gyi Yan Lon Quarter, Aung Myay Thar Zan Township, Mandalay	Managing Director
U Maung Shwe @ Khin Maung Shwe	Myanmar 9/Ma Kha Na (N)047737	No.101/2, Bu Kone Village, Patheingyi Township, Mandalay	Director
U Tun Win	Myanmar 9/Ma Ya Ma (N)053811	No.76, Pyay Gyi Yan Lon Quarter, Aung Myay Tharzan Township, Mandalay	Director
U Kyaw Shein	Myanmar 9/Ma Na Ma (Ei)000048	No.1/7, Theik Pan Street, Mahar Myaing Quarter, Mahar Aung Myay Township, Mandalay	Director
U Myo Myint Aung	Myanmar 13/La Ya Na (Ei)000608	Building (A), Room (G-3), Shwe Gone Thu Housing, Pan Hlaing Quarter, Kyimyindaing Township, Yangon	Director
U Hla Win @ U Shin Si	Myanmar 9/Ma Na Ma (N)122804	No.54, 78th Street, Between 29 x 30 Street, Hay Mar Zala Ward, Chan Aye Tharzan Township, Mandalay	Director

U Zaw Khaing Myint @ Kyauk Kyar Chan	Myanmar 13/Ka Ma Na (N)037294	No.73, 33th Street, Between 71 x 72 Street, Yan Myo Lon Quarter, Chan Aye Tharzan Township, Mandalay	Director
U Aung Thu Ya	Myanmar 14/Ha Tha Ta (N)013309	No.(YA/44), Yat Guat Gyi (8), Pyin Oo Lwin Township, Mandalay	Resigned From Director (w.e.f 28-1-2015)
U Sein Myo Aung	Myanmar 9/Ma Na Ma (N)098578	Wa(10-35), Thayarwaddy Mingyi Street, A-Quarter, Pyi Gyi Tagon Township, Mandalay	Appointed As Director (w.e.f 28-1-2015)

The company is 100% owned by nationals, all shareholders are nationals.

Number of the shares so allotted payable in cash - 143,385 Shares

Nominal amount of the shares so allotted - 14,338,500,000 Kyats

Amount paid or due and payable on cash such share - 100,000 Kyats

Presentation of the environmental and social experts

Myanmar Environment Sustainable Conservation, MESC is a consultant firm officially registered in 2014 as a limited company (a consultant/service company) at the Ministry of National Planning and Economic Development. Document: YaKa-8(Ga) 001/2014(004720), dated: 6th June, 2014. Registration No. 830/2014-2015, (20-5-2014). The new company registered number is 110649193.

The Transitional Registration/License No. of the consultant firm, MESC is No. 0003, ECD, Dated 1st July 2017.

Contact Address : Room no. (B -5), Building no.67/69, Parami Road, 16 Ward, Hlaing Township, Yangon Region

Contact person : Myint Kyaw Thura

95 9 420105071

Contact number : 95 9 73044903

E-mail : myanmar.esc@gmail.com

Facebook website : www.myanmar environment sustainable conservation.com

Members of MESC who are IEE/EIA appraisers, or IEE/EIA practitioners or who are involved in this IEE/EIA project are as follows:

Name	Nationality & National Registration Card No.	Registration/license No. by ECD	Designation
U Myint Kyaw Thura M.Sc (Zoology)	Myanmar 12/Da Ga Ta (N)028349	0006	Managing Director, Biodiversity Specialist (Fauna), EIA practitioner and EIA Appraiser
U Saw Han Shein B.Sc (Botany) M.Sc (Marine Biology)	Myanmar 10/Ma La Ma(N)008173	0007	Retired Professor, EIA Practitioner and Appraiser
Dr. Thiri Dawe Aung Ph.D (Zoology)	Myanmar 12/Da La Na (N) 029433	0008	Biodiversity Specialist (Ornithologist)
U Tin Tun Aung B.Sc (Engineering)	Myanmar 12/U Ka Ma (N)172111	0009	Engineer and EIA practitioner
Daw Khin Nhwe Naing M.Sc (Botany)	Myanmar 9/Pa Kha Ka (N)001252	00010	Biodiversity Specialist (Flora), Environment Researcher
U Than Soe Oo M.Sc (Forestry)	Myanmar 9/Ma Na Ma (N) 050808	00011	EIA practitioner
U Oakka Kyaw Thu B.Sc (Geology)	Myanmar 7/Ya Ta Ya (N) 090371	00012	Geologist
Daw Thin Thin Yee B.Sc (Chemistry)	Myanmar 12/Tha Ga Ka (N)039292	00013	Chemical Environment Researcher, Computer Programmer

- U Myint Kyaw Thura is involved in fauna study, EIA practitioning and appraising and writing of report, in part.
- U Saw Han Shein is involved in EIA practitioning appraising and report writing (chief report writer).
- Dr. Thiri Dawe Aung involved in avifauna study writing part of report.
- U Tin Tun Aung is involved in the EIA practitioning and aspects of the report and provision of information, data and facts and writing part of the report.
- Daw Khin Nhwe Naing is involved in flora study and writing report, in part.

- U Than Soe Oo is involved in EIA practitioning and part of the report writing especially on the socio-economic aspect,
- U Oakka Kyaw Thu is involved in the geological and geographical aspects by conduction desktop survey and gathering of secondary information on local geology.
- Daw Thin Thin Yee is involved in the physical aspects, especially ambient air, water quality, noise and vibration and soil etc and compilation of data on the physical components; including secondary information on weather.

Actually members of MESC always work together wholly as a tight-knit group in writing of each and every EMP/IEE/EIA report. Discussion, consensus building, cooperation and coordination are the principle and norm of the consultant firm.

MESC has also part time members working as free lances.

The firm is not in a position to employ all its part time members on a permanent basis.

These are botanists, zoologists, ornithologists, ecologists, aquatic ecologists, social scientists, medical officer (doctor), engineers and geologists working with this firm.

For the physical and chemical environmental studies MESC has to hire experts, say for example, from the Health Department and from registered laboratory in Yangon. Since portable test kits are sometime not reliable, experts from the Health Department have to be hired for the analysis of air quality. Experts from a registered laboratory were hired for the analysis of water (or samples have to be sent to the laboratory).

Members of MESC have quite a lot of experiences with IEE, EIA and SIA works.

So far, starting from 2014 MESC has been involved in IEE, EIA, SIA and EMP projects: such as limestone minings/quarries; gold and copper minings; tin and tungsten minings; coal minings; cement factories; Iron and steel factory; hotel and housing projects; fuel storage tank farms; fuel storage and distribution terminal; cigarette factory, paper factory, electronic parts factory, ear-phone factory, saw mill/lumbering project, motorcycle and spare parts factory, sugar factory, hydro power electricity project, coal fired thermal plant, water boom park, zip line project, seed processing plant, specific taxonomic and ecological study of herpetofauna, specific biodiversity and ecological survey of forest and parts etc projects.

MESC is now involved in the on-going project such as private hospital project, biomass power plant, assembly and installation of lifts, escalators and elevator, transmission line, shopping center project, villa project, aquaculture project, industrial factory complex project, assembling/marketing car projects, concrete transmission poles, soft drinks and drinking water and sugar mill. Some members have also participated in road construction (air quality) project, herpetological survey in association with foreign experts.

Ngwe Yi Pale' Cement Co., Ltd has contracted the consultant firm, Myanmar Environment Sustainable Conservation Co., Ltd (MESC) to conduct EIA and prepare this EIA report.

The water required for the two cement plants and the proposed coal-fired power plant is sourced from a streamlet originating from a perennial underground spring. If availability of water becomes an issue water will be sourced from Nant Pan Si stream (chaung) 3 miles in the southeast.

The spring, the streamlet and Nant Pan Si stream are actually the one and same water course.

Summary of EIA activities

The activities undertaken by MESC for EIA works included site survey including designated areas, data and information (both primary and secondary) collection and recording and the subsequent analysis work.

The EIA conducted by MESC team covered all the four phases of the project, namely, the Preconstruction Phase (Planning Phase), the Construction Phase, the Operation Phase and the Decommissioning Phase/Rehabilitation Phase. Emphasis was given on the Construction and Operation Phase. The potential impacts, both negative and positive, were predicted, identified and assessed and mitigation measures to be put in place for all negative impacts were prescribed.

The Environmental Management Plans (EMP) together with Monitoring Plan (MP) was drawn up and implementation of the plans was described. A public hearing and public consultation was also held.

The EIA report was prepared and written according to the guidelines, the procedures and the format prescribed by the Environment Conservation Department, Ministry of Natural Resources and Environmental Conservation (MONREC).

The project alternatives

The proposed site is inside the 280 acres premise of crown cement plant. The purpose of implementing this project is to provide adequate electricity to the new cement plant. So there will be no better alternative location for the implementation of this project. This coal-fired power plant will provide adequate electricity for another crown cement plant with a capacity of 4,000 tons Portland cement per day which is in the process of construction.

Other alternatives, namely, reorientation alternative, technology alternative, demand alternatives, input or supply alternative, activities alternative, mitigation alternatives, EMP alternative and lastly "no go alternative" or "no project alternation" are also briefly described in Chapter-3.

Environment to be affected by the project

There are 3 villages in the near and far vicinity: Lauk Hpan is 1 mile in the northeast, Khe San village is about 2.1 miles in the southeast and Lei Gyi Taw is about 2.2 miles in the southeast.

The land use of Naunghkio Township is as follows:

(a)	Cultivated land (acreage)	-	174,473 acres
	Paddy field	-	14,925 acres
	Farmland	-	144,295 acres
	Crude farm (Kaing)	-	1,399 acres
	Garden/orchard	-	13,854 acres
(b)	Fallow land	-	16,829 acres
(c)	Industrial land	-	925 acres
(d)	Residential area (city)	-	881 acres
(e)	Residential area (village)	-	6,012 acres
(f)	Other land	-	19,265 acres
(g)	Reserved forest/Protected area	-	145,970 acres
(h)	Virgin forest	-	425,066 acres
(i)	Virgin land	-	1,569 acres
(j)	Uncultivable land	-	19,002 acres

The Naunghkio Reserved Forest is about 1.43 miles south of the site. The forest is greatly degraded.

There is no known Rural Development Plan, Agricultural Development Plan, Infrastructure Development Plan etc. at the local Regional/State and union levels for this area. Certain INGO groups come and go to certain parts of Naunghkio Township but not at this area.

Summary of infrastructure and services, socio-economic aspects, livelihood and income and health

All 3 villages are within 7-8 miles from the Mandalay-Lashio Highway and Mandalay-Lashio Railway. Lauk Hpan Village is about 1 mile northeast, Khe San is about 2.1 miles in the southwest and Lei Gyi Taw is about 2.2 miles southeast of the project site.

Infrastructure and services of the three villages

Sr. No.	Infrastructure and services	Lauk Hpan	Lei Gyi Taw	Khe San
1.	Accessibility-motor road	√	√	√
2.	Access to electricity (provided by Ngwe Yi Pale' Co., Ltd)	√	√	√
3.	Water (sources)	3 Tube wells & (community water pond by the Co.)	from 3 natural springs	Mostly shallow wells; 12 tube wells.
4.	Education facility (school)	Affiliated middle school	Primary school	Primary school
5.	Health facility clinic	One village clinic	×	One village clinic
6.	Village library	×	×	×
7.	Government building/public building	×	×	×
8.	Police station/sub-station	×	×	×

Note: No access to gridline electricity; village electrification provided by the company. At Lauk Hpan 100% household use electricity for cooking while in the two other villages the uses of electricity and fuel wood are 50% and 50%.

All three villages are accessible by motor roads, but there are few vehicles (9 at Lauk Hpan, 8 at Lae Gyi Taw, and 40 at Khe San, mostly light trucks). The only town in the area is Naunghkio Town, about 6 miles in the south east.

Basic Socio-economic aspects

Sr. No.	Socio-economic aspects	Lauk Hpan	Lei Gyi Taw	Khe San
1.	Population	548	280	455
	Male	222	137	219
	female	326	143	236
2.	Households	124	62	96
	Houses	118	57	91
3.	Religion (%)			
	Buddhist	100%	100%	100%
	Christian	-	-	-
	Other	-	-	-
4.	Ethnicity %			
	Bamar	5%	20%	-
	Shan	90%	-	100%
	Shan (Danu)	-	80%	-
	Gurkhas (Shan & Shan Danu are the majority)	5%	-	-
5.	Education			
	Literacy rate (adults) %	80%	60%	85%
	Schools	Middle school	Primary school	Primary school
	Teachers	12	3 (two teachers appointed by the company)	5
	Students	60	26	57
6.	Living conditions			
	Wooden house	Mostly wooden houses (corrugated iron roofing)	Mostly wooden houses (15-thatched roof)	Mostly wooden houses (corrugated iron-roofing)
	Brick houses (2-storeyed)	17 Nos.	1 Nos.	30 Nos.
	Bamboo houses	×	×	×
7.	Material possession (% household)			
	Cars (private)	4 Nos.	2 Nos.	10 Nos.
	Truck (pick up or light truck)	5 Nos.	6 Nos.	30 Nos.
	Trawler-G	-	3 Nos.	-
	Motorcycle (% of household)	100%	100%	95%
	Television (% of household)	90%	90%	85%
	Hand phone(% of household)	100%	100%	100%

Note: From visual inspection survey and KII secondary data.

Livelihood and income

Sr. No.	Livelihood and income	Lauk Hpan	Lei Gyi Taw	Khe San
1.	Livelihood/occupation (percentage of households) Farmers (Mostly Taung Yar farming or Yar farming; few paddy fields)	80%	75%	75%
	Main crops Maize	√	√	√
	Sugar cane	√	√	√
	Rice (Taung Yar rice)	√	√	√
	Peanut	√	√	√
	Sesame	√	√	√
	mustard	√	√	√
2.	Seasonal job/odd job	20%	25%	25%
	Employed by the company (Nos.)	2	1	2
	Government services (Nos.)	1 (teacher)	-	1 (nurse)
3.	Seasonal Income per household (crops farming) Lowest Income (range) per household	10-15 lakhs	10-15 lakhs	10-15 lakhs
	Highest Income (range) per household	90-150 lakhs	80-100 lakhs	100-150 lakhs
	Daily wages	Ks 4000 (F) Ks 5000 (M)	Ks 5000 (F) Ks 6000 (M)	Ks 4000 - 5000

Summary of health

Health aspects

Sr. No.	Health status (Parameters)	Lauk Hpan	Lei Gyi Taw	Khe San
1.	Health status (general)	Low	Low	Low
2.	Health facilities			
	Village clinic	√	×	√
	Private clinic (the company clinic)	√	×	×
	Health service personal			
	- nurse	×	×	×
	- mid wife	1	×	1
	- other health worker	×	×	2
3.	Data on			
	- mortality	NA	NA	NA
	- morbidity	NA	NA	NA
	- HIV/AIDS	NA	NA	NA
4.	Health issue			
	Malaria (not totally eradicated yet)	√	√	√
	Cholera	√	√	√
	Seasonal diseases (mostly cough, cold, headache etc)	√	√	√

Note: A sub-Township Hospital at Thone Hse Village and Township Hospital in Naunghkio Town for serious cases. Up to 2016 Malaria was widespread; but now still not yet totally eradicated.

Records of cases of patient undergoing treatment at the three clinics, namely, at Lauk Hpan, Khe San and at the company clinic.

- 984. Cases at Lauk Hpan village clinic. (The company has donated in cash and kinds)
- 372. Cases at Khe San village clinic. (The company has donated in cash and kinds)
- 3381 cases at the company's clinic. (All patients, both employees and locals are treated free of charge)

People from different small villages and hamlets eg. Pan Ti, Nam Ke Aik etc, who have undergone treatment at these three clinics are treated free of charge. The total number of patients (employees plus locals) recorded, so far, are 6443. It is not possible to determine whether the patients are the results of impacts from these three projects or not. It is not possible to determine whether diseases are caused by drinking water or eating crops impacted by the project.

The common illness/ailment are:

Cold, cough, headache, body ache, lumbago, injuries at work places (at farm works), diarrhea, abdominal pain, eye infection, tooth ache, pregnancy, diabetes, skin diseases, allergy, food poison, dizziness, general weakness, etc. the most common cases at the two village clinics are injuries at workplaces such as farm works. The common cases at the company's clinic are colds, coughs, headaches.

As the proposed thermal plant is inside the premise of an established cement plant (crown cement plant) there is no need for selection of new site and clearing of forest and land for the site. The impact on natural biodiversity is almost zero.

The project is not expected to have significant or irreversible negative environmental impacts during the Construction Phase or Operation Phase.

Impact of the construction will be typical of all large scale construction (civil work) activities, short term, transient and limited to the project.

Impacts during the long term Operation Phase will be mainly on the air environment and land environment of the local area as fly ash, down ash and slag are generated. However these can be effectively mitigated to a great extent. Flue gases from the boiler include heavy metals, dioxin, furans, PM, NO_x, SO_2, HCl, CO, CO_2 etc. But modern technology can mitigate or minimize or even eliminate all these pollutants. It is said that many modern thermal power plants today are so clean that more dioxins and other air pollutants are released from home fire places and back yard barbecues than from power plants. Due to stringent regulations incinerators are no longer significant in term of emission of dioxin, dust and heavy metals.

Environmental policy, legal and institutional frame work

This chapter encompasses the national environmental policy, the corporate environmental policy of the company, relevant Myanmar Laws to be complied with by the company, list of international and regional conventions related to the environment; institutional frame work of NECCCCC and ECD which is responsible for EIA; IFC standards for environmental and social sustainability, EHS standards and guidelines, National Environmental Quality Emission Guidelines (NEQEG) prescribed by ECD and international standards and guidelines for coal thermal plant.

40 laws, rules and regulation are listed. These are described in relative detail as practical as possible. Emphasis is given on Environmental Policy of Myanmar, some excerpts from relevant laws and the National Environmental Quality Emission/effluent Guideline (NEQEG) and Environmental Health and Safety (EHS) regarding the implementation of the project.

Description of the project

The description of the project in relative details is in Chapter 3. This chapter covers project background, objectives, title of the project, Project location, over view map and layout, project implementation time schedule, details description of the project covering installation and infrastructure, main components (together with photographs), machinery and equipment (together with photographs), technology applied and production process and other detail aspects such as budget, staff, working hours, water, electricity and fuel consumption etc. The project alternative is mentioned at the end of this Chapter-3.

Emphasis is given on technology, especially process in the generation of electricity power, cooling and almost total recirculation of water, management of emission and wastes and uses of raw materials and resources and their management.

Solid fuel (pulverized coal) and Fuel Gas Desulphurization (FGD) agent limestone ($CaCO_3$) are used. Circulating Fluidized Bed Combustion Boiler (CFBCB) type, 240 tons capacity is deployed. Steam turbine (60 MW) and turbine generator (60 MW), cyclone separator and FD fans are also involved. For mitigation of PM the Electrostatic Precipitator (ESP), in combination with a series of 7 bag filters are deployed. Mitigation for SO_2 and NO_x is also described.

For cooling and recirculation of water a close circuit cooling and recirculation system is applied involving the application of a cooling tower of 2,500 tons capacity and accessories, turbine condenser and deaerator.

The water treatment in the first place for demineralized water and softener involves the uses of mechanical filter and zeolite softener, Reverse Osmosis (R.O membrane system) and mixed bed (Cat-ion+ Anion) Region system. (Natural raw water is not used).

The next survey was conducted from 9-3-2019 to 13-3-2019.

These are described in relatively technical details in this Chapter-3.

Description of the surrounding environment

Chapter-4 deals with the description of the surrounding environment in detail, encompassing: methodology; the physical components of the environment (climate, weather, meteorology, basic geology, soil, ambient air, water quality etc); biological components of the environment (cultivated plants and natural flora and fauna); socio-economic components (land uses, basic demography, local economy, main occupations, education, health and other aspects); brief cultural/religious components and visual components of the surrounding environment.

As the proposed site is inside the compound of crown cement plant where vegetation was already cleared since 2013 the potential impact on biodiversity is negligible as there is little biological component remains in the cement factory compound to be impacted.

Information/data on meteorology (temperature, rainfall, humidity) are secondary data obtained from Meteorological Department. Information on local geology is also secondary data.

Data on ambient air, water, soil as well as data on biological components are all primary data, collected during the survey. Data on air, water, noise etc are compared with NEQEG Guideline values.

Data on socio-economic and cultural components comprised both secondary and primary data. These are gathered through conducting interviews such as Key Informant Interview (KII) and Focal Group Discussion (FGD). Household Interview (HHI) not conducted, since this not a standalone Social Impact Assessment (SIA) report.

Information or visual component is obtained through visual inspection.

As regard biodiversity, 212 species of natural flora and 68 species of artificial flora (cultivated plants) are recorded. As for fauna 109 species of birds, 8 species of herpetofauna and 5 species of mammals are recorded (mostly small rats and squirrels).

There have been significant impact on the flora (forest) of the area and this has nothing to do with the project (it was owing to the cement plant project such as the clearing of land 280 acres for cement project and quarry activities in the south).

Risk and impact assessment

Risk and impact assessment are made following pragmatic approach method.

Risk assessment is the work of expertise, mathematicians, statisticians, computer programmers and specialists, medical scientist, engineers etc and the works involves the application of models, mathematical models, computer models, complex equations and formulae etc. In other word it is purely academic in nature or pure research in nature and, therefore, beyond the scope of this EIA study which emphasizes on environmental aspects.

The criteria for risks and impacts depicted earlier in tabulated forms are in one way or another pragmatic assessment of real and potential impacts which can be construed as (or which is tantamount to) assessment of hazards and risks.

In this proposed project context the pragmatic method, namely, Experts Judgement Method/Experts Consensus Method or Ad hoc method is applied. And this based faminly from IFC table of risk assessment, (likelihood against consequences).

In other work, the simple matrix method of probability x consequence is applied and the risk scoring (result) is moderated through Expert's Consensus.

Probability (1 – 5) X Consequence (1 – 5) = Scoring (moderated by Expert's Consensus when/where necessary.

Risk rating matrix

Actual risk outcome					
Low (1-3)	Moderate (4-6)		High (8-12)		Extreme (15-25)
Consequence	Likelihood				
	Rare 1	Unlikely 2	Possible (moderate) 3	Likely 4	Almost certain 5
Catastrophic (Extreme) 5	5	10	15	20	25
Major (High) 4	4	8	12	16	20
Moderate (Medium) 3	3	6	9	12	15
Minor (Low) 2	2	4	6	8	10
Negligible 1	1	2	3	4	5

Note: - Consequence x Likelihood=actual outcome

- Red: avoid, control, mitigate;
- Yellow and orange: control, mitigate;
- Green: accept/assume

Actual risk outcomes are categorized into 4 levels:

Low - (Scoring 1-3)

Moderate - (Scoring 4-6)

High - (Scoring 8-12)

Extreme - (Scoring 15-25)

Note: - This simple, pragmatic and straight forward matrix method is selected for assessment of impact and risk.

Impacts

The two potential negative impacts anticipated and identified during the Preconstruction Phase (Planning Phase) are:

- Instigation by activists that can lead to polarization of locals into pro-project group and anti project group and
- The hiking of price of land and property by opportunistic speculators.

Actually none of these impacts have occurred.

The eight negative/potential negative impacts identified during the Construction Phase are:

- Mobilization and preparation activities and storage of building materials
- Impact on air environment
- Impact: noise and vibration
- Impact on soil
- Impact of waste disposal
- Potential accidents in work place
- Potential social issue and
- Potential security issue

Actually all these impacts are temporary or transient (only during Construction Phase); after completion of construction all impacts has ceased.

The eight negative/potential negative impacts anticipated and identified during the Operation Phase are:

- Impact on air environment
- Impact: noise and vibration
- Impact of waste disposal (solid and liquid waste)
- Occupational health and safety
- Potential impact on traffic
- Potential social impact
- Potential security issue and
- Potential visual impact

The three potential negative impacts identified during the Decommissioning Phase are:

- Dismantaling, demolishing and clearing impact (decommissioning impact)
- Potential residual impact
- Potential impact on air environment

Mitigation measures

Mitigation measures to be taken during the Construction, Operation and Decommissioning Phase are summarized in the following tabulated form.

(EMP cell leader, cell members, and specially trained staff are responsible for implementation of EMP and taking mitigation measures)

During the Construction Phase

Sr. No.	Impact	Mitigation measures (out line)
1.	Mobilization and preparation activities	- Do not clear vegetation more than necessary. - Have a logistics plan for heavy trucks and machinery; restrict the movements of trucks. - Plan to prevent the spilling of building materials outside the site. - Fence the site for the factory or office. - Plan for systematic storage of all building materials.
2.	Impact; dust and smoke	- Manage dust and smoke. - Comply with NEQEG guidelines of ECD. - Do not clear the ground more than necessary. - Avoid open burning of debris. - Suppress dust with water spray. - Restrict vehicular movements, reduce the speed. - Stop earth work or loading and unloading of earth, sand when strong wind is blowing. - Limit open stockpiles of earth, sand and lime powder. - Minimize drop height when loading and unloading earth and other loose materials. - Plant fast growing trees to trap dust. - Procure equipment and vehicles that are eco-friendly. - Keep equipment and vehicle well-maintained and well-operated. - Provide adequate PPEs.

3.	Noise and vibration	- Procure eco-friendly equipment and vehicles, eg. low noise level ones. - Restrict noise to working hours only (no construction work at night). - Install silencers on certain machinery. - Switch off or throttle down equipment during idle hours. - Limit/restrict the movement and speed of vehicles. - Keep equipment and vehicles well maintained and well-operated. - Manage vibration (of machinery, vehicles); provide suitable foundation; ensure smooth surface of road for mitigation of vibration. - Provide PPEs.
4.	Impact on soil	- Do not clear the ground more than necessary. - Avoid unnecessary destruction of soil profile. - Separate top soil from sub-soil (separate stockpiles); top soil for revegetation; sub-soil for construction. - Keep stockpiles from physical disturbance (wind, water). - Prevent soil erosion and siltation. - Prevent wash water from carrying earth and materials into drainage system. - After construction work, resurface and stabilize exposed ground. - Do not keep the ground bare for long period during wet season. - Rake and restore soil compacted by vehicles or machinery. - Avoid fuel oil spill on soil; remove the spill immediately; do not wash down with water but use absorbent; collect used oil in old drums and dispose. - Train workers for handling of fuel and cleanup of spills.
5.	Waste disposal (solid waste, construction tailings, debris)	- Avoid open burning of debris. - Dump waste at approved landfills. - Educate and train workers for goodhouse keeping. - Put up left over construction materials for sale. - Hire a contractor for tidying up the site after completion of construction work. - Discipline workers for good housekeeping practice.

6.	Potential accident at work place	- Create safety working conditions. - Try to achieve zero accident. - Set up "safety first" signages. - Train workers for good working practice and good safety practice. - Educate them for good health practice and hygiene. - Prohibit the drinking of alcohol during working hours. - Have a plan for emergency response. - Provide first aid traing and firefighting training. - Cover the building/structure with netting to prevent falling of debris, foots. - Provide adequate PPEs. - Provide adequate first aid kits well-stocked with medicine. - Provide adequate firefighting facility. - Organize mock drills and rehearsals. - Display phone numbers of Red Cross Society, Ambulance Service, Fire Brigade, Police Station, Naunghkio Township Hospital. - Take out insurance for the company; also take out fire insurance.
7.	Potential social issue	- Avoid the potential negative impacts on the socio-economic life of the locals. - Maintain good relation with the locals. - Conduct public consultations from time to time; heed to their voices. - Educate workers for appropriate behaviours when dealing with locals. - Manage misbehaviour and social illness of workers. - Keep separate dormitories for male and female workers. - Ask the construction contractor to discipline his workers. - Apply punitive actions for wrong doer. - Prohibit the drinking of alcohol during working hours; ban the use of narcotics. - Prevent all kinds of quarrals and brawls. - Train workers for good housekeeping. - Avoid damage to local infrastructure, water resources and potential disturbances to the locals.

8.	Potential security issue	- Manage the security of site. - Wall or fence the site. - Control all accesses; set up gates and deploy security guards. - Do not let workers enter the neighbouring village without pre-authorization. - Do not let them mingle freely with locals (Construction Phase only). - Keep certain materials under lock and key. - Ask the building contractor to discipline his workers (construction phase only). - Take punitive actions for wrong doer.

During the Operation Phase

Sr. No.	Impact	Mitigation measures (out line)
1.	Impact on air environment	- Manage dust and smoke. - Comply with NEQEG guideline values (PM_{10}: 50; $PM_{2.5}$: 25; NO_x: 200; SO_2: 20 µg/m^3 etc) <u>For fugitive emission</u> - Avoid open burning of debris. - Spray water for dust suppression. - Restrict vehicular movements, maintain road clear of dirt. - Cover load with tarpaulin during transportation. - Stop loading and unloading of coal and lime for a while when strong wind is blowing. - Limit open stockpiles of coal and lime powder - Minimize drop height when loading and unloading of above-mentioned materials. - Plant fast growing trees to trap dust. - Procure equipment and vehicles that emit less smoke, in the first place. - Keep equipment and vehicle well-maintained and

		well-operated and well-lubricated. - Use low sulphur fuel oil. - Provide adequate PPEs. - Heed to complaint of the locals regarding dust and smoke. <u>For point source emission</u> - Pulverized coal and limestone in the first place (for FGD SO_2) - Install Electrostatic precipitator (for PM) - Install series of bag filters (for PM); 7 bag filters at boiler vicinity - Apply complete combustion method (for NOx) - Install flue gas analyzer for continuous monitoring - Creation of green belt for sequestration of CO_2.
2.	Noise and vibration	- Comply with NEQEG guideline by ECD (70dBA day and night). - Procure equipment and vehicles that emit lower noise level, in the first place. - Restrict the movements of vehicles - Restrict noise to working hours, if possible. - Install silencers on certain noisy machinery. - Create green belt; trees abate noise (already done; 137257 trees planted.) - Build the crusher house underground to mitigate noise and dust; apply remote control system. - Install wall (acoustic enclosure) or acoustic barrier for noisy equipment, if any; place noisier equipment further away from other, if possible - If possible avoid operation of all equipment at the same time - Modified old vehicle and equipment to reduce noise - Keep instrument, and vehicle well-mainted; can reduce noise level by more than 50%

		- Design the foundation of machinery to reduce vibration; install vibration absorber, shock absorber, if necessary - Reduce the speed of heavy truck; ensure the smooth surface of road to reduce vibration - Provide adequate PPEs eg: ear muffs, ear plugs (actually not necessary- the crushing process is remotely controlled).
3.	Waste disposal (solid and liquid)	- Comply with NEQEG guideline by ECD, 2015. - Train workers in the handling of waste (solid and liquid) - Plan and manage for safe and systematic disposal - Always avoid dumping of solid and liquid waste into the open - Always avoid open burning of waste; plan for minimization of waste as practical as possible. - Consider for future reclamation, comprehensive utilization and outward transportation of wastes. (a) <u>Solid waste (industrial), for specific purpose</u> - Routinely collect ash (fly and bottom) by mechanical means (trays, conveyor belts) and store in silos. - Reuse for making bricks, for cement making, for any, for construction purpose (already done). - Separate waste into at least 2 categories: recyclable and non-recyclable. - Avoid open burning; burn in incinerator or dispose at approved landfill; avoid indiscriminate discharge by all means. (b) <u>Liquid waste (industrial)</u> - Recycle all used water; install cooling and recirculation system eg. cooling tower, condenser, etc. (this is exactly what the company has done) - Also plan for specific waste water treatment (mostly for recirculation of used water)

		- Ensure that the project does not compromise the availability of water (recirculation has solved this issue). - Assess the use of water regularly; conserve water - Harvest rain water; use storm water, if necessary <u>Waste water (domestic)</u> - Educate and train workers for minimization of the use of water - Treat water before discharge (conventional treatment) domestic waste water is simply drained into the large receiving pond, the waste water sink. - Waste water from toilet goes into septic tanks and soak tanks. - Avoid indiscriminate discharge of domestic waste water on land or into water body. - Wash vehicle and machinery only in designated area.
4.	Occupational health and safety issue	- Create safety working place. - Educate, train, supervise workers for good working practice and good safety practice. - Train workers for safety handling and operation of machinery and equipment, eg. the long run operation of boiler and other machinery - Organize induction training; provide work manual and safety manual. - Have a comprehensive plan for emergency procedure. - Provide first aid and firefighting training. - Provide adequate first aid kits. - Provide adequate PPEs. - Provide adequate firefighting equipment. - Regularly check equipment and especially electrical once for faults, leak, malfunction and fix them immediately.

		- Apply safe handling and storage of fuels and chemicals. - Take out insurance for power plant, fire insurance, workers insurance. - Avoid accidental fire and explosive by all means; safety handling and storage of fuel, coal, removal of all ignition sources. - Set up alarm system- eg. for fire, (detection of heat, smoke) for major machinery break down, for emergency shutdown. - Ensure that all workers pass a medical examination prior to being employed, - Organize drills or mock drills regularly for emergency preparedness, emergency response, emergency procedure, contingency plan, rescue plan, etc. - Display address or phone numbers of Fire Brigade, Ambulance Service, Hospital and Police Station so that everyone can see easily in case of emergency event.
5.	Impact on traffic	- Plan and manage traffic; try to achieve zero road accident as far as possible - Compliance with traffic rules and regulation. - Educate drivers for defensive driving; organize training and accident prevention class; take special care when driving near schools or place where children are present. - Schedule the logistic of vehicle; if possible avoid peak hours; avoid dangerous route, as far as possible; try to reduce traffic congestion - Set up sinage or speed limit at the intersection of main road and access road; also near school etc. - Never overload; avoid spilling of materials during transportation, cover with tarpaulin; if possible use speed control device (governors) on trucks and apply remote monitoring of driver roster to avoid overtiredness.

		- Regularly check and maintain vehicles to reduce risk of accident (no equipment malfunction, no break down) - Keep a log bog for each vehicle; have a record book and check the arrivals and departures of all vehicles. - Deploy a staff at the entrance to direct traffic and systematic parking - Ensure that the parking area can accommodate all vehicles.
6.	Potential social impact	- Prevent or minimize negative impact on socio-economic life of the local. - Build and maintain good relation with locals. - Appoint an affable staff as a liaison officer of the company to deal with the local in an affable manner. - Hold public consultation from time to time. - Set up a community consultation committee effectively impact this. - Educate the workers for etiquette, and respect the custom and tradition of the locals. - Manage misbehaviours and social illness of workers. - Keep separate housing for male and female workers (The company has separate housing for male and female workers). - Provide proper training on work place regulation and code of conducts. - Provide welfare programme (The company has a good programme). - Educate and discipline workers for conducts. - Deal with workers on a fair and square basis; not to overwork and underpaid - Take punitive action on wrong doer, eg sacking, dismissal.

		- Prohibit the drinking of alcohol during working hours; ban the use of narcotics. - Prohibit all kinds of quarrels and brawls taking place among workers or between works and locals. - Prohibit all kinds of unethical sexual practices. - Consider hiring locals in the future when there are vacant plots; prioritize the purchase of foods and commodities from local market. - Avoid impacting local drinking water sources and other resources. - Consider for gender parity; employ women workers as much as possible. - Ensure that there is no issue of child labour as far as the project is concerned. - Provide adequate sanitation eg-toilets, baths etc. - Plan and implement CSR as practical as possible
7.	Potential security issue	- Manage security of the site. - Effective fencing/walling of the site. - Control all accesses; set up security gates; deploys guards. - Do not let workers mingle freely with locals. - Do not let the workers enter the neighbouring village without pre-authorization. - Put certain materials under lock and key. - Apply punitive measures to wrong doer. - Provide ID cards for all for easy idenfication. - Provide uniform for all.
8.	Visual impact	- Execute for an operation plan which is focused on visual appeal as practical as possible. - Plant trees for reforestation, create green belt. (already done) - Use eye pleasing paints and colours for the building and structure.

		- Reserve green area as far as possible; create green zone outside the premise. (already done) - Provide appropriate lighting only for secrurity reason; avoid excessive use of light at night. - Use yellow light instead of white light at night to discourage aggregation of insects; if insect aggregate turn off the light for a while.

During the Decommissioning Phase

Sr. No.	Impact	Mitigation measures (out line)
1.	Dismantling, and clearing impact (decommissioning impact)	- Hire decommissioning contractor to do the work. - Dispose materials that are no longer useable ;redeploy or put up for sale those that are useable - Machinery and equipment that are no longer use be made into iron scrap and send to smelting mill - Put up for sale those that are still useable - Restore the ground and soil profile. - Revegetate and rehabilitate the ground, select a variety of plant species.
2.	Potential residual impacts	- Clear and remove all residuals. - Remove all soil contaminated by fuel oil. - Test the soil; ensure that no contaminant remain. - Also test the air and water in the vicinity for possible pollutants. - Restore the soil to its natural condition as practical as possible. - Revegetate and rehabilitate the area.
3	Potential impact on air environment	- Keep machinery and vehicles well-maintained, well-operated and well-lubricated - Restrict vehicular movements - Avoid open burning of any solid wastes - Provide PPEs

Cumulative impact assessment

Simply from environmentalist point of view the cumulative impacts from this project alone can be negligible as all the wastes (solid, liquid) generated are treated/managed and systematically disposed off routinely. As regards accumulative (successive) health impact on workers exposed to long hours of smoke, dust and noise the potential impact can be substantial. The company has provided adequate Personal Protective Equipments (PPEs) to these workers and regular (yearly) medical check-up are conducted.

The cumulative impact in the form of combined impact (of the existing 2 cement factories and the proposed thermal plant) is, no doubt, significant.

The so called, simultaneous cumulative impact (happening at the same time from three different sources, namely, the 1,000 tons cement factory, the 4,000 tons cement factory and this proposed coal fired thermal plant) is really significant and serious indeed, if no mitigation measured are effectively put in places. The impacts from the two cement factories are much higher.

The company has applied mitigation measures for all these factories eg. 6 ESP for all and a total of 100 bag fitters inside the premise at the three factories. (One ESP and 7 bag filters for this coal-fired Thermal plant).

The incremental cumulative impact in the form of loss of natural resources due to extraction is also briefly described. The cumulative impact on traffic from various sources (various activities from various vehicles from various sources) is briefly mentioned.

Environmental Management Plan (EMP)

Since this chapter is also the essence of the report it is described in relative detail. This chapter is elaborated into various sections, namely, executive summary in brief, brief project description, health policies and commitment, legal requirement and institutional arrangement, summary of impacts and mitigation measures, overall budget for implementation of EMP, management and monitoring sub-plan for each identified impact and contents of each such plan.

Since this is not a standalone EMP report certain sections, brief project description and summary of impacts are very briefly mentioned (in accordance with ECD format). The remaining sections are described in detail, in tabulated forms. Emphasis is given on management and monitoring sub plan (MMSP) especially mitigation measures to be taken for each subplan.

In order to effectively carry out EMP and MP the company has set up a fund. 0.5 percent of the budget equipvalent to USD 50,000 is set aside for EMP fund.

The company will, therefore, alloted the EMP fund for the 4 programmes as follow:

- 35% of the fund (US$ 17,500) for the implementation of monitoring programme (This will be mostly for hiring technicians)
- 10% of the fund (US$ 5,000) for reporting works (This will include the purchase of stationary)
- 20% of the fund (US$ 10,000) for capacity building and training (This will include the hiring of trainers and purchase of teaching or educational materials)
- 30% of the fund (US$ 15,000) for emergency programme (tentative allotment) (This will include the hiring of trainers)
- 5% of the fund (US$ 2,500) for miscellaneous expenses

The cost for taking mitigation measures such as procurement of Electrostatic Precipitator, bag filters, and other ecofriendly devices etc. will be borne by the main project budget, in the first phase.

Note: Since mitigation measures will be taken by all EMP cell members and workers supervized by them all mitigation works will be free of charge. All are well-paid staff and employees, they need not be hired.

As Monitoring Plan (MP) is integral part of EMP it is mentioned together with EMP. Parameters to be monitored and frequency for monitoring are depicted in tabulated form. Monitoring Plan also includes monitoring the effectiveness of mitigation measures taken and even the effectiveness of EMP.

In accordance with the EIA format overall and comprehensive monitoring plan is shown at the end of Chapter 6. The specific monitoring plan (Chapter 8) is shown in tabulated form below. (The EMP cell leader, cell members and specially trained staff are responsible for carrying out the plan technicians have to be hired from time to time to test air, noise level, and water and soil quality).

<u>Monitoring Plan</u>

Regular monitoring will be made during the Construction, Operation and Decommissioning Phase and the report will be submitted to ECD on a regular basis (semi-annual short report).

Summary of monitoring plan during the Construction Phase

Sr.	Components/ issue	Parameters to be monitored	NEQEG guideline values	Monitoring spot/site	Frequency	Responsible person	Cost (once off)	Remark
1	Air quality	NO_2 O_3 PM_{10} $PM_{2.5}$ SO_2 VOC	200 µg/m^3 100 µg/m^3 50 µg/m^3 25 µg/m^3 20 µg/m^3 400 µg/m^3	At construction site Coordinates: N. Lat 22º 21' 32"; E. Long 96º 42' 10",	semi-annually	EMP cell members and hired technicians	Ks 1,700,000	Technicians have to be hired
				At Lauk Hpan village Coordinates: N. Lat 22º 21' 58.29"; E.Long 96º 42' 48.17"	semi-annual	EMP cell members and hired technicians	Ks 1,700,000	Technicians have to be hired
				At Khe San village Coordinates: N. Lat 22º 20' 50.6"; E. Long 96º 40' 31.7"	semi-annually	EMP cell members and hired technicians	Ks 1,700,000	Technicians have to be hired
				At Lei Gyi Taw village Coordinates: N.Lat 22º 20' 13.83"; E.Long 96º 43' 31.29"	semi-annually	EMP cell members and hired technicians	Ks 1,700,000	Technicians have to be hire

2	Water quality	<u>Surface water</u> BOD COD pH Total nitrogen Total phosphorus Dissolved solid Oil and grease Total coliform	 50 mg/l 125 mg/l 6-9 STU 10 mg/l 2 mg/l 50 mg/l 10 mg/l 400 mg/l	At stream Coordinates: N. Lat 22º 22' 29.9"; E. Long 96º 42' 07.7" At Lauk Hpan Coordinates: N. Lat 22º 21' 58.4"; E. Long 96º 42' 45.5" At Khe San village Coordinates: N. Lat 22º 21' 08.7"; E. Long 96º 40' 24.0"	semi-annually semi-annually semi-annually	EMP cell members and hired technicians EMP cell members and hired technicians EMP cell members and hired technicians	Ks 80,000 Ks 80,000 Ks 80,000	Technicians have to be hired Technicians have to be hired Technicians have to be hired
3	Noise level	dB(A) day and night	70 dB(A)	At construction site Coordinates: N. Lat 22º 21' 32"; E. Long 96º 42' 10", At Lauk Hpan village Coordinates: N. Lat 22º 21' 58.29"; E.Long 96º 42' 48.17" At Khe San village Coordinates: N. Lat 22º 20' 50.6"; E. Long 96º 40' 31.7"	quarterly or semi-annually quarterly or semi-annually quarterly or semi-annually	EMP cell members and hired technicians EMP cell members and hired technicians EMP cell members and hired technicians	Ks 70,000 Ks 70,000 Ks 70,000	Technicians have to be hired Technicians have to be hired Technicians have to be hired

				At Lei Gyi Taw village Coordinates: N. Lat 22º 20' 13.83"; E.Long 96º 43' 31.29"	quarterly or semi-annually	EMP cell members and hired technicians	Ks 70,000	Technicians have to be hired
4	Solid waste	- monitor construction wastes and disposal - monitor trash/garbage generated and disposal	- -	At construction site Coordinates: N. Lat 22º 21' 32"; E. Long 96º 42' 10"	weekly	EMP cell members	Free of charges	-
5	Soil	- monitor contamination of soil; testing soil quality	- - -	Discharge Pond (domestic waste water sink)Coordinates: N. Lat. 22º 21' 47.6"; E. Long 96º 42' 40.6" At Lauk Hpan Coordinates: N. Lat. 22º 22' 08.2"; E. Long 96º 42' 32.3" At Khe San village Coordinates: N. Lat. 22º 21' 01.0"; E. Long 96º 40' 45.9"	semi-annually semi-annually semi-annually	EMP cell members and hired technicians EMP cell members and hired technicians EMP cell members and hired technicians	Ks 140,000 Ks 140,000 Ks 140,000	Technicians have to be hired Technicians have to be hired Technicians have to be hired

		- monitor soil erosion if any, (rainy season)		At Lei Gyi Taw Coordinates: N. Lat. 22º 20' 50.8"; E. Long 96º 43' 20.1"	semi-annually mothly	EMP cell members and hired technicians EMP cell members	Ks 140,000 Free of charges	Technicians have to be hired -
6	Occupational health and safety	- monitor OHS measures taken - monitor provision of First Aid kit and stocking of medicines and drugs - monitor Emergency Preparedness and Response plan + actions	- - -	At construction site Coordinates: N Lat. 22°21'34.00", E Long. 96°42'8.57"	monthly	EMP cell member	Free of charges	
7	Social issue, social illness	- check social illness/ill-social behavior - monitor conducts of workers - check disciplinary action taken	- - -	At construction site Coordinates: N Lat. 22°21'31.48", E Long. 96°42'9.32"	weekly and monthly	EMP cell member	Free of charges	

Summary of monitoring plan during the Operation Phase

Sr.	Components/ issue	Parameters to be monitored	NEQEG guideline values	Monitoring spot/site	Frequency	Responsible person	Cost (once off)	Remark
1	Air quality and emission	Air quality NO_2 O_3 PM_{10} $PM_{2.5}$ SO_2 VOC	 200 µg/m^3 100 µg/m^3 50 µg/m^3 25 µg/m^3 20 µg/m^3 400 µg/m^3	At coal-fired Thermal plant Coordinates: N. Lat 22º 21' 32"; E. Long 96º 42' 10"	semi-annually	EMP cell members and hired technicians	Ks 1,700,000	Technicians have to be hired
				At Lauk Hpan Coordinates: N. Lat. 22º 22' 08.2"; E. Long 96º 42' 32.3"	semi-annual	EMP cell members and hired technicians	Ks 1,700,000	Technicians have to be hired
				At Khe San village Coordinates: N. Lat. 22º 21' 01.0"; E. Long 96º 40' 45.9"	semi-annually	EMP cell members and hired technicians	Ks 1,700,000	Technicians have to be hired
				At Lei Gyi Taw village Coordinates: N. Lat. 22º 21' 01.0"; E. Long 96º 40' 45.9"	semi-annually	EMP cell members and hired technicians	Ks 1,700,000	Technicians have to be hired

		Emission (coal fuel/ boiler) NO_2 PM_{10} SO_2	 510 mg/Nm^3 50 mg/Nm^3 900 mg/Nm^3	check and monitor the continuous flue gas analyser installed Coordinates: N Lat. 22°21'35.55, E Long. 96°42'8.24"	weekly/ monthly	EMP cell members	Free of charges	-
2	Water quality/ effluent	Water quality BOD COD pH Total nitrogen Total phosphorus Dissolved solid Oil and grease Total coliform	 50 mg/l 125 mg/l 6-9 STU 10 mg/l 2 mg/l 50 mg/l 10 mg/l 400 mg/l	At Stream Coordinates: N.Lat 22º 22' 29.9"; E. Long 96º 42' 07.7"	semi-annually	EMP cell members and hired technicians	Ks 80,000	Technicians have to be hired
				At Lauk Hpan Coordinates: N. Lat 22º 21' 58.4"; E. Long 96º 42' 45.5"	semi-annually	EMP cell members and hired technicians	Ks 80,000	Technicians have to be hired
				At Khe San village Coordinates: N. Lat 22º 21' 08.7"; E. Long 96º 40' 24.0"	semi-annually	EMP cell members and hired technicians	Ks 80,000	Technicians have to be hired
		Effluent Arsenic Cadmium Chromium (total) Copper Iron	 0.5 mg/l 0.1 mg/l 0.5 mg/l 0.5 mg/l 1 mg/l	At boiler blowdown Coordinates: N. Lat 22º 21' 32.9"; E. Long 96º 42' 07.6"	semi-annually	EMP cell members and hired technicians	Ks 200,000	Technicians have to be hired

		Lead Mercury Oil and grease P^H Temperature increase Total residual chlorine Total suspended solids Zinc	0.5 mg/l 0.005 mg/l 10 mg/l 6-9 SU <3º C 0.2 mg/l 50 mg/l 1 mg/l	At cooling tower Coordinates: N. Lat 22º 21' 32.9"; E. Long 96º 42' 06.4" At discharge point Coordinates: N. Lat 22º 21' 28"; E. Long 96º 42' 07"	semi-annually semi-annually	EMP cell members and hired technicians EMP cell members and hired technicians	Ks 200,000 Ks 200,000	Technicians have to be hired Technicians have to be hired
3	Noise level	dB(A) day and night	70 dB(A)	At coal-fired Thermal plant Coordinates: N. Lat 22º 21' 32"; E. Long 96º 42' 10" At Lauk Hpan Coordinates: N.Lat 22º 21' 58.29"; E. Long 96º 42' 48.17" At Khe San village Coordinates: N. Lat 22º 20' 50.6"; E. Long 96º 40' 31.7" At Lei Gyi Taw	semi-annually semi-annually semi-annually	EMP cell members and hired technicians EMP cell members and hired technicians EMP cell members and hired	Ks 70,000 Ks 70,000 Ks 70,000	Technicians have to be hired Technicians have to be hired Technicians

				Coordinates: N. Lat 22º 20' 13.83"; E. Long 96º 43' 31.29"		technicians		have to be hired
4	Solid waste	- monitor industrial wastes especially ash collection and storage at silos and reuse - monitor domestic wastes, collection and disposal	-	At coal-fired Thermal plant Coordinates: N. Lat 22º 21' 32"; E. Long 96º 42' 10"	weekly	EMP cell members	Free of charges	-
5	Soil	- monitor contamination of soil; testing soil quality	- -	Discharge Pond (domestic waste water sink) Coordinates: N. Lat. 22º 21' 47.6"; E. Long 96º 42' 40.6" At Lauk Hpan Coordinates: N. Lat. 22º 22' 08.2"; E. Long 96º 42' 32.3" At Khe San village	semi-annually semi-annually semi-annually	EMP cell members and hired technicians EMP cell members and hired technicians EMP cell members	Ks 140,000 Ks 140,000 Ks 140,000	Technicians have to be hired Technicians have to be hired Technicians

				Coordinates: N. Lat. 22º 21' 01.0"; E. Long 96º 40' 45.9" At Lei Gyi Taw Coordinates: N. Lat. 22º 20' 50.8"; E. Long 96º 43' 20.1"	semi-annually	and hired technicians EMP cell members and hired technicians	Ks 140,000	have to be hired Technicians have to be hired
		- monitor soil erosion if any, (rainy season)			monthly	EMP cell members	Free of charges	-
6	Occupational health and safety	- monitor OHS measures taken - monitor provision of First Aid kit and stocking of medicines and drugs - monitor Emergency Preparedness and Response plan + actions - check the clinic treatment record	- - - -	At the coal-fired Thermal plant site Coordinates: N Lat. 22°21'34.00", E Long. 96°42'8.57" At clinic Coordinates: N Lat. 22°21'31.65, E Long. 96°42'43.91"	monthly monthly	EMP cell members EMP cell members	Free of charges EMP cell members	- -
7	Social issue, social illness	- check social illness/ill-	-	At the coal-fired Thermal plant site	weekly and monthly	EMP cell members	Free of charges	-

		social behavior - monitor conducts of workers - check disciplinary action taken	- -	Coordinates: N Lat. 22°21'31.48", E Long. 96°42'9.32" At clinic Coordinates: N Lat. 22°21'31.65, E Long. 96°42'43.91"	weekly and monthly	EMP cell members	Free of charges	-

Summary of monitoring plan during the Decommissioning Phase

Sr.	Components/ issue	Parameters to be monitored	NEQEG guideline values	Monitoring spot/site	Frequency	Responsible person	Cost (once off)	Remark
1	Air quality	NO_2 O_3 PM_{10} $PM_{2.5}$ SO_2 VOC	200 µg/m^3 100 µg/m^3 50 µg/m^3 25 µg/m^3 20 µg/m^3 400 µg/m^3	At old plant site Coordinates: N. Lat 22º 21' 32"; E. Long 96º 42' 10" At Lauk Hpan Coordinates: N. Lat 22º 21' 58.29"; E.Long 96º 42' 48.17" At Khe San village Coordinates: N. Lat 22º 20' 50.6"; E. Long 96º 40' 31.7" At Lei Gyi Taw Coordinates:	annually annually annually annually	EMP cell members and hired technicians EMP cell members and hired technicians EMP cell members and hired technicians EMP cell members and hired	Ks 1,700,000 Ks 1,700,000 Ks 1,700,000 Ks 1,700,000	Technicians have to be hired once a year Technicians have to be hired once a year Technicians have to be hired once a year Technicians have to be hired once a

				N. Lat 22º 20' 13.83"; E.Long 96º 43' 31.29"		technicians		year
2	Water quality	BOD COD pH Total nitrogen Total phosphorus Dissolved solid Oil and grease Total coliform	50 mg/l 125 mg/l 6-9 STU 10 mg/l 2 mg/l 50 mg/l 10 mg/l 400 mg/l	At stream Coordinates: N. Lat 22º 22' 29.9"; E. Long 96º 42' 07.7" At Lauk Hpan Coordinates: N. Lat 22º 21' 58.4"; E. Long 96º 42' 45.5" At Khe San village Coordinates: N. Lat 22º 21' 08.7"; E. Long 96º 40' 24.0"	annually annually annually	EMP cell members and hired technicians EMP cell members and hired technicians EMP cell members and hired technicians	Ks 80,000 Ks 80,000 Ks 80,000	Technicians have to be hired once a year Technicians have to be hired once a year Technicians have to be hired once a year
3	Noise level	dB(A) day and night	70 dB(A)	At old plant site Coordinates: N. Lat 22º 21' 32"; E. Long 96º 42' 10" At Lauk Hpan Coordinates: N. Lat 22º 21' 58.29"; E.Long 96º 42' 48.17" At Khe San village Coordinates: N. Lat 22º 20' 50.6"; E. Long 96º 40' 31.7" At Lei Gyi Taw Coordinates:	annually annually annually annually	EMP cell members and hired technicians EMP cell members and hired technicians EMP cell members and hired technicians EMP cell members and hired	Ks 70,000 Ks 70,000 Ks 70,000 Ks 70,000	Technicians have to be hired once a year Technicians have to be hired once a year Technicians have to be hired once a year Technicians have to be

				N. Lat 22º 20' 13.83"; E.Long 96º 43' 31.29"		technicians		hired once a year
4	Solid waste (decommissioning wastes, debris)	- monitor decommissioning works (dismantling, demolition) and generation of huge quentity of debris, and systematic disposal and tidying up of the site	-	At the old plant; especially formed open coal stock yard Coordinates: N Lat. 22°21'29.08", E Long. 96°41'57.13"	weekly/ monthly	EMP cell members	Free of charges	- - -
5	Soil	- test soil quality, check for construction of soil (especially the soil at the spot once used as open coal stock yard).	-	At the old plant; especially formed open coal stock yard Coordinates N Lat. 22°21'29.08", E Long. 96°41'57.13"	annually	EMP cell members and hired technicians	Ks 140,000	Technicians have to be hired
				At Lauk Hpan Coordinates: N. Lat. 22º 22' 08.2"; E. Long 96º 42' 32.3"	annually	EMP cell members and hired technicians	Ks 140,000	Technicians have to be hired
				At Khe San village Coordinates: N. Lat. 22º 21' 01.0"; E. Long 96º 40' 45.9"	annually	EMP cell members and hired technicians	Ks 140,000	Technicians have to be hired
				At Lei Gyi Taw Coordinates:	annually	EMP cell members and hired	Ks 140,000	Technicians have to be

				N. Lat. 22º 20' 50.8"; E. Long 96º 43' 20.1"		technicians		hired
6	Occupational health and safety	- monitor OHS measures taken - monitor First Aid kit and stocking of medicines and drugs - check the clinic treatment record - monitor emergency response plan	- - -	At the old plant site Coordinates: N Lat. 22°21'34.00", E Long. 96°42'8.57"	monthly	EMP cell members	Free of charges	-
7	Social issue, social illness	- check social illness/ ill-social behavior - monitor conducts of workers - check disciplinary action taken	- - -	At the old plant site Coordinates: N Lat. 22°21'31.48", E Long. 96°42'9.32"	weekly and monthly	EMP cell members	Free of charges	-

Projected budgets and reponsiblities

The overall budget for implementation of EMP was already described in the earlier part of this Chapter-8 (8.4); where 0.5% of the project budget (that is USD 50,000) is set aside for implementation of EMP. The Sub-budget allotted for each programme is also described there.

35% of EMP budget, that is USD 17,500, each is allotted for monitoring programme. The fund cannot cover the whole life of the project (not even Operation Phase of 30 years). The fund will be only steed money; as time goes on more money will be added to the fund.

The main expenses are for hiring experts/technicians for monitoring air quality/emission, noise and vibration, water quality/effluent and soil quality.

There are EMP contractors in many development countries and they are hired to undertake all EMP tasks. But as there are no EMP contractors in Myanmar yet the said experts/technicians from other departments or from private laboratories have to be hired regularly, every 6 months. The cost of hiring them is really high indeed; the main expense for monitoring works.

And as there are no EMP contractors in the nation yet, the authority of Ngwe Yi Pale' Cement Co., Ltd has to make do with available staffs and resources. The EMP cell members (s) and specially trained staff (20) will be deployed for carrying out EMP tasks. All these 25 staffs are well-paid staff members and so there will be no extra cost for their specific fees; all will undertake monitoring works free of charge.

All mitigation measures will be also taken, free of charge, by these 25 staffs, (a few more staff will be deployed from time to time, where necessary). Therefore, there will be also no extra expense for carrying out mitigation actions.

The expenses for procurement of device or materials for taking mitigation measures, for instance, procurement of hoses for spraying water (dust suppression); water spraying to do undertaken once a day during the hot dry month; procurement of PPE, e.g. face masks, mouth and nose covers, ear muffs, boots, helmets, gloves – etc. To be worn by worker exposed to long hour of dust and high level noise. All main mitigative devices will be purchase from the main budget.

Procurement and installation of ESP, bag filters, and other mitigation devices e.g. noise abatour/silencers; vibration absorber will be also borne by the project main budget. Procurement of fire engine (fire truck), fire extinguishers, hydrants, hoses, jet etc. will be from the main budget, not from EMP budget.

Therefore, the actual expense will be for the hiring technicians for monitoring of air qulaity, noise level, water and soil quality. The once off cost and annual costs are shown in the table below:

<u>Cost for conducting monitoring</u>

Monitoring Plan covering component/issue, parameter to be monitored, monitoring spot/site, frequency/timing, responsible persons, once off cost, and remarks are described below in tabulated form.

Based from that table the annual cost for monitoring can be calculated and shown below in table.

During the Construction Phase

Sr.	Component/ Parameter	Monitoring point	Once off cost	Frequency/ timing	Annual cost	Remarks
1	Air quality	- construction site	Ks 1,700,000	semi-annually	Ks 3,400,000	Technicians have to be hired
		- Lauk Hpan village	Ks 1,700,000	semi-annually	Ks 3,400,000	
		- Khe San village	Ks 1,700,000	semi-annually	Ks 3,400,000	
		- Lei Gyi Taw village	Ks 1,700,000	semi-annually	Ks 3,400,000	
2	Water quality	- stream	Ks 80,000	semi-annually	Ks 160,000	Technicians have to be hired
		- Lauk Hpan village	Ks 80,000	semi-annually	Ks 160,000	
		- Khe San village	Ks 80,000	semi-annually	Ks 160,000	
3	Noise level	- construction site	Ks 70,000	semi-annually	Ks 140,000	Technicians have to be hired
		- Lauk Hpan village	Ks 70,000	semi-annually	Ks 140,000	
		- Khe San village	Ks 70,000	semi-annually	Ks 140,000	
		- Lei Gyi Taw village	Ks 70,000	semi-annually	Ks 140,000	
4	Soil	- construction site	Ks 140,000	semi-annually	Ks 280,000	Technicians have to be hired
		- Lauk Hpan village	Ks 140,000	semi-annually	Ks 280,000	
		- Khe San village	Ks 140,000	semi-annually	Ks 280,000	
		- Lei Gyi Taw village	Ks 140,000	semi-annually	Ks 280,000	
				Total =	**Ks 15,760,000**	

Note – Detail parameters for air, water, noise level are described. (Together with NEQEG guideline values)

Coordinate: for each monitoring spot are also described.

Note – Other parameters to be monitored/checked by EMP cell members are free of charge. (All are well-paid staff)

During the Operation Phase

Sr.	Component/ Parameter	Monitoring point	Once off cost	Frequency/ timing	Annual cost	Remarks
1	Air quality	- coal-fired power plant	Ks 1,700,000	Semi-annually	Ks 3,400,000	Technicians to be hired
		- Lauk Hpan village	Ks 1,700,000	Semi-annually	Ks 3,400,000	
		- Khe San village	Ks 1,700,000	Semi-annually	Ks 3,400,000	
		- Lei Gyi Taw village	Ks 1,700,000	Semi-annually	Ks 3,400,000	
	Emission	- continuous flue gas analyser installed at stack	Free of charges	Monthly	Free of charges	Just checking and monitoring LCD and record
2	Water quality	- coal-fired power plant	Ks 80,000	semi-annually	Ks 160,000	Technicians to be hired
		- Lauk Hpan village	Ks 80,000	semi-annually	Ks 160,000	Technicians to be hired
		- Khe San village	Ks 80,000	semi-annually	Ks 160,000	Technicians to be hired
	Effluent	- coal-fired thermal plant	Ks 80,000	semi-annually	Ks 160,000	Technicians to be hired
3	Noise level	- coal-fired power plant	Ks 70,000	semi-annually	Ks 140,000	Technicians to be hired
		- Lauk Hpan village	Ks 70,000	semi-annually	Ks 140,000	Technicians to be hired
		- Khe San village	Ks 70,000	semi-annually	Ks 140,000	Technicians to be hired
		- Lei Gyi Taw village	Ks 70,000	semi-annually	Ks 140,000	
4	Soil	- coal-fired power plant	Ks 140,000	semi-annually	Ks 280,000	Technicians have to be hired
		- Lauk Hpan village	Ks 140,000	semi-annually	Ks 280,000	Technicians have to be hired
		- Khe San village	Ks 140,000	semi-annually	Ks 280,000	
		- Lei Gyi Taw village	Ks 140,000	semi-annually	Ks 280,000	
				Total =	**Ks 15,920,000**	

Note – Detailed parameter for air, noise level, water are described (together with NEQEG guideline values).

Coordinates for each monitoring point are mentioned earlier.

Other parameter to be checked/monitored by EMP cell members are free of charges, (all are well- paid staff).

During the Decommissioning Phase

Sr.	Component/ Parameter	Monitoring point	Once off cost	Frequency/ timing	Annual cost	Remarks
1	Air quality	- coal-fired thermal plant area - Lauk Hpan village - Khe San village - Lei Gyi Taw village	Ks 1,700,000 Ks 1,700,000 Ks 1,700,000 Ks 1,700,000	Annually Annually Annually Annually	Ks 1,700,000 Ks 1,700,000 Ks 1,700,000 Ks 1,700,000	Technicians have to be hired once a year
2	Water quality	- coal-fired thermal plant area - Lauk Hpan village - Khe San village	Ks 80,000 Ks 80,000 Ks 80,000	Annually Annually Annually	Ks 80,000 Ks 80,000 Ks 80,000	Technicians have to be hired once a year
3	Noise level	- coal-fired thermal plant area - Lauk Hpan village - Khe San village - Lei Gyi Taw village	Ks 70,000 Ks 70,000 Ks 70,000 Ks 70,000	Annually Annually Annually	Ks 70,000 Ks 70,000 Ks 70,000 Ks 70,000	Technicians have to be hired once a year
4	Soil	- coal-fired thermal plant area - Lauk Hpan village - Khe San village - Lei Gyi Taw village	Ks 140,000 Ks 140,000 Ks 140,000 Ks 140,000	Annually Annually Annually Annually	Ks 140,000 Ks 140,000 Ks 140,000 Ks 140,000	Technicians have to be hired once a year
				Total =	**Ks 7,880,000**	
				Annual Grand Total =	**Ks 39,560,000**	

The allotted fund for monitoring (USD 17,500) will be adequate for one year; more money will have to be added later as time goes on.

Responsibilities

The responsible person for undertaking monitoring action plan is the EMP cell leader and 5 cell members. In addition 20 specially trained staff will carry out the monitoring works. While technicians will have to be hired semi-annually these EMP cell members and 20 staff will carry on the regular weekly, and monthly monitoring especially, visual inspection/checking works on environmental and social components.

In fact the EMP cell leader, cell members and 20 trained staff are responsible not only for monitoring, but all aspects of EMP.

They will also superize workers involved in taking mitigation measures.

Ngwe Yi Pale' Cement Co., Ltd has tentatively formed the EMP cell as follow:

1. U Khin Maung Aye Manager EMP cell leader
2. U Aye Min Soe Engineer Member
3. U Chit Ko Ko` Engineer Member
4. U Win Aung Technician Member
5. U Maung Maung Oo Technician Member
6. U Hla Myint Yar-eain-moo Member
7. U Ye Lu Local Member

Public consultation and information disclosure

Since public consultation is an integral part of EIA, IEE, EMP this chapter is described in relative detail.

During the scoping survey a meeting was held at Lauk Hpan village on 20-11-2017.

During the first EIA survey trip the first public consultation meeting was held during February, 2018 at Lauk Hpan Village.

During the second survey undertaken in March, 2019 three public consultation meetings were held at Lauk Hpan Village (second meeting), Khe San Village and Lei Gyi Taw Village.

The results of public consultation meetings and especially the minutes of each meeting were described in relative details in this chapter.

Results of public consultations (2017 and 2018 at Lauk Hpan)

Extrapolating from the results of these two meetings it is quite clear that the acceptance of the project by the local is high. This is due to the fact that the company has been in the area since 2004 and has already maintained good relation with the local community.

The mind sets of the company's authorities can be termed "philanthropic mind sets". So far, the company has spent more than Ks 6,764,390,633 for effective and meaningful implementation of CSR programmes, (many CSR programmes are implemented even when the company has not realized any profit yet).

One local, U Ye Lu asked for the village lamp posts to be well-lit with bulbs/lamps. It seemed there was lack of maintenance from the part of the villages. So the deputy manager replied that he would provide more bulbs/lamps but the villagers should take responsibilities for the long term maintenence of bulbs/lamps.

As regards dust along the by-pass road the company will tackle this issue by regularly spray water to suppress dust.

U Hla Myint, Yar-eain-hmoo asked for the road between the village and clinic to be paved.

As the deputy manager was not in a position to undertake this he would have to ask for permission first from the company authority and carry out the pavement of road. (Already done)

U Gyi One, a local simply said that the cement factory is real benefactor for the village and that he agreed with the proposed project.

As Ngwe Yi Pale' Cement Co., Ltd has been in operation here for many years the local people are all familiar with the activities of the company. Many are employed in the factory.

Name of local	**Things requested or issues raised**	**Action taken by the company**
U Ye Lu	- Request for the village lamp posts to be well-lit - Dust generated due to vehicular movement	- Already done (during the submission of this amended EIA) - Already tackled (during the submission of this amended EIA)
U Hla Myint	- Request for paving the road between the village and clinic	- Already done (during the submission of this amended EIA)

The company has, no doubt, good relation with the local community. The acceptance of the proposed project is high to very high.

Summary of results of 3 public consultation meetings at 3 villages during March, 2019.

Results of consultation

Sr. No.	Issued raised/request made	Reply from the company
	At Khe San village	
1.	- improved village road and village electrification not materialized yet	- the company will implement this during the coming June to October
2.	- renovation for village administration office	- the company will donate bricks and cement
	At Lauk Hpan village	
3.	- renovation of the village monastery	- will do this in the coming October
4.	- the yield of maize from the plot close to the factory has declined considerably	- will seek the advice of agriculture expert and fix this promptly
5.	- removal of garbage dump at the southern part of the village	- with the aid of heavy machinery a new landfill will be constructed immediately
	At Lei Gyi Taw village	
6.	- for company truck drivers to reduce the speed for safety of the school children	- will again warn the drivers for this or punish them
7.	- there used to be 5 springs but now only 3 springs left; there is the issue of water during dry months	- water trucks will distribute water (Short term plan) - will select new perennial springs and build more community water pond for the village
8.	- to construct a monastery	- still need permission from the Home Affair Ministry
9.	A few houses are not electrified yet	- the old cable cannot bear extra load. There is a plan for changing the old cables with a new and better one. That is after this coal-fired power plant is operation.

On the whole the company has very good relation with the villagers of these villages. The reason is simple; the company has so far spent Ks. 989,089,750 for implementation of CSR programme for the whole area.

During the meetings most villagers have expressed their gratitudes for the improvement of their village infrastructure road transportation, village electrification and community water ponds etc. The acceptance of the projects (2 cement plants and the coal-fired thermal plant) by the locals is high. There is a good cordial relationship between the company and the local communities. In fact they view the company as their great benefactor.

Conclusion

After taken into consideration of all the pros and cons of this project it can be concluded that the advantages outweight the disadvantages in many aspects. The project will contribute to the increase in the GDP of the country and also increase in earning for the nation in the form of tax, duty and revence. It will bring employment opportunities for many locals and, most of all, contribute greatly to national infrastructure development. There is no doubt that is will be economically viable and environmentally sustainable if all the rules, regulation and statutory requirements are complied with and all mitigation measures prescribed are duly taken.

Ngwe Yi Pale' Cement Co., Ltd will:

- comply with all the rules, regulation and statutory requirements
- study and heed to all the impacts/potential impacts addressed in the report and duly carry out all the mitigation/corrective measures prescribed in the report
- implement the EMP, especially all the management and monitoring sub-plans prescribed in the report
- duly undertake the rehabilitation task after the completion of the project

2. INTRODUCTION

Coal-fired thermal power is a plant that produces electricity through the incineration of coal. The heat produced by incineration is used to boil water and generate steam which is used to drive steam turbine in order to generate electricity.

The pivotal role played by electricity for the modernization of a nation was realized since the middle period of the Industrial Revolution, about 150 years ago. The slogan during the early Industrial Revolution era was "The modern world is the world of machinery". After the invention of and early application of electricity the slogan was then changed to "The modern world is the world of electricity". Since then electricity has become an essential commodity for modern man and one of the main infrastructure pillars of a nation. Since then all western countries had utilized their energy resources, eg. coal, hydro energy etc for the production of electricity and development of the nations.

When it comes to national electrification Myanmar is lagging far behind the international communities. As mentioned earlier the percentage of electrification in Myanmar was only 14% while that of its neighbour, Thailand, was 99.3% (that was in 2013 and now the situation has improved to a certain extent, but still lagging behind its neighbour). Electricity consumption in Myanmar at the moment is only 5GW while in Thailand it is 43GW. Singapore, with only 1/10 of the population of Myanmar, consumes 13GW of electricity, it is learnt.

To increase production of electricity is a must for Myanmar. All means and ways should be applied and all available energy resources should be utilized for the increase production of electricity in the country.

Coal-fired thermal power plants have been established worldwide and in many countries; coal-fired power plants are the main producers of electricity for many nations. eg. China, India, USA, Russia etc. Coal is still the number one energy resources for production of global electricity. 40% of global electricity is generated from coal-fired power plants. No other energy sources, eg. natural gas, oil, hydroelectricity, solar, wind, etc ever come close to coal in term of magnitude of electricity production.

In this context Ngwe Yi Pale' Cement Co., Ltd has proposed for the construction and operation of coal-fired power plant inside its crown cement plant premise for adequate electricity for the new cement plant with a capacity of producing 4,000 tons/day and for villages electrification.

2.1 Presentation of the project proponent

Ngwe Yi Pale' Cement Co., Ltd is a subsidiary of Ngwe Yi Pale' Group of Companies, a conglomerate that involves in various big businesses, eg. the mining of coal, gypsum, iron bauxite, limestone and production of cement, sugar, hydroelectricity production and trees plantation and forest restoration.

Ngwe Yi Pale' Cement Co., Ltd was registered as a limited company on 3-3-2014 (Document: Certificate of Incorporation No. 5666/2013-2014; Directorate of Investment and Company Administration, Ministry of National Planning and Economic Development).

Name of the project proponent	:	Ngwe Yi Pale' Cement Co., Ltd
Address (Head office)	:	No. 157, 33rd Street, between 75th and 76th Street, Chan Aye Thar Zan Township, Mandalay Region, Myanmar
Telephone	:	02 73941, 02 30838, 09 977150337, 09 977150304, 09 977150398, 09 977150308, 09 977150313
Fax	:	02 71424
E-mail	:	info@ngweyipale.com
Webiste	:	www.ngweyipale.com
Contact person	:	U Lin Thein Aung (Admin Manager)
Phone	:	09 977150336, 09 444002600
E-mail	:	lintheinaung777@gmail.com
Factory address	:	Lauk Hpan village, Naunghkio Township, Shan State
Objective	:	The production of adequate electricity for the new crown cement plant and for village electrification of the region.

Particulars of executive and administrative body

Name	Nationality & National Registration Card No.	Address of resident	Designation
U Thein Myint @ Chaung Hpin	Myanmar 13/Na Kha Na (Ei)000017	No.(415), S2, Pyay Gyi Yan Lon Quarter, Aung Myay Thar Zan Township, Mandalay	Managing Director
U Maung Shwe @ Khin Maung Shwe	Myanmar 9/Ma Kha Na (N)047737	No.101/2, Bu Kone Village, Patheingyi Township, Mandalay	Director
U Tun Win	Myanmar 9/Ma Ya Ma (N)053811	No.76, Pyay Gyi Yan Lon Quarter, Aung Myay Tharzan Township, Mandalay	Director
U Kyaw Shein	Myanmar 9/Ma Na Ma (Ei)000048	No.1/7, Theik Pan Street, Mahar Myaing Quarter, Mahar Aung Myay Township, Mandalay	Director
U Myo Myint Aung	Myanmar 13/La Ya Na (Ei)000608	Building (A), Room (G-3), Shwe Gone Thu Housing, Pan Hlaing Quarter, Kyimyindaing Township, Yangon	Director
U Hla Win @ U Shin Si	Myanmar 9/Ma Na Ma (N)122804	No.54, 78th Street, Between 29 x 30 Street, Hay Mar Zala Ward, Chan Aye Tharzan Township, Mandalay	Director
U Zaw Khaing Myint @ Kyauk Kyar Chan	Myanmar 13/Ka Ma Na (N)037294	No.73, 33th Street, Between 71 x 72 Street, Yan Myo Lon Quarter, Chan Aye Tharzan Township, Mandalay	Director
U Aung Thu Ya	Myanmar 14/Ha Tha Ta (N)013309	No.(YA/44), Yat Guat Gyi (8), Pyin Oo Lwin Township, Mandalay	Resigned From Director (w.e.f 28-1-2015)
U Sein Myo Aung	Myanmar 9/Ma Na Ma (N)098578	Wa(10-35), Thayarwaddy Mingyi Street, A-Quarter, Pyi Gyi Tagon Township, Mandalay	Appointed As Director (w.e.f 28-1-2015)

The company is 100% owned by nationals, all shareholders are nationals.

Number of the shares so allotted payable in cash - 143,385 Shares

Nominal amount of the shares so allotted - 14,338,500,000 Kyats

Amount paid or due and payable on cash such share - 100,000 Kyats

ကုမ္ပဏီမှတ်ပုံတင်လက်မှတ်

Certificate of Incorporation

ငွေရည်ပုလဲ ဘိလပ်မြေ ကုမ္ပဏီ လီမိတက်

NGWE YI PALE CEMENT COMPANY LIMITED

Company Registration No. 130799027

မြန်မာနိုင်ငံကုမ္ပဏီများအက်ဥပဒေ ၁၉၁၄ ခုနှစ် အရ

ငွေရည်ပုလဲ ဘိလပ်မြေ ကုမ္ပဏီ လီမိတက်

အား ၂၀၁၄ ခုနှစ် မတ်လ ၃ ရက်နေ့တွင်

အစုရှယ်ယာအားဖြင့် တာဝန်ကန့်သတ်ထား သည့် အများနှင့်မသက်ဆိုင်သောကုမ္ပဏီ

အဖြစ် ဖွဲ့စည်းမှတ်ပုံတင်ခွင့် ပြုလိုက်သည်။

This is to certify that

NGWE YI PALE CEMENT COMPANY LIMITED

was incorporated under the Myanmar Companies Act 1914 on 3 March 2014 as a Private Company Limited by Shares.

ကုမ္ပဏီမှတ်ပုံတင်အရာရှိ

Registrar of Companies

ရင်းနှီးမြှုပ်နှံမှုနှင့်ကုမ္ပဏီများညွှန်ကြားမှုဦးစီးဌာန

Directorate of Investment and Company Administration

Former Registration No. 5666/2013-2014

Figure-1: Certificate of Incorporation

2.2 Presentation of the environmental and social experts

Myanmar Environment Sustainable Conservation, MESC is a consultant firm officially registered in 2014 as a limited company (a consultant/service company) at the Ministry of National Planning and Economic Development. Document: YaKa-8(Ga) 001/2014(004720), dated: 6th June, 2014. Registration No. 830/2014-2015, (20-5-2014). The new company registered number is 110649193.

The Transitional Registration/License No. of the consultant firm, MESC is No. 0003, ECD, Dated 1st July 2017.

Contact Address **:** Room no. (B -5), Building no.67/69, Parami Street, 16 Ward, Hlaing Township, Yangon Region

Contact person **:** Myint Kyaw Thura

95 9 420105071

Contact number **:** 95 9 73044903

E-mail : myanmar.esc@gmail.com

Facebook website **:** www.myanmar environment sustainable conservation.com

Members of MESC who are IEE/EIA appraisers, or IEE/EIA practitioners or who are involved in this IEE/EIA project are as follows:

Name	Nationality & National Registration Card No.	Registration/license No. by ECD	Designation
U Myint Kyaw Thura M.Sc (Zoology)	Myanmar 12/Da Ga Ta (N)028349	0006	Managing Director, Biodiversity Specialist (Fauna), EIA practitioner and EIA Appraiser
U Saw Han Shein B.Sc (Botany) M.Sc (Marine Biology)	Myanmar 10/Ma La Ma(N)008173	0007	Retired Professor, EIA Practitioner and Appraiser
Dr. Thiri Dawe Aung Ph.D (Zoology)	Myanmar 12/Da La Na (N) 029433	0008	Biodiversity Specialist (Ornithologist)
U Tin Tun Aung B.Sc (Engineering)	Myanmar 12/U Ka Ma (N)172111	0009	Engineer and EIA practitioner
Daw Khin Nhwe Naing M.Sc (Botany)	Myanmar 9/Pa Kha Ka (N)001252	00010	Biodiversity Specialist (Flora), Environment Researcher

U Than Soe Oo M.Sc (Forestry)	Myanmar 9/Ma Na Ma (N) 050808	00011	EIA practitioner
U Oakka Kyaw Thu B.Sc (Geology)	Myanmar 7/Ya Ta Ya (N) 090371	00012	Geologist
Daw Thin Thin Yee B.Sc (Chemistry)	Myanmar 12/Tha Ga Ka (N)039292	00013	Chemical Environment Researcher, Computer Programmer

- U Myint Kyaw Thura is involved in fauna study, EIA practitioning and appraising and writing of report, in part.
- U Saw Han Shein is involved in EIA practitioning appraising and report writing (chief report writer).
- Dr. Thiri Dawe Aung involved in avifauna study writing part of report.
- U Tin Tun Aung is involved in the EIA practitioning and aspects of the report and provision of information, data and facts and writing part of the report.
- Daw Khin Nhwe Naing is involved in flora study and writing report, in part.
- U Than Soe Oo is involved in EIA practitioning and part of the report writing especially on the socio-economic aspect,
- U Oakka Kyaw Thu is involved in the geological and geographical aspects by conduction desktop survey and gathering of secondary information on local geology.
- Daw Thin Thin Yee is involved in the physical aspects, especially ambient air, water quality, noise and vibration and soil etc and compilation of data on the physical components; including secondary information on weather.

Actually members of MESC always work together wholly as a tight-knit group in writing of each and every EMP/IEE/EIA report. Discussion, consensus building, cooperation and coordination are the principle and norm of the consultant firm.

MESC has also part time members working as free lances.

The firm is not in a position to employ all its part time members on a permanent basis.

These are botanists, zoologists, ornithologists, ecologists, aquatic ecologists, social scientists, medical officer (doctor), engineers and geologists working with this firm.

For the physical and chemical environmental studies MESC has to hire experts, say for example, from the Health Department and from registered laboratory in Yangon. Since portable test kits are sometime not reliable, experts from the Health Department have to be hired for the analysis of air quality. Experts from a registered laboratory were hired for the analysis of water (or samples have to be sent to the laboratory).

Members of MESC have quite a lot of experiences with IEE, EIA and SIA works.

So far, starting from 2014 MESC has been involved in IEE, EIA, SIA and EMP projects: such as limestone minings/quarries; gold and copper minings; tin and tungsten minings; coal minings; cement factories; Iron and steel factory; hotel and housing projects; fuel storage tank farms; fuel storage and distribution terminal; cigarette factory, paper factory, electronic parts factory, ear-phone factory, saw mill/lumbering project, motorcycle and spare parts factory, sugar factory, hydro power electricity project, coal fired thermal plant, water boom park, zip line project, seed processing plant, specific taxonomic and ecological study of herpetofauna, specific biodiversity and ecological survey of forest and parts etc projects.

MESC is now involved in the on-going project such as private hospital project, biomass power plant, assembly and installation of lifts, escalators and elevator, transmission line, shopping center project, villa project, aquaculture project, industrial factory complex project, assembling/marketing car projects, concrete transmission poles, soft drinks and drinking water and sugar mill. Some members have also participated in road construction (air quality) project, herpetological survey in association with foreign experts.

REPUBLIC OF THE UNION OF MYANMAR

Ministry of Natural Resources and Environmental Conservation

CERTIFICATE FOR TRANSITIONAL CONSULTANT REGISTRATION

(ကြားကာလအကြံပေးလုပ်ကိုင်သူမှတ်ပုံတင်ခြင်းအထောက်အထားလက်မှတ်)

No. 0003 Date 01 JUL 2017

The Ministry of Natural Resources and Environmental Conservation, hereby, issues this certificate to the organization under Environmental Impact Assessment Procedure, Notification No. 616/2015.

(ပတ်ဝန်းကျင် ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်း၊ အမိန့်ကြော်ငြာစာအမှတ်၊ ၅၁၆/၂၀၁၅ အရ သယ်ဇာတနှင့် သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာနသည် ဤအထောက်အထားလက်မှတ်ကို အမွဲအစည်းအား ထုတ်ပေးလိုက်သည်။)

(a)	Name of Organization (အမွဲအစည်းအမည်)	Myanmar Environment Sustainable Conservation-MESC
(b)	Name of the representative in the organization (အမွဲအစည်းကိုယ်စားလှယ်၏ အမည်)	U Myint Kyaw Thura
(c)	Citizenship of the representative in the organization (အမွဲအစည်းကိုယ်စားလှယ်၏ နိုင်ငံသား)	Myanmar
(d)	Identity Card /Passport Numberof the representative person in the organization (အမွဲအစည်းကိုယ်စားလှယ်၏ မှတ်ပုံတင်/ နိုင်ငံကူးလက်မှတ် အမှတ်)	12/ Da Ga Ta (N) 028349
(e)	Address of organization (ဆက်သွယ်ရန်လိပ်စာ)	Room No. B-5, Building No.72, Marlar Myaing 6th street, 16 Ward, Hlaing Township, Yangon. myanmar.esc@gmail.com , 09 73044903
(f)	Type of Consultancy (အကြံပေးလုပ်ကိုင်မှုအမျိုးအစား)	Organization
(g)	Duration of validity (သက်တမ်းကုန်ဆုံးရက်)	31 March 2018

EXTENSION
သက်တမ်းတိုးချဲ့ခြင်း
The VALIDITY of this certificate is extended for one year from (1.4.2018) to (31.3.2019)
ဤသက်သေခံအား (၁-၄-၂၀၁၈) ရက်နေ့မှ (၃၁-၃-၂၀၁၉) ရက်နေ့အထိ တစ်နှစ်သက်တမ်း တိုးချဲ့ပေးသည်။
13.9.2018
For Director General
(Soe Naing, Director)
Environmental Conservation Department

Director General
Environmental Conservation Department
Ministry of Natural Resources and Environmental Conservation

Areas of Expertise Permitted
(ခွင့်ပြုသည့် ကျွမ်းကျင်မှုနယ်ပယ်များ)

1. Air Pollution Control

2. Ecology and Biodiversity

3. Facilitation of Meeting

4. Geology and Soil

5. Land use

6. Modeling for Water Quality

7. Socio-Economy

8. Water Pollution Control

EXTENSION
သက်တမ်းတိုးခြင်းခြင်း
The VALIDITY of this certificate is extended for one year from (1.1.2020) to (31.12.2020)
ဤလက်မှတ်အား(၁-၁-၂၀၂၀)ရက်စွဲမှ(၃၁-၁၂-၂၀၂၀)
ရက်စွဲအထိ တစ်နှစ်သက်တမ်းတိုးပြုခြင်းသည်။
5.7.2020
For Director General
(Soe Naing, Director)
Environmental Conservation Department

EXTENSION
သက်တမ်းတိုးခြင်းခြင်း
The VALIDITY of this certificate is extended for nine months from (1.4.2019) to (31.12.2019)
ဤလက်မှတ်အား(၁-၄-၂၀၁၉) ရက်စွဲမှ (၃၁-၁၂-၂၀၁၉)
ရက်စွဲအထိ (ကိုး)လသက်တမ်းတိုးပြုခြင်းသည်။
7.6.19
For Director General
(Soe Naing, Director)
Environmental Conservation Department

EXTENSION
သက်တမ်းတိုးခြင်းခြင်း
The VALIDITY of this certificate is extended for six months from (1.7.2021) to (31.12.2021)
ဤလက်မှတ်အား(၁-၇-၂၀၂၁)ရက်စွဲမှ(၃၁-၁၂-၂၀၂၁)
ရက်စွဲအထိ (၆)လ သက်တမ်းတိုးပြုခြင်းသည်။
For Director General
(Soe Naing, Director)
Environmental Conservation Department

Figure-2: Transitional certificate of consultant firm

2.3 Presentation of health expert

As regards health expert the Consultant Firm (MESC) is not in a position yet, to employ health experts for EIA.

However, the consultant firm (MESC) has one part time medical officer (MBBS), who cannot be called an HIA expert yet.

One of the senior members, U Myint Kyaw Thura is the General Secretary of Myanmar Environmental Assessment Association (MEAA) and holds an HIA certificate. (Online training on HIA cosponsored by IFC, Australia Aid and MEAA, Oct 2010. One junior member has attended special lecture classes provided by HIA experts from MEAA.

In undertaking EIA works MESC has always asked for the help of technicians from the Occupational Environmental Health Division (OEHD) of the Department of Public Health.

Ambient air/emission and water quality/effluent, noise and vibration are measured and analysed by experienced technicians from Occupational and Environmental Health Division (OEHD), Ministry of Health and Sports.

One day when Health Impact Assessment (HIA) becomes mandatory the company and consultant firm will hire health experts, for this matter.

Figure – 3: Certificate of HIA

3. ENVIRONMENTAL POLICY, LEGAL AND INSTITUTIONAL FRAME WORK

3.1 Corporate environmental and social policies

(**Reproduced from:** International Finance Corporation (IFC), Policy on Environmental and Social Sustainability, 2012)

There are eight performance standards for a big company to do business in a new area. The project proponent will follow these standards as practical as possible. At the moment the company has not yet any written policy or written statement on environment.

I) Assessment and Management of Environmental and Social Risks and Impacts

- identify and evaluate environmental and social risks and impacts of the project
- adopt mitigation measures to avoid, or if avoidance is not possible, minimize or mitigate the impact; compensate for the impacts on people and on the environment
- promote improved environmental and social performance through the effective use of management system
- ensure that grievances from the effected people are responded and managed appropriately
- promote and provide means for adequate engagement with the community throughout the project period

II) Labour and Working Conditions

- promote the fair treatment, non-discrimination and equal opportunity of workers
- establish, maintain and improve the worker-management relationship
- promote compliance with national employment and labour laws
- promote safe and healthy working conditions and the health of workers
- avoid the use of forced labour and child labour

III) Resource Efficiency and Pollution Prevention

- avoid or minimize adverse impacts or human health and the environment by avoiding or minimizing pollution from project activities
- promote more sustainable use of resources, including energy and water
- reduce project-related GHG emissions

IV) Community Health, Safety and Security

- avoid adverse impact on the health and safety of the community during the project life
- ensure that the safeguarding of personnel and property is carried out in accordance with relevant human rights principles and in a manner that avoids or minimizes risks to the community

V) Land Acquisition and Involuntary Resettlement

- avoid, and when avoidance is not possible, minimize displacement by exploring alternative project designs
- avoid forced eviction
- avoid, or where avoidance is not possible, minimize social and economic impacts from land acquisition or restriction on land use by
  - (i) providing compensation for loss of assets at replacement cost (value of asset plus transaction costs), and
  - (ii) ensure that resettlement activities are implemented with appropriate disclosure of information, consultation and the informed participation of those effected
- improve or restore, the livelihoods and standards of living of displaced persons

VI) Biodiversity Conservation and Sustainable Management of living Natural Resources

- protect and conserve biodiversity
- maintain the benefits from ecosystem services
- promote the sustainable management of living natural resources through the adoption of practices that integrate conservation needs and development priorities

VII) Indigenous Peoples

- ensure that the development process fosters full respect for the human rights, dignity, aspirations, culture, and natural resource-based livelihoods of indigenous peoples
- avoid adverse impacts of project on indigenous people, or when avoidance is not possible, minimize and/or compensate for such impacts
- promote sustainable development benefits and opportunities for indigenous people in a culturally appropriate manner
- establish and maintain an ongoing relationship with these people throughout the project period
- respect and preserve the culture, knowledge and practices of indigenous peoples

VIII) Cultural Heritage

- protect cultural heritage from the adverse impacts of project activities and support its preservation
- promote the equitable sharing of benefits from the use of cultural heritage

Principle for Environmental and Social Sustainability

The ethic code for 21th century big business is not to make profit at the expense of the environment and the local community.

The big company should not focus only on economically viable venture but also on functionally sound and ecologically viable as well as socially sustainable venture.

Environmental and social policy of Ngwe Yi Pale' Cement Co., Ltd

The company pledges to comply with all the environmental Laws, Rules and Regulation concerning the generation of electricity from coal fired thermal plant. The company also pledges to do the business that will be environmentally sound as far as possible.

The company will endeavour to:

- Operate the factory with an environmentally and socially responsible manner and to comply with laws and regulation
- Prevent pollution of surrounding area; monitoring and adopting suitable measures for environment protection
- Implement EMP effectively to mitigate pollution of water, land, air, noise and dust and proper disposal of waste
- Develop green belt in available space
- Conservation of natural resources (water, coal) and energy as far as possible
- Create environmental awareness among employees and local community through education and training
- Duly compensate for any loss or damage of local people properties
- Duly implement meaningful CSR programme (2% of the net profit will be set aside for execution of CSR programme).

Corporate Social Responsibility (CSR)

CSR has become mandatory in most developed countries. It has also become mandatory for big companies doing business in developing countries. In fact it has become an official policy of many big companies worldwide.

A big company that is doing business in an area must commit itself to environmental and social sustainability. The motto is "**do not harm the environment and the people**".

The company must take the responsibility for community development as far as possible. A certain amount of budget or 2 percent of the net profit has to be allocated for CSR activities, it is learnt.

Many view CSR as a form of compensation for the environmental and socio-economic components impacted. The main objective of CSR is more than mitigation and compensation; but also for the economic and social development of the community impacted by the project. The compensation for land or property lost or damaged due to project, the construction of school, and clinic, the improvement for infrastructure and the provision of alternative livelihoods, donations, charities etc. are parts of CSR activities. The CSR activities must be meaningful and effective, not a mere formality.

The main essence of CSR is taking the responsibility for the community development. And the main principles of CSR are:

- not to destroy the environment
- not to infringe on human rights
- not to get involve in child labour or forced labour, and
- not to get involve in bribery and corruption in league with corrupt officials or authorities when doing business.

CSR programme implemented

So far the company has already spent Ks 989,089,750 for CSR programme. CSR programme was started even when no profit is realized yet. (See ANNEX).

Commitment

The project proponent is commitment itself to the continuation of its CSR programme. 2% of the net profit will be allotted for execution of CSR programme.

U Sein Myo Aung

Executive Director

Ngwe Yi Pale' Cement Co., Ltd

3.2 Policy and legal frame work

The environmental policy is to protect and conserve the environment while striving for national development; in other words to aim for sustainable development.

The National Environmental Policy (1994) is:

- to achieve harmony and balance between socio-economic, natural resources and environment through the integration of environmental considerations into the development process enhancing the quality of life of all its citizens

In short, the policy covers three strategic areas:

(a) Clean environment and health, functioning ecosystem

(b) Sustainable development, and

(c) Mainstreaming environmental protection and management.

Article 42 of Myanmar Constitution (2008) clearly states that "The Union shall protect and conserve national environment".

Environmental conservation is an obligation of every citizen of Myanmar as per the Myanmar constitution (2008). Section-8, Article 390 of the constitution states that "Every citizen has the duty to assist the Union in carrying out the following matter: (b) environmental conservation.

The conservation of the environment was/is one of the priorities of successive governments.

Myanmar is cooperating with the international community to draft a national environment policy and adopt its main tasks in order to contribute to sustainable development, policies, strategies and work programmes relating to climate change, a framework for a green economy and strategies and work programmes for waste management.

The nation is in the process of formulating a new and comprehensive national environmental policy. Since 2015 United Nations Development Programme (UNDP) has been supporting the government to formulate a new national environmental policy that places environmental consideration at the centre of efforts to promote economic and social development, reduce poverty and mitigate and adapt to climate change and natural disasters.

This national environmental policy will ensure environmental protection and sustainable development across the country.

The pragmatic aim is to integrate environmental governance into the national economic development programme. This is indeed a new multifaceted national environmental policy and strategic frame work that address new challenges.

3.2.1 Existing applicable laws and rules

Ngwe Yi Pale' Cement Co., Ltd shall comply with the following laws relating to environmental, socioeconomic and health affairs.

1. The Environmental Conservation Law, 2012
2. The Environmental Conservation Rules, 2014
3. Environmental Impact Assessment Procedure, 2015
4. National Environmental Quality (Emission) Guideline, 2015
5. The Ethnic Rights Protection Law, 2015
6. Myanmar Investment Law, 2016
7. Myanmar Investment Rules, 2017
8. The Burma Companies Act, 1914
9. Private Industrial Enterprise Law, 1990
10. Electricity Law, 2014
11. Electricity Rules, 2015
12. Myanmar Insurance Law, 1993
13. Myanmar Mine Law, 2015
14. Myanmar Mine Rules, 2016
15. Boiler Law, 2015
16. Labour Organization Law, 2011
17. Settlement of Labour Disputes Law, 2012
18. Employment and Skill Development Law, 2013
19. Minimum Wages Law, 2013
20. Payment and Wages Law, 2016
21. Leaves and Holidays Act, 2014
22. Workmen's Compensation Act, 1923
23. The Social Security Law, 2012
24. Occupational Health and Safety Law, 2019

25. The Factories Act, 1951
26. Myanmar Public Health Law, 1972
27. Prevention and Control of Communicable Diseases Law, 1995
28. The Control of Smoking and Consumption of Tobacco Product Law, 2016
29. The Protection and Preservation of Cultural Heritage Region Law, 1998
30. Protection and Preservation of Antique Objects Law, 2015
31. The Protection and Preservation of Ancient Monument Law, 2015
32. Conservation of Water Resources and River Law, 2006
33. Conservation of Water Resources and River Rules, 2013
34. The Forest Law, 2018
35. The Conservation of Biodiversity and Protected Areas Law, 2018
36. Farmland Law, 2012
37. Fire Brigade Law, 2015
38. Fresh Water Fisheries Law, 1991
39. Prevention of Hazards from Chemical Substances Law, 2013
40. The related laws enacted by Shan State Hlutaw and rules issued by Shan State Government

The above-mentioned laws and guidelines are directly or indirectly related to the project. The company will comply with all these laws. Since these laws cover a very wide spectrum and various aspects, the company is not in a position to read and study all these laws. The company, therefore, has hired a legal expert to deal with the details of these laws.

When implementing the project the company authority will apply the common sense and simple logics not to pollute the air, water, land and the community. When it comes to details the legal expert hired by the company will assist the company to comply with these laws, accordingly.

Staffs will be educated and trained for environmental awareness and for maintenance of environmental performance during the entire life of the project.

However, certain points or Articles of the law which are of great environmental relevent are excerpted and reproduced as follows:

Excerpts of Laws, Rules and Act of relevance

The project proponent shall comply with the following Law, Rule, Act particularly the Sections/Articles reproduced below.

1. The Environmental Conservation Law, 2012

Section-7 (d): The ministry prescribes environmental quality standards including standards on emission, effluents, solid wastes, production procedures, processes and products for conservation and enhancement of environmental quality;

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-24: The Ministry may, in issuing the prior permission, stipulate terms and conditions relating to environmental conservation. It may conduct inspection whether or not it is performed in conformity with such terms and conditions or inform the relevant Government departments, Government organization to carry out inspections.

Section-29: No one shall violate any prohibition contained in the rules, notification, orders, directives and procedures issued under this Law.

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.

2. The Environmental Conservation Rules, 2014

Rule-69 (a): Any person shall not emit, cause to emit, dispose, cause to dispose, pile and cause to pile, by any means, the pollutants to environment and hazardous waste or hazardous material stipulated by notification under the Law and any these rules at any place which may affect the public directly or indirectly.

Rule-69 (b): Any person shall not carry out the action which can be damaged to natural environment which is changing due to ecosystem and such system, except the permission of the relevant Ministry in order to the interest of the public.

3. Environmental Impact Assessment Procedure, 2015

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

(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 condition 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 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 the proposed project's potential adverse impacts.

Section-106: The project proponent shall, during all phase of the project (Preconstruction, 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 or the ministry is or may be required, within not later than twenty-four (24) hours, and in all cases within seven (7) days the project proponent becoming aware of such accidents.

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 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 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, with 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 purpose 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.

Section-117: The Project Proponent shall further ensure that the Ministry's rights of access hereunder shall extend to access by the Ministry to the Project's contractors and information storage, and persons.

4. National Environmental Quality (Emission) Guideline, 2015

All the guidelines that are of relevance for this project are shown under a separate section of this report.

5. The Ethnic Rights Protection Law, 2015

Section-5: Indigenous people (ta-ne tain-yin-tha) should receive complete and precise information about extractive industry project and other business a activities in their area before project implementation so that negotiation between groups and the Government/companies can take place.

6. Myanmar Investment Law, 2012 (Amended 2016)

Section-50: (d) The investor shall register the land lease contract at the Office of Registry of Deeds in accordance with the Registration Act.

Section-50: (e) The Government may grant more favorable terms and conditions for the lease of land and the use of land by Myanmar citizen investors.

Section-51: The investor:

(a) May appoint any citizen who is a qualified person as senior manager, technical and operational expert, and advisor in his investment within the union in accordance with the law.

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;

(f) Shall not make any significant alternation of topography or elevation of the land on which he is entitled to lease or to use, without the approval of the commission.

(g) Shall abide by 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 their 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;

(o) Shall pay effective compensation for loss incurred to the victim, if there are 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 permit or 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, and shall submit the situation of environmental and social impact assessment to the Commission along the period of activities of the investments which obtained permit or endorsement of the Commission.

Section-73: The investor shall insure the types of insurance stipulated in the provision of the rules at any insurance enterprise which is entitled to carry out insurance businesses within the Union.

7. Myanmar Investment Rules, 2017

Rules-202: The Investor must comply with the conditions of the Permit and other applicable laws when making an Investment.

Rule-203: The Investor shall fully assist while negotiating with the Authority for settling the grievances of the local community that have been effected due to Investments.

Rules-206: It the Investor is desirous to appoint a foreigner as senior management, technician expert or consultant according to section 51(a) of the law, it shall submit such foreigner's passport, expertise evidence or degree and profile to the Commission Office for approval.

Rules-212: Every Investor that holds the Permit or Tax Incentives must have taken out the relevant insurance out of the following types of insurance at any insurance business that holds the license in the Union based on the nature of the business:

(a) Property and Business Interruption Insurance;

(b) Engineering Insurance;

(c) Professional Liability Insurance;

(d) Professional Accident Insurance;

(e) Marine Insurance; and

(f) Workmen Compensation Insurance.

8. The Burma Companies Act, 1914

Part II; Section-4 (1): No company, association or partnership consisting of more than ten persons shall be formed for the purpose of carrying on the business of banking unless it is registered as a company under this Act.

Part IV; Section-72 (1): A company shall as from the day on which it begins to carry on business, or as from the twenty-eighth day after the date of its incorporation, whichever is the earlier, have a registered office to which all communications and notices may be addressed.

Form I; Section-27 (A):

(1) Name of the company.

(2) Country of incorporation of the company.

(3) Location of the company's Head Office and/or principal office in the Union of Burma.

(4) The objects for which the company is formed (field of business).

(5) (a) The amount of Capital and the number of shares into which the Capital is divided.

(b) If more than one class of shares in authorized, the description of each class.

(6) The names, addresses and nationality of the directors.

(7) The maximum amount of indebtedness which may be incurred by the company and also a prohibition against the contracting of debts in excess of that mount.

(8) Period of validity of permit.

(9) Statement of compliance with legal requirements for issue of Capital including the amount to be paid in before business is commenced.

Statement of compliance with such conditions as may be prescribed.

9. Private Industrial Enterprise Law, 1990

Section-4: (a) Any person desirous of conducting any private industrial enterprise;

(b) Any person conducting any private industrial enterprise on the day this Law is enacted; by using any type of power which is three horsepower and above or manpower of ten wage-earning workers and above shall register under this Law.

Section-13: The duties of the entrepreneur are as follows:-

(a) Shall pay the registration fees, fees for the renewal of registration and other payable duties and taxes prescribed by the Directorate;

(b) Shall abide by the terms and conditions of the registration certificate;

(c) Shall conduct the enterprise by opening an account with the relevant bank in the name of its registered enterprise;

(f) Shall shift the place of enterprise, change the nature of enterprise, amalgamate enterprises and split up enterprises only with the approval of the Directorate;

(g) Shall abide by the orders and directives issued from time to time by the Ministry and the Directorate;

(h) Shall also abide by the existing laws.

Section-26: No one shall conduct a private industrial enterprise contained in section ~ without obtaining registration under this Law.

Section-27: An entrepreneur:

(a) In distributing and selling the goods he has produced shall not sell without a trade mark;

(b) Shall not violate any provision of section 13;

(c) Shall not fail to comply with any order or decision passed by the Minister and the Director General.

10. Electricity Law, 2014

Section-10: When engaging in electricity activities, the ministry, the relevant region or state government and the head ("oozi") of the relevant self-administered division or self-administered zone –

(b) shall carry out an environmental impact assessment (EIA) in order to minimize the impact on the environment in accordance with the provisions stipulated in the Environmental Conservation Law. They shall pay compensation for the impact and contribute to the environmental conservation fund. Private entrepreneurs holding a license must also comply with these points

Section-18: The license holder has the right to engage in electric power generation and distribution only after having received the electrical hazards safety certificate from the chief inspector.

Section-21: (a) The license holder shall, if he fails to comply with the law, rules, regulations, procedures, orders and directions or the specified quality, standards and norms, be responsible in accordance with the law if any person or organization is affected or suffers a loss as a result.

Section-22: (a) The license holder shall be responsible in accordance with the law if any person or organization is affected or suffers a loss due to his negligence in performance;

Section-26: The license holder must comply with the following-

(a) Electricity exploration must be done in accordance with the law;

(b) In electric power generation, transmission and distribution-

(1) Electrical power must be generated as specified in the license;

(2) Instruments for measuring electric power and protective equipment must be systematically used and maintained in accordance with the stipulations.

Section-27: The license holder and the authorized person must inform the chief inspector and the relevant department in charge immediately if an electrical hazard has accidentally occurred when generating, transmitting, distributing or consuming electric power.

Section-40: The license holders comply with the rules, norms and procedures issued by the ministry and must accept necessary inspections by the relevant government departments and organizations.

Section-68: If the negligence or irresponsibility of the license holder or of persons assigned by him has caused injury, disability or death by electrocution or fire, the aggrieved person has the right to request compensation from the license holder as follows-

(a) If the aggrieved person is entitled to compensation according to the existing labour compensation law, the compensation specified in this law;

(b) If the aggrieved person is not entitled to compensation according to the existing labour compensation law, the compensation specified in the rules, issued under this law

11. Electricity Rules, 2015

Section-19: The contractor shall be responsible for the contractual services provided by the contractor and the contractor. Business procedures must comply with performance standards.

Section-67: The permit holders in the electric power permits are subject to the guidelines issued by the Ministry of Electric Power. Cooperation in the investigation of the increase in electricity burden and the need for drawing up the demand for electricity.

12. Myanmar Insurance Law, 1993

Section-15: Owner of motor vehicles shall effect life insurance for a minor

Section-16: An entrepreneur or 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 effect compulsory General Liability Insurance with the Myanmar Insurance.

13. Myanmar Mine Laws, 1994 (Amended, 2015)

Objective (f): not to destroy the environment due to mining activities.

Chapter-4, Section-13(e): Plan and manage for mining activities without harming the environment.

This includes : to set up fund for environmental conservation

: set up fund for implementation of decommissioning and rehabilitation

Chapter-5: is permit for the use of water (if public water)

Chapter-10: is offences and penalties for doing mining business and associated business without permit.

Section-29: The Ministry may with the approval of the Government issue prohibitions in respect of purchasing obtaining, storing, possessing, transporting, selling, transferring of any mineral obtained from mineral production.

14. Myanmar Mine Rules, 1996 (Amended, 2018)

Among the regulation, are: the permit holder must:

- Minimize environmental negative impacts on local communities and make an annual contribute to a fund for environmental conservation (Article-13).
- Contribute to Mine closure fund for rehabilitation (Article-13).
- Not to pollute and to maintain water quality above and below ground (M Rule-154).
- Make provision for safety and prevention of accidents at the mine/quarry site (Article-13).
- Provide all necessary measures for safety in the mine/quarry (M Rule-176).
- Monitor and regularly impact and maintain the working environment, tools and equipment and others for safe working, (M Rule-176).

Prepare and emergency plan (M Rule-176), among others.

15. Boiler Law, 2015

Section-5: Any person desirous to use a boiler for any enterprise shall register under this law.

Section-6: A boiler shall be manufactured in accord with Myanmar standards and international standards.

Section-7: The documents and certificates relating to the boiler shall be attached to the application and submitted to the inspector when applying for the registration of the boiler under section-5.

Section-12: The owner shall:

(a) Apply to the respective inspector to obtain certificates in accord with the prescribed manner.

(b) Apply to register only for the boiler constructed in accord with Myanmar standards or international standards.

Section-14: The owner shall apply to the respective inspector in advance in order to obtain permission though he or she has obtained the certificate or the provisional order if desirous to carry out any of the following matters:

(a) Using the boiler at more than allowable pressure

(b) Repairing, altering adding or renewing any steam-pipe, pipe or any mounting or other fitting attached such steam pipe, feed-pipe or mounting or other fitting attached to the boiler.

Section-15: The owner shall submit the certificate or provisional order when so requested by the respective government department and organization as may be necessary.

Section-18: The owner shall inform immediately to the inspector if any accident occurs.

Section-19: The owner shall not:

(a) use a boiler at a pressure higher than allowable pressure;

(b) repair and alter or force to repair and alter the safety valve to exceed allowable pressure;

(c) do any act contained in sub-section (b) of section 14 without permission.

Section-20: The owner shall not use the following boiler:

(a) Boiler without certificate or provisional order

(b) Boiler of which certificate or provisional order is void

(c) Boiler of which certificate or provisional order is revoked.

Section-21: The owner shall engrave the register number specified by the chief inspector in accord with the prescribed manner.

Section-22: The owner:

(a) has the right to use a boiler in accord with the prescribed manner if he or she obtains certificate or provisional order;

(b) may, if desirous to alter the term of the certificate or provisional order, apply in advance for inspection before the expiry of the term of such certificate or provisional order.

Section-24: The owner shall not:

(a) Carry out with the person who has not boiler repairer certificate on the receipt of notice to repair, alter, add or renew any boiler, steam pipe, feed pipe or any mounting or other fitting attached to such boiler, steam-pipe and feed pipe.

(b) Assign any person to charge the boiler used in the work except the person who operates and maintains the boiler

Section-29: (a) Any person desirous to obtain a boiler attendant certificate may apply to the respective inspector in accord with the stipulations;

Section-30: The boiler attendant shall:

(a) have the right to operate the boiler which is issued certificate or provisional order with the approval of the owner;

Section-31: The boiler attendant shall not use the boiler at more than allowable pressure.

Section-38: The inspector, in accord with the prescribed manners, shall:

(a) Inspect the boiler existing within the area where he is responsible,

(b) Inspect any boiler existing anywhere according to the assignment of the Chief Inspector.

Section-40: During performing under section 38, an inspector may enter and inspect any place or building in which he has reason to believe that a boiler is in use.

Section-59: No one shall amend, alter, deface, destroy the form and make invisible the register number engraved under section 21.

Section-62: No one shall adjust and alter the safety valve in order to exceed the allowable pressure on his volition or under the instruction of the owner.

16. Labour Organization Law, 2011

Section-17: The labour organization shall have the right to carry out freely in drawing up their constitution and rules, in electing their representatives, in organizing their administration and activities or in formulating their programmes the labour organization has the right to negotiate and settle with the employer if the workers are unable to obtain and enjoy the right of the workers contained in the labour laws and to submit demands to the employer claim in accord with the relevant law if the agreement cannot be reached.

Section-18: The labour organizations have the right to demand the relevant employer to re-appoint a worker if such worker is dismissed by the employer and if there is cause to believe that the reason of such dismissal were based on labour organization membership or activities, or were not in conformity with the labour law.

Section-19: The labour organizations have the right to send representation to the Conciliation Body in settling the dispute between the employer and the worker. Similarly, they have the right send representatives to the Conciliation Tribunal formed with the representatives from the various levels of labour organization.

Section-20: In discussing with the Government the employer and the complaining workers in respect of workers' right or interests contained in the labour laws, the representative of the labour organization also have the right to participate and discuss.

Section-21: The labour organizations have the right to participate in solving the collective bargains of the workers in accord with the labour laws.

Section-22: The labour organizations shall carry out peacefully in carrying out holding meetings, going on strike and carrying out other collective activities in accord with the procedure, regulations, by-law and any directives prescribed by the relevant labour Federation ship.

17. The Settlement of Labour Dispute Law, 2012

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

Section-39: No employer shall alter the condition of service relating to workers concerned in such dispute at the consecutive period before commencing the dispute within the period under the 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-51: It an employer in the course of settlement of dispute commits any action omission without sufficient case, which by causing reduction in production resulting so as to reduce the workers' benefits shall be liable to pay full compensation in the amount determined by the Arbitration Body or Tribunal. Such money shall be recovered as the arrear of land revenue.

18. Employment and Skill Development Law, 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 labour 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: Employer shall conduct occupational training to enhance the skills of workers who are to be employed as well as workers who are presently employed in accordance with the requirements of the enterprise and the policy of the Skills Development Agency

Section-30: (a) The employers of Industrial and Service Enterprises shall pay contribution to the fund every month without fail amounting to not less than below 0.5% of the payroll of his workers up to the level of supervisors of the workers.

Section-30: (b) The employer shall not deduct the contribution paid under sub- section (a) to the fund from the wages of the workers.

19. Minimum Wages Law, 2013

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-18: The inspection officer:

(a) Has the right to enter and inspect the relevant commercial, production and service workplaces, agricultural and livestock breeding workplaces and inspect whether or not they comply with and carry out in accord with the rules, notifications, orders, directives and procedures under this Law, whether or not the lists, schedules and documents, wages relating to the workers are prepared correctly, and whether or not such lists, schedules and documents are reported to the Department in accord with the stipulations;

(b) May summon, inspect the relevant persons under the assignment of duty by the Department, asking and copying for the relevant lists, schedules and documents.

(c) If there are outside workers at employer, has the right to inspect information relating to such outside workers, their names and addresses and the right to ask for and copy their lists and documents and lists relating to minimum wage;

(d) In carrying out under sub-section (a), (b) and (c) relating to inspection, if required by the employer to produce the document, shall show the civil service identify card issued by the relevant department;

(e) Report to the Department in accord with the stipulations relating to the finding under sub-sections (a), (b) and (c), and documents and papers called for.

20. Payment and Wages Law, 2016

Section-3: The employer:

(a) shall pay wages to the workers employing in his business in local currency or foreign currencies stipulated by the Central Bank of Myanmar. Such payment may be paid in cash or cheque or deposit into the bank account of the worker with the agreement between the employer and the worker.

(b) In paying such wages:

(i) if it is necessary to pay particular benefit, profits and opportunities for workers working in commerce, production and service businesses, it may be paid in cash or some in cash and some in things set up by local price on own volition of workers in accordance with the stipulations.

(ii) For workers employing in agriculture and livestock breeding business, it rnay be paid some wage in cash and something set up by local price according to custom, or on the volition of majority of worker or by collective agreement. In paying so, it shall be for personal use and the interest of his family, and shall be appropriate and equitable.

(c) If any worker is conscripted under the Public Military Service Law, the (60) days of wages shall be paid as a special right.

Section-4: The employer:

(a) shall pay wages at the end of the work or at the time agreed to pay to the worker for hourly, daily, weekly or other part time work, or temporary or piece work;

(b) shall not exceed one month than the period agreed with the worker under sub-section (a) to pay wages;

(c) shall pay the wages for the permanent work monthly. In making such payment:

(i) if workers are not more than 100, wages shall be paid at the end of the period for payment of wage;

(ii) If workers are more than 100, it shall be paid no later than five days after the end of the period for payment of wage;

(d) shall pay the due wages within two working days from the date of termination, if a worker is terminated;

(e) shall pay the wages at the end of the period for payment of wages, if a worker resigns on his own volition by sending prior written notice of resignation;

(f) shall pay the due wages to a legal heir within two working days after the decease, if a worker is deceased;

(g) shall pay all wages on a working day.

Section-5: employer encounters difficulties to make payment under sub-section (c) of the Section 4 due to any unexpected condition, including natural disaster, the employer shall submit that which date has been altered for the payment of wages with the consent of the workers to the Department on reasonable ground.

Section-6: The Department may, with the approval of the Ministry, allow the employers to postpone payment within the appropriate time under stipulated conditions, if it is scrutinized that the submission under Section5should be allowed.

Section-7: The employer:

(a) may deduct from wages, except leaves which are entitled wages under the relevant law and public holidays, for the absent period from work;

(b) may deduct expenses which are allowance for accommodation and ferry service arranged by the employer, meal allowance, electricity charges, water service charges and income taxes liable to paid by workers and cash paid in excess under a mistake, which are not included in the expression of wages under this Law;

(c) may deduct advance payment or reimburse or saving for the worker or any contribution under any law demanded by a worker from wages.

(d) may deduct from the wages of the worker under a decision of a Court or Arbitration Council or Arbitration Body.

Section-8: The employer shall not deduct from the wages of the worker except deduction from wages in accordance with provisions of Section 7 and Section 11.

Section-9: In deducting from wages under Section 7, all deductions made by the employer shall not exceed 50 percent of the wages of a worker except deduction from wages for the failure of a worker to perform his duty.

Section-10: The employer:

(a) shall obtain prior approval of the Department for what deduction can be made from wage and how much can be deducted before deducting anything stipulated as a fine under section 11.

(b) shall post the approval contained in sub-section (a) in conspicuous places at relevant factory and work;

(c) shall not exceed fine deducted for compensation than the value of damage or loss by action or omission of a worker;

(d) in deducting from wages under Section 11:

(i) shall not deduct from wages without giving right to defence of the worker;

(ii) shal1 not deduct more than 5 percent of the monthly wages of the worker.

(e) shall not absolutely deduct as the fine from a worker under 16 years of age;

(f) may caffy out the date of payment of passing fine in accordance with the agreement between the employer and the worker;

(g) shall deduct from wages for compensation due to loss of property within a limited period by an agreement of the relevant Township Conciliation Body;

(h) shall enter the deducting cash from wages into the register and systematically maintain it;

(i) shall submit a report of the deduction from wages to the Department;

(j) sha1l use fines of deduction from wages under sub-section (b) of Section 11 for the worker benefit in coordination with legally registered Labour aryanization in the factory.

Section-11: The employer may designate as fine to compensate for the following acts and omissions of a worker and deduct from his wages:

(a) any loss of property and cash expressly entrusted to the worker by the employer due to intentional negligence and carelessness or dishonest acts or omissions of the worker, which is caused directly by the carelessness and mistake of such worker;

(b) violation of any terms or conditions stipulated as fines in the employment agreement.

Section-12: The worker:

(a) may request to the employer to be settled by himself or legally registered labour organization or the Workplace Coordination Committee in the factory if the following conditions occur;

(i) deduction from wages obtainable without credible reason;

(ii) failure to pay overdue payment of wages.

(b) may submit to the inspector to solve the problem, if the employer fails to solve the problem asked under sub-section (a), within six months from the date of deduction or failure to pay.

Section-13: (a)The inspector rnay scrutinize such submission under sub-section (b) of the Section 12 and, if necessary, interrogate the relevant persons and make an appropriate order.

Section-13: (b) The worker or employer may file an appeal to the chief inspector, if he does not satisfy the order made under sub-Section (a), within 30 days from the date of such order.

Section-13: (c) The chief inspector may make an appropriate order after scrutinizing the appeal under sub-section (b) and hearing the employer and the worker.

Section-13: (d) The order of the Chief Inspector is final.

Section-14: If a worker has worked overtime he has the right to be paid according to the rate of payment designated.

Section-22: No employer shall not violate sections 4, 5, 8, 9 and 11 regarding payment and term and rate of payment.

Section-23: No employer shall violate the rules, decrees and prohibition regarding payment to its employees.

Chapter-8 deals with penalties for violation of the law. The penalties range from:

- Imprisonment of no more than 3 months and fine not more than Ks 500,000.
- Imprisonment of no more than 3 months and fine at least Ks 2,000,000.
- Imprisonment of up to 6 months and fine at least Ks 5,000,000.

21. Leaves and Holiday Act, 1951 (Amended 2014)

The law contains 18 sections and the purpose is for regulating the taking of leaves and holidays, covering the hours of work, weekly rest and paid leave. Three types of leaves, namely Earned leave, casual leave and leave on Medical Certificate are stipulated. The holidays during that period (the 19505) include: Independence Day, Fullmoon of Tabaung, Thingyan, Burmese New Year, May Day, Full Moon of Kason, Resistance Day, beginning of Buddhist Lent, Martyrs' Day, End of Buddhist Lent, Full Moon of Tansaungmone, and National Day. One Islam Holiday and Hindu Holiday are official but are not written in the Act, but are notified in short advance.

22. Workmen's Compensation Act, 1923

It was/is an Act to provide for the payment by certain classes of employers to their workmen of compensation for injury by accidents.

This law was amended in 2005 by chairman of the State Peace and Development Council. Since the rate in kyats for compensation during the 1920s are no longer applicable (workable) the rate for compensation are increased. The rate shall be according to the Notification by the existing Ministry of Labour. eg. fine which may extend to "Ks 100" is substituted by "Ks 10,000".

Section-13: Compensation shall be paid in line with the provision of the said law.

23. Social Security Law, 2012

Section-11:(a) The following establishments shall be applied with the provisions for compulsory registration for social security system and benefits contained in this Law if they employ minimum number of workers and above determined by the Ministry of Labour in co-ordination with the Social Security Board:

(i) 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, warehouse- es and establishments;

(ii) Government departments, Government organizations and regional administrative organizations which carry out business;

(iii) development organizations;

(iv) financial organizations;

(v) companies, associations, organizations, and their subordinate departments and branch carry out business;

(vi) shops, commercial establishments, public entertaining establishments;

(vii) Government departments and Government organizations which carry out business or transport businesses owned by regional administrative body, and transport businesses carried out with the permission of such department, body or in joint venture with such department or body;

(viii) constructions carried out for a period of one year and above under employment agreement;

(ix) businesses carried out with foreign investment or citizen investment or joint ventured businesses;

(x) businesses relating to mining and gem contained in any existing law;

(xi) businesses relating to petroleum and natural gas contained in any existing law;

(xii) ports and out-ports contained in any existing law;

(xiii) businesses and organizations carried out with freight handling workers;

(xiv) Ministry of Labour and its subordinate departments and organizations;

(xv) establishments determined by the Ministry of Labour, from time to time, that they shall be applied with the provisions of compulsory registration for Social Security System and benefits contained in this Law in coordination with the Social Security Board and with the approval of the Union Government.

Section-11: (b) The project owner will register to the respective social security office.

Section-15: (a) The project owner will pay the social security fund for four types of social security

Section-18: (b) The project owner will pay the fund which have to be paid by himself together with the fund which have to be paid from the salaries of the employees.

Section-48: (b) The employers may effect insurance by registering voluntarily for the workers who are not applied to provisions of compulsory registration for employment injury benefit insurance system and by paying stipulated contribution to employment injury benefit insuance fund.

Section-75: The project owner will submit the lists and records, provided in article 75, to related social security office.

24. Occupational Health and Safety Law, 2019

Section-12: The Employer shall, in accordance with the stipulations of the Ministry:

(a) appoint the Person In-charge for Occupational Safety and Health to closely supervise safety and health of Workers in line with the type of Industry/Business; and

(b) form the respective Occupational Safety and Health Committee in line with the type of Industry/Business comprising equal number of Employer and Worker representatives to become safe and healthy Workplace on condition that the number of Workers in his/her Industry/Business exceeds the number determined by the Ministry for that purpose. The Occupational Safety and Health of female Workers shall be considered according to the nature of Industry/Business whten forming such Occupational Safety and Health Committee.

Section-14: Persons In-charge for Occupational Safety and Health shall comply with this Law and rules, orders, directives and procedures made under this Law to make the Workplace to be a safe Workplace that is good for health.

Section-16: Inspection Officers shall enter the Workplaces to which this Law applies and inspect Occupational Safety and Health conditions and direct Employers for their compliance and report the findings to the Chief Inspection Officer.

Section-17: Inspection Officers have the powers to perform the following for Occupational Safety and Health in accordance with their codes of conduct:-

(a) the power to enter, inspect and inquire at any Workplaces related to this Law at any time by showing the Inspection Officer's identity without warrant;

(b) the power to look at, make copies of and seize as evidence as required documents and records in connection with Workplaces and Processes;

(c) the power to take photos and record videos in connection with Workplaces and Processes that may be harmful to Occupational Safety and Health;

(d) the power to assess and measure and take records of the extent of impairment and duration caused to the environment of the Workplace due to loudness, light, heat, coldness, particles, gas and Hazardous Materials, and obtain the assistance of the expert in the relevant field of study if required;

(e) the power to inquire of any person in the Workplace during working hours with the assistance of the Recognised Doctor to check any conditions that put or are likely to put Workers in contact with Occupational Disease; and

(f) the power to require responsible persons at clinics or hospitals to deliver, with the stipulated security grade, medical treatment records of the Worker who is under treatment or information relating to death due to Occupational Accident or Occupational Disease, or autopsy results asked by the Department in the stipulated form.

Section-18: Inspection Officers shall, with the approval of the Chief Inspection Officer, order the Employer to temporarily close a whole or part of the Workplace, and notify the relevant Departments if required, if they believe that an Occupational Accident, Occupational Disease, Hazardous Eventor Major and Serious Occupational Accident occurs or is likely to occur because:

(a) it is not appropriate to continue doing the Industry/Business due to dangerous Workplace condition, or unsafe operation carried by Workers, or existence of Hazardous Materials and Hazardous Machines, or layout and function of Workplace, part of the machine or equipment;

(b) it is not appropriate to continue doing the Industry/Business due to breach or incompliance with any of the provisions of this Law;

(c) it deems that Workers in the Workplace are in danger due to acts, omissions, negligence or carelessness; or

(d) it needs to evacuate Workers from hazards because an Occupational Accident or accident is about to occur.

Section-26: The Employer shall be responsible to: -

(a) arrange as required to assess the risks of Workplace, Process and machines and materials used thereat;

(b) arrange as required to assess the likelihood of occurrence of hazards at the Workplace and to the environment;

(c) arrange to have Workers medical checked-up by the Recognized Doctor in accordance with stipulations whether they suffer from any Occupational Disease;

(d) arrange to improve the Workplace until it is safe and good for health based on the findings as per sub-sections (a), (b) and (c)

(e) provide Workers with sufficient number of personal protective clothing, materials and facilities prescribed and approved by the Department on free of charge basis and cause Workers to wear them while working;

(f) prescribe precautionary plans and plans for emergency;

(g) provide a clinic, appoint the Registered Doctors and nurses and provide medicines and supporting equipment for any Industry/Business where the number of Workers is not less than the number determined by the Ministry;

(h) make necessary arrangements for managers, Workers and members of the Occupational Safety and Health Committee including (Employer) himself/herself to attend Occupational Safety and Health training courses stipulated by the Ministry in accordance with their departments or types of work;

(i) make necessary arrangements to enable immediate reporting to the Person In-charge for Occupational Safety and Health or manager in case where a Worker suffers an Occupational Accident or his/her life or health is likely to be in danger;

(j) arrange to prevent any persons in the Workplace from Occupational Safety and Health risks occurred due to materials, machines or wastes used in the Workplace or Process;

(k) immediately stop the Process, evacuate Workers and conduct necessary rescue plans if any Occupational Accident is about to occur. If possible, Workers will be relocated to another appropriate safe Workplaces;

(l) display Occupational Safety and Health instructions, danger signs, notices, posters and signage for directions in accordance with stipulations;

(m) arrange to be complied with precautions when entering restricted hazardous Workplaces;

(n) arrange to disseminate Occupational Safety and Health manuals and guidelines issued by the relevant Ministries for knowledge, technology, information and skills not only to Workers but also to related persons or raise their awareness or knowledge thereof;

(o) lay down the fire safety plan, perform fire drilling and train Workers to use fire extinguishers systematically;

(p) allow the Chief Inspection Officer and Inspection Officers to enter Workplaces, inquire, request documents and information or seize exhibits;

(q) cause Workers to work only for the specified working hours if they have to work in Hazardous Industry/Business and Workplace; and

(r) Incur the expenses for Occupational Safety and Health matters.

Section-27: No Employer shall dismiss or demote a Worker: -

(a) during any period before a medical certificate is issued by the Registered Doctor for occupational injury or by the Recognized Doctor for contact with Occupational Disease;

(b) because the said Worker has addressed a complaint for hazardous or health detrimental condition;

(c) because the said Worker has conducted the responsibilities of Occupational Safety and Health Committee; or

(d) because the said Worker has refused to work in any condition where an Occupational Accident or Occupational Disease is about to occur.

Section-34: The Employer is responsible to undertake the following in accordance with the stipulations: -

(a) informing the Department in case of an Occupational Accident, Hazardous Event or Major and Serious Occupational Accident;

(b) if a Worker is in contact with a stipulated Occupational Disease or contaminated or likely to be contaminated due to materials or Process used, sending a report to the Department together with a medical report prepared by the Recognized Doctor.

Section-36: (a) Inspection Officers must perform inspection as required if any Occupational Accident, Hazardous Event, Occupational Disease or Occupational Contamination breaks out.

(b) No one shall, without consent of the Chief Inspection Officer, remove, conceal, add or change a whole or part of the materials, machines, equipment, layout, documents or signs relating to the occurrence of an Occupational Accident, Hazardous Event, Occupational Disease or Occupational Contamination.

25. The Factories Act, 1951 (Amended 1986)

The law contains 10 Chapters and 109 articles.

Purpose: to ensure the health, safety, welfare, fair working time the clean environment for the employees working inside a factory. This law focuses on all stipulation for the employer (project owner).

The project owner should abide by nearly all sections in this Act. The project owner has to abide by all provisions for healthy, safety, welfare, (Chapter 3, 4, 5 respectively) working-hours and other needs. The project owner shall ask its legal expert to study this Act in details for his advice.

This Act also contains the provision for chemicals management and storage. The chemicals use in the manufacturing of motorcycle, paints, thinners, varnishes etc, may not require permits. Since iron smelting will not be involved permit for "hot work" may not be also necessary.

Chapter-8 is on the employment of young person.

Chapter-9 deals with punishment and procedure for employer who violates this law.

This factories Acts requires all factories to have proper pollution control measures such as air pollution, sewage and waste water treatment system and solid waste management system.

26. Myanmar Public Health Law, 1972

Section-3: The Company shall cooperate with the authorized person or organization in line with the law and shall abide by any instruction or stipulation for public health.

Section-5: The company shall accept any inspection anytime and anywhere if it is needed.

27. Prevention and Control of Communicable Diseases Law, 1995

Section-3: In order to prevent the outbreak of Communicable Diseases the Department of Health shall implement the following project activities.

(a) Immunization of children by injection or orally.

(b) immunization of those who have attained majority, by injection or orally, when necessary;

(c) carrying out health educative activities relating to Communicable Disease.

Section-4: When a principal epidemic disease of a notificable disease occurs:-

(a) Immunization and other necessary measures shall be undertaken by the Department of Health, in order to control the spread thereof

(b) The public shall abide by the measures undertaken by the Department of Health under sub-section (a)

Section-9: The head of the household or any member of the household shall report immediately to the nearest health department or hospital when any of the following events occur:-

(a) Rat fall

(b) Outbreak of a principal epidemic disease

(c) Outbreak of a noticeable disease

Section-11: In order to prevent and control the spread of a principal disease the health officer may undertake the following measures:-

(a) Investigation of a patient or any other person required

(b) Medical examination

(c) Causing laboratory examination of stool, urine, sputum and blood sample to be carried out

(d) Causing investigation by injection to be carried out

(e) Carrying out any other investigation.

28. The Control of Smoking and Consumption of Tobacco Product Law, 2016

Section-9: The person in charge at the factory shall:-

(a) Keep the caption and mark referring that it is a non-smoking area the place mentioned.

Section-6: In accordance with stipulation.

(b) Arrange the specific place where smoking is allowed as mentioned in section-7 and keep the caption and mark also referring that it is a specific place where smoking is allowed, in accordance with the stipulation

(c) Supervise and carry out measures so that no one shall smoke at the non-smoking area.

(d) Accept the inspection when the supervisory body comes to the place for which he is responsible.

29. Protection and Preservation of Cultural Heritage Regions Law, 1998

Section-13: A person desirous of carrying out one of the following shall abide by the provisions of other existing laws and also apply to the Department in accordance with stipulation to obtain prior permission under this law:-

(a) Within the ancient monumental zone or the ancient site zone

(1) Construction or extending a building

(2) Renovating the ancient monument or extending the boundary of its enclosure;

(b) Within the preserved or protected zone, constructing extending, renovating a hotel, motel, guest house, lodging house or industrial building or extending the boundary of its enclosure

(c) Within the culture heritage region:

(1) Carrying out the renovation and maintenance work of the ancient monument without altering the original ancient form and structure or original workmanship;

(2) Carrying out archeological excavations;

(3) Building road, constructing bridge, irrigation canal and embankment or extending the same

Section-22: No person shall construct a building which is not in conformity with the conditions prescribed region wise by The Ministry of Culture in the cultural heritage region.

30. Protection and Preservation of Antique Objects Law, 2015

Section-12: A person who finds any object which has no owner or custodian shall promptly inform the relevant Ward or Village-Tract Administration if he known or it seems reasonable to assume that the said object is an antique object.

31. Protection and Preservation of Ancient Monuments Law, 2015

Section-12: Anyone who has found an ancient building of 100 years or more of age without owner on the ground, underground above the water or under the water has to inform, if the building is recognized as or believed to be an ancient monument , the nearest village or township administration department.

Section-15: Every person desirous to engage in the following within the area of certain ancient monuments has to apply for the permission of the administration department:

(b) Constructing industrial building

(e) Digging a well, pond

(h) Constructing buildings near an ancient monument if this violets the structural rules approved by the ministry.

The administration development can approve or reject an application submitted under section 14 or 15 after having analyzed it.

Section-20: No one is allowed to do any of the following acts likely to cause damage to an ancient monument within the boundary without prior written permission of the administration department

(b) Using and driving heavy machines and vehicles which may cause vibration within the area of an ancient monument

(f) Releasing of chemical waste which can cause pollution of ancient monument and the natural environment

32. The Conservation of Water Resources and Rivers Law, 2006

Section-8: No person shall:

(a) Carry out any act or channel shifting with the aim to ruin the water resources and river and creeks.

(b) Cause the wastage of water resources willfully.

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.

Section-19: No one shall dispose of any substance into the river, creek that may cause damage to water way or change of water course 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-22: No one shall, without the permission of the Directorate, pile sand, shingle and other heavy materials for business purpose on the bank area and water front area.

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.

Section-29: Whoever attempts or conspires or abets in the commission of an offence under this law shall be punished with the punishment provided for such offence in this law.

Section-30: Any government department and organization or any person desirous of constructing drainage, utilizing river water intake, constructing bridged spanning rivers, connecting underground pipe, connecting underground electric cables, connecting underground telecom cable or digging in river or creeks, bank boundary and water front boundary, under the requirement of work, shall in order not to adversely affect the water resources and river and creeks, carry out only after obtaining the approval of the Ministry of Transport.

33. Conservation of Water Resources and River Rules, 2013

Chapter-3, Protection of water pollution and conservation of environment

Section-8: No one:

(a) must not pollute the river water by dumping hazardous substance into the water

(b) must not dump plastic bags, any plastic materials or nylon ropes into the water

(c) must not construct latrine by the river side to prevent water pollution by human wastes

(d) must not dump any human wastes, fuel oils, chemical toxic wastes into the water

(e) all activities should be executed according to international standards

Section-9: Any one who has committed such an offence must pay for this to the Directorate

Chapter-11, Construction of buildings/structures on the river bank premise

Section-53: Anyone who want to construct any buildings or structures near the river must obtain permit from the relevant Ministry and Directorate.

34. The Forest Law, 2018

Section-12: Whoever within a forest land and forest covered land at the disposal of the Government:-

(a) is desirous of carrying out any development work or economic scheme shall obtain the prior approval of the Forest Ministry:

Section-40: Whoever commits any of the following acts shall, on conviction, be punished with fine which may not exceed kyats 300,000 or with imprisonment for a term which may not exceed 1 year or with both:

(a) trespassing and encroaching in a reserved forest;

(c) breaking up any land, clearing, digging or causing damage to the rriginal condition of the land without a permit in a reserved forest;

Section-41: Whoever commits any of the following acts shall, on conviction, be punished with fine ranging from kyats 300,000 to 500,000 or which may not exceed 2 years or with both:

(a) extracting, moving, keeping in possession unlawfully any forest produce, with the exception of timber from teak and reserved tree, without a permit;

(b) selling or utilizing in other works, forest produce extracted under section 18 subsection (d), without the prior permission of the person authorized to grant permission for extraction.

Section-42: Whoever commits any of the following acts shall, on conviction, be punished with fine ranging from kyats 500,000 to 1,000,000 or with imprisonment for a term which may not exceed to 7 years or with both:

(a) felling, cutting, girdling, marking, lopping, tapping or injuring by fire or otherwise any tree in a reserved forest;

(b) extracting, moving, keeping in possession unlawfully timber from reserved tree other than teak without a permit;

35. The Conservation of Biodiversity and Protected Areas Law, 2018

Section-34: A Park Warden may pass an administrative order incurring a fine of a minimum Kyats 10,000, which may extend to a maximum of Kyats 30,000 to be paid, on a person who commits any of the following acts within a Protected Area or within the Zoological Garden or Botanical Garden administered by the Government or in which the Government has subscribed share capital:

(b) trespassing a prohibited place other than a place where the public is permitted for recreation;

(c) grazing or free grazing or causing domestic animals to trespass;

Section-35: A Park Warden may pass an administrative order causing a fine of a minimum Kyats 30,000 extending to a maximum of Kyats 100,000 to be paid on a person who commits any of the following acts within Protected Areas or within the Zoological Garden or Botanical Garden administered by the Government or in which the Government has subscribed share capital:

(a) entering a prohibited area without permission;

Section-39: Whoever commits any of the following acts shall, on conviction be punished with imprisonment for a term that may extend to 3 years or with fine of a minimum Kyats 200,000 extending to a maximum of Kyats 500,000, or with both:

(d) polluting soil, water and air with intention, damaging a water-course or poisoning water, electrification, using chemical or explosive materials within a Protected Area;

(e) possessing or disposing of toxic objectives or mineral wastes in a Protected Area;

Section-40: Whoever commits any of the following acts shall, on conviction be punished with imprisonment for a term that may extend to 5 years or with fine of a minimum Kyats 300,000 which may extend to a maximum of Kyats 1,000,000 or with both -

(c) destroying ecosystem or any natural condition or encroaching in the Protected Area;

36. Farmland Law, 2012

Chapter III

Section-9: The person who has the right to use the farmland shall have the following rights:

(a) right to have the farmland in possession, right to use the farmland, right to enjoy the benefit arises from this right;

(b) right to sell, mortgage, lease, exchange and gift on the whole or part of the right to use the farmland in accord with the stipulated terms and conditions;

Chapter IV

Section-12: The person who has the right to use the farmland:

(a) shall carry out the farmland as prescribed in this Law;

(b) shall pay land revenue and other taxes levied by the Ministry relating to the farmland;

Chapter X

Section-30: In respect of the application to utilize farmland for other purposes in the interest of the public:

(b) The respective Region or state Government shall give permission to utilize the farmland for other purposes except paddy land, with the recommendation of the Region or State Farmland Management Body.

Chapter XII

Section-35: Any person who has the right to use the farmland fails to comply with the order passed under Section 19 or the order or decision passed in the dispute of the right to use the farmland under this Law shall, on conviction, be punished with imprisonment for a minimum of six months to a maximum of two years and shall also be liable to fine for a minimum of three hundred thousand kyats to a maximum of five hundred thousand kyats.

37. Fire Brigade Law, 2015

Section-24: No person shall fail to abide by the directives in respect of fire precaution and prevention issued under section -16 by the Township Fire Service Department.

Section-25: The owner or manager of the factory, workshop, work site or business exposed to fire hazard shall:

(a) Not fail to form the reserve fire bridge

(b) Not fail to provide materials and apparatus for fire precaution and prevention, in conformity with the directive of the Fire Service Department

38. Fresh Water Fisheries Law, 1991

Section-40: No one shall cause harassment of fish and other aquatic organisms or pollution of water in a fresh water fisheries water.

39. Prevention of Hazard from Chemical Substances Law, 2013

Section-14: The Central Supervisory Board:-

(b) shall grant the licence with regulations, if permit to grant the licence, after being paid the licence fees.

Section-15: A person who has obtained a licence, before starting the respective chemical and related substances business:-

(a) Shall be inspected for the safety and the power of resistance of the machinery and equipments by the respective Supervisory Board and Board of Inspection;

(b) Shall be attended the person who serve in the work to the respective foreign trainings or the training and the expert trainings on prevention of hazard from the chemical and related substances opened by the government department and the government organizations.

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

(a) Shall abide by the license regulation;

(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 Board 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;

Section-17: A person who has obtained a license, shall put the insurance in accordance with 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-20: A person who has obtained a licence shall apply the related chemical and related substances that will be used in his chemical and related substances business in accordance with the stipulations to the Central Supervisory Board.

Section-21: The Central Supervisory Board scrutinizes the application according to section 20 and if it is in accord with the stipulations, shall issue the registration certificate with regulations after being paid the registration fees for the respective chemical and related substances.

Section-22: A person who has obtained the registration certificated shall abide the regulations consisted in the registration certificate furthermore shall also abide the order and instructions issued occasionally by the Central Supervisory Board.

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.

40. Will comply with any regulation and statutory requirements prescribed by Shan State Development Committee.

The project proponent has made a commitment that it will comply with all the laws, rules and regulations mentioned above.

U Sein Myo Aung

Executive Director

Ngwe Yi Pale' Cement Co., Ltd

3.2.2 International and Regional Conventions and Protocols

Myanmar has either signed or ratified no less than thirty treaties, conventions and protocols concerning environment, it is learnt.

Some of the regional conventions or protocols signed or ratified by Myanmar are:

(i) ASEAN Agreement on Conservation of Nature and Natural Resources. Kuala Lumpur, 1985

(ii) Agreement on Aquatic Centre in Asia and Pacific Bangkok, 1988

(iii) ASEAN Agreement on Tran-boundary Haze Pollution, 2002

(iv) Establishment of ASEAN Regional Centre for Biodiversity, 2005

Some of the international conventions and protocol which are of importance are:

(i) Convention on Wetlands of internationally importance, RAMSAR 1971 and amended, 1987

(ii) Convention for the protection of World Culture and National Heritages. Paris, 1972.

(iii) Convention on International trade in Endangered Species of wild Fauna and Flora. Washington, 1973, and amended, Bonn, 1979.

(iv) Convention on conservation of migratory species of wild animals. Bern, 1983.

(v) Vienna convention for the protection of Ozone Layer. Vienna, 1985.

(vi) Convention on Biological Diversity. Rio-de-Janero, 1992

(vii) U N Frame work Convention on Climate Change, 1992.

(viii) Kyoto Protocol on the frame work convention on climate change. Kyoto, 1998

(ix) Protocol on Bio safety. Cartagena, 2000

(x) Convention on Persistent Organic Pollution (POP). Stockholm, 2004

Recently the country has participated in:

(xi) UN Climate Change Conference, COP (conference of the parties) 21, Paris, 2015

(xii) UN Climate change conference, COP 22, Marrakesh, 2016

(xiii) UN Climate change conference, COP 23, 2017

(xiv) UN Climate change conference, COP 24, Katowice, 2018

(xv) Will also paticipate in UN Climate change conference, COP 25, Madrid.

3.2.3 International standards and guidelines

1) Boiler tubes for coal-fired power plant. https://www.materials.sandvik>s

2) Building and civil engineering works. www.iso.org>ios>catalogue-tc-browse

3) China coal emission standard/COR NERSTONEMAG. cornerstonemag.net>tag>china-coal

4) China: New emission standards for power plant/Airclim. www.airclim.org>acidnews>china-new

5) Coal boiler operation. info.dogpile.com/

6) Coal-fired power plant--Power Generation--Tenaris. www.tenaris.com>products>coal-fired power

7) Coal-International Organization for standard-ization. https://www.iso.org>ics>73.040.htm

8) Construction safety guideline. www.webcrawler.com/

9) Emission standards and control of $PM_{2.5}$ from coal-fired power plant. https://www.usea.org>default>fily

10) Environmental, Health and Safety Guidelines for thermal power plant. www.euromot.eu>download.

11) IBC. International Building Code, 2015. https://www.slideshare.net>vaughan15

12) IFC 2017. Environmental, health and safety guidelines for thermal power plant (Draft) IFC. https://www.ifc.org>wps>wam>connect

13) International Energy Agency (IEA): Power generation from coal. https://www.iea.org>clab>papers.

14) ISO Electrical Standards. www.peshematic.com/

15) ISO. Standards. ICS91. Construction materials building. www.iso.org>iso>catalogue-ics-browse

16) ISO. Sustainability in building and civil engineering works. www.iso.org>iso>catalogue-details

17) ISO. 14084-1-5. Process diagram for power plant. Part I & II.

18) Pollution control of coal-fired power generation in China. cornerstonemag.net>pollution-control

19) Power Generation Standards. https://webstone.ansi.org>Default

20) Power Plant Safety. info.dogpile.com/

21) Thermal Power: guidelines for new plants. IFC. https://www.ifc.org>therm new PPAH.

22) Thermal Power Plant - IFC. www.ifc.org>wps>wcm>connect>f

23) W.B. Environmental, Health and Safety guidelines for Thermal Power Plant. https://www.scrib.com>document>En.

The above-mentioned standards and guidelines are intended mainly for developed countries but also for certain developing countries trying to improve their images. Ngwe Yi Pale' Cement Co., Ltd will do its best to follow these guidelines and standards as practical as possible.

3.3 Contractual and other commitment

Commitments made by the project proponent

The project proponent has made a sincere commitment and confirmed that:

(a) the information and data in this EIA report are true and accurate and that the report is complete,

(b) the EIA has been prepared in strict compliance with applicable laws including EIA procedure and with the ToR for the EIA, and

(c) that the project proponent will at all times comply fully with the commitments, mitigation measures, EMP and MP in the EIA report (EIA procedure 616/2015, Section-62 (a, b, c)).

U Sein Myo Aung

Executive Director

Ngwe Yi Pale' Cement Co., Ltd

Ngwe Yi pale' Cement Co., Ltd is fully committed to:

- complying with laws, rules and regulation in implementing this project
- undertaking all mitigation measures, as practical as possible, mentioned in this report
- implementing the EMP and MP mentioned in this report
- preventing the pollution of the surrounding area; not to pollute the air, land and water environment
- conservation of natural resources and energy as far as possible,
- create environmental awareness among employees and local community through education and training, and
- duly implement CSR programme meaningfully

U Sein Myo Aung

Executive Director

Ngwe Yi Pale' Cement Co., Ltd

Commitments by the consultant firm, MESC

The consultant firm has made a sincere commitment and confirmed that:

(a) the information and data in this EIA report are true and accurate and that the report is complete, and

(b) that the EIA has been prepared in strict compliance with applicable laws including EIA procedure and wth the ToR for the EIA (EIA procedure 616/2015, section-62 (a, b)).

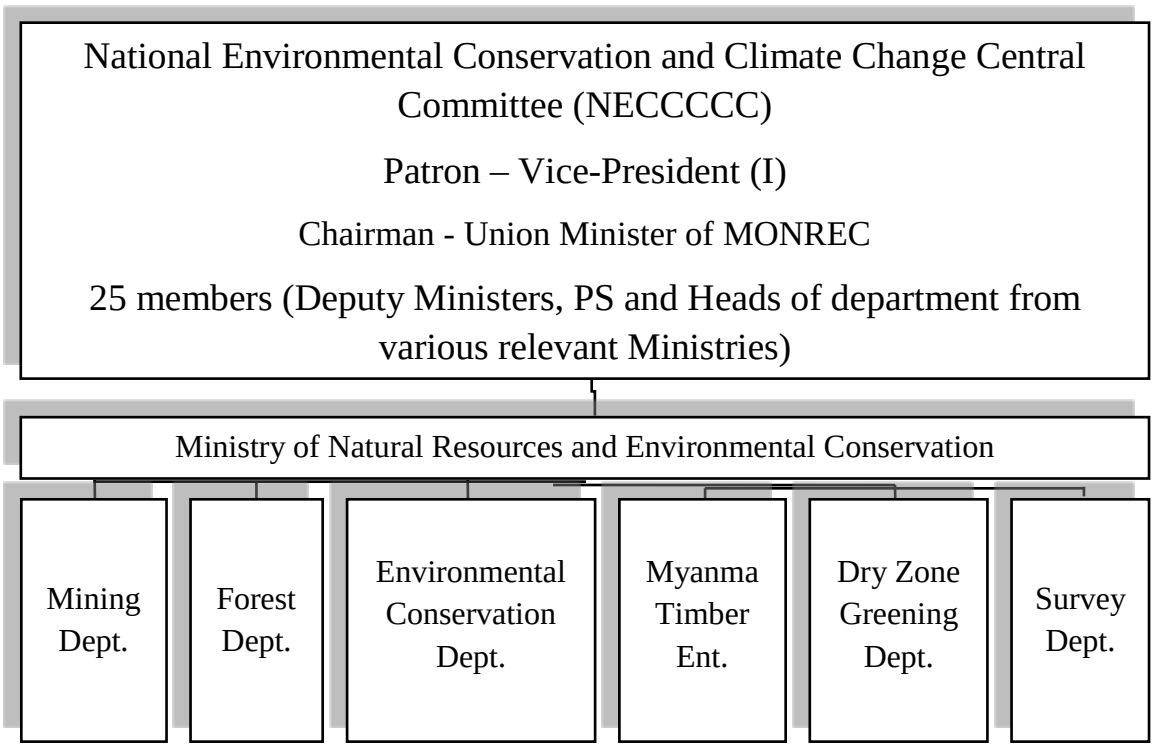
The report has been prepared by MESC with utmost effort with all reasonable skills, care and diligence within the term of contract with the client (Ngwe Yi Pale' Cement Co., Ltd) and based on our experience, using professional judgment and based on the information that is available to us.

Myint Kyaw Thura
Managing Director
Myanmar Environment Sustainable Conservation

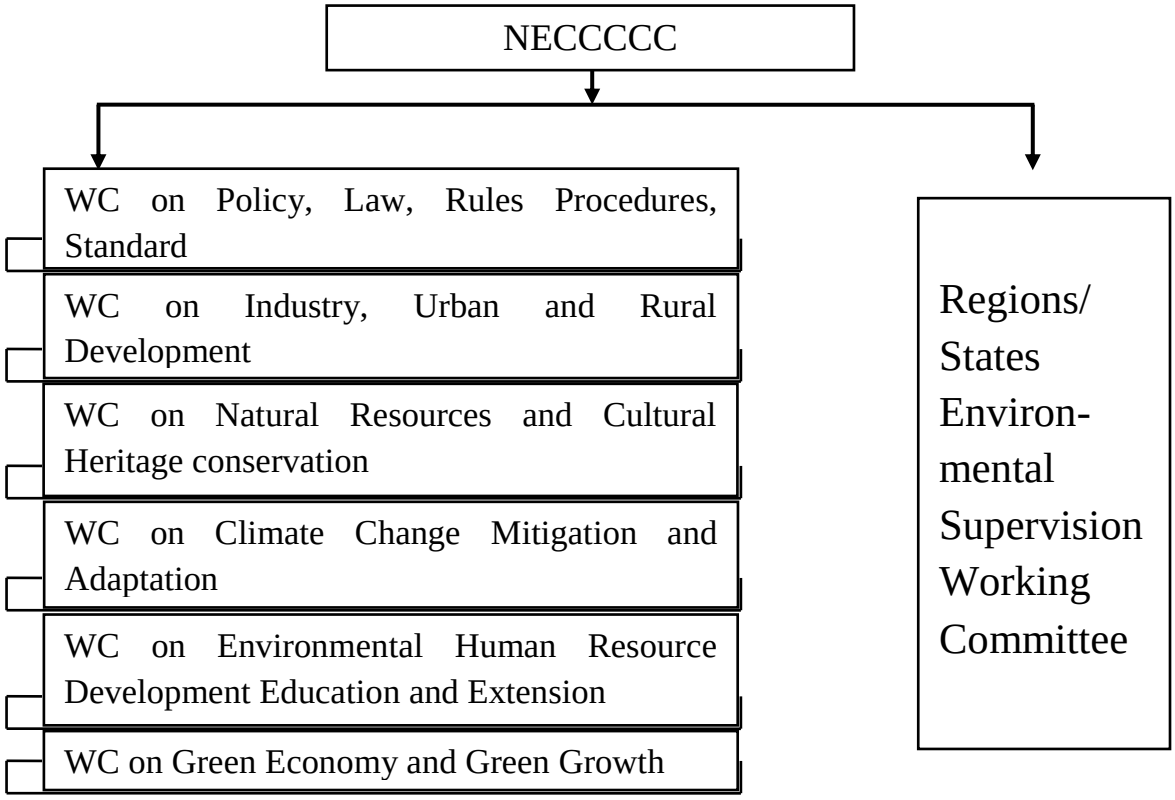
3.4 Institutional frame work

The National Environmental Conservation Committee (NECC) was formed in 2011 with the aim to achieve sound environmental management in the country. It is enlarged and reorganized as National Environmental Conservation and Climate Change Central Committee (NECCCCC).

The institutional organization of NECCCCC is as follow:

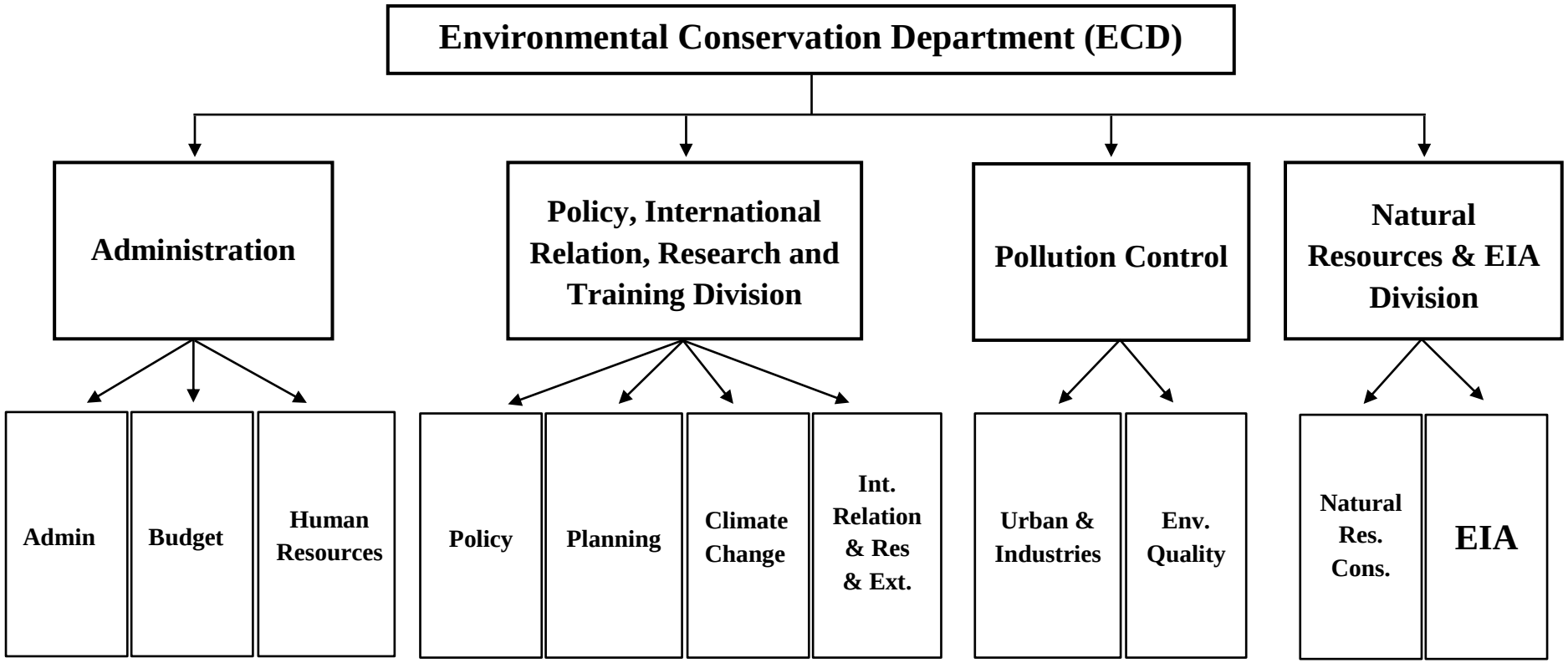


There are six Working committees under NECCCCC and supervision WC at 14 states and Regions.



Institutional organization of ECD

ECD is a major department under MONREC and is headed by a director general. Under the Director General are one Deputy Director General and 4 Directors at the directorate. ECD is the focal and coordinating agency for the overall environmental management of the country. It is also directly responsible for all the management of IEE, EIA, EMP etc. activities taking places all over the country.



These four departments are each headed by a director.

The main tasks of ECD include:

- implementing environmental conservation policy
- designing and implementing monitoring programmes
- prescribing environmental quality standards and,
- conducting activities relating to waste management and conducting environmental impacts assessments

Recently various Environmental Conservation Departments at States and Regional levels under the Directorate were established in all the 14 States and Regions of the nation. This will surely greatly enhance the conservation of the environment and especially the management of the environment of the country.

Occupational and Environmental Health Division (OEHD)

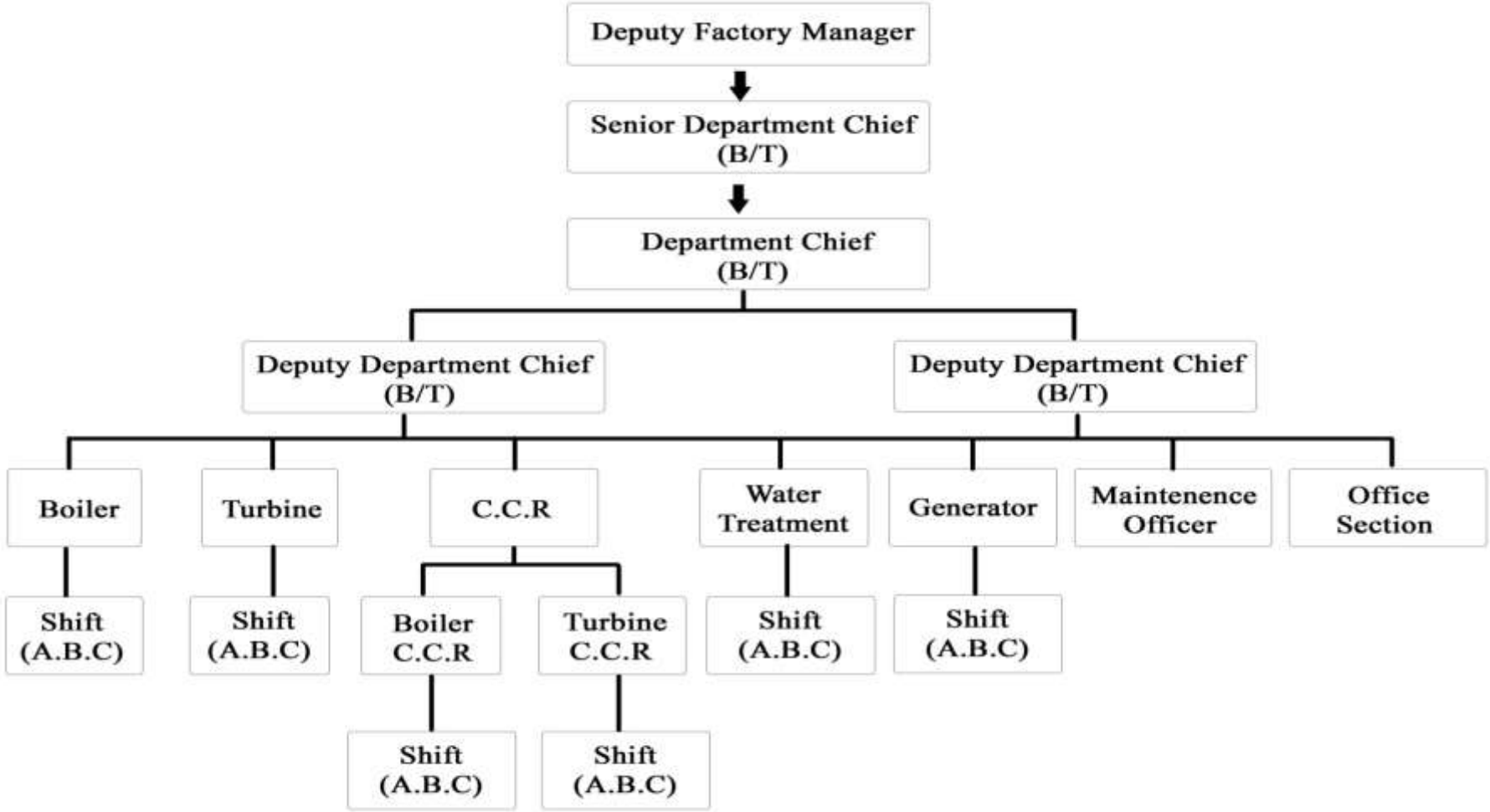
The Occupational and Environmental Health Division under the Department of Public Health is the focal agency involves in environmental and health affairs.

The occupational and Environmental Health Division is involved in implementing Environmental Health Programme in the country.

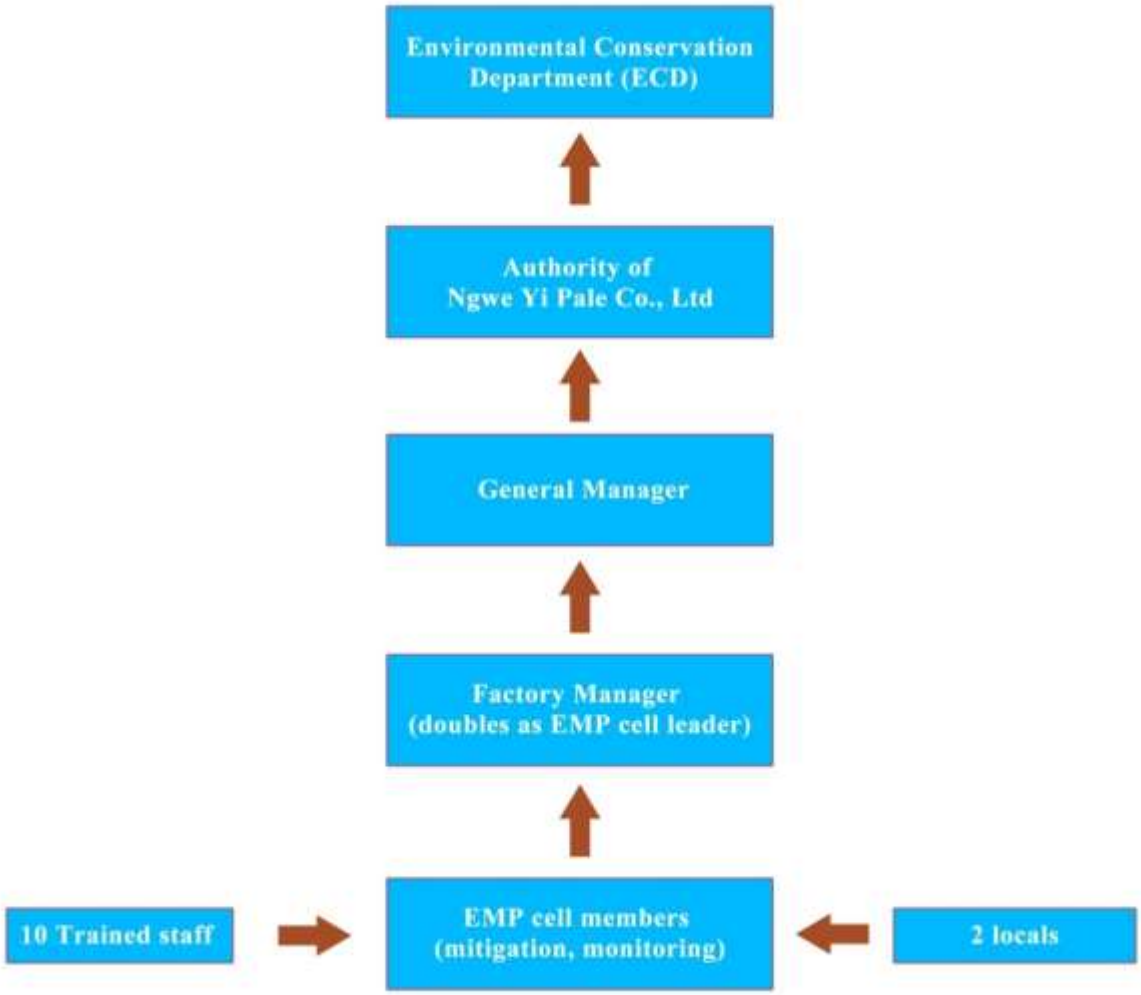
At the moment it is involved in:

- Environmental monitoring: on air quality and water quality
- Medical monitoring: health assessment on workers (periodic medical examination, performing physical examination, chest X-ray, biomarker survey on workers)
- Work place assessment: eg- on air quality, waste (solid) and waste water, heat stress and light, noise level, soil quality, water sanitation and hygiene etc. in certain factories.
- Assessment of environmental health probably related to climate change and general health impact assessment.

Institutional arrangement (Organization chart) of the company



Institutioanl arrangement of Ngwe Yi Pale' Co., Ltd for the implementation of EMP



The company is not a position yet to set up an Environmental, Health and Safety Department/unit (EHS). The nucleus organization EMP cell members and specially trained staff will undertake all mitigation, EMP, EMDP works.

3.5 Project's Environmental and Social Standards

Regarding environmental and social standards the company will follow the International Finance Corporation's Environmental and Social Standards and Guidelines, especially Health and Safety Guidelines.

The Environmental and Social Guidelines or Principles encompasses:

- Assessment and Management of Environmental and Social Risks and Impacts

  (This includes among others, to adopt mitigation measures for impacts and promote improved environmental and social performance and management system).

- Labour and Working Conditions

(This inludes, among others, compliance with employment and labour laws; creation of safety working environment and provision of compensation and avoidane of child labour etc.)

- Resource Efficiency and Pollution Prevention

  (Ths includes, among others, conservation of natural resource, refrain from over-exploitation, conservation of water and energy, preventon of pollution by all means as far as possible, including reduce projet-related GHG and other emission etc.)

- Community Health, Safety and Security

  (This includes, among others, avoidance, prevention and minimization of all risks and negative impacts on the health and safety of the local community, adhere to human rights, safeguarding personnel and property etc.)

- Land Acquisition and Involuntary Resettlement

  (This includes, avoidance as for as possible, land grabbing, forced land acquisition, forced eviction, forced relocation and forced resettlement. Generous compensation for loss and damages, if any, to be undertaken etc.)

Biodiversity Conservation and Sustainable Management of living Natural Resources

(This includes, among others, to protect and conserve the biodiversity and the sustainable utilization of the living natural resources etc.)

- Indigenous Peoples
- (This includes, among others, respect for human rights, culture and tradition, voidance of impacts on the indigenous people, provision of compensation, implementation of CSR activities, community assistance and development etc.)
- Cultural Heritage

(This includes, among others, protection of cultural, religious and historical heritages and promote the preservation of these heritages etc.).

3.5.1 Project Environmental Standards

National Environmental Quality Guideline by Environmental Conservation Department (ECD)

(a) Air quality; air emission guideline

Ngwe Yi Pale' Cement Co., Ltd will comply with the general National Environmental Quality Emission Guideline values (Code No. 1.1) for air emission as prescribed by the Environmental Conservation Department (from Notification No.615/2015, December 2015, by ECD, then under the Ministry of Environmental Conservation and Forestry (MOECAF), now MONREC.

Parameter	Averaging Period	Guideline Value μg/m^3
Nitrogen dioxide	1-year 1-hour	40 200
Ozone	8-hour daily maximum	100
Particulate matter PM_{10}[a]	1-year 24-hour	20 50
Particulate matter $PM_{2.5}$[b]	1-year 24-hour	10 25
Sulfur dioxide	24-hour 10-minute	20 500

[a] Particulate matter 10 micrometers or less in diameter

[b] Particulate matter 2.5 micrometers or less in diameter

National Environmental Quality Emission Guideline values (Code No. 2.1.1) for air emission levels (applicable to non-degraded air sheds) of thermal power prescribed by ECD (from Notification No.615/2015, December 2015, by ECD, MOECAF)

Combustion Technology/ Fuel	Parameter/Guideline Values		
	Particulate matter PM_{10}[a]	Sulfur dioxide	Nitrogen oxide
Combustion turbine			
Fuels other than natural gas (unit > 50 MW[c])	50 mg/Nm^3[b]	Use of ≤ 1% Sulfur fuel	310 Mg/Nm^3
Boiler			
Liquid fuels (plant 50-600 MW)	50 mg/Nm^3	900 Mg/Nm^3	400 Mg/Nm^3
Solid fuels (plant 50-600 MW)	50 mg/Nm^3	900 Mg/Nm^3	510 Mg/Nm^3
Reciprocating engine			
Biofuels/gaseous fuels other than nature gas	50 mg/Nm^3	-	30% higher than for other fuels
Liquid fuels (plant 50-300 MW)	50 mg/Nm^3	1,170 Mg/Nm^3	1,460 Mg/Nm^3

[a] Particulate matter 10 micrometers or less in diameter

[b] Milligrams per normal cubic meter at specified temperature and pressure

[c] Megawatt

(b) Water quality (effluent guide lines)

Ngwe Yi Pale' Cement Co., Ltd will comply with the General National Environmental Quality Emission Guideline values (Code no. 1.2) for waste water of (from Notification No.615/2015, December 2015, by ECD, then under the Ministry of Environmental Conservation and Forestry (MOECAF), now MONREC.

(Waste water, storm water runoff, effluent and sanitary discharges (general application))

Parameter	Unit	Guideline value
5 day biochemical oxygen demand	mg/l	50
Ammonia	mg/l	10
Arsenic	mg/l	0.1
Cadmium	mg/l	0.1
Chemical oxygen demand	mg/l	250
Chlorine (total residual)	mg/l	0.2
Chromium (hexavalent)	mg/l	0.1
Chromium (total)	mg/l	0.5
Copper	mg/l	0.5
Cyanide (free)	mg/l	0.1
Cyanide (total)	mg/l	1
Fluoride	mg/l	20
Heavy metals (total)	mg/l	10
Iron	mg/l	3.5
Lead	mg/l	0.1
Mercury	mg/l	0.01
Nickel	mg/l	0.5
Oil and grease	mg/l	10
pH	S.U.[a]	6-9
Phenols	mg/l	0.5
Selenium	mg/l	0.1
Silver	mg/l	0.5
Sulphide	mg/l	1
Temperature increase	ºC	<3[b]
Total coliform bacteria	100 ml	400
Total phosphorus	mg/l	2
Total nitrogen	mg/l	10
Total suspended solids	mg/l	50
Zinc	mg/l	2

National Environmental Quality Emission Guideline values (Code No. 2.1.1) for effluent levels of thermal power prescribed by ECD (from Notification No.615/2015, December 2015, by ECD, MOECAF)

Parameter	Unit	Guideline Value
Arsenic	mg/l	0.5
Cadmium	mg/l	0.1
Chromium (total)	mg/l	0.5
Copper	mg/l	0.5
Iron	mg/l	1
Lead	mg/l	0.5
Mercury	mg/l	0.005
Oil and grease	mg/l	10
pH	S.U.[a]	6-9
Temperature increase	^{o}C	<3[b]
Total residual chlorine	mg/l	0.2
Total suspended solid	mg/l	50
Zinc	mg/l	1

[a] Standard unit

[b] Temperature increase due to discharge of once-through cooling water

(c) Noise level

The National Environmental Quality Emission General Guideline for noise to be complied with (Code no. 1.3) (from Notification No.615/2015, December 2015, by ECD, then under the Ministry of Environmental Conservation and Forestry (MOECAF), now MONREC

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

Note: Noise level at work place must not exceed 85-90dBA. (Provide PPE, ear muff, ear protection for workers exposed to high noise level for long period. The ideal level not interfere with health is 45dBA.)

(d) Odour

Guideline standard for odorant unit is must not be more than between 5 and 10 (ECD).

3.6 Health standards for projects with health impacts

3.6.1 Environmental, Health and Safety (EHS)

The International Finance Corporation (IFC), a division of World Bank, has prescribed EHS general guidelines for general industrial practices. It provides guidance to users on EHS issues in doing their business.

The applicability of the EHS guideline shall be tailored to the hazards/risks or impacts identified as the result of EIA.

The IFC's EHS General Guidelines encompass Environmental, Occupational Health and Safety (OHS) and Community, Health and Safety (CHS).

Environmental

This main section includes:

a) air emission and ambient air quality

b) energy conservation

c) waste water and ambient water quality

d) water conservation

e) hazardous materials management

f) waste management

g) noise management and

h) contaminated land management

(a) Air emission and ambient air quality

The guideline describes how to avoid or mitigate the impacts on human health, safety and on the environment from emission.

(b) Energy conservation

The guideline provides information about common techniques for energy conservation. For instance, in the operation of environmentally friendly equipment, machinery, vehicles, motors, pumps, fans etc. and the operation of Heating, Ventilation and Air Conditioning (HVAC) systems.

(c) Waste water and ambient water quality

The guideline provides management of waste water (industrial, domestic, ulitity, sanitary waste waters) and management of ambient water quality. It provides common techniques for waste water treatment and for the application of reduce, reuse, recover and recycle principle.

(d) Water conservation

The guideline provides the techniques for continuous reduction in water consumption and water management, water monitoring, reduce, reuse and recycle of water, if possible, and also rain water harvest and storm water harvest and uses.

(e) Hazardous materials management

The guideline provides guidance for any project that use, store, and handle any quantity of hazardous materials (Hazmets). Hazmets is defined as materials that represent a risk to human health, property or the environment due to their physical and chemicals characteristics eg- explosives, compressed gases, flammable gases, liquids and solids, oxidizing substances; toxic, radioactive and corrosive substances.

(f) Waste management

The guideline is applicable for any project that generate, store or handle any quantity of wastes. Waste management covers waste prevention, waste storage; waste reduction, reuse, recover and recycle; waste transportation and disposal.

(g) Noise management

The guideline is for the management of noise level when it exceeds the guideline values for day and night and for certain situations. The measures include the selection of eco-friendly machinery, equipment and vehicles; installation of silencers, mufflers, casing of equipment, installation of acoustic barriers, provision of PPEs etc.

(h) Contaminated land management

Land is considered contaminated when it contains hazardous materials or oil concentration above naturally occurring level. The guideline provides the management of contaminated land/soil which includes prevention, mitigation, soil management especially risk assessment and management including the removal of contaminated soil.

3.6.2 Occupation Health and Safety (OHS)

The Occupation Health and Safety guideline by IFC encompasses:

- general facility design and operation
- physical hazards
- chemical hazards
- biological hazards
- radiological hazards
- Personal Protective Equipment (PPE)
- special hazard environments
- communication, training and monitoring

Occupational Health and Safety (OHS) by ILO

OHS is defined by International Labour Organization (ILO) as:

- The science of the anticipation, recognition, evaluation and control of hazards arising in or from the work place that could impair the health and well-being of workers taking into account the possible impact on the surrounding communities and the general environment.

Some core principles of OHS

- All workers have rights and employers must ensure that:
  - work should take place is a safe and health working environment;
  - condition of work should be consistent with worker's well-being and human dignity;
- Occupational safety and health policy must be established
- Social partners (employers and employees) and other stakeholders must be consulted
- OHS programmes and policies must aim at both prevention and protection
- Continuous improvement of OHS must be promoted
- Health promotion is a certral element of OHS practices

- Compensation, rehabilitation and curative services must be made available to workers who suffer occupational injuries, accidents and work related diseases
- Education and training are vital components of safe, healthy working environment
- OHS policy must be enforced

3.6.3 Community Health and Safety (CHS)

The Community Health and Safety guideline by IFC encompasses:

- water quality and availability
- structural safety of project infrastructure
- life and fire safety L&FS
- traffic safety
- transport of hazardous materials and disease prevention
- emergency preparedness and response

4. DESCRIPTION OF THE PROJECT AND ALTERNATIVE SELECTION

4.1 Project background and objectives

Crown Cement Plant was established by Ngwe Yi Pale' Cement Co., Ltd near Lauk Hpan village, Naunghkio Township and has been in operation since 2014. The area does not have access to gridline electricity. As a new cement plant is already constructed adequate electricity is needed. In this context the project proponent, Ngwe Yi Pale' Cement Co., Ltd has proposed for the construction and operation of a coal-fired thermal power plant inside its cement plant premise.

Project objectives

- To produce adequate electricity for the newly built cement plant and its long term operation.
- To use part of the electricity produced for villages electrification of some villages in the region (part of CSR activities).
- To contribute to the development of energy sector, especially electric energy sector of the nation.
- To contribute to the increase in the production of cement essential for infrastructure development of the nation.
- To contribute to the development of the Energy sector and the Industrial sector of Myanmar.

Project details

Title of the project	:	The construction and operation of a coal-fired thermal power plant inside the premise of crown cement plant owned by the company, project proponent.
Proposed by	:	Ngwe Yi Pale' Cement Co., Ltd
Address (Head office)	:	No. 157, 33rd Street, between 75th and76th Street, Chan Aye Thar Zan Township, Mandalay Region, Myanmar
Telephone	:	02 73941, 02 30838, 09 977150337, 09 977150304, 09 977150398, 09 977150308, 09 977150313
Fax	:	02 71424

E-mail	:	ngweyipale@gmale.com
Website	:	www.ngweyipale.com
Contact person	:	U Lin Thein Aung (Admin Manager)
Phone	:	09 977150336, 09 444002600
E-mail	:	lintheinaung777@gmail.com
Factory address	:	Lauk Hpan village, Naunghkio Township, Shan State

4.2 Project location, over view map and site layout plan

As mentioned earlier the proposed site in the near Lauk Hpan village, Naunghkio Township, Shan State. It is 6 miles northwest of Naunghkio Town. It is inside the existing Crown Cement Plants premise of 280 acres, owned by the project proponent. The area for the proposed coal-fired plant is 12.3 acres. GPS position: 22˚ 21' 31.1"; 96˚ 42' 33.6" (See Satellite image).

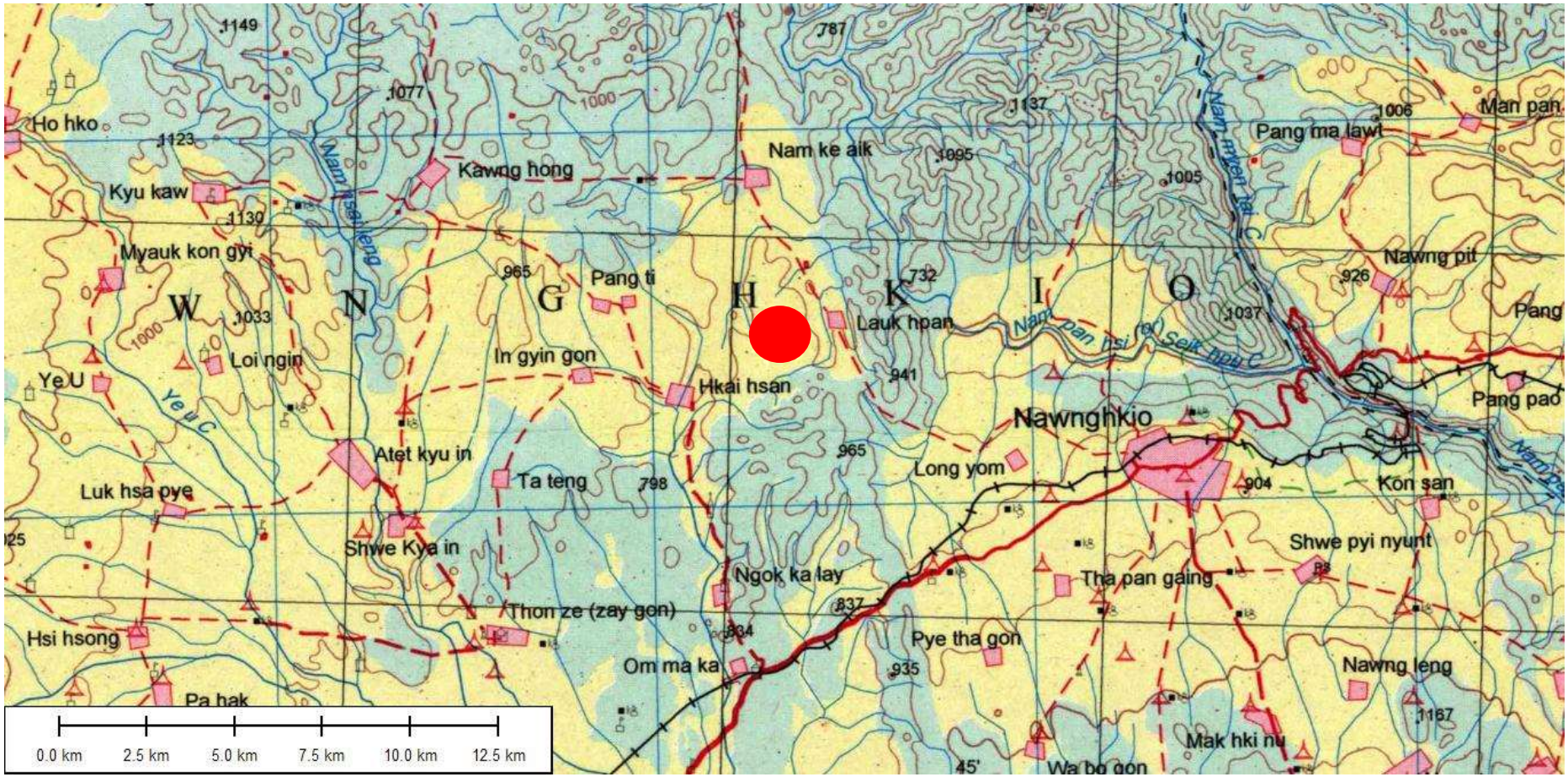
Figure – 4: Overview of Crown Cement Factories (4000 ton factory and 1000 ton factory) and coal-thermal plant (The 60W- Boiler Turbine (thermal plant) which is the theme of this EIA report)

1. 4000 ton cement factory
2. 1000 ton cement factory
3. Limestone pre blending
4. Worker's housing
5. Coal unloading area
6. Sand stone/iron stone warehouse
7. Coal warehouse
8. Coal pre blending
9. Coal warehouse
10. Gypsum warehouse
11. Coal warehouse
12. Sub-station/transformer
13. 15MW boiler/turbine
14. Water Treatment Facility 1.
15. Generator
16. 60MW Boiler/Turbine (thermal plant)
17. Cooling Tower
18. Coal warehouse
19. Main crusher (2)
20. Main crusher (1)
21. Workshop
22. Factory Manager Office
23. Ground tank (1500,000 gallons)
24. Housing for Chinese Experts and Canteen
25. Officer quarter
26. Administer office, Meeting Hall and part of officer quarter
27. Main housing for workers (50) acres)
28. Bazaar/stalls (50 acres).

Note: Only No. 16, 17 and 18 are the theme of this EIA report.

Note: The lands where the access roads pass through are bought from the villagers (land owners) and the access roads are built.

Figure – 5: Satellite image of the proposed project site (in the north-eastern portion of the main cement factory compound)



Legend:

- Project site
- Stream/rivulet
- Township border line/State border line
- Village

Figure – 6: Map of part of Naunghkio Township showing proposed project site (red circle)

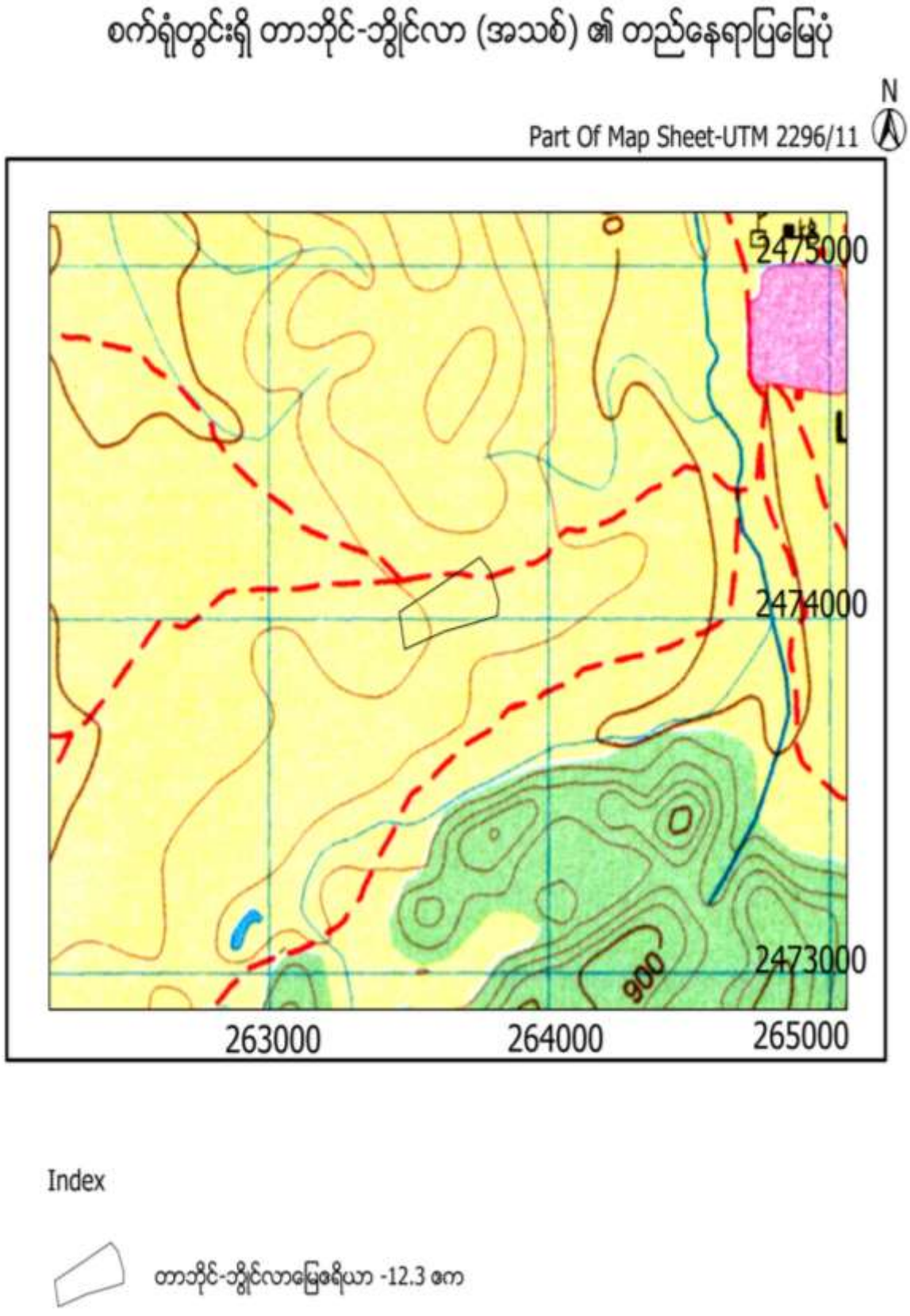


Figure – 7: Map showing exact location of proposed thermal plant inside the 280 acres premise of two cement plants

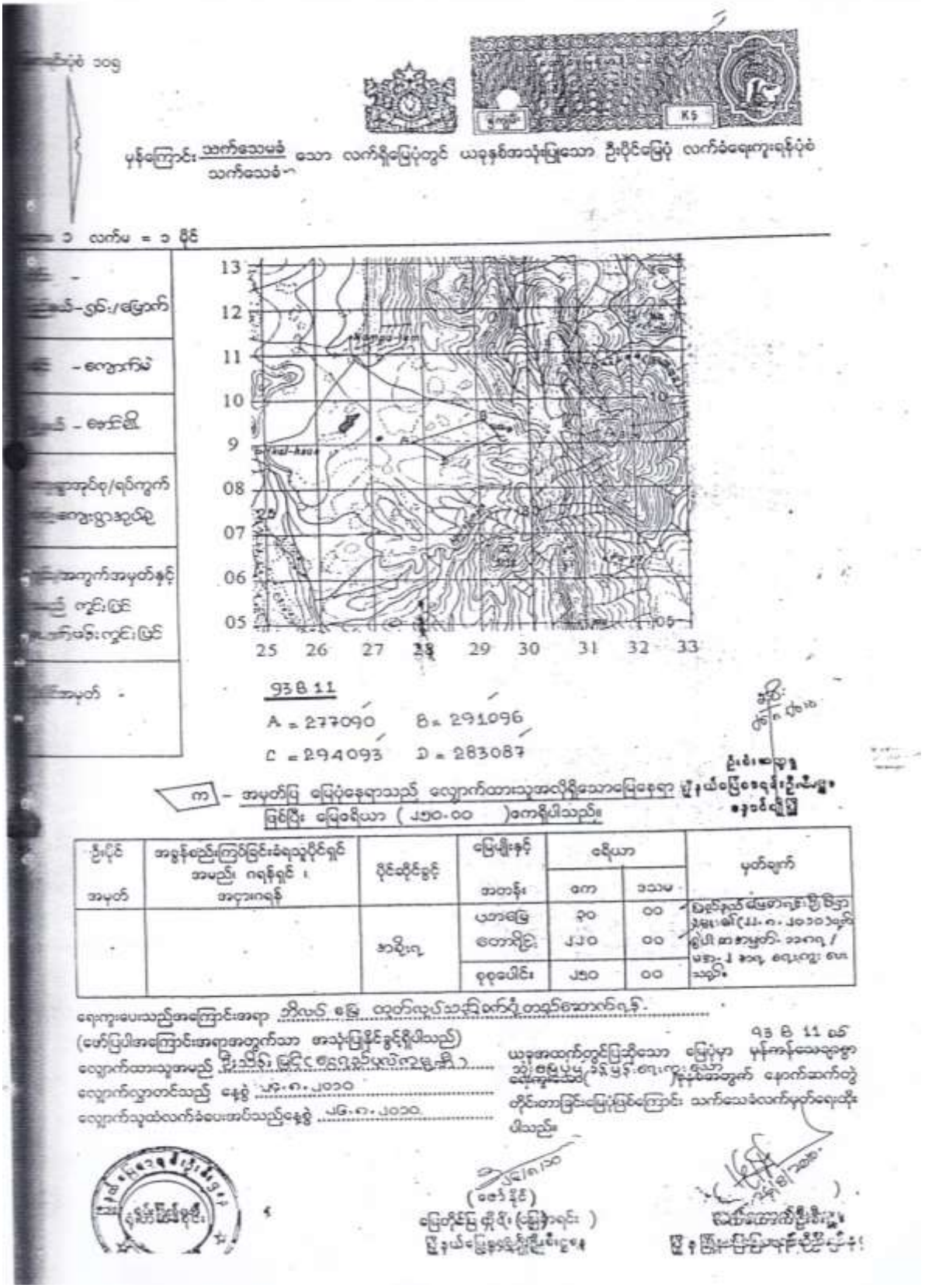


Figure – 8: Document concerning plot of land of cement factory where coal thermal plant will be built

Figure – 9: Coal thermal plant in the process of construction

Figure – 10: Steam boiler (240 Tons)

Figure – 11: Boiler & Turbine

Figure – 12: Turbine house

Figure – 13: Coal conveyor

Figure – 14: Coal crushing machine

Figure – 15: Coal hopper

Figure – 16: Coal feeding system

Figure – 17: Coal storage

Figure – 18: Coal grab and underground crusher

Figure – 19: Hammer crusher & EP control room

Figure – 20: 60 MW Steam turbine generators

Figure – 21: Backup generators

Figure – 22: Bag Filters

Figure – 23: Bag Filter and Limestone Silo

Figure – 24: Bag Filter (Fly Ash Silo)

Figure – 25: Turbine condenser

Figure – 26: Deaerator

Figure – 27: Air compressor

Figure – 28: Boiler, Turbine, EP Dust collector and Air compressor

Figure – 29: EP Dust Collector

Figure – 30: Bottom ash silo and stack

Figure – 31: Stack (83.8 m) and gas analyser house

Figure – 32: Flue gas analyzer

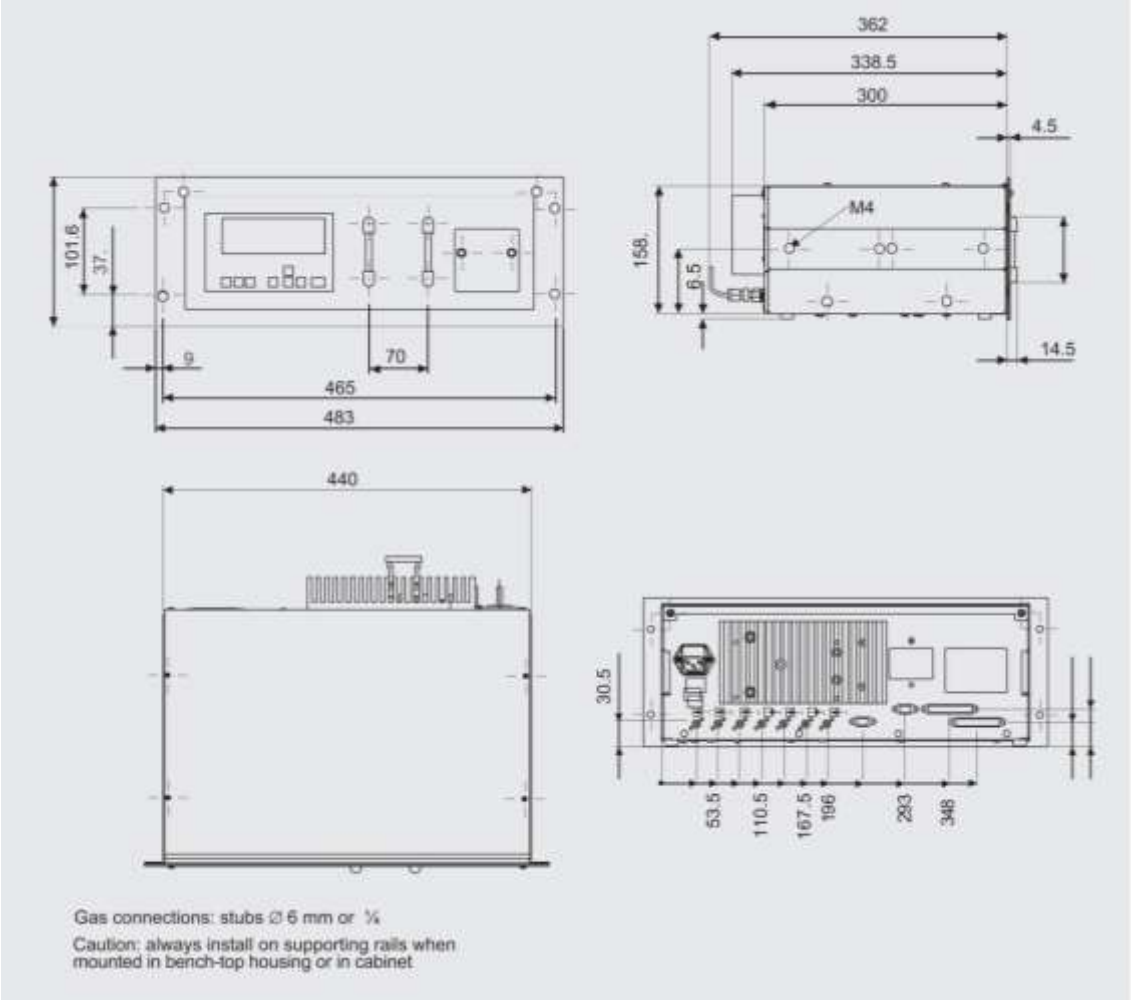


Figure – 33: Dimensional drawings

Figure – 34: LCD signboard installed near the gate showing results of continuous monitoring

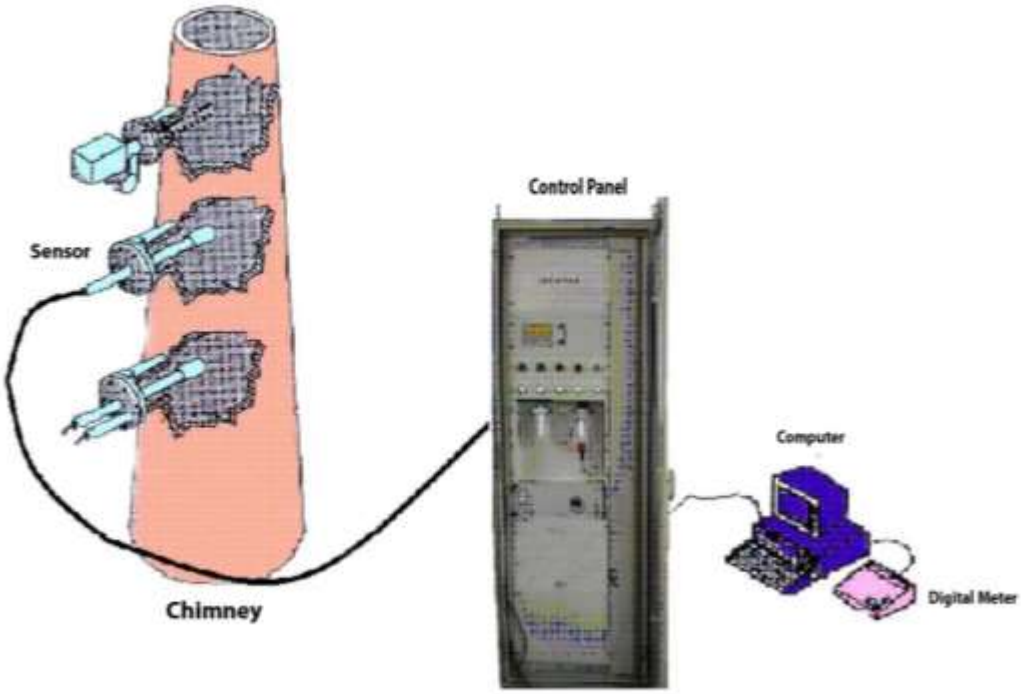


Figure – 35: SO_x, NO_x and PM detector

Figure – 36: Sensors

Figure – 37: Converter control panel

Figure – 38: High voltage control panel

Figure – 39: High voltage panel

Figure – 40: Low voltage panel

Figure – 41: Distribution control system (DCS)

Figure – 42: Distribution control system (DCS)

Figure – 43: Central Control Room (C.C.R)

Figure – 44: Fuel oil depot

The site is about 5 miles north of Mandalay-Lashio highway. The Mandalay-Lashio railway runs parallel with the highway.

The site is about 46 miles north-east of Mandalay City and 6 miles away from Naunghkio Town.

4.3 Project development and implementation time schedules

The estimated duration of the whole project life:

i) Preconstruction Phase : 1 year

ii) Construction Phase : 2 years

iii) Operation Phase : 30 years

iv) Decommissioning Phase : 2 years

4.3.1 Work plan and implementation schedule

This is merely the work plan and schedule for the effective implementation of the project during the four phases, namely, Preconstruction, Construction, Operation and Decommissioning/Rehabilitation Phase, of the project life.

Plans and implementation should be formulated since in the early Preconstruction Phase through the Construction Phase, Operation Phase and up to the early Decommissioning Phase.

A generalized time frame for planning and implementation for the project's whole life is shown in the **Figure-45** below.

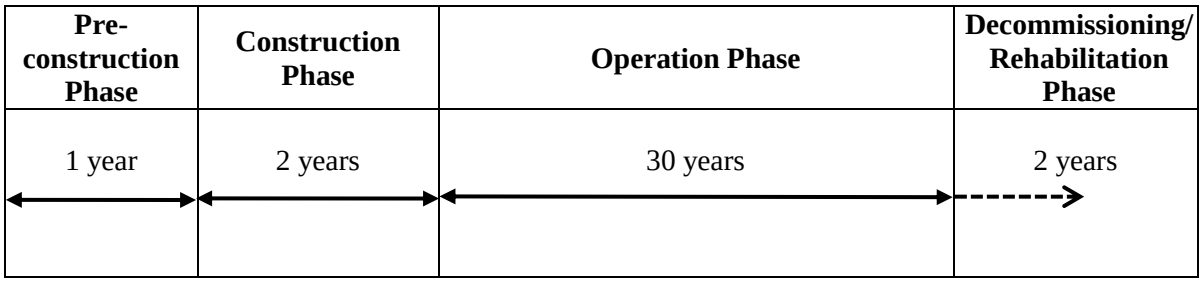


Figure – 45: Generalized time frame for planning and implementation of the project during the four phases of project life

4.3.1.1 During the Preconstruction Phase

Planning should be taken into serious consideration in the very early planning stage for the Preconstruction Phase works. For instance, the procurement of environmentally friendly tools, equipment, machinery and vehicles etc. This will include the purchase of tools that are durable, and reliable but not so expensive; purchase of machinery equipment and vehicles that emit less smoke and generate lower noise level and vibration; and machinery and vehicles that are fuel efficient, those that consume less fuel, less energy and use less water for conservation purposes. In other words, tools and methodology that are of practical application for sustainable construction activities shall be applied.

In addition devices such as noise and vibration abators, silencers, a variety of PPE such as masks, face mask, gas masks; goggles, ear muffs, gloves, boots, safety belts, special outfits, etc should be procured in advance.

Facilities for first aids and for fire fighting (eg. fire extinguisher) should be procured in advance.

There should be detail plan for the selection and procurement of a variety of building materials for sand, gravel, bricks, cements, timbers to iron rods, glass panel, sheet, roofings

and so on. Also the materials for installation, furnishing and finishing works eg: plumbing system, electric system, paints and varnishes etc, in short, all the detail plan for the construction of buildings and structures at the site. When planning for the procurement of all the above-mentioned material items serious consideration should be taken for the selection of ecologically friendly materials. After planing for procurement implementation of procurement will follow.

4.3.1.2 During the Construction Phase

It is estimated that this phase will last for 2 years and that is for construction of structures at the site only.

During this phase 92 workers including 23 Chinese technicians were employed. The coal-fired plant (12.3 acres) is inside the main cement factory premise (280 acres). There is no need for building access road and fencing the site.

- camp for workers need not to be built; the cement factory has it workers' housing for all workers from three plants
- water will be shared with that of the cement factory

The main tasks during this phase:

- Preparation : clearing small vegetation, leveling the ground
- Earth work and foundation work
- Structural construction works : e.g. construction of boiler house and its system, turbine house, coal warehouse, coal conveyor system silos, for limestone and ash, EP control rooms, cooling tower and its system a new water tank (for this plant), ESP and bag filters system, flue gas analyser house, stack etc.
- Installation works: the works involve has installation of all machinery and equipment. E.g. installation of steam boiler and system; steam turbine and its system including turbine condenser; electrostatic precipitator and its system and bag filters system; installation of cooling tower system installation of a variety of control panels (central control, voltage control, distribution control etc.).

  In addition installation of a variety of small machinery and equipment, e.g. pumps, generators, compressors; installation of electricity and water system (plumbing). Also installation of main generator and electric cable line to be connected to the cement factory.
- Finishing work: including painting, decoration, furnishing furniture, final touch etc.

4.3.1.3 During the Operation Phase

It is estimated that this long term phase will last for up to 30 years. During this phase 150 staffs including 14 Chinese technicians are employed.

As it is the most important phase of the whole project effective plan should be implemented during this phase. The long term sustainable success of the whole project also depends very much on the effectiveness and implementation of plan by efficient EMP cell members.

The main task is the smooth operation of the coal-fired power plant efficiently. The plant will be operated 24 hours a day (in 3 shifts, each 8 hours); 40 work hours per week.

The operational days per year will be up to 300 days.

The works are mainly routing operation for production electricity to ensure that 60 MW electricity is produced for the cement factory. Other works involve: routing maintenance of machinery, equipment and vehicle; routing monitoring of the uses/consumption of water, coal, limestone, fuel oils; and regular replenishment of coal, limestone and fuel oils. Regular mitigation works and monitoring works will be performed.

4.3.1.4 During the Decommissioning Phase and Rehabilitation Phase

It is estimated that this phase will last for 2 years.

During this phase the plant will be decommissioned and closed; the site will be isoloated and shut down. Works involve the removal of machinery, equipment, vehicles, the dismantling and tearing down of building and structures. Machinery equipment which is still useable will be reused or put up for scale; those that are no longer use able will be made into scraps and sent to iron smelting mill. The reuse or put up for sale for some materials; the disposal of unwanted materials and removal of contaminated soil; and the clearing of the site.

The air, water, soil quality will be tested for the last time to ensure that the ecology is intact.

After that the rehabilitation task will have to be implemented, mainly in the form of re-vegetation.

Plan for decommissioning/rehabilitation will be formulated in advance.

A decommissioning contractor will be hired for decommissioning works and another contractor will be hired for rehabilitation works.

4.4 Description of the project

Project size

12.3 acres (it is inside the Crown cement plant compound with an area of 280 acres).

Installation and infrastructure

The infrastructure includes:

- the main buildings and structures of the thermal plant
- administrative office and
- other associated buildings

Main components

The main components of the project include:

- The main power plant comprising boiler and furnace unit, cyclone seperators, FD fans turbine unit, generator unit, etc.
- Electrostatic Precipitator system, bag filters system, ID fans, flue gas analyser and the 83.8m high stack.
- Water cooling system unit and water recirculation system, cooling tower, condenser, deaerator.
- Open air substation (transformer), transmission line, and control room.
- Coal storage, warehouse
- Limestone silos
- Conveyer belt
- Ash handling control room, ash silo
- Water treatment for R.O water, R.O system, softener (zeolite system) recirculation filter pump system. (**Note:** No specific waste water treatment; almost 100% recirculated)
- Laboratory
- Green belt and open space.
- Office and control room.
- Housing, dormitory, kitchen and messing, toilet etc.
- Store, warehouses
- Workshop
- Garage
- Oil depot (common depot for all)
- Security gate, guard house

Details of some machinery/equipment

(All are made in China by JINAN Boiler Group Co., Ltd)

(a) Steam boiler (240 tons)

It is Circulating Fluidized Bed Combustion (CFBC) boiler type.

Model:	-	UG-240/9.81 M; No. Ts. 2110562-2019
Rated capacity	-	240 t/h
Rate steam pressure	-	9.81 MPa
Rated steam temperatures	-	540ºC- see also **ANNEX** for more about boiler

(The type of boiler is sub critical)

(b) 60 MW steam turbine

Model	-	C13/T5378/C60-8.82/0.981
Rated power	-	60,000 kW (60 MW)
Rated speed	-	3,000 rpm
Inlet steam pressure	-	8.82 MPa
Inlet steam temperature	-	535ºC
Exhaust steam pressure	-	0.981 MPa

(c) 60 MW steam turbine Generator

Standard	-	6B/T7064/2260/3, 2012
Generator type	-	QF 60-2 (CCJEC Co., Ltd)
Rated voltage	-	10,500 V
Rated capacity	-	60 MW
Rated current	-	4,124 A
Rated power	-	60,000 kW (60 MW)
Frequency	-	50 Hz
Revolution	-	3,000 rpm

(d) Electrostatic Precipitator (ESP)

Model - XLD189-4

- Type Dry, horizontal and plate; 1 set
- Inlet smoke volume of dust remover: 565, 340 m^3/hr
- Dust collector inlet flue gas temperature: 135ºC
- Dust concentration at inlet of dust remover: 48.8 g/Nm^3
- Dust concentration at outlet of precipitator: 50 mg/Nm^3 (dry smoke standard)
- Guaranteed efficiency: 99.90%
- Bulk resistance: 300 Pa

(e) Flue Gas Analyser (for continuous monitoring of emission)

Specification:

ULTRAMAT 23 NDIR gas analyser

Measured components Max. 4, of which up to 3 infraredsensitive gases plus oxygen Measuring ranges 2 per channel

Characteristics Linearized

Conformity CE-identification to EN 61326/A1, EN 61010-1

Display LCD with LED backlighting and contrast control, function keys 80 characters (4 lines/20 characters)

Position of use Front panel vertical

Design, enclosure

Weight Approx. 10 kg

Ambient conditions

Permissible ambient temperature

- Operation +5 to +45 °C
- Storage and transport -20 to +60 °C

Permissible ambient humidity < 90% RH (relative humidity) for storage and transport

Permissible pressure variations 700 to 1200 hPa

Sample gas pressure

Messgasdruck

- Without pump unpressurized
- With pump unpressurized suction mode, factory-adjusted with 2-m hose at sample gas outlet; an upper range value calibration is required in case of other venting conditions.

Sample gas flow 72 to120 l/h (1.1 to 2 l/min)

Sample gas temperature 0 to 50 °C

Sample gas humidity < 90% RH (relative humidity)

The sophisticated equpiment applies automation system; the recorded values of PM, SO_2, NOx, O_2, H_2O and temperature are automatically display simultaneously at LCD and at recorded graph. (The equipment is fully computerized and all the records are also saved and stored in the computer.)

This equipment is the best quality so far available.

(f) Bag filter-Model PW32-6

Air volume	-	11,500-13,800 m^3/h
Total filtration area	-	192 m^2
Filtration wind speed	-	1.0m/min
Filter bag material	-	Polyester needle point
Dust collector resistance	-	1,470-1,770 Pa
Dust concentration of imported gas	-	<200g/Nm^3
Dust concentration outlet gas	-	<30mg/Nm^3
Ash removal compressed air	-	Pressure: 0.5-0.9 MPa

(g) Cooling tower (2,500 tons)

The cooling tower needs softener water. Consumption rates:

Cooling tower water	-	80 T/hr
Demineralized water	-	6.5 T/hr
Coal consumption (1 kWh)	-	0.7 kg coal

Circulation pump

Model	-	YKK -500-10
Rated voltage	-	10,000 V
Rated power	-	355 kW
Rated current	-	27.28 A
Frequency	-	50 Hz
Revolution	-	595 rpm

Generator

Model: QF	-	60-2 (CCJEC)
Rated voltage	-	10,500 V
Rated power	-	6,000 kW (60 MW)
Rated current	-	4,124 A
Frequency	-	50 Hz
Revolution	-	3,000 rpm

Heavy machinery and trucks

Grab crane (5 tons)	-	2 Nos.
Loader (4 tons)	-	1 Nos.

(To be used only when grab crane is non-operational)

Office vehicles to share with Crown Cement Factory.

Truck (20 tons)	-	100 Nos. (This coal-fired project will share some of these trucks for coal transportation)

Figure – 46: Source of water (streamlet originating from underground spring)

Figure – 47: Common ground tank (for all three plants)

Figure – 48: 2.1 million gallons water tank

Figure – 49: 1.5 million gallons water tank

Figure – 50: 100,000 gallons water tank

Figure – 51: R.O Membrane System

Figure – 52: Regeneration System (Feed Tank)

Figure – 53: Mixed bed (Cat ion + Anion) Resin

Figure – 54: R.O purified water tank

Figure – 55: Water softener

Figure – 56: Pure water

Figure – 57: Mechanical filters and Zeolite softeners

Figure – 58: Laboratory test

Figure – 59: Brick making machine and bricks made from ash

Figure – 60: Office

Fiugre – 61: Meeting hall

Figure – 62: Company messing hall

Figure – 63: Dormitory

Figure – 64: Factory clinic

Technology

The technology involves the burning of coal for generation of electricity applying modern technology with the aids of Chinese engineers and technicians.

A mixture of pulverized coal and limestone (1000:1) is incinerated and the heat produced is used to boil water and generate steam which is used to drive steam turbine which then drive the generator and produced electricity. Limestone ($CaCO_3$) is effective for desulphurization (fuel gas desulphurization, FGD).

Process in the generation of electricity power

Coal is first crushed by jaw crusher (<20mm) and conveyed by underground conveyor I and II. The conveyor is tubular type to minimize dust emission. Coal is then pulverized by hammer crusher (<2.5mm) and then conveyed by conveyor III to coal feeding system, coal

hopper. In the same way pulverized $CaCO_3$ is conveyed to the hopper; ratio of pulverized coal to pulverized limestone is 1000:1-3. Coal feeder has a capacity of feeding 35 ton/hour.

Pulverized coal (including $CaCO_3$) from the feeding system is conveyed to combustion chamber, furnace.

The boiler applied is the Circulating Fluidized Bed Combustion Boiler (CFBCB) type, 240 ton capacity.

The steam generated is converted into dry steam by means of very high temperature. The high temperature dry stream spins the turbine which is connected to the electric generator which creates electricity.

This coal-fired plant can be termed Subcritical type since it involves the application of boiler with high pressure (9.81 MPa) and high temperature (540°C).

(The boiler needs demineralized, R.O, water), while the cooling tower needs softener water.

To enhance combustion two Forced Draft (FD) fans, are applied for supplying pressurized fresh air into the combustion chamber. The first FD fan prevents spilling of burning coal dust onto the floor and making them floating inside. The second FD fan creates turbulent flow and enhances complete combustion.

(The so-called 2 steps firing method)

To further enhance complete combustion two cyclone separators are applied. The solid fuel (coal dust) completely and partially combusted in the chamber is forced into the flue line by FD fan into the cyclone separator where it is completely combusted and recirculated back into the chamber.

(Advantages of cyclone separator: increase boiler efficiencies, low fuel consumption, maintain relatively low temperature (800-900 ºC) in chamber and, therefore, minimize thermal NO_X generation)

(When temperature is above 1200℃ large quantity of NO_X emits); according to Chinese experts.

Heat generated from combustion chamber is absorbed by wall tubes installed inside the chamber. The water inside the tube pipes flows into drum and vapourizes into wet steam, which then flows through super heater coils and transforms into dry stream. This dry stream spins the blade of turbine which drives the generator and finally electricity is generated.

60kW electricity can be generated. At the movement the highest load used is 40 kW.

(The turbine is 60MW steam turbine and the steam turbine generator has also rated capacity of 60MW.)

Process in brief for the generation of electricity from a coal-fired power plant (schematic diagram)

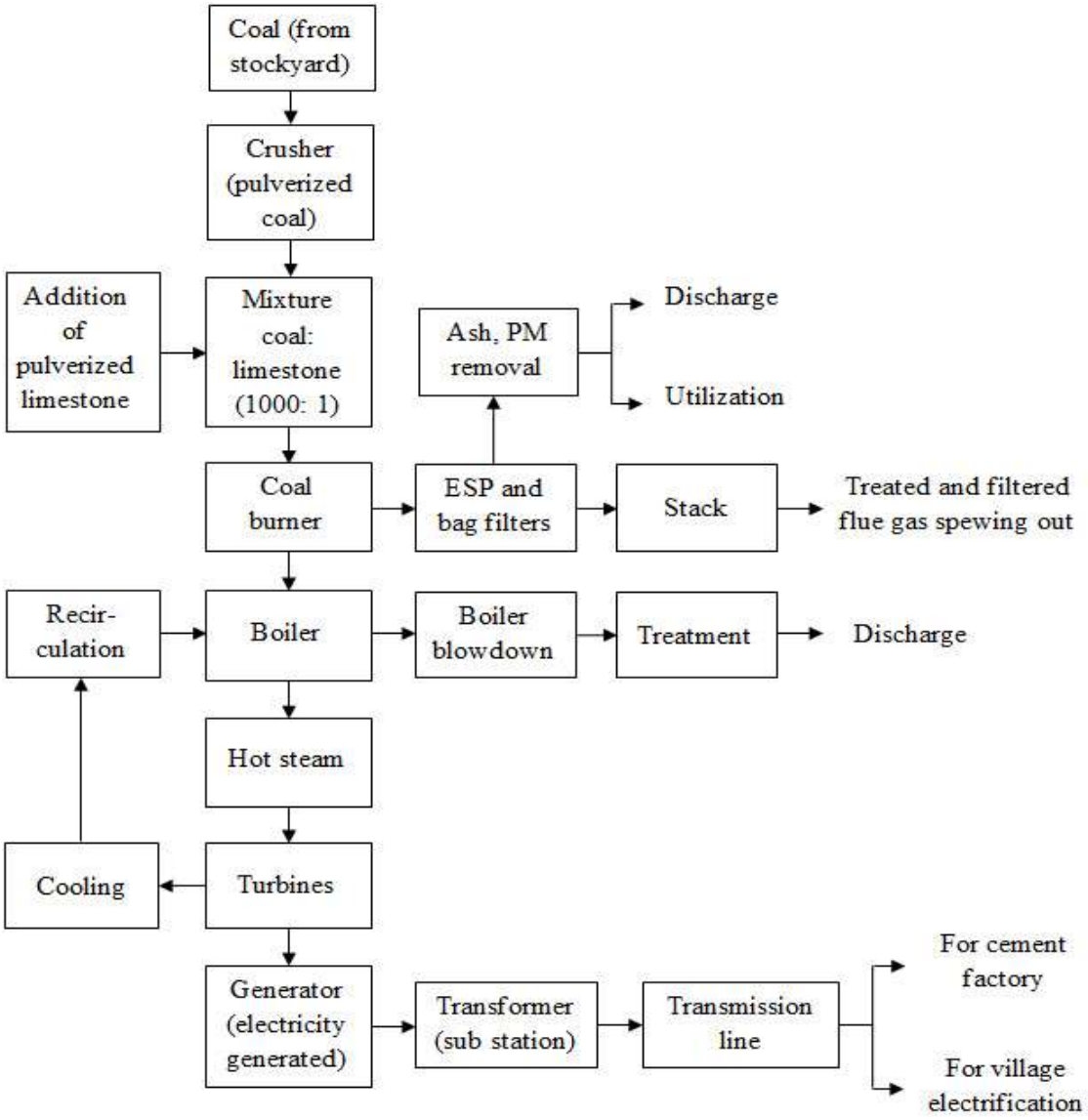


Figure – 65: Simplified flow chart for the generation of electricity in a coal-fired power plant, recirculation and generation of wastes (emission, liquid, solid waste)

Simplified steps: (in driving turbine, generator and production of electricity)

Combustion chamber → inlet heat absorb → wall tube inlet water→ convert→ wet steam→ super heater→ dry steam→ turbine→ generator→ electricity produced.

The electricity generated is used for cemet factories and also for villages electrification programme.

The whole system involves the application of mechanical automation and manual labour is minimized.

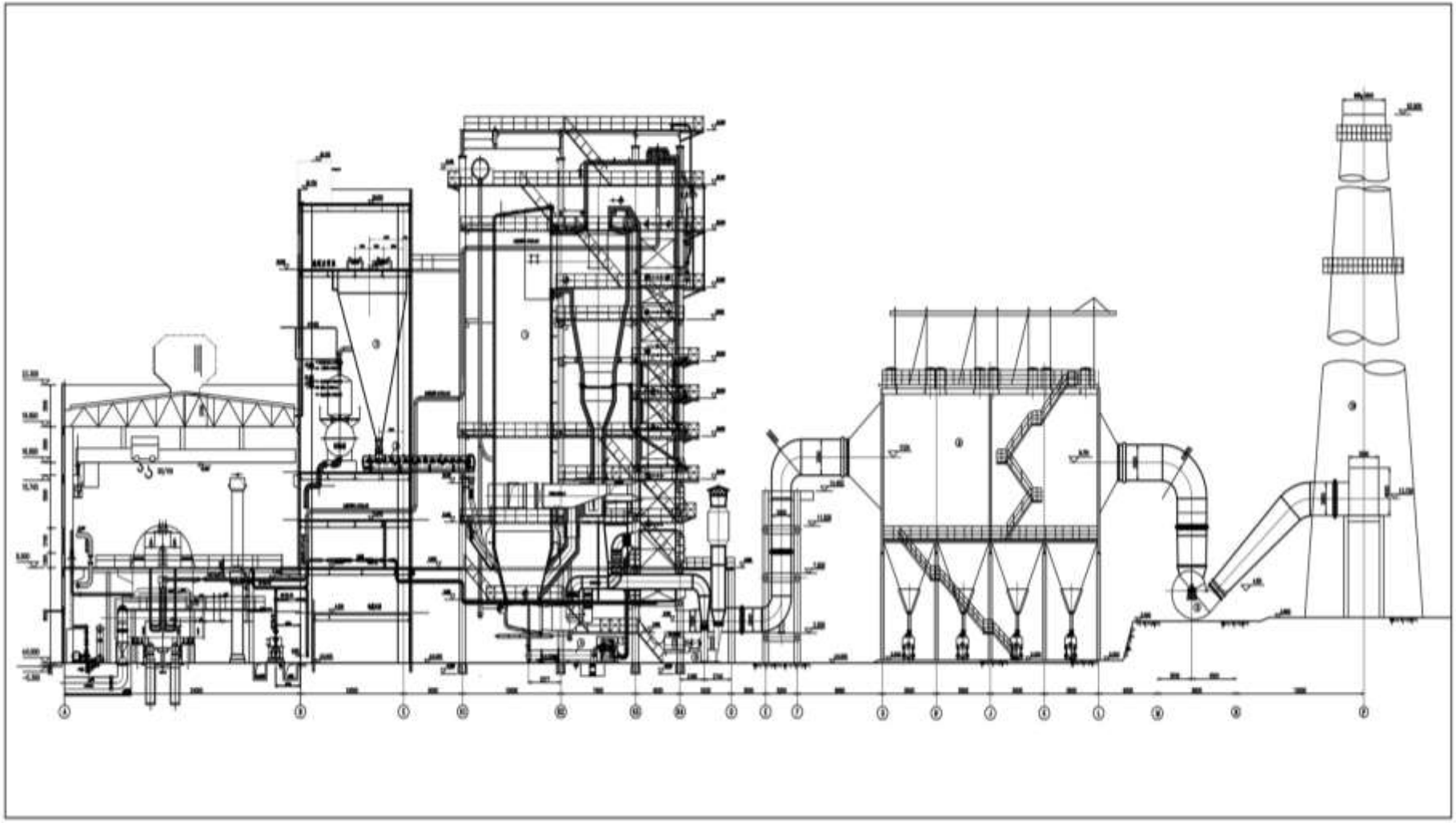


Figure – 66: Power Plant Drawing

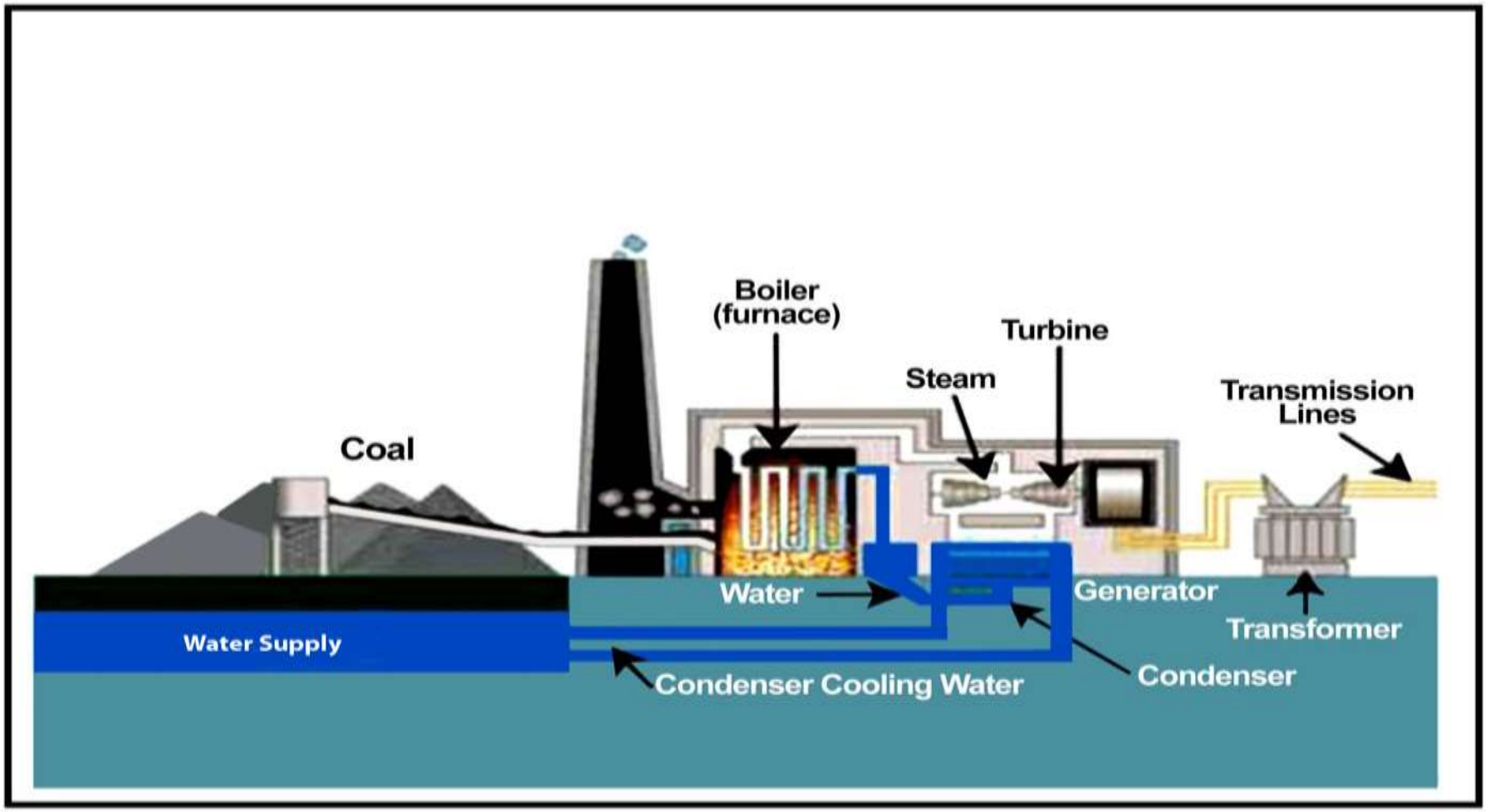


Figure – 67: Schematic process flow of coal fired plant

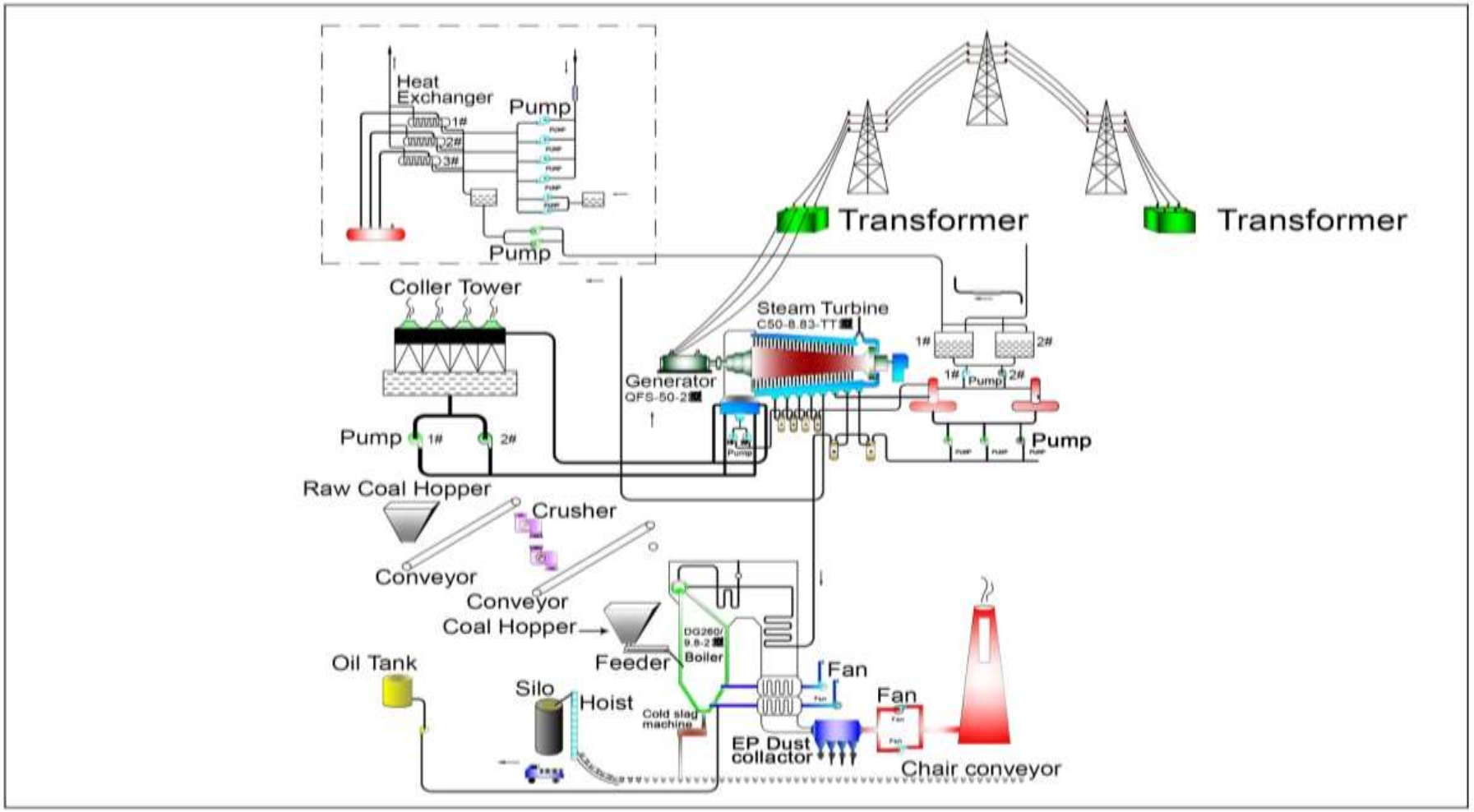


Figure – 68: Schematic flow chart diagram

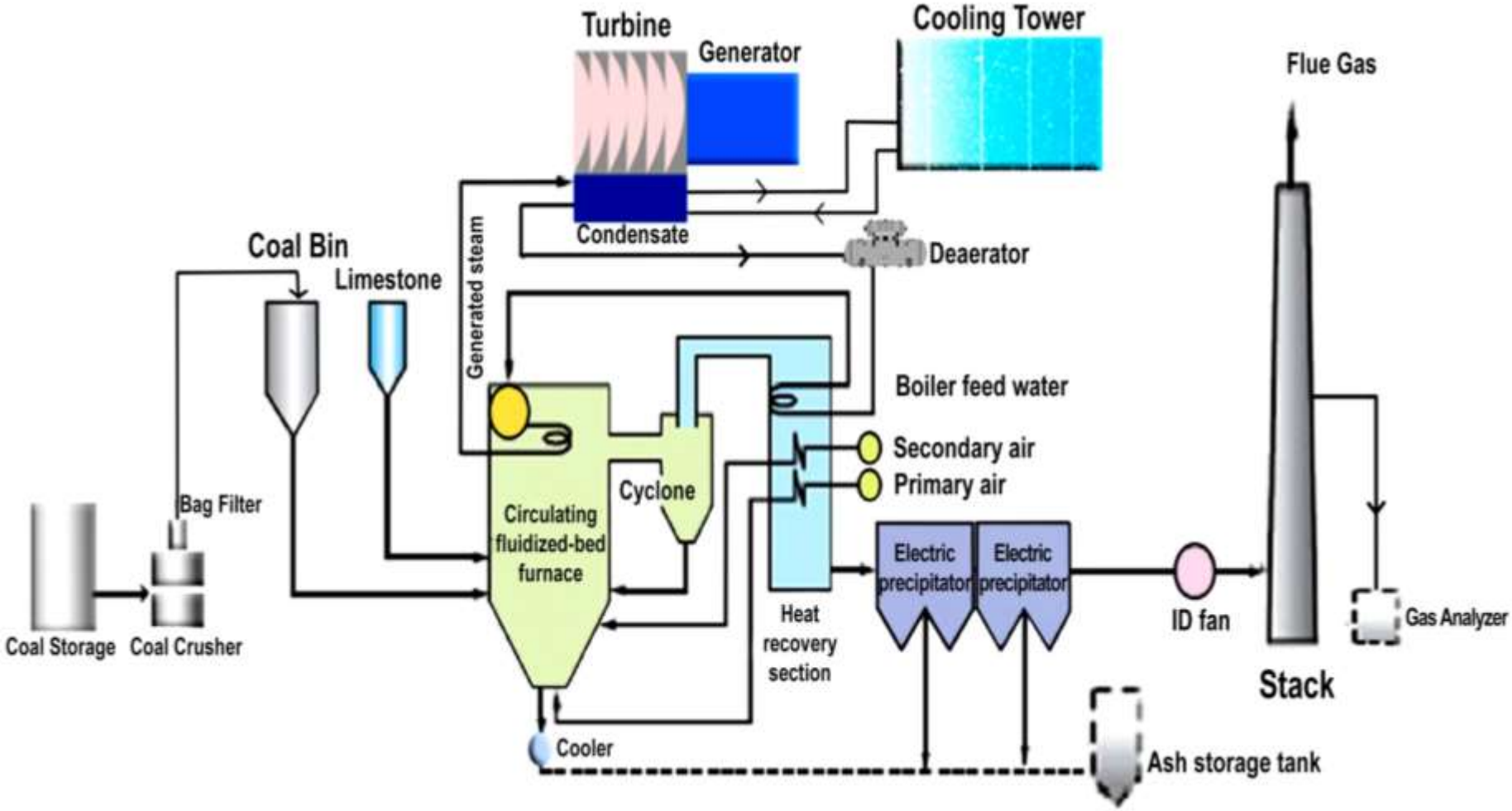


Figure – 69: Process Flow of Circulating Fluidized Bed Combustion Boiler

Recirculation of water

Water is cooled and recirculated for further uses and so the system is closed circuit dry cooling system.

It is a closed circuit cooling and recirculation system. The essence is the condensation of steam (vapour to water) and recirculation of water. The equipment applied is Turbine Condenser.

The temperature and pressure of exhaust steam are reduced and transformed into condensate (water). To reduce temperature the water passes through condenser tube while the steam passes outside the tubes. (Known as heat exchanger system) The water is further cooled in the cooling tank and then recirculated and reused.

(Advantages of condensate: can recirculate more than 95% of used water; reduces consumption of coal and water, and increase the capability of the boiler).

To prevent the water from oxidation, de-aerator is applied. The deaerator equipment can reheat the water from condensate to 102-105ºC and can remove oxygen from the water, preventing the occurrence of oxidation.

As mentioned above used water has to be cooled first and passes through a series of four cooling ponds and then recirculated and reused (as boiler feed water). In this process cooling tower is involved.

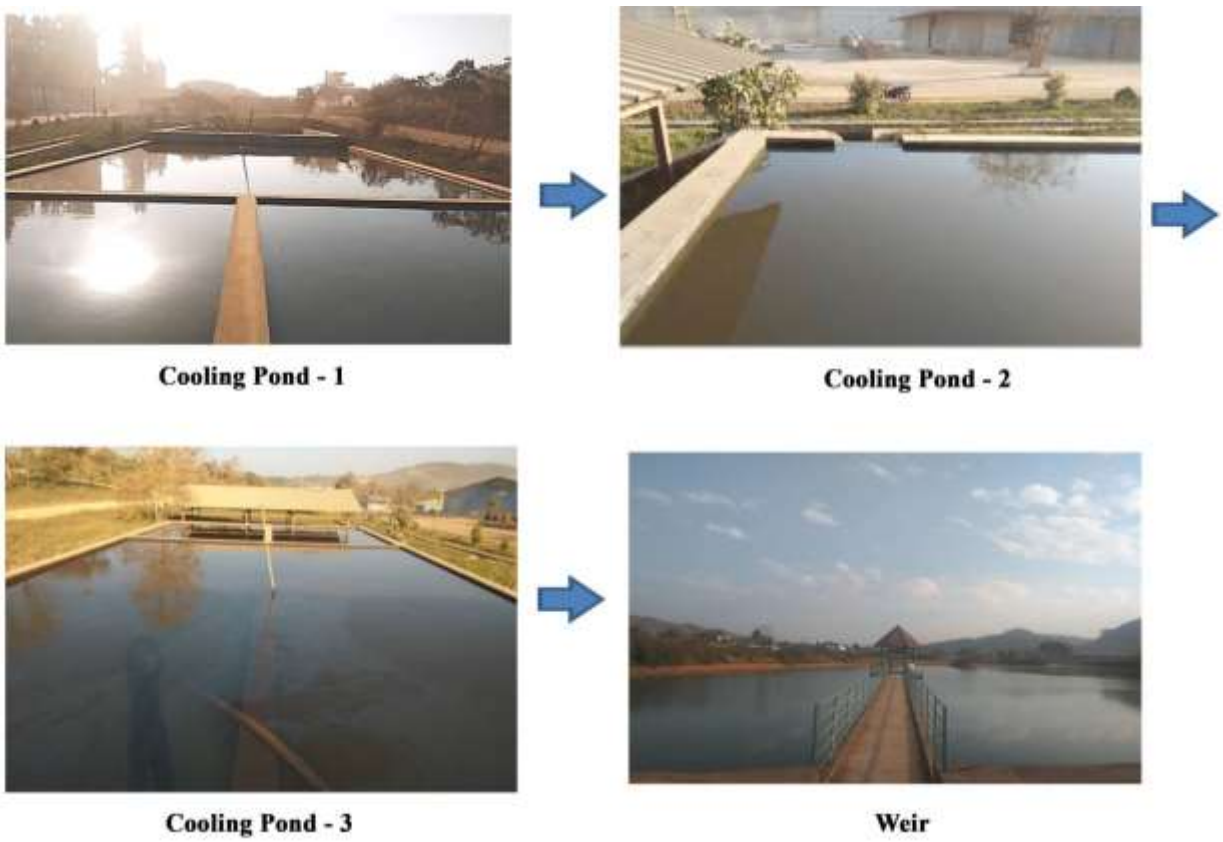


Figure – 70: Recirculation of used water system from 4 cooling tanks

Cooling tower

The cooling tower is quite a big facility; it has a capacity of 2500 tons. The method used in the cooling tower is the close circuit method. A generalized simplified flowchart diagram is shown earlier.

Boiler ⟶ hot steam ⟶ turbine ⟶ cooling ⟶ recirculation and reuse

The temperature at the outlet is 32 ºC. Water passes through the condenser tube while the steam passes outside the tubes (heat exchanger system). Owing to accidental small spillage, and evaporation new water has to be replenished. Depending on the MW involved (MW 20, 40, 60), 60-80 tons of new water has to be replenished per day. 3.5-6.5 tons of R.O water has to be replenished per day. Draining is undertaken weakly and the quantity per drain is 370.61 tons (once). Boiler blow down is done every day (0.06-0.8 tons/hr) while cooling blow down, weakly (1.8-2.2 tons/hr)

Actually the used water etc is not directly discharged but flow into sedimentation tank, (cooling tank) where the small quantity of sediment is manually removed and the used water is recirculated (by mean of forced filtration by two mechanical filters (filter pumps) of 60 ton/hour capacity each). Almost 100% of used/waste water is recirculated the only waste to be discarded is the sludge (sediment)at the bottom of the tank which is menually removed and disposed at a approved landfill. The whole system also involves application of automation and manual labour is minimized.

Figure – 71: Cooling Tower

Material balance

Depending on the MW (20 MW, 40MW, 60MW) coal consumption can vary (the company has so far, mostly used 40MW).

Coal consumption (20-60MW) → 384- 1008 ton/day

Limestone consumption (20-60MW) → 1.5-3.24 ton/day

The waste generated are:

- Fly ash (60%) - (20-60MW) → 230.4- 604.8 ton/day
- Bottom ash (40%) - (20-60MW) → 153.6- 403.2 ton/day
- Small quantity of limestone dust.

There will be no bioler slag due to the effectiveness of complete combustion system.

Theoretically when 1 ton of coal is incinerated 30 kg of SO_2, 9 kg of NOx, 2800 (2.8 tons) of CO_2 are generated (if no mitigation measures taken). In this project context 384 to 1008 tons of coal is burnt a day (depending on 20-60 MW utilized). Therefore, up to 30 tons of SO_2, 9 tons of NOx and 2800 tons of CO_2 are generated per day. (If no mitigation measures taken in the first place).

After mitigation ash for PM_{10}, SO_2 and NO_X the results obtained by flue gas analyser are as follows:

PM_{10} - 42 mg/Nm^3, SO_2 - 142 mg/Nm^3 and NOx - 199 mg/Nm^3.

All values are within the NEQEG guideline values.

The coal thermal plant is in operation now and the values of emission for PM_{10}, SO_2 and NOx are the same as above.

The mitigation/management of CO_2, SO_2 and NO_X is described later in **Chapter-5**.

Management of emission (PM, SO_2, NO_X)

<u>For PM, especially PM_{10}</u>

The project proponent has installed one Electrostatic Precipitator, ESP, (dry, horizontal and plate type) and 7 bag filters for mitigation of PM especially PM_{10}.

ESP and bag filters can reduce 99.9% of PM, it is learnt. (3 bag filters are also installed at Hammer Crusher to mitigate coal dust). The height of the stack is 83.8 m and is up to conventionally accepted practice (>75m): (The Chinese Engineers do not apply the formula Hg= H+1.5 L). By the time this EIA was conducted the stack was already constructed.

However, the rule of the thumb is that the height of a stack should be at least twice the height of the nearest building, that is, residential building. In this context the height is by far more than twice the heights of housings for staff.

The nearest structures to the stack are ESP house, turbine house and boiler house. (There are actually not buildings but structures).

Four air compressors are used to facilitate the flow of air/flue gas and PM; Induced Draft Fans (ID Fan) are installed. ID fans draw the flue out of the ESP and then flow out of the stack. The PM (ash) are precipitate in the ESP while some are retained in the filter bags. As mentioned earlier up to 600 ton and 400 ton of fly ash and down ash are collected a day. There are two silos for storage of ash, one for fly ash and one for down ash.

These ashes are used as raw materials for making brick, for road repair or filling or paving. Some are reused as chemical gypsum in the manufacturing of cement.

For SO_2

Pulverized limestone $CaCO_3$ (dry absorption method or dry FGD) is applied for the reduction and minimization of SO_2 (desulphurization). It is burnt together with coal. Theoretically, the burning of $CaCO_3$ will have the following reactions:

CaCO3 - $CaO + CO_2$

$CaO + SO_2$ - $CaSO_3$

$2CaSO_3 + O_2$ - $2CaSO_4$

$2SO_2 + O_2$ - $2SO_3$

$CaO + SO_3$ - $CaSO_4$

$CaSO_4$ (calcium sulphate) in the form of lime dust is re-used as chemical gypsum in the making of cement.

Flue Gas Desulphurization (FGD) by means of application of $CaCO_3$ also reduce and minimizes fluran and dioxin, two organic toxic gases, it is learnt.

For NO_X

The pragmatic way is the application of complete combustion method; application of cyclone separators. (Theoretically complete combustion can minimize or even eliminate NO_X, mercury, fluran, dioxin, etc and all unwanted toxic or harmful gases.).

Theoretically large quantity of NO_X can generates only when the temperature is higher than 1300 ºC. This CFBC boiler is designed (in China) to maintain the combustion chamber temperature within 800-900 ºC ("low temperature") and so only negligible quantity of NO_X is generated, (according to Chinese experts). If the temperature is more than 1000^{o}C large quantity of NOx will generate).

The cyclone separator installed can maintain the temperature within 800-900 ºC. Screen tubes are installed in the upper portion of the combustion chamber. This enhances superheated stream efficiency while lowering and maintaining the temperature.

Oxygen analyzer is installed on the flue gas route tube to regulate O_2 and reduce excess air, if any.

Comments

The project proponent (and the hired technicians) at the moment cannot be measured or analyzed heavy metal (mercury), halide compound, dioxians and flurans, etc. Attempt will be made later.

From theoretical calculation:

Up to 2800 tons of CO_2; 30 ton of SO_2, and 9 tons of NO_X are generated a day if no management or mitigation measures are taken. However, the project proponent believes that SO_2 and NO_X (and PM) have been effectively mitigated.

For pragmatic purpose the only effective way of mitigation for CO_2 is the planting of trees and creation of green belt or green zone (Trees effectively sequestrate CO_2).

Recently the company has installed Flue Gas Analyzer at the stack for continuous monitoring of emission. This equipment can monitor PM_{10}, SO_2, NO_X, O_2, H_2O, temperature and flow rate. The results are displayed in the LCD screen for easy inspection by anyone.

Management of waste

Industrial waste

In this coal thermal plant context the industrial waste that is generated in large quantity is fly ash and bottom (down) ash. As mentioned earlier 230.4-604.8 tons of fly ash and 153.6-403.2 tons of bottom ash are collected at the ESP and 7 bag filters (3 bag filters at underground crusher house also collect coal dust). Trucks are not used for transportation of ash, but conveyor is used. Dry ash handling method is applied; ash collected is conveyed by conveyor to ash silos. Fly ash and bottom ash are conveyed by conveyor and stored in separate silos. Fly ash is used as material for making bricks. The company has two "brick making machines" and relatively large quantity of bricks has been, so far, made. (Of course bricks are made from the combined fly ash of all three factories). Fly ash is also reused as "gypsum" in the manufacturing of cement in the nearby two cement factories. Almost all ash are used up for making bricks. So far no need to dispose at landfill, which is one mile in the north west.

Bottom ash (down ash) is used as construction materials; in road repair or refilling road.

Limestone dust is generated in very low quantity and is reused as raw materials in the manufacturing of cement. Coal dust from coal shed is also generated in small quantity from time to time; it is collected and reused together with pulverized coal.

(Relatively large quantity of limestone dust and cement dust are generated from the other two cement factories which are owned by the same company but these have nothing to do with this coal-fired thermal plant; and are out of the scope of this EIA report.)

Sediments and slag at the bottom of pond are manually removed and disposed at landfill, which is one mile in the north west.

Domestic wastes (solid wastes)

Domestic wastes in the form of office waste, dormitory (housing) waste, kitchen (organic) waste, debris and trash are generated in small quantity (up to 20kg/day).

The waste is not burned but regularly collected and disposed at the approved landfill in the vicinity. Waste bins (garbage bins) are placed in appropriate places for collection and regular disposal. The landfill is about 1 mile in the north west.

These are also described later in **Chapter-5**.

Figure – 72: Satellite image showing project site and two cement plants and the common land fill in the north west

Chemical waste

Only one chemical, sodium hydroxide, is used for controlling pH of water. Small quantity of NaOH has to be used from time to time to control the pH of water. It is a very mild chemical and is not hazardous or harmful.

The work in the laboratory is mainly for testing of temperature, pH, alkalinity, hardness and glass wares are simply washed down in the sink. Only negligible quantity of chemical is used, or not used at all, given the fact only test kits are used.

Used oils

Used oils are quite hazardous. Used oils are stored in old drums and are given away to recyclers or and ones who want it.

Used filter bags, other filters etc are sometime considered as hazardous waste. These will be simply discarded at the approved landfill, one mile in the north west.

Water balance and closed circuit recirculation of water

Raw water has to be treated in the first place as the system uses only demineralized water or R.O water and softener water. Mechanical filter and zeolite softener, Reverse Osmosis (R.O) membrane system and mixed bed (Cation + Anion) Resin system are applied.

Up to almost 100% of water is recirculated and that involves cooling system inside the cooling tower.

Depending on MW load (20 MW, 40MW, 60MW) the consumption of water (cooling water or softener water) is 60-80 ton/day.

The consumption of demineralized (R.O) water is 3.5-6.5 ton/day.

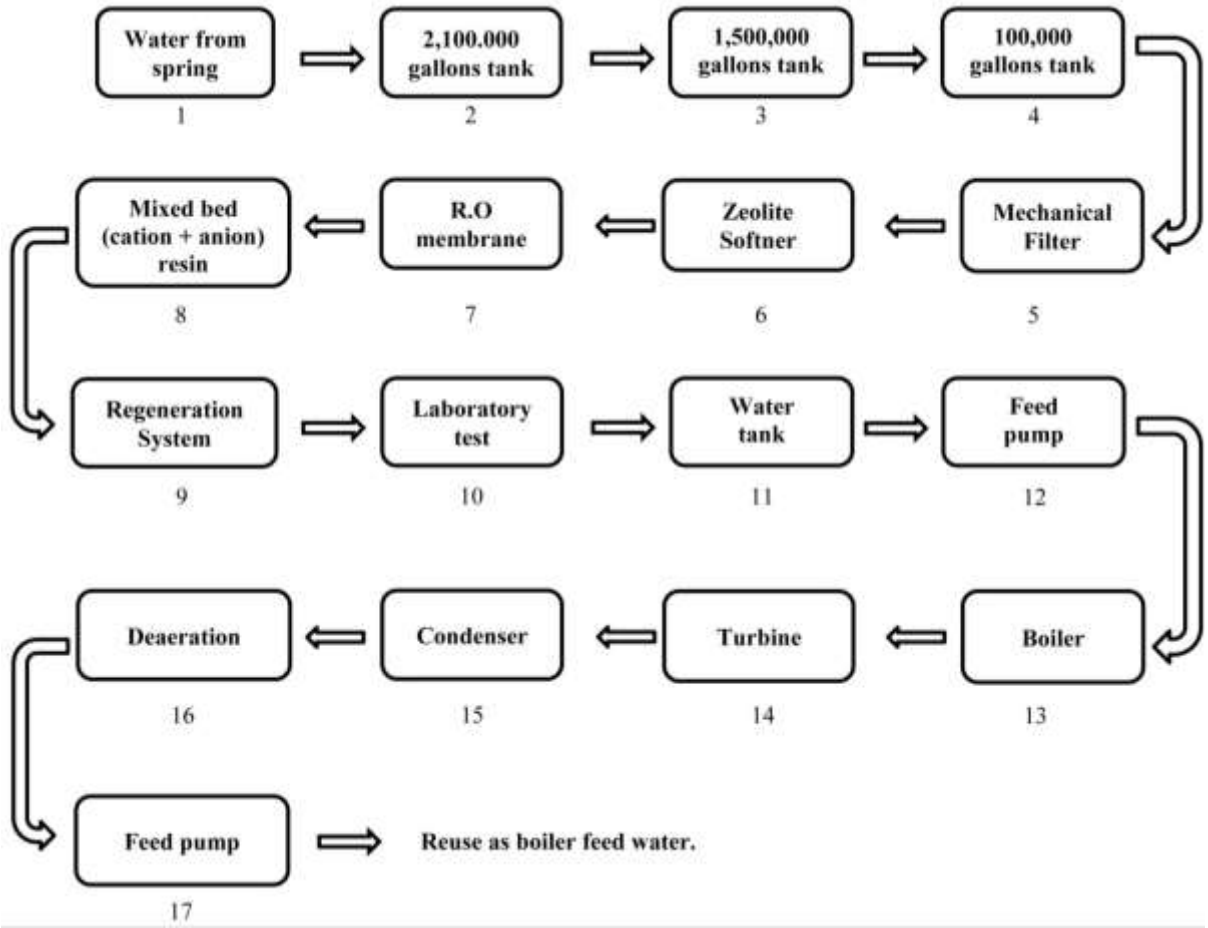
3% of softener/cooling water (1.8-2.2 ton) is lost due to cooling blow down once a week.

2% of demineralized (R.O) water (0.06- 0.8 ton) is lost due to boiler blow down daily.

The boiler blow down simply flows into a small sedimentation tank (sedimentation treatment) and finally discharged into the large earthern pond. The sediment/sludge, if any, is menually removed.

As mentioned earlier the water loss has to be replenished daily or weekly. (Depending on MW involved (MW 20, 40, 60) about 60-80 tons of water has to be replenished per day.)

The close circuit recirculation route is shown in simplified chart as follows:



Step 1-10 involves sourcing, collection, storage and treatment.

Step 11-17 involves heating, steaming, cooling and recirculation.

Management of waste water/used water (Industrial waste water)

Strictly speaking there is no industrial waste water but only used or processed water (virtually no organic waste water as in a food factory a distillery or the like).

It is estimated that 90-112 tons/day of water is used in this coal-fired power plant system. However, more than 90% of the used water is recirculating through cooling, forced filtering and recirculation. It is a closed circuit cooling, forced filtration and recirculation of water. Cooling tower is used for cooling while further cooling is done at a series of 3-4 cooling tanks.

However, 100% of the water cannot be recirculated; draining has to be done for used water/processed water that not fit for recirculation. For example boiler blows down water, cooling blow down water and black flush water from iron exchange and small quantity of sludge water.

The quantity of water to be drained per week is 370.61 tons, average about 53 tons/day. These include:

- boiler blow down 0.06 – 0.8 ton (daily)
- cooling blow down 1.8 – 2.2 tons (weekly)
- black flush from iron exchange 8.0 – 12.0 tons (daily)

These were not recirculated but discharged; they are conventionally treated, only simple conventional physical treatment method is applied (that is sedimentation and gradual cooling down to 3^{o}C higher there natural water), before discharged into the large earthen pond (water impoundment) in the north-east.

However, after the newly constructed waste water/used water treatment plant is completed the boiler blowdown and cooling blowdown need not be discharged but recirculated and reused. This new waste water/used water treatment plant is mainly for treatment and reuse of used water, not for sewage.

Since about 53 tons of water is actually lost per day replenishment has to be undertaken daily. To be on the safe side 60-80 tons of new water has to be refilled daily to compensate also for other potential water losses such as other minor processes, from evaporation, probable steam effluent, and minor spillages which cannot be quantified.

The "once through cooling system" is not applied; only closed circuit cooling is used.

Turbine condenser reduces the temperature and pressure of exhaust steam which is transformed into condensate (water). The water is further cooled down is a series of 3-4 cooling tanks; the first cooling tank also function as settlement tank. This can be termed conventional sedimentation (physical treatment). The sediment, if any, that settle at the floor of this tank is manually removed. Usually 0.2-0.3 tons of sediment sludge is generated per day. The sludge can be used as fertilizer, but not here. It is dried and disposed at the landfill about 1 mile in the north west of bare land.

The water from the last cooling tank (No.4) is recirculating applying forced filtration (which can be termed mechanical treatment). Two mechanical filter pumps with a capacity of 60 tons/hour each forced filtered the cooled waste water/used water which is recirculated and reused as feeder water for boiler again.

The waste water treatment action can be summaried as follows:

The used water/waste water from boiler blowdown and cooling blowdown were cooled in three steps: at three cooling tanks 1, 2 and 3 and settled down there. The sedimentation of overflow water take places at mechnical filter and then passess through a series of softeners. In this way the water is purified and then flowed into the storage tank.

The construction of the centralized water treatment plant for two cement factories and this coal fired thermal plant is now completed and already in operation. This treatment plant can treat 480 tons of waste water per day.

Figure – 73: Waste water/used water treatment plant

Since more than 90% of the water is recirculating the quantity of water to be discharged is small. The water is gradually cooled down at the cooling tanks till the temperature is only $3^{o}C$ higher than the receiving water body (the large pond/impoundment in the north east).

Other forms of industrial used/waste water

Certain coal-fired power plants have steam effluent but not envisaged in this plants (no spillage of condensate).

Ash handling water: dry ash handling is practiced; no need for water and ash pond.(the ash is mechanically conveyed by conveyor to ash silo)

ESP and filters have to be washed from time to time but the water used cannot be quantified.

Floor and yard (work place) drain: only occasioned sweeping is done; no washing.

Other industrial wastes water/used water outside the cooling recirculation system:

- Material storage (coal storage) run off.

  The four coal warehouse for the three plants (one coal-fired power plant and 2 large cement plants) cannot yet accommodate the huge quantity of coal for the 3 plants. A certain proportion of coal has to be still stored at the open coal yard. But the coal yard has concrete floor and bund to prevent percolation and leachate.

- Machinery and vehicle washing: this has to be undertaken from time to time but the used water/washed water cannot be quantified.

  Similarly the quantity of roof drain, rain water influx and storm water cannot be quantified; all flow down the network of drainage system with no considerable impact.

Only small quantity of laboratory waste water/used water is generated because only DD test kit and JD test kit are used for testing of temperature, pH, hardness, alkalinity etc. The laboratory glass wares, if used, are simply washed down in the sink and flowed down the drain.

The company has so far not yet installed sediment trap and oil and grease removal equipment because there is little or negligible quantity of sediment which all settled down into the sedimentation tank. So far grease is not an issue in this coal fired thermal plant yet.

Domestic waste water

The company has a plan for treatment of domestic waste water where conventional treatment such as screening, sedimentation, probable areation, chemical treatment (chlorination) and final discharge are involved. This has not materialized yet. At the moment the domestic waste water simply flow into the drainage system and end up at the artificial large pond (the impoundment) in the north east, which is at the moment used as waste water sink.

The sanitary waste water from the toilets goes into the septic tanks and soak tanks.

As mentioned earlier the large tank in the north east is created out of a natural water impoundment area. It is a large lake with large water body that is quite suitable to be used as a waste water sink. Some locals culture fish such as carps and tilapilas in this large earthen pond. The water quality is, so far, good enough for rearing of fish, eg. carps and tilapilas. The water in this pond is not used by the locals for drinking and other purposes.

Any way the company will build waste water treatment system in the near future as there are 1166 workers working in these factories while almost 904 workers are camped inside the common factories premise of 280 acres. (Of the 1166 workers only 150 are from this coal-fired power plant project; during the construction there were 92 workers).

As regard water consumption by workers for this coal-fired project alone:

- During the Construction Phase the water consumption by 92 workers was 552-782 gallons per day
- During the Operation Phase the water consumption by 150 workers will be 900-1275 gallons per day (based from 6-8.5 gallons per capita per day as calculated by company technicians)

Most water is used for shower and toilet and therefore roughly 650 gallons per day will end up as used/waste water during the Construction Phase; while roughly 1100 gallons per day will end up as used/waste water during the Operation Phase.

When the total workforces of 904 for all three factories are taken into account 5424-7684 gallons will be used and roughly almost all will end up as used/waste water.

The domestic waste water simply flow down the network of drainage system, either dry up on the way or end up into the large pond in the north east.

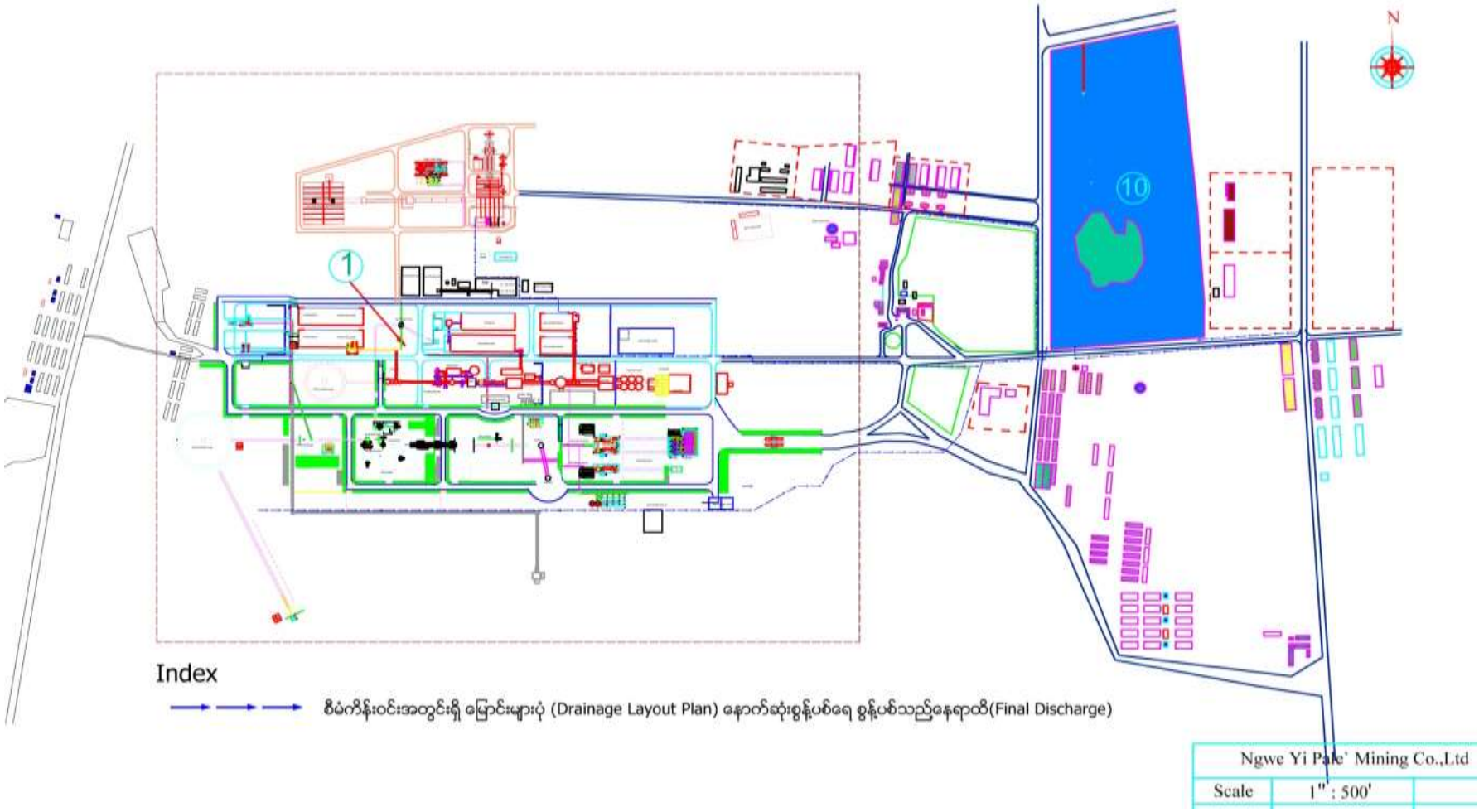


Figure – 74: Network of drianage system

The company has a small laboratory for testing water quality.

The water quality (eg: R.O water, demineralized water) is tested daily for temperature, pH, hardness, calcium content etc applying DD test kit and JD test kit. The recirculated water from the thermal plant is also tested regularly while the water from the large receiving pond is tested only from time to time. Regarding the testing of discharge water the company has at the moment only future plan for testing the used water/waste water before discharge. But this has not materialized yet. The pragmatic way is to hire technician for semi-annual monitoring (testing) of the used/waste water in the impoundment.

Uses of materials and resources (Operation Phase)

Coal (lignite)

Good quality Anthracite coal is not available in Myanmar. Lignite coal from Kalaywa is used since 1926.

Coal is procured from Yatsauk Township, about 85 miles south; Thibaw Township, about 103 miles north-east and Nantsan Township about 234 miles north east, but at the moment shares with that from Crown Cement Plant stock. (Actually procurement is done by officer of Crown Cement Factory not by the project.)

Annual coal requirement is 286750 tons. (300 operational days)

(Daily consumption is up to 1008 tons if 60MW load is used) The company has plan for sourcing electricity from a big sugar factory (capacity 12000 tons of sugar cane/day) during sugar production period (115 days). Bagasse will be used as fuel during that period and so coal has to be used for only 185 days per year.

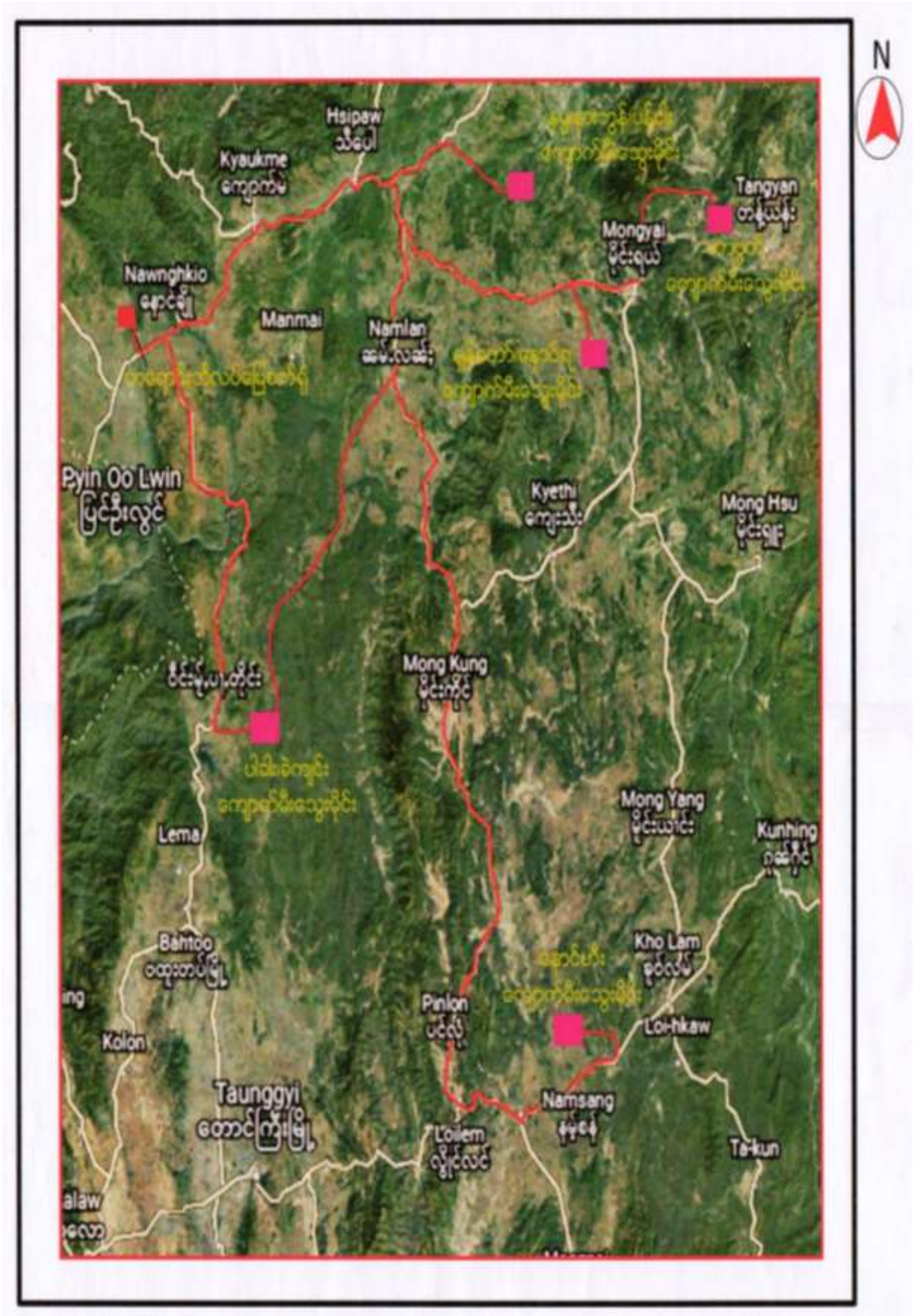


Figure – 75: Map showing places where coal is procured and transportation routes

The properties of coal

Type of coal: lignite (soft coal)

Carbon content (fixed carbon)	: 25-35%
Sulphur content	: 0.4-1%
Volatile matters (mostly VOC)	: 30-40%
Moisture content	: 10-20%
Ash	: 5-10%
Specific gravity	: 1.3-1.5
Calorific value (heating value)	: 4500-8300 Btu/lb; (9.3-19.3 MJ/kg)

Coal is transported by trucks (20 tons) covered with tarpaulin sheet from the sources mentioned above, Thibaw, Yatsauk, Nantsan. (Transpontation is done by trucks of the cement factories).

Formerly coal was stored in open coal yard (common coal stock yard for two cement factories and this coal fired thermal plant) with concrete floor.

Now there are four coal warehouses, (coal shed with roofing walling and concrete floor) for coal. The three coal sheds (ware houses) 1-3 are for cement plants. Coal needed for this thermal plant is taken from the nearby No.4 coal warehouse, west of the project site. However some portion of coal has still to be stored in open coal yard temporary as the four warehouses cannot accommodate all coal sometiomes. The open stock yard has concrete floor to prevent percolation and is bunded to prevent spread of coal. A conveyor connects this No.4 coal warehouse with the project site. Part of the conveyor is underground (underground conveyor) and the part above ground has cover (tubular type). This eliminates the emission of coal dust (pulverized coal) during conveying. No truck is used.

Coal is pulverized first with jaw crusher and then with hammer crusher. Crusher house is underground. Crushing is remotely controlled from control room; workers are not exposed to dust. Two bag filters are installed inside crusher house.

Limestone

Only small quantity of limestone ($CaCO_3$) is used; the ratio is 1000 coal: 1 limestone $CaCO_3$ is used as the main agent for desulphurization.

Annual requirement of limestone ($CaCO_3$) is small: 300 tons. Hugh quatity of limestone is needed for the two Crown Cement factories and is extracted from the quarry site one mile, in the south. The mined out limestone is crushed at two crusher sites. (Main crusher I and II) near the quarry.) The small quantity of limestone needed for this thermal plant is taken from the nearby crusher II. This coal fire plant will not have a separate limestone storage yard. As

crusher II is just in the adjacent south logistic is not an issue. Since the amount requires is small, only $\frac{1}{1000}$ of coal quantity there will be no conveyor belt for limestone. (The limestone from the common stock will be simply poured into the limestone bin/hopper and feed, together with coal, to the boiler.)

The limestone consists mainly of pure calcite, and aragonite.

Chemicals

The only chemical used is sodium hydroxides (NaOH). It has to be used from time to time to control the PH of water (from acidic condition to alkali condition). This chemical is store in a sperate room.

The annual requirement is 70kg.

(There are already two domestic waste water treatment facilities operated by Crown Cement Factories, one of which will be shared with this coal fired thermal plant. Hence no other chemical such as, chlorine for water treatment, is necessary. These two treatment facilities are only for purifications and softener.)

Water

Annual requirement of water is 300,000 gallons (4000 tons).

Although large quantity of water has to be used daily almost all (95%) are recirculated and so the annual requirement is low.

Water for all the three factories is sourced from a spring water, 1.32 miles in the north. The spring is a perennial ground water spring and is not a drinking source of water for the villagers of Lauk Hpan Village. It is perennial spring water with little fluctuation in flow rate (wet months or dry months) throughout the year. The ground water (spring water) forms into a streamlet. The water is first pumped into a ground tank (collecting tank) and again into the next tank and then to the factory compound.

The availability of water, so far, is not an issue. The company has, however, plan B that considered for the sourcing of water from Nant Pan Si stream with larger quantity of water, 3 miles away, as an alternative water source, if necessary.

The water needed for this project is simply taken from the 100,000 water tank for this plant. The other two larger tanks are also for the nearby cement plant. (Raw water cannot be directly used; only demineralized water (R.O water) and softener water have to be used in this project context.

Figure – 76: Map showing the site of two cement plant of one coal fired thermal plant and sources water from a spring

Fuels requirement (monthly)

Diesel	-	1000 gals/month
Grease No.3	-	100 kg/month
Gear oil (No. 220)	-	250 gals/month
Gear oil (No. 320)	-	500 gals/month
Engine oil (No. 46)	-	200 gals/month

(Fuel requirement is quite low as most activities involve the use of electricity. The project proponent will share with Crown Cement factory. There is a common fuel depot, of 100,000 gallons; will also share office vehicles with the cement factory.)

Fuel is delivered to the site by the vendors (fuel companies).

Physical Properties of diesel

Specific gravity	:	0.88
Sulphur content	:	0.05% (wt)
Ash content	:	0.20%
Calorific value	:	44.80 mj/kg

The 100,000 gallons common fuel (diesel) depot has concrete floor and corrugated iron roofing at appropriate height (for ventilation and appropriate venting).

The used diesel and oil is collected in old drums regularly and give away to local recyclers.

Uses of raw materials and resources (Construction Phase)

The Construction Phase has already completed and the plant is already in operation. From the old record books the raw materials used for construction are:

-	cement	:	60,000 bags (50 kg)
-	iron bar	:	708.879 tons (assorted)
-	ply wood	:	2,120 sheet
-	corrugated iron	:	7380 m
-	binding wire	:	217 coils
-	gravel	:	5,176 tons
-	sand	:	1,251 suddrens

Other main aspects of the project

The estimated budget is USD 10 million.

Electricity to be generated/produced; 60MW. The electricity generated will be for the new cement plant (Phase II) with a capacity of 4000 tons/day and for village electrification.

Staff strength:

- Construction Phase : 92 (including 23 Chinese engineers/technicians)

  50% each are skilled and unskilled labourers

- Operation Phase : 150 (including, 14 Chinese engineers/technicians)

  Majority are skilled and migrant labours due to nature of jobs,

Working hours : 8 hours/day, in three shifts, 40 hours/week

The factory runs 24 hours a day 7 days a week.

Other aspects

Transportation of coal and limestone.

The former plan is for transportation of coal (requirement 286,750 tons) from Yatsauk, Thibaw and Nantsan Township. But this is now no longer necessary as transportation of coal required by all three plants (2 cement plants and 1 coal fired power plant) will be undertaken by responsible persons of the cement plant. The coal-fired power plant will share the coal from the common coal stock (now kept in 4 coal warehouses).

Transportation of limestone

Only small quantity of limestone is required for this coal-fired power plant project. Limestone will be taken from the common limestone stock (for all three plants); No transportation issue.

Waste management

Waste management for: industrial wastes domestic waste, chemical waste (negligible) and hazardous waste (used oil, used filter etc.) are already described earlier.

4.5 Description of the selected alternatives

Sometimes it is necessary to have Plan A, B, C etc (alternative plan) for the implementation of a proposed project. This can ensure the project to progress smoothly and successfully even if a change in plan has to be undertaken. The alternative plan can be in form of alternative site for the project or alternative method or technology for the operation of the project.

In the case of selection of project site if the original Plan A site is not appropriate the Plan B should be duly selected. For instance if Plan A site has the following issues:

i) it is inside a protected area or wildlife sanctuary or bird sanctuary

ii) it is too close to big lake or reservoir that serves as water drinking source for a community

iii) it is inside or too close to historical cultural and religious monuments or sites including archaeological ones

iv) it is inside or too close to agricultural land or animal farms

v) it is prone to natural disasters-earth quake, floods, violent storm, landslide etc. and

vi) the issue of land disputes or land grabbing.

All these above-mentioned issues, particularly the last one, can provoke loud public outcry or mass protest and can eventually leads to political instability of the region. In such a case there is no other choice but to discard Plan A and select Plan B for the long term benefit of the project. In this context there is no better alternative for switching from Plan A to Plan B. There was/is no major public outcry or mass protest and the company is in a certain degree of harmony with local community.

The proposed site is within Naunghkio Township area. When factors such as availability of land and accessibility are taken into consideration the site is suitable for the establishment of a power plant. The main advantage will be provision of electricity for the new cement plant, Crown cement plant. No better alternative is envisaged.

There can be alternative plans for the relocation, reorientation of the main components of the project if necessary --- such as the reorientation or relocation of the site (s). The plan and design provided by the Chinese experts is practical and viable and no suggestion for better relocation and reorientation.

As regards alternative method or technology the project proponent has selected the technology or Best Available Technology (BAT).

As regards demand alternative the company has in the initial phase already used generator as the site has no access to grideline electricity. This coal-fired thermal plant is actually a better alternative for long term use of electricity for the upgrade cement plant.

As regards energy source alternative the company has a plan for substitution of coal energy by bagasse produced from a planed sugar factory (No.3) and also by applying electricity generated from a planed hydro dam by the company. When the new sugar factory and hydro dam are in full operation coal will be no longer necessary.

Regarding alternative sources of water the company has a plan B for sourcing water from Nant Pansi stream 3 miles away. (However the water from a spring, the existing sources of water is a perenial spring and water is availabe through out the year. Therefore plan B is not neccessary yet. As another alternative the project proponent will consider for the harvesting and use of rainwater as far as possible for the conservation of water resource. Rain water could be used for watering plants, suppressing dust, washing machinery and vehicles and other domestic uses.

As regards activities alternative workers will be encouraged to use public transportation system as far as possible, rather than own transport systems to reduce the overall fuel uses and to reduce carbon emissions. The company will encourage its employees to walk or ride bicycle for conservation of fuel and reduction of emission. Another activity alternative is to train employees to adopt to modern technology rather than conventional technology. And train them to work "smarter" rather than "harder".

Finally there is the "no go alternative" or "do nothing alternative" or "no project alternative" and this is explained in the following subsection.

4.6 Comparison and selection of the preferred alternatives

When comparison of above mentioned alternatives the consultant firm cannot suggest any better alternatives than the existing site.

As the proposed coal-fired power plant is inside the premise of Crown Cement Plant there is no need for site selection. There is also no need for consideration for alternative location. The readily available land, no more expense for land, no more clearing of land and vegetation and the ideal location in term of logistic make the proposed site the best location.

There are no issues such as national park, protected area, wildlife sanctuary, bird sanctuary etc in the vicinity. There is also no water reservoir, wetland, major farms in the vicinity. Socio-economically there is no issue of land grabbing, land disputes, forced eviction and forced relocation. The area is also not prone to major floods and major earth quake.

The cost benefit analysis will also favour this site than an alternative site.

This "no project alternatives" or "no project alternative" will also mean no more development in the socio-economic aspect of the local area and the region. The company has invested huge sum of money and therefore will proceed with this project.

The company will be prepared for any better alternative in the future, eg. mitigation alternative or EMP alternative. Moreover as new technologies are emerging quite rapidly the company will be ready to adapt to any state-of-the-art technology or better technology.

5. DESCRIPTION OF THE SURROUNDING ENVIRONMENT

The designated study area is the proposed coal-fired power plant site and neighbourhood within a 2 miles radius from the site (mostly the premise 280 acres of the existing Crown Cement Plant). During the Construction Phase small quantity of smoke emitted from generators and pumps cannot travel more than 100 meters. In the same way dust generated from earth work and noise generated from civil construction work cannot travel more than 100 meters. During the long Operation Phase flue gas (smoke), ash and process waste water will be generated from the power plant. However during the Operation Phase air emission from the stack (point source emission) will be significant and can travel up to a few miles (if ESP, fabric filter (filter bags) are not applied and if other measures such as limestone FGD are not implemented then the distance travelled may be more than 1 mile). Due to effective mitigation, e.g. ESP, bag filters, dry FGD system, controlled complete combustion etc. which is of course Good International Industry Practice the actual area of influence (AOI) will be within one mile radius, that is, actual impacts can be felt, or seen or heard within 1 mile radius. The outer 2 miles radius can be considered as buffers zone. (Theoretically emission can travel hundreds of miles if mitigation measures are not taken.) Dust generated from vehicular movements and other activities inside the concrete floor compound, if any, will be negligible.

As regard biological component there is no natural biodiversity to be impacted as the site is within the compound of Crown Cement Plant. As vegetation was already cleared during the early constrution phase for the two large cement factories no more vegetation has to be cleared. There are no cultural and religious monuments nearby to be impacted.

The site with an area of 12.3 acres is inside the compound of the cement plant with an area of 280 acres, so most of the buildings and structures are the facilities of the cement plants. Coal-fired power plant has only a few building/structure – e.g. turbine house, boiler, cooling tower, control room, crusher house (underground), and stack etc.

The environmental study area covers an area of 16 sq miles which is occupied mostly by the cement factory complex and surrounding area outside.

In the north and west are sugar cane farms and field. There is degraded and greatly fragmented forest/bush in the east and south. Biodiversity study is mainly conduct there. In short, all the plants and animals found in this 2 miles radius (in the forest and bushes as well as in the factory compund, in the residential area) are study.

In some occasion biodiveristy study is conducted even outside this 2 miles radius; for example bird study.

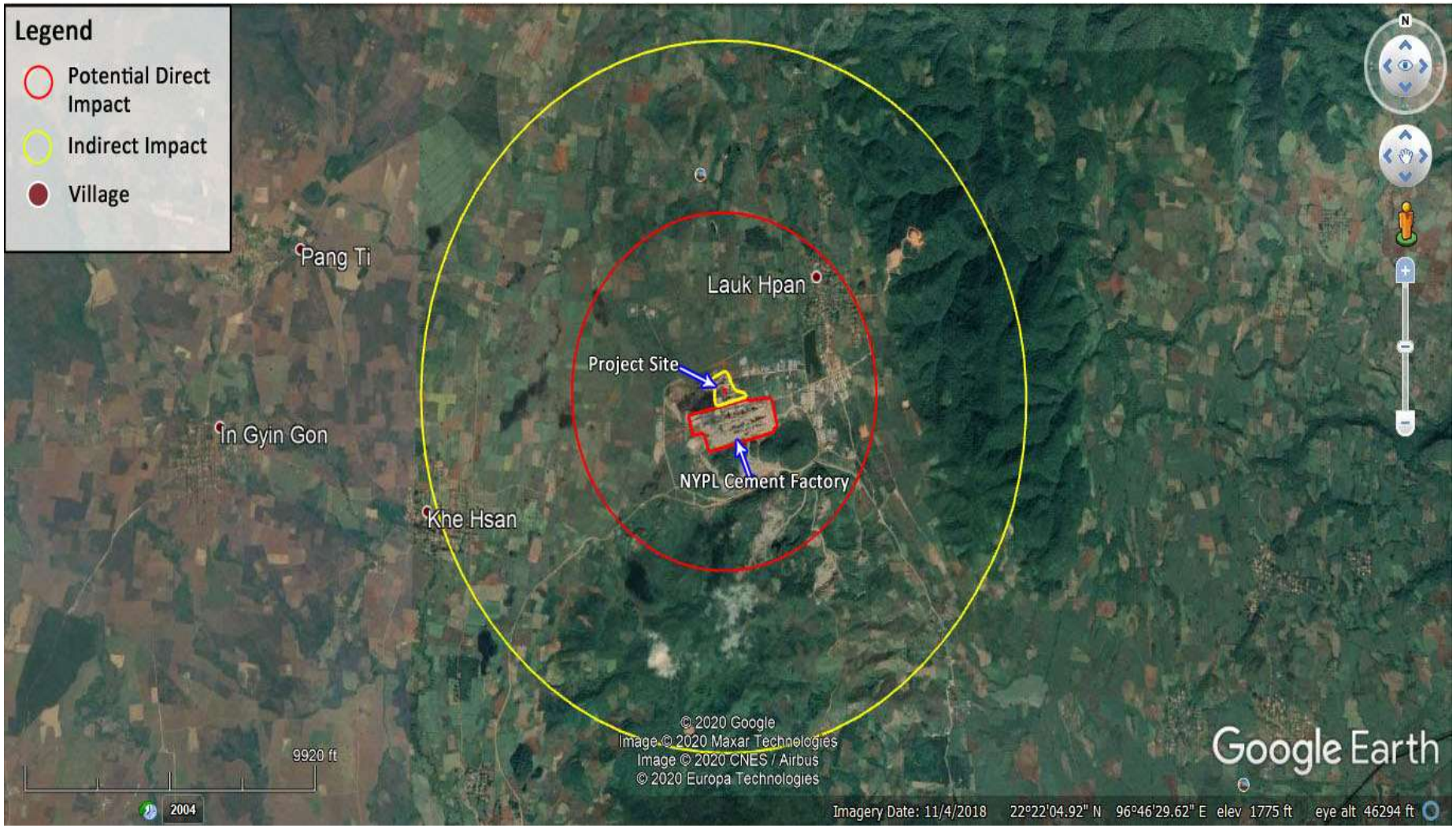


Figure – 77: The project site and designated study area within two miles radius

Setting the study limit

The study encompasses the proposed project area and vicinity within a two miles radius. The reason for setting the study limit of 2 miles radius is already furnished above. In this context this is for only this proposed coal fired thermal plant project of 12.3 acres; not for the much larger 280 acres project of the two cement factories. The premise of Crown cement factory together with Lauk Hphan village is in corporated into the area of study. Lauk Hpan, the nearest village is about 1 mile in the north east. As the prevailing wind of the area is from Southwest to Northwest this village will have the more impact than other nearby village, all in the west. However, due to effectiveness of mitigation e.g. ESP, bag filters, dry FGD, complete combustion etc. none of the local has filed any complaints regarding emission. During the second survey, March, 2019 study Khe San and Lei Gyi Taw Villages are also incorporated into the study area for socio-economic study.

(The study limit sets in a pragmatic approach manner, workable manner and short to the point. Theorectically affect of emissions can reach more than 10 km or even up to 100 km. This is beyond the pragmatic approach of this EIA report)

Methodology for data collection and analysis

EIA work involved the visual inspection of the area, the surveying work and collection of baseline environmental and social data.

The main objective is the collection, recording and documentation of all baseline data; this is the methodology widely practiced and internationally accepted proctice.

The physical data such as air quality, particulate matter (PM), SO_2, NO_2 and noise were all primary data, collected through field survey. The data for water analysis were also primary data. Basic geological data is secondary data from a previous geological data.

Data on biodiversity; flora, fauna (birds, mammals, reptiles and amphibian and aquatic organisms, if present) were all primary data collected through this study. Some data for large mammals, if any, were secondary data from locals.

The social data included both primary data collected through visual inspection and transect work, and secondary data acquired through Key Informant Interview (KII) or other secondary source (SS).

Methodology

<u>Physical data</u>

The testing and measurement of air quality, ambient air, PM, SO_2 and NO_2 involved the use of relatively sophisticated and bulky equipment and so technicians (on leave) from the Health Department have to be contracted. The portable air test kits has the advantage of measuring the in situ (on the spot) condition but not so reliable.

For measuring PM, SO_2 and NO_X etc EPAS-HA2 Scanner and EPAS air sampler (Respirable dust sampler Environtech APM-460 NC) are deployed.

The duration of measurement is 24 hours for PM and SO_2; 1 hour for Carbon monoxide (CO) of NO_X, volatile organic compound (VOC), hydrocarbon (HC) and methane (CH_4) and 8 hours for ozone (O_3).

Technicians from OEHD are hired for measurements of air quality, noise and vibration.

Portable water test kits are also not so reliable and water samples have to be brought back to Yangon for analysis at a registered private laboratory. The technicians at this laboratory carried out the analysis work.

Noise level was measured on the spot using a portable Digital Noise Level Detector, VICTOR, which was quite reliable; later Digital Sound Level Meter, EXTECH407732 was used. BENETECH Vibration Meter is used for testing vibration.

According to the hired technicians the equipment for testing air quality and for noise level have to be sent back abroad each year for calibration.

All geological data are secondary information from the findings of geologists in previous study. The methodology involved Satellite image analysis, geological mapping, lithogeo-chemical survey, gravity investigation and mechanical drilling for extraction of samples at various depths, it was learnt. Analysis work was conducted in Yangon by geologists hired by the company.

All meteorological data, monthly rainfall, monthly maximum and minimum temperature, humidity, wind speed etc. were secondary data. They were obtained from Naunghkio Township Meteorology Office.

Biological data

The data on the biological components particularly flora were all primary data. All data on flora, birds, reptiles, amphibian as well as the large majority of aquatic organisms, if present, were collected through this field surveys. Surveys were conducted by different groups of botanists, zoologists. The survey period last from 17-11-2017 to 23-11-2017.

Actually biological survey was carried out covering 2 miles radius area but as there are only degraded forest and fragmented forest/bushes in the east and south biodiversity is mainly conducted in these two areas. The overall biodiversity study is also conducted in the factory compound and in the village areas and all the sugar farm areas.

The methodology is typically taxonomic study with certain transect walk through the forest/bush and on the spot identification is the main essence of the study. Only flora (plants) and avianfauna (birds) are the main components; other taxonomic groups are very rare or absent. Actually only degraded natural vegetation remains in the vicinity. As it is only basic toxonomic work no sampling is undertaken; just identification, recording and preperation of inventory of species. The forest is greatly fragmented and degraded due to the operation of three projects. (Efforts are made for compensatory replanting of trees by the company.) The study on the biodiversity is also undertaken outside and around the factory compound, especially in the south and east where forest and bushes can be still found.

During this trip it is not possible to study large wildlife as they no longer exist in the area. However, there are Pig-tailed monkeys in the vicinity but actually these can no longer be termed wild animals but are already tamed monkeys. Common amphibians and reptiles are very rarely found. As regards avian fauna, some forest birds can be still found in relatively large numbers.

Regarding aquatic organisms there were none to study. (No stream or water body in the vacinity only a steamlet which is actually a spring.)

As wildlife are very scarce or almost depleted the flora remains the main biological component for study. But as the project is inside the premise of a big cement factory (where the vegetation was cleared long ago) there is very little natural flora left to study. The essential tool for EIA work include computer, GPS, camera, telescopes (especially for birds) binoculars, hand lens, microscope (especially for aquatic microorganisms), compass, portable water and air test kits, anemometer, herbarium press, measuring tapes, ropes, pruners and cutter, tool for catching and trapping wild life, if any, (snare, trap, scoop, nets including plankton net, stakes etc), lamp and torch for night survey for nocturnal animals. Chemical preservatives (alcohol, formalin) together with plastic containers of various sizes for the preservation of specimens (especially those that could not be identified during the survey trip but to be identified later) were also necessary.

Google Earth satellite imagery was also applied for the overview of forest or bush structure, if any, generalized distribution pattern and possible detection of peculiar micro-ecological niches (for both plants and animals), if any.

Socio-economic data

As regards socio-economic data most were secondary data. These were gathered by means of conducting Key Informant Interview (KII) by means of predesigned/prestructured questionaires, and also from certain Secondary Source (SS). Certain primary data were acquired by means of visual inspections; transect walks and focal group discussion (FGD).

Cultural aspects

As for cultural components there were no important cultural, religious, historical and archeological monuments or sites in the area. The exceptional case: a small Buddhist monastery in the village and there was no likelihood to be impacted by the project.

In the case of visual component the landscape of the mountain would be impacted due to quarry ativities for extraction of limestone by the two cement factories and this would be discussed in impact assessment in **Chapter-6**.

5.1 Physical component of the surrounding environment

5.1.1Climate

The climate is the hot wet tropical monsoon climate with relatively high temperature the whole year through. But as the elevation is relatively high it is cool to relatively cold in the cool season. There is a dry season (March – June) a wet season (June to September) and a cool season (November – end of February). This is just the generalized pattern.

Table-(1), (2), (3) and (4) show the monthly maximum, minimum mean temperature, rainfall humidity and wind speed during (2010-2018 January). The data were secondary ones acquired from the Naunghkio Township Meterology and Hydrology Department.

Table-1: Monthly minimum and maximum temperature (ºC) of Naunghkio Township during 2010-2018 January

Month	Monthly temperature																	
	Maximum									Minimum								
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2010	2011	2012	2013	2014	2015	2016	2017	2018
January	26.2	24.3	24.2	24.7	24.7	24.5	23.4	25.7	24.2	9.0	10.0	9.0	9.1	8.5	9.1	6.8	7.4	8.2
February	27.9	28.2	27.9	29.0	26.3	27.1	27.2	28.6		10.6	10.2	10.0	12.5	10.4	8.3	9.7	10.8	
March	30.9	29.6	29.5	30.4	30.3	31.2	31.4	30.0		16.6	15.2	14.5	19.6	14.5	13.4	13.1	12.9	
April	33.8	29.7	31.2	33.0	31.7	30.7	34.3	30.7		20.8	18.2	19.0	18.8	19.1	16.7	17.1	17.2	
May	32.4	28.8	30.6	28.8	30.3	31.1	30.9	30.8		22.9	20.7	21.6	20.6	21.3	19.5	17.4	19.5	
June	29.3	28.2	29.0	29.2	28.8	30.4	29.4	39.0		22.6	22.2	22.4	22.2	22.7	20.9	18.5	20.9	
July	28.4	28.7	27.6	27.5	28.7	28.2	28.7	28.6		22.9	22.1	22.1	22.2	22.1	20.6	18.3	20.9	
August	28.9	27.4	27.9	27.0	28.7	28.4	29.2	28.7		22.6	21.9	21.9	21.6	21.4	20.1	18.0	20.7	
September	28.0	28.1	28.9	28.3	29.2	30.1	29.8	29.5		21.3	21.6	21.4	21.6	20.2	20.4	17.7	20.0	
October	27.6	27.1	28.1	26.9	28.2	28.5	28.8	29.0		20.8	19.4	18.3	18.9	16.9	16.4	16.3	18.3	
November	26.9	25.7	25.9	26.4	27.6	26.5	26.3	27.8		14.2	12.7	17.0	14.9	14.0	12.7	11.6	14.6	
December	24.7	23.4	24.8	22.8	25.6	24.2	25.8	24.5		11.2	11.8	10.2	9.4	9.2	8.9	8.2	10.1	

During the last eight years, the month April, 2010, had recorded the highest temperature (33.8ºC) while January 2017 had the lowest temperature record (7.4 ºC).

Table-2: Shows the monthly rainfall and total rainfall of Naunghkio Township during the last eight years (2010-2018 January)

Month	Total rainfall per month (inch)								
	2010	2011	2012	2013	2014	2015	2016	2017	2018
January	-	0.39	0.12	0.47	-	0.79	-	0.16	2.12
February	-	-	-	-	0.98	-	-	-	
March	0.12	1.62	0.47	0.04	-	1.06	-	0.55	
April	0.55	5.90	2.88	0.16	3.71	3.39	1.70	3.66	
May	4.13	10.79	5.63	7.13	5.86	10.59	7.79	8.31	
June	8.86	7.28	4.10	7.87	10.36	3.26	10.98	7.83	
July	10.24	5.99	5.00	12.79	9.64	14.45	3.78	5.24	
August	8.34	12.16	9.76	11.30	8.03	9.33	10.47	5.51	
September	11.65	8.47	6.70	11.42	8.55	3.90	2.41	11.06	
October	12.24	5.20	3.46	5.36	3.89	6.58	9.29	4.45	
November		0.37	3.46	0.11	1.46	2.75	2.79	2.32	
December	3.07	0.67	0.12	-	-	0.20	0.08	0.52	
Total rainfall	**59.2**	**58.84**	**41.7**	**56.65**	**52.48**	**56.3**	**49.29**	**49.61**	

A comparison of rainfall patterns during the last 8 years (2010-2018 January) revealed that the year 2010 had the highest annual total rainfall–59.2 inches while the year 2012 had the lowest–41.7.

Table-3: Monthly humidity (%) of Naunghkio Township during (2010-2018 January)

Month	Humidity (%)								
	2010	2011	2012	2013	2014	2015	2016	2017	2018
January	99	84	83	79	83	79	82	83	78
February	62	69	64	64	71	67	78	76	
March	55	60	58	53	53	59	59	64	
April	47	69	61	48	60	63	56	70	
May	64	82	72	76	77	74	77	80	
June	79	85	81	77	81	79	87	83	
July	85	83	84	87	86	86	86	85	
August	87	88	85	86	81	87	84	87	
September	86	86	82	83	86	81	87	86	
October	80	89	82	84	81	86	89	86	
November	79	81	87	88	88	88	92	84	
December	87	94	87	81	-	-	89	85	

A comparison of the values of mean monthly humidity (%) for the last eight years showed that the highest value, 99 occurred in January, 2010 while the lowest, 47, occurred in Aprily, 2010.

Table-4: Monthly wind speed (mph) of Naunghkio Township during (2010-2018 January)

Month	Wind speed (mph)								
	2010	2011	2012	2013	2014	2015	2016	2017	2018
January	2.3	2.1	2.6	2.1	1.6	3.5	2.3	1.3	1.6
February	2.9	2.8	3.3	2.3	2.8	4.9	4.4	1.6	
March	3.4	3.2	3.1	3.5	3.2	5.0	5.7	6.2	
April	1.1	1.8	3.6	4.2	3.0	5.0	6.2	5.8	
May	2.5	2.0	2.4	2.2	2.4	3.6	4.8	2.2	
June	2.0	2.1	2.3	1.7	3.0	3.2	3.1	1.7	
July	1.7	2.3	1.9	1.4	2.5	2.7	3.1	1.6	
August	2.0	2.0	1.4	1.9	2.9	2.6	3.8	1.5	
September	2.1	2.4	2.1	1.8	3.1	2.7	4.1	1.8	
October	2.4	2.1	1.6	1.5	3.5	2.7	2.1	1.5	
November	1.2	1.7	1.1	1.7	2.6	1.7	2.1	1.1	
December	1.8	1.3	1.7	1.1	2.3	2.9	3.0	1.3	

The highest wind speed (6.2 mph) was recorded in March, 2017 and April, 2016 while the lowest (1.1 mph) was recorded in April, November, December and November, 2010, 2012, 2013 and 2017, respectively. The direction of prevailing winds were generally from South West to North East during the rainy season while during the cool season the general direction were from North East to South West. But during the hot dry season the winds were irregular and there were no perceptible prevailing wind with regular direction.

Later the project proponent has hired another consultant firm, Sustainable Environment Myanmar (SEM) for modeling and plotting of Wind Rose projection (Air Dispersion Modeling). Based from meteorologial data recorded between 1/1/2014 and 12/31/2018 (software application) average wind roses is shown in the followng diagram.(Actually the project proponent is unable to comprehend the full meaning of this diagram as it is the work of the experts involving soft ware application. However, it can be generally stated that the air shed of the area is predominated by the South West winds and seondary winds from the North East).

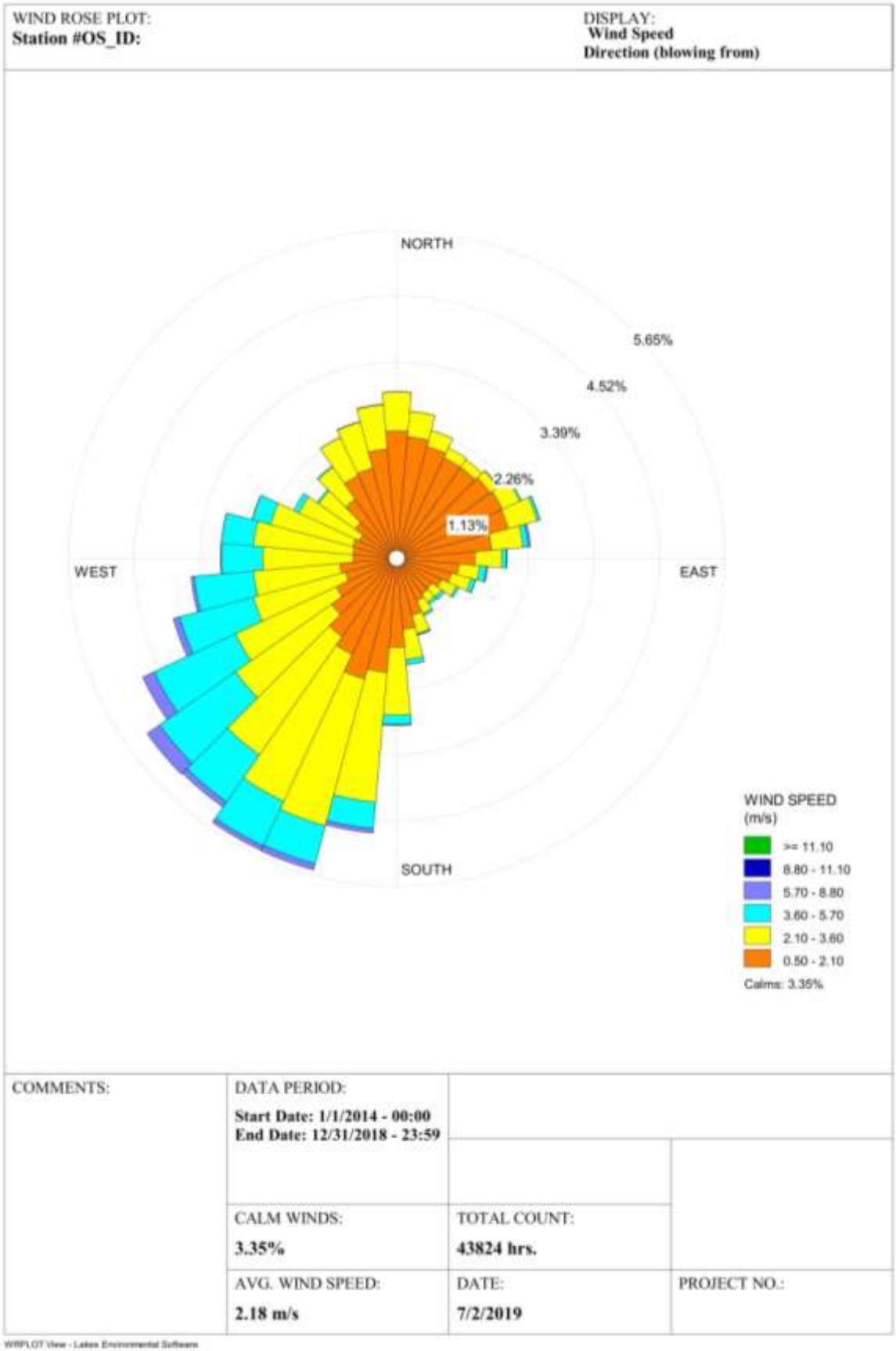


Figure – 78: Wind rose

5.1.2 Topography

The area is a hilly region with undulating hills and valleys. The forest around the area is degraded ones and there are farm lands on hills and in valleys.

The elevation is 976 msl. The site is 1 mile south-west of Lauk Hpan village, Naunghkio Township and is 5 miles north of Mandalay-Lashio highway.

Hydrology

There are no water courses or water bodies. There is an artificial pond (created from a natural water impoundment area during the rainy season) and a streamlet originates from underground spring. This streamlet flows into the Nant Pansi Stream (Chaung) about 3 miles in the south. Water for the three plants is sourced from this streamlet.

Nant Pan Si water will be also used, if necessary.

With the help of technicians from the Irrigation Department the flow rate and volume of water from this streamlet is measured. The results are as follow:

Flow rate : 5.5 feet/sec

Volume of water flow rate : 41.09 gallons/sec (During the dry season)

(During the wet season the volume is more than twice that of the dry season.)

The water from this streamlet supplies all the water required by the three factories. The annual water requirement is 300,000 gallons and therfore the water from this streamlet is more than enough for requirement. Moreover the water is almost 100% recirculated therefore water is not an issue. However, if necessary, the company has a plan for sourcing water from Nant Pansi stream, 3 miles away in the south east.

Figure – 79: Sounding water depth and water volume

(Once again the project proponent cannot comprehend the complex formulae and equation applied for determination of water flow, by the technicians.)

5.1.3 Basic geology (secondary data from geologist of the company)

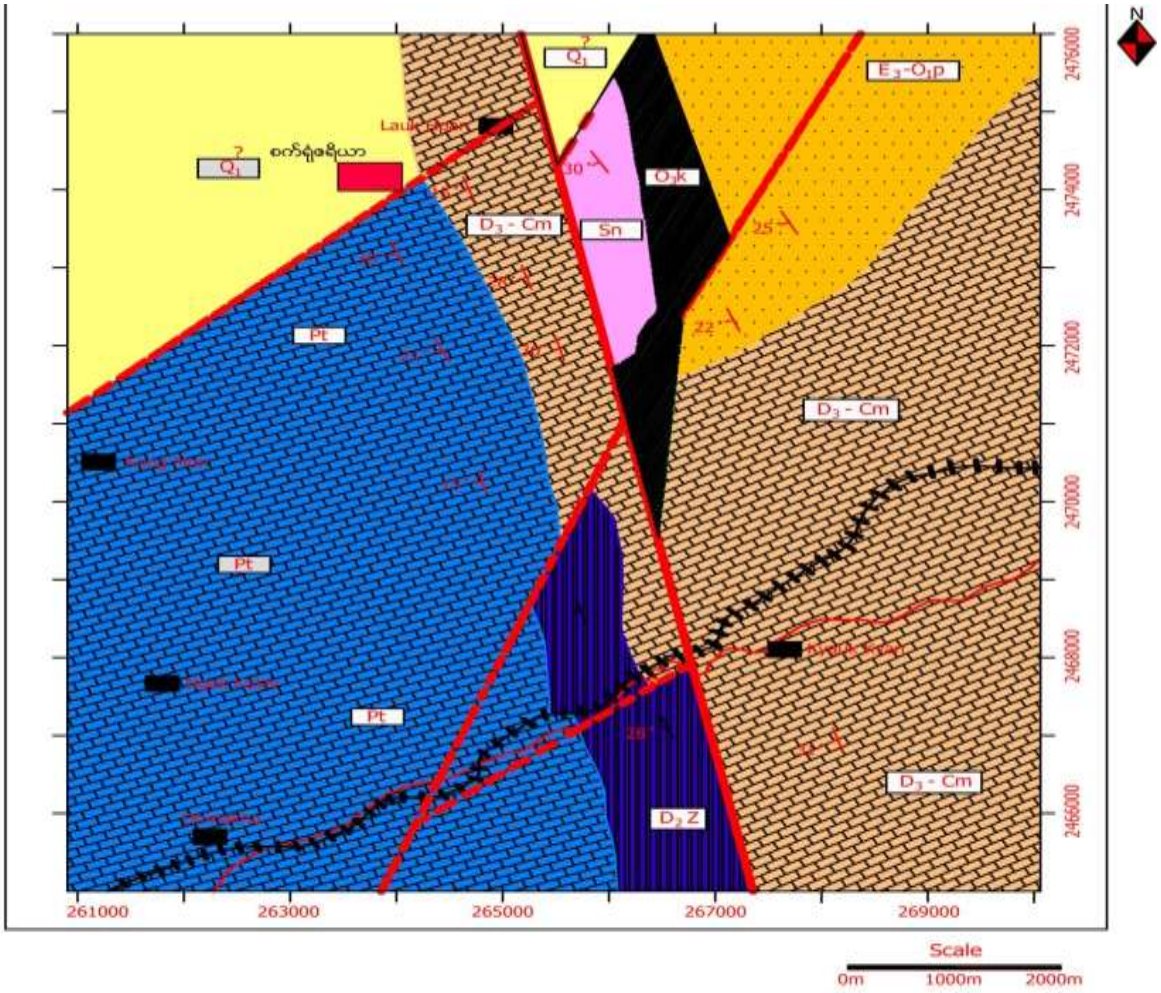
The region is within the Eastern Highland Belt, Geo-tectonic zone of Myanmar. This belt is characterized by major geologic components such as highly folded rocks of Paleozoic Era, partly metamorphosed. There are limestone layers in two horizons; one in Silurian to Devonian Periods, another in carboniferous to Permian Periods.

The project site is underlain by limestone of Permian to Triassic Periods.

The limestone is massive and its bedding, which is stiff and jointed at an interval of 50cm to 3m is scarcely seen at the site.

Geological components distributed at the project site generally from top to bottom are: top soil, debris deposit, calcite deposit, boulders (river deposit), cobbles (river deposit) pebbles (river deposit) siltstone and limestone.

The general soil type is acrisol (ferric acrisol, FAO classification). Generally it is clay rich, associated wth humid tropical climate and usually found at area of undulating topography.



INDEX	AGE	FORMATION	LITHOLOGY
	Permian	Thitsipin Formation	Massive- Thick Bedded Light Grey to Bluish Grey Calcitic Limestone & Buff to Black ,Thinly Bedded Shale
	Late Devonian-Carboniferous	Maymyo Dolomite Formation	Thick Bedded to Massive , Light grey to grey brecciated dolomitic Limestone
	Middle Devonian	Zebingyi Formation	Medium bedded, Dark Grey to Black Calcareous Siltstone & Black Limestone
	Silurian	Naungbaw Formation	Medium-Thick bedded, Purplish to Grey Green Colour Phacoidal Limestone & Purple Calcareous Shale
	Late Ordovician	Kyaingtaung Formation	Thin-Thick Bedded Limestone with Silt Band, Locally dolomitized
	Late Cambrian-Early Odovician	Pangyun Formation	Coase Grain Micaceous Quartzose Sandstone, Purplish Grey Quartzite, Micaceous Phyllite and Quartzite

Geological Symbol

- Dip & Strike
- Kyauk kyan Fault
- Fault
- Car Road
- Railway
- Village

Figure – 80: General geology of the study area

Natural hazards

There were no precedents of natural hazards such as major earth quakes, major floods, extreme weather events (droughts and excessive rainfall) and wildfire ete within memories of 5 decades, it is learnt.

When the unprecedented catastrophic floods that wreaked havoc on 11 of the 14 States and Regions of the country in 2015 this area was spared (due to high elevation), a glimpse at the meteorological data during the last eigh years did not rerveal any extreme weather events (regarding rainfall and temperature).

The area is within the Kyauk-kyan fault line zone which runs from north to south. Further in the west is the Shan Crap Fault Zone which also runs from north to south. However, there were/are no precedents of major earthquakes but only occassional small tremors. So far there is also no precedent of landslide at the limestone hill in the south due to limestone quarry.

During the last 2 decades (from 1991-2012) there were 7 recorded medium and storng earthquakes in the country. None of them have affected this area.

Cyclones and major storms that usually made landfalls in Rhakine State and some coastal area did not affect this area.

Soil test

During the second survey trip (9-3-2019 to 13-3-2019) soil tests for mercury, iron, lead and cadmium were conducted.

With the assistance of technicians from Department of Agriculture, Land Uses Division, soil samples from five points, namely, Lauk Hpan village, Khe San village, Lei Gyi Taw village, Lauk Hpan maize farm land, and soil from the N.E discharge pond (domestic waste water sink) were tested. The whole coal-fired plant gound is paved with concrete floor.

The coordinates for the five points are as follows.

Lauk Hpan village (St-1)	- N. Lat. 22º 22' 08.2"; E. Long 96º 42' 32.3"
Khe San village (St-2)	- N. Lat. 22º 21' 01.0"; E. Long 96º 40' 45.9"
Lei Gyi Taw village (St-3)	- N. Lat. 22º 20' 50.8"; E. Long 96º 43' 20.1"
Lauk Hpan village farm land (St-4)	- N. Lat. 22º 21' 56.1"; E. Long 96º 42' 59.1"

Discharge Pond (domestic waste water sink) (St-5) N. Lat. 22º 21' 47.6"; E. Long 96º 42' 40.6"

The three villages in the vicinity of the project site and are thus selected. Actually only Lauk Hpan Village is within the 1 mile radius (direct impact area); the outer 1 mile is buffer zone. Khe-hsan and Lei Gyi Taw Village are just outside the buffer zone.

It is expected that the 5 stations (monitoring points) can represents the situation of the whole area of study. However this EIA report is not a once for all one. During the long Operation Phase testings will have to be done on a semi-annual basis and reported to the authority. There can be or cannot be a charge in selection of monitoring spots/points.

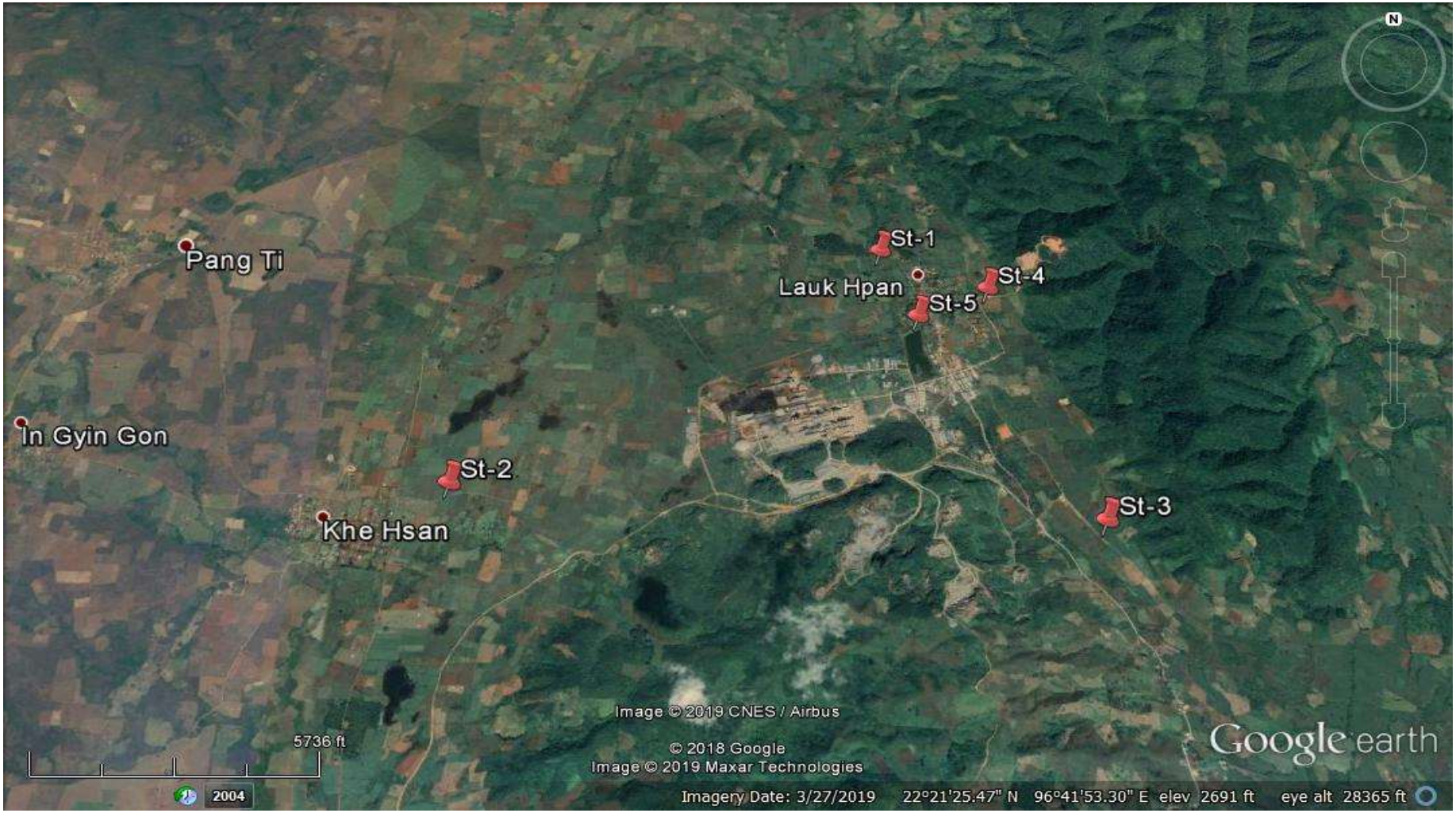


Figure – 81: Satellite image of the area showing spots where soil samples are taken

Soil analytical data

Sr. No	Sample	Depth in	Iron (Fe) mg/kg	Mercury (Hg) mg/kg	Lead (Pb) mg/kg	Cadmium (Cd) mg/kg
1.	Lauk Hpan Village	0-6"	Not detected	Not detected	6.7	0.78
2.	Khe San Village	0-6"	Not detected	Not detected	4.65	Not detected
3.	Lei Gyi Taw Village	0-6"	33.9	Not detected	4.15	Not detected
4.	Lauk Hpan village farm land	0-6"	Not detected	Not detected	11.85	Not detected
5.	Discharge Pond	0-6"	28.71	Not detected	15.9	Not detected

Mercury and Cadmium are not detected in all five spots.

Iron is detected from Lei Gyi Taw and discharge pond.

Lead is detected from all five points.

The values are much lower than the guideline values for lead in soil (400PPM, by NEPA, 2012). Actually this is only something like baseline data. Unless the previous data (5-10 years ago) are not known it is not possible to speculate any thing.

Leaf test

During the second survey trip (9-3-2019 to 13-3-2019) tests for Iron, Lead, Cadmium and Chromium were conducted. Leaves of sugar cane at 4 farms are collected, wrapped in black plastic bags and brought back to Yangon. With the assistance of technicians from the Department of Research and Innovation, Analysis Department, analysis of sugar cane leaves (the only available crop in the area during the time of survey) was conducted. The coordinate of four stations where the sugar cane leaves were sampled were:

Lauk Hpan village sugar cane farm (St-1) : N. Lat. 22º 22' 08.2"; E. Long 96º 42' 32.3"

Khe San village sugar cane farm (St-2) : N. Lat. 22º 21' 01.0"; E. Long 96º 40' 45.9"

Lei Gyi Taw sugar cane farm (St-3) : N. Lat. 22º 20' 50.8"; E. Long 96º 42' 59.1"

Lauk Hpan village another sugar cane farm (St-4): N. Lat. 22º 21' 56.1"; E. Long 96º 42' 59.1"

Note: The Analysis Department is not able to test Mercury content.

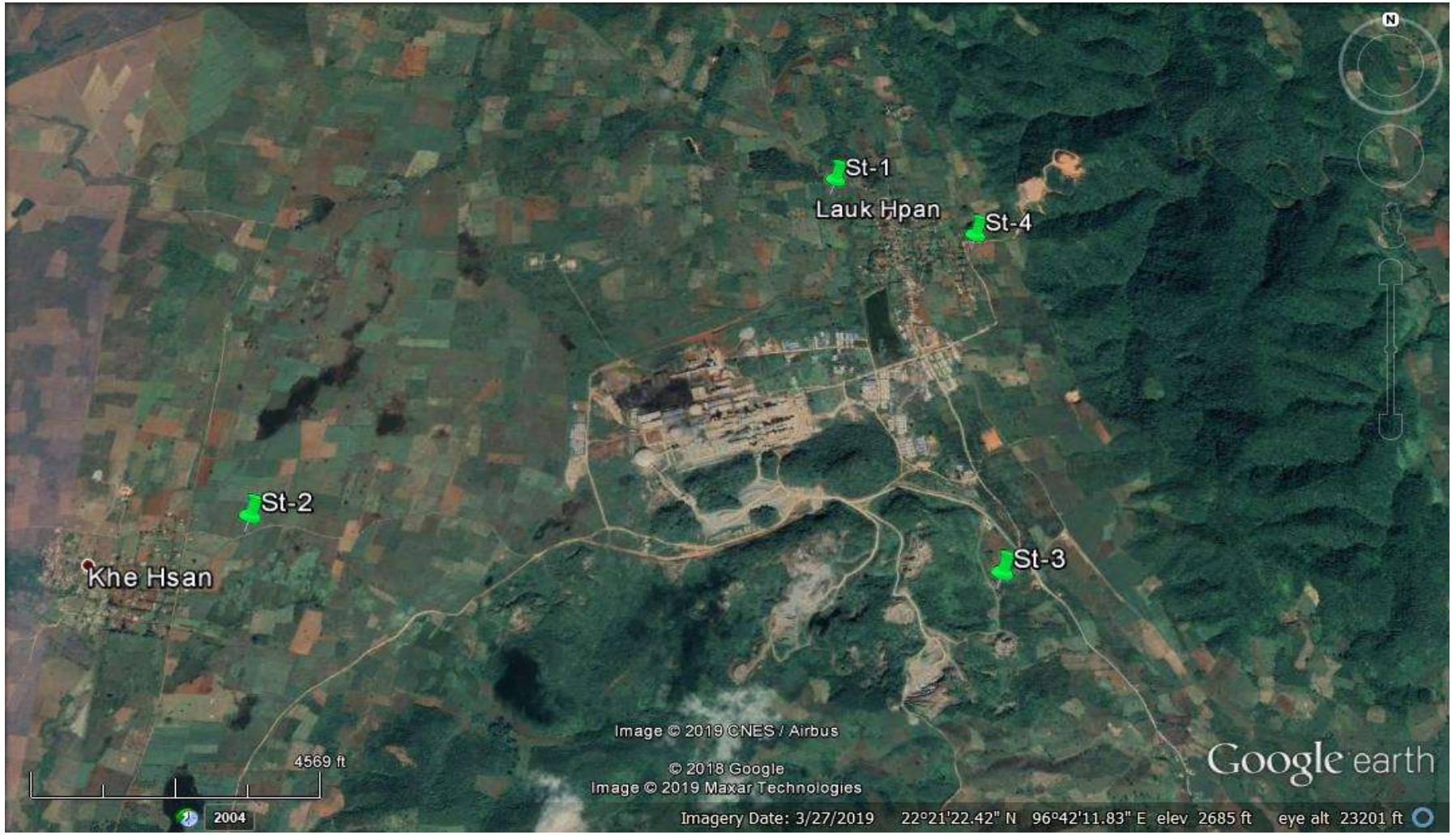


Figure – 82: Satellite image of the area showing spots where leaf samples are taken

Leaf analysis data

No.	Parameters	Station-1 (mg/kg)	Station-2 (mg/kg)	Station-3 (mg/kg)	Station-4 (mg/kg)
1.	Iron as Fe	43.00	41.31	53.52	531.36
2.	Lead as Pb	0.838	0.646	0.702	1.45
3.	Cadmium as Cd	0.364	0.251	0.406	0.542
4.	Chromium as Cr	1.06	1.11	2.11	3.47

The hired technicians said that the method they used is AOAC International method, practiced internationally.

These are actually baseline data. As there are no previous data it is not possible to compare the situation and make any comment.

Also as the consultant firm, MESC, has no health expert, especially nutritionist, it cannot give any special comment. Of course, lead, cadmium and chromium are known as undesirable heavy metals that can cause human poisonings. The common sense is that if they are found in edible vegetable it can be harmful. In this area the only readily available crop leaf for testing is sugar cane leaf which is not edible.

Logically the heavy metals in sugar leaf can, in one way or another, get into the sugar cane juice and end up in sugar crystal. But this is beyond the knowledge of the consultants and beyond the scope of this EIA study.

5.1.4 Water

The water for the cement factory is sourced from a stremlet originates from spring water. The proposed coal thermal plant also sources water from this spring. The water samples from six stations are collected and analysed at a registered laboratory in Yangon and shown in the following table **(See ANNEX)**. The coordinates of six stations were as follows: The collecting date is 11-3-2019.

Point-1 Stream water (St-1) : N. Lat 22º 22' 29.9"; E. Long 96º 42' 07.7"

Point-2 Khe San village (St-2) : N. Lat 22º 21' 08.7"; E. Long 96º 40' 24.0"

Point-3 Lauk Hpan village (St-3) : N. Lat 22º 21' 58.4"; E. Long 96º 42' 45.5"

Point-4 Boiler blow down (St-4) : N. Lat 22º 21' 32.9"; E. Long 96º 42' 07.6"

Point-5 Discharge pond (St-5) : N. Lat 22º 21' 47.6"; E. Long 96º 42' 40.6"

Point-6 Cooling tower (St-6) : N. Lat 22º 21' 32.9"; E. Long 96º 42' 06.4"

The reasons for selecting these 6 stations are:

- St-1 is the source of water;
- St-2 and St-3 are the water resources at the two nearby villages;
- St-4 and St-5 are used water/waste water; and St-6 is on the water at the cooling tower.

It is expected that the six stations (monitoring points) can well-represent the situation of the whole area. But as this EIA report is not a perfect once for all report there can be or cannot be a change in the monitoring points over the years. A semi-annual monitoring (testing) has to be conducted.

At each site water sample was manually collected in 1 gallon bottles and brought back to Yangon for analysis at a registered laboratory at Insein ISO, TECH Laboratory.

The technicians said they use standard method for water and waste water analysis.

Figure – 83: Satellite image of the area showing spots where water samples are taken

Table-5: Analysis of water samples from three stations

No.	Parameters	At the stream water	Khe San Village of tube well water	Lauk Hpan Village of tube well water	WHO guideline values
1.	pH	8.8	8.0	8.2	6.5 – 8.5
2.	Turbidity	-	2 NTU	3 NTU	5 NTU
3.	Iron	-	0.15 mg/l	0.16 mg/l	0.3 mg/l
4.	Total Hardness	-	280 mg/l	242	500 mg/l as $CaCO_3$
5.	Total Alkalinity	-	324 mg/l	272 mg/l	-
6.	Chloride (CL)	-	3 mg/l	33 mg/l	250 mg/l
7.	Sulphate (SO_4)	-	50 mg/l	40 mg/l	500 mg/l
8.	Suspended solids	4 mg/l	-	-	-
9.	Nitrate ($N.NO_3$)	0.3 mg/l	-	-	50 mg/l
10.	Chlorine (Residual)	-	-	-	-
11.	Phosphate	Nil	-	-	-
12.	Lead (as Pb)	-	-	-	0.01 mg/l
13.	Arsenic (As)	-	Nil	Nil	0.01 mg/l
14.	Chemical Oxygen Demand, COD	32 mg/l	-	-	-
15.	Biochemical Oxygen Demand, BOD	8 mg/l	-	-	-
16.	Cyanide	-	Nil	Nil	0.07 mg/l
17.	Zinc (Zn)	-	-	-	3 mg/l
18.	Copper (Cu)	-	Nil	Nil	2 mg/l
19.	Dissolved Solids	-	289 mg/l	295 mg/l	1000 mg/l
20.	Manganese	-	Nil	Nil	0.05 mg/l
21.	Oil and Grease	15.2 mg/l	-	-	10 mg/l

The values are on the whole lower than the National Environmental Quality Emission Guideline (NEQEG) values prescribed by ECD and the WHO guideline values (See also **ANNEX**). The exceptional cases are oil and grease at stream water at cooling tower. The reasons are unknown, probably the result of accidental oil/grease spill into the stream and probably over-lubrication of machinery in side the factory premise.

Table-6: Analysis of waste water samples from three stations

No.	Parameters	waste water/used water (blow down)	waste water/used water (cooling tower)	waste water (final discharge)	NEQEG guideline values
1.	Arsenic (As)	Nil	Nil	Nil	0.5 mg/l
2.	Cadmium	Nil	Nil	Nil	0.1 mg/l
3.	Chromium (total)	Nil	Nil	Nil	0.5 mg/l
4.	Copper (Cu)	Nil	Nil	Nil	0.5 mg/l
5.	Iron	0.25 mg/l	0.58 mg/l	0.40 mg/l	1 mg/l
6.	Lead (as Pb)	Nil	Nil	Nil	0.5 mg/l
7.	Mercury	Nil	Nil	Nil	0.005 mg/l
8.	Oil and Grease	4.05 mgl	10.58	8.49 mg/l	10 mg/l
9.	pH	7.5	8.7	8.3	6-9
10.	Temperature increase	25.0 °C	25.0 °C	25.0 °C	$<3^{b}$
11.	Total residual chlorine	Nil	Nil	Nil	0.2 mg/l
12.	Total suspended solids	6 mg/l	62 mg/l	23 mg/l	50 mg/l
13.	Zinc (Zn)	Nil	Nil	Nil	1 mg/l

The values are on the whole lower than the National Environmental Quality Emission Guideline (NEQEG) values prescribed by ECD and the WHO guideline values (See also **ANNEX**). The exceptional cases are oil and grease at used water at cooling tower. The reasons are unknown, probably the result of accidental oil/grease spill into the stream and probably over-lubrication of machinery in side the factory premise.

Water test for Pb, Cr, Cd and Hg

During the second survey trip water test for Pb, Cr, Cd and Hg was conducted at five points (5 stations), namely, Khe San village, Lauk Hpan village, boiler blow down, final discharge pond (domestic waste water sink) and cooling towers. The collecting date is 11-3-2019.

The coordinates for the five points are:

Khe San village : N. Lat 22º 21' 08.7"; E. Long 96º 40' 24.0",

Lauk Hpan village : N. Lat 22º 21' 58.4"; E. Long 96º 42' 45.5"

Boiler blow down : N. Lat 22º 21' 32.9"; E. Long 96º 42' 07.6"

Discharge pond : N. Lat 22º 21' 47.6"; E. Long 96º 42' 40.6"

Cooling tower : N. Lat 22º 21' 32.9"; E. Long 96º 42' 06.4"

Water analytical data

Sr. No	Sample	Lead (Pb) mg/kg	Chromium (Cr) mg/kg	Cadmium (Cd) mg/kg	Mercury (Hg) mg/kg
1.	Khe San Village	Not detected	-	Not detected	Not detected
2.	Lauk Hpan Village	Not detected	-	Not detected	Not detected
3.	Blow down (boiler)	-	0.1	Not detected	Not detected
4.	Final discharge pond	-	0.1	Not detected	Not detected
5.	Cooling Tower	-	0.1	Not detected	Not detected

5.1.5 Ambient air quality

The ambient air qualities at different spots were measured by technicians from the Health Department. The methodology was already mentioned earlier in this Chapter. The coordinates are:

St-1 (at the site) : N. Lat 22º 21' 32"; E. Long 96º 42' 10", (date: 15.11.2017)

St-2 (at Lauk Hpan village) : N. Lat 22º 21' 58.29"; E. Long 96º 42' 48.17" (date: 9.3.2019 – 10.3.2019)

St-3 (at Lei Gyi Taw village) : N. Lat 22º 20' 13.83"; E. Long 96º 43' 31.29" (date: 10.3.2019 – 11.3.2019)

St-4 (at Khe San village) : N. Lat 22º 20' 50.6"; E. Long 96º 40' 31.7" (date: 11.3.2019 – 12.3.2019)

Those four spots are selected in order to know the air quality at the factory and at three nearby residential areas (villages).

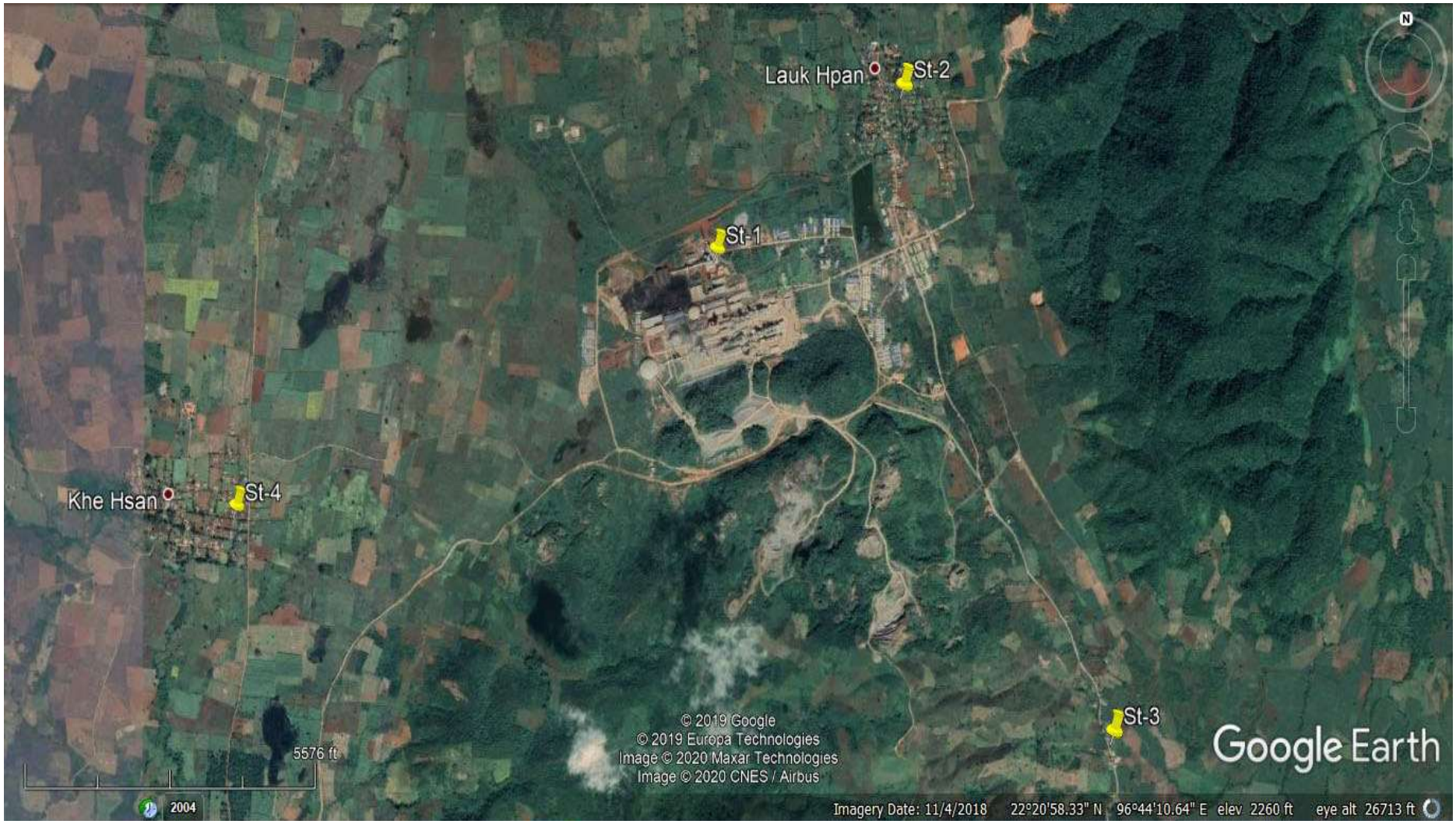


Figure – 84: Satellite image of the area showing spots where air quality and noise level are measured

Air quality representing the wet season and dry season cannot be measured yet. In the near future when the compulsory semi-annual monitoring have to be conducted the month of January (dry season) and the month of July (wet season) will be selected and the monitoring report will be submitted to ECD semi-annually.

The followings are the results of air quality measurments conducted by technicians from Occupational and Environmental Health Division, Ministry of Health and Sports.

Table-7: Ambient air quality (showing baseline data, air modelling predicted data compared with NEQEG and EU guidelines)

Sr. No	Parameters	Existing values at site	Existing values at Lauk Hpan village	Existing values at Lei Gyi Taw village	Existing values at Khe San village	Results of flue gas analyser	Results obtained from air dispersion modelling at site	Results obtained from air dispersion modelling at Lauk Hpan village	Results obtained from air dispersion modelling at Khe San village	NEQEG guideline values	EU Standard
1	PM_{10}	33.9 µg/m^3	30.1 µg/m^3	29.3 µg/m^3	30.7 µg/m^3	38 µg/m^3	45.07 µg/m^3	36.47 µg/m^3	46.66 µg/m^3	50 µg/m^3 (24 hrs)	50 µg/m^3
2	$PM_{2.5}$	19.4 µg/m^3	16.7 µg/m^3	16.8 µg/m^3	18.2 µg/m^3	-	-	-	-	25 µg/m^3 (24 hrs)	25 µg/m^3 (annual)
3	NO_2	37 µg/m^3	42 µg/m^3	39 µg/m^3	40 µg/m^3	127 µg/m^3	141.36 µg/m^3	117.50 µg/m^3	119.24 µg/m^3	200 µg/m^3 (1 hr)	200 µg/m^3
4	SO_2	14.9 µg/m^3	12.8 µg/m^3	11.6 µg/m^3	13.2 µg/m^3	83 µg/m^3	14.55 µg/m^3	20.49 µg/m^3	11.92 µg/m^3	20 µg/m^3 (24 hrs)	-
5	Ozone (O_3)	12.7 µg/m^3	22 µg/m^3	18.1 µg/m^3	11 µg/m^3	-	-	-	-	100 µg/m^3 (8 hrs)	120 µg/m^3
6	CO	50 µg/m^3	47 µg/m^3	39 µg/m^3	54 µg/m^3	-	-	-	-	3000 µg/m^3 (1 hr)	-
7	VOC	21.3 µg/m^3	19.5 µg/m^3	19.5 µg/m^3	18.9 µg/m^3	-	-	-	-	400 µg/m^3 (1 hr)	-
8	Hydrocarbon (HC)	496 ppm	453 ppm	472 ppm	487 ppm	-	-	-	-	-	-
9	Methane (CH_4)	5415 ppm	4013 ppm	4143 ppm	4436 ppm	-	-	-	-	-	-

The duration of measurement is 24 hours for PM and SO_2; 1 hour for Carbon monoxide (CO) of NO_X, volatile organic compound (VOC), hydrocarbon (HC) and methane (CH_4); 8 hours for ozone (O_3). Also see ANNEX for more.

(The newly installed flue gas analyser monitored air parmaters on an hourly basis. And these are calculated for 24 hours)

The values at the site are on the whole lower than the National Environmental Quality Emission (NEQEG) guideline values prescribed by ECD. (Guideline values for Hydrocarbon (HC) and Methane CH_4 not available.)

There can be certain impacts on the physical components but all impacts can be either controlled or mitigated.

Ambient noise and vibration

The hired technicians applied the methodology already mentioned earlier.

The coordinates for noise level measurements at four spots are the same with air quality measuring spots. Measurements were made at the same day and same time with those of ambient air (mentioned earlier). These four spots/points are selected in order to know the noise level at the factory site and at the three nearby villages.

The noise levels are as follows:

Table-8: Quality of Ambient noise level (dBA) by sample sites (compared with NEQEG guideline)

	At plant site		**Lauk Hpan village**		**Lei Gyi Taw village**		**Khe San village**		**NEQEG guideline value**	
	Day	**Night**	**Day**	**Night**	**Day**	**Night**	**Day**	**Night**	**Day**	**Night**
(Residential institutionals educational	-	-	50	46	51	49	49	45	55	45
Industrial, commercial	56	52	-	-	-	-	-	-	70	70

The noise levels values are all lower than NEQEG value.

The factory is still under construction.

When the factory is in full operation the noise level can be higher than NEQEG guideline value for commercial and industrial areas as prescribed by ECD. But the project proponent shall do its utmost to mitigate this impact and reduce the noise level by all means.

5.2 Biological components of the surrounding environment

5.2.1 Forest

The forest of the area is typical deciduous forest on the western region of Shan Plateau.

The area is a hilly region with undulating hills and valleys. The forests around the area are degraded ones and there are farms lands on hills and in valleys.

5.2.2 Flora species

The survey work on flora was carried out on the flat terrain and 2 miles radius The floral study involves the overall view of the forest, and classification of forest type (secondary, deciduous), distribution pattern, if possible, transect walk through the forest, walk around the periphery, and on the spot identification of the species. In other word, the methodology applied is simple taxonomic and ecological study.

The vegetation within the two miles radius of the site is studied in detail while a rapid survey was done for vegetation outside the area of study limit.

Diversity

A total of 212 species of natural plants and 68 species of cultivated plant are recorded. Although the forest is no longer a primary one the biodiversity is still high and that is due to the fact that the area is latidudinally in the tropical area but altitudinally it resembles the forest of sub-temperate zone, and locally it is at the south western periphery of Shan Plateau.

The inventory of plant species recorded for the whole area is shown in **Table-9**.

Table-9: List of plant species (natural vegetation) found and recorded

No.	Botanical Name	Common Name	Family	Habitat
1	*Albizia odorantissima* (L.f) Benth.	Taung-ma-gyi	Mimosaceae	T
2	*Alpinia zerumbet* B.L Rurtt.	Padegaw	Zingiberaceae	S
3	*Alternanthera sessilis* L.	Pazonsar-yaing	Amaranthaceae	H
4	*Amaranthus spinosus* L.	Hin-nu-new	Amaranthaceae	S
5	*Anagallis arvensis* L.	Nget-manakhin-sar	Bromeliaceae	H
6	*Anogeissus acuminata* Wall.	Yone-pin	Combretaceae	T
7	*Anthocephalus cadamba* Miq.	Mau-bin	Rubiaceae	T
8	*Antidesma velutinum* Tuls.	King-balin-Gyi	Euphorbiaceae	T
9	*Apluda mutica* L.	Myet-wa	Poaceae	G
10	*Argemone mexicana* L.	Kone-khayar	Papaveraceae	S
11	*Artemisia vulgaris* L.	Me-di-dok	Asteraceae	S

12	*Arundo donax* L.	Alokyu	Poaceae	G
13	*Baleria cristata* L.	Leik-su-apyar	Acanthaceae	S
14	*Bambusa tulda* Roxb.	Thaik-wa	Poaceae	B
15	*Bauhinia acuminata* L.	Swe-daw	caesalpiniaceae	ST
16	*Bauhinia racemosa* Lam.	Phalan-pin	Caesalpiniaceae	T
17	*Bauhinia vahlii* Wight & Arn.	Phalan-new	caesalpiniaceae	C
18	*Bidens pilosa* L.	Spanish needle	Asteraceae	S
19	*Blumea balsamifera* L.	Phone-ma-thein	Asteraceae	S
20	*Blumea densiflora* L.	Phone-ma-thein	Asteraceae	S
21	*Bombax ceiba*L.	Thinbaw-letpan	Bombacaceae	T
22	*Bombax insigne* Wall.	Dee-dote	Bombacaceae	T
23	*Bombax malabaricum* DC.	Let-pan	Bombacaceae	T
24	*Borassus flabellifer* L.	Htum-pin	Arecaceae	T
25	*Bothriochloa pertusa* (L.) A.Camus.	Pan-daw-phyu	Poaceae	G
26	*Bridelia retusa* (L.) A.Juss.	Seik-chi	Euphorbiaceae	T
27	*Buddleia asiatica* Lour.	Kyaung-mi-ku	Buddleieaceae	S
28	*Butea frondosa* Aroxb.	Pauk-pin	Fabaceae	T
29	*Butea monosperma* (Lam.) O.Ktze	Pauk	Fabaceae	T
30	*Callicarpa macrophylla* Vahl.	Pe-bok-pin	Verbenaceae	T
31	*Calotropis procera* (Ait.) R.Br.	Ma-yo	Asclepiadaceae	S
32	*Canna indica* L.	Bote-dan-thayanan	Cannaceae	H
33	*Capsicum minimum* Roxb.	Nga-yoke	Solanaceae	S
34	*Careya arborea* Roxb.	Bant-bway	Lecythidaceae	T
35	*Caryota urens* L.	Minbaw	Arecaceae	T
36	*Cassia occidentalis* L.	Kazaw-poke	Caesalpiniaceae	S
37	*Cassia tora* L.	Dant-gywe	Caesalpinaceae	S
38	*Centotheca lappacea (L.) Desv.*	Lin-nwe-thaik-thaik	Poaceae	G
39	*Cephalostachyum pergracile* Munro.	Tin-wa	Poaceae	B
40	*Cephalostachyum virgatum* Kurz.	Thayaw-wa	Poaceae	B
41	*Chloris inflata* Link	Laykhwa-myat	Poaceae	G
42	*Chukrasia tabularis* A.Juss.	Yin-mar	Meliaceae	T
43	*Citrus aurantifolium* (Christm.) Sw	Than-paya	Rutaceae	S
44	*Cleome burmanii* Wight & Arn.	Taw-hin-galar	Capparaceae	S
45	*Clerodendrum serratum* Spreng.	Yin-byar-net	Verbenaceae	S
46	*Cochlospermum religiosum* (L.) Alston	War-gon	Cochlospermaceae	S

47	*Corchorus olitorius* L.	Pilaw-yaing	Tiliaceae	S
48	*Cordia myxa* L.	Taung-thanut	Boraginaceae	T
49	*Costus speciosus* Sm.	Phalaung-taung-mway	Costaceae	H
50	*Crassocephalum crepidioides* (Benth.)	Pan-zauk-htoe	Asteraceae	H
51	*Croton oblongifolius* Roxb.	Thet-yin-gyi	Euphorbiaceae	ST
52	*Croton wallichii* Muell.Arg	Thet-yin-kadoe	Euphorbiaceae	T
53	*Cymbopogon virgatus* Stapf.	Myat-sat	Poaceae	G
54	*Dalbergia cultrata* Grah	Yin-daik	Fabaceae	T
55	*Dalbergia kurzii* Prain.	Thit-pok	Fabaceae	T
56	*Dalbergia muliflora* Heyne.	Thit-pagan	Fabaceae	T
57	*Dalbergia paniculata* Roxb.	Thit-pagan	Fabaceae	T
58	*Dalbergia stipulacea* Roxb.	Tamalan-nwe	Fabaceae	C/C
59	*Dendrocalamus brandisii* Kz	Wa-bo	Poaceae	B
60	*Dendrocalamus longifimbriatus* Gamble.	Myin-wa	Poaceae	B
61	*Derris elliptica* (Roxb.) Benth	Hone-pin	Fabaceae	S
62	*Desmodium cephalotes* Wall.	Lauk-min	Fabaceae	S
63	*Desmodium pulchellum* Benth.	Taung-tamin	Fabaceae	S
64	*Desmodium triquetrum* (L.) DC	Lauk-thay	Fabaceae	S
65	*Dillenia pentagyna* Roxb.	Zin-byan	Dilleniaceae	T
66	*Diplocyclos palmatus* (L.)C.Jeffrey	Tha-khwar-byauk-thi	Cucurbitaceae	C
67	*Duabanga grandiflora* (Roxb.ex DC) Walp.	Lin-zin	Lythraceae	T
68	*Elephantopus scaber* L.	Sin-che	Asteraceae	H
69	*Emblica officinalis* Gaertn.	Zi-phyu	Euphorbiaceae	T
70	*Eragrostis nigra* Nees ex Steud.	Myat-thin-don	Poaceae	G
71	*Erythrina arborescens* Roxb.	Kathit	Fabaceae	T
72	*Erythrina indica* Lam.	In-kathit	Fabaceae	T
73	*Erythrina stricta* Roxb.	Taung -kathit	Fabaceae	T
74	*Eugenia fruticosa* Roxb.	Thabye-ni	Myrtaceae	T
75	*Eupatorium odoratum* L.	Taw-bizet	Asteraceae	S
76	*Euphorbia hirta* L.	Kywe-Kyaung-min-say	Euphorbiaceae	H
77	*Euphorbia pucherrima* Willd	Ganaing-kyet-thayay	Euphorbiaceae	S
78	*Ficus benjamina* L.	Nyaung-thabye	Moraceae	T
79	*Ficus cunia* Ham.	Ka-dwut	Moraceae	T
80	*Ficus hispida*L.	Kha-aung	Moraceae	T
81	*Ficus lacor* Buch-Ham.	Nyaung-chin	Moraceae	T

82	*Ficus religiosa* L.	Bawdi-nyaung	Moraceae	T
83	*Ficus semicordata* Ham	Ka-dwut	Moraceae	T
84	*Ficus* sp.	Thaphan	Moraceae	S
85	*Flemingia chappar* Ham	Kya-pa-hone	Fabaceae	S
86	*Flemingia congesta* Roxb.	Kyay-myi-ni	Fabaceae	S
87	*Flemingia strobilifera* R.Br.	Phalan-phyu	Fabaceae	S
88	*Flueggea leucopyrus* Willd.	Kone-chin-ya	Euphorbiaceae	S
89	*Galinsoga parviflora* Cav.	Bizet-wa	Asteraceae	H
90	*Gigantochloa albo-ciliata* Kurz.	Wa-phyu-gyi	Poaceae	B
91	*Gluta tavoyana* Wall.	Thayet-thitsay	Anacardiaceae	T
92	*Glycyrrhiza glabra* L.	Nwe-cho	Fabaceae	S
93	*Grewia hirsuta* Vahl.	Kyet-tayaw	Tiliaceae	ST
94	*Grewia retusifolia* Kurz.	Tayaw	Tiliaceae	ST
95	*Grewia scabrophylla* Roxb.	Phet-shat	Tiliaceae	ST
96	*Grewia tiliaefolia* Roxb.	Tayaw	Tiliaceae	T
97	*Haplophragma odenophyllum* (Wall.) Dop.	Phet-than	Bignoniaceae	T
98	*Harrisonia perforata* Merr.	Tabu	Simaroubaceae	ST
99	*Helicia nilagirica* Bedd.	Dauk-yet	Proteaceae	T
100	*Heliotropium indicum* L.	Sin-na-maung	Boraginaceae	S
101	*Hemigraphis blumeana*	Unknow	Acanthaceae	S
102	*Hevea brasiliensis* ull.Arg.	Yaba	Euphorbiaceae	T
103	*Homalium tomentorum* (Vent) Benth.	Myauk-chaw	Flacourtiaceae	T
104	*Hymenodictyon excelsum (Roxb.) Wall.*	Khu-than	Rubiaceae	T
105	*Impatiens balsamina* L.	Dan-talat-pin	Balsaminaceae	S
106	*Imperata cylindrical* (L.) P.Beauv.	Thet-kal	Poaceae	G
107	*Impomea sepiaria* koen.ex.Roxb.	Taw-kanzon	Convolvulaceae	C/C
108	*Ipomoea quamoclit* L.	Myat-lay-pan	Convolvulaceae	C/C
109	*Ipomoea violacea* L.	Taung-kazon	Convolvulaceae	C/C
110	*Jatropha curcas* (L.)	Siyo-kyetsu	Euphorbiaceae	S
111	*Jussiaea sufruticosa*L.	Taw-lay-nyin	Onagraceae	S
112	*Justica diffusa* R.Br	Bahome-phyu	Acanthaceae	S
113	*Kydia calycina* Roxb.	Tabo	Malvaceae	T
114	*Lagerstroemia parviflora* Roxb.	Zaung-pale	Lythraceae	T
115	*Lagerstroemia villosa* Wall	Zaung-pale	Lythraceae	T
116	*Lantana camara* L.	Sein-napan	Verbenaceae	S

117	*Lathyrus aphaea* L.	Sadaw-pe	Fabaceae	C/C
118	*Leea aequata* L.	Naga-mauk-thi	Leeaceae	S
119	*Leucaena leucocephala* (Lam.) De wit	Baw-sa-gaing	Mimosaceae	ST
120	*Lithocapus collettii* (King) Merr	Sagat	Fagaceae	T
121	*Lithocapus Sp.*	Phet-kasar	Fagaceae	T
122	*Luffa acutangula* (L.) Roxb.	Thabut-khar-nwe	Cucurbitaceae	C/C
123	*Mallotus barbatus* Muell.Arg.	Taw-Thidin	Euphorbiaceae	ST
124	*Matteuccia struthiopteris* L.	Dayin-gouk	Onocleaceae	F
125	*Melanorrhoea usitata* Wall.	Thit-say	Anacardiaceae	T
126	*Mikania micrantha* H.B.K.	Bizet-nwe	Asteraceae	C/C
127	*Millettia extensa* Benth.	Win-u	Fabaceae	C/C
128	*Mimosa pudica* L.	Hti-Ka-yone	Mimosaceae	S
129	*Mimosa rubicaulis* Lam.	Japan-htika-yone	Mimosaceae	S
130	*Mitragyna rotundifolia* (Roxb.) O.Kuntze.	Binga	Rubiaceae	T
131	*Mucuna pruriens* (L.) DC	Khway-laya	Fabaceae	C/C
132	*Musa sapientum*	Ya-khine-nga-pyaw	Musaceae	H
133	*Musa sinensis* Sw.	Wet-ma-lut	Musaceae	H
134	*Musa x paradisiaca* L.	Phee-gyam	Musaceae	H
135	*Nasturtium indicum* DC.	Taw-mon-nyin	Cruciferae	H
136	*Ocimum sanctum* L.	Pin-sein-net	Labiatae	S
137	*Oroxylum indicum* Vent.	Kyaung-sha	Bignoniaceae	ST
138	*Ottochloa nodosa* (Kunth) Dandy.	Wa-yone -myat	Poaceae	G
139	*Oxalis corniculata* L.	Monato	Oxalidaceae	H
140	*Pajanelia longifolia* (Willd.) K.Schum	Kyaung-sha-letto	Bignoniaceae	ST
141	*Pandanus fascicularis Lam.*	Sat-tha-phuu	Pandanaceae	ST
142	*Pavonia odorata* Willd.	Barlar-pin	Malvaceae	S
143	*Pennisetum alopecuroides* Etouffee	Pandaw-ni	Poaceae	G
144	*Petraea volubilis* L.	Thamaga-pan	Verbenaceae	C/C
145	*Phaseolus calcaratus* Roxb.	Pe-yin	Fabaceae	C/C
146	*Phlox drummondii* Hook.	Thayet-htal-pan	Polemoniaceae	H
147	*Phyllanthus reticulates* Poir.	Ye-chin-ya	Euphorbiaceae	S
148	*Physalis minima* L.	Pauk-pin	Solanaceae	H
149	*Picrorhiza kuroa* Royle.	Saung-may-khar	Scrophulariaceae	S
150	*Pilosella officinarum* (L.)	kwyet-na-ywet	Asteraceae	H
151	*Pinus nigra*	Pine	Pinaceae	T

152	*Pinus wallichiana* A.B.Jacke.	Htinn-yu-ywet-pyar	Pinaceae	T
153	*Piper cubebe* L.f	Paik-chin	Piperaceae	C/C
154	*Plantago major* L.	Say-pode	Plantaginacea	H
155	*Polygonum glabrum* Willd.	Unknown	Polygonaceae	S
156	*Polygonum tomentosum* Willd.	Ma-har-kar-kyan-sit	Polygonaceae	S
157	*Premna amplectens.*	Yin-byar-Phyu	Verbenaceae	S
158	*Pterospermum semisagittatum* Buch-Ham	Nagye	Sterculiaceae	T
159	*Quercus helferiana* A.DC	Yin-gu-akyi	Fagaceae	T
160	*Quercus semiserrata Roxb.*	Sagat	Fagaceae	T
161	*Ricinus communis* L.	Kyet-su	Euphorbiaceae	S
162	*Ruellia tuberosa* L.	Naga-maing	Acanthaceae	S
163	*Saccharum spontaneum* L.	Kaing	Poaceae	G
164	*Samanea saman*	Kokko	Fabaceae	T
165	*Semecarpus anacardium* L.f.	Thit-say-pho	Anacardiaceae	T
166	*Senna siamea* (Lam.) irwin & Barneby	Mezali	caesalpiniaceae	T
167	*Sesbania bispinosa* (Jacq.) Fa & Re.	Nyan-pin	Fabaceae	S
168	*Setaria pumila* (Boir)	Kyaung-mi	Poaceae	G
169	*Shorea obtusa* Wall	Thit-ya	Dipterocarpaceae	T
170	*Sida acuta* Burm.	Tabyatsi-ywet-chon	Malvaceae	S
171	*Sida cordifolia* L.	Tabyatsi-ywet-wine	Malvaceae	S
172	*Smilax macrophylla* Roem.	Taung-tama	Meliaceae	T
173	*Solanum indicum* L.	Kazaw-kha	Solanaceae	S
174	*Solanum nigrum* L.	Baung-laung-nyo	Solanaceae	S
175	*Solanum torvum* L.	Khayan-kazaw	Solanaceae	S
176	*Sphaeranthus indicus L.*	Kadu	Asteraceae	H
177	*Spondiaas pinnata* (L.)Kurz	Taw-gyway	Anacardiaceae	T
178	*Sterculia versicolor* Wall.	Shaw-phyu	Sterculiaceae	T
179	*Sterreospermum suaveolens* DC.	Kywe-ma-gyo-lein	Bignoniaceae	T
180	*Streblus asper* Lour.	Ohm-Nae	Moraceae	T
181	*Stychnos nux-vomica* L.	Kha-paung	Loganiaceae	T
182	*Syzygium campanulatum*	Ar-si-yan-thabye	Myrtaceae	T
183	*Syzygium cumini* L.	Java plum	Myrtaceae	ST
184	*Tadehagi triquetrum* (L) H.Ohashi	Lauk-thay	Fabaceae	S
185	*Tamarindus indica* L.	Magyi	Caesalpinaceae	T
186	*Tamilnadia uliginosa* (Retz)	Hman-phyu-pin	Rubiaceae	ST

187	*Terminalia alata* Heyne & Roth	Htauk-kyant	Combretaceae	T
188	*Terminalia arjuna* Wight &Arn.	Htauk-kyant	Combretaceae	T
189	*Terminalia bellerica* Roxb.	Thit-seint	Combretaceae	T
190	*Terminalia chebula* Retz.	Phan-khar	Combretaceae	ST
191	*Terminalia mantaly* H.Perrier	Taiwam-benda	Combretaceae	T
192	*Themeda triandra* Forssk.	Myauk-mi	Poaceae	G
193	*Thunbergia grandiflora* Roxb.	Pan-ye-sut-new	Acanthaceae	C/C
194	*Thyrsostachys oliveri* Gamble.	Thana-wa	Poaceae	B
195	*Tithonia diversifolia* A.Gray	Nay-kyar	Asteraceae	S
196	*Toona ciliata* M.Roemer.	Taung-tama	Meliaceae	T
197	*Trichosanthes cordata* Roxb.	kyi-ar-gyi	Cucurbitaceae	C/C
198	*Typha angustifolia* Chaub. Bory.	Paik-swel	Typhaceae	G
199	*Uncaria pilosa*Roxb.	Kyet-tet	Rubiaceae	C/C
200	*Urena lobata* L.	Kat-sine	Malvaceae	S
201	*Vernonia cinerea* (L.) Less.	Kadu-pyan	Asteraceae	H
202	*Vitex limonifolia* Wall.	Kyun-gok-new	Verbenaceae	T
203	*Vitex peduncularis* Wall.	Kyet-le-zen	Verbenaceae	T
204	*Vitex quinata* (Lour.) F.N Will	Kyet-Yo	Verbenaceae	T
205	*Wattakaka volubilis* (L.f) Stapf	Gwe-dauk-new	Asclepiadaceae	C
206	*Wendlandia tinctoria* (Roxb.)	Taung-sagyin	Rubiaceae	T
207	*Wendlandia paniculata* DC.	Sagyin	Rubiaceae	ST
208	*Youngia japonica (L.) DC.*	Nay-kyar	Asteraceae	H
209	*Zea mays*L.	Pyaung	Poaceae	G
210	*Zehneria umbellata*	Tha-kwar-byauk-thi	Cucurbitaceae	C/C
211	*Ziziphus aenoplia* (L.) Mill.	Zi-pin	Rhamnaceae	T
212	*Ziziphus mauritiana* Lam.	Zi-chin	Rhamnaceae	T

Table-10: List of plant species (artificial vegetation) found and recorded

No.	Botanical name	Myanmar name	Family name	Habitat
1	*Acacia auriculiformis* A.Cunn.	Malaysia-padauk	Fabaceae	T
2	*Albizia saman* F.Muell.	Kokko	Fabaceae	T
3	*Allium cepa* L.	Kyet-thon-ni	Liliaceae	H
4	*Ananas comosus* (L.) Merr.	Nar-nat	Bromeliaceae	S
5	*Annona squamosa* L.	Awza	Annonaceae	T
6	*Araucaria columnaris*	Htin-yu-paday-thar	Araucariaceae	T
7	*Araucaria heterophylla*	Christmas	Araucariaceae	T
8	*Archidendron jiringa* (Jack) I.C.Nielsan	Danyin	Mimosaceae	T
9	*Artocarpus heterophyllus* Lam.	Pein-ne	Moraceae	T
10	*Averrhoa carambola* L.	Zaung-laya	Oxalidaceae	T
11	*Azadirachta indica* A.Juss	Tama	Meliaceae	T
12	*Bambusa vulgaris* Schrad. Ex.J.C Wendl.	Shwe-wa	Poaceae	B
13	*Bougainvillea glabra* Choisy.	Sekku-pan	Nyctaginaceae	C/C
14	*Brassica alba* Boiss.	Mon-nyin-phyu	Brassicaceae	H
15	*Brassica nigra* L.	Mon-nyin-net	Brassicaceae	H
16	*Cajanus cajan* (L.) Mills.	Pe-sin-gon	Fabaceae	S
17	*Callistermon lanceolatus* DC.	Payoke-swe-le	Myrtaceae	ST
18	*Camellia sinensis* (L.) Kuntze.	Laphet	Theaceae	S
19	*Carica papara* L.	Thinbaw	Caricaceae	ST
20	*Cassia fistula* L.	Ngu-shew-wa	Cassalpidiaceae	T
21	*Castanopsis indica* A.DC	Thit-e-gyin	Fagaceae	T
22	*Catharanthus roseus* (L.) G.Don.	Thinbaw-manyo	Apocynaceae	S
23	*Cedrus deodara* (D.don.) G.Don.	Net-htin-yu	Pinaceae	T
24	*Chrysanthemum coronarium* L.	Gan-damar	Asteraceae	S
25	*Clausena excavate* Burm.f	Pyin-daw-thein	Rutaceae	S
26	*Codiaeum variegatum* (L.) Blume.	Ywet-hla	Euphorbiaceae	S
27	*Coriandrum sativum* L.	Nan-nan-pin	Apiaceae	H
28	*Cycas pectinata* Roxb.	Mon-daing	Cycadaceae	Cy
29	*Cymbopogon citratus* Stapf.	Sapalin	Poaceae	G
30	*Dalbergia oliveri* Gamble	Tamalan	Fabaceae	T
31	*Delonix regia* (Bojer ex Hook.Rof)	Sein-pan-gyi	Caesalpinaceae	T
32	*Dipterocarpus tuberculatus* Roxb.	In	Dipterocarpaceae	T
33	*Duranta repens* L.	Bo-ka-daw-myet-kone	Verbenaceae	S
34	*Eucalyptus globulus* Labill	Eu-ka-lit	Myrtaceae	T

35	*Eugenia kurzii Duthic.*	thabye-nyo	Myrtaceae	T
36	*Euphorbia milii* Moutins.	Kiss-me-quick	Euphorbiaceae	S
37	*Euphorbia neriifolia* L.	Sha-sung-myin-na	Euphorbiaceae	S
38	*Gmelina arborea*Roxb.	Ye-ma nay	Verbenaceae	T
39	*Grevillea robusta* A.Cunn.ex R.Br	Khar-taw-mi	Proteaceae	ST
40	*Hibiscus esculantus* L.	Yone-padi	Malvaceae	S
41	*Hibiscus rosa-sinensis* L.	Khaung-yan	Malvaceae	S
42	*Hibiscus sabdariffa* L.	Chin-baung-ni	Malvaceae	S
43	*Jasminum abyssinicum* H.ex. DC.	Sapal	Oleaceae	S
44	*Lagerstroemia speciosa* (L.) Pers.	Pyin-ma	Lythraceae	T
45	*Luffa aegyptiaca* Mill.	Thabut-cho	Cucurbitaceae	C/C
46	*Lycopersicun esculentum* Mill.	Khayan-chin	Solanaceae	S
47	*Macadamia integrifolia* Maiden & Betche	Macadamia	Proteaceae	T
48	*Mangifera indica* L.	Tha-yet	Anacardaceae	T
49	*Mesua ferrea* L.	Gant-gaw	Guttiferae	T
50	*Millettia ovalifolia* Kurz.	Thin-win	Fabaceae	T
51	*Millettia pendula* Benth.	Thin-win	Fabaceae	T
52	*Mimusops elengi* L.	Khayay	Sapotaceae	T
53	*Moringa oleifera* Lamk.	Dant-tha-lon	Moringaceae	T
54	*Nerium oleander* L.	New-thar-ge	Apocynaceae	C/C
55	*Persea americana* Mill.	Htaw-pet-thi	Lauraceae	T
56	*Pinus amerkusii* Jungh	Htinn-yu	Pinaceae	T
57	*Pinus nigra*	Pine	Pinaceae	T
58	*Plumeria rubra*	Tayoke-saga-phyu	Apocynaceae	ST
59	*Prunus cerasoides* D.Don	Cherry	Rosaceae	T
60	*Psidium guajava* L.	Malaka	Myrtaceae	ST
61	*Pterocarpus indicus* Willd	Padauk	Fabaceae	T
62	*Rhoea discolor* Hance.	Mee-kwin-gamone	Commelinaceae	H
63	*Rosa centifolia* L.	Hnin-si	Rosaceae	S
64	*Spondias mangifera* Willd.	Gway-thi	Anacardiaceae	T
65	*Swietenia macrophylla* King.	Mahaw-gani	Meliaceae	T
66	*Tecoma stan (*L.) Juss.ex Kunth	Sein-ta-chu	Bignoniaceae	ST
67	*Tectona grandis* L.f	Kyun	Verbenaceae	T
68	*Xylia xylocarpa* (Roxb) Taub.	Pyin	Mimosaceae	T

Table-11: IUCN red list (natural vegetation) found and recorded

No.	Botanical Name	Common Name	Family	Habitat	IUCN
1	*Alternanthera sessilis* L.	Pazonsar-yaing	Amaranthaceae	H	LC
2	*Arundo donax* L.	Alokyu	Poaceae	G	LC
3	*Bauhinia acuminata* L.	Swe-daw	caesalpiniaceae	ST	LC
4	*Caryota urens* L.	Minbaw	Arecaceae	T	LC
5	*Chloris inflata* Link	Laykhwa-myat	Poaceae	G	LC
6	*Cleome burmanii* Wight & Arn.	Taw-hin-galar	Capparaceae	S	LC
7	*Dalbergia cultrata* Grah	Yin-daik	Fabaceae	T	VU
8	*Dendrocalamus longifimbriatus* Gamble.	Myin-wa	Poaceae	B	LC
9	*Emblica officinalis* Gaertn.	Zi-phyu	Euphorbiaceae	T	NT
10	*Mitragyna rotundifolia* (Roxb.) O.Kuntze.	Binga	Rubiaceae	T	LC
11	*Phyllanthus reticulates* Poir.	Ye-chin-ya	Euphorbiaceae	S	LC
12	*Plantago major* L.	Say-pode	Plantaginacea	H	LC
13	*Polygonum tomentosum* Willd.	Ma-har-kar-kyan-sit	Polygonaceae	S	LC
14	*Quercus semiserrata Roxb.*	Sagat	Fagaceae	T	VU
15	*Senna siamea* (Lam.) irwin & Barneby	Mezali	caesalpiniaceae	T	LC
16	*Sida acuta* Burm.	Tabyatsi-ywet-chon	Malvaceae	S	LC
17	*Smilax macrophylla* Roem.	Taung-tama	Meliaceae	T	NT
18	*Sterculia versicolor* Wall.	Shaw-phyu	Sterculiaceae	T	LC
19	*Tadehagi triquetrum* (L) H.Ohashi	Lauk-thay	Fabaceae	S	VU

VU - Vulnerable
NT - Near Threatened
LC - Least Concern

T = Tree
C/C = Climber/Creeper
ST = Small Tree
B = Bamboo
H = Herb
G = Grass
S = Shrub
F = Fern
C = Climber
Cy = Cycads

Of the 212 species recovered 19 species are in the IUCN Red List, ranging from Vulnerable (VU) to Least Concern (LC). This is actually on a global perspective; in this context species that are supposed to be in IUCN List still thrive well.

Family wise species composition was shown in **Figure – 85.**

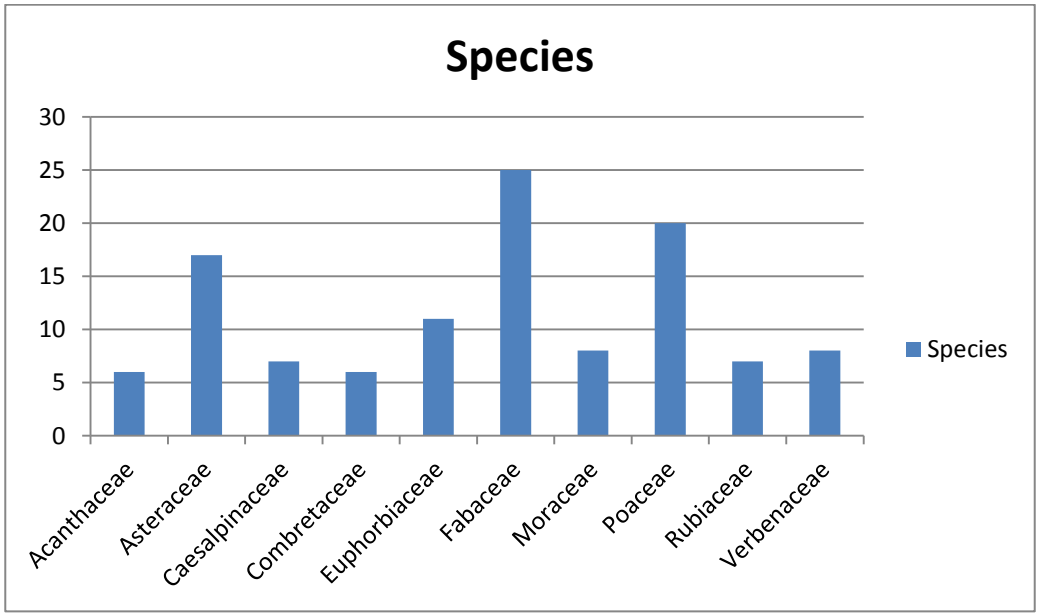


Figure – 85: Family wise species composition of natural vegetation among major families

In term of diversity the family Fabaeae dominates all other families follows by Poaceae and Asteraceae.

Abundance/dominance general pattern

A rapid study on the density of trees reveals a fairly abundance of plant individuals.

The most abundant plants (big trees) in term of number were *Bombax malabaricum* DC. and *Callicarpa macrophylla* Vahl. In small trees were *Leucaena leucocephala* (Lam.) De wit, *Lithocapus collettii* (King) Merr and *Wendlandia paniculata* DC.

Rare and vulnerable species

On the whole big trees were very rare. Big trees with GBH (Girth at Breast Height) of 300cm represented less than 1% of the whole study area. Those large trees were indeed trees that were neglected by loggers due to very low quality wood.

19 species of trees were in the IUCN Red list, as Vulnerable (VU), Near Threatened (NT) and Least Concern (LC). They were as follows:

Tadehagi triquetrum (L) H.Ohashi (VU), *Quercus semiserrata Roxb.*(VU), *Dalbergia cultrata* Grah (VU), *Emblica officinalis* Gaertn. (NT), *Smilax macrophylla* Roem.(NT), *Alternanthera sessilis* L., *Arundo donax* L., *Bauhinia acuminata* L., *Caryota urens* L., *Chloris inflata* Link, *Cleome burmanii* Wight & Arn., *Dendrocalamus longifimbriatus* Gamble., *Mitragyna rotundifolia* (Roxb.) O. Kuntze., *Phyllanthus reticulates* Poir., *Plantago major* L., *Polygonum tomentosum* Willd., *Senna siamea* (Lam.) irwin & Barneby, *Sida acuta* Burm. and *Sterculia versicolor* Wall (LC).

The Red List (IUCN Status) was actually for the global perspective.

Species of Socio-economic interest

There are trees of economic importance, particularly for the extraction of timber. But all big trees, with the exception of trees with very low quality wood were gone. Only small trees of quality wood remained. There were still a very few isolated trees of medium wood quality, especially those of the Dipterocarpaceae family.

This secondary vegetation still provided fuel wood for the villagers.

Medicinal plants still existed in this secondary forest but were not economically viable due to the scarcity of the plants.

Alpinia zerumbet, Blumea balsamifera, Citrus aurantifolium, Croton oblongifolius, Desmodium triquetrum, Emblica officinalis, Eupatorium odoratum, Euphorbia hirta, Leucaena leucoephala and Terminalia chebula are medicinal plants but are not plentiful to be commercially feasible.

Rudimentary bamboo thickets could be still found here and there; all were stunt.

The impact of the project on the biodiversity particularly vegetation would be insignificant as most are already gone. This will be mentioned later in **Chapter-6**.

5.2.3 Fauna species

5.2.3.1 Avian fauna (birds)

The data is primary data collected during EIA study. To survey the whole area evenly and to get a good section of the area surveyed 2 transect lines and 9 points were designated. In addition random surveys in the forest and bush were carried out, going to places or spots where birds were expected to be seen. The GPS position of transect points are as follow:

- N 22° 21' 36.565", E 96° 42' 33.003"
- N 22° 20' 53.588", E 96° 42' 13.502"
- N 22° 20' 46.365", E 96° 42' 33.662"
- N 22° 21' 43.233", E 96° 42' 26.796"
- N 22° 22' 15.780", E 96° 42' 26.741"
- N 22° 21' 03.881", E 96° 42' 10.014"
- N 22° 20' 38.557", E 96° 41' 47.657"
- N 22° 22' 15.574", E 96° 42' 38.221"
- N 22° 22' 12.600", E 96° 42' 30.366"

Diversity

A total of 109 species of avian fauna (birds) belonging to 40 families were recorded. Inventory list of bird species is shown in **Table-12**.

Table-12: Lists of bird species recorded from and around the study area

No.	Common Name	*Scientific name*	Individual
	PHASIANIDAE: PERDICINAE Partridges, francolins, quails		
1	Chinese Francolin	*Francolinus pintadeanu*	5
	PHASIANIDAE: PHASIANINAE: Pheasants & junglefowl		
2	Red Junglefowl	*Gallus gallus*	1
	ANTIDAE: DENDROCYGNINAE: Whistling-ducks		
3	Lesser Whistling-Duck	*Dendrocygna javanica*	15
	ARDEIDAE: ARIDEINAE: Herons & egrets		
4	Pond-Heron	*Ardeola sp*	8
5	Eastern Cattle Egret	*Bubulcus coromandus*	12
6	Great Egret	*Ardea alba*	3
7	Intermediate Egret	*Mesophoyx intermedia*	2
8	Little Egret	*Egretta garzetta*	2
	PHALACROCORACIDAE: Cormorants		
9	Little Cormorant	*Phalacrorax niger*	1
	FALCONIDAE: FALCONINAE: Falcons		
10	Common Kestrel	*Falco tinnunculus*	3
	FALCONIDAE: ACCIPITRINAE: Hawks, eagles & allies		
11	Oriental Honey-Buzzard	*Pernis ptilorhynchus*	4
12	Black -shouldered Kite	*Elanus caeruleus*	6
13	Black-eared Kite	*Milvus lineatus*	4
14	Crested Serpent-Eagle	*Spilornis cheela*	3
15	Shikra	*Accipiter badius*	2
16	Himalayan Buzzard	*Buteo burmanicus*	1
	VANELLIDAE: Lapwings & allies		
17	Red-wattled Lapwing	*Vanellus indicus*	4
	COLUMBIDAE: COLUMBINAE: Typical pigeons & doves		

18	Rock Pigeon	*Columba livia*	c
19	Oriental Turtle-Dove	*Streptopelia orientalis*	4
20	Red Collared-Dove	*Streptopelia tranquebarica*	8
21	Spotted Dove	*Streptopelia chinensis*	c
	COLUMBIDAE: TRERONINAE: Green-pigeons, fruit-doves, imperial-pigeons & allies		
22	Yellow-footed Green- Pigeon	*Treon phoenicopterus*	8
	PSITTACIDAE: PSITTACINAE: Parrots & parakeets		
23	Grey-headed Parakeet	*Psittacula finschii*	47
	CUCULIDAE: CUCULINAE: Old World cucukoos		
24	Banded Bay Cuckoo	*Cacomantis sonneratii*	2
	CUCULIDAE: CUCULINAE: Old World cucukoos		
25	Plaintive Cuckoo	*Cacomantis merulimus*	2
26	Asian Koel	*Eudynamys scolopacaceus*	1
	CUCULIDAE: PHAENICOPHAEINAE: Malkohas & allies		
27	Green-billed Malkoha	*Rhopodytes tristis*	12
	CUCULIDAE: CENTROPODINAE: Coucals		
28	Greater Coucal	*Centropus sinensis*	6
29	Lesser Coucal	*Centropus bengalensis*	1
	STRIGIDAE: Typical owls		
30	Asian Barred Owlet	*Glaucidium cuculoides*	2
	APODIAE: APODINAE: Typical swifts		
31	Asian Palm-Swift	*Cypsiurus balas*	c
32	House Swift	*Apus affinis*	c
	APODIDAE: HEMIPROCNINAE: Treeswifts		
33	Whiskered Treeswift	*Hemiprocne comata*	6
	CORACIIDAE: Rollers		
34	Indian Roller	*Coracias benghalensis*	9
	ALCEDINIDAE: HELCYONINAE: Larger kingfishers		
35	White-throated Kingfisher	*Halcyon smyrnensis*	3
	ALCEDINIDAE: ALCEDININAE: Smaller kingfisher		
36	Common Kingfisher	*Alcedo atthis*	1

	MEROPIDAE: Bee-eaters		
37	Little Green Bee-eater	*Merops orientalis*	c
38	Blue-tailed Bee-eater	*Merops philippinus*	5
39	Chestnut-headed Bee-eater	*Merops leschenaulti*	c
	UPUPIDAE: Hoopoes		
40	Common Hoopoe	*Upupa epops*	5
	RAMPHASTIDAE: MEGALAIMINAE: Asian barbets		
41	Great Barbet	*Megalaima virens*	2
42	Lineated Barbet	*Megalaima lineata*	8
43	Coppersmith Barbet	*Megalaima haemaccephala*	4
	PICIDAE: PICINAE: Typical woodpeckers		
44	Gery-capped Pygmy Woodpecker	*Dendrocopos canicapillus*	1
45	Common Flameback	*Dinopium javanese*	2
46	Greater Flameback	*Chrysocolaptes lucidus*	5
	ORIOLIDAE: Orioles & allies		
47	Black-naped Oriole	*Oriolus chinensis*	9
48	Black-hooded Oriole	*Oriolus xanthornus*	2
49	Bar-winged Flycatcher-Shrike	*Hemipus picatus*	
	AEGITHINIDAE: Ioras		
50	Common Iora	*Aegithina tiphia*	c
	RHIPIDURIDAE: Fantails		
51	White-throated Fantail	*Rhipidura albicollis*	3
	DICRURIDAE: Drongos		
52	Black Drongo	*Dicrurus macrocercus*	c
53	Ashy Drongo	*Dicrurus leucophaeus*	3
54	Bronzed Drongo	*Dicrurus aeneus*	2
55	Greater Racket-tailed Drongo	*Dicrurus paradiseus*	1
56	Hair-crested Drongo	*Dicrurus hottentottus*	5
	MONARCHIDAE: Monarchs, paradise-flycatchers & allies		
57	Black-nape Monarch	*Hypothymis azurea*	1
	CORVIDAE: Crows, nutcrackers, magpies, jays, treepies & allies		
58	House Crow	*Corvus splendens*	c

59	Eastern Jungle Crow	*Corvus levaillantii*	c
60	Rufous Treepie	*Dendrocitta vagabunda*	9
	LANIIDAE		
61	Brown Shrike	*Lanius cristatus*	5
62	Burmese Shrike	*Lanius collurioides*	4
63	Long-tailed Shrike	*Lanius schach*	7
	NECTARINIIDAE: Sunbirds & spinderhunters		
64	Purple Sunbird	*Cinnyris asiaticus*	9
	DICAEIDAE: Flowerpeckers		
65	Scarlet-backed Flowerpecker	*Dicaeum cruentatum*	2
	CHLOROPSEIDAE: Leafbirds		
66	Blue-winged Leafbird	*Chloropsis cochinchinesis*	2
67	Goldren-fronted Leafbird	*Chloropsis aurifroms*	16
	PLOCEIDAE: Weavers & allies		
68	Baya Weaver	*Ploceus philippinus*	42
	ESTRILDIDAE: ESTRILDINAE: Avadavat & allies		
69	Red Avadavat	*Amandava amandava*	19
	ESTRILDIDAE: LONCHURINAE: Java Sparrow, munias,		
70	White-rumped Munia	*Lonchura striata*	c
71	Scaly-breasted Munia	*Lonchura punctulata*	c
	PASSERIDAE: Sparrows & allies		
72	House Sparrow	*Passer domesticus*	c
73	Plain-backed Sparrow	*Passer flaveolus*	c
74	Eurasian Tree-Sparrow	*Passer montanus*	c
	MOTACILLIDAE: Wagtails & pipits		
75	Olive-backed Pipit	*Anthus hodgsoni*	6
76	Paddyfied Pipit	*Anthus rufulus*	4
77	White Wagtail	*Motacilla alba*	24
78	Citrine Wagtail	*Motacilla citreola*	5
	FRINGILLIDAE: CARDUELINAE: Siskins, serins, finches, grosbeaks		
79	Common Rosefinch	*Carpodacus erythrinus*	8
	STURNIDAE: STURNINAE: Mynas, starlings & allies		
80	Jungle Myna	*Acridotheres fuscus*	c

81	Collared Myna	*Acridotheres albocinctus*	4
82	Common Myna	*Acridotheres tristis*	c
83	Vinous-breasted Myna	*Acridotheres burmannicus*	c
	MUSCICAPIDAE: SAXICOLINAE: Shortwings, robins, redstarts,		
84	Siberian Rubythroat	*Luscinia calliope*	7
85	Pied Bushchat	*Saxicola caprata*	c
	MUSCICAPIDAE: MUSCICAPINAE: Old World flycatchers & allies		
86	Blue-throated Flycatcher	*Cyornis rubeculoides*	3
87	Verditer Flycatcher	*Eumyias thalassinus*	2
88	Taiga Flycatcher	*Ficedula albicilla*	5
89	Oriental Magpie-Robin	*Copsychus saularis*	c
90	White-rumped Shama	*Copsychus malabaricus*	2
	PYCNONOTIDAE: Bulbuls		
91	Black-headed Bulbul	*Pycnonotus atriceps*	3
92	Black-crested Bulbul	*Pycnonotus flaviventris*	c
93	Streak-eared Bulbul	*Pycnonotus blanfordi*	c
94	Red-whiskered Bulbul	*Pycnonotus jocosus*	14
95	Red-vented Bulbul	*Pycnonotus cafer*	c
	HIRUNDINIDAE: HIRUNDININAE: Martins, swallows & allies		
96	Barn Swallow	*Hirundo rustica*	c
97	Red-rumped Swallow	*Cecropis daurica*	c
	PHYLLOSCOPIDAE: *Seicercus & Phylloscopus* warblers		
98	White-spectacled Warbler	*Seicrcus affinis*	8
99	Yellow-browed Warbler	*Phylloscopus inornatus*	7
100	Radde's Warbler	*Phylloscopus schwarzi*	2
101	Dusky Warbler	*Phylloscopus fuscatus*	c
	TIMALIIDAE: Babblers		
102	Yellow-eyed Babbler	*Chrysomma sinense*	c
103	Oriental White-Eye	*Zosterops palpebrosus*	c
104	Abbott's Babbler	*Malacocincla abbotti*	2
	ACROCEPHALIDAE: *Acrocephalus* warblers & allies		
105	Thick-billed Warbler	*Acrocrphalus aedon*	3

	CISTICOLIDAE: Cisticolas, tailorbirds, prinias & allies		
106	Zitting Cisticola	*Cisticola juncidis*	7
107	Common Tailordbird	*Orthotomus sutorius*	c
108	Rufescent Prinia	*Prinia rufescens*	4
109	Grey-breasted Prinia	*Prinia hodgsonii*	c

- c = Common

Only one species, Grey-headed Parakeet *Psittacula finschii* is categorized as Near Threatened species according to the IUCN Red list (2017). This is a very wide global perspective and sometimes does not represent the true local situation.

The area is also not in one of the designated Important Birds Area (IBA) of Myanmar. There is no lake or wet land nearby which acts as bird sanctuary or place where shore birds or aquatic birds aggregate.

No roosting places or nests were observed during the study.

Family wise species composition was shown in **Figure – 86**.

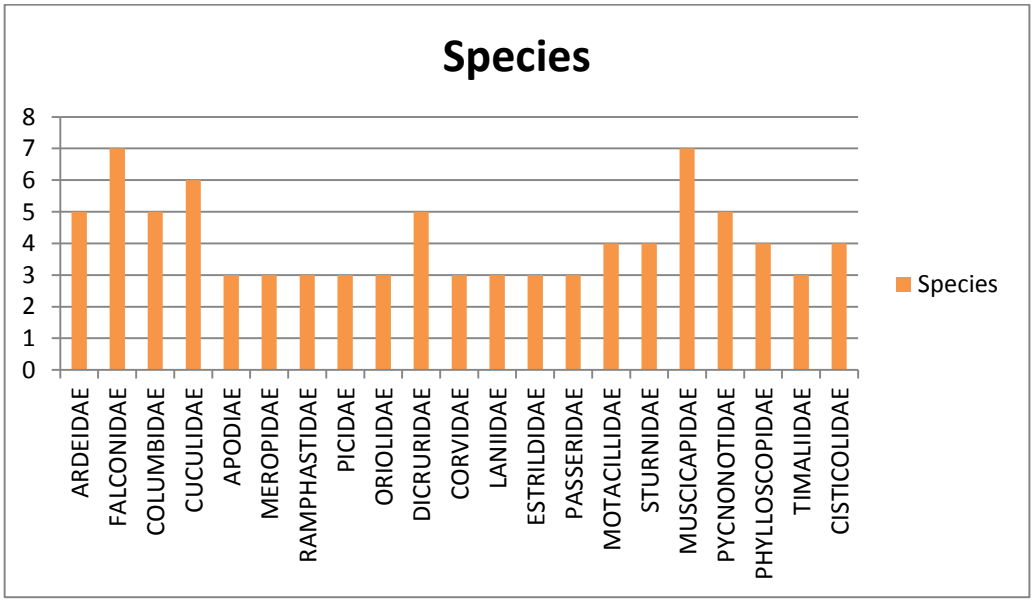


Figure – 86: Family wise species composition of birds

Distribution, abundance/dominance

Generally there were more birds in the foot hill, the bamboo thickets and plantation, that were in low altitude area.

Exceptional cases: birds of various species aggregated on trees on either altitude which bore fruit for the birds.

All the birds found were commonly found species; tree birds and forest birds. No endemic species were found. Migratory birds from faraway places were also not found. (Actually this was not a migration season for birds.)

With the exception of the jungle fowl, *Gallus gallus* whose habitat was on land all other birds were tree-dwellers. Swiftlets and swallows could be termed aerial birds spending most of their time flying around.

In term of abundance and dominance Columba spp, Streptopelia spp, Merops spp, Passer spp and Hirundo spp are the dominant species. Discrurus spp, Pycnonatus spp and Prinia spp are relatively abundance.

The remaining species range from common to rare to very rare. This was the generalized picture for the whole study area

Rare and endangered species

As mentioned earlier, only one species, Grey-headed Parakeet is categorized as Near Threatened (NT) according to the IUCN Red List (2017).

The area was not in the designated Important Birds Area (IBA) or Protected Areas System (PAS) of Myanmar. There was no lake or wetland nearby which acted as birds sanctuary or area where birds aggregated.

Species of Socio-economic interest

The jungle fowl *Gallus gallus* was priced as food for its meat and exploited. But very few were found. There were no bird hunters or trappers.

Doves and pigeons were also priced for their meat. In fact the local people consumed any available birds, big and small.

There was no illegal trading of birds to Thailand such as the cases of red vented bulbul, streak ear bulbul and spotted dove which took place in Kayin and Mon states particularly, at the border area.

Unlike land animals birds are very mobile and could fly away easily to other suitable habitats. The area is not isolated but contiguous with thick jungle upstream.

5.2.3.2 Herpetofauna (amphibian and reptiles)

The data for herpetofauna is primary data during EIA study conducted by the consultant firm, MESC.

The survey work mainly involved walking and visual inspection. No traps or snares were used. Surveys were carried out twice a day; one during day time and the other one during night. Virtually all amphibians are nocturnal and many reptiles are also nocturnal in habits. They are more active at night and the chance for encounter is much higher.

Diversity

A total of 8 amphibians and reptiles species were recorded. They belong to 5 families.There are 2 species of amphibians and 6 species of lizards. The inventory of list of herpetofauna species is shown in **Table-13**.

Table-13: Lists of herpetofauna recorded from the study environs

No	Family	Scientific name	Common name
1	Bufonidae	*Duttaphrynus melanostictus*	Common Toad
2	Dicroglossidae	*Fejervarya limnocharis*	Paddy Frog
3	Agamidae	*Calotes versicolor*	Garden Fence Lizard
4		*Calotes mystaceus*	Blue-crested Lizard
5	Gekkonidae	*Gekko gecko*	Tockay Gecko
6		*Hemidactylus brookii*	Brooki's House Gecko
7		*Hemidactylus frenatus*	Common House Gecko
8	Scincidae	*Eutropis multifasciata*	Common Sun Skink

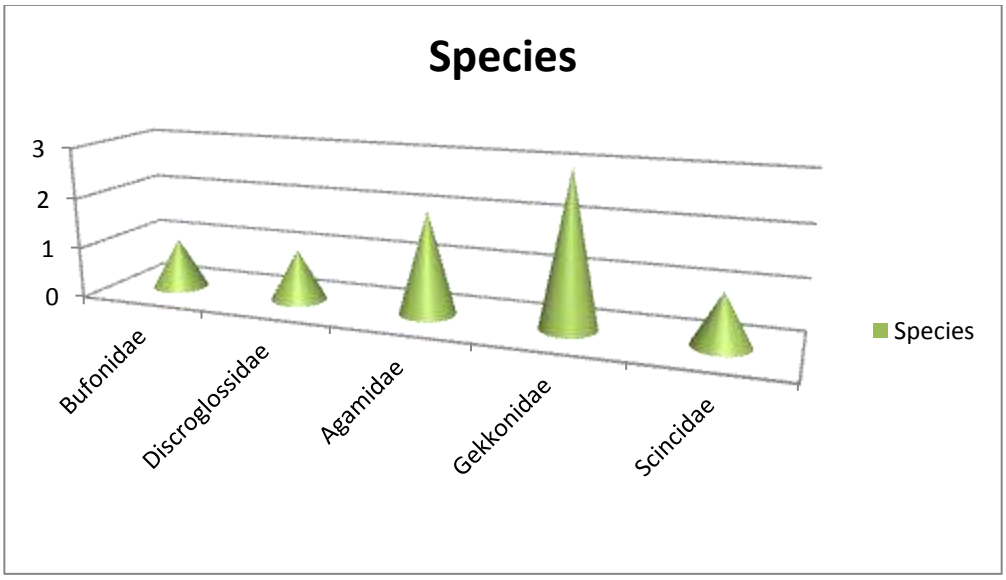


Figure – 87: Family wise species composition of herpetofauna

Distribution, abundance/dominance

As few species are found it is difficult to study their distribution pattern and their abundance.

Rare and endangered species

According the IUCN Red List (2017) 1 species is listed as Least Concern (LC). It is Paddy Frog *Fejervarya limnocharis*.

Species of socio-economic interest

The *Fejervarya limnocharis* is consumed by local people, especially in the early moonson season.

5.2.3.3 Mammalian fauna

The data on mammalian is primary data during EIA study conducted by the consultant firm, MESC.

The survey method also involved searching for tell-tale signs or evidences such as new or fresh scats, foot prints, scratches, tracks and trails etc. Scats and foot prints are specific and so the animal could be identified quite correctly based on these two evidences.

As wildlife is getting rare it is not possible to observe them during only one survey period. Secondary data have to be gathered from the local elders or old hunters. At least the history of the wildlife of the area can be obtained.

Diversity

A total of 5 species of mammal belonging to 4 families and 3 orders were found and recorded. The mammal species were confirmed through sighting or from other tell-tale evidences, eg- foot prints, scats and information from locals.

Table-14: Recorded mammal species from the study area

No	Order	Family	Scientific name	Common name	Track & Sign	IUCN
1.	PRIMATES	Cercopithecidae	*Macaca leonina*	Northern Pig-tailed Macaque	sighting	VU
2.	CARNIVORA	Viverriadae	Unidentified civet	Civet	scat, footprint	
3.	RODENTIA	Suidae	*Callosciurus erythraeus*	Pallas's Squirrel	sighting	LC
4.		Muridae	*Mus cervicolor*	Fawn-coloured Mouse	sighting	
5.			*Rattus rattus*	House Rat	sighting	LC

According to the IUCN red list (2017) one species as Vulnerable (VU) and two species of Least Concerned (LC) were categorized.

Distribution, abundance/dominance

Since very few animals, both in species (biodiversity) and numbers were found it was not practical to consider their distribution, abundance and dominance.

Small mammals such as squirrels mothers and have different distribution patterns and habitats. Squirrels are tree dwellers living on trees either among the leaves or small branchy or either in nests (especially for nursing litters).

As mentioned above, only scat and foot prints of civet are actually found.

Rare and endangered species

With the exception of Pallas Squirrels which is quite common the two other mammals are very rare.

From the information gathered from old hunterss and knowledgeable villagers it was learnt that up to two decades ago (when the forest was already degraded to large extent) there were quite a variety of wild animals existing in this area.

Species of socio-economic interest

All the three mammals are edible but are rare nowadays and are of little economic importance.

5.2.3.4 Aquatic organisms

There in no rivulet or stream or water body nearby to study the aquatic organisms; only underground spring.

5.2.4 Biodiversity up to the ecosystem level and habitats change

Impact on biodiversity up to the ecosystem level can be interpreted in different ways:

(a) From purely ecological level aspects the level will be at the species level, population level, community level and ecosystem level.

(b) From aspects of extent or magnitude of impact it will be at foot print level, landscape level and ecosystem level.

(c) The extent can be also interpreted as at foot print level, local level, regional level, national level, major regional level (transboundry) or international level.

Since the proposed project is not inside a big jungle of high biodiversity with different communities and fragile ecology but inside a cement factory premise with little biodiversity remains, the EIA is concerned with only the category (b) extent and magnitude of impact aspect.

5.2.4.1 Impact at the plant (factory) premise and vicinity

In setting the study limit the area within the two miles radius is selected for the reason of impact study at the landscape level only. Therefore the study of impact on biodiversity is limited to the foot print level and the landscape level for pragmatic purpose.

Substantial impact on biodiversity at the landscape level is not anticipated during this project Construction Phase. Vegetation has been already cleared during the construction phase of the two existing cement factories and access road many years ago.

(For a project that involves the clearing of forest for thousand of acres, such as major mining operation and major plantation operation, the impact will be seen and felt not only at the landscape level but also at the ecosystem level. Here the thermal power plant needs only a few acres (12.3) inside the larger cement factory compound of 280 acres already in existence. So the impact on biodiversity at the start of the Construction Phase of this thermal plant is really insignificant. Large vegetation inside the 280 acres premise were already cleared for cement project; only small vegetation e.g. grass, herb, still remain will have to be cleared. Therefore the impacts on biodiversity will be minor.

During the operation phase the impact in the form of smoke (emission) on the biodiversity is almost zero as it is effectively mitigated.

5.3 Socio-economic component of the surrounding environment

The information and data for socio-economic are based on visual inspection, and interviews. The interviews are conducted applying structured questionaires such as KII interview and FGD interview. All are primary data.

Lauk Hpann village is the nearest village to the proposed project site and is incorporated into the study area of 16 sq. miles.

During the second field trip in March, 2019 another two villages, Khe San and Lei Gyi Taw are also incorporated. (The elders from the villages, Pang Ti, Nam Ke Aik, Naung Kwin and Inn Gyin Gon have also attended the meeting.)

Lauk Hpan and Lei Gyi Taw Villages are under the jurisdiction of Lone Yone Village tract while Khe San Village is under Pin Tee Village tract. All are in Naunghkio Township, Kyauk-me District, Shan State.

Lauk Hpan Village is in the adjacent north east; Lei Gyi Taw is in the north and Khe San in the northwest. All are northwest of Naunghkio Town.

No serious negative impacts on the socio-economic life the local community of the villages are anticipated. There can be little or minor impact on Lauk Hpan village as it is the nearest to the project site. The impact of emission, (smoke, flue gas, PM) can be significant if

mitigation measures are not taken. (The company has quite effectively taken the mitigation measures.) There can be no impact on the drinking water sources as the company sources water from underground spring, not from the drinking water sources of the villagers. (The company has also sunk tube wells and built community water pond for the villagers.)

Used water is almost 100% recirculated; waste water is treated (conventional sedimentation method only) before discharged into a lake which is domestic water sink, in the adjacent north east.

So far there is no issue regarding social impact such as quarrels and brawls broking out between the factories employees and villagers. The company has done its utmost to maintain good relation with the local community.

Land uses

The land uses was formerly a mixture of cultivated area (mostly farms and taung yar but little paddy field), plantation, bush land, vacant/fallow land, reserved forest in the far south and three residential areas (three villages).

The land use pattern has changed owing to the establishment of the two Crown Cement factories. The clearing of the forest/bush for the construction of operation of the two factories and for the construction of various roads and the operation of the quarries (limestone, laterite) in the south has greatly changed the landscape of the area.

The land use map of the area is not available.

Figure – 88: Google image showing the fields and farms in the vicinity of the project site

The land use of Naunghkio Township is as follows:

(a)	Cultivated land (acreage)	-	174,473 acres
	Paddy field	-	14,925 acres
	Farmland	-	144,295 acres
	Crude farm (Kaing)	-	1,399 acres
	Garden/orchard	-	13,854 acres
(b)	Fallow land	-	16,829 acres
(c)	Industrial land	-	925 acres
(d)	Residential area (city)	-	881 acres
(e)	Residential area (village)	-	6,012 acres
(f)	Other land	-	19,265 acres
(g)	Reserved forest/Protected area	-	145,970 acres
(h)	Virgin forest	-	425,066 acres
(i)	Virgin land	-	1,569 acres
(j)	Uncultivable land	-	19,002 acres

The Naunghkio Reserved Forest is 1.43 miles in the south; it is greatly degraded forest.

There is no known Rural Development Plan, Agricultural Development Plan, Infrastructure Development Plan etc. at the local, Regional State and Union levels for this area. Certain INGO groups come and go to certain parts of Naunghkio Township but not at this area.

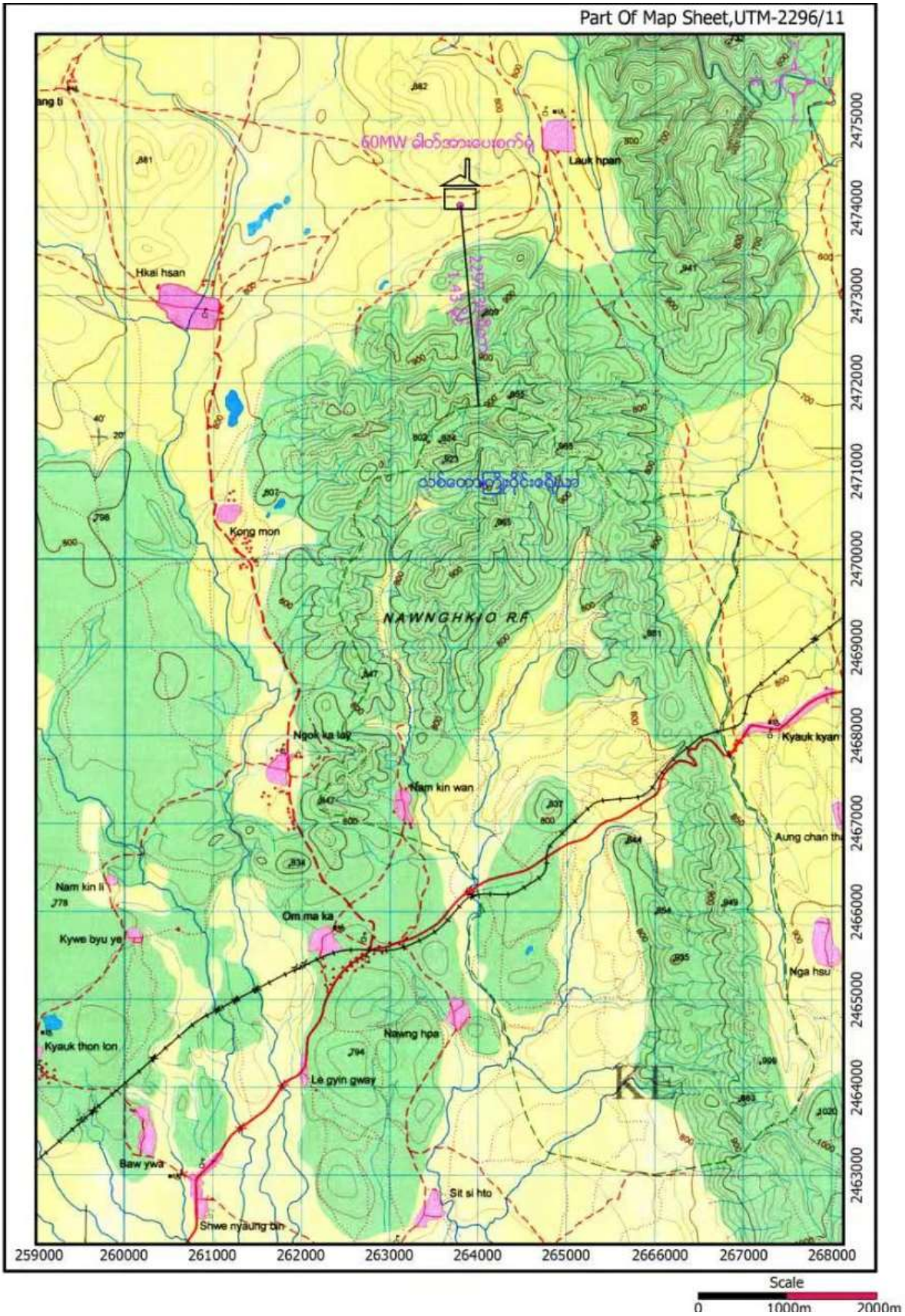


Figure – 89: Map showing project site and Naunhkio Reserved Forest

Summary of infrastructure and services, socio-economic aspects, livelihood and income and health

All 3-villages are within 7-8 miles from the Mandalay-Lashio Highway and Mandalay-Lashio Railway. Lauk Hpan Village is about 1 mile northeast, Khe San is about 2.1 miles in the southwest and Lei Gyi Taw is about 2.2 miles southeast of the project site.

Table – 15: Infrastructure and services of the three villages

Sr. No.	Infrastructure and services	Lauk Hpan	Lei Gyi Taw	Khe San
1.	Accessibility-motor road	√	√	√
2.	Access to electricity (provided by Ngwe Yi Pale' Co., Ltd)	√	√	√
3.	Water (sources)	3 Tube wells & (community water pond by the Co.)	from 3 natural springs	Mostly shallow wells; 12 tube wells.
4.	Education facility (school)	Affiliated middle school	Primary school	Primary school
5.	Health facility clinic	One village clinic	×	One village clinic
6.	Village library	×	×	×
7.	Government building/public building	×	×	×
8.	Police station/sub-station	×	×	×

Note: No access to gridline electricity; village electrification provided by the company. At Lauk Hpan 100% household use electricity for cooking while in the two other villages the uses of electricity and fuel wood are 50% and 50%.

All three villages are accessible by motor roads, but there are few vehicles (9 at Lauk Phan, 8 at Lei Gyi Taw and 40 at Khe San, mostly light trucks). The only town in the area is Naunghkio Town, about 6 miles in the south east.

Table – 16: Basic Socio-economic aspects

Sr. No.	Socio-economic aspects	Lauk Hpan	Lei Gyi Taw	Khe San
1.	Population	548	280	455
	Male	222	137	219
	female	326	143	236
2.	Households	124	62	96
	Houses	118	57	91
3.	Religion (%)			
	Buddhist	100%	100%	100%
	Christian	-	-	-
	Other	-	-	-
4.	Ethnicity %			
	Bamar	5%	20%	-
	Shan	90%	-	100%
	Shan (Danu)	-	80%	-
	Gurkhas (Shan & Shan Danu are the majority)	5%	-	-
5.	Education			
	Literacy rate (adults) %	80%	60%	85%
	Schools	Middle school	Primary school	Primary school
	Teachers	12	3 (two teachers appointed by the company)	5
	Students	60	26	57
6.	Living conditions			
	Wooden house	Mostly wooden houses (corrugated iron roofing)	Mostly wooden houses (15-thatched roof)	Mostly wooden houses (corrugated iron-roofing)
	Brick houses (2-storeyed)	17 Nos.	1 Nos.	30 Nos.
	Bamboo houses	×	×	×
7.	Material possession (% household)			
	Cars (private)	4 Nos.	2 Nos.	10 Nos.
	Truck (pick up or light truck)	5 Nos.	6 Nos.	30 Nos.
	Trawler-G	-	3 Nos.	-
	Motorcycle (% of household)	100%	100%	95%
	Television (% of household)	90%	90%	85%
	Hand phone(% of household)	100%	100%	100%

Note: From visual inspection survey and KII secondary data.

Table – 17: Livelihood and income

Sr. No.	Livelihood and income	Lauk Hpan	Lei Gyi Taw	Khe San
1.	Livelihood/occupation (percentage of households) Farmers (Mostly Taung Yar farming or Yar farming; few paddy fields)	80%	75%	75%
	Main crops			
	Maize	√	√	√
	Sugar cane	√	√	√
	Rice (Taung Yar rice)	√	√	√
	Peanut	√	√	√
	Sesame	√	√	√
	mustard	√	√	√
2.	Seasonal job/odd job	20%	25%	25%
	Employed by the company (Nos.)	2	1	2
	Government services (Nos.)	1 (teacher)	-	1 (nurse)
3.	Seasonal Income per household (crops farming) Lowest Income (range) per household	10-15 lakhs	10-15 lakhs	10-15 lakhs
	Highest Income (range) per household	90-150 lakhs	80-100 lakhs	100-150 lakhs
	Daily wages	Ks 4000 (F) Ks 5000 (M)	Ks 5000 (F) Ks 6000 (M)	Ks 4000 - 5000

Summary of health

Table-18: Health aspects

Sr. No.	Health status (Parameters)	Lauk Hpan	Lei Gyi Taw	Khe San
1.	Health status (general)	Low	Low	Low
2.	Health facilities			
	Village clinic	√	×	√
	Private clinic (the company clinic)	√	×	×
	Health service personal			
	- nurse	×	×	×
	- mid wife	1	×	1
	- other health worker	×	×	2

3.	Data on - mortality	NA	NA	NA
	- morbidity	NA	NA	NA
	- HIV/AIDS	NA	NA	NA
4.	Health issue Malaria (not totally eradicated yet)	√	√	√
	Cholera	√	√	√
	Seasonal diseases (mostly cough, cold, headache etc)	√	√	√

Note: A sub-Township Hospital at Thone Hse Village and Township Hospital in Naunghkio Town for serious cases. Up to 2016 Malaria was widespread; but now still not yet totally eradicated.

Records of cases of patient undergoing treat at the three clinics, namely, at Lauk Hpan, Khe San and at the company clinic.

- 984. Cases at Lauk Hpan village clinic. (The company has donated in cash and kinds)
- 372. Cases at Khe San village clinic. (The company has donated in cash and kinds)
- 3381 cases at the company's clinic. (All patients, both employees and locals are treated free of charge)

People from different small villages and hamlets eg. Pan Ti, Nam Ke Aik etc, who have undergone treatment at these three clinics are treated free of charge. The total number of patients (employees plus locals) recorded, so far, are 6443. It is not possible to determine whether the patients are the results of impacts from these three projects or not. It is not possible to determine whether diseases are caused by drinking water or eating crops impacted by the project.

The common illness/ailment are:

Cold, cough, headache, body ache, lumbago, injuries at work places (at farm works), diarrhea, abdominal pain, eye infection, tooth ache, pregnancy, diabetes, skin diseases, allergy, food poison, dizziness, general weakness, etc. the most common cases at the two places such as farm works. The common cases at the company's clinic are colds, coughs, headaches.

Cases of patients for the three clinics are as follows (during 2018-2020).

Table – 19: Number of patients and diseases recorded from Lauk Hpan village clinic during 2018

No.	Disease	January	February	March	April	May	June	July	August	September	October	November	December
1.	Cough	3	2	4	3	2	1		1	2	1		3
2.	Head ache	2	1	3	6	8	7	12	6	7	5	6	8
3.	Body ache	5	2	2	7	6	5	9	5	10	9		12
4.	Injury during working hours	15	17	20	13	15	17	16	10	12	16	11	14
5.	Abdomen pain	6	13	6	7	9	5	4		6	5	8	9
6.	Diarrhoea	2	3	2	5	8	11	10	5	4	6	4	7
7.	Eye infection		3	1	5	6	2	1		3	5	4	5
8.	Tooth ache	4	2	4	7	8	8	9	6	5	9	8	7
9.	Fever	12	5	5	10	12	10	15	7	8	10	9	14
10.	Injury- accident	5	2	5	4	9	7	10	6	5	7	8	9
11.	Dizzy	4	4		5	6	4	8	2	5	4	6	8
12.	Weak	2		2	8	5	3	6	4	3	5	5	8
13.	Allergic		1	3	2		1	1		1			3
14.	Diabetes	2		2	3	3	2	4	2		4	3	5
15.	Vomit				3	4	3	5		4	2	2	3
16.	Food poison	3		2	3		5				2		1
Total		**65**	**55**	**61**	**91**	**101**	**91**	**110**	**54**	**75**	**90**	**75**	**116**

Table – 20: Number of patients and diseases recorded from Lauk Hpan village clinic during 2019

Date Months		Patient	Cold		High Blood	Weak ness	Diarrhoca/ Choiera		Abdomen pain	Pregnancy	Lumbago	Tooth ache	Cough	Diabetes	Skin Infection	Total
			Adult	Children			Adult	Children								
Jan	2019	77	19	7	7	11	3	1	5	2	8	2	8	1	3	77
Feb	2019	62	16	6	9	7	2	1	3	1	2	3	6	2	4	62
Mar	2019	65	17	6	8	9	1	1	4	2	2	3	6	2	4	65
Apr	2019	65	17	6	8	9	1	2	4	1	2	2	6	3	4	65
May	2019	69	20	7	8	10	2	1	4	2	3	2	5	2	3	69
Jun	2019	70	21	6	8	10	3	1	4	1	3	2	5	2	4	70
Jul	2019	105	28	7	10	11	4	2	6	3	8	4	13	3	6	105
Aug	2019	82	24	9	6	10	3	2	5	1	8	2	7	2	3	82
Sep	2019	105	28	7	10	11	4	2	6	3	8	4	13	3	6	105
Oct	2019	69	21	6	8	10	3	1	4	1	3	3	4	2	3	69
Nov	2019	72	21	8	8	9	2	2	3	2	4	2	5	3	3	72
Dec	2019	67	20	6	8	9	2	1	3	2	3	2	5	2	4	67
Tot		908	252	81	98	116	30	17	51	21	54	31	83	27	47	908

Table – 21: Number of patients and diseases recorded from Lauk Hpan village clinic during 2020

Date Months		Patient	Cold		High Blood	Weak ness	Diarrhoca/		Abdomen pain	Pregnancy	Lumbago	Tooth ache	Cough	Diabetes	Skin Infection	Total
			Adult	Children			Adult	Children								
Jan	2020	77	19	7	7	11	3	1	5	2	8	2	8	1	3	77
Feb	2020	63	16	7	9	7	2	1	3	1	2	3	6	2	4	63
Mar	2020	66	17	7	8	9	1	1	4	2	2	3	6	2	4	66
Apr	2020	67	17	7	8	9	1	2	4	1	2	3	6	3	4	67
May	2020	71	21	7	8	10	2	1	4	2	3	2	6	2	3	71
Jun	2020	72	21	7	9	10	3	1	4	1	3	2	5	2	4	72
Jul	2020	107	28	7	10	11	4	2	7	3	9	4	13	3	6	107
Aug	2020	83	24	9	7	10	3	2	5	1	8	2	7	2	3	83
Sep	2020	106	29	7	10	11	4	2	7	3	9	4	11	3	6	106
Oct	2020	70	21	6	9	10	3	1	4	1	3	3	4	2	3	70
Nov	2020	72	21	8	8	9	2	2	3	2	4	2	5	3	3	72
Dec	2020	70	20	6	8	10	2	1	3	3	3	2	5	3	4	70
Tot		924	254	85	101	117	30	17	53	22	56	32	82	28	47	924

Table – 22: Number of patients and diseases recorded from Khe San village clinic during 2018

No.	Disease	January	February	March	April	May	June	July	August	September	October	November	December
1.	Cough	7	2	2	1	2	2	2	2		1	3	3
2.	Head ache	3	1	2	1	1	1		2	1	1	1	
3.	Body ache	4	2	2	2		1		2	2		1	
4.	Injury during working hours	10	12	8	14	13	7	10	5	3	5	2	
5.	Abdomen pain	7	10	4	2	7	4	4	1	1	2	1	2
6.	Diarrhoea	6	4	4	1	3	2	1	2	1		1	
7.	Eye infection	1	3	1	1	1	2	3	1	1	1		
8.	Tooth ache	4	2	2		2	2	3	1	1	1		1
9.	Fever	5	4	3	16	6	6	10	7	3	6	6	4
10.	Injury- accident	2	2	3	1	1		1	1	1		1	2
11.	Dizzy	2											
12.	Weak	3		1		1			1	1		1	2
13.	Allergic	2	3	2	2	1	1		1	1	2	1	
14.	Diabetes			2						1			
15.	Vomit						1			1			
16.	Food poison						1	1					
Total		**55**	**45**	**36**	**39**	**38**	**30**	**35**	**25**	**18**	**19**	**18**	**14**

Table – 23: Number of patients and diseases recorded from Khe San village clinic during 2019

(Khae san -2019)

Date Months		Patient	Cold		High Blood	Weak ness	Diarrhoca/ Choiera		Abdomen pain	Pregnancy	Lumbago	Tooth ache	Cough	Diabetes	Skin Infection	Total
			Adult	Children			Adult	Children								
Jan	2019	60	15	5	6	9	2	1	4	1	6	1	6	1	3	60
Feb	2019	50	12	5	7	6	1	1	3	1	2	2	5	2	3	50
Mar	2019	51	14	5	6	7	1	1	3	1	1	2	5	2	3	51
Apr	2019	52	14	5	7	7	1	1	3	1	1	2	5	2	3	52
May	2019	54	16	5	6	8	1	1	3	2	2	1	4	2	3	54
Jun	2019	56	17	5	7	8	2	1	3	1	2	2	4	1	3	56
Jul	2019	84	22	5	8	9	3	1	5	3	7	3	10	3	5	84
Aug	2019	64	19	7	5	8	2	1	4	1	6	1	6	1	3	64
Sep	2019	84	22	5	8	9	3	1	5	3	7	3	10	3	5	84
Oct	2019	57	17	5	7	8	2	1	3	1	3	2	3	2	3	57
Nov	2019	56	17	6	6	7	1	2	2	2	3	2	4	2	2	56
Dec	2019	55	16	5	6	8	2	1	3	2	2	1	4	2	3	55
Tot		723	201	63	79	94	21	13	41	19	42	22	66	23	39	723

Table – 24: Number of patients and diseases recorded from Khe San village clinic during 2020

(Khae San -2020)

Date Months		Patient	Cold		High Blood	Weak ness	Diarrhoea/ Choiera		Abdomen pain	Pregnancy	Lumbago	Tooth ache	Cough	Diabetes	Skin Infection	Total
			Adult	Children			Adult	Children								
Jan	2020	63	16	5	6	9	3	1	4	2	6	1	6	1	3	63
Feb	2020	55	16	5	8	6	1	1	3	1	2	2	5	2	3	55
Mar	2020	53	14	5	7	8	1	1	3	1	1	2	5	2	3	53
Apr	2020	53	14	5	7	7	1	1	4	1	1	2	5	2	3	53
May	2020	57	17	5	6	8	2	1	3	2	3	1	4	2	3	57
Jun	2020	56	17	5	7	8	2	1	3	1	2	2	4	1	3	56
Jul	2020	85	22	5	8	9	3	2	5	3	7	3	10	3	5	85
Aug	2020	66	19	7	5	8	3	1	4	1	7	1	6	1	3	66
Sep	2020	87	23	6	8	9	3	2	5	3	7	3	10	3	5	87
Oct	2020	58	17	5	7	8	2	1	3	1	3	2	4	2	3	58
Nov	2020	59	17	7	6	8	1	2	3	2	3	2	4	2	2	59
Dec	2020	56	16	5	6	8	2	1	3	2	3	1	4	2	3	56
Tot		748	208	65	81	96	24	15	43	20	45	22	67	23	39	748

Table – 25: List of patients and diseases having free medical treatment provided by the company's clinic during 2018

Date/Month	Patient	Cold		High blood	Weakness	Diarrhoea/ Cholera		Abdomen pain	Pregnancy	Lumbago	Tooth ache	Cough	Diabetes	Skin diseases	Total
		Adult	Children			Adult	Children								
Jan 2018	380	207	24	36	22	13	5	20	9	5	6	17	4	12	380
Feb 2018	274	139	7	29	32	20	1	14	7	2		8	5	10	274
March 2018	277	113	3	26	38	22	9	18	6	2	2	25	6	7	277
April 2018	269	111	5	25	29	16	5	15	13	6	3	21	8	12	269
May 2018	298	119	4	15	21	59	1	27	6	4	8	16	6	12	298
June 2018	275	95	3	23	15	37	1	25	2	5	11	16	13	29	275
July 2018	237	107	7	23	19	15		13	2	6	3	20	7	15	237
August 2018	202	101		27	13	11		12	1	3	6	19	4	5	202
Sep 2018	240	117	6	28	29	9		16	2	5	4	12	4	8	240
Oct 2018	308	191	7	31	29	4	5	12	1	6	2	10		10	308
Nov 2018	344	175	27	30	31	12	1	12	7	7	3	24	10	5	344
Dec 2018	277	133	4	35	22	16	3	13	5	5	5	16	13	7	277

Table – 26: List of patients and diseases having free medical treatment provided by the company's clinic during 2019

Date Months		Patient	Cold		High Blood	Weakness	Diarrhoca/ Choiera		Abdomen pain	Pregnancy	Lumbago	Tooth ache	Cough	Diabetes	Skin Infection	Total
			Adult	Children			Adult	Children								
Jan	2019	302	76	27	28	43	12	3	19	7	30	6	32	5	14	302
Feb	2019	251	62	26	37	28	6	6	14	6	8	11	24	8	15	251
Mar	2019	264	68	26	32	37	6	5	15	6	7	11	25	9	17	264
Apr	2019	262	69	26	33	36	4	6	17	4	6	10	24	11	16	262
May	2019	276	81	27	30	39	7	5	15	8	12	7	22	9	14	276
Jun	2019	278	83	26	34	39	11	4	15	6	11	9	19	7	14	278
Jul	2019	417	110	27	40	44	15	7	26	13	34	14	51	13	23	417
Aug	2019	328	95	36	26	40	12	6	21	5	32	6	28	7	14	328
Sep	2019	419	112	27	40	44	15	7	26	13	34	14	51	13	23	419
Oct	2019	280	84	25	34	39	11	4	15	6	13	11	17	8	13	280
Nov	2019	285	83	32	31	37	6	9	12	9	15	8	20	11	12	285
Dec	2019	273	79	23	32	38	9	5	14	10	12	7	19	10	15	273
Tot		3635	1002	328	397	464	114	67	209	93	214	114	332	111	190	3635

Table – 27: List of patients and diseases having free medical treatment provided by the company's clinic during 2020

Date Months		Patient	Cold		High Blood	Weak ness	Diarrhoca/ Choiera		Abdomen pain	Pregnancy	Lumbago	Tooth ache	Cough	Diabetes	Skin Infection	Total
			Adult	Children			Adult	Children								
Jan	2020	307	78	27	28	43	13	3	19	8	31	6	32	5	14	307
Feb	2020	256	64	26	38	28	6	6	14	6	8	11	25	8	16	256
Mar	2020	269	69	26	33	38	6	5	16	6	7	11	26	9	17	269
Apr	2020	266	70	26	33	37	4	6	18	4	6	10	25	11	16	266
May	2020	283	83	27	31	40	8	5	16	8	13	7	22	9	14	283
Jun	2020	283	85	26	35	40	11	4	16	6	11	9	19	7	14	283
Jul	2020	426	112	27	41	45	16	8	26	13	35	14	52	13	24	426
Aug	2020	332	96	37	26	40	13	6	21	5	33	6	28	7	14	332
Sep	2020	429	114	28	41	45	16	8	26	13	35	14	52	13	24	429
Oct	2020	287	86	26	35	40	11	4	16	6	13	11	18	8	13	287
Nov	2020	292	84	33	32	38	6	9	13	9	16	8	21	11	12	292
Dec	2020	278	81	24	32	38	9	5	14	10	13	7	20	10	15	278
Tot		3708	1022	333	405	472	119	69	215	94	221	114	340	111	193	3708

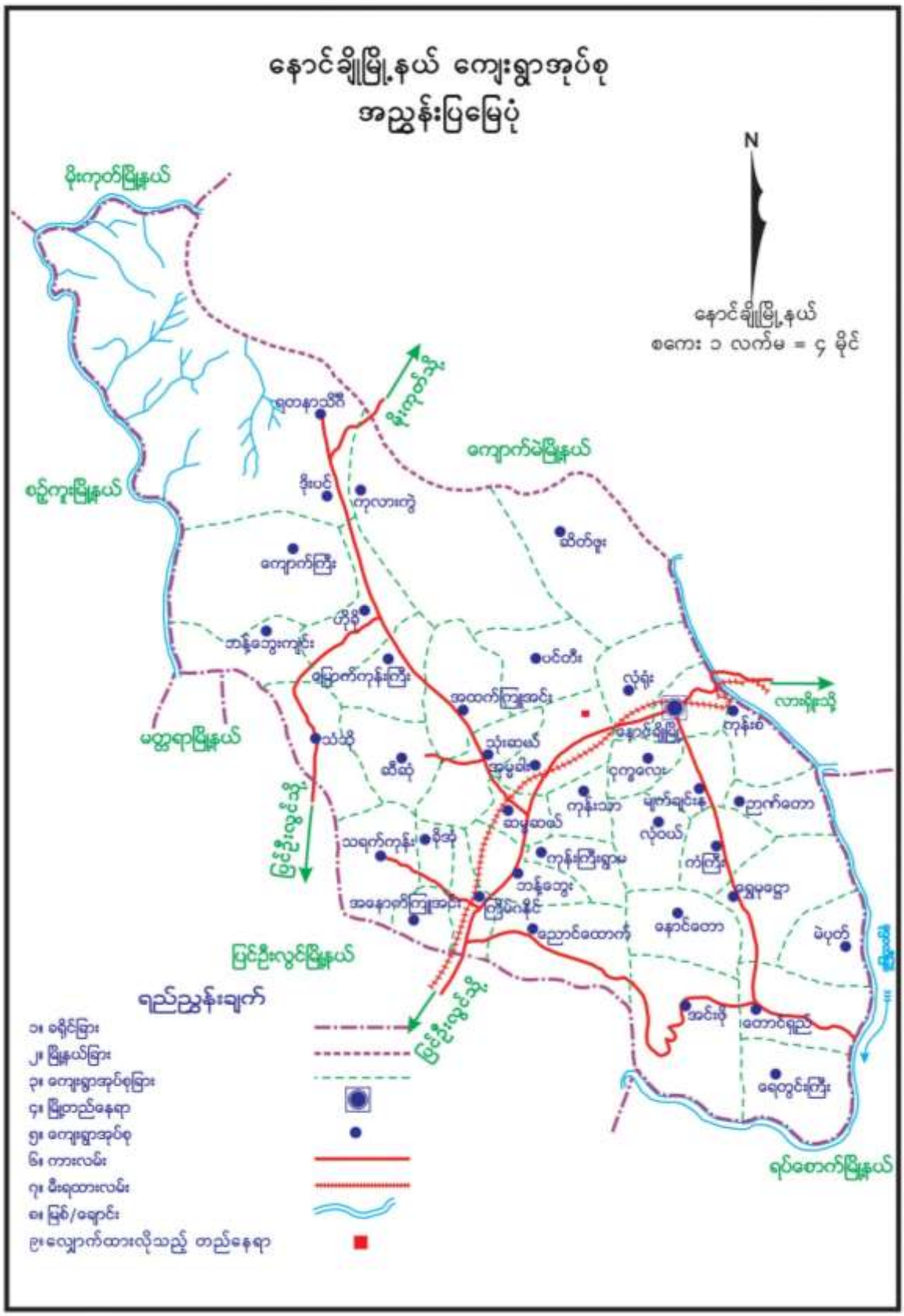


Figure – 90: Map of Naunghkio Township

Figure – 91: Lauk Hpan village

Figure – 92: Farmland of the village

Figure – 93: The village concrete road constructed by the company

Figure – 94: Affiliated Middle School, Lauk Hpan village

Figure – 95: At the entrance of the village monastery

Figure – 96: Village clinic

Figure – 97: Community water pond

Figure – 98: Khe San village

Figure – 99: Sugar cane field

Figure – 100: The village road constructed by the company

Figure – 101: Village Primary School

Figure – 102: Village monastery

Figure – 103: Village clinic

Figure – 104: Lei Gyi Taw village

Figure – 105: Farmland of the village

Figure – 106: Village road constructed by the company

5.4 Cultural components of the surrounding environment

Table – 28: Cultural/religious aspects of three villages

Sr. No.	Religious, cultural, historical, archeological attributes, etc.	Lauk Hpan	Lei Gyi Taw	Khe San
1.	Famous pagoda	×	×	×
	Village pagoda	×	×	under construction
	Village monastery	1	* Not materialized yet.	1
2.	Number of monks	2	×	4
	Novices	6	×	10
	Nuns - etc	×	×	×
3.	Percentage of Buddhist	100%	100%	100%
4.	Village "Nat" shrine	1	1	1**
5.	"Bo" tree or large sacred tree	×	×	×
6.	Nat worshippers	present	present	present
7.	Other religions			
	Christian	×	×	×
	Muslim/mosque	×	×	×
	Hindus/temple	×	×	×

8.	Historical monument (site/structure)	×	×	×
9.	Archeological monument, site, structure, objects, etc	×	×	×

* Application submitted for the construction and establishment of a village monastery

** Village Nat festival on Myanmar New Year.

Note: No annual or seasonal religious festival of magnitude; only normal religious event on full moon day, new moon day and the two 8th days of the Burmese months.

Impacts on the cultural, religious, historical and archeological components are not anticipated. There are no famous religious monument, historical monument and archeological site to be impacted by the project.

Myanmar Buddhists still worship nat spirit and the locals are not an exception. The Buddhists believe in the 31 abodes of life. The lowest abode of nat spint is close to that of human being and these nat are worshiped. Many still keep this tradition of worshipping or rather propitiating the nat while the main faith is Buddhism. Offertory (hnget-pyaw-pwei, ohn-pwei) for the nat spirits usually included one coconut and three or five combs of bananas arranged on a receptacle, usually a large bowl or a tray. Or the offertory could be a coconut (nat-ohn-thee) hung up at a place as offering to the nat.

There is no known annual or seasonal festival for nat spirit in the area.

The project will not have any impact on the belief and worship/propitiation of the nat sprits or guardian spirits.

The staffs and workers of the company will be educated to respect the culture and tradition of the local people.

There is however, a small mountain with cave, 4 miles away which was once the hideout of Sayar San, the Burmese nationalist leader who took up arms against the colonial British Government (Sayar San was captured by the British soldiers, put in jail in Tharyarwady Town and executed). The cave and the site is now something like an historical site and has potential tourist attraction. The activities at the project site cannot have any negative impact on this Sayar San Hideout as all impacts are mitigated, quite effectively (and it is 4 miles away).

Figure – 107: Nat shrine at Lauk Hpan Village

Figure – 108: Construction of Khe San Village pagoda

Figure – 109: Nat shrine at Khe San Village

Figure – 110: Nat shrine at Lei Gyi Taw Village

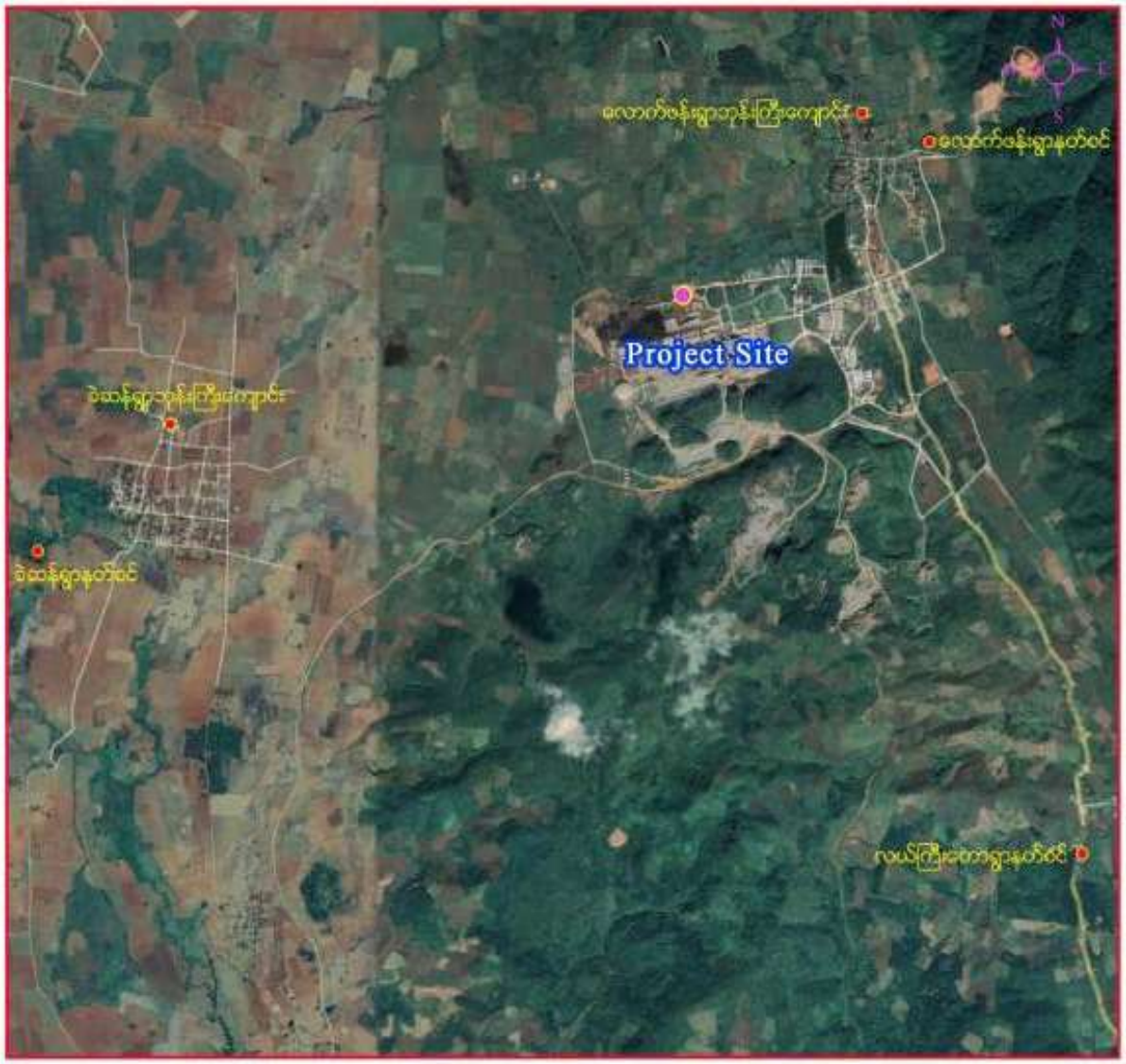


Figure – 111: Satellite image showing monasteries and nat shrines of Lauk Hpan, Khe San and Lei Gyi Taw villages

5.5 Visual components of the surrounding environment

There are no aesthetic or scenic spots of beauty for tourist's attraction; there are no outstanding historical or religious monuments and structures etc and also no outstanding natural landmarks (eg- a great rock, a beautiful lake) to be impacted. On the whole there can be no considerable impact on the visual component of the surrounding area due to the operation of this project.

However there is the alteration of natural landscape due to the establishment of the two factories, (not this project). The clearing of vegetation and the subsequent construction works for these 2 cements factories have already transformed the natural landscape to an industrial landscape. Of course this is inevitable for every developmental project. After all this can be construed simply as a small sacrifice of the ecosystem for the sake of industrial and economic development of the nation.

The company has conducted the creation of green belt and green zone (the compensatory planting of trees) and so when the trees are fully grown up the buildings and structures shall be more or less in harmony with the surrounding landscape and will no longer standout in too contrast with the surrounding.

The area of this coal-fired plant project site is only 12.3 acres, just a small portion of the overall 280 acres for the cement projects. No further substantial impact on the landscape is anticipated as the area is already impacted by activities of the two cement plants.

Greening/rehabilitation plan

Figure – 112: Nursery set up by the company

Figure – 113: Satellite image showing green belt created by the company and the access roads to different parts of the main project site (The Pyin Oo Lwin-Naung Cho Highway is 5 miles in the southeast)

Plants cultivated by plots in project area

(1) Kyun

(2) Kyun

(3) Kyun

(4) Kyun

(5) Macadamia, Cherry, Thanpaya, Danyin

(6) Kyun, Htaw-pat, Macadamia, Da-nyin, Htin-shu

(7) Nursery (Kokko, Coffee), Mezal, Arsian Thabye, Kha-yay, Padauk, Yay-htin-shu, Taiwun-bandar, Magyi, Ohm-pwar, Pyin-katoe, Tamalan, Pein-nae, Htaw-pat, Shwe-wa, Kyun, Nyaung-wine, Kyauk-sein, Yay-thin-win, Mahawgani, Kyauk-hkak, Yay-pa-tone

(8) Htin-shu, Arsian Thabye, Padauk, Kyauk-hkak

(9) Hkar-taw-mi (Nursery)

(10) Hkar-taw-mi (Nursery), Yay-htin-shu, Thit-Hla, Htin-shu, Sakku-pin, Htin-shu-padaythar

(11) Hkar-taw-mi (Nursery), Pein-nae, mezal, Kha-yay, Kyun, Tha-yet

(12) Pyin-katoe, Kyun

(13) Kha-yay, Kyun

Creation of green zone; planting fast growing trees, fruit trees, shade trees and timber producing trees. (Trees act as dust trapper, as wind shield and sequestrate CO_2 and generate O_2. The only pragmatic way of mitigation for CO_2 is the planting of trees.) The company has already planted 137257 trees of various types mostly *Tectona grandis, Gmelina aroborea, Eucalypts globulus, Xylia xylocarpa, Aquilaria agallocha* etc.)

More over the company the has set aside 76.87 acres for planting of trees such as teak, rain trees, jack fruit, bamboo, baw-sa-king, ta-bay-buta trees etc.

6. IMPACTS AND RISKS ASSESSMENT AND MITIGATION MEASURES

6.1 Impacts assessment methodology and approach

As the report deals with environmental affairs focus is made on the impacts/potential impacts and emphasis will be on mitigation/corrective/control measures to be put in place.

As the coal-fired power plant project is still in the construction Phase assessment of impacts is based mainly on prediction. And this is based from previous personal practical experience and also from theoretical knowledge from available references for conducting EIA.

Prediction and identification of the impacts, both negative and positive, and subsequent assessments were made after comprehensive group discussion with EIA practitioners and appraisers.

The visual inspection of the proposed project site was essential for the prediction, identification and assessment of the impacts.

The layout plan and blue prints and details of project specification of the proposed limestone quarry site plan provided by the proponent have to be studied in meticulous details and memorized until each and every big and small component, could be clearly seen in picture in the mind's eyes of the EIA practitioners and appraisers.

The prediction and assessment of the impacts was based from the team's previous experiences with EIA works.

In short, impacts assessment are based from Experts Judgment method/Experts Consensus method/Ad hoc method. Experts judgment method is pragmatic and workable; it may not be so accurate but can never go wrong. This method can be applied quite efficiently even if all required information, data, facts and figures are not all available.

The other assessment methods such as quantitative analysis and mathematical/computer modelling, prediction and simulation medelling, matrix method etc are complex and beyond the capacity and beyond the scope of this report. Applications software and application of modelling methods are quite impressive but can sometimes go wrong if all the required information/data, facts and figures are not available.

Mathematical equation or formula will always produce a result. However, sometimes the result from mathematical formula and computer modelling can become unrealistc and, therefore, moderation has to be done through expert's consensus. In such case only Experts' Consensus has the "final say" or the end decision, it is learnt.

In this impact/risk assessment context a combination of IFC's risk rating matrix method and Experts Consensus method (Experts moderation) are applied for pragmatic purpose (ad hoc purpose).

To uphold a standard EIA report the impacts assessment are made encompassing all the four phases, namely, Preconstruction, Construction, Operation and Decommissioning Phase. The assessments also cover all the five environmental components of the surrounding environment, namely, the physical, biological, socio-economic, cultural and visual components.

The base line data or background data for the physical, biological, socio-economic, cultural and visual components of environment were carried out. (These were already mentioned in **Chapter-5.**) These baseline/background data could be one day in the future compared with the actual impacts during the Construction and Operation Phase.

Predictions and assessments of impact/potential impacts are extrapolated from all the main activities involve in coal incineration and electricity generation. The main activities such as clearing of vegetation for site and access road, the construction activities during the whole Construction Phase and most of all operation activities during the whole long Operation Phase and lastly all activities during the Decommissioning Phase are assessed.

Since impacts are the resultants of the above-mentioned activities each and every activity and the resultant impacts are considered, predicted, identified and assessed. Mitigation measure for each and every impact/potential impact is then prescribed.

As the project site is inside the premise of the existing crown cement plant the negative impact on natural biodiversity is almost zero as no vegetation has to be cleared for implementation of the project. (Vegetation were already cleared when the construction works for two cement plants have commenced.) Lauk Hpan village about 1½ miles away in the north-east is incorporated into the study area.

6.2 Identification of impacts

2, 8, 8 and 3 negative/potential negative impacts are predicated and assessed for the Pre-construction Phase, Construction Phase, Operation Phase and Decommissioning Phase, respectively. For each and every impact there are many options of mitigation measures to be put in places.

The positive/beneficial impacts during the Construction and Operation Phase were also mentioned. While it is very necessary to mitigate negative impacts it is also very necessary to optimize or enhance the positive impacts.

The project proponent really believed that the assessment of impact and potential impacts are thorough and complete based from on ground situation inspection and from various reference books.

In the same way the mitigation measure to be taken described later are effective (if not perfect) for all impacts.

6.2.1 Potential negative impacts during the Pre-construction Phase (Planning Phase) and mitigation measures to be put in place

Generally speaking there should be no negative impacts during this Pre-construction Phase. However negative/potential negative impacts of socio-economic aspects can happen as follows:

6.2.1.1 The potential polarization of the locals into pro-project and anti-project groups and mitigation measures to be taken

Instigation and agitation by radical environmentalists who are usually against all infrastructure developments and activists who are usually anti-big business and anti-authority can polarize the locals into pro-project group and anti-project groups.

Agitation by activists can even lead to public outcry and political instability of the region. Whether these activists are doing such thing in good faith, eg- for environment and human rights or doing such thing merely for publicity is sometimes questionable. Certain media are also usually adding fuel to the fire.

On the otherhand some big companies in Myanmar usually have little regards for the environment and the community.

Mitigation (out line)

There are no quick fix measures for this impact. Early public meeting and consultation are necessary; and must be meaningful. Transparency is necessary; the company should prioritize employing locals many of which are expecting for employment opportunities.

As the project cannot provide jobs for all locals who want jobs some who are not employed by the company can have feeling of resentment against the company. They can easily become anti-project.

Building of good relation between the company and the local is most important of all.

6.2.1.2 The potential hiking of prices of land and property and mitigation measure to be taken

During the Pre-construction Phase greedy speculators can hike the price of land and property. The price of land can go up considerably or exorbitantly even before the implementation of the projects. Even rumours can lead to the hiking of land and property prices.

As the area is a rural and relatively isolated area it is hoped that this impact will not be so high. On the other hand high inflation has become a common phenomenon and away of life in this country.

Mitigation (out line)

There are no quick fix measures for this. Early public consultation meetings are necessary. The company will uphold transparency and explain the true situation of the project. The company will tell them not to have too high an expectation on the project. The company as well as the locals should realize that inflation is just a normal phenomenon of the country. There is no effective remedy for inflation. The officials of the company will not involve in speculation.

Actually this Preconstrution Phase has already passed without any problem.

6.2.2 Negative/potential negative impacts during the Construction Phase

The Construction Phase starts after the Planning Phase. In this Ngwe Yi Pale' Cement Co., Ltd context the Construction Phase will last for 2 years.

The works during the Construction Phase generally will involve the clearing of land, fencing of the site, construction of access road, mobilization of materials to the site, sourcing of water and electricity for the power plant and also the procurement of coal and limestone and means of transportation.

There will be, no doubt, many negative impacts during this phase. The followings are real or potential impacts identified or predicted and assessed.

6.2.2.1 Impact: mobilization and preparation action and mitigation measure to be taken

Mobilization action, preparation action and transportation action in early phase and later phase of construction can cause nuisance to the public or road users.

The rapid mobilization of large volume of building materials, for the establishment of office quarter and other facilities and heavy machinery can overspill inside or outside and on the road side. These can cause nuisance and also hinder the smooth and easy movement of people in the area and also vehicles and motorcycles.

Access road need not be constructed as the project site (12.3 acres) is inside the already existing cement project site of 280 acres. The access road was already constructed for the cement project.

But the preparation for the site (including the power plant premise) can have minor impact on the flora and hence biodiversity of the area as small vegetation have still to be cleared. There are no big trees to be felled.

Mitigation (out line)

Plan and implement the breakup of the lease area into: fatory site, office, storage site and other associated facilities, park for machinery and vehicles, area for road and area for green belt etc.

The area used to be a quiet remote spot in the fatory compound.The actions mentioned above during the Construction Phase can cause nuisance to others. Restrict the movement of trucks according to schedules.

All materials for construction will be systematically piled up or stored with the site. Do not overspill them outside the site or on the road side. There is the potential issue of theft.

Fence the site securely and deploy guards or watch men.

6.2.2.2 Impact on air environment and mitigation measure to be taken

The impacts during the Construction Phase will be in the form of dust and smoke.

a) Nature of impact: dust

Dust is the main issue during the civil engineering work of the Construction Phase. Wind direction plays an important role in the impact. The clearing of land and earth works such as excavation, digging and refilling of earth greatly generate dust. Vehicular movements as well as operations of other equipment, engines and pumps emit lot of dust.

These processes together with wind erosion of open or disturbed ground would generate dust and could have quite a severe impact. Nuisance and health impact are associated with increased level of dust. The air dust pollution could cause eye problem, allergy, skin disease, respiratory and lung diseases.

Dust of PM_{10}, and above are a nuisance, but $PM_{2.5}$, PM_1 are of serious health concern.

Mitigation (out line)

When clearing the ground vegetation must be removed together (mixed) so that the plant material helps to hold the soil. Or vegetation can be stripped and spread on the newly made soil stockpile; this will minimize emission of dust due to wind. As mentioned earlier, avoid clearing vegetation too far advance of construction.

Spray water regularly for suppression of dust. Plant trees at vacant spots; select hardy, fast growing species and create green zone and green belt. Trees play an important role in minimizing dust; they reduce wind speed and trap a lot of dust.

Provide personal protection equipment (PPE) such as face mask, nose and mouth cover, to workers exposed to dust during earth works or other construction works and so on.

b) Nature of impact: smoke (fugitive emission)

Smoke generated during Construction Phase will be low. The source of emission is from vehicles and some machines used during construction works, such as engines and pumps.

Health impact associated with smoke increased with level of smoke. The emission of Green House Gas can lead to global climate change, especially during the Operation Phase when large quantity of coal has to be burnt.

Mitigation (out line)

Regularly check the engine of vehicles and other machines; well-maintained and operated engines reduce smoke emission; use fuel oil with low sulphur; use environmentally friendly up-to-date instrument, for example, engine with higher fuel efficiency; equip instruments and machines with air pollution control devices to minimize exhaust emission. (These may not be readily available but Ngwe Yi Pale' Cement Co., Ltd will consider this for the near future.)

Avoid vehicles and instruments left running unnecessary; avoid open burning of solid wastes of all kinds, through segregate, recycle and then for disposal at approved dump site (land fill).

Provide PPE such as nose and mouth covers and face masks to workers exposed to smoke. Trees in the site will effectively sequestrate (remove) CO_2 in the smoke. Therefore, plant trees.

6.2.2.3 Impact: noise and vibration and mitigation measure to be taken

During the Construction Phase the source of noise are from construction work such as carpentry work that involve noisy saws and planes, noisy drilling machine and the sound of hammers etc. Movements of vehicles, loading and unloading of materials etc. also produce noise. Gravel roads also produce more noise than tarred ones.

Environmental noise level that is acceptable rating level for noise (International Standard) is around 45 dBA during daytime and 35 dBA at night. Internationally accepted noise level in the work place should not exceed 85 dBA.

Pump and generator are also sources of noise. Prolonged exposure above 85 dBA can impair hearing and can be a major health impact. Noise generally causes nuisance and disturbance to the community. Noise would scare away all the wildlife animals if any, including birds.

Vibration is generated from machinery or mechanical operation during construction work and also from heavy vehicles on the access road. Vibration is usually associated with loud noise; it can damage machines and equipments and also buildings or structures. On the whole vibration during the Construction Phase will be low.

Mitigation (out line)

As the project site is isolated noise is not an issue for the community. Noise can have minor impact on the employees.

The best way to mitigate noise is at its source. Noise specification of equipment and vehicles should be taken into consideration when ordering equipments and vehicles. (This will be mentioned in EMP in Planning Phase.)

All noisy machines and equipment should be fitted with noise muffler or silencers. Place noisier machines away from other working units. No construction work at night.

Big trees and vegetation, if any, in and around the project site (mine site) effectively absorb noise. Keep trees intact as far as possible; avoid unnecessarily cutting of trees.

Provide adequate PPE such as ear muffs, ear plugs etc. to workers at all activities/locations that exceed permissible occupational noise level limit standard (85 dBA).

As mentioned earlier, because the site is isolated and away from residential area the noises generated during the Construction Phase are negligible.

Vibration due to heavy truck from road can be mitigated by ensuring a flat and smooth road surface; paved road is much better than unpaved road; tarred road is better than concrete road; limit the speed.

Well-maintained and well-operated machine produce less vibration, therefore, give priority to maintenance and efficient operation of machines. Foundation for the installation of the machine should be firm and durable. This reduces vibration and protects machinery and equipment from damage. It is standard practice to mount machines in such a manner to minimize vibration. Install vibration absorber where necessary.

6.2.2.4 Impacts on soil and mitigation measure to be taken

The earth work which is an integral part of construction work can alter the profile and structure of soil. Spillage of fuel oils and chemicals during the construction work, from machinery and vehicles can contaminate the soil.

There is also the potential erosion of soil and soil loss due to the removal of vegetation for access road construction and the power plant facility. Other impacts are: soil compaction due to repetitive movement of vehicles and heavy machinery and the potential percolation of domestic sewage into the sub-surface layer and hence under ground water.

If the construction work happen to be during the rainy season there is the potential for erosion of soil and siltation and sedimentation of natural drainage system or water course.

Mitigation (out line)

When doing the clearing work or excavation of earth, remove top soil with vegetation (grass, herbs) on it. Stockpile top soil in conical heaps; allow grass and herbs to grow on top soil. Remove and stockpile subsoil separately. Maintain the topsoil against erosion when filling of earth has to be done; replace, first, the subsoil and then the top soil on top. This will greatly help in greening or landscaping work.

Maintain all vehicles and machinery to prevent spill of fuel oil and hydraulic oil. Avoid washing down oil spill with water because this will only help percolate oil underground. Soak oil spill and then dispose the soak at approved disposal site. Pave vehicles and cranes parks and collect run off; bund the fuel depot to prevent spreading of spilled oil. Collect used oil in a drum and discard later at an approved landfill site.

For disposal of domestic waste water construct a small septic tank together with soak pit to collect the sewage from kitchen, bath etc. Occasionally sprinkle sand or dirt into the pit latrines to mitigate the impact of bad odour. The pit latrines may not be a serious issue for ground water as the Construction Phase last for at most, two years.

Schedule the construction works so that large area of soil were not laid bare during the monsoon months. Do not clear the land in advance more than necessary. Phase the earth work (in the early period of construction) so that it was limited to workable size only to a minimum area.

Resurface and stabilized the exposed ground surface as soon as possible, that is, after earth work. Soil compacted by heavy truck and heavy machinery movements will be raked and restored to original condition.

To prevent subsequent siltation or settlement, drain or ditch must have adequate backfill and after completion of back fill the surface should be restored to its original condition.

Manage the overall erosion and sedimentation control during the Construction Phase, particularly during the rainy season.

6.2.2.5 Impact of waste disposal (solid waste and liquid waste) and mitigation measure to be put in place

Solid waste generated during the construction phase will be large quantity of debris in the form of bits and pieces of building materials, iron materials, timber, soft wood, bamboo, used as scaffolds, left over bricks, construction tailings, sand, gravel, and so on.

It is not practical to determine or calculate the amount of these wastes but the quantity is really large given the magnitude of the work.

Many of the leftover materials are unused or surplus materials because even well-experienced planning and design engineers may not be able to estimate the exact quantity of building materials to be used. There will always be unused or surplus timbers, iron rods, cement, brick etc., not to mention iron nails. Unless systematically resold, reused and recycled and systematically disposed these materials can pose a great impact on the area. After two years of construction work, ill-disciplined workers without good house-keeping practice can also litter the site to a great extent.

Large quantity of water has to be used during the Construction Phase, mostly for cement works, e.g. cement batching. Occasional washing of machinery and vehicles and occasional suppression of dust have also to use substantial quantity of water. There are 92 employees (including 23 Chinese technicians) during the Construction Phase. The quantity of water for domestic uses is substantial.

Mitigation (out line)

All unused or surplus building materials can be sold to others who need it. The large majority of debris can be also put up for sale since most can be reused or recovered. Even left over building materials can be sold. Those that should be disposed off should be disposed at an approved land fill. Always avoid open burning of debris.

The best thing to do would be to hire a contractor for the clearing job after the construction phase.

There will not be any substantial waste water during the Construction Phase. All required water are used up in construction works – e.g. in cement works, no actual effluent left.

Domestic waste water from temporary housing or camp will flow into the earthern ditch or drain and dry up. No special treatment of used/waste water to be taken. Instead of toilets, pit latrines (flushed type) are provided during the Construction Phase and so there will be no sewage from toilets. From purely environmentalist point of view, pit latrines are not so eco-friendly since it can have impact or ground water. But this is so far the pragmatic way of implementing sanitation during the temporary Construction Phase.

Discipline workers for good house-keeping practice to minimize waste demand the building contractor to do this and ask him to take responsibility for the conducts of his construction workers.

6.2.2.6 Potential accident at work places and mitigation measure to be put in place (OHS issue)

Accidents can occur from time to time during construction work either to construction workers or neighbours if they are close to construction site. This can also happen to passers-by near the construction site or any local people and also become Community Health and Safety issue.

The slipshodness of the construction workers and the falling of bits and pieces of construction materials or tools from above can cause minor or major injury to other workers or passers-by or any local people.

Certain accidents can be fatal.

This can also become Community Health and Safety issue.

The 10 most common construction sites accidents worldwide are:

- Fall from heights (scalfolding); slip and fall; electrocution; falling debris, materials and objects; getting caught-in between objects and materials; fire and explosion; over exertion; machinery accidents; getting hit by a vehicle; and trench (for wiring and pipes) collapses.

Mitigation (out line)

- Plan and manage for zero accident not only for company's workers but also for locals in the vicinity.
- Set up "Safety First" sign boards at places where workers can see easily.
- Create safety condition for all workers; create accidents free environment.
- Educate, train and supervise construction workers for good working practice, good engineering practice, good safety practice and good house-keeping practice so that these good practices will be ingrained in each and every worker's mind.

- Try to meet all statutory requirement for safety construction (rules, regulation, labour Act).
- Provide adequate lavatory facility, bath and washing area, potable drinking water.
- Provide adequate Personal Protection Equipment (PPE) where necessary.
- Provide First Aid Training for some staff;
- Keep first aid kits well-stocked with medicine and drugs.
- Accidents or near-missed to be duly reported.
- Display phone number of Ambulance service. Red Cross Society, Township Hospital, Fire Bridge etc.
- Prohibit the drinking of alcohol during working hours; ban the use of narcotics among workers.
- Ensure that workers are not subject to over exertion, excessive repetitive motions; excessive manual works (apply mechanical labour rather than manual labour).
- Cover the whole structure during the Construction Phase with nylon lace or netting to prevent accidental falling of debris and tools etc (a common engineering practice implement in construction work to prevent accidents and injuries for workers as well as locals in the vicinity).

6.2.2.7 Potential social issue and mitigation measure to be taken

This impact can be a two-way impact. The project which attracts a large number of construction workers can have an impact on the workers which come from different parts of the country. On the other hand, these workers can have an adverse impact on the project.

When a large number of construction workers are involved there is the potential for the occurrence of undesirable social issues. Some examples are: disputes, quarrels, brawls among themselves or with locals; theft; misappropriation of materials and money, vandalism, unethical sexual practices or sexual offences and so on. All these have potential to hinder the progress of construction works.

Other impacts on the socio-economic component can be:

- potential damage to existing roads caused by movement of heavy trucks and machinery; and continual uses of vehicles moving to and from the sites can impact the safety of people and domestic animals
- generation of dust, and noise causing potential disturbance or nuisance to the local people
- potential contamination of local drinking water sources due to constructon activites
- potential siltation of nearby paddy fields or other farms,if any, during rainy season due to quarry activites

Mitigation (out line)

Education and disciplinery action are necessary. Ask the building contractor to discipline his construction workers and to take responsibility for the conducts of his workers. Take and apply punitive measures such as suspension or sacking of the wrongdoer.

Keep separate dormitory (housing) for males and females construction workers; the two housings must be appropriately far apart.

Prohibit the drinking of alcohol and the use of narcotics in the site.

Educate the workers for dealing with the locals; educate them to respect the local culture, etiquette and custom. Do not let the construction workers mingle freely with the local.

Prevent all kinds of quarrels and brawls taking place between the workers and the local community.

- Avoid and/or prevent the damage to existing road and public utilitize by all means. Heeds to the safety of local people and domestic animals.
- Avoid or prevent or mitigate all potential disturbances to the local people.
- Avoid or prevent potential contamination of local drinking water and also potential siltation of paddy fields and farm, especially during the rain season.

6.2.2.8 Potential security issue and mitigation measure to be taken

Since the power plant is within the cement plant compound security may not be a serious issue. However large number of workers from the existing cement plant and 92 more construction workers will be inside the large compound.

The Construction Phase is the period when it is usually difficult to maintain security. The working atmosphere is rather fluid and dynamic in nature. The in (entering the jobs) and out (quitting the jobs) of workers tend to happen almost all the time. This is the period when cases of thefts, misappropriations and vandalisms happen most.

Unlike the permanent employees during the Operation Phase who are well-disciplined, the temporary workers during the Construction Phase are usually quite difficult to discipline. The building contractor usually has no chance to hand pick them but to select them in haste due to the nature of construction work.

There is always the potential security issue for the project. If left unchecked the construction workers can pose a potential for security issue.

Lauk Hpan village is about one mile away from the power plant. So the power plant is not so isolate. Some of the local people may also pose a potential security issue.

Mitigation (out line)

The fencing or walling of the power plant compound must be effective and reliable enough to keep the intruders at bay.

Access control must be implemented. Security gates must be set up; set up watch towers if necessary; no unauthorized access is permitted. The company and the building contractor must prohibit the workers from entering the neighboring village without preauthorization from the company or the elders of the villages. All entering and leaving of the power plant site should be checked. Do not let the construction workers mingle freely with the locals.

Heavy building materials (which cannot be lifted easily) such as iron bars, iron rod, big timber etc. and materials of less value, for example, bricks, sand, gravel etc. can be piled up in the open. Materials of certain value, for instance, iron work, timber work, frame, iron nails, and associates, corrugated iron sheets, glass panels etc. must be kept in store or ware house under lock and key.

Ask the contractor to discipline his construction workers.

The condition should include punitive measures if found to be in contravention of the requirement, for instance, suspension or termination of the employment.

Note – The Construction Phase has already passed without any substantial issues.All the impacts/ potential impacts during this phase are transient in nature and ceased after the end of the Conatruction Phase.

Note – Impact on biodiversity not envisaged. This project site of only 12.3 acres is within 280 acres of Crown Cement Plant compound. Since the vegetation was already cleared during Cement Plant project Construction Phase no further clearing of vegetation is necessary.

Therefore no substantial impact on biodiversity is envisaged during the Construction Phase.

However, the Crown Cement factory project, the main project, has impact on the biodiversity during Construction Phase due to it large size, 280 acres of land to be cleared. The access road has to be constructed. The coal fired thermal plant project shares this access road.

During the Operation Phase the main activity inside the coal fired power plant will be burning of coal and generation of electricity. There will be impact of emission on the surrounding biodiversity especially flora but will be difficult to access. Moreover, mitigation measures, e.g. ESP and series of bag filter, complete combustion, desulphurization etc. are applied and therefore the impact may not be so serious.

Note – Impact on cultural and religious component is also not envisaged as there are no famous religions monument historical and archeological monument nearby to be impacted; only Buddhist monastery in each village. (Already mentioned earlier in Chapter 5, 5.4).

6.2.3 Positive (beneficial) impacts during the Construction Phase

The positive or beneficial impacts during the Construction Phase are in socio-economic aspects. The economic benefits to the region are expected to be substantial.

The proposed project will invigorate and boost the local economy and will bring economic benefits to people who are involve in extraction/production and sale of building materials of all sorts, both raw materials and manufactured goods.

Contractors of raw materials such as sand, gravel and bricks get the chance for doing lucrative and brisk business in providing these raw materials for sales. The extraction or production of these raw materials will also provide jobs for many locals.

Timber merchants and merchants of soft wood and bamboo (for scaffolding) as well as merchants of construction merchandize such as iron rods, bars, iron works and nails, roofing, aluminum sheet, glass panels, cement and so on can promote their sales. At the same time more jobs for the locals can be provided by these merchants; small business men and small sub-contractors will be also benefited by the production, extraction and sale of these building merchandize.

The proposed project will provide jobs for 92 construction workers for 2 years. This is quite a substantial contribution to provision of jobs for young people and unemployed people, partially solving unemployment problem when unemployment is high in the country. Many unskilled workers will have the chance to become skilled workers during the period of two years.

Ngwe Yi Pale' Cement Co., Ltd will bear in mind that while negative impacts should be mitigated or minimized positive impacts should be promoted or enhanced.

6.2.4 Negative impacts during the Operation Phase

This is the long term phase (30 years) for the operation of coal-fired power plant.

The activities taken places at the power plant can lead to certain pollution of air, water and land. But when mitigation measures involving modern technology are applied the impacts can be reduced to insignificant magnitude.

After all, a small sacrifice of the mini-ecosystem is necessary for the generation of electricity, an esstential commodity and one of the main pillars of nationl energy and infrastructure development.

6.2.4.1 Impact on air environment and mitigation measure to be taken

When coal is incinerated flue gas, smoke, dust/ash are generated. It has the potential environmental impact on human health.

Waste gases of coal thermal power plant consist of flue gases. Pollutants can be divided into:

- Dust (particulate matters: PM_{25}, PM_{10}, $PM_{2.5}$, PM_1 etc). In this power plant context the main component of PM is ash.
- Acid gas (SO_2, HCl, NO_x, CO_2 etc), mainly SO_2 and NO_x. CO_2 is the well known green house gas.
- Heavy metals (mercury, lead, chromium etc)
- Mercury can have toxic effect on nervous, digestive and immune system and on lung, kidney, skin and eyes, especially when ingested from food contaminated with mercury (not from inhalation).
- Organic toxic pollutants (dioxins, furans etc)
- In addition unburned hydrocarbons and volatile organic compound (VOC) are generated.

One of the well-known air pollutants from the power plant is the particulate matter ash which can be in the form of fly ash and bottom ash. Fly ash comes from stack and is air pollutant. Bottom ash (down ash) comes from the furnace and is mixed with slag.

It is not possible to gauge the quantity pollutants from the burning of coal.

Generally when 1 ton of coal is incinerated: 30 kg of SO_2; 9 kg of NO_x and 2800 kg (2.8 tons) of CO_2 are generated if no mitigation measures are taken, it is learnt.

The main point source emission/stationary emission is from the stack and this is the most important issue of emission.

Coal consumption at the factory (20-60 MW) ranges from 384-1008 ton/day. Therefore without mitigation up to 30 ton of SO_2, 9 ton of NO_x and 2800 tons of CO_2 are generally generated per day (or 9000 tons of SO_2, 2700 tons of NO_x and 840,000 tons of CO_2 per year of 300 working days).

After mitigation (ESP, filter bags, dry FGD, and complete combustion) is emission can be minimized down to accepted level. CO2 is the main gas (75% of GHG and contribute greatly to global warming.

CO_2 cannot be pragmatically mitigated but can be only partially offset by creation of green belt; trees sequestrate CO_2 to a certain extent. Carbon emission in Myanmar when compared with China, USA, India and Russia is quite minor.

Good quality anthracite coal is not available; only lignite has to be inevitably used.

Fugitive Emission (Smoke) is generated from vehicles and machinery activitives and also from burning of trash and debris. The company has altogether 100 trucks (20 tons type) for transportation of coal for 2 cement plants and this coal fired power plant and also for transportation of the finished products cement. The 100,000 gallons common diesel depot is for all the three factories. But the requirement for this coal fired power plant is only 1000 gallons (about 34 tons) per month. Theoretically 0.51 kg of SO_2, 21.9 kg of NO_2, 0.76 kg of PM_{10}, 6.25 kg of $PM_{2.5}$, and 107.78 kg of CO_2 will be generated per month (based from emission factor for diesel).

Fugitive dust emission is generated from vehicular movement, loading, unloading and handling and crushing of coal and lime stones. Coal dust (PM) can be generated during transportation by trucks but this is not an issue since all trucks are well-covered with tarpaulins. Inside the compound coal is conveyed by conveyors. Ash can be an issue, but it is conveyed by conveyers and stored in ash silo for making bricks. The dry ash handling method is applied (no need for water and no ash pond).

Fugitive dust emission is also generated from two crushers. But these two crushers are built underground and dust emission is minimized. Both crushers are mechanically and remotely controlled; no need for workers to work in the underground crusher house. Pulverized coal is conveyed by a conveyor (which is partly underground) to coal hopper near the furnace. The conveyor is tubular type and therefore dust emission is minimized.

All these pollutants pose environmental and health issues.

Wind direction and condition of wind plays a great role in dispersion of air emission. But this natural phenomenon is beyond the capacity of the project proponent. It is not practical to build the factory in the first place on the lee ward side or windward side from the village as the factory has to be built near the limestone hill. Of the nearby villages, Laukhpan is in the north east. The prevailing wind is from S.W to W.E and therefore this village will be the main receptor for most time of the year.

All these pollutants pose environmental and health issues.

Mitigation (out line)

A variety of options for mitigation methods can be applied for mitigation of gas flue, dust, smoke etc. Modern incinerator in a coal power plan can reduce the volume of original waste or pollutants by 95 to 99%, it is learnt.

Theorectically the methodology for mitigation includes:

- The use of pulverized coal and pulverized limestone (CaO_3) (CaO_3 for desulphurization) (applied by the company)
- Installation of high efficiency Electro Static Precipitator (ESP) to minimize PM (applied)
- Installation of series of bag filters, fabric filters (applied).
- Theoretically any one of the following 7 method can be also applied for mitigation of emission.
- Application of wet and dry scrubber (not applied in this context)
- Desulphurization process; installation of Flue Gas Desulphurization FGD system based on sulphur content. (Applied; by the company; pulverized CaO_3 is used)
- Deacidification process (not applied)
- Activated carbon injection and absorption (partially applied; pulverized coal is used)
- Application of catalyst system for capturing other pollutants, eg. Selective Catalytic Reduction (SCR) (not applied)
- Other chemical dosing process (eg. lime water, NaOH etc) (not applied) and
- Other reactor and catalyst system (not applied)

Note – Some methods are not applied because they are not known or not familiar with our technicians. It does not necessarily mean that all methods have to be applied; a combination of some methods can tackle the issue quite satisfactorily.

The mitigation measures options considered by Ngwe Yi Pale' Cement Co., Ltd

Mitigation so far taken:

Select only quality coal (anthracite) in the first. (Not practical, only lignite coal is available.)

So far, for pragmatic purpose the company has actually applied the following technologies with quite satisfactory result.

- Dry Flue Gas Desulphurization (FGD) by lime stone; pulverized coal and limestone, in the first place applying limestone feeding system (limestone is affective for desulphurization).
- The ratio of limestone to coal is 1:1000 (small quantity of limestone required). The chemical reaction desulphurization will transform $CaCO_3$ finally to $CaSO_4$ (calcium sulphate). This $CaCO_3$ desulphurization can also minimize fluran and dioxin, it is learnt.

- $CaSO_4$ (calcium sulphate) can be effectively reused as chemical gypsum for manufacturing of quality cement.

- Install Electrostatic precipitator (ESP) – Model XCD 187-4 with precipitation rate up to 99.9 % (dry absorption method for PM minimization). The company has installed one ESP for the coal fired plant and 3 ESP each for two cement plants.

- Install 7 bag filters (fabric filters); (dry absorption) a combination of ESP and bag filter can reduce dust up to 99%, it is learnt.

- Apply complete combustion method by maintaining constant temperature (at 800-900 °C with the aid of cyclone separator and FD Fan) for elimination of NO_x, (generally less than 10 kg of NO_x per ton of coal is generated without mitigation. After mitigation the value is zero or almost zero, it is learnt from Chinese experts. If the temperature is very high more NO_x will generate e.g. at 1300^{o}C, they said.

- Complete combustion can eliminate NO_X, mercury, fluran and dioxin, it is learnt. (From referrence and according to Chinese experts). According to them the temperature 800-900 ^{o}C is the best. If the temperature is much higher than 1000 ^{o}C there will be an increased in generation of NO_x.

- Install flue gas analyzer for continuous monitoring of emission (a recent improvement). The results are displayed on the LED Board (Net working system).

- Ensure that the height of the stack is up to standard level. (The stack is 83.8m high and it is up to standard, it is learnt. The company does not know the formula for stack height built by Chinese engineers. They could not be contacted, having left the country after construction.

The rule of the thumb for stack height is that it is at least twice or 2.5 time the height of the nearest building or structure). The rule of the thumb is pragmatic and workable, and is of course, within GIIP requirement, it is learnt.

The IFC formula for stack height is:

HG = H + 1.3 L; where

HG = Stack height at the top

H = height of nearby structuring (s)

L = lesser dimension (height or with) of nearby structures, which means structures within/touching a radius of 5 L but less than 800 m.

The company believes that the issue of emission is tackled and no other options for mitigation measures mentioned above are necessary now.

This can be seen from the results of testing of PM_{10}, $PM_{2.5}$, SO_2, NO_2, O_3, CO, VOC where all values are lower than NEQEG guideline values.

As regards heavy metal such as mercury, organic toxic pollutant such as dioxins and furans these cannot be measured or detected by the hired technician yet.

However complete combustion can reduce mercury greatly and desulphurization can minimize dioxins and favors, it is learnt.

As for mitigation measures for dust and smoke (fugitive emission) outside the plant:

- Restrict vehicular movement inside the premise; a reduction to 15km/hr can reduce 70% of dust, it is learnt.
- The company has 100 heavy trucks for transportation (transportation of coal for 3 plants and transportation of manufactured cements from 2 plants).
- Cover the coal trucks with tarpaulins during transportation, to avoid generation of fugitive dust.
- Spray water for supression of dust when and where necessary (effectiveness 90%, it is learnt).
- Sweep the road regularly, if necessary.
- Lower drop height when unloading raw materials (coal and limestone) to reduce dust (not really necessary since all are mechanically performed).
- Stop loading and unloading during strong wind.
- Stop grinding coal and limestone for a while during strong wind is blowing;
- Install bag filter at hammer crushers house (the company has done this); altogether the company has installed 110 bags filters inside the whole compound of 280 acres.
- Generation of dust from crusher is inevitable; provide PPE, face masks, mouth and nose cover, for workers (both crushers are installed in underground crusher house and so dust dispersal is minimized or eradicated).
- Install cover on conveyor belt, or use tubular type (The company has underground conveyor as well as tubular conveyor system).
- Select and procure eco-friendly vehicles, manchiery and equipment that consume less fuel, emit lower sound level and generate less smoke in the first place.
- Always avoid open burning of trash, debris and solid waste; use an incinerator and dispose the burnt out waste at an approved landfill.

- Creation of green zone; planting fast growing trees, fruit trees, shade trees and timber producing trees (Trees act as dust trapper, as wind shield and sequestrate CO_2 (main GHG gas) and generate O_2. The only pragmatic way of mitigation for CO_2 is the planting of trees). (The company has already planted 137257 trees of various types mostly *Tectona grandis,Gmelina aroborea, Eucalypts globulus, Xylia Xylocarpa, Aquilaria agallocha* etc; trees and plants can effectively offset CO_2, it is learnt.

- Theoretically a mature tree can absorb 167 kg of CO_2 per year. Therefore when all these 13,725 planted tree are fully grown they can absorb 22,921,919 kg (22,921 tons) of CO_2 per year.

- As mentioned earlier, it is estimated that, 840,000 tons of CO2 is generated from the factory per year of 300 working days, (that is without mitigation measures such as ESP, bag filter, complete combustion etc.) Of course CO2 and cannot be practically mitigated but can only offset by sequestration by trees.

More over the company has set aside 76.87 acres for planting of trees such as teak, rain trees, jack fruit, bamboo, baw-sa-king, ta-bay-buta trees etc. This tree when fully grown will also greatly contribute to sequestration of CO_2.

- Provide adequate PPEs (masks) for workers exposed to long hours of smoke and dust.

- The local community should be able to file complaints regarding smoke and dust.

- Comply with the National Environmental Quality Emission Guideline (NEQEG) of ECD for emission mentioned in **Chapter-3**.

Air dispersion modelling

Based from point sources of emission (stacks of 3 factories) and receptor locations the experts from SEM have plotted air dispersion models (Air Emission Regulatory Model-AERMOD) for PM_{10}, SO_2 and NO_x (24 hrs and one year for PM_{10} and SO_2 and 1 hr and one year for NO_x).

According to experts from SEM the meterological data used in air dispersion modelling are not from the meterological data of Naunghkio Township by Meterological Department. These data are obtained from US. EPA AERMET meterological pre-processor programme.

Modelling was conducted from 11-3-2019 to 15-3-2019. The receptors selected are the project site and the villages in the vicinity (Lauk Hpan, Khesan, Pang Ti and Nam Ke Aik). No special equipment or devices are involved, only computer software, AERMOD. There is no need for calibration. Modelling was conducted based on satellite data and image, meterological data especially wind direction and velocity and conditions of terrain.

Objective: To understand the mode of air dispersion in the air shed at the factory and surrounding area.

The air/gas dispersion data and models are shown below:

Predicted PM_{10} Concentrations – Kiln Main Stack, CFPP Stack and Coal Stockpile

The ground level concentrations (both the daily and yearly averages) are lower than applicable limits.

Receptor	Avg. Period	PM_{10}	
		Concentration at Air Sensitive Receptor (µg/m^3)	NEQEG (µg/m^3)
Worker Accommodation	24-hr	45.07	50
	Annual	3.48	20
Lauk Hpan Village	24-hr	36.47	50
	Annual	2.66	20
Khe Hsan Village	24-hr	46.66	50
	Annual	2.78	20
Pang Ti Village	24-hr	6.58	50
	Annual	0.26	20
Nam Ke Aik Village	24-hr	7.01	50
	Annual	0.73	20

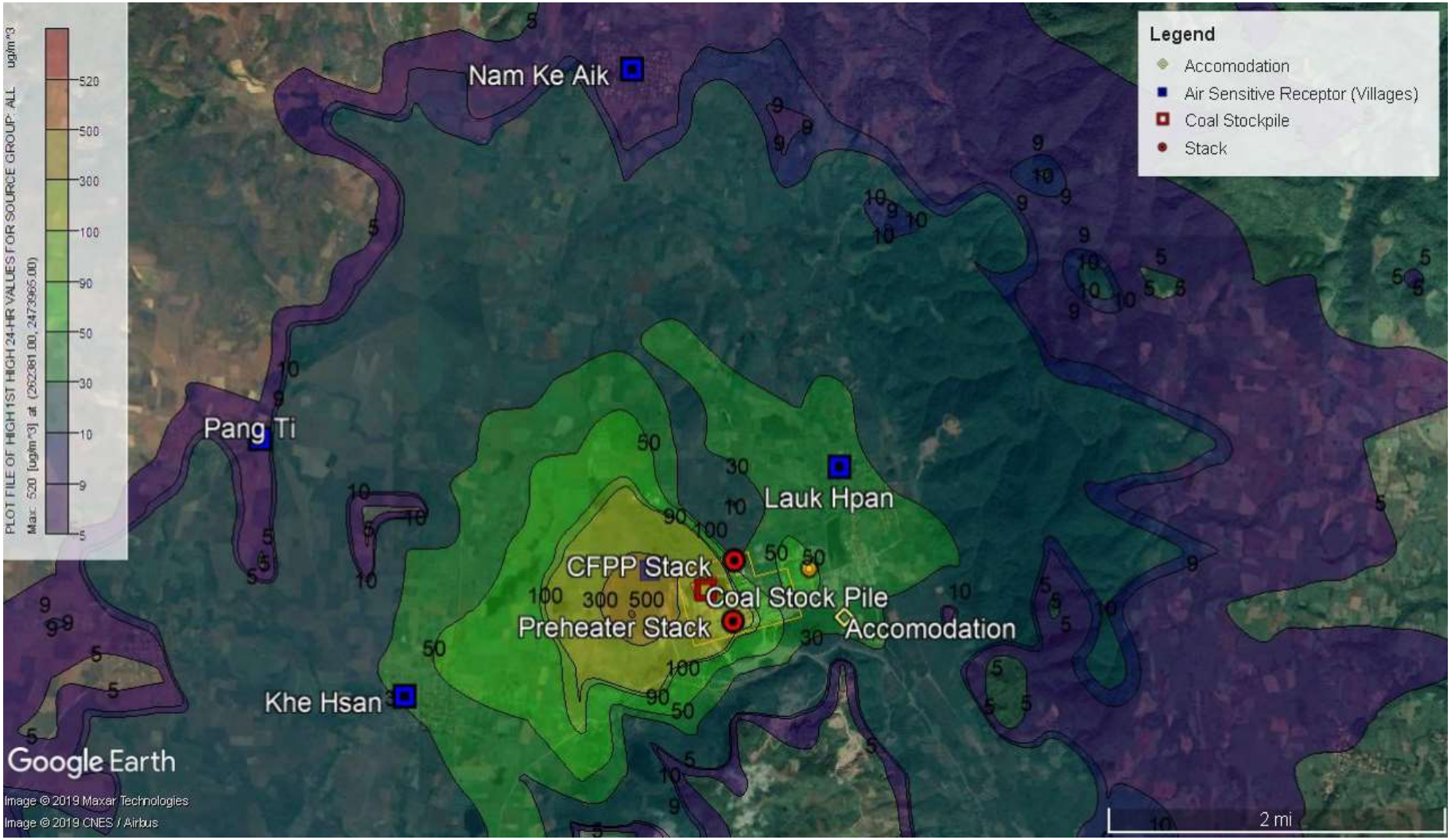


Figure – 114 : Predicted PM_{10} (24-hr) Concentrations – Kiln Main Stack, CFPP Stack and Coal Stockpile

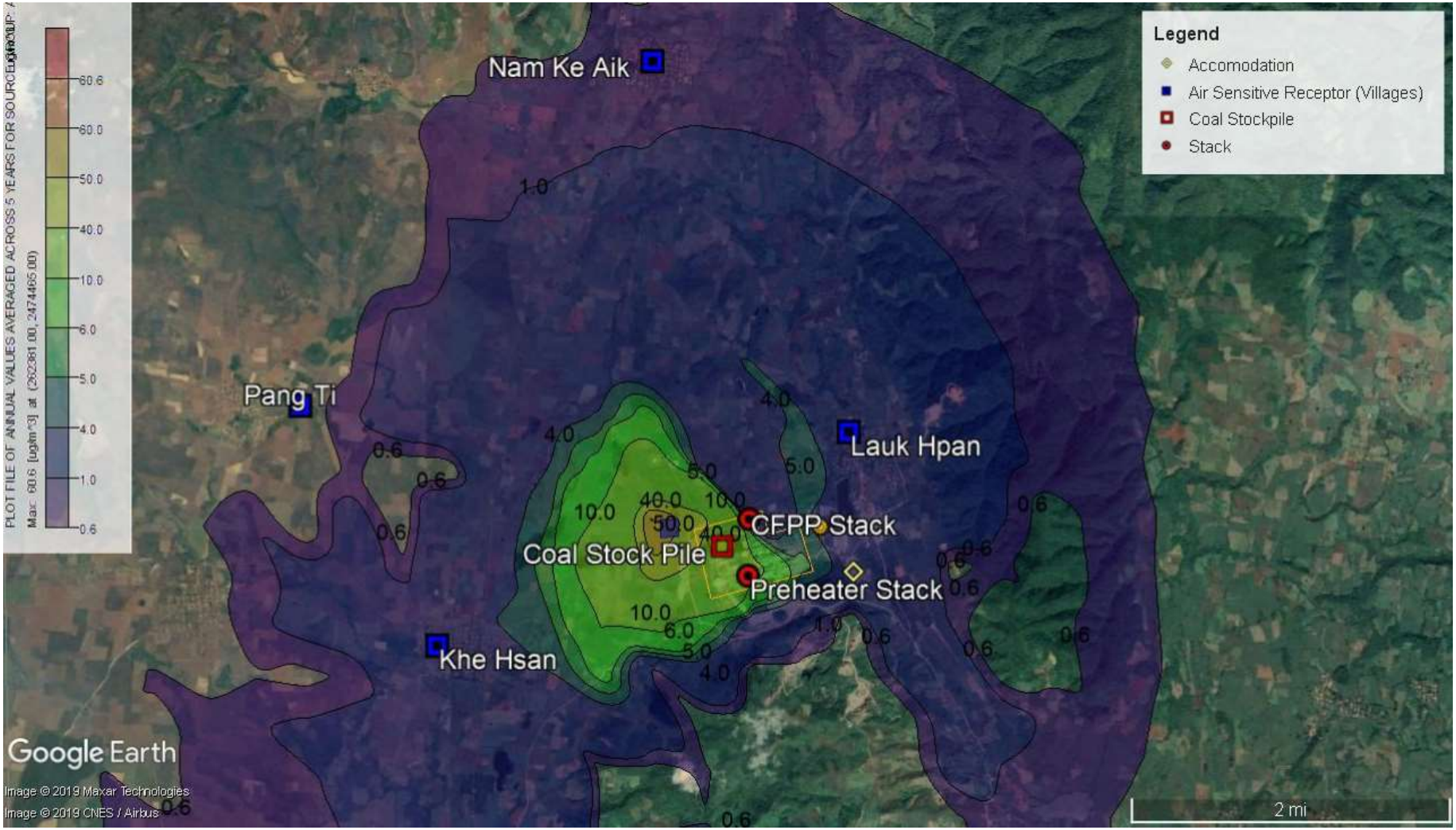


Figure – 115: Predicted PM_{10} (Annual) Concentrations – Kiln Main Stack, CFPP Stack and Coal Stockpile

Predicted SO_2 Concentrations

SO_2 daily concentrations are well below the applicable limits and can be summarized as follows:

Receptor	Avg. Period	SO_2	
		Concentration at Air Sensitive Receptor (µg/m^3)	NEQEG (µg/m^3)
Worker Accommodation Camp	24-hr	14.55	20
	Annual	1.87	-
Lauk Hpan Village	24-hr	20.49	20
	Annual	3.13	-
Khe Hsan Village	24-hr	11.92	20
	Annual	1.11	-
Pang Ti Village	24-hr	10.41	20
	Annual	0.45	-
Nam Ke Aik Village	24-hr	2.38	20
	Annual	0.27	-

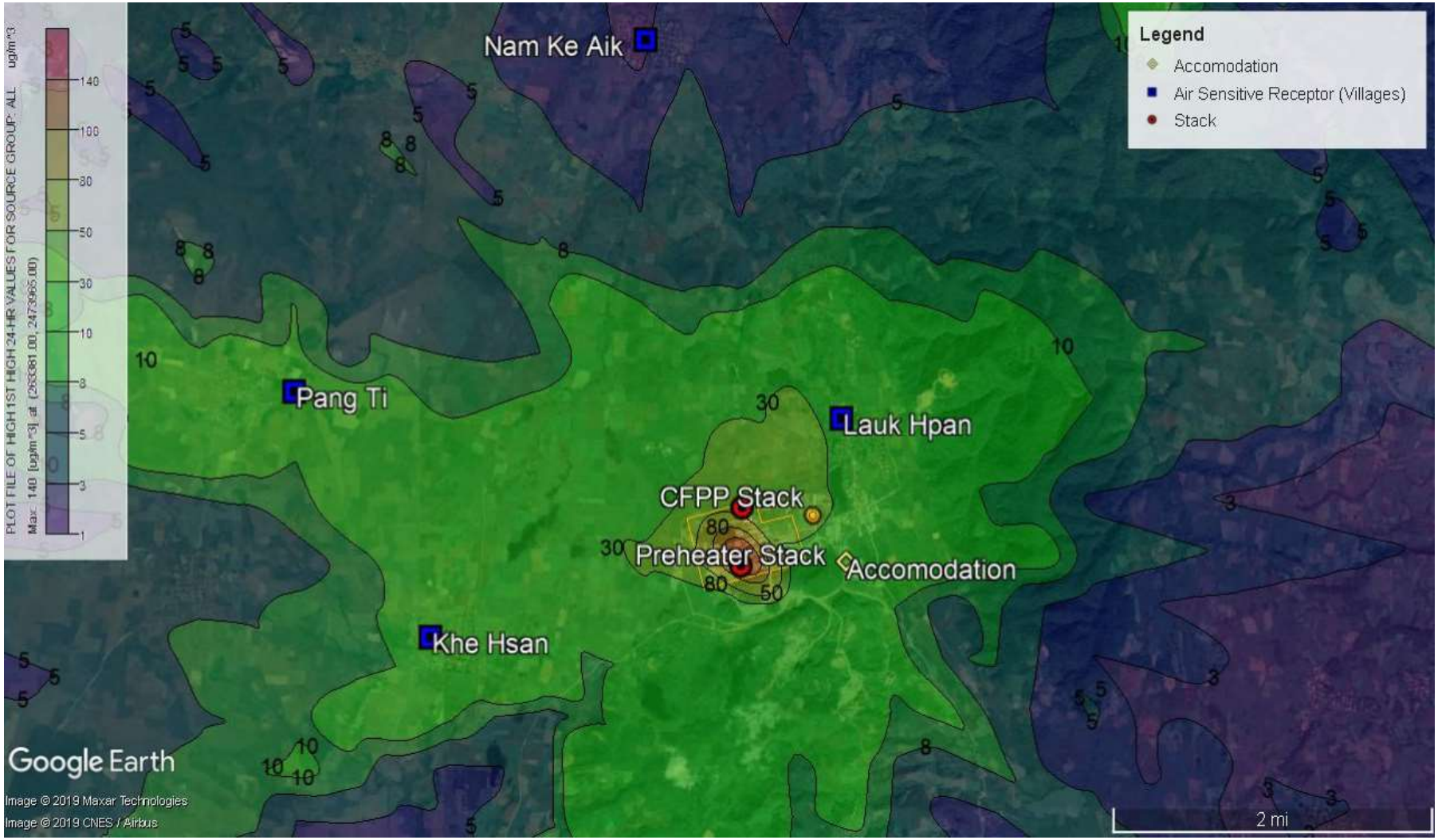


Figure – 116: Predicted SO_2 (24-hr) Concentrations

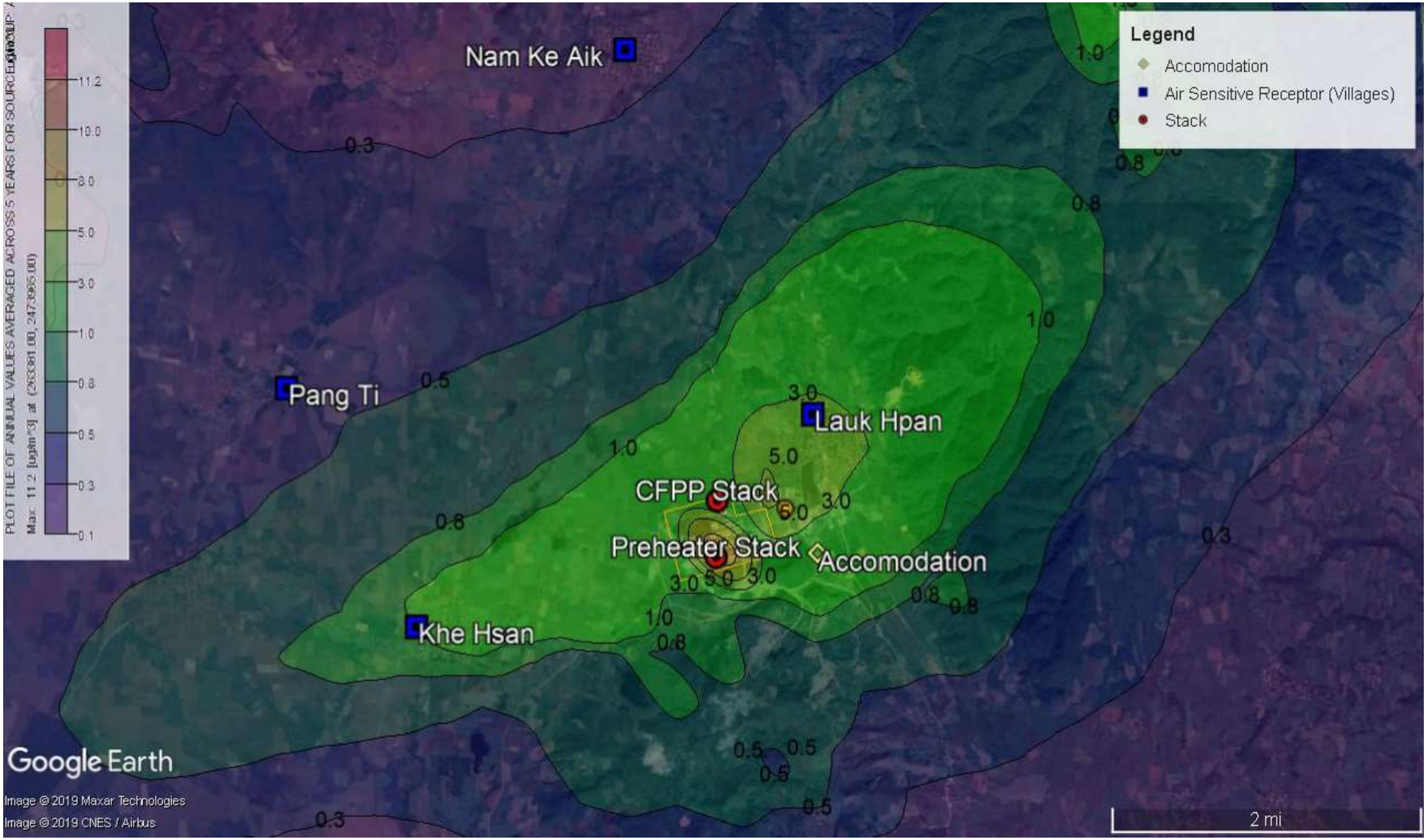


Figure – 117: Predicted SO_2 (Annual) Concentrations

Predicted NO_x Concentrations

NO_x ground concentrations at the air sensitive receptors are shown in the following table.

Receptor	Avg. Period	NO_x	
		Concentration at Air Sensitive Receptor ($\mu g/m^3$)	NEQEG ($\mu g/m^3$)
Worker Accommodation	1-hr	141.36	200
	Annual	2.60	40
Lauk Hpan Village	1-hr	117.50	200
	Annual	4.13	40
Khe Hsan Village	1-hr	119.24	200
	Annual	1.51	40
Pang Ti Village	1-hr	92.89	200
	Annual	0.63	40
Nam Ke Aik Village	1-hr	41.17	200
	Annual	0.37	40

Figure – 118: Predicted NO_x (1-hr) Concentrations

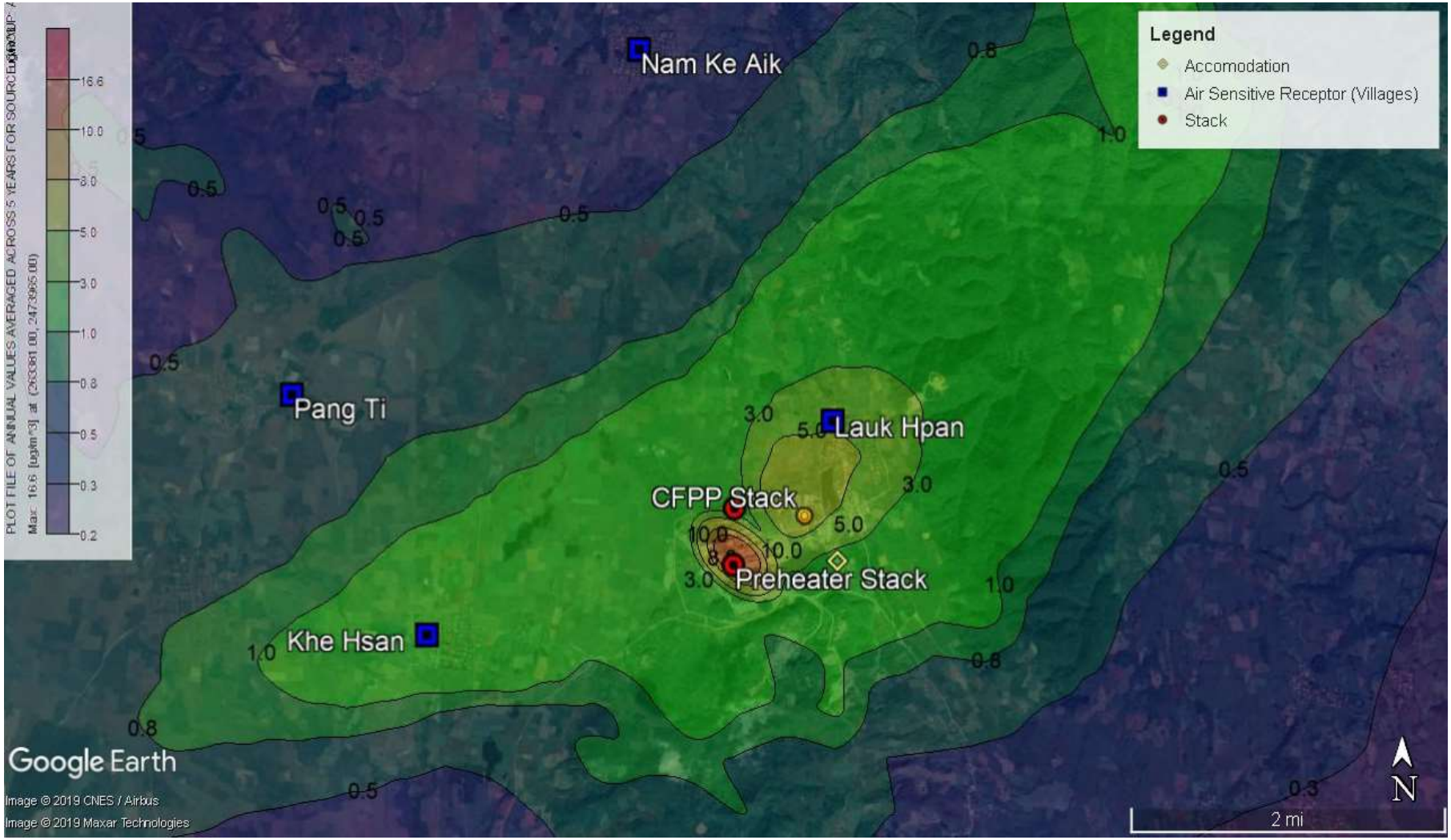


Figure – 119: Predicted NO_x (Annual) Concentrations

Once again the project proponent cannot fully comprehend these computer models and modelling method.

However the experts from SEM have concluded that emissions from these three factories have only a minor contribution to the overall modeled concentrations for PM_{10}, SO_2 and NO_x. This is due to the fact that 7 ESP (3 each for two cement plants and 1 for coal fired thermal plant) and altogether 110 bag filters are installed inside the three plants and inside the whole compound. These devices (ESPs and bag filters) have greatly mitigated or minimized the impacts of PM_{10}, SO_2 and NO_x.

6.2.4.2 Impact: noise and vibration and mitigation measure to be put in place

Noise is generated from a variety of sources in a power plant. Principal sources of noise in the power plant include turbine generators and auxiliaries; boiler and auxiliaries, fans and ductworks; pumps, compressors, condensers; precipilators; motors; transformers, etc.

Outside the plant (inside the plant compound) noise is generated from vehicular movement, crushers, operation of machinery and loading, unloading and handling of materials.

Increase of ambient noise level will cause disturbance or nuisance for the employees, but working in noisy workplace for long hours can impair hearing.

There can be damage to local structures due to vibration. Vibration and loud noise are one way or another, associated.

Mitigation (out line)

- Select machinery, equipment and vehicle which are eco-friendly generating lower sound power level in the first place. (Eco-friendly machinery/equipment can reduce noise level by 20-30%, it is learnt.)
- Install silencers for fans.
- Install suitable mufflers on engine exhausts and compressor component.
- Install wall (acoustic enclosure) for noisy equipment, if possible.
- Plan for acoustic performance of the building in the first place and apply sound insulation as practical as possible.
- If possible will avoid the operation of all equipment at the same time.
- Restrict the hours of operation, if possible.
- In this context the crusher house (jaw crusher and hammer crusher) is built underground and is remotely controlled from a control room. Noise issue from crusher is tackled. Workers are not exposed to long hours of high level noise. Part of the conveyor is underground.

- Modified old vehicles and equipment by incorporating minor design change to reduce noise.
- Implement effective maintenance of vehicle and machinery which can reduce noise level by more than 50%, it is learnt.
- If possible plan and install acoustic barrier (eg. tall wall or any effective sound barrier) to reduce noise transmission to the surrounding; if possible errect barrier between the nearest village and the plant.
- Creating of green belt/green zone; planting fast growing trees, shade trees, fruit trees and timber producing trees. Trees perform as noise barrier or noise abator or absorber. The species already planted by the company are mentioned earlier.
- Design and place noisier equipment further away from others, if possible.
- Design the foundation of machinery to reduce vibration. (Prolonged vibration can damage machinery and building.)
- Install vibration isolation for mechanical equipment; apply vibration insulator, vibration absorber or shock absorber.
- Reduce the speed of heavy truck to reduce vibration.
- Ensure a smooth surface of road to reduce vibration resulting from heavy truck movement.
- Provide adequate PPEs (ear muffs, ear protectors) to workers exposed to long hours of high noise level; especially those working at the two crusher units. (Ear muff can effectively mitigate noise level to 70-90%, it is learnt.)
- Comply with NEQEG guideline by ECD for noise level; manage to meet all statutory requirement.
- Develop a mechanism to record and respond to complaints, if any.

6.2.4.3 Impact of waste disposal (solid and liquid) and mitigation measure to be put in place

(a) Solid waste (mostly ash)

The main solid wastes (industrial wastes) generated from the power plant during the Operation Phase include fly ash, down ash (ash particles is the major waste), boiler slag, cooling tower sludge, waste water treatment sludge. Some solid wastes are also generated from handling of coal and limestone, from coal and limestone stock yards, from belt conveyors facility. Domestic wastes such as trash and debris are generated at the office and inside the premise. Food waste is produced from the kitchen and messing room. Unless systematically managed, these solid wastes will have serious impacts on the environment.

The three main solid waste are fly ash, bottom/down ash and limestone dusts and the quantities generated per day are:

- Fly ash (60%) (20-60 MW) : 230.4 – 604.8 tons/day
- Bottom ash (40%) (20-60 MW) : 153.6 – 403.2 tons/day
- Limestone dusts (5%) (20-60 MW) : 11.5 – 30.24 tons/day
- Waste water treatment sludge : 0.2 – 0.5 ton/day

Boiler slag is negligible due to complete combustion. It is not yet able to calculate wastes generated from handling and conveying etc and are generally negligible. Only about 20 kg of domestic solid waste is generated par day.

Solid waste, in the form of coal dust is also generated at coal stock yard and coal dust can leach into the soil. The coal from the common open storage yard for all projects is now removed and stored in 4 separate coal warehouses with concrete floors, roofing and walls (coal warehouse No.4 is for this project; the other 3 are for cement project). Coal from warehouse No.4 is transported to crusher and then to hopper by long conveyor (trucks are not used).However, these 4 coal warehouses cannot still accomodate all the coal needed for the three plants. Some coal has to be still stored in open coal stockyard with concrete floor (to prevent percolation) temporary from time to time; the stockyard is also bunded to prevent the spread of coal and any potential seepage.

Domestic solid waste – e.g. office waste, housing waste, kitchen waste, trash are collected in waste bins and regularly disposed at the landfill in the north west.

Mitigation (out line)

- Plan and manage for the safe and systematic disposal of solid waste; track all wastes generated; assess the volume per daily or weekly basis.
- Practice dry handling (collection) of fly ash and down ash; apply conveyer belt for transportation of ash; trucks are not used for transportation of ash. Ash is stored in separated ash silos for fly and down ash.
- If possible recycle the ash eg: into cement fly ash brick, various concrete application. (the company has done this.) Or use ash as farmland fertilizer, or road and embankment filling.
- Also recycle or reuse other solid waste; dispose only non-recyclable wastes. eg. The company has used bottom ash for road filling, limestone.
- Dust ($CaSO_4$)is reused in cement processing.
- As regards slag removal simply collect and dispose or use slag for construction purpose.

- Reuse sludge from treatment of water eg: as fertilizer.
- As regards sludge disposal it shall be dried or incinerated before disposal at a landfill.
- Have a separate system for domestic waste collections and disposal.
- Always avoid dumping of any solid wastes (both industrial and domestic) into the river or on land.
- Also always avoid open burning of any solid waste; use incinerator and then dispose at approved landfill.
- If possible apply High Concentrated Slurry Diposal Technology (HCSDT).
- Plan for minimization of solid waste as practical as possible.
- Also plan for solid waste leachate collection and disposal.
- Ensure that coal dust residual at the former open stock yard is thoroughly removed.
- Also collect and remove coal dust inside coal warehouse regularly
- Consider for future reclamation, comprehensive utilization and outward transportation (dispose at further distance) of solid wastes.
- Educate and train workers for good house keeping practice; do not litter.
- Manage to meet all statutory requirements Municipal Law regarding solid waste management.

(b) Liquid wastes/waste water/used water

Waste water includes industrial waste water (thermal discharges and waste water effluent) and domestic waste water (including sanitary waste water). Industrial waste water includes a variety of waste water: waste water stream (effluent) in plower plant waste, process waste water, thermal/boiler blow down, cooling water blowdown, ash handling waste water, leachate waste water material storage runoff, boiler chemical clearing waste water, floor or yard drain, water from roof drain, storm water, coal yard rain water, washing waste water at unloading platform, and waste water from vehicle, machinery washing and oil-contaminated effluent.

Waste water stream (effluent) and process waste water are generated from the daily activities of the plant but only in small or negligible quantity as water is almost 100% recirculated.

In this factory context the two main blows down are boiler blow down and cooling blow. Boiler blow down and cooling blow down take places daily and weekly, respectively.

Ash handling is done by dry handling method; no water is used and therefore no need for ash pond.

Leachate water, runoff, washing waste water at unloading platform and waste water from vehicles, machinery washing and oil contaminated effluent occur from time to time (not daily).

Oil and grease are usually generated only from fuel (diesel) based power plant but not from this coal based power plant.

Generally industrial waste water/used water includes:

- total suspended solid (usually is largest quantity) and oil and grease (substantial in fuel-based plant but only negligible in coal based or gas based plant)

The followings are present usually in very low concentration e.g. Fe, Lead; while the following are present in much lower concentration e.g. chlorine, chromium, copper, iron, zinc, lead, cadmium, mercury, arsenic, phosphorous.

This is from theoretical perspective; but in this coal fired plant context chlorine, cadmium, chromium, copper, lead and zinc are not detected in water analysis (all are NIL).

The newly installed waste water/used water treatment plant is mainly for the treatment of waste water/used water (not sewage). It can treat 480 tons/day. The treated water is 100% purifed and resued in manufacturing process.

In this coal-fired plant context the whole process can be summarized as follows:

Since raw water is not used, water is treated and purified first place by mean of Reverse Osmosis (RO) membrane system and water softener. A variety of mechanical filters and zeolite softeners are applied. The quality of water for use is tested daily or weekly to maintain good quality water. The water is for use in boiler. Hot steam drives the turbine that generates electricity. The steam is cooled down by condenser and water is re-circulated. The steps involve passing through cooling tower and 4 large cooling tanks. The water is then re-circulated for reuse by two powerful mechanical filters (filter pumps). These two filter pumps can effectively filter the used water so that almost 100% can be re-circulated and reused.

Actually there is virtually no discharge of waste/used water. Only small quantity of water from boiler blow down has to be discharged. Before discharge simple conventional physical treatment (that is sedimentation and gradually cooling) is undertaken at the setting pond and then discharge when the temperature of discharging water is about 3ºC higher than the receiving water body, the large earthern pond.

Since the water is treated and purified in the first place and no chemical are involved the used water/waste water is not hazardous. Almost 100% is recirculate and the small portion to be discharged (e.g. boiler blow down, wash water, occasional floor yard wash etc.) are cooled down in three steps: at three cooling tanks 1, 2 and 3 and settled there. The sedimentation of overflow water takes place at mechanical filter and then passes through a series of softeners. In this way the water is purified and flow into storage tank.(After completion of the newly

constructed waste water/used wayer treatment plant boiler blow down and cooling blowdown are no longer disharged but all are recirculated.)

Other industrial waste/used water in the form of washed water will simply flows down the drain and end up in the large earthern pond (impoundment) in the north-east. As mentioned above the water is treated and purified in the first place before use and no chemicals are involved. The used water/waste water is not harmful.

It is estimated that the generation of waste water:

- from the power plant is 2070 tons/day (actually almost 100% of generated water is re-circulated. However, small quantity (19.2 tons/day) of blow down water will have to be discharged. The blow down water flows into a sedimentation tank (physical sedimentation treatment) gradually cool down and finally discharge at a temperature not higher than 3ºC of the receiving water body (the large earthern pond or small lake in the north east). The pH of the used water/waste water is only 8-9 (not acidic and not harmful to the soil and organisms). However, after the completion of the new waste water/ used water treatment plant boiler blow down and cooling blowdown are no longer disharged but all are recirculated).

- from the domestic waste water is about 15 tons/day at the moment. This is also not given special treatment but only sedimentation treatment before final discharge.

Only power plant waste water is treated by means of mechanical filtration (capacity 120 ton/hour) for recirculation. The filtrated water is re-circulated for further uses. The pH of the waste water is 8-9 pH (not acidic) and not harmful to the soil.

Mitigation (out line)

- Drainage system has been constructed for the whole 280 acres area in the first place (Main drainage canals and subsidiary drainage canals for each building underneath eaves). Rain water run-off and storm water will be simply managed by this drainage system.

- Plan and establish a waste water treatment plant to collect, treat and dispose off effluent; also for recirculating some waste water eg. from boiler, condenser (not materialized yet).

- Plan and manage for systematic treatment and disposal of both industrial and domestic waste waters; assess the amount generated on a daily or weekly basis.

- As the plant use water in a range of cooling methodology ensure that the project does not compromise the availability of water.

- As a mean of conservation of water, cooling and recirculation systems will be installed.

- Efficient condenser will be applied for effective cooling and recirculation and reuse of boiler fed water.
- Assess the use of water regularly; conserve water as practical as possible.
- Educate and train workers for conservation of water as practical as possible; also train them for good house keeping practice as far as handling of waste water is concerned.
- Avoid indiscriminate discharge of waste/used water on land and into water course/water body by all means.
- Avoid accidental spillage of waste/used water; should there is any spillage immediately tackle the issue (wipe out or wash down).
- Also avoid accidental spill of fuel oil; should there is any spill do not wash down with water but use absorbent (rag saw dust) for removal.
- Harvest rain and collect storm water during rainy season, if necessary. There is no need to use storm water as water is not an issue.
- Reuse most industrial waste water for processes inside the plant; discharge the rest only after treatment. Ensure that it is treated before discharge utilizing conventional treatment methodology. In this factory context the waste water (process power plant) is recirculated applying two mechanical filters 60 tons/hour capacity each. Almost 100 % of the water is filtered and reused.
- Install oil separator for oily runoff water (oil and chemicals will be stored in appropriate depot, to prevent contamination).
- Collect used oil in old drum and give away to recylers.
- At the moment domestic waste water (from office, kitchen, bath, etc.) goes into the drain into domestic waste water sink, a water impoundment area trasmfomed into a sink. Fish cultured in this impoundment are normally growing well indicating that the water quality in this impoundment (sink) is still good. Sanitary waste water from toilets goes into the septic tank and soak thank. However conventional treatment involving screening, sedimentation, probable chlorination and discharge will be applied separately for coal-fired thermal plant. The company has a plan for this but not materialized yet.
- At the movement the simple treatment means only physical treatment, that is sedimentation, natural gradually cooling and forced fiteration by filter pumps.
- Sludge from sewage treatment plant will be dried, and if possible vermicompost and used as manure (As the waste water (process power plant) is almost 100% recirculated the amount of sludge generated is only 02-0.3 ton/day).

- Follow the 5Rs principle, reduce, reuse, recycle, recover and redesign as practical as possible. Thermal water is not discharged but recooled and recirculate almost 100 % (Not need for discharge of water at 3°C higher than temperature of the receiving water body, receptor).

- Plans for treatment of domestic waste water from workers housing. (As mentioned earlier the plan has not materialized yet.) The domestic waste water is drained into the large pond in the north east created from a natural water impoundment area (during rainy season).

- At least reuse crude re-circulated water for dust suppression and for watering plants.

- Manage to meet all staturory requirements- rules, regulation regarding waste water management.

6.2.4.4 Occupational health and safety (accidents at work places) and mitigation measure to be taken

As in the cases of all workplaces inside a factory there is the potential for occupational hazards inside a coal-fired thermal power plant. There is also the issue of community health and safety.

It is generally agreed that the five common hazards inside a power plant are: dust, heat, fire and explosion electrical hazard and chemical hazards.

Dust (PM): contains silica which can cause silicosis (a disease of the lung caused by inhalation of silica dust). PM sometimes contains arsenic particle which can cause skin and lung cancer. Coal dust can cause asthema and black lung and even lung cancer.

Fire and explosion: The thermal plant has to stores, transfers and use huge quantity of coal and also substantial amount of fuel. Furnace and boiler can become source of fire and explosion. Boiler hazard is considered a common hazard for power plant workers.

Heat: The work involves high temperature (hot work) and this is considered occupational hazards for workers.

Electrical hazards: All energized equipment and power lines can pose electrical hazards for workers, such as electrocution, electrical shock and burn.

Chemical hazards: Although no toxic chemical or strong acids are used in a power plant certain chemicals and substances when handling in large volume for long period can cause hazards to workers eg: lime slurry, strong caustics and certain weak acids.

The company is aware of all these occupational hazards and will do its best for the avoidance, prevention and management of these hazards.

Mitigation (out line)

- Plan and implement safety working environment at the coal-fired power plant and also consider for the safety of the local people in the vicinity.
- Try to achieve zero accident at the work places thoroughly as well as zero accidents for the lcoal people nearby.
- Thoroughly educate, train and supervise the workers for good working practice and good safety practice until the good practice become a good habit ingrained in their mindsets; also train them for safety awareness.
- Train them for safety handling and operation of machinery equipment and also electrical ones including cables, fixtures, etc.
- Organize induction training for new workers; provide work manuals and safety manual.
- Ensure that electricians are of high qualification; check all electrical words, cables and hand power tools for faults, leaks, defacts and malfunction and immediately fix the faults, leaks and malfunctions.
- For pragmatic purpose: use automated combustion and safety control.
- Avoid accidental fire and explosion by all means. Store flammable materials away from ignition source and oxidizing materials; or get rid of all ignition sources. Especially train workers for prevention/avoidance of fire and explosion.
- Set up alarm system for instance, fire detector, heat and smoke detector, pressure detector etc.; general alarm system for emergency and for malfunction and breakdown of machinery; alarm system of emergency shutdown of the factory and system for immediate repair and re-operation of the whole factory. Set up alarm system for power outage and backup system (generator); also system for main control for switch on/switch off of electric power.
- Maintain boiler safety control for the long run operation; provide effective training for the long run operation of boiler; control temperature and pressure.
- Also maintain safety control of turbines, generators, compressor, safety running of all equipment including steam system, condensers cooling system. Safety operation of crusher, conveyors and so on.
- Regularly clean the facility and prevent accumulation of solid fuel.
- Provide all necessary PPEs, eg: face masks, nose and mouth covers, ear muffs, gloves, boots, helmets and also special suits for hot works to workers exposed to dust, emission, heat, loud noise.

- Keep the fuel dump at a safety distance; the storage facility must have concrete floor and roofing at appropriate hight; bund the dump and put up signage and warning signs; also bund storage area of lime, chemical etc. Effectively train worker for the safety transportation and handling of fuel oils, chemicals etc.
- Ensure that all workers pass a medical examination prior to being employed.
- Provide First Aid and basic Firefighting trainings for workers.
- If necessary organize regular drills or mock drills for emergency response.
- Draw detail plan for prevention of fire and emergency plan, covering emergency preparedness, emergency response, emergency procedures, contingency plan and rescue operation plan.
- Provide adequate firefighting suits and equipment (fire extinguishers, water jet pumps, fire water pond to be always filled with water.
- Display addresses phone numbers of Fire Brigade, Ambulance Service, Hospital and Police Station so that everyone can see easily.
- Take out insurance for the power plant and consider for life Insurance for every worker.
- Train workers for awareness of health and hygiene; provide adequate drinking water, proper sanitation facility eg: bath room and toilet, for them.
- Plan for full medical care for workers.
- Manage to meet all statutory requirements (rules, regulations, factory act, labour act) for safety of workers as well as local people nearby.
- Prevent adverse impact on the quality of local drinking water; avoid potential hazards pose on the public; conduct road safety education for the locals; prevent accidental release of hazardous materials; prevent the occurance and spread of communicable disease among the workers as well as locals.

6.2.4.5 Impact on traffic and mitigation measure to be taken

The proposed site is about 5 miles north of Mandalay-Lashio highway (between Pyin Oo Lwin and Naunghkio). The access road linking the site and highway was built by Ngwe Yi Pale' Cement Co., Ltd. The access road is 4.5 miles long and 20 feets wide. The company has deployed heavy haul trucks for transportation of coal from various parts of the country. Moreover, limestone as well as fuel has also to be transported by heavy trucks. But limestone quarry site is only one mile away in the south. These heavy trucks have also to be used for transportation inward of coal and outward of finished cement products, cement bags.

In this coal-fired thermal plant context logistics has to be planned only for the procurement and transportation of coal from the township of Yatsauk, Thibaw and Nantsam. Of the total

286,750 tons of coal per year for three factories combined 95,000 tons will be for this project. (300 tons of limestone needed will be shared with the stock of two cement plants).

For transportation of coal for the three plants the company has 100 trucks (20 tons type). 20 tons heavy trucks will be deployed and the trips per year of 300 operation days are 4,750 (475 trips per month and 15 trips per day). Generally one vehicle every two hours have to be deployed the whole year (300 operation days) round, that is a net increase of one vehicle on the road every two hours.

The common wide open stock yard for coal for the three plants in now removed and coal is now stored in 4 different ware houses with roofings and walls. Coal ware house No.4 is for this thermal plant. Procurement of coal for all will be done by Crown Cement Factory. In the near future there will be no need for the thermal power plant to procure and transport coal. Coal will be shared with the common stock of coal for 2 cement plants.

Operations of two large cement plants have already increased traffic volume in the areas. Operation of a thermal plant will add to the traffic issue. The increased traffic can be especially significant in sparsely populated areas. The traffic issue on the access road (from Mandalay-Lashio highway to the site) may not be a serious issue. But the Mandalay-Lashio highway has heavy traffic and so the issue on the high way can be quite serious.

Traffic accidents have become one of the most significant causes of injuries and fatalities worldwide. Prevention and control of traffic-related injuries and deaths is necessary. Prevention and control will include the adaptation of safety measures that are protection for company workers and road users, including locals who are most vulnerable to traffic accidents.

If trucks loaded with coal are not covered fugitive emission of dust (dust spill) can occur along the way, causing traffic nuisance and health issue. (All trucks are well-covered with tarpaulins; this is compulsory). Therefore fugitive emission of coal dust during transportation is not an issue. Ash generated is not transported by trucks. A conveyor is used to convey the ash to two ash silos, one for down ash and one for fly ash.

Mitiagtion (out line)

At the moment the project proponent is not in a position of collect the quantitative data on the traffic on the high way through observation and calculation (at the moment beyond the scope of this report).

At the moment it is also not yet possible to assess and map traffic pattern; assess traffic volume and level of service (LOS), and traffic flow rote on the high way.

Most of all the project proponent as well as the consultant firm do not have the slightest idea on "Congestion Management Programme (CMP)" as practiced in developed countries.

However, for pragmatic purpose the project proponent will do its best to undertake the following mitigation measures as practical as possible:

- Compliance with traffic rules and regulations, eg: High Way Law, 2000
- Plan and manage for road safety by all means.
- Strictly prohibit the drinking of alcohol and use of narcotics when driving hours.
- Set up sign board, traffic signal, speed limit etc at road intersection (of access road and high way) to direct heavy truck drivers to reduce speed at this intersection; and also along the access road where necessary eg: near school or sensitive area.
- Emphasize safety aspect among drivers; organize training and accident prevention class.
- Educate the trucks drivers and all other drivers for road safety.
- Educate them for defensive driving; heavy truck with big loads to be travelled at reduced speed; drivers must wear seat belts while driving.
- Never overload the trucks with coal, limestone etc; heed to road regulation.
- Ensure that all the loaded trucks are covered with tarpaulin and ensure that there are no spillages along the way.
- Adopt limit for trip duration and arrange driver rosters to avoid overtiredness.
- The driving hours per day for a driver will be less than 10 hours.
- Avoid dangerous routes as far as possible and peak hours of the day to reduce the risk of accidents; if possible schedule the time to avoid peak hours.
- If possible use speed control devices (governers) on trucks and apply remote monitoring of driver action.
- Regularly check and maintain vehicle to reduce accidents; ensure that there are no equipment malfunction or failure; procure brand new quality vehicles.
- Keep the vehicle well-operated, well-maintained and well-lubricated. Keep a log book each for all company vehicles.
- Have a record book and check the arrival and departure of all trucks and vehicles.
- Ask the dirvers to reduce speed when passing through or near a village to reduce dust generation and vibration (especially if the road is a dirt road).

- Try to achieve zero road accidents, both for locals and the domestic animals; and also take special care when driving along stretches located near schools or locations where children may be present.
- Try to implement safer and more efficient traffic pattern; try to reduce traffic congestion and traffic level.
- Deploy a staff at the entrance to direct traffic and systematic parking.
- Ensure that the parking area can accommodate all vehicles.
- (As mentioned above logistics for coal may no longer be necessary for consideration. Coal ware house No.4 is allotted for this coal thermal plant and the procurement for all 3 plants will be undertaken by Crown Cement Plant alone.)

6.2.4.6 Potential social issue and mitigation measure to be put in place

These are already mentioned in the Construction Phase. Such cases are unlikely to occur during the Operation Phase as all workers are handpicked by the authority of the factory. Unlike the blue collar construction workers who are employed for short term (two years) the workers in the Operation Phase are permanents workers. It is expected that they are better well-disciplined than the construction workers. However, when many employees are camped inside the compound there is always, the potential for social issue.

(The coal fired thermal plant has 150 employees while the two cement plants have 1016 employees, totalling 1166 employees.)

Any way the authority of the factory has to deal with these workers on a long term basis. Measures for creating a peaceful and productive atmosphere will be taken into account.

Impacts on the socio-economic component of the area can be in the form of:

- Potential damage to existing roads caused by movement of heavy trucks and machinery; and continual uses of vehicles moving to and from the sites can impact the safety of people and domestic animals.
- Generation of dust, and noise causing potential disturbance or nuisance to the local people.
- Dust falling on farm land can have potential negative impact on local crops. But the only main crop in the area is sugar cane, not directly edible vegetables. The leaves of sugar cane are already tested at the Department of Research and Innovation Analaysis Department where Fe, Pb, Cd and Cr were tested.
- Potential contamination of local drinking water sources due to land reclamation activites, (earth piling, earth levelling), if any.

- Potential siltation of nearby farms during rainy season due to land reclamation activites, (earth piling, earth levelling), if any.
- Ill-social behavior of workers or locals can lead to quarrels and brawls among themselves or with locals; theft, misappropriation of materials and money, vandalism, unethical sexual practice or sexual offences, spread of Sexually Transimitted Diseases (STD) and so on (as the site is near a village). These can have also certain negative impact on the project.
- Loss of natural resources or livelihood, mental agony and risk of food security etc, especially at sources of raw material (coal, limestone etc).

Mitigation (out line)

Provide adequate housings for the workers (The company has already done this. There are separate housing/dormitory for male and female works, and messing halls. 904 workers are camped here. Healthy food, and potable water are provided; and adequate lavatory facilities for to all workers are provided).

Educate employees to be good workers who are dutiful, well-disciplined and diligent. Give them proper training on factory and work place regulation, and code of conducts.

Apply punitive measures such as termination of job or demotion to wrongdoer. Also apply incentives to boost production. Prohibit the drinking of alcohol in the work places; ban the use of narcotics.

As for dealing with local community educate workers regarding local cultural behavior and awareness to achieve responsible and healthy community interactions; to respect their culture, traditions and customs. Educate then to follow the "Do" and "Don't" when dealing with the locals. Organize short lecture courses and instruction of this matter.

Prohibit all kinds of quarrels and brawls taking place among the workers and also between the workers and local community. Take punitive actions.

Prohibit all kinds of unethical sexual practices or sexual offences.

Prohibit the misappropriation of materials and money as far as possible.

The company will deal with the employees on a fair and square basis. The company is aware of widespread cases of workers unrest in Yangon as a result of overworked, underpaid, and unhealthy relation between the employees and the factory authority.

In addition to regular medical checkup, voluntary HIV testing on the workers is necessary as they are permanent workers of the factory.

- Consider hiring locals in the future when there are vacant posts, especially unskilled jobs.

- Prioritize the purchase of foods and commodities from local market
- Try to reduce the potential impact to quality of existing life style of the local community in the area.
- Avoid/prevent potential contamination of local drinking water and potential siltation of fields and farms.
- Avoid/prevent potential negative imapct on farm land and crops.
- Conduct testing of farm land soil and leaves of crops (the only local crop is sugar cane) to detect any negative impact, and mitigate the impact, if possible. (Soil test and leaf test mentioned earlier in Chapter 5, 5.1.3. Mercury not detected in all 5 soil samples; cadmium detected in 4 samples; lead, iron, cadmium and chromium detected in all leaf tests). But it is not possible to speculate if the presence of these 4 elements are due to activities of the coal fired power plant.
- Implement CSR programme for the community (certain CSR actions had been already taken by Ngwe Yi Pale' Cement Co., Ltd).
- Maintain cordial relation with the local community (Appoint an affable liaison officer to liaise with the locals).Avoid friction between the company and the locals.
- Listen to the views, thoughts and opinion of the local people, heed to their concerns.
- Consider for gender parity; employ women workers as practical as possible.
- Ensure that there is no issue of child labour.

6.2.4.7 Potential security issue and mitigation measure to be taken

This is already mentioned in the Construction Phase when 92 workers were employed. Unlike the hectic nature of work during the Construction Phase the working atmosphere during the Operation Phase is stable.

However security situation tends to slacken when a power plant is running for several years. So for the long term Operation Phase the plan for security will be more practical. It is expected that the employees (150) hand-picked by the power plant authority will not pose any security threat to the power plant. But outsiders, the local people, at one time or another can cause security problems such as theft, vandalism etc.

Mitigation (out line)

Security will be planned for the long term. The wall of the power plant compound will be good and reliable enough to keep the intruder at bay. Educate security personnel of the power plant to be attentive and dutiful. Always restrict the access to the power plant; if necessary set up watch towers.

All workers, both white and blue collar, will wear uniform and keep ID card for easy identification.

Security will be tight throughout the entire Operation Phase.

- Regularly check the fence and wall of the power plant compound to ensure adequate security.
- No unauthorized person on site.
- Security guards at entrances; and patrol inside at night.
- Keep things under lock and key as far as possible; take regular locks inspection.
- Also post security guards or watch men at the site.

6.2.4.8 Potential visual impact and mitigation measure to be taken

When the construction of power plant is complete it will, together with the existing cement plant, stand out prominently in its surrounding. The big structure together with the tall stack may not be in harmony with its surrounding of degraded forest. It can have certain impact on the natural scenery of the area. Environmentalists can considered this as visual negative impact or simply sight pollution.

Conditions were dark at night in the once prior to the establishment of crown cement plant. So the local community, even from a distance, can have the so called lighting offensive at night. Bright light is also considered sight pollution. (Children living in bright cities no longer have the chance to enjoy looking at the twinkling stars in the sky at night. Some environmentalists view this as an infringement on the basic human rights of the children.)

Bright light at night has the potential to attract hundreds of insects from the vicinity and kill them.

When the coal-fired power plant is established there can be more impact of light of this rural environment. The company authority will not use excessive light at night but only for security reason.

There are no aesthetic or scenic spots of beauty for tourist's attraction; there are no outstanding historical or religious monuments and structures etc and also no outstanding natural landmarks (eg- a great rock, a beautiful lake) to be impacted.

However there is the alteration of natural landscape due to the establishment of the two factories, (not this project). The clearing of vegetation and the subsequent construction works for these 2 cements factories have already transformed the natural landscape to an industrial landscape. Of course this is inevitable for every developmental project. After all this can be

construed simply as a small sacrifice of the ecosystem for the sake of industrial and economic development of the nation.

Mitigation (out line)

When painting the buildings and structures consider for visually agreeable colours. Do not use bright red paint or bright yellow paint which will be offensive to the eyes. For instance use light gray colours or light brown colour (or colours that are quite pleasing to the eyes).

- Create green lawns and green belt inside the premise as soon as the construction work has completed.

Reforest the surrounding area of the premise. This will greatly mitigate the visual impact; without green lawn and green belt the power plant will look like an outcropping structure amid its surrounding.

- There is no scenic spot of tourist attraction in the area that can be impacted by this project.

- Provide appropriate lighting at night only for security reason. Avoid excessive use of light at night. Follow the principle of Singapore (Dim City) that save energy rather tham that of Hong Kong (Bright City) which uses excessive lighting for ostentatious purpose. Since white light attract, more insects use yellow light. Switch off the light for a while if too many insect aggregate at the lamps.

A lamp installed at the top of the stack will ensure that the stack does not pose hazard for air planes, if any.

The company has conducted the creation of green belt and green zone (the compensatory planting of trees) and so when the trees are fully grown up the buildings and structures shall be more or less in harmony with the surrounding landscape and will no longer standout in too contrast with the surrounding.

The area of this project site is only 12.3 acres just a small portion of the overall 280 acres. No further substantial impact on the landscape already impacted by the two existing cement plants.

6.2.5 Positive (beneficial) impacts during the Operation Phase

The potential positive impacts during the Construction Phase had been already mentioned.

The positive impacts during the Operation Phase are long term positive socio-economic impacts.

The most significant positive impact that can be easily seen is job creation. 150 workers will be employed permanently. This is a not so small benefit for the country, and a very big

benefit for the region, especially in this time of high unemployment. It is a well-known fact that many of our youths have to go abroad for jobs and have to work in unfavourable work places and working conditions.

The proposed salaries for the 150 staffs that range from 144,000 Kyats (the lowest blue color job) to 600,000 Kyats (the highest white color job) are reasonable, and are indeed higher than employees of government service.

These 150 employees can enjoy certain social benefits such as; free ferry, free lodging and overtime wages. There will be a worker welfare teashop and food shop with reduced price for the workers. There will be recreation facility for them and they will have the rights to enjoy their leisure time. All the staffs will surely get special health care when sick or injured.

There can be employment opportunities from vacant posts from time to time or extra jobs when the business progreses well and when there is an expansion of the business in the near future. The door is still open for this.

The benefit that will accrue to the nation as result of the direct investment inflow of USD 10 million has been already mentioned. This will contribute in one way, or another, to the GDP of the nation, to a certain extent. The follow up economic benefit to the country in the form of income tax, duties and revenues from the business (including those from the staffs) will also contribute to the economy of the nation in one way or another. In short the beneficial impacts are:

- Provision of electricity; village electrification and uplift of back ward area.
- Improve residential environment and health.
- Community benefit & social value.
- Job creation, benefit to local economy, stability and availability of reliable energy.
- Provide clean energy, reduce GHS, reduce dependence on fuel.

6.2.6 Potential negative impacts during the Decommissioning Phase

Since this phase will come 30 years later (at the end of Operation Phase) only a very brief and generalized account will be given.

The company will hire a decommissioning contractor for doing the decommissioning work. The works will include isolation and shutdown of the plant; demolishing and dismantling of all the buildings and structures and also dismantling or removing all machinery and equipment. Materials that are salable will be put up for sale; those that have to be disposed will be systematically disposed off. The plot will be cleared and if there are contaminated soils this will be removed. All redisuals, if any, will be removed.

6.2.6.1 Impact: potential dismantling, demolition and clearing impacts (decommissioning impact) and mitigation measures to be taken

As in the case during the Construction Phase the impact such as accidents in work place, due to lack of management and training, can occur. This can be prevented and/or mitigated.

Mitigation (out line)

- Plan and manage for safe and effective decommissioning work.
- Hire decommissioning contractor for the demolition of buildings and structures and dismantling of equipment; and also tidying up the site.
- Dispose those that are no longer useable at an approved land fill.
- Machinery and equipment that are obsolete must be made into iron scrap and sent to smelting mill.
- Remove all soil contaminated by oil spill and dispose off at an approved land fill or dump site.
- Put up for sale or reuse certain equipment that are still usable.
- Level the ground; plant trees and commence rehabilitation work and restore the site to its original condition more than 30 years ago.

6.2.6.2 Potential residual impacts and mitigation measures to be taken

After 30 years of operation the soil can be contaminated by fuel spills or residual chemicals, even though no toxic or harmful chemical are used. The contaminated soil has to be removed and disposed off to an approved landfill. The last chemical testing for soil will be required. The soil at the former open coal stock yard will be also test. (Coal was later removed to 4 coal warehouse with roofing and wall but contamination may probably remain at the former site). The soil structure/profile has to be restored to its quasi-original condition as practical as possible.

Mitigation (out line)

- Plan and manage for effective removal and clearing of all residuals.
- Test the soil for any contamination by fuel oils or hydrocarbons; hire technicians (no chemicals is used throughout the Operation Phase)
- Also test the water in the vicinity for pollutants; hire technicians.
- Remove soils contaminated by fuel oils and chemical; dispose at an approved land fill.
- Ensure that all contaminates are removed; conduct final chemical testing.

- Also removeall other residuals, if any, resulting from 3 plus decades of activities.
- Test the air, water and soil for the last time to ensure that none are contaminated; no trace of pollution left.
- Restore the soil to its natural condition as far as possible and commence rehabilitation task; continue the work until a green zone is created (or) put up the plot for sale (or) redeploy the plot for any business.

Note – There can be negligible air emission impact due to such activities as dismantling, moving, removing, disposing and tidying up works.

However, there can be no impact on water environment or effluent impact as no water is used at all during the short Decommissioning Phase.

6.2.6.3 Potential impact on air quality (air environment)

There can be negligible air emission impact due to activities such as dismantling, removing, disposing and tidying up works.

Mitigation (out line)

- Spray water, where necessary
- Keep machinery and vehicles well-maintained, well-operated and well-lubricated
- Restrict vehicular movements
- Avoid open burning of any solid wastes
- Provide PPEs, to workers where neccessary

However there can be no impact on water environment or effluent impact as no water is used at all during the short decommissioning phase.

Note: Each and every impact/potential impact during construction, operation and decommissioning phases are mitigated. For each and every impact there are a variety of options for mitigation measures to be taken. These are already described in technical details. The project proponent really believes that these different options of mitigation measures can mitigate all the said impacts completely effectively, at least to a great extent.

6.3 Determination of significance of these negative impacts

6.3.1 During the Pre-construction Phase

Two potential indirect negative impacts, namely, the instigation by activists and the hike in price of property in this area context were insignificant. So far there was no serious issue regarding these two potential impacts happening during the short Preconstruction Phase.

6.3.2 During the Construction Phase

Most of the physical impacts during this phase were of minor significance given the fact that the power plant is in the rural area.

Of the 8 negative/potential negative impacts during this phase most impacts are minors, given the small area involved (12.3 acres). Two impacts, namely, "Accidents in work place" and "Social impact" are quite difficult to gauge their significance. These two impacts can be quite significant if not well-manated. But they can be prevented and/or mitigated if there is effective management. Actually all the impacts during this phase are temporary or transient. All these impacts cease after Construction Phase.

The negative economic impact, if any, will be negligible. On the other hand the positive impacts are significant: the provision of temporary job (2 years) form up to 92 construction workers including 23 foreign technicians. They can improve their skill during these 2 years. The project will invigorate and boost the local economy and bring economic benefit to the locals who are involved in extraction/ production and sale of raw building materials. Sub-contractors for sand, gravel, bricks, timpber and other basic building materials can promote their sales and benefiting locals.

6.3.3 During the Operation Phase

Of the 8 negative/potential negative impacts anticipated the large majority are of minor impact. (The impact on air environment (PM, SO_2, NO_x) is significant indeed if not mitigated. Since effective mitigation measure are taken then impacts become insignificant.)

The impact "occupational hazards" can be a significant and serious one if the workers are not well-trained, well-supervised and well-management. The company shall give priority to the effective education, training and supervision of the workers.

The impact "social impact" is quite difficult to anticipate. But this can be prevented and/or mitigated if the company can apply effective management.

The positive (beneficial) impact will be significant.

The power plant will provide permanent jobs for 14 foreign technicians and more than 100 locals, of out 150 employees. The benefit will accrue to the nation in a direct investment of USD 33 millions. The project will increase the GDP of the country; increase investment, increase employment, increase in earning in the form of tax, duty and revenue etc.

6.3.4 During the Decommissioning/Rehabilitation Phase

The 2 negative/potential negative impacts are negligible and can be prevented or mitigated. The decommissioning work at the power plant site will be an easy one given the small size (12.3 acres) of the area. However the decommissioning task to be undertaken at places where coal and limestone have been extracted by cement plants, that is the mine site, will be a great task. The main tast there are reforestation and restoration of ecology. Actually this is the duty of the authority of crown cement plant, not this coal-fired power plant.

6.4 Significance and other criteria for impacts

This is depicted in tabulated forms as follow:

Table – 29: Criteria for impacts during the Construction Phase (risk ranking) (Qualitative impact accessment)

Sr. No	Nature of impacts	Extent	Duration	Level of impact	Frequency	Intensity	Significance	Probability	Remarks
1.	Mobilization and preparation action	Foot print	Short term	Level-2	O	L	IS	HP	-
2.	Impact on air environment	Foot print	Short term	Level-2	F	L	IS	D	Intermittant
3.	Noise and vibration	Foot print	Short term	Level-2	F	L	IS	D	Intermittant
4.	Impacts on soil	Foot print	Short term	Level-2	O	L	IS	HP	-
5.	Impact: waste disposal	Foot print	Short term	Level-1	F	L	IS	D	-
6.	Potential accidents in work place (OHS)	Foot print	Short term	Level-2	OI	L	IS	P	-
7	Poetntial social impact	Foot print & beyond	Short term	Level-2	OI	L	IS	IP	-
8.	Potential security issue	Foot print	Short term	Level-2	OI	L	IS	IP	-

Note: Quoted from a few examples of coal thermal plant projects from abroad (theoretical and descriptive aspects only not analytical aspects) and based from experts judgment/ experts consensus. (The situation without mitigation measures taken; the situation will surely improve if mitigation measure are duly executed).

Table – 30: Criteria for impacts during the Operation Phase (Qualitative impact assessment)

Sr. No	Nature of impacts	Extent	Duration	Level of impact	Frequency	Intensity	Significance	Probability	Remarks
1.	Impact on air environment	Foot print & beyond	Long term	Level-4	F	H	Sg	D	Intermittant
2.	Noise and vibration	Foot print	Long term	Level-2	F	L	IS	D	Intermittant
3.	Impact: waste disposal	Foot print & beyond	Long term	Level-3	F	M	IS-Sg	D	
4.	Occupational health and safety	Foot print	Long term	Level-2	O-OI	L	IS	IP	

5.	Impact on traffic	Beyond foot print	Long term	Level-1	F	L	IS	P	
6.	Potential social impact	Foot print & beyond	Long term	Level-2	OI	L	IS-Sg	IP	
7	Potential security issues	Foot print	Long term	Level-2	OI	L	IS	IP	
8.	Visual impact	Foot print	Long term	Level-1	-	L	IS	D	

(The situation without mitigation measures taken; the situation will surely improved if mitigation measures are duly executed.)

Note: Quoted from a few examples of coal thermal plant project abroad (theoretical and descriptive aspects only not analytical aspects) and based from experts judgement/experts consensus.

Note: The project proponent is not in position to comprehend the analytical aspects and so only descriptive aspect is depicted.

After discussion are made among EIA appraisers and practioners correction and a consensus is reached.

Note – See also Chapter 6, 6.6 for another approach to imapct assessment.

Foot print refers to actual area of project site. Impact can be within or beyond foot print level eg. landscape level, local ecosystem level, regional level etc.

***Explanation**

Level of impacts

Short term = During Construction Phase

Long term = During Operation Phase

Level 1 = Very low (cannot be easily seen or felt)

Level 2 = Low (can have impact on biodiversity and environment to certain extent, short duration)

Level 3 = Medium (Medium impact on environment)

Level 4 = High (short duration to medium duration of high impact)

Level 5 = Very high (long duration and very high impact)

Frequency of impacts

F = Frequently (happen more than once a month)

O = Often (happen more than once a year)

OI = Often (isolated case; happen once between 1 year and 10 years)

S = Seldom (happen once between 10 years and 100 years)

R = Rarely (rarely happen during 100 years period)

Intensity

VH = Very high or catastrophic : 91-100% (percentage of effect of impact)

H = High or crtical : 51-90% (percentage of effect of impact)

M = Medium or moderate : 11-50% (percentage of effect of impact)

L = Low or negligible : 1-10% (percentage of effect of impact)

Probability

VIP = Very improbable : 0-1% (chance or probability)

IP = Improbable : 2-10% (chance or probability)

P = Probable : 11-50% (chance or probability)

HP = Highly probable : 51-90% (chance or probability)

D = Definite or almost certain : 91-100% (chance or probability)

Significance

IS = Insignificance (usually low impact and can be effectively mitigated)

IS-Sg = Insignificance to significance (can range from low to high impact)

Sg = Significance (high to very high impact and cannot be effectively mitigated; avoidance and prevention are only plausible solutions, if that is possible. If not utmost mitigations have to be undertaken or at least, partially mitigate the serious impact.)

6.5 Determination of any residuals

No substantial residual impacts are anticipated during the whole life of the project, from the Preconstruction Phase to the Decommissioning Phase.

Construction Phase

During the Construction Phase large quantity of solid waste such as a variety of debris and construction waste, will be generated in large quantity. But these will be disposed off regularly and after the completion of construction work a contractor will be hired for tidying up the whole site. There will be not residual left.

There can be small oil spills (diesel, petroleum, engine oils, lubricants etc) but these will be immediately remediated or mitigated (already mentioned earlier). There can be small spills of chemicals in the forms of emulsion paints, varnishes, spray, expoxy resin, adhesives etc. during the later part of Construction Phase. Such small spills will be cleared after each working session. There will be no residual left after the Construction Phase. The company will ensure that there will be no residuals of any kinds left after Construction Phase.

Operation Phase

During the long Operation Phase waste such as ash (fly ash, down ash), and sludge will be generated in large quantity. But these solid wastes will be managed and disposed on a routinely basis and there will be no residue left. The handling of the main waste, ash, is dry handling without water. Ash is conveyed by conveyor to two ash silos (one for fly ash and another for dry ash). Ash is used for making bricks and other construction material; only negligible quantity will have to be disposed at the landfill. Water is almost 100% recirculated through cooling system and only small quantity has to be discharge. The liquid wastes will be also at least primarily treated before discharge. Certain chemicals such as sodium hydroxide, calcium hydioxide etc are used in power plant but these are not toxic ones and will be removed in case of spillage.

There can be also small spill of fuel oil from time to time. But these will be immediately removed by asbsorbant, not washing down with water (already mentioned earlier in "mitigation measures").

The project component will carry on the timely removal and discharge/disposal of waste of all kind; final tidying up of site will be duly undertaken.

Therefore it can be stated that there will be no residual left (no radio active substance and toxic substance are used) after the end of the long operation phase.

Decommissioning Phase

After the end of the project life decommissioning works will be undertaken and the site will be rehabilitated. A decommissioning contractor will be hired to do the works. Decommissioning works will include dismantling and removal of all machinery and equipment (some put up for sale, some discard) and the demolition of factory, all buildings and structures and their removal. The soil, if contaminated, e.g. oil, will he removed. The whole area will be tidied up. In the same way rehabilitation works will be carried out in various spots elsewhere where coal and limestone have been extracted. Air water and soil will be tested for the last time. The ecology of all these spots will be restored.

Therefore, there will be no residuals remain after Decommissioning Phase.

6.6 Risks assessment

Risk assessment is a process that involves measurement of risk to determine, prioritizes and to enable identification of appropriate level of risk treatments (used also to describe the overall process of risk management).

Risk is a function of likelihood and consequence. Likelihood is the chance that the hazard might occur. Since the risk of any hazard is dependent upon the chance that it will occur (likelihood) and the impact of an occurrence (consequence) therefore risk score will be:

Risk score = Likelihood x Consequence

In some cases personnel are only exposed to the hazard for part of the time. Hence, a more detailed analysis of the risk ranking can be carried out by taking risk exposure (% of time personnel are present) and probability (chance that they will be injured) into consideration. Thus:

Risk score = (Probability x Exposure) x Consequence

Note: Value used for likelihood, consequence, exposure or probability need to be agreed by the risk assessment team, and professional judgement is very necessary.

Risk rating --is the category, level, or risk assigned following risk assessment and is usually categorized into: High, Medium and Low.

Risk ranking -- can be determined by qualitative and quantitative means. According to pundits no one method is best or perfect. The best choice of method will depend on the circumstances and preferences at the work place, eg, at the limestone quarry site, at the time the exercise is done. However regardless of the method establishing risk ranking will set priorities for harzard control. The most important purpose in hazard identification, risk assessment, and ranking is to draw up and implement plans to control these hazards (Hazard = source of potential harm, injury or loss).

Pundits from different nations have formulated a great variety of risk ranking criteria based also from different occupational aspects.

6.6.1 Why conduct risks assessment

Risks assessment is important because it:

- Create awareness of hazards and risks
- Identify who may be at risk
- Determine if existing controls are adequate, and can prioritize hazards and control measures.

6.6.2 The objectives of risk assessments

The objectives of risk assessments are:

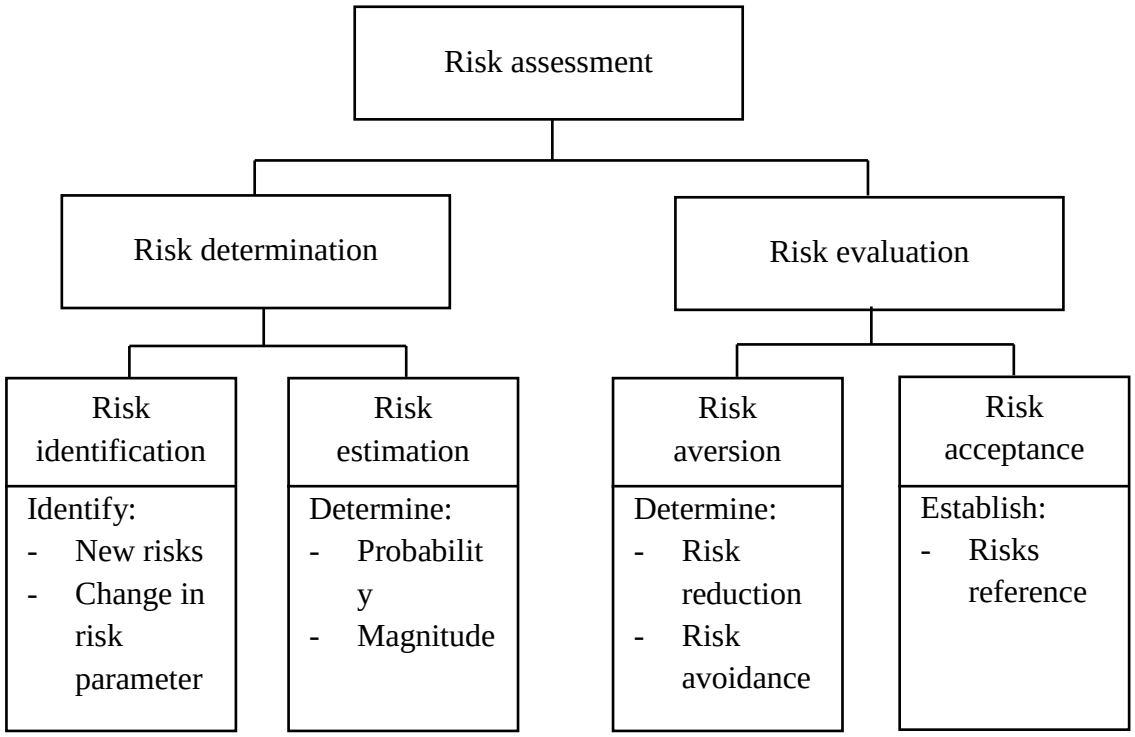
- To Prevent injuries or illness
- To remove a hazard or reduce the level of its risk
- To create a safer and healthier workplace

6.6.3 Risks assessment and management in brief

- Fully scope the risk assessment.
- Identify all hazards (potential hazards) and threats.
- Describe who might be harm.
- Evaluate the risks (high, medium, low, how bad, how often)
- Document and record the findings.
- Exchange information with other hospitals.
- Prepare for follow-up after risk assessment.
- Apply integrated risk mitigations.
- Regularly check the effectiveness of the risk assessment, management and mitigation programme.
- Review the risks assessment and management.
- If possible, appoint a risk assessment and compliance officer to effectively implement risk assessment and management. (This officer shall have one or two staffs eg. computer programmer, statistician under his supervision.)

Risk assessment can be summarized into risk identification, estimation and evaluation.

This can be simplified in diagram as:



Ref. Rowe, 1980

While "Hazard" is a source of potential harm or injury or loss "Risk" is the probability of occurrence of risk.

Risk assessment is a relatively new technique which has its beginning in the early 1985. There are several theoretical problems associated with risk assessment techniques.

The term "risk assessment" is used to explain the total process of risk analysis which include both the determination of level of risk and social evaluation of risks. Determination includes both identifying risks and estimating the possibility and magnitude.

Different countries (and different scientists) have applied different technique for assessment of risks. So there are many models for risk assessment and risk management. A broad range of risk analyses have been carried out by scientists from different countries and organizations (eg. UK, USA, Cana, France Germany, WHO etc).

Although there are differences in the ways in which risk assessment is accomplished in different countries they usually contain three steps: risk identification, risk estimation and risk evaluation.

Risk identification: is usually achieved by means of different scientific methods (eg. toxicology and epidermiology) and the conclusions are dependent upon the employment of biostatistical techniques.

Risk estimation: is the measurement of the range of potential consequences of a hazard. Techniques include subjective and objective measurement from personal judgment, models and formulae.

Risk evaluation: is the process of determining the meaning or value of the estimated risk to those individuals affected by the hazards.

6.6.4 International Finance Corporation (IFC) table of risk assessment (risk ranking table)

Based on the data of accidents (consequences) and likelihood (probability) the risk ranking will be as follow:

Table – 31: IFC table of risk assessment (risk ranking table)

Likelihood	Consequences				
	Insignificant (1)	**Minor (2)**	**Moderate (3)**	**Major (4)**	**Catastrophic (5)**
(A) Almost certain	L	M	E	E	E
(B) Likely	L	M	H	E	E
(C) Moderate	L	M	H	E	E
(D) Unlikely	L	L	M	H	E
(E) Rare	L	L	M	H	H

Legend:

E = Extreme risk; immediate action required

H = High risk; senior management attention required

M = Moderate risk; management responsibility should be specified

L = Low risk; manage by routine procedure

Note: In this coal-fired thermal plant project context the risk ranking can be:

- In the early operation phase --- (H).
- After one year of operation the risk ranking can be --- (M).
- Later based on skill, experience and practice of workers the risk ranking can be --- (M) or (L)
- For the long run alternate --- (M) and (L) should be applied from time to time.
- But never—(L) for long period of several months.

Note: See also risks and impacts criteria in tabulate forms earlier.

6.6.5 Pragmatic approach

Risk assessment is the work of expertise, mathematicians, statisticians, computer programmers and specialists, medical scientist, engineers etc and the works involves the application of models, mathematical models, computer models, complex equations and formulae etc. In other word it is purely academic in nature or pure research in nature and, therefore, beyond the scope of this EIA study which emphasizes on environmental aspects.

The criteria for risks and impacts depicted earlier in tabulated forms (from refernces) are in one way or another pragmatic assessment of real and potential impacts which can be construed as (or which is tantamount to) assessment of hazards and risks.

In this proposed project context the pragmatic method, namely, Experts Judgement Method/Experts Consensus Method or Ad hoc method is applied. And this based mainly from IFC table of risk assessment, (likelihood against consequences).

In other word, the simple matrix method of probability x consequence is applied and the risk scoring (result) is moderated through Experts' Consensus.

Probability (1-5) x Consequence (1-5) = scoring (moderated) by Experts' consensus when/where necessary.

Risk rating matrix

Actual risk outcome					
Low (1-3)	Moderate (4-6)		High (8-12)		Extreme (15-25)
Consequence	Likelihood				
	Rare 1	Unlikely 2	Possible (moderate) 3	Likely 4	Almost certain 5
Catastrophic (Extreme) 5	5	10	15	20	25
Major (High) 4	4	8	12	16	20
Moderate (Medium) 3	3	6	9	12	15
Minor (Low) 2	2	4	6	8	10
Negligible 1	1	2	3	4	5

Note: - Consequence x Likelihood=actual outcome

- Red: avoid, control, mitigate;
- Yellow and orange: control, mitigate;
- Green: accept/assume

Actual risk outcomes are categorized into 4 levels:

Low - (Scoring 1-3)

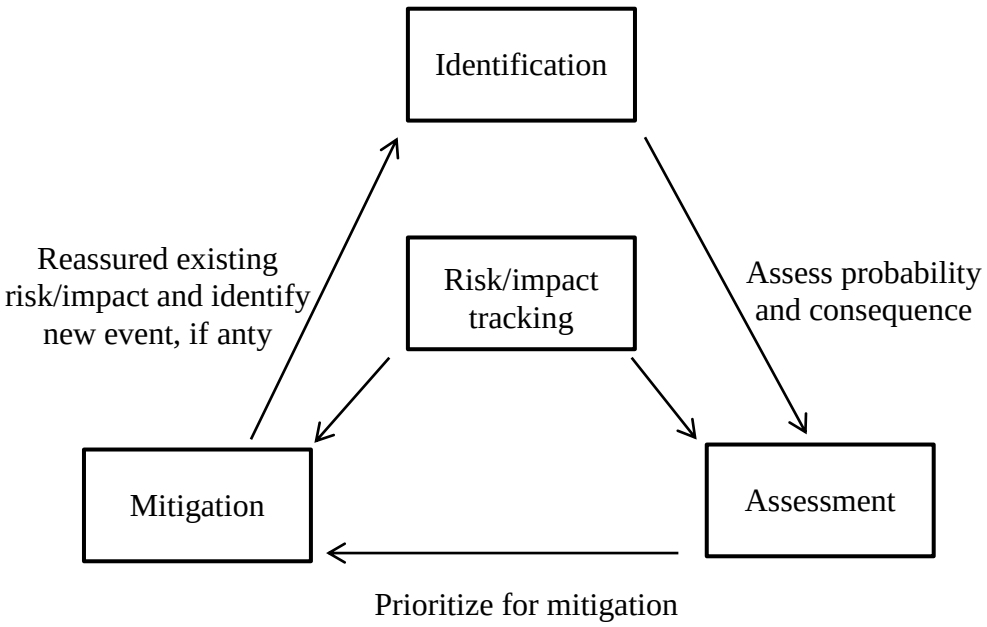
Moderate - (Scoring 4-6)

High - (Scoring 8-12)

Extreme - (Scoring 15-25)

Note: - This simple, pragmatic and straight forward matrix method is selected for assessment of impact and risk.

Risk and impact management (3 fundamental steps)



Note: - This simple, pragmatic and straight forward method (only 3 steps) is selected for taking mitigation measures. Based from this idea impact identification, assessment and mitigation are carried out.

For pragmative purpose of risk assessment certain governmental departments or agencies in other countries have provided guideline for risk assessment for different occupations for example. For example, the Ministry of Environment and Forest of the Government of India has prescribed guidelines for risk assessment for minings and quarries etc.

One relatively reliable way of risk assessment is to collect all data or records on accidents or mishaps that have occurred previously (5 to 10 years ago) at various coal-fired power plants throughout the nation. Then analysis on these data is made and subsequent risk assessment is conducted (not applicable in Myanamr yet).

Another point to be born in mind is that risk assessment can be done only from negative or pessimistic perspectives. It is not practical to make risk assessment from positive or optimistic point of view. (No risk can be anticipated from optimistic point of view.)

The end point in risk assessment, therefore are simply worst case scenario. But in the real world worst case scenario very rarely happen.

No developmental project is devoid of risk; the risk may be low or medium or high. The 8 negative/potential negative impacts each for the Construction and Operation Phases mentioned earlier are in one way or another associated with risks. Among them "Accidents at work places"; "Occupation Health and Safety" are associated with medium to high risk. "Impact on air environment", "traffic" and "waste disposal" are associated with low to medium risks. After mitigation measures are duly taken most will remain as low risk.

The company will look into the nature of all those impacts and assess the risks and follow the preventive, corrective and mitigation measures prescribed in this EIA report.

6.7 Comprehensive monitoring plan

Monitoring of physical, biological and social environments is of paramount importance for the successful implementation of a project.

First of all the working environment should be monitored for occupational hazards. But virtually all activities taken places at a project site need to be monitored for effective and successful implementation of the project.

Monitoring Plan (MP) is an essential tool for ensureing that mitigation measures for each and every negative impact is undertaken effectively throughout the life of the project. It is also an essential tool for ensuring that the positive (beneficial) impacts are enhanced, or CSR programme are effectively and meaninfully implemented. Monitoring should be planned, designed and implemented by professionals or specially trained personals eg. EMP cell.

Monitoring Plan (MP) is actually an integral part of Environmental Management Plan (EMP); these two are the different sides of the same coin.

Monitoring Plans for Construction, Operation and Decommissioning Phases of the project are shown in tabulated forms (encompassing monitoring spots, trequency of monitoring, responsible persons and estimate costs).

Table – 32: Summary of monitoring programme for Construction Phase (tabulated for the pragmatic approach)

Sr. No.	Components	Parameters to be monitored	Monitoring place/spot	Frequency	Responsible persons	Approximate costs
1.	Air environment/ air emission	- monitor ambient air - monitor all the parameters for general emission NEQEG guideline by ECD*; compare the results with those of NEQEG values and take subsequent mitigation action. Ensure that the value is lower than or on a par with that of NEQEG value (See also **Chapter -3.5.1**)	At construction site Coordinates: N. Lat 22º 21' 32"; E. Long 96º 42' 10" At Lauk Hpan village Coordinates: N. Lat 22º 21' 58.29"; E. Long 96º 42' 48.17" At Khe San village Coordinates: N. Lat 22º 20' 50.6"; E. Long 96º 40' 31.7" At Lei Gyi Taw village Coordinates: N. Lat 22º 20' 13.83"; E. Long 96º 43' 31.29"	Semi-annually	Hired technicians	Ks 4,000,000
2.	Noise and vibration	- monitor the noise level for comparison with the NEQEG noise level values by ECD*; compare the results with those of NEQEG balues and take subsequent mitigation action. Ensure that the value is lower than or on a par with that of NEQEG value (See also **Chapter -3.5.1**)	At construction site Coordinates: N. Lat 22º 21' 32"; E. Long 96º 42' 10" At Lauk Hpan village	Semi-annually	Hired technicians	Ks 2,800,000

			Coordinates: N. Lat 22º 21' 58.29"; E. Long 96º 42' 48.17" At Khe San village Coordinates: N. Lat 22º 20' 50.6"; E. Long 96º 40' 31.7" At Lei Gyi Taw village Coordinates: N. Lat 22º 20' 13.83"; E. Long 96º 43' 31.29"			
3.	Water environment/ effluent	- monitor all the parameters for NEQEG effluent guideline by ECD*. Compare the results with those of NEQEG balues and take subsequent mitigation action. Ensure that the value is lower than or on a par with that of NEQEG value (General application) (See also **Chapter-3.5.1**)	At stream Coordinates: N. Lat 22º 22' 29.9"; E. Long 96º 42' 07.7" At Lauk Hpan Coordinates: N. Lat 22º 21' 58.4"; E. Long 96º 42' 45.5" At Khe San village Coordinates: N. Lat 22º 21' 08.7"; E. Long 96º 40' 24.0"	Semi-annually	Hired technicians	Ks 280,000

4.	Contamination of soil and ground water	- monitor spillage of fuel oil, grease, chemical, etc, if any, (ensure that there is no contamination)	Discharge Pond (domestic waste water sink)Coordinates: N. Lat. 22º 21' 47.6"; E. Long 96º 42' 40.6" At Lauk Hpan Coordinates: N. Lat. 22º 22' 08.2"; E. Long 96º 42' 32.3" At Khe San village Coordinates: N. Lat. 22º 21' 01.0"; E. Long 96º 40' 45.9" At Lei Gyi Taw Coordinates: N. Lat. 22º 20' 50.8"; E. Long 96º 43' 20.1"	Semi-annually	Hired technicians	Ks 560,000
5.	Erosion and siltation	- monitor earth work and drainage system, especially during rainy season (ensure that there is no erosion or siltation)	Inside the compound	Weekly (especially during rainy season)	EMP cell members	Free of charge
6.	Solid waste (construction tailing, debris)	- monitor type, amount generated reused, recycled, and disposed of; keep a log book	At construction site Coordinates: N. Lat 22º 21' 32"; E. Long 96º 42' 10"	Weekly	EMP cell members	Free of charge
7.	Biodiversity component	- monitor clearing of grass and small vegetation (keep a record book)	Inside the compound	Weekly	EMP cell members	Free of charge

8.	Plan for prevention of fire outbreak	- monitor the plan and the readiness for prevention of fire - monitor the stock piling of building materials that can easily catch fire - monitor every mock drill for time fighting	Inside the compound	Weekly	EMP cell members	Free of charge
9	Occupational Health and Safety	- monitor the plan for safety working conditions, achievement of zero accidents and avoidence of occupational diseases	At construction site Coordinates: N Lat. 22°21'34.00", E Long. 96°42'8.57"	From time to time	EMP cell members	Free of charge

* **Note:** So far there are no EMP contractors and/or MP contractors (as in some developed countries) in Myanmar. Therefore technicians from other departments have to be hired at exorbitant prices.

The EMP cell members are actually the staff, well-paid by the company and therfore need not be paid for undertaking EMP and MP works (free of charge).

Table – 33: Summary of monitoring programme for Operation Phase (tabulated form)

(a) The pragmatic approach

Sr. No.	Components	Parameters to be monitored	Monitoring place/spot	Frequency	Responsible persons	Estimated cost
1.	Emission	- monitor all the parameters for NEQEG emission guideline values by ECD* (Code no. 1.1) compare the results with those of NEQEG values and take subsequent mitigation actions. Ensure that the values are lower than or on a par with those of ECD's, NEQEG values. (See also **Chapter-3.5.1**)	At coal-fired Thermal plant Coordinates: N. Lat 22º 21' 32"; E. Long 96º 42' 10" At Lauk Hpan village Coordinates:	Semi-annually (Daily since the installation of flue gas analyser at stack)	Hired technicians (Technicians have to be still hired for testing ambient air)	Ks 4,000,000

			N. Lat 22º 21' 58.29"; E. Long 96º 42' 48.17" At Khe San village Coordinates: N. Lat 22º 20' 50.6"; E. Long 96º 40' 31.7" At Lei Gyi Taw village Coordinates: N. Lat 22º 20' 13.83"; E. Long 96º 43' 31.29" check and monitor the continuous flue gas analyser installed Coordinates: N Lat. 22°21'35.55, E Long. 96°42'8.24"			
2.	Effluent	- monitor all the parameters for NEQEG effluent guideline values by ECD* (Code no. 2.1.1) compare the results with those of NEQEG values and take subsequent mitigation actions. Ensure that the values are lower than or on a par with those of ECD's, NEQEG values. (See also **Chapter-3.5.1**)	At boiler blowdown Coordinates: N. Lat 22º 21' 32.9"; E. Long 96º 42' 07.6" At cooling tower Coordinates: N. Lat 22º 21' 32.9"; E. Long 96º 42' 06.4"	Semi-annually	Hired technicians	Ks 280,000

			At discharge point Coordinates: N. Lat 22º 21' 28"; E. Long 96º 42' 07"			
3.	Noise and vibration	- monitor the noise level for comparison with the NEQEG noise level values by ECD compare the results with those of NEQEG values and take subsequent mitigation actions. Ensure that the values are lower than or on a par with those of ECD's, NEQEG values. (See also **Chapter-3.5.1**) - monitor the wearing of PPE	At coal-fired Thermal plant Coordinates: N. Lat 22º 21' 32"; E. Long 96º 42' 10" At Lauk Hpan Coordinates: Lat 22º 21' 58.29"; E. Long 96º 42' 48.17" At Khe San village Coordinates: N. Lat 22º 20' 50.6"; E. Long 96º 40' 31.7" At Lei Gyi Taw Coordinates: N. Lat 22º 20' 13.83"; E. Long 96º 43' 31.29" At work place, near noisy machine	Semi-annually From time to time	Hired technicians EMP cell members	Ks 2,800,000 Free of charge

4.	Soil	- monitor contamination of soil (if any) - monitor soil erosion (if any) especially during rainy season	Discharge Pond (domestic waste water sink) Coordinates: N. Lat. 22º 21' 47.6"; E. Long 96º 42' 40.6" At Lauk Hpan Coordinates: N. Lat. 22º 22' 08.2"; E. Long 96º 42' 32.3" At Khe San village Coordinates: N. Lat. 22º 21' 01.0"; E. Long 96º 40' 45.9" At Lei Gyi Taw Coordinates: N. Lat. 22º 20' 50.8"; E. Long 96º 43' 20.1"	Semi-annually Rainy season	Hied technicians EMP cell members	Ks 560,000 Free of charge

5.	Solid waste	- monitor ash generated - monitor trash/ trash garbage	At coal-fired Thermal plant Coordinates: N. Lat 22º 21' 32"; E. Long 96º 42' 10"	Daily	EMP cell members	Free of charge
6.	Waste water (used water)	- monitor the recirculation of used water, the removal of sediment and disposal; the replenishment of new water	- Inside the factory	Daily	EMP cell members	Free of charge

* **Note:** All parameters prescribed by ECD cannot be measured yet (Lack of tools, expertise, training).

(b) <u>The generalized monitoring of other parameters (practiced in many countries)</u>

Sr. No.	Components	Parameters to be monitored	Monitoring place/spot	Frequency	Responsible persons	Estimated cost
1.	Weather	- monitor weather - listen to weather news, forecast	- At the factory compound - At the factory compound	- Daily - Daily	- EMP cell members - EMP cell members	- Free of charge - Free of charge
2.	Daily activities at work places	- monitor daily activities of workers at work places	- Inside the factory	- Daily	- EMP cell members	- Free of charge
3.	Water consumption	- monitor water consumption by the manufacturing process	- At water tank; at cooling bed	- Daily	- EMP cell members	- Free of charge
4.	Fuel consumption	- monitor fuel oil purchased, used, used oil generated, oil waste, collection of used oil/oil-waste	- Inside the factory	- Monthly	- EMP cell members	- Free of charge
5.	Monitor electricity consumption	- monitor electricity consumption	- Inside the factory	- Weekly	- EMP cell members	- Free of charge

6.	Routine operation of machinery equipment, etc	- monitor operation hours of machinery and equipment - monitor distance travel of vehicles - monitor log books	- Inside the factory - Every car - Every log book	- Daily - Weekly - Weekly	- EMP cell members - EMP cell members - EMP cell members	- Free of charge - Free of charge - Free of charge
7.	Occupational health and safety measures and emergency measures	- monitor OHS measures taken - inspect facilities for emergency preparedness - monitor training (fire fighting and first aid) and drill	- At the factory - At the factory - At the factory	- Weekly - Monthly - From time to time	- EMP cell members - EMP cell members - EMP cell members	- Free of charge - Free of charge - Free of charge
8.	Social illness, ill social behavior	- check disciplinary action taken - monitor conducts of workers	- At the factory - At the factory	- Occasionally - Occasionally	- EMP cell members - EMP cell members	- Free of charge - Free of charge
9.	Security	- monitor performance of security staffs	- At the factory	- Monthly	- EMP cell members	- Free of charge
10.	Capacity building	- monitor effectiveness of capacity building programme and other trainings	- At the factory	- From time to time	- EMP cell members	- Free of charge
11.	Compliance with regulation	- monitor all main activities to ensure compliance with legal requirements and corporate commitment	- At the factory	- Monthly	- EMP cell members	- Free of charge

12.	Effectiveness of mitigation measures	- monitor mitigation measures taken and check their effectiveness	- At the factory	- Weekly or monthly	- EMP cell members	- Free of charge
13.	Green belt creation and landscaping	- monitor the creation of green belt and landscaping - monitor the nursery of sapling and on-growing	- Inside the compound	- Monthly - Monthly	- EMP cell members - EMP cell members	- Free of charge - Free of charge
14.	Crops in the vicinity	- monitor the crops, vegetables in nearby farms to see or detect any effect/impact - analyse chemical content of vegetables/crops	- Nearby farms - Nearby farms	- From time to time - From time to time	- EMP cell members - Hired technicians	- Free of charge - Ks 300,000
15.	Community health	- if possible, monitor the health condition of locals of Lauk Hpan, Khe San and Lei Gyi Taw	- The three said villages	- Once a year	- Ask the help of the Health Department	- Not implemented yet/only taken into consideration

Note: The procurement of certain materials will be made from EMP fund or from the main budget.

Table – 34: Summary of monitoring programme for Decommissioning/Rehabilitation Phase (tabulated form)

Sr. No.	Components	Parameters to be monitored	Monitoring place/spot	Frequency	Responsible persons	Estimated cost
1.	Decommissioning and Rehabilitation	- monitor the Decommissioning process - monitor removal of all residuals, if any - monitor rehabilitation process, ensure that planted trees are all well-established.	- Inside the compound - Inside the compound	Weekly Monthly	EMP cell members EMP cell members	Free of charge Free of charge
2	Occupational health and safety	- monitor the plan for safety working conditions, achievement of zero accidents and avoidence of occupational diseases	- At the workplaces	From time to time	EMP cell members	Free of charge

7. CUMULATIVE IMPACTS ASSESSMENT

Cumulative impact can be either:

- Successive addition of impacts over a long period or
- The addition of impacts from other sources at the same time, simultaneous cumulative impact, or
- Both

In this coal fired power plant project context the impacts caused by the project is not so serious or significant given the fact that mitigation measures have been taken and will continue to do so. This project occupies only a small portion (12.3 acres) of the 280 acres of the cement project.

However, because of their magnitude (1,000 tons/day and 4,000 tons/day) the impact caused by these two cement factories will be really significant indeed.

Simultaneous cumulative impact (impacts happening at the same time) from three sources, namely the coal fired power plant and two large cement plants can be roughly assessed right now.

Apart from this coal thermal plant and the adjoining two cement plants there are no other project in this area and therefore no other simultaneous impacts and envisaged.

However successive cumulative impact (incremental cumulative impacts) can be effectively assessed only after all plants have been operating for 10 years or more.

7.1 Cumulative impact at the project site (power plant site)

Simultaneous cumulative impacts (from three sources) at the project site

<u>At the end of the Construction Phase</u>

If waste generated during the Construction Phase, such as construction tailings, debris, trash, unused building materials etc are not routinely or regularly cleared or disposed then the cumulative impact over a period of 2 years (Construction Phase) will be significant indeed. Large quantity of accumulated construction tailing and debris will remain.

When this is taken into consideration for three plants the simultaneous cumulative impact will be significant.

<u>Management measure in brief</u>

Since all the wastes are regularly cleared and disposed off then there can remain no cumulative impact on the site.

More over all these solid wastes, if any remain, have been cleared, removed and disposed of at an approved land fill. The site has been completely tidied up at the end of the Construction Phase. Therefore, there can be no accumulative impact on the site and surrounding after the Construction Phase.

During the long Operation Phase

The main solid wastes generated during the long Operation Phase will be fly ash, down ash, probably slag sludge and certain amount of unused coal and limestone. Coal dust and limestone dust etc are also generated at crusher sites, especially hammer crusher area (There are two large crusher sites for the two large cement factories and for coal fired thermal plant).

There are substantial amount of domestic waste, namely kitchen waste, food waste, office waste, dormitory waste, trash etc.

Industrial liquid waste generated during the Operation Phase will be waste water, and all kinds of process waste water, thermal blow down, boiler blow down, waste water from unloading platform, and from vehicle and machinery waste etc.

Substantial quantity of domestic waste water and sanitary waste water will be also generated.

In the earlier **Chapter-3** estimation of generation of fly ash and down ash are given. Depending the MW load, (20, 40, 60 MW) the generation rate are 230.4-604.8 ton/day for fly ash and 153.6-403.2 ton/day for bottom ash. (Unless effective management and mitigation measures are taken the incremental cumulative impacts over the years will be really serious.) The domestic waste is estimated at 20 kg/day.

As mentioned earlier 90-122 tons/day of domestic waste water generated. (The recirculation of used/waste water and conventional treatment of domestic waste water are already addressed earlier.)

As regards emissions it is estimated that 2,800 tons of CO_2, 30 tons of SO_2 and 9 tons of NO_X are generated per day from this coal fired thermal project where the main raw materials is coal. That is if mitigation measures are not taken.

The facts and figures above are only for coal fired thermal plant.

As for the two cement factories (which are not the subject of this EIA report) the facts and figures estimated will be as follow:

Generally when 1 ton of cement is produced:

- 800 kg of CO_2 is generated
- Up to 2 kg of SO_2 is generated
- Up to 0.8 kg of NO_X is generated and
- Up to 0.6 kg PM is generated. (Little waste; most raw materials are all used up)

Multiply the figures by 5,000 (total production of ton/per day for two factories) and the result is:

- 4,000 tons CO_2/day
- 10 tons SO_2/day
- 4 tons NO_X/day
- 3 tons PM/day

Multiply these figures again by 300 (operational days per year and the results will be 1,200,000 tons, 3,000 tons, 1,200 tons and 900 tons for CO_2, SO_2, NO_X and PM respectively.

Unless effective management is undertaken and mitigation measures carried out the incremental (successive) cumulative impact over one year will be very significant. When this is multiply by 30 (years of project life) the result will be astronomical. However the company has take mitigation measures as practical as possible and so substantial cumulative impact of SO2, NOX and PM are not anticipated. (The company has applied a total of 7 electrostatic precipitator and 110 filter bags for the three factories, mostly for the two larger cement factories.)

However CO_2 cannot be still effectively minimize or mitigated. Therefore a total of 7000 ton of CO_2 will be generated every day. But CO_2 will not be accumulated at the upper air shed; it will be dispersed or blown away and gone with the wind. It can accumulate in the upper strata of the atmosphere and contribute to the increase in GHG and subsequent global warming. (This is the inevitable results of industry and economic development. Rationalization can be made when CO_2 emission from this project is compared with CO_2 emission from the four top emitters, namely, China, USA, India and Russia. When compared with emission from these 4 countries the emission from this area will be just the magnitude of burning a joss stick.) The only plausible way for mitigation of CO_2 emission is the compensatory planting of trees and creation of green belt/zone to sequestrate CO_2 emission from as far as possible.

Therefore it can be stated that except CO_2, there can be little or no cumulative impact during the operation phase, if mitigation measures are effectively taken.

<u>Management measure in brief</u>

The PM, solid and liquid wastes of all kinds will be effectively managed. Solid wastes will be collected and disposed of; or in some cases incinerated before dispose off at approved landfill or dumping site.

The cumulative impact of traffic cannot be effectively mitigated but can be only manage to a certain extent. The raw materials have to be transported and the final product has to be duly transport routinely. It is not practical to reduce the number of trips of the trucks. But mitigation measure regarding traffic congention and prevent accident can be implemented up to a certain extent.

So it can be stated that there will be little or no accumulative impact during the long Operation Phase.

Decommissioning Phase

In this era of environmental awareness the project proponent cannot abandon the site and easily walk away after the end of the Operation Phase. Systematic and meaningful decommissioning has to be duly undertaken. Otherwise the old abandoned site together with old dilapidated buildings and structures will become a residual and cumulative impact issue. Systematic decommissioning and rehabilitation have to be duly undertaken.

The power plant will be isolated and all buildings and structures dismanlted or demolished. Some machinery or iron materials will be reused or put up for sale; some will become iron scrap and send to smelting mill. The site will be tidied up and ecologically restored (already mention earlier in **Chapter-6**).

Therefore, at the end of the project there will be no accumulative impact on the area.

7.2 Cumulative impact at sources of raw material extraction

Large quantity of coal is required every day for incineration and generation of electricity.(also much more for production of cement).

Limestone (pulverized) is also required in the desulphurization process during the burning of pulverized coal.

The cumulative impact can be seen at the coal mine and limestone quarry after 30 years of operation. Unless the coal mine and limestone quarry are well-managed the cumulative impact after 30 years of operation will be significant. All the vegatation in the near vicinity will be gone. Compensatory planting of trees is essential and compulsory.

Actually the ecological restoration of coal mine area and limestone area is the responsibility of the authority of crown cement plant, not this coal-fired power plant.

In this coal-fired thermal plant context the raw materials used are coal, small quantity of limestone and large quantity of water. All these are shared with the cement project. (Small portion of coal and limestone from cement project are taken).

As regards cement project for two cement factories other raw material such as laterite (iron stone), clay, and gypsum have to be also used for the production of Portland cement.

The annual combined requirement of coal for the three factories is nearly 300,000 (operational day of 300).

The requirement for limestone is huge (6750 tons of limestone per day for the combined production of 5,000 tons of cement per day by the two cement factories; 1.3 ton of limestone for production of 1 ton of cement). For a 300 working day per year the figure is 2,025,000 tons of limestone. In other word this is the incremental or successive cumulative impact per year.

Limestone is extracted from the quarry in the adjacent south. At the end of Operation Phase the limestone mountain can be gone and there will be a total change in the relief and alternation of landscape of the area. This is inevitable because natural resource (limestone) has to be extracted for the production of cement and hence cumulative impact is inevitable and irreversible. The only mitigation can be the well-calculated extraction of limestone (not to overexploit or over extract, more than necessary; follow sustainable extraction as far as possible for the long run) and after the end of the operation phase create large green zone at the sites of the old mined out quarries.

Since the loss of natural non-living resources (limestone) is irreversible the incremental/successive cumulative impact cannot be actually mitigated and the impact will remain. Only superfacial remediation (eg. the creation of green zone at the area where once the limestone mountain stood) can be done. If green zone is effectively created and rehabilitation of the ecology is achieved to a certain extent the result will be quite satisfactory and acceptable from environmental point of view.

The same is true for other non-living natural reasons- eg. coal, laterite, gypsum, etc. However these are not extracted from the vicinity but procured from a far – eg. from Yatsauk, Thibaw, Nantsam township. Cumulative impact will happen at those places. The company will be aware of the incremental cumulative impacts in the forms of the loss of non-living natural resources and will do its utmost to alleviate the cumulative impact as practical as possible. Otherwise the successive cumulative impact at the limestone quarry, coal mines, laterite and clay quarries and gypsum mine will really be significant. Therefore rehabilitative and ecological restoration is imperative.

Management measure in brief

The project proponent, Ngwe Yi Pale' Cement Co., Ltd will not wait until the end of the long Operation Phase but will carry out rehabilitation work phase by phase. When extraction of coal and/or limestone at a spot is completed rehabilitation for that spot (soil restoration, replanting trees) will be undertaken. Then extraction work will move to a new spot for extraction. By the time the long Operation Phase of 30 years is completed all effected spots (extraction/mining spots) will be already ecologically restored.

On the whole it can be clearly stated that there will be no accumulative impact on the environment due to the implementation of this project if the mitigation and remediation measures and rehabilitation measures are duly taken.

7.3 Cumulative impact on the road, especially the high way

Potential and real impact on traffic is already mentioned earlier. That was considered only for transportation of coal. (Limestone quarry is nearby and so logistic is not an issue.) Coal-fired thermal plant does not produce any final products, only electricity, and logistic consideration not necessary.

However the final products from the two cement factories, that is 5000 tons/day of cement product has to be considered for logistics. The company has to deploy 200 trucks per day (or 200 trips per day) for the marketing and distribution of cement bags. There will be a considerable increase in traffic or in other words an increase of 8 vehicles on the road every hour. When the logistic for coal is considered there will be increase of 110 trucks on the road per day (The company has to deploy 110 trucks (or trips) for transportation of coal per day). There will be an increase of 8 vehicles on the road every hour. Theoretically when the operational 300 days/year is considered there will be an increase of 33000 trips per year for coal and 60000 trips for cement per year.

Traffic congestion is the result of vehicular activities of this project and also various vehicular activities from various sources other than this project. That is the reason why high-way along the Shan State is always heavy with traffic day and night. The company can mitigate this cumulative impact with only limited means and limited success. Mitigation/alleviation measures to be taken for impact on traffic are already described earlier in **Chapter-6**.

The company has plan for the sharing of electricity with one of its sugar factories during the sugar cane season (That is when the sugar factory is in operation for 115 days). There will be no need for coal during that period, but only 185 days per year. This can tackle the transportation (and hence traffic) issue to a certain extent.

8. ENVIRONMENTAL MANAGEMENT PLAN (EMP)

EMP objectives and concepts

EMP is the key to ensure that the environmental quality of the area does not deteriorate due to the operation of the coal-fired power plant. EMP involves the management of the overall environmental issue including physical, biological, socio-economic, cultural and visual issues. EMP is a long term systematic approach from planning, development, implementation, monitoring and feedback EMP also involves management for quality of the project.

The overall EMP includes planning and design of an environmental friendly coal-fired power plant. EMP task includes the procument of eco-friendly machinery, equipment and vehicles that emit less smoke, lower noise level, and those that are fuel efficient. EMP also involves the conservation of water and energy.

Monitoring Plan (MP) is an integral part of EMP and the objectives of EMP and MP are:

- To control the work environment of the factory, during the short Construction Phase and Operation Phase of the project
- To minimize the negative impacts and enhance the positive impacts
- To ensure compliance with relevant rules, regulations and statutory requirements
- To ensure social acceptability of the project by neighbours and
- To encourage highest performance for individual employee of the plant.

Mitigation and EMP are different side of the same coin and mitigation measures are an integral part of EMP. So each and every EMP will be based on potential negative impacts and subsequent mitigation measures.

When formulating EMP each and every negative/potential negative impact as well as all mitigation measures has to be considered together.

In this proposed project context there will be a pair of sub-plan (sub-EMP and sub-MP) for each and every negative/potential negative impact.

8.1 Project description by project phase

The project, very briefly, is for the construction and operation of coal fired thermal plant with a capacity of generating 60 MW.

The electricity will be used for the operation of a nearby new cement factory. The Crown Cement factory, with a capacity of producing 40,000 tons of cement per day and also for village electrification for infrastructure development the local area.

This has been already described earlier in **Chapter-3** and will not be repeated here, since this **Chapter-8** is not a separate standalone EMP report.

8.2 Project environmental, socio-economic and where possible Health Policy and commitment, legal requirement and institutional arrangement

The project environmental and socio-economic policies are already described in details in Chapter 3 and will not be repeated here. (This is not a standalone EMP separate report). Only Health Policy, Legal requirement and institutional arrangement are described below:

Health Policy, Legal Requirement and Institutional Arrangement

Health policy

The health policy of the Nation is "Health for All".

The policy guidelines for health service provision and development have been provided in the constitution. **Article-28** of the constitution of the Republic of Union of Myanmar (2008) states that:

The Union shall:

i) earnestly strive to improve education and health of the people

Article 367:

Every citizen shall, in accord with the health policy laid down by the Union, have the right to health care.

National Health Policy (1993)

The National Health Policy was developed with the guidance of the National Health Committee in 1993.

The National Health Policy has placed "Health for All" goal as a prime objective. There are 15 main points regarding the National Health Policy (1993). The first main point No.1 is:

- to raise the level of health of the country and promote the physical and mental well-being of the prople with the objective of achieving "Health for All"

The main point, No.9 concerns environment which states:

- to intensify and expand environmental health activities including prevention and control of air and water pollution

Health Legislation

Certain portion of health legislation also addresses environmental sanitation and communicable disease prevention, as far as environmental affair is concerned. That includes the control of disposal of human and other wastes, concerns for water purity and hygiene of housing and food sanitation.

Certain health legislation that are relating in one way or another, to environmental affairs are:

- The Public Health Law (1972)

Which includes environmental sanitation and cleanliness of food, among others

- Prevention and Control or Communicable Diseases Law (1995) (Revised 2011)

This law describes measures to be taken in relation to environmental sanitation, among others.

- The Control of Smoking and Consumption of Tobacco Product Law (2006)

This law describes the creation of tobacco smoke free environment, among other. This is of relevant at the work place and project site where many employees are working.

Health Development Plan and Myanmar Health Vision 2030

This long term plan has been drawn up to meet any future health challenge. This plan has 9 main objectives and one of them is:

- to develop a health system in keeping with the changing political, socio-economic and environmental situations

(a) National Environmental Health Agenda

Environmental Health is actually one of the intergral parts of Environmental Protection and Conservation aspect. EIA, IEE and EMP works normally encompass the physical, biological, socio-economic, cultural and visual components of the surrounding environment. The third component, that is, socio-eocnomic, includes public health component, (mortality and morbidity, diseases, accident and injuries etc.).

The Occupational and Environmental Health Division under the Department of Public Health is the focal point agency concerning Occupational and Environmental Health aspects.

This Department (Division) is involved in:

- environmental monitoring eg- air quality, water quality

- work place assessment eg- air quality, waste and water quality, heat stress, light, noise level

Health Impacts Assessment (HIA) and Social Impacts Assessment (SIA) are actually important parts of environmental protection and conservation works.

(b) Environmental, Health and Safety (EHS)

The International Finance Corporation (IFC), a division of World Bank, has prescribed EHS general guidelines for general industrial practices. It provides guidance to users on EHS issues in doing their business.

The applicability of the EHS guideline shall be tailored to the hazards/risks or impacts identified as the result of EIA.

The IFC's EHS General Guidelines encompass Environmental, Occupational Health and Safety (OHS) and Community, Health and Safety (CHS).

Environmental

This main section includes:

a) air emission and ambient air quality

b) energy conservation

c) waste water and ambient water quality

d) water conservation

e) hazardous materials management

f) waste management

g) noise management and

h) contaminated land management

Occupation Health and Safety (OHS)

The Occupation Health and Safety guideline by IFC encompasses:

- general facility design and operation
- physical hazards
- chemical hazards
- biological hazards
- radiological hazards
- Personal Protective Equipment (PPE)
- special hazard environments
- communication, training and monitoring

Community Health and Safety (CHS)

The Community Health and Safety guideline by IFC encompasses:

- water quality and availability
- structural safety of project infrastructure
- life and fire safety L&FS
- traffic safety
- transport of hazardous materials and disease prevention
- emergency preparedness and response

These are summarized later in pragmatic EMP for safety and Health Aspects (Ref: IFC guideline, 2012).

The company will liaise with authority from occupational and environmental Health Division and duty follow their directions. Will also request the division for providing training courses for workers and for giving lectures/educative talk for workers. Also liaise with Township Health Authority for any assistance required.

(c) Occupational Health and Safety (OHS) by ILO

OHS is defined by International Labour Organization (ILO) as:

- The science of the anticipation, recognition, evaluation and control of hazards arising in or from the work place that could impair the health and well-being of workers taking into account the possible impact on the surrounding communities and the general environment.

Some core principles of OHS

- All workers have rights and employers must ensure that:
  - Work should take place is a safe and health working environment;
  - Condition of work should be consistent with worker's well-being and human dignity;
  - Adequate housings and facilities for workers; healthy food and potable water.
  - Provision of health facilities for workers.
- Occupational safety and health policy must be established
- Social partners (employers and employees) and other stakeholders must be consulted
- OHS programmes and policies must aim at both prevention and protection

- Continuous improvement of OHS must be promoted
- Health promotion is a certral element of OHS practices
- Compensation, rehabilitation and curative services must be made available to workers who suffer occupational injuries, accidents and work related diseases
- Education and training are vital components of safe, healthy working environment
- Provision of welfare and physical development plan for workers and labour law must be complied with.
- OHS policy must be enforced

The company will liaise with the factories and General Labour Laws Inspection Department and duty follows its directive and guidelines.

And also request the authority of the Department for providing training course on Occupational Health and Safety and also for giving lectures/educative talks on pertinent Labour Law and Labour Rights.

See also **ANNEX** pledge made by the company for workers' welfare, and also for fire safety (in Burmese).

Commitments

The project proponent, Ngwe Yi Pale' Cement Co., Ltd has made a commitment to follow and implement health policy as far as possible. In particular, the Occupational Health and Safety (OHS) and the Community Health and Safety (CHS) issues will be addressed and tackles as practical as possible.

U Sein Myo Aung

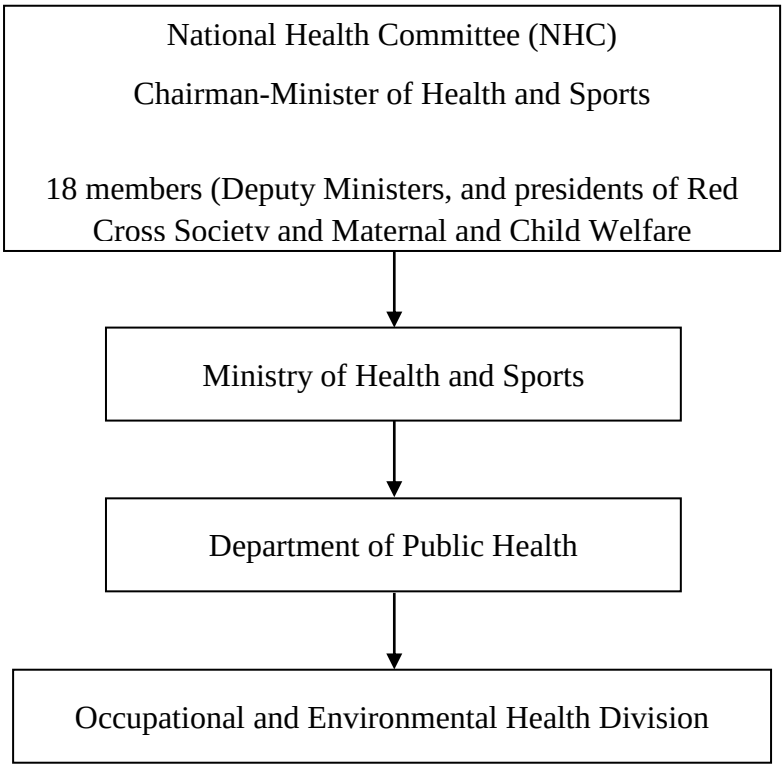
Executive Director

Ngwe Yi Pale' Cement Co., Ltd

Institutional Arrangement

The following chart shows the Institutional Arrangement of Health and Enviroment. (The institutional organization of NECCCCC and ECD are already described in **Chapter-3**).

Institutional Arrangement (organization)



The National Health committee (NHC) is an umbrella organization comprising 18 members from 9 ministries and one member of Nay Pyi Taw Council, and presidents of Red Cross Society and Maternal and Child Welfare Association.

The Chairman of NHC is the Uinon Minister of Health and Sports while the Vice Chairman is the Union Minister of Labour. 9 deputy ministers under 9 ministries and a member of Nay Pyi Taw Council, the president of Red Cross Society, and the president of Maternal and Child Welfare Association are also members of NHC.

The Deputy Minister of Health and Sports is the Secretary and the Director General of Department of Health Planning, is the Joint secretary.

Occupational and Environmental Health Division (OEHD)

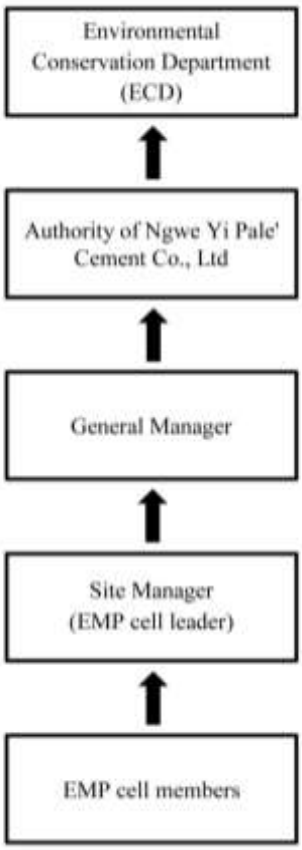
The Occupational and Environmental Health Division under the Department of Public Health is the focal agency involves in environmental and health affairs.

The occupational and Environmental Health Division is involved in implementing Environmental Health Programme in the country.

At the moment it is involved in:

- Environmental monitoring: on air quality and water quality
- Medical monitoring: health assessment on workers (periodic medical examination, performing physical examination, chest X-ray, biomarker survey on workers)
- Work place assessment: eg- on air quality, waste (solid) and waste water, heat stress and light, noise level, soil quality, water sanitation and hygiene etc. in certain factories.
- Assessment of environmental health probably related to climate change and general health impact assessment.

Institutional arrangement of the company for implement of EMP



- EMP cell leader and cell members are responsible for implementation of EMP.
- The EMP cell members report to EMP cell leader who report to the General Manager who then report to the authority of the Ngwe Yi Pale' Cement Co., Ltd .
- The authority of the company then report to the Environmental Conservation Department (ECD), the Ministry of Natural Resources and Environmental Conservation (MONREC).The report espcially the monitoring report will be submitted by the authoirty of the company on a regular basis, semi-annually.

8.3 Summary of impacts and mitigation measures

The potential impact/real impact during of 4 phases are already described in details in Chapter 6, 6.2.1, 6.2.2, 6.2.3, 6.2.4, 6.2.5 and 6.2.6.

Mitigation measures to be taken during the Construction, Operation and Decommissioning Phase are summarized in the following tabulated form.

(EMP cell leader, cell member, and specially trained staff are responsible for implementation of EMP and taking mitigation measures)

Table – 35: During the Construction Phase

Sr. No.	Impact	Mitigation measures (out line)
1.	Mobilization and preparation activities	- Plan for sustainable mobilization and preparation work. - Do not clear vegetation more than necessary. - Have a logistics plan for heavy trucks and machinery; restrict the movements of trucks. - Plan to prevent the spilling of building materials outside the site. - Fence the site for the factory or office. - Plan for systematic storage of all building materials.
2.	Impact; dust and smoke	- Comply with NEQEG guidelines of ECD. - Do not clear the ground more than necessary. - Avoid open burning of debris. - Suppress dust with water spray. - Restrict vehicular movements, reduce the speed. - Stop earth work or loading and unloading of earth, sand when strong wind is blowing. - Limit open stockpiles of earth, sand and lime powder. - Minimize drop height when loading and unloading earth and other loose materials. - Plant fast growing trees to trap dust. - Procure equipment and vehicles that are eco-friendly. - Keep equipment and vehicle well-maintained and well-operated. - Provide adequate PPEs. - Heed to complaint of the local concerning dust and smoke.

3.	Noise and vibration	- Comply with NEQEG guideline of ECD. - Procure eco-friendly equipment and vehicles, eg. low noise level ones. - Restrict noise to working hours only (no construction work at night). - Install silencers on certain machinery. - Switch off or throttle down equipment during idle hours. - Limit/restrict the movement and speed of vehicles. - Keep equipment and vehicles well maintained and well-operated. - Manage vibration (of machinery, vehicles); provide suitable foundation; ensure smooth surface of road for mitigation of vibration. - Provide PPEs. - Heed to the complaints of the locals regarding noise.
4.	Impact on soil	- Do not clear the ground more than necessary. - Avoid unnecessary destruction of soil profile. - Separate top soil from sub-soil (separate stockpiles); top soil for revegetation; sub-soil for construction. - Keep stockpiles from physical disturbance (wind, water). - Prevent soil erosion and siltation. - Prevent wash water from carrying earth and materials into drainage system. - After construction work, resurface and stabilize exposed ground. - Do not keep the ground bare for long period during wet season. - Rake and restore soil compacted by vehicles or machinery. - Avoid fuel oil spill on soil; remove the spill immediately; do not wash down with water but use absorbent; collect used oil in old drums and dispose. - Train workers for handling of fuel and cleanup of spills. - Manage overall erosion during rainy season.

5.	Waste disposal (solid waste, construction tailings, debris)	- Comply with rules and regulations. - Avoid open burning of debris. - Dump waste at approved landfills. - Educate and train workers for goodhouse keeping. - Put up left over construction materials for sale. - Hire a contractor for tidying up the site after completion of construction work. - Discipline workers for good housekeeping practice.
6.	Potential accident at work place	- Create safety working conditions. - Try to achieve zero accident. - Set up "safety first" signages. - Train workers for good working practice and good safety practice. - Educate them for good health practice and hygiene. - Prohibit the drinking of alcohol during working hours. - Have a plan for emergency response. - Provide first aid traing and firefighting training. - Cover the building/structure with netting to prevent falling of debris, foots. - Provide adequate PPEs. - Provide adequate first aid kits well-stocked with medicine. - Provide adequate firefighting facility. - Organize mock drills and rehearsals. - Display phone numbers of Red Cross Society, Ambulance Service, Fire Brigade, Police Station, Naunghkio Township Hospital. - Take out insurance for the company; also take out fire insurance.
7.	Potential social issue	- Avoid the potential negative impacts on the socio-economic life of the locals. - Maintain good relation with the locals. - Conduct public consultations from time to time; heed to their opinions. - Educate workers for appropriate behaviours when dealing with locals. - Manage misbehaviour and social illness of workers. - Keep separate dormitories for male and female workers.

		- Ask the construction contractor to discipline his workers. - Apply punitive actions for wrong doer. - Prohibit the drinking of alcohol during working hours; ban the use of narcotics. - Prevent all kinds of quarrals and brawls. - Train workers for good housekeeping. - Heed to the voice of the locals. - Avoid damage to local infrasture, water resources and potential disturbances to the locals.
8.	Potential security issue	- Wall or fence the site. - Control all accesses; set up gates and deploy security guards. - Do not let workers enter the neighbouring village without pre-authorization. - Do not let them mingle freely with locals (Construction Phase only). - Keep certain materials under lock and key. - Ask the building contractor to discipline his workers (construction phase only). - Take punitive actions for wrong doer.

Table – 36: During the Operation Phase

Sr. No.	Impact	Mitigation measures (out line)
1.	Impact on air environment	- Comply with NEQEG guideline values (PM_{10}: 20; $PM_{2.5}$: 10; NO_x: 40; SO_2: 20 µg/m^3 etc) <u>For fugitive emission</u> - Avoid open burning of debris. - Spray water for dust suppression. - Restrict vehicular movements, maintain road clear of dirt. - Cover load with trapaulin during transportation. - Stop loading and unloading of coal and lime for a while when strong wind is blowing. - Limit open stockpiles of coal and lime powder - Minimize drop height when loading and unloading of above-mentioned materials.

		- Plant fast growing trees to trap dust. - Procure equipment and vehicles that emit less smoke, in the first place. - Keep equipment and vehicle well-maintained and well-operated and well-lubricated. - Use low sulphur fuel oil. - Provide adequate PPEs. - Heed to complaint of the locals regarding dust and smoke. <u>For point source emission</u> - Pulverized coal and limestone in the first place (for FGD SO_2) - Install Electrostatic precipitator (for PM) - Install series of bag filters (for PM); 7 bag filters at boiler vicinity - Apply complete combustion method (for NOx) - Install flue gas analyzer for continuous monitoring - Creation of green belt for sequestration of CO_2. - (In this factory context coal is pulverized in underground crusher house. Part of the conveyor is underground while the above ground part is tubular type. 3 bag filters are also inside the crusher house).
2.	Noise and vibration	- Comply with NEQEG guideline by ECD (70dBA day and night). - Procure equipment and vehicles that emit lower noise level, in the first place. - Restrict the movements of vehicles - Restrict noise to working hours, if possible. - Install silencers on certain noisy machinery. - Create green belt; trees abate noise (already done 137257 trees planted.) - Build the crusher house underground to mitigate noise and dust; apply remote control system. - Install wall (acoustic enclosure) or acoustic barrier for noisy equipment, if any; place noisier equipment further away from other, if possible

		- If possible avoid operation of all equipment at the same time - Modified old vehicle and equipment to reduce noise - Keep instrument, and vehicle well-mainted; can reduce noise level by more than 50% - Design the foundation of machinery to reduce vibration; install vibration absorber, shock absorber, if necessary - Reduce the speed of heavy truck; ensure the smooth surface of road to reduce vibration - Provide adequate PPEs eg: ear muffs, ear plugs (actually not necessary- the crushing process is remotely controlled).
3.	Waste disposal (solid and liquid)	- Comply with NEQEG guideline by ECD, 2015. - Train workers in the handling of waste (solid and liquid) - Follow the 5 Rs principles, reduce, reuse, recycle, recover and redesign. - Plan and manage for safe and systematic disposal - Always avoid dumping of solid and liquid waste into the open - Always avoid open burning of waste; plan for minimization of waste as practical as possible. - Consider for future reclamation, comprehensive utilization and outward transportation of wastes. (a) <u>Solid waste (industrial), for specific purpose</u> - Routinely collect ash (fly and bottom) by mechanical means (tray, conveyor belts) and store in silos. - Reuse for making bricks, for cement making, for any, for construction purpose (already done). - If possible reuse sludge eg. as fertilizer - Separate waste into at least 2 categories: recyclable and non-recyclable. - Avoid open burning; burn in incinerator or dispose at approved landfill; avoid indiscriminate discharge by all means.

		(b) Liquid waste (industrial) Generally no industrial liquid waste (waste water) is generated since the used water/waste water is almost 100% recirculated. However there can be certain industrial waste water in the form of boiler blow down, cooling water blow down, process water, washed water, etc. This small quantity is drained into the drainage system after physical treatment (sedimentation and cooling). - Recycle all used water; install cooling and recirculation system eg. cooling tower, condenser, etc. (this is exactly what the company has done) - Also plan for specific waste water treatment (mostly for recirculation of used water) - Ensure that the project does not compromise the availability of water (recirculation has solved this issue). - Assess the use of water regularly; conserve water - Harvest rain water; use storm water, if necessary Waste water (domestic) - Educate and train workers for minimization of the use of water - Treat water before discharge (conventional treatment) domestic waste water is simply drained into the large receiving pond, the waste water sink. - Waste water from toilet goes into septic tanks and soak tanks. - Avoid indiscriminate discharge of domestic waste water on land or into water body. - Wash vehicle and machinery only in designated area.
4.	Occupational health and safety issue	- Create safety working place. - Educate, train, supervise workers for good working practice and good safety practice. - Train workers for safety handling and operation of machinery and equipment, eg. the long run operation of boiler and other machinery - Organize induction training; provide work manual and safety manual.

		- Have a comprehensive plan for emergency procedure. - Provide first aid and firefighting training. - Provide adequate first aid kits. - Provide adequate PPEs. - Provide adequate firefighting equipment. - Regularly check equipment and especially electrical once for faults, leak, malfunction and fix them immediately. - Apply safe handling and storage of fuels and chemicals. - Take out insurance for power plant, fire insurance, workers insurance. - Avoid accidental fire and explosive by all means; safety handling and storage of fuel, coal, removed of all ignition sources. - Set up alarm system- eg. for fire, (detection of heat, smoke) for major machinery break down, for emergency shutdown. - Ensure that all workers pass a medical examination prior to being employed, - Organize drills or mock drills regularly for emergency preparedness, emergency response, emergency procedure, contingency plan, rescue plan, etc. - Display address or phone numbers of Fire Brigade, Ambulance Service, Hospital and Police Station so that everyone can see easily in case of emergency event. - Train workers for health and hygiene practices; provide proper sanitation facility eg. bath room, toilets, etc. - Provision of healthy food and potable water.
5.	Impact on traffic	- Plan and manage traffic; try to achieve zero road accident as far as possible - Compliance with traffic rules and regulation. - Educate drivers for defensive driving; organize training and accident prevention clan; take special care when driving near schools or place where children are present.

		- Schedule the logistic of vehicle; if possible avoid peak hours; avoid dangerous route, as far as possible; try to reduce traffic congestion - Set up sinage or speed limit at the intersection of main road and access road; also near school etc. - Never overload; avoid spilling of materials during transportation, cover with tarpaulin; if possible use speed control device (governors) on trucks and apply remote monitoring of driver roster to avoid overtiredness. - Regularly check and maintain vehicles to reduce risk of accident (no equipment malfunction, no break down) - Keep a log bog for each vehicle; have a record book and check the arrivals and departures of all vehicles. - Deploy a staff at the entrance to direct traffic and systematic parking - Ensure that the parking area can accommodate all vehicles.
6.	Potential social impact	- Prevent or minimize negative impact on socio-economic life of the local. - Build and maintain good relation with locals. - Appoint an affable staff as a liaison officer of the company to deal with the local in an affable manner. - Hold public consultation from time to time. - Set up a community consultation committee effectively impact this. - Educate the workers for etiquette, and respect the custom and tradition of the locals, especially the local Shan and Gurkhas custom, culture and tradition. Hire one knowledgeable local shan elder and one local Gurkha elder to explain to all workers about their custom and tradition especially about the "dos" and "don't" when meeting in the local community. Organize short lecture courses. - Manage misbehaviours and social illness of workers. - Keep separate housing for male and female workers (The company has separate housing for male and female workers).

		- Provide proper training on work place regulation and code of conducts. - Provide welfare programme (The company has a good programme). - Educate and discipline workers for conducts. - Deal with workers on a fair and square basis; not to overwork and underpaid; need to overtime works, if any, and duly pay them. - Take punitive action on wrong doer, eg sacking, dismissal. - Prohibit the drinking of alcohol during working hours; ban the use of narcotics. - Prohibit all kinds of quarrels and brawls taking place among workers or between works and locals. - Prohibit all kinds of unethical sexual practices. - Consider hiring locals in the future when there are vacant plots; prioritize the purchase of foods and commodities from local market. - Avoid impacting local drinking water sources and other resources. - Consider for gender parity; employ women workers as much as possible. - Ensure that there is no issue of child labour as far as the project is concerned. - Provide adequate sanitation eg-toilet, baths etc. - Heed to the voice of the locals, their view, and concern, if any. - Plan and implement CSR as practical as possible (The company has so far spent Ks 531,504,000 for CSR).
7.	Potential security issue	- Effective fencing/walling of the site. - Control all accesses; set up security gates; deploys guards. - Do not let workers mingle freely with locals. - Do not let the workers enter the neighbouring village without pre-authorization. - Put certain materials under lock and key. - Apply punitive measures to wrong doer. - Provide ID cards for all for easy idenfication. - Provide uniform for all.

8.	Visual impact	- Execute for an operation plan which is focused on visual appeal as practical as possible. - Plant trees for reforestation, create green belt. (already done) - Use eye pleasing paints and colours for the building and structure. - Reserve green area as far as possible; create green zone outside the premise. (already done) - Provide appropriate lighting only for secrurity reason; avoid excessive use of light at night. - Use yellow light instead of white light at night to discourage aggregation of insects; if insect aggregate turn off the light for a while.

Table – 37: During the Decommissioning Phase

Sr. No.	Impact	Mitigation measures (out line)
1.	Dismantling, and clearing impact (decommissioning impact)	- Manage for effective decommissioning of site and also at coal mine site - Hire decommissioning contractor to do the work. - Dispose materials that are no longer useable redeploy or put up for sale those that are useable - Machinery and equipment that are no longer use be made into iron scrap and send to smelting mill - Put up for sale those that are still useable - Restore the ground and soil profile. - Revegetate and rehabilitate the ground, select a variety of plant species.
2.	Potential residual impacts	- Clear and remove all residuals. - Remove all soil contaminated by fuel oil. - Test the soil; ensure that no contaminant remain. - Also test the air and water in the vicinity for possible pollutants. - Restore the soil to its natural condition as practical as possible. - Revegetate and rehabilitate the area.

Commitment

The project proponent, Ngwe Yi Pale' Cement Co., Ltd is committed to taking implementing all the mitigation measures prescribed in this Chapter as practical as possible.

In addition to implementing each and every sub-plan for management relating to each and every impact the company will also implement the following overall generalized EMP.

U Sein Myo Aung
Executive Director
Ngwe Yi Pale' Cement Co., Ltd

1) EMP for application of environmentally sound idea and technology
2) EMP for procurement of ecologically friendly equipment and machinery
3) EMP for air pollution management
4) EMP for water pollution management
5) EMP for land pollution management
6) EMP for biodiversity protection and conservation
7) EMP for good working practices and good safety practices
8) EMP for conservation of water, fuel and electricity
9) EMP for the protection of the socio-economic component as well as the cultural and visual components of the surrounding environment.
10) EMP for compensation for loss and/or damage of locals' properties.
11) EMP for rehabilitation after completion of project

These 10 points are simply enumerated in this report, and will not be eleborated.

8.4 Overall budget for implementation of the EMP

Since EMP involves the management of all environmental issues there have to be adequate budget for the implementation of EMP.

Actual EMP will be only for the Operation Phase since the Construction Phase has been long completed. However for theoretical purpose are included.

This budget will be only for the implementation of EMP but it will cover the procurement of certain devices, and equipment for uses in monitoring and certain materials for uses in emergency aspects eg- PPEs first aid facility medicines etc.

In order to effectively execute EMP and MP the company has set up a fund for the implementation of EMP and MP (in addition to a separate fund for the implementation of CSR). 0.5 percent of the project budget (USD 50,000) is set aside for EMP fund which will cover the initial costs and the recurring expenses for the effective implementation of EMP and MP.

The following programmes are integral parts for the successful execution of EMP:

- Mitigation measures programme
- Monitoring Programme
- Reporting Programme
- Capacity building and training programme
- Emergency Programme

The company will, therefore, alloted the EMP fund for the 4 programmes as follow:

- 35% of the fund (US$ 17,500) for the implementation of monitoring programme (This will be mostly for hiring technicians)
- 10% of the fund (US$ 5,000) for reporting works (This will include the purchase of stationary)
- 20% of the fund (US$ 10,000) for capacity building and training (This will include the hiring of trainers and purchase of teaching or educational materials)
- 30% of the fund (US$ 15,000) for emergency programme (tentative allotment) (This will include the hiring of trainers)
- 5% of the fund (US$ 2,500) for miscellaneous expenses
- The cost for taking mitigation measures such as procurement of Electrostatic Precipitator, bag filters, and other ecofriendly devices etc. will be borne by the main project budget in the first phase

Note: Since mitigation measures will be taken by all EMP cell members and workers supervized by them all mitigation works will be free of charge. All are well-paid staff and employees, they need not be hired.

For monitoring programme sometimes experts or technicians, have to be hired eg- to monitor the quality of air, water and soil. The normal and regular monitoring such as visual inspection will be undertaken by EMP cell members.

Experts or competent trainers have to be also hired for capacity building programme. All kinds of materials such as teaching aids and educational materials have to be procured.

As regards emergency programme trainers from the fire Brigade, Red Cross Society and ambulance and emergency unit will have to be hired.

All the required PPE, first aid facility and medicines have to be procured.

As EMP cell members are salaried employees of the company there is no need to hire them, and additional salary for them is not necessary.

But for the two villagers who will be members of EMP cells there need to be an arrangement made for them in the form of honorarium or fees.

The above-mentioned budget and the allomen are for the costs and expenses for the long Operation Phase only.

The fund cannot cover the whole life of the project of 30 plus year. The fund can be considered as seed money; as time goes on more money will have to be added to the fund.

The funds for reporting programme and capacity building and training can be fixed to a great extent. But the fund for emergency programme cannot be fixed due to the unpredictable nature of emergency programme. Unfortunately if major accidents happen more funds will have to be raised and reallocated for emergency programme (Emergency, health, safety are parts of EMP).

The fund for monitoring programme may not be also fixed for the long run. Depending on the finding of internal and external environmental acidits and also based on the degree of achievement against the environmental objectives the monitoring programe has to be changed or modified. If more monitoring works have to be carried out then the funding will have to be increased.

In the near future when EMP and MP and their implementation have become mandatory the cost such as setting up even a small laboratory (which can have dual purposes for quality control lab and environmental lab for monitoring of air, water, soil etc) will be really costly and procuring of equipment and devices and chemicals etc can be expensive. The company shall consider this before hand.

Organization to implement EMP and MP

To effectively carry out the EMP works a small organization, the EMP cell, has to be formed.

EMP cell

An EMP cell (a small nucleus organization) is formed for the effective implementation of EMP and MP. The cell members include the manager, who is the EMP cell leader, one engineer, and 4 technicians. This EMP cell is also the monitoring committee. Two local villagers will be added to this monitoring committee later.

Ngwe Yi Pale' Cement Co., Ltd has tentatively formed the EMP cell as follow:

1.	U Khin Maung Aye	Manager	EMP cell leader
2.	U Aye Min Soe	Engineer	Member
3.	U Chit Ko Ko`	Engineer	Member
4.	U Win Aung	Technician	Member
5.	U Maung Maung Oo	Technician	Member
6.	U Hla Myint	Yar-eain-moo	Member
7.	U Ye Lu	Local	Member

The monitoring works will cover the Construction Phase, Operation Phase and Mine closure/ Decommissioning Phase of the project life. The EMP cell leader (monitoring committee leader) and members are responsible for execution of the EMP and monitoring programme.

They will be specially trained for doing this. As for monitoring specific parameters eg- air quality, water quality and soil, technicians or experts from Yangon will be hired to do the analysis works.

It is not pragmatic for the EMP members, especially the five employees, of the company to get involve solely in EMP and MP activities because their main task is for operation of power plant (production work) while EMP and MP activities are actually supplementary works. The company shall not be in a position to set aside 5 well-paid employees just to engage in EMP or MP work alone; it will otherwise result in under-staffed situation for the project. Therefore the EMP cell leader and members have also to get involve in the routine production work as far as possible.

20 staffs will be also specially trained for carrying out EMP and MP works.

In the near future there will be environmental audits and there will be management review of EMP and MP.

The authority of the company will review EMP and MP activities as well as audit report on an annual basis. The review will include:

- Finding of internal and external environmental audits
- Achievement against the environmental objective and targets
- Environmental objectives and targets for the coming year
- Stakeholders concerns and other information, and
- Aspects and impacts in relevant to the up coming operation and environmental policy.

Pragmatic EMP for safety and health aspects (Summarized from IFC guidelines)

I. Occupational Health and Safety (OHS) Plan

First of all Ngwe Yi Pale' Cement Co., Ltd will plan and execute for the creation of a safe working environment and, particularly safety working place, following the guideline prescribed by IFC.

Educate, train and supervize its workers for good working practice, good practice and good house-keeping practice until all these god practices are ingrained in their mind sets and become good habits (will conduct special) induction course for newly employed workers).

Also educate and train them for good health practice, good hygiene practice and educate them for environmental awareness.

Specially workers will be educated, trained and supervized in the safety handling and operation of machinery and equipment. Safety manual hand books will be issued to all workers who are involved in the operation of machinery.

Workers will be specially trained in the handling and application of chemical (even if not toxic) and fuel and other substance.

Medical screening will be conducted for all workers prior to employment (pre-employment medical screening) and periodic medical examination (every six months) will be undertaken for all workers. The company will consider for HIV and STD testing in the near future.

The Company has already built a clinic with adequate first aid kits and medicines and drugs; at a cost of Ks 10,324,000. Employees as well as locals are treated free of charge.

Adequate sanitation will be provided and workers will be trained for good house-keeping practice and good health and hygiene practices (only male workers are camped; there are a few female workers from the villages who are not camped inside the factory premise. The company will liaise with Township Health Department on a regular basis.

A standard operating procedures for health and safety measures will be drawn encompassing; identification of risks, prevention, keeping a log book/record for accident; submiting the record book to Factories Inspection Department regularly, and plan for first aid procedures and subsequently admission to the nearest hospital (also partly mentioned in **Chapter-6**).

Special Induction Course/New Task employees training; installment of covers or rail guards for risky machinery; area signage; labelling of equipment and chemicals both risky and non-risky ones (in the forms of pictogram) will be undertaken.

Moreover the following subheadings concerning OHS guideline prescribed by IFC will be followed or at least referred to as far as possible. (These are summarized as follow.)

(a) General facility design and operation

Work places will be designed and equipped to protect OHS-; and prioritize structural integrity.

Severe weather and facility shut down

Work place structure will be designed and constructed to withstand severe weather (eg. violent storm, excessive rainfall) and also for an evacuation plan.

Work place and exit

Space at work place will be adequate for all kinds of activities, emergency exists (eg. fire exits) will be constructed/installed.

Fire precaution

The workplace will be designed in the first place for the preventing the start of fire; provision of firefighting equipment and also fire detector and alarm systems, if possible (Firefighting equipment, that is easily accessible and simple to use eg. portable fire extinguisher).

Lavatory and showers

Provision of adequate lavatory facility (toilets and washing area) with essential tissues papers and soaps etc.

Potable water supply

Provision of adequate potable drinking water that meets drinking water quality standards.

Clean eating area

Arrangement for provision of clean eating area for workers (not exposed to hazardous or noxius substances).

Lighting

Sufficient natural light or artificial illumination for worker safety and health.

Safe access

Provision of easy, safe and appropriate access in case of emergency.

First aid

Ensure that first aid can be provided at all times for workers. Provision of first aid with adequate medicine and drugs. Demarcate a place as first aid room/station.

Air supply

Sufficient fresh air will be supplied and good ventilation system will be implemented (eg. mechanical ventillation system such as fans and blowers). Ventilation and air cooling system will be equipped, maintained and operated to prevent the spread of pathogenic microorganisms.

(b) Communication and training

OHS training

Provide OHS training for all workers. In addition good working practice and good safety practice workers will be also trained for personal safety (preventing injury), basic hazards awareness, site specific hazards and emergency procedure for fire evacuation and natural disaster.

New task employee training

Ensure that all workers will recieve adequate training and information prior to employment. The training will cover: knowledge of materials, equipment and tools; known hazards in the operation and their control; potential risk to health; precaution to prevent exposure; hygiene requirement, wearing of PPEs and appropriate response to accidents.

Area signage

Appropriately mark hazardous areas (eg. electrical room, compressor rooms etc) chemical store, fuel depot etc as well as emergency exit.

Signage will be in accordance with international standards (eg. pictogram-easily understood by all).

Labelling of equipment

Label all bottles, containers for chemicals, both hazardous and non-hazardous.

(c) Physical hazards

Rotating and moving equipment

Design and install machine to eliminate trap hazards and ensure that extremities (eg. hands, fingers) are kept out of harm way during operation. Equipment will be protected by a guard/device that prevent access to the moving part.

Design and install equipment so that regular servicing can be undertaken without removing the guarding devices.

Noise

Ensure that no workers be exposed to a noise level greater than 85 dBA for a duration of more than 8 hours per day.

No unprotected ear will be exposed to a peak sound pressure level (instantaneous) of more than 140 dBA.

Provision of PPEs eg. ear plugs, ear muffs.

Apply acoustic insulating material (noise abator, silencer); isolate noisier equipment (install sound barrier); conduct periodic medical hearing check for workers exposed to long hours of high noise level.

Vibration

Avoid, prevent hand-arm vibration (eg. use of hand tools) and whole-body vibration (standing/sitting on vibrating surface) by all means. Reduce or limit working hours for vibrating work.

Install vibration dampening pads or device.

Electrical

Check all electrical cords, cables and hand power tools for faults or leaks and immediately fix the faults.

Mark all electrical devices and lines with warning sign.

Label service rooms housing high voltage equipment.

Establish "No Approach" zone around or under high voltage power line.

Eye hazards

Use machine guards or splash shields or/and face and eye protection (PPE) such as goggle and face mask where necessary.

Welding/hot work

Provide welder googles or full-face eye shield.

Provide protective suit for workers working near boiler.

Industrial vehicle driving and site traffic

Train operators in the safe operation of specialized vehicles and fork lifts; to strictly follow operating rules and procedures.

Ensure the operators undergo medical surveillance.

Ergonomics, repetitive motions and manual handling

Ensure that workers are not subject to excessive repetitive motions, over exertion and excessive manual handling. Use mechanical labour rather than manual labour as practical as possible to reduce injury and strain on workers eg. use mechanical assists to reduce or eleminate exertions requirement to lift materials.

Implement programme that reduce unnecessary forces and exertions.

Working at height

Implement protection measures whenever a worker has to work at a height of more than 2 meters eg. installation of guard rails; proper use of ladders and scaffolds; the wearing of safety belt and body hareness.

Illumination

Work area light intensity will be adequate for the general purpose of working inside a factory. If natural light is not sufficient energy efficient light sources (lamps, bulbs) with minimum heating emission will be used.

(d) Chemical hazards

Although all the chemicals used are non-toxic the company will educate and train its workers for the handling and application of chemicals. The company will:

- Minimize the release of chemical into the work environment.
- Keep the number of workers exposed to chemical to a minimum.
- Label all chemicals (use pictogram).
- Wear PPEs where necessary.

Air quality

- Maintain the level of PM, emission at concentration below those recommended by ECD (Described in **Chapter-3**).
- Conduct work practices to minimize release of air contaminant eg. direct piping of liquid and gaseous materials; minimize handling of dry powdered materials; enclosed operation; local exhaust ventilation at emission point.

Fire and explosions

- Store flammable away from ignition sources and oxidizing materials.
- Fuel and flammable storage shall be at a remote spot.
- Storage unit with concrete floor and roofing at appropriate height (for ventilation and explosions venting).
- Keep adequate fire extinguishing equipment.
- Define and label warning sign for fire hazard area.
- Provide specific training for handling of flammable materials.

Corrosive, oxidizing and reactive chemicals

None of these are used at the factory.

Asbestos containing materials (ACM)

These materials are not used.

(e) Biological hazards

The company does not use any biological agents (eg. bacteria, blue green algae, yeasts etc) in the operation of the coal fired plant or the treatment of water.

As mentioned earlier workers will be educated and trained for health and hygiene and also environmental awareness to prevent the spread of air-borne, water-borne and vector borne disease. The company doctor and health staff will regularly liaise with the Township Health Department.

(f) Radiological hazards

These are not anticipated; the company does not apply ultraviolet radiation for purification of water.

(g) Personnel Protective Equipments (PPEs)

The company will provide adequate PPEs for all workers exposed to dust, emission, heat, high level noise, and those who have to handle chemicals and fuel and any one where and when PPEs are necessary.

Note: In case of occupational diseases or any diseases workers will be promptly admitted to the Naunghkio Township Hospital and, if necessary, to Mandalay General Hospital.

In case of accident the injured workers will be given First Aid Treatment and subsequently admitted to Naunghkio Township Hospital and, if necessary, to Mandalay General Hospital.

For practical purpose the company will focus on health and safety impacts which are of particular concern during the operation of thermal plant:

Non-ionizing radiation

Workers usually have higher exposure to electric and magnetic field (EMF) due to working close to electric power generations, equipment and connecting high-voltage transmission lines; the last one contributes the greatest electric field impact due to the it nature (generation and transmission of power).

Mitigation/corrective measures include:

- Identify potential exposure level in the workplace
- Train workers in the identification of EMF levels and hazards
- Establish and identify safety zone to differentiate between zones of high EMF level and low EMF level
- Increase the distance between the source of EMF and worker or apply shielding material.

Heat

Exposure to heat occur during operation and maintenance of combustion units, pipes and related hot equipment.

Mitigation/corrective measures include:

- Inspect and maintain pressure vessels and piping regularly

- Provide adequate ventilation to reduce heat and humidity
- Reduce working time in high temperature environment; ensure access to drinking water
- Insulate hot equipment eg- combustion units, generators and pipe to alleviate heat
- Post warning sign near high temperature surface; provide PPE such as insulated gloves and shoes

Noise

High level noise are generated from turbine generators and auxiliaries; boilers and auxiliaries, such as pulverizer, disel engines; fans and ductwork, pumps, compressors, condensers, precipitators, motors, transformers, cooling towers etc.

Mitigation/corrective measures:

- Ensure that no workers be exposed to noise level higher than 85 dBA for a duration of more than 8 hours a day
- Provide PPEs eg- ear plugs, ear muffs

Confined space

Specific areas for confined space entry include solid fuel ash containers, turbines, condensers and cooling towers (during maintenance works).

O_2 depletion occur in confined space and can be poisonous. Well ventilation of confined space is necessary.

Mitigation/corrective measures include:

- Prior to entry into confined space process or feed lines in the space will be disconnected or drained, and blanked and locked out
- Mechanical equipment in the space will be disconnected, or de-energize or locked out
- Atmosphere within the space will be tested to assure the oxygen content is between 19.5% and 23% and that any flammable gas or vapour; if any, must not exceed 25% of its Lower Exposure Limit (LEL). If these conditions are not met the space will be well-ventilated until the conditions are met or use appropriate PPE respirator or Self Contained Breathing Apparatus (SCBA), or life line; also deploy safety watch workers outside the confined space with resue and first aid equipment at the ready.
- Adequate training is a must for workers prior to working in confined space.

Electrical hazards

Energized equipment and power lines can pose electrical hazards for workers at the thermal power plant.

Mitigation/corrective measures include:

- Ensure that workers are well-trained (as electricians)
- Install hazard warning sign; provide PPE if necessary
- Label service rooms housing high voltage equipment
- Establish "No approach zone" around or under high voltage power line
- Ensure that line power equipment are switch off or deactivated before work is performed
- Check all electrical equipment, cords, cables and also hand power fools for faults or leaks and immediately fix the faults

Fire and explosion hazards

The thermal power plant stores, transfers, and uses large quantities of fuels; therefore careful handling is necessary to mitigate fire and explosion risks.

Mitigation/corrective measures include:

- Train workers for safety handling of fuels and also chemicals, if any
- Store fuel and flammable materials away from ignition sources and oxidizing materials; fuel depot shall be at a remote spot; (the building with concrete floor and roofing at appropriate height for ventilation and explosion venting).
- Define and label warning sign
- Keep adequate fire extinguishers

For specific purpose

- Use automated combustion and safety controls
- Conduct proper maintenance of boiler safety controls
- Implement systematic and safety start up and shut down procedures to minimize the risk of suspending hot coal particles (eg- in the pulverizer/crusher) during start up
- Conduct regular cleaning of the place to prevent accumulation of coal PM

- Remove hot spots from the coal stock pile (to prevent spontaneous combustion) and spread until cooled; always avoid loading hot coal into the pulverized fuel system
- Use automated systems eg- temperature gauge and carbon monoxide sensor to survey coal storage area to detect fires caused by self-ignition and to identify risk points.

Dust (PM)

Dust is mainly generated at the crusher site, vehicular movements and other activities. PM is also generated in handling solid fuel (coal), additive and solid fuel combustion waste (SFCW) such as ash.

PM may contain silica (associated with silicosis), arsenic (skin and lung cancer), coal dust (black lung), biomass dust (asthma and cancer) etc.

Mitigation/corrective measures for PM are already described earlier in technical detail.

For specific purpose:

- Use PM controls (eg- exhaust ventilation) to keep PM below applicable guideline (show earlier in **Chapter-2 (2.3**), or wherever free silica levels in air borne PM exceed 1 percent.

II. Community Health and Safety (CHS) Plan (sources: IFC)

Evaluation of risk and impact

First of all evaluate potential risk and impact on the community and subsequent mitigation measures. Avoid/minimize the risk as far as possible.

Operate the project in accordance with Good International Industry Practice (GIIP).

Water quality and availability

Avoid/prevent adverse impact to the quality and availability of ground water and surface water resources, especially protect public drinking water sources at all times. Avoid the adverse impact on ground water (and soil) as far as possible.

Structural safety of project facility

Strictly follow the principle of good engineering practice and structural integrity during the designing and construction of the facility.

Avoid or reduce potential hazards posed to the public while accessing project facilities. Undertake hazard analysis to identify opportunities to reduce the consequence of a failure or accident.

Life and Fire Safety (L & F)

Design, construct and operate all now buildings accessible to the public in accordance with building, regulation and requirement and internationally accepted Life and Fire Safety (L & F) standards.

Provide fire prevention, means of egress (fire exit), detection and alarm system and emergency response plan. Train some staffs for firefighting and first aid training. Provide adequate firefighting equipment eg. fire extinguisher.

Traffic safety

Also conduct road safety education campaign for the local community.

Transport of hazardous materials

Comply with law and regulation relevant to transportation of hazardous materials. Also plan for measures for preventing and/or mitigating the consequence of accidental release of hazardous materials (chemicals, substances).

Avoid/minimize potential for community exposure to hazardous materials.

Disease prevention

Prevent the occurance and spread of communicable disease by all means. Undertake health awareness and education initiative (health education campaign) in local community and also provide health service for them as practical as possible.

Avoid/minimize water-borne, water-based, water-releted and vector borne disease and communicable diseases that would result from project activities.

Avoid/minimize by all means spread of diseases from workers. Provide adequate medical treatment.Regularly liaise with Township Healty Authority.

Emergency preparedness and response

Develop Emergency Preparedness and Response Plan and Contingency Plan (action plan) for effective implementation when necessary.

Provide operation manuals for External Emergency Plan and Internal Emergency Plan for all staffs, local community and government inspector. Conduct rehearsal or drills for such plans. Cooperate with local community and authority in preparation of emergency plan and review and update the plan occassionally.

Notify competent authority in the event of emergency that has occured on the site, if any.

Implement safety audits for the facility and promote the execution of the overall environmental management system.

III. Cultural heritage

In implementing the project the project proponent will be aware of the law regarding cultural heritage eg. Protection and Preservation of Cultural Heritage Regions Law, 1998 and Protection and Preservation of Ancient Monuments Law, 2015.

Cultural heritage area, ancient monument and archeological site must not be impacted by all means. If such heritage area and ancient monument happen to be in the proposed area the alternative project site has to be selected so as not to impact the heritage and monument found in the site area and vicinity.

In the early Construction Phase construction workers were instructed to report back promptly if they accidently find any archeological evidence such as artifacts and objects as well as unexploded ordnance (UXO) while doing construction work.

(No such objects were found and the project has proceeded to the Operation Phase quite smoothly.)

IV. Reporting requirement

Reporting is necessary for the effective and successful implementation of EMP.

Internal monitoring and inspection reporting

The physical and social parameters to be monitored are already mentioned earlier. Each and every monitoring/inspection work carried out by members of EMP cell will be catalogued in relevant log books. The internal monitoring and inspection will also have to involve in checking the performance of machinery, equipment and vehicles or at least the regular monitoring/checking of the log books of machinery, equipment and vehicle. All these findings or observations will be reported.

There will be a monthly reporting session for effective communication with the EMP leader or authority.

Incident, accident and emergency reporting

In cases of incident and accident (including near miss) prompt reporting will be carried out. This will be in the form of verbal reporting follows by written statement, after emergency and contingency procedures have been undertaken.

The written statement will be more comprehensive and will include the location and cause of accident, the time, extent and intensity and how actions for emergency and contingency procedures were taken. Estimate of loss will have to be followed later. A good reporting will help the EMP leader and authority to take future action, to learn lesson from the incident or

accident and enable them to draw future plan for health, safety risks and emergency management.

As mentioned earlier there will be a separate log book for registering complaints and grievances, if any. Prompt reporting on complaints and grievance is necessary and the authority has to take necessary measures in a timely manner.

Reporting on training programmes

As mentioned earlier there will be regular monitoring and inspection of all training programmes provided, namely, capacity building training, training provided for safety such as firefighting training and training provided for health such as First Aid Training; also training for quick response and preparedness such as drills and mock drills.

It is not necessary to monitor every session of a training programme and its process. But it is necessary to monitor, inspect and watch every drill, mock drill or rehearsal.

EMP cell members conducting monitoring and inspection works will be able to interpret and assess the overall condition of the training processes especially assessment of the effectiveness and applicability of each training.

A report on the training including assessment on its effectiveness will be submitted at the end of each and every training programme.

Finally Annual review will be prepared and an Annual Environmental Management Report will be submitted.

V. Capacity building and traning

Training is essential for effective and efficient implementation of EMP and MP. However it is not yet practical to plan for capacity building of the EMP cell members up to standard of developed countries. Training needs will be identified based on the existing and available capacity of the company and project personnel.

EMP cell leader or EMP officer will be trained to be able to recommend measures to improve environmental condition. He/she will be trained to implement control and protective measures for effective implementation of EMP and also able to ensure suitability, edequacy and effectiveness of the MP implemented.

The two pragmatic training programmes, Firefighting and First Aid Training are already addressed. One capacity building and training of importance for EMP cell members will be practical training for conducting monitoring and inspection and for assessment of the finding or observation. The parameters to be monitored and inspected are already mentioned earlier.

The training programme for monitoring and inspection work involves the selection or location of the spot/place and the parameter to be monitored. As already mentioned earlier the parameters include physical ones --- air, noise level, water, waste as well as social aspects already mentioned, and inspecting the performance of workers and workers compliance with environmental requirements.

The capacity building and training programme will also cover other basic aspects such as:

- conduct environmental awareness to the staffs/workers
- conduct safety programme to create safety awareness among staffs/workers
- train staffs/workers on general safety measures and, if necessary, conduct safety rehearsal or safety drill to educate them

As regards the actual monitoring and inspection this will be carried out in the form of visual inspection only. It is not practical at the moment yet for the members of EMP and MP cell to monitor (test) the physical parameters that involves the use of equipment and chemicals for this purpose, for instance, air test kit, water test kit, noise level detecting kit etc.

Therefore specially trained technicians or experts, for instance, from the Health Department or from YCDC have to be hired for air quality analysis and water samples have to be sent to registered laboratory in Yangon for analysis.

Ngwe Yi Pale' Cement Co., Ltd has already set up its own laboratory, not only for quality and standards, but also for implementation of EMP. The company can train its EMP cell members in the operation of these equipments and the application of chemicals for EMP implementation, especially for testing and analysis of air and water quality.

Emergency plan

The chance for major accident to occur in a well-managed coal thermal plant is remote.

Violent storm and earthquake could be ruled out for his area; there was no precedent of such disasters within memory and the area was not on a fault line. Up to 2014 flood was ruled out; but what had happened in July and August of last year (2015) indicated how major floods could be unpredictable in this era of climate change or rather climate disruption. There were major floods in 11 out of 14 states and regions of the country resulting in catastrophe.

Accident like fire break out, especially bush/forest fire could not be totally ruled out given the nature of the work. In this EIA report emergency plan would mainly focus on emergency and contingency plan for outbreak of fire.

Emergency procedures (generalized)

- first draw up a plan for prevention measures for fire accident (the company has already drawn up plans for fire prevention and fire fighting)
- carefully plan for emergency response and procedures (the company has already done this)
- provide firefighting training for some workers (already done)
- provide adequate firefighting facility, water ponds, hydrants, water jet pumps, and fire extinguishers; provide adequate PPEs such as firefighting suits, if possible.
- regularly check the firefighting facility, its readiness; ponds to be always filled with water
- organize mock drills regularly and assess the effectiveness of drills and training; assess the readiness, quick response and quick evacuation processes
- provide First Aid Training to some workers
- provide adequate first aid facility-such as stretchers, equipment, first aid kits including medicines; regularly check the condition of first aid facility
- display addresses and phone numbers of Fire Fighting Brigade, Ambulance Service, Redcross Society, Hospital's emergency department, police station etc so that everyone can see easily
- set up effective alarm system and control system both mechanically and manually control
- take out insurance for the company; also insurance for fire and flood disaster
- effectively install lightning arrestors, lightning strips and rods, down lead and grounding electrodes
- deploy tight security all the time (arson and sabotage could not be totally ruled out due to anti-big business, anti-tycoon and anti-crony mindsets of certain people)
- in case of emergency excute the plan in a systematic manner as plan.

Emergency response and contingency procedures (in brief)

The objectives of Emergency reponse are:

- to minimize confusion through effective delegation of responsibitities
- to minimize danger or safety risks by providing first aids
- to minimize damage to property and the environment by isolating the incident
- to minimize operation and business assest as far as practical

VI. Landslide (Potential landslide)

There is the potential for landslides, floods, erosions, spreads, etc due to indiscriminate forest/bush clearing and quarrying. These can cause increase in the incidence of landslides (Human induced landslide), especially during the rainy season.

- check the geological setting of the area before starting quarry; develop an evacuation plan
- look for any warning signs, such as natural springs, seeps, cracks, natural erosion, etc
- implement proper quarry techniques, follows all the regulation regarding quarry and mining.

When landslides occur:

- stay alert and away from landslide (There can be additional landslide)
- start recuse operation when only the situation become stable
- checked for people, trapped people as priority in recuse work, and rescue
- evacuate machinery, equipment later
- use the limestone and sandstone from the landslide area ass raw material for making cement.

Ngwe Yi Pale' Cement Co., Ltd will later draw up seperate emergency response and contingency procedures for:

- storm
- flood
- earth quake
- accidents at work places, sudden illness such as epidemics that effect many workers

8.5 Management and monitoring sub-plan (MMSP) by project phases

Objective

- to effectively carry out EMP and MP in a pragmatic and meaningful way
- the sub-plan to be focused on impact/potential impacts
- to summarize mitigation management or control measures for issue/components prescribed by in EIA Procedure by ECD (mentioned above).

MMSP for Construction, Operation and Decommissioning/Rehabilitation and drawn for effective implementation of EMP. The plan is based from "Environment Impact Assessment Procedure"; Notification No. 616, 2015 as prescribed by ECD, covering:

- noise and vibration, waste, hazardous waste, waste water and storm water, air quality, odour, chemicals, water quality, erosion and sedimentation, biodiversity, occupational health and safety, community health and safety, cultural heritage, employment and training and emergency response. In addition sub-plans for traffic safety management and visual impact (aesthetic) management focus on visual appeal (aesthetic beauty) also include.

Responsible people

EMP cell leader, EMP cell members (4) and specially trained staff (20) are responsible for execution of all management and monitoring sub-palns.

During the Construction Phase

Sr. No.	Potential issue	Sub-plans (mainly for taking mitigation measures)	Responsible persons	Cost estimate (One year)	Time frame/ - frequency
1.	Noise and vibration	- Plan in the Preconstruction Phase for procurement of equipment, and vehicles that emit lower noise level. - Procure these eco-friendly machinery, equipment, vehicle - Procure these eco-friendly machinery, equipment, and vehicle. - Comply with ECD's NEQEG guidelines for noise level. - Test/monitor air quality regularly - Install silencers and mufflers. - Avoid construction work at night. - Provide PPE to workers exposed to prolonged high noise level. - Manage vibration of machine, equipment and vehicle. - Limit the speed of vehicles. - Monitor noise level, hired technicians	Hired technicians for testing	Ks. 800,000	Semi-annually
2.	Waste	- Designate separate dumping site for vegetation waste, overburden and topsoil; ensure that the site are stable; give away vegetable waste (trees) to locals for fire wood. - Regularly collect waste at camp in waste bins and dispose at approved landfill (or dumping) site.	5 EMP cell members, 20 trained staff	Free of charge	Throughout Construction Phase; occasionally, weekly, monthly as required

3.	Hazardous waste	- Not generated.	-	-	-
4.	Waste water and storm water	- Create systematic drainage at the site to manage waste water; ensure that it does not enter the stream; also to manage storm water. - Create sustable drainage at stie to manage storm water. - Keep natural drainage of the slope intact; do not block or alter as far as possible. (Ensure taht the construction of series of assess road, and factory site do not damage the natural drainage as far as possible.) - Ensure that overburden and stop soils stockpiles, from not effected by storm water. - Monitor the situation; hired technicians.	5 EMP cell members, 20 trained staff	Free of charge	Throughout Construction Phase; occasionally, weekly, monthly as required
5.	Air quality	- Comply with ECD's NEQEG emission guidelines. - Plan in the Pre-Construction Phase for the procurement of equipment, vehicles that emit less smoke (to be certified for emission compliance) and procured them. - Test/monitor air quality regularly. - Keep equipment and vehicles well-maintained, well-operated and well-lubricated to reduce smoke emission. - Used machinery and vehicle with low emission rate; use fuel with low sulphur content. - Avoid open burning of debris. - Spray water for suppression of dust. - Restrict vehicular movement; maintain road clear of mud and dirt.	Hired technician for testing	Ks. 3,000,000	Semi-annually

		- Limit open stockpile of earth, sand etc. - Provide PPE to workers who are exposed to smoke or dust for long period. - Test, monitor air quality regularly			
6.	Odour	- Not generated.	-	-	-
7.	Chemicals	- Not used during Construction Phase	-	-	-
8.	Water quality	- Avoid water bodies as far as possible when constructing or building roads - Test/monitor water quality regularly - Storage of fuel oil as well as used fuel oil should be done in a designated bunded side until removal - Maintain vehicles and machinery adequately to prevent spillages resulting in surface water or underground water contamination - When handling fuel oil avoid accidental spillages into the surface water; should spillages occur implement appropriate clean up immediately. - Avoid disposing of waste (both liquid and solid) into water bodies. - Educate at workers for conservation of water - Top soil should be allowed to naturally vegetate in order to stabilize soil particles and thus preventing erosion and limiting siltation to avoid pollution of water by all means. - Test water quality regularly (semi-annuall)	Hired technician for testing	Ks. 1,000,000	Semi-annually

9.	Erosion and sedimentation	- Implement erosion control/management when the natural slope is more than 20^{o}. - Minimize the area of bare soil exposed as practical as possible (do not clear the vegetation more than necessary leaving large area of bare land). - Prevent erosion and sedimentation especially during monsoon season. - Run-off from areas adjacent to the site will be diverted around disturbed areas (construction of small diversion canal/drainage). - Create systemmatic drainage system. - Control sediment (build sediment trap or dam where necessary). - Prevent sliding and erosion top soil stockpile as far as possible: let grass and vegetation grow on stockpile for stabilization. - Ensure that run-off from the site is discharged at non-erosive velocities; discharge will be to location that do not adversely impact the natural waterways (the stream). - Monitor erosion and sedimentaion, regularly.	5 EMP cell members, 20 trained staff	Free of charge	Throughout Construction Phase; occasionally, weekly, monthly as required
10.	Biodiversity	- Do not clear vegetation more than necessary for the construction of access road and site. - Prevent the spillages of hydrocarbons which has negative impact on plants especially on the root system	5 EMP cell members, 20 trained staff	Free of charge	Throughout Construction Phase; occasionally, as required

		- Avoid open burning of debris. - Educate workers for fire awareness and protection. - Promote environment awareness to workers. - Implement rehabilitation to promete natural vegetation establishment after completion at site. - Restrict vehicular movement to the access road to prevent habitat disturbance of birds and animals. - Prevent the potential injury or dealth of wildlife due to vehicular movements especially during nigh time. - Avoid the use of excessive bright light for long hours at night to prevent the aggregation and eventual death of large number of insects - Monitor biodiversity situation, regularly			
11.	Occupational Health and Safety	- Creation of a safe working place and working condition. - Facilities will have adequate space for all kinds of activities, - Provision of adequate lavatory facility, bath and washing area; provision of adequate potable drinking; provision of health living spaces and clear eating areas, provision of first aid at all times for workers (the company has its own clinic). - For practical purpose provide First Aid Training for some workers with the assistance of Township Red Cross society; will provide adequate first aid facility including first aid kits, medicines and drugs.	5 EMP cell members, 20 trained staff	Free of charge	Throughout Construction Phase; occasionally, as required

		- Provide training for Occupational Health and Safety; training for good safety practice, for personal safety (preventing accidents, injuries), basic hazards awareness, and site specific hazards. - Provide training on safety handling and operation of machinery equipment, safety storage and handling of fuel oils and coal. - Will provide adequate PPEs to workers where and when necessary to ensure the basic health protection and safety of workers. - Safe work procedure for all electrical works covering construction, operation and decommissioning and demolition works. - Educate and train drivers, particularly heavy truck drivers for safety driving and defensive driving; ensure that the access road is not bumpy and safe for driving. - Try to achieve zero accidents in hauling and transportation activities including traffic. - Ensure that workers are not subject to excessive repetitive motions, over exertion and excessive manual handling; if possible will use mechanical labour rather than manual labour as practical as possible to reduce fatigue, strain and injury on workers. - Monitor OHS situation, regularly.			

12.	Community Health and Safety	- Will control smoke and dust as practical as possible; will avoid open burning of debris and trash so that smoke will not reach the village; educate the driver to lower speed when passing through the village (the reduction of speed from 40 km to 35 km can reduce dust to 50%, it is learnt). - Local should be able to file complaints regarding dust, noise and vibration. - Ensure that the water ponds do not become breeding ground for mosquitoes; regularly changing of water; application of mild chlorination; annihilation of mosquito larvae by all means; educate workers to use mosquito's nets at night and provision of mosquito nets. - Also ensure that domestic solid wastes, liquid waste water and drainage do not become breeding ground for flies, mosquitoes and insect for prevention of vector borne diseases and water borne or water related disease. - Will prevent the occurrence and spread of infectious and communicable diseases by all means; will undertake health awareness and educations initiative (health education campaign) in local community as far as possible. During the long Operation Phase will consider for setting up a clinic at the site and provide htalth care for locals as practical as possible. - Avoid/minimize by all means, vector borne, water borne (water based, water related disease and communicable diseases that would result from project activities. Liaise	5 EMP cell members, 20 trained staff	Free of charge	Throughout Construction Phase; occasionally, as required

		with Township Health Authority regularly. - Avoid/minimize by all mean spread of diseases from workers. Educate long distance truck driver regarding sex education example for use of prophylactic condom; prevent spread of STD, HIV/AIDS. - Educate workers regarding code of conducts, social conducts, etiquette and local culture and tradition. - Educate drivers for safe driving and defensive driving and to comply with rules and regulation regarding traffic; also conduct road safety education campaign for the local community, if possible; local should be able to file complaint regarding traffic. - Comply with law and regulation relevant to transportation of hazardous materials such as fuel oils; also plan for measures for preventing and/or mitigation the consequence of accidental release/spill of hazardous materials (fuel oil); avoid/minimize community exposure to hazardous materials. - Develop emergency preparedness and emergency response plan and contingency plan (action plan) for effective implementation when necessary; provide operation manuals for external emergency plan and internal emergency plan for all workers. Conduct rehearsals or drills for such plan. Cooperation with local community and authority in preparation of emergency plan. - Monitor CHS situation, regularly.			

13.	Cultural heritage	- Ensure that the project has no impact on the Buddhist monastery. - Monitor the situation. - Pay courtesy visit (obeisance visit) occasionally to the abbot monk and offer cash and kinds and build good cordial relation. - Get involve in religious festivals; provide donations.	5 EMP cell members, 20 trained staff	Free of charge	From time to time
14.	Employment and training	- Plan for human resource development. - Prioritize employing locals as far as possible. - Organize new task employees for job training. - Also provide systematic induction training for new workers to enable them to do their jobs efficiently. - Induction training will cover: general training; skill training for efficiency and mandatory training relating to health and safety (e.g. safety operation of machinery and handling of hazardous materials). - Educate and train them for good working practice, good safety practice, good health and hygine practice and good environmental awareness practice until all these practices are ingrained in their mind sets and become good habits. - Educate and train them for familiarization with negative impacts and subsequent taking of mitigation measures. - Educate and train them for basic eco-friendly behaviours e.g. good house-keeping practice, do not litter, do not dirty your place, minimize the use of water, fuel.	Company authority and EMP cell members, officers from government department for training and educating	Ks. 10,000,000 (honourarian fees, courtesy gift)	From time to time as required

15.	Emergency response	- Prepare Emergency Response Plan (ERP) and team to prevent fatilities and injuries, to reduce damage and to protect environment and community. - Prepare emergency preparedness plan and execute the plan. - (Emergency Response Plan will cover emergency resources, emergency preparedness and training, emergency response procedures, administration of the plan, communication and procedures, and debriefing and post-traumatic stress procedures.) - For practical purpose provide training for firefighting, training for First Aid and Rescue. - Provide facilities (e.g. firefighting equipment, suit, first aid kits, and emergency vehicle. - Display phone numbers of Firefighting Department, Ambulance Services, Red Cross Society, Hospital and Police Station. - Monitor the execution of emergency response.	5 EMP cell members, 20 trained staff	Ks. 14,420,000 (Set aside for emergency case, for educating and training by government officials honorarium fees)	Once during Construction Phase

During the Operation Phase

Sr. No	Potential issue	Sub-plans (mainly for taking mitigation measures)	Responsible persons	Cost estimate (One year)	Time frame/ frequency
1	Noise and vibration	- Comply with ECD's NEQEG noise level guidelines. - Plan for appropriate choice of machinery and vehicles (that emit low noise level); method of working, efficient material handling. - Installation of noise abating devices e.g. silencers, mufflers at air inlet and outlet of far and compressor; place noisier sources far away in overall design, (if possible). - Keep vehicles and machinery well-operated and well-maintained to generate lower noise level and prevent undesirable noise level. - Restic or limit vehicular movement to mitigate noise and vibration. - Create smooth road surface to mitigate vibration. - It is not practical to mitigate high noise level and vibration from blasting. - Develop green belt (plant trees) around the site; trees abate noise and serve as noise sink (pollution sink). - If necessary install vibration absorbers or vibration absorbers or vibration abators. - Provide adequate PPE e.g. ear muffs, ear protectors to workers exposed to long hours of high noise level;	Hired technicians for testing	Ks. 1,600,000	Semi annually

		- Conduct regular noise monitoring to ensure that the levels are within noise exposure standard (not higher than 85-90 dBA); hire technicians every six months. - Implement GRM; locals can file compliant regarding noise. - Monitor noise and vibration; hire technicians.			
2	Waste	- Reuse cement dust, clinker dust for making cement. - Temporarily store ash and slag in a shed for regular disposal at the approved landfill. - Place waste bins inside the compound for industrial as well as domestic waste. - Industrial wastes such as used filter, old tools and device a variety of packing materials have to be all discharged at landfill. - Used fuel oil, engine oils etc. are stored in old drums and give away to local recyclers or anyone who want it. - Instruct workers for proper handling and disposal of wastes, especially domestic waste, at landfill. - Follow the 5 Rs principle; reduce, reuse, recover, recycle and redesign, wherever possible. - Separate solid waste into categories, (recyclable and non-recyclable, hazardous and non-hazardous) use separate bins, disposed non-recyclable ones and hazardous ones at approved landfill. - Dispose waste only after all waste preventive and recycling strategies have been undertaken.	5 EMP cell members, 20 trained staff	Free of charge	Throughout Operation Phase; occasionally, weekly, monthly

		- Avoid disposal of waste water outside (on land or into water body). - Educate and train workers for good house-keeping practices; do not litter, do not pollute. - Monitor waste regularly; monitor effective new of mitigation measures taken.			
3	Hazardous waste	- No hazardous waste envisaged; - Used fuel oil, engine oil will be collected in drums and give away to recyclers sued filter bags will be discarded at landfill.	5 EMP cell members, 20 trained staff	Free of charge	Throughout Operation Phase; occasionally, weekly, monthly
4	Waste water and storm water	- Create systematic drainage at the site to manage waste water; ensure that it does not enter the stream; also manage storm water. - Create suitable drainage at site to manage storm water. - The dry process method generates reglible industrial waste water. - Recirculate used water through cooling tower. - Used water to be used for watering plan and washing vehicles, machinery. - Brown waste water (kitchen, baths) will end up in waste water collection tank and dry up; no special treatment. - Black waste water (toilet) will end up in septic tanks and sock pits.	5 EMP cell members, 20 trained staff hired and technicians	Ks. 20,000,000 (for hired technicians only)	Occasionally by EMP cell member, semi-annually for hired technician

		- Avoid disposal of waste water either on open ground or into the river; educate workers for this. - Monitor waste water regularly (semi-annually by technicians). - Monitor effectiveness of mitigation measures taken. - Regular monitor waste water.			
5	Air quality	- Comply with ECD's NEQEG emission guideline. - Consolidate and compact all areas to prevent generation of dust due to wind. - Install one ESP and 7 bags filter to mitigate emission. - Reduce NO_2 by control combustion (complete combustion) - Use dry coal to achieve complete combustion and reduce NO_2, PM_{10} and $PM_{2.5}$). - Regularly collect coal dust, ash, slag at the base of boiler and dispose. - Monitor main emission from the stack regularly (visual inspection by staff every week); only one stack, 83.8 m high and diameter 1.5m. - Hire technicians for testing/measuring emission (semi-annually) - Also hire technician for measuring air quality (semi-annually). - Spray water for suppression of dust (dry months) - Reduce the speed of vehicle to reduce dust generation. - Restrict vehicular movement; maintain road clear of mud and dirt. - Avoid open burning of debris or solid waste.	Testing for monitoring	Ks. 60,000,000	Semi annually

		- Keep equipment and vehicles well-maintained well-operated and well-lubricated to reduce smoke. - Implement GRM (locals can file complainst regarding emission). - Provide PPE (e.g. face masks, mouth and nose covers, gas masks) to workers exposed to long hours of dust and smoke. - Monitor air quality (hire technicians) - Monitor the effectiveness of mitigation taken.			
6	Odour	- Not generated.	-	-	-
7	Chemicals	- Only small quantity required; all chemical are for laboratory used; no special treatment required. - Keep MSDS for all chemical.	5 ESMP cell members and lab technicians	Free of charge	Daily or weekly
8	Water quality	- Plan and manage for preventing pollution on the water environment. - Manage so that factory's activities will not impact the surface water of Nant Pansi Chaung. - Manage for the stability of top soil to prevent erosion and siltation; - Fuel oil depot is away from a stream; the depot is bunded to protect surface water from oil spill. - Avoid disposing of waste (liquid and solid) into the stream by all means. - Manage water conservation; reduce water consumption. - Adhere to the princile of conservation of water; educate workers for this.	Hired technician for testing	Ks. 20,000,000	Semi annually

		- Hired technicians for testing water quality. - Apply a monitoring plan for water quantity and quality based on simple parameter e.g. temperature, pH and total alkalinity (hired technicians). - Also monitor the effectiveness of mitigation measures taken. - Adequately maintain vehicle and machinery to prevent spillages resulting in groundwater contamination. - Avoid spillage during the handling of fuel oil. - Should accidental spillages occur implement appropriate clean up immediately; do not wash down spill with water; use absorbents or saw dust for clean-up. - Monitor water quality; hired technicians. - Monitor the effective of mitigation taken.			
9	Erosion and sedimentation	- Implement erosion control/management when the natural slope is more than 20^{o} (actually not necessary). - Ensure that activities do not impact soil structure. - Minimize the area of bare soil exposed as practical as possible (do not clear the vegetation more than necessary leaving large area of bare land). - Create sound drainage system; the factory compound has a network of drainage. - Run-off from areas adjacent to the site will be diverted (construction of small diversion canal/drainage). - Control sediment if necessary, inside the compound. - Ensure that run-off from the site is discharged at non-erosive velocities; discharge will be to location that do not adversely impact the natural flow of the stream.	5 EMP cell members, 20 trained staff	Free of charge	Occasionally, weekly, monthly

		- Ensure that the soil profile of the site is stable and not easily eroded. - Regularly monitor erosion (rainy season). - Monitor the effectiveness of mitigation measures taken.			
10	Biodiversity	- Plan for minimum disturbance to the flora and fauna. - Do not clear vegetation more than necessary. - Avoid open burning of debris. - Implement rehabilitation to promote natural vegetation establishment after Construction Phase. - Restrict vehicular movement to the access road to prevent habital disturbance of birds and animals. - Prevent the potential injury or death of small wildlife due to vehicular movements especially during night time. - Avoid the use of excessive bright light for long hours at night to prevent the aggregation and eventual death of large number of insects. - Identify sensitive species which need to be avoided; if any, avoid the disturbance of animal habitat such as nest and breeding ground. - Plant trees, create green belt; establish a plant nursery near the end of the Operation Phase for major rehabilitation of the site. - Monitor the situation concerning biodiversity conservation; monitor the greening of the area. - Monitor the effectiveness of mitigation measure taken	5 EMP cell members, 20 hired staff	Free of charge	occasionally weekly, monthly

11	Occupational Health and Safety	- Plan and manage for creation of a safe working environment, (safe working place and working condition for all its staff. - Provide adequate portable drinking water. - Adequate lavatory facilities – toilets, baths, washing areas with essential tissue papers and soaps etc. - Provide healthy living space (housing) and clean eating areas. - Workers are providing with PPE, where necessary. - Set up a factory clinic; - Emergency and logistics plan for sicked and injured staffs; treatment at clinic; admission to nearest hospital. - Education and training for safety handling and operation of machinery, equipment; safety storage, handling and uses of coal chemical, fuels, etc. - Provide OHS training for all staff; educate and train them for good working practice, good safety practice, good housekeeping practice, good health and hygiene practice. - Provide fire fighting training and First Aid training. <u>Physical hazards</u> - Avoid machinery accidents by all mean. - Ensure that no worker is exposed to noise level greater than 85-90 dBA. (Provide ear muffs, ear plugs); exposed to smoke, dust for long hours. - Avoid, prevent whole body vibration, and hand-arm vibration. Reduce working hours for high level noise and vibration works. - Mark all electrical devices and lines with warning signs. - Label service rooms housing high voltage equipment. - Ensure that electricians are all well-trained and experienced.	5 EMP cell members, 20 trained staff	Ks. 2,000,000 (fees and courtesy gifts for trainers, lacturers etc.)	From time to time as required

		- Provide PPE, e.g. protective suits including insulation gloves and boots to workers working near hot places. - Train driver for safety driving; follow rules and regulation; do not overload truck; - Try to achieve zero accident. - Ensure that workers are not subjected to excessive repetitive movement, over extertion and excessive manual handling to prevent strain, sprain, and injuries. - Use mechanical labour rather than manual labour; apply automation system as far as possible. - Educate train and supervise staff for safety storage, handling and application of coal, limestone, fuel. - Label all chemicals (pictogram); keep MSDS for hazardous ones. - Fuel and flammable storage in secured spots (safety fuel depot). - Keep adequate fire extinguishers, equipment, (fire fighting pond to be always full of water). - Define and label warning signs for all fire hazards and explosion hazards area. - Minor cases of sick and injuries will be treated at the factory's clinic; major or serious cases will be promptly admitted to the nearest hospital at Naimghkio Township Hospital. - Plan and execute for emergency response to accidents and injuries and rescue operation.			

		- Monitor the activities daily. - Take out insurance for the plant and also life insurance for workers, if necessary.			
12	Community Health and Safety	- Will control smoke and dust as practical as possible; will avoid open burning of debris and trash so that smoke will not reach the village; educate the driver to lower speed when passing near or through the village (the reduction of speed from 40 km to 35 km can reduce dust to 50%, it is learnt). - Locals should be able to file complaints regarding dust, noise and vibration (through GRM system). - Ensure that the water ponds do not become breeding ground for mosquitoes; regularly changing of water; application of mild chlorination; annihilation of mosquito larvae by all means; educate workers to use mosquito's nets at night and provision of mosquito nets. - Also ensure that domestic solid wastes, liquid waste water and drainage do not become breeding ground for flies, mosquitoes and insect for prevention of vector borne diseases and water borne or water related disease. - Will prevent the occurrence and spread of infectious and communicable diseases by all means; will undertake health awareness and educations initiative (health education campaign) in local community as far as possible. The clinic at the site will also provide health care for locals as practical as possible. - Avoid/minimize by all means, vector borne, water borne (water based, water related disease and communicable diseases	5 EMP cell mambers and 20 trained staff	Free of charge	From time to time as required

		that would result from project activities. Liaise with Township Health Authority regularly. - Avoid/minimize by all mean spread of diseases from workers. Educate long distance truck driver regarding sex education example for use of prophylactic condom; prevent spread of STD, HIV/AIDS. - Educate workers regarding code of conducts, social conducts, etiquette and local culture and tradition. - Educate drivers for safe driving and defensive driving and to comply with rules and regulation regarding traffic; also conduct road safety education campaign for the local community, if possible; locals should be able to file complaint regarding traffic (through GRM system). - Comply with law and regulation relevant to transportation of hazardous materials such as fuel oils; also plan for measures for preventing and/or mitigation the consequence of accidental release/spill (fuel oil); avoid/minimize community exposure to hazardous materials. - Develop emergency preparedness and emergency response plan and contingency plan (action plan) for effective implementation when necessary; provide operation manuals for external emergency plan and internal emergency plan for all workers and if necessary also to local community and government inspectors. Conduct rehearsals or drills for such plan. Cooperation with local community and authority in preparation of emergency plan. - Monitor CHS situation regularly.			

13	Cultural heritage	- Ensure that factory's activities have no impact on the village Buddhist monastery. - Monitor the situation. - Pay courtesy visit (obeisance visit) occasionally to the abbot monk and offer cash and kinds and build good cordial relation. - Get involve in religious festivals; provide donations.	5 EMP cell members, 20 trained staff	Free of charge	From time to time as required
14	Employment and training	- Plan for human resource development. - Prioritize employing locals as far as possible. - Organize new task employees for job training. - Also provide systematic induction training for new workers to enable them to do their jobs efficiently. - Induction training will cover: general training; skill training for efficiency and mandatory training relating to health and safety (e.g. safety operation of machinery and handling of hazardous materials such as fuel. - Educate and train them for good working practice, good safety practice, good health and hygine practice and good environmental awareness practice until all these practices are ingrained in their mind sets and become good habits. - Educate and train them for familiarization with negative impacts and subsequent taking of mitigation measures. - Educate and train them for basic eco-friendly behiviours e.g. good house-keeping practice, do not litter, do not dirty your place, minimize the use of water, fuel. - More specific training for operation of heavy machinery and specific machinery and equipment and heavy trucks will be organized.	Company authority and EMP cell members	Free of charge	From time to time as required

		- Review on the effectiveness of training will be done for improvement. - Overall regular monitoring of activities at the site will be conducted.			
15	Emergency response	- Prepare Emergency Response Plan (ERP) and team to prevent fatalities and injuries, to reduce damage and to protect environment and community. - Prepare emergency preparedness plan execute the plan. - (Emergency Response Plan will cover emergency resources, emergency preparedness and training, emergency response procedures, administration of the plan, first aid work, recue operation works, communication and procedures, and debriefing and post-traumatic stress procedures.) - For practical purpose provide training for firefighting, training for First Aid and Rescue. - Provide facilities (e.g. firefighting trucks, time extinguishers, equipment, suit, first aid kits, and emergency vehicle. - Display phone members of Firefighting Department, Ambulance Services, Red Cross Society, Hospital and Police Station. - Review on the effectiveness of training will be done for improvement. - Regular monitoring of all activities at the project site will be conducted. - Mock drill for ERP will be conducted, on a regular basic; bi-annually.	5 EMP cell members, 20 trained sstaff	Ks. 14,420,000 (Set aside for emergency case)	From time to time as required

During the Decommissioning/Rehabilitation Phase

Sr. No.	Potential issue	Sub-plans (mainly for taking mitigation measures)	Responsible persons	Cost estimate (for 1 year)	Time frame/ frequency
1	Air quality and water quality	- Test air quality and water quality each for the last time to ensure that they are within guideline values and that water do not remain polluted. - Monitor the situation; take corective measure.	Hired technicians	Ks. 6,000,000 for air Ks. 2,000,000 for water	Semi-annually
2	Soil quality	- Test soil quality for the last time to ensure that the soil is not polluted or contaminated with fuel oil; ensure that the site is ecologically restored.	Hired technicians	Ks. 400,000	Semi-annually
3	Erosion and sedimentation	- Ensure that no erosion and sedimentation take place during the Decommissioning/Rehabilitation Phase. - Monitor the situation, take corective measure.	5 EMP cell members, 20 trained staff	Free of charge	Occasionally, weekly, monthly
4	Community Health and Safety	- Manage to ensure that community health and safety are not compromise during Decommissioning/Rehabilitation Phase; ensure that the site is safe for local community at Rehabilitation Phase. - Monitor the situation; take corective measure.	5 EMP cell members, 20 trained staff	Free of charge	From time to time
5	Biodiversity	- Ensure for effective rehabilitation (reforestation) - Ensure that replanted trees are all well-reestablished; replant new sapling necessary. - Continue regular tending (weeding, application of fertilizer, if necessary) of the replanted trees for at least 2 years. - Monitor the effectiveness of decommissioning/rehabilitation work. - Monitor and take corective action.	5 EMP cell members, 20 trained staff	Free of charge	From time to time

Commitment

The project proponent has made a sincere commitment to conduct the above-mentioned specific monitoring programme on a regular basic. The finding of monitoring results will be duly submitted to the authority, Environmental Conservation Department (ECD) semi-annually.

U Sein Myo Aung
Executive Director
Ngwe Yi Pale' Cement Co., Ltd

8.5.1 Industrial Risk Management Plan (IRMP)

Generally from economist's point of view "Industrial Risks" is defined as factors that can impact a particular industry. For instance, negative impact on profitibility, sales, cash flow, growth, stock prices etc. In other words, industrial risks mean factors that can beyond the scope of this EIA report.

From purely environmentalist's perspective the industrial risks are:

- Industrial air pollution, industrial water pollution and industrial land pollution and so on.

Industrial air pollution (emission)

The main emission from a coal-fired thermal plant includes SO_2, NO_x and particulate matter (PM).

In this context Ngwe Yi Pale' Co., Ltd has quite effectively managed these emission. SO2 is managed/mitigated by applying dry FGD (Flue Gas Desulphurization) method where pulverized limestone is used as desulphurization agent.

NO_x is managed/mitigated by applying complete combust ion method where the temperature is maintained at 800-900 ^oC with the aid of cyclone separator and FD fan.

PM is managed/mitigated by application of ESP (Electrostatic precipitator) and a series of bag filters. (These are already described earlier in Chapter – 6).

In this EIA context industrial risks refer to occupational risk or health risk. (Risk is defined as a chance or probability that a person will be harmed or experience an adverse health effect if exposed to a hazard).

Risk Management Plan (RMP)

Simple way of risk management in coal-fired thermal plant:

- Identify the risks/hazards
- Analyse and evaluate risk
- Manage the risk (control and treat the risk)

After risks are identified and evaluated the first management plan to execute will be to provide. Communication and training for all workers.

Provision should be made to provide OHS orientation training to all employees to ensure they are appropriate of the basic site rule of work at the site and of personal protective and preventing injury to fellow workers.

Training will consist of basic hazard awareness, work place specific hazard, safe work practice, and emergency and procedure for fire, excavation and natural disaster as appropriate.

The training should also cover:

- Knowledge of materials, equipment and tools
- Known hazards and how to control
- Potential risks to health
- Precaution to prevent exposure
- Hygiene requirement
- Wearing and used of PPE and
- Appropriate response to incidents and accidents.

Industrial risks and management

Actually there are a variety of industrial health risks and hazards. Risks of particular concern during the operation of a coal-fired thermal plant are:

1) Non-ionizing radiation
2) Heat
3) Noise
4) Confined space
5) Electrical hazard
6) Fire and explosion
7) Chemical hazards and
8) Particulate matter (PM)

1) Non-ionizing radiation

This is a work site hazards where workers are exposed to electric and magnetic fields (EMF). This is due to working near electric power generator, equipment and connecting high voltage terminal lines. High voltage line contributes to greater electric field impact at a coal-fired thermal plant site.

Management

- Identify the potential exposure level in the work place.
- Train workers in the identification of occupational electric and magnetic fields.
- Establish safety zone to differentiate between work areas with elevated EMF level compared to those acceptable for public exposure; limit access to only properly trained workers.
- For practical purpose increase the distance between the source and workers, if possible; or apply shielding material (metallic coating which are earthed).

2) Heat

In Coal-fired thermal plant occupational exposure to heat occurs during operation and maintenance of combustion units (furnace, boiler, cyclone, etc.), hot pipes and related hot equipment (generator, turbine).

Management

- Regularly inspect and maintain pressure vessels and piping's.
- Provide adequate ventilation (fans) in work areas to reduce heat and humidity.
- Reduce the time required for working in elevated temperature environment; ensure access to drinking water.
- Insulate and shield surfaces where workers come in close contact with hot equipment such as combustion units, generators and pipes.
- Stick warning signs near high temperature surface.
- Provide PPE as appropriate, including outfits, insulated gloves and shoes.

In this project context the company has maximized mechanical automation works and minimized manual works as far as possible thus minimizing exposure to heat.

3) Noise

In a coal-fired thermal plant high level noises are generated from a variety of sources, for instances, turbine, generators and auxiliaries, boiler and auxiliaries such as pulverizer; diesel engine; fan and ductwork; pumps; compressor; condensers; precipitators, including rappers and plate vibrators; piping and values; motors; transformer; circuit breakers and cooling tower.

Management

- Select and procure equipment with lower sound power level in the first place, if possible.
- Ensure that no worker is exposed to noise level greater than 85 dB(A) for a duration of 8 hours without PPE (ear plugs, ear muffs).
- No ear should be exposed to a peak sound level of more than 140 dB(A) (PPE should be capable of reducing sound level at the ear to level 85 dB(A).
- If possible, limit the duration of noise exposure. (For every 3 dB(A) increase in sound levels, the allowed exposure period should be reduced by 50 percent).
- Install acoustic insulating materials; for example, install silencer for fan; muffler or noise abator on engine exhaust and compressor component.
- If possible, isolate the noise sources or relocate noise source to less sensitive area.
- Install sound insulation in the room;
- Check daily high noise level time
- Conduct periodic medical hearing checkup on workers exposed to long hours of high noise level

In this project context the project proponent has applied mechanical automation system as far as possible minimizing exposure of workers to high sound level. Two noisy crushers are stationed underground to minimize sound level and dust generation.

- Install vibration absorber or vibration dampening pads or devices
- Limit the duration of exposure
- Check the daily exposure time of vibration

4) Confined space

In this coal-fired thermal plant context specific areas for confined space entry including;

- Ash silos, turbine house, condenser, and cooling water tower.

As the operation of the plant involves mechanical automation and control normally no worker will have to enter confined space. However, during certain maintenance activities workers will have to enter such confined space.

Management

- First of all thoroughly train workers for working in confined space
- Provide safety measures for venting, monitoring and rescue operation as far as possible. The area adjoin an access to a confined space should provide ample room for emergency and rescue operation.

- Access hatches should accommodate 90% of the workers to work in such confined space.

- Prior to entry into a confined space the following should be checked and prepared in advance:

- Process or feed lines into the space should be disconnected or drained, and blanked and locked out.

- Mechanical equipment in the space should be disconnected, de-energized and locked out as appropriate.

- The atmosphere within the confined space should be tested to ensure the oxygen content is between 19.5% and 23% and the presence of any flammable gas or vapor does not exceed 25%. (If the atmospheric conditions are not met. The confined space should be ventilated until the target safe atmosphere is achieved.

- Entry is only to be undertaken with appropriate PPE.

- Safety precaution should include Self Contained Breathing Apparatus (SCBA), life lines, and safety watch worker stationed outside the confined space with rescue and first aid equipment readily available.

- No worker will have to work alone in a confined space (no lone and isolated workers in such a space).

5) Electrical hazards

Energized electrical equipment and power lines can pose electrical hazards for workers at the coal-fired thermal plant. Exposed or faulty electrical devices e.g. circuit breakers, panels, cables, cords and hand tools, can pose risk to workers. Over hand wire can be stuck by metal devices (poles, ladder) and by vehicles with metal booms etc.

Management

- Provide specialized electrical safety training to workers working with or around exposed components of electric circuit. For instance training in basic electrical theory, proper safe work procedures, hazard awareness and identification, proper use of PPE, proper lockout/tagout procedure, first aid including CPR (Cardiopulmonary Resuscitation) and proper rescue operation.

- Install hazard warning light inside electrical equipment enclosure to warn of inadvertent energization; mark all energized electrical devices and lines with warning sign.

- Protect power cords and extension cords against damage from traffic

- Use of voltage sensors prior to and during workers entrance into enclosure containing electrical components.

- Deactivate and ground line power equipment and distribution lines wherever possible before work is performed on or proximal to them.
- Check all electrical cords, cables, and hand power tools for faults.
- Establish "No Approach Zone" around or under high voltage power line.

6) Fire and explosion

Coal-fired thermal plant stores, transfers and use large quantity of coal; therefore, careful handling is necessary to mitigate fire and explosion risks. Especially, fire and explosion hazards increase as the particle size of coal is reduced. In this project context pulverized coal can fuel a propagating explosion occur within thermal cycles, cyclones, bag filters, pulverized coal system, crushers and other process or conveyance equipment.

Coal-fire thermal plant also have to use fuel oil (diesel) but fuel oil requirement is low (only 10000 gallons/month) as most activities involve the use of electricity. Diesel is shared with the other two cement plants from a common depot. Diesel is flammable and therefore careful handling is necessary.

Management

- Draw up a plan for prevention of fire and explosion and emergency plan
- Provide specific worker training in handling of flammable materials (fuel oils and coal)
- provide training in fire prevention, firefighting and suppression; also provide First Aid training
- Provide firefighting equipment (fire extinguishers, water jet pump; fire water pond to be always filled with water).
- Store coal in secured warehouse (concrete floor, steel walling and roofing); remove all ignition sources. (The project proponent does not need to store large quantity of diesel, which is shared with the fuel for 2 nearby cement plants.)
- Set up alarm system; for instance, fire detector, heat and smoke detector, general alarm system for breakdown of machinery; alarm system for emergency shutdown of the plant etc.
- Maintain boiler safety control for long term operation.
- Implement start up and shutdown procedures to minimize the risk of suspending hot coal particles (e.g. in pulverize, mill and cyclone/during start up.
- Never load hot coal into the pulverized fuel system.
- Regular clearing of the facility to prevent accumulation of coal PM (e.g. on floor and equipment).

- Use automated combustion and safety controls.
- Also use automated system such as temperature gouges or carbon monoxide sensor to survey coal storage area to detect fire caused by self-ignition and to identify risk points, if possible.
- Display address or phone numbers of Fire Bridge, Ambulance Service, Hospital, Police Station etc. so that everyone can see easily.
- Take out insurance for the power plant and consider for life insurance for every worker.

7) Chemical hazard

Chemical hazards are not envisaged as no hazardous chemicals are used. Water purification treatment have applied physical means – e.g. mechanical filter and zeolite softener, reverse osmosis membrane system etc. only small quantity of sodium hydroxide (a very mild chemical) is used for controlling the pH of water (Annual requirement: only 70 kg).

The plant laboratory, for water quality testing, uses mostly DD test kit and JD test kit where negligible quantity is chemical are used. The test kit mainly operates physically.

8) Particulate matter (PM)

SO_2 and NO_x can be effectively mitigated and more of their traces, if any left, cannot be detected with naked eyes (unseen) and dissipate in the air shed. No further management necessary.

Even though PM can be effectively mitigated it remains as ash or dust in large quantity and has to be managed.

PM is generated in handling coal (non-pulverized and pulverized), additives (pulverized limestone) and solid fuel combustion waste (SFCW) such as ash.

PM may contain silica, arsenic, coal dust, and other potentially harmful substances. The inhalation of silica PM or dust can cause silicosis (a disease of the lung). Inhalations of arsenic particles can lung cancer while prolonged contact with the skin can also cause skin cancer. Coal dust is well known for causing black lung disease or coal workers' pneumoconiosis.

Management

- For effective management of PM (fly ash and bottom ash) the company has deployed 1 electrostatic precipitator (ESP) and 7 bag filters where 230-604 tons of fly ash and 153-403 tons of bottom ahs/down ash are collected.
- Dry handling of dry ash is undertaken; the conveyor conveys the ash to respective fly ash and down ash silos.

- The ashes are used for making bricks (the company has two brick making machines that use fly ash from this coal-fired thermal plant and cement dust from the two nearby cement plants.)

- Manage coal dust at crusher sites; to mitigate dust the crusher site is stationed under ground and furnished with 3 bags filters; part of the conveyor is also underground.

- Limestone dust is generated in small quantity, only one thousandth that of coal, (ratio 1000 coal: 1 limestone), it is reused.

Other management works include:

- Storage of coal in enclosed storage structure; e.g. warehouse with steel walling and roofing; storage of limestone in silo.

- Spray water for suppression of dust especially at coal storage area and open ground.

- Trucks loaded with coal are all well-covered with tarpaulins, to prevent PM emission and spillage.

- Lower the drop height of truck during loading and unloading of coal to minimized PM generation.

- Design and transport system inside the compound; conveyers are used for transportation of pulverized coal and limestone to hopper; conveyor is also used transportation of ash to ash silos; conveyors are enclosed (tubular conveyor).

Other industrial occupation hazards such as: rotating and moving machines; eye hazards; hot work; ergonomic, repetitive motions and manual handling, and working at height already briefly described earlier in Chapter 8.

8.5.2 Emergency Response Plan (ERP)

An emergency is defined as an unplanned event when a project operation losses control or could lose control; of a situation that may result in risks to human health, property or the environment either within the facility or in the local community.

Objectives:

- to protect the people and environment,

- incase of emergency light, major accidents, the certain shutdown of factory and other unexpected emergency

- to prevent fatalities and injuries and to minimize danger and safety risks

- to minimize damage to property and the environment by isolating the incident, and

- to minimize panic and confusion through effective delegation of responsibilities.

All projects should have an emergency responsible plan that includes the following basic elements:

- administration (policy, purpose, distribution etc.)
- organization of emergency area (command center, medical station etc.)
- roles and responsibilities
- communication system
- emergency response procedures
- emergency resources
- training
- checklist (role and action list and equipment check list)
- business continuously and compensation

The project proponent has set up nucleus organization the EMP cell. The leader of EMP cell, EMP cell members and trained staff/workers will implement the general Emergency Plan and the specific Emergency Response Plan. Small teams are delegated to perform their responsibilities such as firefighting team, exvacution team, First Aid treatment and rescue operation team and temporary shelter preparation team.

Emergency Preparedness Plan (EPP)

First of all there should be an Emergency Preparedness Plan (EPP) which is an integral part of ERP. An EPP includes:

- emergency preparedness training
- emergency preparedness facility and resources before the actual planning and execution of ERP.

(A) Training

The emergency preparedness facilities and emergency response plan require training programs and practice exercise (drills) for testing systems to ensure an adequate level of emergency preparedness. Training programme will encompass:

- identify training needs based on the roles and responsibilities, capabilities and requirements of personnel in an emergency.

- develop training plan to address needs, especially for firefighting, spill response and excavation
- conduct annual or bi-annual training and perhaps more training when the response includes specialized equipment, procedures or hazards
- provide training exercises to allow personal the opportunity to test emergency preparedness.

These include:

- desk top exercise with only a few personnel where the contact lists are tested and the facilities and communication assessed, and
- response exercises such as drills/mock drills that allow for testing of equipment and logistics
- debrief upon completion of a training exercise to assess the effectiveness of the training
- record training activities and the outcomes of the training

(B) Emergency preparedness facilities and resources

These include:

- Finance and emergency funds
- Fire services
- Medical services
- Logistic especially contingency
- Availability of resources
- Mutual aid, and
- Contact list

(i) Finance and emergency funds

A mechanism should be providing for funding emergency activities.

(The company has a fund for execution of EMP of which USD 15,000 is allotted for emergency programme).

(ii) Fire services

- First consider the level of local firefighting capacity (e.g. the township Fire Department and Fire Brigade) and whether the equipment is available for use at the thermal plant in the event of a major emergency. (It is expected that the township fire brigade can cope with an event of fire emergency).
- Provide adequate firefighting facility (e.g. fire extinguisher, water jet pump, hydrants, water supplies/firefighting water pond and PPE. (The company has such facility).

(iii) Medical services

- Set up a medical facility (clinic) with medical workers (nurses); the clinic will be stocked with adequate medicine and drugs; also stocked with first aid kits and first aid facility.
- Medical workers and workers trained in First Aid will give treatment; minor cases will be treated at the clinic; major cases will be admitted to the nearest hospital (Naunghkio Township hospital).

(iv) Logistic especially contingency

- Designated certain vehicles (cars, trucks) for use in emergency cases for transportation of injured workers to the nearest hospital and for use in other emergency execution of materials.
- Liaise with the township Ambulance services, as appropriate for emergency cases.

(v) Availability of resources

Take appropriate measures for managing the availability of resources in case of emergency. These include:

- Maintain a list of external equipment, personal, facilities, funding, expert knowledge and materials. That may be required to respond to emergency. (The list should include personnel with specialized expertise for spill cleanup, flood control, water treatment etc.)
- Provide personnel who can readily call as resources as required (e.g. EMP cell members and trained staff)
- Track and manage the costs associated with emergency resources.

(vi) Mutual Aid

- Mutual aid agreement decrease administrative confusion during emergency and provide a clear basis for response for mutual aid providers (e.g. mutual aid agreements with Township Fire Brigade and Township Red Cross Society).
- Mutual aid agreement will be maintained with the Fire Brigade and the Red Cross Society to allow for sharing of personnel and specialized equipment.

(vii) Contact list

- Keep a list of contact information for all internal and external resources and personnel. The list will include the name, description, location and contact details (for example address, telephone numbers, email etc. of the Fire Brigade, the Red Cross Society. The Ambulance Service, the Township hospital, the local authority, Police Station etc.).

(C) Pragmatic Emergency Response Plan

With the exception of fire accident, the probability of a major accident occurring in the coal-fired thermal plant is really remote. Unfortunately there is the probability for fire outbreak due to the nature of work (the handling of large quantity of solid fuel).

The emergency response plan especially for fire outbreak is already mentioned earlier; but is summarized below:

Emergency response plan for fire emergency

- first draw up a plan for prevention measures for fire accident (the company has already drawn up plans for fire prevention and fire fighting)
- carefully plan for emergency response and procedures (the company has already done this)
- provide firefighting training for some workers (already done)
- provide adequate firefighting facility, water ponds, hydrants, water jet pumps, and fire extinguishers; provide adequate PPEs such as firefighting suits, if possible.
- regularly check the firefighting facility, its readiness; ponds to be always filled with water
- organize mock drills regularly and assess the effectiveness of drills and training; assess the readiness, quick response and quick evacuation processes
- provide First Aid Training to some workers
- provide adequate first aid facility-such as stretchers, equipment, first aid kits including medicines; regularly check the condition of first aid facility
- display addresses and phone numbers of Fire Fighting Brigade, Ambulance Service, Redcross Society, Hospital's emergency department, police station etc so that everyone can see easily
- set up effective alarm system and control system both mechanically and manually control

- take out insurance for the company; also insurance for fire and flood disaster
- effectively install lightning arrestors, lightning strips and rods, down lead and grounding electrodes
- deploy tight security all the time (arson and sabotage could not be totally ruled out due to anti-big business, anti-tycoon and anti-crony mindsets of certain people)
- in case of emergency excute the plan in a systematic manner as plan.

The company has 5 kg extinguisher (49 nos.) and 35 kg extinguisher (12 nos.). There is a firefighting water pump station installed near cooling tower. Fire hydrants are already installed around the coal thermal plant, under coal conveyor belt and on both side of coal warehouse.

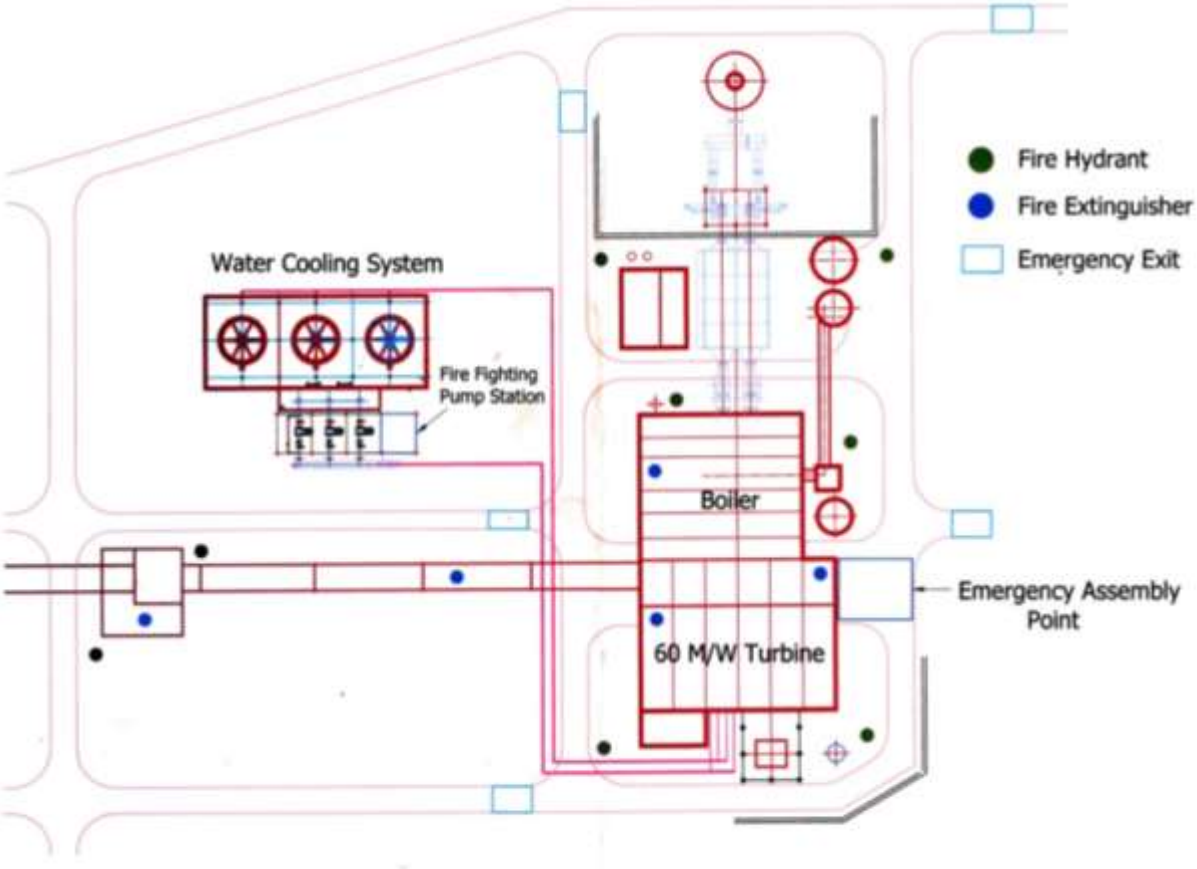


Figure – 120: Layout plan for fire emergency plan (showing spots where hydrants, extinguishers, emergency exit and assembly point

(D) Business continuity and compensation

In the aftermath of a major accident:

- Assess the losses damages and injuries
- Assess the cost for compensation
- Undertake the compensation, rehabilitation and the curative measures for workers who had suffered injuries or death
- Compensate for the less and/or damage, if any, suffered by the locals
- Resume and continue the normal operation of the effected coal-fired thermal plant as soon as possible.

8.5.3 Water Inlake Management Plan (WIMP)

This coal-fired thermal plant applies wet cooling system, wet cooling account for the largest usage of water in coal-fired thermal plants. The cooling tower with a capacity of 2500 tons is built for this.

Wet flue gas desulpherization or the so-called wet scrubber method has the second largest usage orf water in such a wet cooled plant. (In this project context only dry scrubber method is applied. Pulverized limestone is used as dry Fuel Gas Desulphurization (FGD) agent).

Other used of water include: cooling power plant equipment: air heater and precipitator wash down, back flush from ion exchangeer, boiler waer purification (blow down), cooling blow down, etc. Samll quantity of water is lost due to evaporation leakage or spillage, etc.

Management principle (conservation of water)

Since a thermal plant required a large amount of water the water has to be recirculating for the purpose of conservation. (The once flow through system is considered a wasteful use of water and therefore no longer applied in most countries).

Even in the wet cooling and recirculation system a large amount of water is needed to cool and condense the hot steam coming out of the turbine. The steam is cooled, and condensed back into water and recycled through the system. The cooling tower plays a major role in cooling.

For execution of water intake management plan the following facts are considered:

- availability water throughout the Operation Phase
- water quality to be up to standard for a thermal plant
- storage and distribution
- application of water conservation method

Availability of water (management for sourcing water)

Since coal-fired thermal power plant requires a large quantity of water the plants are established near a river or a large water body or water course or water source.

The readily availability of water is the main issue; some plants in India and a few countries have to shut down due to water issue during the dry season of the year.

In this project context there are no large river or water body nearby but only springs, streamlets and streams in the area. Only perennial springs or streamlets are considered; ephemeral springs or streamlets are not considered.

Water is sourced from this perennial spring/streamlet that originates from ground water.

The volume of water flow rate is 41.09 gallons/sec during the dry season.

The water from this spring/streamlet supplies all the water required by the three plants (2 cement plants and this proposed coal-fired thermal plant).

Since water is almost 100% recirculate the annual required for this project is estimated at only 300,000 gallons.

In case the availability of water throughout the year become an issue the company has plan B for sourcing water from Nant Pan Si stream, further downstream, with larger volume of water. (The spring, the streamlet and Nant Pan Si stream are actually the one and same water course).

Water quality

For effective long term operation of the plant water quality has to be maintained up to standards.

The cooling tower needs softened water while the boiler (fluidized bed combustion boiler) needs demineralized water (R.O water).

The raw water has to be treated in the first place. Mechanical filter and zeolite softener, Reverse Osmosis (R.O) membrane system and mixed bed (cat ion +Anion) Resin system are applied. To control pH the chemical sodium hydroxide (NaOH) in small quantity has to be applied from time to time (from acid to alkali condition).

The company has also set up a laboratory for regular testing of water quality, mostly using water test kit e.g. DD test kit and JD test kit.

Water storage and distribution management

The water sourced from the said streamlet flows by means of gravity flow, through PVC pipe, into company's common ground tank (for all three plants, 2 cement plants and 1 coal-fired thermal plant).

From the common ground tank the water is pumped and flowed through 2,100,000 million and 1,500,000 gallons tank and into 100,000 gallons tank. (The water from two much larger tanks is distributed to the two cement plants nearby).

The 100,000 gallons tank is for the coal-fired thermal plant. The water has to undergo a series of treatment: mechanical filter, zeolite softener, R.O membrane and mixed bed (cat ion + anion) resin system to achieve the required standard.

The treated softener water (for cooling tower) and R.O demineralized water (for boiler) are separately stored in respective tanks.

R.O demineralized water in the boiler is heated by furnace for generation of hot steam which drives the turbine for the generation of electricity for the two cement plants and for domestic uses.

The hot steam is cooled, and condensed into water and recirculate through the cooling tower. The cooled and condensed water has to pass through a series of 3 cooling tanks and finally recirculate by filtered pumps. Part of the water is also reused as boiler feeder water. The purified pure water is also for domestic uses.

Application of water conservation method

Fresh water resources are getting scarcer annually and conservation of water is one of the main theme in environmental conservation.

- The first and foremost principle in water conservation in the coal-fired thermal plant is the almost 100% recirculation and reuse of water, known as closed circuit wet cooling system. The hot steam used for driving turbine blades (for generation of electricity) is cooled, condensed into water and recirculate. The company, with environmental awareness in mind, is applying this method. (The once flow through non-recirculating system is the wasteful use of water and no longer suitable in the area of environmental awareness).

- Secondly, the dry FGD system or dry scrubber system is applied for the conservation of water. Pulverized limestone is used as an effective Fuel Gas De-sulphurization agent. Very small quantity of pulverized $CaCO_3$ (the ratio for pulverized limestone to pulverized coal is 1:1000) is burnt together with pulverized coal. This is an affective FGD method also known as dry scrubbing. (In wet scrubbing method lime water, known as chemical dozing, is applied, it has to use a relatively large quantity of water).

Dry scrubbing and wet scrubbing have both advantages and disadvantages; that is, dry scrubbing cannot be termed the best method or perfect method. But for the sake of water conservation it is advantageous.

- To effectively conserve water dry ash handling method, where no water is used is applied. The down ash and fly ash are collected at the bottom by mean of a conveyor that conveys the ash to ash silos by mechanical means. There are separate silo for down ash and fly ash.

  In wet ash handling method relatively large quantity of water has to be used. There should be an ash pond to collect the ash by wet handling method. Unless the ash pond is property lined or sealed it can have negative impact on the subsoil and underground water.

  Even though the water is almost 100% recirculated there are occasions where waste/used water have to be discarded. For instance: boiler blow down has to be done daily and the water discharged. Cooling blow down has to be done weekly.

  Some equipment have to be washed from time to time e.g. air heater, precipitator and the washed water is discharged; the work place is rarely washed. Small quantity of water is lost through evaporation spillages or leakages. Therefore, it is estimated that 60-80 tons of new water has to be replenished (make up water).

  The company has done its best for minimization of water uses. Workers are educated and trained for the conservation of water and other resources such as energy and fuel.

8.6 Content of each subplan

8.6.1 Objective

- To ensure that EMP is thoroughly planned and effectively implemented and legal requirement are complied with.
- To ensure that Monitoring Plan (MP) is throughly planned and effectively implemented.
- To ensure that management action and monitoring action are duly taken.
- To ensure that mitigation measures to be taken are duly implemented and
- To ensure that the EIA report is not a formality but a meaningful tool for operating the project in an eco-friendly manner and in a sustainable way.

8.6.2 Legal requirement

The legal requirement for the implementation of this project and National Environmental Quality guideline values to be complied with are already described earlier in **Chapter-3** also in part (environmental health) in the earlier part of this **Chapter-8**.

However the relevant requirement for implementation EMP and MP are reproduced below:

- Environmental Conservation Law, 2012
- Environmental Conservation Rules, 2014
- Environmental Impact Assessment Procedures, 2015
- National Environmental Quality (Emission) Guideline, 2015
- Boiler Law, 2015
- The conservation of water Resources and River Law, 2006
- The conservation of water Resources and River Rules, 2013
- Occupational Health and Safety Law, 2019

In implementing management and monitoring sub plan the project proponent will, most of all, comply with the National Environmental Quality (Emission) Guideline as prescribed by the Environmental Conservation Department (ECD), the Ministry of Natural Resources and Environmental Conservation (MONREC).

The project proponent will regularly monitor the basic physical environmental parameters such as air quality and emission, noise level and vibration, water quality and effluent, and soil.

The results will be compared with NEQEG (emission) guideline values prescribed by ECD; and improvement will be made as practical as possible. Where necessary the WHO guideline values or USNEPA guideline value will be also adopted.

8.6.3 Overview map and site layout maps, images, aerial photo, satellite images

Monitoring points where air quality/emission, noise level, water quality/effluent will be measured/tested; as well as points where water sample and soil sample to be taken are shown below:

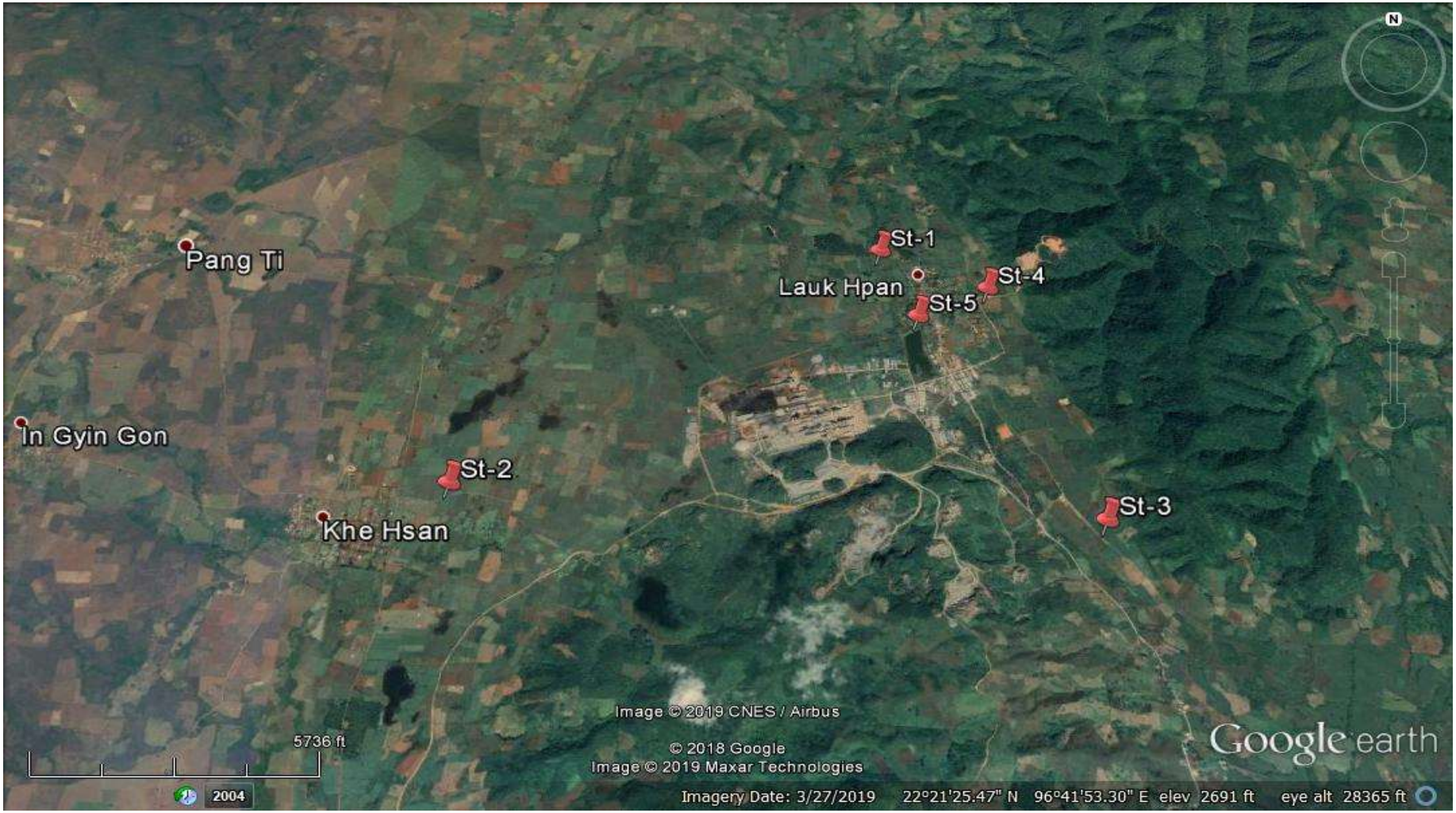


Figure – 121: Satellite image of the area showing spots where soil samples are taken

Figure – 122: Satellite image of the area showing spots where water samples are taken

Figure – 123: Satellite image of the area showing spots where air quality and noise level are measured

Regular, semi-annual, monitoring will be conducted and the findings will be reported to ECD.

8.6.4 Implementation schedule

The management and monitoring sub-plan (MMSP) will cover the three phases of the project. But for pragmatic purpose focus is made on the Operation Phase as the coal-fired power plant is already running.

During the Preconstruction (Planning) Phase (plan only)

First of all the authority of the company will plan and manage for the application of environmentally sound idea and technology.

The authority of the company will plan and manage for the procurement of eco-friendly machinery, equipment, vehicles and materials etc (that generate less smoke, lower noise level, that consume less fuel oil, use fewer energy etc).

The authority will plan for prevention/mitigation of air, water and land pollution in implementing the project.

Implementation of EMP and MP will not commence as it is not pragmatic to do so.

During the Construction Phase

The project proponent will plan and manage for the construction of the coal-fired thermal plant in an eco-friendly manner. The use of eco-friendly building materials and the application of ecologically sound methodology in construction activities will be applied. All the impact/potential impacts anticipated during this Construction Phase will be taken into consideration and subsequent mitigation measures duly taken during the construction of the plant. The construction works will be undertaken with environmental awareness always in mind. The anticipated impacts during this phase will be always kept in mind and the mitigation measures to be taken will be duly taken.

A contractor and party will be hired for tidying up the place after Construction Phase. During the Construction Phase, implementation of EMP and MP will be undertaken as practical as possible. The sub-plans are already described earlier.

During the Operation Phase

During this long Operation Phase the main task will be for the efficient generator of 60 MW electricity, sustainable operation of plant, maintenance and repair works.The task also involves the long term procurement and regular replenishment of raw materials coal and fuels etc.These works will be undertaken with environmental awareness always in mind. The predicted or anticipated impacts during this long phase will be kept in mind and the subsequent mitigation measures to be taken will be duly put in place.

The implementation of EMP will be undertaken effectively and the progress will be evaluated from time to time.MP will be also duly implemented according to plan.In other words, the main electricity production task and the EMP work will go hand in hand for the smooth and sustainable operation of the plant and the successful implementation of the project.

Sub-plan are already described earlier.

During the Decommissioning Phase/Rehabilitation Phase

After the end of the Operation Phase affective and meaningful decommissioning task will be carried out. A decommissioning contractor will be hired for decommissioning works. The project proponent will ensure that there is no residual impact left and there is no contaminated soil or substance left. After that effect revegetation of the site will be undertaken. In the aftermath of the project the site will be restored to it original condition.

Implementation of EMP and MP will be undertaken as partial as possible during this phase.

The sub-plan are already described earlier. The generalized implementation schedule of EMP and MP are depicted below is schematic diagram.

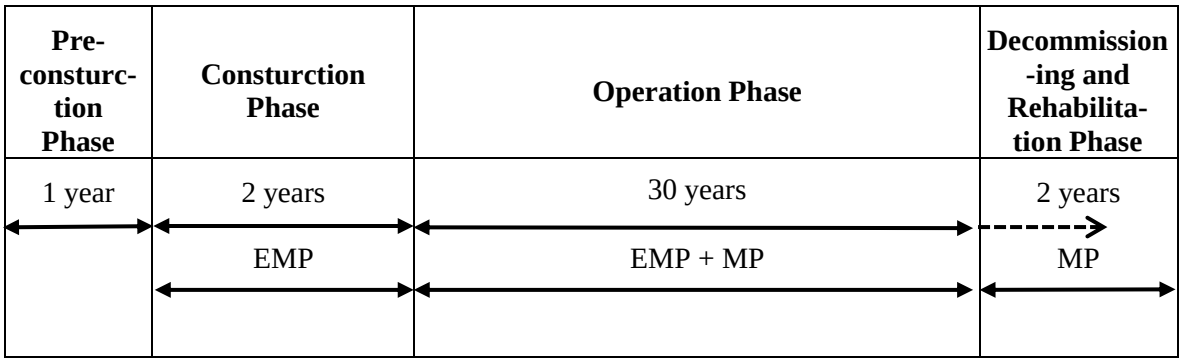


Figure – 124: Generalized time frame for planning and implementation of EMP and MP during the four phases of project life

8.6.5 Management action plan

Overall environmental and social management sub-plan and implementation of sub-plan are already described earlier in 8.5 (in tabulated form) in accordance with EIA procedure (2015) prescribed by ECD).

For practical purpose management actions plan for:

- air quality and emission
- noise and vibration
- water quality and waste water
- solid waste
- soil (erosion and sedimentation) and
- occupational health and safety

During the Construction Phase and Operation Phase are described below.

During the Construction Phase

1. Air quality and management action plan

Objective : The main objective is to mitigate/reduce emission (smoke or gaseous emission) and control air quality as practical is possible.

Legal requirement : will comply with NEQEG emission guideline (2015), code No. 1.1, 2.3.3.3 prescribed by ECD in EIA procedure (2015).

Management action: The following will be implemented for all emission (fugitive emission of smoke and dust) during the Construction Phase. These have been extracted from mitigation measure described earlier in Chapter 6, 6.2.2.2 and Chapter 8, 8.5 in tabulated form and summarized below:

- Comply with NEQEG emission guideline.
- Do not clear vegetation more than necessary.
- Procure equipment that any environmentally friendly, that emit less smoke.
- Keep equipment, and vehicle well-lubricated to reduce emission, if possible.
- Use fuel oil low in sulphur, if possible.
- Avoid open burning of debris.
- Spray water for suppression of dust.
- Restrict vehicular movement.
- Limit open stockpile of earth, sand, etc.
- Provide PPE, face masks, nose and mouth covers to workers where necessary.
- Conduct regular monitoring (semi-annually); hire technicians for this.

2. Noise and vibration management action plan

Objective : to mitigate/reduce noise and vibration level generated from construction activities.

Legal requirement : will comply with NEQEG guideline, 2015, prescribed by ECD, code No.1.3.

Management action: The following will be implemented for the control/mitigation of noise level and vibration generated from construction activities. There have been excerpted from mitigation measures described earlier in Chapter 6, 6.2.2.3 and overall and chapter 8, 8.5 in tabulated form, and summarized below:

- Will comply with NEQEG guideline (2015) prescribed by ECD, code No. 1.3.
- Procure eco-friendly machinery that emits lower noise level in the first place.
- Noisy machine to be fitted with noise muffler or silencer, if possible.
- Keep machinery and vehicle well-operated, well-maintained and well-lubricated to reduce noise level.
- Ensure that foundations for equipment are stable to mitigated vibration.
- Restrict limit truck movement.
- Keep the road surface smooth and flat (to mitigate vibration).
- Construction activities must be during daytime (no construction at night).
- Keep big trees, if any, infect to absorb noise.
- Provide PPE, ear muffs, to workers where necessary.
- Conduct regular monitoring (semi-annually); hire technicians.

3. Water quality and waste water management action plan

Objective: not to impact any surface water surface or underground quality and manage waste water (effluent).

Legal requirement: will comply with NEQEG guideline value 2015, prescribed by ECD, code No.1 and code No.1.2.

Management action: The following will be implemented to control water quality and manage effluent. These have been extracted from mitigation measures described earlier in Chapter 6, 6.2.2.5 and Chapter 8, 8.5 (tabulated form) and summarized below:

- Comply with NEQEG emission/effluent guideline.
- Plan and manage for prevention on the water environment.
- Manage so that construction activities do not impact surface or ground water.
- Create systematic drainage system at construction site to manage waste/used water; also drainage system to manage storm water.
- Keep natural drainage of the area in fact; ensure that construction of access road, and factory site do not damage natural damage.
- Store fuel oil as well as used oils in a designated bunded side.
- Avoid contamination of surface or underground water.

- Avoid accidental spillage; should spillage occur do not waste down with water (to prevent percolation), but immediately remove with absorbents or sawdust.
- Avoid disposing of waste to any water body.
- Educate workers for conservation of water.
- No specific waste water treatment during Construction Phase.
- Test water quality and effluent every six months; hire technicians.

4. Waste management action plan

Objective: to mitigate/reduce construction waste and domestic waste.

Legal requirement: will comply with Environmental Conservation Law, 2012 (to discharge the waste in accord with environmentally sound method and not to pollute the environment.

Management action

The following will be implemented for the management of waste. These have been excerpted from mitigation measures described earlier in Chapter 6, 6.2.2.5 and from EMP sub-plan, Chapter 8, 8.5 (in tabulated form) and summarized below:

- Will comply with Environmental Conservation Law 2012, Article 14, 15, 32 and Environmental Conservation Rule, 2014, Rules. 69.
- As regard domestic waste, educated and train worker for proper handling of waste, and minimize waste.
- Separate waste into recyclable and non-recyclable ones use separate bin.
- As regard construction waste – ensure large quantity of construction waste and leftover are temporarily dumped inside the construction site in a systematic way.
- Surplus or left over material to be put up for sale later.
- After completion of construction works hire a contractor and party for tidying up the site.
- Material that should be disposed of will be disposed at the approved landfill.
- Avoid open burning of debris by all means.

5. Soil management action plan (emission and sedimentation)

Objective: to avoid and prevent soil erosion and prevent the destruction of soil structure and profile due to construction activities.

Legal requirement: to comply with Environmental Conservation Law, 2012.

Management action

The following will be implemented for the management of soil. These have been extracted from mitigation measures described in Chapter 6, 6.2.2.4 and EMP sub-plan, Chapter 8, 8.5 (in tabulated form) and summarized below:

- Ensure that when doing construction work soil structure and profile are not destructed more than necessary.
- Keep top soil and sub-soil separated (backfill sub-soil first and then top soil on top to facilitate re-vegetation).
- Avoid contamination of soil as much as possible; no fuel spill or leaked; should there is a spill do not wash down with water (to prevent percolation into soil); remove spill immediately with absorbents (rags, saw dust); prevent spreading of spill.
- Schedule the construction work so that large areas of soil are not laid bare during monsoon month.
- Resurface and stabilize exposed ground surface after earth work.
- Soil compacted by heavy trucks/machinery to be raked and restored.
- Prevent soil erosion and sedimentation especially during monsoon season.
- Run off from area adjacent the site will be diverted.

6. Occupational Health and Safety management action plan

Objective: try to achieve zero accident at work place as practical as possible.

Legal requirement: to comply with Occupational Health and Safety Law 2019, (depicted in Chapter 3.

Management action

The following will be implemented. These have been extracted from mitigation measures described in Chapter 6, 6.2.2.6 and in EMP sub-plan, Chapter 8, 8.5 (in tabulated form) and summarized below:

- Plan and manage for zero accident.
- Create a safe working place and working condition.
- Educate, train and supervise workers for good working practice, good safety practice and good housekeeping practice so that these good practices will be ingrained in each and every workers mind.
- Provide adequate lavatory facility, bath and washing area; potable water.

- Provide adequate PPE, where necessary.
- Provide First Aid training for some staff; keep First Aid Kit well-stored with medicine and drugs.
- Develop emergency response plan for any unexpected accidents and injuries.
- Display phone numbers of Ambulance Service, Red Cross Society, Hospital, Fire brigade etc.
- Maximize mechanical labour and minimize manual labour as far as possible to prevent workers for over exertion, excessive repetitive motions, and to reduce fatigue, strain and injury on workers.
- Cover the whole structure during Construction Phase with lace or nettling to prevent accidental of objects (a common civil engineering practice).

During the Operation Phase

1. Air quality and emission management action plan

Objective **:** The main objecive is to mitigation/reduce emission and control air quality as practical as possible.

Legal requirement **:** will comply with NEQEG emission standards guideline (2015), Code No.1.1, 2.3.3.3, prescribed by ECD in EIA procedure (2015), (Chapter 3, 3.5.1)

Management actions : The following will be implemented for all emission (point soure emission or stationary emission and fugitive emission of smoke and dust), generated from the operation of the project. These have been extracted from mitigation measures described earlier in Chapter 6, 6.2.4.1 and environmental management sub-plans in Chapter 8, 8.5 (tabulated form) and are summarized as below:

- All air emission will comply with NEQEG emission standards values guideline mentioned above.
- Procure eco-friendly machinery that emits less smoke in the first place.
- Install emission management system e.g. Cyclone, ESP, filter bag house etc. between boiler and stack (as designed by Chinese experts).
- Apply dry FGD using pulverized limestone.
- Apply complete combustion method (maintain temperature at 800 – 900 ^{o}C)
- Use dry coal in the first place.
- Regular collection and disposal of coal dust, ash, and store in separate silo.

- Spray water for fugitive emission of dust; daily or as required (during dry months).
- Restrict/reduce vehicular movement (speed limit 20 mph).
- Always avoid open burning of debris and trash.
- Develop green belt (plan fast growing trees) for trapping dust.
- Keep equipment and vehicles well-operated, well-maintained and well-lubricated to reduce smoke.
- Provide PPE (e.g. face mask, mouth and noise cover where necessary).
- Implement GRM, so that locals can file complaint regarding smoke and dust.
- Conduct regular monitoring (Preferable every 6 months; hire technicians for this).
- Conduct daily overall visual inspection of smoke and dust condition.
- Monitor effectiveness of mitigation measures taken, weekly or monthly.

2. Noise and vibration management action plan

Objective : The main objective is to mitigate/reduce noise and vibration level, generated from the operation of the factory.

Legal requirement : Will comply with NEQEG emission guideline, 2015, prescribed by ECD, Code No.1.3.

Management actions : The following will be implemented for the control/mitigation of noise level and vibration generated from the operation of the factory.

These have been extracted from mitigation measures described earlier in Chapter 6, 6.2.4.2 and overall environmental management sub-plans described earlier in Chapter 8, 8.5 in tabulated form, and summarized as below:

- Will comply with NEQEG emission guideline (2015) prescribed by ECD, Code No.1.3
- Procure eco-friendly machinery that emits lower noise level in the first place.
- Install noise abating device e.g. silencer, muffler, where possible.
- Ensure that foundations for machinery/equipment are stable to mitigation vibration.
- Keep machinery and vehicle well-operated, well-maintained and well-lubricated to mitigate noise and vibration.
- Restrict/limit vehicular movement to mitigate vibration.

- Create smooth road surface to mitigate vibration.
- Develop green belt (plant fast growing grees) around the compound to abate noise.
- Provide PPE e.g. ear muffs, ear protectors where necessary.
- Conduct regular monitoring, preferably every 6 months; hire technicians for this.
- Conduct regular daily inspection of noise condition.
- Implement GRM (the locals can file complaints regarding noise).
- Regularly monitor the effectiveness of mitigation measures taken weekly or monthly.

3. Water qulaity and waste water management action plan

Objective : The main objective is not to impact any surface or underground water quality and to manage the waste water (effluent).

Legal requirement: Will comply with NEQEG emission guideline values (2015) prescribed by ECD, Code No.1.2 (generally application) and Code No.2.1.1 (coal fire power plant).

Management action : The followings will be implemented to avoid the impact of waste water and to control/mitigate and manage waste water.

These have be excerpted from mitigation measures described earlier in Chapter 6, 6.2.4.3 (b) and overall environmental management sub-plans edscribed earlier in 8.5 (tabulated form) and summarized as below:

- Comply with NEQEG emission guideline values (2015) prescribed by ECD, Code No.1.2, and Code No.2.3.3.3.
- Apply physical and chemical treatment of water for use in coal-fire thermal plant – e.g. mechanical filter, Reverse Osmosis method, Zeolite softener, and cat-ion + anion resin.
- Ensure that all activities do not impact the ground water.
- Avoid disposing of all waste, (solid and liquid) into any water body by all means.
- Prevent oil spills or oil spread into any water body.
- Apply 100% recirculation of water (for general conservation of water and for minimization of chemical treatment and purification), e.g. cooling tower.
- Adhere to the principle of water conservation; educate staffs for this.
- (As water is 100% recirculated industrial waste water is not an issue, only waste/used water).

- Set up network of drainage system for domestic waste water and storm water.
- Domestic waste water (brown water) from office, dormitory, kitchen, baths etc. will end up in waste water pond and dry up (no special treatment required).
- Black water for toilets will end up in septic tanks and soak pits.
- Monitor water quality regularly (preferably every 6 months, hire technicians for this).
- Conduct weekly visual inspection of water condition.
- Monitor effectiveness of mitigation measures taken, weekly or monthly

4. Waste (solid waste) management action plan

Objectives : The main objective is to mitigate/reduce industrial waste and domestic waste.

Legal requirement: Will comply with Environmental Conservation Law, 2012 and Environmental Conservation Rules, 2014. That is to discharge the wastes in accordance with environmentally sound methods and not to pollute the environment.

Mangement actions : The following will be implemented for the management of wastes generated. These have been excerpted from mitigation measures described earlier in Chapter 6, 6.2.4.3 and EMP sub plan, Chapter 8, 8.5 (tabulated form).

- Will comply with Environmental Conservation Law, 2012. Articles 14, 15, 32; Environmental Conservation Rules, 2014; Rule 69.
- Educate and train staffs for the proper handling of wastes, educate them for good housekeeping, and minimization waste as practical as possible.
- Collect coal dust and ash, daily by conveyor system and store them in silos for reuse (dry ash handling method to be applied.
- As for domestic wastes (including negligible medical waste at clinic) collect them daily in small waste baskets or big garbage bins (waste baskets in office, clinic and dormitory; big bins placed in kitchen and elsewhere inside the compound) daily. Store them temporary at the waste dump insides the compound and disposed them fortnightly at the landfill by company's trucks.
- Separate waste into recyclable and non-recyclable ones; dispose only those that are non-recyclable.
- Avoid open burning of solid wastes.
- Monitor waste management fortnightly or monthly.
- Monitor the effectiveness of mitigation measures taken.
- Implement GRM (locals can file complaint regarding waste).

5. Soil management action plan (erosion and sedimentation)

Objectives : The main objective is to avoid and prevent soil erosion and prevent the destruction of soil structure and profile due to activities of the project.

Legal requirement : To comply with Environmental Conservation Law, 2012.

Management action : The following will be implemented for the prevention of soil erosion and destruction of soil structure. These have be extracted from Chapter 8, 8.5, EMP sub plan (tabulated form) and summarized below:

- Ensure that there is no contamination of soil; avoid spillage of fuel on soil, remove the spill immediately.
- Ensure that project activities do not impact soil structure (during the rainy season).
- Ensure that soil is stable and not easily eroded; compact soil where possible).
- Minimize the area of bare soil exposed (plant, grass and trees where possible to prevent erosion).
- Control run off and storm water (create reliable drainage system; divert storm water so that it can flow freely).
- Prevent dirt and debris getting the drainage causing siltation.
- Monitor the soil condition weekly or monthly.
- Monitor the effectiveness of mitigation measures taken (weekly or monthly during rainy season).

6. Occupational Health and Safety management action plan

Objectives : to avoid/prevent health impact on workers and try to achieve zero accident at work places as far as possible.

Legal requirment : to comply with Occupational Health and Safety Law, 2019

Management actions : The following will be implemented. These have been excerpted from mitigation measures described earlier in Chapter 6, 6.2.4.4 and in EMP sub plan, Chapter 8, 8.5 and summarized below:

- Create safe working place and working condition.
- Educate, train and supervise workers for good working practice, good engineering practice, good safety practice, and good health and hygiene practice so that these good practices will be ingrained in their mind sets.

- Apply mechanical rather than manual works at the coal-fire thermal plant and also apply automation system as far as possible (the company is exactly doing this).
- Train them for safety handling of coal, limestone, fuels and also train them for safety and efficient operation of all machinery and equipment at the power plants, e.g. crusher ,conveyor, boiler, furnace, turbine, water purification, hot system, cooling system, recirculation system etc.
- Organize induction effective induction training; provide work manuals and safety manual.
- Organize OHS training for all workers.
- Avoid accidental fire and explosion by all means.
- Set up alarm systems.
- Provide basic First Aid training and Firefighting training for some workers; provide adequate equipment facility.
- Set up factory clinic (the factory has one).
- Develop plan for emergency response.
- Take out insurance for the power plant and consider for life insurance for workers.

During the Decommissioning Phase (action plan)

Objectives : to undertake systematic decommissioning and rehabilitation of the site.

Legal requirement : To comply with Environmental Conservation Law, 2012 and Occupational Health and Safety Law, 2019 (depicted earlier in Chapter 3).

Management action : The following will be implemented. These have be extracted from mitigation measures described in earlier in Chapter 6, 6.2.6.1 and EMP sub plan, Chapter 8, 8.5, and summarized below:

- Plan and manage for safe and effective decommissioning work;
- Hire a decommissioning contractor and party for demolition of buildings and structures and dismantling of equipment and tidying up the site.
- Put up for sale those that are still useable and saleable; dispose those that are not.
- Soil, if contaminated, will be removed and disposed.
- Test air, water and soil quality for the last time to ensure that they are within guideline values (that air, water and soil are not polluted; no erosion of soil).

- Plant trees and commence rehabilitation work and ensure that the site is ecologically restored.
- Ensure for effective restoration/reforestation; all replanted trees are well-established.
- Monitor the effectiveness of decommissioning and rehabilitation works.
- Ensure that the site is safe for local communities after decommissioning and rehabilitation.

8.6.6 Monitoring Plans

In accordance with EIA format, overall and comprehensive monitoring plans are already described in Chapter 6, 6.2.5.

This specific monitoring plans under the Environmental Mangement Plan (Chapter 8) are described in the following tabulated forms.

Regular monitoring will be made during the Construction, Operation and Decommissioning Phase and the report will be submitted to ECD on a regular basis, (semi-annual short report).

Table – 38: Summary of monitoring plan during the Construction Phase

Sr. No.	Components/ issue	Parameters to be monitored	NEQEG guideline value	Monitoring spot/site	Frequency	Responsible persons	Costs (once off)	Remarks
1.	Air quality	NO_2 O_3 PM_{10} $PM_{2.5}$ SO_2 VOC	200 µg/m^3 100 µg/m^3 50 µg/m^3 25 µg/m^3 20 µg/m^3 400 µg/m^3	At construction site Coordinates: N. Lat 22º 21' 32"; E. Long 96º 42' 10", At Lauk Hpan village Coordinates: N. Lat 22º 21' 58.29"; E. Long 96º 42' 48.17" At Khe San village Coordinates: N. Lat 22º 20' 50.6"; E. Long 96º 40' 31.7" At Lei Gyi Taw village Coordinates: N. Lat 22º 20' 13.83"; E. Long 96º 43' 31.29"	semi-annually semi-annually semi-annually semi-annually	EMP cell member and hired technicians EMP cell member and hired technicians EMP cell member and hired technicians EMP cell member and hired technicians	Ks 1,700,000 Ks 1,700,000 Ks 1,700,000 Ks 1,700,000	Technicians have to be hired Technicians have to be hired Technicians have to be hired Technicians have to be hired

2.	Water quality	BOD COD pH Total nitrogen Total phosphorus Dissolved solid Oil and grease Total coliform	50 mg/l 125 mg/l 6-9 STU 10 mg/l 2 mg/l 50 mg/l 10 mg/l 400 mg/l	At stream Coordinates: N. Lat 22º 22' 29.9"; E. Long 96º 42' 07.7" At Lauk Hpan Coordinates: N. Lat 22º 21' 58.4"; E. Long 96º 42' 45.5" At Khe San village Coordinates: N. Lat 22º 21' 08.7"; E. Long 96º 40' 24.0"	semi-annually semi-annually semi-annually	EMP cell member and hired technicians EMP cell member and hired technicians EMP cell member and hired technicians	Ks 80,000 Ks 80,000 Ks 80,000	Technicians have to be hired Technicians have to be hired Technicians have to be hired
3.	Noise level	dB(A) day and night	70 dB(A)	At construction site Coordinates: N. Lat 22º 21' 32"; E. Long 96º 42' 10", At Lauk Hpan village Coordinates: N. Lat 22º 21' 58.29"; E. Long 96º 42' 48.17" At Khe San village Coordinates: N. Lat 22º 20' 50.6"; E. Long 96º 40' 31.7"	Semi-annually semi-annually semi-annually	EMP cell member and hired technicians EMP cell member and hired technicians EMP cell member and hired technicians	Ks 70,000 Ks 70,000 Ks 70,000 Ks 70,000	Technicians have to be hired Technicians have to be hired Technicians have to be hired Technicians have

				At Lei Gyi Taw village Coordinates: N. Lat 22º 20' 13.83"; E. Long 96º 43' 31.29"	semi-annually	EMP cell member and hired technicians		to be hired
4.	Solid waste	- monitor construction waste and disposal - monitor trash/garbage generated and disposal	- -	At construction site Coordinates: N. Lat 22º 21' 32"; E. Long 96º 42' 10"	Weekly	EMP cell member	Free of charges	-
5.	Soil	- monitor contamination of soil; testing soil quality	- -	Discharge Pond (domestic waste water sink)Coordinates: N. Lat. 22º 21' 47.6"; E. Long 96º 42' 40.6" At Lauk Hpan Coordinates: N. Lat. 22º 22' 08.2"; E. Long 96º 42' 32.3"	semi-annually semi-annually	EMP cell member and hired technicians EMP cell members and hired technicians	Ks 140,000 Ks 140,000	Technicians have to be hired Technicians have to be hired

				At Khe San village Coordinates: N. Lat. 22º 21' 01.0"; E. Long 96º 40' 45.9" At Lei Gyi Taw Coordinates: N. Lat. 22º 20' 50.8"; E. Long 96º 43' 20.1"	semi-annually semi-annually	EMP cell members and hired technicians EMP cell members and hired technicians	Ks 140,000 Ks 140,000	Technicians have to be hired Technicians have to be hired
		- monitor soil erosion if any, (rainy season)			mothly	EMP cell members	Free of charges	-
6.	Occupational health and safety	- monitor OHS measures taken - monitor provision of First Aid Kits and stocking of medicines and drugs - monitor Emergency Preparedness and Response plan + actions	-	At construction site Coordinates: N Lat. 22°21'34.00", E Long. 96°42'8.57"	monthly	EMP cell members	Free of charges	-

7.	Community health and safety	- monitor CHS measures taken - monitor Emergency Preparedness and Response plan + actions - regularly monitor the well being of the locals	-	At Lauk Hpan village Coordinates: N Lat. 22°21'57.91", E Long. 96°42'44.48" At Khe San village Coordinates: N Lat. 22°20'52.41, E Long. 96°40'19.59"E At Lei Gyi Taw Coordinates: N Lat. 22°20'11.18, E Long. 96°43'32.22"	quarterly quarterly quarterly	EMP cell members EMP cell members EMP cell members	Free of charges Free of charges Free of charges	- - -
8.	Social issue, social illness	- check social illness/ill social behaviour - monitor conducts of workers - check disciplinary action take	-	At construction site Coordinates: N Lat. 22°21'31.48", E Long. 96°42'9.32"	weekly and monthly	EMP cell member	Free of charges	-

Note: The main component of green house gas (carbon dioxide) cannot be effectively measured and effectively mitigated. Other minor gas such as NO_2 and Ozone.

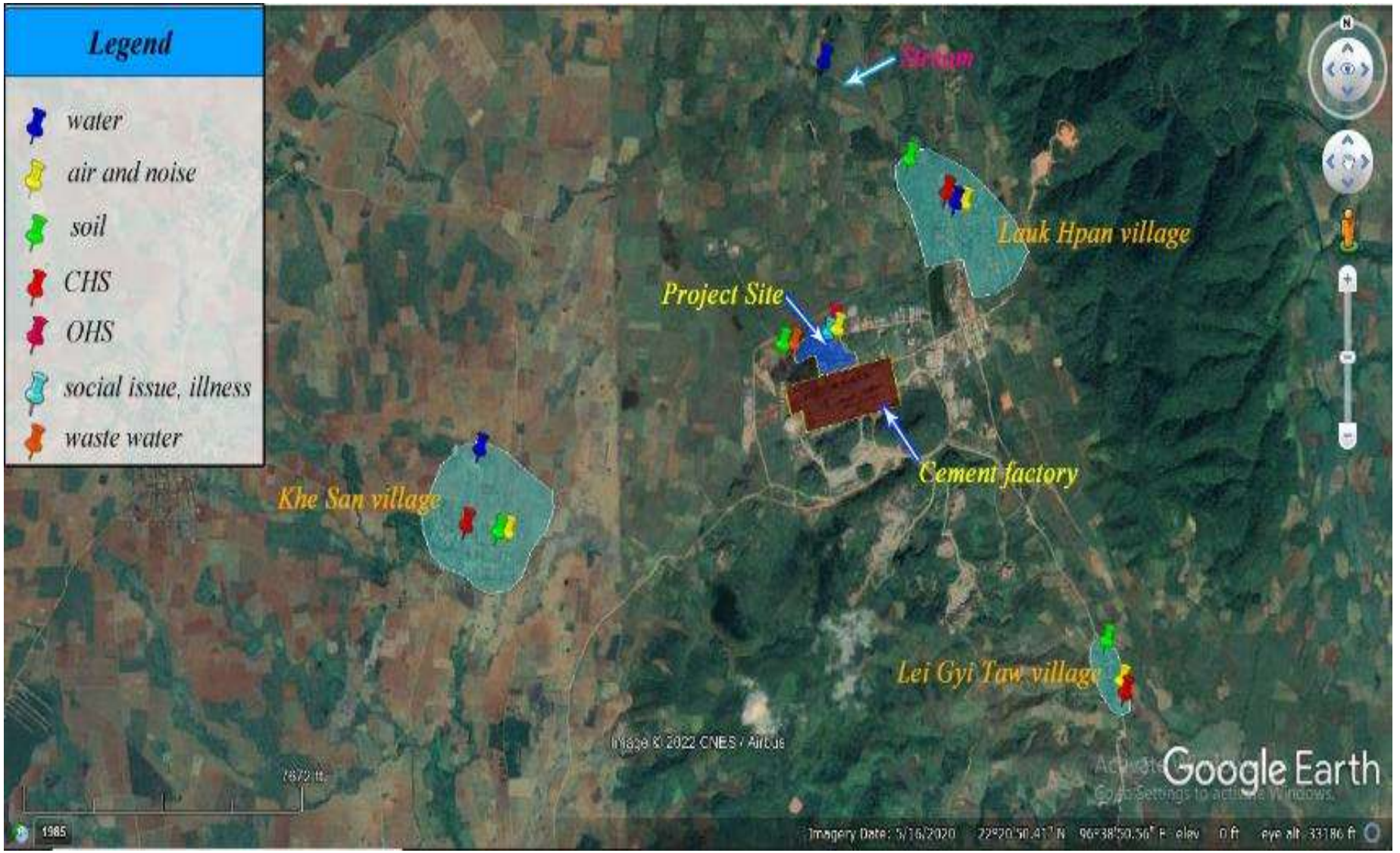


Figure – 125: Monitoring spots/sites during construction phase

Table – 39: Summary of monitoring plan during the Operation Phase

Sr. No.	Components/ issue	Parameters to be monitored	NEQEG guideline value	Monitoring spot/site	Frequency	Responsible persons	Costs (once off)	Remarks
1.	Air quality	<u>Air quality</u> NO_2 O_3 PM_{10} $PM_{2.5}$ SO_2 VOC	 200 µg/m^3 100 µg/m^3 50 µg/m^3 25 µg/m^3 20 µg/m^3 400 µg/m^3	At coal-fired Thermal plant Coordinates: N. Lat 22º 21' 32"; E. Long 96º 42' 10"	semi-annually	EMP cell members and hired technicians	Ks 1,700,000	Technicians have to be hired
				At Lauk Hpan Coordinates: N. Lat. 22º 22' 08.2"; E. Long 96º 42' 32.3"	semi-annually	EMP cell members and hired technicians	Ks 1,700,000	Technicians have to be hired
				At Khe San village Coordinates: N. Lat. 22º 21' 01.0"; E. Long 96º 40' 45.9"	semi-annually	EMP cell members and hired technicians	Ks 1,700,000	Technicians have to be hired
				At Lei Gyi Taw village Coordinates: N. Lat. 22º 21' 01.0"; E. Long 96º 40' 45.9" check and monitor the continuous flue gas analyser installed Coordinates: N Lat. 22°21'35.55, E Long. 96°42'8.24"	semi-annually	EMP cell members and hired technicians	Ks 1,700,000	Technicians have to be hired

		Emission NO_2 PM_{10} SO_2	 510 mg/Nm^3 50 mg/Nm^3 900 mg/Nm^3	check and monitor the continuous flue gas analyser installed	weekly and monthly	EMP cell members	Free of charges	
2.	Water quality /effluent	Water quality BOD COD pH Total nitrogen Total phosphorus Dissolved solid Oil and grease Total coliform Effluent Arsenic Cadmium Chromium (total) Copper Iron Lead Mercury Oil and grease P^H Temperature increase Total residual chlorine Total suspended	 50 mg/l 125 mg/l 6-9 STU 10 mg/l 2 mg/l 50 mg/l 10 mg/l 400 mg/l 0.5 mg/l 0.1 mg/l 0.5 mg/l 0.5 mg/l 1 mg/l 0.5 mg/l 0.005 mg/l 10 mg/l 6-9 S.U <3 º C 0.2 mg/l 50 mg/l	At Stream Coordinates: N. Lat 22º 22' 29.9"; E. Long 96º 42' 07.7" At Lauk Hpan Coordinates: N. Lat 22º 21' 58.4"; E. Long 96º 42' 45.5" At Khe San village Coordinates: N. Lat 22º 21' 08.7"; E. Long 96º 40' 24.0" At boiler blowdown Coordinates: N. Lat 22º 21' 32.9"; E. Long 96º 42' 07.6" At cooling tower Coordinates: N. Lat 22º 21' 32.9"; E. Long 96º 42' 06.4" At discharge point Coordinates:	semi-annually semi-annually semi-annually semi-annually semi-annually	EMP cell member and hired technicians EMP cell member and hired technicians EMP cell member and hired technicians EMP cell member and hired technicians EMP cell member and hired technicians	Ks 80,000 Ks 80,000 Ks 80,000 Ks 80,000 Ks 200,000	Technicians have to be hired Technicians have to be hired Technicians have to be hired Technicians have to be hired Technicians have to be hired

		solids Zinc	1 mg/l	N. Lat 22º 21' 28"; E. Long 96º 42' 07"	semi-annually	EMP cell member and hired technicians	Ks 200,000	Technicians have to be hired
3.	Noise level	dB(A) day and night	70 dB(A)	At coal-fired Thermal plant Coordinates: N. Lat 22º 21' 32"; E. Long 96º 42' 10"	semi-annually	EMP cell member and hired technicians	Ks 70,000	Technicians have to be hired
				At Lauk Hpan Coordinates: N. Lat 22º 21' 58.29"; E. Long 96º 42' 48.17"	semi-annually	EMP cell member and hired technicians	Ks 70,000	Technicians have to be hired
				At Khe San village Coordinates: N. Lat 22º 20' 50.6"; E. Long 96º 40' 31.7"	semi-annually	EMP cell member and hired technicians	Ks 70,000	Technicians have to be hired
				At Lei Gyi Taw Coordinates: N. Lat 22º 20' 13.83"; E. Long 96º 43' 31.29"	semi-annually	EMP cell member and hired technicians	Ks 70,000	Technicians have to be hired
4.	Solid waste	- monitor industrial waste especially ash collection and storage at silos and reuse - monitor domestic wastes, collection and disposal	- -	At coal-fired Thermal plant Coordinates: N. Lat 22º 21' 32"; E. Long 96º 42' 10"	Weekly	EMP cell members	Free of charges	-

5.	Soil	- monitor contamination of soil; testing soil quality - monitor soil erosion if any (rain season)	- -	Discharge Pond (domestic waste water sink) Coordinates: N. Lat. 22º 21' 47.6"; E. Long 96º 42' 40.6" At Lauk Hpan Coordinates: N. Lat. 22º 22' 08.2"; E. Long 96º 42' 32.3" At Khe San village Coordinates: N. Lat. 22º 21' 01.0"; E. Long 96º 40' 45.9" At Lei Gyi Taw Coordinates: N. Lat. 22º 20' 50.8"; E. Long 96º 43' 20.1":	semi-annually semi-annually semi-annually monthly	EMP cell member and hired technicians EMP cell member and hired technicians EMP cell member and hired technicians EMP cell member	Ks 140,000 Ks 140,000 Ks 140,000 Free of charges	Technicians have to be hired Technicians have to be hired Technicians have to be hired Technicians have to be hired -
6.	Occupational health and safety	- monitor OHS measures taken - monitor provision of First Aid Kits and stocking of medicines and drugs	-	At the coal-fired Thermal plant site Coordinates: N Lat. 22°21'34.00", E Long. 96°42'8.57"	monthly	EMP cell members	Free of charges	-

		- monitor Emergency Preparedness and Response plan + actions - Check the clinic treatment record		At clinic Coordinates: N Lat. 22°21'31.65, E Long. 96°42'43.91	monthly	EMP cell members	Free of charges	-
7.	Community health and safety	- monitor CHS measures taken - monitor Emergency Preparedness and Response plan + actions - regularly monitor the well being of the locals	-	At Lauk Hpan village Coordinates: N Lat. 22°21'57.91", E Long. 96°42'44.48" At Khe San village Coordinates: N Lat. 22°20'52.41, E Long. 96°40'19.59" At Lei Gyi Taw Coordinates: N Lat. 22°20'11.18, E Long. 96°43'32.22"	quarterly quarterly quarterly	EMP cell members EMP cell members EMP cell members	Free of charges Free of charges Free of charges	- - -
8.	Social issue, social illness	- check social illness/ill social behaviour - monitor conducts of workers - check disciplinary action take	-	At the coal-fired Thermal plant site Coordinates: N Lat. 22°21'31.48", E Long. 96°42'9.32" At clinic Coordinates: N Lat. 22°21'31.65, E Long. 96°42'43.91"	weekly and monthly	EMP cell members	Free of charges	-

Note: As regard air quality monitoring this will be conducted three times (three 24 hours days) to represent the actual situation during semi-annual monitoring as directed by ECD.

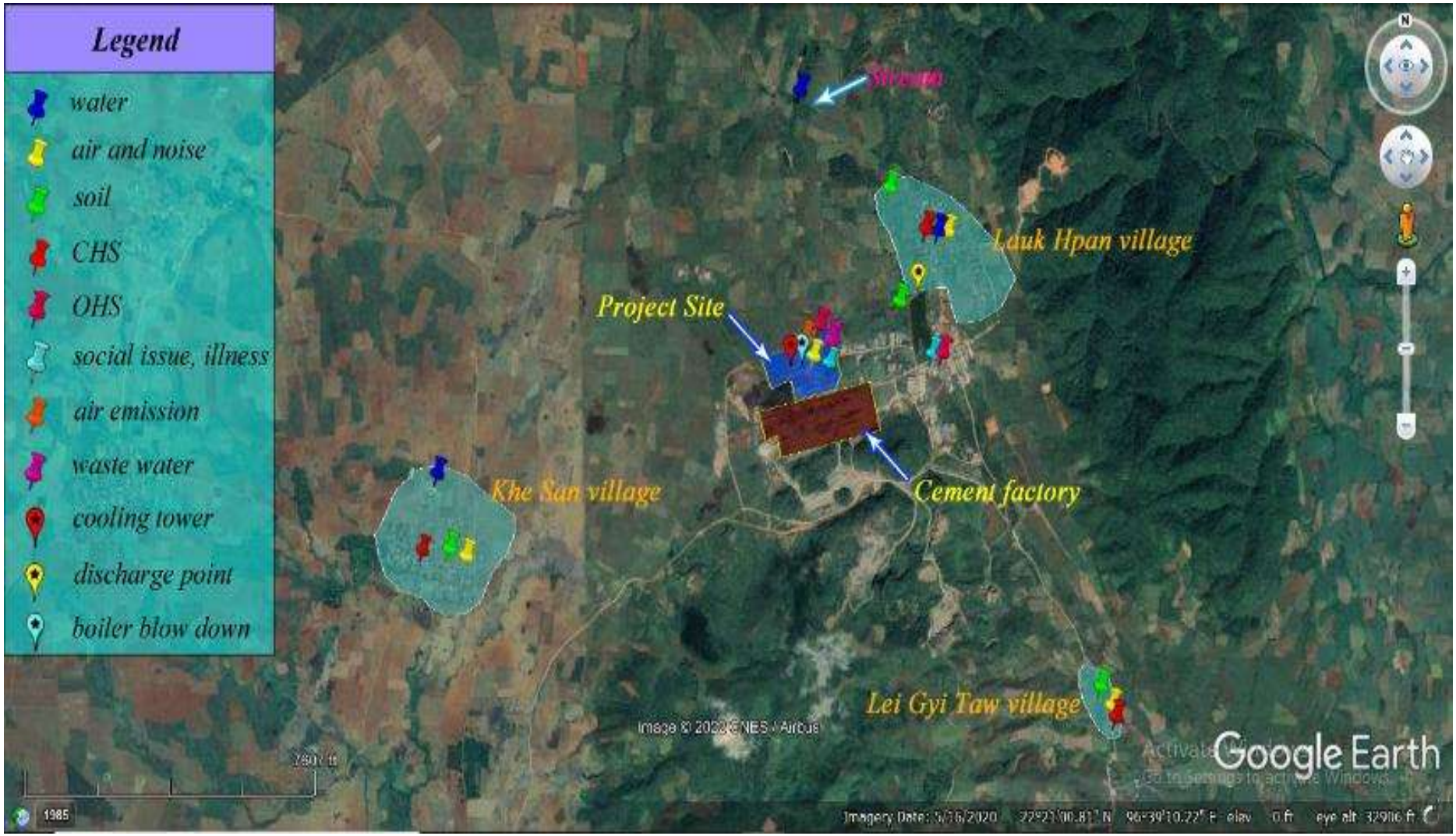


Figure – 126: Monitoring spots/sites during operation phase

Table – 40: Summary of monitoring plan during the Decommissioning Phase

Sr. No.	Components/ issue	Parameters to be monitored	NEQEG guideline value	Monitoring spot/site	Frequency	Responsible persons	Costs (once off)	Remarks
1.	Air quality	NO_2 O_3 PM_{10} $PM_{2.5}$ SO_2 VOC	200 µg/m^3 100 µg/m^3 50 µg/m^3 25 µg/m^3 20 µg/m^3 400 µg/m^3	At old plant site Coordinates: N. Lat 22º 21' 32"; E. Long 96º 42' 10" At Lauk Hpan Coordinates: N. Lat 22º 21' 58.29"; E. Long 96º 42' 48.17" At Khe San village Coordinates: N. Lat 22º 20' 50.6"; E. Long 96º 40' 31.7" At Lei Gyi Taw Coordinates: N. Lat 22º 20' 13.83"; E. Long 96º 43' 31.29"	annually annually annually annually	EMP cell member and hired technicians EMP cell member and hired technicians EMP cell member and hired technicians EMP cell member and hired technicians	Ks 1,700,000 Ks 1,700,000 Ks 1,700,000 Ks 1,700,000	Technicians have to be hired once a years Technicians have to be hired once a years Technicians have to be hired once a years Technicians have to be hired once a years
2.	Water quality	BOD COD pH Total nitrogen Total phosphorus Dissolved solid Oil and grease Total coliform	50 mg/l 125 mg/l 6-9 STU 10 mg/l 2 mg/l 50 mg/l 10 mg/l 400 mg/l	At stream Coordinates: N. Lat 22º 22' 29.9"; E. Long 96º 42' 07.7" At Lauk Hpan Coordinates: N. Lat 22º 21' 58.4"; E. Long 96º 42' 45.5"	annually annually	EMP cell member and hired technicians EMP cell member and hired technicians	Ks 80,000 Ks 80,000	Technicians have to be hired once a years Technicians have to be hired once a years

				At Khe San village Coordinates: N. Lat 22º 21' 08.7"; E. Long 96º 40' 24.0"	annually	EMP cell member and hired technicians	Ks 80,000	Technicians have to be hired once a years
3.	Noise level	dB(A) day and night	70 dB(A)	At old plant site Coordinates: N. Lat 22º 21' 32"; E. Long 96º 42' 10"	annually	EMP cell member and hired technicians	Ks 70,000	Technicians have to be hired once a years
				At Lauk Hpan Coordinates: N. Lat 22º 21' 58.29"; E. Long 96º 42' 48.17"	annually	EMP cell member and hired technicians	Ks 70,000	Technicians have to be hired once a years
				At Khe San village Coordinates: N. Lat 22º 20' 50.6"; E. Long 96º 40' 31.7"	annually	EMP cell member and hired technicians	Ks 70,000	Technicians have to be hired once a years
				At Lei Gyi Taw Coordinates: N. Lat 22º 20' 13.83"; E. Long 96º 43' 31.29"	annually	EMP cell member and hired technicians	Ks 70,000	Technicians have to be hired once a years
4.	Solid waste (decommissioning wastes debris)	monitor decomm--issioning works (dismantling, demolition and generation of huge quentity of debris, and systematic disposal and tidying up of the site	-	At the old plant; especially from open coal stock yard Coordinates: N Lat. 22°21'29.08", E Long. 96°41'57.13"	Weekly/ monthly	EMP cell member	Free of charges	-

5.	Soil	Test soil quality check for construction of soil (especially the soil at the spot once used as open coal stockyard).	- -	At old plant site, from open coal stock yard. Coordinates: N Lat. 22°21'29.08", E Long. 96°41'57.13" At Lauk Hpan Coordinates: N. Lat. 22º 22' 08.2"; E. Long 96º 42' 32.3" At Khe San village Coordinates: N. Lat. 22º 21' 01.0"; E. Long 96º 40' 45.9" At Lei Gyi Taw Coordinates: N. Lat. 22º 20' 50.8"; E. Long 96º 43' 20.1"	annually annually annually annually	EMP cell member and hired technicians EMP cell member and hired technicians EMP cell member and hired technicians EMP cell member and hired technicians	Ks 140,000 Ks 140,000 Ks 140,000 Ks 140,000	Technicians have to be hired Technicians have to be hired Technicians have to be hired Technicians have to be hired
6.	Occupational health and safety	- monitor OHS measures taken - monitor First Aid Kits and stocking of medicines and drugs - monitor Emergency response plan - Check the clinic treatment record	-	At the old plant site Coordinates: N Lat. 22°21'34.00", E Long. 96°42'8.57"	monthly	EMP cell member	Free of charges	EMP cell members

7.	Community health and safety	- monitor CHS measures taken - monitor Emergency Preparedness and Response plan + actions - regularly monitor the well being of the locals	-	At Lauk Hpan village Coordinates: N Lat. 22°21'57.91", E Long. 96°42'44.48" At Khe San village Coordinates: N Lat. 22°20'52.41, E Long. 96°40'19.59" At Lei Gyi Taw Coordinates: N Lat. 22°20'11.18, E Long. 96°43'32.22"	quarterly quarterly quarterly	EMP cell members EMP cell members EMP cell members	Free of charges Free of charges Free of charges	- - -
8.	Social issue, social illness	- check social illness and ill-social behaviour - monitor conducts of workers - check disciplinary action take	-	At the old plant site Coordinates: N Lat. 22°21'31.48", E Long. 96°42'9.32"	weekly and monthly	EMP cell member	Free of charges	-

Note: Air quality is measured by hired technicians the equipment/instructment they used are EPAS scanner and EPAS air sampler (Respirable dust sampler Enirontech APM-460 NC). 24 hours for most parameters; 1 hour for NO_2 and 8 hours for Ozone.

Noise level is measured by digital sound level meter, EXTECH 407732. Vibration is measured by BENETECH vibration meter.

Water sample is simply collected and brough back to Yangon and analysis is made by technicians at register laboratory, ISO TECH.

Soil sample is also collected and brough back to Yangon and soil analysis is conducted by technicians at Department of Agriculture (Land Use).

In addition to semi-annual monitoring of air quality and water quality seasonal monitoring (dry season and wet season) will be conducted during January (dry season) and July (wet season).

Figure – 127: Monitoring spots/sites during decommissioning phase

8.6.7 Projected budgets and reponsiblities

The overall budget for implementation of EMP was already described in the earlier part of this Chapter-8 (8.4); where 0.5% of the project budget (that is USD 50,000) is set aside for implementation of EMP. The Sub-budget allotted for each programme is also described there.

35% of EMP budget, that is USD 17,500 is allotted for monitoring programme. The fund cannot cover the whole life of the project (not even Operation Phase of 30 years). The fund will be only seed money; as time goes on more money will be added to the fund.

The main expenses are for hiring experts/technicians for monitoring air quality/emission, noise and vibration, water quality/effluent and soil quality.

There are EMP contractors in many development countries and they are hired to undertake all EMP tasks. But as there are no EMP contractors in Myanmar yet the said experts/technicians from other departments or from private laboratories have to be hired regularly, every 6 months. The cost of hiring them is really high indeed; the main expense for monitoring works.

And as there are no EMP contractors in the nation yet, the authority of Ngwe Yi Pale' Cement Co., Ltd has to make do with available staffs and resources. The EMP cell members (s) and specially trained staff (20) will be deployed for carrying out EMP tasks. All these 25 staffs are well-paid staff members and so there will be no extra cost for their specific fees; all will undertake monitoring works free of charge.

All mitigation measures will be also taken, free of charge, by these 25 staffs, (a few more staff will be deployed from time to time, where necessary). Therefore, there will be also no extra expense for carrying out mitigation actions.

However, there will be expenses for procurement of device or materials for taking mitigation measures. For instance, procurement of hoses for spraying water (dust suppression); water spraying to do undertaken once a day during the hot dry month; procurement of PPE, e.g. face masks, mouth and nose covers, ear muffs, boots helmets, gloves – etc. To be worn by worker expose to long hour of dust and high level noise. All these mitigation devices will be purchased from the main budget.

Procurement and installation of ESP, bag filters, other mitigative devices e.g. noise abatour/silencers, vibration absorber will be borne by the project main budget. Procurement of fire extinguishers, hydrants, hoses, jet etc. will be also from the main budget, not from EMP budget)

Therefore, the actual expense will be for the hiring technicians for monitoring of air quality, noise level, water and soil quality. The once off cost and annual costs are shown in the table below:

Cost for conducting monitoring

Monitoring plan covering component/issue, parameter to be monitored, monitoring spot/site, frequency/timing, rewponsible person, once off cost, and remarks are already described (in tabulated form) earlier in 8.6.6.

Based from that table the annual cost for monitoring can be calculated and shown below in table.

During the Construction Phase

Sr. No.	Component/ Parameters	Monitoring points	Once off cost	Frequency timing	Annual csot	Remarks
1	Air quality	- construction site - Lauk Hpan village - Khe San village	Ks 1,700,000 Ks 1,700,000 Ks 1,700,000	semi-annual semi-annual semi-annual	Ks 3,400,000 Ks 3,400,000 Ks 3,400,000	Technicians have to be hired
2	Water quality	- construction site - Lauk Hpan village - Khe San village	Ks 80,000 Ks 80,000 Ks 80,000	semi-annual semi-annual semi-annual	Ks 160,000 Ks 160,000 Ks 160,000	Technicians have to be hired
3	Noise level	- construction site - Lauk Hpan village - Khe San village	Ks 70,000 Ks 70,000 Ks 70,000	semi-annual semi-annual semi-annual	Ks 140,000 Ks 140,000 Ks 140,000	Technicians have to be hired
4	Soil	- construction site - Lauk Hpan village - Khe San village	Ks 140,000 Ks 140,000 Ks 140,000	semi-annual semi-annual semi-annual	Ks 280,000 Ks 280,000 Ks 280,000	Technicians have to be hired
	Total				**Ks 11,140,000**	

Note – Detailed parameters for air, water, noise level are already described earlier in 8.6.6 (together with NEQEG guideline values)

– Coordinates for each monitoring spot are also described aerlier in 8.6.6.

Note – Other parameter to be monitored/checked by EMP cell members are free of charges (all are well-paid staff)

During the Operaton Phase

Sr. No.	Component/ Parameters	Monitoring points	Once off cost	Frequency timing	Annual cost	Remarks
1	Air quality	- coal-fired power plant	Ks 1,700,000	semi-annual	Ks 3,400,000	Technicians have to be hired
		- Lauk Hpan village	Ks 1,700,000	semi-annual	Ks 3,400,000	
		- Khe San village	Ks 1,700,000	semi-annual	Ks 3,400,000	
	Emission	- continuous flue gas analyzer installed at stack	free of charges	monthly	free of charges	Just checking and monitoring LCD and record
2	Water quality	- coal-fired power plant	Ks 80,000	semi-annual	Ks 160,000	Technicians have to be hired
		- Lauk Hpan village	Ks 80,000	semi-annual	Ks 160,000	
		- Khe San village	Ks 80,000	semi-annual	Ks 160,000	
	Effluent	- coal-fire thermal plant	Ks 80,000	semi-annual	Ks 160,000	Technicians have to be hired
3	Noise level	- coal-fired power plant	Ks 70,000	semi-annual	Ks 140,000	Technicians have to be hired
		- Lauk Hpan village	Ks 70,000	semi-annual	Ks 140,000	
		- Khe San village	Ks 70,000	semi-annual	Ks 140,000	
4	Soil	- coal-fired power plant	Ks 140,000	semi-annual	Ks 280,000	Technicians have to be hired
		- Lauk Hpan village	Ks 140,000	semi-annual	Ks 280,000	
		- Khe San village	Ks 140,000	semi-annual	Ks 280,000	
	Total				**Ks 11,300,000**	

Note – Detailed parameters for air, noise level, water are already described earlier in 8.6.6 (together with NEQEG guideline value).

– Coordinate for each monitoring point are already mentioned earlier in 8.6.6.

– Other parameter to be monitored/checked by EMP cell member is free of charges (all are well-paid staff)

During the Decommissioning Phase

Sr. No.	Component/ Parameters	Monitoring points	Once off cost	Frequency timing	Annual cost	Remarks
1	Air quality	- coal-fired thermal plant area - Lauk Hpan village - Khe San village	Ks 1,700,000 Ks 1,700,000 Ks 1,700,000	annual annual annual	Ks 1,700,000 Ks 1,700,000 Ks 1,700,000	Technicians have to be hired once a year
2	Water quality	- coal-fired thermal plant area - Lauk Hpan village - Khe San village	Ks 80,000 Ks 80,000 Ks 80,000	annual annual annual	Ks 80,000 Ks 80,000 Ks 80,000	Technicians have to be hired once a year
3	Noise level	- coal-fired thermal plant area - Lauk Hpan village - Khe San village	Ks 70,000 Ks 70,000 Ks 70,000	annual annual annual	Ks 70,000 Ks 70,000 Ks 70,000	Technicians have to be hired once a year
4	Soil	- coal-fired thermal plant area - Lauk Hpan village - Khe San village	Ks 140,000 Ks 140,000 Ks 140,000	annual annual annual	Ks 140,000 Ks 140,000 Ks 140,000	Technicians have to be hired once a year
	Total				**Ks 5,970,000**	
	Annual Grand Total				**Ks 28,410,000**	

The allocated fund for monitoring (USD 17500) will be adequate for one year; more money will have to be added later as time goes on.

Responsibilities

The responsible persons for undertaking monitoring action plan are the EMP cell leader and 5 cell members. (EMP cell organization is shown earlier in this chapter.) In addition 20 specially trained staff will carry out the monitoring works. While technicians will have to be hired semiannually these EMP cell members and 20 staff will carry on the regular weekly, and monthly monitoring especially, visual inspection/checking works on environmental and social components.

In fact the EMP cell leader, cell member and 20 trained staff are responsible not only for monitoring, but all aspects of EMP.

They will also supervise workers involved in taking mitigation measures.

9. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

Public consultation is an integral part of EIA/IEE and EMP. Involving the public participation in the EIA/IEE/EMP work is fundamental to increasing the understanding and acceptance of the project.

Public consultation and participation should be started at early as possible in the preparation of EMP. And it has to be a continuous process, especially during the Operation Phase, carry out from time to time.

Purposes of the consultation during the preparation of the EIA/IEE/EMP report

- To enlighten the locals/stakeholders about the project
- To increase the understanding and acceptance of the project
- To give the locals/stakeholders the opportunity to present their views, opinions, perception of the project, express their concerns, complaints, grievances etc
- To identify impacts and issues that are not immediately obvious to project proponent and the EIA/EMP team
- To access social assistant and community development needs for the locals/stakeholders
- To gain community consent and to interact with the people to further strengthen existing cordial relationship
- To tap local knowledge and to negotiate for mutually beneficial future that is sustainable and locally relevant

Requirements for public consultations:

- Public consultation should be conducted in the early phase of project
- Must ensure the direct involvement of the locals/stakeholders
- Must ensure that all locals/stakeholders who are interested will have the chance to fully participate, especially the vulnerable and marginalized group,
- It should be a continuous process --- throughout the entire phase of the project, especially during the long Operation Phase, and
- There must be an action plan or response programme such as complaints and grievances mechanism (CGM) to tackle any issue.

9.1 Methodology and approach

Standard methodology applied here includes:

(i) **Consensus building:** First of all a pre-sensitizing visits to the local authority (Village Administrator and party, elders) and briefing on the proposed project was carried out, and ask for their approval and assistant for holding the public consultation.

(ii) **Transect walk:** site visit (visit to the village) and conduct visual inspection.

(iii) **Actual public consultation meeting:** mainly involves disclosure of the proposed project and giving complete and accurate information; consultation mainly in the form of two-way conversation --- listening and talking; waiting for their response; further discussion.

(iv) **Interviews and discussions:**

- in the form of KII/SS, (Key Informant Interview/Secondary Source) for the gathering of secondary baseline socio-economical data and community profile with the aid of questionnaires

- in the form of FGD (Focal Group Discussion); interview with few selected people (authority, knowledgeable persons) especially for ranking the pressing need of the locals for prioritizing the needs for community assistance and implementation of CSR.

- Households Interviews (HHI) not conducted in this EIA study (Not a comprehensive SIA study)

9.2 Summary of consultation activities

(a) Preliminary counsultation meeting during the scoping study by MESC

Date : 20-11-2017

Time : 15:30 – 16:30 hours

Venue : Village school, Lauk Hpan Village

Attendees : 17 persons

A preliminary public consultation was held on 20-11-2017 between the responsible officers of the company and the locals. The village administrator and members, village elders and interested person and stakeholders have attended the consultation meeting. It was actually a sensitizing visit and briefing, explaining the proposed project to the locals and stakeholders.

Minutes of meeting

The responsible officer of the company, U Khin Maung Aye explained to them in general about the proposed project. The scoping team leader, U Myint Kyaw Thura explained to them how the scoping survey will be conducted, and how the detail follow up EIA study will be conducted later.

They were invited to express their views and opinions. 4 attendees expressed their views.

U Thein Aung, a local: The Company has done a lot for the good of the community; such as provision of water, building or major renovation and extension of school and village electrification. The company has also bought the land from the locals for the implementation of the project at appropriate prices. I have nothing more to say.

U Pyin Nyar, a local: There can be both positive and negative impact when a project is implemented. We can now see evidence of positive (beneficial) impacts in the form of CSR programme such as building of road, building of school provision of water for the locals, and village electrification. The village has developed greatly and the locals are enjoying the fruit of CSR programme. Formerly the village was just a hamlet. Negative impacts have not yet seen. The eastern part of the village is quite far away from the community water pond and it has become a small issue. If possible I would like to ask the company for boring a new tube-well.

U Chann Thar, a local: There was/is no negative impact and so I have nothing to say about this. The company and the local community has become a family as we have cordial relationship. The company has provided donations and charities during occasions of Thar-yay-nar-yay (joy and grief).

Daw Yi, the headmaster: Formerly the school was only a small building. Thanks to the company, now we have new buildings (extensions) and more toilets for students. The company has also employed two female teachers for the school. This is good for the education of the local children.

Figure – 128: Preliminary public meeting at village school

A transect walk visual survey was made later. The scoping team has not heard or witnessed any anti-project attitude among the locals.

As the Ngwe Yi Pale Cement Co., Ltd has been operating the cement factory since 2014 the officials and staff of the company have already acquainted with the local elders it seems that the company has over all good relation with the locals. The company has already spent more than Ks 980 million in CSR programme for the region. It is quite clear that the implementation of the proposed project is welcome and the level of acceptance is high, given the fact that many youths are hoping for job opportunity. The authority of the company will prioritize the hiring of the locals if they are qualified for the jobs.

(b) Public counsultation meeting during the EIA study

Date : 28-2-2018

Time : 15:15 – 16:15 hours

Venue : Lauk Hpan Village Buddhist Monastery

Attendees : 40 persons

The responsible officers from Township General Administration Department, Special Police Branch and an NLD Township representative also attended the meeting.

(Invitation cards were distributed to township level government officials of relevant departments, township CBOs, village administrators all heads of village households and stakeholders.)

Minutes of meeting

First U Hla Myint (Yar-eain-hmoo), member of village administration very briefly explained to the participants, about the meeting.

U Myint Kyaw Thura, team leader of EIA survey: Explained to them about the EIA survey to be undertaken; the anticipated impacts and how impacts will be mitigated in brief. That there will be both negative and positive beneficial impacts and that he would like to hear the comments and opinions from the participants.

U Ye Lu, a local: He would like the village lamp posts to be well-lit at night. The dust generated due to vehicles and motorcycles movement at the village by pass road is a serious issue.

U Khin Maung Aye, Deputy cement factory manager: The company will provide the light bulbs/lamps for the lamp posts but the villagers should look after the bulbs/lamps for maintenance. Waters will be regularly sprayed for suppression of dust. (Dust at the village by pass road is nothing to do with the project; it is due to the motorycle movements by the locals)

U Hla Myint, Yar-eain-hmoo: We would like the road from the village to the clinic paved.

U Khin Maung Aye (Dy. Manager): I will report this to the company authority and do this.

U Gyi One, a local: This factory only brings benefit for us. Now we have 24 hours electricity. We no longer use firewood for cooking. The village has developed a lot. This factory is just like a mother for us. I, therefore, agree with the implementation of the project.

The meeting was over at 16:20 hours.

Figure – 129: Public consultation meeting during EIA survey

Figure – 130: FGD meeting

Figure – 131: KII meeting

Results of consultation

Extrapolating from the results of these two meeting it is quite clear that the acceptance of the project by the local is high. This is due to the fact that the company has been in the area, since 2004 and has already maintained good relation with the local community.

The mind sets of the company's authorities can be termed "philanthropic mind sets". So far, the company has spent more than Ks 6,764,390,633 for effective and meaningful implementation of CSR programmes, (many CSR programmes are implemented even when the company has not realized any profit yet).

One local, U Ye Lu asked for the village lamp posts to be well-lit with bulbs/lamps. It seemed there was lack of maintenance from the part of the villages. So the deputy manager replied that he would provide more bulbs/lamps but the villagers should take responsibilities for the bulbs/lamps.

As regards dust along the by-pass road the company shall tackle this issue by regularly spray water to suppress dust.

U Hla Myint, Yar-eain-hmoo asked for the road between the village and clinic to be paved.

As the deputy manager was not in a position to undertake this he would have to ask for permission first from the company authority and carry out the pavement of road.

U Gyi One, a local simply said that the cement factory is real benefactor for the village and that he agreed with the proposed project.

As Ngwe Yi Pale' Cement Co., Ltd has been in operation here for many years the local people are all familiar with the activities of the company. Many are employed in the factory.

Name of local	Things requested or issues raised	Action taken by the company
U Ye Lu	- Request for the village lamp posts to be well-lit - Dust generated due to vehicular movement	- Already done (during the submission of this amended EIA) - Already tackled (during the submission of this amended EIA)
U Hla Myint	- Request for paving the road between the village and clinic	- Already done (during the submission of this amended EIA)

The company has, no doubt, good relation with the local community. The acceptance of the proposed project is high to very high.

(c) Public consultation meeting at Khe San village, Naunghkio Township

Date : 9-3-2019

Time : 08:30 - 10:00 hours

Venue : Zeya-thu-kha Monastery, Khe San Village

Attendance : 84 persons

The meeting was attended by officers from the township General Administration Department, Township Agricultural Land Management and Statistics Department and Township forest Department, also officers of the Ngwe Yi Pale' Cement Co., Ltd., village administration and members, village elders, interested person and stake holder from Khe San, Lauk Hpan, Nant-kel-aik, Kyan kinn and Pang Ti village. (Invitation cards were distributed to township level Government Officials relevant departments, township CBOs, village administrators all heads of village households and stakeholders.)

U Sein Myo Aung, Director, Ngwe Yi Pale' Co., Ltd: I am Sein Myo Aung , the director of the company. Mingalarbar. Thank you all for your attendance in spite of the fact that you are tied up with your respective work/duty. As Khe San village is one of the nearest villages to our factory we want to know what impacts or disturbances are on your village and what issue

or problem you have to face. Our aim is to tackle the issue and solve the problems, if any. I also thank the authorities from governmental department for attending the meeting.

Daw Hnin Mya Mya Oo (Deputy head of Township General Administration): What Ngwe Yi Pale' company have done so far are only for the development of the area and community. Before the establishment of this factory it was really bad for transportation as there is only one dirt road. As the company has upgraded the gravel road to paved road transportation has improved greatly. I believe that the local community has seen and felt the benefit. The village is also electrified by the company. To electrify a village is difficult even when done on self-reliance basis. Ngwe Yi Pale' Co., Ltd has also contributed greatly to the community development concerning health and education. On behalf of the local people I greatly thank the company for this. I request all of you to give comments and express your views and opinions on the advantages and disadvantages of the project and to say what are still need for the development of the village and community.

U San Kwei, the Khe San village administrator: When compared with the previous situation we have witnessed development a lot. Once transportation was very difficult but after the establishment of the factory in 2010 there is considerable development. Ngwe Yi Pale' Company has donated generously for the upgrade of school building, for the setting up of clinic, donation for the monastery and electrification of the village.

The villagers from the nearby villages may have some needs for their villages. I therefore, would like to ask you to speak up for the good of your villages and express your view and opinion regarding the advantages and disadvantages of the existence of the factory.

U Aung Khan, Yar-ein-hmoo, Nant-kei-aik village: Mingalarbar to all the officers, elders and all participants. My name is U Aung Khan and I am Yar-ein- hmoo of Nant kal-aik village. Since the emergence of this factory nine years ago (2010) I have seen no negative impact. Formerly transportation was really difficult. As the company has upgraded old road as well as built new road now it is becoming nearer to our village. When a meeting between the factory officers and local community in 2016/2017 I had attended that meeting. At that meeting we had mentioned the need for upgrade of road and village electrification. At the moment these two requirements have not achieved yet. We knew that the company has done a lot for the development of religion, socio-economic, health and education of local community. I ask for village road improvement and village electrification.

U Sein Myo Aung, director: In the coming months, from June to October we will implement village road improvement and village electrification.

U Khin Maung Aye, manager of the factory: We will do our best for village and community development.

U Htun Kyaw, from Kyan-kin Ywar Thit village: Since the emergence of this cement factory there is considerable development for the area. I hope that later all villages in the area will achieve improved transportation and village electrification.

U Sein Myo Aung, Director: We have a plan for road upgrade and village electrification for all eight villages under Pang Ti village tract, even if the villagers do not ask for this. First priority will be for road. Only then can there will be good and easy transportation between the factory and nearby villages. The second priority will be village electrification. We will implement this plan steadily; there can be no problem with road and electricity. I want to know what do you want more for your villages.

A local from Pang-ti village: We need renovation for Pang-ti village administrator office.

U Sein Myo Aung, director: We will donate bricks and cement for renovation of that office

U Khin Maung Aye, factory manager: I thank all the participants for attending the meeting. The meeting came to an end at 10:15 hours.

Figure – 132: Public consultation meeting at Khe San Village

(d) Public consultation meeting at Lauk Hpan village, Naunghkio Township

Date : 9-3-2019

Time : 10:30 - 11:45 hours

Venue : Lauk Hpan Village Monastery

Attendance : 127 presons

The meeting was attended by an officer from the Township General Administration Department, Township Agricultural Land Management and Statistics Department and Township forest Department.

(Invitation cards were distributed to township level Government Officials relevant departments, town CBOs, village administrators all heads of village households and stakeholders.)

U Myint Kyaw Thura, team leader MESC, scoping team: Mingalarbar to all the officers from governmental departments, organizations, village administration and members and all stakeholders. My name is Myint Kyaw Thura and my organization is Myanmar Environment Sustainable Conservation (MESC), which is a neutral organization. We have come again for conducting scoping study on the 60MW coal fired plant project. In 2018 we have been once to this area for conducting scoping and EIA and has already written a report. This time we come to investigate the condition for villages which are within the 2 mile radius from the factory. I therefore invite you to give comment and express your views and opinions frankly. Only then can we will be able to know the true situation. Thank you all.

U Sein Myo Aung, director of the company: Mingalarbar. Thank you all for your attendance. As Lauk Hpan village is the nearest one to our factory we want to know your views, opinion and what you are feeling toward this factory. I invite you to speak and discuss frankly so that we will know the true situation. Thank you all.

Daw Hnin Mya Mya Oo, Deputy head of Township General Administration Department: Mingalarbar. I am Daw Hnin Mya Mya Oo, the deputy head of Township General Administration Department. I am glad to see my local relatives again. Once I was a clerk at Lone Yone village administrator office. I was promoted and transferred to Kyauk mei township office. Now I has transferred to Naunghkio Township office as the post become vacant. I have been to this Lauk Hpan village many times. The situation has greatly changed. Once it was really difficult to travel during the rainy season. Now the village road is better than the town/city road. The village has been electrified and there are community water ponds for the villagers. The primary school is now as good as a middle school. All these benefit are due to the generosity of Ngwe Yi Pale' Company. The company has done a great deal for the development of the village and the local community.

Now the company has come to do more assistance for the village on behalf of the people of Lauk Hpan village. I thank Ngwe Yi Pale' Company for all this development.

U Hla Myint, Lauk Hpan Village Administrator: I thank the company for all the community assistance and development undertaken by the company.eg. religious, cultural, health, education, socio-economic, and village infrastructural development regarding village road, village water and village electrification.

We have good relation between the company and the village. Whenever we asked for help the company used to take prompt action. We have good relation with the director, managers and staffs of the company.

I invite you to give comment and express your view frankly.

Daw Nan Shwe Kyar, a local: I would like to ask for the renovation of our monastery.

U Sein Myo Aung , director: We will duly do that after the month of October.

Daw Aye Ywet, a local: I would like to ask for removal of the garbage dump at the southern part of the village.

U Sein Myo Aung, director: With the aid of heavy machinery we will construct a new landfill. We will do it immediately.

U Khin Maung Aye, factory manager: We will gradually carry out all the programmes for village development. If you have any difficult you can contact us through the village administrator.

Thank you all.

The meeting has come to a close at 11:45 hours.

Figure – 133: Public consultation meeting at Lauk Hpan Village

(e) Public consultation meeting at Lei Gyi Taw village, Naunghkio Township

Date : 9-3-2019

Time : 2:00 - 13:30 hours

Venue : Lauk Hpan Village Monastery

Attendance : 73 persons

The meeting was attended by Township General Administration Department, the village administrator, responsible officer of the company and local elders.

(Invitation cards were distributed to township level Government Officials relevant departments, township CBOs, village administrators all heads of village households and stakeholders.)

U Myint Kyaw Thura, team leader MESC: Mingalarbar to all the officers from governmental departments, organizations, village administration and members and all stakeholders. My name is Myint Kyaw Thura and my organization is Myanmar Environment Sustainable Conservation (MESC), which is a neutral organization. We have come again for conducting scoping study on the 60MW coal fired plant project. In 2018 we have been once to this area for conducting scoping and EIA and has already written a report. This time we come to investigate the condition for villages which are within the 2 mile radius from the factory. I therefore invite you to give comment and express your views and opinions frankly. Only then can we will be able to know the true situation. Thank you all.

U Sein Myo Aung, director: I invite you to give comment and express your opinions and view frankly if there are any impacts or disturbances due to the operation of this factory. This is the main objective of this consultation meeting.

Daw Htay, a local: Everything the company is doing is good. I would like the company to tell its drivers to drive their trucks in slow speed for the safety of school children.

U Win Min Htun, the village administrator: Everything is ok. Due to heavy traffic there are dust during the dry season. Since there can be safety issue for school children and villagers I want to ask the company drivers to reduce the speed when driving inside or close to the village. Regarding environment we used to have 5 springs but now there are only 3 springs. There is water issue. If possible I would like to ask for the construction of village tube well.

U Sein Myo Aung, director: We will warn our drivers again for reducing speed. We will set up speed limit at the road side and install slow down ridge on the road. We will plan water trucks for distribution of water to villagers. Later we will select spots where there are perennial springs and build water ponds and source water with the aid of pumps.

Daw Tin Tin Htay, a local: I have nothing to say about the factory. I thank the company for village electrification. Being poor our main needs are water and electricity.

Ma Wah, a local: I want the company to construct a building for the monastery. There are villagers who will donate their land for this.

Daw Hnin Mya Mya Oo, Deputy head of Township General Administration Department: Even if there are land donors for the construction of a monastery there are legal process to do such as obtaining permit from the Home Affairs Ministry and the Religion Affair Department. So you have to wait for this matter for some times.

U Win Min Htun, the village administrator: There are still some households that not have access to village electrification yet. I would like to ask for village electrification for each and every household.

U Khin Maung Aye, factory manager: The wire cable used for village electrification are not durable enough yet for more electric load, and that is the reason why all houses are not totally electrified. We have a plan for changing the old cables with new and better one.

We have done our best for community development. However as we are tied up with our job there can be certain inefficiency and short coming. And I would like you to bear with us.

Thank you all.

The meeting was over at 13:30 hours.

Figure – 134: Public consultation meeting at Lei-gyi-taw Village

Results of consultation

Sr. No.	Issued raised/request made	Reply from the company
1.	At Khe San village - improved village road and village electrification not materialized yet	- the company will implement this during the coming June to October
2.	- renovation for village administration office	- the company will donate bricks and cement
3.	At Lauk Hpan village - renovation of the village monastery	- will do this in the coming October
4.	- the yield of maize from the plot close to the factory has declined considerably	- will seek the advice of agriculture expert and fix this promptly
5.	- removal of garbage dump at the southern part of the village	- with the aid of heavy machinery a new landfill will be constructed immediately; already done

6.	At Lei Gyi Taw village - for company truck drivers to reduce the speed for safety of the school children	- will again warn the drivers for this or punish them
7.	- there used to be 5 springs but now only 3 springs left; there is the issue of water during dry months	- water trucks will distribute water (Short term plan) - will select new perennial springs and build more community water pond for the village
8.	- to construct a monastery	- still need permission from the Home Affair Ministry
9.	A few houses are not electrified yet	- the old cable cannot bear extra load. There is a plan for changing the old cables with a new and better one. That is after this coal-fired thermal plant is in operation.

On the whole the company has very good relation with the villagers of these villages. The reason is simple; the company has so far spent Ks. 989,089,750 for implementation of CSR programme for the whole area.

During the meetings most villagers have expressed their gratitudes for the improvement of their village infrastructure road transportation, village electrification and community water ponds etc. The acceptance of the projects (2 cement plant and the coal-fired themal) by the locals in high. There is a good cordial relationship between the company and the local communities. In fact, they view the company as their great benefactor.

9.3 Future ongoing consultations

As mentioned earlier public consultation must be a continuous process throughout the project period, from the Pre-construction Phase, through the Construction Phase and Operation Phase to the Decommissioning Phase. One more public consultation meeting should be held during the Construction Phase. As regards the long Operation Phase (30 years) there should be regular public consultations annually or bi-annually depending on the situation, or from time to time whenever there is a need for public consultation. This is very important for maintaining the long term cordial relationship with the locals and hence the long term benefit for cement business.

Grievances Redress Mecharism (GRM)

The Grievances Redress Mecharism (GRM) Complaints and Grievances Mechanism (CGM) programme will be implemented throughout the entire project period. It will be practical, applicable, effective and meaningful, not a formality. The public relation officer and EMP cell leader will always give special attention to CGM.

The complaints handling and response will be effective. A hotline for complaint will be set up. The address and phone numbers of the plant (U Khin Maung Win, Manager, 09 977150288) will be made available at the village administrative office so that any villager can see. A register book and a log book to documents all GRM will be kept and the complaints/grievance handling response and redress will be effective. The date and time of complaints; detail of complaint; action taken and if no action is required the reason why must be explained and all recorded and documented. The company on its part will endeavor to tackle all the issue of complaints with good intention. Post complaint contact, if any or if required, will be also documented. (All these will be tackled by U Khin Maung Win and his subordinates)

Example of the log book sheet for GRM:

1. Name of complainant (person/organization) ----------
2. Date of receipt ----------
3. Summary of complaint/grievance ----------
4. Date of action taken ----------
5. Action taken by who ----------
6. If action is not required give the reason why ----------
7. Grievance resolved/settled (Yes/No) ----------
8. Any post GRM contact (Yes/No) ----------
9. Any follow up issue or action (Yes/No) ----------
10. Need a legal expert (Yes/No) ----------

The main aim is to tackle all the issues arisen and solve the problems is a friendly manner for the long term benefit of both the community and the company.

The problems or issues will be solved at the local level, as far as possible; will avoid going to court.

The GRM will be for community grievance only not for staffs/employees. They can file their complaints or utter their dissatisfaction directly to the manager or company authority.

Future public consultation will involve the continuation of CSR programme (affordable programme) and donation and charity works as far as possible.

A community development plan is drawn and the activities involve community assistances, donations, charities and community development (See also **ANNEX**).

Community Engagement

A Community Consultation Committee will be setup and the committee will comprise the manager of the plant, the Administration Manager (contact person), the EMP cell leader and six members and the liaison officer. This liaison officer will play a key role in community consultation meetings throughout the entire Operation Phase of the project.

The venue for the regular or occasional public consultation meeting will be the meeting hall of the company. As mentioned above the regular implementation of CSR programme in the form of community development, community assistance, donation and charity activities shall be the main themes of future public consultation.

Community Information Plan

Moreover a Community Information Plan will be formulated for provision of timely information to the community.

First of all the Community Information Plan will comply with the guideline in "The Draft Guideline on Public Participation in Myanmar's EIA process (2017).

- Prior to the commencement of construciton, the proponent shall prepare and implement a community information plan that sets out the community communication and consultation process to be implemented during construction and operation of the project. The plan shall include but not be limited to: procedures to inform the local community of planned investigations and construction activities, including noisy works, procedures to inform the relevant community of construction traffic routes and any potential disruptions to traffic flows and amenity impacts; procedures to consult with local landowners with regard to construction traffic to ensure the safety of people or animals and livestock and to limit disruption to livestock movements; procedures to inform the community where work outside the construction hours specified in the EIA, in particular noisy activities, has been approved; and procedures to inform and consult with affected landowners to rehabilitate impacted land.

In fact during the first public consultation meeting the responsible officer of the company and leader of the consultant firm have informed the local community about the project activities and potential impacts in advance in brief.

- A portion of the company office area will be allotted for the setup of an information centre. The liaison officer and a clerk will be deployed at the centre.

- All kinds of information related to the project will be made available at this information centre.

- The information centre will encourage the locals to express their views, give advices or give comments regarding the project. Forms for advice or comment will be made available and all the advices, comments and concerns received will be recorded, and all issues tackled as far as possible.
- The information concerning the implementation of CSR programme such as community assistance and community development including; the renovation of school, monastery, village infrastructure, donation in cash and kinds during religious festival in times of weal and woe, etc. (The company has carried out various CSR activities not only for the nearby villages level but also at the township, district and regional level and so all these information will be made available at the centre. See also ANNEX. Documents photography of CSR programme implementation are shown.
- The information will be also made available at each village administrator office of each village.
- After each regular public consultation meeting (annually or biannually depending on situation) the result of the each consultation meeting will be made available at this company's information centre and also at the village administrator office.
- Records of minutes of all consultation meetings held will be kept; anyone who is interested can peruse the minutes of each meeting.
- Should there be any issue regarding Complaints Grievance Mechanism information on how the issue is tackled will be provided.
- Whenever there is/are post vacancy or vacancies this will be announced in the form of a notice set up both at the information centre and at the village administrator office. Priority will be given to the locals for employment at the vacant post(s).

Table – 41: Tentative programme for future public consultations

Sr. No.	Day/month/year	Agenda	Remarks	Information disclosure
1.	First week of December, 2019	all agenda brought up	regular (or) any emergency meeting when necessary	within one week after meeting; only minutes of meeting, no lengthly report
2.	First week of July, 2020	all agenda brought up	regular (or) any emergency meeting when necessary	within one week after meeting; only minutes of meeting, no lengthly report

3.	First week of December, 2020	all agenda brought up	regular (or) any emergency meeting when necessary	within one week after meeting; only minutes of meeting, no lengthly report
4.	First week of July, 2021	all agenda brought up	regular (or) any emergency meeting when necessary	within one week after meeting; only minutes of meeting, no lengthly report

Note: may be more meetings as required (eg. emergency meetings, impromptu meetings.)

9.4 Information Disclosure

The public consultation meeting held at Lauk Hphan village on 28-2-2018 was made public. The information is also launched at the MESC facebook website, http://www.myanmar environment sustainable conservation.com. (The company does not want to disclosure the EIA report which is not approved yet). The copies of approved EIA reports will be kept at the site office, the company head office, at Lauk Hpan Village administrator office and at the consultant firm, MESC, office for perusal for interested persons. When the EIA report is approved "Executive Summary" will be launched at the facebook, website (in English and Burmese).

Further public consultation meeting held at Khe-san, Lauk-hpan and Lei-gyi-taw villages on 9.3.2019 were also made public. The information is also launched at the MESC facebook website, http://www.myanmar environment sustainable conservation.com. The company will also disclose the information on its website, www.ngweyipale.com after approval of the report.

List of commitments

Sr. No.	Chapter	Section	Page
1	Chapter – 3	3.1	Page. 66
2	Chapter – 3	3.2.1	Page. 104
3	Chapter – 3	3.3	Page. 108
4	Chapter – 3	3.3	Page. 109
5	Chapter – 8	8.2	Page. 350

10. CONCLUSION

This EIA report has been organized, prepared and written in accordance with the rules, regulations guidelines and most of all, the format for EIA prescribed by the Environmental Conservation Department (ECD) of the Ministry of Natural Resources and Environmental Conservation (MONREC).

The report has been prepared with utmost effort with all reasonable knowledge, skill, care and deligence within the tern of contract with the client. Recommendations are based on our experience, using professional judgement and based on available information.

Purely from environmentalists point of view there is no reason not to undertake the implementation of this project due to the following facts:

- There are no cases of land disputes or cases of land grabbings, forced eviction and forced relocation or resettlement.
- There are no cultural, historical and archeological sites nearby to be effected.
- There are no protected area, national park or wildlife part, wildlife sanctuary and important bird area, etc to be effected.
- The area is not an ecologically fragile habitat or wilderness containing well-known endangered species of plants or animals.
- There is no wet land or lake where large number of aquatic birds aggregate or no natural reservoir nearby which is the drinking water source for large population centre.
- There is no attractive scenic spot or site of aesthetic beauty for potential recreational centre for tourism.
- The area is not prone to natural hazards, eg floods, draughts, violent storms and landslides.

One can never expect a developmental project devoid of negative impacts. Wherever and whenever a developmental project like production of electricity, limestone quary and cement production is implemented there can surely be a more or less impacts on the physical, biological and socio-economic components of the surrounding environment. This is inevitable and irreversible.

For a Least Developed Country (LDC) like Myanmar with its infrastructure still lagging far behind others in the infrastructural development of the nation is a must. And electricity is one of the main infrastructures of the nation. Then a pragmatic way of thinking and a pragmatic

way of doing things has to be undertaken. Coal thermal plant is reasonable choice for the production of electricity for the cement plant. This is the way the infrastructure of a country is developed and there is no other way round. Hard decision has to be made based on rationalization or reasoning rather than emotion. In developing the national infrastructure one should be realistic rather than idealistic, rational rather than emotional, and pragmatic rather than theoretical in doing things. The main objective here is to increase the production of cement and to do a business that is environmentally sound, socially sustainable and economically viable.

In this era of environment awareness there are now many well-established guidelines for the prevention or mitigation measures which can more or less eliminate or minimize all or most of the undesirable impacts resulting from the execution of a project. There are also appropriate measures (mitigation, corrective, remedial) that can limit or minimize the impacts as well as measures for maintaining the longterm well-being of the environment.

After taken into consideration of all the pros and cons of this project it can be concluded that the advantages outweight the disadvantages in many aspects. There is no point to stop the implementation of this project but instead proceed with the implementation of this project. The project will contribute to the increase in the GDP of the country and also increase in earning for the nation in the form of tax, duty and revenue. It will bring employment opportunities for many locals and, most of all, contribute greatly to national infrastructure development. There is no doubt that is will be economically viable and environmentally sustainable if all the rules, regulation and statutory requirements are complied with and all mitigation measures prescribed are duly taken.

To sum up, Ngwe Yi Pale' Cement Co., Ltd will:

- comply with all the rules, regulation and statutory requirements
- study and heed to all the impacts/potential impacts addressed in the report and duly carry out all the mitigation/corrective measures prescribed in the report
- implement the EMP, especially all the management and monitoring sub-plans prescribed in the report
- duly undertake the rehabilitation task after the completion of the project

Ngwe Yi Pale' Cement Co., Ltd will: do its best and try to become an outstanding and examplary company among other companies in doing environmentally sound business.

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ANNEX

Health Impact Assessment

1. EXECUTIVE SUMMARY

This rapid HIA report is the annexure of the main EIA report (second amended report).

This short report is based from the theoretical perspective of the potential health impacts due to the operation of the coal-fired power plant. It is a simple qualitative assessment based from the findings during the EIA survey and public consultation meeting. It is also a descriptive report (not a quantitative analytical report, such as an in depth or comprehensive HIA reports.)

Objective

- To identify and assess the impacts of the project on public health. To provide decision makers with a set of evidence based recommendation about the project and to propose or prescribe effective and meaningful mitigation measures to be taken to alleviate the negative impacts on public health as far as possible.

About the project and HIA in brief

The project is for the construction and operation of the coal-fired thermal plant with a capacity of producing 60 MW electricity to be used by a nearby cement plant and for village electrification. The project site is inside the main factory compound of 2 cement factories which are the main project. It is near Laukhpan Village, about 6 miles north-west of Naunghkio Town.

The coal-fired thermal plant has to burn up to 100 tons of coal (together with 1-3 tons of limestone) to produce electricity of 60 MW. Because of the magnitude of the project HIA is necessary, (the technical details of the project are already described in the main EIA report).

In this short report the overall policy, legislative and institutional frame work are very briefly mentioned (these are already mentioned in details earlier in the main EIA report).

Policy, legislative and institutional frame work

The national environmental policy is to achieve harmony and balance between socio-economic, natural resources and environment through the integration of environmental consideration into the development process enhancing the quality of life of all its citizen covers:

- clean environment and health and functioning ecosystem
- sustainable development, and
- main stream environmental protection and managements.

The environmental and health policy of the project proponent is to do the coal-fired power plant business with no or little negative impacts on the physical environment and socio-economic environment, especially health environment.

The corporate environmental and social policies as prescribed by IFC are summarized and outlined, 40 laws, rules and regulations that are relevant are listed (in the main EIA report).

For pragmatic purpose the National Environmental standards encompassing NEQEG guidelines as prescribe by ECD are reproduced again and depicted in tabulated form.

Health Standards for the project as prescribed by IFC and ILO covering Environmental Health and Safety (EHS), Occupational Health and Safety (OHS) and Community Health and Safety (CHS) are outlined.

Methodology

The methodologies in conducting HIA are more or less the same as conducting HIA, namely screening, scoping, assessing, recommending, reporting, monitoring and evaluation.

The four basic types/methods of HIA are: Desk-based HIA, Rapid HIA, In-depth or comprehensive HIA and specific HIA focusing only on one main negative impact (e.g. $PM_{2.5}$).

In this HIA context it is a rapid HIA.

Steps in HIA process

The steps in HIA process are also screening (the first step), scoping (second step), assessment (third step), recommendation (4^{th} step) and reporting (5^{th} step). Monitoring and evaluation are follow-up steps after the report. These are briefly described.

Public health management plan (PHMP)

PHMP is indeed a grand plan to be implemented by the ministry of Health and Sports. However, in this local area level context, the project proponent has also tried its best, to contribute to the execution of this PHMP.

The company has so far spent Ks 531,504,000 for implementation of meaningful CSR program of which Ks 14,198,000 are used for health assistance and health improvement for the local communities (e.g. establishment of the factory's clinic and giving free medical treatments to locals; donation in cash and kinds to 3 villages clinics, donation in cash to Naunghkio Township hospital; donation in cash to welfare association of the hospital and disinfectant team and construction of toilets for schools and monasteries and also water tanks etc.).

Project phase in brief

The durations for the Preconstruction Phase, Construction Phase, Operation Phase and Decommissioning Phase are: 1, 2, 30 and 2 years, respectively. 92 construction workers were deployed during the Construction Phase and 150 employees are employed during the Operation Phase. A decommissioning contractor as well as a rehabilitation (reforestation) contractor and parties will be hired for decommissioning and rehabilitation.

Project's health policy, commitment

The project's health policy and commitment are mentioned. The most relevant laws, rules, regulation, requirements are listed, e.g. Myanmar Public Health Law 1972; Occupational Health and Safety Law, 2019; Prevention and control of Communicable Disease Law, 1995, the Control of smoking and consumption of Tobacco Products Law, 2016; National Environmental Quality (Emission) Guideline, 2015, etc.

Health impacts related to health issue and mitigation measures

These are the essence of HIA report and are summarized. During the Construction Phase 6 potential impacts that are of health risk are identified and described in relative details together with subsequent mitigation measures.

The potential negative health impacts are:

- air pollution, noise and vibration, wastes (solid, liquid), potential accidents at work place (construction site), potential traffic issue and potential social issue.

During the Operation Phase 9 potential impacts that are of health concern are identified and described in relative details together with their sub-sequent mitigation measures.

The potential negative health impacts are:

- air pollution, water quality and effluent and water storage; noise and vibration, wastes; heat and hot works; fire and explosion; potential traffic issue; OHS issue and CHS issue.

Based from Experts Judgement/Experts Consensus Method and from IFC table (matrix risk/impact rating) the above mentioned negative impacts are assessed.

The positive impacts during the Construction and Operation Phase are also mentioned, e.g. infrastructure improvement, increase in local employment, increase in local income, increase in GDP for the nation, increase in earnings for the nation from taxes, duties and revenues.

Budget for implementation of PHMP

The company does not have a separate budget yet, for implementation of PHMP. However, it has a fund for EMP and MP.

The fund will be shared; monitoring of the physical environment also means indirect monitoring the health environment. Although it has no budget yet for PHMP it has already spent Ks 14,198,000 for public health assistance and public health improvement.

The company's clinic, established at a cost of Ks 10,324,000 has provided free medical services, not only to its employees, but also to the local people. The company has donated in cash and kinds to the nearby 2 village clinics and also to Naunghkio Township Hospital, and also welfare association of the hospital. The company has constructed several toilets for the local schools and monasteries and also built water tanks for local community.

Monitoring plans and sub-plan

Specific monitoring plan and sub-plan by project phases are mentioned in the last section of this report.

The semi-annual monitoring of air quality, noise level, water quality, solid waste, OHS aspects, potential traffic issue and potential social issue during the Construction Phase are described in tabulated form.

The semi-annual monitoring of air quality/emission, noise level, water quality (effluent), solid waste, heat and hot works, fire and explosion, traffic issue, OHS and CHS issue during the Operation Phase are described in tabulated form.

Regular monitoring of physical parameters during the short Decommissioning Phase is also described in tabulated form.

2. INTRODUCTION

Health Impact Assessment (HIA) is defined as a practical approach used to judge the potential health effect of a project on a population.

In other words, it is a systematic process that uses an array of data sources and analytical methods and considers input from stakeholders and determines the potential effects of a project on the health of a population.

WHO defines HIA as "a combination of procedures, methods and tools by which a project may be judged as to its potential effects on the health of a population and the distribution of those effects within the population".

HIA provided a framework or procedure for estimating or assessing the impacts of the project (in this case the coal-fired thermal plant) on a selected environmental health issue for a defined population (workers at the plant and locals in the vicinity).

It is a well-known fact that coal-fired thermal plants have high negative impacts on the environment and social component, and especially health component, of the surrounding environment. Air pollution is a major global health concern and a large variety of diseases, ailments and health problems are caused by air pollutants from coal-fired thermal plants, unless effective mitigation measures are taken.

In this project context, the large coal-fired thermal plant, with a capacity of producing up to electricity, has to burn up to 1000 kg of coal per day. The negative health impacts of the project, if not effectively mitigated, are really high. HIA for the project is, therefore, imperative.

HIA can play a vital role in environmental and health awareness raising, promoting public participation and placing health on the agenda of all developed sectors.

Requirement for conducting HIA are emerging in the international communities nowadays, becoming mandatory in all developed countries and many developing countries.

3. POLICY, LEGISLATIVE AND INSTITUTIONAL FRAME WORK

The environmental policy, legislative and institutional frameworks are already described earlier in the main EIA report, Chapter 3.

These are summarized in this HIA report. The first and foremost policy of the project proponent is to do the coal-fired power plant business with no or little impact on the physical environment and socio-economic environment especially health environment; and to avoid or prevent occurrence of occupational problems and to achieve zero accidents in the work places.

The project proponent will endeavor to:

- Operate the coal-fired power plant in an environmentally, socially and healthfully responsible manner.
- Will avoid or prevent pollutions of all kinds.
- The corporate environmental and social policies as prescribed by IFC cover:
- The assessment and management of environmental and social (including health) risks and impacts.
- Management of labour and working condition.
- Management of resources efficiency and pollution prevention.
- Management of community health, safety and security.
- Management of land acquisition and involuntary resettlement, if necessary.
- Management of biodiversity conservation and sustainable management of living natural resources.
- Management of indigenous people, if present, and
- Management of cultural heritage, if present.

The national environment policy is:

- To achieve harmony and balance between socio-economic, natural resources and environment through the integration of environmental consideration into the development process enhancing the quality of life of all its citizens.

The policy covers three strategic areas:

(i) clean environment and health and functioning ecosystem
(ii) sustainable development, and
(iii) mainstreaming environmental protection and management

In this said EIA report 40 laws, rules, regulation that are relevant to environmental and social aspects are listed. Most relevant excerpts of articles, sections, sub-section from each law, rules, regulation are reproduced.

- International standards and guideline are listed.
- Commitments made by the project proponent and by the consultant firm are mentioned (in the main EIA report).
- The institutional organization of NECCCCC, and ECD (MONREC) as well as institutional organization of the proponent, Ngwe Yi Pale' Cement Co., Ltd, are depicted in charts and diagrams (in the main EIA report).
- As regards National Environmental standard.

The National Environmental Quality (Emission) Guideline prescribed by ECD is given. The NEQEG cover environmental guideline for coal-fired power plant.

- air quality and emission
- water quality and effluent
- noise level and
- odour

The guideline values are reproduced and shown in tabulated forms:

(a) Air quality; air emission guideline

Ngwe Yi Pale' Cement Co., Ltd will comply with the general National Environmental Quality Emission Guideline values (Code No. 1.1) for air emission as prescribed by the Environmental Conservation Department (from Notification No.615/2015, December 2015, by ECD, then under the Ministry of Environmental Conservation and Forestry (MOECAF), now MONREC.

Parameter	Averaging Period	Guideline Value μg/m^3
Nitrogen dioxide	1-year	40
	1-hour	200
Ozone	8-hour daily maximum	100
Particulate matter PM_{10}[a]	1-year	20
	24-hour	50
Particulate matter $PM_{2.5}$[b]	1-year	10
	24-hour	25
Sulfur dioxide	24-hour	20
	10-minute	500

[a] Particulate matter 10 micrometers or less in diameter

[b] Particulate matter 2.5 micrometers or less in diameter

National Environmental Quality Emission Guideline values (Code No. 2.1.1) for air emission levels (applicable to non-degraded air sheds) of thermal power prescribed by ECD (from Notification No.615/2015, December 2015, by ECD, MOECAF)

Combustion Technology/ Fuel	Parameter/Guideline Values		
	Particulate matter PM_{10}[a]	Sulfur dioxide	Nitrogen oxide
Combustion turbine			
Fuels other than natural gas (unit > 50 MW[c])	50 mg/Nm^3[b]	Use of ≤ 1% Sulfur fuel	310 Mg/Nm^3
Boiler			
Liquid fuels (plant 50-600 MW)	50 mg/Nm^3	900 Mg/Nm^3	400 Mg/Nm^3
Solid fuels (plant 50-600 MW)	50 mg/Nm^3	900 Mg/Nm^3	510 Mg/Nm^3
Reciprocating engine			
Biofuels/gaseous fuels other than nature gas	50 mg/Nm^3	-	30% higher than for other fuels
Liquid fuels (plant 50-300 MW)	50 mg/Nm^3	1,170 Mg/Nm^3	1,460 Mg/Nm^3

[a] Particulate matter 10 micrometers or less in diameter

[b] Milligrams per normal cubic meter at specified temperature and pressure

[c] Megawatt

(b) Water quality (effluent guide lines)

Ngwe Yi Pale' Cement Co., Ltd will comply with the General National Environmental Quality Emission Guideline values (Code no. 1.2) for waste water of (from Notification No.615/2015, December 2015, by ECD, then under the Ministry of Environmental Conservation and Forestry (MOECAF), now MONREC.

(Waste water, storm water runoff, effluent and sanitary discharges (general application))

Parameter	Unit	Guideline value
5 day biochemical oxygen demand	mg/l	50
Ammonia	mg/l	10
Arsenic	mg/l	0.1
Cadmium	mg/l	0.1
Chemical oxygen demand	mg/l	250
Chlorine (total residual)	mg/l	0.2
Chromium (hexavalent)	mg/l	0.1

Chromium (total)	mg/l	0.5
Copper	mg/l	0.5
Cyanide (free)	mg/l	0.1
Cyanide (total)	mg/l	1
Fluoride	mg/l	20
Heavy metals (total)	mg/l	10
Iron	mg/l	3.5
Lead	mg/l	0.1
Mercury	mg/l	0.01
Nickel	mg/l	0.5
Oil and grease	mg/l	10
pH	S.U.[a]	6-9
Phenols	mg/l	0.5
Selenium	mg/l	0.1
Silver	mg/l	0.5
Sulphide	mg/l	1
Temperature increase	ºC	<3[b]
Total coliform bacteria	100 ml	400
Total phosphorus	mg/l	2
Total nitrogen	mg/l	10
Total suspended solids	mg/l	50
Zinc	mg/l	2

National Environmental Quality Emission Guideline values (Code No. 2.1.1) for effluent levels of thermal power prescribed by ECD (from Notification No.615/2015, December 2015, by ECD, MOECAF)

Parameter	Unit	Guideline Value
Arsenic	mg/l	0.5
Cadmium	mg/l	0.1
Chromium (total)	mg/l	0.5
Copper	mg/l	0.5
Iron	mg/l	1
Lead	mg/l	0.5
Mercury	mg/l	0.005

Oil and grease	mg/l	10
pH	S.U.[a]	6-9
Temperature increase	^{o}C	<3[b]
Total residual chlorine	mg/l	0.2
Total suspended solid	mg/l	50
Zinc	mg/l	1

[a] Standard unit

[b] Temperature increase due to discharge of once-through cooling water

(c) Noise level

The National Environmental Quality Emission General Guideline for noise to be complied with (Code no. 1.3) (from Notification No.615/2015, December 2015, by ECD, then under the Ministry of Environmental Conservation and Forestry (MOECAF), now MONREC

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

Note: Noise level at work place must not exceed 85-90dBA. (Provide PPE, ear muff, ear protection for workers exposed to high noise level for long period. The ideal level not interfere with health is 45dBA.)

In the final part of the chapter health standards for projects with impacts are summarized and outlined. These cover:

- Environmental Health and Safety (EHS),
- Occupational Health and Safety (OHS), and
- Community Health and Safety (CHS).

Regarding OHS and CHS the guideline by IFC and by ILO as well as core principle of OHS are briefly outlined. The IFC guideline for CHS are also briefly outlined (in the main EIA report).

4. METHODOLOGY

The application of HIA is broad and the methodologies used to analyze impacts are variable but the basic steps described for HIA are the same as those described for EIA, comprising:

- Screening, scoping, assessing, recommending, reporting, and the follow-up monitoring and evaluating.

  The key components of HIA are: review of available data; research and identification of priority health issue through the use of assessment methods; designing of a health action plan with stakeholder's consultation (e.g. in comprehensive type of HIA) and implementation of intervention and the monitoring of long term health impact.

  Basically there are four types/methods of HIA practiced worldwide: Desk-based HIA, Rapid HIA, Comprehensive HIA and HIA focusing on only one outstanding impact in detailed.

(i) Desk-based HIA

It is a theoretical and qualitative assessment method to provide a broad overview of potential health impacts (no health experts are involved; often no field survey is conducted).

(ii) Rapid HIA

Rapid HIA is used to investigate the impacts/effects on health in a short time period, and most widely practiced. It can be done by EIA practitioners with only rudimentary medical knowledge. The purpose is to investigate only the potential health impacts resulted from the activities of a project (in this context the coal-fired thermal plant project). The rapid HIA methodology is typically a prospective assessment of a project. Rapid HIA involves visual inspection of the overall condition and assessing the potential impact on the health component of the workers of a project and local communities; gathering opinions, and concerns and view from the locals regarding the project; gathering secondary medical records/data from the clinics in the area; using knowledge of health determinants as to expected/anticipated impacts of the project and description of the potential or experts health impacts applying qualitative assessment (and if possible quantitative assessment) methods as appropriate.

(iii) Comprehensive HIA or In-depth HIA

Comprehensive or In-depth HIA is conducted by a large team of health scientists, heath experts, and health workers etc. to provide an in-depth or holistic assessment of potential health impacts as well as real health impacts. It takes a much longer time period and involves a larger budget.

It is more like a comprehensive public health survey of the area.

Comprehensive or In-depth HIA involves physical, medical and clinical examination for any possible medical signs or symptoms of a health condition resulted from the activities of a project. (It is best done when a project is already in operation for quite a long period of time).

This comprehensive HIA is beyond the capacity and scope of this EIA and HIA report. Actually it is the best method as far as HIA is concerned.

(iv) Specific HIA focusing on only one outstanding impact in detailed

In coal-fired thermal plants context it is generally agreed that the $PM_{2.5}$ is the most outstanding health issue. Because of its small particle size $PM_{2.5}$ is more hazardous or dangerous than the larger PM_{10} and $PM_{2.5}$.

PM_1 and $PM_{2.5}$ are also known as respiratory PM and the wearing of face masks, nose and mouth covers are sometimes not very effective, especially the much smaller PM_1.

In this method the impact of $PM_{2.5}$ is studied in meticulous details and the impacts on health are described in theoretical perspective. For this coal-fired thermal plant project the Rapid HIA method is applied. The report is prepared and written in accordance with the format prescribed. Since this HIA is an annexure of the main EIA report, data, information and facts that are relevant to HIA are excerpted from EIA report.

HIA PROCESS

Generally HIA process encompasses 6 steps. (The same as EIA process) They are:

- Screening, scoping, assessment, recommendation, reporting, and monitoring and evaluation.

Screening

Screening is the first step in HIA process. Screening determines whether an HIA is feasible, timely and would add value to the decision making process.

Screening determines the potential health implication of the project and determines if an HIA is, in fact, required.

(This is a big project where 60 MW of electricity is produced and therefore, EIA as well as HIA are required.)

Scoping

Scoping is the second step in HIA process. Scoping establishes the scope of health effect (key health issue as well as public health concerns), that will be include in the HIA, the population effected, source of data and method to be used (an alternative to be considered, if required). In other words, to scope for what need to be covered in the assessment and reported in the HIA report.

A plan is developed for HIA and the scope of the health impact to be addressed is created.

Assessment (risks assessment and assessment of health impact)

This is the third step in HIA process. It is most important step and is actually the essence of the HIA process. The assessment covers not only negative impacts but also positive impacts due to the implementation of the project. The rapid assessment procedure is usually chosen.

Impacts (negative and positive) as well as potential and impacts and anticipated impacts are predicted, identified and assessed, based in primary and secondary data. Within define scope available data/information and evidences are gathered and used to determine/estimate the potential health gain (positive impacts) or loss (negative impacts).

The procedure also involves: consider who will be affected by the project, review of baseline data indicating current population health status in the area defined as determinants.

Recommendation

This is the fourth step in HIA process. Based from the findings/results from assessment and based from the potential advantage and disadvantage (the pro and con) recommendation is made (whether to proceed with the project or not).

Recommendation will be also made for mitigation measures (their effectiveness) and recommendation to enhance positive impacts. Also to recommend the options that can be applied for health promotion and measures to control the negative health impacts.

Reporting

Actually this is the fifth and last step in HIA process. (Monitoring and evaluation is actually the follow up step). It is the documentation and presentation of findings and recommendation for decision makers.

A report will be prepared, written and submitted to the relevant authorities or decision makers. The report will be accurate and complete as far as possible, based from the findings and results from the assessment.

The relevant authority or decision makers will read the report and make decision. The project proponent will follow the recommendation and guideline prescribed in the report, particularly mitigation measures to be taken.

Monitoring and evaluation

This is the follow-up step after submission of the report and it is a long and continuation process to be undertaken during the long Operation Phase.

The main task is to monitor the actual impact of the project on public health and to enhance the existing evidence base regarding impact.

The effectiveness of the prescribed mitigation measures will be also monitored. In fact, all aspects and all activities of the project should be monitored.

5. PUBLIC HEALTH MANAGEMENT PLAN (PHMP)

Public health management plan (PHMP)

PHMP is defined as the operational uses of resources of society and health services towards the improvement of health experiences of the population. The plan is holistic approaches that involve the participation of health scientists, health experts, health officers and health workers as well as the population. HIA report can serve as a contributing factor to the effective implementation of PHMP.

Public health management plan is indeed a grand plan to be implemented by the Ministry of Health and Sports. However, in this local area level context, the project proponent has also tried its best to contribute to the execution of this PHMP at the local level.

The execution of CSR programme could be also considered as a part of public health management and improvement plan.

The CSR programme implemented by the company covers community assistant and development in education, health and social affairs. As regards health aspects the company has donated furniture and racks (for medicine) for the local clinics; donation in cash (three times) to the Naunghkio Township Hospital, and also provision of monthly financial assistant to the township hospital. Moreover, donations to the welfare associations of the hospital and donation to the disinfectant team (spraying disinfectant for mosquito's control) have been undertaken. In addition the constructions of toilets for schools and monasteries have been carried out.

The company has already established a company's clinic at a cost of Ks 10,329,000 providing free medical treatments not only to its employees but also to the locals in the vicinity. Kyats 531,504,000 have been spent for overall CSR programme of which Ks 14,198,000 are for health sector.

Public health management plan at the local level is indeed essential for the health of the local communities. A large development project like the coal-fired power plant can have high impacts on the health of the local communities, unless the negative health impacts are controlled, managed and mitigated. With the emergence of mitigation measures during the nineteen nineties the negative health impacts have been greatly mitigated or alleviated. However, there are still a few developing countries that do not have yet applied such mitigation measures at all and therefore, the adverse impacts still linger in those countries.

Taking effecting mitigation measures against such health impacts can be construed as implementing public health management plan.

Health facilities and health care services in the local area

The nearby villages, Laukhpan village and Khesan village, each has a village clinic (public clinic). The company has also established a company's clinic where both its employees and local people are giving free medical treatments. The nearest hospital, Nuanghkio Township Hospital is 6 miles away and easily accessible.

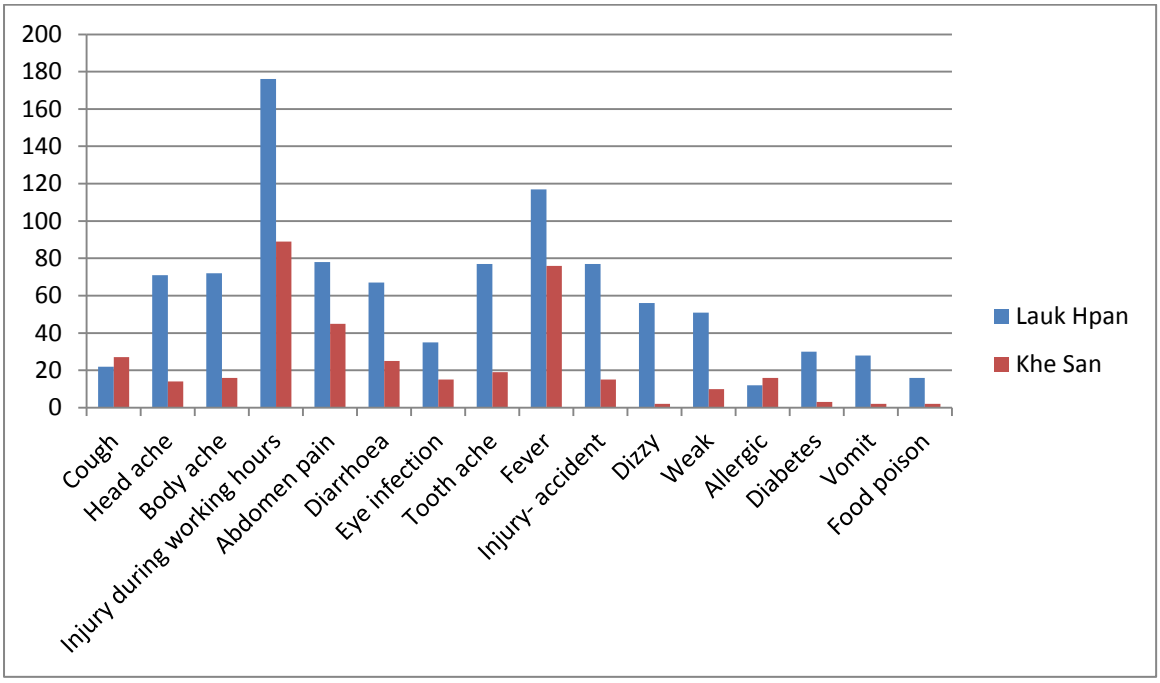
During EIA survey the consultant firm has made an attempt to relate the negative impacts of the coal-fired thermal plant with the health situation of the local people. During public consultation meetings (there were altogether 4 meetings) the local people were invited to express their health concerns regarding the operation of the project. None of them have expressed their health concerns. (They expressed their views and opinions only on other matters). This might be due to their ignorance regarding the potential health impact of the project. Or maybe the mitigation measures taken by the company are so effective and all impacts are eradicated that the local people cannot see or feel any health impact. (This is just speculation from optimistic point of view).

Medical records of the three clinics were examined to find out any health problems related to the operation of the project. For instance, to find out if any respiratory disease or lung diseases could be attributed to the air pollutants caused by the project. It was observed that the incident of cough was quite high at the factory's clinic. Cough is a generalized medical term and it is difficult to pin point what exactly cause coughing. (Do respiratory infections caused by cold or influenza, or asthma, or postnasal drip or lung disease (Tuberculosis) etc. cause coughing? or does air pollutants PM2.5 causes coughing? Only in-depth HIA conducted by health experts can pin point the cause of coughing).

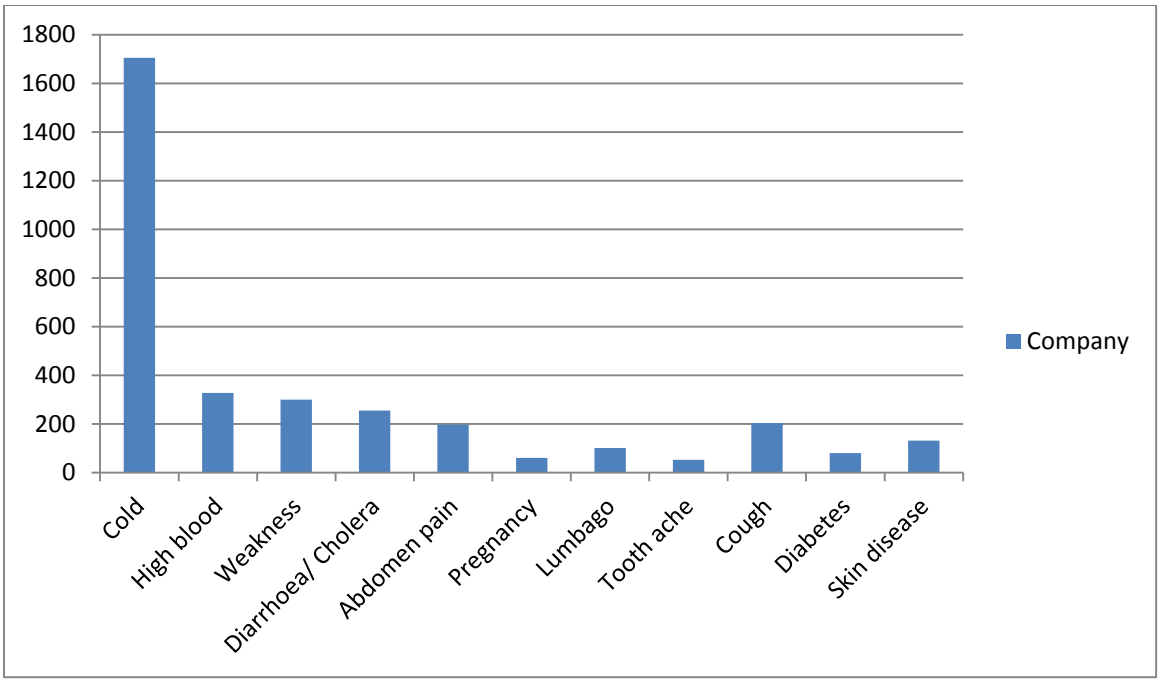
After examination of medical records of the company's clinic the followings are also opened to questions.

- Is high blood pressure caused by the high noise level and/or air pollutants from the plants?
- Is weakness caused by excessive manual work or fatigue or by whole body vibration?
- Are cholera/diarrhea caused by polluted water or indirectly caused by house flies?
- Is lumbago caused by excessive manual work at the work place? (Only comprehensive/in-depth HIA can correctly answer these questions).

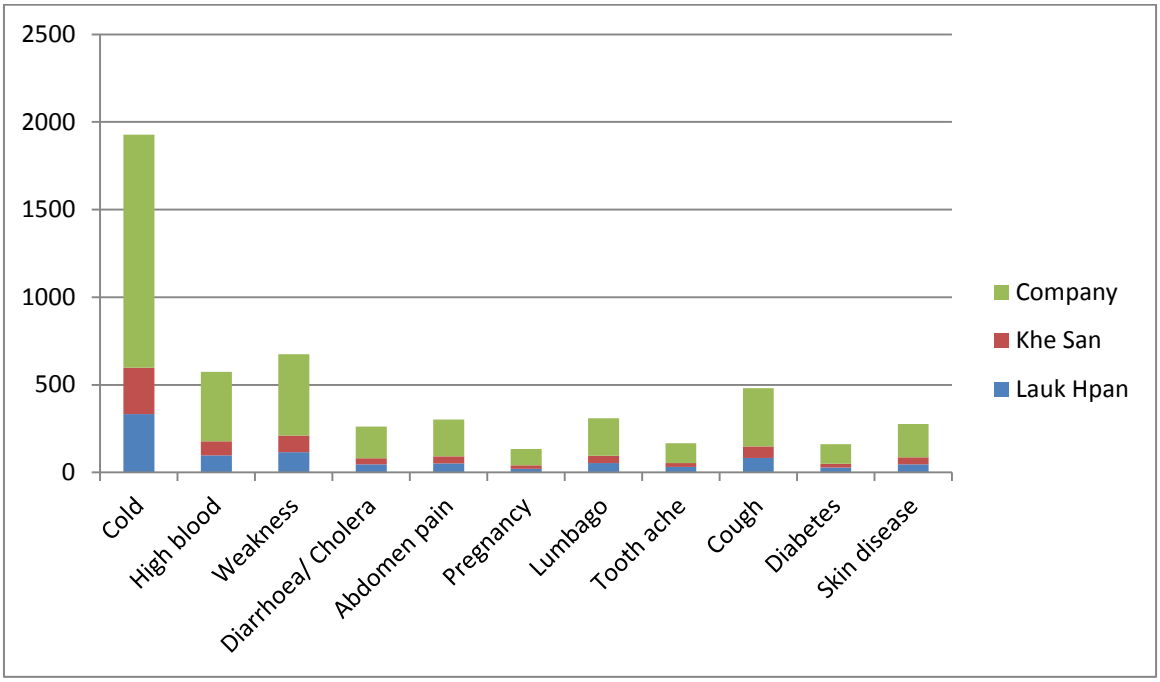
The medical records/data at three clinics are shown in histogram below:



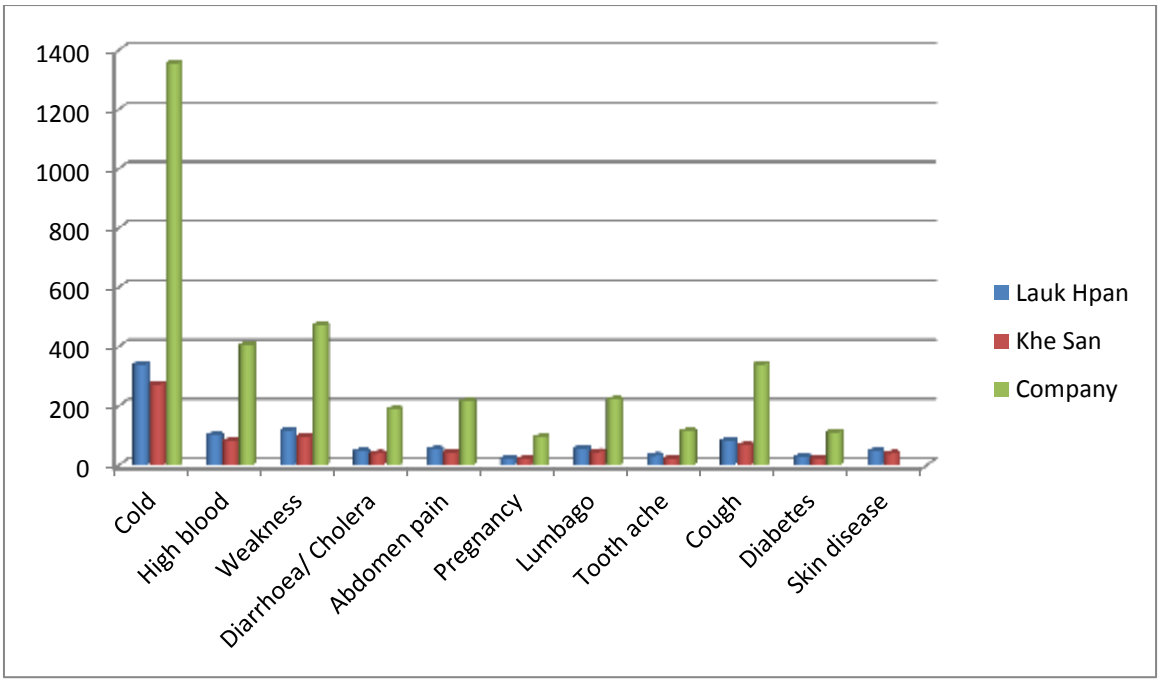
Bar chart showing number of cases treatment dealing at the clinic during 2018



Bar chart showing number of cases treatment dealing at the clinic during 2018



Bar chart showing number of cases treatment dealing at the clinic during 2019



Bar chart showing number of cases treatment dealing at the clinic during 2020

A. Project Description by project phase (in brief)

(i) The Preconstruction Phase/Planning phase

The planning covers application of environmentally sound technologies, procurement of environmentally sound machinery, equipment and vehicles and materials in detailed.

The detailed plan and design for construction of access road and a variety of buildings and structures to ensure their structural integrity (that can withstand violent storm, tremors and minor earthquake etc.).

The planning also covers sourcing of water and electricity and energy (fuels).

The plans also cover construction of a factory clinic, and installation of fire-fighting facility and procurement of mitigative equipment and devices – e.g. PPEs. All are paper works. Good efficient and meticulous planning will decide the success of a project.

Duration: 1 year

(ii) The Construction Phase

This is actually the works of civil engineering and electrical engineering and plumbing.

The construction covers:

- Preparation works or initial construction works, (access road, clearing vegetation, leveling ground, fencing)
- Earth works and foundation works
- Actual construction works – construction of all buildings and structures requirement for the effective operation of the coal-fired thermal plant (too many buildings and structures to be mentioned in details).
- Installation works – (all electricity and plumbing works); also installation of all big and small machinery and equipment and furnishing furniture.

Finishing works (painting, decoration, final touches)

Duration: 2 years.

Work force: 92 construction workers are employed.

(iii) Operation phase

The main phase of the project and the main tasks are for the smooth operation and eco-friendly operation of the coal-fired thermal plant over a long period. The plant will be run for 24 hour a day (in 3 shifts, each 8 hours) and the operational days will be 300 days/year.

The works are mainly routine operation of the plant daily for the production of 60 MW of electricity (to be used by one nearby cement plant and for village electrification). There will be regular maintenance works for machinery, equipment, devices and vehicles; also routine monitoring of the consumption of water, and energy and regular replenishment of raw materials: coal, limestone and fuel oils.

There will be also regular mitigation works and monitoring works.

Duration: 30 years

Workforce: 150 employees.

(iv) Decommissioning Phase

The coal-fired thermal plant will be shut down and isolated. A decommissioning contractor will be hired for undertaking the works. Main works involve the demolition of buildings and structures; and the dismantling and removal of machinery and equipment.

Machinery and equipment that are still useable and saleable will be put up for sales, those that have to be discarded with be discarded at the landfill. Iron materials will be made into scrap and sent to smelters.

Contaminated soil, if any, will be removed and discarded. Air, water and soil quality will be tested for the last time to ensure that the site ecology has not deteriorated.

After that rehabilitation (reforestation) will be undertaken and another contractor and party will be hired for the reforestation and restoration work.

Duration: 2 years.

The project proponent will ensure that after decommissioning and rehabilitation of the ecology of the site is restored to its quasi original situation 33 years ago.

B. Project's Health Policy and Commitment, Legal Requirements and Institutional Arrangement

The first and foremost health policy is to run the business that has little or no negative impact on the health environment, to achieve zero accident and avoid occurrence of occupational health diseases and ailments.

The project will obey, abide and comply with laws and rules relating to health environment.

The company will endeavor to:

- Operate the coal-fired power plant in an environmentally, socially and healthy responsible manner.
- Prevent pollution and ecological degradation of the surrounding area.
- Implement Public Health Management Plan effectively to mitigate pollution of air, water, land that pose health threats.
- Implement PHMP to tackle all OHS, and CHS issue, as practical as possible.

Commitments

The project proponent, Ngwe Yi Pale' Cement Co., Ltd has made a commitment to implement health policy and to strictly comply will laws, rules and regulations regarding health affairs.

In particular OHS and CHS issues will be addressed and solved as far as possible.

U Sein Myo Aung
Executive Director
Ngwe Yi Pale' Cement Co., Ltd

Legal Requirement

Laws, rules, regulation, requirement etc. pertaining to the project are already described earlier in the main EIA report, Chapter 3, 3.2.1.

However, laws, rules, regulation that are relevant to HIA are listed below again:

- Myanmar Public Health Law, 1972
- Occupational Health and Safety Law, 2019
- Prevention and Control of Communicable Diseases Law, 1995
- The Control of Smoking and Consumption of Tobacco Products Law, 2016

Some laws, rules and regulation that are, in one way or another, related to health are:

- National Environmental Quality (Emission) Guideline, 2015
- The Environmental Conservation Law, 2012
- The Environmental Conservation Rules, 2014

Excerpts of the relevant Articles, Sections, Sub-section for each law and rules are already mentioned earlier in detailed in the main EIA report, Chapter 3, 3.2.1 (will not be repeated here).

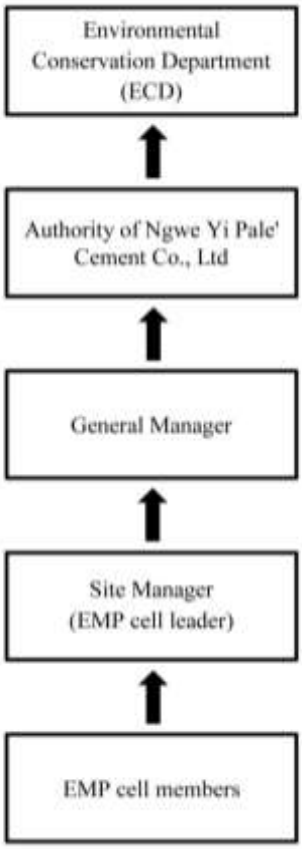
Institutional Arrangements

The Institutional Arrangement of Health and Environment, at the national level, is already depicted in chart earlier in the main EIA report, Chapter 8, 8.2.

The arrangement (organization) comprises:

- The National Health Committee (NHC),
- Ministry of Health and Sports,
- Department of Public Health and
- Occupational and Environmental Health Division. (OEHD)

The project institutional arrangements for conducting HIA and implementation of Health Management Plan (HMP) is shown in diagram below:



The company does not have an EHS unit yet; therefore, the EMP cell will double as EHS unit.

EMP cell is a nucleus organization or an ad hoc organization, formed by the company to implement EMP in a practical term. If possible, one day an EHS unit will be organized and formed and will replace EMP cell unit. EHS unit will be also directly involved in HIA and HMP.

C. Summary of Health impacts and mitigation measures which cover Occupational Health and Safety (OHS) and Community Health and Safety (CHS)

No serious health impacts are envisaged during the short Preconstruction and Decommissioning Phase and these two phases are omitted.

I. During the Construction Phase

1. Impact: air pollution/emission and mitigation measures

(a) Fugitive dust emission

Dust is one of the main issues during the civil engineering work of the Construction Phase. All construction activities in one way or another generate dust. Vehicular movements also generated dust; all are air pollutants with high health risks.

Dust is mainly in the form of cement dust, lime powder dust and earth dust.

Inhalation of cement dust can causes: irritation of nose, throat, and lung, occupational asthma, lung function impairment, pneumoconiosis, carcinoma of lung, stomach and colon. Dermal contact with cement (particularly wet cement) can causes skin burns, serious skin problems and damage to the skin.

Inhalation of lime powder can causes irritation of nose and respiratory duct, coughing and sneezing, and lung impairment and lung diseases.

Dermal contact with lime powder can cause irritation and skin burn.

Inhalation of dust from vehicular movement can cause pneumonitis and silicosis.

(b) Fugitive smoke (from machinery, vehicles)

The main emission is diesel exhaust emission. Inhalation of diesel exhaust emission can cause irritation of eyes, ears and throat, headache, fatigue, nausea, cough, sputum production, respiratory disease, lung function impairment and even lung cancer and stress on brain.

Mitigation

- Spray water for suppression of dust
- Stop loading/unloading of earth, sand, lime powder for a while when strong wind is blowing
- Restrict vehicular movement to mitigate dust
- Avoid opening burning of trash and solid wastes
- Select and procure machinery and vehicles that are eco-friendly (that emit less smoke) in the first place
- Keep machinery and vehicles well-operated, well-maintained and well-lubricated to reduce emission
- If possible use diesel with low sulphur content
- Install air pollution control devices e.g. filter to minimize exhaust emission
- Provide adequate PPE (face masks, nose and mouth covers) to workers exposed to dust and smoke; make it mandatory.

2. Impact: noise and vibration and mitigation measures

Sources of noise are: from a variety of construction activities, including cement mixer, pumps, generator, vehicular movements, loading and unloading of building materials.

Noise level at a construction site sometime exceeds 85-90 dBA (permissible noise level).

Vibration is generated by heavy machinery e.g. excavator, cement mixer and heavy trucks.

Both high noise level and high vibration have can pose health risks, some may be serious.

High noise level – can cause a variety of health problems: tinnitus, high blood pressure, anxiety and depression, heart disease, sleep disturbance, physical and psychological stress, interference with communication and can contribute to work place accidents and injuries by making it difficult to hear warning signals.

Prolonged exposure to high noise level causes hearing impairment and even permanent hearing loss (deafness).

Vibration

Hand-arm vibration can cause stresses and strains on tendons, muscles, bones and joints, and effect nervous system. Prolonged hand-arm vibration can lead to Hand-Arm Vibration System (HAVS), the whitening of one or more fingers when exposed to cold.

Whole body vibration can cause fatigue, stomach problems, headache, and loss of balance, shakiness and number of health disorders.

Mitigation

- Restrict working hours for construction works (no construction work at night time).
- Restrict the operation hours of heavy machinery and heavy trucks; also restrict the speed of heavy trucks.
- If possible, select and procure machinery and vehicles that are eco-friendly (that emit lower noise level).
- If possible, install silencer, noise abators.
- Ensure that the foundation of machinery and equipment are stable to reduce vibration; install vibration absorber/shock absorber, where necessary.
- Restrict and limit the working hours of operation of vibration machinery (e.g. excavator, dozer, cement mixer, and heavy truck).
- From health perspective the best mitigation measures is provision of adequate PPE (ear plugs, ear muffs, ear protectors).

3. Impact: wastes (solid and liquid) and mitigation measures

(a) Solid wastes

Industrial solid wastes

Large quantities of industrial solid wastes (construction wastes) are generated during the Construction Phase.

The impact of construction wastes, debris, and trash on health is not envisaged.

Domestic solid waste – (from workers camp, kitchen).

92 construction workers are deployed and the domestic waste is quite substantial. Unless well managed it can pose health risks. The organic wastes from kitchen and messing hall can attract house flies and rats. Rats and mice are associated with a variety of diseases: bubonic plague, salmonellosis, hantavirus, rate-bite fever, tularemia etc. (Rats and mice can spread more than 35 diseases, it is learnt).

House files can spread diseases such as: typhoid fever, cholera, diarrhea, dysentery, shigellosis and E.coli.

(b) Liquid wastes

Industrial waste/effluent

Virtually there will be no industrial waste during the Construction Phase, all the water is used up in construction workers, mostly cement batching and washing machinery.

Domestic liquid waste/waste water

Substantial quantity of waste water is generated from worker camp (with 92 workers), kitchen, and bath. During the short Construction Phase this is not an issue; temporary earthen ditch are constructed to drain the waste water; no special treatment required. Temporary latrines (water flush type and files proof) are provided for workers and are destroyed and removed after Construction Phase.

Mitigation

- Educate and train workers for good housekeeping practice (do not litter do not dirty your place); avoid indiscriminate dumping of solid and liquid waste.
- Also educate them for minimization of waste as far as possible and conservation of water.
- Avoid open burning of solid waste; discard them at the approved landfill.
- After construction work hire a contractor and party for clearing up of all construction waste including surplus building materials. Reuse or sell those materials that are useable and saleable; discard those that have to be discarded at the approved landfill.
- Ensure that domestic solid waste are systematically collected and discarded; ensure that waste bins are files free and rodents free.

4. Impact potential accidents at work place/construction site (potential OHS issue)

Accidents can occur from time to time at a construction site if not well-managed. Accidents at the construction can lead to injuries and even fatalities.

The 10 most common construction site accidents worldwide are:

- Fall from height (scaffolding); slip and fall; electrocution; falling debris, materials and objects; caught-in between objects and materials; fire and explosion; over exertion; machinery accidents; getting hit by a vehicles, and trench (for wiring and pipe) collapse. All have impacts on health, some can have very serious consequences, e.g. fatalities.

Mitigation

- Try to achieve zero accident at construction site.
- Set up "Safety First" signboards at place where workers can see easily.
- Create safety working condition and safety environment as practical as possible.
- Educate, train and supervise them for good working practice and good safety practice so that these good practices will be ingrained in their mind sets.
- Provide adequate PPEs where necessary.
- Provide First Aid training and Firefighting training.
- Keep first aid kits well-stocked.
- Prohibit the drinking of alcohol during working hours, ban the use of narcotics.
- Ensure that workers are not subject to over worked, over exertion, and excessive manual works.
- Develop an Emergency Responsible Plan and rescue plan; display address and phone numbers of ambulance service, Red Cross Society, Township Hospital, Fire Brigade, Police station, etc.
- Cover the whole structure during the Construction Phase with netting to prevent accidental falling of debris and tools etc. (a common civil engineering practice).

5. Impact: potential traffic issue and mitigation measures

In the early Construction Phase large volume of building materials as well as construction workers have to be mobilized to the site. During the Construction Phase a variety of building materials have to be still transported from time to time.

There is an increase in traffic on the access road and there is the potential for traffic congestion and road accidents. The access road built earlier by the cement company is used mainly by the trucks from cement factories. The local road users are mostly motorcyclists. There local motorcyclist usually has little regards for road regulation, many are ignorance; there is the potential for accidents the local domestic animals are also prove to road accident.

Mitigation

- Try to achieve zero traffic accident.
- Educated the company's drivers to comply with traffic rules and regulations and road safety; especially heavy truck drivers for defensive driving.
- Strictly prohibit alcohol drinking and narcotic use during driving hours.
- Set up traffic signage, speed limits etc. where necessary.
- Never overload the trucks with building materials,
- Trucks loaded with earth, sand, pebble etc. must be covered with tarpaulin to prevent spillage along the way.
- Educate all drivers to reduce speed when passing near or through a village; to take special care when driving near schools or locations where children may be presents.
- Regularly check vehicles to reduce or mitigate accidents; ensure that there are no equipment malfunctions or failure.
- Keep all vehicles well-operated, well-maintained, and well-lubricated.
- Ensure those drivers are not over-worked and over-fatigued.

6. Impact: potential social issue and mitigation measures

There are 92 construction workers, many are immigrant workers. (Unlike the permanent staff during the Operation Phase which is well-disciplined, the construction workers during the Construction Phase are usually not well-disciplined. This is due to the nature of work and the nature of moving from site to site. The construction contractor does not have time to train them effectively). When a relatively large number of workers are involved at a site there is the potential for the occurrence of undesirable social issues. Some examples are: friction between the company's workers and villager; dispute, quarrel, melee, brawl; theft; vandalism; unethical sexual practices or sexual offensive and so on.

From health perspectives impacts of health concerns are: injuries caused by quarrels melee and brawl and occurrence and spread of sexually transmitted diseases (STD) and HIV/AIDS.

Mitigation

- Education and disciplinary actions are necessary. Ask the construction contractor to discipline his workers and take responsibility for the conducts of his workers.
- Apply punitive actions e.g. suspension or sacking of the wrong doer(s).
- Prevent all kinds of quarrels and brawls.
- Prohibit the drinking of alcohol during working hours, ban the use of narcotic.

- Keep separate housing for male and female workers; the two housings must be appropriately far apart.
- Have zero tolerance for sexual offensive and misconducts.
- Educate the worker to respect the local custom, culture and etiquette.

7. Potential impacts on community health and safety

All the potential impacts mentioned earlier, namely, air pollution/emission, noise and vibration, wastes (solid, liquid), potential accidents at construction site and potential traffic issue can have negative impacts on community health and safety.

The mitigation measures to be taken for community health and safety are the same as mentioned earlier for OHS issues.

Positive impacts during the Construction Phase

The project provides jobs for 92 construction workers for 2 years. Many unskilled construction workers will have the chance to become skilled workers during the period of two years; they can also acquire technology from Chinese engineers.

The project boosts the local economy and brings economic benefit to people who are involved in extraction/production and sale of building materials – e.g. earth, sand, gravel, lime powder, timber, bricks, etc.

Merchants of construction merchandize such as iron rods, bars, iron works, and roofing, aluminum sheet, cement, etc. can promote their sales and at the same time jobs to be provided by these merchants.

The access road construction by the company has improved the basic infrastructure of the area.

At the national level the benefit from this project will be the direct investment inflow of USD 10 million, contributing to the increase in GDP of the nation. Other benefits are in the form of increase in income tax, duties and revenues of the nation.

II. During the Operation Phase

1. Air pollution/emission and mitigation measures

(a) Point source/stationary emission

The main emission is point source emission from stack. About 1000 kg of coal has to be incinerated for the production of 60 MW electricity. Air pollutants mainly include: particulate matters PM (MP_{25}, PM_{10}, $PM_{2.5}$, and PM_1); gases, mainly CO_2, SO_2, and NO_x, and to a lesser extent CO, HCL gas; organic acid pollutants (dioxin, furans etc.), arsenic, heavy metals (mainly mercury, and lead, chromium etc.).In addition unburned hydrocarbons and VOC are also generated.

The main PM is ash and also coal dust.

(b) Fugitive emission – from other machinery and vehicles.

Air pollutants from fugitive emission also mainly include PM_1 (dust), SO_2 and NO_x.

All air pollutants have negative impacts on human health. Inhalation of the above-mentioned air pollutants can pose a variety of health risks.

It is generally known that people working is a coal-fired power plant or people living near such a plant have higher death rates at earlier ages, along with increased risk of a variety of respiratory diseases, lung cancer, cardio-vascular diseases and other health problems. (That is, if no mitigation measures are taken).

Inhalation of coal dust can cause a variety of Chronic Obstructive Pulmonary Diseases (COPD), asthma, and other breathing problems, lower respiratory infections, chronic bronchitis, lung disease and lung cancer, ischemic heart disease, stroke and growth problem in children. Mercury, if present, can have toxic effect on nervous, digestive, and immune system and on lung and kidney, if inhaled. Mercury can cause reduce in IQ. Dust from vehicular movements can cause pneumonitis and silicosis, if the dust is inhaled.

Exhaust emission (diesel emission) can also cause respiratory diseases, and cardiovascular diseases. Workers, if not wearing masks, are exposed to these air pollutants daily.

Mitigation

For point source emission

- Control, manage and mitigate emission as practical as possible.
- Mitigation measures include: installation of Electrostatic Precipitators, (ESP)and series of bag filter (for PM); application of dry Flue Gas Desulphurization (FGD), for SO_2 (pulverized $CaCO_3$ is used); application of complete combustion method at a constant temperature (800-900 ^oC) for NO_x, mercury, fluran and dioxin; and application for activated carbon injection and absorption (e.g. pulverized coal is used).
- The height of the stack should be up to standard. (The company has applied all these methods).

For fugitive emission

- Spray water for suppression of dust.
- Sweep the road regularly.
- Restrict and limit vehicular movements.
- Cover trucks with tarpaulin during transportation of coal.

- Stop loading/unloading when strong wind is blowing.
- Select and procure eco-friendly machinery and vehicle that emit less smoke, in the first place.
- Build the crushers underground to mitigate fugitive dust emission of coal and limestone and remotely controlled the crushers.
- Us tubular conveyor to mitigate dust emission.
- Avoid open burning of solid waste. (The company has taken all these measures).
- Plant fast growing trees; tree efficiently trap dust. The most effective mitigation is the wearing of face mask, mouth and nose cover.
- Provide adequate PPE to workers exposed to smoke and dust; make it mandatory. (The company has undertaken these measures).

2. Water quality, effluent and water storage issue and mitigation measures

Water quality

Owing to geological formation and hydrogeological condition the water of the area is relatively hard water. It has the potential impact on health of the workers such as formation of kidney stone, if not purified in the first place.

Non-potable or contaminated water can transmit a variety of diseases such as diarrhea, cholera, dysentery, typhoid and polio etc.

Effluent/waste water

The effluent/waste water/used water from the coal-fired power plant can have negative impact on the physical-environment (water, air and land pollution) but only indirect and minor impact on health. (Unlike the effluent say for example, from a food factory where the effluent contains large quantity of organic waste with bad odour and highly polluted, the waste water/used water from the coal-fired power plant is relatively clear water with only low degree of pollution).

Moreover, workers will not be exposed to waste water or will not be in direct contact with waste water as automation system is applied in the operation the power plant. Domestic waste water can be effectively managed or mitigated.

Water storage

The coal-fired power plant requires huge quantity of water, which is stored in one weir, one 2.1 million gallon tank, one 1.5 million gallon tank and one 100,000 gallons tank. The huge quantity of water can become a good habitat and breeding ground for mosquitoes,

consequently leading to occurrence of malaria. (Globally Myanmar is among the top malaria infested nations). Another water related disease is schistosomiasis (or bilharzia) caused by parasitic blood flukes of fresh water snails. These large water tanks can become suitable habitat for water snail which can indirectly lead to schistosomiasis. (In terms of impact this disease is second only to malaria as the most devastating parasitic disease worldwide).

Mitigation

- Manage the water quality; ensure that the water is soft water and potable.
- Apply a series of methods for water purification – e.g. Reverse Osmosis (R.O) system, water softener system, Mixed led Resin system, mechanical filter system etc. and control the pH of water. (The company has applied all these method).
- Recirculate the water for water conservation and minimization of waste water/used water. (The company has undertaken this; almost 100% of water is recirculated applying forced filtration and cooling systems).
- Construct a network of drainage system to manage waste water/used water and also rain water influx and storm water.
- Small quantity of water to be discharged (e.g. from boiler blow down, cooling blow down, back flush from ion exchange etc.) will be treated before discharge. (The two cements plants nearby have waste water treatment system but the coal-fired thermal plant does not have such a system yet. The treatment, so far, is only physical treatment; filtration and sedimentation before discharge. The coal-fired thermal plant has a plan for construction of its own treatment system or shares the waste water treatment facilities with these two cement factories. The waste water/used water from this plant, after crude treatment or physical treatment, flows down the drain and end up in the large lake where some locals culture fish, and these fish (carps, tilapia) are thriving well.)
- Domestic waste water can be managed; domestic brown water (from kitchen, baths, washing etc.) will flow into the drain while black water (from toilet) will end up in septic tanks and soak pits.
- Used fuel oils will be collected in old drums and give away to local recyclers.
- Inspect the weir and 3 large storage tanks regularly and try to control proliferation of mosquitoes as practical as possible (e.g. mild chlorination; not done yet).
- Manually remove and destroy water snails, if found, as practical as possible (not found in substantial number yet).
- Educate workers for good health practice, to be aware of drinking water related diseases (for the safe side boil water, drink green tea); and to be aware of risk of malaria (use mosquitoes net).

3. Noise and vibration and mitigation measures

In a coal-fired thermal plant noise is generated from a variety of sources and many are high level noises – e.g. turbine generator and auxiliaries, boiler and auxiliaries, fans and dust tube, pumps, compressor, precipitator, motors, etc.

In the plant compound noise is also generated from crusher (high level), heavy truck movements, operation of machinery, loading/unloading, etc.

Increase in noise level can cause minor health impact such as disturbance or nuisance but exposure to long hours or high noise level can cause hearing impairment or even permanent hearing loss (deafness).

Other forms of health impacts are:

- Physical and psychological stress, interference with communication and concentration, and can contribute to work place accidents and injuries by making it difficult to hear warning signals.
- High level noise can cause tinnitus, high blood pressure, anxiety and depression, heart disease and other related health problem – e.g. sleep disturbance, hypertension, annoyance, and change in immune system.
- Hand-arm vibrations are not envisaged as the operation applies automation. Whole body vibration can cause fatigue, head ache, stomach problems and loss of balance.

According to Occupational Safety and Health Administration (OSHA) USA Permissible Exposure Limit (PEL) is 90 dBA for 8 hours per day. At 100 dBA exposure should be less than 15 minute/day. For all workers exposed to long hours of noise level must wear PPE (ear plugs, ear muffs); it is mandatory.

Mitigation

- If possible, select and procure eco-friendly machinery equipment and vehicles that emit lower noise level, in the first place.
- If possible, place noisy machinery away or isolated such machinery.
- If possible, install silencer, noise abator for fans.
- Install mufflers on engine exhaust and compressor component.
- Install vibration abator, vibration absorber; keep the foundation of machinery stable.
- Install wall (acoustic enclosure) for noisy equipment.

- If possible avoid the operation of all machinery/equipment at the same time; restrict the hour of operation.
- Construct crusher house underground and remotely control crusher. (The company has done this and loud noise issue from crusher is tackled).
- Keep machinery/equipment well-maintained, well-operated, well-lubricated to mitigated noise.
- Reduce the speed of heavy truck to mitigate noise and vibration; ensure a smooth surface of road to reduce vibration.
- Create green zone, plant fast growing trees; trees are good noise barrier.
- Provide adequate PPE (ear muffs, ear plugs, ear protectors).

4. Waste and mitigation measures

Industrial waste (solid wastes)

The main industrial wastes are fly ash and bottom ash; up to 600 tons of fly ash and 400 tons of dry ash are produced per day. This is the main issue and effective mitigation is required. Dermal contact with ash probably cannot pose any health risk but dispersal of ash in the air can lead to inhalation of ash (PM). (The diseases caused by inhalation of PM are already mentioned earlier). But ashes usually contain radium, a radioactive substance, and prolonged dermal contact with ash over the years can cause benign cancer. Since coal has to be pulverized coal dust from warehouse is used; need not be discarded.

Other industrial wastes of less importance are slag, treatment sludge, scrap materials, used filters etc. (used filter are considered hazardous).

Domestic solid wastes

Domestic solid waste such as water from housings, office wastes, trash debris, and organic wastes from kitchen, messing hall and wastes from packing wastes can be managed and controlled. There are 150 employees during the Operation Phase and therefore the domestic waste generated will be substantial.

Very small quantity of medical waste is also generated. Domestic wastes if not managed can attract house files and rodents and eventually pose health risks.

Mitigation

- Control and manage ash; fly ash and done ash are collected mechanically and conveyed by conveyors to two ash silos, one for fly ash and another for down ash. (Dry ash handling is applied and no need for water and ash pond which can generate bad odur).

- Ash is not discarded but made into bricks, and other building materials (this is exactly what the project proponent is doing).
- Other industrial waste of lesser quantity are manually collected and discard at the approved landfill one mile in the north east.
- Avoid open burning of solid wastes by all means.
- Avoid discriminating dumping of waste by all means.
- Collect domestic waste in waste bins and regularly discard them at landfill.
- Ensure that waste bins do not become breeding ground for house files and do not attract rats and mice.
- Educate and train workers for good housekeeping practice (do not litter, do not dirty, your place); keep your living area and working places clean and tidy.

5. Heat and hot works and mitigation measures

In the coal-fired thermal plant exposure to heat is happening all the time during the operation and maintenance of a variety of combustion units, namely, furnace, boiler, cyclone, turbine, generator, hot stream, hot piping and related hot equipment.

Workers exposed to heat can have a variety of heat stresses, including; profuse sweating, heat exhaustion, heat cramp, heat stroke, dehydration, dizziness, drop in blood pressure, severe hyperthermia etc.

Heat stress can exacerbate underlying illness such as cardio vascular diseases, diabetes, asthma, psychological distress and increase the risk of accidents and infectious diseases.

Welding has to be undertaken from time to time in maintenance works. If not well-trained welding iron cutting work can lead to accident such as skin burn, eyes injury and electric shocks.

Mitigation

- Plan for mechanical labour and automatic system to minimize workers exposure to heat as far as possible (the company has done this).
- Inspect and maintain furnace, boiler, and cyclone regularly; also inspect and maintain pressure vessel and piping.
- Provide adequate ventilation to reduce heat and humidity.
- Reduce working time in high temperature environment; provide adequate drinking water.
- Insulate hot equipment, if possible, e.g. combustion unit, generators and hot pipes to alleviate heat.

- Post warning signs near high temperature surfaces.
- Welding and iron cutting should be undertaken only by trained workers.
- Provide welder goggle's or full-face eye shields.
- Provide protective suits e.g. PPE, outfits, boots, helmets, gloves, etc. where necessary.

6. Potential fire and explosion and mitigation measures

One of the main coal-fired thermal plant's hazards is fire and explosion. Pulverized coal dust has to be used in large quantity and coal powder has the potential for fire and explosion.

Pulverized coal dust

Coal dust is highly inflammable in nature and can cause explosion. Coal dust suspended in air is explosive; there are precedents of coal dust explosions in some coal-fired power plants abroad. Coal dust has far more surface area per unit weight than lumps of coal and, therefore, more susceptible to spontaneous combustion, that is coal powder has greater risk than coal lump.

Coal dust explosion can happen at crusher but good ventilation can prevent explosion.

Coal lump, by itself, is flammable and prove to fire outbreak. (Coal is reactive to oxygen and will generate CO_2 and creates heat. As coal get hotter it will eventually get to auto-ignition temperature and coal will burn).

Fuel oils

Fuel oils have the potential for fire and explosion; but may not be an issue in this coal-fired power plant. Fuel needs not be stored in large quantity here; fuel is shared with the nearby cement plant which has a large fuel depot.

However, care is always necessary when handling fuel oils. Accidental leakages and spillages can lead to fire outbreak. Used oil has to be systematically collected and give away to locals who need it.

Rare cases of fire and explosion also happen at filter bag units, it is learnt, and that was due to ambient high temperature. The ash (PM) collected in the filter bag can cause fire and explosion.

Fire and explosion can cause major accident; it can lead to major injuries and deaths. It can also cause great damage and loss to machinery, equipment and assets of the plants.

Generally deaths are caused more by inhalation of CO rather than actually body burning. Inhalation of CO fume can lead to severe tissue damages and extremely serious cases can be life threatening.

Mitigation

- Avoid and prevent fire and explosion by all means.
- Educate and train workers for the awareness of coal dust explosion and safety handling of pulverized coal and also handling of fuel oils.
- Apply mechanical labour and automation system as far as possible.
- Keep ignition sources away from coal, coal dust and fuel.
- Provide adequate ventilation.
- Avoid accident spillage or leakage of fuel oil; should spill occurred remove immediately with absorbent. (Do not wash down with water which will percolate to subsurface soil and probably ground water).
- Train some workers for firefighting with the help of township fire brigade.
- Also train some workers for first aid training; keep first aid kits well-stocked. (The plant has one clinic).
- Develop Emergency Preparedness and Plan (EPP), Emergency Response Plan (ERP) and rescue operation plan and conduct rehearsals or mock drills.
- Display addresses and phone number of Fire Brigade, Ambulance Service, Red Cross Society, Hospital, Police station, etc.
- Take out insurance for the power plant, fire insurance and workers insurance.

7. Potential traffic impact and mitigation measures

This include potential traffic congestion, traffic disruption and delay; and from health perspective, traffic accidents (road accident).

The coal-fired thermal plant and two cement plants have a total of 100 heavy trucks (20 tons truck).

These trucks will be mainly used for transportation of coal and transportation of the cement (from 2 cement plants).

It is calculated that every two hours one truck will be deployed and there will be substantial increase in traffic on the road. This can contribute to traffic congestion ad delay or even road accidents.

The access road, 4.5 miles long between Mandalay-Lashio High way and the site, is built by the company. This access road has light traffic and the road will be used mostly by the company's trucks and other vehicles of the company.

Unless the drivers are well-trained and well-experienced there is the potential for road accidents. Traffic accidents have become one of the most significant causes of injuries and fatalities worldwide. Safety measures for the protection of company workers, all road users (mostly locals) as well as domestic animals which are most vulnerable to traffic accidents is necessary.

From health perspective traffic accidents (road accident) cause injuries and permanent disabilities and loss of lives.

From socio-economic perspective road accidents can lead to increase of dependence, loss of one's ability to lead a normal life, destruction of property, increased of poverty, loss of a companionship of a loved one who died in a total accident and so on.

Mitigation

- Educated drivers for road safety, compliance with traffic rules and regulation.
- Especially educate heavy truck drivers for defensive driving, heavy truck with big load to be travelled at reduced speed.
- Organize training and accident prevention class; try to achieve zero accident.
- Never overload the truck; ensure truck loaded with coal is covered with tarpaulin to prevent spillage.
- Set up traffic signals, speed limits where necessary especially at intersection, near schools or location where children may be present.
- To reduce speed when passing through or near a village to prevent accident (to man and animals) and reduce dust generation and vibration.
- Keep all vehicles well-operated, well-maintained and well-lubricated; ensure that there are no equipment malfunction and failure.
- Keep a logbook each for all vehicles; check arrival and departure.
- Ensure that drivers are not over fatigued; the driving hours per day to be less than 10 hours (to prevent driving stress).

8. Potential Occupation health and safety issue and mitigation measures

In a coal-fired power plant the most outstanding issue is severe respiratory issue due to exposure to air pollutants, and inhalation of $PM_{2.5}$, PM_{10} are well-known health risk. Exposure to PM and air pollutants e.g. SO_2, NO_x can lead to a variety of disease, ailments and health problems (already described earlier).

Another outstanding health risk is extreme heat stress; workers are exposed to heat and high temperature in a coal-fired power plant (already described earlier).

Another outstanding health risk is fire and explosion (already described earlier). The chance for fire and explosion is remote but it is a real danger; coal dust, hydrogen and other gases in ambient air pose the highest explosion risk.

Other occupational and health risks associated with a coal-fired thermal plant are: high noise level, slips and tall (especially during maintenance works), electrical hazards, physical hazards, chemical hazards (if hazardous chemicals used), non-ionizing radiation, machinery accidents, excessive manual works, working at heights and working in confined space (during maintenance works) etc. (all are already described earlier).

Mitigation

- Exposure to air pollutants can be mitigated through the application of mitigative equipment and mitigative measures (e.g. ESP, bag filters, dry FGD application, complete combustion, and provision of appropriate PPE).
- Extreme heat stress can be mitigated through the application of mechanization and automation system (minimization of manual labours) and provision of appropriate PPE, e.g. outfit, helmet, boots, glove, etc.
- Potential fire and explosion can be prevented through educating and training workers for the awareness of potential for fire and explosion and taking all safety precaution measures. Maximize mechanical labour and minimize manual labour to alleviate the risk of fire and explosion etc.
- The overall mitigation and correction measures for other health risk; create a safe working environment and safe working conditions all working places. Effective education, training and supervision for good working practice, good safety practice and good health and hygiene practice are imperative.
- Follow the ergonomic principle: avoid tight working condition: avoid over exertion and fatigue, and repetitive motions, (minimize manual labour as far as possible and optimize mechanical labour and apply automation system as practical as possible).

9. Potential community health and safety issue and mitigation measures

The activities of the project can pose health hazards and risk on the local community in the vicinity.

Community health and safety issue include: air pollution, high noise level, water quality and effluent, life and fire safety issue, traffic and transportation of hazardous materials and spread of disease due to the activities of the project.

Air pollution

Impacts of air pollution or human health are already described earlier. Not only workers at the coal-fired power plant can be impacted but also locals in the near vicinity can be impacted if emission is not well-managed or mitigated.

High noise level – can also affect the local community in the near vicinity if not well-managed.

Water quality and effluent

Activities at the power plant can have adverse impact on the water quality and availability of ground water and surface water resources. (One village has complained that one or two springs are dried up).

Effluent from the power plant flows into the large lake (water impoundment) in the north-east. Some local raise fish in that lake; so far there is no considerable issue yet.

Life and Fire safety (L and F)

There may be public access to the plant from time to time. All buildings and structures inside the plant compound, if not structurally safe can have hazards on the public. If fire prevention measures is not taken beforehand, there can be serious issue if fire accidently break out.

Traffic and transportation of hazardous material

The coal-fired power plant and two cement plants have 100 heavy trucks. There is a considerable increase in traffic along the 4.5 miles access road from Mandalay-Lashio highway to the site built by the company. There will be also traffic increase on the high way.

There is the potential for traffic congestion and also road accidents leading to injuries and death not only to the locals but also their domestic animals.

When heavy trucks pass through or near a village there are the potential issue of noise and vibration and generation of dust due to vehicular movements.

Diesel and fuel oils are considered hazardous. There is the potential accidental spillage or other accident.

Spread of disease

This coal-fired thermal plant has 150 employees during Operation Phase the three plants have a combined workforce of over 900. The potential disease that start from the three plants, if communicable ones, can spread to the local communities.

Huge quantity of water has to be stored and these large ponds can become breeding for mosquitoes resulting in spread of malaria and other water-borne disease or water related disease.

Mitigation

A variety of mitigation measures to be taken for emission (air pollutant), high noise level and waste water are already described in technical detailed earlier.

Corrective measures for life safety issue: Ensure that all building and structures accessible to the public must be designed, constructed and operated in accordance with building regulation requirement and internationally accepted life and fire safety standards.

Traffic

Mitigation measures to be taken for impact of traffic are already described earlier.

Corrective measures for transportation of hazardous materials: comply with law and regulation relevant to the transportation of fuel oil and chemicals. Also plan for measures for preventing and/or mitigating the consequence of accidental spillage or release of hazardous materials.

Spread of diseases

Prevent the occurrence and spread of communicable disease from factory workers to the locals by all means. Undertake health awareness and conduct health education in local community and also provide health service for them at the plant clinic.

Avoid/minimize water-borne, water-related and vector borne disease and communicable disease that would result from the project activities. Regularly liaise with Naunghkio Township Health Authority.

Positive impacts during the Operation Phase

The positive impacts are long term positive socio-economic impacts.

There is an increase in employment: 150 people are employed permanently; and the salaries are reasonable: Ks 144,000 – Ks 600,000. There can be employment opportunities from time to time for extra jobs when the business progress well.

There is improvement in infrastructure: The access road constructed by the company is used by the local; the nearby villages are electrified. The company has already spend Ks 989,089,750 for implementation of CSR programme in a variety of community assistance and community developments.

From health perspective there is an improvement in health infrastructure and health service: the company's clinic provides free medical treatment to all villagers who come to the clinic. The CSR programme donates cash and kinds to the village clinics.

The development in infrastructure (the access road), local job opportunities and increase in house hold income will help maintain good mental health condition. Jobs and increase stable incomes relieve symptoms of health problems such as anxiety and depression. The project can, therefore, directly contribute to the well-being and health of the local communities.

Impact Assessment (Qualitative)

Impact assessments are already described in the EIA report, which are overall assessment of impact on the environment. However, the impact on health is quite different from that on environment (physical) environment.

A combination of 2 methods, namely Experts judgement/Experts Consensus Method and the Simple Matrix method of likelihood multiply by consequence (Likelihood x Consequence = Scoring outcome) are applied.

IFC table of Risk/impacts analysis

Likelihood	**Consequence**				
	Insignificant (negligible)	**Minor**	**Moderate**	**Major**	**Catastrophic/ Extreme**
	(1)	(2)	(3)	(4)	**(5)**
Almost certain (5)	5	10	15	20	25
Likely (4)	4	8	12	16	20
Possible (moderate) (3)	3	6	9	12	15
Unlikely (2)	2	4	6	8	10
Rare (1)	1	2	3	4	5

Scoring/outcome

1, 2, 3	= negligible/insignificant
4, 5, 6	= minor (low)
8, 9, 10	= moderate (medium)
12, 15, 16	= major (high)
20, 25	= catastrophic (extreme)

Risks/impacts rating during the Construction Phase (health perspective)

Sr.	Impact/potential impact	Likelihood	Consequence	Actual outcome		Expected outcome after mitigation
1	air pollution/air emission	5	3	15 (high)	Mitigation measures	low (minor)
2	noise and vibration	5	2	10 (medium)		low (minor)
3	wastes (solid, liquid)	4	2	8 (medium)		low (minor)
4	potential accidents at work place	1	3	6 (low)		negligible
5	potential traffic issue	2	3	6 (low)		low
6	potential social issue	1	3	3 (negligible)		negligible

- Impact on health from health perspective (not impact on overall physical environment)

Risk/impacts rating during the Operation Phase (health perspective)

`Sr.	Impact/potential impact	Likelihood	Consequence	Actual outcome		Expected outcome after mitigation
1	air pollution/emission	5	5	25 (extreme)	Mitigation measures	low
2	water quality, effluent and storage of water	5	4	20 (extreme)		low
3	noise and vibration	5	4	20 (extreme)		low
4	wastes	4	2	8 (moderate)		low
5	heat and hot explosion	3	3	9 (moderate)		low
6	potential fire and explosion	1	4	4 (low)		negligible
7	potential traffic issue	2	3	6 (low)		low
8	occupation health and safety issue	4	3	12 (high)		low
9	community health and safety issue	2	2	4 (low)		negligible

- Impact on health from health perspective (not impact on overall physical environment).

D. Budget for implementation of PHMP

The project proponent does not have a separate budget for the implementation of PHMP, yet.

However, there is a budget for the implementation of Environmental Management Plan (EMP).

0.5 percent of the main budget (USD 10 million) equivalent to USD 50,000 is set aside for EMP fund, which will cover the initial costs and recurring expenses for the implementation of EMP and MP (Monitoring Plan). The fund is allocated for execution of 4 programmes or plans follow:

Monitoring plan	- 35 % of EMP fund	: USD 17,500
Emergency Plan	- 20 % of EMP fund	: USD 15,000
Capacity building and training	- 20 % of EMP fund	: USD 10,000
Reporting	- 10 % of EMP fund	: USD 5,000
Miscellaneous expense	- 5 % of EMP fund	: USD 5,000

Note – The expenses for taking mitigations such as procurement of equipment – e.g. ESP, bag filters and other mitigation equipment, and PPEs will be borne by the main project's budget. Mitigation measures will be undertaken by the EMP cell members and trained staff that are all well-paid. They need not be hired and, therefore, no expenses. As for monitoring and testing, experts or technicians will have to be hired from time to time.

For the time being, the costs for executing MP will be also for execution of PHMP. For instance, monitoring of air quality, noise levels, water and soil quality for the physical component also cover health component. (The impacts on physical environment are more or less the same as impact on health environment).

Most of the expenses, so far, are for monitoring. These already described earlier in the EIA report, Chapter 8, 8.6.6. They are summarized as follow:

Operation Phase

- costs for monitoring air quality at 3 monitoring spots : Ks 5,100,000
- cost for monitoring water quality at 3 monitoring spots : Ks 240,000
- cost for monitoring effluent at one spots : Ks 80,000
- cost for monitoring noise level at 3 monitoring spots : Ks 210,000
- cost for monitoring soil quality at 3 spots : Ks 420,000

Totaling : Ks 6,050,000

This Ks 6,050,000 is once off cost and since semiannual monitoring will be conducted the costs for one year will be Ks 13,100,000.

(Other monitoring works will be undertaken by EMP cell members and trained staff and will be free of charges).

The alloted fund for monitoring plan can cover for only a few years. As time goes on more money will be added to the fund. Inflation has to be also considered.

The fund for emergency plan has not used yet. Unfortunately, if major accident happens more money will have to be also added.

As regards capacity building and training health experts will have to be hired for providing training and giving lectures on PHMP (or honorarium fees or courtesy gifts to be provided if they are government officials.)

As for reporting plan consultants may have to be hired, if necessary.

Money spent, so far, for execution of PHMP

Even though the company has no official budget yet for implementation of PHMP the company has so far, spent huge sum of money for public health assistance and health improvement.

Of the Ks 531,504,000 spent for CSR programme, Ks 14,198,000 are spent for public health assistance and health improvement. For instance, the company has established the company's clinic at a cost of Ks 10,324,000 providing free medical treatments, not only to its employees, but also for the local people.

The company has donated in cash and kinds to the two nearby village clinics, and also to Naunghkio Township Hospital; separate donations to welfare association of the hospital and disinfectant team (mosquitoes eradication). The company has constructed many toilets for local schools and monasteries and also water tanks.

Although the company has no official budget yet for PHMP, it has kept a blank cheque for the implementation of PHMP.

E. Monitoring Plans and Sub-plans by project phases

The overall as well as comprehensive monitoring plans are already described earlier in tabulated form in Chapter 6, 6.7 of the main EIA report.

During the Construciton Phase

Sr. No.	Components/ issue	Parameters to be monitored	NEQEG guideline value	Monitoring spot/site	Frequency	Responsible persons	Costs (once off)	Remarks
1.	Air quality	NO_2 O_3 PM_{10} $PM_{2.5}$ SO_2 VOC	200 µg/m^3 100 µg/m^3 50 µg/m^3 25 µg/m^3 20 µg/m^3 400 µg/m^3	At construction site Coordinates: N. Lat 22º 21' 32"; E. Long 96º 42' 10", At Lauk Hpan village Coordinates: N. Lat 22º 21' 32"; E. Long 96º 42' 10", At Khe San village Coordinates: N. Lat 22º 20' 50.6"; E. Long 96º 40' 31.7" At Lei Gyi Taw village Coordinates: N. Lat 22º 20' 13.83"; E. Long 96º 43' 31.29"	semi-annually semi-annually semi-annually semi-annually	EMP cell member and hired technicians EMP cell member and hired technicians EMP cell member and hired technicians EMP cell member and hired technicians	Ks 1,700,000 Ks 1,700,000 Ks 1,700,000 Ks 1,700,000	Technicians have to be hired Technicians have to be hired Technicians have to be hired Technicians have to be hired
2.	Water quality	BOD COD pH	50 mg/l 125 mg/l 6-9 STU	At stream Coordinates: N. Lat 22º 22' 29.9"; E. Long 96º 42' 07.7"	semi-annually	EMP cell member and hired technicians	Ks 80,000	Technicians have to be hired

		Total nitrogen Total phosphorus Dissolved solid Oil and grease Total coliform	10 mg/l 2 mg/l 50 mg/l 10 mg/l 400 mg/l	At Lauk Hpan Coordinates: N. Lat 22º 21' 58.4"; E. Long 96º 42' 45.5" At Khe San village Coordinates: N. Lat 22º 21' 08.7"; E. Long 96º 40' 24.0"	semi-annually semi-annually	EMP cell member and hired technicians EMP cell member and hired technicians	Ks 80,000 Ks 80,000	Technicians have to be hired Technicians have to be hired
3.	Noise level	dB(A) day and night	70 dB(A)	At construction site Coordinates: N. Lat 22º 21' 32"; E. Long 96º 42' 10", At Lauk Hpan village Coordinates: N. Lat 22º 21' 32"; E. Long 96º 42' 10", At Khe San village Coordinates: N. Lat 22º 20' 50.6"; E. Long 96º 40' 31.7" At Lei Gyi Taw village Coordinates: N. Lat 22º 20' 13.83"; E. Long 96º 43' 31.29"	semi-annually semi-annually semi-annually semi-annually	EMP cell member and hired technicians EMP cell member and hired technicians EMP cell member and hired technicians EMP cell member and hired technicians	Ks 70,000 Ks 70,000 Ks 70,000 Ks 70,000	Technicians have to be hired Technicians have to be hired Technicians have to be hired Technicians have to be hired

4.	Solid waste	- monitor construction waste and disposal - monitor trash/garbage generated and disposal	-	At construction site Coordinates: N. Lat 22º 21' 32"; E. Long 96º 42' 10"	Weekly	EMP cell members	Free of charges	-
5.	Occupational health and safety	- monitor OHS measures taken - monitor provision of First Aid Kits and stocking of medicines and drugs - monitor Emergency Preparedness and Response plan + actions	-	At construction site Coordinates: N Lat. 22°21'34.00", E Long. 96°42'8.57"	monthly	EMP cell members	Free of charges	
6.	Traffic issue	- monitor traffic flow - prevent traffic congesting - prevent road accident	-	Inside the compound Coordinates: N Lat. 22°21'29.21", E Long. 96°42'33.72" At road intersection and access road	weekly weekly	EMP cell members EMP cell members	Free of charges Free of charges	- -

				Coordinates: N Lat. 22°21'34.47", E Long. 96°42'49.03"				
7.	Social issue, social illness	- check social illness/ill social behaviour - monitor conducts of workers - check disciplinary action take	-	At construction site Coordinates: N Lat. 22°21'31.48", E Long. 96°42'9.32"	weekly and monthly	EMP cell members	Free of charges	-

During the Operation Phase

Sr. No.	Components/ issue	Parameters to be monitored	NEQEG guideline value	Monitoring spot/site	Frequency	Responsible persons	Costs (once off)	Remarks
1.	Air quality	<u>Air quality</u> NO_2 O_3 PM_{10} $PM_{2.5}$ SO_2 VOC	 200 µg/m^3 100 µg/m^3 50 µg/m^3 25 µg/m^3 20 µg/m^3 400 µg/m^3	At coal-fired Thermal plant Coordinates: N. Lat 22º 21' 32"; E. Long 96º 42' 10" At Lauk Hpan Coordinates: N. Lat. 22º 22' 08.2"; E. Long 96º 42' 32.3"	semi-annually semi-annually	EMP cell member and hired technicians EMP cell member and hired technicians	Ks 1,700,000 Ks 1,700,000	Technicians have to be hired Technicians have to be hired

				At Khe San village Coordinates: N. Lat. 22º 21' 01.0"; E. Long 96º 40' 45.9" At Lei Gyi Taw village Coordinates: N. Lat. 22º 21' 01.0"; E. Long 96º 40' 45.9" check and monitor the continuous flue gas analyser installed Coordinates: N Lat. 22°21'35.55, E Long. 96°42'8.24"	semi-annually semi-annually	EMP cell member and hired technicians EMP cell member and hired technicians	Ks 1,700,000 Ks 1,700,000	Technicians have to be hired Technicians have to be hired -
		<u>Emission</u> NO_2 PM_{10} SO_2	 510 mg/Nm^3 50 mg/Nm^3 900 mg/Nm^3	check and monitor the continuous flue gas analyser installed	weekly and monthly	EMP cell members	Free of charges	
2.	Water quality /effluent	<u>Water quality</u> BOD COD pH Total nitrogen Total phosphorus Dissolved solid Oil and grease Total coliform	 50 mg/l 125 mg/l 6-9 STU 10 mg/l 2 mg/l 50 mg/l 10 mg/l 400 mg/l	At Stream Coordinates: N. Lat 22º 22' 29.9"; E. Long 96º 42' 07.7" At Lauk Hpan Coordinates: N. Lat 22º 21' 58.4"; E. Long 96º 42' 45.5"	semi-annually semi-annually	EMP cell member and hired technicians EMP cell member and hired technicians	Ks 80,000 Ks 80,000	Technicians have to be hired Technicians have to be hired

		<u>Effluent</u> Arsenic Cadmium Chromium (total) Copper Iron Lead Mercury Oil and grease P^H Temperature increase Total residual chlorine Total suspended solids Zinc	 0.5 mg/l 0.1 mg/l 0.5 mg/l 0.5 mg/l 1 mg/l 0.5 mg/l 0.005 mg/l 10 mg/l 6-9 SU <3ºC 0.2 mg/l 50 mg/l 1mg/l	At Khe San village Coordinates: N. Lat 22º 21' 08.7"; E. Long 96º 40' 24.0" At boiler blowdown Coordinates: N. Lat 22º 21' 32.9"; E. Long 96º 42' 07.6" At cooling tower Coordinates: N. Lat 22º 21' 32.9"; E. Long 96º 42' 06.4" At discharge point Coordinates: N. Lat 22º 21' 28"; E. Long 96º 42' 0.7 "	semi-annually semi-annually semi-annually semi-annually	EMP cell member and hired technicians EMP cell member and hired technicians EMP cell member and hired technicians EMP cell member and hired technicians	Ks 80,000 Ks 200,000 Ks 200,000 Ks 200,000	Technicians have to be hired Technicians have to be hired Technicians have to be hired Technicians have to be hired
3.	Noise level	dB(A)	70 dB(A)	At coal-fired Thermal plant	semi-annually	EMP cell member and	Ks 70,000	Technicians have to be hired

		day and night		Coordinates: N. Lat 22º 21' 32"; E. Long 96º 42' 10" At Lauk Hpan Coordinates: Lat 22º 21' 58.29"; E. Long 96º 42' 48.17" At Khe San village Coordinates: N. Lat 22º 20' 50.6"; E. Long 96º 40' 31.7" At Lei Gyi Taw Coordinates: N. Lat 22º 20' 13.83"; E. Long 96º 43' 31.29"	semi-annually semi-annually semi-annually	hired technicians EMP cell member and hired technicians EMP cell member and hired technicians EMP cell member and hired technicians	Ks 70,000 Ks 70,000 Ks 70,000	Technicians have to be hired Technicians have to be hired Technicians have to be hired
4.	Solid waste	- monitor industrial waste especially ash collection and storage at silos and reuse - monitor domestic wastes, collection and disposal	- -	At coal-fired Thermal plant Coordinates: N. Lat 22º 21' 32"; E. Long 96º 42' 10"	Weekly	EMP cell members	Free of charges	-
5.	Heat and hot works	- monitor the situation at	-	inside the coal-fired power plant at high	Weekly	EMP cell members	Free of charges	-

		furnace, boiler, turbine, generator, hot piping, hot stream - monitor the wearing of PPE (make it mandatory)	-	temperature spots Coordinates: N Lat. 22°21'34.16", E Long. 96°42'8.63"				
6.	Potential fie and exploration	- monitor the situation at crusher house, at hopper, bag filter units and ash - monitor the handling and use of fuel oil - monitor the wearing of PPE	-	at crusher house Coordinates: N Lat. 22°21'30.15", E Long. 96°42'0.91" at car park Coordinates: N Lat. 22°21'30.57", E Long. 96°42'9.77"	weekly monthly	EMP cell members EMP cell members	Free of charges Free of charges	- -
7.	Traffic issue	- monitor traffic flow - prevent traffic congesting - prevent road accident	-	Inside the compound Coordinates: N Lat. 22°21'29.21", E Long. 96°42'33.72" At road intersection and access road Coordinates: N Lat. 22°21'34.47", E Long. 96°42'49.03"	weekly weekly	EMP cell members EMP cell members	Free of charges Free of charges	- -
8.	Occupational	- monitor OHS	-	At the coal-fired	monthly	EMP cell	Free of	-

	health and safety	measures taken - monitor provision of First Aid Kits and stocking of medicines and drugs - monitor Emergency Preparedness and Response plan + actions - Check the clinic treatment record		Thermal plant site Coordinates: N Lat. 22°21'34.00", E Long. 96°42'8.57" At clinic Coordinates: N Lat. 22°21'31.65, E Long. 96°42'43.91	monthly	members EMP cell members	charges Free of charges	-
9.	Community health and safety issue	- monitor CHS measures taken - monitor Emergency Preparedness and Response plan + actions regularly monitor the well being of the locals	-	At Lauk Hpan village Coordinates: N Lat. 22°21'57.91", E Long. 96°42'44.48" At Khe San village Coordinates: N Lat. 22°20'52.41, E Long. 96°40'19.59"E At Lei Gyi Taw Coordinates: N Lat. 22°20'11.18, E Long. 96°43'32.22"	semi-annually semi-annually semi-annually	EMP cell members EMP cell members EMP cell members	Free of charges Free of charges Free of charges	- - -
		- monitoring traffic check	-	on the access road	monthly	EMP cell	Free of	- monitoring traffic check

		log book for each vehicle - Check the medical record		Coordinates: N Lat. 22°21'34.47", E Long. 96°42'49.03" at the factory's clinic Coordinates: N Lat. 22°21'31.65, E Long. 96°42'43.91	monthly	members EMP cell members	charge Free of charge	log book for each vehicle - Check the medical record

During the Decommissioning Phase

Sr. No.	Components/ issue	Parameters to be monitored	NEQEG guideline value	Monitoring spot/site	Frequency	Responsible persons	Costs (once off)	Remarks
1.	Air quality	NO_2 O_3 PM_{10} $PM_{2.5}$ SO_2 VOC	200 µg/m^3 100 µg/m^3 50 µg/m^3 25 µg/m^3 20 µg/m^3 400 µg/m^3	At coal-fired Thermal plant Coordinates: N. Lat 22º 21' 32"; E. Long 96º 42' 10" At Lauk Hpan Coordinates: N. Lat. 22º 22' 08.2"; E. Long 96º 42' 32.3" At Khe San village Coordinates: N. Lat. 22º 21' 01.0"; E. Long 96º 40' 45.9" At Lei Gyi Taw village	annually annually annually annually	EMP cell member and hired technicians EMP cell member and hired technicians EMP cell member and hired technicians EMP cell	Ks 1,700,000 Ks 1,700,000 Ks 1,700,000 Ks 1,700,000	Technicians have to be hired once a years Technicians have to be hired once a years Technicians have to be hired once a years Technicians have to be hired

				Coordinates: N. Lat. 22º 21' 01.0"; E. Long 96º 40' 45.9"		member and hired technicians		once a years
2.	Water quality	BOD COD pH Total nitrogen Total phosphorus Dissolved solid Oil and grease Total coliform	50 mg/l 125 mg/l 6-9 STU 10 mg/l 2 mg/l 50 mg/l 10 mg/l 400 mg/l	At stream Coordinates: N.Lat 22º 22' 29.9"; E. Long 96º 42' 07.7" At Lauk Hpan Coordinates: N. Lat 22º 21' 58.4"; E. Long 96º 42' 45.5" At Khe San village Coordinates: N. Lat 22º 21' 08.7"; E. Long 96º 40' 24.0"	annually annually annually	EMP cell member and hired technicians EMP cell member and hired technicians EMP cell member and hired technicians	Ks 80,000 Ks 80,000 Ks 80,000	Technicians have to be hired once a years Technicians have to be hired once a years Technicians have to be hired once a years
3.	Noise level	dB(A) day and night	70 dB(A)	At coal-fired Thermal plant Coordinates: N. Lat 22º 21' 32"; E. Long 96º 42' 10" At Lauk Hpan Coordinates: N.Lat 22º 21' 58.29"; E.Long 96º 42' 48.17" At Khe San village	annually annually annually	EMP cell member and hired technicians EMP cell member and hired technicians EMP cell	Ks 70,000 Ks 70,000 Ks 70,000	Technicians have to be hired once a years Technicians have to be hired once a years Technicians

				Coordinates: N. Lat 22º 20' 50.6"; E. Long 96º 40' 31.7" At Lei Gyi Taw Coordinates: N. Lat 22º 20' 13.83"; E. Long 96º 43' 31.29"		member and hired technicians		have to be hired once a years
4.	Solid waste (decommissioning wastes debris)	monitor decommissioning works (dismantling, demolition and generation of huge quentity of debris, and systematic disposal and tidying up of the site	-	At coal-fired Thermal plant Coordinates: N. Lat 22º 21' 32"; E. Long 96º 42' 10"	Weekly/ monthly	EMP cell members	Free of charges	-
5.	Soil	Test soil quality check for construction of soil (especially the soil at the spot once used as open coal stockyard).	- -	Discharge Pond (domestic waste water sink) Coordinates: N. Lat. 22º 21' 47.6"; E. Long 96º 42' 40.6" At Lauk Hpan Coordinates: N. Lat. 22º 22' 08.2"; E. Long 96º 42' 32.3" At Khe San village	annually annually	EMP cell member and hired technicians EMP cell member and hired technicians EMP cell member and	Ks 140,000 Ks 140,000	Technicians have to be hired Technicians have to be hired Technicians

				Coordinates: N. Lat. 22º 21' 01.0"; E. Long 96º 40' 45.9" At Lei Gyi Taw Coordinates: N. Lat. 22º 20' 50.8"; E. Long 96º 43' 20.1"	annually annually	hired technicians EMP cell member and hired technicians	Ks 140,000 Ks 140,000	have to be hired Technicians have to be hired
6.	Occupational health and safety	- monitor OHS measures taken - monitor First Aid Kits and stocking of medicines and drugs - monitor Emergency response plan - Check the clinic treatment record	-	At the coal-fired Thermal plant site Coordinates: N Lat. 22°21'34.00", E Long. 96°42'8.57" At clinic Coordinates: N Lat. 22°21'31.65, E Long. 96°42'43.91	monthly	EMP cell members	Free of charges	-
7.	Social issue, social illness	- check social illness and ill-social behaviour - monitor conducts of workers - check disciplinary action take	-	At the coal-fired Thermal plant site Coordinates: N Lat. 22°21'31.48", E Long. 96°42'9.32"	weekly and monthly	EMP cell members	Free of charges	-

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NGWE YI PA LÈ CEMENT CO., LTD.
CROWN cement
NO. (62), 15th STREET, BET (87-88) STREET, MANDALAY. TEL: 02-31941, 09-91007169
NO. (157), 33rd STREET, BET (75-76) STREET, MANDALAY, MYANMAR. TEL: 02-71424

ဝန်ထမ်းများသက်သာချောင်ချိရေးနှင့် သာယာပျော်ရွှင်ရေး အစီအမံများ

ကျွန်တော်တို့၏ Ngwe Yi Pale' Cement Co., Ltd ရှိ ဝန်ထမ်းများ၏ သက်သာချောင်ချိရေးနှင့် သာယာပျော်ရွှင်ရေးအတွက် ရက်မှန်ကြေး၊ အချိန်ပိုကြေးနှင့် နှစ်သစ်ကူးကာလများတွင် ဝန်ထမ်းများ လှူဒါန်းသုံးစွဲနိုင်ရေး နှစ်သစ်ကူးအပိုဆုကြေးများ ထုတ်ပေးသွားမည် ဖြစ်ပါသည်။

ဝန်ထမ်းများ ကျန်းမာရေးအတွက် အရေးပေါ် ဆေးကုသရေးအတွက် ဆေးပေးခန်းနှင့် ကျန်းမာရေး ဝန်ထမ်းထားရှိပြီး လိုအပ်သောဆေးဝါးများလည်း ထားရှိပေးထားပြီး ဖြစ်ပါသည်။ မြို့နယ်လူမှုဖူလုံရေး အသင်း၏ အသင်းဝင်ရောက်စေမည်ဖြစ်ပြီး နာမကျန်းဖြစ်ပါက ရသင့်သည့် ဝန်ထမ်းအခွင့်အရေးများ အပြည့်အဝ ခံစားခွင့်ပေးပြီး ဆေးကုသမှုခံယူစေမည် ဖြစ်ပါသည်။

လေးစားစွာဖြင့်

ဦးစိန်မျိုးအောင်

အမှုဆောင်ဒါရိုက်တာ

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ပတ်ဝန်းကျင်ညစ်ညမ်းမှုမရှိစေရေး ဆောင်ရွက်ထားမှုအခြေအနေ တင်ပြခြင်း

ကျွန်တော်တို့၏ မြန်မာနိုင်ငံကုမ္ပဏီများ အက်ဥပဒေအရ ဖွဲ့စည်းတည်ထောင်ထားသော Ngwe Yi Pale' Cement Co., Ltd မှ လုပ်ငန်းဆောင်ရွက်ရာတွင် ပတ်ဝန်းကျင်ညစ်ညမ်းမှုမရှိစေရန် သန့်စင်ခန်းများအား အလုံအလောက်ထားရှိခြင်း၊ အမှိုက်ပုံးများထားရှိခြင်း၊ လုပ်ငန်းခွင်ပတ်ဝန်းကျင်အား သန့်ရှင်းရေး လုပ်ငန်းများဆောင်ရွက်ခြင်း၊ ရေနှုတ်မြောင်းများကို ရေစီးရေလာကောင်းမွန်အောင် ပြုပြင်ခြင်းလုပ်ငန်းများကို အစဉ် ပြုလုပ်မည်ဖြစ်ပါကြောင်း ဝန်ခံကတိပြု အပ်ပါသည်။

လုပ်ငန်းများမှ ထွက်ရှိသည့် စွန့်ပစ်ပစ္စည်းများနှင့် အခြားစွန့်ပစ်ပစ္စည်းများအား ပတ်ဝန်းကျင်မထိခိုက်စေရန်နှင့် စွန့်ပစ်ပစ္စည်းအမျိုးအစားအလိုက် သတ်မှတ်နေရာများတွင် စနစ်တကျစွန့်ပစ်နိုင်ရန် စီစဉ်ထားရှိမည်ဖြစ်ပါကြောင်း တင်ပြ အပ်ပါသည်။

အမှိုက်များကို စနစ်တကျစွန့်ပစ်ခြင်းနှင့် သက်ဆိုင်ရာအဖွဲ့အစည်းများမှ ချမှတ်ထားသော စည်းမျဉ်းစည်းကမ်းများကို လိုက်နာမည်ဖြစ်ကြောင်းနှင့် ပတ်ဝန်းကျင်စီမံချက် ရေးဆွဲဆောင်ရွက်သွားမည် ဖြစ်ပါကြောင်း ဝန်ခံကတိပြု ပါသည်။

လေးစားစွာဖြင့်

ဦးစိန်မျိုးအောင်

အမှုဆောင်ဒါရိုက်တာ

Ngwe Yi Pale' Cement Co., Ltd

NGWE YI PA LÈ CEMENT CO., LTD.
CROWN cement
NO. (62), 15th STREET, BET (87-88) STREET, MANDALAY. TEL: 02-31941, 09-91007169
NO. (157), 33rd STREET, BET (75-76) STREET, MANDALAY, MYANMAR. TEL: 02-71424

မီးဘေးကြိုတင်ကာကွယ်မှု အစီအစဉ် တင်ပြခြင်း

လုပ်ငန်းခွင်အတွင်းရှိ အဆောက်အအုံများနှင့် သတ်မှတ်နေရာများတွင် မီးသတ်ဆေးပူးများ ချိတ်ဆွဲထားရှိသည့်အပြင် မီးလောင်မှုဖြစ်ပွားပါက မီးငြိမ်းသတ်နိုင်ရန် ဝန်ထမ်းများအား မီးသတ်သင်တန်း များသို့ စေလွှတ်ပြီး အရေးပေါ်အခြေအနေတွင် သင်တန်းများပေးသွားမည် ဖြစ်ပါသည်။

လေးစားစွာဖြင့်

ဦးစိန်မျိုးအောင်

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CSR ရံပုံငွေထားရှိမည်ဖြစ်ကြောင်း ဝန်ခံကတိပြုခြင်း

မြန်မာနိုင်ငံကုမ္ပဏီများ အက်ဥပဒေအရ ဖွဲ့စည်းတည်ထောင်ထားသော ကျွန်တော်တို့၏ Ngwe Yi Pale' Cement Co., Ltd သည် ရှမ်းပြည်နယ် နောင်ချိုမြို့နယ်၊ လောက်ဖန်းကျေးရွာအနီး ကျောက်မီးသွေးသုံး လျှပ်စစ်ဓါတ်အားပေးစက်ရုံ စီမံကိန်းအတွက် ကနဦး (၃၀)နှစ်နှင့် တစ်ကြိမ်လျှင် (၁၀)နှစ်ဖြင့် သက်တမ်းတိုးမြှင့်လုပ်ငန်း ဆောင်ရွက်သွားမည် ဖြစ်ပါသည်။

အဆိုပြုလုပ်ငန်း၏ နှစ်စဉ် အသားတင်အမြတ်ငွေမှ ၃%အား CSR ရံပုံငွေအဖြစ် ထားရှိသုံးစွဲမည် ဖြစ်ကြောင်း ဝန်ခံကတိပြုပါသည်။

လေးစားစွာဖြင့်

ဦးစိန်မျိုးအောင်

အမှုဆောင်ဒါရိုက်တာ

Ngwe Yi Pale' Cement Co., Ltd

ISO TECH LABORATORY

Laboratory Technical Consultant: U Saw Christopher Maung
B.Sc Engg: (Civil), Dip S.E (Delft) Lecturer of YIT (Retd), Consultant (Y.C.D.C), LWSE 001.
Former Member (UNICEF, Water quality monitoring & Surveillance Myanmar)

W0318 012

WATER QUALITY TEST RESULTS FORM

Client	MESC
Nature of Water	Stream Water (Cool Thermal Plant)
Location	Naung Hkio
Date and Time of collection	4.3.2018
Date and Time of arrival at Laboratory	5.3.2018
Date and Time of commencing examination	6.3.2018
Date and Time of completing	11.3.2018

Results of Water Analysis

			WHO Drinking Water Guideline (Geneva - 1993)
pH	8.8		6.5 - 8.5
Colour (True)		TCU	15 TCU
Turbidity		NTU	5 NTU
Conductivity		micro S/cm	
Total Hardness		mg/l as $CaCO_3$	500 mg/l as $CaCO_3$
Calcium Hardness		mg/l as $CaCO_3$	
Magnesium Hardness		mg/l as $CaCO_3$	
Total Alkalinity		mg/l as $CaCO_3$	
Phenolphthalein Alkalinity		mg/l as $CaCO_3$	
Carbonate ($CaCO_3$)		mg/l as $CaCO_3$	
Bicarbonate (HCO_3)		mg/l as $CaCO_3$	
Iron		mg/l	0.3 mg/l
Chloride (as CL)		mg/l	250 mg/l
Sodium Chloride (as NaCL)		mg/l	
Sulphate (as SO_4)		mg/l	200 mg/l
Total Solids		mg/l	1500 mg/l
Suspended Solids	4	mg/l	
Dissolved Solids		mg/l	1000 mg/l
Manganese		mg/l	0.05 mg/l
Phosphate	Nil	mg/l	
Phenolphthalein Acidity		mg/l	
Methyl Orange Acidity		mg/l	
Salinity		ppt	

Remark: This certificate is issued only for the receipt of the test sample.

Tested by
Signature:
Name: Zaw Hein Oo, B.Sc (Chemistry), Sr. Chemist, ISO TECH Laboratory

Approved by
Signature:
Name: Soe Thit, B.E (Civil) 1980, Technical Officer, ISO TECH Laboratory

(a division of WEG Co.,Ltd.)
No.18, Lanthit Road, Nanthargone Quarter, Insein Township, Yangon, Myanmar.
Ph: 01-640955, 09-73225175, 09-73242162, Fax: 01-644506, E-mail: isotechlaboratory@gmail.com, Website: weg-myanmar.com

ISO TECH LABORATORY

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W0318 012

WATER QUALITY TEST RESULTS FORM

Client	MESC
Nature of Water	Stream Water (Cool Thermal Plant)
Location	Naung Hkio
Date and Time of collection	4.3.2018
Date and Time of arrival at Laboratory	5.3.2018
Date and Time of commencing examination	6.3.2018
Date and Time of completing	11.3.2018

Results of Water Analysis

			WHO Drinking Water Guideline (Geneva - 1993)
Temperature (°C)		°C	
Fluoride (F)		mg/l	1.5 mg/l
Lead (as Pb)		mg/l	0.01 mg/l
Arsenic (As)		mg/l	0.01 mg/l
Nitrate ($N.NO_3$)	0.3	mg/l	50 mg/l
Chlorine (Residual)		mg/l	
Ammonia (NH_3)		mg/l	
Ammonium (NH_4)		mg/l	
Dissolved Oxygen (DO)		mg/l	
Chemical Oxygen Demand (COD)	32	mg/l	
Biochemical Oxygen Demand (BOD) (5 days at 20 °C)	8	mg/l	
Cyanide (CN)		mg/l	0.07 mg/l
Zinc (Zn)		mg/l	3 mg/l
Copper (Cu)		mg/l	2 mg/l
Silica (Si)		mg/l	

Remark: This certificate is issued only for the receipt of the test sample.

Tested by

Signature:

Name: Zaw Hein Oo
B.Sc (Chemistry)
Sr. Chemist
ISO TECH Laboratory

Approved by

Signature:

Name: Soe Thit
B.E (Civil) 1980,
Technical Officer
ISO TECH Laboratory

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Occupational and Environmental Health Laboratory

No. (250), Lower Kyeemyindine Rood, Ahlone Township, Yangon, Myanmar.
Tel: +9567-431139, 431138, +951-221387, 210844,
Fax: +9567-431139, +951-223824

Sample Name:	Stream Water	**Received Date:**	5.3.2018
		Reported Date:	7.3.2018
		Reg no:	051/2018
Address:	နှောင်ချို (Cool thermal plant)		

No.	Analyzes	Ref: Value	Unit	Result	Method
1	Oil and Grease	10	mg/L	15.2	*Standard Method of waste water analysis*

Tested by

OH(Lab)

Checked by

Laboratory Officer

Signed by

Dr. Thura Aung
Medical Officer

Dr. Kay Khaing Aye
Deputy Director
Occupational and Environmental Health Division

ISO TECH LABORATORY
Laboratory Technical Consultant: U Saw Christopher Maung
B Sc Engg: (Civil), Dip S.E (Delft) Lecturer of YIT (Retd), Consultant (Y.C.D.C), LWSE 001.
Former Member (UNICEF, Water quality monitoring & Surveillance Myanmar)

WW0319 090

WATER QUALITY TEST RESULTS FORM

Client	MESC Co.,Ltd.
Nature of Water	Wastewater (Blow Down)
Location	Naung Cho
Date and Time of collection	11.3.2019
Date and Time of arrival at Laboratory	13.3.2019
Date and Time of commencing examination	14.3.2019
Date and Time of completing	16.3.2019

Results of Water Analysis

			WHO Drinking Water Guideline (Geneva - 1993)
pH	7.5		6.5 - 8.5
Colour (True)		TCU	15 TCU
Turbidity		NTU	5 NTU
Conductivity		micro S/cm	
Total Hardness		mg/l as $CaCO_3$	500 mg/l as $CaCO_3$
Calcium Hardness		mg/l as $CaCO_3$	
Magnesium Hardness		mg/l as $CaCO_3$	
Total Alkalinity		mg/l as $CaCO_3$	
Phenolphthalein Alkalinity		mg/l as $CaCO_3$	
Carbonate ($CaCO_3$)		mg/l as $CaCO_3$	
Bicarbonate (HCO_3)		mg/l as $CaCO_3$	
Iron	0.25	mg/l	0.3 mg/l
Chloride (as CL)		mg/l	250 mg/l
Sodium chloride (as NaCL)		mg/l	
Sulphate (as SO_4)		mg/l	500 mg/l
Total Solids		mg/l	1500 mg/l
Suspended Solids	6	mg/l	
Dissolved Solids		mg/l	1000 mg/l
Manganese		mg/l	0.05 mg/l
Phosphate		mg/l	
Phenolphthalein Acidity		mg/l	
Methyl Orange Acidity		mg/l	
Salinity		ppt	

Remark: This certificate is issued only for the receipt of the test sample.

Tested by
Signature:
Name: Zaw Hein Oo
B.Sc (Chemistry)
Sr. Chemist
ISO TECH Laboratory

Approved by
Signature:
Name: Soe Thit
B.E (Civil) 1980,
Technical Officer
(ISO TECH Laboratory)

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WW0319 090

WATER QUALITY TEST RESULTS FORM

Client	MESC Co.,Ltd.
Nature of Water	Wastewater (Blow Down)
Location	Naung Cho
Date and Time of collection	11.3.2019
Date and Time of arrival at Laboratory	13.3.2019
Date and Time of commencing examination	14.3.2019
Date and Time of completing	16.3.2019

Results of Water Analysis

			WHO Drinking Water Guideline (Geneva - 1993)
Temperature (°C)	25.0	°C	
Fluoride (F)		mg/l	1.5 mg/l
Lead (as Pb)	Nil	mg/l	0.01 mg/l
Arsenic (As)	Nil	mg/l	0.01 mg/l
Nitrate ($N.NO_3$)		mg/l	50 mg/l
Chlorine (Residual)	Nil	mg/l	
Ammonia (NH_3)		mg/l	
Ammonium (NH_4)		mg/l	
Dissolved Oxygen (DO)		mg/l	
Chemical Oxygen Demand (COD)		mg/l	
Biochemical Oxygen Demand (BOD) (5 days at 20 °C)		mg/l	
Cyanide (CN)		mg/l	0.07 mg/l
Zinc (Zn)	Nil	mg/l	3 mg/l
Copper (Cu)	Nil	mg/l	2 mg/l
Silica (Si)		mg/l	

Remark: This certificate is issued only for the receipt of the test sample.

Tested by

Signature:
Name: Zaw Hein Oo
B.Sc (Chemistry)
Sr. Chemist
ISO TECH Laboratory

Approved by

Signature:
Name: Soe Thit
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Former Member (UNICEF, Water quality monitoring & Surveillance Myanmar)

WTL-RE-001
Issue Date - 01-12-2012
Effective Date - 01-12-2012
Issue No - 1.0/Page 1 of 2

WW0319 091

WATER QUALITY TEST RESULTS FORM

Client	MESC Co.,Ltd.
Nature of Water	Wastewater (Cooling Tower)
Location	Naung Cho
Date and Time of collection	12.3.2019
Date and Time of arrival at Laboratory	13.3.2019
Date and Time of commencing examination	14.3.2019
Date and Time of completing	16.3.2019

Results of Water Analysis

			WHO Drinking Water Guideline (Geneva - 1993)
pH	8.7		6.5 - 8.5
Colour (True)		TCU	15 TCU
Turbidity		NTU	5 NTU
Conductivity		micro S/cm	
Total Hardness		mg/l as $CaCO_3$	500 mg/l as $CaCO_3$
Calcium Hardness		mg/l as $CaCO_3$	
Magnesium Hardness		mg/l as $CaCO_3$	
Total Alkalinity		mg/l as $CaCO_3$	
Phenolphthalein Alkalinity		mg/l as $CaCO_3$	
Carbonate ($CaCO_3$)		mg/l as $CaCO_3$	
Bicarbonate (HCO_3)		mg/l as $CaCO_3$	
Iron	0.58	mg/l	0.3 mg/l
Chloride (as CL)		mg/l	250 mg/l
Sodium chloride (as NaCL)		mg/l	
Sulphate (as SO_4)		mg/l	500 mg/l
Total Solids		mg/l	1500 mg/l
Suspended Solids	62	mg/l	
Dissolved Solids		mg/l	1000 mg/l
Manganese		mg/l	0.05 mg/l
Phosphate		mg/l	
Phenolphthalein Acidity		mg/l	
Methyl Orange Acidity		mg/l	
Salinity		ppt	

Remark: This certificate is issued only for the receipt of the test sample.

Tested by
Signature:
Name: Zaw Hein Oo
~~B.Sc (Chemistry)~~
Sr. Chemist
ISO TECH Laboratory

Approved by
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(a division of WEG Co.,Ltd.)
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Former Member (UNICEF, Water quality monitoring & Surveillance Myanmar)

WW0319 091

WATER QUALITY TEST RESULTS FORM

Client	MESC Co.,Ltd.
Nature of Water	Wastewater (Cooling Tower)
Location	Naung Cho
Date and Time of collection	12.3.2019
Date and Time of arrival at Laboratory	13.3.2019
Date and Time of commencing examination	14.3.2019
Date and Time of completing	16.3.2019

Results of Water Analysis

			WHO Drinking Water Guideline (Geneva - 1993)
Temperature (°C)	25.0	°C	
Fluoride (F)		mg/l	1.5 mg/l
Lead (as Pb)	Nil	mg/l	0.01 mg/l
Arsenic (As)	Nil	mg/l	0.01 mg/l
Nitrate ($N.NO_3$)		mg/l	50 mg/l
Chlorine (Residual)	Nil	mg/l	
Ammonia (NH_3)		mg/l	
Ammonium (NH_4)		mg/l	
Dissolved Oxygen (DO)		mg/l	
Chemical Oxygen Demand (COD)		mg/l	
Biochemical Oxygen Demand (BOD) (5 days at 20 °C)		mg/l	
Cyanide (CN)		mg/l	0.07 mg/l
Zinc (Zn)	Nil	mg/l	3 mg/l
Copper (Cu)	Nil	mg/l	2 mg/l
Silica (Si)		mg/l	

Remark: This certificate is issued only for the receipt of the test sample.

Tested by

Signature:

Name: Zaw Hein Oo
B.Sc (Chemistry)
Sr. Chemist
ISO TECH Laboratory

Approved by

Signature:

Name: Soe Thit
B.E (Civil) 1980,
Technical Officer
ISO TECH Laboratory

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Laboratory Technical Consultant: U Saw Christopher Maung
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WW0319 092

WATER QUALITY TEST RESULTS FORM

Client: MESC Co.,Ltd.
Nature of Water: Wastewater (Final)
Location: Naung Cho
Date and Time of collection: 12.3.2019
Date and Time of arrival at Laboratory: 13.3.2019
Date and Time of commencing examination: 14.3.2019
Date and Time of completing: 16.3.2019

Results of Water Analysis			WHO Drinking Water Guideline (Geneva - 1993)
pH	8.3		6.5 - 8.5
Colour (True)		TCU	15 TCU
Turbidity		NTU	5 NTU
Conductivity		micro S/cm	
Total Hardness		mg/l as $CaCO_3$	500 mg/l as $CaCO_3$
Calcium Hardness		mg/l as $CaCO_3$	
Magnesium Hardness		mg/l as $CaCO_3$	
Total Alkalinity		mg/l as $CaCO_3$	
Phenolphthalein Alkalinity		mg/l as $CaCO_3$	
Carbonate ($CaCO_3$)		mg/l as $CaCO_3$	
Bicarbonate (HCO_3)		mg/l as $CaCO_3$	
Iron	0.40	mg/l	0.3 mg/l
Chloride (as CL)		mg/l	250 mg/l
Sodium chloride (as NaCL)		mg/l	
Sulphate (as SO_4)		mg/l	500 mg/l
Total Solids		mg/l	1500 mg/l
Suspended Solids	23	mg/l	
Dissolved Solids		mg/l	1000 mg/l
Manganese		mg/l	0.05 mg/l
Phosphate		mg/l	
Phenolphthalein Acidity		mg/l	
Methyl Orange Acidity		mg/l	
Salinity		ppt	

Remark: This certificate is issued only for the receipt of the test sample.

Tested by
Signature:
Name: Zaw Hein Oo
B.Sc (Chemistry)
Sr. Chemist
ISO TECH Laboratory

Approved by
Signature:
Name: Soe Thit
B.E (Civil) 1980,
Technical Officer
ISO TECH Laboratory

(a division of WEG Co.,Ltd.)
No.18, Lanthit Road, Nanthargone Quarter, Insein Township, Yangon, Myanmar.
Ph: 01-640955, 09-73225175, 09-30339681, Fax: 01-644506, E-mail: isotechlaboratory@gmail.com, Website: weg-myanmar.com

ISO TECH LABORATORY
Laboratory Technical Consultant: U Saw Christopher Maung
B.Sc Engg: (Civil), Dip S.E (Delft) Lecturer of YIT (Retd), Consultant (Y.C.D.C), LWSE 001.
Former Member (UNICEF, Water quality monitoring & Surveillance Myanmar)

WW0319 092

WATER QUALITY TEST RESULTS FORM

Client	MESC Co.,Ltd.
Nature of Water	Wastewater (Final)
Location	Naung Cho
Date and Time of collection	12.3.2019
Date and Time of arrival at Laboratory	13.3.2019
Date and Time of commencing examination	14.3.2019
Date and Time of completing	16.3.2019

Results of Water Analysis

			WHO Drinking Water Guideline (Geneva - 1993)
Temperature (°C)	25.0	°C	
Fluoride (F)		mg/l	1.5 mg/l
Lead (as Pb)	Nil	mg/l	0.01 mg/l
Arsenic (As)	Nil	mg/l	0.01 mg/l
Nitrate ($N.NO_3$)		mg/l	50 mg/l
Chlorine (Residual)	Nil	mg/l	
Ammonia (NH_3)		mg/l	
Ammonium (NH_4)		mg/l	
Dissolved Oxygen (DO)		mg/l	
Chemical Oxygen Demand (COD)		mg/l	
Biochemical Oxygen Demand (BOD) (5 days at 20 °C)		mg/l	
Cyanide (CN)		mg/l	0.07 mg/l
Zinc (Zn)	Nil	mg/l	3 mg/l
Copper (Cu)	Nil	mg/l	2 mg/l
Silica (Si)		mg/l	

Remark: This certificate is issued only for the receipt of the test sample.

Tested by

Signature:
Name: Zaw Hein Oo
B.Sc (Chemistry)
Sr. Chemist
ISO TECH Laboratory

Approved by

Signature:
Name: Soe Thit
B.E (Civil) 1980,
Technical Officer
ISO TECH Laboratory

(a division of WEG Co.,Ltd.)
No.18, Lanthit Road, Nanthargone Quarter, Insein Township, Yangon, Myanmar.
Ph: 01-640955, 09-73225175, 09-30339681, Fax: 01-644506, E-mail: isotechlaboratory@gmail.com, Website: weg-myanmar.com

ISO TECH LABORATORY

Laboratory Technical Consultant: U Saw Christopher Maung
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Former Member (UNICEF, Water quality monitoring & Surveillance Myanmar)

ISO-TECH LABORATORY

ISO 9001:2008 Cert. No

WTL-RE-001
Issue Date - 01-12-2012
Effective Date - 01-12-2012
Issue No - 1.0/Page 1 of 2

W0319 431

WATER QUALITY TEST RESULTS FORM

Client: MESC Co.,Ltd.
Nature of Water: Tube Well Water (180' ft)
Location: ခဲဆန့်ကျေးရွာ၊ နောင်ချိုမြို့နယ်။
Date and Time of collection: 11.3.2019
Date and Time of arrival at Laboratory: 13.3.2019
Date and Time of commencing examination: 14.3.2019
Date and Time of completing: 16.3.2019

Results of Water Analysis

WHO Drinking Water Guideline (Geneva - 1993)

pH	8.0		6.5 - 8.5
Colour (True)		TCU	15 TCU
Turbidity	2	NTU	5 NTU
Conductivity		micro S/cm	
Total Hardness	280	mg/l as $CaCO_3$	500 mg/l as $CaCO_3$
Calcium Hardness		mg/l as $CaCO_3$	
Magnesium Hardness		mg/l as $CaCO_3$	
Total Alkalinity	324	mg/l as $CaCO_3$	
Phenolphthalein Alkalinity		mg/l as $CaCO_3$	
Carbonate ($CaCO_3$)		mg/l as $CaCO_3$	
Bicarbonate (HCO_3)		mg/l as $CaCO_3$	
Iron	0.15	mg/l	0.3 mg/l
Chloride (as CL)	3	mg/l	250 mg/l
Sodium chloride (as NaCL)		mg/l	
Sulphate (as SO_4)	50	mg/l	500 mg/l
Total Solids		mg/l	1500 mg/l
Suspended Solids		mg/l	
Dissolved Solids	289	mg/l	1000 mg/l
Manganese	Nil	mg/l	0.05 mg/l
Phosphate		mg/l	
Phenolphthalein Acidity		mg/l	
Methyl Orange Acidity		mg/l	
Salinity		ppt	

Remark: This certificate is issued only for the receipt of the test sample.

Tested by
Signature: Hein
Name: Zaw Hein Oo, B.Sc (Chemistry), Sr. Chemist, ISO TECH Laboratory

Approved by
Signature: Soe Thit
Name: Soe Thit, B.E (Civil) 1980, Technical Officer, ISO TECH Laboratory

(a division of WEG Co.,Ltd.)

No.18, Lanthit Road, Nanthargone Quarter, Insein Township, Yangon, Myanmar.
Ph: 01-640955, 09-73225175, 09-30339681, Fax: 01-644506, E-mail: isotechlaboratory@gmail.com, Website: weg-myanmar.com

ISO TECH LABORATORY

Laboratory Technical Consultant: U Saw Christopher Maung
B.Sc Engg: (Civil), Dip S.E (Delft) Lecturer of YIT (Retd), Consultant (Y.C.D.C), LWSE 001.
Former Member (UNICEF, Water quality monitoring & Surveillance Myanmar)

WTL-RE-001
Issue Date - 01-12-2012
Effective Date - 01-12-2012
Issue No - 1.0/Page 2 of 2

W0319 431

WATER QUALITY TEST RESULTS FORM

Client: MESC Co.,Ltd.

Nature of Water: Tube Well Water (180' ft)

Location: မဲဆန့်ကျေးရွာ၊ နောင်ချိုမြို့နယ်။

Date and Time of collection: 11.3.2019

Date and Time of arrival at Laboratory: 13.3.2019

Date and Time of commencing examination: 14.3.2019

Date and Time of completing: 16.3.2019

Results of Water Analysis — **WHO Drinking Water Guideline (Geneva - 1993)**

Temperature (°C)		°C	
Fluoride (F)		mg/l	1.5 mg/l
Lead (as Pb)		mg/l	0.01 mg/l
Arsenic (As)	Nil	mg/l	0.01 mg/l
Nitrate ($N.NO_3$)		mg/l	50 mg/l
Chlorine (Residual)		mg/l	
Ammonia (NH_3)		mg/l	
Ammonium (NH_4)		mg/l	
Dissolved Oxygen (DO)		mg/l	
Chemical Oxygen Demand (COD)		mg/l	
Biochemical Oxygen Demand (BOD) (5 days at 20 °C)		mg/l	
Cyanide (CN)	Nil	mg/l	0.07 mg/l
Zinc (Zn)		mg/l	3 mg/l
Copper (Cu)	Nil	mg/l	2 mg/l
Silica (Si)		mg/l	

Remark: This certificate is issued only for the receipt of the test sample.

Tested by

Signature: Hein

Name: Zaw Hein Oo
B.Sc (Chemistry)
Sr. Chemist
ISO TECH Laboratory

Approved by

Signature: Soe Thit

Name: Soe Thit
B.E (Civil) 1980,
Technical Officer
ISO TECH Laboratory

(a division of WEG Co.,Ltd.)

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Laboratory Technical Consultant: U Saw Christopher Maung
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Former Member (UNICEF, Water quality monitoring & Surveillance Myanmar)

W0319 430

WATER QUALITY TEST RESULTS FORM

Client: MESC Co.,Ltd.
Nature of Water: Tube Well Water (305' ft)
Location: လောက်မန်းကျေးရွာ၊ နောင်ချိုမြို့နယ်။
Date and Time of collection: 11.3.2019
Date and Time of arrival at Laboratory: 13.3.2019
Date and Time of commencing examination: 14.3.2019
Date and Time of completing: 16.3.2019

Results of Water Analysis			WHO Drinking Water Guideline (Geneva - 1993)
pH	8.2		6.5 - 8.5
Colour (True)		TCU	15 TCU
Turbidity	3	NTU	5 NTU
Conductivity		micro S/cm	
Total Hardness	242	mg/l as $CaCO_3$	500 mg/l as $CaCO_3$
Calcium Hardness		mg/l as $CaCO_3$	
Magnesium Hardness		mg/l as $CaCO_3$	
Total Alkalinity	272	mg/l as $CaCO_3$	
Phenolphthalein Alkalinity		mg/l as $CaCO_3$	
Carbonate ($CaCO_3$)		mg/l as $CaCO_3$	
Bicarbonate (HCO_3)		mg/l as $CaCO_3$	
Iron	0.16	mg/l	0.3 mg/l
Chloride (as CL)	33	mg/l	250 mg/l
Sodium chloride (as NaCL)		mg/l	
Sulphate (as SO_4)	40	mg/l	500 mg/l
Total Solids		mg/l	1500 mg/l
Suspended Solids		mg/l	
Dissolved Solids	295	mg/l	1000 mg/l
Manganese	Nil	mg/l	0.05 mg/l
Phosphate		mg/l	
Phenolphthalein Acidity		mg/l	
Methyl Orange Acidity		mg/l	
Salinity		ppt	

Remark: This certificate is issued only for the receipt of the test sample.

Tested by
Signature: Hein
Name: Zaw Hein Oo
B.Sc (Chemistry)
Sr. Chemist
ISO TECH Laboratory

Approved by
Signature:
Name: Soe Thit
B.E (Civil) 1980,
Technical Officer
ISO TECH Laboratory

(a division of WEG Co.,Ltd.)
No.18, Lanthit Road, Nanthargone Quarter, Insein Township, Yangon, Myanmar.
Ph: 01-640955, 09-73225175, 09-30339681, Fax: 01-644508, E-mail: isotechlaboratory@gmail.com, Website: weg-myanmar.com

ISO TECH LABORATORY

Laboratory Technical Consultant: U Saw Christopher Maung
B.Sc Engg (Civil), Dip S.E (Delft) Lecturer of YIT (Retd), Consultant (Y.C.D.C), LWSE 001.
Former Member (UNICEF, Water quality monitoring & Surveillance Myanmar)

WTL-RE-001
Issue Date - 01-12-2012
Effective Date - 01-12-2012
Issue No - 1.0/Page 2 of 2

W0319 430

WATER QUALITY TEST RESULTS FORM

Client: MESC Co.,Ltd.
Nature of Water: Tube Well Water (305' ft)
Location: လောက်မန်းကျေးရွာ၊ နောင်ခိုကြီးနယ်။
Date and Time of collection: 11.3.2019
Date and Time of arrival at Laboratory: 13.3.2019
Date and Time of commencing examination: 14.3.2019
Date and Time of completing: 16.3.2019

Results of Water Analysis

			WHO Drinking Water Guideline (Geneva - 1993)
Temperature (°C)		°C	
Fluoride (F)		mg/l	1.5 mg/l
Lead (as Pb)		mg/l	0.01 mg/l
Arsenic (As)	Nil	mg/l	0.01 mg/l
Nitrate ($N.NO_3$)		mg/l	50 mg/l
Chlorine (Residual)		mg/l	
Ammonia (NH_3)		mg/l	
Ammonium (NH_4)		mg/l	
Dissolved Oxygen (DO)		mg/l	
Chemical Oxygen Demand (COD)		mg/l	
Biochemical Oxygen Demand (BOD) (5 days at 20 °C)		mg/l	
Cyanide (CN)	Nil	mg/l	0.07 mg/l
Zinc (Zn)		mg/l	3 mg/l
Copper (Cu)	Nil	mg/l	2 mg/l
Silica (Si)		mg/l	

Remark: This certificate is issued only for the receipt of the test sample.

Tested by
Signature:
Name: Zaw Hein Oo
B.Sc (Chemistry)
Sr. Chemist
ISO TECH Laboratory

Approved by
Signature:
Name: Soe Thit
B.E (Civil) 1980,
Technical Officer
ISO TECH Laboratory

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Ph: 01-640955, 09-73225175, 09-30339681, Fax: 01-644506, E-mail: isotechlaboratory@gmail.com, Website: weg-myanmar.com

Analysis of water quality

Occupational and Environmental Health Laboratory

No. (250), Lower Kyeemyindine Rood, Ahlone Township, Yangon, Myanmar.
Tel: +9567-431139, 431138, +951-221387, 210844,
Fax: +9567-431139, +951-223824

Sample Name: Waste Water	**Received Date:** 14.3.2019
	Reported Date: 19.3.2019
Address: ဘိလပ်မြေစက်ရုံ၊ ငွေရည်ပုလဲကုမ္ပဏီ၊ နောင်ချိုဖြို့နယ်။	**Reg no:** 069/2019
Site Name: Blow Down	

Analyses	Ref: Value	Unit	Results	Method
Oil and Grease	10	mg/L	4.05	*Standard method For Water and Waste Water Analysis*

Reference: National Environmental Quality (Emission) Guidelines

Tested by	Checked by	Signed by
OH (Lab) Daw Ohnmar Htwe MLT-I	Daw Aye Aye Thinn Laboratory Officer	Dr. Kay Khaing Aye Deputy Director Occupational and Environmental Health Division

Occupational and Environmental Health Laboratory

No. (250), Lower Kyeemyindine Rood, Ahlone Township, Yangon, Myanmar.
Tel: +9567-431139, 431138, +951-221387, 210844,
Fax: +9567-431139, +951-223824

Sample Name:	Waste Water	**Received Date:**	14.3.2019
		Reported Date:	19.3.2019
Address:	ဘီလပ်မြေစက်ရုံ၊ ငွေရည်ပုလဲကုမ္ပဏီ၊ နောင်မျိုမြို့နယ်။	**Reg no:**	068/2019
Site Name:	Cooling Water		

Analyses	Ref: Value	Unit	Results	Method
Oil and Grease	10	mg/L	10.58	*Standard method For Water and Waste Water Analysis*

Reference: National Environmental Quality (Emission) Guidelines

Tested by	Checked by	Signed by
OH (Lab) Daw Ohnmar Hla MLT-I	Daw Aye Aye Thinn Laboratory Officer	Dr. Kay Khaing Aye Deputy Director Occupational and Environmental Health Division

Occupational and Environmental Health Laboratory

No. (250), Lower Kyeemyindine Rood, Ahlone Township, Yangon, Myanmar.
Tel: +9567-431139, 431138, +951-221387, 210844,
Fax: +9567-431139, +951-223824

Sample Name: Waste Water	**Received Date:** 14.3.2019
	Reported Date: 19.3.2019
Address: ဘိလပ်မြေစက်ရုံ၊ ငွေရည်ပုလဲကုမ္ပဏီ၊ နောင်ချိုဖြူနယ်။	**Reg no:** 070/2019
Site Name: Final	

Analyses	Ref: Value	Unit	Results	Method
Oil and Grease	10	mg/L	8.49	*Standard method For Water and Waste Water Analysis*

Reference: National Environmental Quality (Emission) Guidelines

Tested by	Checked by	Signed by
OH (Lab) Daw Ohnmar Hla MLT-I	Daw Aye Aye Thinn Laboratory Officer	Dr. Kay Khaing Aye Deputy Director Occupational and Environmental Health Division

DEPARTMENT OF AGRICULTURE (LAND USE)
WATER ANALYTICAL DATA

MESC (13.3.2019)

Division - ရှမ်းပြည်နယ်
Township - နောင်ရှိုး

Sheet No. 1
Sr No. W 1-3

Sr No.	Sample	Chromium (Cr) mg/kg	Cadmium (Cd) mg/kg	Mercury (Hg) mg/kg
1	Blow down	0.1	Not detected	Not detected
2	Final	0.1	Not detected	Not detected
3	Cooling Tower	0.1	Not detected	Not detected

(ဒေါက်တာသန္တာညီ)
လက်ထောက်ညွှန်ကြားရေးမှူး
ဒုတိယဓါတ်ခွဲခန်းတာဝန်ခံ
မြေအသုံးချရေးဌာနခွဲ

DEPARTMENT OF AGRICULTURE (LAND USE)
WATER ANALYTICAL DATA

MESC (13.3.2019)

Division - ရှမ်းပြည်နယ်

Township - နောင်ရှိုး

Sheet No. 1

Sr No. W 1-2

Sr No.	Sample	Lead (Pb) mg/kg	Cadmium (Cd) mg/kg	Mercury (Hg) mg/kg
1	ခဲဆန်ကျေးရွာ	Not detected	Not detected	Not detected
2	လောက်ဖန်းကျေးရွာ	Not detected	Not detected	Not detected

(ဒေါက်တာသန္တာညီ)
လက်ထောက်သွန်ကြားရေးမှူး
ဒုတိယဓါတ်ခွဲခန်းတာဝန်ခံ
မြေအသုံးချရေးဌာနခွဲ

DEPARTMENT OF AGRICULTURE (LAND USE)
SOIL ANALYTICAL DATA

MESC (13.3.2019)

Division - ရှမ်းပြည်နယ်

Township - နောင်ချို

Sheet No. 1

Sr No. S1-5

Sr No.	Sample	Depth in	Iron (Fe) mg/kg	Mecury (Hg)mg/Kg	Lead (Pb)mg/kg	Cadmium (Cd) mg/kg
1	လောက်ဖန်းကျေးရွာ	0-6"	Not detected	Not detected	6.7	0.78
2	ခဲဆန်ကျေးရွာ	0-6"	Not detected	Not detected	4.65	Not detected
3	လယ်ကြီးတောကျေးရွာ	0-6"	33.9	Not detected	4.15	Not detected
4	လောက်ဖန်းပြောင်းခင်း	0-6"	Not detected	Not detected	11.85	Not detected
5	final	0-6"	28.71	Not detected	15.9	Not detected

(ဒေါက်တာသန္တာညီ)
လက်ထောက်ညွှန်ကြားရေးမှူး
ဒုတိယဓါတ်ခွဲခန်းတာဝန်ခံ
မြေအသုံးချရေးဌာနခွဲ

Analysis Report

THE GOVERNMENT OF THE REPUBLIC OF THE UNION OF MYANMAR
MINISTRY OF EDUCATION
DEPARTMENT OF RESEARCH AND INNOVATION
ANALYSIS DEPARTMENT
No.(6) KABA AYE PAGODA ROAD, YANGON

Reference: Myanmar Environment Sustainable Conservation Co., Ltd

Sample: ဓာရွတ်

RESULT

Sample No.		1791/18-19
Job No.		J-1778
Sample Marked.		S4
Iron as Fe	(mg/kg)	531.36
Lead as Pb	(mg/kg)	1.45
Cadmium as Cd	(mg/kg)	0.542
Chromium as Cr	(mg/kg)	3.47

Not a Certificate of Conformance
စံချိန်စံညွှန်းကိုက်ညီကြောင်းထောက်ခံချက်မဟုတ်ပါ

Remark: *Result valid for the received sample only.*

Method/ Equipment used: A.O.A.C, F.A.A.S

Tested by: Daw Htike Htike Oo

Daw Cho Tha Zin Min

Checked by: Dr. Khin Aye Tue

Technical Director: U Win Khaing Moe

Our Reference: G 12

Date: 26.3.19

Analysis Report

THE GOVERNMENT OF THE REPUBLIC OF THE UNION OF MYANMAR
MINISTRY OF EDUCATION
DEPARTMENT OF RESEARCH AND INNOVATION
ANALYSIS DEPARTMENT
No.(6) KABA AYE PAGODA ROAD, YANGON

Reference: Myanmar Environment Sustainable Conservation Co., Ltd

Sample: အရွက်

RESULT

Sample No.		1790/18-19
Job No.		J-1777
Sample Marked.		S3
Iron as Fe	(mg/kg)	53.52
Lead as Pb	(mg/kg)	0.702
Cadmium as Cd	(mg/kg)	0.406
Chromium as Cr	(mg/kg)	2.11

Not a Certificate of Conformance
စံချိန်စံညွှန်းကိုက်ညီကြောင်းထောက်ခံချက်မဟုတ်ပါ

Remark: *Result valid for the received sample only.*

Method/ Equipment used: A.O.A.C, F.A.A.S

Tested by: Daw Htike Htike Oo

Daw Cho Tha Zin Min

Checked by: Dr. Khin Aye Tue

Technical Director: U Win Khaing Moe

Our Reference: G12

Date: 26.3.19

Analysis Report

THE GOVERNMENT OF THE REPUBLIC OF THE UNION OF MYANMAR
MINISTRY OF EDUCATION
DEPARTMENT OF RESEARCH AND INNOVATION
ANALYSIS DEPARTMENT
No.(6) KABA AYE PAGODA ROAD, YANGON

Reference: Myanmar Environment Sustainable Conservation Co., Ltd

Sample: အရွက်

RESULT

Sample No.		1789/18-19
Job No.		J-1776
Sample Marked.		S2
Iron as Fe	(mg/kg)	41.31
Lead as Pb	(mg/kg)	0.646
Cadmium as Cd	(mg/kg)	0.251
Chromium as Cr	(mg/kg)	1.11

Not a Certificate of Conformance
စံချိန်စံညွှန်းကိုက်ညီကြောင်းထောက်ခံချက်မဟုတ်ပါ

Remark: *Result valid for the received sample only.*

Method/ Equipment used: A.O.A.C, F.A.A.S

Tested by: Daw Htike Htike Oo

Daw Cho Tha Zin Min

Checked by: Dr. Khin Aye Tue

Technical Director: U Win Khaing Moe

Our Reference: 612

Date: 26.3.19

Analysis Report

THE GOVERNMENT OF THE REPUBLIC OF THE UNION OF MYANMAR
MINISTRY OF EDUCATION
DEPARTMENT OF RESEARCH AND INNOVATION
ANALYSIS DEPARTMENT
No.(6) KABA AYE PAGODA ROAD, YANGON

Reference: Myanmar Environment Sustainable Conservation Co., Ltd

Sample: အရွက်

RESULT

Sample No.		1788/18-19
Job No.		J-1775
Sample Marked.		S1
Iron as Fe	(mg/kg)	43.00
Lead as Pb	(mg/kg)	0.838
Cadmium as Cd	(mg/kg)	0.364
Chromium as Cr	(mg/kg)	1.06

Not a Certificate of Conformance
စံချိန်စံညွှန်းကိုက်ညီကြောင်းထောက်ခံချက်မဟုတ်ပါ

Remark: *Result valid for the received sample only.*

Method/ Equipment used: A.O.A.C, F.A.A.S

Tested by: Daw Htike Htike Oo

Daw Cho Tha Zin Min

Checked by: Dr. Khin Aye Tue

Technical Director: U Win Khaing Moe

Our Reference: G12

Date: 26.3.19

HJ/T 76-2007

Flue gas emission continuous monitoring time average report

COMPANY: NGWE YI PALE CEMS

POLLUTION SOURCE: Chimney Monitoring

监测年份: 10.12.2021

TIME	dust			SO2			NOX			FLOW	O2	TEM	H2O	负荷	备注
		conversion			conversion			conversion		X10000					
	mg/Nm3	mg/Nm3	t/a	mg/Nm3	mg/Nm3	t/a	mg/Nm3	mg/Nm3	t/a	Nm3/h	%	℃	%	%	
0 -1	43	41.25	9.77	86.12	106.25	2.95	123.76	160.75	28.03	226715	5.91		6		
1 -2	43	40.69	9.71	101.01	140.02	2.93	122.30	160.11	27.52	224908	5.90	87.27	6		
2 -3	39	36.45	8.27	89.40	120.90	2.76	121.84	160.05	25.89	212515	5.89	86.41	6		
3 -4	36	25.21	6.95	88.20	119.52	2.52	121.80	145.22	38.42	194160	3.99	84.27	6		
4 -5	35	23.89	6.75	89.40	119.82	2.52	130.66	150.21	42.37	193750	4.55	83.03	6		
5 -6	35	24.12	6.55	96.12	105.36	2.45	151.20	170.45	34.68	188764	5.65	82.65	6		
6 -7	35	23.88	6.49	96.32	104.29	2.45	144.32	171.46	27.18	187940	5.65	81.18	6		
7 -8	34	23.89	6.57	98.11	112.80	2.54	101.12	130.28	19.77	196344	5.24	81.07	6		
8 -9	35	24.55	7.12	97.21	110.35	2.64	80.89	120.55	18.45	200030	4.79	82.00	6		
9 -10	35	25.61	6.95	98.11	109.23	2.61	89.59	122.69	19.57	206682	4.83	82.27	6		
10 -11	35	25.22	7.26	89.40	100.21	2.70	96.76	119.98	20.09	207659	4.85	82.78	6		
11 -12	33	21.23	7.18	89.21	98.99	2.76	138.54	160.25	33.72	212195	5.46	82.73	6		
12 -13	34	23.78	7.34	100.50	120.78	2.82	120.16	140.90	36.94	217383	5.00	83.22	6		
13 -14	35	24.69	7.73	101.00	130.25	2.88	151.68	172.00	33.59	221676	5.48	84.69	6		
14 -15	34	23.95	7.60	106.13	122.53	2.89	167.32	171.32	37.25	222371	5.88	84.72	6		
15 -16	38	28.97	8.65	101.02	132.18	3.03	123.90	150.23	28.42	223984	5.62	86.36	6		
16 -17	41	40.01	9.68	98.42	110.28	3.10	129.90	150.33	30.91	230152	5.42	88.02	6		
17 -18	41	38.25	9.43	89.24	108.72	3.07	124.07	174.20	31.62	225966	5.58	88.71	6		
18 -19	37	27.58	8.12	86.32	106.28	2.85	124.97	160.23	37.44	219405	5.92	87.37	6		
19 -20	38	28.96	8.28	78.20	106.87	2.90	101.20	120.26	28.58	223278	4.20	86.38	6		
20 -21	40	38.21	8.95	75.80	96.98	2.91	121.88	140.85	45.65	223904	4.66	85.95	6		
21 -22	41	40.29	9.09	78.16	99.25	2.88	121.91	150.35	44.03	221318	4.86	85.91	6		
22 -23	41	39.55	8.98	79.54	105.30	2.89	145.20	170.80	39.65	222506	5.86	85.82	6		
23 -24	43	39.58	8.91	78.98	100.24	2.97	130.64	160.22	28.82	220906	5.72	85.72	6		
平均值	37	30	8	90	113	3	126	152	32	214471	5	85	6		
最小值	33	21	6	76	99	2	81	120	18	187940	4	81	6		
最大值	43	41	10	106	140	3	167	174	46	230153	6	89	6		
样本数	24	24	24	24	24	24	24	24	24	24	24	23	24		
年排放量			193			67			780	314230					

烟气年排放总量单位:x 10000m3/年

上报单位(盖章): 单位负责人: 报告人: 报告日期: 年 月 日

ငွေရည်ပုလဲဘိလပ်မြေကုမ္ပဏီလီမိတက်

နောင်ချိုမြို့နယ်အတွက် ဒေသဖွံ့ဖြိုးရေးလှူဒါန်းဆောင်ရွက်ချက်များ
(၂၀၁၂ မှ ၂၀၁၆ အထိ)

လူမှုရေး

စဉ်	အကြောင်းအရာ	လှူဒါန်းငွေ (ကျပ်)
1	ဂန်ထမ်းများနှင့် ကျေးရွာလူထုအတွက် ဆေးပေးခန်း	၁၀,၃၂၉,၀၀၀
2	လောက်ဖန်းကျေးရွာ မီးလင်းရေးအတွက် Transformer လှူဒါန်းခြင်း	၆,၀၀၀,၀၀၀
3	လောက်ဖန်းကျေးရွာ နေအိမ်လျှပ်စစ်မီးသွယ်တန်းခြင်း	၄,၃၇၇,၀၀၀
4	လောက်ဖန်းကျေးရွာ အများသုံးရေချိုးကန်	၂၂၃,၀၀၀
5	လောက်ဖန်းကျေးရွာ လမ်းမီးသွယ်တန်းခြင်း	၅၆၆,၀၀၀
6	လောက်ဖန်းဘုန်းတော်ကြီးကျောင်း (ကုဋီ)နှင့် ရေကန်	၁၁၅,၀၀၀
7	လုံရုံးကျေးရွာ အုပ်ချုပ်ရေးရုံး	၄၄၈,၀၀၀
8	လောက်ဖန်းဘုန်းကြီးကျောင်း ဆွမ်းကပ်နှင့်ရွာသားများ ထမင်းကျွေးခြင်း။	၁,၃၇၅,၀၀၀
9	လောက်ဖန်းဘုန်းကြီးကျောင်း အလှူပေးခြင်း (ဆန်+ဆီ+ဆား+ကြက်သွန်)	၁၆၈,၀၀၀
10	လောက်ဖန်းဘုန်းကြီးကျောင်း 2 ခန်းတွဲ+4 ခန်းတွဲအိမ်သာ ဆောက်လုပ်ခြင်းနှင့် လျှောက်လမ်းတို လုပ်အားခပေးခြင်း	၅,၅၀၀,၀၀၀
11	လောက်ဖန်းဘုန်းကြီးကျောင်း ဆွမ်းစားဆောင် ဆောက်လုပ်ခြင်း	၄,၀၇၈,၀၀၀
12	လောက်ဖန်းကျေးရွာ အများသုံးရေချိုးကန် + ကျွဲ၊ နွားသောက်ရေကန်	၂၁၇,၀၀၀
13	ကျောက်ကြမ်းရွာမီးလင်းရေးအတွက် Transformer လှူဒါန်းခြင်း	၇,၆၀၀,၀၀၀
14	လောက်ဖန်းကျေးရွာသောက်သုံးရေအတွက် အင်္ဂိစိတ္တင်းနှင့် ရေကန်	၅,၂၅၀,၀၀၀
15	သဖန်းကိုင်းဘုန်းကြီးကျောင်း မဟာဗောဓိအရံစေတီတစ်ဆူ လှူဒါန်းခြင်းနှင့် လမ်းခင်းပေးခြင်း	၁,၃၀၀,၀၀၀
16	စက်ရုံမြေတိုးချဲ့ဇရိယာ မြေဝယ်ကိစ္စအတွက် ကျေးရွာရန်ပုံငွေပေးခြင်း (ခဲဆန်)	၂၇၀,၀၀၀
17	ခဲဆန်ဘုန်းကြီးကျောင်း ဆွမ်းကပ်နှင့် ရွာသူ/သားများ ထမင်းကျွေးခြင်းစရိတ်	၉၄၀,၀၀၀
18	သပြေဒိုးကျေးရွာ အင်္ဂိစိတ္တင်း တူးဖော်လှူဒါန်းပေးခြင်း	၁,၅၀၀,၀၀၀
19	သပြေဒိုးကျေးရွာ ရေကန်ဆောက်လုပ်လှူဒါန်းပေးခြင်း	၂,၁၀၀,၀၀၀
20	မီးသတ်ဦးစီးဌာနသို့ အလှူငွေထည့်ဝင်ခြင်း	၁၀၀,၀၀၀
21	နောင်ချိ ရဲစခန်းသို့ ဗလာစာအုပ်လှူဒါန်းခြင်း (40 ဒါဇင် x 2100)	၈၄,၀၀၀
22	21 ကြိမ်မြောက် မြန်မာတိုင်းရင်းသားတို့၏ ရိုးရာယဉ်ကျေးမှုပြိုင်ပွဲ အလှူငွေ လှူဒါန်းခြင်း	၃၀၀,၀၀၀
23	မြို့နယ်အထောက်အကူပြု ပတ်ဝန်းကျင်စိမ်းလန်းစိုပြေရေးအတွက် ထောက်ပံ့စရိတ် ပေးခြင်း။	၁,၀၀၀,၀၀၀

24	စစ်ကိုင်းတိုင်း ရေဘေးသင့်သူများအတွက် လှူဒါန်းငွေပေးခြင်း	၁,၀၀၀,၀၀၀
25	2013 ခုနှစ် နှစ်ဆန်းတစ်ရက်နေ့ ရွာလုံးကျွတ်ထမင်းကျွေးခြင်း (လောက်ဖန်း)	၁,၅၀၀,၀၀၀
26	2013 ခုနှစ် သီတင်းကျွတ်လပြည့်နေ့ ရွာလုံးကျွတ် ထမင်းကျွေးခြင်း (လောက်ဖန်း)	၁,၅၀၀,၀၀၀
27	2013 ခုနှစ် တန်တောင်မုန်းလပြည့်နေ့ ရွာလုံးကျွတ် ထမင်းကျွေးခြင်း (လောက်ဖန်း)	၁,၅၀၀,၀၀၀
28	2014 ခုနှစ် နှစ်ဆန်းတစ်ရက်နေ့ ရွာလုံးကျွတ် ထမင်းကျွေးခြင်း (လောက်ဖန်း)	၁,၅၀၀,၀၀၀
29	2014 ခုနှစ် သီတင်းကျွတ်လပြည့်နေ့ ရွာလုံးကျွတ် ထမင်းကျွေးခြင်း (လောက်ဖန်း)	၁,၅၀၀,၀၀၀
30	2014 ခုနှစ် တန်ဆောင်မုန်းလပြည့်နေ့ ရွာလုံးကျွတ် ထမင်းကျွေးခြင်း (လောက်ဖန်း)	၁,၀၀၀,၀၀၀
31	2015 ခုနှစ် နှစ်ဆန်းတစ်ရက်နေ့ ရွာလုံးကျွတ်ထမင်းကျွေးခြင်း (လောက်ဖန်း/ခဲဆန်)	၂,၃၁၁,၀၀၀
32	နမ္မကျောက်မီးသွေးမိုင်း ၀န်ထမ်းများ လက်ဆောင်ပေးခြင်း	၁၇,၀၀၀
33	လောက်ဖန်းဘုန်းကြီး ဆွမ်းကပ်ခြင်းနှင့် ရွာလုံးကျွတ် ထမင်းကျွေးခြင်း (သီတင်းကျွတ်)	၁,၇၃၂,၀၀၀
34	ကျောက်ခေါင်းဘုန်းကြီးကျောင်း သီတင်းကျွတ်လှူဒါန်းခြင်း	၁၀၀,၀၀၀
35	သီတင်းကျွတ်လပြည့်ဘုန်းကြီးကျောင်း (၇)ကျောင်းသို့ ဆန်(13x23350Ks) လှူဒါန်းခြင်း	၃,၀၃၀,၀၀၀
36	ပို့/ဆက်ရုံး ပဒေသာပင်ပြုလုပ်ပေးခြင်း	၁၅,၀၀၀
37	ကျေးရွာမဲရုံအဖွဲ့ဝင် (၂၆)ဦးအဖွဲ့အား ထမင်းကြော် နေ့/ည ကျွေးမွေးခြင်းစရိတ်	၇၈,၀၀၀
38	သံသရာအေးစေတီ ဗုဒ္ဓပူဇနိယပွဲတော် အလှူငွေပေးအပ်ခြင်း	၃၀၀,၀၀၀
39	ငုကွေ့လေး မီးလင်းရေး Transformer လှူဒါန်းခြင်း	၅,၁၄၅,၀၀၀
40	ငုကွေ့လေး မီးလင်းရေးပစ္စည်းများ လှူဒါန်းခြင်း	၁,၂၈၅,၀၀၀
41	အမှတ်(၁၁၅)ခြေမြန်တပ်ရင်းသို့ ဘိလပ်မြေ(၁၅၀)အိတ် လှူဒါန်းခြင်း	၆၉၀,၀၀၀
42	အမှတ်(၁၁၄)ခြေမြန်တပ်ရင်း သို့ ဘိလပ်မြေ(၅၀)အိတ် လှူဒါန်းခြင်း	၂၃၀,၀၀၀
43	ကုန်းစံရွာ၊ လုံရုံးအုပ်စု မီးလင်းရေးအလှူငွေ	၅၀၀,၀၀၀
44	နောင်ချိုမြို့နယ်လုံးဆိုင်ရာ ဘုံကထိန်အလှူငွေ ပေးအပ်ခြင်း	၁၀၀,၀၀၀
45	လောက်ဖန်းဘုန်းကြီးကျောင်း ပဒေသာပင်လှူဒါန်းခြင်း(ညှပ်မကြီး)	၈၀၀,၀၀၀
46	ဘုံကထိန်အတွက် လောက်ဖန်းရွာအဖွဲ့အား ကျွေးခြင်း	၇၁၀,၀၀၀
47	ဘုံကထိန်အတွက် လောက်ဖန်းကျောင်းပင့်သံဃာ (၄၂)ပါးလှူဒါန်းခြင်း	၁,၃၃၃,၀၀၀
48	ဗုဒ္ဓပူဇနိယပွဲတော်သံဃာ ၈၀ နှင့် သီလရှင် ၉၀ အားပထွေငွေလောင်းလှူခြင်း	၁၇၀,၀၀၀
49	မြိုင်ကြီးကွေ့အနီး ဂိဇ္ဈာစရတောရကျောင်းဆောင်သစ် ဆောက်လုပ်ခြင်းအတွက် လှူဒါန်းခြင်း	၅၀၀,၀၀၀
50	ဗုဒ္ဓပူဇနိယပွဲတော်တွင် သံဃာတော်များ ဆွမ်းလောင်းလှူရန်။ 4အိတ်x23350	၉၃,၀၀၀
51	သဖန်းကိုင်းဘုန်းတော်ကြီးကျောင်း ဆွမ်းကပ်လှူဒါန်းရန်။	၄၀၀,၀၀၀
52	မီးဘေးသင့် ပြည်သူများအား လှူဒါန်းခြင်း။ နမ့်ဆန် MD-Pass	၁,၁၀၀,၀၀၀
53	နောင်ချို သံဃာတော်များအား လှူဖွယ်ပစ္စည်းလောင်းလှူရန်အတွက် ပစ္စည်းများ ၀ယ်ယူခြင်း။	၁,၀၂၀,၀၀၀
54	ကျောက်ကြမ်းဘုန်းကြီးကျောင်းအလှူ	၃၀၄,၀၀၀
55	ရွာထဲဆေးခန်းအတွက် ဆေးတင်စင်တန်းလျားနှင့် စားပွဲပြုလုပ်ရန်	၁၇၀,၀၀၀
56	ရွာထဲဆေးခန်းအတွက် ဆေးပစ္စည်းတင်စင်ပြုလုပ်	၈၄၉,၀၀၀

57	(2/2016)နောင်ချိုပြည်သူဆေးရုံ အလှူငွေပေးခြင်း	၁၀၀,၀၀၀
58	နောင်ချိုမြို့နယ်ထွေ/အုပ်ရုံးသို့ သင်္ကြန်အလှူငွေ လှူဒါန်းခြင်း။ စက်ရုံ-500000	၅၀၀,၀၀၀
59	ပင်တီးရွာဘုန်းကြီးကျောင်း ခြံစည်းရိုးကာရံခြင်း လုပ်အားခ။	၈၂၃,၀၀၀
60	ယင်းဂူပင်ရွာလမ်းဖွင့်ပွဲနှင့် ဘုန်းကြီး(၁၀)ပါး ဟတ္ထငွေကပ်ခြင်း	၅၀,၀၀၀
61	(3/2016)နောင်ချိုပြည်သူ့ဆေးရုံသို့ လှူဒါန်းငွေပေးခြင်း	၁၀၀,၀၀၀
62	နှစ်ဆန်း(၁)ရက်နေ့ လောက်ဖန်းဘုန်းကြီးကျောင်း ဆွမ်းကပ်ခြင်းနှင့် ရွာသူ/သား စက်ရုံဝန်ထမ်းများ ထမင်းကျွေးကုသိုလ်ပြုစရိတ် (11.4.2016 မှ 17.4.2016 ထိ)	၁,၄၅၅,၀၀၀
63	(4/2016) နောင်ချိုမြို့ ပြည်သူ့ဆေးရုံသို့လှူဒါန်းငွေပေးခြင်း	၁၀၀,၀၀၀
64	မီးသတ်ရုံး အလှူငွေပေးခြင်း	၁၀၀,၀၀၀
65	စေတနာမွန် နာရေးကူညီမှုအသင်း ကားအသုံးပြုခနှင့် အလှူငွေပေးခြင်း။ (နောင်ချို-ကျောက်မဲ)	၂၀၀,၀၀၀
66	(5/2016)နောင်ချိုပြည်သူ့ဆေးရုံသို့ လစဉ်ထောက်ပံ့ငွေ လှူဒါန်းခြင်း။	၁၀၀,၀၀၀
67	ခဲဆန်ရွာဘုန်းကြီးကျောင်း ဆွမ်းနှင့် ရွာသူ/ရွာသားများအား ထမင်းကျွေး ကုသိုလ်ပြုခြင်း။	၁,၂၈၄,၀၀၀
68	သဖန်းကိုင်းဘုန်းကြီးကျောင်း လှူဖွယ်ပစ္စည်းများ လှူဒါန်းခြင်း။	၂၈၀,၀၀၀
69	မြိုင်ကြီးဂိဇ္ဇာစရတောရကျောင်း သိမ်ဆင်းလောင်းလှူခြင်းနှင့် သံဃာဝေယျာဝစ္စ လှူဒါန်းခြင်း	၁၅၀,၀၀၀
70	ဆေးရုံ ဆေးပဒေသာပင်နှင့် နာရေးကူညီမှုအသင်းသို့ လှူဒါန်းငွေပေးအပ်ခြင်း။ (၂၀၁၆-ခုနှစ်)	၁,၆၅၀,၀၀၀
71	နောင်ချိုမြို့ ဘိုးဘွားရိပ်သာ အဆောင်တစ်ဆောင် လှူဒါန်းခြင်း	၁၅,၀၀၀,၀၀၀
72	သဖန်းကိုင်း ဘုန်းကြီးကျောင်း နေ့ဆွမ်းကျွေး၊ လှူဖွယ်ပစ္စည်းနှင့် စာရေးကိရိယာ လှူဒါန်းခြင်း	၈၇၃,၀၀၀
73	သဖန်းကိုင်းဘုန်းကြီး နိုင်ငံခြားသွားရန်အတွက် အလှူငွေကပ်လှူခြင်း	၅၀၀,၀၀၀
74	တဲတိုက်ဘုန်းကြီးကျောင်း လှူဖွယ်ပစ္စည်းများ လှူဒါန်းခြင်း	၄၈၈,၀၀၀
75	နောင်ချိ ခြင်ဆေးဖျန်းအဖွဲ့ (အင်းစိမ်းမြေ) ရန်ပုံငွေ။ (၂၀.၇.၂၀၁၆ မှ ၂၁.၇.၂၀၁၆)	၂၀၀,၀၀၀
76	စက်ရုံပတ်ဝန်းကျင်ရှိ ဘုန်းကြီးကျောင်း(၈)ကျောင်းသို့ ဆန်လှူဒါန်းခြင်း (23.8.2016)	၂၅၆,၀၀၀
77	နောင်ချိုကန်ကြီးရွာ သာသနာ့ကျောင်းဆောင် လှူဒါန်းခြင်း	၂၄၀,၀၀၀
78	ငွေရည်ပုလဲကုမ္ပဏီအုပ်စုမှ နောင်ချိုမြို့နယ်လုံးဆိုင်ရာ ဘုံကထိန် အလှူငွေ ပေးခြင်း (၂၉.၁၁.၂၀၁၆)	၁,၀၀၀,၀၀၀
79	တန်ဆောင်တိုင်လပြည့် လောက်ဖန်းဘုန်းကြီးကျောင်း ကထိန်အလှူ အတွက် ကုန်ကျစရိတ်ပေးခြင်း (၁၄.၁၁.၂၀၁၆)	၃,၅၅၁,၅၅၀
80	နောင်ချိုမြို့နယ် မဟာဘုံကထိန်အတွက် ပဒေသာပင်လှူဒါန်းခြင်း (၁၈.၁၁.၂၀၁၆)	၁၁၃,၀၀၀
	စုစုပေါင်း	**၁၇၁,၁၃၂,၇၅၀**

ပညာရေး

စဉ်	အကြောင်းအရာ	လျှာဒါန်းငွေ (ကျပ်)
1	လောက်ဖန်းစာသင်ကျောင်း (အဆောင်-၁)	၂၀,၀၀၀,၀၀၀
2	လောက်ဖန်းစာသင်ကျောင်း (၄)ခန်းတွဲ ကျောင်းအိမ်သာနှင့် ရေကန်	၈,၃၀၀,၀၀၀
3	လောက်ဖန်းစာသင်ကျောင်း စာရေးခုံ+ထိုင်ခုံ	၃,၈၀၀,၀၀၀
4	နမ့်ကယ်အိုက်၊ ပင်တီး၊နောင်ကွမ်ကျောင်း စာရေးခုံ၊ စာသင်ခုံ၊ ကျောက်သင်ပုန်း၊ အလံတိုင်	၂,၈၀၀,၀၀၀
5	လယ်ကြီးတောစာသင်ကျောင်း၊ (၄)ခန်းတွဲ ကျောင်းအိမ်သာ+ရေကန်+စာရေးခုံ+ထိုင်ခုံ+ဘီရို	၃၅,၅၀၀,၀၀၀
6	ထပ်တိုးလောက်ဖန်းစာသင်ကျောင်း (အဆောင်-၂)	၁၈,၁၀၁,၀၀၀
7	လောက်ဖန်းစာသင်ကျောင်း သောက်ရေစင် (Steel)	၂၅၀,၀၀၀
8	လောက်ဖန်းကျောင်းရှိ ဆရာမများနှင့် စတုတ္ထတန်းအောင် ကျောင်းသူ/သား ထောက်ပံ့စရိတ်။	၆၃၀,၀၀၀
9	ပညာရေးဖောင်ဒေးရှင်းအတွက် ဘိလပ်မြေစက်ရုံမှ လှူဒါန်းငွေပေးခြင်း	၁,၁၄၀,၀၀၀
10	2015- ပညာသင်နှစ် လောက်ဖန်းကျေးရွာမှ နောင်ချိုဒေါ်စိန်ဌေး အဆောင်နေ ကျောင်းသား/သူ ထောက်ပံ့စရိတ်။	၂၈၈,၀၀၀
11	ကျောင်းသူ/သားများ ပေတံ၊ ခဲတံ ပေးဆေရာတွင် မလောက်၍ ထပ်မံဝယ်ယူခြင်း စရိတ်။	၇,၀၀၀
12	ကျောင်းသူ/သားများ (ခဲတံ၊ ခဲဖျက်၊ ပေတံ)ပေးရာ မလောက်၍ ပြန်ဝယ်ယူခြင်း။	၂၃,၀၀၀
13	စာသင်ကျောင်းများသို့ စာအုပ်၊ ခဲတံနှင့် စာရေးကိရိယာ လှူဒါန်းခြင်းစရိတ်။	၁၆၀,၀၀၀
14	လောက်ဖန်းစာသင်ကျောင်း ဝတ်စုံလှူဒါန်းခြင်း။	၃၄၀,၀၀၀
15	လောက်ဖန်း၊ ပင်တီး၊ ခဲဆန်၊ နောင်ကွမ်၊ နမ့်ကယ်အိုက်၊ လယ်ကြီးတော၊ ကျောက်ကြမ်း စာသင်ကျောင်းများသို့ ဗလာစာအုပ်၊ ကွန်ပါဗူး၊ ခဲတံ၊ ခဲဖျက် လှူဒါန်းခြင်း	၉၅၀,၀၀၀
16	2014 ခုနှစ် ပတ်ဝန်းကျင်ကျေးရွာများမှ နောင်ချိုတွင် အဆောင်နေပညာသင် ကျောင်းသား/သူများအား ထောက်ပံ့ခြင်း။	၅၀၄,၀၀၀
17	ပတ်ဝန်းကျင်ဘုန်းကြီးကျောင်း၊ စာသင်ကျောင်းများအား ဘိလပ်မြေအိတ် လှူဒါန်းခြင်း။	၂,၈၅၂,၀၀၀
18	ခဲဆန်/အင်ကြင်းကုန်း/အနောက်ကုန်းဘောင်ကြီး (အ.မက) ဗီဒိုကြီး(၁)၊ စာသင်ခုံ(၂၅)စုံ	၂,၂၇၀,၀၀၀
19	ကျောက်ကြမ်းစာသင်ကျောင်း (၈)ခန်းတွဲ ကျောင်းအိမ်သာ	၅,၂၀၀,၀၀၀
20	သဖန်းကိုင်း ပရဟိတကျောင်းသို့ လှူဒါန်းခြင်းစရိတ် (ဆန်+ဆီ+ဆား+ကြက်သွန်)	၁၃၅,၀၀၀
21	MD မှ သဖန်းကိုင်းပရဟိတကျောင်းရှိ ကိုရင်+ကျောင်းသားများအား လှူဒါန်းငွေပေးခြင်း။	၂၅၀,၀၀၀
22	သဖန်းကိုင်း ပရဟိတဘုန်းတော်ကြီးကျောင်းသို့ လှူဒါန်းငွေပေးခြင်း။	၂၈၀,၀၀၀
23	သဖန်းကိုင်း ပရဟိတကျောင်းအတွက် အသုံးအဆောင်ပစ္စည်းများ လှူဒါန်းခြင်း။	၁၀၀,၀၀၀
24	သဖန်းကိုင်းကျောင်းနှင့် စက်ရုံပတ်ဝန်းကျင်ရှိ စာသင်ကျောင်းမှ ဆရာ၊ ဆရာမ (၆၈)ဦး အား ချီးမြှင့်ငွေ (သံဃာတော်/ဆရာကြီး/ဆရာမကြီး - 10ဦး x 20000/ ဆရာ/ဆရာမ -	၇၈၀,၀၀၀
25	ခဲဆန်၊ အင်ကြင်းကုန်း၊ အနောက်ကုန်းတောင်ကြီး စာသင်ကျောင်း စာရေးခုံ+ထိုင်ခုံ+ဘီရို	၂,၂၀၀,၀၀၀

26	နောင်ကွမ် စာသင်ကျောင်း ဆောက်လုပ်ခြင်း	၈,၀၀၀,၀၀၀
27	၂၀၁၂-ခုနှစ် ပညာသင်နှစ်အတွက် ပတ်ဝန်းကျင်ကျေးရွာကျောင်းများသို့ ကျောင်းသုံး စာရေးကိရိယာနှင့် ဆရာ/ဆရာမများအတွက် ကျောင်းဝတ်စုံ ထောက်ပံ့ခြင်း	၇၀၀,၀၀၀
28	ငုကွေးကျောင်းမှ ဆရာ/ဆရာမများအတွက် ထောက်ပံ့စရိတ်ပေးခြင်း။	၇၀,၀၀၀
29	လောက်ဖန်း ဆရာမနေအိမ်+အိမ်သာ(၂)လုံး ဆောက်လုပ်လျှုဒါန်းခြင်း။	၁၂,၆၀၀,၀၀၀
30	ခဲဆန် စာသင်ကျောင်း ဆောက်လုပ်ခြင်း။	၉,၀၀၀,၀၀၀
31	ကျောက်ကြမ်း ဆရာမနေအိမ်နှင့် အိမ်သာ ဆောက်လုပ်လျှုဒါန်းခြင်း။	၁၅,၅၀၀,၀၀၀
32	လားရှိုး နည်းပညာတက္ကသိုလ်မှ ကျောင်းသား/သူများ မိတ်ဆုံစားပွဲ ဧည့်ခံစရိတ်ပေးခြင်း။	၄,၂၃,၀၀၀
33	114 Army သို့စာသင်ခုံပြုလုပ်ပေးခြင်း။	၈၁၀,၀၀၀
34	ခဲဆန်(အမက)ပညာရည်ချန်ဆုပေးပွဲ ချီးမြှင့်ငွေပေးခြင်း။	၂၀၀,၀၀၀
35	လောက်ဖန်းစာသင်ကျောင်း ပညာရည်ချန်ဆုပေးပွဲ ချီးမြှင့်ငွေပေးခြင်း။	၃၀၀,၀၀၀
36	ဒေသန္တရပစ္စည်းများ ဝယ်ယူခြင်း။ Solar 150W, Battery Panasonic, ဗဟို 500W, ကြိုး(လယ်ကြီးတော အ.မ.က(ခွဲ)ကျောင်းအသုံးပြုရန်)	၂၉၉,၀၀၀
37	(1/2016 မှ 6/2016)ထိ လောက်ဖန်းဆရာမများအား ထောက်ပံ့ငွေပေးခြင်း 1 ဦး x 15000၊ 5 ဦး x 10000	၃၂၅,၀၀၀
38	ဆိပ်ဖူးတောင် ဘုန်းကြီးစာသင်ကျောင်း ကလေးသူငယ်များအတွက် အာဟာရဒါန လျှုဒါန်းခြင်း။	၁၀၀,၀၀၀
39	ခဲဆန် စာသင်ကျောင်း စားပွဲ/စာသင်ခုံနှင့် စတိုပစ္စည်းတင်စင်	၆၉၈,၀၀၀
40	ခဲဆန် စာသင်ကျောင်းစားပွဲ/စာသင်ခုံလုပ်	၁၁,၀၀၀
42	ငုကွေးကျေးရွာ ဆရာမများအတွက် နှစ်ခန်းတွဲအိမ်သာ တည်ဆောက်ခြင်း လုပ်အားခ	၅၅၇,၀၀၀
43	ငုကွေးကျေးရွာ ဆရာမများအတွက် နေအိမ်တည်ဆောက်ခြင်းလုပ်အားခ	၁,၅၄၈,၀၀၀
44	ပင်တီးကျေးရွာ ဆရာမများအတွက် နှစ်ခန်းတွဲအိမ်သာနှင့် ရေကန်တည်ဆောက်ခြင်း လုပ်အားခ။	၇၆၃,၀၀၀
46	2016-2017 ခုနှစ်တွင် ပညာရေးဖောင်ဒေးရှင်း ရန်ပုံငွေ လှုဒါန်းခြင်း (ငွေရည်ပုလဲ ပညာရေးဖောင်ဒေးရှင်း)	၁၀၂,၃၂၈,၀၀၀
48	2016-ခုနှစ် ဝန်ထမ်းသားသမီးများ ပညာသင်စရိတ်ငွေ ပေးခြင်း။	၁၆,၂၆၀,၀၀၀
50	ခ.မ.ရ (၁၁၄)တပ်ရင်း စာသင်ခုံ လှုဒါန်းခြင်း။	၁,၂၀၀,၀၀၀
51	ပတ်ဝန်းကျင်ကျေးရွာရှိ ကျောင်း(၇)ကျောင်း စာရေးကိရိယာလှုဒါန်းခြင်း။	၄,၈၁၃,၀၀၀
52	ကံကြီးသီလရှင်ကျောင်းအတွက် စာရေးကိရိယာနှင့် လှုဖွယ်ပစ္စည်းများ လှုဒါန်းခြင်း (2015-2016)	၂,၃၈၁,၀၀၀
53	လောက်ဖန်းကျေးရွာ ကျောင်းဆရာ/ဆရာမများအား ထောက်ပံ့ငွေပေးအပ်ခြင်း (8 ဦး) ၂၀၁၆ ခုနှစ်	၂၅၅,၀၀၀
54	သဖန်းကိုင်း ကျောင်းသူ/သားများ အတွက် လှုဒါန်းငွေ (2015-2016)	၅၀၀,၀၀၀
55	ငုကွေး-၂(အ.မ.က)ကျောင်းသို့ စာရေးကိရိယာနှင့် ဝတ်စုံများထောက်ပံ့ လှုဒါန်းခြင်း	၂၂၂,၀၀၀
	စုစုပေါင်း	**၂၈၆,၄၅၃,၀၀၀**

လမ်းတံတား

စဉ်	အကြောင်းအရာ	လှူဒါန်းငွေ (ကျပ်)
1	လောက်ဖန်းရွာ စာသင်ကျောင်းမှ စက်ရုံမော်တော်ယာဉ်ဂိတ်အထိ (ရွာပတ်လမ်း-ကွေ့အပါ) ကွန်ကရစ်လမ်းခင်းခြင်း	၄၈,၃၀၅,၀၀၀
2	လောက်ဖန်း၊ ခဲဆန်ကျေးရွာ လမ်းသံကူကွန်ကရစ်တံတား ဆောက်လုပ်လှူဒါန်းခြင်း	၄,၀၀၀,၀၀၀
3	ကျောက်ကြမ်းမှ လောက်ဖန်းထိ ကျေးရွာကုန်ထုတ်လမ်း (ကျောက်ကြမ်းလမ်း) ပြုလုပ်ခြင်း	၆၁,၆၀၀,၀၀၀
4	ကျောက်ကြမ်းရွာ ဘုန်းကြီးကျောင်းမှ စက်ရုံဂိတ်(၁)အထိ ကတ္တရာလမ်းခင်းခြင်း။	၃၆၇,၇၇၉,၀၀၀
5	စက်ရုံပတ်လမ်း ကတ္တရာလမ်းခင်းခြင်း (လောက်ဖန်းရွာမှ ဂိတ်-၁ ထိ)	၄၁,၄၆၀,၀၀၀
6	ကတ္တရာ လမ်းခင်းလုပ်သားအဖွဲ့အား ပံ့ပိုးခြင်း အာလူး၊ ကြက်သွန်နီ၊ ကုလားပဲ	၃၀,၀၀၀
7	ဘန့်ဘွေးကျင်း ကျေးရွာကုန်ထုတ်လမ်း တိုးချဲ့ပြုပြင် ပြန်းခင်းပေးခြင်း။	၇,၉၂၀,၀၀၀
8	ငုက္ခလေးကျေးရွာ လမ်းပြုပြင်ခြင်း	၁၁၀,၀၀၀
9	ကျောက်ကြမ်းမှ လောက်ဖန်းထိ ကျေးရွာလမ်း ပြုပြင်ခြင်း	၃၀၀,၀၀၀
	စုစုပေါင်း	**၅၃၁,၅၀၄,၀၀၀**

The following photographs show schools, buildings, roads etc built and donated by the company.

ကျေးရွာအမည် - ဆောက်ဖို့ နေ့စွဲ ၂၄.၇.၁၈

အစည်းအဝေးတက်ရောက်သူများစာရင်း

စဉ်	အမည်	လက်မှတ်	မှတ်ချက်
၁.	ကိုဖြိုးဇော်ဟိန်း		ဒု-ဦးစီး ငွေကုပ်
၂.	ကိုအောင်မြင့်ထွန်း		N.I.D.
၃.	ကိုအောင်လင်းဦး		9B.
၄.	ကိုရန်ဇိုး		
၅.	~~ကို[illegible]~~	ကိုသာထူးဝေ	
၆.	မပုမာ		
၇.	ဦးမောင်ကြည်		
၈.	ဦးရဲထွန်းတင်		
၉.	ကိုဇော်သူ		
၁၀.	ကိုကျော်ဆန်းဝင်း		
၁၁.	ဒေါ်အေးမာကလာ		
၁၂.	ကိုကျော်လင်းထွန်း		
၁၃.	ကိုဆန်းမြင့်		
၁၄.	ကိုကျော်စွာ		
၁၅.	ကိုမိုင်းအောင်		

ကျေးရွာအမည်...ရေလာက်ဖန်း... နေ့စွဲ 28.2.18

အစည်းအဝေးတက်ရောက်သူများစာရင်း

စဉ်	အမည်	လက်မှတ်	မှတ်ချက်
၁၆.	လှရှိန်းမွန်		
၁၇	ဦးဖိုးမိုးအောင်		
၁၈.	လှဝင်းဇော်		
၁၉.	ဦးရဲလှ		
၂၀.	ဦးကာဗိ		ရပ်မိရပ်ဖ
၂၁.	ဦးအောင်ညွှန့်		
၂၂.	ဦးမိုက်ညို (၁)		
၂၃.	ဦးချမ်းသာ		ရပ်မိရပ်ဖ
၂၄.	ဦးမိုက်ညို (၂)		
၂၅.	ဦးဖိုးငွေ		
၂၆.	ဦးမြင့်ဆန်း ကျော်ဝင်း		
၂၇.	ဦးအောင်ကျော်ဇေယျ		
၂၈	ဦးခင်မောင်ဇေး		
၂၉.	ဦးမောင်မောင်ညို		
၃၀.	ဦးဥမ်းမူ		

ကျေးရွာအမည်-ယောက်ဖန်း..   နေ့စွဲ-၂၈..၃..၂၀၁၈

အစည်းအဝေးတက်ရောက်သူများစာရင်း

စဉ်	အမည်	လက်မှတ်	မှတ်ချက်
၃၁	ဦးလှမြင့်	[signature]	ရာအိမ်မှူး
၃၂	ဦးအောင်မြင့်ထွန်း	–	
၃၃	ဦးဆုတင်	ဦးဆုတင်	
၃၄	ဦးအေးမင်းထွန်း	[signature]	
၃၅	ဒေါ်မာယာ	[signature]	
၃၆	ဦးတီပု	[signature]	
၃၇	ဦးမင်းမင်းဦး	[signature]	
၃၈	ဦးအောင်ဟန်	[signature]	
၃၉	ဒေါ်ရွှေကြာ	[signature]	
၄၀	ဒေါ်ဘွဲ့	ဒေါ်ဘွဲ့	

ကျေးရွာအမည် ----[illegible]---- ရက်စွဲ- ၉.၃.၂၀၁၉

အစည်းအဝေးတက်ရောက်သူများစာရင်း

စဉ်	အမည်	လက်မှတ်	မှတ်ချက်
၁။	ဦးစိုးလှ	[signature]	တောင်သူကြီး
၂။	ဦးစိုးညွန့်	[signature]	[illegible] / လယ်ပိုင် / [illegible]
၃။	ဒေါ်နှင်းမြမြင့်	[signature] ၉.၃.၂၀၁၉	[illegible]
၄	ဦး စောအောင်	[signature]	ရပ်ရွာလူကြီး

ကျေးရွာအမည်---ဒံတန်---------- နေ့စွဲ--၉-၃-၂၀၁၉--

အစည်းအဝေးတက်ရောက်သူများစာရင်း

စဉ်	အမည်	လက်မှတ်	မှတ်ချက်
၁.	ဦးစံကျော်	ကျော် .	
၂.	ဦးအာ	အာ	
၃	ဦးဖာလာ	[illegible]	
၄.	ဦးဖေါ်ထွန်း.	ထွန်း.	
၅.	ဦးသာဝင်း	ဝင်း	
၆.	ဦးဖိုးကျော်ထွန်း.	ထွန်း	
၇.	ဦးပန္နဝ	ဝ	
၈.	ဦးစံနွယ်	နွယ်	
၉.	ဦးမောင်	မေမ	
၁၀.	ဦးစိုးသိန်း	စိုးသိန်း	
၁၁.	ဦးသိန်းထွန်း.	ဦးသိန်းထွန်း	
၁၂.	ဦးကျော်သိန်း	သိန်း	
၁၃.	ဦးတာမောင်	မောင်	
၁၄.	ဖိုးထွန်းကောင်း	ထွန်း	
၁၅	ဦးစံကွမ်း	ကွမ်း	
၁၆	ဦးထွန်းဝ	ဝ	

ကျေးရွာအမည်--ရဲစခန်း--------- နေ့စွဲ--၄.၃.၂၀၁၇.

အစည်းအဝေးတက်ရောက်သူများစာရင်း

စဉ်	အမည်	လက်မှတ်	မှတ်ချက်
၁၇	ဦးအုန်းလှပင်	ဦးအုန်းလှပင်	
၁၈	ဦးရှုမြ	[illegible]	
၁၉.	ဦးအံ့ငွေ	အံ့ငွေ	
၂၀.	ဦးချစ်ဆွေ	ဆွေ	
၂၁.	ကိုသိန်းလွင်	လွင်	
၂၂.	စိုးကြည်ဝင်း	ဝင်း	
၂၃.	ဦးဝင်းမြ	[illegible]	
၂၄.	ကိုအုန်းကြွ	အုန်းကြွ	
၂၅	ဦးသာစိုး	သာ	
၂၆.	ဦးအုန်း	အုန်း	
၂၇.	ဦးမောင်ညို	ညို	
၂၈	ဦးအံ့ဝင်း	ဝင်း	
၂၉	ဦးသာသိန်း	သာနီ	
၃၀	ဦးထွန်းရွှေ		
၃၁	ဦးအုန်းနိုင်	နိုင်	
၃၂.	ဦးသာငြိမ်	သာငြိမ်း	

ကျေးရွာအမည် ခဲခွန် ရက်စွဲ ၉.၃.၂၀၁၉

အစည်းအဝေးတက်ရောက်သူများစာရင်း

စဉ်	အမည်	လက်မှတ်	မှတ်ချက်
၃၃	ဦးအဝင်းပန်	ပန်	
၃၄	ဦးဝင်းအောင်		
၃၅	ဦးသာရင်		
၃၆	ဦးစံဦးကြို	[illegible]	
၃၇	ဦးလှဦး	[illegible]	
၃၈	ဦးဘံပြူ		
၃၉	ဦးကာလဦး		
၄၀	ဦးဇော်မြ	ဇော်မြ	
၄၁	စိုင်းဝင်းဟန်		
၄၂	စိုင်းအောင်ဝင်း	[illegible]	
၄၃	ဦးမြအောင်		
၄၄	ကိုလှကျော်		
၄၅	သိန်းမြ	[illegible]	
၄၆	မိုးကြင်	[illegible]	

ကျေးရွာအမည် ---ခါတ်--------- ရက်စွဲ---၉.၃.၂၀၁၉.

အစည်းအဝေးတက်ရောက်သူများစာရင်း

စဉ်	အမည်	လက်မှတ်	မှတ်ချက်
၄၇	ဦးဟာသဖ	[illegible]	
၄၈	ဦးဖိုး	ဖိုး	
၄၉	ဦးအံကို	[illegible]	
၅၀	ကိုတုံ	တုံ	
၅၁.	ကိုမှုံး	မှုံး	
၅၂.	ဦးဒွေ	[illegible]	
၅၃	ကိုနာ	နာ	
၅၄	မောင်ပု	ပု	
၅၅	ကိုတင်ဦး	ဦး	
၅၆	ဦးပညာ	ဦးပညာ	
၅၇	ဒေါ်မြဦး	ဦး	
၅၈.	ဒေါ်ပေါက်	ပေါက်	
၅၉	ဒေါ်ခင်ငြိမ်	ငြိမ်	
၆၀	ဒေါ်ဝယ်	ဝယ်	

ကျေးရွာအမည် ---ခဲဘုန်---------- ရက်စွဲ ၉.၃.၂၀၁၉

အစည်းအဝေးတက်ရောက်သူများစာရင်း

စဉ်	အမည်	လက်မှတ်	မှတ်ချက်
၆၁.	ဒေါ်စန်းညွန့်	ညွန့်	
၆၂.	ဒေါ်ပေါ်ဘိ	ဘိ	
၆၃.	နှင်းဖွေးလှ	လှ	
၆၄.	ဒေါ်ဖုန်း	ဖုန်း	
၆၅.	ဒေါ်နွယ်	နွယ်	
၆၆.	ဒေါ်ကြာ	ကြာ	
၆၇.	ဒေါ်အေးရင်	ရင်	
၆၈.	ဒေါ်သာ	သာ	
၆၉.	ဒေါ်ဝင်းကြည်	ကြည်	
၇၀.	ဒေါ်အေးမုံ	မုံ	
၇၁.	ဒေါ်မှုန့်	မှုန့်	
၇၂.	ဒေါ်မြင့်ခင်	မြင့်ခင်	
၇၃.	အေးဘုဖ	ဥဘုဖ	
၇၄.	ဒေါ်သိန်းချင်	ချင်	

ကျေးရွာအမည် ---ခဲဘုန်း---------- ရက်စွဲ--၉.၃.၂၀၂၄--

အစည်းအဝေးတက်ရောက်သူများစာရင်း

စဉ်	အမည်	လက်မှတ်	မှတ်ချက်
၇၅.	ဒေါ် ဖွေ့ သာ	သာ	
၇၆	ဒေါ်နန်းခိုင်ဥဒ္ဒ	[illegible]	
၇၇	ဒေါ်နန်းဝင်းဆိ	ဆိ	
၇၈	ဒေါ်နန်း စိန်မြင့်	Saine	
၇၉	ဒေါ်နန်း ခမ်းဘွတ်	ဘွတ်	
၈၀.	ဒေါ်နန်းဖြူ	ဖြူ	
၈၁	ဒေါ်ဝင်းမွေ	မွေ	
၈၂	ဒေါ်ဇော်ရင်	G	
၈၃	ဦးကျော်ဝင်း	ကျော်	
၈၄	ဦး ဝိမ္မိန္ဒ	[illegible]	

ကျေးရွာအမည်- နှံ့ကယ်ဒွိုက်-၁ ရေခန်ကွင်း   နေ့စွဲ- ၆၊၃၊၂၀၁၉

အစည်းအဝေးတက်ရောက်သူများစာရင်း

စဉ်	အမည်	လက်မှတ်	မှတ်ချက်
၁.	ဦးသိန်းတွာဖေ	[signature]	
၂.	ဦးနေဖိတ်ကြီး	[signature]	
၃.	ဦးသာသာနု	[signature]	
၄.	ဦးအောင်ခမ်း	[signature]	
၅.	ဦးအောင်မြင့်	[signature]	
၆.	ဦးထွန်းကျော်	[signature]	
၇.	ဦးစာလိန္တာ	ခါလိန္ဒ	
၈	ဦးခုနိုးဆောင်	ခုနိုး	

ကျေးရွာအမည် ဒိုင်ကြင်း ကျေးရွာ၊ [illegible]　　　　ရက်စွဲ ၇.၃.၁၉

အစည်းအဝေးတက်ရောက်သူများစာရင်း

စဉ်	အမည်	လက်မှတ်	မှတ်ချက်
၁	ဦးစိန်ညွှန့် ✓	စိန်ညွှန့်	
၂	ဦးသာဝေး	သာဝေး	
၃	ဦးဩဘ	[illegible]	

ကျေးရွာအမည် – ဆားသဝါးမြောင်း

ရက်စွဲ – ၉/၃/၂၀၁၉

အစည်းအဝေးတက်ရောက်သူများစာရင်း

စဉ်	အမည်	လက်မှတ်	မှတ်ချက်
၁။	ကာလီဒွ	[signature]	ဂုဏ်မိဂုဏ်ဖ
၂။	ဦးစံပွင့်ကြီး	[signature]	ဂုဏ်မိဂုဏ်ဖ
၃။	ဦးဇော်ဂျ	[signature]	ဂုဏ်မိဂုဏ်ဖ
၄။	ဦးကာဝိ	[signature]	ဂုဏ်မိဂုဏ်ဖ
၅။	ဦးအေးမြင့်ကျော်	[signature]	
၆။	ကာဝိ	[signature]	
၇။	ဖွင့်ရှ	[signature]	
၈။	ဦးသာကွယ်	[signature]	ဂုဏ်မိဂုဏ်ဖ
၉။	ဦးနိုင်ဟ	[signature]	
၁၀။	ကိုဖိုးကျော်ဦး	[signature]	
၁၁။	ကိုချစ်ဆွေ	[signature]	
၁၂။	ဦးခိုက်ဘော	[signature]	
၁၃။	ဒေါ်ဘွေစိန်	[signature]	
၁၄။	ကိုခိုက်ဂွေး	[signature]	

ကျေးရွာအမည် - [illegible] ရက်စွဲ ၆/၃/၂၀၁၉

အစည်းအဝေးတက်ရောက်သူများစာရင်း

စဉ်	အမည်	လက်မှတ်	မှတ်ချက်
၁၅။	ဦးဒီပုံး		
၁၆။	ကိုရှိုင်းကျော်		
၁၇။	ဘစိန်		
၁၈။	ဆွေဦး	ဆွေ	
၁၉။	ကိုတင်ကျွယ်		
၂၀။	ဦးအုန်းဖေ		
၂၁။	ဒေါ်ရွှေကြာ (၁)		
၂၂။	ဒေါ်ရွှေကြာ (၂)	ကြာ	
၂၃။	ကိုမောင်ညို		
၂၄။	ဦးမောင်ကြည်		
၂၅။	ဒေါ်မြကြည်		
၂၆။	ဒေါ်အေးခမ်း	ခမ်း	
၂၇။	ဒေါ်ရွှေစိန်	စိန်	
၂၈။	ဒေါ်မြဦး	ဦး	

ကျေးရွာအမည် --ကြောက်ယက်---- ရက်စွဲ ၆-၃-၂၀၁၉

အစည်းအဝေးတက်ရောက်သူများစာရင်း

စဉ်	အမည်	လက်မှတ်	မှတ်ချက်
၃၀။	ဒေါ်ဝင်းကြက်	[illegible]	
၃၁။	ဒေါ်ရှက်	[illegible]	
၃၂။	ဒေါ်အေးဟန်	ဟန်	
၃၃။	ဒေါ်မြင့်အောင်	အောင်	
၃၄။	ဒေါ်ခမ်းမှတ်	မှတ်	
၃၅။	ဒေါ်မြင့်ဆွေ	ဆွေ	
၃၆။	ဒေါ်တင်အေး	အေး	
၃၇။	ဒေါ်ခမ်းအေး	ခမ်းအေး	
၃၈။	ကိုအောင်ဝင်းနိုင်	[illegible]	
၃၉။	ဒေါ်အေးလင်း	လင်း	
၄၀။	ဒေါ်စမ်းခမ်း	[illegible]	
၄၁။	ဒေါ်ပုနား	[illegible]	
၄၂။	ဒေါ်ကြိုမာ	[illegible]	
၄၃။	ဒေါ်ချို	[illegible]	

ကျေးရွာအမည် --ဆောကမ်ဖန်း---   ရက်စွဲ ၆-၁၁-၂၀၁၉

အစည်းအဝေးတက်ရောက်သူများစာရင်း

စဉ်	အမည်	လက်မှတ်	မှတ်ချက်
၄၄။	ဒေါ်ချိုမာ	ချို	
၄၅။	ဒေါ်တိုးဦး	ဦး	
၄၆။	ဒေါ်စိုးဟန်	ဟန်	
၄၇။	ဒေါ်ဟန်မြ[illegible]	kj	
၄၈။	ဒေါ်တင်မြိုင်	မြိုင်	
၄၉။	ဒေါ်မာယာ	[illegible]	
၅၀။	ဒေါ်လှမြီး	[illegible]	
၅၁။	ဒေါ်အေးငြိမ်း	ငြိမ်း	
၅၂။	ဒေါ်ခမ်းအောင်	ခမ်းအောင်	
၅၃။	ဒေါ်နှင်းလှ	လှ	
၅၄။	ဒေါ်စောမြ	မြ	
၅၅။	ဒေါ်အေးသာ	သာ	
၅၆။	ဦးထွန်းအောင်	[illegible]	ရပ်မိရပ်ဖ
၅၇။	ဦးဝိလာသ	[illegible]	ရပ်မိရပ်ဖ

ကျေးရွာအမည် ----------

ရက်စွဲ ----------

အစည်းအဝေးတက်ရောက်သူများစာရင်း

စဉ်	အမည်	လက်မှတ်	မှတ်ချက်
၁	ဦး[illegible]	[illegible]	[illegible]
၂	ဦး[illegible]	[illegible]	[illegible]
၃	ဦး[illegible]	[illegible]	
၄	ဦး[illegible]	[illegible]	
၅	ဦး[illegible]	[illegible]	
၆	ဦး[illegible]	[illegible]	
၇	ဦး[illegible]	[illegible]	
၈	ဦး[illegible]	[illegible]	
၉	ဦး[illegible]	[illegible]	
၁၀	ဦး[illegible]	[illegible]	
၁၁	ဦး[illegible]	[illegible]	
၁၂	ဦး[illegible]	[illegible]	
၁၃	ဦး[illegible]	[illegible]	
၁၄	ဦး[illegible]	[illegible]	
၁၅	ဦး[illegible]	[illegible]	

ကျေးရွာအမည် ---

ရက်စွဲ ---

အစည်းအဝေးတက်ရောက်သူများစာရင်း

စဉ်	အမည်	လက်မှတ်	မှတ်ချက်
၁။	ဦးထင်အောင်		
၂။	ဦးအောင်ထွေး		
၃။	ဦးဝံကျော်		
၄။	ဦးတွန်းမင်းလတ်		
၅။	ဦးမောင်ဟန်		
၆။	ဦးဘိုက်ညွှန့်		
၇။	ဦးလှထွန်း		
၈။	ဦး ကံဆာ		
၉။	ဦးစံထင်		
၁၀။	ဦးလှဇီး		
၁၁။	ဦးကျော်ဇေယျ		
၁၂။	ဦးထင်ကြည့်		
၁၃။	ဦးအောင်ချမ်း		
၁၄။	ဦးအောင်ကျော်ထွဋ်		

ကျေးရွာအမည် ‑ လောက်ဖနိုး ‑‑‑‑‑‑ ရက်စွဲ ‑ ၉.၃.၂၀.

အစည်းအဝေးတက်ရောက်သူများစာရင်း

စဉ်	အမည်	လက်မှတ်	မှတ်ချက်
၈၆.	ဦးအိုက်ကျော်	[signature]	
၈၇	ဦးနောင်မြင့်သိန်း	[signature]	
၈၈.	ဦးဒွဲဇဝဲ	[signature]	
၈၉.	ဦးဝေလီမိုဘွန်	[signature]	
၉၀.	ဦးတင်မြင့်	[signature]	
၉၁.	ဦးထွန်းထွန်းလင်း	[signature]	
၉၂.	ဦးလာဘွားထက်	[signature]	
၉၃.	ဦး [illegible] (၂) [illegible]	[signature]	
၉၄	ဦး [illegible]	[signature]	
၉၅.	ဦးလှမြင့်	[signature]	လောက်ဖနိုး ရပ်ကျက်ရေးမှူး
၉၆	ဒေါ်မြကြည် ✓		
၉၇	ဒေါ်လှမြ ✓		
၉၈	ဒေါ်ခင်ဆွေ ✓		
၉၉	ဒေါ်စိန်လှ ✓		

ကျေးရွာအမည် [illegible]   ရက်စွဲ ၉-၃-၁၉

အစည်းအဝေးတက်ရောက်သူများစာရင်း

စဉ်	အမည်	လက်မှတ်	မှတ်ချက်
၁၀၀	ဦးထက်ဖြိုးအောင်		
၁၀၁	ဦးနိုင်ဦး		
၁၀၂	ဦးဝင်းဆွေ	ဝင်းဆွေ	
၁၀၃	ဦးညွှန့်ကြူ		
၁၀၄	ဦးအောင်သာ		
၁၀၅	ဦးမြင့်ဆွေ		
၁၀၆	ဦးမှာသိန်း		
၁၀၇	ဒေါ်ပေါသာနှီး		
၁၀၈	ဒေါ်ပြုံးနှင့်ရှိစိုး		
၁၀၉	ဦးထွန်းထွန်းငွေ		
၁၁၀	ဦးစိုးဝင်း		
၁၁၁	ဦးမျိုးကျော်ဝင်း		
၁၁၂	ဦးအောင်ဇေယျာ		
၁၁၃	ဦးဝင်းမြင့်		

ကျေးရွာအမည် --ဓလော်ဂိုင်------ ရက်စွဲ-၆-၇-၂၀၁၉-

အစည်းအဝေးတက်ရောက်သူများစာရင်း

စဉ်	အမည်	လက်မှတ်	မှတ်ချက်
၁၁၄	ဦး‌မောင်ဦး		
၁၁၅	ဦးရှမ်းကြွယ်		
၁၁၆	ဦးလှိုင်ကြိုးဦး		
၁၁၇	ဒေါ်ခင်မျိုးဝေ		
၁၁၈	ဒေါ်ဝေဝေနိုင်		
၁၁၉	ဒေါ်နုနုမြ		
၁၂၀	ဒေါ်မေဆိုးဖိုးလှိုင်		
၁၂၁	ဒေါ်သဲဇင်ဆွိ		
၁၂၂	ဒေါ်နွဲ့နွဲ့ဝင်း		
၁၂၃	ဦးသုခ (၁) ...		
၁၂၄	ဦးဟိန်းသူရိန်ထွန်း		
၁၂၅	ဦးစည်သူ		
၁၂၆	ဦးအောင်သက်		
၁၂၇	ဦးမိုးလှိုင်ထွန်း	Hlaing	

ကျေးရွာအမည် --ထားဝါကြီး ရွာ--

ရက်စွဲ --၉/၃/၂၀၁၉

အစည်းအဝေးတက်ရောက်သူများစာရင်း

(1)

စဉ်	အမည်	လက်မှတ်	မှတ်ချက်
၁။	နိုင်လင်းမိုး	[illegible]	
၂။	ဒေါ်ကြွယ်ဝင်းလတ်	[illegible]	
၃။	ဦးတင်မောင်	မောင်	
၄။	ဦးသိန်းကျူး	သိန်းကျူး	
၅	ကျော်ဇင်အေး	ကျော်	
၆	ဒေါ်ဝင်းငွေ	ငွေ	
၇	ဒေါ်သိန်းတာ	တာ	
၈	ဦးတင်ဝေ	ဝေ	
၉	ဦးဘိုးလင်း	ဘိုး	
၁၀	ဦးရဲကို	ရဲကို	
၁၁	ဦးမြမောင်	မြမောင်	
၁၂	ဦးကျော်နှား	ကျော်နှား	
၁၃	ဦးသန်းလွင်	သလင်	
၁၄	ဒေါ်မြစိန်	စိန်	

ကျေးရွာအမည် ကာပဒ်ကြီးတော ရက်စွဲ ၄-၃-၁၉

အစည်းအဝေးတက်ရောက်သူများစာရင်း

②

စဉ်	အမည်	လက်မှတ်	မှတ်ချက်
၁၅	ဦး ကျော်လှိုင်	[illegible]	
၁၆	ဦး ပေါ်ကာခ	[illegible]	
၁၇	ဒေါ်ဖြူသောင်းအေး	ဖြူသောင်း	
၁၈	ဒေါ်ဝါစန်းမြ	စန်းမြ	
၁၉	ဦး မင်း ဦး	မင်း ဦး	
၂၀	ဦးအောင်ခါ	အောင်ခါ	
၂၁.	ဒေါ်ကြွေ	ကြွေ	
၂၂	ဒေါ်ခင်ဖြိုး	ဖြိုး	
၂၃	ဒေါ်ခင်စောဝိ	[illegible]	
၂၄.	သင်းနွယ်ဦး	[illegible]	
၂၅.	ဦးဖိုးဖေ	ဖေ	
၂၆.	ဒေါ်ပုဝင်း	ဝင်း	
၂၇	ရဲမြင့်အောင်	[illegible]	
၂၈.	မမြဒုံ	မမြဒုံ	

ကျေးရွာအမည် လယ်ကြီးတော ရက်စွဲ ၉-၃-၁၉

(၃)

အစည်းအဝေးတက်ရောက်သူများစာရင်း

စဉ်	အမည်	လက်မှတ်	မှတ်ချက်
၂၉	မဖြူမြမွေး	မြ	
၃၀	ဒို မြင့်ဆွေဇင်	မြင့်	
၃၁	မကြူကြူဆွေ	ကြူ	
၃၂	~~ငွေနု ငွေ~~ မနိုင်ငွေး	ငွေး	
၃၃	ဒေါ်ခင်ဇော်ပို	ဇော်ပို	
၃၄	ဦးမိုးအောင်	မိုး	
၃၅	ဦးသူ	သူ	
၃၆	ဦးအောင်ခိုင်ဝင်း	ခိုင်	
၃၇	ဦးမြင့်အောင်	အောင်	
၃၈	ဦးကျော်သိန်း	ကျော်	
၃၉	ဒေါ်သိန်းမြ	မြ	
၄၀	ကိုသားငယ်	သားငယ်	
၄၁	ဦးအောင်မာ	မာ	

(4)

ကျေးရွာအမည် ထားဝယ်ကြီး:တော   ရက်စွဲ ၇-၃-၁၇

အစည်းအဝေးတက်ရောက်သူများစာရင်း

စဉ်	အမည်	လက်မှတ်	မှတ်ချက်
၄၂	ဦး.ဖိုး.လှမြင့်	ဖိုး:	
၄၃	ဦး:ကျော်ဦး	ဦး:	
၄၄	ဦး ရဲတင့်ထွန်း	ထွန်း	
၄၅	ဦး.ဖိုး.သိန်း	ဖိုး:	
၄၆	ဒေါ်ဝေ:	ဝေ:	
၄၇	ဦးအုန်းလွင်.	လွင်:	
၄၈	ဦး.ထွန်းအောင်ကျော်	[illegible]	
၄၉	ဦး:ကျော်မြင့်ထွန်း	[illegible]	
၅၀	ဦး. [illegible]	[illegible]	
၅၁	ဒေါ်ညိုမြင့်	မြင့်	
၅၂	ဦး:ဝင်းမင်းထွန်း	[illegible]	
၅၃	ဦး:ရန်ပိုင်ထွန်း	ထွန်း	
၅၄	ဦး:ဖိုး:ဝ.	ဝ	
၅၅	ဦး:ထောင်ဝေ:	ဝ	

(ဂ). ကျေးရွာအမည် ထောက်ကြံ့တော ရက်စွဲ ၅-၃-၁၅

အစည်းအဝေးတက်ရောက်သူများစာရင်း

စဉ်	အမည်	လက်မှတ်	မှတ်ချက်
၁၆	ဒေါ်မှု		[signature]
၁၇	ဦး မင်း မင်း နိုး	[signature]	
၁၈	ဦးအိုက်ဇော်မှူး	[signature]	
၁၉	ဦးစံသိန်းကျော်	[signature]	
၂၀	ဒေါ်မေသန္တာမော်	[signature]	
၂၁	ဦးအောင်မြင့်ဌေး	[signature]	
၂၂	ဒေါ်သဲစုမိုးမြင့်	[signature]	
၂၃	ဒေါ်နှင်းဝေကျော်	[signature]	
၂၄	ဒေါ်သူမြတ်	[signature]	
၂၅	ဒေါ်ရှင်ထားသဉ္ဇာ	[signature]	
၂၆	ဒေါ်တင်အေးဝေ	[signature]	
၂၇	ဦး မင်းမင်းနိုး	[signature]	
၂၈	ဒေါ်သီတာနွယ်	[signature]	
၃၀	ဦးထိုက်သော်အောင်	[signature]	

ကျေးရွာအမည် ---လှော်ကြီးရွာ---- ရက်စွဲ---၉.၃.၂၀၁၉.

(၆)

အစည်းအဝေးတက်ရောက်သူများစာရင်း

စဉ်	အမည်	လက်မှတ်	မှတ်ချက်
၇၁။	ဒေါ်မြသီတာထွန်း	[signature]	
၇၂။	ဒေါ်တင်လာထွန်း	[signature]	
၇၃။	ဦးသန်းအောင်ဝင်း		

Lists of attendees

ဖိတ်ကြားလွှာ

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ရှမ်းပြည်နယ်မြောက်ပိုင်း၊ နောင်ချိုမြို့နယ်၊ လုံရုံးကျေးရွာအုပ်စု၊ လောက်ဖန်းကျေးရွာအနီးတွင် အကောင်အထည်ဖော်ဆောင်ရွက်လျက်ရှိသော Ngwe Yi Pale Cement ကုမ္ပဏီလီမိတက်၏ ကျောက်မီးသွေးသုံးလျှပ်စစ်ဓါတ်အားပေးစက်ရုံအတွက် ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း (EIA)နှင့်ပတ်သက်၍ လုပ်ငန်းဆိုင်ရာကိစ္စများအား ဒေသခံမိဘပြည်သူများနှင့် ညှိနှိုင်းတိုင်ပင် ဆွေးနွေးခြင်း သတင်းအချက်အလက်များ ထုတ်ဖော်တင်ပြခြင်းအား အောက်ပါအစီအစဉ်အတိုင်း ကျင်းပမည် ဖြစ်ပါသဖြင့် တက်ရောက်ဆွေးနွေးနိုင်ပါရန် လေးစားစွာ ဖိတ်ကြားအပ်ပါသည်။

အစီအစဉ်

နေ့ရက် ။ ။ ၁၃၇၉ ခုနှစ်၊ တပေါင်းလဆန်း (၁၄)ရက်နေ့၊ (၂၈-၂-၂၀၁၈)၊ ဗုဒ္ဓဟူး

အချိန် ။ ။ နေ့လည် (၃း၀၀) နာရီ

နေရာ ။ ။ လောက်ဖန်းဘုန်းကြီးကျောင်း၊လောက်ဖန်းကျေးရွာ၊ နောင်ချိုမြို့နယ်၊ ရှမ်းပြည်နယ်

Ngwe Yi Pale' ကုမ္ပဏီလီမိတက်

Invitation card

No.67/69, B - 5, Parami Road, 16 Ward, Hlaing Tsp.ph: +95- 9420105071, +95- 973044903

Email: myanmar.esc@gmail.com