

Environmental Impact Assessment (EIA) Report for Korea-Myanmar Industrial Complex Project, Hlegu Township, Yangon



Submitted to

KMIC

KMIC Development Co., Ltd

By

MSR

Myanmar Survey Research

1 April 2020

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Industrial Complex

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No: KMIC 2020-32

Date: 27 Apr 2020

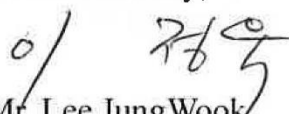
To: Director General

Environment Conservation Department
Ministry of Natural Resources and Environmental Conservation

Subject: Submission of EIA Report for KMIC Development Project

- (1) KMIC Development Co., Ltd is planning to develop Korea-Myanmar Industrial Complex on the land of approximately 555.81 acres in Hlegu township, Yangon Region. This project is being implemented jointly by Ministry of Construction, Government of the Republic of the Union of Myanmar and Korean Consortium.
- (2) In order to conduct Environmental Impact Assessment (the "EIA") for the 555.81 acre land, the project proponent commissioned a third party, Myanmar Survey Research (MSR). MSR visited KMIC site and the surroundings for the preparation of the EIA report in accordance with the existing laws, regulation, guidelines, and standards of the corresponding Ministries of the Republic of the Union of Myanmar.
- (3) KMIC Development Co., Ltd would like to confirm the following aspects related to the EIA report:
 - (a) The accuracy and completeness of the EIA;
 - (b) The EIA has been prepared in strict compliance with applicable laws including EIA procedure; and
 - (c) The project will, at all times, comply fully with the commitments, mitigation measures and plans in the EIA reports.

Yours sincerely,


Mr. Lee JungWook

Managing Director of KMIC Development Co., Ltd.

Submission of Documentation

We, Myanmar Survey Research (MSR) Co., Ltd., hereby submit this Environmental Impact Assessment (EIA) Report for KMIC Project in Hlegu township, Yangon Region. To our best knowledge, the information contained in this report is accurate and truthful, representing all findings related to the project.

Signed at Yangon on 26 March 2020.

Environmental Impact Assessment Team Members

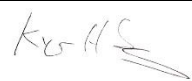
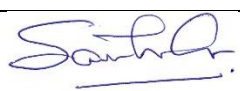



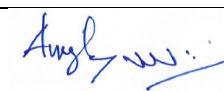
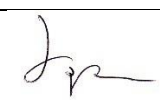
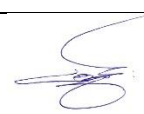

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U Phone Myint Tun (Consultant, Physical Environment)	Member	
U William Han Lwin Senior Analyst and International Law	Member	
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TERMS AND ACRONYMS

TERMS

U	“U” is an honorific placed before the name of a male adult. It is an equivalent of “Mr.” It does not say whether the person addressed is single or married.
Daw	“Daw” is an honorific placed before the name of a female adult. It does not say whether the person addressed is single or married.
Ma	“Ma” is used to address a female child or a young lady. Women of same age— young or old—also address each other using this honorific. Especially older persons use this address for younger persons.
Ko	“Ko” is used to address a young man. Men of same age—young or old—also address each other using this honorific. Older persons also use this address for younger persons.

ACRONYMS

(ACGIH)	American Conference of Governmental Industrial Hygienist
MSL	Mean Sea Level
BOD ₅	5-day Biochemical Oxygen Demand
CBD	Central Business District
Co., Ltd.	Company Limited
CO	Carbon monoxide
CO ₂	Carbon dioxide
COD	Chemical Oxygen Demand
CSR	Corporate Social Responsibility
D	Diameter
DUHD	Department of Urban and Housing Development
Dy	Deputy
ECC	Environmental Compliance Certificate
ECD	Environmental Conservation Department
ECL	Environmental Conservation Law
ECR	Environmental Conservation Rules
e. g	For example
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EPC	Engineering, Procurement and Construction
ESIA	Environmental and Social Impact Assessment
FAO	Food and Agriculture Organization
GEF	Global Environment Facility
GIS	Geographic Information System
IT	Information Technology
JVC	Joint Venture Company
KMIC JVC	KMIC Development Co., Ltd.
km	Kilometer
kV	Kilovolts
MDGs	Millennium Development Goals
MEPE	Myanmar Electric Power Enterprise
MMK	Myanmar kyat
MOC	Ministry of Construction
MOF	Ministry of Forestry
MOECF	Ministry of Environmental Conservation and Forestry
MONREC	Ministry of Natural Resources and Environmental Conservation
MoU	Memorandum of Understanding
MSR	Myanmar Survey Research
M.S.T	Myanmar Standard Time
MW	Megawatt

m ² (sqm)	Square meter
mm	millimeter
NBSAP	National Biodiversity Strategy and Action Plan
NCDP	National Comprehensive Development Plan
NEQ	National Environmental Quality
NLD	National League for Democracy
no.	Number
NSDS	National Sustainable Development Strategy
PAP	Project Affected People
PM	Particulate Matter
PPE	Personal Protective Equipment
ppm	Parts per million
R& D	Research and Development
SAR	Sodium Absorption Ratio
SIA	Socio-economic Impact Assessment
SO ₂	Sulphur dioxide
USDA	Union Solidarity and Development Association
USDP	Union Solidarity and Development Party
UNEP	United Nations Environment Programme
UNESCO	United Nations Economic, Scientific and Cultural Organization
VOC	Volatile Organic Compound
µg/m ³	micro gram per cubic meter
mg/l	milligram per liter
E	East
W	West
S	South
N	North
SE	South East
SW	South West
NE	North East
NW	North West

Basic Education System in Myanmar

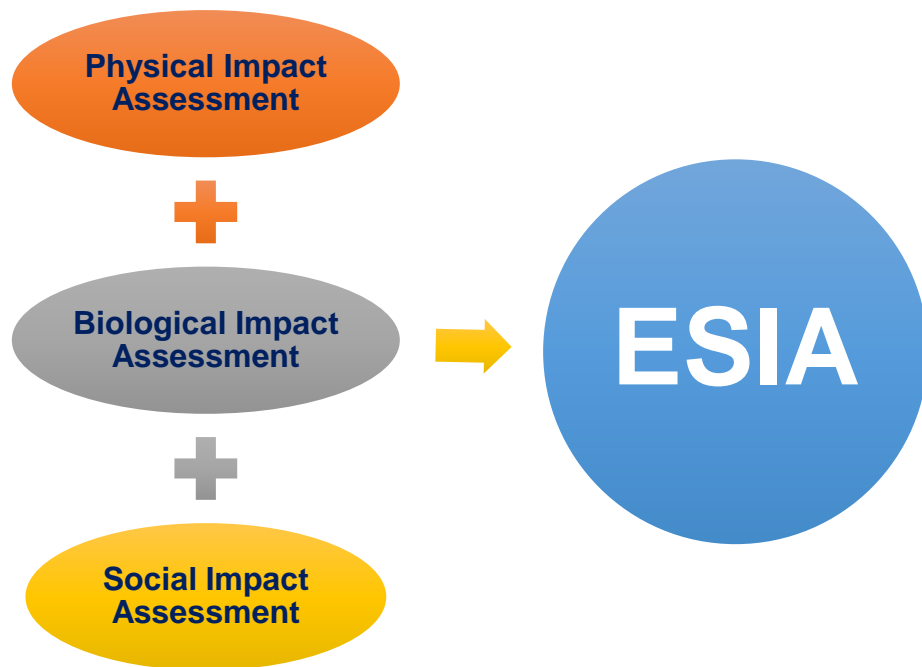
Primary School	= Elementary School	1 st Grade (Kindergarten)
		2 nd Grade
		3 rd Grade
		4 th Grade
		5 th Grade
Middle School	= Lower Secondary School	6 th Grade
		7 th Grade
		8 th Grade
		9 th Grade
High School	= Upper Secondary School	10 th Grade
		11 th Grade
		12 th Grade (Matriculation)

After completing 12 years of Basic Education, a student can join an institution of higher learning.

Post-Primary School	A primary school teaching some more Middle School grades in addition to the Primary School grades.
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ESIA

This assessment comprises three components



SECTION 1

EXECUTIVE SUMMARY



Executive Summary (Myanmar)

ရန်ကုန်တိုင်းဒေသကြီး၊ လှည်းကူးမြို့နယ်ရှိ ညောင်နှစ်ပင်ဧရိယာတွင် တည်ဆောက်မည့် ကိုရီးယား-မြန်မာ စက်မှုလုပ်ငန်းနယ်မြေစီမံကိန်း ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း အစီရင်ခံစာအကျဉ်းချုပ် (မြန်မာဘာသာ)

၁။ နိဒါန်း

ဤအစီရင်ခံစာ၏ ရည်ရွယ်ချက်မှာ ကိုရီးယား-မြန်မာ စက်မှုလုပ်ငန်းနယ်မြေစီမံကိန်းကြောင့် ပတ်ဝန်းကျင်အပေါ် အလားအလာရှိသော ထိခိုက်မှုများနှင့် ဆက်စပ်သက်ရောက်မှုများကို စနစ်တကျ အမျိုးအစားခွဲခြားဖော်ထုတ်ပြီး ဆန်းစစ်မှုပြုလုပ်ရန်ဖြစ်ပါသည်။ ထို့ပြင် ဖြစ်နိုင်ခြေရှိသော စီမံကိန်း အခြား ဆောင်ရွက်နိုင်သော နည်းလမ်းများကို စနစ်တကျဆန်းစစ်မှုပြုလုပ်ခြင်းနှင့် အလားအလာရှိသော ထိခိုက်မှု များကို လျော့နည်းစေသည့် ဆီလျော်သော နည်းလမ်းများကို ဆုံးဖြတ်ဖော်ထုတ်ရန်ဖြစ်ပါသည်။ ဤအစီရင် ခံစာတွင် ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှု အစီအစဉ်ပါရှိပါသည်။

၂။ စီမံကိန်းအကြောင်းအရာနှင့်တည်နေရာ

ပြည်ထောင်စုသမ္မတမြန်မာနိုင်ငံတော်အစိုးရ၊ ဆောက်လုပ်ရေးဝန်ကြီးဌာနနှင့် ကိုရီးယားနိုင်ငံမှ ကိုရီးယား-မြန်မာ စက်မှုလုပ်ငန်းနယ်မြေ ဖွံ့ဖြိုးတိုးတက်ရေး ကုမ္ပဏီလီမိတက် (ကိုရီးယား-မြန်မာ စက်မှု လုပ်ငန်းနယ်မြေ ဖက်စပ် ကုမ္ပဏီ) KMIC Development Co., Ltd. (KMIC JVC) တို့သည် ကိုရီးယား-မြန်မာ စက်မှုလုပ်ငန်းနယ်မြေစီမံကိန်းကို အကောင်အထည်ဖော်ရန် ၂၀၁၅ ခုနှစ်၊ စက်တင်ဘာလတွင် စတင်လုပ် ဆောင်ခဲ့ပါသည်။ နှစ်ဖက်သဘောအဖွဲ့အစည်းတို့သည် အဆိုပါလုပ်ငန်းစီမံချက်ကို ရန်ကုန်မြို့မြောက်ဘက် ၄၀ ကီလိုမီတာ အကွာအဝေးတွင်ရှိသောညောင်နှစ်ပင်ဒေသတွင် အကောင်အထည်ဖော်ရန် သဘောတူညီခဲ့ကြ သည်။ ၎င်းလုပ်ငန်းတည်နေရာသည် ၅၅၅.၈၁ ဧက (၂၄၉၂၈၈ စတုရန်းမီတာ) ကျယ်ဝန်းသော မြေပြန့်ဖြစ်ပြီး လှည်းကူးမြို့နယ်ရှိ ညောင်နှစ်ပင်မွေးမြူရေးနှင့် စိုက်ပျိုးရေးဇုန် အမှတ်-၃ အနီးတွင် တည်ရှိပါသည်။ လုပ်ငန်းနယ်မြေ၏ ၁၆၄၀၂၄၅ စတုရန်းမီတာမှာ စက်မှုလုပ်ငန်းများအတွက်ဖြစ်ပြီး ကျန်သော အစိတ်အပိုင်း တွင် လမ်းများအပါအဝင် အခြားအခြေခံအဆောက်အအုံနှင့်ပတ်သက်သည်များ တည်ရှိမည်ဖြစ်ပါသည်။ စက်မှုလုပ်ငန်းများအတွက် သတ်မှတ်ထားသောမြေကို မြေကွက် အကြီး၊ အလတ်၊ အသေးဟူ၍ သုံးမျိုးပိုင်းခြား သတ်မှတ်ထားပြီး ထိုမြေကွက်များပေါ်တွင် အထည်ချုပ်၊ အစားအစာ ထုတ်လုပ်ခြင်း၊ ကျောက်မျက်ရတနာလုပ်ငန်း၊ ယာဉ်အပိုပစ္စည်းနှင့်လျှပ်စစ်ပစ္စည်းများတပ်ဆင်ခြင်း စသည့် လုပ်ငန်းများနှင့် သက်ဆိုင်သည့် စက်ရုံများနှင့်ကုန်လှောင်ရုံများကို ဆောက်လုပ်မည်ဖြစ်ပါသည်။ ကျန်သောအစိတ်အပိုင်းတွင် လူနေအဆောက်အအုံများ၊ စီးပွားရေးလုပ်ငန်းအဆောက်အအုံများ၊ အသက်မွေးဝမ်းကျောင်း ပညာသင်တန်း ကျောင်း၊ အဓိကလမ်းမများ၊ လမ်းဖြတ်များနှင့်ရေမြောင်းများ၊ လျှပ်စစ်မီးကြိုးသွယ်တန်းခြင်း၊ စိမ်းလန်း သစ်ပင်စိုက်ပျိုးခင်းများ၊ လျှပ်စစ်ဓါတ်အားခွဲရုံ၊ ရေပုပ်ရေဆိုးသန့်စက်ရုံ၊ ရေသန့်စင်စက်နှင့် အများပြည်သူနှင့် သက်ဆိုင်သည့်နေရာများ (ပန်းခြံ၊ ကစားကွင်း၊ အိမ်သာစသည်)တို့ကိုဆောက်လုပ်မည်ဖြစ်ပါသည်။

ဤလုပ်ငန်းစီမံကိန်းဧရိယာကို ညောင်နှစ်ပင်အမျိုးသားညီလာခံဝင်းဟုအများကသိရှိကြပြီး၊ ယခု အခါ ထိုဝင်းကိုအသုံးမပြုတော့သည့်အလျောက် (စီမံကိန်းမြေနှင့် ထိုမြေပေါ်ရှိ အဆောက်အအုံများကို

၂၀၀၈ ဖွဲ့စည်းပုံ အခြေခံဥပဒေရေးဆွဲရန်အတွက် ၁၉၉၄ မှ ၂၀၀၇ အထိ အမျိုးသားညီလာခံကျင်းပရာတွင် အသုံးပြုခဲ့ပြီး နောက်ပိုင်းတွင်အသုံးပြုခြင်းမရှိတော့သည်မှာ ယခုအချိန်အထိဖြစ်ပါသည်။) ယခင်ကရှိခဲ့သော ခန်းမ၊ တည်းခိုဆောင်၊ ကဇာတ်ရုံ၊ ဆေးရုံ၊ လမ်းစသည့် အဆောက်အအုံများမှာ ပျက်စီးယိုယွင်းနေပြီး ထိုနေရာသည် နွေရာသီတွင်ခြောက်သွေ့ကာ ဖုံးဆိုးတောအဖြစ်ရှိပြီး၊ မိုးရာသီတွင် ရွှံ့ထူထပ်ပြီး မြက်ပင်ရိုင်းများ၊ သစ်ပင်ရိုင်းများ၊ ခြံပုတ်မျိုးစုံတို့ ဖုံးလွှမ်းနေသည့် နေရာအဖြစ် ရှိနေပါသည်။

၂.၁။ လမ်း

စီမံကိန်းဧရိယာအတွင်းတွင် ၃၈၊ ၄၆၊ ၂၆၊ ၁၈၊ ၁၂ နှင့် ၈ မီတာ အကျယ်ရှိသော လမ်းများကို ဖောက်လုပ်သွားပါမည်။

၂.၂။ ရေအရင်းအမြစ်နှင့်ရေအသုံးချရေး

ညောင်နှစ်ပင်ဒေသရှိ မွေးမြူရေးနှင့်စိုက်ပျိုးရေးဇုန်ကို ရေပေးဝေရန် ၂၀၀၁ ခုနှစ်ကတည်းက ဆောက်လုပ်ခဲ့သော ကလီထော်ရေလှောင်တံမံမှ ရေကိုရယူသုံးစွဲရန်စီစဉ်ထားပါသည်။

၂.၃။ လျှပ်စစ်ဓာတ်အားရယူသုံးစွဲမှု

စီမံကိန်းသည် ၂၃၀ ကေဗွီ ကမာနတ်-မြောင်းတကာ မဟာဓာတ်အားလိုင်းမှ လျှပ်စစ်ဓာတ်အားကို ရယူအသုံးပြုမည်ဖြစ်သည်။ အဆိုပြုစီမံကိန်းဝင်း အတွင်းတွင် လျှပ်စစ်ဓာတ်အားခွဲရုံကို တည်ဆောက်မည် ဖြစ်ပြီး လုပ်ငန်းဧရိယာအတွင်းတွင် လျှပ်စစ်ဓာတ်အားကို မြေပေါ်လမ်းဘေးဓာတ်တိုင်များ စိုက်ထူ သွယ်တန်း၍ ဖြန့်ဝေပေးပြီး စီမံကိန်းလည်ပတ်သည့် အဆင့်တွင် ဓာတ်အားမီဂါဝပ် ၅၀ ကို အသုံးပြုမည် ဖြစ်သည်။

၂.၄။ မွေးမြူရေးနှင့်စိုက်ပျိုးရေးဇုန်

ကေ (၁၀၀၀၀) ခန့် ကျယ်ဝန်းသောညောင်နှစ်ပင်ဧရိယာတွင် စိုက်ပျိုးရေး ဇုန် ၃ ဇုန်ကို ထူထောင် ထားပြီးဖြစ်သည်။ စိုက်ပျိုးရေးလုပ်ငန်းကို လုပ်ကိုင်နိုင်ရန်အတွက် သတ်မှတ်ထားသောဈေးနှုန်းကို ပေး ဆောင်နိုင်သည့် ပုဂ္ဂိုလ်တစ်ဦးစီအား စီမံကိန်းမြေဧရိယာတစ်ဝိုက်တွင် မြေ ၅ ဧကစီကို အသုံးပြုခွင့်ပေးထား ပါသည်။ စီမံကိန်းဧရိယာတစ်ဝိုက်တွင် လူပုဂ္ဂိုလ်အချို့က ၅ ဧကစီကျယ်သော မြေကွက်များတွင် သီးပင် စိုက်ခင်းများစိုက်ပျိုးထားရှိသည်။ အလားတူနှစ်ရှည်သီးနှံပင်များဖြစ်သော သရက်၊ ပိန္နဲ၊ နဂါးမောက်သီး၊ ကြက်မောက်သီးအပင်များကို အဆိုပါမြေကွက်များစိုက်ပျိုးထားသည်ကိုတွေ့ရသည်။ သီးပင်စိုက်ပျိုးခင်း များနှင့် ကပ်လျက် ငါးမွေးမြူရေးကန်များ၊ ကြက်ဘဲမွေးမြူရေးခြံများ ထူထောင်ထားရှိသည်ကိုလည်းတွေ့ ရသည်။ လှည်းကူးမြို့နယ်နှင့် မော်ဘီမြို့နယ်အကြားရှိ ယခင်သဘာဝပေါက်ပင်များရှိခဲ့သောနေရာတွင် ယခုအခါ ရာဘာနှင့်အော်ရေးရှားပင်များအပါအဝင် ဝင်ငွေရရှိစေသောသီးနှံစိုက်ပျိုးခင်းများနှင့် စပါးစိုက်ခင်း များက နေရာယူလျက်ရှိကြသည်။

၂.၅။ စီမံကိန်း အခြားဆောင်ရွက်နိုင်သောနည်းလမ်းများ

ရန်ကုန်တိုင်းဒေသကြီးတွင် ပြန်လည်နေရာချထားရေးပြဿနာ၊ လျှပ်စစ်မီးရရှိရေးနှင့် ရေရရှိရေးတို့ အတွက် စိုးရိမ်ပူပန်မှုမရှိရသောနေရာမှာ ရှားပါးလှသည်။ ဤစီမံကိန်းနေရာသည် အဓိက လမ်းမကြီးများနှင့် အမြန်လမ်းမကြီးများသို့ အတိုဆုံးခရီးအကွာအဝေးဖြင့် ရောက်ရှိနိုင်ရန် စီစဉ်၍ရနိုင်ပါသည်။ ဤနေရာကို

နဂိုမူလအတိုင်း ပေါက်ပင်အရိုင်းများဖြင့်သာ ထားမည်ဆိုပါလျှင် နိုင်ငံ၏ရည်မှန်းချက်ဖြစ်သော “တိုင်းပြည် စီးပွားဖွံ့ဖြိုးတိုးတက်အောင်လုပ်ဆောင်ခြင်း” သဘောတရားကို ဆန့်ကျင်ရာရောက်ပေသည်။

၃။ မူဝါဒ၊ ဥပဒေနှင့် အဖွဲ့အစည်းဆိုင်ရာမူဘောင်

ဤအပိုင်းတွင် စက်မှုလုပ်ငန်းဆိုင်ရာနယ်မြေများကို အကောင်အထည်ဖော်သော စီမံကိန်းများ အတွက် ဥပဒေမူဘောင်မည်သို့ရှိသည်ကိုဖော်ပြပြီး၊ စီမံကိန်းကိုအကောင်အထည်ဖော်ဆောင်ရွက်ရာတွင် မြန်မာနိုင်ငံတွင်ပတ်ဝန်းကျင်နှင့်သဟဇာတဖြစ်ပြီးလူမှုရေးရာပတ်ဝန်းကျင်နှင့် လိုက်လျောညီထွေဖြစ်အောင် သတ်မှတ်ပြဋ္ဌာန်းထားသည့် ဥပဒေ၊နည်းဥပဒေနှင့် လုပ်ထုံးလုပ်နည်းများနှင့်အညီ မည်သို့ဆောင်ရွက်ရမည် ဆိုသည်ကို ဖော်ပြထားသည်။

ပတ်ဝန်းကျင်နှင့်လူမှုရေးထိခိုက်မှုဆန်းစစ်ချက်လုပ်ငန်းတွင် အမျိုးသားစီမံကိန်း မူဝါဒဆိုင်ရာ လုပ်ငန်းမူဘောင်ကိုလေ့လာသုံးသပ်ခြင်း၊အစိုးရ၏သက်ဆိုင်ရာလမ်းညွှန်ချက်များအပေါ် လေ့လာသုံးသပ် ခြင်းနှင့် လုပ်ငန်းကဏ္ဍများနှင့်ပတ်သက်သော ဥပဒေများအပေါ်လေ့လာသုံးသပ်ခြင်းများပါဝင်ပါသည်။ မူဝါဒဆိုင်ရာအစီအမံများက အဆိုပြုစီမံကိန်းလုပ်ငန်းအပေါ် မည်သို့သက်ရောက်မှုရှိသည်ကို ဤဆန်းစစ် ခြင်း အစီရင်ခံစာတွင် အသေးစိတ် ဖော်ပြမည်ဖြစ်သည်။

၄။ အခြေခံအချက်အလက်ရယူခြင်း

၄.၁။ လေ့လာမှုနယ်ပယ်

မြန်မာ့အစိုးရသုတေသန (MSR) ၏ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းအဖွဲ့သည် ယခင် စီမံကိန်း အဆိုပြုချက်တွင် ဖော်ပြပါရှိသော ၂၄၆၄၂၅ စတုရန်းမီတာ (၆၀၀ ဧက) အကျယ်အဝန်းပေါ်အခြေခံပြီး မြေကြီး၊ ရေ နမူနာကောက်ယူခြင်းများ ပြုလုပ်ခဲ့ပါသည်။ လေ့လာအသွေးတိုင်းတာခြင်းကို စီမံကိန်း ဧရိယာနှင့် စီမံကိန်းသက်ရောက်မှုရှိမည့်ဧရိယာများကို လွှမ်းခြုံနိုင်ရန် တိုင်းတာသည့် နေရာမှ ၅ ကီလိုမီတာ အချင်းဝက်အထိ လွှမ်းခြုံနိုင်သည့်နေရာများတွင် ရွေးချယ်တိုင်းတာခဲ့ပါသည်။

လူမှုပတ်ဝန်းကျင်လေ့လာမှုနယ်ပယ်အဖြစ် စီမံကိန်းဧရိယာမှ ၅ ကီလိုမီတာ အချင်းဝက် အကွာ အဝေး အတွင်း၌ တည်ရှိသော ကြာကန်စု၊ ညောင်နှစ်ပင်၊ တကူတုံး၊ စုန်ကုန်း၊ ကြာအင်း (အနောက်) နှင့် ကြာအင်း (အရှေ့) ကျေးရွာများကို သတ်မှတ်ပါသည်။

ဇီဝပတ်ဝန်းကျင်လေ့လာမှုနယ်ပယ်အဖြစ် စီမံကိန်းဧရိယာမှ ၃ ကီလိုမီတာ အချင်းဝက် အကွာ အဝေးအတွင်းရှိ နေရာဒေသများကို အဓိကထား၍ သတ်မှတ်ပါသည်။ သို့ရာတွင် လူမှုရေး၊ ရုပ်ပိုင်းနှင့် သက်ရှိ များအပေါ် ထိခိုက်မှုဆန်းစစ်ခြင်းသည် စီမံကိန်း ပတ်ဝန်းကျင် ဧရိယာကိုသာ ကန့်သတ်လုပ်ဆောင်ခြင်း မဟုတ်ပါ။ ဒေသတွင်းနှင့် နိုင်ငံတော်အဆင့်အထိ ထိခိုက်မှုမည်မျှရှိနိုင်သည်ကို နားလည်သဘောပေါက်စေရန် လေ့လာဆန်းစစ်ချက်များကို ကျယ်ကျယ်ပြန့်ပြန့် လုပ်ဆောင်ထားပါသည်။

၄.၂။ ရုပ်ပိုင်းဆိုင်ရာပတ်ဝန်းကျင်အချက်အလက်များရယူခြင်း

၄.၂.၁။ လေ့လာအသွေးတိုင်းတာခြင်း

စီမံကိန်းဧရိယာအတွင်း သတ်မှတ်ထားသောနေရာတွင် တပ်ဆင်ထားသော EPAS haz-scanner စက်၏ အလိုအလျောက်အာရုံခံကိရိယာများဖြင့် လေ့လာအသွေးကို တိုင်းတာပါသည်။ ၎င်းတို့က

လက်ရှိအခြေအနေတွင်ရှိသော လေအရည်အသွေးကို မှတ်တမ်းတင်ထားပြီး လေထုညစ်ညမ်းမှုရှိလာနိုင်သောအခါ ရှိလာသည့်အခြေအနေနှင့် နှိုင်းယှဉ်ဖော်ပြပြီးခွဲခြမ်းစိတ်ဖြာနိုင်ရန် ဖြစ်ပါသည်။ လေနမူနာ စုဆောင်းသည့် အချိန်သည် EPAS haz-scanner လေနမူနာ စုဆောင်းသည့် ကရိယာကို အသုံးပြုပြီး PM_{2.5} နှင့် PM₁₀ တို့ကို တိုင်းတာခြင်းနှင့် အခြားသော ဓာတ်ငွေ့များကို EPAS haz-scanner ၏ အလိုအလျောက် အာရုံခံကိရိယာများဖြင့် တိုင်းတာ ခြင်းတို့၏ ၂၄ နာရီတိုင်းတာသည့်အဆင့် အပေါ်အခြေခံသည်။ ၂၀၁၇ ခုနှစ် ဧပြီလတွင် လေတိုင်းတာမှုတစ်ကြိမ်နှင့် ၂၀၁၉ ခုနှစ် ဇူလိုင်လတွင် လေတိုင်းတာမှုတစ်ကြိမ် စုစုပေါင်း နှစ်ကြိမ် ပြုလုပ်ခဲ့ပါသည်။ လေတိုင်းတာမှုများကို ကျန်းမာရေးနှင့်အားကစားဝန်ကြီးဌာန၊ လုပ်ငန်းခွင် နှင့် ပတ်ဝန်းကျင် ကျန်းမာရေးဌာနခွဲ၊ ပတ်ဝန်းကျင် ကျန်းမာရေးဓာတ်ခွဲခန်းတွင် စစ်ဆေးပါသည်။ ဓာတ်ခွဲခန်း တွင် စစ်ဆေးတွေ့ရှိချက်များအရ ပထမအကြိမ် လေတိုင်းတာမှုတွင် PM_{2.5} ၊ PM₁₀ နှင့် ဆလဖာဒိုင် အောက်ဆိုဒ်၊ ဒုတိယအကြိမ် လေတိုင်းတာမှုတွင် ဆလဖာဒိုင် အောက်ဆိုဒ်တို့၏ လေထုထဲတွင်ပါဝင်မှုမှာ အမျိုးသားပတ်ဝန်းကျင်အရည်အသွေးထုတ်လွှတ်မှု လမ်းညွှန်ချက်များပါ ရည်ညွှန်းတန်ဖိုးများထက် ကျော်လွန်နေပြီး နိုက်ထရိုဂျင် ဒိုင်အောက်ဆိုဒ်၊ ကာဗွန်မိုနောက်ဆိုဒ်၊ အိုဇုန်းနှင့် VOCs တို့သည် ရည်ညွှန်း တန်ဖိုးများအောက် လျော့နည်းပါသည်။

၄.၂.၂ ဆူညံသံနှင့်တုန်ခါမှုတိုင်းတာခြင်း

အသံအဆင့်အားစောင့်ကြည့်တိုင်းတာခြင်းကို မြန်မာနိုင်ငံတွင် ခွင့်ပြုချက်ရရှိပြီး လက်ရှိ အသုံးပြု နေသော အမေရိကန်နိုင်ငံရှိ အစိုးရစက်မှုဆိုင်ရာသန့်ရှင်းမှုကွန်ဖရင့် (ACGIH) မှချမှတ်ထားသည့် စံချိန်စံညွှန်း အတိုင်းဆောင်ရွက်ပါသည်။ တိုင်းတာမှုကို ၂၄ နာရီ ဆောင်ရွက်ပါသည်။ တစ်နာရီအတွင်းပျမ်းမျှ ဆူညံသံ အဆင့် (Leq in dBA) နှင့် အမြင့်ဆုံး ဆူညံသံ (Lmax in dBA)ကို တိုင်းတာပါသည်။ ဤတိုင်းတာမှုကို လေအရည်အသွေး တိုင်းတာခြင်းနှင့် အတူလုပ်ဆောင်ခဲ့ပါသည်။ နေ့အချိန်နှင့် ညအချိန်တို့အတွက် တစ်နာရီ အတွင်းပျမ်းမျှ ဆူညံသံနှင့် အမြင့်ဆုံး ဆူညံသံအဆင့်တို့မှာ ရည်ညွှန်းတန်ဖိုးများအောက် လျော့နည်းပါသည်။

၄.၂.၃ မြေဆီလွှာအရည်အသွေးတိုင်းတာခြင်း

မြေဆီလွှာ အာဟာရဓာတ်နှင့် သတ္တုပါဝင်မှုကို တိုင်းတာစစ်ဆေးရန် အပေါ်ယံမြေဆီလွှာ နမူနာ စုစုပေါင်း ၁၀ မျိုးနှင့် အောက်မြေဆီလွှာ နမူနာ စုစုပေါင်း ၈ မျိုးကို ကောက်ယူခဲ့ပါသည်။ ၂၀၁၇ ခုနှစ် ဧပြီလ တွင် အပေါ်ယံမြေဆီလွှာ နမူနာ ၆ မျိုးနှင့် အောက်မြေဆီလွှာ နမူနာ ၄ မျိုး၊ ၂၀၁၉ ခုနှစ် ဇူလိုင်လတွင် အပေါ်ယံမြေဆီလွှာ နမူနာ ၄ မျိုးနှင့် အောက်မြေဆီလွှာ နမူနာ ၄ မျိုးကို ကောက်ယူခဲ့ပါသည်။ မြေဆီလွှာ နမူနာများကို စီမံကိန်းဧရိယာ ပတ်ဝန်းကျင်နှင့် စိုက်ပျိုးရေးဇုန် ၁ အတွင်းမှ ကောက်ယူခဲ့ပါသည်။

မြေဆီလွှာလေ့လာခြင်းကို ရုရှားမြေဆီလွှာသိပ္ပံပညာရှင်၏ စမ်းသပ်ခြင်းနည်းနှင့် FAO၊ UNESCO တို့၏နည်းစနစ်များကို အသုံးပြုဆောင်ရွက်ပါသည်။ မြေဆီလွှာ အရောင်အဆင်း၊ မြေသားအခြေအနေ၊ မြေဆီလွှာဖွဲ့စည်းထားပုံ၊ ရေငွေ့ပါဝင်မှု၊ မာကျောမှု၊ ရေစီးရေလာ၊ ပေါင်းစပ်ပါဝင်မှုနှင့် မြေဆီလွှာသစ်ဖြစ်ထွန်းမှုစသော ရုပ်ပိုင်းဆိုင်ရာဂုဏ်သတ္တိများကို မှတ်တမ်းတင်ပြီး၊ မြေဆီလွှာ အမျိုးအမည် သတ်မှတ်ခြင်းကို ရုရှားနိုင်ငံမြေဆီလွှာအမျိုးအစားခွဲခြားမှုနည်းနှင့် FAO ၏မြေဆီလွှာအမျိုး အစားခွဲခြား နည်းများကို အသုံးပြုပါသည်။

မြေကြီးနမူနာများကို စိုက်ပျိုးရေး၊ မွေးမြူရေးနှင့် ဆည်မြောင်းဝန်ကြီးဌာန၊ စိုက်ပျိုးရေးဦးစီးဌာန၊ ဓာတ်ခွဲခန်းတွင် ဓာတ်ခွဲစမ်းသပ်ပြီး အတည်ပြုချက်ရယူပါသည်။ ဓာတ်ခွဲခန်းအဖြေအရ ရေတွင်ပျော်ဝင်သောဆားကို ခွဲခြမ်းစိတ်ဖြာရာတွင် ပျော်ဝင်ဆားပမာဏ၊ လျှပ်ကူးသတ္တိ၊ ကြွင်းကျန် ဆိုဒီယမ်ကာဗွန်နိတ်နှင့် ဆိုဒီယမ်စုပ်ယူနိုင်သည့်အချိုးတို့သည် ပြဿနာမရှိကြောင်း သိရှိရပါသည်။ မြေဆီလွှာ အာဟာရဓာတ်နှင့် ပတ်သက်ပြီး ကောင်းမွန်သော အနေအထားတွင်ရှိပါသည်။ သတ္တုပါဝင်မှုတွင် နီကယ်၊ ခရိုမီယမ်၊ ကယ်ဒမီယမ်နှင့် ခဲပါဝင်မှုတို့ကို မတွေ့ရှိရဘဲ သံဓာတ်ပါဝင်မှုမှာ အများဆုံးပါဝင်ရန်ခွင့်ပြုထားသော ပမာဏ ၂၄၀ ppm ထက် များစွာကျော်လွန်နေသည်ကို တွေ့ရှိရပါသည်။

၄.၂.၄။ ရေအရည်အသွေးတိုင်းတာခြင်း

ရေအရည်အသွေးတိုင်းတာစစ်ဆေးရန် ရေနမူနာ စုစုပေါင်း ၁၂ မျိုးကို ၂၀၁၇ ခုနှစ် ဧပြီလနှင့် ၂၀၁၉ ခုနှစ် ဇူလိုင်လတို့တွင်ကောက်ယူခဲ့ပါသည်။ မြေပေါ်ရေ/သောက်ရေ အတွက် ရေနမူနာ ၅ မျိုးကို ရေကန်၊ ရန်ကုန်-မန္တလေးအမြန်လမ်းအနီး (၆.၂ မိုင်) ရှိ ကြာအင်းချောင်း၊ လက်ပန်ဝဲကျေးရွာအနီး ပုဇွန်တောင်ချောင်း၊ ကလီထော် ရေလှောင်တံခံတို့မှ ကောက်ယူခဲ့ပြီး စွန့်ပစ်ရေ နမူနာ ၅ မျိုးနှင့် မြေအောက်ရေ (ရေတွင်းရေ) နမူနာ ၂ မျိုးကိုလည်းကောက်ယူခဲ့ပါသည်။

ရေနမူနာများကိုစစ်ဆေးတိုင်းတာရန် atomic absorption spectrophotometer (graphite furnace method) ကရိယာနှင့် POTATEST ၏ Spectrophotometer နှင့် Incubation နည်းကို အသုံးပြု၍ စစ်ဆေးလေ့လာပါသည်။ ကောက်ယူထားသော ရေနမူနာများ၏ ပါရာမီတာများဖြစ်သော ရေ၏အရောင်အဆင်း၊ ချဉ်ဓာတ် (pH)၊ BOD၊ COD၊ Total Dissolved Solid၊ နိုက်ထရိတ်၊ အာဆင်နစ်၊ ဘတ်တီးရီးယားပေါက်ပွားနေမှုစသည်တို့ကို တိုင်းတာခြင်းဖြစ်ပြီး ဓာတ်ခွဲခန်းအဖြေအရ ပါရာမီတာအများစု၏ ရေတွင် ပါဝင်မှု/ပြင်းအားမှာ ရည်ညွှန်းတန်ဖိုးအောက် လျော့နည်းနေပြီး စွန့်ပစ်ရေတွင် ဆီ/ချောဆီပါဝင်မှုမှာ ရည်ညွှန်းတန်ဖိုးထက် ကျော်လွန်နေပါသည်။

၄.၃။ သက်ရှိပတ်ဝန်းကျင်ဆိုင်ရာအချက်အလက်များရယူခြင်း

ယခုအဆိုပြုထားသော စက်မှုနယ်မြေစီမံကိန်းမြေသည် သီးပင်စိုက်ခင်းများနှင့် စီးပွားဖြစ်စိုက်ပျိုးထားသော သစ်သီးနှင့်ဟင်းသီးဟင်းရွက်စိုက်ပျိုးခင်းများနှင့် ဆက်စပ်နေသော တောတိရစ္ဆာန်များရှင်သန်နေထိုင်ရန် မြက်ရိုင်း၊ သစ်ပင်ရိုင်းများရှိသည့် ပလပ်မြေအဖြစ် ရှိနေသော အသုံးပြုခြင်းမရှိသည့် မြေဖြစ်သည်။ စီမံကိန်း ပြုလုပ်မည့် နေရာသို့သွားရောက်၍ အခြေခံအချက်အလက်များကိုရယူခဲ့ပါသည်။ ၎င်းနေရာ၏ ကုန်းနေ၊ရေနေသတ္တဝါများ၊ သစ်ပင်ပန်းမန်၊ မြေအသုံးချမှုဆိုင်ရာအချက်အလက်များကို ရယူမှတ်တမ်းပြုစုခြင်းတို့ကို ပြုလုပ်ခဲ့ပြီး နေရာဒေသ၏ဖြစ်စဉ်သမိုင်း၊ ယခင်ကဖြစ်တည်ခဲ့သော သစ်ပင်နှင့် တိရစ္ဆာန်များနှင့် ယခုရှိနေသောသစ်ပင်နှင့် တိရစ္ဆာန်များဆိုင်ရာ အချက်အလက်များကို ရရှိနိုင်ရန် ဒေသခံများနှင့် တွေ့ဆုံခြင်းတို့ကိုဆောင်ရွက်ခဲ့ပါသည်။

မြေပြင်နှင့်ရေပြင်ဂေဟဖြစ်စဉ်များကို လေ့လာဆန်းစစ်ခဲ့ပြီး စီမံကိန်းနေရာတွင် ရှိနေကြသော သတ္တဝါများ ရှင်သန်နေထိုင်ရာနေရာများကို ခွဲခြားလေ့လာမည်ဖြစ်သည်။

သက်ရှိများအပေါ်ထိခိုက်မှုကို ဆန်းစစ်လေ့လာသည့်အဖွဲ့သည် မျက်မြင်လေ့လာခြင်းနှင့် စီမံကိန်းမြေဧရိယာကိုအပိုင်းလိုက်ဖြတ်၍လေ့လာခြင်းတို့ကို ပြုလုပ်ခဲ့ပါသည်။ သစ်ပင်ကြီးများ၊ သစ်ပင်ငယ်များ၊

ခြံပုတ်များ၊ သစ်ပင်မျိုးစိတ်များနှင့် ၎င်းတို့ စီမံကိန်းဝန်းကျင်တွင် မည်သို့ပျံ့နှံ့ပေါက်ရောက်နေသည်ကို အမျိုးအစားအလိုက် ခွဲခြားသတ်မှတ်ခဲ့ပါသည်။

၄.၄။ လူမှု-စီးပွားဆိုင်ရာအချက်အလက်များရယူခြင်း

စီမံကိန်းဧရိယာမှ အချင်းဝက် ၅ ကီလိုမီတာအတွင်းရှိ ရွာ ၆ ရွာမှ ကျေးရွာခေါင်းဆောင်များ၊ ကျေးရွာ အုပ်ချုပ်ရေးအဖွဲ့များမှ တာဝန်ရှိသူများ၊ ရဟန်းတော်များ၊ အခြားဘာသာရေးခေါင်းဆောင်များ၊ စီးပွားရေး လုပ်ငန်းလုပ်ကိုင်နေသူများ၊ ကျန်းမာရေး ဝန်ထမ်းများ၊ ဈေးဆိုင်ပိုင်ရှင်များ၊ ရွာသူရွာသားများ (အမျိုးသမီး၊ လူကြီး၊ လူငယ် အပါအဝင်) ကို မေးမြန်းဆွေးနွေးခဲ့ပါသည်။ ထို ကျေးရွာ ၆ ရွာ၏ လူမှုစီးပွားအခြေအနေကို မှတ်တမ်းပြုစုခဲ့ပါသည်။

၅။ ဖြစ်ပေါ်နိုင်သည့် ပတ်ဝန်းကျင်ထိခိုက်မှုများ

စီမံကိန်းလုပ်ငန်းအဆင့်တစ်ခုချင်းစီအလိုက် ဖြစ်ပေါ်နိုင်သည့် ပတ်ဝန်းကျင်ထိခိုက်မှုများမှာ လေထု ညစ်ညမ်းခြင်း၊ ရေညစ်ညမ်းခြင်း၊ ဆူညံသံနှင့် တုန်ခါမှုဖြစ်စေခြင်း၊ အစိုင်အခဲ စွန့်ပစ်အညစ်အကြေး ထုတ်လွှတ်ခြင်း၊ မြေတိုက်စားခြင်းနှင့် မြေအရည်အသွေးကျဆင်းခြင်း၊ မြေအောက်ရေနှင့် မြေပေါ်ရေကို ညစ်ညမ်းစေခြင်းနှင့် သဘာဝပေါက်ပင်များ ပျက်စီးပြီး တောတိရစ္ဆာန်များကို အခြားနေရာသို့ ရွှေ့ပြောင်း စေခြင်း၊ အများပြည်သူ၏ကျန်းမာရေးနှင့် ဘေးအန္တရာယ်ကင်းရှင်းရေးကို ထိခိုက်စေခြင်းနှင့် အရေးပေါ် အခြေအနေများ ပေါ်ပေါက် လာစေခြင်း စသည်တို့ဖြစ်ပါသည်။

၅.၁။ ထိခိုက်မှုဆန်းစစ်ခြင်းလုပ်ငန်း နယ်ပယ်

စီမံကိန်း၏ ကောင်းကျိုးနှင့် ထိခိုက်မှု (ဆိုးကျိုး) နှစ်မျိုးလုံးကို ဆန်းစစ်ခဲ့ပါသည်။ ဆန်းစစ်ရာတွင် ရုပ်ပိုင်း၊ ဇီဝပိုင်း နှင့် လူမှုစီးပွားရေးဆိုင်ရာ အရေးပါသော အခြေအနေများကို ဆန်းစစ်အကဲဖြတ်ခြင်းနှင့် ဖြစ်ပေါ်နိုင်သည့် ပတ်ဝန်းကျင်ထိခိုက်မှုများ၏ပမာဏနှင့်အရေးပါမှုကိုအကဲဖြတ်ခြင်း၊ ပတ်ဝန်းကျင် အပေါ်သက်ရောက်မှုများကို လျော့ပါးစေနိုင်သည့် နည်းလမ်းများနှင့် ကြွင်းကျန် သက်ရောက်မှုများကို ဖော်ထုတ်ခြင်း၊ ဆက်စပ်သက်ရောက်မှုများကို ဖော်ထုတ်ခြင်းနှင့် လျော့ပါးစေနိုင်သည့် နည်းလမ်းများ ပါဝင် ပါသည်။

၆။ ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်

ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းလုပ်ငန်းစဉ်မှပေါ်ထွက်လာသောစီမံကိန်း၏အားလုံးသော ဖြစ်စဉ် များတလျှောက် အကောင်အထည်ဖော်ရမည့် ပတ်ဝန်းကျင်နှင့်လူမှုစီးပွားဆိုင်ရာ စီမံခန့်ခွဲမှုအစီအစဉ် များကို ရှင်းလင်းစွာ သတ်မှတ်ဖော်ပြထားပြီး အကောင်အထည်ဖော်လုပ်ဆောင်နိုင်ရန် ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှု အစီအစဉ်ကိုရေးဆွဲခဲ့ပါသည်။ ၎င်းအစီအစဉ်ကိုအကြိုတည်ဆောက်ခြင်း၊ တည်ဆောက်ခြင်း၊ လုပ်ငန်းလည် ပတ်ဆောင်ရွက်ခြင်း၊ ရပ်ဆိုင်းခြင်းနှင့်ပိတ်သိမ်းခြင်းကာလများအတွင်း ဖော်ဆောင်ရမည်ဖြစ်သည်။ ထို့ပြင် စီမံကိန်းအစီအစဉ်ရေးဆွဲခြင်းနှင့်ပုံဖော်ခြင်းတွင် ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုဆိုင်ရာ ရည်မှန်းချက်များကို ထည့်သွင်းစဉ်းစားရန်ဖြစ်ပါသည်။

၇။ ပတ်ဝန်းကျင်စောင့်ကြပ်ကြည့်ရှုမှုအစီအစဉ်

ပတ်ဝန်းကျင်ဆိုင်ရာစီမံခန့်ခွဲမှုအစီအစဉ်နှင့်အတူ စောင့်ကြပ်ကြည့်ရှုမှုအစီအစဉ်တစ်ရပ်ကိုလည်း ထည့်သွင်းရေးဆွဲထားပါသည်။ ကောင်းမွန်သော ပတ်ဝန်းကျင်ရေးရာလုပ်ဆောင်ချက်ကိုရရှိရန် ၎င်း စောင့်ကြပ်ကြည့်ရှုမှုအစီအစဉ်သည် ပတ်ဝန်းကျင်အနေအထား၏ အလားအလာနှင့်အပြောင်းအလဲတို့ကို စောင့်ကြည့်မှုပြုလုပ်ပြီး လိုအပ်ပါက ကုစားသည့်ဆောင်ရွက်ချက်များကို ပြုလုပ်နိုင်ရန်အတွက်ဖြစ်သည်။

၈။ လူမှုစီးပွားဆိုင်ရာသက်ရောက်မှုကိုဆန်းစစ်ခြင်းနှင့်အများပြည်သူနှင့်တိုင်ပင်ဆွေးနွေးခြင်း
ဤလုပ်ငန်းစဉ်တွင် အပိုင်း ၃ပိုင်း ပါဝင်သည်။

(က) အများပြည်သူနှင့်တိုင်ပင်ဆွေးနွေးခြင်းနှင့် စီမံကိန်းအကြောင်းရှင်းလင်းတင်ပြခြင်း

(ခ) လူမှုအခြေခံအခြေအနေကို ပဏာမ လေ့လာခြင်းနှင့် အချက်အလက်ကောက်ယူခြင်း

(ဂ) လူမှုရေးဆိုင်ရာ သက်ရောက်မှုကိုဆန်းစစ်ခြင်း

အများပြည်သူနှင့်တွေ့ဆုံဆွေးနွေးခြင်းတွင် အောက်ဖော်ပြပါလုပ်ငန်းများကိုဆောင်ရွက်ပါသည်။

(က) စီမံကိန်းဧရိယာကို ဗဟိုပြုလျက်အချင်းဝက် ၅ကီလိုမီတာအတွင်း၌ တည်ရှိသောကျေးရွာ (၆) ရွာရှိရပ်ရွာခေါင်းဆောင်များ၊ ကျေးရွာအုပ်ချုပ်ရေးတာဝန်ရှိသူများ၊ ဗုဒ္ဓဘာသာ ဘုန်းတော်ကြီးများ၊ စီးပွားရေးလုပ်ငန်းလုပ်ကိုင်သည့် ဒေသခံအသိုင်းအဝိုင်း၊ ကျောင်းဆရာ များ၊ ကျန်းမာရေးဝန်ထမ်းများ၊ ကုန်ပစ္စည်းရောင်းချသူများနှင့် ဆိုင်ပိုင်ရှင်များကို တွေ့ဆုံ မေးမြန်းခဲ့ပါသည်။

(ခ) စီမံကိန်းသက်ရောက်မှုရှိမည့်ကျေးရွာ(၆)ရွာ၏အချက်အလက်များကိုကောက်ယူခဲ့ပါသည်။

(ဂ) စီမံကိန်းကြောင့် တိုက်ရိုက် သို့မဟုတ် သွယ်ဝိုက်ပြီး သက်ရောက်ခြင်းခံရနိုင်သည့် လူမှု အသိုက်အဝန်းများ၊ အိမ်ထောင်စုများ၊ စီမံကိန်းနယ်မြေနှင့်အနီးအနားဒေသတွင် နေထိုင်သူ များ၊ စိုက်ပျိုးရေးနှင့်မွေးမြူရေးဇုန် (၃) ဇုန်မှ တာဝန်ရှိသူများ၊ ညောင်နှစ်ပင်ဧရိယာရှိ ကျေးရွာအုပ်ချုပ်ရေးအဖွဲ့များနှင့် ၂၀၁၉ ခုနှစ် ဖေဖော်ဝါရီလ ၈ ရက်တွင် စိုက်ပျိုးရေးနှင့် မွေးမြူရေးဇုန် (၃) အစည်းအဝေးခန်းမတွင် ပြုလုပ်ခဲ့သော အများပြည်သူနှင့်တွေ့ဆုံပွဲ တွင် တွေ့ဆုံကာ တိုင်ပင်ဆွေးနွေးခြင်းနှင့် စီမံကိန်းအကြောင်းရှင်းလင်းတင်ပြခြင်းကို ပြုလုပ်ခဲ့ ပါသည်။

(ဃ) ဒုတိယအကြိမ်အများပြည်သူနှင့်တိုင်ပင်ဆွေးနွေးခြင်းကို ၂၀၂၀ ခုနှစ် မတ်လ ၂၃ ရက် တွင် ပြုလုပ်သွားရန်စီစဉ်ထားခဲ့ပါသည်။ သို့ရာတွင် ကမ္ဘာ့ကျန်းမာရေးအဖွဲ့မှ COVID-19 ရောဂါ ဖြစ်ပွားပျံ့နှံ့မှုအား ကမ္ဘာ့ကပ်ရောဂါအဆင့်သတ်မှတ်ခြင်းနှင့် ပြည်ထောင်စုသမ္မတမြန်မာ နိုင်ငံတော်၊ နိုင်ငံတော်သမ္မတရုံးမှ လူစုလူဝေးများပြုလုပ်ခြင်းကို ရှောင်ကြဉ်ကြပါရန် နှိုးဆော်ချက်များအရ COVID-19 ရောဂါ ကူးစက်ပျံ့ပွားမှုကို ကာကွယ်ရန်နှင့် (ပျံ့နှံ့ခဲ့လျှင်) ပျံ့နှံ့မှုကိုလျော့ချနိုင်ရန် လိုအပ်သည့် ကြိုတင်စီမံဆောင်ရွက်မှုများကို မိမိတို့အားလုံး လိုက်နာဆောင်ရွက်ကြရန်မှာ အရေးကြီးပါသဖြင့် စီစဉ်ထားသောအများပြည်သူနှင့် တိုင်ပင် ဆွေးနွေး ပွဲကို ဆိုင်းငံ့ထားခဲ့ရပါသည်။ သို့ဖြစ်ပါ၍ အများပြည်သူနှင့်တိုင်ပင်ဆွေးနွေးပွဲကို COVID-19 ရောဂါကူးစက် ပျံ့ပွားမှုကို လုံးဝထိန်းချုပ်နိုင်ပြီး နိုင်ငံတော်သမ္မတရုံးမှ လူစုလူဝေးများပြုလုပ်ခြင်းကို ခွင့်ပြုသည့် အချိန်မှသာ ပြန်လည်ကျင်းပ ပြုလုပ်နိုင်မည်

ဖြစ်ပါသည်။

၈.၁။ အများပြည်သူနှင့်တိုင်ပင်ဆွေးနွေးပွဲတွင် ဆွေးနွေးအကြံပြုချက်များနှင့် တွေ့ရှိချက်များ

- ၁။ ညောင်နှစ်ပင်စိုက်ပျိုးမွေးမြူရေးဇုန် (၃)တွင်မူလတန်းကျောင်းသာရှိသဖြင့်အလယ်တန်းကျောင်းလိုအပ်ကြောင်းတွေ့ရှိရသည်။
- ၂။ အလုပ်သမားများ မှော်ဘီ၊ လှည်းကူး၊ ထောက်ကြံ့တို့တွင်သွား၍ အလုပ်လုပ်ကြရန် အခက်အခဲရှိနေ၍ စက်မှုဇုန်ပေါ်ပေါက်လာပါက ၎င်းတို့ကို အလုပ်ခန့်ထားသင့်ပါသည်။
- ၃။ ကျန်းမာရေးအတွက် ဆေးကုသရန်ငါးဆူတောင်ရွာသို့ သွားရသဖြင့် အခက်အခဲ ရှိနေသောကြောင့် ကျေးလက်ဆေးပေးခန်း/ဆေးရုံတစ်ခုလိုအပ်ကြောင်း တွေ့ရှိရသည်။
- ၄။ ဇုန် (၃) အတွင်းရှိစိုက်ပျိုးရေးလုပ်ကိုင်သူများမှာ ကလီထော်ဆည်မှ ရေကိုမရရှိသဖြင့် ရေလွှတ်ပေးရန်လိုအပ်ကြောင်း တွေ့ရှိရသည်။
- ၅။ စိုက်ပျိုးမွေးမြူရေးဇုန်တွင် နေထိုင်ကြသည့် မိသားစုများနားရေးဖြစ်ပါက မြေမြှုပ်သဂြိုဟ်ရန် မြေနေရာမရှိသဖြင့်သန့်ရှင်းမြေတစ်ခုလိုအပ်သည်။
- ၆။ ညောင်နှစ်ပင်ညီလာခံဝင်း၏ ပြင်ပပတ်လည်ရှိလမ်းများမှာပျက်စီးနေသဖြင့် လမ်းများ ကောင်းအောင် ဆောင်ရွက်ပေးရန်လိုအပ်သည်။
- ၇။ စက်မှုဇုန်တွင်ပတ်ဝန်းကျင်ရှိနေထိုင်သူများကို ဒုက္ခပေးနိုင်သော အနံ့အသက်များနံသည့် စက်ရုံများပါဝင်ပါက ကျန်းမာရေးထိခိုက်မှုရှိနိုင်၍ ၎င်းစက်ရုံများတည်ဆောက်ခြင်းကို မလိုလားကြပါ။
- ၈။ စိုက်ပျိုး၊ မွေးမြူရေးဇုန်ဖြစ်သဖြင့် စိုက်ပျိုး၍ ထွက်လာသောအသီးအရွက်များ၊ မွေးမြူရေးထွက်ကုန်များကို နိုင်ငံခြားတင်ပို့ ပေးမည့် စက်ရုံ ၊ အလုပ်ရုံများပါဝင်ရန်လိုလားကြသည်။
- ၉။ ဇုန်အတွင်း နေထိုင်ကြသူအများစုမှာ အဝီစိတွင်းနှင့် လက်တူးရေတွင်းမှရေကို သောက်သုံးကြရသဖြင့် သောက်သုံးရေကောင်း၊ ရေသန့်ရရှိရန် လိုအပ်သည်။
- ၁၀။ စက်မှုဇုန်ပေါ်ပေါက်လာပါက မြေဈေးကောင်းလာမည်ဖြစ်ပြီး မြေပိုင်ရှင်မှ မြေရောင်းလိုက်လျှင် နေရာ၊ လုပ်စရာမရှိဖြစ်သွားမှာကို စိုက်ပျိုးရေးလုပ်ရန် မြေငှားလုပ်ကိုင်နေသူများသည် စိုးရိမ်ပူပင်လျက်ရှိကြသည်။
- ၁၁။ စက်မှုဇုန်တွင် ဓါတုပစ္စည်းများအသုံးပြုခြင်းနှင့် စက်ရုံထုတ် စွန့်ပစ်ပစ္စည်းများကြောင့် စိုက်ပျိုးမြေများ ပျက်စီးသွားမှာကို စိုးရိမ်မှုရှိနေကြသည်။
- ၁၂။ စက်မှုဇုန်ဆောင်ရွက်ရာတွင် ကွဲ၊ နွား သားသတ်ရုံများပါဝင်လာမည်ကို ဒေသခံများနှင့် ဘုန်းတော်ကြီးများက စိုးရိမ်မှုရှိကြသည်။
- ၁၃။ စိုက်ပျိုးရေးဇုန်အဖြစ်ထူထောင်ထားသော်လည်း ဆည်ရေအလုံအလောက်မရှိသောကြောင့် စက်ရေတွင်းများကို မှီခိုနေကြရသော နေရာများတွေ့ရှိရသည်။

၉။ အစီရင်ခံစာဖွဲ့စည်းပုံ

အစီရင်ခံစာကို သယံဇာတနှင့်သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာန၏ ကြေညာချက်အမှတ် - ၆၁၆/၂၀၁၅ အရ ထုတ်ပြန်ထားသော ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်းအတိုင်းရေးသားပြုစုပါသည်။

အကျဉ်းချုပ်အစီရင်ခံစာ (မြန်မာ၊ အင်္ဂလိပ် နှစ်ဘာသာဖြင့်)

- (က) နိဒါန်း
- (ခ) မူဝါဒ၊ ဥပဒေနှင့်အဖွဲ့အစည်းဆိုင်ရာမူဘောင်
- (ဃ) စီမံကိန်းအကြောင်းအရာဖော်ပြချက်နှင့် အခြားနည်းရွေးချယ်ခြင်းများ
- (င) အနီးပတ်ဝန်းကျင်အကြောင်းအရာများဖော်ပြချက်
- (စ) ပတ်ဝန်းကျင်အပေါ်သက်ရောက်မှုနှင့် ဘေးအန္တရာယ်ရှိမှုဆန်းစစ်ခြင်းနှင့် လျော့နည်းစေရေး လုပ်ငန်းများ
- (ဆ) ဆက်စပ်သက်ရောက်မှုဆန်းစစ်ခြင်း
- (ဇ) ပတ်ဝန်းကျင် စီမံခန့်ခွဲမှုအစီအစဉ်
- (ဈ) အများပြည်သူနှင့်တိုင်ပင်ဆွေးနွေးခြင်းနှင့်သတင်းအချက်အလက်များထုတ်ဖော်တင်ပြခြင်း
- (ည) နိဂုံး

၁၀။ နိဂုံး

စီမံကိန်းကြောင့် ဖြစ်ပေါ်လာနိုင်သော ပတ်ဝန်းကျင်၊ လူမှုရေးနှင့် ကျန်းမာရေးဆိုင်ရာ သက်ရောက်မှုများကို ဆန်းစစ်ပြီး ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်ကို ရေးဆွဲခဲ့ပါသည်။ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း လုပ်ငန်းစဉ်တွင် အများပြည်သူပူးပေါင်းပါဝင်မှုကို အလေးထားဆောင်ရွက်ခဲ့ပြီး ၎င်းတို့၏ အကြံပြုချက်များနှင့် ပတ်ဝန်းကျင်ထိန်းသိမ်းရေး ဦးစီးဌာန၊ သယံဇာတနှင့်သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာန၏ သဘောထားမှတ်ချက်များကို ထည့်သွင်းစဉ်းစားပြီး ဤအစီရင်ခံစာကို ရေးသားထားပါသည်။ သို့ဖြစ်ပါ၍ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်းနှင့်အညီ ဤစီမံကိန်းအတွက် ပတ်ဝန်းကျင်ထိခိုက်မှု ဆန်းစစ်ခြင်းကို ဆောင်ရွက်ခဲ့ပြီး စီမံကိန်းဖော်ဆောင်သူမှ လိုက်နာဆောင်ရွက်ရမည့် ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်ကို ရေးဆွဲခဲ့ပါသည်။



Executive Summary (English)

1. Introduction

The objective of this report is to present the systematic identification and assessment of potential adverse impacts including cumulative impacts of the Industrial Complex project, systematic assessment of feasible project alternatives and determination of appropriate measures to mitigate potential adverse impacts. The report also includes the Environmental Management Plan (EMP).

2. Project Description and Location

The Ministry of Construction, Government of Myanmar and KMIC Development Co., Ltd. (KMIC JVC) have worked together on September 2015 to develop an industrial complex called KMIC Project. Both parties have agreed to develop it at Nyaung Hnitpin area about 40 km away to the north of Yangon. This site is 555.81 acres (2,249,288 square meter) wide flat land, located near Nyaung Hnitpin Livestock and Agricultural Zone No.3 in Hlegu Township. In this site, the industrial park would occupy the land area of 1,640,245 m². The rest will be occupied by other inside infrastructure including roads. The industrial park will be made up of three scale (large, medium and small) industrial plots where factories and warehouses for Garment Products, Food Manufacturing, Jewelry Processing, Vehicle Spare Parts, Electronic Parts installation etc. will be constructed. Besides, it will contain inside infrastructure such as residential, commercial, vocational training school, main roads, intersection roads, drainage, overhead electricity installation, plantation of green spaces, substation, wastewater treatment plant, water purification plant and public facilities.

The project site area also is known as Nyaung Hnitpin National Convention Compound, currently remained as unused land (that project area including buildings on it were used for drafting 2008 Constitution of Myanmar from 1994 to 2007 and then the Government at that time and the succeeding Governments had not used that area until this project was initiated.) where the buildings (Hall, Hostel, Theatre, Hospital, etc...) and roads have been remained in ruin among the Phone-zoe area of a fallow land, dry in summer, swampy in rainy season covered with wild grasses, wild plants and weak herbs and shrubs of many species.

2.1 Road

There are six types of road ways which would be constructed in the internal infrastructure. They are 38 m wide, 46 m wide, 26 m wide, 18m wide, 12 m wide and 8 m wide road ways.

2.2 Water Resource and usage

The developer has already planned to install the water from Kalihtaw Dam which was constructed since 2001 for supplying water for livestock and Agricultural Zone of Nyaung Hnitpin area.

2.3 Electricity

The project will use electricity supplied by government and installed from 230 kV Kamarnat-Myaungtakar national grid. The proper process of transformers will be installed at substation-yard. Internal supply will be installed overhead lines at road sides. Demand of consumption of electricity at the proposed project's operation stage will be 50 MW.

2.4 Livestock and Agricultural Zone

Three agricultural zones have been established at the Nyaung Hnitpin area of about 10,000 acres of land. Around the project site there exists 5-acre unit of land which is offered to any individual who could pay the designated price to use the land for agriculture. There are orchards of 5-acre land owned by different persons surrounding the project site. Long-term crops, such as mango, jack fruit, dragon fruit, and rambutan are grown in most of the unit of land. Many fish farming ponds and poultry keeping farms have also been already established just next to these orchards. Former vegetation of natural forest of the area have already been replaced by paddy growing fields and cash crop plantation including rubber and acacia plantation across the landscape between Hlegu and Hmawbi townships.

2.5 Project Alternatives

In terms of an alternative project, such area which does not need to solve the resettlement problem, worry on electricity and availability of water is rare in Yangon Region. Transport system could be built with shortest route to reach the main highways and expressways. No actionable option of keeping the area by maintaining the status quo of abandoning in wilderness is negative to the country goal of economic growth.

3. Policy, Legal and Institutional Framework

This session specifies the legislative framework relating to the project like KMIC Project. This session mainly focuses on the enacted laws, regulations and guidelines which are compulsory for the project proponent to comply with in developing the project as environmentally friendly and socially responsible business investment in Myanmar.

The ESIA process will include: a review of the National Policy and Legal Framework, a review of relevant Government Guidelines and legal policies in force, and a review of most of the relevant laws regulating such a kind of project in Myanmar. A full assessment of policy and regulatory context is detailed in this report.

4. Baseline Data Collection

4.1 Study Limit

MSR study team sets the study limit within the premises of 2,464,282 m² (600 Acres) wide land which is previous proposal limit for soil samples, water samples collection. Air quality measurement is done within 5 km radius range which covers the existing proposed land area of project site and area of influence of the project.

For the social environment, the study covers 6 villages, namely, Kyarkansu, Nyaung Hnitpin, Takutone, Sonekone, Kyarinn (Ashe) and Kyarinn (Anauk) villages which are located within 5 km radius from the project site.

Focus area for the biological environment is at project site and area within 3 km range for ecological perspective. However, overall social, physical and biological impact assessments are not limited to the surrounding area of the project site. The study looks at the wider scope for an understanding of regional and national level effect of the project.

4.2 Physical Environmental Data Collection

4.2.1 Air Quality Analysis

Air quality was measured by using Auto Sensors of the EPAS haz-scanner which was installed at the project site to identify the current condition of air quality to analyze and match with the air quality of later time in case of occurrence of air pollution. Sampling period was based on 24-hour measurement level of PM_{2.5} and PM₁₀ using EPAS air sampler and other gases were

also measured by auto sensors of the EPAS haz-scanner. Two times of measurements were conducted (one location in each time for air quality measurement): one in April 2017 and the other in July 2019. Results were certified by Environmental Health Laboratory, Occupation and Environmental Health Division, Ministry of Health and Sports. According to the laboratory test results, for the first time measurement, the concentrations of PM₁₀, PM_{2.5} and SO₂ were higher than the reference value of National Environment Quality - NEQ (Emission) Guidelines and for the second time measurement, the concentrations of SO₂ was higher than the reference value of NEQ Guidelines. The concentrations of NO₂, CO, O₃ and VOCs were much lower than the guideline values.

4.2.2 Noise and Vibration Analysis

The sound level monitoring was performed in accordance with standard procedures adopted by American Conference of Governmental Industrial Hygienist (ACGIH) which is authoritatively and currently used in Myanmar; measuring was conducted 24 hours (1-hour average noise level (Leq in dBA) and (Lmax in dBA). It was done in conjunction with air quality measurement. The sound levels L_{eq} and L_{max} for day time and night time respectively are lower than the reference value.

4.2.3 Soil Analysis

Total 10 samples of top soil and 8 samples of deep/sub soil were collected for testing nutrients and heavy metals content of the soil respectively. In April 2017, top soil from 6 places and deep/sub soil from 4 places were collected from the project site. In July 2019, top soil from 4 places and deep/sub soil from 4 places were collected from different places around the project area including within the agricultural zone 1.

Soil survey was made by using Russian soil scientist soil analysis method and F.A.O/UNESCO method. Physical properties of soil such as soil color, texture, structure, moisture, hardness, drainage, inclusion and new formation were recorded, and soil names were given by using Russian soil classification, F.A.O soil classification method.

Results were certified by laboratory of Department of Agriculture, Ministry of Agriculture, Livestock and Irrigation. The laboratory results showed that there was no distinct problem in total dissolved salt content in water soluble salts analysis, no problem in Electrical conductivity and residual sodium carbonate and SAR sodium Absorption Ratio also did not show as a soil problem. Therefore, there is no nutrients problem and soil soluble salts problem in these soils. Regarding heavy metals analysis, the concentration of Nickel, Chromium, Cadmium and Lead are not detectable, but the concentration of Iron is much higher than the maximum allowable limit of 250 ppm.

4.2.4 Water Analysis

Total 12 water samples were collected to test water quality. 5 water samples for surface water/drinking water (pond, Kyarinn Creek (6.2 miles) near Yangon-Mandalay Expressway and Pazundaung Creek near Let Pyan Wae village, Kalihtaw Dam), 5 water samples for drain water (wastewater), and 2 samples for ground water (tube well water). The water samples were collected in April 2017 and July 2019 respectively.

Standard method of water analysis with atomic absorption spectrophotometer (graphite furnace method), Spectrophotometer and Incubation method by POTATEST were used to measure the values of following parameters of collected water samples. These parameters include Color, pH, BOD, COD, Total Dissolved Solid, Nitrate, Arsenic, Bacterial Growth etc. According to laboratory results, most of the parameters' concentrations are lower than the reference value while some parameters like oil and grease for wastewater has higher concentration than the reference value.

4.3 Biological Environmental Data Collection

Current proposed industrial complex site is a restricted and abandoned place that becomes a wild fallow land, covered with wild grasses and wild plants which provides variety of habitats for wild animals to survive with some connectivity with surrounding of orchards and commercial fruit and vegetable growing fields.

Site visits were made to conduct baseline data collection. The secondary information of terrestrial and aquatic fauna, flora and land-use were also recorded, and interviews with residents were made for getting information of the history of the area and presence and absence of flora and fauna in the past and present time.

Both terrestrial and aquatic ecosystems were examined. Most habitats on sites were differentiated. The biological impact assessment field team carried out observations, transect line survey in the project area. The tree, plant, and shrub and species composition of plant and their distribution near the project site were studied and identified taxonomically.

4.4 Socio-Economic Data Collection

Key stakeholder interviews in 6 villages located in 5 km radius from the project site. Village heads, village administrative officials, religious leaders, local business community, school teachers, health workers, local stores and villagers (including women, young and old people) in villages were interviewed. Village profiles of 6 villages have been established.

5. Potential Impacts

The potential impacts identified for different project phases including but not limited to Air pollution, Water pollution, Noise and vibration, Solid wastes generation, Soil erosion and degradation, Surface and Ground water contamination, Destruction of vegetation and expelling of wildlife to other places, Community Health and safety, and Emergency risk.

5.1 Scope of Impact Assessment

The occurrence of impacts that may be both beneficial and adverse were evaluated.

The impact assessment covered: Evaluation of identified important features of biophysical and socioeconomic situation; Description and evaluation of the magnitude and significance of the potential effects.

Detail specific impact assessment

Mitigation and enhancement measures to address the identified effects and identification of any residual effects following mitigation; a description and evaluation of residual effects of the Proposed Development and cumulative impact assessment.

6. Environmental Management Plan (EMP)

An EMP was developed to ensure that the management actions arising from ESIA processes are clearly defined and implemented through all phases of the project life cycle. It is to be implemented during the pre-construction/construction phase and, thereafter, throughout the project life-cycle. This is to ensure that environmental management objectives are integrated into the project planning and design.

7. Environmental Monitoring Plan

A monitoring program was provided along with environmental management plan, for the major aim of a monitoring program is to detect trends and changes so that remedial measures can be taken to achieve good environmental performance.

8. Socio-economic Impact Assessment and Public Consultation

The socio-economic impact assessment process is comprised of three parts:

i. Public Consultation and Disclosure; ii. Preliminary Social Baseline Collection, and iii. Social Impact Assessment

The approach focused on:

- Key stakeholder interviews in 6 villages located in 5 km radius from the project site. Village heads, village administrative officials, Buddhist monks, local business community, school teachers, health workers, commodity-sellers with small venter in villages were interviewed.
- Village profiles of 6-villages with the influence of project were established.
- Directly and indirectly affected PAPs in communities, households, and individuals who live near the proposed project site as well as officials from three agricultural and animal breeding zones and village administrations of the Nyaung Hnitpin area were invited to participate in the Public Consultation meeting which was held at Zone No. 3. meeting hall on 8 February 2019.
- The second public consultation meeting was planned to organize on 23 March 2020 and some invitations were already sent to the invitees. Yet, in light of the WHO designation of COVID-19 as a global pandemic and the Myanmar President's Office recommendation to avoid large gatherings, it is important to take necessary measures to prevent and limit the spread of coronavirus in Myanmar and hence the planned public consultation meeting was postponed. Therefore, the public consultation meeting can only be held when the virus is totally controlled, and mass gatherings are allowed by Myanmar Government.

8.1 Findings and Suggestions of community during Public Consultation and Interviews

1. As there is only one primary school in Nyaung Hnitpin Agriculture and Livestock Zone (3), it is found that Middle School is needed.
2. It is observed that the workers experience difficulties to work in Hmawbi, Hlegu and Htauk Kyant township. When the industrial zone is developed, they should be hired to employ in the zone.
3. It is found that a dispensary / hospital is needed because it is difficult for the people to go to Ngar Suu Taung village for medical treatment.
4. The cultivators at Zone (3) cannot get the water supply from Kalihtaw dam, it is found that water from this dam should be provided.
5. It is necessary to provide a cemetery land for the people who are living in Nyaung Hnitpin Agriculture and Livestock Zone (3) because they don't have land for burial.
6. It is necessary to upgrade the roads for the people because the roads outside of Nyaung Hnitpin Convention Center are bad.
7. People worry for their health because there will be factories that produce bad odor in the Industrial zone. So that they don't want to build such factories in the zone.
8. People want agricultural and livestock processing export companies in the industrial zone because the zone itself is used for agriculture and livestock breeding.
9. It is necessary for people to access to clean drinking water because they have to use water from the well and tube well.

10. Tenant worry for losing lands when the landlords sell their lands with high price when the industrial zone is developed.
11. People worry for degradation of cultivated land because of chemical and industrial wastes from the Industrial Zone.
12. People and Buddhist monks worry that there will be slaughter houses in the Industrial Zone.
13. Thought the agricultural zone has been established, it is found that there is not enough reservoir water so that people have to rely on the well.

9. Report Structure

The EIA report is structured according to “Environmental Impact Assessment Procedure” by Ministry of Natural Resources and Environmental Conservation (notification no. 616/2015).

Executive Summary (Myanmar and English)

- 1) Introduction
- 2) Policy, Legal and Institutional Framework
- 3) Project Description and Alternatives
- 4) Description of the Surrounding Environment
- 5) Impact and Risk Assessment and Mitigation Measures
- 6) Cumulative Impact Assessment
- 7) Environmental Management Plan
- 8) Public Consultation and Disclosure
- 9) Conclusion

10. Conclusion

It is confirmed that the environmental, social and health impacts of the Project were assessed, and the Environmental Management Plan was formulated properly. In the process of EIA, opportunity of public involvement was ensured and comments from the public and MONREC were reflected into the final EIA Report. Thus, the EIA was completed in accordance with the requirements of the EIA Procedure properly for the project proponent to follow the EMP accordingly.



CHAPTER 1. INTRODUCTION

1.1 Introduction

This Environmental Impact Assessment (EIA) report has been prepared by Myanmar Survey Research (MSR) on behalf of KMIC Development Co., Ltd. (KMIC JVC). The proposed project is the development of an industrial complex to be built on the land of approximately 555.81 acres in Hlegu township. KMIC JVC is currently preparing an outline planning application for the site, including an Environmental and Social Impact Assessment (ESIA).

The intention is to submit an ESIA Report to the Environmental Conservation Department for the Environmental Compliance Certificate for the Industrial Complex in the area of Nyaung Hnitpin public land area of 555.81 acres along with infrastructure development for roads, electricity and water pipeline.

1.2 Project Proponent

Table 1. 1: Project Proponent Information

Company Name:	KMIC Development Co., Ltd. (KMIC JVC)
Contact person	Mr. Kim Gunwoo, Mr. Noh Hun Seung
Company Address	KMIC Development Co., Ltd. Office Suite 2007, Pyay Garden Office Tower, 346-354, Pyay Road, Sanchaung Township, Yangon
Country	Myanmar
Telephone	+95-99757 99222
Email	gonwoo2@gmail.com
Website	http://www.mykmic.com

1.3 Environmental and Social Impact Assessment Expert Team

It is obligatory for the project proponent, KMIC JVC, to submit an Environmental and Socio-economic Impact Assessment (ESIA) report with regards to the project to Environmental Conservation Department. Hence, it has contracted Myanmar Survey Research – an independent and private research firm in Myanmar – to conduct this assessment to ensure that the project will be environmentally sound and acceptable to local communities and in full compliance with guidelines and regulations of ECD and the Myanmar Environmental Conservation Law.

Myanmar Survey Research is a leading research company in Myanmar with more than 20 years of research experiences in social, marketing, industry and environmental and social impact assessment.

General Information and Address of MSR ESIA Team

Table 1. 2: General Information and Address of MSR ESIA Team

Company Name:	Myanmar Survey Research Co. Ltd.
Company Address	MSR Head Office Yangon-Central-Railway Station Building, Mingalartaungnyunt Township, Yangon
Country	Myanmar
Website	http://www.myanmarsurveyresearch.com
Telephone	+95-1-370464
Fax	+95-1-254263
Email	msr@myanmarsurveyresearch.com
Qualifications and Experience of MSR	Established in 1995, Myanmar Survey Research company has been providing research and consultancy services for more than twenty years to local and international firms including international organizations like UN agencies, World Bank and INGOs in Myanmar. MSR is certified by Department of Environmental Conservation of the Ministry of Natural Resources and Environmental Conservation. Besides ESIA assessment services for different types of projects in Myanmar, MSR also offers market, social and industry research services.

Assessment team members



Figure 1. 1: MSR EIA Team meeting on project

The MSR's EIA assessment team has been formed for conducting the ESIA study and assessment for this KMIC Project with the following environmental and social experts:

Table 1. 3: MSR EIA Assessment Team Members

Name and designation	Position in team	Responsibility
U Kyaw Hlaing President	Leader	Overseeing the EIA/ESIA assessment process and the project
Dr. San Tun Aung Senior Adviser	Dy Leader	Advising on socio-economic impact assessment and editing the report
U Tin Than	Member	Assessment of flora, fauna and ecosystem

Biologist		
Engr. U Myint Swe Consultant Engineer	Member	Specialist gathering data of physical environment and devising the Environmental Management and Monitoring Plan
U Aung Lin Social Impact Assessment Specialist	Member	Co-writer of ESIA report and gathering data (Social impacts)
U Ko Ko Soe Lwin Thaw (a) Ko Soe GIS & IT Specialist	Member	Cartography, photography and designing
U Oo Kyaw Maung Policy Specialist	Member	Policy specialist Specialize on laws, by-laws and regulations of Myanmar related to EIA/ESIA
U Kyan Dyne Aung Environmental Engineering Management Specialist	Member	Conducting research and designing the environmental management plan of different project.
U Phone Myint Tun Consultant, Physical Environment	Member	Air Quality & Noise Level Assessment Hydrology, Geology & Soil Studies
U William Han Lwin Senior Analyst, MSR	Member	Senior Analyst and Report Writer
U Nyana Soe, Project Coordinator	Member	Coordinating and project implementation Do in-depth study of secondary research / literature review and, from time to time, liaise between company staff and officials from the developer side, whenever required
Daw Tin Tin Htwe Staff	Member	Supporting Staff Assist in typing and desktop publishing
Government agencies that provide lab results		
Relevant Agencies	Lab tests performed	
Land Use Division of Department of Agriculture	Soil interpretation and soil analysis; soil water extraction interpretation and soil water extraction analysis	
Plant Protection Division of Department of Agriculture	Heavy metal analysis of soil sample	

U Kyaw Hlaing (President-cum-Research Director)



U KYAW HLAING (PRESIDENT-CUM-RESEARCH DIRECTOR) is a founding member of Myanmar Survey Research (MSR), which was officially established in 1995.

He has had experience in conducting more than 300 research projects on various industries, macroeconomics, international relations and socio-economics and health. He is also a co-founder of AV Media Ltd, Yangon, Myanmar Monitor, Yangon and Myanmar Think Tank, which is attached to MSR. He has had experience in conducting five ESIA surveys.

He worked for Daikan Service Co Ltd in Tokyo, Japan, as a managerial assistant from 1992 to 1994. In 1995, he was an Administrative Associate at California Institute of Biological Research, San Diego, USA. In MSR, he was the Vice-President of MSR from 1995 to 1998.

U Kyaw Hlaing obtained a B Sc degree from Yangon University in 1985 and MA degree, specializing in International Management, from the International University of Japan in Niigata, in 1992.

U San Tun Aung, Ph.D. (Sociology, University of Hawaii)

U SAN TUN AUNG has been Technical Advisor to Myanmar Survey Research since 2009. Before joining MSR, he served with IFRC (International Federation of Red Cross and Red Crescent Societies), Myanmar Delegation Yangon, at various positions—Regional Information Officer and Senior Field Officer—from August 2004 to August 2008. From September 2002 to July 2004, he worked for Myanmar Red Cross Society, Yangon, in the position of Head of Communications. He was also Editor of The Myanmar Times, a weekly news journal published in two versions—Myanmar and English. He taught English to undergraduate students as a lecturer at English Language Institute, Thammasat University, Bangkok, for one year from June 1993 to June 1994. The first organization he joined after university graduation was The Working People’s Daily (Now renamed: The New Light of Myanmar), a State-owned English language newspaper. He was an editor there from July 1983 to July 1992. He studied mathematics at University of Rangoon for BS and MS degrees which were conferred on him in 1977 and 1983 respectively. He obtained MA (International Development Program) from International University of Japan in 1998. Now he holds a Ph D, specializing in sociology, conferred by University of Hawaii, USA.



U Aung Lin (Social Impact Assessment Specialist)



U AUNG LIN (Social Impact Assessment Specialist) joined MSR 19 years ago in 1998 as an Assistant Librarian who was responsible for gathering data and information.

He occasionally takes charge of MSR’s data collection teams playing a key role in public consultations and conducting in-depth interviews with key stakeholders. He was promoted to Librarian and Databank Manager in 2003. He monitors political and economic news stories carried by State-owned newspapers

and private weekly news journals, and also carries out radio and television monitoring. He has had experience in conducting five ESIA surveys.

He is knowledgeable in almost all sectors and fields—the environment, deforestation, water and sanitation, mangroves, fishery industry, special economic zones (SEZs) and industrial zones, national infrastructure projects, hydropower and other sources of electricity, rice industry and agri-products, mining, etc.

Before joining MSR, he was a teacher from 1981 to 1998. With pen-names “Ko Lin Nwe (Main Ma Hla Island)” and “Ko Lynn Man Aung,” he has written a total of 200 articles on the natural environment and reduction of natural disasters among other topics.

He was conferred a B Sc with specialization in physics by Yangon University in 1979

U Myint Swe (Engineer)

U MYINT SWE is currently the Civil Engineer of MSS Engineering Co Ltd, which is an affiliate of MSR. He is mainly responsible for analyzing physical impact of the proposed project and developing environmental management plan (EMP) and monitoring plan.

He is experienced in civil engineering field more than 42 years of surveying, construction of buildings, Roads, Bridges, Revetments, Ports and calculating of structure designs.

U Myint Swe is the civil engineer of MSSE engineering Co Ltd which is an affiliate of MSR. He obtained degree of A.G.T.I (Civil) from Government Technical Institute of Myanmar. He has conducted over 52 construction projects at Building department, Yangon City Development Committee (YCDC) from 1975 to 1992. He has also conducted as a senior licensed engineer and consultant, serviced to over 65 construction projects from 1993 to current. He was recognised Registered Senior Engineer (R.S.E) by Myanmar Engineering Council and awarded (Engr.) title.

He has reorganized as a Membership of the Society of Environmental Engineering, MSEE (UK) and also a Member of Myanmar Engineer Society.



U Ko Ko Soe Lwin Thaw (GIS & IT Specialist)

U KO KO SOE LWIN THAW (GIS SPECIALIST), or better known as KoSoe, has officially been appointed a GIS and IT specialist since 2012. His other tasks on the EIA/ESIA team include doing cartography, designing and audio-video production.

He was an Assistant Manager and also a Creative Director for Lao Fo Ye Co Ltd in Singapore from 2008 to 2012. He also worked as a producer/editor for MRTV 3 and MRTV 4, government television channels in English version, from 1996 to 2008. He is also engaged in live show production and post-production. From 1992 to 1995, he worked as a freelance videographer and video editor in Singapore.

Bangkok Bureau of NHK Japan appointed him Assistant Cameraman (TV) from 1991 to 1992. Earlier from 1989 to 1991, he worked for AV Media Co Ltd (Yangon) as a cameraman.

He pursued his academic education, computer applications and advanced English in Singapore.



U Kyan Dyne Aung (Environmental Engineering Management Specialist and Report Writer)

U Kyan Dyne Aung obtained his bachelor's degree in civil engineering from Yangon Technological University in 2002. He worked as a construction site engineer in TACCO construction company from 2002 to 2004. After working a few years in the private construction business, he did his master's in environmental engineering management in Sydney, Australia in the years of 2005 and 2006. He was then appointed as Consultant – Civil Engineer for the project, namely, Community Development for Remote Townships – CDRT in Mon Kayin area from September 2006 to July 2007. Then he joined Asian Institute of Technology (AIT) in May 2008 to work for School of Environment, Resources and Development (SERD) as research associate. He worked on preparation and reviewing of several Environmental reports including but not limited to Environmental Impact Assessment, Healthcare Waste Status for Developing Countries, NGOs Implementing 3R Practice in Developing Countries, Eco-Industrial Cluster, and Integrated Management of Municipal Solid Waste in Asia. Afterwards, he was also a Project Officer in External Relations and Communications Office, AIT for organizing the 50th Anniversary Celebration of AIT until February 2010. In March 2010, he joined one of the leading Myanmar local Environmental NGOs, ECODEV. Being a Program Officer there for almost four years, he was responsible for managing several climate change and Environment related programs, projects and activities. From October 2013 to April 2018, he was a Senior Program Officer at Yangon Heritage Trust, a prominent local NGO, and had a good experience of overseeing and managing different and very challenging heritage and urban planning issues. He is now working for Myanmar Survey Research as Environmental



Engineering Management Specialist and Report Writer for Environmental Impact Assessment on diverse projects and development.

U Oo Kyaw Maung (Policy Specialist)



U Oo Kyaw Maung (Policy Specialist) joined MSR in 2016 as a senior researcher. He is responsible for conducting research on different of social, economic policy issues for MSR. He will be advising on laws, by-laws and regulations related to the proposed project.

U Oo Kyaw Maung has extensive working experiences as independent consultant in different national and international organizations. In addition to such experiences, he also worked for UN agency in Myanmar for over four years.

U Oo Kyaw Maung hold B.A (Economics). Also, he holds Postgraduate Diploma in Public Administration and Master of Public Policy (Economic Policy) from the Australian National University.



CHAPTER 2. POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

Introduction

This section states the legislative framework concerning an industrial complex like KMIC Project. This section mainly focuses on essential policies, laws, regulations in force and guidelines that are compulsory by the project developer to comply with in developing the project. A full assessment of all relevant policies, legal, institutional and guidelines concerning the proposed project were detailed in this ESIA Report.

2.1 Relevant Local Laws, Rules and Regulations

2.1.1 National Administrative Framework

Since National League for Democracy Party's government has taken the executive power, there are 25 ministries under the Office of the President as of November 2017. Regarding environmental, natural resources and social issues related to investment businesses, one of the focal agencies is the Environmental Conservation Department (ECD) of the Ministry of Natural Resources and Environmental Conservation (MONREC), which the Ministry of Environmental Conservation and Forestry (MOECA) were merged in April 2016.

While ECD is the focal institute for environmental conservations, the following institutional consideration, regulatory setting and policies are equally essential for the project developer to comply with in doing investment business in Myanmar.

2.1.2 Constitution of Republic of Union of Myanmar

The existing constitution of Myanmar came into effect in 2008. According to the constitution, the Union government has put special consideration and obligation to the critical role of natural environment for sustainable development and economic growth. Meanwhile, the constitution also states the commitment of the Union and its government in:

- Preservation and safeguarding of cultural heritage;
- Environmental conservation;
- Striving for development of human resources; and
- Protection and preservation of public property.

2.1.3 National Sustainable Development Strategy

The National Sustainable Development Strategy (NSDS) is part of a broader program of the UN Sustainable Development Commission set up after the World Summit on Sustainable Development in 2002. Every country, including Myanmar, that signed Agenda 21 at the Earth Summit in Rio de Janeiro in 1992, agreed to develop an NSDS by 2010 in line with the Millennium Development Goals (MDGs). UNEP provided funding for Myanmar to develop an NSDS. The main aim of the process was to develop an NSDS in line with international standards by meeting the MDGs and ensure that environmental and social impacts are mitigated when implementing development projects. Myanmar's NSDS was published in August 2009.

The major three goals that are designated in Myanmar's NSDS are (1) sustainable management of natural resources, (2) integrated economic development and (3) sustainable social development. In addition to these goals, specific strategies are outlined under each goal. For example, the goal for Sustainable Management of Natural Resources suggests strategies for forest resource management, sustainable energy production and consumption, biodiversity conservation, sustainable freshwater resources management, sustainable management of land resources, sustainable management for mineral resources utilization, and so on.

2.1.4 Myanmar National Environment Policy (1994)

With purposes to establish sound environmental policies, utilization of water, land, forests, mineral, marine and other mineral resources to conserve the environment and prevent environmental degradation, the National Commission for Environmental Affairs (NCEA) draft the National Environmental Policy in 1994. To meet with emerging challenges a new multifaceted national environmental policy, based on this National Environmental Policy, has finalized the final stage of drafting national environment policy by the Ministry of Natural Resources and Environmental Conservation (MONREC). This new national environmental policy is intended to “complement the national economic policy.”¹ The policy objectives also include “achieving harmony and balance between its people, their cultural heritage, the environment and its national resource”². Principally, this policy states that it is the obligation of the government to take “environmental considerations into account when developing anything that may enhance the quality of the life of all its citizens” and environmental protection should always be “primary objectives in seeking development”³. In addition, the policy also emphasizes “not to exceed its jurisdiction or infringe upon the interests of the other nation”⁴ while it has the sovereignty right to utilize its natural resource.

2.1.5 National Land Use Policy

The National Land Use Policy was drafted under the guideline of the former president U Thein Sein’s administration in 2014. This National Land Use Policy is the guide for the emergence of a new land law, including “harmonization of existing laws relating to land and their implementation” in Myanmar.

Some of the core objectives of this policy include:

- To promote sustainable land use management and protection of cultural heritage areas, environment, and natural resources for the interest of all people in the country;
- To recognize and protect customary land tenure rights and procedure of the ethnic nationalities; and
- To develop transparent, fair, affordable and independent dispute resolution mechanisms in accordance with rule of law.

In addition to these objectives, one of the basic principles of the National Land Use Policy is (a) “to legally recognize and protect legitimate land tenure rights of people, as recognized by the local community, with particular attention to vulnerable groups such as smallholder farmers, the poor, ethnic nationalities and women”⁵.

2.1.6 Myanmar Forest Policy

The policy document formalizes the commitment and intent of the government in “ensuring sustainable development of the forest resource both for environmental and economic purposes”⁶. This policy was drawn in 1995 to facilitate in implementation of the Forest Law promulgated in 1992. The policy mainly focuses on sustainable production, satisfying basic needs, institutional strengthening and improvements in efficiency. In addition, the policy focus pertains (a) forest and biodiversity protection and participatory forestry. This policy also

¹ “A new and comprehensive national environmental policy for Myanmar”, UNDP (2016), <http://www.mm.undp.org/content/myanmar/en/home/presscenter/pressreleases/2016/12/a-new-and-comprehensive-national-environmental-policy-for-myanmar.html>

² Myanmar Laws & Regulations” Forest Legality Initiative, <http://www.forestlegality.org/risk-tool/country/myanmar>

³ Myanmar Laws & Regulations” Forest Legality Initiative, <http://www.forestlegality.org/risk-tool/country/myanmar>

⁴ Myanmar Laws & Regulations” Forest Legality Initiative, <http://www.forestlegality.org/risk-tool/country/myanmar>

⁵ Chapter (3) (a), Basic principles, the National Land Use Policy

⁶ Myanmar Forest Policy (2015)

reinforces the commitment of Myanmar government to “ensure sustainable development of forest resources while conserving wildlife, plants and ecosystem”⁷.

Specifically, the Myanmar Forest Policy have identified six imperatives which are essential to achieve broader national goals and objectives. These imperatives are as follow.

1. Protection of soil, water, wildlife, biodiversity and environment
2. Sustainability of forest resources to ensure perpetual supply of both tangible and intangible forest benefits for all generations
3. Basic needs of the people for fuel, shelter, food and recreation
4. Efficiency to harness, in a socio-environmentally friendly manner, the full economic potential of the forest resources
5. Participation of the people in the conservation and utilization of the forests
6. Public awareness about the vital role of the forest in the well-being and socio-economic development of the nation

2.1.7 National Biodiversity Strategy and Action Plan (NBSAP)

The United Nations Convention on Biological Diversity (CBD) is a framework for national action for the conservation of biodiversity, the sustainable use of its components, and the equitable sharing of benefits arising from the utilization of genetic resourcesⁱ. To fulfill this commitment to the Conservation, the government meeting No.17/2006 of the Republic of the Union of Myanmar, held on 25th May 2006, approved to formulate National Biodiversity Strategy and Action Plan (NBSAP), for which the funding is provided by the United Nations Environment Program (UNEP) and Global Environment Facility (GEF)ⁱⁱ. On the third of May 2012, the Government of the Republic of the Union of Myanmar adopted the Myanmar National Biodiversity Strategy and Action Plan by the Government Meeting No. 16/2012.

The fundamental objectives of the NBSAP is to provide “a strategic planning framework for the effective and efficient conservation and management of biodiversity and natural resources with greater transparency, accountability and equity”⁸. In addition to this objective, the National Biodiversity Strategy and Action Plan is designed based on the five grounded guided principles. Two of these five principles recognize that it is the indispensable right of indigenous and ethnic people in conserving biodiversity and for their coexistence with ecosystem. Also, the highest consideration is put to secure the access to common resources by economically disadvantaged groups⁹.

2.1.8 Myanmar Industrial Policy

In February 27, 2016, Industrial Policy was laid down by the Ministry of Industry, the Government of the Republic of the Union of Myanmar. In order to accomplishing the vision of the State “to establish the peaceful and modern developed new democratic nation”, the industrial policy implicitly states to accomplish the specific missions in 2020, which includes “to restore eternal peace and all-round improvement through country”.

Likewise, Myanmar industrial policy has stipulated the essential factors to be assessed from different point of views to successfully establish the industries in the industrial zones and special economic zones across the country. These includes

- a. National Development Strategy that the investors needed to be “acquainted widely the National Comprehensive Development Plan (NCDP), regional

⁷ “Myanmar Law & Regulations”, Forest Legality Initiative, <http://www.forestlegality.org/risk-tool/country/myanmar>

⁸ National Biodiversity Strategy and Acton Plan (2011)

⁹ National Biodiversity Strategy and Action Plan (2011)

development plans, the Investment Law, Industrial Zone Law and the Special Economic Zone Law are as a guide¹⁰

- b. Location and situation for which the following criteria are essential to be fulfilled for the long-term development
 - a. A place for regional development
 - b. A place of good water resource
 - c. A place of good electricity supply
 - d. A place of good information and communication
 - e. A place where there is enough labor
 - f. A place where environmental conservation can be arranged
 - g. A place where land, water and air transportation are good

2.1.9 Myanmar Special Economic Zone Law and Rule (2014)

This law was enacted in 2013 and revised in January 2014. This law provides the foundation for the establishment of Special Economic Zone to encourage economic growth and foreign investments in Myanmar. This law specifies a number of incentives for the investors, such as tax exemption for five years and 50% income tax relief on items exported overseas for five years. In addition to these incentives for investors, the article (35) of this law stipulates that investors shall abide by the environmental standards described in the Myanmar Environmental Conservation Law and International standards.

2.1.10 Land Acquisition Act (1894)

This law serves as the fundamental law for land acquisition in Myanmar. It sets out the procedures of land acquisition and compensation. Further, the law has outlined relevant procedures such as notice periods, procedures for objections to acquisition, the method of valuation of land, process for taking possession of land, court process and appeals, procedure for the temporary occupation of land, and the acquisition of land for companies. The act requires that compensation at market value is provided to those from whom the land is acquired.

2.1.11 Farmland Law and Rules (2012)

This law determines the land use rights of farmland and the granting of land use right to eligible farmers. Also, this law allows the rights to sell, mortgage, lease, exchange, and give either whole or part of the right to use the farmland. In addition, the law also determines the formations as well as the roles and responsibility of farmland administrative bodies at various levels. The Farmland law and rules determine procedures such as the application for farmland registration and obtaining land use certificates, application of transfer of farmlands for other purposes, and indemnities and compensation.

2.1.12 Environmental Conservation Law and Rules

The Pyidaungsu Hluttaw enacted this law by law No. 9 of 2012 on the date of 30th March 2012. The key objectives of this law are:

- To enable to implement the Myanmar National Environmental Policy;
- To enable to lay down the basic principles and give guidance for systematic integration of the matters of environmental conservation in the sustainable development process;
- To enable to emerge a healthy and clean environment and to enable to conserve natural and cultural heritage for the benefit of present and future generations;

¹⁰ Chapter 5, "Establishment of Industries in Industrial Zones and Special Economic Zones" Myanmar Industrial Policy (2016), Ministry of Industry, the Government of the Republic of the Union of Myanmar

- To reclaim ecosystems as may be possible which are starting to degenerate and disappear;
- To enable to manage and implement for decrease and loss of natural resources and for enabling the sustainable use beneficially;
- To enable to implement for promoting public awareness and cooperation in educational program for dissemination of environmental perception;
- To enable to promote international, regional and bilateral cooperation in the matters of environmental conservation;
- To enable to cooperate with Government Departments, Government Organizations, International organizations, non-government organizations and individuals in matters of environmental conservation.

Subsequently, the Environmental Conservation Rules (ECRs) were enacted in June 2014 as the detailed enforcement regulations for the Environmental Conservation Law. ECL stipulates MONREC's responsibility for environmental policy and administration, formulation of environmental management plan, implementation of environmental monitoring, setting of environmental standards, management of hazardous waste, and formulation and implementation of EIA, among others. The Environmental Conservation Law (ECL 2012) and Rules (ECL Rules 2014) both have implications for domestic and foreign investors in Myanmar. Article 7 of the ECL states the duties and powers of the Ministry of Environmental Conservation and Forestry (MOECA), which include:

- Prescribing environmental quality standards on emissions, effluents, solid waste, production procedures, processes and products;
- Facilitating the settlement of environmental disputes;
- Specifying categories and classes of hazardous wastes generated from the production and use of chemicals or other hazardous substances used in industry, agriculture, mineral production, sanitation and other activities;
- Prescribing categories of hazardous substances that may significantly affect the environment;
- Prescribing the terms and conditions for effluent treatment in industrial estates, buildings, and other sites and emissions of machines, vehicles and mechanisms;
- Developing and implementing a system of environmental impact assessment (EIA) and social impact assessment (SIA); and
- Enforcing compensation by polluters for environmental impacts; collecting funds from organizations which benefit from natural ecosystems and revenues from businesses which explore, trade and use natural resources, in order to support environmental conservation works.

2.1.13 Protection of Wildlife, Wild Plants and Conservation of Natural Areas Law (1994)

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

2.1.14 The Forest Law

The State Law and Order Restoration Council promulgated the Forest Law in 1992. This law was formulated by focusing on the balanced approach towards conservation and development issues implicit in the concept of sustainable forestry. It decentralizes the management and opens opportunities for increased private sector involvement in timber trade. Highlighting environmental and biodiversity conservation, the law encourages community forestry and people's participation in forest management to meet the basic needs of the rural people but

prescribes severe punishments for offences. In addition, the MOF has promulgated the Forest Rules in 1995.

2.1.15 Myanmar Investment Law

The Myanmar investment law (Law No. 40/2016) is enacted by the Pyidaungsu Hlutaw in 2016. The foreign investment law (the Pyidaungsu Hluttaw Law No.221/2012) and the Myanmar Citizens Investment Law (the Pyidaungsu Hluttaw Law No.18/2013) are repealed with this Law. However, the Myanmar Investment Commission which was formed by that Law is still given the power to perform its duties. Any decisions made by the commission under this power conferred by this law is the final and conclusive. The Ministry of Planning and Finance undertakes the office-work of the commission and bear the expenditures of the Commission.

The following objectives of this law are essential to comply with for this proposed investment project.

- To develop responsible investment business which do not cause harm to the natural environment and thee social environment for the interest of the Union and its citizens
- To protect the investors and their investment businesses in accordance with the law
- To enable the citizens to be able to work alongside with the international community
- To develop business and investment businesses that meet international standards

2.1.16 The Public Health Law

The public health law is enacted in January 1972. The objectives of the law include aspect of environment, food, sanitary, cosmetic items, diseases and medicine.

The guidance of the law is as follow for environment:

1. Residential area has to be trash free and wastage has to be properly disposed.
2. Area of drinking water source has to be cleaned and monitor according to the international standards.
3. Residential area has to be free of odor, smoke, carbon dioxide, dust, noise and radioactive materials.
4. Public and government buildings for the municipal and health care are advised to be developed.

Also, food manufacturing buildings has to follow:

1. Processed Food deliver to the public has to be clean and healthy.
2. Food production buildings are meant to be clean from fraud product, disease, dust and pest.

2.1.17 The Conservation of Water Resources and Rivers Law

The State Peace and Development Council Law enacted this law by Law No.8/2006 on the date of 2nd October 2006.However, this law is under the jurisdiction of the Ministry of Transport. This law focuses on transportation safety and its development. However, it lacks actual numerical criterion for natural environment. The main objectives of this law include:

1. To conserve and protect water resources and rivers system for beneficial utilization by the public.
2. To ensure smooth and safety waterways navigation along rivers and creeks;
3. To contribute to the development of State economy through improving water resources and river system and
4. To prevent environmental impact

2.1.18 The Protection and Preservation of Cultural Heritage Regions Law

The State Peace and Development Council Law enacted this law by law No.9/98 on the date 10th September 1998 with the objectives:

1. To implement the protection and preservation policy with respect to perpetuation of cultural heritage that has existed for many years;
2. To protect and preserve the cultural heritage regions and the cultural heritage therein so as not to deteriorate due to natural disaster or man-made destruction;
3. To uplift hereditary pride and to cause dynamism of patriotic spirit of citizens by protecting and preserving the cultural heritage regions;
4. To promote public awareness and will as to the high value of the protection and preservation of the cultural heritage regions;
5. To protect cultural heritage regions from destruction;
6. To carry out protection and preservation of the cultural heritage regions in conformity with the International Convention approved by the State.

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

This law describes functions and responsibilities of health personnel and citizens in relation to prevention and control of communicable diseases. It also describes measures to be taken in relation to environmental sanitation, reporting and control of outbreaks of epidemics and penalties for those failing to comply. The law also authorizes the Ministry of Health and Sport to issue rules and procedures when necessary with approval of the government.

2.1.20 The Explosive Act (1884)

The explosive act stipulates the prohibitions on production, possession and use of explosives without permission.

2.1.21 The Explosive Substances Act (1908)

The Explosive Substance Act stipulates the prohibitions on production, possession and use of explosives without permission

2.1.22 The Prevention of Hazard from Chemical and Related Substances Law (2013)

The Prevention of Hazard from Chemical and Related Substances Law, the central law of chemicals management in Myanmar enacted in 2013, stipulates that when chemical and related substances is to be transferred, stored, used, or disposed, operating approval certificate should be obtained in accordance with the regulations based on the international treaties.

2.1.23 The Worker's Compensation Act (1923)

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

2.1.24 The Payment of Wages Act (1936)

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

2.1.25 The Factory Act (1951)

This act stipulates the work condition of the workers in the factory such as working hours, worksite safety and health measures. According to the act, worker at age of 18 or over shall not work exceed eight working hours per day or forty-four hours per week, and the working days shall not exceed six days per week. As for worksite safety, the factory shall be kept clean

with proper ventilation, light and heat and the workspace shall be situated away from drains, latrines or other things which create a bad or unhealthy smell.

2.1.26 The Shops and Establishment Act (1951)

This act stipulates the payment of wage, working hours, holidays at shops and commercial establishment.

2.1.27 The Leave and Holidays Act (1951, revised in 2014)

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

2.1.28 The Labor Organization Law (2011)

The Labor organization law replaced the Trade Union Act enacted in 1927 for protecting the rights of the workers, having good relations among the workers of between the employer and the work, and for forming and carrying out the labor organization systematically and independently. Under this law, the labor organization has the right to carry out freely in drawing up their constitution and rules. It has the right to negotiate and settle with the employer if the workers are unable to obtain the right of the workers contained in the labor laws. On the one hand, the employer shall recognize the labor organizations and assist as much as possible if the labor organizations request for help for the interest of his workers.

2.1.29 The Social Security Law (2012)

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

2.1.30 The Labor Dispute Settlement Law (2012)

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

2.1.31 The Minimum Wage Law (2013)

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

2.1.32 The Export and Import Law (2012)

In 2012, the Export and Import Law was enacted and the Control of Imports and Exports Act (1947) was abolished. It aims to implement the economic principles of the State successfully, to lay down the policies to export and import that support the development of the State; and that are to be in conformity with the international trade standards.

2.1.33 The Electricity Law (2014)

In 2014, the Electricity Law of 1984 was replaced by the new Electricity Law, a comprehensive piece of legislation covering licensing, a new regulatory commission, standards, inspection, tariff, and restrictions. The Electricity Law divides projects into “small” (up to 10 MW), “medium” (between 10 MW to 30 MW) and large (upwards of 30 MW); the states and regions can issue permits for small and medium power plants. In case these plants are not connected to the

national grid, the Union Government Ministry is not the primary authority involved. The authorities have a legal right to use land for power plants under the Electricity Law and have the right to expand and maintain their facilities. The law also provides that the authorities can build transmission lines in accordance with existing laws.

2.1.34 The Boiler Law (2015)

The Boiler Law was enacted for protection of the accidents related to the boiler, building up skill resources, and mitigation of the long-term environmental and health impacts generated from boilers. It is described that the boiler that is to be used should meet international requirements.

2.1.35 Environmental Impact Assessment Procedure (2015)

Environmental Impact Assessment procedures have been prepared by the Ministry of Natural Resources and Environmental Conservation under the Environmental Conservation Law (2012). It requires that the Project Proponent shall include in its evaluation environmental, social and health aspects of the environment, and shall identify and assess all adverse impacts and risks for environmental, social issues and, if relevant, health issues that potentially could arise from the Project. Therefore, this Law can be effectively considered an EIA procedural framework.

2.1.36 National Environmental Quality (Emission) Guidelines (2015)

The Ministry of Natural Resources and Environmental Conservation has established environmental quality standards, namely, the National Environmental Quality Standard (2012) and the National Environmental Quality (Emission) Guidelines (2015). The National Environmental Quality (Emission) Guidelines (2015) have been primarily excerpted from the International Finance Corporation (IFC) Environmental Health and Safety (EHS) Guidelines, which provide technical guidance on good international industry pollution prevention practice for application in developing countries. The Guidelines are generally considered to be achievable in new facilities by existing technology at reasonable costs. Application of these Guidelines to existing facilities may involve the establishment of site-specific targets, with an appropriate timetable for achieving them.

The National Environmental Quality (Emission) Guideline (2015) (hereafter referred to as 'Guidelines') states that:

- These Guidelines provide the basis for regulation and control of noise and vibration, air emissions, and liquid discharges from various sources in order to prevent pollution for purposes of protection of human and ecosystem health.
- These Guidelines refer to emission sources, and are intended to prevent or minimize adverse impacts to environmental quality or human health by ensuring that pollutant concentrations do not reach or exceed ambient guidelines or standards; the Guidelines apply to projects that generate noise or air emissions, and/or that have direct or indirect discharge of process water, waste water from utility operations or storm water to the environment.
- Emissions Guidelines shall apply to any project subject to EIA Procedure.
- Provisions of the general and applicable industry-specific Guidelines shall be reflected in project environmental management plan (EMP) and environmental compliance certificate (ECC) and together constitute a project's commitment to take necessary measures to avoid, minimize and control adverse impacts to human health and safety, and the environment through reducing the total amount of emissions generation, to adopting process modification, including waste minimization to lower the load of pollutants requiring treatment, and as necessary, to apply treatment techniques to further reduce the load of contaminants prior to release of discharge.
- As specified in the EIA Procedure, all projects are obliged to use, comply with and refer to applicable national guidelines or standards or international standards adopted by

the Ministry of Natural Resources and Environmental Conservation. These Guidelines shall henceforth be applied by the Ministry in satisfying this requirement until otherwise modified or succeeded by other guidelines or standards.

- As specified in the EIA Procedure, following receipt of project approval, a project shall commence implementation strictly in accordance with the project EMP and any additional requirements set out in the project Environmental Compliance Certificate (ECC), which will encompass conditions relating to emissions.
- As specified in the EIA Procedure, projects shall engage in continuous, proactive and comprehensive self-monitoring of the project and comply with applicable guidelines and standards.
- Air emissions, noise, odor, and liquid/effluent discharges will be sampled and measured at points of compliance as specified in the project EMP and ECC.

The National Environmental Quality (Emission) Guidelines were established on 29 December 2015. They consist of General & Industry-specific Guidelines. General Guidelines would apply to the proposed Project. Applicable General Guidelines are presented below:

Air Emissions

Table 2. 1: National Environmental Quality (Emission) (NEQ) Guidelines for Air Emissions

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

Wastewater, Storm Water Runoff, Effluent and Sanitary Discharges (general application)

Table 2. 2: NEQ Guidelines for Wastewater, Stormwater Runoff, Effluent and Sanitary Discharges

Parameter	Unit	Guideline Value
5-day Biochemical oxygen demand	mg/l	50
Ammonia	mg/l	10
Arsenic	mg/l	0.1
Cadmium	mg/l	0.1
Chemical oxygen demand	mg/l	250
Chlorine (total residual)	mg/l	0.2
Chromium (hexavalent)	mg/l	0.1
Chromium (total)	mg/l	0.5
Copper	mg/l	0.5
Cyanide (free)	mg/l	0.1
Cyanide (total)	mg/l	1

Fluoride	mg/l	20
Heavy metals (total)	mg/l	10
Iron	mg/l	3.5
Lead	mg/l	0.1
Mercury	mg/l	0.01
Nickel	mg/l	0.5
Oil and grease	mg/l	10
pH	S.U. ^a	6-9
Phenols	mg/l	0.5
Selenium	mg/l	0.1
Silver	mg/l	0.5
Sulphide	mg/l	1
Temperature increase	°C	<3 ^b
Total coliform bacteria	100 ml	400
Total phosphorus	mg/l	2
Total suspended solids	mg/l	50
Zinc	mg/l	2

^a Standard unit

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

Noise Levels

Table 2. 3: NEQ Guidelines for Noise Levels

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

^a Equivalent continuous sound level in decibels

2.2 International Conventions, Treaties and Agreements

The government of the Republic of the Union of Myanmar has also ratified international agreements and treaties which are related to environmental and social issues. It is also essential for the project proponent to take into consideration these treaties and agreements in commencing the project. The Major International Agreements and Treaties are:

1. Plant Protection Agreement for the Asia and Pacific Region; Vienna Convention for the Protection of the Ozone Layer; Montreal Protocol on Substances that Deplete the Ozone Layer;

2. London Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer;
3. United Nations Framework Convention on Climate Change (UNFCCC); United Nations Convention to Combat Desertification;
4. International Civil Aviation Organization: ANNEX 16 Annex to the Convention on International Civil Aviation Environmental Protection Vol. I, II, Aircraft Noise;
5. Vienna Convention for the Protection of Ozone Layer;
6. Montreal Protocol on Substances that Deplete the Ozone Layer;
7. Convention Concerning the Protection of the World Cultural and Natural Heritage;
8. Convention on Biological Diversity (CBD); International Tropical Timber Agreement (ITTA);
9. Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES);
10. ASEAN Agreement on the Conservation of Nature and Natural Resources: Catagena Protocol on Bio-safety
11. Kyoto Protocol to the United Nations Framework Convention on Climate Change;
12. Ramsar Convention on Wetlands; and
13. Copenhagen Amendment to Montreal Protocol on Substances that deplete the Ozone Layer.
14. United Nations Declaration on the Rights of Indigenous Peoples.

2.3 Policies, Procedures and Guidelines of Project Proponent

2.3.1 Environmental Policy of the Project Proponent

The KMIC JVC is committed to providing a quality services in a manner that ensures a safe and healthy workplace for the employees and minimizes the potential impact on the environment. The Corporation sets out the policies to make sure that the environment is protected by conserving energy and natural resources and proper management of the wastes generated. The Policy addresses the following aspects:

- 1) Taking significant environmental aspects and impacts into account throughout the project construction and operations;
- 2) Ensuring that the environmental issues are properly assessed and considered when key decisions are taken for the project activities;
- 3) Establishing and measuring the significant environmental impacts of construction and operations, setting targets for performance improvements and monitoring progress against those targets in areas including but not limited to energy, greenhouse gas emissions, water usage/quality and waste;
- 4) Using energy and natural resources wisely and efficiently, reusing and recycling whenever possible and practical;
- 5) Developing and improving operations and technologies to minimize waste, and other pollution, minimize health and safety risks, and dispose of waste safely and responsibly;
- 6) Ensuring that employees have a level of knowledge and understanding appropriate to their environmental responsibilities and are aware of actions they can take to reduce their impacts; and
- 7) Updating the policy as needed according to the new laws, rules and regulations.

A unit with members will be established with specific responsibilities for the Project's environmental policy and performance. The findings and results of the Project's environmental performance would be available at the Project website.

2.3.2 Social Policy of the Project Proponent

The KMIC JVC sets the social policy covering the following factors:

- 1) Employment opportunities;
- 2) On – job skills training;
- 3) Workplace safety and health;
- 4) Mandatory social security schemes for certain workers and voluntary insurance under the social security schemes for all workers entitling them to benefits according to law; and
- 5) Provision of health care and monetary benefits that are provided for in the Social Security Law in an accurate and speedy manner, supporting insured workers and their families in times of need and suffering.

The healthcare and monetary benefits include:

- (i) medical treatment and cash benefit for sickness;
- (ii) medical treatment and cash benefits for maternity;
- (iii) temporary and permanent disability (regarding employment injury) benefit;
- (iv) funeral benefit for decease due to occupation; and
- (v) survivors' benefit for occupational decease.

The policy will also cover:

Fair Employment System: The talented individuals who can work together would be hired to achieve the mission and vision in a transparent manner. The diversity and human rights of the employees are respected and there will be no discrimination based on their gender, ethnicity, age, religion, educational background and physical disability while ensuring full compliance with Myanmar Labor Law and International Labor Organization (ILO) on the prohibition of force labor.

Ethical Management System: Based on the high level of ethical standards, a transparent and fair company culture is created to build an ethical management system so that all employees can conduct themselves and make decisions rightly. We fully comply with all applicable laws and regulations and treat every individual fairly with respect according to our ethical practice guidelines.

Improving Employees: It is important to have an accurate understanding of the mindset and values that each and every employee has toward the company and their work, and to improve employee satisfaction as well as reflecting these findings into the management of the company, in order to bring out the full potential of each and every employee and to create a lively workplace environment.

Creating Healthy and Enjoyable Workplace: The healthy and enjoyable workplace will be created by developing public places such as recreation place, day care center and playground for children, canteen and lounge for workers.

2.3.3 Corporate Social Responsibility Programs of Project Proponent

The KMIC JVC will accept Corporate Social Responsibility (CSR) for the communities living near to the project. The CSR programs will cover:

Education Sector: Construction and upgrading school building and facilities, providing necessities for students (for instance, school uniforms, books, pencils).

Healthcare Sector: Building dispensary/healthcare center at the appropriate village where villagers from surrounding villages can access.

Infrastructure Development: Upgrading of the roads which connect the project site and the village nearby.

2.3.4 Occupational Health and Safety Guidelines and Standards of Project Proponent

The KMIC JVC as an employer considers its employees to be its most valuable assets and undertakes to safeguard them through providing and maintaining, as far as reasonably practical, a working environment that is safe and without risk to the health of its employees.

The consortium also believes that health and safety orientation is a vital component of the health and safety management system. It is the process of introducing new, inexperienced, transferred and returning employees to a safe and healthy workplace.

Orientation provides employees with necessary safety information about their job and tasks, informs them of specific details about workplace hazards and provides an opportunity to learn about the company and their colleagues, ask questions and to clarify new or confusing information.

The orientation will be conducted for all employees, and workers for the construction phase and the length of time required for orientation will depend on the workplace, and the specific job and tasks. Orientation will not consist of a whirlwind of checklists and safety manuals handed to the new employee, but rather needs to be practical and hands-on, and will focus on the skills the employee must develop to be successful at their job.

Orientation Topics

The following topics are the minimum requirement for the company to review with new employees before they begin work:

1. Contact Information:

Names, phone numbers of employee's supervisor and company personnel, including emergency contact information.

2. Rights and Responsibilities:

Explain both the employee and employer responsibilities as outlined in Occupational Safety and Health Law (Draft) by Pyidaungsu Hluttaw.

3. Procedures and Codes of Practice:

Explain the company's procedures and codes of practice as it pertains to the employee's job and department. Outline the expectations for the employee and the employee's supervisor to adhere to all standards.

4. First Aid:

Introduce first aid providers, indicate areas for first aid kits or room, explain to employees how to summon first aid for themselves or for a co-worker.

5. Accident/Injury Reporting Procedures:

Explain the established company procedure and contact people for reporting any injuries sustained by the employee.

6. Emergency Procedures and Preparedness:

Review the company's emergency personnel contact info; evacuation plan, including exit routes; evacuation signals and sirens; location of eyewash stations and showers, fire extinguishers, and alarm pull boxes; identify fire marshal(s); and identify exposures. Other procedures may include:

- ✓ Bomb threats/suspicious packages
- ✓ Threatening, violent or disruptive behaviours
- ✓ Chemical spills, gas leaks
- ✓ Debriefing assistance for critical incidents

7. Personal Protective Equipment (PPE):

Review the required PPE (legal) standards for specific jobs or job tasks, including the appropriate use, fitting, storage, and maintenance for assigned jobs.

8. Code of Practice for Working Alone:

Outline the process for any employee who works alone so they can remain safe on the job or to be able to summon emergency assistance, if required.

9. Workplace Hazardous Material Information System (WHMIS):

Explain where hazardous material and substances are located and review the labeling system, hazardous symbols and location and contents of the Material Safety Data Sheets (MSDS). Train employees on site-specific products and accompanying MSDS material.

Guidelines, standards and activities for occupational health and safety

1. Organising the Site

1.1 Planning the work

A good planning will be made by gathering as much information about the project and the project site before works begin to ensure safety during construction phase. Information that could be sought would be:

- a) Underground services;
- b) Presence of live bare electrical conductors, underground/overhead insulated cables. Advice from the authority concerned would also be sought prior to start of work;
- c) Ground conditions;
- d) Contract documents;
- e) Nearby schools, footpaths and roads; and
- f) Other activities going on the site.

1.2 Organising the work

Responsibilities regarding safety and health between different stakeholders would be clearly allocated:

- a) Between client/main contractor/subcontractor;
- b) By appointment of competent supervisors/safety and health officers; and
- c) By proper coordination on site between parties.

1.3 Common facilities to be provided

The provision of basic facilities to ensure safety, health and welfare of employees would be ascertained.

1.3.1 Site access

Adequate, safe and separate pedestrian and vehicular traffic routes would be provided on and around the site.

1.3.2 Site boundaries

The construction site will be fenced to prevent the entry of unauthorised persons on construction sites, which are located in built-up areas and alongside vehicular and pedestrian traffic routes.

1.3.3 Public safety

The public safety would be ensured through appropriate fencing of site or by other means.

1.3.4 Lighting

The adequate lighting of all worksite would be ensured through natural and/or artificial lighting.

1.3.5 Site tidiness

- a. The site would be kept tidy.
- b. Walkways and stairs would be kept free of slipping and tripping hazards.
- c. There will be no protruding nails on loose or fixed materials.

1.3.6 Storage areas

- a) The storage areas would be set up for plants, materials, flammable substances (e.g. flammable liquids and gases) and hazardous substances (e.g. chemicals).
- b) The flammable materials would be stored away from other materials and protected from accidental ignition.
- c) The obstruction of access routes/emergency escapes by proper storage of materials would be prevented.
- d) Materials to be properly stacked to prevent falls.

1.3.7 Fire Safety

Details can be reviewed in Fire Safety Management and Fire Emergency Plan.

2.0 Excavations

- a) All utility services, such as electrical, water and sewer in the area would be located and identified before beginning to excavate.
- b) The pointed tools will not be used to probe for underground electrical cables.
- c) Trees, utility poles, rocks or similar objects near the edge of an excavation would be removed or secured to prevent workers from being injured.
- d) The sides of excavations would be supported by sheet piling, shoring and bracing to guard against danger to workers from fall or dislodgement of earth, rock or other material.
- e) The excavation slopes and/or supporting systems would be inspected daily for erosion or deterioration.
- f) The excavated materials will be kept back at least 600 mm (2 ft.) from the edge of any trench excavation and 1.2 m (4 ft.) from any other excavation.
- g) The substantial guardrails or barriers would be erected around excavations to prevent workers or other persons from falling into them.
- h) A ladder will be provided when workers are required to enter excavations over 1.5 m (5 ft) in depth.
- i) The load, plant or equipment would not be placed or moved near the edge of any excavation where it is likely to cause its collapse and thereby endanger any person unless precautions such as the provision of shoring or piling are taken to prevent the sides from collapsing.
- j) The anchored stop blocks, and barriers would be provided to prevent vehicles being driven into the excavation.
- k) The heavy vehicles will not be allowed near the excavation unless the support work has been specially designed to permit it.
- l) If an excavation is likely to affect the security of a structure on which persons are working, precautions would be taken to protect the structure from collapse by providing shoring.

3.0 Working at Height

3.1 General provisions

- a. Ensure that working platform is secure and check that it:
 - i. will support the weight of workers using it and any materials and equipment they are likely to use or store on it.
 - ii. is stable and will not overturn.
 - iii. is footed on stable ground or on a stable support or structure.
- b. Provide guard rails, barriers, etc. at open edges, including edges of floors, floor openings, edges of roofs and edges of working platforms.

3.2 Guard rails

Guard rails would:

- a) be made from any material, provided they are strong and rigid enough to prevent people from falling and be able to withstand other loads likely to be placed on them.
- b) be fixed to a structure, or part of a structure capable of supporting them.
- c) Include:
 - i. a main guard rail at least 900 mm above any edge from which people are liable to fall.
 - ii. a toe board at least 150 mm high.
 - iii. a sufficient number of intermediate guard rails or suitable alternatives.
- d) Risks of falls through openings or fragile material (e.g. rooflights), to be reduced by providing appropriate and adequate guard rails or barriers to cover the opening or material.

3.3 Safe working platforms

All working platforms would be:

- a) Fully boarded and securely fixed to prevent displacement.
- b) Strong enough to support the load usually placed on it (workers and materials).
- c) Provided with toe-boards so as to prevent materials and tools from falling over the edges.

3.4 General access scaffolds

All scaffolds would be:

- a) Properly designed, constructed, erected and maintained so as to prevent collapse or accidental displacement.
- b) Based on a firm and level foundation.
- c) Erected on a firm ground capable of supporting the weight of the scaffold and any load likely to be placed on it.
- d) Braced and tied into a permanent structure or otherwise stabilized.
- e) Provided with platforms that are fully boarded and wide enough for the work and for access.
- f) Provided with scaffold boards that are properly supported and rest on at least three supports.
- g) Have a safe ladder or other access onto the work platforms.

3.5 Safe use of access ladders

- a) Any ladder would be properly fixed to prevent slipping.
- b) A good handhold would be provided to the ladder.
- c) The ladder would be leaned at the proper angle to minimize the risk of slipping outwards, that is, about 1 m out at the base for every 4 m in height.
- d) The top of the ladder would rest against a solid surface and not on fragile or other insecure materials such as cement or plastic guttering.
- e) Both feet of the ladder would rest on a firm footing and cannot slip.
- f) If the ladder is more than 3 m long or used as a way to and from a workplace, it would be secured from falling by fixing it at the top or sometimes at base.
- g) If the ladder cannot be fixed a second person would secure the ladder at the base while it is being used.
- h) The ladder would extend a sufficient height (about 1 m) above any landing place where workers will get on and off it unless some other adequate handhold is available.

3.6 Stepladders

- a) Stepladders would be fully opened, and both spreader bars would be locked.
- b) Stepladders would not be used on top of scaffolds, platforms, or other surfaces above the ground.

- c) Unattended tools, such as hammers, would not be left on top of stepladder.
- d) Stepladder would be dismantled before being moved.
- e) Top most rung of a stepladder would not be used.

3.7 Care of ladders

- a) Ladders would be inspected regularly by a competent person and damaged ladders should be removed from service.
- b) Ladders would be properly stored on racks under cover and above ground.
- c) Ladders would not be hung from its rungs.

3.8 Roof works

- a) All roof-work operations would be pre-planned and properly supervised.
- b) Roof work would only be undertaken by workers who are physically and psychologically fit and have the necessary knowledge and experience for such work.
- c) Work on roofs should not be carried on in weather conditions that threaten the safety of workers.

3.8.1 Flat roofs

- a) All the edges and openings on a roof from or through which there is a risk of fall would be protected with suitable guardrails and toe boards.
- b) All covers for openings in roofs would be of substantial construction and be secured in position.

3.8.2 Sloping roofs

- a) When work is being carried out on sloping roofs, sufficient and suitable crawling boards or roof ladders would be provided and firmly secured in position as soon as practicable.
- b) During extensive work on sloping roofs, edge protection in the form of barriers or guardrails high enough and strong enough would be provided to stop worker from falling off the roof.

3.8.3 Fragile Roofs

Where workers are required to work on or near roofs or other places covered with fragile material, through which they are liable to fall, they would be provided with sufficient suitable roof ladders or crawling boards strong enough, when spanning across the supports for the roof covering, to support those workers.

4.0 Moving, Lifting and Handling Loads

4.1 Manual handling

- a) Work site and storage of materials would be planned so that manual handling is reduced to a minimum.
- b) Manual handling would be done by the kinetic lifting technique and the person involved should be properly trained.

4.2 Hoists

- a) Selection of a hoist, which is suitable for the site and capable of lifting the loads required will be made.
- b) To prevent people being struck by the platform or other moving parts:
 - i. Enclose the hoistway at places where people might be struck, e.g., working platforms or window/door openings;
 - ii. Provide gates at all landings and at ground level;
- c) Prevent falling down the hoistway by making sure:
 - i. the hoistway is fenced where people could fall down it;
 - ii. the gates at landings are kept closed except during loading and unloading;

- iii. the edge of the hoist platform is close to the edge of the landing so that there is no gap to fall through;
- d) Prevent being hit by falling materials by:
 - i. stopping loads falling from the platform, e.g., make sure wheelbarrows are not overfilled;
 - ii. not carrying loose loads. Put loose loads in proper container or use a hoist with an enclosed platform;
 - iii. not overloading the platform;
 - iv. enclosing the hoistway;
 - v. hoist should be used to carry materials only.

4.3 Lifts

Lifts for the carriage of persons need to be especially constructed and installed for the purpose, with such features as mechanical and electrical interlocking devices on the cage and landing gates.

4.4 Mobile cranes

- a) The crane would be able to lift the load on a site.
- b) It should be of such a size so that it can be used safely on a site.
- c) Crane's inspection certificates would be up-to-date.
- d) The crane would be fitted with an automatic Safe Load Indicator, which should be in good working order.
- e) The employer would ensure that the driver is trained and experienced in the operation of the type of crane being used.
- f) The crane should be sited in a safe place, so that;
 - The driver has a clear view of the site.
 - It is well away from excavations and overhead powerlines.
 - It is on level ground which can take its full weight and together with its maximum load.

5.0 Site Vehicles and Mobile Plant

- a) Provide safe site entry and exit points with adequate turning room and good visibility for vehicle drivers;
- b) Keep pedestrians separate from vehicles, e.g., by providing separate site entry and exit points;
- c) Consider a one - way system and avoid needs for vehicles to reverse wherever possible;
- d) Consider fitting reversing alarms to vehicles;
- e) Make use of signalers to control high-risk situations, e.g., where visibility is restricted;
- f) Prepare the running surface of temporary roads. Where the site is muddy, use hardcore or other fill to overcome the problem of skidding and repair potholes;
- g) Protect any temporary structures, such as scaffolds or falseworks, which might be damaged and made unsafe if struck by a vehicle;
- h) Protect any excavations and alongside any areas of water if vehicles must pass close by;
- i) Take precautions, such as stop blocks, where vehicles tip materials into excavations;
- j) Make sure that vehicles are not overloaded as they may become unstable, difficult to steer or have their braking efficiency impaired;
- k) Make sure loads are securely attached to vehicles and that loose materials cannot fall from lorries or site dumpers and strike workers; and
- l) Take special precautions with blind corners.

6.0 Chemicals

- a) Follow the instructions provided on the labels when working with glues, paints, and solvents;
- b) Work with glue, paint, or solvents in well-ventilated areas so as to prevent build-up of hazardous environment to chemical vapours; and

- c) Use appropriate personal protective equipment and clothing to employees working with chemicals based on labels and Material Safety Data Sheet (MSDS).

7.0 Protective Equipment

Employees on construction sites need specific Personal Protective Equipment (PPE) to ensure their safety and health. e.g.:

7.1 Safety helmet

- a) Employees would be provided with safety helmets to protect the head from injury due to falling or flying objects or due to striking against objects or structures.
- b) Employers would ensure that the safety helmets are worn.
- c) When working at height, a strap would additionally be used to prevent the safety helmets from falling.

7.2 Footwear

- a) Protective footwear would be provided to workers who are exposed to the risk of injury of materials being dropped on their feet or nail or other sharp objects penetrating their sole.
- b) Where it is likely that employees will be working in water or wet concrete, appropriate boots would be provided.

7.3 Goggles and safety spectacles

The employer would provide goggles or other suitable protective device when likely to be exposed to eye or face injury from airborne dust or flying particles, dangerous substances, harmful heat, light or other radiation, and in particular during welding, flame cutting, rock drilling, concrete mixing or other hazardous work;

7.4 Gloves and protective clothing

Protective gloves and suitable protective clothing to protect hands or the whole body as required when exposed to heat radiation or while handling hot, hazardous or other substances which might cause injury to the skin would be provided by the employer.

7.5 Other protective equipments

Where necessary, workers would be provided with and required to wear the following personal protective equipment:

- a) Ear protection when exposed to noise.
- b) Dust masks when exposed to excessive dust.
- c) Waterproof clothing and head coverings when working in adverse weather conditions.
- d) Safety harnesses with independently secured lifelines where protection against falls cannot be provided by other appropriate means.
- e) Life vests and life preservers where there is a danger of falling into water.
- f) Distinguishing clothing or reflective devices or otherwise conspicuously visible material when there is regular exposure to danger from moving vehicles.

Note: All protective equipments would be properly maintained and stored after use.

8.0 Emergency Procedures

8.1 Transport

- a) Where an employee has suffered injury or illness at work necessitating his removal to his home or to a hospital or other similar institution, the employer shall promptly and at his own expense provide an appropriate means of conveyance for the employee.
- b) The appointed person or first-aider shall accompany the injured or ill employee to a hospital or other similar institution whenever the circumstances so justify.



CHAPTER 3. PROJECT DESCRIPTION AND ALTERNATIVES

3.1 Project Background

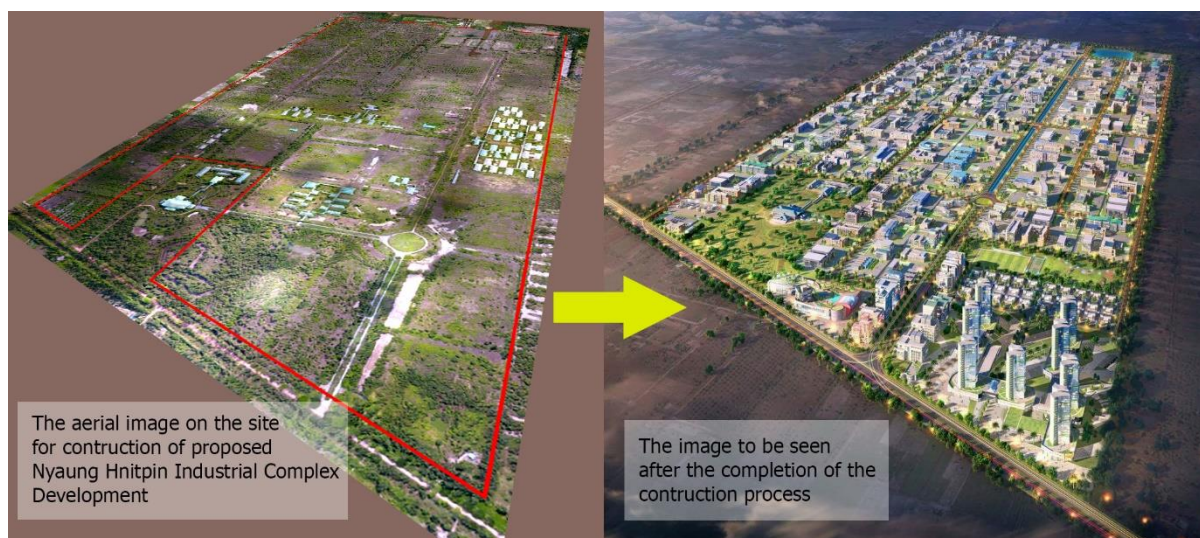


Figure 3. 1: Overview Image of Project

This Environmental Impact Assessment (EIA) report has been prepared by Myanmar Survey Research (MSR) on behalf of KMIC JVC.

The proposed project is the development of an industrial complex to be built on the land of approximately 555.81 acres in a public open space, access and landscaping. KMIC JVC is currently preparing an outline planning application for the site, including an Environmental and Social Impact Assessment (ESIA).

At this stage, the intention is to submit an ESIA Report to the Environmental Conservation Department to obtain the Environmental Compliance Certificate for construction of the KMIC project of land area of 555.81 acres along with infrastructure development for roads, electricity and water pipeline.

3.2 Project Description

The project is designed for large scale, middle scale and small scale industrial compounds including internal infrastructure such as 8 high rise residential, 30 villa blocks, 2 management centers, 1 public support facility, 4 commercial buildings, Industrial area, gas station, recreation park, main roads, intersection roads, drainage, overhead electricity installation, plantation of green spaces, electricity sub-station, wastewater treatment plant, and water purification plant. There will be approximately 203 buildings, including large scale, middle scale and small-scale industrial plots be situated and constructed. These buildings include factories and warehouses for Garment Products, Food Manufacturing, Jewelry Processing, Vehicle Spare Parts and Electronic Parts installation. Residential areas will be used for dormitory and apartments for managers and owners. Total 100,000 job opportunities will be created. According to the documents of MIC Permit, in 2020, 1,400 workers/year, in 2021, 24,000 workers/year, in 2022, 19,200 workers/year and in 2023 , 4,800 workers/year would be employed.

The existing two-lanes access road way to the project site is 9.45 km in length and 6 m in width and connecting from Yangon - Mandalay main road junction to the proposed site. Ministry of Construction will improve the existing road way as 4 lanes carriage ways mid island and sidewalks. The requirement of water will be supplied from Kalihtaw Dam which is situated

in the north. The direct buried supply pipes will be used, and the water will be purified at site. The 230 KV transmission line will be installed from Kamarnat- Myaungtakar national grid.



Figure 3. 2: Artist Impression

3.3 Project Location

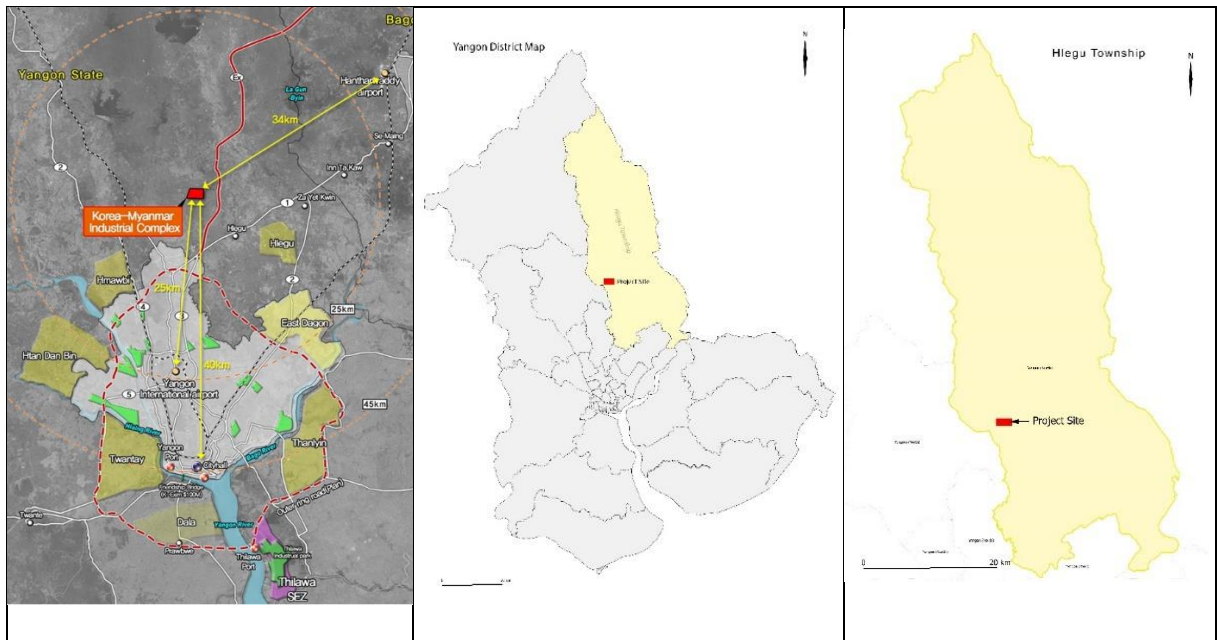


Figure 3. 3: Project Location Overview Map

Ministry of Construction, Government of Republic of Union of Myanmar, and KMIC JVC agreed to develop an Industrial complex around Yangon Region. KMIC JVC is formed, and it initiates KMIC Project which is located in Nyaung Hnitpin Livestock and Agricultural Zone No.3, Hlegu Township, and which is 40 km north from Yangon Port, 25 km from Yangon International Airport and 35 km from Hantharwaddy Airport (Bago), 9 km from Yangon – Mandalay Expressway. The land is 555.81 acre (2,249,288 square meter) in area and is flat and swampy

area previously known as Nyaung Hnitpin Research and Training Institute of Union Solidarity and Development Association (USDA), later became Union Solidarity and Development Party (USDP). According to the Government of Union of Myanmar, it was a training institution until 1992. Then it was called a National Convention Center until 2008 when it was closed. However, it was told that the ownership of the project site had never belonged to USDP, rather it belonged to Yangon Region Government prior to transferring it to Ministry of Construction.

The location is between:

Table 3. 1: Location Points for Project Boundary

	Latitude	Longitude
Point A	17.136131°	96.155709°
Point B	17.141934°	96.157951°
Point C	17.142103°	96.162789°
Point D	17.144476°	96.162692°
Point E	17.144329°	96.158867°
Point F	17.145730°	96.159415°
Point G	17.146511°	96.179249°
Point H	17.137174°	96.178757°

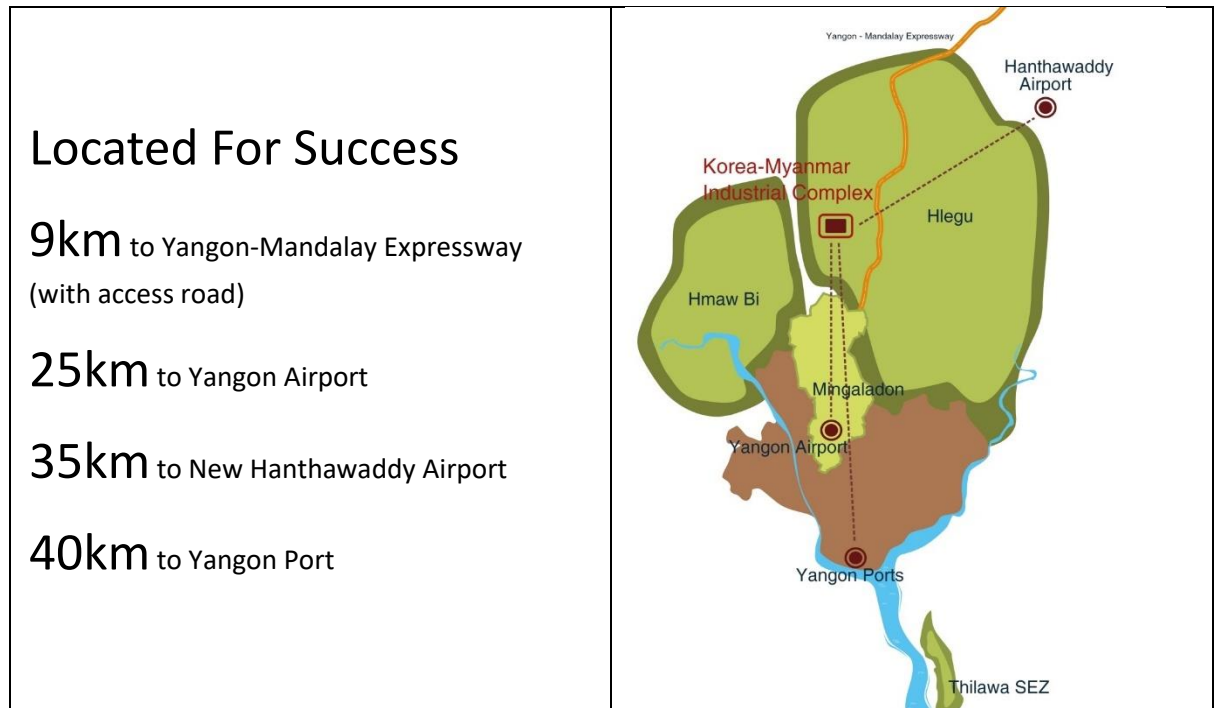


Figure 3. 4: Project Location Map



Figure 3. 5: Aerial Photo of Existing Project Site (Taken by MSR Drone Team)

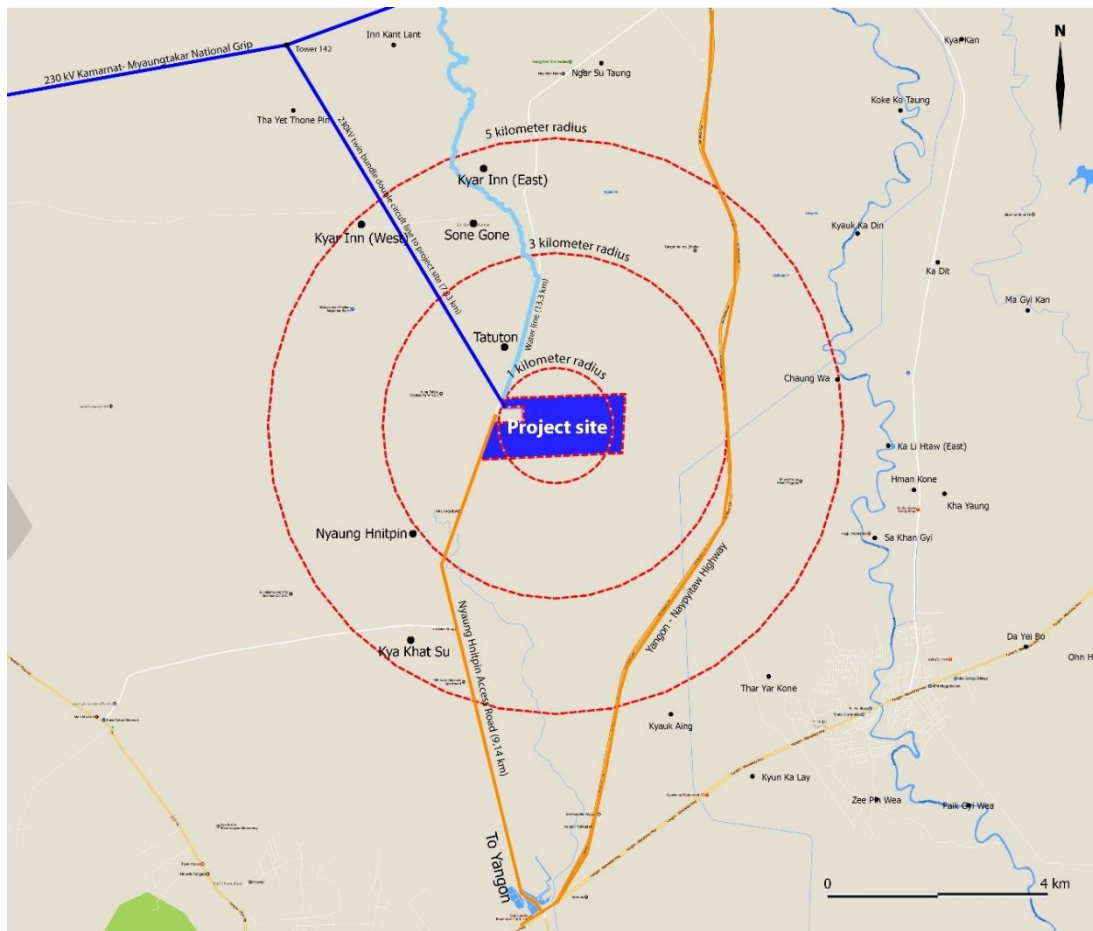


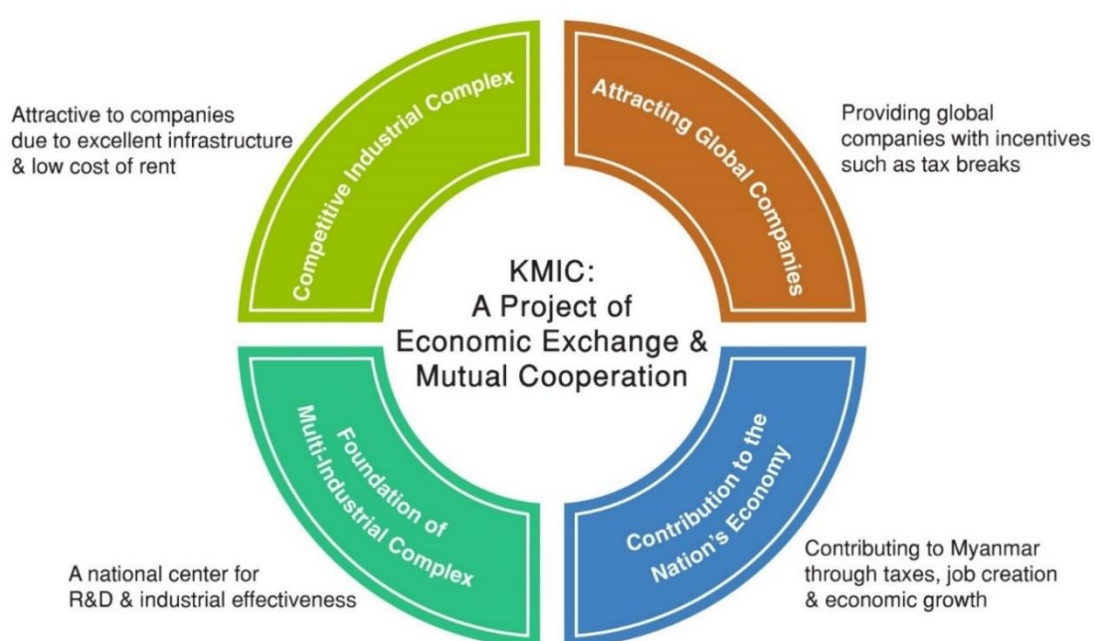
Figure 3. 6: Map of Project Site and surrounding villages

3.4 Project Development and Implementation Time Schedules

3.4.1 Development Concept

KMIC Development Co., Ltd. (hereinafter referred to as KMIC JVC, Project Proponent or the Developer) plans to implement an Industrial Complex in Nyaung Hnitpin, Hlegu township, Yangon Region, Myanmar. The main objectives of the development are mentioned below:

- 1) To become a competitive industrial complex by attracting international companies providing with excellent infrastructure, incentives such as tax breaks, and low cost of rent;
- 2) To become a national center for R& D and industrial effectiveness as a foundation of multi-industrial complex;
- 3) To contribute the national economic growth through job creation and revenue generation; and
- 4) To become a project of economic exchange and mutual cooperation between two countries.



This KMIC project not only benefits the region but also the whole country.

3.4.2 Implementation Time Schedule

Table 3. 2: Implementation Time Schedule

Implementation Year	Activity	Remark
2020 or 2021	Phase 1 construction started	Industrial, Commercial, Water Purification Plant, Power Transformer (Substation) and Wastewater Treatment Plant
2022	Phase 1 construction completed	
2022	Phase 2 construction started	Industrial, Residential, Villas, Park, Management office
2023	Phase 2 construction completed	

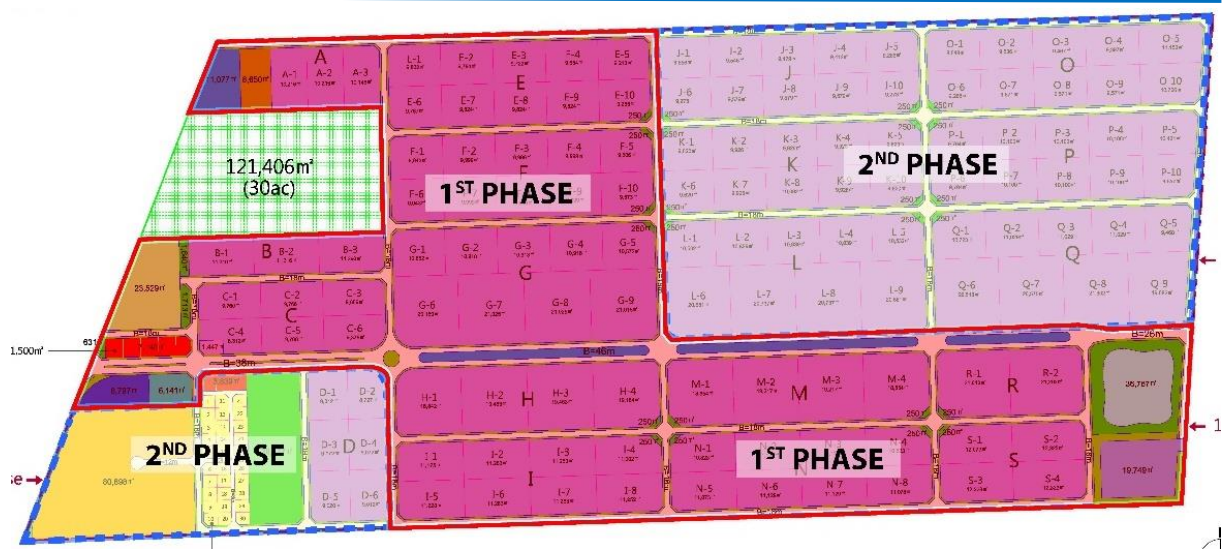


Figure 3. 7: Project Phases for Implementation

3.5 Project Summary

Land Use Type	Area(m ²)	Percentage(%)	Note
Total	2,249,288	100.0	
Industrial Area	1,593,119	70.9	
Residential Area	60,888	3.6	
Villa	23,810	1.1	
Commercial Area	10,267	0.3	
Technopark (IT Park)	23,620	1.0	
Gas Station	1,447	0.1	
Public Facility Site	915,698	22.9	
Road	286,589	11.4	
Retention Canal	26,002	1.1	
Park	82,628	3.7	Included Undercurrent Facility
Buffer Green Belt	04,609	4.2	
Management Office	8,797	0.4	
Public Support Facility	6,141	0.3	
Substation	8,650	0.4	
Wastewater Treatment Plant	19,749	0.9	
Water Purification Plant	11,077	0.5	

Exclusion site : 121,406 m²

Land Use Type	Area(m ²)	Percentage(%)	1st Phase		2nd Phase	
			Area(m ²)	Percentage(%)	Area(m ²)	Percentage(%)
Total	2,249,288	100.0	1,273,514	56.6	975,774	43.4
Industrial Area	1,593,119	70.9	876,708	39.0	716,411	31.8
Residential Area & Villa	104,708	4.7	104,708	4.7		
Commercial Area	10,267	0.3	7,143	0.3	3,124	0.2
Other Facility Site	640,474	24.0	399,659	17.3	150,815	6.7

Master Plan
S = 1 : 8,000

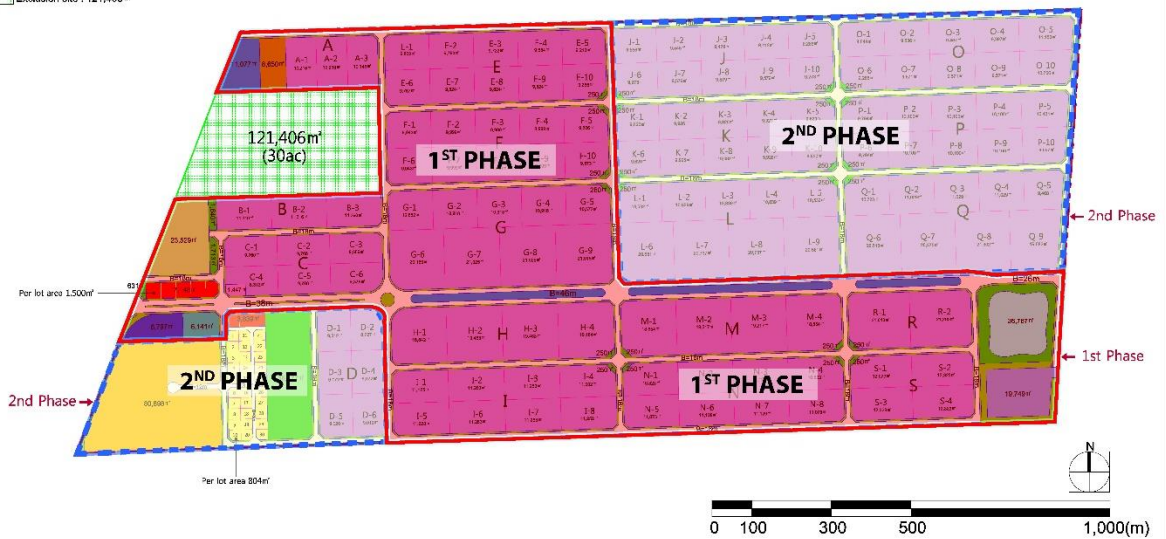


Figure 3. 8: Project Master Plan showing project phases (See large Image in A3 size in Appendix)

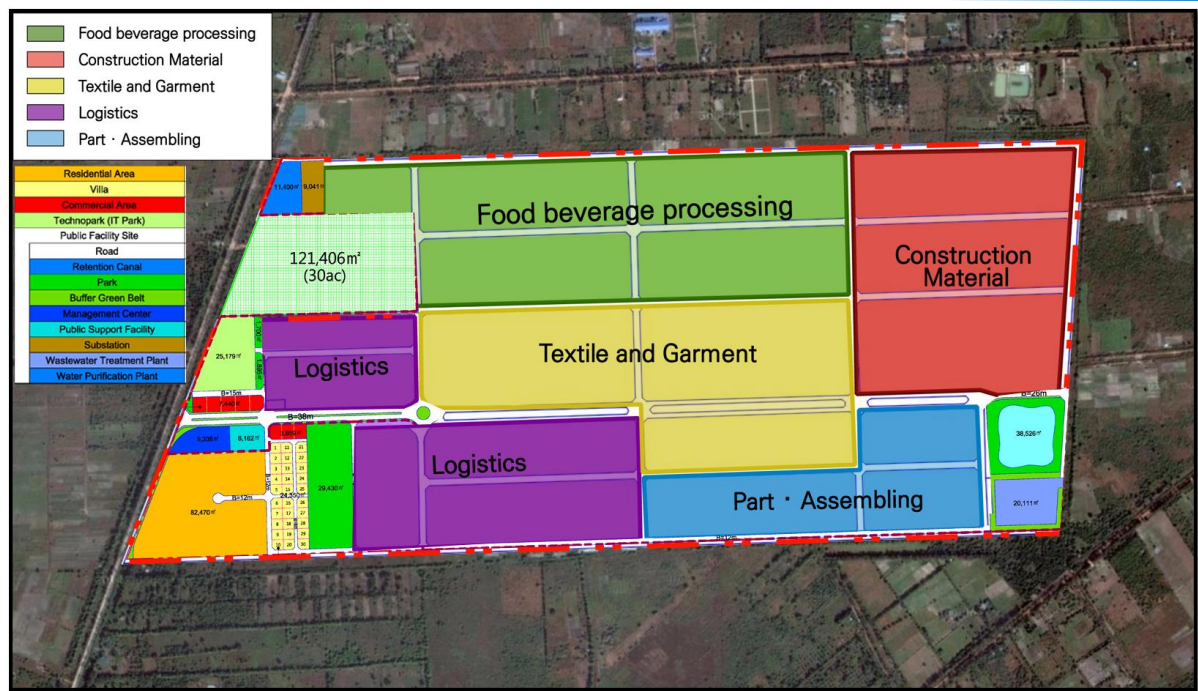


Figure 3. 9: Site Layout Map with different Factories and Facilities of Complex (See large image A3 size in Appendix)

Table 3. 3: Project Summary

PROJECT SUMMARY																										
Project Name	KMIC Project																									
Location:	Nyaung Hnitpin Livestock and Agricultural Zone No.3, Hlegu Township, Yangon Region.																									
	Coordinates: <table border="1"> <tr> <td>Point A</td> <td>Latitude 17.136131°</td> <td>Longitude 96.155709°</td> </tr> <tr> <td>Point B</td> <td>Latitude 17.141934°</td> <td>Longitude 96.157951°</td> </tr> <tr> <td>Point C</td> <td>Latitude 17.142103°</td> <td>Longitude 96.162789°</td> </tr> <tr> <td>Point D</td> <td>Latitude 17.144476°</td> <td>Longitude 96.162692°</td> </tr> <tr> <td>Point E</td> <td>Latitude 17.144329°</td> <td>Longitude 96.158867°</td> </tr> <tr> <td>Point F</td> <td>Latitude 17.145730°</td> <td>Longitude 96.159415°</td> </tr> <tr> <td>Point G</td> <td>Latitude 17.146511°</td> <td>Longitude 96.179249°</td> </tr> <tr> <td>Point H</td> <td>Latitude 17.137174°</td> <td>Longitude 96.178757°</td> </tr> </table>			Point A	Latitude 17.136131°	Longitude 96.155709°	Point B	Latitude 17.141934°	Longitude 96.157951°	Point C	Latitude 17.142103°	Longitude 96.162789°	Point D	Latitude 17.144476°	Longitude 96.162692°	Point E	Latitude 17.144329°	Longitude 96.158867°	Point F	Latitude 17.145730°	Longitude 96.159415°	Point G	Latitude 17.146511°	Longitude 96.179249°	Point H	Latitude 17.137174°
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Point F	Latitude 17.145730°	Longitude 96.159415°																								
Point G	Latitude 17.146511°	Longitude 96.179249°																								
Point H	Latitude 17.137174°	Longitude 96.178757°																								
	40 km north from Yangon CBD, 25 km from Yangon International Airport and 34 km from Hantharwaddy Airport (Bago)																									
Site area:	555.81 acre (2,249,288 square meter)																									
Land Use	Classification	Area (sqm)	Composition Rate (%)																							
	Industrial	1,640,245	72.9																							
	Residential	83,010	3.6																							
	Villa	23,810	1.1																							
	Commercial	9,852	0.5																							
	Gas Station	1,447	0.1																							
	Public Facilities Site (including greening area)	490,924	21.8																							
	Total	2,249,288	100.0																							

	Public Facilities Site		
	<ul style="list-style-type: none"> • Road 	233,745	10.4
	<ul style="list-style-type: none"> • Retention Canal (Water way) 	25,062	1.1
	<ul style="list-style-type: none"> • Park 	82,928	3.7
	<ul style="list-style-type: none"> • Buffer Green Belt 	94,775	4.2
	<ul style="list-style-type: none"> • Management Center 	8,797	0.4
	<ul style="list-style-type: none"> • Public Support Facility 	6,141	0.3
	<ul style="list-style-type: none"> • Substation 	8,650	0.4
	<ul style="list-style-type: none"> • Wastewater Treatment Plant 	19,749	0.9
	<ul style="list-style-type: none"> • Water Purification Plant 	11,077	0.5
	Total	490,924	21.8
Building	203 buildings		
Land Owner	Myanmar Government Land, Ministry of Construction (MOC)		
Land Lease	50 years + 10 years + 10 years (Land is contributed by DUHD as a shareholder of JV)		
Construction /Preparation Period	<ol style="list-style-type: none"> 1. a period of three (3) years from the date of commencement of Zone A 2. a period of three (3) years from the date of commencement of Zone B 		
Project Period	Phase 1: 2019 – 2069 Phase 2: 2022 – 2072 (Expected)		
Investment Capital	75 million USD		
Business Structure	Joint Venture between Myanmar Government, Ministry of Construction (40%) and LH Consortium (60%)		
	<p>Myanmar (DUHD, under MOC)</p> <ul style="list-style-type: none"> • Land Contribution, • Construction of External Infrastructure, • Government Liaison etc... <p>Land contribution for 50 years Terms of investment which is equivalent to 40% of share, construction of external infrastructure facilities (power, driveway, water) and regulatory support.</p> <p>LH Consortium (Korea Land & Housing Corporation and Global Sae-A Co., Ltd)</p> <ul style="list-style-type: none"> • Cash Contribution, • Project Management, • Marketing etc... <p>LH Consortium is responsible for 3 main aspects, namely, making a capital contribution to fund the joint venture by holding 60% of the shares, Marketing and planning, design, construction and quantity management as the main developer.</p>		

<p>Developer</p>	<p>KMIC Development Co., Ltd.</p> <p>Address: Office Suite 2007, Pyay Garden Office Tower, 346-354, Pyay Road, Sanchaung Township, Yangon</p> <p>Contact person:</p> <p>For Social issue: Mr. Kim Gunwoo Email: gonwoo2@gmail.com Phone: 09 9757 99222</p> <p>For Environmental issue : Mr. Noh Hun Seung Email : no1211@lh.or.kr Phone: 0959791554414</p>
<p>Electricity Source</p>	<p>230kV twin bundle double circuit Line from Tower No.142 Myaungtagar – Kamarnat National Grid. Total estimated consumption 50 MW</p>
<p>Water usage</p>	<p>10,000 cubic meters (2.6 million gallons) per day (Kalihtaw Dam)</p>
<p>Access Road</p>	<p>9.45 km length, expanding 4 lanes from Highway Road No.1 and No.2 Junction to Nyaung Hnitpin Research and Training Institute</p>

The project is designed for large scale, middle scale and small scale industrial compounds including inside infrastructure such as residential, commercial, vocational training school, main roads, intersection roads, drainage, overhead electricity installation, plantation of green spaces, public support, electricity sub-station, wastewater treatment plant, water purification plant and public facilities.

The large scale, middle scale and small scale industrial plots will be situated and construction will include factories and warehouses for Garment Products, Food Manufacturing, Jewelry Processing, Vehicle Spare Parts and Electronic Parts installation. Residential areas will use for dormitory purpose and apartments for managers and owners.

3.6 Proposed Land Use Pattern

From the total demarcated land area of 2,249,288 square meters, KMIC project will occupy 100 percent of the land area. The Industrial area will occupy 72.9% (1,640,245 square meter), Residential area is 3.6% (80,898 square meter), Villa is 1.1% (23,810 square meter), Commercial, IT park and Gas station will take 1.6% (35,963 square meter), and Public Facility Site such as road, retention canal, park, buffer green belt, management center, public support facility, substation, wastewater treatment plant and water purification plant would occupy 22.9% (515,498 square meter).

The developer planned to complete the proposed project within two phases. The detail arrangement is as follow:

Table 3. 4: Proposed Landuse Pattern

Land Use Type	Total		1 st Phase		2 nd Phase	
	Area (m ²)	%	Area (m ²)	%	Area (m ²)	%
Total	2,249,288	100	1,273,514	56.6	975,774	43.4
Industrial Area	1,640,245	72.9	905,011	40.2	735,234	32.7
Residential & Villa Area	106,820	4.7	-	-	106,820	4.7
Commercial Area	11,299	0.6	7,440	0.3	3,859	0.2
Other	490,924	21.8	361,063	16.1	129,861	5.8

The proposed project will be completed after phase1 and phase 2 construction work.

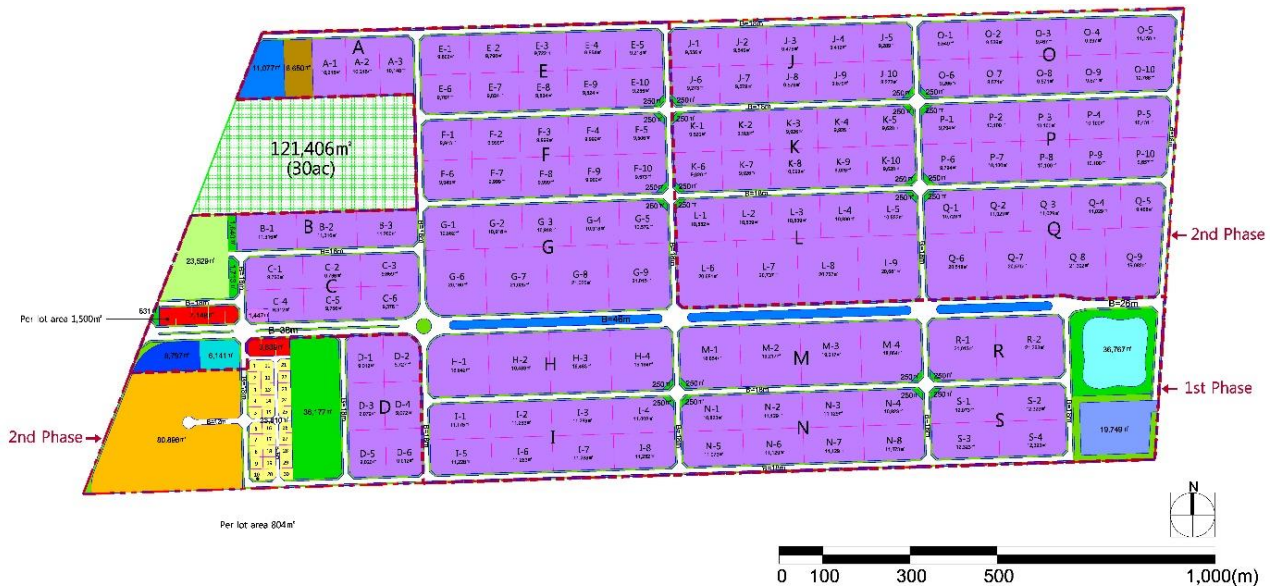


Figure 3. 10: Lot Layout and Land Use Plan Drawing (See large image A3 size in Appendix)

3.7 Proposed Internal Infrastructure

The two-meter high reinforced brick wall fencing will be constructed around parameter of proposed land and entrance gates will be constructed at main road. Main entry roads and intersection roads will be paved by concrete and road side drainage will be constructed by concrete which will collect storm water to detention ponds. Over flows from detention pond will be disposed at front and back drains. Sewage from every habitant area will be collected to waste water treatment plant and treated water will be disposed along the back drainage which will lead to Kalihtaw creek. Residential, commercial and public buildings will be constructed at beside entrance gates. The power substation facilities will be dropped from 230 KV high tension line which will be looped from Kamarnat - Myaungtakar national grid. Purification plant and buildings will be constructed beside access road near the entrance. The plant will purify the water supplied from Kalihtaw Dam.

3.7.1 Road Ways in KMIC Project Compound

There are six types of road ways which would be constructed in the internal infrastructure. They are 38 m wide, 46 m wide, 26 m wide, 18m wide, 12 m wide and 8 m wide road ways. Details of cross section of roads are as follow:

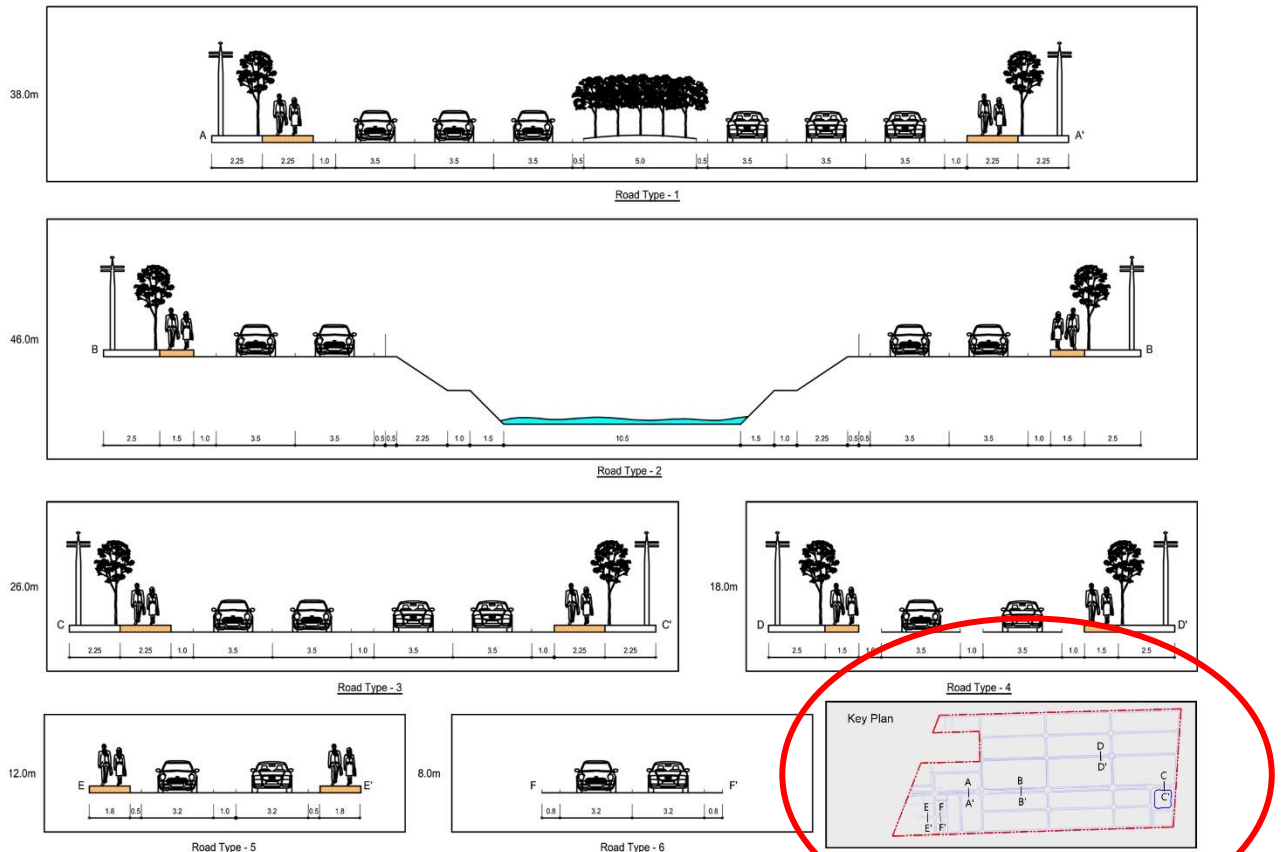


Figure 3. 11: Internal Road Infrastructure Section Drawing

3.7.2 Water Use and Supply System

During construction, the Engineering, Procurement and Construction (EPC) contractors usually dig several ponds to collect rainwater and make use of it for construction. Penta-Ocean construction Co.,Ltd, which was the EPC contractor for Thilawa Phase A, confirmed this practice. KMIC JVC planned to expose several temporary ponds for on-site measures (prevention of flooding in wet weather). It is sufficient to use fresh water for construction.

Water from water purification plant will be supplied to the KMIC project and the schematic diagram of water supply system is shown in Fig 3.12.

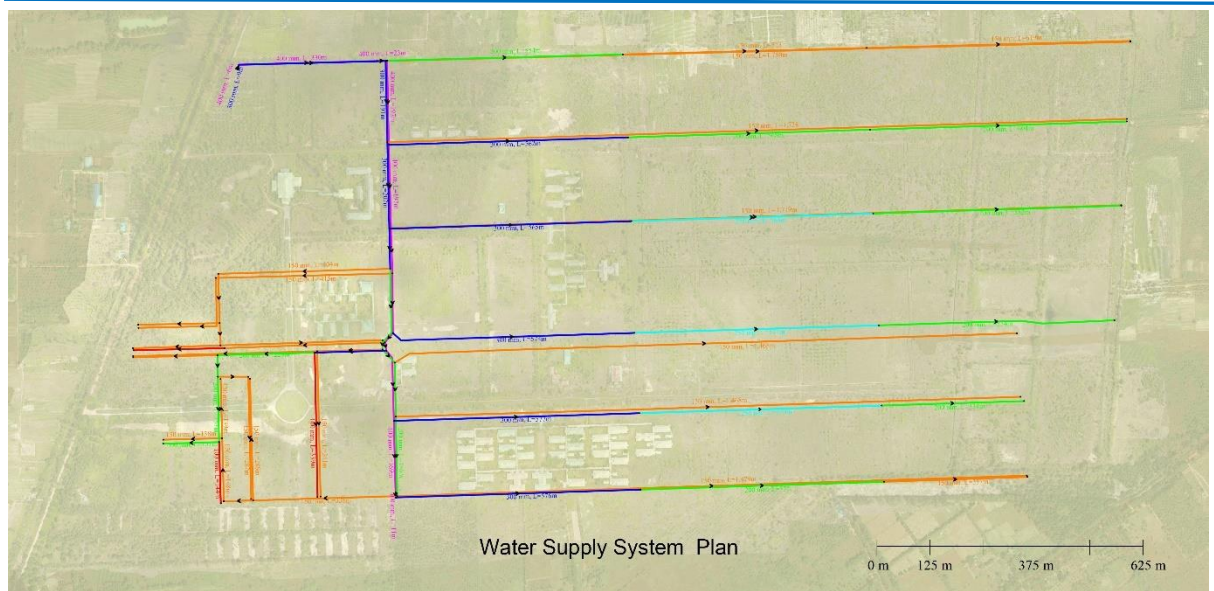


Figure 3. 12: Diagram of water supply system

A - LINE

Particulars	Standard	Unit	Quantity	Explanatory
PIPE	D100	M	-	
	D150	M	13,016	
	D200	M	566	
	D250	M	-	
	D300	M	843	
	D400	M	-	

B - LINE

Particulars	Standard	Unit	Quantity	Explanatory
PIPE	D100	M	697	
	D150	M	3,174	
	D200	M	3,761	
	D250	M	2,284	
	D300	M	3,022	
	D400	M	1,396	

3.7.3 Water Purification Plant



Figure 3. 13: Location map of Water Purification Plant

The location of water purification plant for KMIC project will be constructed at the corner of north west area as shown in the figure above. The appropriate land occupancy will be 11,770 square meters. The following facilities will be included in the water treatment plant installation.

The following figures show the water purification plant layout plan, the process of water purification plant and size of each facility of the plant.

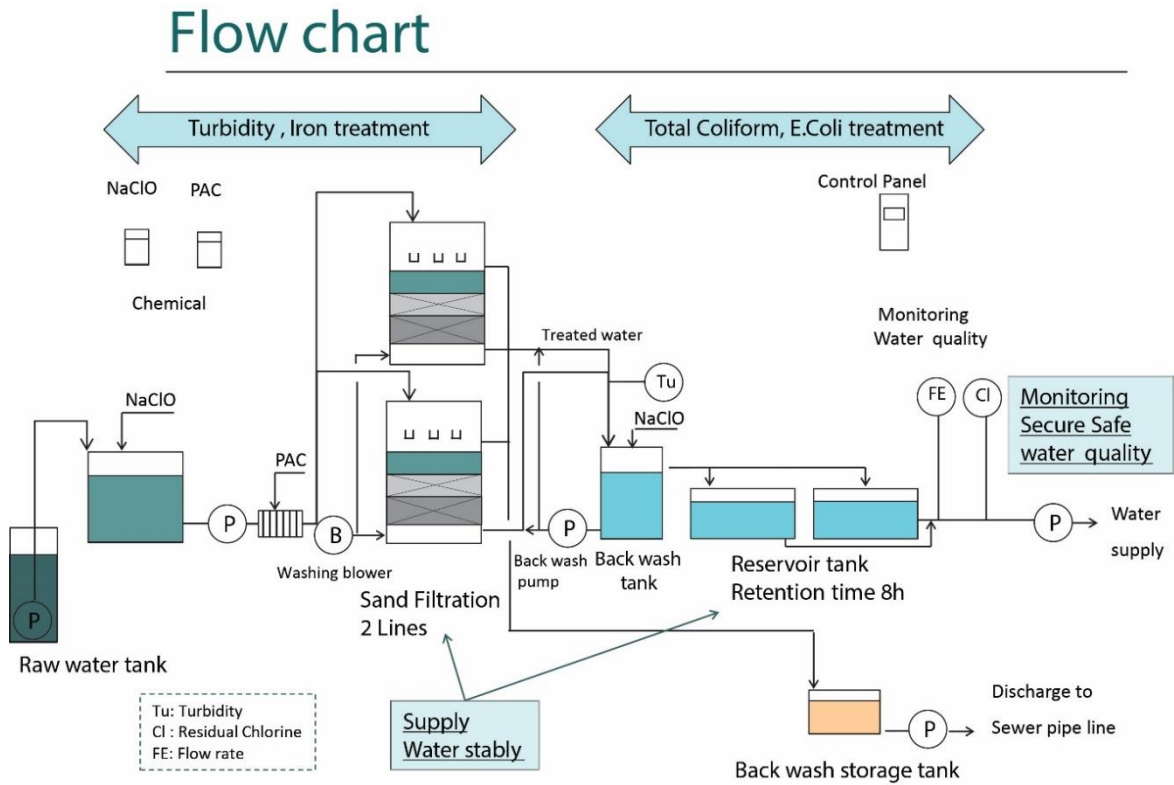


Figure 3. 14: Process Flow Chart of Water Purification Plant

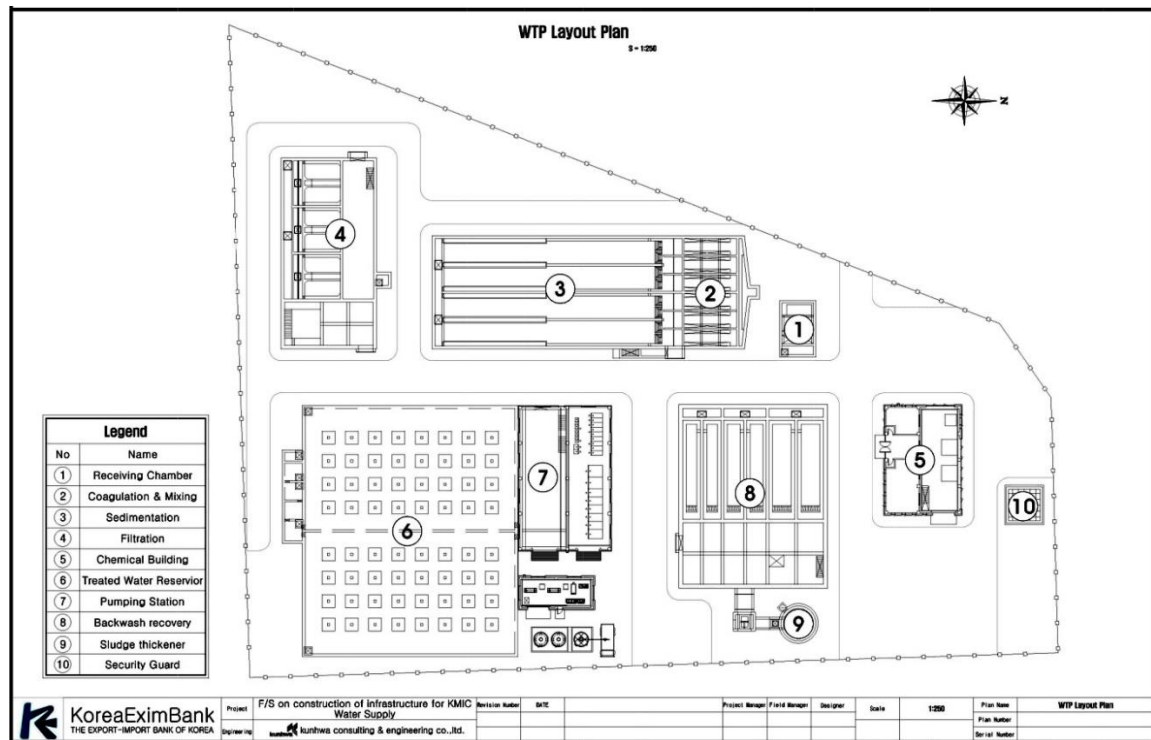


Figure 3. 15: Water Purification Plant Layout Plan

Table 3. 5: Details of Water Purification Plant

No.	Facility	Dimension
1	Receiving Chamber	W2.5m×L2.4m×H3.0m (2module)
2	Mixing Flocculation	W8.4m×L8.4m×H2.6m (2module)
3	Sedimentation	W8.4m×L39.5m×H3.6m (2module)
4	Rapid Filter	B3.1m×L6.1m×2cell (3module)
5	Chemical Building	10,000m ³ /day
6	Treater Water Reservoir	W20.8m×L36.0m×H4.5m (2module)
7	Pumping Station	10,000m ³ /day
8	Backwash	W3.4m×L17.0m×H3.0m (2module)
	Sludge	W3.0m×L17.0m×H3.0m (2module)
	Recovery	W4.4m×L17.0m×H3.0m (2module)
9	Sludge Thickener	D7.0m(1module)
10	Security Guard	-

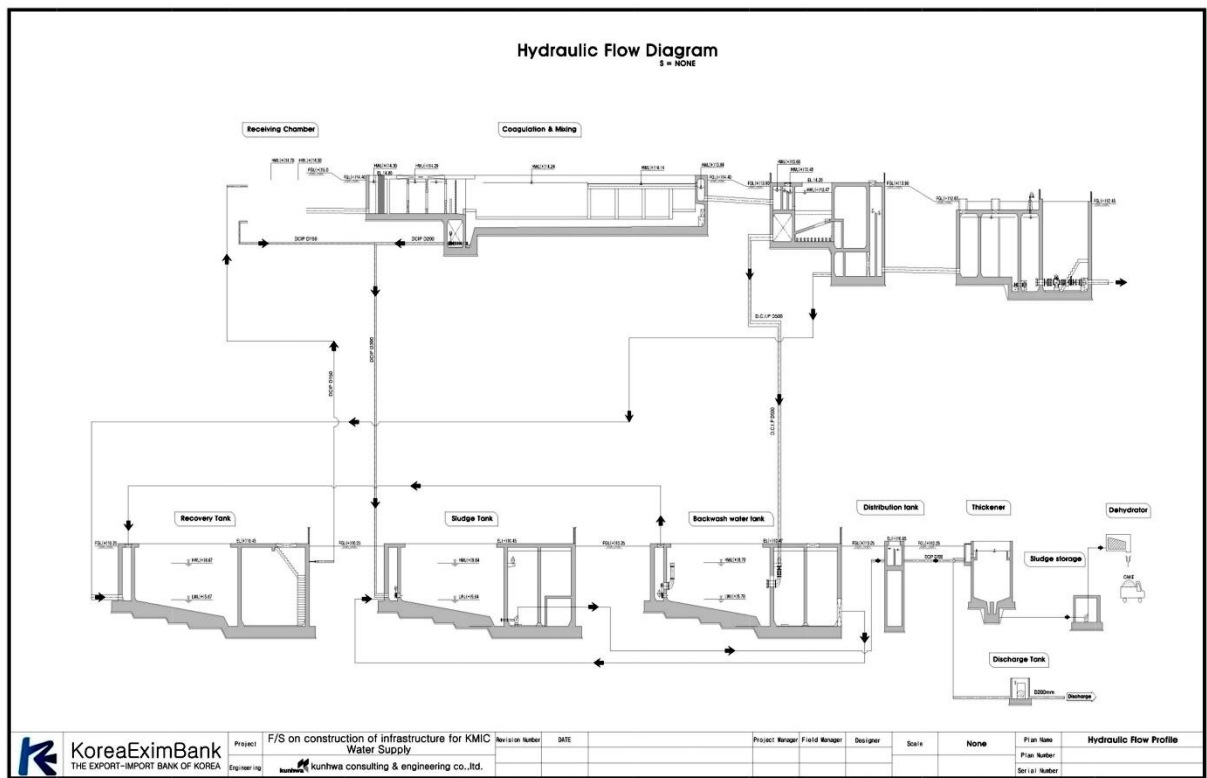


Figure 3. 16: Hydraulic Flow Diagram

3.7.4 Electricity Supply

230kV substation 1 EA, 100 MVA Transformer 2EA

1st 230 kV Gas Circuit Breaker (GCB), 2nd Circuit Breaker 33kV, Gas Insulated Switch (GIS)

The raw water pumping station is scheduled to be provided from the three phase lines. The water treatment plant is planned to be supplied the necessary power according to the entire power plan of the complex.

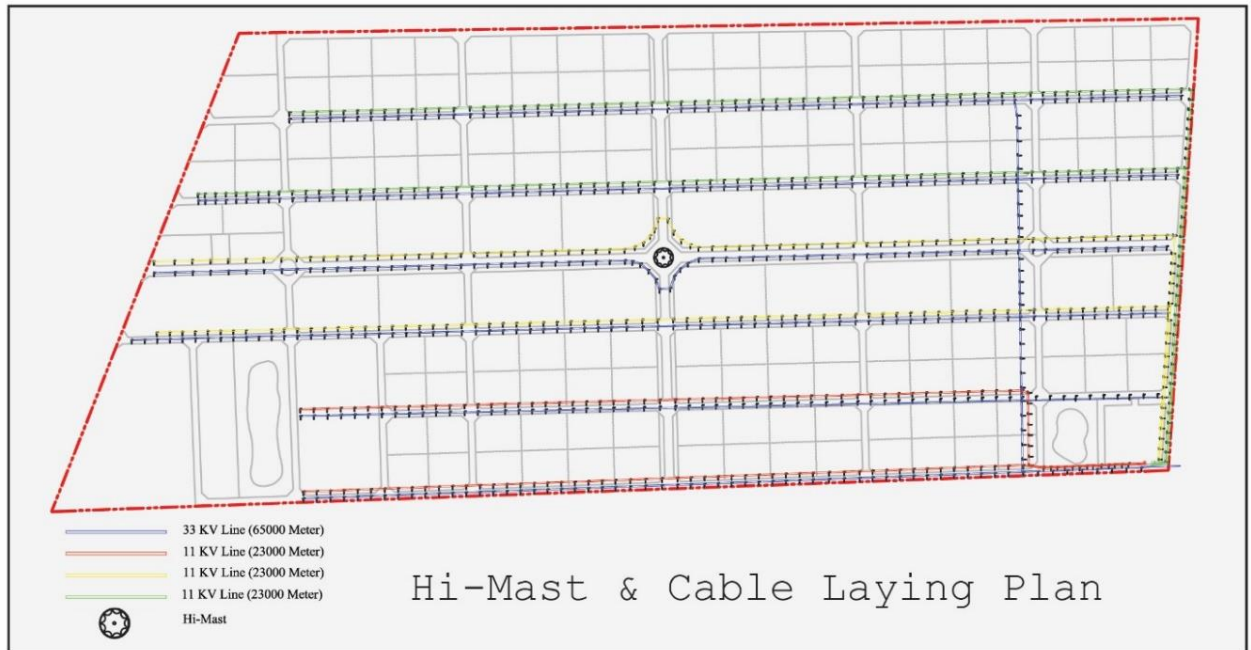


Figure 3. 17: Transmission line construction 230kV cable spec. 605 MCM 2-line 7.5 km

The substation is located in the site next to the water purification plant in the upper left corner of the KMIC complex. The substation and the water purification plant will be built by Ministry of Construction and will be maintained by the respective Myanmar government ministries. The residents will be provided with electricity via an electric pole installed on the ground. (Planning to install 11KV, 33KV power lines)

3.7.5 Wastewater and Sewage Collection and Disposal

Domestic wastewater, industrial wastewater and other disposed water will be collected via road side pipe network and gathered into wastewater treatment plant. The estimated capacity of wastewater will be 8,000 cubic meters per day. Wastewater from Industrial plots, residential plots and other infrastructure buildings will be collected through buried pipe lines at the road side. The developer will use ejectors, pumps and compressors along pipeline. The plant will treat wastewater and which will be constructed at south east corner of proposed project land. Treated water will be disposed off at the back drainage which leads to Kalihtaw creek.

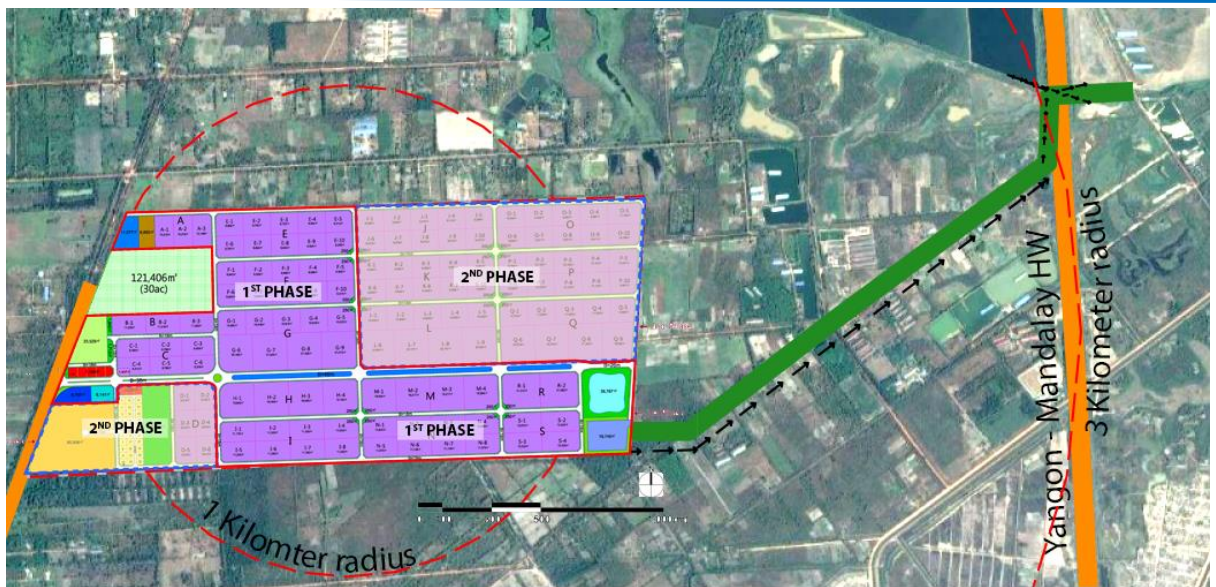


Figure 3. 18: Proposed Drainage



Figure 3. 19: Wastewater Treatment Plant Location Map

The treatment process of wastewater and sewage can be seen in the flow diagram below.

Flow Chart

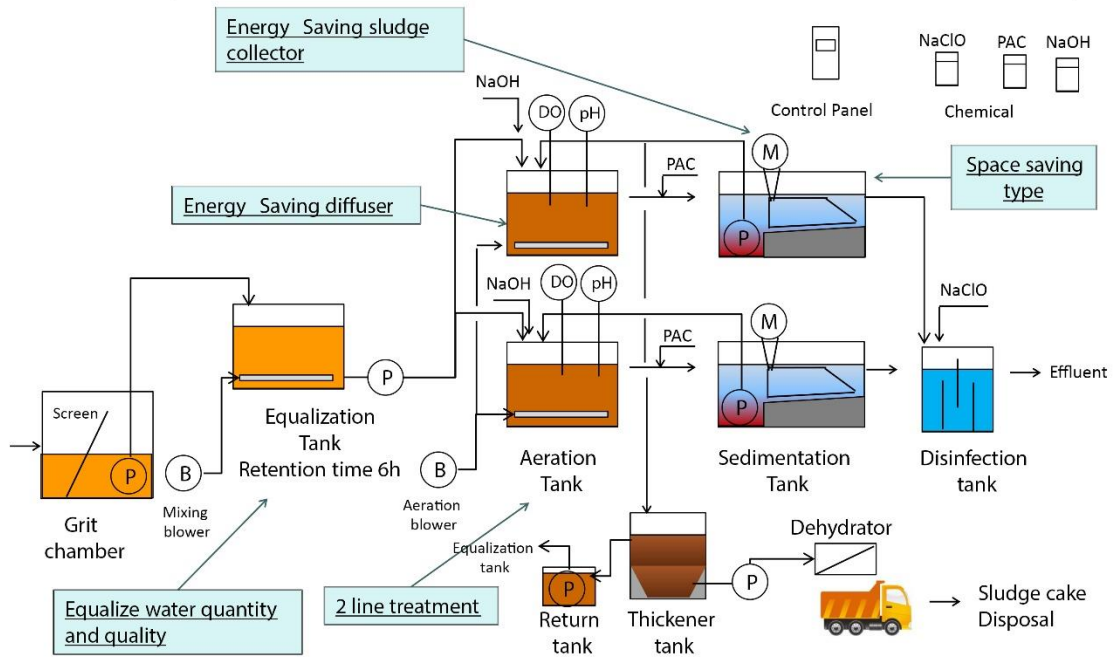


Figure 3. 20: Wastewater treatment plant flow diagram

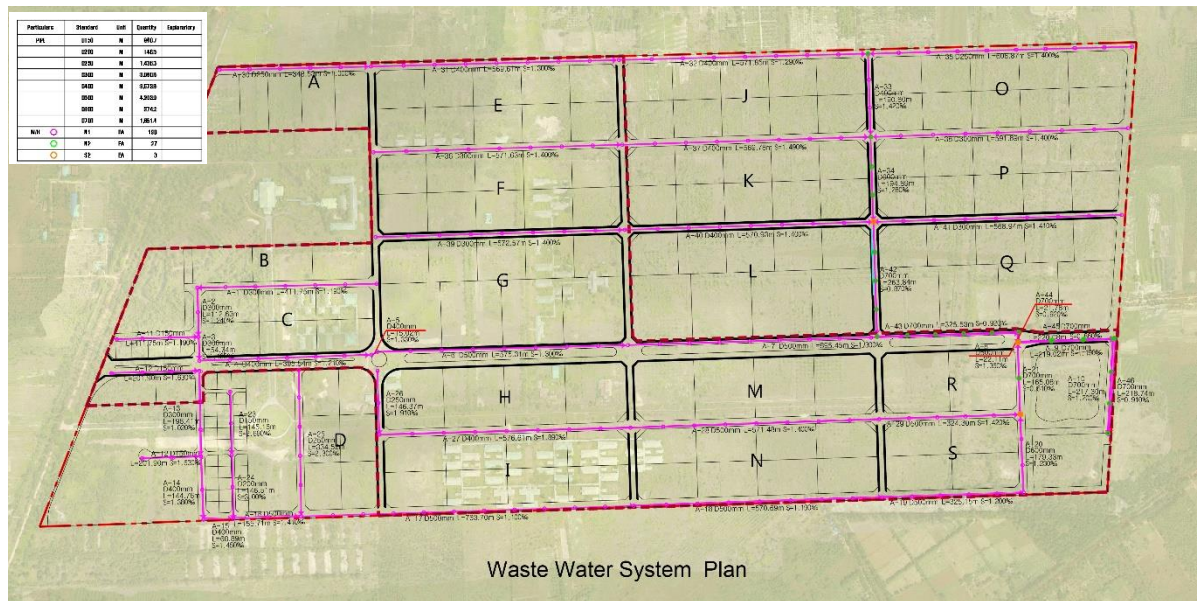


Figure 3. 21: Wastewater System Plan

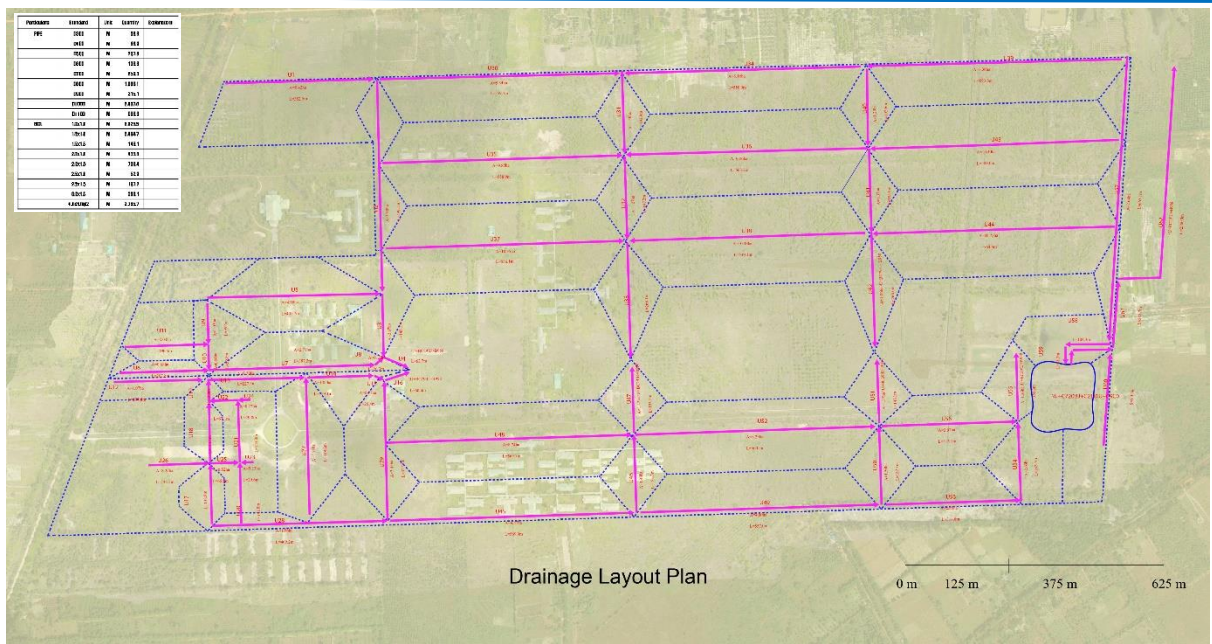


Figure 3. 22: Drainage Layout Plan

3.7.6 Solid Waste Management System

During pre-construction phase, demolition of old buildings and site cleaning will be resulted in large quantities of solid waste that come out of the excavation and grading earth level at the site. In the construction phase, solid waste will consist of rejected parts of pre-casted concrete, solid components, surplus materials, rejected materials, papers, containers, broken bricks, solvent containers, empty paint drums, surplus oil and waste from workers. Such solid waste will be injurious to the environment through blockage of drainage system, choking of water bodies, and negative impact on human and animal health. This may be accentuated by the fact that some of the waste materials contain hazardous substances such as paints, solvent, cement, adhesives, and chemicals. Some of waste materials including plastic containers and plastic bags are not biodegradable and can have long term and cumulative effects on the environment. Non-hazardous waste will be reused and recycled as much as possible.

3.7.6.1 Construction Phase

The non-hazardous and hazardous solid waste management plan for construction phase will be set by the developer. This plan is also applicable for pre-construction phase.

Non-hazardous solid waste management plan

Waste Transfer Plots

The waste transfer plots are used to collect the refuse and to reload their waste into a garbage truck of a professional company authorized by KMIC JVC. The transfer plots may have stationary compactors, recycling bins, material recovery facility, transfer containers and trailers, transfer packer trailers, or mobile equipment. It is designed with drainage of paved areas and adequate water hydrants for maintenance of cleanliness and fire control and other concerns like land scaling, weight scales, traffic, odor, dust, litter and noise control. Some wastes would be used for composting.

Final collection of Waste

The contractor will have an arrangement with a professional company authorized by KMIC JVC to treat waste.

Note: The 3Rs (Reduce, reuse and recycle) practice would be applied in the project and trainings related to the non-hazardous solid waste management will be conducted for the workers.

Hazardous solid waste management plan

Waste minimization (Reduction at source)

Source reduction includes material substitute and good management practice. The construction workers and staff in the compound will be encouraged to utilize chemical waste minimization (waste reduction) techniques to reduce the volume and toxicity of chemical wastes produced in the project compound.

Minimizing quantities of ordering chemicals – This can also reduce potential chemical exposure to personnel, thus minimizing the risks and severity of accidents.

Substitution – Substitution of a non-hazardous or less hazardous chemical in place of a hazardous chemical is a commonly used method of reducing waste. For e.g. Changing a cleaning agent from a toxic, flammable solvent to an appropriate soap or detergent solution, and the use of water-based paints and cements over solvent based.

Collection, Transportation and Disposal of Hazardous Waste

All waste stored together must be compatible. Guidelines for segregation of chemicals as found in the Laboratory Safety Manual must be adhered to. Generally, classes, i.e. ignitable, corrosives, toxics, and reactive, would be segregated. This information will be listed on the label of each chemical or on the MSDS. Mixing of wastes that represent different hazard classes must be avoided.

The transportation of hazardous waste can pose a threat to the public and to promote safety and protect the public's health, four basic control measures will be followed for the movement of hazardous waste from a source to disposal site: hazardous waste manifest, labelling, haulers, and incident and accident reporting.

The hazardous waste will be separately kept in the waste transfer station and EPC contractor will be responsible for handling and disposing of hazardous waste.

The waste storage areas will be located within the facility and sized to the quantities of waste generated, and have a hard, impermeable floor with drainage, and designed for cleaning/disinfection with available water supply. The storage area will be secured by locks with restricted access and designed for access and regular cleaning by authorized cleaning staff and vehicles. It will also be protected from sun, and inaccessible to animals/rodents.

3.7.6.2 Operation Phase

The non-hazardous and hazardous solid waste management plan for operation phase will be set by the developer.

Non-Hazardous Solid Waste Management Plan

Waste minimization (Reduction at source)

Source reduction includes technological efficiency, material substitute and good management practice.

Waste segregation and storage

The domestic waste (general waste), and recyclable wastes would be segregated and disposed in the relevant dust bins by the tenants with their own arrangement in their project compound. The tenants' storage of solid waste shall be allowed with KMIC JVC's prior approval only when it is stored in solid waste receptacles or trash containers which must be large enough to facilitate storage and collection and which must be installed within their plots.

Waste collection

The waste generated by tenants would be collected on a daily basis by the cleaners. The system requires use of a special container, truck container pick-up equipment, and replacement of the container.

Final collection of Waste

The tenants shall have their arrangement with a professional company authorized by KMIC JVC to treat solid waste.

Note: The 3Rs (Reduce, reuse and recycle) practice would be applied in the whole compound and especially in offices, industries, and commercial areas where office stationeries and different reusable and recyclable materials are being used. Trainings related to the non-hazardous solid waste management will be conducted for all concerned persons.

Hazardous Solid Waste Management Plan

The hazardous waste management plan contains the following procedures and processes.

Waste minimization (Reduction at source)

Source reduction includes technological efficiency, material substitute and good management practice. The employees and staff of all factories, industries and offices in the compound will be encouraged to utilize chemical waste minimization (waste reduction) techniques to reduce the volume and toxicity of chemical wastes produced in the project compound.

Minimizing quantities of ordering chemicals – This can also reduce potential chemical exposure to personnel, thus minimizing the risks and severity of accidents.

Recycling – Many materials treated as chemical waste are actually surplus chemicals that are reusable. The unopened or unwanted chemicals would be transferred to laboratories and related industries where they may be used.

Substitution – Substitution of a non-hazardous or less hazardous chemical in place of a hazardous chemical is a commonly used method of reducing waste. For e.g. Changing a cleaning agent from a toxic, flammable solvent to an appropriate soap or detergent solution, and the use of water-based paints and cements over solvent based.

Waste Collection

All waste stored together must be compatible. Guidelines for segregation of chemicals as found in the Laboratory Safety Manual must be adhered to. Incompatible waste (oxidizers and organic solvents, for example) generated by a single laboratory would be separated by storing these materials in separate cabinets or shelves. Generally, classes, i.e. ignitable, corrosives, toxics, and reactive, should be segregated. This information will be listed on the label of each chemical or on the MSDS. Mixing of wastes that represent different hazard classes must be avoided.

Transportation and Disposal of Hazardous Waste

The transportation of hazardous waste can pose a threat to the public and to promote safety and protect the public's health, four basic control measures will be followed for the movement of hazardous waste from a source to disposal site: hazardous waste manifest, labelling, haulers, and incident and accident reporting.

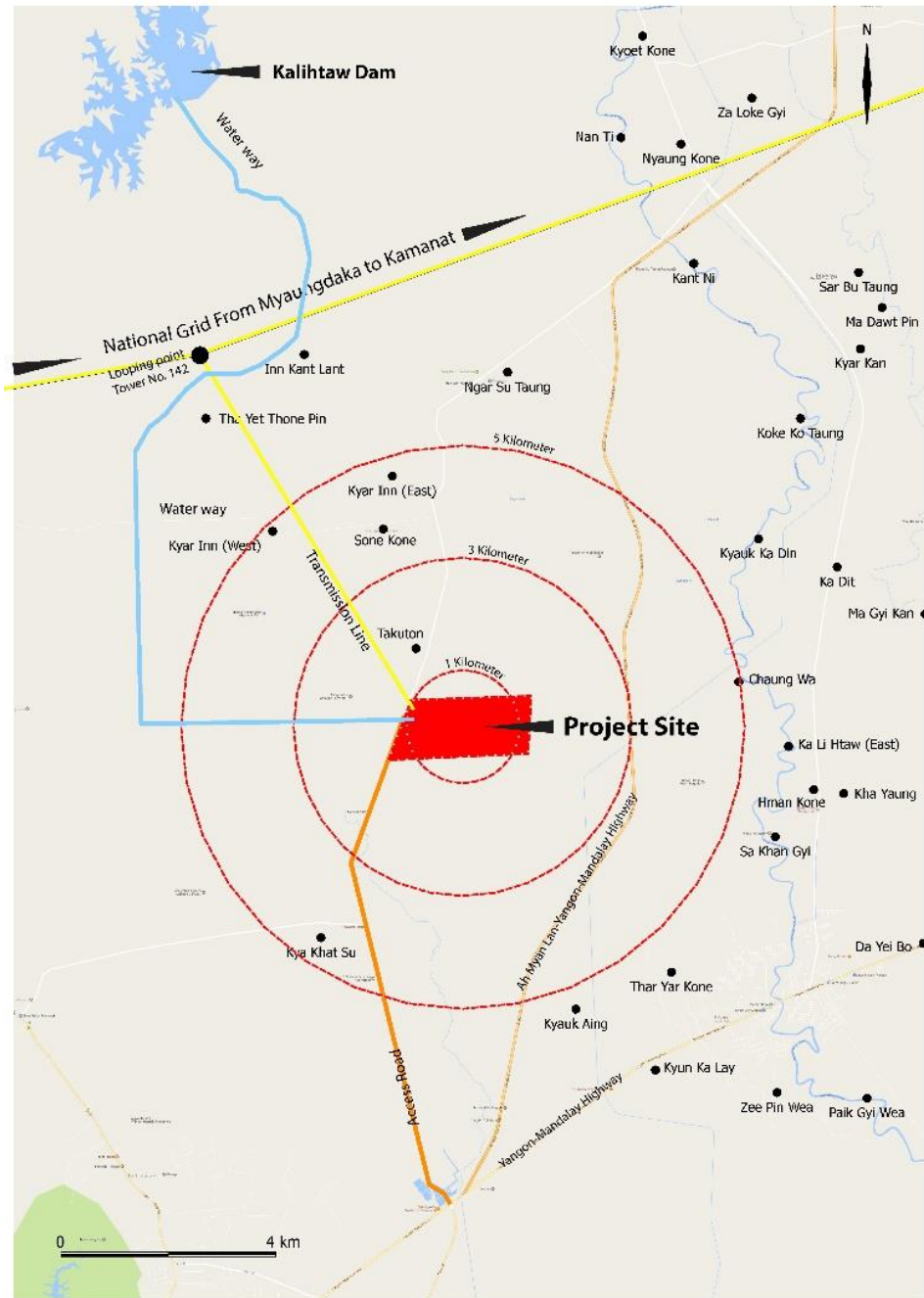
The hazardous waste will be separately kept in some plots set up by each tenant until a professional company collects waste. The tenants shall have their arrangement with a professional company authorized by KMIC JVC to treat solid waste. Respective tenants will be responsible for handling and disposing of hazardous waste.

The waste storage areas will be located within the facility and sized to the quantities of waste generated, and have a hard, impermeable floor with drainage, and designed for cleaning/disinfection with available water supply. The storage area will be secured by locks with restricted access and designed for access and regular cleaning by authorized cleaning staff and vehicles. It will also be protected from sun, and inaccessible to animals/rodents.

3.8 Proposed External Infrastructure

The external infrastructure development will be implemented by Ministry of Construction, counterpart of KMIC Development Co., Ltd. (KMIC JVC) and not related to this Environmental Impact Assessment of KMIC project. Therefore, the information mentioned under this section 3.8 is just for information.

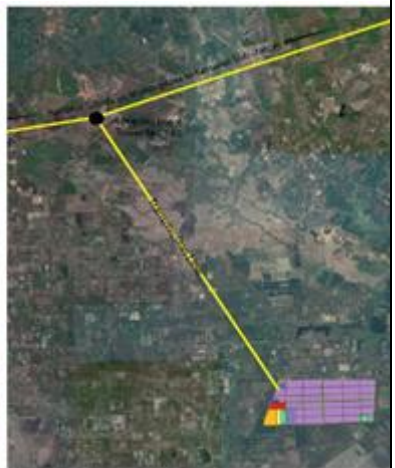
The existing access road way to the project site is 9.45 km length and 6 meter wide: two lanes lies from Yangon - Mandalay main road T junction to the proposed site. Ministry of Construction (MOC) will improve the existing road way to 4 lanes carriage ways mid island and sidewalks. Requirement of consumption of water will be supplied from Kalihtaw Dam which is situated in the north. Direct buried supply pipes (D=600mm) will be used and the water will be purified at KMIC site. 230 KV electricity will be installed from Myaungtakar - Kamarnat national grid.



Water Supply



Access Road



Power Supply

Figure 3. 23: Map showing External Structures and Project Site

3.8.1 Access Road



Figure 3. 24: Access Road to Project Site

The Ministry of Construction (MOC), counterpart of the developer, has planned to upgrade existing road which has access to Yangon –Mandalay express way to the proposed project site. The existing tar road was constructed since 2002 and 9.45 km length but already damaged by heavy loaded transportation. The 6-meter-wide the existing road way will be improved to 21-meter crest width road way. Two lane -7-meter carriage way will be constructed at both side of 3-meter mid island. Both 2-meter-wide sidewalk will be situated at edges. Necessary drainage at road side will be constructed. Along the traffic way, culverts and bridges will be constructed. Regulatory signs such as control, command and prohibitions, Guidance signs such as direction and guide signs, Caution and Warning signs such as advanced warning signs and hazard marker signs, safety barriers will be installed for road safety. The expanded and improved road shall also accommodate heavy trucks.

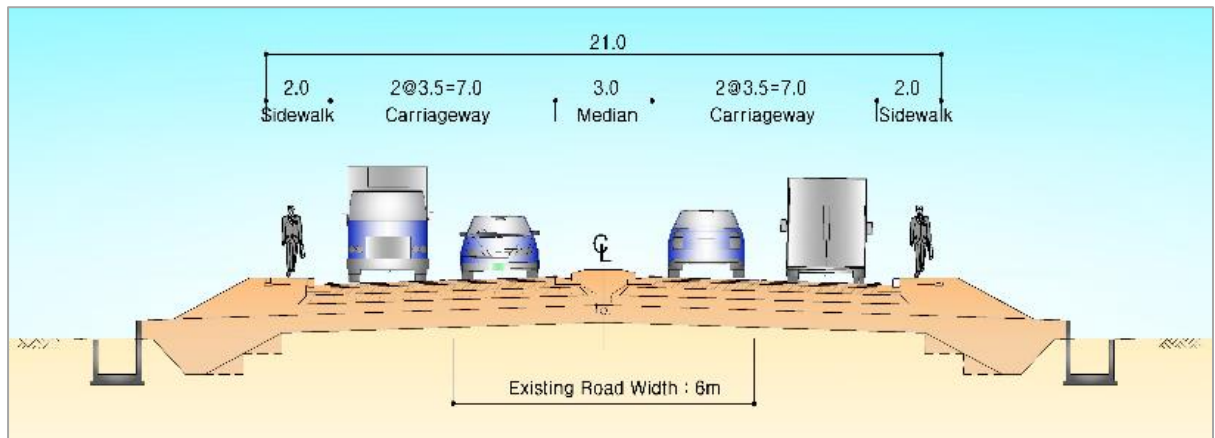


Figure 3. 25: Proposed design to upgrade existing road

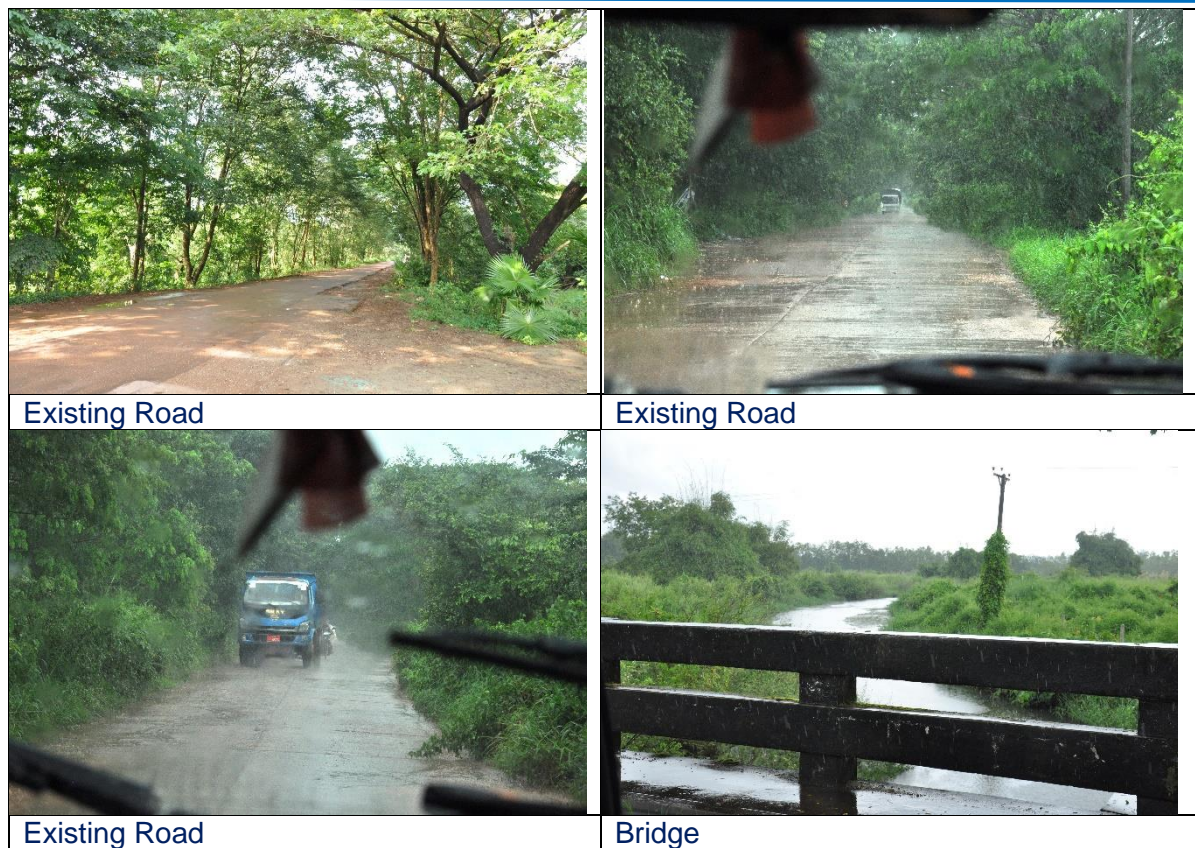


Figure 3. 26: Existing Road Condition Photos

3.8.2 Water Resource and Usage

The developer has already planned to access water from Kalihtaw Dam which was constructed in 2001 for the purpose of supplying water for livestock and Agricultural Zone in Nyaung Hnitpin. It now supplies water also to residents and farms in the area. The developer has planned 600 mm diameter pipe line (buried) to be installed from Kalihtaw Dam to KMIC project, along the 17.95 km kilometer-stretch bank crest road belonging to irrigation department and 5 kilometer long Town road. Total pipe line distance is 20 kilometers. The dam is 65 feet height and 3500 feet in length.

The dam is supplying water to 9,000 acres of agricultural land. Maximum storage of high flood level of the dam is 26,000 acre-feet and dead storage level of dam is 760 acre-feet (at a minimum). The developer will install supply pipe line along the old creek to avoid public area and cultivated lands. In the operation phase, daily requirement of purified water will be 10,000 cubic meters (2.6 million gallons). The purification plant will be constructed at the north-west corner of the proposed project site and water supply pipes will be buried at main and intersection road sides. Raw water from Kalihtaw dam will reach in front of proposed project land via collection drain. The water will be collected in raw water tank. Chemical treatment and mechanical treatment will be done at the plant and secure safe water will be supplied.

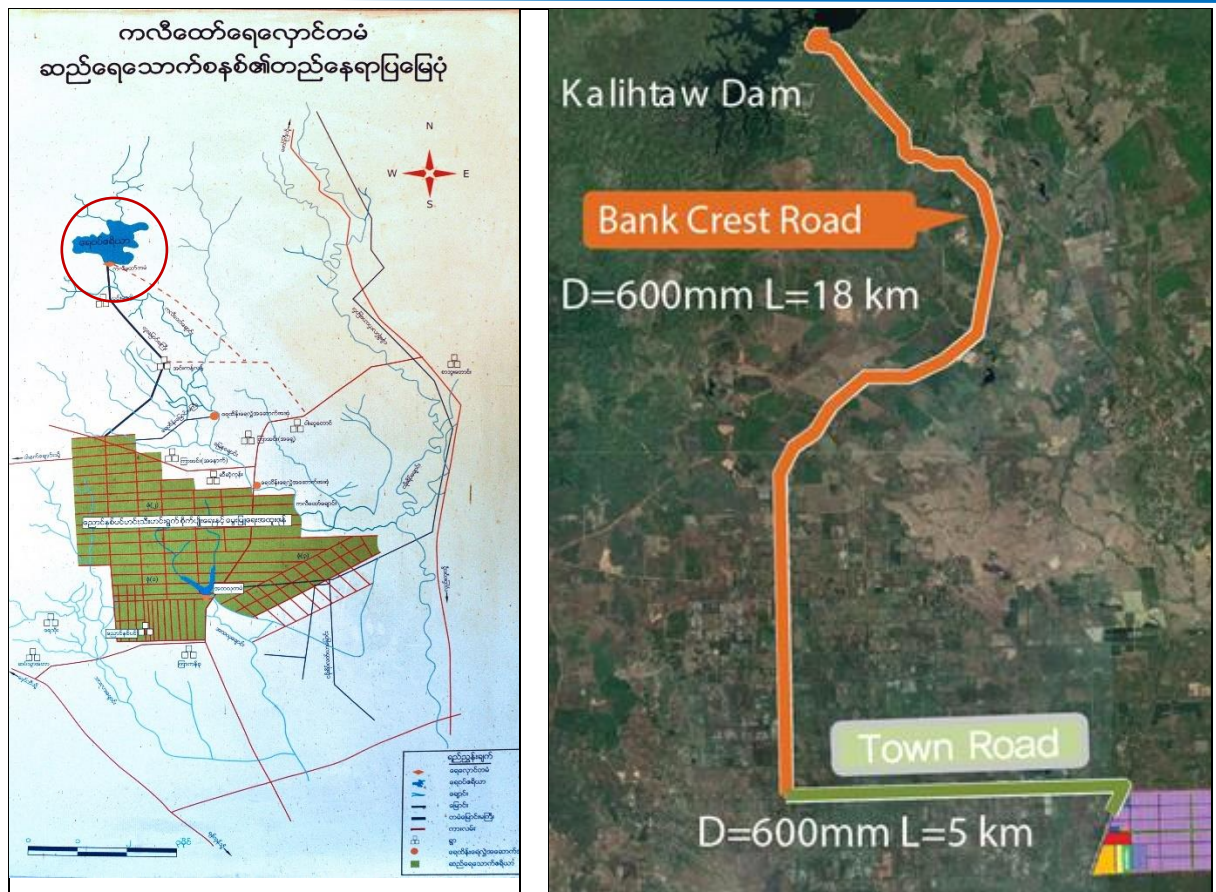


Figure 3.27: Kalihtaw Dam location and water supply pipes line ROW



Kalihtaw Dam



Kalihtaw Dam



Water Channel to Agricultural Zone



Water Channel to Agricultural Zone

Figure 3.28: Kalihtaw Dam Photos

3.8.3 Power Supply

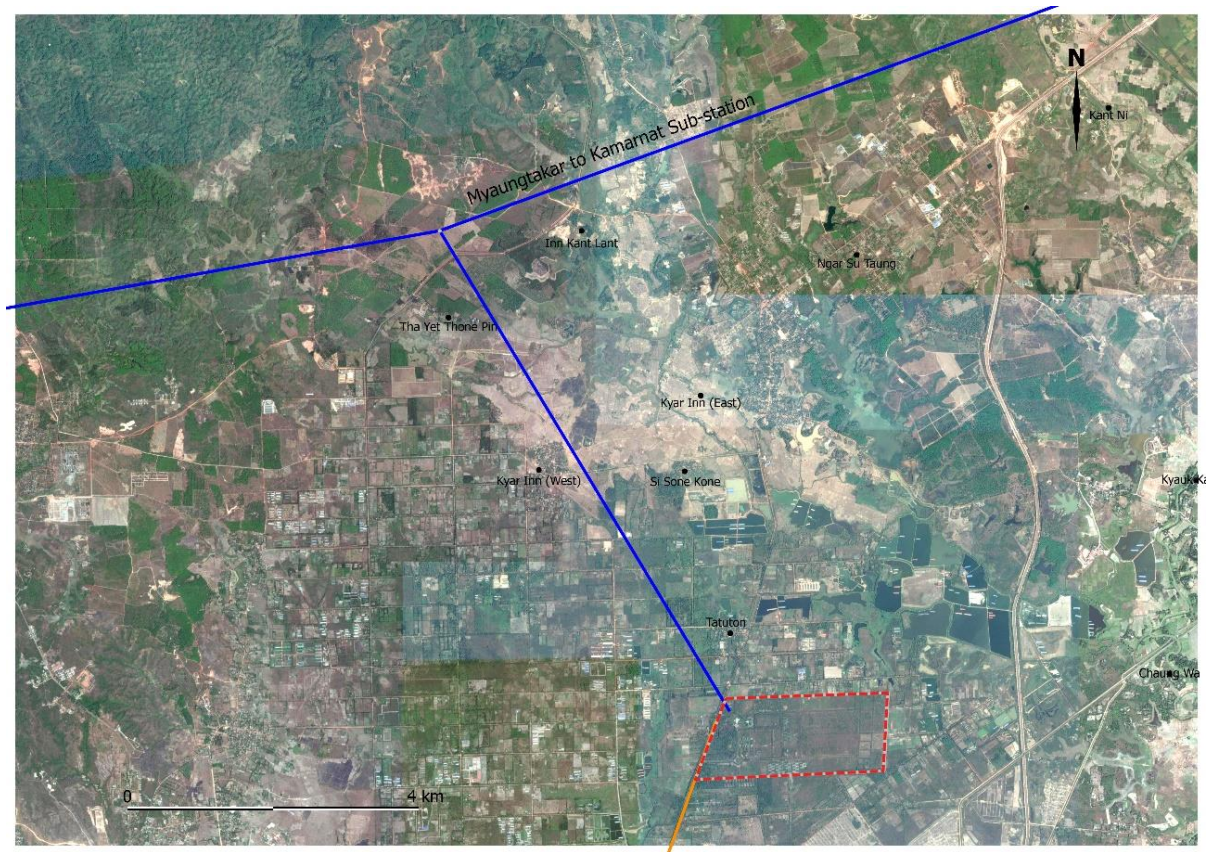


Figure 3. 29: Proposed power supply ROW

The electricity will be supplied by Ministry of Electricity and Energy (MoEE) and installed 230kV Twin Bundle Double Circuit Line from existing 230kV high-tension line Myaungdakar-Kamarnat national grid. The looping point is 48 km from Kamarnat and 16 km from Myaungtakar. From looping point to proposed project site will have a 9 km stretch. 230 KV high tension line is already constructed as national grid. Demand of consumption of electricity at the proposed project’s operation stage will be 50 MW.

230 KV high tension voltage will be dropped off to the stage of industrial use, the developer will construct a substation-yard at the northern site of proposed land. The proper process of transformers will be installed at substation yard. Internal supply will be installed overhead lines at road sides.

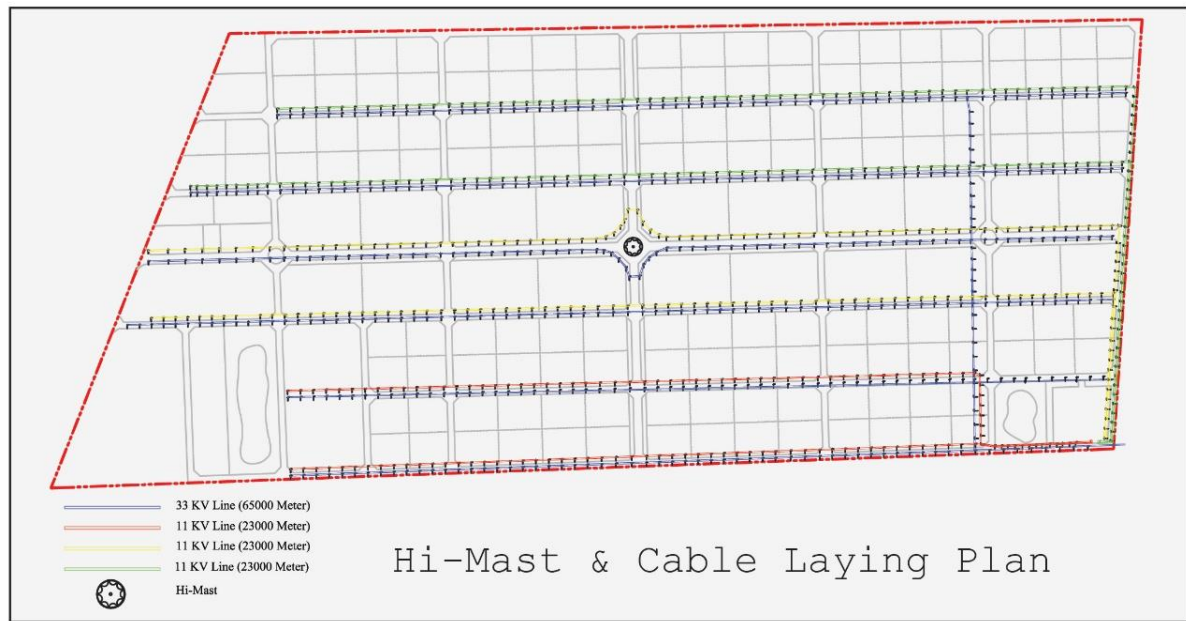


Figure 3. 30: Hi-Mast & Cable Laying Plan

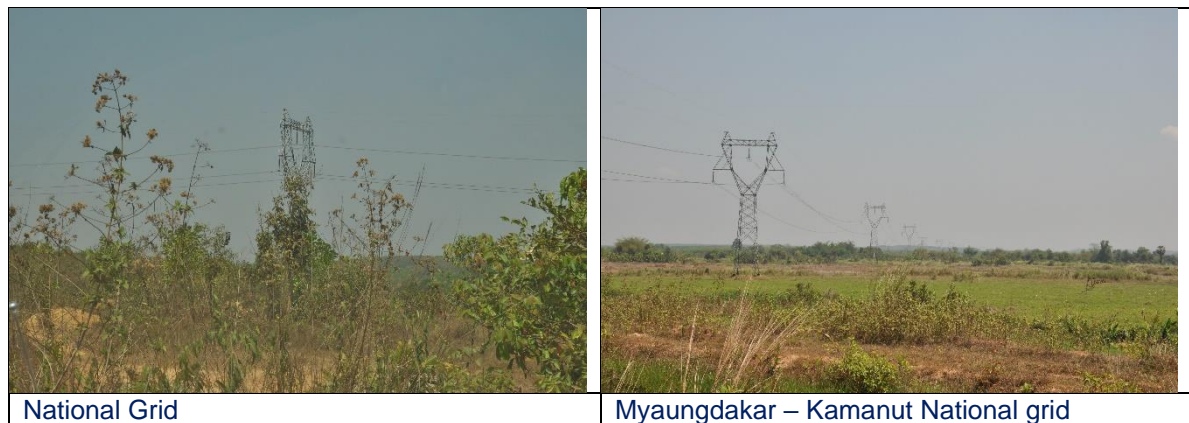


Figure 3. 31: Existing National Grid - Myaungdakar - Kamanut Station

3.9 Alternatives

In terms of alternative, such area which does not need to take into account the resettlement issue, and no concerns about electricity and availability of water. Transport system could be built with shortest route to reach the main highways and expressways.

The project location is located in the Nyaung Hnitpin Livestock and Agricultural Zone No.3, Hlegu Township, and specifically situated at former research and training institute by Union Solidarity and Development Association. Currently, the land is not in use and the buildings on which are in poor condition. There are Zone No. 1 and 2 around the project area and no villages are situated near the project site. The nearest village is Takutone village and it is around 1.54 km away from the project site. Therefore, generally the impact on public will be not much significant and hence that location was selected for the proposed project.

The buildings (residential, industrial and commercial) in the complex would adopt the features of the green buildings (sustainable buildings) mentioned below as much as possible in order to be environmentally responsible and resource efficient.

- a) Energy efficient through the natural lighting, ventilation and solar passive designs;
- b) Efficient use of water through recycling and water harvesting;
- c) Use of renewable energy through photo voltaic systems and solar systems etc.;

- d) Non-toxic material in-door environment;
- e) Using green cooling commodities (Ozone – depleting substances, CFCs, HCFCs and HFCs, free air conditioners and refrigerators)
- f) Use of recycle/recyclable materials; and
- g) Efficient waste utilization and disposal.

The project will also include wastewater treatment system, hazardous and non-hazardous waste management plan and emergency response plan.

The public consultation meeting was carried out in February 2019 and the concerns, opinions and suggestions of the public were taken into consideration for CSR programs, and developing the Environmental Management Plan and mitigation measures.

Therefore, the project would be environmentally as well as socially accountable and this area is the best option for the proposed project.

No Project Option

If the proposed project is not implemented, economic benefits generated by the project would not be gained. Benefits loss would include:

- Employment generation and project expenditures during the development and operation of the project;
- Potential loss/slowdown of trade and cooperation between two countries;
- Loss of revenue for the Union and region governments;
- Potential loss of infrastructure upgrading in Hlegu region;
- Potential slowdown in the economic development of Hlegu region;



CHAPTER 4. DESCRIPTION OF THE SURROUNDING ENVIRONMENT

4.1 Description the Surrounding Environment

Basically, the project site is an abandoned place which has been left in nature without caring the land and buildings that had been used for convening meetings in late 1990s, an effort of accomplishment for developing the current constitution of the country. Now it becomes a Phone-zo area of a fallow land, dry in summer, swampy in rainy season. As the KMIC project site is a restricted area, the total lot has been thickly covered with wild plants of abundantly growing coarse grasses of Thetke (*Imperata cylindrical*), Kaing (*Saccharum spontaneum*); weak herbs of many species such as Ye-salat (*Pistia stratiotes*) and Naya-myet (*Setaria verticillata*), Mahuya-Pein (*Colocasia esculenta*), Burma linseed (*Hygrophila phlomoides*) and Sin-hna-maung pin (*Heliotropium indicum*) as well. And it is also found proliferately thriving wild small trees of Phon-ma-thein (*Blumea balsamifera*), Malaysia Padauk (*Acacia auriculiformis*) and Ka-aung pin (*Ficus hispida*).

Some of the roads and buildings are in a state of ruin now. In and around this area, an agricultural zone has been established. Each individual owner was offered 5 acres of land per unit so as to grow vegetables and seasonal plants. Perennial trees, such as mango, jack fruit, and rambutan are grown in some yards. Whole lots of surrounding areas including villages have been designated as agricultural and livestock breeding zones. Many fish farming ponds and poultry keeping farms have been already established just next to the project site area. Former vegetation of natural forest have already been replaced by paddy growing and cash crop plantation including rubber and acacia plantation.

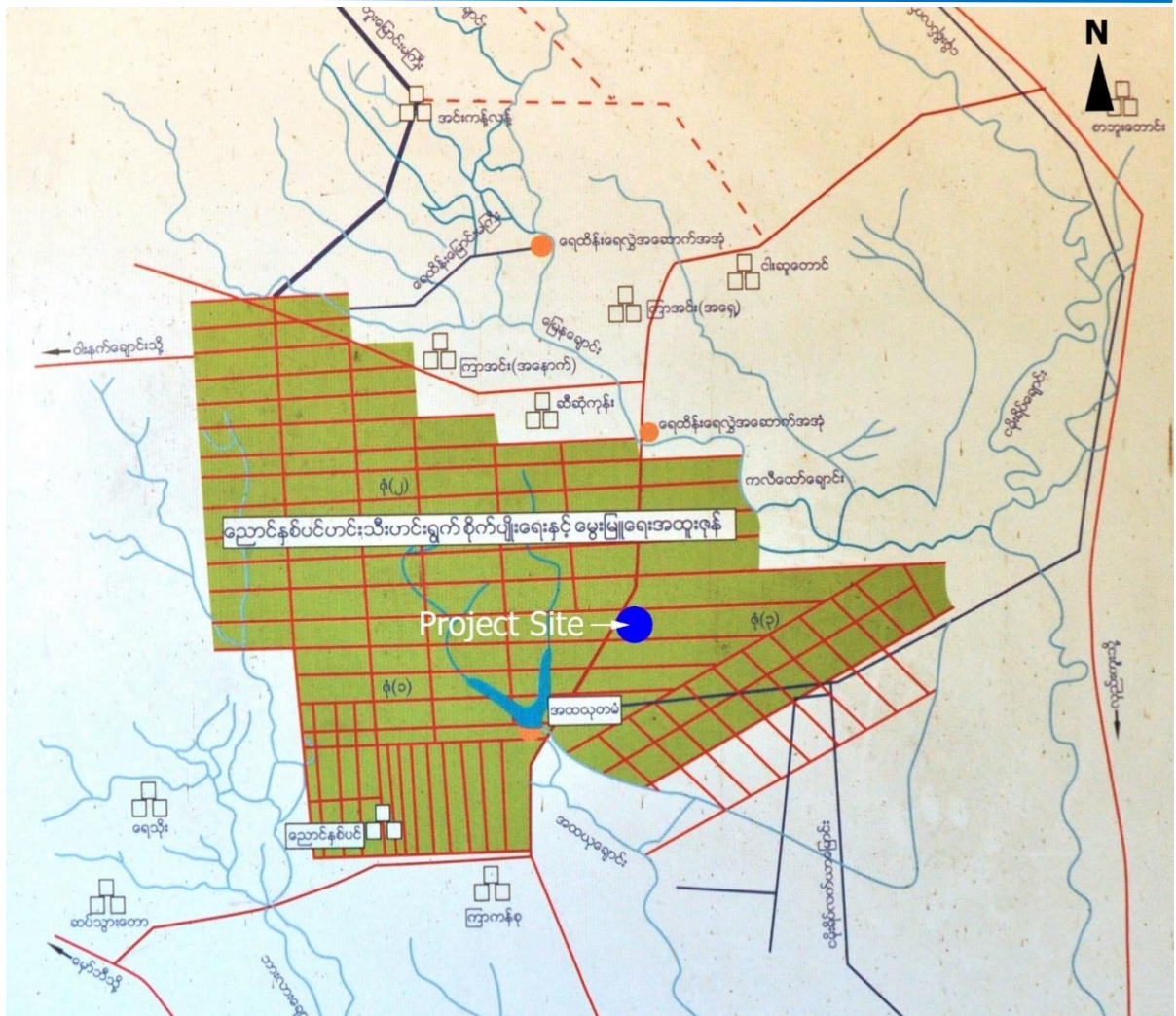


Figure 4. 1: Location Map of Nyaung Hnitpin Livestock and Agricultural Zone and Surrounding Environment

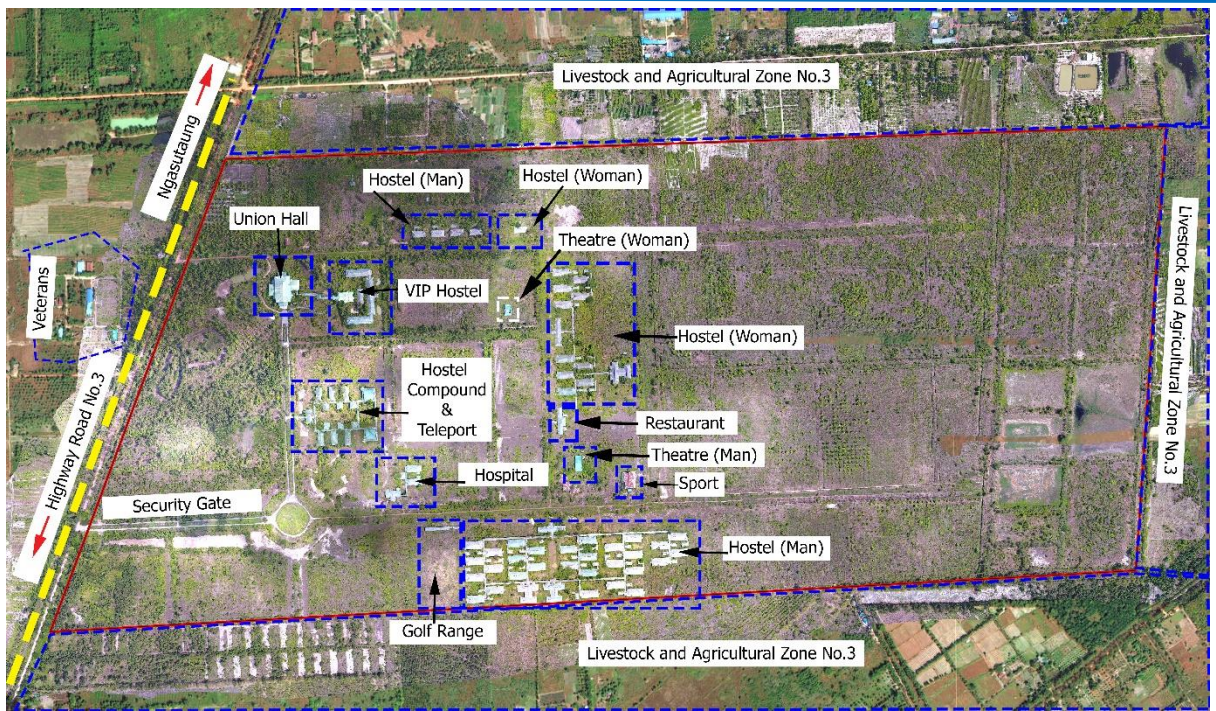


Figure 4. 2: Aerial Photo of Existing Buildings' location



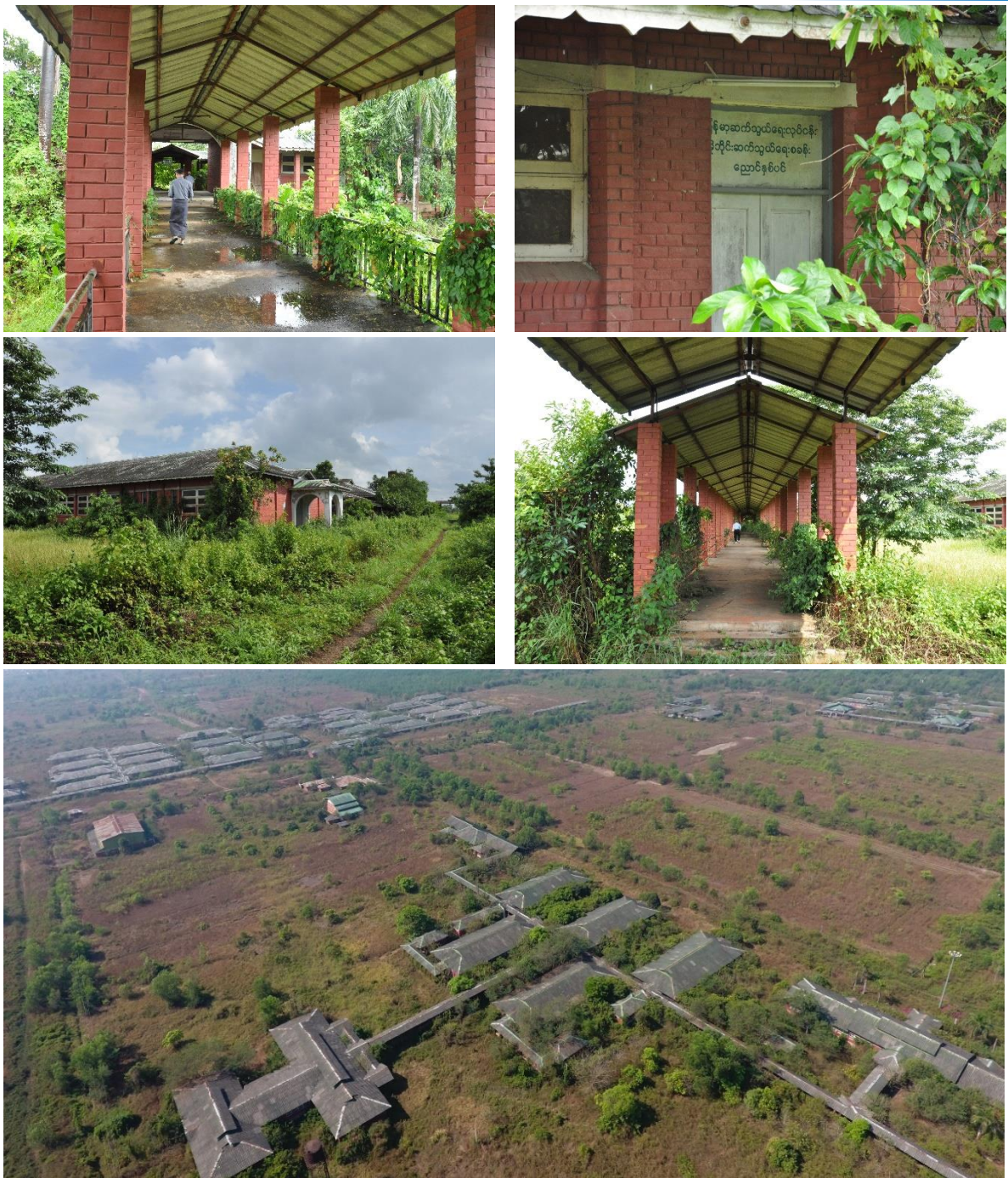


Figure 4. 3: Existing Buildings

4.2 Geology

Yangon area is underlain by alluvial deposits, the non-marine fluvial sediments of Irrawaddy formation, and hard, massive sandstone of Pegu series. The alluvial deposits are composed of gravel, clay, silts, sand and laterite which lie upon the eroded surface of the Irrawaddy formation at 4.6 m above mean sea level (MSL). The rock type in Yangon is mainly soft rocks, which consist of sandstone, shale, limestones and conglomerate.

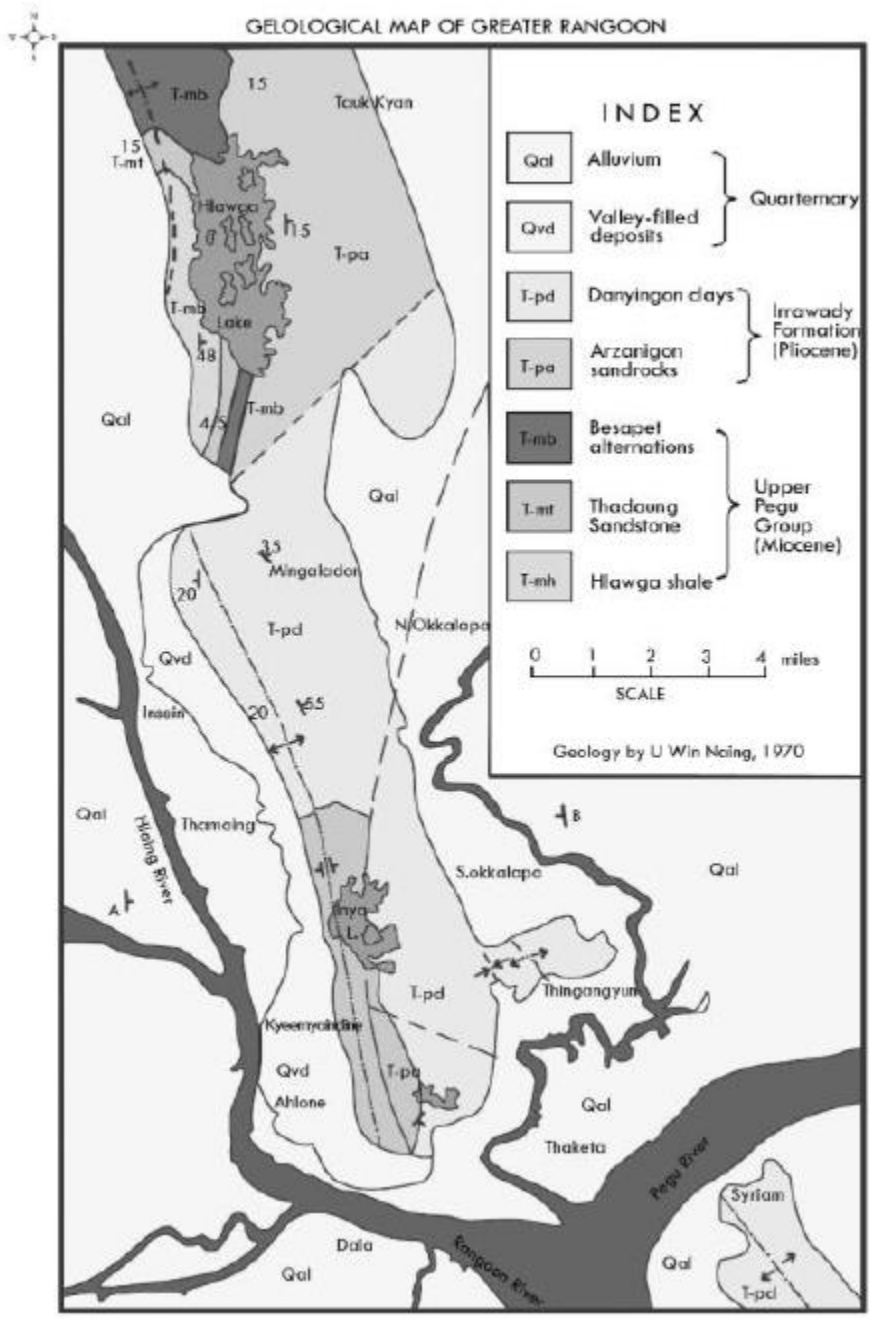


Figure 4. 4: Geological Map of Yangon

4.3 Tectonics

Yangon is situated in the southern part of the Central lowland which is one of the three major tectonic provinces of Myanmar. The Taungnio Range of the Gyophyu catchment area of Taikkyi District, north of Yangon, through the Thanlyin Ridge, south of Yangon forming a series of isolated hills probably resulted from the progressive deformation of the Upper Miocene rocks as the eastern continuation of the subduction or stretching and compression along the southern part of the Central basin and regional uplifting of the Pegu Yoma (Aung Lwin 2012).

4.4 Hydrogeology

Yangon is rich in groundwater resources conserved by unconsolidated Tertiary-Quaternary deposits. In Yangon, groundwater is mostly extracted from Valley filled deposits and Ayeyarwady sandstones. The aquifer of the project area is alluvial aquifer (Holocene - Younger alluvium) and the major units are sand, gravels and muds.

Groundwater availability is generally based on the distribution of permeable and relatively impermeable rocks. The nature of openings in the rocks determines permeability of rocks. Based on local geological considerations, potential groundwater source of Yangon can be roughly divided into two sub regions, namely the low potential area and high potential area. Low potential areas are areas with those rock units of Hlawga Shale, Thadugan Sandstones and Basepet Alternation of upper Pegu Group (Miocene epoch) and Danyingon Clays of Irrawaddy rocks. These rocks and formations are a dense, massive and consolidated nature and have impervious characteristic. High potential areas are underlain by Pliocene Series and recent Formations.

4.5 Soil

The soil type of the project area is Meadow and Meadow Alluvial soil. The meadow soils which occur near the river plains with occasional tidal floods are non-carbonate. They usually contain large amount of salts. Meadow Alluvial soils (fluvic Gleysols) can be found in the flood plains. They have the texture of silty clay loam and they have the neutral soil reaction and are rich in available plant nutrients.

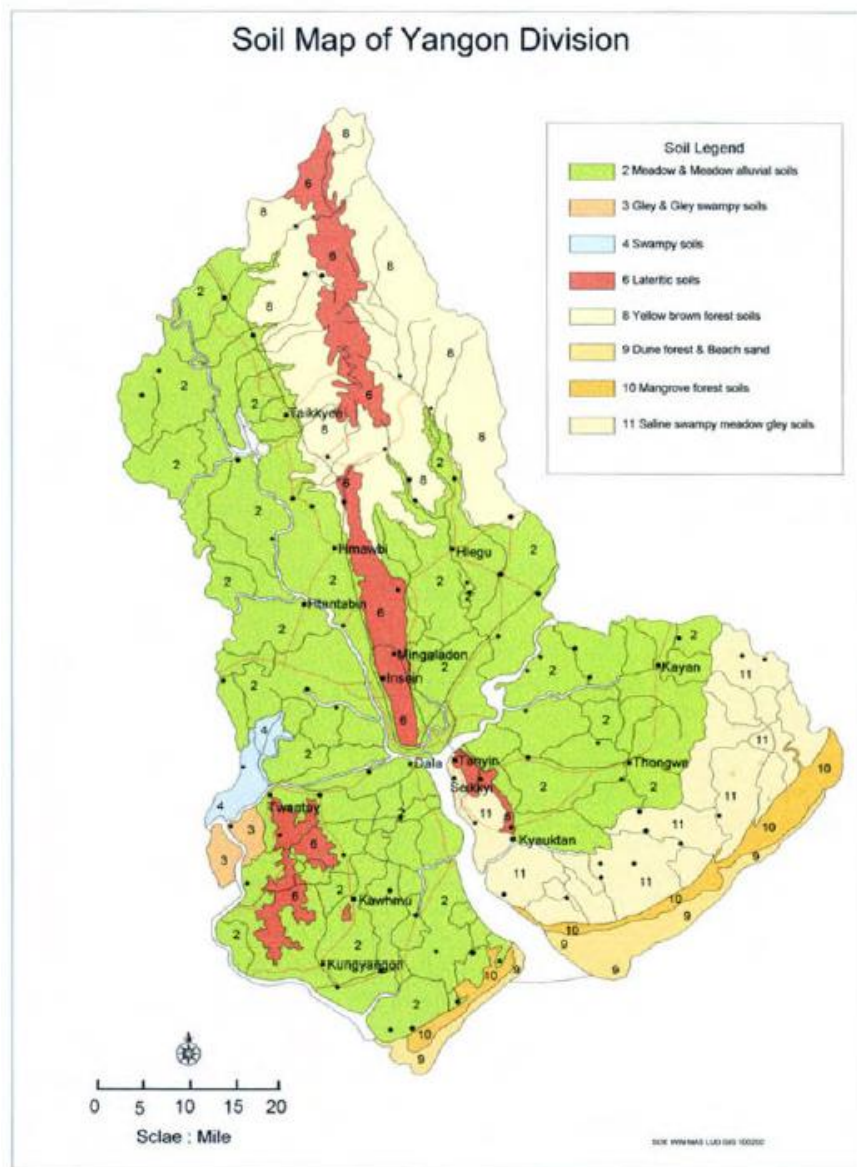


Figure 4. 5: Soil map of Yangon area (copyright of Land use division, Myanmar Agriculture Service (Feb 11, 2002)

4.6 Climate

Yangon Region is located in the tropical monsoon climate region, and it has three seasons, summer (March to May), rainy season (June to October), and cold season (November to February). In Yangon Region, there are three meteorological stations, namely, Kaba Aye, Mingalardon, Hmawbi, which are managed by Department of Meteorology and Hydrology, Ministry of Transport and Communication. Long-term monthly averages for the climatic parameters, which can be representative of the climate of project area are obtained from Hmawbi station which is closet to the project site.

Rainfall

The monthly rainfall data for 2014 – 2018 are mentioned in the table below.

Table 4. 1: Monthly Rainfall (mm) 2014 - 2018

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2014	0	0	0	0	182	390	760	547	249	82	180	0
2015	0	0	Trace	29	256	358	828	315	264	197	25	0
2016	38	1	23	0	387	310	581	509	332	208	6	0
2017	Trace	0	0	98	319	427	643	491	326	328	10	0
2018	2	0	0	35	26	434	666	562	303	280	42	1

“Trace” The amount of rainfall which cannot be measured.

“1 mm=0.04 inch”

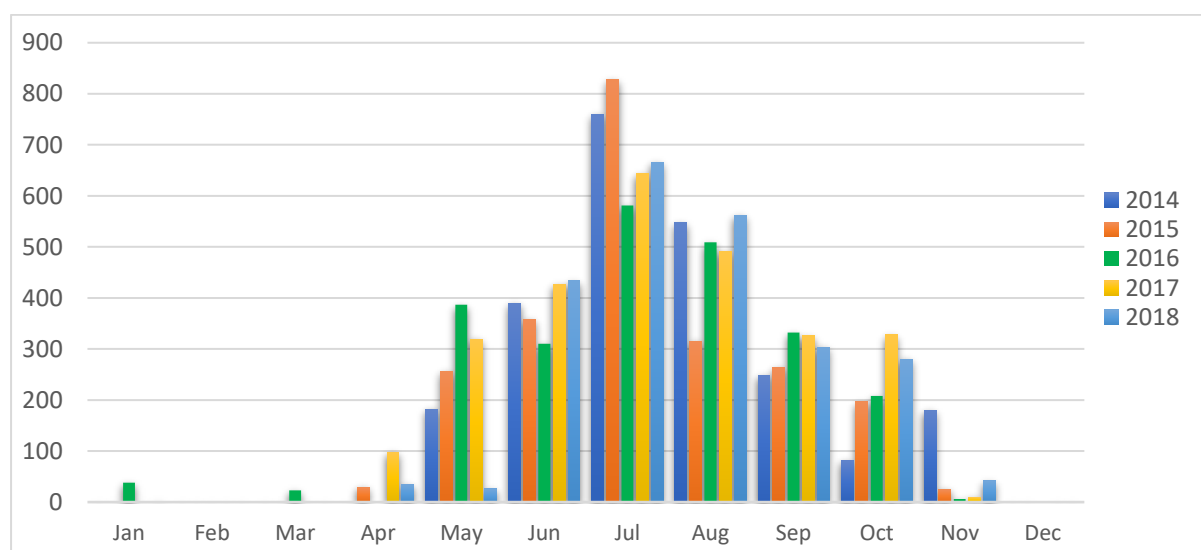


Figure 4. 6: Monthly Rainfall (mm) 2014 - 2018

For the months of rainy season (June – October), July 2015 has the highest rainfall of 828 mm while October 2014 has the lowest rainfall of 82 mm.

Highest and Lowest Temperatures

The monthly mean maximum temperature (°C) for 2014 – 2018 are mentioned in the table below.

Table 4. 2: Monthly Mean Maximum Temperature (°C) 2014-2018

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2014	31.9	34.3	37.5	37.8	34.8	30.8	29.8	30.0	31.2	33.1	30.0	32.9
2015	31.9	34.5	37.6	38.0	36.0	31.8	30.9	30.8	31.8	32.4	34.5	33.5

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Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2016	31.8	34.7	37.1	38.8	37.2	30.8	30.6	30.4	31.9	31.9	33.7	33.1
2017	32.7	34.9	36.9	36.1	35.0	31.8	29.8	30.2	32.6	32.6	34.7	32.7
2018	33.0	34.9	37.1	38.1	35.8	30.9	29.9	30.2	32.1	32.8	33.2	32.9

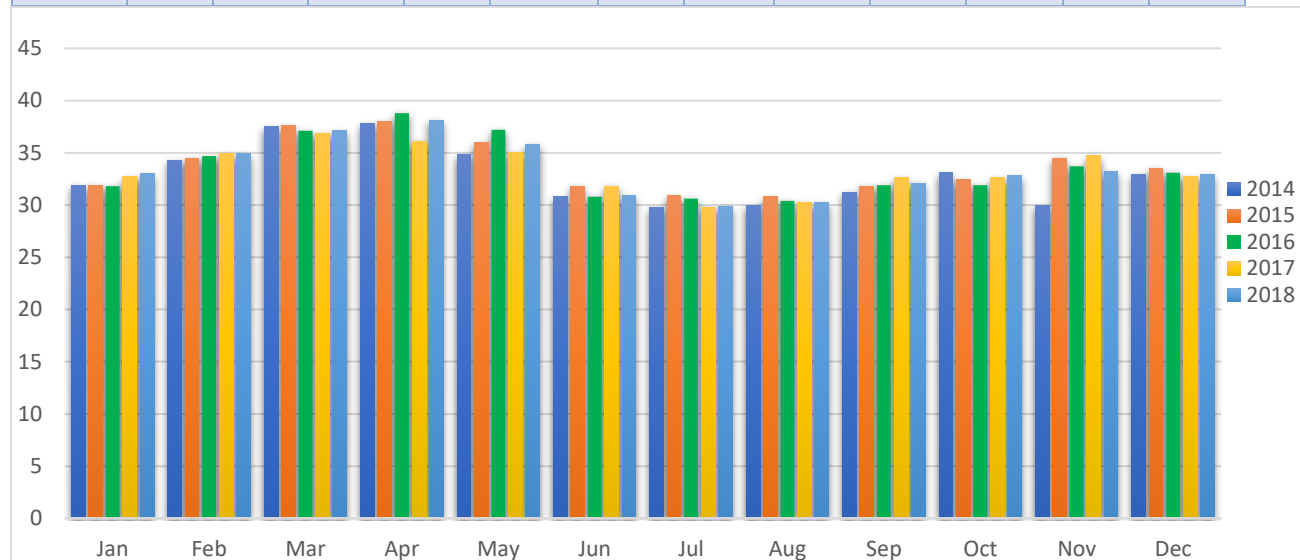


Figure 4. 7: Monthly Mean Maximum Temperature (C) 2014 - 2018

For mean maximum temperature of the months of summer (March to May), April 2016 has 38.8°C (highest) and May 2014 has 34.8°C (lowest).

Table 4. 3: Monthly mean Minimum Temperature (°C) 2014 – 2018

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2014	14.4	16.5	18.7	24.1	24.8	24.4	23.7	23.8	23.9	23.2	21.3	19.2
2015	17.1	16.3	19.9	23.6	25.0	24.6	24.6	24.7	24.7	24.0	21.8	18.1
2016	14.6	18.1	22.1	24.0	24.6	24.9	24.9	24.8	23.8	24.2	21.9	20.3
2017	18.4	18.2	20.2	23.4	25.2	24.9	24.5	24.7	24.7	24.0	22.6	18.8
2018	17.9	17.4	21.0	23.5	24.1	24.9	24.6	23.4	23.2	22.4	19.9	19.3

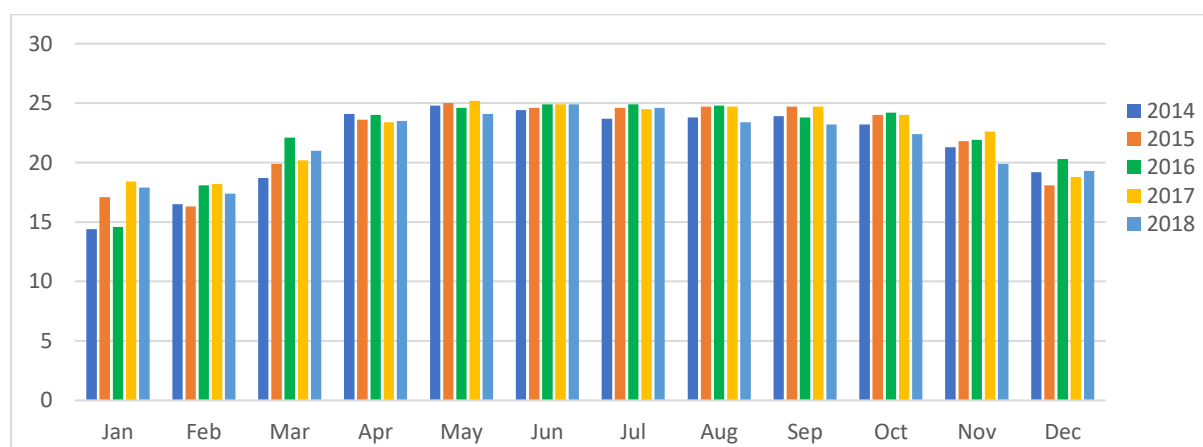


Figure 4. 8: Monthly Mean Minimum Temperature (C) 2014 - 2018

For mean minimum temperature of the months of summer (March to May), May 2017 has 25.2°C (highest) and March 2014 has 18.7°C (lowest).

Wind Direction and Wind Speed

Wind Direction

Monthly mean wind direction measured at 6:30 hrs M.S.T, 9:30 hrs M.S.T, 12:30 hrs M.S.T, 18:30 hrs M.S.T for 2014 - 2018 is mentioned in the tables below.

Table 4. 4: Monthly Mean Wind Direction At (6:30)hrs M.S.T 2014-2018

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2014	NE	NE	NE	E	SE	SE	SE	SE	SW	E	SE	Clam
2015	NE	NE	SE	SE	SW	SE	SE	SW	SE	E	NW	NW
2016	E	E	E	E	SE	SE	SE	SE	SE	SE	NW	NW
2017	NE	E	W	W	SW	SE	SW	SE	SE	SE	Clam	NW
2018	E	E	SW	SW	SE	SE	SW	S	SE	SE	Clam	Clam

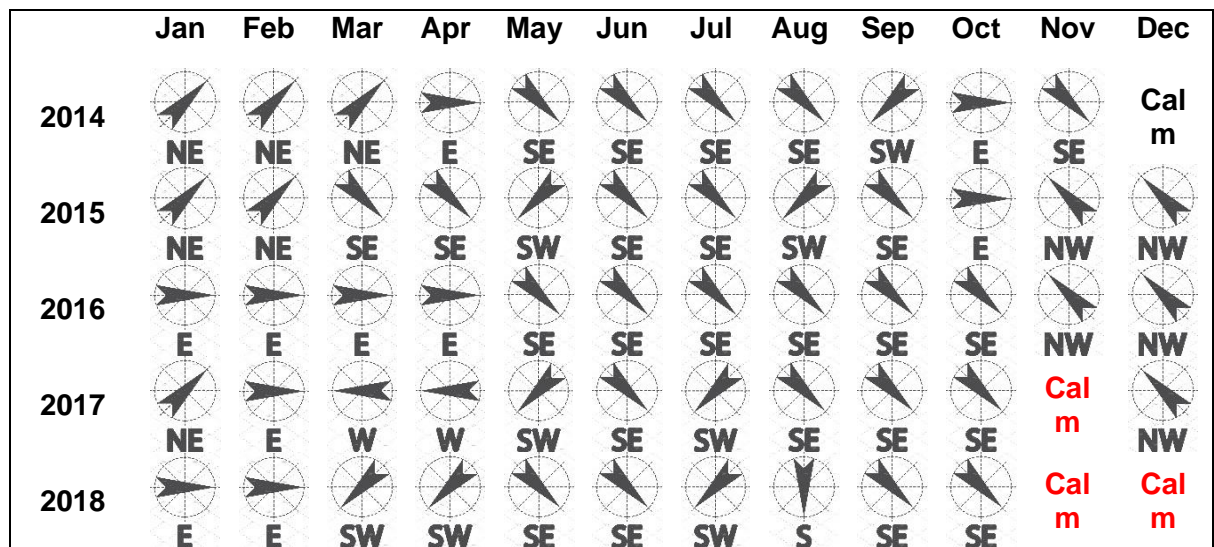
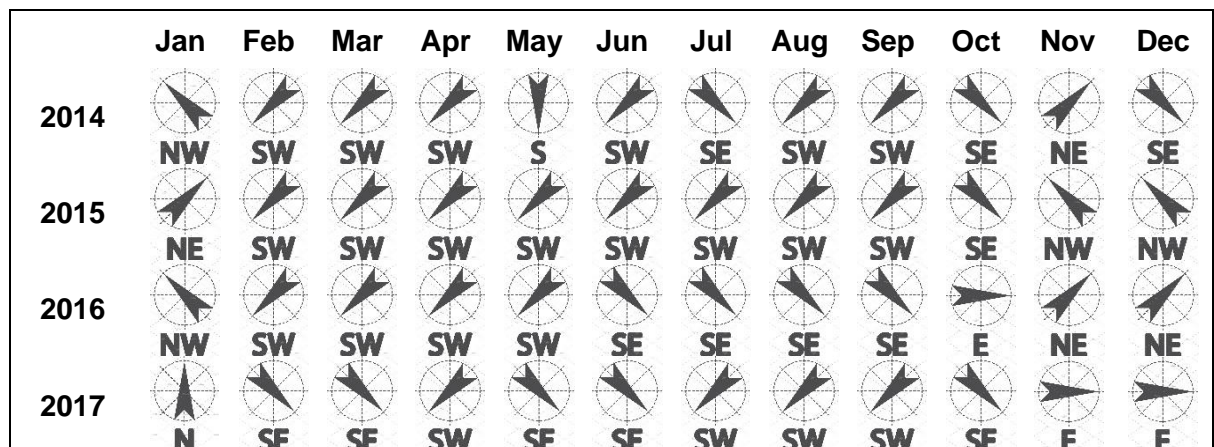


Figure 4. 9: Monthly Mean Wind Direction at (6:30) hrs. M.S.T 2014 - 2018

Table 4. 5: Monthly Mean Wind Direction At (9:30)hrs M.S.T 2014-2018

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2014	NE	SW	SW	SW	S	SW	SE	SW	SW	SE	NE	SE
2015	NE	SW	SW	SW	SW	SW	SW	SW	SW	SE	NW	NW
2016	NW	SW	SW	SW	SW	SE	SE	SE	SE	E	NE	NE
2017	N	SE	SE	SW	SE	SE	SW	SW	SW	SE	E	E
2018	E	SE	SE	SW	SE	S	SW	SW	SW	E	E	NW



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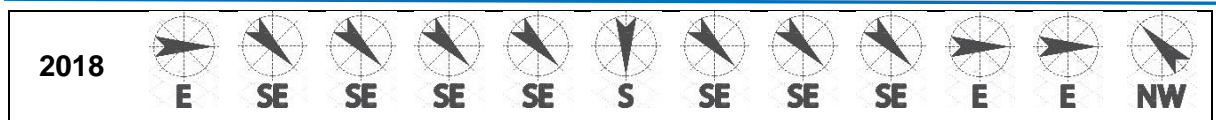


Figure 4. 10: Monthly Mean Wind Direction at (9:30) hrs. M.S.T 2014 - 2018

Table 4. 6: Monthly Mean Wind Direction At (12:30)hrs M.S.T

2014-2018

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2014	NE	NE	SW	SW	SW	SW	SW	SW	SW	SE	SE	NE
2015	NE	SE	SE	SW	SW	SE	SE	SW	SW	SE	NW	N
2016	NW	E	SE	SE	SW	SE	SE	SW	SW	E	NW	NE
2017	NE	SE	SW	SW	SE	SW	SW	SW	SW	SE	E	E
2018	NW	SE	SW	SW	SE	SW	SW	SW	SW	E	NE	E

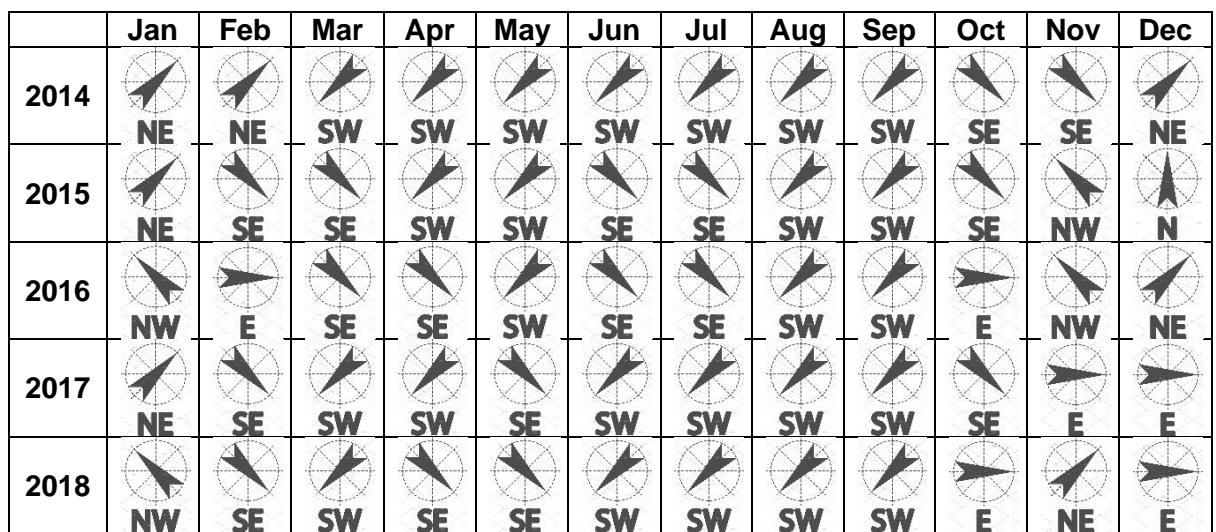


Figure 4. 11: Monthly Mean Wind Direction at (12:30) hrs. M.S.T 2014 - 2018

Table 4. 7: Monthly Mean Wind Direction At (18:30)hrs M.S.T 2014-2018

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2014	NE	SW	SW	SW	S	SW	SE	SW	SW	SE	NE	SE
2015	NE	SW	SW	SW	SW	SW	SW	SW	SW	SE	NW	NW
2016	NW	SW	SW	SW	SW	SE	SW	SW	SW	SW	SE	NE
2017	NW	SW	SW	SW	SW	SW	SW	SW	SW	SE	SE	E
2018	NW	SW	SW	SW	SE	SW	SW	SW	SW	SW	Clam	SW

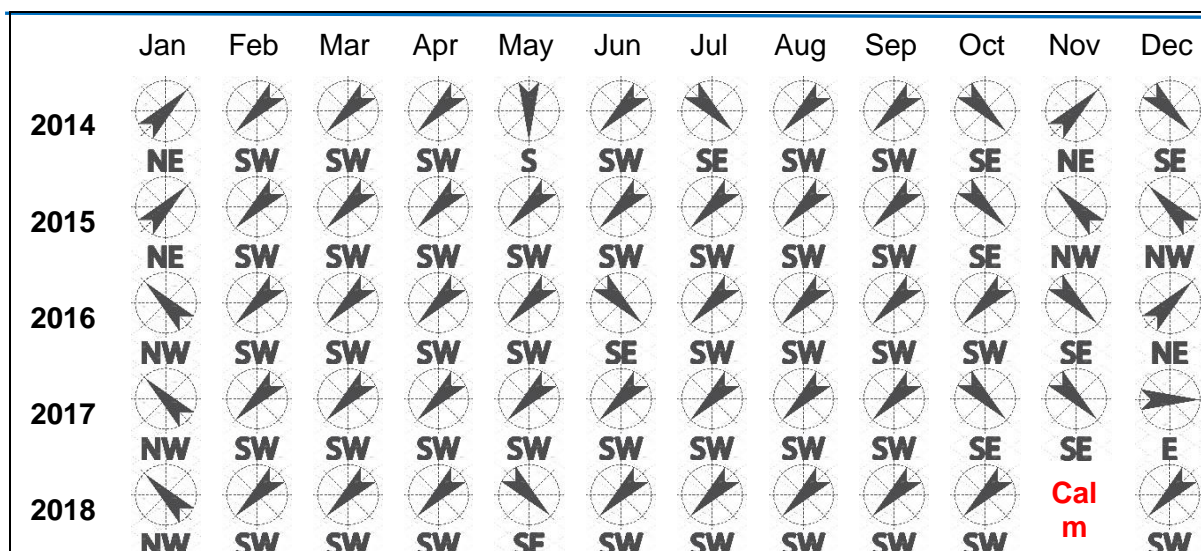


Figure 4. 12: Monthly Mean Wind Direction at (18:30) hrs. M.S.T 2014 - 2018

Wind Speed

Monthly mean wind speed measured at 6:30 hrs M.S.T, 9:30 hrs M.S.T, 12:30 hrs M.S.T, 18:30 hrs M.S.T for 2014 - 2018 is mentioned in the tables below.

Table 4. 8: Monthly Mean Wind Speed (mph) At (6:30) hrs M.S.T 2014-2018

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2014	0.5	0.7	0.9	0.9	0.8	0.8	1.4	0.5	0.4	0.5	0.5	0.0
2015	0.2	0.7	0.6	0.4	0.4	0.8	1.4	0.2	0.2	1.0	0.4	0.3
2016	0.5	0.4	0.5	0.2	0.6	1.0	0.6	1.4	0.4	0.1	0.2	0.5
2017	0.2	0.5	0.3	0.9	1.5	0.7	1.2	0.6	0.3	0.5	0.0	0.2
2018	0.1	0.1	0.2	0.6	0.6	1.3	0.9	0.5	0.8	0.5	0.0	0.0

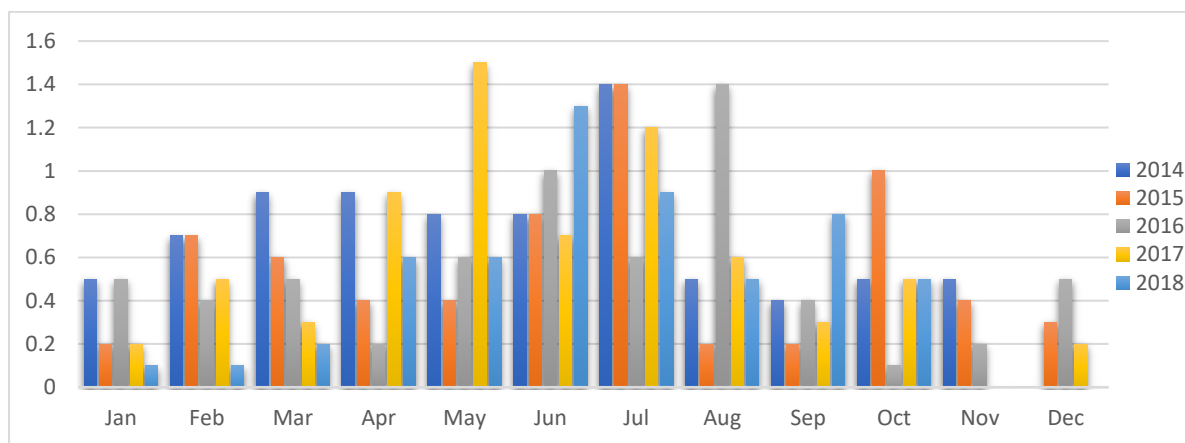


Figure 4. 13: Monthly Mean Wind Speed (mph) at (6:30) hrs. M.S.T 2014 - 2018

Table 4. 9: Monthly Mean Wind Speed (mph) At (9:30) hrs M.S.T 2014-2018

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2014	2.7	1.8	2.3	3.6	3.1	3.2	3.3	2.6	2.7	2.0	1.4	1.4
2015	1.8	2.5	2.3	2.4	2.4	2.4	3.3	3.1	3.3	2.7	1.9	1.7
2016	2.0	0.3	2.2	3.8	2.7	3.2	2.9	3.2	1.8	2.1	2.2	1.9
2017	2.1	2.6	2.6	2.7	2.9	2.9	2.4	2.4	2.1	1.9	1.9	1.9
2018	1.3	2.8	2.3	2.5	2.8	3.3	3.6	3.5	2.9	2.1	1.9	2.0

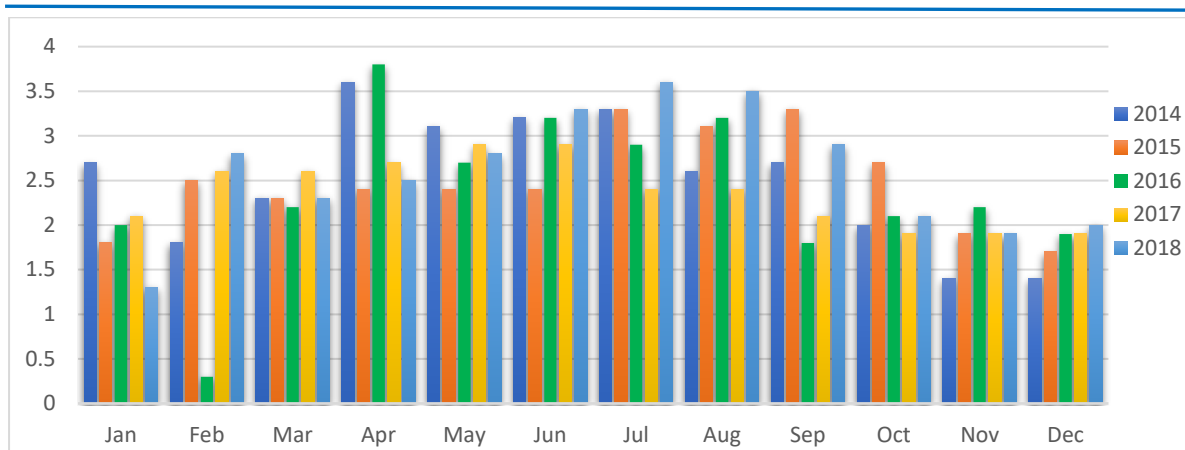


Figure 4. 14: Monthly Mean Wind Speed (mph) at (9:30) hrs. M.S.T 2014 – 2018

Table 4. 10: Monthly Mean Wind Speed (mph) At (12:30) hrs M.S.T 2014-2018

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2014	3.1	3.1	3.8	4.7	3.8	3.4	3.1	3.5	2.9	2.2	1.7	1.9
2015	2.9	3.0	3.1	3.5	3.2	3.4	4.7	3.6	4.5	3.3	2.0	2.2
2016	2.6	3.2	3.2	4.5	4.3	4.3	3.9	4.7	3.1	3.0	3.2	3.0
2017	3.3	4.2	4.2	4.0	3.9	4.3	3.2	3.2	2.6	2.7	2.4	2.8
2018	2.7	3.5	3.6	3.5	3.6	4.9	0.5	0.5	4.2	2.9	2.2	2.6

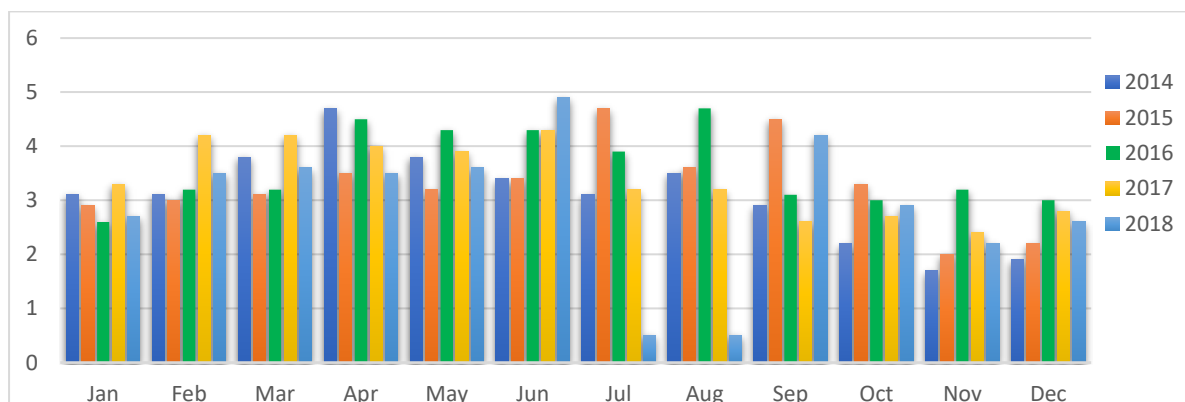


Figure 4. 15: Monthly Mean Wind Speed (mph) at (12:30) hrs. M.S.T 2014 – 2018

Table 4. 11: Monthly Mean Wind Speed (mph) At (18:30) hrs M.S.T 2014-2018

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2014	0.7	1.8	2.1	3.5	3.3	2.1	2.9	2.3	2.2	0.6	0.1	0.0
2015	0.3	0.7	2.6	3.6	3.5	1.9	2.8	1.7	2.7	0.5	0.4	0.6
2016	0.9	1.0	2.8	4.8	3.9	2.4	1.9	2.4	2.4	1.2	0.7	0.3
2017	0.7	1.6	3.5	2.8	3.6	2.9	2.1	2.4	2.2	0.5	0.3	0.1
2018	0.6	0.9	2.4	2.5	3.4	3.1	2.4	3.2	1.4	0.2	0.0	0.2

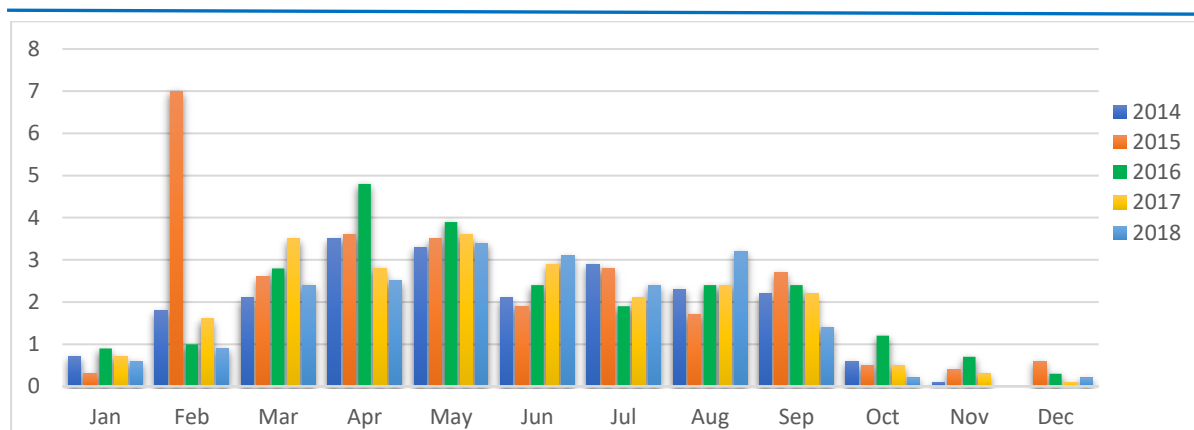


Figure 4. 16: Monthly Mean Wind Speed (mph) at (18:30) hrs. M.S.T 2014 - 2018

Table 4. 12: Monthly Mean Relative Humidity (%) At (6:30) hrs M.S.T 2014-2018

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2014	95	95	97	95	96	98	99	99	95	96	95	95
2015	93	93	94	96	96	98	97	97	98	95	95	94
2016	94	94	95	94	95	96	98	99	99	95	95	94
2017	89	93	95	94	95	98	98	98	98	93	93	91
2018	93	94	94	94	96	99	99	99	99	99	99	96

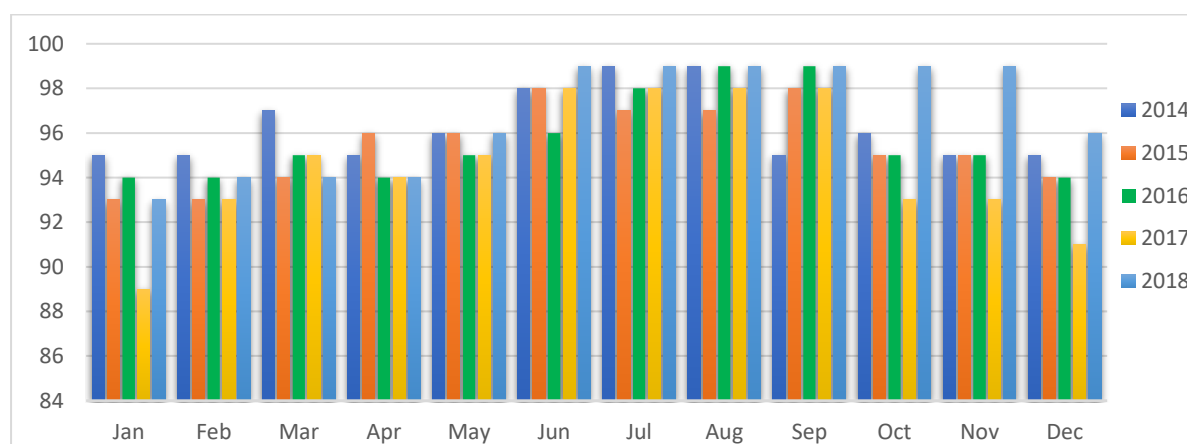


Figure 4. 17: Monthly Mean Relative Humidity (%) at (6:30) hrs. M.S.T 2014 - 2018

Table 4. 13: Monthly Mean Relative Humidity (%) At (9:30) hrs M.S.T 2014-2018

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2014	68	73	74	72	77	89	94	93	89	80	78	70
2015	71	71	73	69	75	87	90	90	86	84	77	72
2016	70	73	79	94	76	88	91	91	92	88	80	75
2017	71	70	72	73	81	87	93	92	89	89	80	71
2018	69	71	75	72	78	92	95	95	89	86	79	81

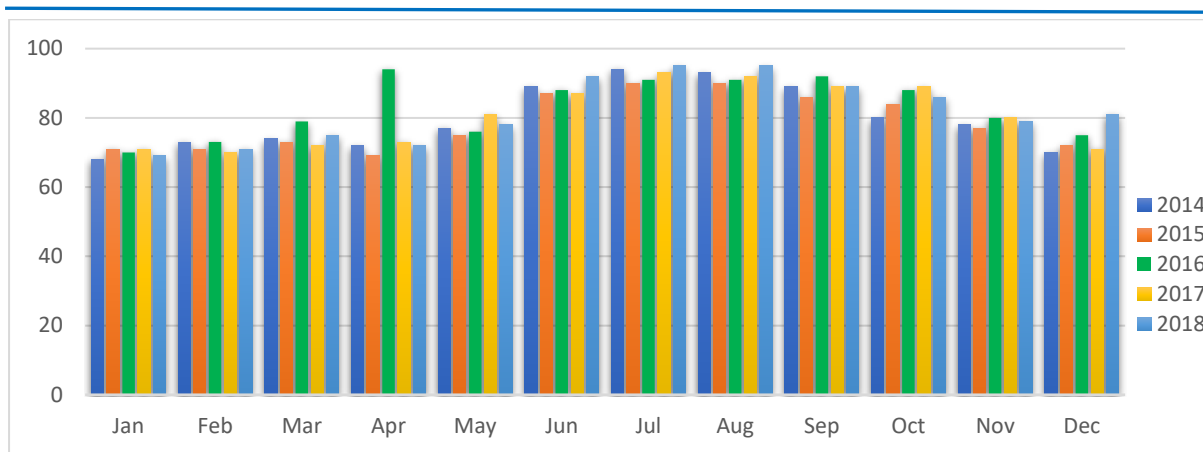


Figure 4. 18: Monthly Mean Relative Humidity (%) at (9:30) hrs. M.S.T 2014 - 2018

Table 4. 14: Monthly Mean Relative Humidity (%) At (12:30) hrs M.S.T 2014-2018

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2014	40	39	35	48	63	82	88	86	78	68	65	50
2015	45	37	48	47	57	77	84	84	76	74	60	50
2016	43	42	46	45	56	81	85	84	79	75	64	54
2017	46	37	36	50	66	80	87	85	76	80	64	51
2018	47	41	43	43	62	85	89	87	79	73	64	59

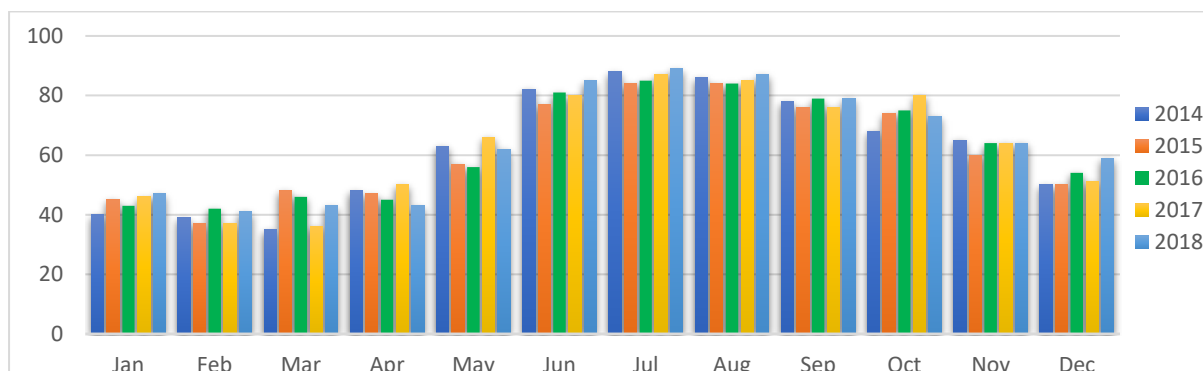


Figure 4. 19: Monthly Mean Relative Humidity (%) at (12:30) hrs. M.S.T 2014 - 2018

Table 4. 15: Monthly Mean Relative Humidity (%) At (18:30) hrs M.S.T 2014-2018

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2014	56	47	44	50	73	92	95	93	89	87	82	73
2015	61	46	55	51	69	90	91	93	91	89	82	71
2016	61	52	51	46	65	87	90	89	90	89	81	71
2017	60	45	40	54	70	89	91	89	89	92	86	73
2018	57	48	46	46	72	91	97	96	90	88	89	80

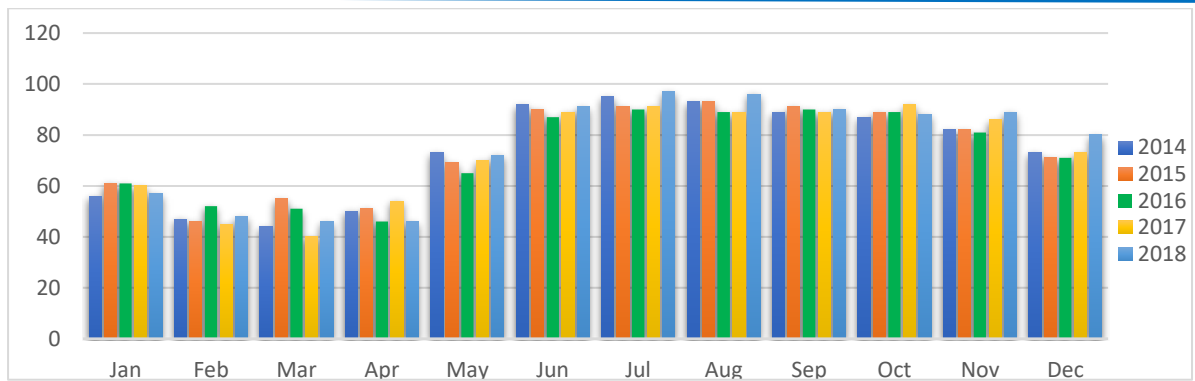


Figure 4. 20: Monthly Mean Relative Humidity (%) at (18:30) hrs. M.S.T 2014 - 2018

4.7 Earthquake

It could be seen in the above Figure that Myanmar falls in the Alpide Belt.

The Alpide Belt or Alpine-Himalayan orogenic belt is a seismic belt and orogenic belt that includes an array of mountain ranges extending along the southern margin of Eurasia, stretching from Java to Sumatra through the Himalayas, the Mediterranean, and out into the Atlantic. It includes the Alps, the Carpathians, the Pyrenees, the mountains of Anatolia and Iran, the Hindu Kush, and the mountains of Southeast Asia. It is the second most seismically active region in the world, after the circum-Pacific Belt (The Ring of Fire), with 17% of the world's largest earthquakes.

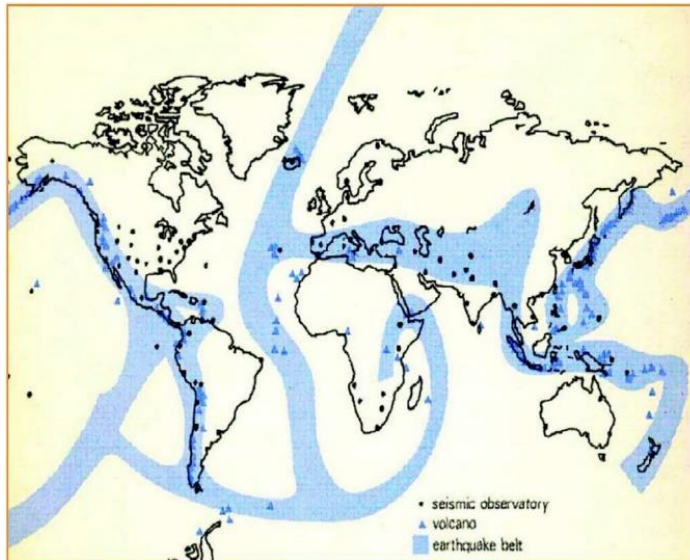


Figure 4. 21: Myanmar in Alpide Earthquake Belt
SOURCE: MANUAL ON EARTHQUAKE, UN-HABITAT

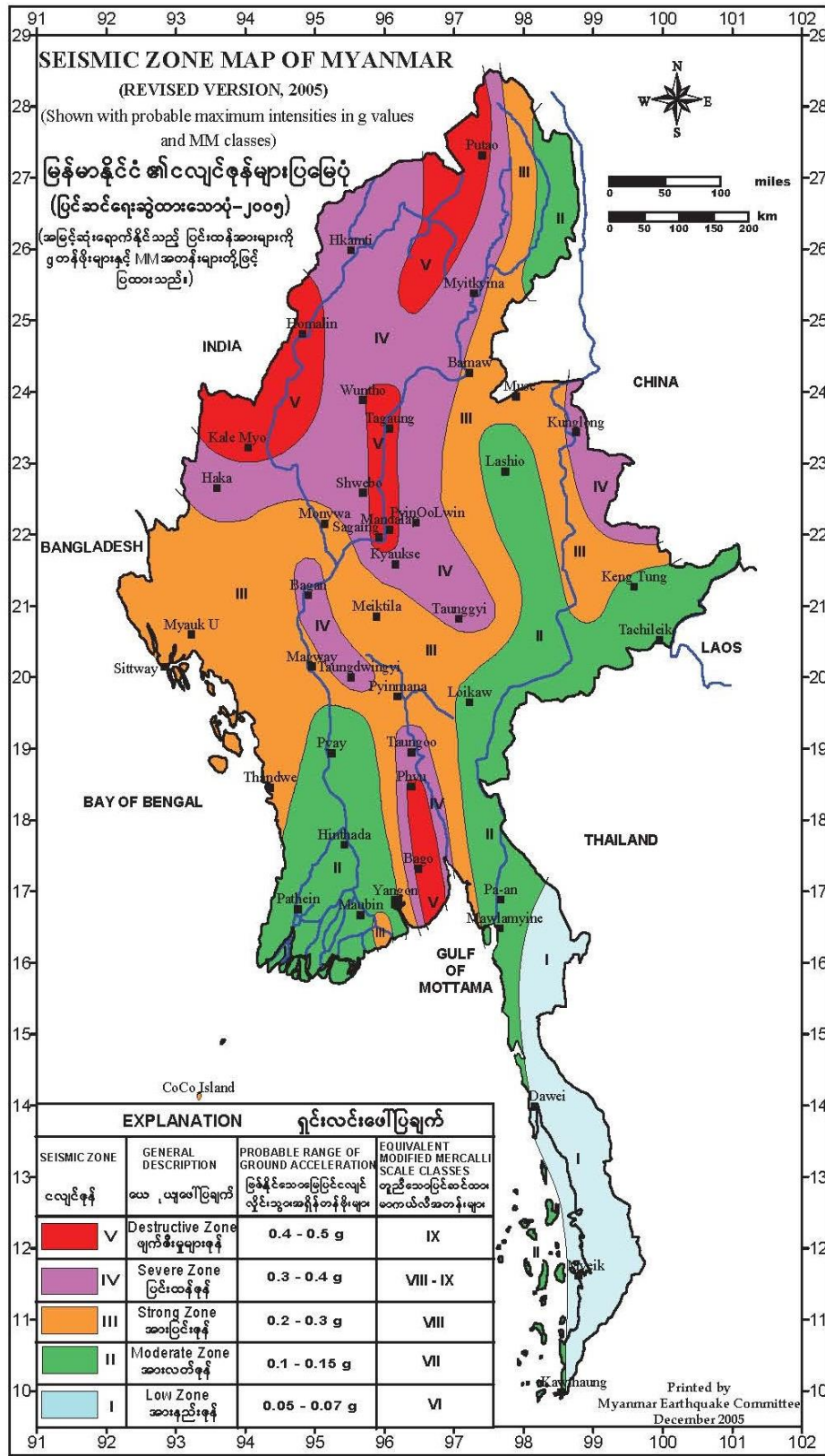


Figure 4. 22: Seismic Map of Myanmar

According to the above Seismic Map of Myanmar, Yangon/Hlegu Township is located in the zones where only strong and moderate earthquakes will likely strike, avoiding the zones where destructive and severe earthquakes could strike.

Myanmar's Earthquake Zone and the Sagaing Fault

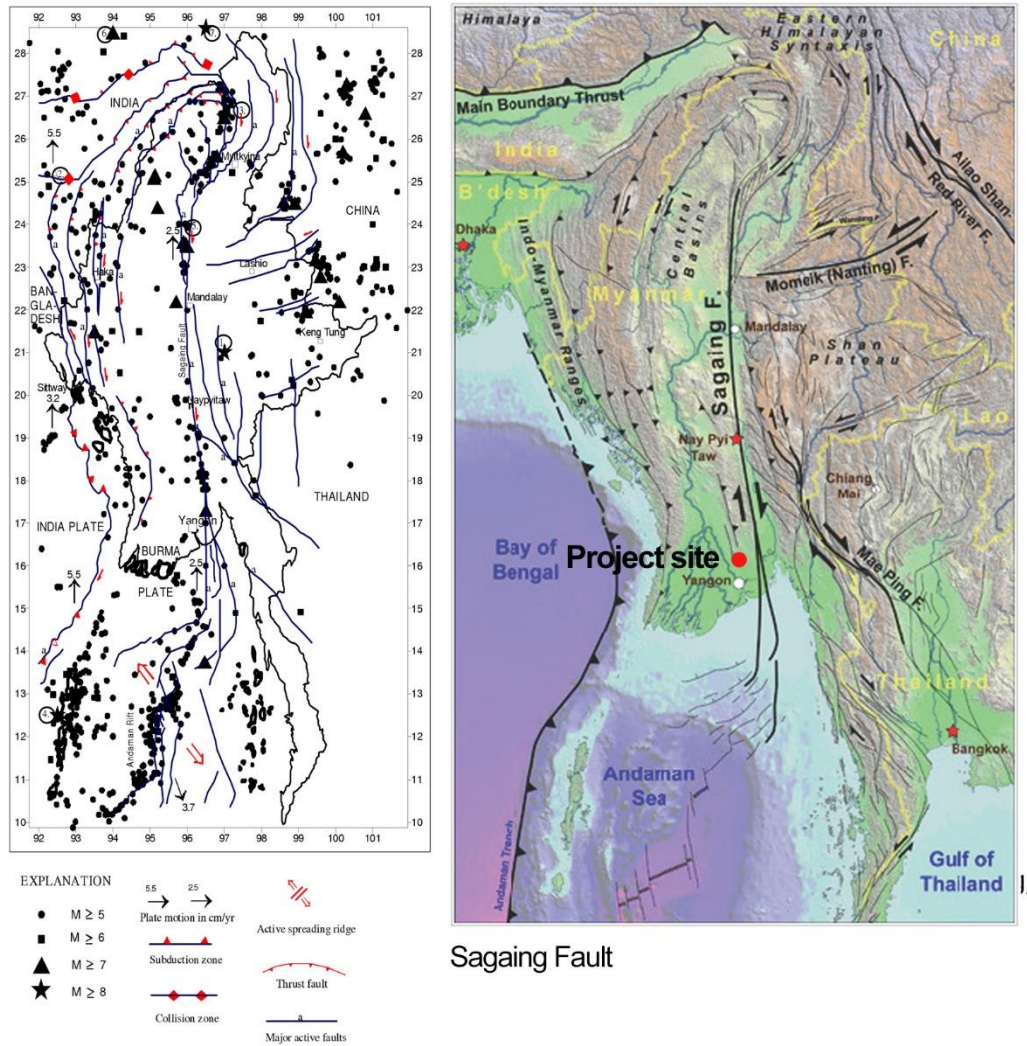


Figure 4. 23: Myanmar's Earthquake Zone and the Sagaing Fault
 Source: Department of Geological Engineering, Gadjah Mada University and www.sagaingfault.info/index.html#info

The proposed project site is located at approximately 37 kilometers to the west of the 1,200-kilometre long Sagaing Fault which stretches from the northernmost part of the Lao country to the Gulf of Mottama.

Summary record of earthquakes which struck Myanmar is listed in Table below.

Table 4. 16: List of earthquakes which struck Myanmar

Date	Location	Magnitude and/or brief description
868	Bago	Shwemawdaw Pagoda a fell
875	Bago	Shwemawdaw Pagoda a fell
1429	Innwa	Fire-stopping enclosure walls fell
1467	Innwa	Pagodas, solid and hollow, and brick monasteries destroy-ed
24 July 1485	Sagaing	3 well-known pagodas fell
1501	Innwa	Pagodas, etc. fell
13 Sep 1534	Bago	Pagodas including Shwemawdaw and Mahazedi fell
1567	Bago	Kyaikko Pagoda fell
1582	Bago	Umbrella of Mahazedi Pagoda fell
9 Feb 1588	Bago	Pagodas, and other structures fell
30 Mar 1591	Bago	The Great Incumbent Buddha destroyed
23 June 1620	Innwa	Ground surface broken, river fishes were killed after quake

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18 Aug 1637	Innwa	River water flush
10 Sep 1616	Innwa	-
11 June 1648	Innwa	-
1 Sep 1660	Innwa	-
3 April 1690	Innwa	-
15 Sep 1696	Innwa	4 well-known pagodas destroyed
8 Aug 1714	Innwa	Pagodas etc. fell; the water from the river gushed into the city
4 June 1757	Bago	Shwemawdaw Pagoda damaged
2 April 1762	Sittwe	M=7 RS: very destructive violent earthquake felt over Bengal, Rakhine up to Calcutta
27 Dec 1768	Bago	Ponnya Yadana Pagoda fell
9 June 1776	Innwa	A well-known pagoda fell
26 April 1850	Innwa	-
21 Mar 1839	Innwa	Oil place and many buildings demolished;
23 Mar 1839	Innwa	Pagodas and city walls fell; ground surface broken; the river's flow reversed for sometime; Mingun Pagoda shattered; about 300 to 400 persons killed
6 Feb 1843	Kyaukphyu	Eruption of mud volcanoes at the Ram bye (Ramree) Island
3 Jan 1848	Kyaukphyu	The civil line and other buildings were damaged
24 Aug 1858	Pyay	Collapsed houses and tops of pagodas at Pyay, Henzada, and Thayet Myo and felt with some damages in Innwa, Sittwe, Kyaukphyu and Yangon
8 Oct 1888	Bago	Mahazedi Pagoda collapsed
6 Mar 1913	Bago	Shwemawdaw Pagoda lost its final
5 July 1917	Bago	Shwemawdaw Pagoda fell
10 Sep 1927	Yangon	-
17 Dec 1927	Yangon	M-7 RS: extended to Dedaye
8 Aug 1929	Near Taungoo	Bent railroad tracks, bridges and culver is collapsed , and loaded trucks overturned (Swa Earthquake)
5 May 1930	Near Khayan	M-7.3 RS. 1 mix-IX; in a zone tending north-south for 37km south of Bago (on the Sagaing Fault line) about 500 persons in Bago and about 50 persons in Yangon killed
3 Dec 1930	Nyaunglebin	M-7.3 RS: railroad tracks twisted (Pyu Earthquake): about 30 persons killed
27 Jan 1931	East of Indawgyi	M-7.6 RS: 1 mix-IX: numerous fissures and cracks (Myitkyina Earthquake)
10 Aug 1931	Pyinmana	-
27 Mar 1931	Yangon	-
16 May 1931	Yangon	-
21 May 1931	Yangon	-
12 Sep 1946	Tagaung	M-7.5 RS
12 Sep 1946	Tagaung	M-7.75 RS
16 July 1956	Sagaing	M-7.0 RS: Several pagodas severely damaged (40to50 persons killed)
8 July 1976	Bagan	M-6.8 RS: Several pagodas in Bagan Ancient City were severely damaged (only 1 person killed)
22 Sep 2003	Taundwingyi	M-6.8 RS: Severe damaged to rural houses and religious buildings (7 persons killed)
24 Mar 2011	Tarlay	Mw 6.8, Myanmar, Thailand, Laos, China and Vietnam border areas were affected and about 150 person were killed when 130 houses collapsed.
24 Aug 2016	Chauk	Mw 6.8, several temples in the nearby ancient city of Bagan were damaged and four people were reported dead

Source: Myanmar Geosciences Society

4.8 Topography

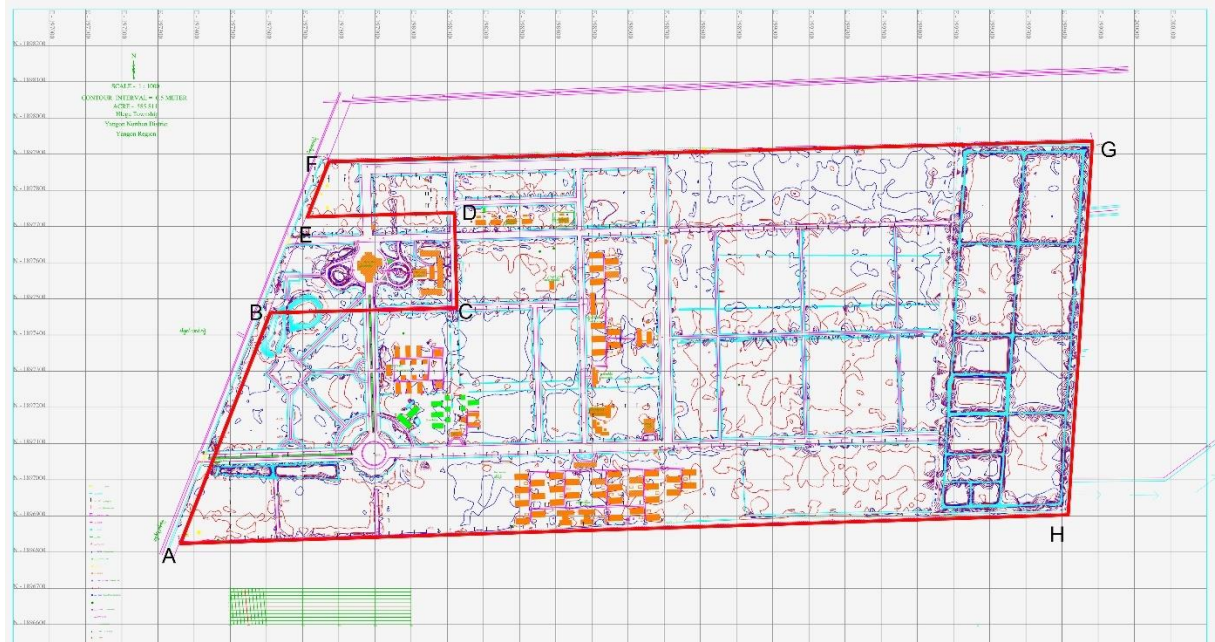


Figure 4. 24: Topography Map of Project Site

The proposed project land is situated between latitude N-1896800 and N-1898000 and between longitude E-197300 and E-199900. Approach road way to project site is 9.14 km length from junction of Yangon - Mandalay Highway No.3.

The project location is between:

	Latitude	Longitude
Point A	17.136131°	96.155709°
Point B	17.141934°	96.157951°
Point C	17.142103°	96.162789°
Point D	17.144476°	96.162692°
Point E	17.144329°	96.158867°
Point F	17.145730°	96.159415°
Point G	17.146511°	96.179249°
Point H	17.137174°	96.178757°

The highest point is 15.5 meters above sea level (ASL) in the north east and the lowest point is 11.5 meters above sea level (ASL) in the south-west of the project site. The land was previously used as research and training institute by Union Solidarity and Development Party (USDP). Currently, it remains as an unused land where the buildings (Hall, Hostel, Theatre, Hospital, etc.) have been ruined.

4.9 Study Limit

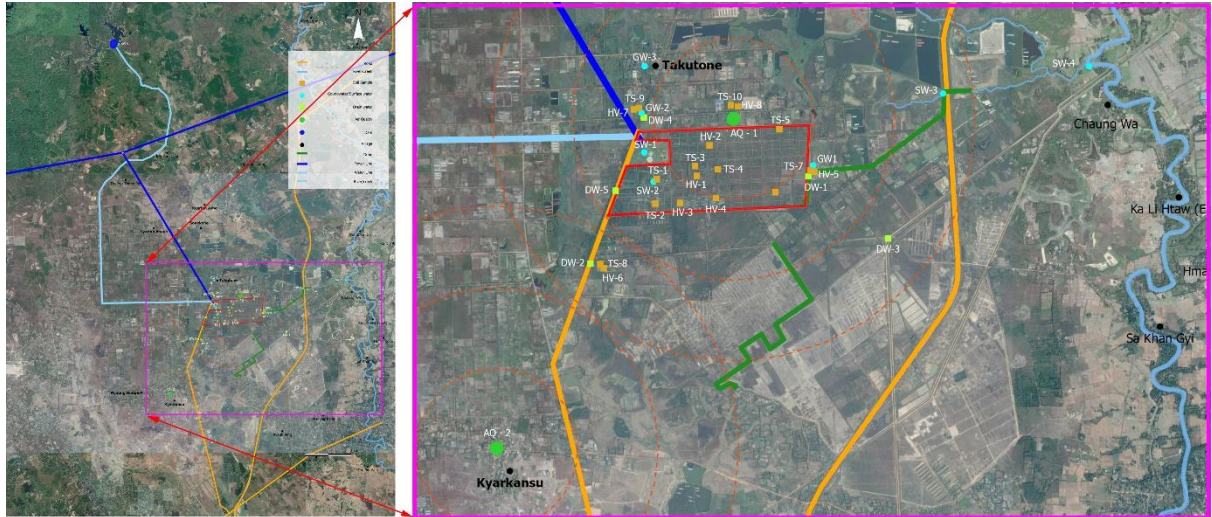


Figure 4. 25: Map of setting the study limit

MSR study team set the study limit within the proposed premises such as 2,249,288 square meter (555.81 acres) wide land and the study area is 3 to 5 kilometers radius of the project area (surrounding environment) for physical data collection and impact assessment. The study area would cover not only the project site but also included the spatial and temporal limits of individual environmental components outside the Project Area boundaries where an effect can be reasonably expected. The geographic boundaries for the assessment included the area that will be directly affected by the project operations.

For the social environment, the study covers 6 villages, namely, Kyarkansu, Nyaung Hnitpin, Takutone, Sonekone, Kyarinn (Ashe) and Kyarinn (Anauk) villages which are located within 5 km from the project site or more. These 6 villages are the areas which will likely be directly affected by the project. According to the experts' observation, the impact of the project and its influence area are expected within 3 – kilometer radius of the project. The detailed information of socioeconomic conditions of households in these villages is described in 4.11.3.5 Village Profile Overview.

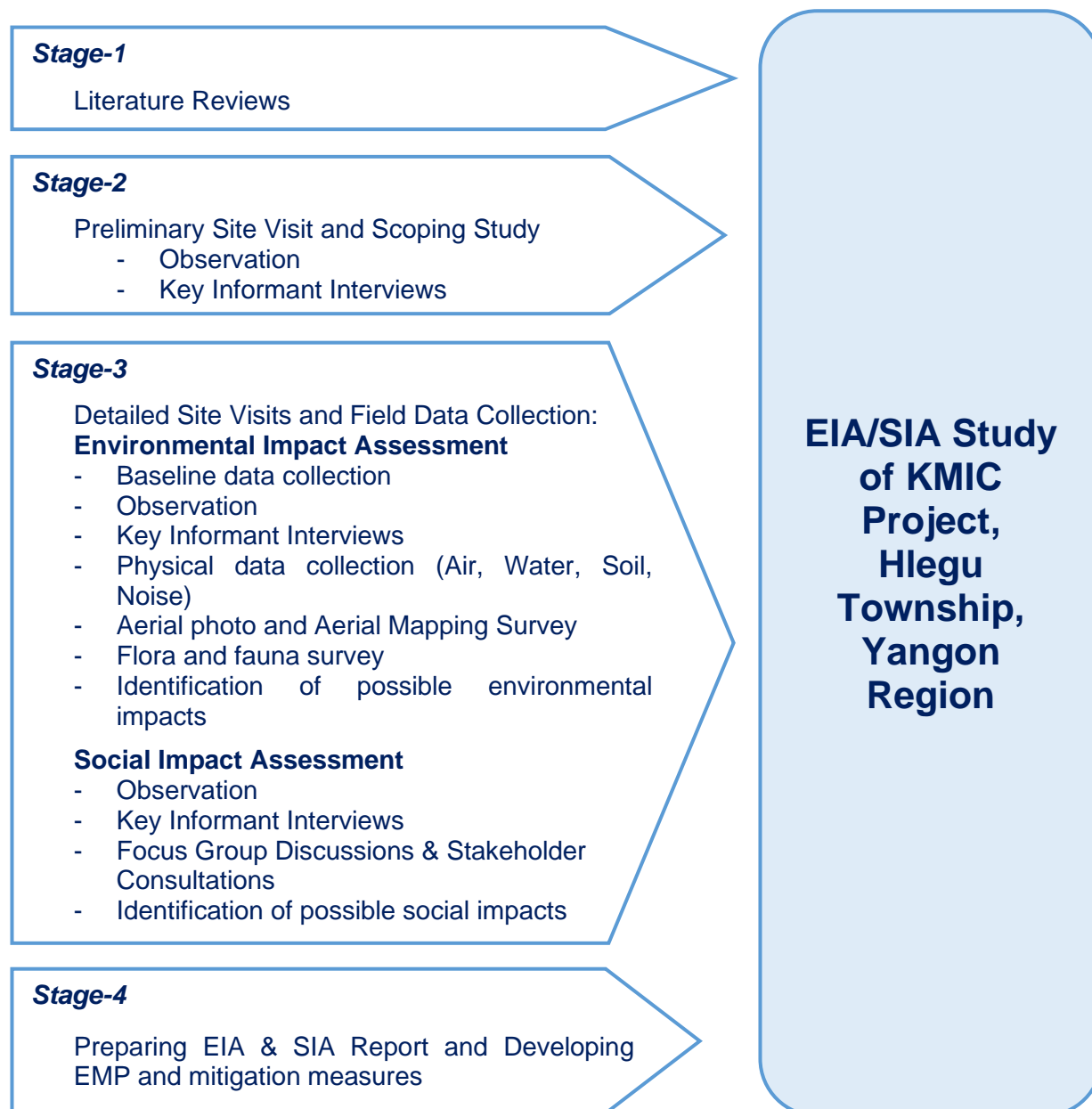
The main focus area for the biological impact assessment is the project site and ecological aspect is observed inside and outside of range and is within 3 km from the project site.

However, the overall social and biological impacts are not limited to the surrounding areas of the project site. Therefore, the study looked at wider scope and contribution to regional level.

In addition, the study would cover topography of landscape and presence of large natural lakes and fish-farming ponds surrounding the project site in such distance. Thus, drainage system of the areas (freshwater aquatic environment) especially in rainy season expands within the area of 3 km radius from the center of the project site where aquatic organisms will have the effect of the industrial zone development.

4.10 Research methodology

Research methodology involved literature reviews, preliminary site visit for scoping study, and detailed field data collection at sites. By reviewing and analyzing the data collected, EIA and SIA reports were prepared, and Environmental Management Plan and mitigation measures were developed.



4.11 Baseline Data Collection

4.11.1 Physical Environmental Baseline Data Collection

Physical environmental study team of MSR studied topographic map, site layout plan, water drains and associated structures. The team visited the site and observable locations of the proposed project and decided to collect samples as baseline data for this environmental impact assessment report.

1. Air may be polluted by dust emission, operating of machineries which use diesel fuel at construction, operation and decommission phases and 24 hour - ambient air quality test was done near the proposed project area. 2 locations were selected to measure the air quality and sound level. The analytical reports are baseline data of air.
2. Wastewater and groundwater may be impacted by oil spills, dumping of materials, dumping of solid waste, factory waste and sewage. Total 12 water samples were collected to test water quality. 5 water samples for surface water/drinking water (pond, Kyarinn Creek (6.2 miles) near Yangon-Mandalay Expressway and Pazundaung Creek near Let Pyan Wae village, Kalihtaw Dam), 5 water samples for drain water (wastewater), and 2 samples for ground water (tube well water). The analytical reports are baseline data of wastewater and ground water.

3. Soil may be impacted negatively at site by preparation, construction, operation and decommissioning phases. MSR study team collected total 10 samples of soil in which 6 samples of soil to analyze soil nutrients and 4 samples of soil to analyze heavy metal contents. The analytical reports are baseline data of soil.

The following map shows the locations of soil and water sample collection and air quality measurement.

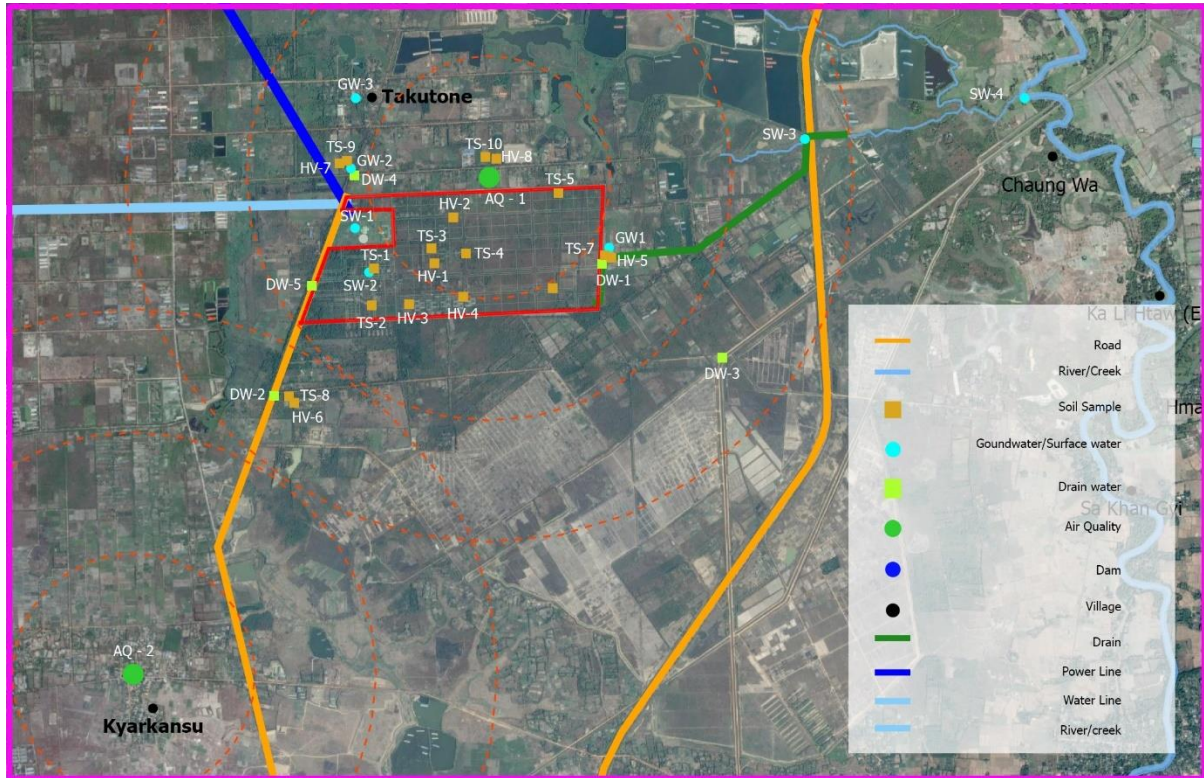


Figure 4. 26: Locations of Soil, Water Sample Collection and Air Quality Measurement

- TS - Top soil sample collection point (nutrients test)
- HV - Sub soil/Deep soil sample collection point (Heavy metal contents test)
- AQ - Air Quality Measurement point
- GW - Ground Water sample collection point
- DW (WW) – Drain Water sample collection point (Wastewater)
- SW - Surface Water sample collection point (Pond, Creek, Dam water)

4.11.1.1 Air Quality and Sound Level

4.11.1.1.1 Air Quality and Sound Level Measuring Location

Ambient air quality and sound level were measured at two locations mentioned in the following table. This measurement was done by Occupational and Environmental Health Laboratory, Ministry of Health and Sports in two different seasons. AQ 1 was located at fram land (downwind direction of project site) near the project area and the measurement was made on 25 April 2017. AQ 2 was located in the monastery compound of Kyarkansu village (upwind direction of project site) and the measurement was conducted on 17 July 2019.

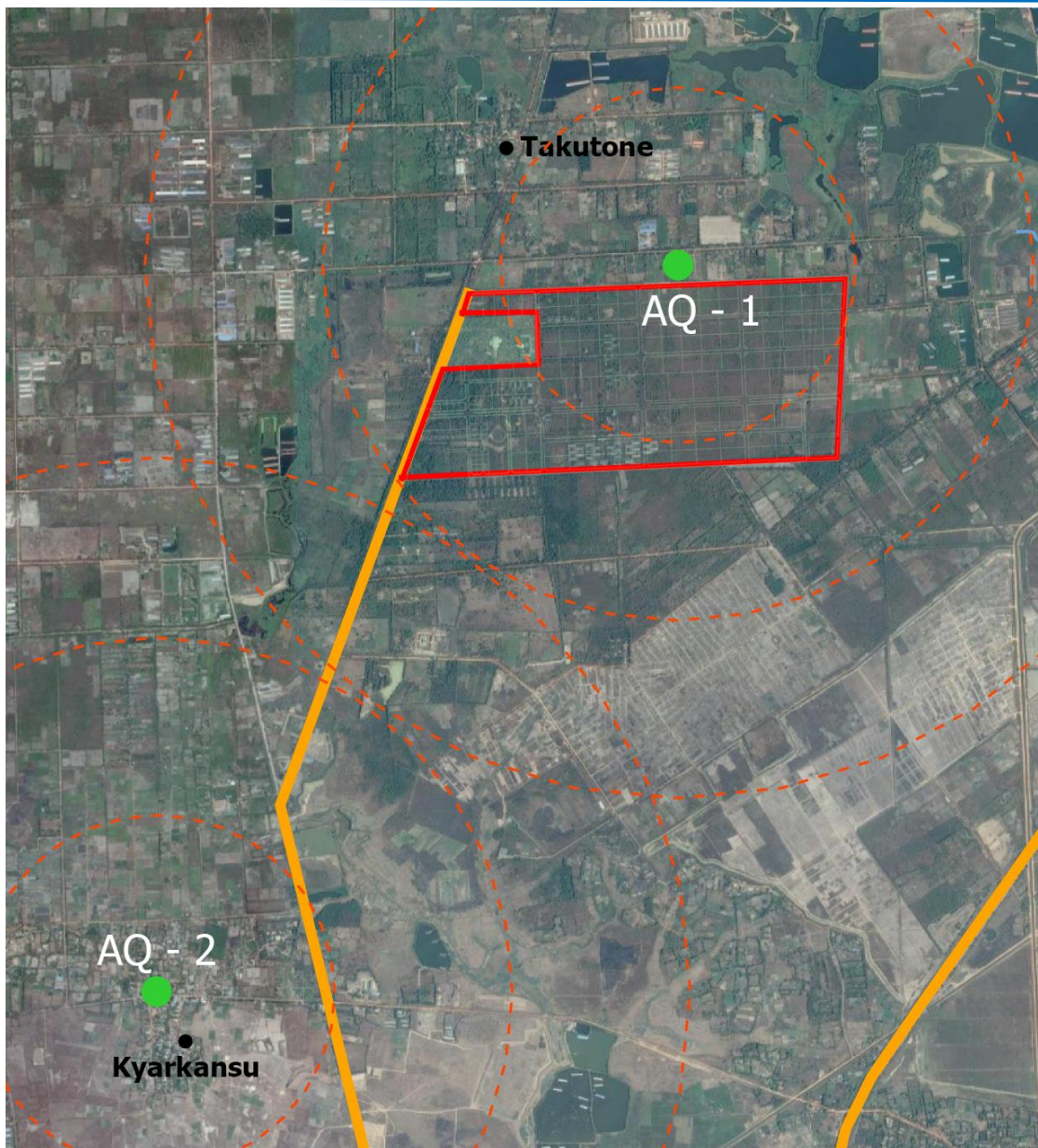


Figure 4. 27: Locations of Air Quality Measurement

AQ - Air Quality Measurement point

Table 4. 17: Air Quality Measuring Locations

Sample point	Latitude	Longitude
AQ -1	N 17° 8' 48.93"	E 96° 10' 12.93"
AQ-2	N 17° 6' 37"	E 96° 8' 34"

4.11.1.1.2 Air quality survey method

Measuring period was based on 24-hour measurement level of PM_{2.5} and PM₁₀ using EPAS air sampler and other gases were also measured by auto sensors of the EPAS haze-scanner. Particulate Matter (PM₁₀), Particulate Matter (PM_{2.5}), Sulphur dioxide (SO₂), Nitrogen dioxide (NO₂), Carbon monoxide (CO), Total Volatile Organic Compound (TVOCs), Hydrocarbon (HC), and Methane (CH₄) are measured 1-hour average and Ozone (O₃) is measured 8 hours average. The report covered the observations for the baseline data obtained in one cross-sectional survey.



Figure 4. 28: Air Quality Measurement Device



Figure 4. 29: Air Quality Measurement in Monastery Compound, Kyarkansu Village

4.11.1.1.3 Sound level survey method

Maximum Sound Pressure Level (L_{max}) and the Equivalent Continuous Sound Level (L_{eq}) were measured. Acoustic environment monitoring was performed in accordance with standard procedures adopted by American Conference of Governmental Industrial Hygienist (ACGIH) which is authoritatively and currently used in Myanmar.



Figure 4. 30: Sound Level Measuring Device

4.11.1.1.4 Ambient Air Standards and Noise Levels

The maximum concentrations of air pollutants considered to be protective of the environment and sound levels are defined in the *National Environmental Quality (Emission) Guidelines, 2015* (See tables below).

Table 4. 18: NEQ Guidelines for ambient air standards

Parameter	Averaging Period	Guideline Value $\mu\text{g}/\text{m}^3$
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

Table 4. 19: NEQ Guidelines for noise levels

Receptor	One Hour LAeq (dBA) ^a	
	Day Time 07:00 - 22:00 (10:00 - 22:00 for Public holidays)	Night Time 22:00 - 07:00 (22:00 - 10:00 for Public holidays)
Residential, institutional, educational	55	45
Industrial, commercial	70	70

^a Equivalent continuous sound level in decibels

4.11.1.1.5 Air Quality Results

The air quality test results are presented below.

Table 4. 20: Air quality results at AQ1 (Measured date 25 – 26 April 2017)

Name	AQ-1	Reference Unit	Unit
PM ₁₀ (24 hr)	70.6	50	$\mu\text{g}/\text{m}^3$
PM _{2.5} (24 hr)	32.1	25	$\mu\text{g}/\text{m}^3$
SO ₂ (24 hr)	50.7	20	$\mu\text{g}/\text{m}^3$
NO ₂ (1 hr)	78.3	200	$\mu\text{g}/\text{m}^3$
CO (1 hr)	301	30000	$\mu\text{g}/\text{m}^3$
O ₃ (8 hr)	17.8	100	$\mu\text{g}/\text{m}^3$
VOCs (1 hr)	17.9	400	$\mu\text{g}/\text{m}^3$
HC	401.1	-	ppm
CH ₄	6362	-	ppm

The content of Hydrocarbon (HC) is (401.1) ppm and that of Methane (CH₄) is (6362) ppm respectively.

NO₂ (1 hr) is (78.3) micro gram per cubic meter, CO (1 hr) is (301) micro gram per cubic meter, O₃ (8 hr) is (17.8) micro gram per cubic meter, VOCs (1 hr) is (17.9) micro gram per cubic meter. The emissions of these parameters are lower than reference value.

PM₁₀ (24 hr) is (70.6) micro grams per cubic meter, PM_{2.5} (24 hr) is (32.1) micro grams per cubic meter and SO₂ (24 hr) is (50.7) micro grams per cubic meter. The emissions of these parameters are higher than reference value.

Particulate matter (PM₁₀), Particulate matter (PM_{2.5}) and Sulphur dioxide (SO₂)

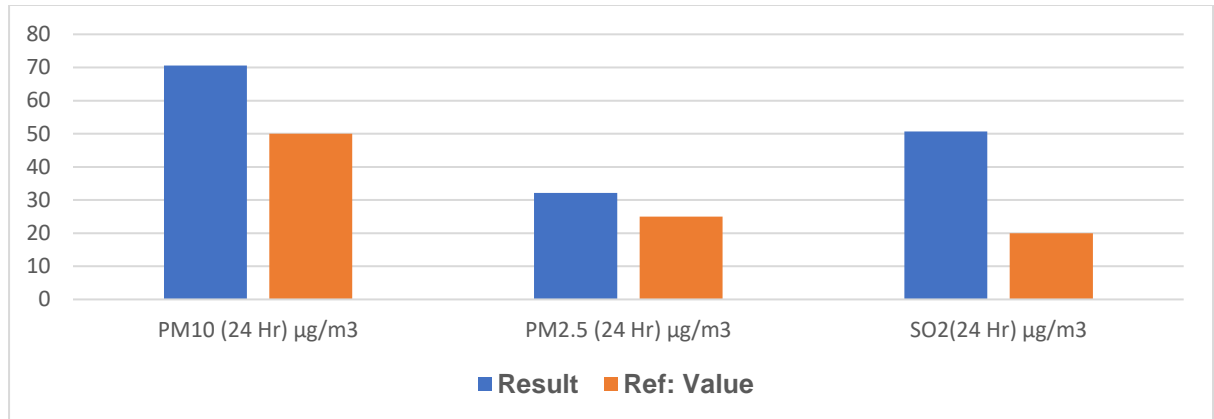


Figure 4. 31: Comparison between Reference and Result Values of PM and Sulphur Dioxide

Nitrogen dioxide (NO₂) and Volatile Organic Compounds (VOCs)

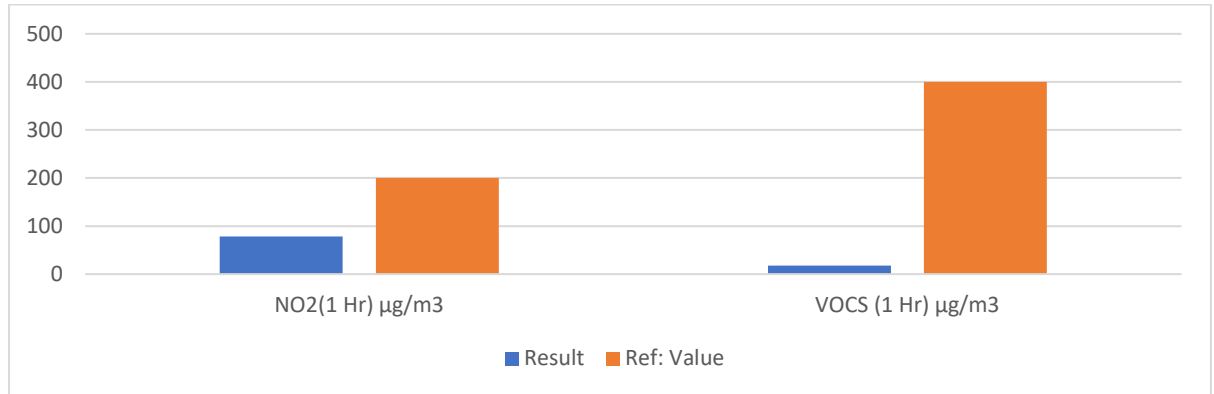


Figure 4. 32: Comparison between Reference and Result Values of Nitrogen dioxide and Volatile Organic Compounds

Carbon Monoxide (CO)

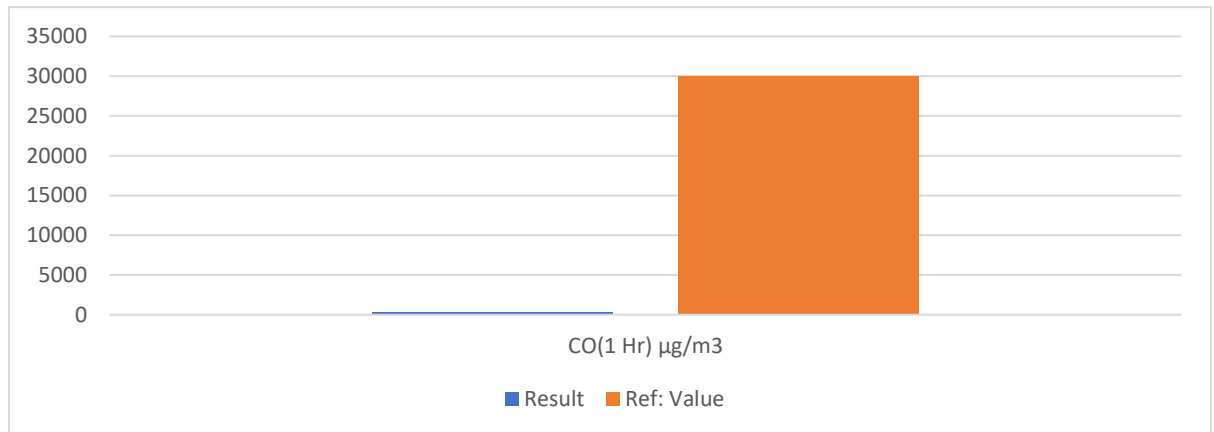


Figure 4. 33: Comparison between Reference and Result Values of Carbon monoxide

Ozone (O₃)

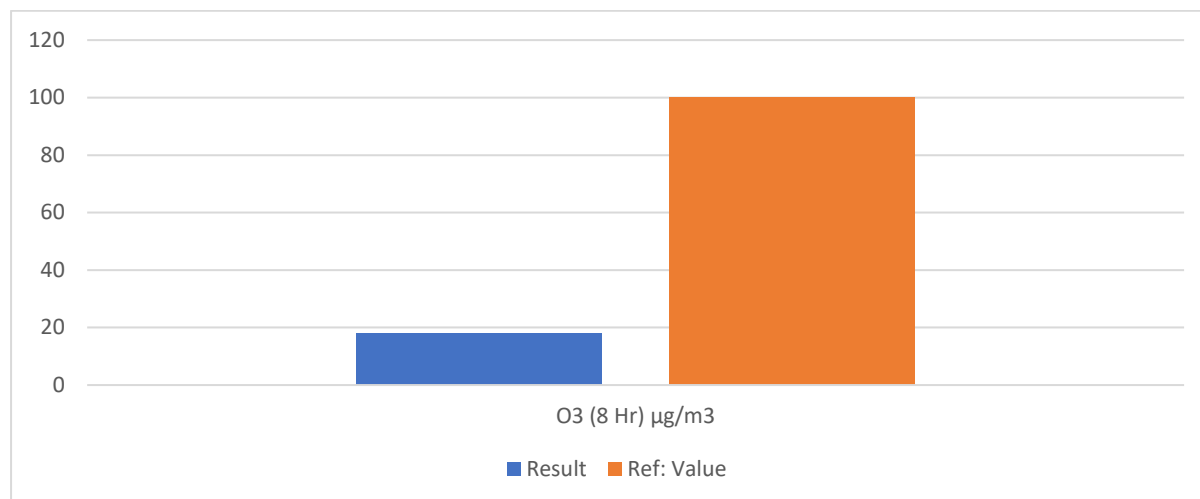


Figure 4. 34: Comparison between Reference and Result Values of Ozone

Hydro carbon (HC) and Methane (CH₄)

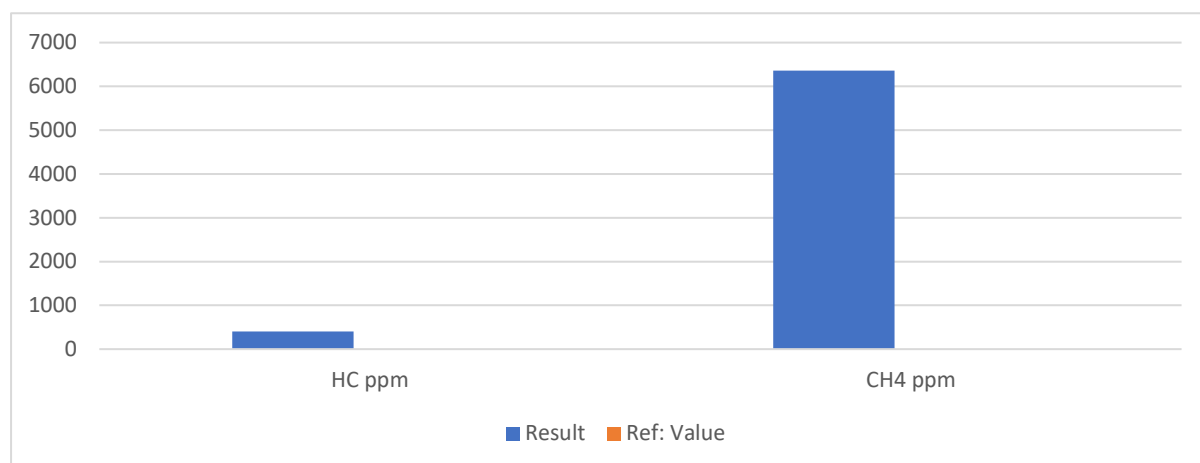


Figure 4. 35: Comparison between Reference and Result Values of Hydro Carbon and Methane

Table 4. 21: Air quality results at AQ2 (Measured date 17 July 2019)

Parameter	Result	Reference Unit	Unit
PM ₁₀ (24 hr)	41.7	50	µg/m ³
PM _{2.5} (24 hr)	20.4	25	µg/m ³
SO ₂ (24 hr)	26.6	20	µg/m ³
NO ₂ (1 hr)	66.5	200	µg/m ³
CO (1 hr)	196.3	30000	µg/m ³
O ₃ (8 hr)	10.9	100	µg/m ³
VOCs (1 hr)	41	400	µg/m ³
HC	504	-	
CH ₄ ppm	4569	-	

The content of Hydrocarbon (HC) is (504) ppm and that of Methane (CH₄) is (4569) ppm respectively.

NO₂ (1 hr) is (66.5) micro gram per cubic meter, CO (1 hr) is (196.3) micro gram per cubic meter, O₃ (8 hr) is (10.9) micro gram per cubic meter, VOCs (1 hr) is (41) micro gram per cubic meter. PM₁₀ (24 hr) is (41.7) micro grams per cubic meter and PM_{2.5} (24 hr) is (20.4) micro grams per cubic meter. The emissions of these parameters are lower than reference value.

SO₂ is (26.6) micro grams per cubic meter is higher than reference value.

Particulate matter (PM₁₀), Particulate matter (PM_{2.5}) and Sulphur dioxide (SO₂)

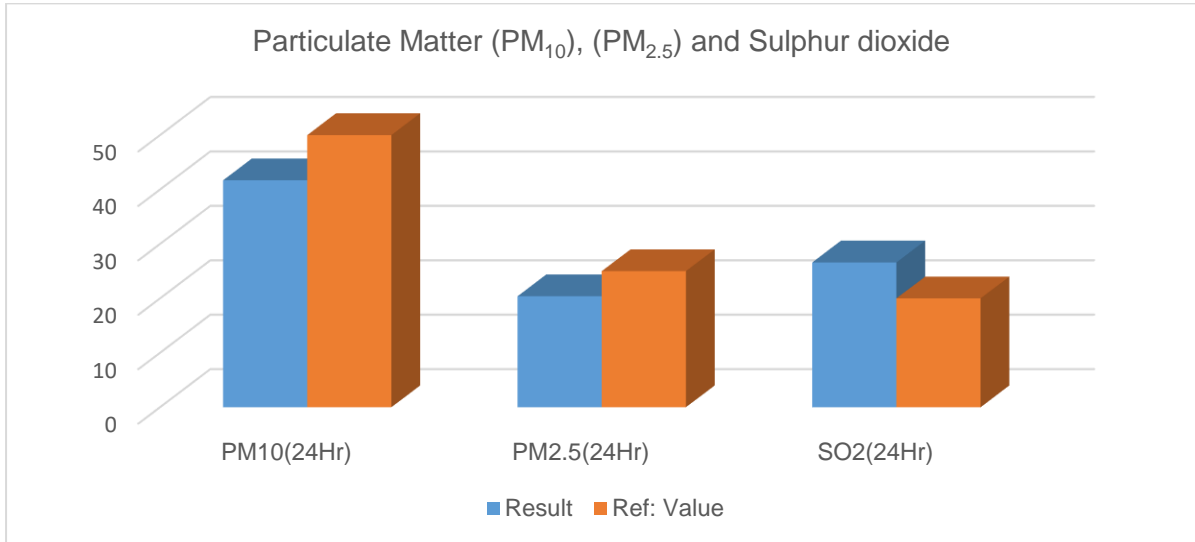


Figure 4. 36: Comparison between Reference and Result Values of PM and Sulphur Dioxide

Nitrogen Dioxide (NO₂), Carbon Monoxide and Volatile Organic Compounds (VOCs)

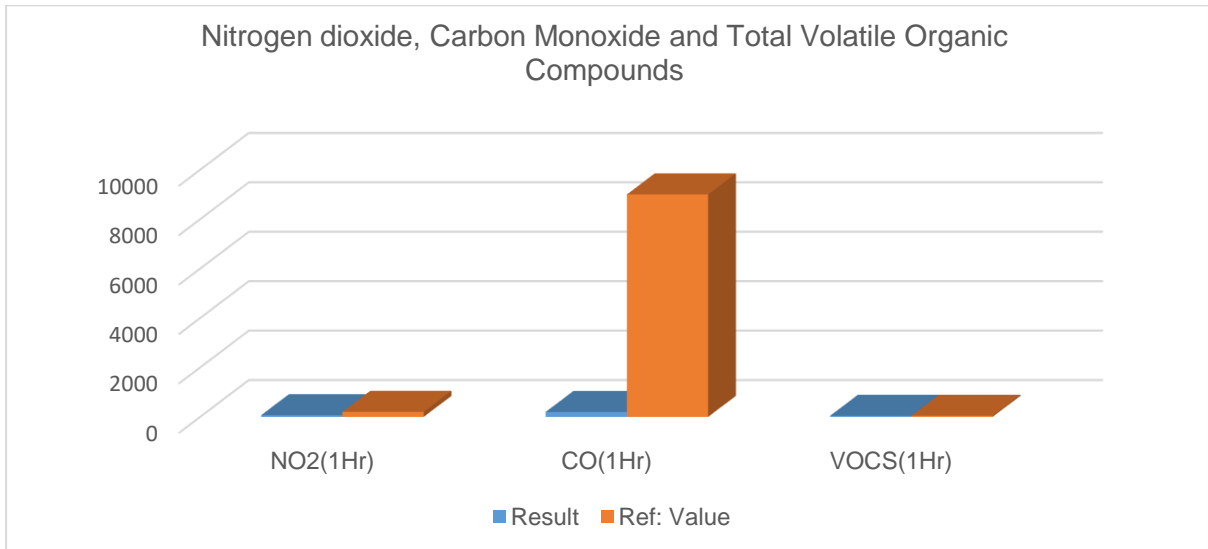


Figure 4. 37: Comparison between Reference and Result Values of Nitrogen dioxide, Carbon Monoxide and Volatile Organic Compounds

Ozone (O₃)

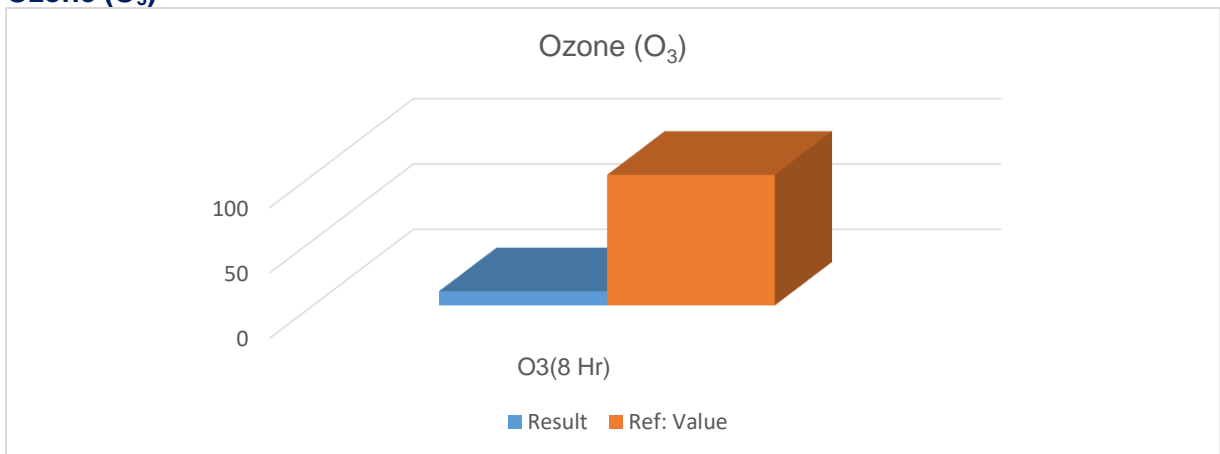


Figure 4. 38: Comparison between Reference and Result Values of Ozone

Hydro carbon (HC) and Methane (CH₄)

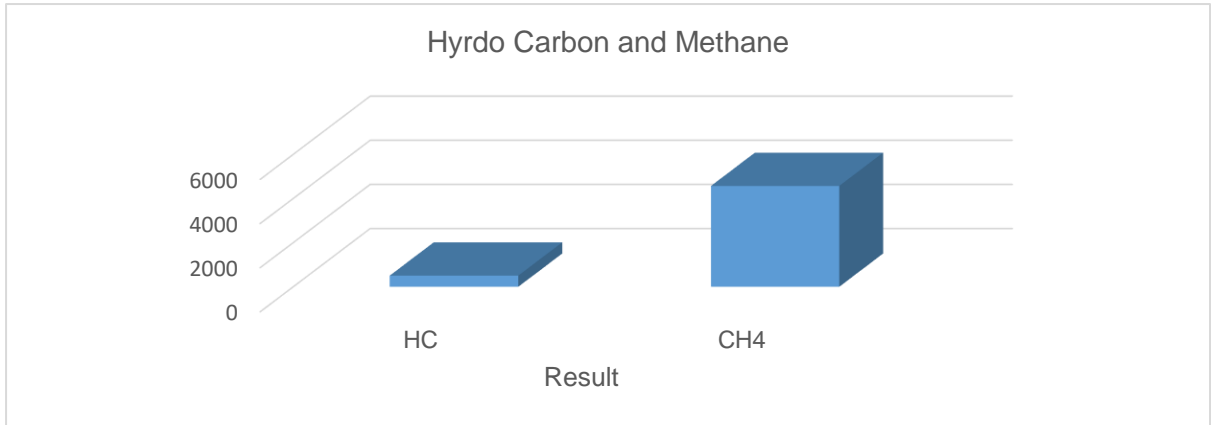


Figure 4. 39: Comparison between Reference and Result Values of Hydro Carbon and Methane

4.11.1.1.6 Sound level Results

The sound level test results are presented below.

Table 4. 22: Sound level results at AQ 1 (Measured date 25-26 April 2017)

Sample Site	L _{eq} in dBA			L _{max} in dBA		
	Day	Night	Total	Day	Night	Total
Farm land near Project site	38	45	42	25	30	27

Equivalent continuous sound level (L_{eq}) in sample site

Equivalent continuous sound level (L_{eq}), the constant noise level that would result in the same total sound intensity being produced over a given period, in day is 38 dBA and that in night is 45 dBA. All values are not increased that the position of observation should be taken into account.

Maximum sound pressure level (L_{max}) in sample site

Maximum sound pressure level (L_{max}), square root of mean of the square of the measurement values (RMS) in day is 25 dBA and at night is 30 dBA. All values are not increased at the position of observation should be taken into account.

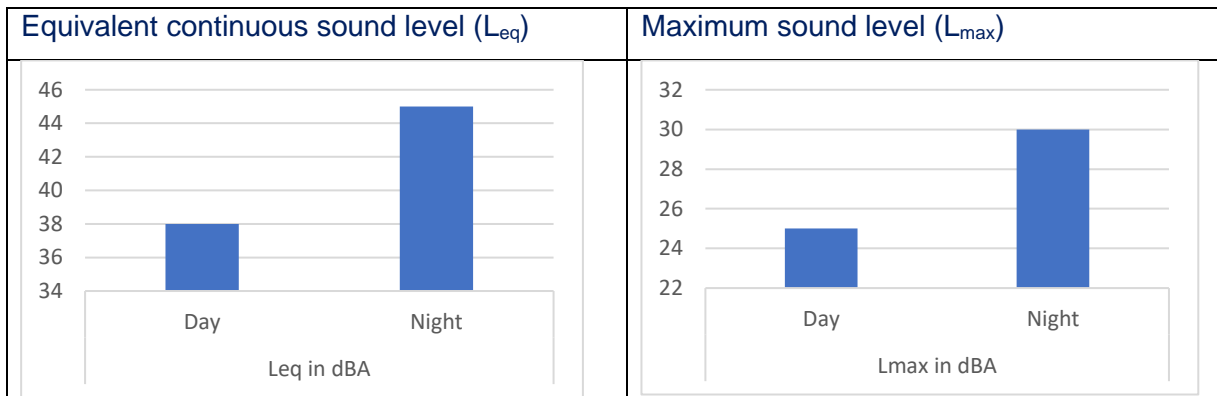


Figure 4. 40: 24 hours (1 hour average noise Leq in dBA and Lmax in dBA) AQ 1

Table 4. 23: Sound level results at AQ 2 (Measured date 17 July 2019)

Sample Site	L _{eq} in dBA			L _{max} in dBA		
	Day	Night	Total	Day	Night	Total
Monastery Compound, Kyarkansu village	42	33	40.8	27	22.6	26

Equivalent continuous sound level (L_{eq}) in sample site

Equivalent continuous sound level (L_{eq}), the constant noise level that would result in the same total sound intensity being produced over a given period, in day is 42 dBA and that in night is 33 dBA. All values are not increased that the position of observation should be taken into account.

Maximum sound pressure level (L_{max}) in sample site

Maximum sound pressure level (L_{max}), square root of mean of the square of the measurement values (RMS) in day is 27 dBA and at night is 22.6 dBA. All values are not increased at the position of observation should be taken into account.

The sound level at receptor (monastery – like residential area) is lower than the reference level.

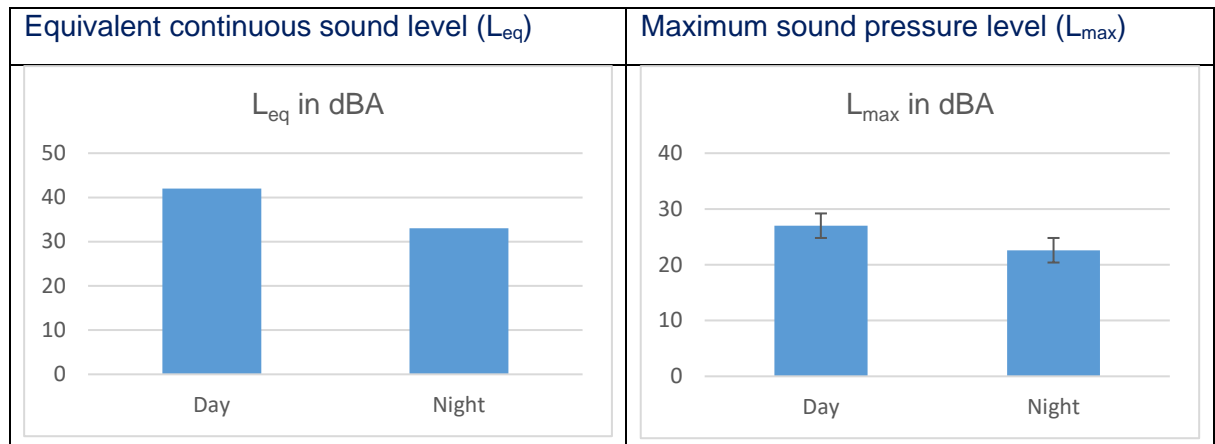


Figure 4. 41: 24 hours (1 hour average noise L_{eq} in dBA and L_{max} in dBA) AQ 2

4.11.1.2 Wind direction and wind speed

The wind direction and speed were measured with the instrument mentioned in the figure below. It was also done at the same two locations for air quality measurement on the same dates.



Figure 4. 42: Wind Direction and Speed Measurement Device

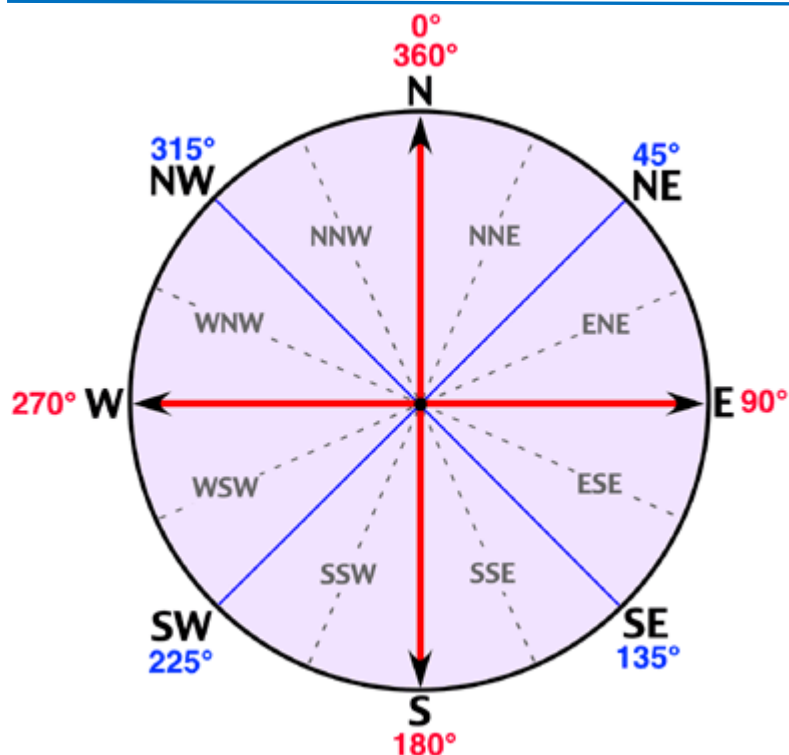


Figure 4. 43: Wind Direction Chart

Table 4. 24: Wind direction and wind speed Results at AQ1 (Measured date 25-26 April 2017)

Starting Date and Time	WDir Deg.	WSpM kph
25.4.2017 (9:00 am) to 26.4.2017 (8:00am)	288	0.3

The wind speed is 0.3 km per hour and wind is blowing from north west (approximately) direction.

Table 4. 25: Wind direction and wind speed Results at AQ 2 (Measured date 17 July 2019)

Starting Date and Time	WDir Deg.	WSpM kph
17.7.2019 (8:55 am) to 18.7.2019 (8:55 am)	166	0.33

The wind speed is 0.33 km per hour and wind is blowing from south east (approximately) direction.

Table 4. 26: Comparison between Air Quality measured in two seasons and sources of air emissions surrounding the site

Name	AQ-1	AQ-2	Reference Unit	Unit
PM ₁₀ (24 hr)	70.6	41.7	50	µg/m ³
PM _{2.5} (24 hr)	32.1	20.4	25	µg/m ³
SO ₂ (24 hr)	50.7	26.6	20	µg/m ³
NO ₂ (1 hr)	78.3	66.5	200	µg/m ³
CO (1 hr)	301	196.3	30000	µg/m ³
O ₃ (8 hr)	17.8	10.9	100	µg/m ³
VOCs (1 hr)	17.9	41	400	µg/m ³
HC	401.1	504	-	ppm
CH ₄	6362	4569	-	ppm

Measurement at AQ 1 was done in dry season and at AQ 2 was done in rainy season. As shown in the above table, the emissions of parameters PM₁₀ and PM_{2.5} measured in the dry

season was higher than the reference value while that of the same parameters measured in rainy season was lower than the reference value. This is mainly because of the unpaved access road (Nyaung Hnitpin - Ngarsuutaung main road) next to the project site. Earthmoving vehicles from other project and other heavy duty vehicles are heavily using the road for different purposes. Dust plumes behind vehicles moving along unpaved roads represent a typical occurrence and fugitive dust from unpaved roads can be considered for air pollution. The humidity, temperature, wind speed and direction of the season/month and man-made fires in the surrounding area are also factors for the higher emission values of parameters.

For SO₂, the major source of emission is expected from the combustion of diesel generators used by industries and local residents. Mainly from the exhaust emissions of vehicles and also from incomplete combustion of various other fuels (including wood, charcoal, and trash).

The dusty road in summer can be seen in the figures below.



Figure 4. 44: Road situation in summer at Nyaung Hnitpin Agricultural and Livestock Zone and windblown dust on the leaves which grown beside Ngar Suu Taung Road

4.11.1.3 Water Quality

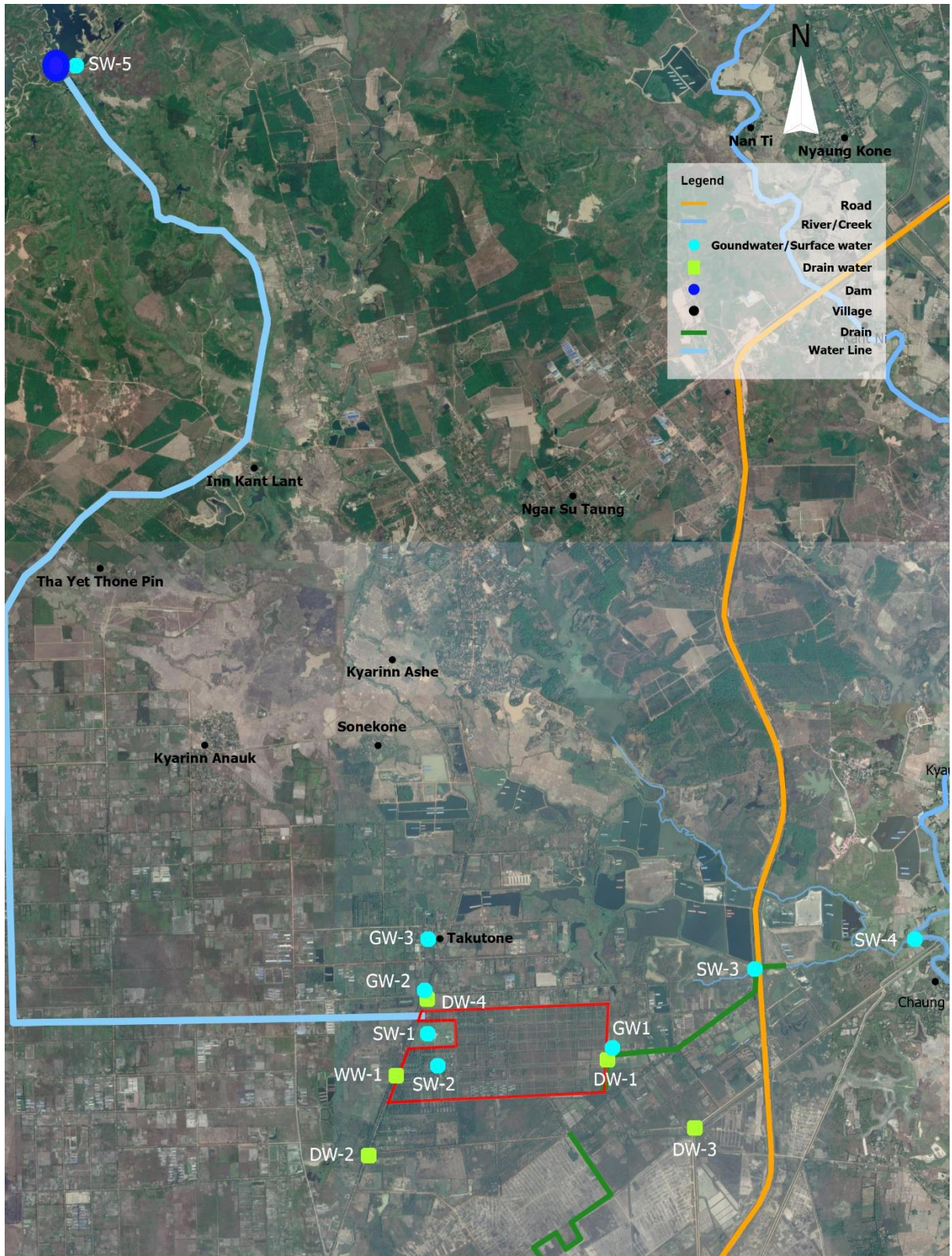


Figure 4. 45: Water Samples Collection Location

4.11.1.3.1 Water Samples Collection Locations

Total 12 water samples were collected to test water quality. 5 water samples for surface water/drinking water (pond, Kyarinn Creek (6.2 miles) near Yangon-Mandalay Expressway and Pazundaung Creek near Let Pyan Wae village, Kalihtaw Dam), 5 water samples for drain

water (wastewater), and 2 samples for ground water (tube well water). The analytical reports are baseline data of wastewater and ground water.

Table 4. 27: Water Sample Collection Locations (26 April 2017)

Sample point (ID)	Location		Remark
SW 1	N 17° 8' 36.27"	E 96° 9' 36.46"	Pond inside Nyaung Hnitpin Compound
SW 2	N 17° 8'22.00"	E 96° 9'39.28"	Pond inside Nyaung Hnitpin Compound
WW 1	N 17° 8'19.28"	E 96° 9'23.36"	Front drain of proposed project site

Table 4. 28: Water Sample Collection Locations (20 July 2019)

Sample point (ID)	Location		Remark
Ground water (Tube Well)			
GW-1	17° 8'29.45"N	96°10'45.81"E	From agriculture land, near the proposed Wastewater Treatment Plant area (downstream area)
GW-2	17° 8'51.67"N	96° 9'34.26"E	State Middle School, Takutone village
Surface water (Drinking water)			
SW-3	17° 9'0.07"N	96°11'41.49"E	Drinking water (Kyarinn Creek)
SW-4	17° 9'10.77"N	96°12'41.92"E	Drinking water (Pazung Taung Creek)
SW-5	17°14'28.60"N	96° 7'15.46"E	Kalihtaw Dam
Drain water (Wastewater)			
DW-1	17° 8'27.61"N	96°10'44.31"E	Existing drain, near proposed Wastewater Treatment Plant area
DW-2	17° 7'51.29"N	96° 9'12.92"E	Drain water at the corner of Zone 3 street and Ngar Suu Taung – Nyaung Hnitpin Road
DW-3	17° 8'1.29"N	96°11'17.83"E	Drain water near project area (road side of Ngarsuutaung – Nyaung Hnitpin Road)
DW-4	17° 8'49.91"N	96° 9'35.22"E	Drain water, outlet of drainage to Ngamoeyeik Dam canal

Note: The latitude and longitude of two water samples' locations for surface water/drinking water (Kyarinn Creek (6.2 miles) near Yangon-Mandalay Expressway and Pazundaung Creek near Let Pyan Wae village) are not included in the above table 4.28.

SW – Surface Water

GW – Ground Water (Water from Tube Well)

DW (WW) – Drain water (Wastewater)

Water samples collecting



<p>Water sample collected from drain at the front of Nyaung Hnitpin Compound.</p>	<p>Water sample collected from drain at the front of Nyaung Hnitpin Compound.</p>
	
<p>Water sample collected from pond at project site</p>	<p>Water sample collected from pond at project site</p>
	
<p>Water sample collected from pond at project site</p>	<p>Water sample collected from pond at project site</p>

Figure 4. 46: Water Samples Collection Location (April 2017)

	
<p>Ground water sampling at farmhouse which lies near proposed wastewater treatment plant</p>	



Figure 4. 47: Ground water sample collection points (July 2019)

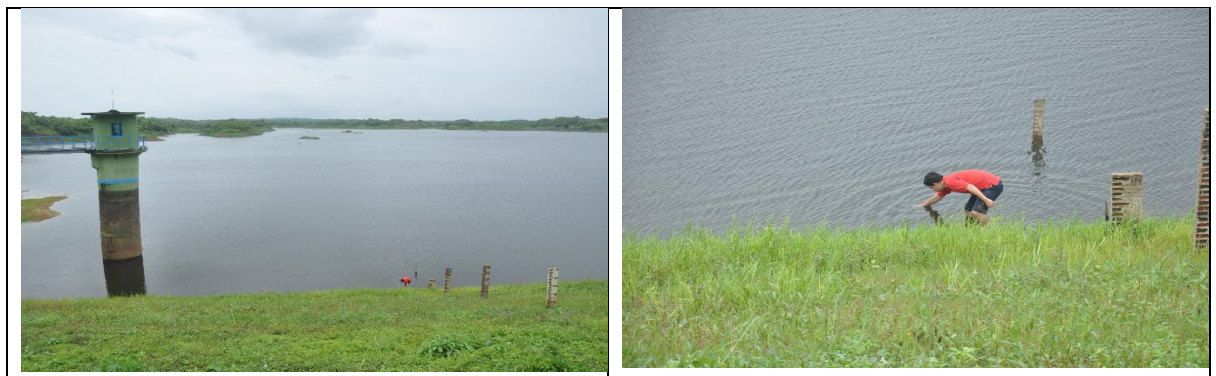




Figure 4. 49: Drain Water/Wastewater sample collection points (July 2019)

4.11.1.3.2 Water Quality Survey Method

The water samples were collected with specially treated bottles by sampling officer of Occupational and Environmental Health Department. Water samples were analyzed at the Occupational and Environment Health Department Laboratory and by using spectrophotometer, atomic absorption spectrophotometer (Graphite furnace method), pH meter with wastewater analysis standard method and POTATEST incubation method.

Ground water samples were collected from tube wells within (2) km of the proposed project site. In each location, two (2) replicates sampling were done at approximately the same time to identify the variability in all sampling and analysis system.

4.11.1.3.3 Water Quality Results

The water quality results are shown in the following tables.

Table 4. 29: Summary of Drain Water (Wastewater) & Surface Water/drinking water Laboratory Results (April 2017)

Parameter	Ref: Value	Unit	Results		
			WW-1 Wastewater	SW-1 Surface Water	SW-2 Surface Water
Turbidity	5-15	NTU	1	1	0.1
Nitrate	10	ppm	0	0	0
Chloride	1000	ppm	1.5	1.6	1.1
pH	5.5 – 9		7.1	7.3	6.5
Sulphate	1000	ppm	12	12	7
Total Dissolved Solid	2000	ppm	20	10	20
Chlorine	1.5	ppm	0.08	0.12	0.05
Electro conductivity	1500	µmhos/cm	70	10	10
Fluoride	1.5	ppm	0	0	0
Hardness	500	ppm as CaCO ₃	20	25	22
Color	15	TCU	10	10	5
COD	200	ppm	30	42	18.0
BOD	20 – 60	mg O ₂ /L	40.5	40.0	22.4
Oil and Grease	10	ppm	13.20	3.20	5.2
Arsenic	50	ppb	0.000	0.000	0.000
Beryllium	0.012	ppm	0.018	0.088	0.018
Calcium	200	ppm	3.406	2.003	2.901
Cadmium	0.003	ppm	0.003	0.005	0.008
Cobalt	0.001 – 0.002	ppm	0.000	0.000	0.000
Chromium	0.05	ppm	0.000	0.000	0.000
Copper	2	ppm	0.000	0.000	0.000
Iron	1	ppm	0.000	0.000	0.000

Lithium	0	ppm	0.005	0.005	0.004
Magnesium	150	ppm	1.840	1.857	2.436
Manganese	0.4	ppm	0.000	0.000	0.000
Molybdenum	0.07	ppm	0.000	0.000	0.000
Nickel	3	ppm	0.000	0.000	0.000
Lead	10	ppb	0.000	0.000	0.000
Antimony	0.02	ppm	0.000	0.014	0.022
Selenium	0.04	ppm	0.084	0.084	0.029
Strontium	0.5 – 1.5	ppm	1.640	1.453	0.55
Titanium	0	ppm	0.024	0.044	0.025
Vanadium	0.0012 – 0.001	ppm	0.000	0.000	0.000
Thallium	0.001	ppm	0.000	0.000	0.000
Zinc	3	ppm	0.000	0.000	0.000
Mercury	0.001	ppm	0.00	0.00	0.00

Findings: Oil and Grease content of wastewater sample 1 is higher than reference value. Heavy metal parameters of Beryllium, Lithium and Titanium for wastewater 1 and surface waters 1 and 2 are higher than reference value. Cadmium for surface waters 1 and 2 are higher than reference value. Antimony parameter of surface water 2 is higher than reference value. Selenium of wastewater 1 and surface water 1 is higher than reference value. Strontium of wastewater sample 1 is also higher than reference value.

Rationale for having higher concentrations of some parameters

Oil and Grease: It can be due to people intentionally drain oil products to the drainage system without considering their effects on the environment. This happens when mechanics spill oil after changing oil from vehicle or motorcycle engines of the villagers or people living nearby.

Natural occurrences such as hurricanes, earthquakes, sea storms, and other climatic disturbances cause natural oil spills.

Beryllium: The primary source of beryllium compounds in water appears to be release from coal burning and other industries using beryllium. Other sources of beryllium in surface water include deposition of atmospheric beryllium and weathering of rocks and soils containing beryllium.

Cadmium: It is widely distributed in the earth's crust at an average concentration of about 0.1 mg/kg. The highest level of cadmium compounds in the environment is accumulated in sedimentary rocks.

Lithium: Lithium is in the alkali-metal group that includes sodium and potassium. High concentration of Lithium in wastewater is expected due to the waste from batteries and grease. Lithium is a soft, silver-white alkali metal, found in some foods and, in some places, the drinking water. Lithium can be found throughout the world, but freshwater typically less than 0.001 to 0.003 ppm.

Antimony: Man-made releases of Antimony occur to water from waste incineration. Antimony is also released naturally from the earth's crust and so is found (usually at relatively low concentrations) in soils, natural water bodies and sediments.

Selenium: The most significant releases of Selenium are likely to occur from industry manufacturing or using it. Selenium may also be released when oil containing it is burned. Small amounts of Selenium compounds may also be released naturally from rocks, soils and water bodies containing them.

Strontium: Strontium is present in nearly all fresh water but generally only in trace amount. The concentration of strontium in wastewater is higher than reference value because this is

probably due to localized geologic conditions that supply considerable amounts of strontium to ground and waters of the area.

Titanium: Titanium is a component of various types of rock, such as rutile, anatase, ilmenite, titanite and brookite, and is therefore abundant in soils. Titanium oxide and other titanium compounds are among the most stable soil components. Consequently, only small amounts of titanium end up in water from rock weathering.

Table 4. 30: Summary of Ground water quality measurement and water quality criteria (July 2019)

Parameter	Ref: Value	Unit	Results		Remarks
			GW-1	GW-2	
Nutrient condition					
Nitrate	-	mg/L	0	0	Maintain the Standard
Salinity					
Chloride	250	mg/L	1.4	2.2	Maintain the Standard
Sulphate	250	mg/L	0	0	Maintain the Standard
Acidification status					
pH	6.5-8.5		6.4	6.6	Normal Range
Trace Metals					
Arsenic	0.05	mg/L	0.006	0.013	Maintain the Standard
Lead	0.01	mg/L	0.0012	0.002	Maintain the Standard
Mercury	0.001	mg/L	0.161	0.00	GW-1, Out of Range
Copper	2	mg/L	0.000	0.003	Maintain the Standard
Zinc	3	mg/L	0	0	Maintain the Standard
Magnesium	150	mg/L	9.674	31.48	Maintain the Standard
Manganese	0.4	mg/L	0.103	1.864	GW-2, Out of Range
Iron	1	mg/L	1.688	3.154	Out of Range
Fluoride	1.5	mg/L	0	0	Maintain the Standard
Other parameters					
Turbidity	5	NTU	0.1	0.1	Maintain the Standard
Total Dissolved Solid	1000	mg/l	126	175	Maintain the Standard
Color	15	TCU	1	1	Maintain the Standard
Total Hardness	500	mg/L as CaCO ₃	228	241	Maintain the Standard
Electro conductivity	-	µmhos/cm	180	250	Maintain the Standard
Phenols	-	mg/L	0	0	Normal
Chlorine (residual)	4	mg/L	0	0	Normal
Bacteriological parameters					
Total coliforms	3	CFU/100ml	7	5	Out of Range
Faecal coliforms	0	CFU/100ml	2	1	Out of Range

Findings: The samples were analyzed for physicochemical parameters and results compared with National Drinking Water Quality Standard. After comparing with National Drinking Water Quality Standard both tube wells, it can be seen that most of the water results of the tube well I, agriculture land, near project site and tube well II, residential area are within the standards. However, the results (mercury concentration, iron contents, total coliforms and faecal coliforms) of the tube well I, farmland area are out of standard's range and while others maintain the standards and also the results (manganese concentration, iron content, total coliforms and faecal coliforms) of the tube well II, residential area are out of standard's range and while others maintain the standards.

Rationale for having higher concentrations of some parameters

Mercury: The main source of mercury in the project area is waste disposal (municipal and hazardous waste). Atmospheric mercury is deposited and accumulated in soils which are in

the connection to water. Mercury in groundwater is from dissolution of minerals and ores, industrial effluents, mercury in the air eventually settles into water or onto land where it can be washed into water.

Manganese and Iron: Iron (Fe) and Manganese (Mn) are metals that occur naturally in soils, rocks and minerals. In the aquifer, groundwater comes in contact with these solid materials dissolving them, releasing their constituents, including Fe and Mn, to the water. The extent to which Fe and Mn dissolve in groundwater depends on the amount of oxygen in the water and, to a lesser extent, upon its degree of acidity, i.e., its pH. Industrial effluent, sewage and landfill leachate may also contribute iron and manganese to local groundwater.

Total Coliforms and Faecal Coliforms: Sources of Total and Faecal Coliform in groundwater can include agricultural runoff, effluent from septic systems or sewage discharges, infiltration of domestic or wild animal fecal matter, poor well maintenance and construction (particularly shallow dug wells) can also increase the risk of bacteria and other harmful organisms getting into a well water supply.

Table 4. 31: Summary of Surface water (Drinking Water) quality measurement and water quality criteria (July 2019)

Parameter	Ref: Value	Unit	SW -3 Drinking water (Kyar Inn Creek)	SW-4 Drinking water (Pazung Taung Creek)	SW-5 Drinking water (Kalihtaw Dam)
Oxygenation condition					
BOD		mg O ₂ / L	20.5	58.1	-
COD		mg/L	8.3	18.8	-
Nutrient condition					
Nitrate	50	mg/L	0	0	0
Salinity					
Chloride	250	mg/L	4.9	1.0	0.5
Sulphate	250	mg/L	8	3	1.0
Phosphate	-	mg/L	3	2	
Acidification status					
pH	6.5-8.5		7.2	7.9	6.6
Trace Metals					
Arsenic	0.05	mg/L	0	0	0.011
Lead	0.01	mg/L	0.000	0.000	0.0009
Mercury	0.001	mg/L	0.000	0.000	0.000
Copper	2	mg/L	0.008	0.005	0.000
Zinc	3	mg/L	2	1	0.000
Magnesium	150	mg/L	14.32	16.8	10.57
Manganese	0.4	ppm	-	-	0.56
Iron	1	mg/L	0.19	0.09	5.804
Fluoride	1.5	mg/L	0	0.0	0
Other parameters					
Turbidity	5	NTU	0.1	1	0.1
TDS	1000	mg/L	196	140	77
Color	15	TCU	10	5	1
EC	-	µS/cm	280	200	110
Total Hardness	500	mg/L as CaCO ₃	57	68	189
Chlorine (Residual)	4	mg/L	0.07	0.14	0.01
Oil and grease		mg/L	1.06	2.62	
Phenol	-	mg/L			0.04
Bacteriological parameters					
Total coliforms	3	CFU/ 100ml	-	-	5
Faecal coliforms	0	CFU/ 100ml	-	-	1

Note: BOD = Biological Oxygen Demand, COD = Chemical Oxygen Demand, DO = Dissolved Oxygen, TDS = Total Dissolved Solid, 1 mg/l= 1ppm, TCU = True Color Unit, NTU – Nephelometric Turbidity Unit

Findings: The samples were analyzed for physiochemical parameters and results compared with National Drinking Water Quality Standard to identify and interpret any deviation in the statutory limits set for parameters in the standard. After comparing with National Drinking Water Quality Standard for surface water (drinking water), it can be seen that all of the results of the parameters are within the reference value except the contents of iron, total coliforms and faecal coliforms of Kalihtaw Dam water is higher than the reference values. The water quality is fair in all other locations and mainly because they are flowing water bodies.

Rationale for having higher concentrations of some parameters

Iron: This is expected because of naturally occurring (erosion and weathering of rocks and minerals) and water from natural geological sources.

Total Coliforms and Faecal Coliforms: Total coliforms include bacteria that are found in the soil, in water that has been influenced by surface water, and in human or animal waste. Human and animal wastes are a primary source of bacteria in water. These sources of bacterial contamination include runoff from feedlots, pastures, dog runs, and other land areas where animal wastes are deposited. Additional sources include seepage or discharge from septic tanks, and natural soil/plant bacteria.

Fecal-coliform bacteria sources, such as combined sewer overflows and wildlife, contribute bacteria mainly through run off during rainfall, whereas other sources, such as sanitary sewer overflows and failing septic systems, contribute bacteria during low- and high-flow conditions. Bacteria also can originate from point sources such as leaking sewers or in leachate from failing septic systems.

Table 4. 32: Summary of Wastewater/Drain Water quality measurement and water quality criteria (July 2019)

Parameter	Ref: Value	Unit	Results			
			DW-1	DW-2	DW-3	DW-4
Oxygenation condition						
BOD	30	mg O ₂ / L	10.5	8.2	2.2	24.4
COD	125	mg / L	26	12	6	14
Nutrient condition						
Nitrate	-	mg / L	0	0	0	0
Salinity						
Chloride	-	mg / L	0.9	1.2	1.4	0.7
Sulphate	-	mg / L	0	3.0	5.0	0
Acidification status						
pH	6-9.0		6.3	6.4	7.0	6.4
Trace Metals						
Arsenic	0.1	mg / L	0.015	0.016	0.015	0.012
Lead	0.1	mg / L	0.0003	0.0005	0.0001	0.0017
Mercury	0.01	mg / L	0.000	0.000	0.000	0.000
Copper	0.5	mg / L	0.000	0.008	0.000	0.001
Magnesium	-	mg / L	1.669	7.992	8.008	4.65
Manganese	-	mg / L	0.712	0.184	1.334	0.546
Iron	3.5	mg / L	3.276	6.259	10.96	4.463
Fluoride	20	mg / L	0	0	0	0
Cadmium	0.1	mg / L	0.00	0.00	0.00	0.00
Chromium	0.5	mg / L	0.00	0.058	0.013	0.00
Other parameters						
Turbidity	-	NTU	0.1	0.1	1	1
TDS	-	mg / L	35	7	14	14
Color	-	TCU	1	1	5	5
EC	-	µmhos/cm	50	10	20	20

Total Hardness	-	mg / L as CaCO ₃	0	6	11	0
Total Chlorine	0.2	mg / L	0.09	0.16	0.11	0.08
Oil and grease	10	mg / L	5.07	2.76	1.23	0.59
Phenol	0.5	mg / L	0	0.21	0.38	0.03
Bacteriological parameters						
Total coliform	400	CFU/100ml	0	0	10	15
Faecal coliform	-	CFU/100ml	0	0	2	3

Note: BOD = Biological Oxygen Demand, COD = Chemical Oxygen Demand, DO = Dissolved Oxygen, TDS = Total Dissolved Solid, 1 mg/l= 1ppm, TCU = True Color Unit, NTU – Nephelometric Turbidity Unit, CFU = Coliform Forming Unit

Findings:The samples were analyzed for physicochemical parameters and results compared with National Environmental Quality (Emission) Guidelines to identify and interpret any deviation in the statutory limits set for parameters in the standard. After comparing with Guidelines, it can be seen that all of the results of the wastewater except iron contents (DW 2, 3, and 4) are within the reference values.

Rationale for having higher concentrations of some parameters

Iron: Iron exists naturally in rivers, lakes, and underground water. It may also be released to water from natural deposits, industrial wastes, refining of iron ores, and corrosion of iron containing metals. The combination of naturally occurring organic material and iron can be found in shallow wells and surface water. This water is usually yellow or brown but may be colorless.

4.11.1.4 Soil Quality

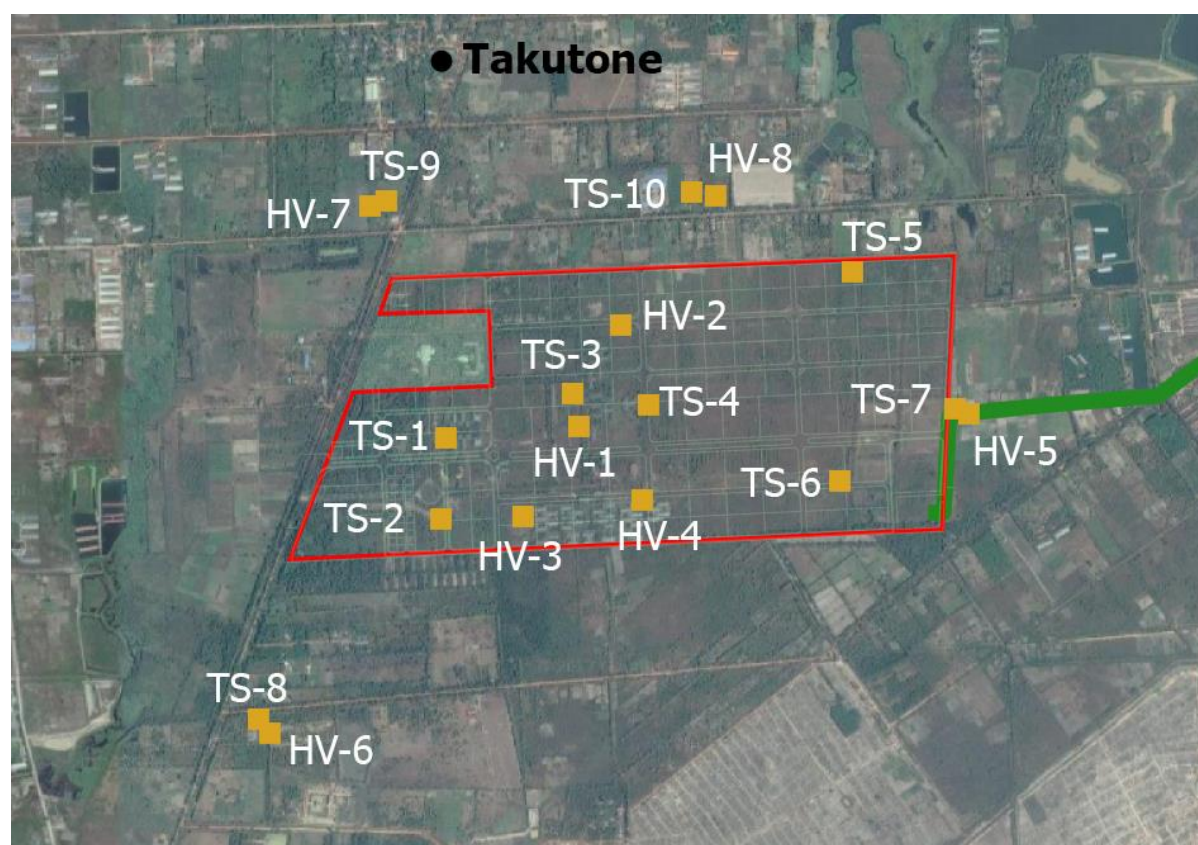


Figure 4. 50: Soil Samples Collection Location

4.11.1.4.1 Soil Samples Collection Location

Total 10 samples of top soil and 8 samples of deep/sub soil were collected for testing nutrients and heavy metals content of the soil respectively. In April 2017, top soil from 6 places and deep/sub soil from 4 places were collected from the project site. In July 2019, top soil from 4

places and deep/sub soil from 4 places were collected from different places around the project area including within the agricultural zone 1.

Table 4. 33: Top soil sample locations (Nutrients Test) (April 2017)

Sample point	Soil Depth	Layer	Location	
			Latitude	Longitude
TS -1	0 "-8"	A/P	17° 8'25.70"N	96° 9'40.70"E
	8" -20"	A/B		
TS -2	0 "-8"	A/P	17° 8'14.90"N	96° 9'39.80"E
	8" -22"	A/B		
TS -3	0 "-10"	A/P	17° 8'31.10"N	96° 9'56.90"E
	10" -18"	A/B		
TS-4	0 "-10"	A/P	17° 8'30.20"N	96°10'5.50"E
	10" -25"	A/B		
TS-5	0 "-10"	A/P	17° 8'45.60"N	96°10'32.70"E
	10" -20"	A/B		
TS-6	0 "-10"	A/P	17° 8'19.60"N	96°10'30.20"E
	10" -20"	A/B		

Table 4. 34: Deep/Sub soil sample locations (Heavy Metals Test) (April 2017)

Sample point	Soil Depth	Layer	Location	
			Latitude	Longitude
HV -1	0 " - 10"	A/P	17° 8'25.97"N	96° 9'57.38"E
	10" -22"	A/B		
HV -2	0 " -10"	A/P	17° 8'38.10"N	96°10'4.20"E
	10" -23"	A/B		
HV -3	0 " -10"	A/P	17° 8'17.60"N	96° 9'50.70"E
	18" -20"	A/B		
	30 " -35"	B		
HV-4	0 " -10"	A/P	17° 8'18.87"N	96°10'7.73"E
	10" -25"	A/B		

Table 4. 35: Top soil sample locations (Nutrients Test) (July 2019)

Sample Point	Soil depth	Layer	Latitude and Longitude	Location
TS-7	0" - 12"	A/P	N 17° 08' 29" E 96° 10' 45"	Eastern Area of Project Site
	12" - 25"	A/B		
		B		
TS-8	0" - 12"	A/P	N 17° 07' 50" E 96° 09' 17"	Near Project Area
	12" - 25"	A/B		
		B		
TS-9	0" - 12"	A/P	N 17° 08' 52" E 96° 09' 34"	Near Farmer Harvest
	12" - 25"	A/B		
		B		
TS-10	0" - 12"	A/P	N 17° 08' 54" E 96° 10' 12"	Near Project Area
	12" - 25"	A/B		
		B		

Table 4. 36: Sub soil/Deep soil sample locations (Heavy Metals Test) (July 2019)

Sample Point	Soil depth	Layer	Latitude and Longitude	Location
HV-5	0" - 12"	A/P	N 17° 08' 29" E 96° 10' 45"	Eastern Area of Project Site
	12" - 25"	A/B		
		B		
HV-6	0" - 12"	A/P	N 17° 07' 50" E 96° 09' 17"	Near Project Area
	12" - 25"	A/B		
		B		

HV-7	0" - 12" 12" - 25"	A/P A/B B	N 17° 08' 52" E 96° 09' 34"	Near Farmer Harvest
HV-8	0" - 12" 12" - 25"	A/P A/B B	N 17° 08' 54" E 96° 10' 12"	Near Project Area

TS – Top Soil

HV – Deep/Sub Soil

Soil samples collecting



Collecting soil samples



Collecting soil samples



Collecting soil samples



Testing soil Electrical conductivity (Ec)



Testing soil pH level



Comparing soil color

Figure 4. 51: Soil Sample Collection (April 2017)



Figure 4. 52: Soil Sample Collection (July 2019)

4.11.1.4.2 Soil Survey Method

The soil survey was conducted by using the Russian soil scientist soil analysis method and FAO/UNESCO method.

When soil survey was conducted physical properties of soil such as soil colour, texture, structure, moisture, hardness, drainage, inclusion and new formation were recorded and the soil name was given by using Russian soil classification, FAO soil classification method.

When classified the soil types, soil horizontal characteristics were based and identified the soil type. Soil properties are formed according to the soil forming process and it is not possible to give nomenclature on the base of site seeing different norms of the soil characteristics. It

needs thousands of million years to form one inch cubic of soil but soil can be easily deteriorated in a few years due to improper use of the land and soil.

4.11.1.4.3 Soil Samples Results for April 2017 Collection

In April 2017, top soil from 6 places and deep/sub soil from 4 places were collected from the project site and according to the soil sample laboratory results, the surveyed soils are light yellow Brown Forest Lateritic at base soils and called as Xanthic Ferralsols according to F.A.O soil classification. The top soils are sandy loam texture. The sub soils about 15 inches depth are 1:1 Kaolinite clay. The third layer soils, about 25" inches depth are clayey and soft lateritic soils and some are red in colour. These soils have rapid water infiltration rate and rain water will be disappeared as soon as after raining. It contains well drainage infiltration rate. It has low soil pH and low cation exchangeable capacity and low in Ca^{+2} , Mg^{+2} and K^{+} . It has low humus content and reduces in micro nutrient content.

The soils are suitable for orchard and vegetable cultivation and it needs to use compost, organic manure and chemical fertilizers as a balanced fertilization. Split application and foliar fertilizer application are suitable. Broken building and other waste materials should be removed when these soils are used for agriculture because it is a Nyaung Hnitpin Zone (3) departmental compound.

The soil survey results are expressed as Profile Description, External Features, chemical analysis and water-soluble salts.

Table 4. 37: Soil Analysis Results

Soil texture	Silt Loam, Silty Clay Loam
Soil Structure	Crumbly & sub angular blocky
Soil pH	Moderately acid, Near Neutral, Extremely acid, Strongly acid
Nitrogen content (N_2)	Low, Very Low
Phosphorus content (P)	Low
Potassium content (K_2O)	Low
Humus	Medium
Organic carbon	Medium
Calcium (Ca^{++})	Low
Magnesium (Mg^{++})	Low
Potassium (K^{+})	Low
Aluminum (Al^{+3})	Not detected
Hydrogen (H^{+})	Low
Sodium (Na^{+})	Low
Cation Exchange capacity (C.E.C)	Low
Electrical conductivity (EC)	Very Low

Table 4. 38: Soil Soluble Salts Analysis Results

Total dissolved solids TDS	Low
Electrical conductivity (Ec)	Very Low

Sodium Adsorption Ratio SAR	Low (Not detected)
Residual Sodium Carbonate RSC	Not detected
pH	Moderately acid, Near Neutral, Extremely acid
Dorminate salts	CaCl ₂ , Ca (SO ₃) ₂ , NaCl, CaSO ₄

Table 4. 39: Heavy Metal Analysis Results

No	Heavy Metal Contaminants	Profile No.1 HV A/P Layer 0-10"		Profile No.2 HV A/P Layer 0-10"		Profile No.3 Layer (B) Layer 30-35"		Profile No.4 HV Layer 0-10"	
		Result (ppm)	Maximum Level (ppm)	Result (ppm)	Maximum Level (ppm)	Result (ppm)	Maximum Level (ppm)	Result (ppm)	Maximum Level (ppm)
1	Nickel (Ni)	ND	35	ND	35	ND	35	ND	35
2	Chromium (Cr)	ND	100	ND	100	ND	100	ND	100
3	Cadmium (Cd)	ND	0.8	ND	0.8	ND	0.8	ND	0.8
4	Lead (Pb)	ND	85	ND	85	ND	85	ND	85
5	Iron (Fe)	894.5	250	950.5	250	939	250	801	250

ND – Not Detected

Soil analytical data of heavy metal analyzed at Pesticide Analytical Laboratory, Plant Protection Division, Department on Agriculture, Ministry of Agriculture, Livestock and Irrigation resulted. The concentration of heavy metals: Nickel, Chromium, Cadmium and lead are (Not Detected) lower than reference value.

Iron (Fe) is 894.5 ppm at Profile No.1 HV A/P Layer 0-10", 950.5 ppm at Profile No.2 HV A/P Layer 0-10", 939 ppm at Profile No.3 HV A/P Layer 30-35" and 801 ppm at Profile No.4 HV A/P Layer 0-10" are higher than maximum permitted level of 250 ppm.

Rationale for having higher concentration of Iron

The amount of iron is different in soils of various origins and used differently. Its natural, average content in soil is 0.6% and may undergo significant changes due to the high vertical mobility of iron in soil profiles. Continuous emissions of metal bearing dust and fumes, as well as discharge of sewage and waste deposition cause increased concentration of heavy metals in the environment. The main sources of iron in the environment are emissions from metal and metallurgical establishments and coal combustion.

Analytical data evaluation and recommendation

There is no plant nutrient problem in soil analysis of Nyaung Hnitpin Zone (3) compound in Hlegu Township, Yangon Region. Also soil problems such as saline soil, sodic soil, sodium toxicity, high in calcium and aluminum content etc.

There is no distinct problem in total dissolved salt content in water soluble salts analysis. SAR sodium Absorption Ratio also did not show as a soil problem.

There is no problem in Electrical conductivity and residual sodium carbonate.

Therefore, there is no nutrients problem and soil soluble salts problem in these soils.

4.11.1.4.4 Soil Samples Results for July 2019 Collection

In July 2019, top soil from 4 places and deep/sub soil from 4 places were collected from different places around the project area including within the agricultural zone 1 for testing

nutrients and heavy metals contents. The survey results show that the surveyed soils are light yellow Brown Forest Lateritic at base soils and called as Xanthic Ferralsols according to F.A.O soil classification. The top soils are sandy loam texture. The sub soils about 15 inches depth are 1:1 Kaolinite clay. The third layer soils, about 25" inches depth are clayey and soft lateritic soils and some are red in colour. These soils have rapid water infiltration rate and rain water will be disappeared as soon as after raining. It contains well drainage infiltration rate. It has low soil pH and low cation exchangeable capacity and low in Ca²⁺, Mg²⁺ and K⁺. It has low humus content and reduces in micro nutrient content.

The soils are suitable for orchard and vegetable cultivation and it needs to use compost, organic manure and chemical fertilizers as a balanced fertilization. Split application and foliar fertilizer application are suitable.

The soil survey results are expressed as Profile Description, External Features, chemical analysis and water-soluble salts.

Table 4. 40: Soil Analysis Results

Soil texture	Silt Loam, Silty Clay Loam
Soil Structure	Crumbly & sub angular blocky
Soil pH	Extremely acid, Strongly acid
Nitrogen content (N ₂)	Low, Very Low
Phosphorus content (P)	Low
Potassium content (K ₂ O)	Low
Humus	Medium
Organic carbon	Medium
Calcium (Ca ⁺⁺)	Low
Magnesium (Mg ⁺⁺)	Low
Potassium (K ⁺)	Low
Aluminum (Al ⁺³)	Not detected
Hydrogen (H ⁺)	Low
Sodium (Na ⁺)	Low
Cation Exchange capacity (C.E.C)	Low
Electrical conductivity (EC)	Very Low

Table 4. 41: Soil Soluble Salts Analysis Results

Total dissolved solids TDS	Low
Electrical conductivity (Ec)	Very Low
Sodium Adsorption Ratio SAR	Low (Not detected)
Residual Sodium Carbonate RSC	Not detected
pH	Strongly acid
Dorminate salts	CaCl ₂ , Ca (SO ₃) ₂ , NaCl, CaSO ₄

Table 4. 42: Heavy Metal Analysis Results

No	Heavy Metal Contaminants	Profile No.5 HV A/P Layer 0-12" A/B Layer 12" – 25" B		Profile No.6 HV A/P Layer 0-12" A/B Layer 12" – 25" B		Profile No.7 Layer A/P Layer 0-12" A/B Layer 12" – 25" B		Profile No.8 HV A/P Layer 0-12" A/B Layer 12" – 25" B	
		Result (ppm)	Maximum Level (ppm)	Result (ppm)	Maximum Level (ppm)	Result (ppm)	Maximum Level (ppm)	Result (ppm)	Maximum Level (ppm)
1	Nickel (Ni)	ND	35	ND	35	ND	35	ND	35
2	Chromium (Cr)	ND	100	ND	100	ND	100	ND	100
3	Cadmium (Cd)	ND	0.8	ND	0.8	ND	0.8	ND	0.8
4	Lead (Pb)	ND	85	ND	85	ND	85	ND	85
5	Iron (Fe)	809.8	250	950.8	250	900.2	250	850.4	250

ND – Not Detected

Soil analytical data of heavy metal analyzed at Pesticide Analytical Laboratory, Plant Protection Division, Department on Agriculture, Ministry of Agriculture, Livestock and Irrigation resulted. The concentration of heavy metals: Nickel, Chromium, Cadmium and lead are (Not Detected) lower than reference value.

Iron (Fe) is 809.8 ppm at Profile No.5 HV A/P Layer 0-12", 950.8 ppm at Profile No.6 HV A/P Layer 0-12", 900.2 ppm at Profile No.7 HV A/P Layer 0-12" and 850.4 ppm at Profile No.8 HV A/P Layer 0-12" are higher than maximum permitted level of 250 ppm.

The reasons why the concentration of iron is higher than the reference value are mentioned in the above section 4.11.1.4.3 Soil Samples Results for April 2017 Collection (Rationale for having higher concentration of Iron).

Analytical data evaluation and recommendation

There is no plant nutrient problem in soil analysis of Nyaung Hnitpin Industrial Complex Project compound in Hlegu Township, Yangon Region. Also soil problems such as saline soil, sodic soil, sodium toxicity, high in calcium and aluminum content etc.

There is no distinct problem in total dissolved salt content in water soluble salts analysis. SAR sodium Absorption Ratio also did not show as a soil problem.

There is no problem in Electrical conductivity and residual sodium carbonate.

Therefore, there is no nutrients problem and soil soluble salts problem in these soils.

4.11.2 Biological Environmental Baseline Data Collection

The biological assessment portion considers the likely ecological issues relating to the proposed Development. It can be expected that significant effects on habitats and species can arise directly during construction (including demolition) and following the completion of the proposed development.

The project site itself has been the used land for some years in since 1995. However, after 2008, the area was abandoned and buildings were left with natural ecological succession of plants and animals in a wilderness terrestrial ecosystem of 600-acre compound, though some connectivity exist with surrounding environment which is basically striving with agricultural activities of flowers and commercial fruit and vegetable growing practice for almost a decade.

The secondary information of terrestrial and aquatic fauna, flora and land use was also recorded, and interviews with local residents were made for getting information of the history of the area and presence and absence of flora and fauna in the past and present time.



Figure 4. 53: Area of the project where tall trees are scattering, and grasses take place the larger area



Figure 4. 54: Northwestern part of the project is covered by to some extent thick tall trees



Figure 4. 55: Tree-lacking area of project site and somewhat larger water bodies existing in the vicinity

Both terrestrial and aquatic ecosystems were examined. Recorded terrestrial flora, fauna and natural habitats were based on secondary information and direct observation and through examination. The tree, plant, and shrub and species composition of plant and their distribution near the project site were studied and identified.

Bird watching was undertaken in the habitats of the study area to build up a true picture of species-habitat relationship. Collection of butterflies was made along the transect lines set up at various habitats in the proposed project area. The specimens were photographed.

For the floral assessment, walk-through and visual identification methods were used. Total thirty seven different family of flowers were recorded. Among them, most are abundant and frequent for species abundance assessment. Total twenty two family types of avifauna, fifteen different types of butterfly, eleven different types of dragonflies, seven different types of fish and prawn were recorded.

The impact assessment covered:

- Evaluation of identified important features: flora and fauna species, habitats and vegetation;
- Description and evaluation of the magnitude and significance of potential impacts of the proposed project on species, habitats and vegetation;
- Detail species-specific assessment;
- Mitigation measures to address the identified potential impacts;
- Cumulative impact assessment; and
- Description and evaluation of residual impacts of the proposed project.

4.11.2.1 Methodology for flora and fauna Survey

4.11.2.1.1 Flora (Vegetation)



Figure 4. 56: Depression of the land at the nearby area of project site keeps water until summer

For the purpose of conducting this EIA, boundaries of the study area were to determine the site maps and development plans provided. The species in both direct impact zone and indirect impact zone nearby villages, lakes, farming and plantation fields were studied, identified and recorded.

The methods of identification are walk-through and visual identification by the floral expert. The survey method was conducted into analysis of the presence or absence of ecologically or commercially important species diversity of flora on the site.



Figure 4. 57: Recorded Terrestrial Plants of Flora collected from secondary forest type in KMIC Project Area

Table 4. 43: Valuable and abundance assessment of collected species identified from KMIC Project Site

No	Type	Family	Science Name	Common Name	Economic/ Ecological Value	Habit	Abundance Assessment			
							D	A	F	R
1	Monocotyledons	Araceae	<i>Caladium esculentum Vent</i>	Pain	Animal feed	Herb	*	*		
2			<i>Caladium numboldtti</i>	Pain kyar	Animal feed	Herb	*	*		
3		Gramineae	<i>Echinochloa colona</i>	Ba-sa-myat	Animal feed	Grass		*		
4		Musaceae	<i>Musa sapientum L.</i>	Nget pyaw	Food	Herb		*		
5		Poaceae	<i>Chrysopogon acicularis</i>	Nauk-po-myat	Wild	Grass		*		
6			<i>Eleusine indica Gaertn.</i>	Sin-ngo-myat	Wild/ Medicine	Grass		*		
7			<i>Cyndon dactylon (L.)</i>	Mye-sa-myat	Wild	Grass		*		
8			<i>Panicum spp.</i>	Myet-hka	Wild	Grass	*	*		
9			<i>Bambusa spp.</i>	Wa	Shade	Bambo			*	
10		Pontederiaceae	<i>Eichornia crassipes Mart</i>	Beda	Wild/ Compose	Aquatic plant		*		
11			<i>Monochoria Vaginalis Kunth</i>	Kadauk set	Wild/ Compose	Aquatic plant			*	
12	Dicotyledons	Asteraceae	<i>Chromolaena odorata (L.)R.M.King & Robinson</i>	Bi-zet	Wild/ Medicine	Shrub	*	*		

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13			<i>Wedelia calendulacea</i> Nees.	Nay-kya-ka-lay	Wild	Herb	*	*		
14			<i>Lactuca sativa</i> L.	Salad	Wild	Shrub				*
15			<i>Mikaniamicrantha</i> H.B.K	Bi-zet-nwee	Wild	Climber		*		
16		Anacardiaceae	<i>Anacardium occidentale</i> L.	Thi-ho	Food	Tree				*
17			<i>Mangifera</i> spp.	Thet-yat	Food	Tree			*	
18		Amaryllidaceae	<i>Crinum amoenum</i> Roxb.	Khat-ta	Ornamental	Herb				*
19		Apocynaceae	<i>Allamanda cathartica</i> L.	Shwe-wa-pan	Ornamental	Shrub			*	
20		Arecaceae	<i>Livistona</i> spp.	Taung-htan	Ornamental	Tree			*	
21		Amaryllidaceae	<i>Zephyranthes</i> spp..	Hnin-pan	Ornamental	Herb			*	
22		Asphodelaceae	<i>Alove vera</i>	Sha-shaung-letpat	Food/Medicine	Herb			*	
23		Bignoniaceae	<i>Oroxylum indicum</i> (L.)Kurz.	Kyaung-sha	Food/Medicine	Small tree			*	
24		Bombacaceae	<i>Bombox ceiba</i> L.	Let-pan	Wild	Tree				*
25		Costaceae	<i>Costus speciosus</i> Sm.	Pha-lan-taung-hmwe	Wild	Herb				*
26		Connaraceae	<i>Cnestis palapa</i> Merr.	Khwee-dauk	Wild/Food	Climber			*	
27		Cariceae	<i>Carica papaya</i> L.	Thin-baw	Food/Medicine	Woody plant			*	
28		Cucurbitaceae	<i>Cucumis sativa</i> L.	Tha-khaw-thi	Food	Climber		*	*	
29		Euphorbiaceae	<i>Cassava</i> spp.	Ka-law	Wild/Food	Woody plant				*
30			<i>Sauropus albicans</i> Blume	Kyet-tha-hin	Wild	Climber		*		
31			<i>Antidesma bunius</i> (L.)Spreng.	Kin-ba-lin	Wild/Food	Small/Shrub			*	
32			<i>Hevea brasiliensis</i>	Rubber	Industrial plantation	Tree			*	
33			<i>Ricinus</i> spp.	Kyet-su	Wild	Small tree			*	
34		Fabaceae	<i>Ptreocarpus macrocarpus</i> Kurz.	Pa-dauk	Wild	Tree				*
35		Leeaceae	<i>Leea rubra</i> Blume	Na-ga-mauk-ni	Food/Medicine	Herb			*	
36		Lythraceae	<i>Lagerstroemia speciosa</i> (L)Pers	Pyin ma	Wild	Tree		*	*	
37		Melastomaceae	<i>Melastoma malabathricum</i> L.	Say-o-pok	Wild/medicine	Tree		*	*	
38		Moraceae	<i>Atrocarpus heterophyllus</i> Lam.	Pein-ne	Food	Tree			*	
39		Meliaceae	<i>Azadirachta indica</i> A.juss	Tama	Wild	Tree			*	
40		Mimosoideae	<i>Acacia auriculiformis</i> A.Cunn.	Ma-lay-sia-padauk	Recover plant	Tree		*	*	
41		Mimosaceae	<i>Albizia lebbek</i> Benth	Kokko	Wild	Tree				*
42			<i>Ficus cinerascens</i>	Tha-phan	Wild	Tree			*	

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43			<i>Ficus spp.</i>	Naung	Wild	Tree			*	
44			<i>Leucaena gluca Benth</i>	Baw-za-gaing	Wild	Small tree			*	
45			<i>Neptunia javanica Miq</i>	Hti-ga-yon	Wild	Shrub		*	*	
46		Myrtaceae	<i>Psidium guajava L.</i>	Ma-la ka	Food	Small tree			*	
47			<i>Eucalyptus camaldulensis Dehh</i>	Yu-ka-lit	Recover plant	Tree			*	
48			<i>Syzygium fruticosum DC.</i>	Tha-bye	Plantation plant	Small tree			*	
49		Oleaceae	<i>Jasminum arboresens Roxb</i>	Sabe	Ornamental	Shrub			*	
50		Rutaceae	<i>Citrus aurantifolia (Christm.)Sw</i>	Than-pa-ya	Food	Shrub			*	
51		Rhamnaceae	<i>Zizyphus jujube Lam.</i>	Zi	Food	Tree			*	
52		Sapindaceae	<i>Nephelium lappaceum</i>	Kyawt-mauk-thi	Food	Small tree			*	
53		Smilacaceae	<i>Smilax macrophylla Roxb</i>	Sein-na-baw-gyi	Wild	Climber			*	
54		Sapotaceae	<i>Mimusops elengi L.</i>	Kha-yae	Shade	Tree				*
55		Tiliaceae	<i>Triumfetta bartramia L.</i>	Kat-se-thay	Wild	Shrub			*	
56			<i>Microcos tomentosa J.E.Smith</i>	Mya-ya	Wild	Tree			*	
57		Vitaceae	<i>Cissus hastate Miq</i>	Sa-byit-yaing	Wild	Climber			*	
58		Zingiberaceae	<i>Curcuma attenuate Wall.</i>	Ma-la	Food	Herb			*	

D = Dominant, A = Abundant, F = Frequent, R = Rare



Acacia auriculiformis A. Cunn



Cissus hastate Miq



Figure 4. 58: Recorded terrestrial plants of Flora collected from KMIC Project Area





<i>Acacia auriculiformis</i> A.Cunn.	<i>Livistona</i> spp
	
<i>Croton roxburghianus</i> Bal.	<i>Dalbergia</i> spp.

Figure 4. 59: Recorded woody plants species of Flora from KMIC Project Area



	
<i>Carex</i> spp.	<i>Aglaia odorata</i>
	
<i>Carex</i> spp. and <i>Wedelia calendulacea</i>	<i>Delonix regia</i>
	
<i>Musa</i> spp.	<i>Sauropus albican</i>

Figure 4. 60: Recorded herb and shrub plants species of Flora from KMIC Project Area



Figure 4. 61: Recorded aquatic plants species of Flora from KMIC Project Area

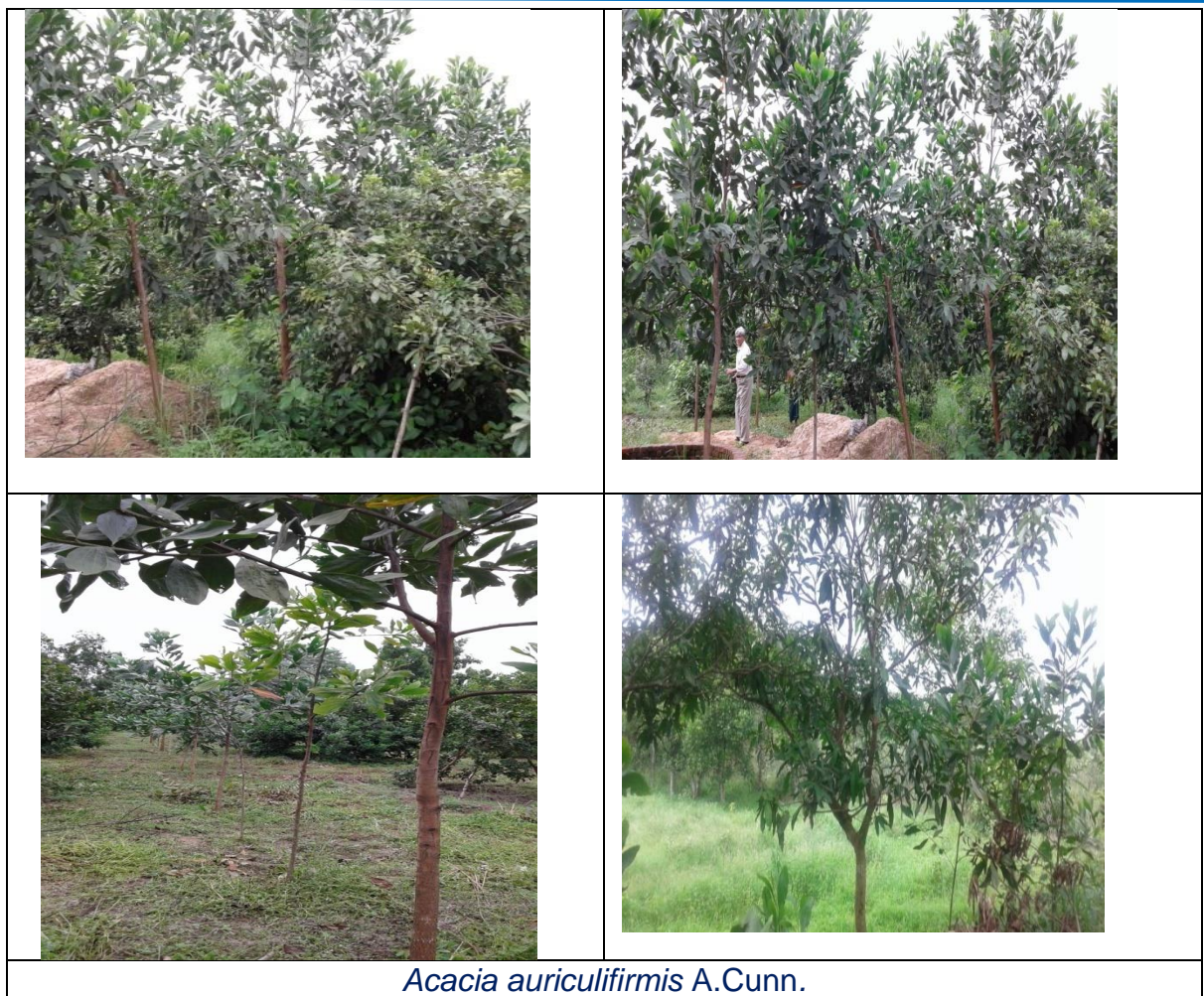


Figure 4. 62: Recorded recover plantation species of Flora from KMIC Project Area

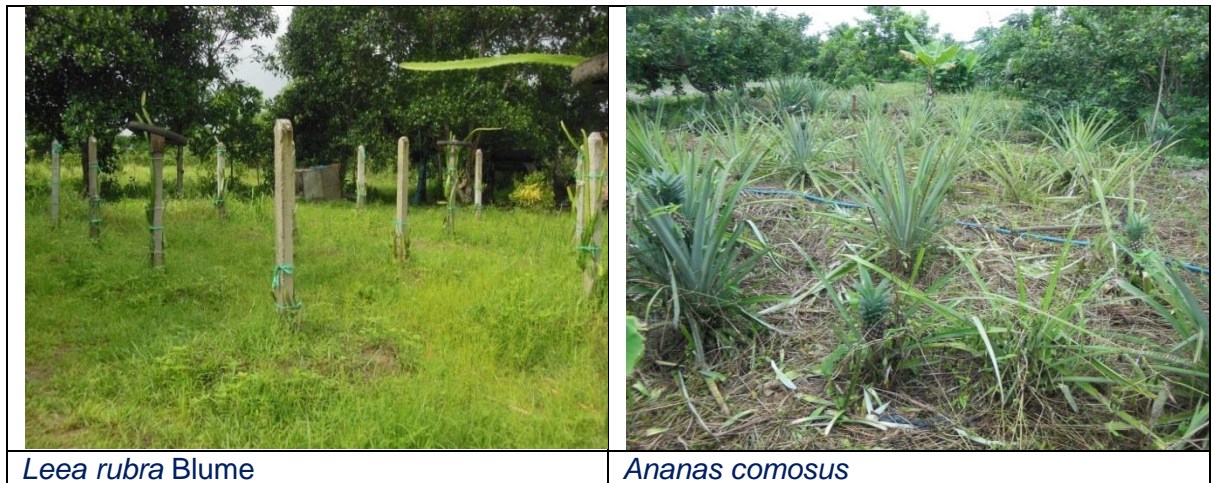




Figure 4. 63: Recorded plantation plants species of Flora from KMIC Project Area





Figure 4. 64: Recorded harvest plants species of Flora from surround orchard of KMIC Project Area



Figure 4. 65: Recorded grass plants species of Flora from KMIC Project Area

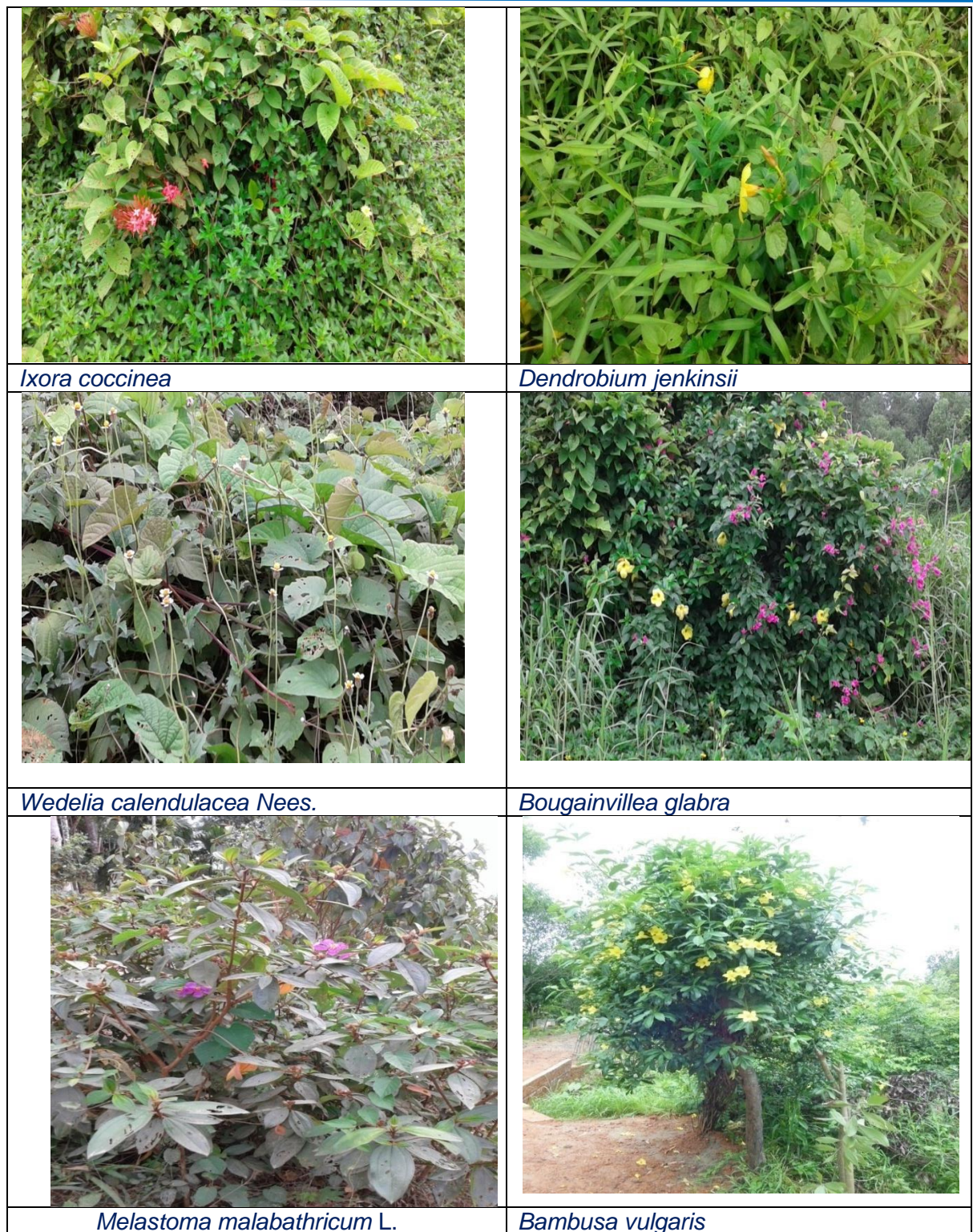


Figure 4. 66: Recorded flowering plants species of Flora from KMIC Project Area

4.11.2.1.2 Avifauna



The findings of an avifaunal survey conducted in 11th, June 2017 were mentioned in the following tables. Birds were identified and enumerated according to the Fixed Radius Point Count Method which is based on the principle of counting individuals from a defined location and estimating the distance to the individual contact. Avifaunal species observed between point counts were also recorded. A total of 7 (seven) points done over a one-day period along

other paths within the area. Notation of species observed between surveys points formed the basis of transects counts for the area.

Table 4. 44: Systematic Position of Avifauna collected from KMIC Project Site










Sr. No.	Order	Family	Scientific name	Common name	Local name
1.	Galliformes	Turnicidae	<i>Turnix suscitator</i>	Barred button quail	Ngone
2.	Coraciiformes	Halcyonidae	<i>Halcyon smymensis</i>	White throated kingfisher	Bein nyin
3.	Coraciiformes	Meropidae	<i>Merops orientalis</i>	Green Bee Eater	Puzin htoe
4.	Cuculiformes	Centropodidae	<i>Centropus sinensis</i>	Greater coucal	Boke
5.	Cuculiformes	Centropodidae	<i>Centropus bengalensis</i>	Lesser coucal	Boke hinie
6.	Apodiformes	Apodidae	<i>Cypsiurus balasiensis</i>	Asian palm swift	Moesar
7.	Columbiformes	Columbidae	<i>Columba livia</i>	Rock pigeon	Khao
8.	Columbiformes	Columbidae	<i>Streptopelia chinensis</i>	Spotted dove	Gyoe Lae Pyauk
9.	Suliformes	Anhingidae	<i>Phalacrocorax niger</i>	Little cormorant	Tinkyee
10.	Passeriformes	Corvidae	<i>Corvus macrorhynchos</i>	Large billed crow	Jungle crow
11.	Passeriformes	Corvidae	<i>Dicrurus macrocercus</i>	Black drongo	Nget law
12.	Passeriformes	Corvidae	<i>Artamus fuscus</i>	Ashy wood swallow	Nil
13.	Passeriformes	Sylviidae	<i>Pteruthius aenobarbus</i>	Chestnut fronted shrike babbler	Nil
14.	Passeriformes	Sylviidae	<i>Turdoides gularis</i>	White throated babbler	Swae
15.	Passeriformes	Sturnidae	<i>Acridotheres tristis</i>	Common myna	Setyet
16.	Passeriformes	Sturnidae	<i>Acridotheres grandis</i>	White vented myna	Nil
17.	Passeriformes	Pycnonotidae	<i>Pycnonotus cafer</i>	Red vented bul bul	Voak phin ni
18.	Passeriformes	Pycnonotidae	<i>Pycnonotus blanfordi</i>	Streak eared bul bul	Voak chawe
19.	Passeriformes	Muscicapidae	<i>Copsychus saularis</i>	Oriental magpie robin	Thabaikele
20.	Passeriformes	Cisticolidae	<i>Prinia hodgsonii</i>	Grey breasted prinia	Nil
21.	Passeriformes	Passeridae	<i>Passer montanus</i>	Eurasian tree sparrow	Sargalay
22.	Passeriformes	Passeridae	<i>Passer domesticus</i>	House sparrow	Sargalay

Table 4. 45: Recorded species of Avifauna from KMIC Project Area

Sr. No.	Order	Family	Scientific name	Common name	Local name	Image
1.	Galliformes	Turnicidae	<i>Turnix suscitator</i>	Barred button quail	Ngone	
2.	Coraciiformes	Halcyonidae	<i>Halcyon smymensis</i>	White throated kingfisher	Bein nyin	

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3.	Coraciiformes	Meropidae	<i>Merops orientalis</i>	Green Bee Eater	Puzin htoe	
4.	Cuculiformes	Centropodidae	<i>Centropus sinensis</i>	Greater coucal	Boke	
5.	Cuculiformes	Centropodidae	<i>Centropus bengalensis</i>	Lesser coucal	Boke hinie	
6.	Apodiformes	Apodidae	<i>Cypsiurus balasiensis</i>	Asian palm swift	Moesar	
7.	Columbiformes	Columbidae	<i>Columba livia</i>	Rock pigeon	Khao	
8.	Columbiformes	Columbidae	<i>Streptopelia chinensis</i>	Spotted dove	Gyoe Lae Pyauk	
9.	Suliformes	Anhingidae	<i>Phalacrocorax niger</i>	Little cormorant	Tinkyee	
10.	Passeriformes	Corvidae	<i>Corvus macrorhynchos</i>	Large billed crow	Jungle crow	
11.	Passeriformes	Corvidae	<i>Dicrurus macrocercus</i>	Black drongo	Nget taw	
12.	Passeriformes	Corvidae	<i>Artamus fuscus</i>	Ashy wood swallow	Nil	
13.	Passeriformes	Sylviidae	<i>Pteruthius aenobarbus</i>	Chestnut fronted shrike babbler	Nil	

14.	Passeriformes	Sylviidae	<i>Turdoides gularis</i>	White throated babbler	Swae	
15.	Passeriformes	Sturnidae	<i>Acridotheres tristis</i>	Common myna	Setyet	
16.	Passeriformes	Sturnidae	<i>Acridotheres grandis</i>	White vented myna	Nil	
17.	Passeriformes	Pycnonotidae	<i>Pycnonotus cafer</i>	Red vented bul bul	Voak phin ni	
18.	Passeriformes	Pycnonotidae	<i>Pycnonotus blanfordi</i>	Streak eared bul bul	Voak chawe	
19.	Passeriformes	Muscicapidae	<i>Copsychus saularis</i>	Oriental magpie robin	Thabaike lwe	
20.	Passeriformes	Cisticolidae	<i>Prinia hodgsonii</i>	Grey breasted prinia	Nil	
21.	Passeriformes	Passeridae	<i>Passer montanus</i>	Eurasian tree sparrow	Sargalay	
22.	Passeriformes	Passeridae	<i>Passer domesticus</i>	House sparrow	Sargalay	

4.11.2.1.3 Insects and Amphibians Fauna

Insects and amphibians being the most obvious groups observed on the project area. Surveys to identify the presence of these groups of animals were conducted through the use of stationary observation sites and walking transects on the property for general identification and utilizing the point count method.







Table 4. 46: Butterfly species (order Lepidoptera) recorded from KMIC Project Area

Sr. No.	Order	Family	Scientific name	Common name
1.	Lepidoptera	Nymphalidae	<i>Acraea terpsicore</i>	Tawny coster
2.		Nymphalidae	<i>Danaus genutia</i>	Striped tiger
3.		Papilionidae	<i>Papilio demoleus</i>	Lime butterfly
4.		Papilionidae	<i>Papilio demoleus</i>	Swallowtail butterfly

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5.		Nymphalidae	<i>Euploea crameri</i>	Euploea crameri bremeri (Spotted black crow)
6.		Hesperiidae	<i>Lambrix salsala</i>	Chestnut bo
7.		Nymphalidae	<i>Tirumala limniace</i>	Oriental blue tiger
8.		Pieridae	<i>Eurema hecabe</i>	Grass yellow
9.		Nymphalidae	<i>Athyma ranga</i>	Black veined sergeant
10.		Pieridae	<i>Appias libythea</i>	Striped albatross
11.		Nymphalidae	<i>Junonia almana</i>	Peacock pansy
12.		Hesperiidae	<i>Taractrocera ceramas</i>	Grass dart
13.		Nymphalidae	<i>Celaenorrhinus ambareesa</i>	Spotted flat
14.		Pieridae	<i>Catopsilia pomona</i>	Emigrant
15.		Nymphalidae	<i>Eulaceura osteria</i>	Purple duke

Table 4. 47: Recorded species of Butterflies from KMIC Project Area

Sr. No	Order	Family	Scientific name	Common name	Image
1.	Lepidoptera	Nymphalidae	<i>Acraea terpsicore</i>	Tawny coster	
2.		Nymphalidae	<i>Danaus genutia</i>	Striped tiger	
3.		Papilionidae	<i>Papilio demoleus</i>	Lime butterfly	
4.		Papilionidae	<i>Papilio demoleus</i>	Swallowtail butterfly	
5.		Nymphalidae	<i>Euploea crameri</i>	Euploea crameri bremeri (Spotted black crow)	
6.		Hesperiidae	<i>Lambrix salsala</i>	Chestnut bo	

7.		Nymphalidae	<i>Tirumala limniace</i>	Oriental blue tiger	
8.		Pieridae	<i>Eurema hecabe</i>	Grass yellow	
9.		Nymphalidae	<i>Athyma ranga</i>	Black veined sergeant	
10.		Pieridae	<i>Appias libythea</i>	Striped albatross	
11.		Nymphalidae	<i>Junonia almana</i>	Peacock pansy	
12.		Hesperiidae	<i>Taractrocer a ceramas</i>	Grass dart	
13.		Nymphalidae	<i>Celaenorhinus ambareesa</i>	Spotted flat	
14.		Pieridae	<i>Catopsilia pomona</i>	Emigrant	
15.		Nymphalidae	<i>Eulaceura osteria</i>	Purple duke	

Table 4. 48: Dragonflies (order Odonata) recorded from KMIC Project Area

Sr.no	Order	Family	Scientific name	Common name
1.	Odonata	Libellulidae	<i>Trithemis pallidinervis</i>	Dancing dropping
2.			<i>Brachythemis contaminata</i>	Asian groundling
3.			<i>Rhyothemis variegata</i>	Common picture wing
4.			<i>Orthetrum pruinosum</i>	Crimson tailed marsh hawk

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5.			<i>Trithemis festiva</i>	Indigo dropwing
6.			<i>Neurothemis tullia</i> (Male)	Pied paddy skimmer
7.			<i>Neurothemis tullia</i> (female)	Pied paddy skimmer
8.			<i>Rhodothemis rufa</i>	Common redbolt
9.			<i>Potamarcha congener</i>	Common chaser
10.			<i>Pantala hymenaea</i>	Spot winged glider
11.			<i>Orthetrum sobina</i>	Green skimmer

Table 4. 49: Recorded species of Dragonflies from KMIC Project Area

Sr. No.	Order	Family	Scientific name	Common name	Photographs
1.	Odonata	Libellulidae	<i>Trithemis pallidinervis</i>	Dancing droping	
2.			<i>Brachythemis contaminata</i>	Asian groundling	
3.			<i>Rhyothemis variegata</i>	Common picture wing	
4.			<i>Orthetrum pruinosum</i>	Crimson tailed marsh hawk	
5.			<i>Trithemis festiva</i>	Indigo dropwing	
6.			<i>Neurothemis tullia</i> (Male)	Pied paddy skimmer	
7.			<i>Neurothemis tullia</i> (female)	Pied paddy skimmer	
8.			<i>Rhodothemis rufa</i>	Common redbolt	
9.			<i>Potamarcha congener</i>	Common chaser	




10.			<i>Pantala hymenaea</i>	Spot winged glider	
11.			<i>Orthetrum sobina</i>	Green skimmer	

Table 4. 50: Systematic position of Herptofauna recorded from KMIC Project Area

Sr.no	Order	Family	Scientific name	Common name
1.	Squamata	Scincidae	<i>Mabuya multifasciata</i>	East Indian brown mabuya

Table 4. 51: Recorded species of Herptofauna from KMIC Project Area

Sr.no	Order	Family	Scientific name	Common name	Photograph
1.	Squamata	Scincidae	<i>Mabuya multifasciata</i>	East Indian brown mabuya	


4.11.2.1.4 Fish and Prawn Fauna







Recorded fish species have been studied with the help of fishermen at the wetland and inn (fisheries) nearby the project area.

Table 4. 52: Systematic position of Fish and prawn fauna recorded from KMIC Project Area

Sr. No.	Order	Family	Scientific name	Common name
1.	Cypriniformes	Cyprinidae	<i>Danio spp:</i>	Striped danio
2.	Perciformes	Anabantidae	<i>Anabas testudineus</i>	Climbing perch
3.	Osteoglossiformes	Notopteridae	<i>Notopterus notopterus</i>	Featherback
4.	Perciformes	Channidae	<i>Channa punctata</i>	Spotted snakehead
5.	Siluriformes	Clariidae	<i>Clarias batrachus</i>	Walking catfish
6.	Perciformes	Cichlidae	<i>Oreochromis mossambicus</i>	Mozambique Tilapia
7.	Decapoda	Palaemonidae	<i>Macrobrachium marible</i>	Fresh water prawn

Table 4. 53: Recorded species of Fish and prawn fauna from KMIC Project Area

Sr. No.	Order	Family	Scientific name	Common name	Photographs
1.	Cypriniformes	Cyprinidae	<i>Danio spp:</i>	Striped danio	

2.	Perciformes	Anabantidae	<i>Anabas testudineus</i>	Climbing perch	
3.	Osteoglossiformes	Notopteridae	<i>Notopterus notopterus</i>	Featherback	
4.	Perciformes	Channidae	<i>Channa punctata</i>	Spotted snakehead	
5.	Siluriformes	Clariidae	<i>Clarias batrachus</i>	Walking catfish	
6.	Perciformes	Cichlidae	<i>Oreochromis mossambicus</i>	Mozambique Tilapia	
7.	Decapoda	Palaemonidae	<i>Macrobrachium maribale</i>	Fresh water prawn	

4.11.2.2 Ecological Impact of the Project

Development of industrial complex projects as integrated scheme on single expanse of land such as the project area property brings within a series of environmental impacts. The

following section identifies anticipated environmental impacts resulting from the proposed project based on the information provided and, on the surveys, conducted in the area.

4.11.2.3 Loss of Vegetation Cover

Primary forests are forests of native tree species, where there are no clearly visible indications of human activities and the ecological processes are not significantly disturbed. Secondary forests regenerate on native forests, which have been cleared by natural or manmade causes, such as agriculture or ranching.

The clearing of the site in preparation for the construction phase represents an immediate and negative environmental impact to the area. The removal of trees, shrubs, herbs and other aquatic plants would reduce the existing vegetative cover, resulting in irreversible loss of natural habitat for floral and associated fauna in this area.

4.11.2.4 Loss of Terrestrial Fauna

The industrial construction activities and the presence of the development will impact negatively (disruptive) effects on the composition of the bird community and lead to loss of species from the area. There will obviously be loss of species from the area, however based on the low numbers of species observed, any loss would be negligible. IT is expected that most species would relocate to more suitable habitat.

Suggested mitigation especially with respect to the birds and insects are able to tolerate the replanting of the development. For sustain and safety of fish fauna care should be needed to avoid releasing anthropogenic wastes into it that is connected with wetland, Inns and Kalitaw creek near the project area.

Table 4. 54: Recorded terrestrial plants species from KMIC Project Area

Sr. No.	Forest type	Habit	Type	Family	Species
1.	Secondary growth forest	Trees	Wilde type and Vegetation type	38	58
		Small trees	Wilde type and Vegetation type		
		Shrubs	Wilde type		
		herbs	Wilde type		
		Climbers/Creepers	Wilde type		
		Aquatic plants	Wild type		
		Horticulture plants	Vegetation type		
		Ornamental plants	Vegetation type		

Table 4. 55: Recorded species of Fish fauna from KMIC Project Area

Sr. No.	Name	Order	Family	Species
1.	Avifauna	7	14	22
2.	Insects fauna(Butterfly)	1	4	15
3.	Insects fauna(Dragonfly)	1	1	11
4.	Herpetofauna	2	2	2
5.	Fish and prawn fauna	5	7	7

4.11.2.5 Discussion and Conclusion for Biodiversity

The studies area from the diversity of avifauna that is recorded species in the proposed area, habitats vegetation for richness of other fauna has been fragmented by human exploitation and modification in the project area. Selecting appropriate plant species for replanting is essential in determined the types of birds, butterflies and other fauna that will re- inhabit the site upon completion if the project.

Industrial clearing of tropical forests for non-timber plantations has been a key driver of biodiversity loss in tropical zone.

A large proportion of plantations are monocultures of fast growing, low-density wood species, such as *Pinus spp.* or *Eucalyptus spp.*, used for fuel, or the pulp and paper industry, notably *Acacia spp.* These plantations also often consist of exotic species, and consider them as a separate category, because they are typically harvested on a much shorter time cycle than timber plantations

Agro forestry maintains a structural diversity that imitates the native forest better than conventional pastures, row crops, and monoculture plantations. In agro forestry systems, perennial tree crops such as coconut, rubber, and other woody plants replace the original forest understory but some canopy trees are left for shade.

The variable impacts of forestry management types on local species richness of different taxa, we conduct a global categorical meta-analysis, using log response ratio as a measure of effect size. Existing meta-analyses on the subject are either restricted to a region of the taxon e.g. plants, management type e.g. selective logging, or consider forestry as one generic land use type without accounting for differences in management types.

The recent trend to destroy forests and to replace them with alien tree plantations, euphemized by timber industry supporters as "planted forests". The expose this dishonesty, it is necessary to enlist the expert views of indigenous peoples and others who are prepared to stand up in defense of the truth: Plantations are not forests!

The estimates for three vegetation layers (canopy, sub canopy, and tall shrub) on primary and secondary sites. The midpoint of the field estimated cover class at each point as our cover estimate importance values by multiplying the percent contribution of each species by the midpoint of the cover class for the primary and secondary forest.

The suggestion of the maintaining and replacing green areas on the development site with trees, shrubs, herbs and other aquatic plants that would continue to attract avifauna and insect species to this area. Plant large trees on perimeter of compound to create a natural windbreak, which will also serve the purpose of being a sight screen.

The materials produced from industrial process released into the atmosphere or discharged into streams or rivers cause pollution. Pollution in the environment affects both animals and plants, either by causing a loss in productivity (slower growth and loss yield) or by damage to tissue, thus causing illness or disease. Pollution can occur in the atmosphere, in the soil, in the sea or in fresh water causes pollution. The progressive accumulation of wastes causes pollution.

Pollution entering the atmosphere produces their effects in many ways; Noise pollution of construction site and vehicles may stress to different fauna of this area and it should be minimized as possible as. This was related to the development plans and the potential impacts identified.

Recommendations are made which are aimed at ensuring compliance with relevant environmental status and ensuring the preservation or restoration of the ecological balance through the mitigation of anticipated impacts.

According to ecological impact, indicator that reveals negatively impact to habitat, biodiversity, change in drainage pattern and soil erosion and noise pollution but positive impact on recover plantation in the project area of industrial construction which having little negative of impact weight.

4.11.3 Social Environmental Baseline Data Collection

4.11.3.1 Setting the Study Limit

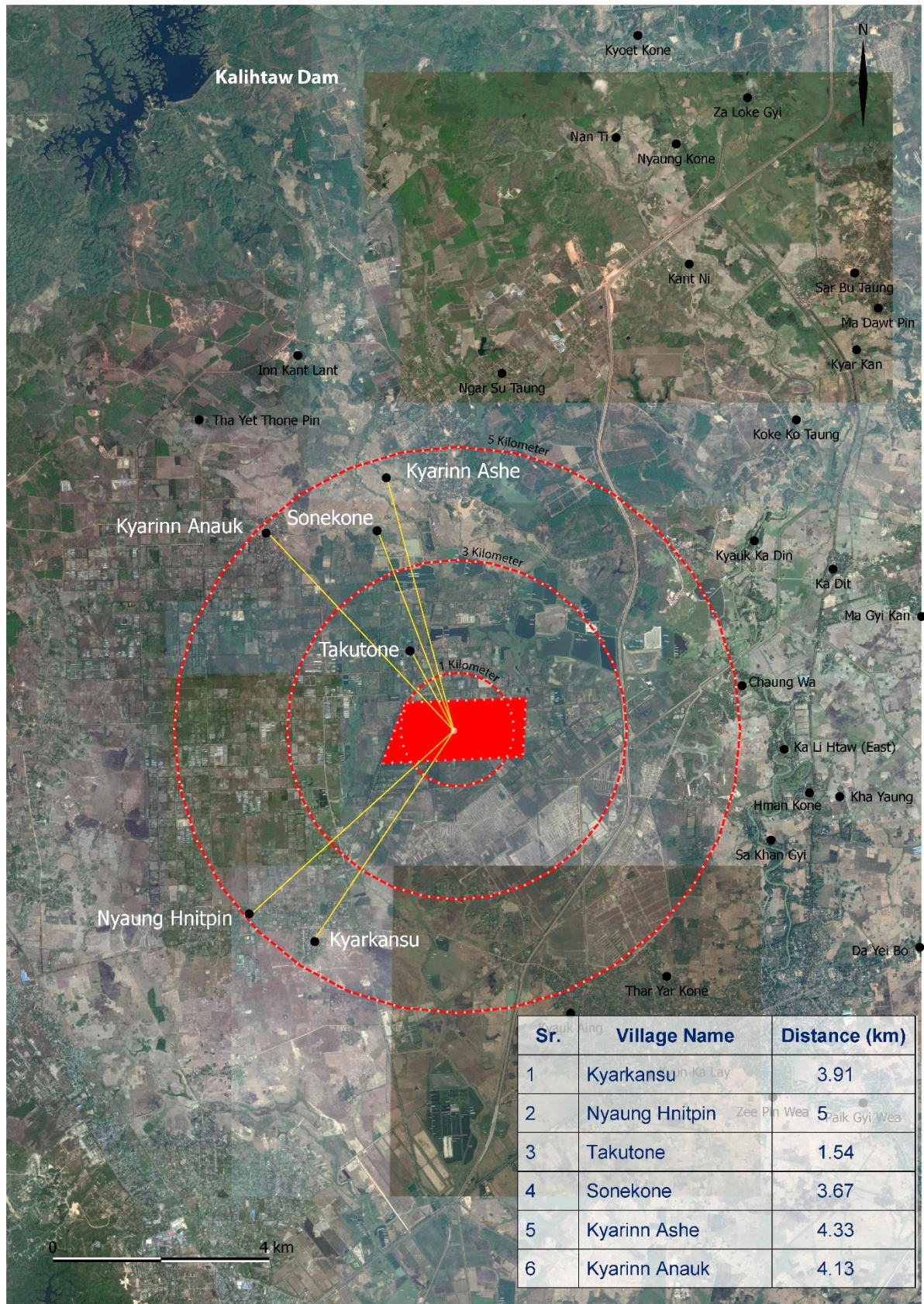


Figure 4. 67: Map of Study Limit

The Social Impact Assessment (SIA) process comprised three parts:

1. Public consultation and disclosure;
2. Social baseline; and
3. Social Impact Assessment.

Early consultation with all interested parties is an essential part of study.

The approach was to focus on:

- Key stakeholder interviews in 6 villages located in 5 km radius from the project site. Village heads, village administrative officials, religious leaders, local business community, school teachers, health workers, local stores and villagers (including women, young and old people) in villages were interviewed.
- Village profiles of 6 villages have been established.
- Directly and indirectly affected PAPs in communities, households, and individuals who live in close proximity to the proposed project site as well as officials from three agricultural and animal breeding zones and village administrations of the Nyaung Hnitpin area were invited to participate in the Public Consultation meeting which was held at Zone no. 2.

4.11.3.2 Summary of Takutone Village Profile (Nearest Village to Project Site)

1	Village Name	Takutone
2	Number of Households	120
3	Population	570
4	Education	Middle school - 1
5	Health	Midwife - 1
6	Economy/Business	Small shop - 8 Light Truck - 2 Motorcycle (motorcycle taxi) - 20 Agriculture: - Livestock: Fish, Chicken, Pig
7	Transport	Light Truck - 2 Three wheeler - 1 Motorcycle - 40
8	Communication	Mobile Phone MPT, MEC, Ooredoo – 250 TV - 60 Radio - 5
9	Social	Monastery - 1
10	Other	Electricity <ul style="list-style-type: none"> • 84 households with electricity from EPC • 36 households without electricity from EPC Water <ul style="list-style-type: none"> • Tube well -10 • Hand-dug well - 70
11	Religion	Buddhist

4.11.3.3 Key Points raised by local communities living around the project site

1. An agricultural zone has been established around the project site. Each individual owner was offered 5 acres of land per unit so as to grow vegetables and seasonal plants.
2. Perennial trees are, however, grown in some yards. The farm-yard owners are worried that the forest fire may spread to their farm-yards if it breaks out in the Nyaung Hnitpin project complex area.
3. Some of the fields cultivated with crops have the water supply through irrigational channels while most of the cultivators rely on artesian/tube wells.
4. People from 6 villages in the immediate vicinity of the project area warmly welcome current investors. They hope there will be more employment opportunities and road transport and socio-economic conditions will be significantly improved only if the factories emerge.
5. Health, economic and educational situations have a lot of difficulties due to the extremely ruined roads that link the area with the nearby villages.
6. As there is a rural dispensary in only one village, the locals are facing with difficulties in seeking health services. As the roads are getting worse in monsoon, the nurses find it difficult to go from one place to another.
7. The Agricultural and Livestock Breeding Zone No 2 is the flood-prone area because it is close to the Takutone Inn (fishery) and lies on the low-land. In this area, business people buy land, dig fish-breeding ponds and breed fish. Digging ponds causes diversion of the natural flow of water and slowdown of water flow, leading to flooding.
8. Another flood-prone area is Takutone Village, adjacent to Nyaung Hnitpin and the Agricultural and Livestock Breeding Zone No 2 and it is also located in the low-lying part of the land. Takutone Inn (fishery) is next to Takutone Village. If the Agricultural and Livestock Breeding Zone 2 is flooded, so is Takutone Village. The floods never reached this village in the past. Flooding began to occur in this village after formation of zones in 2000.

4.11.3.4 Interviews with Villagers

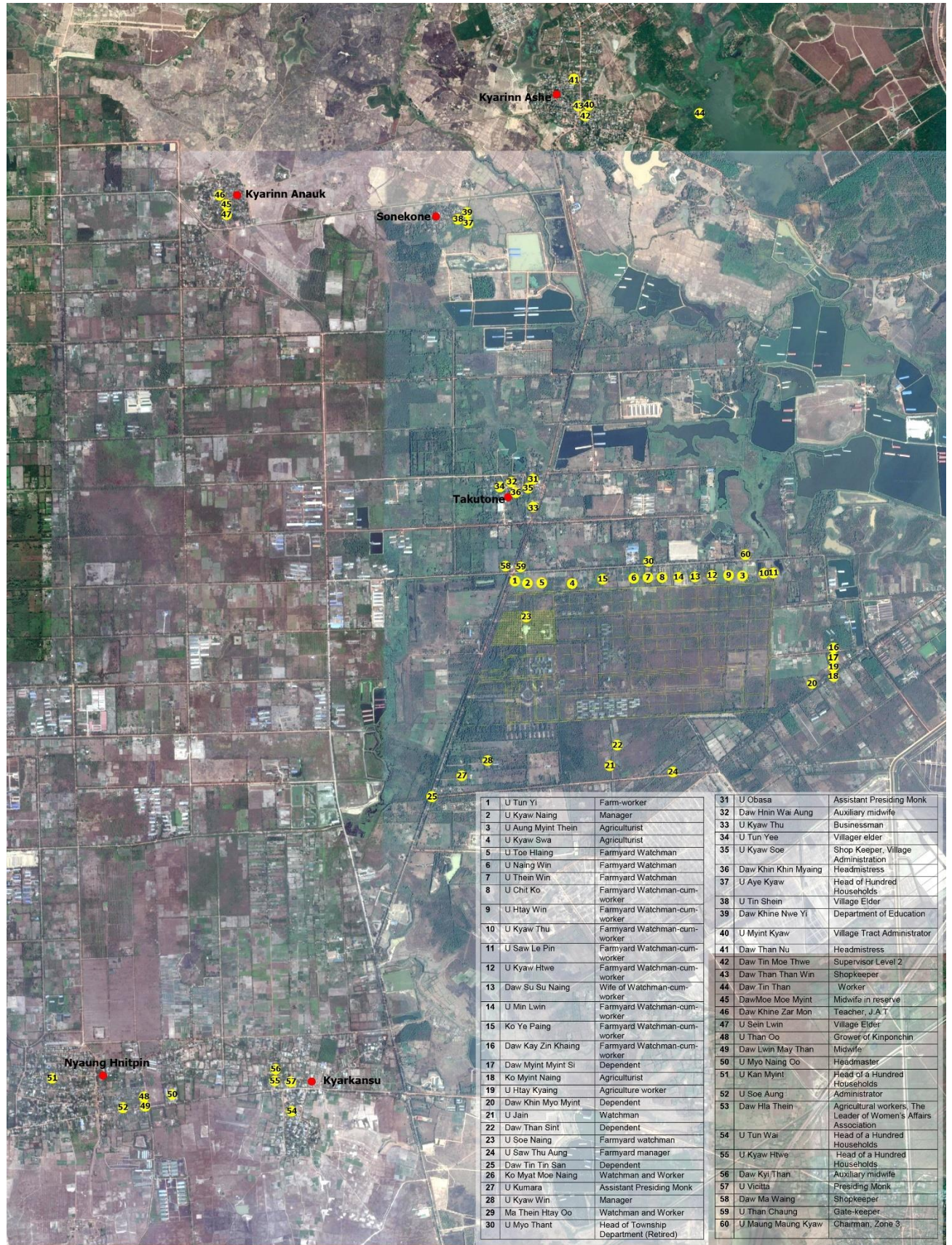






Figure 4. 68: Location of some villagers interviewed by SIA Team

1	Name:	Daw Ma Waing	
	Age:	35	
	Address:	Agriculture and Livestock Breeding Zone 2, Nyaung Hnitpin, Hlegu Township	
	Occupation:	Grocer	
	Rank:	Shopkeeper	
	Tel:	09 976 308000	
<p>I haven't known that an industrial zone is to be established in the immediate vicinity. This is Nyaung Hnitpin Agriculture and Livestock Breeding Zone 2. People from here have to go to work at Hmawbi Industrial Zone (Sanchaungpauk). I have been living here for over 10 years. There is a steel factory in the neighbourhood. Some of the people have to go to work at Shwepyitha Industrial Zone. We have only a primary school. The middle school students from here have to attend the middle school in Nyaung Hnitpin Village. We have to go to the Rural Healthcare Centre in Ngar Suu Taung Village. Our village products are vegetables and fruits. We are happy if an industrial zone emerges near our village. We agree with it. We also hope that we will have better roads and bridges with the emergence of the industrial zone. It will also be a job creation for the people in this area. The nearest villages to the Nyaung Hnitpin Zone are Takutone, Photanagone, Kyarinn, Sonekone, Thayekyun, and Nyaung Hnitpin Villages. I feel joyous because my grocery will sell better if the industrial zone comes into existence.</p>			

2	Name:	U Than Chaung	
	Age:	65	
	Address:	Agriculture and Livestock Breeding Zone 3, Nyaung Hnitpin, Hlegu Township	
	Occupation:	Security for the zone	
	Rank:	Gate-keeper	
	Tel:	09 9729 70250	
<p>I haven't known that an industrial zone will be built in Nyaung Hnitpin . The zonal chairman U Maung Maung Kyaw has once told me about that project. He is the chairman of the Agriculture and Livestock Breeding Zone 3. He is doing agricultural business. I have to collect tax from the cars passing the gate and check them for security. This road is built by the entrepreneurs living on this road after raising funds. Some of my children are in Hlegu. Some are in the armed forces. There is one teacher. Both my wife and myself—only two of us—are here. I hope the locals will have job opportunities if an industrial zone is built here. We are hoping that certain roads will be improved thens. For these reasons, I agree with the construction of the industrial zone.</p>			

3	Name:	U Maung Maung Kyaw	
	Age:	53	
	Address:	No 3 Industrial Zone Road, Agriculture and Livestock Breeding Zone 3, Nyaung Hnitpin , Hlegu Township	
	Occupation:	Agriculture and Livestock Breeding	
	Rank:	Chairman, Zone 3, Agriculture and Livestock Breeding Zone	
	Tel:	09 4500 29805	

I have already known that an industrial zone is to be established in Nyaung Hnitpin . I have been informed that a team from Korea will come and meet me. They will come and discuss the construction of an industrial zone. If MSR Team conducts EIA/SIA assessment, it is very suitable to do that. We are ready to give you necessary help regarding the EIA/SIA assessment. What I specifically desire is the development of this area. It is not for individual purpose but for the purpose of supporting the socio-economic development of our region and our people. If you want to hold a public consultation meeting, I will invite people, provide a venue and help your discussion to be successful.


4	Name:	U Tun Yi	
	Age:	56	
	Address:	Farm No. 1, 2, Agriculture and Livestock Land (3), Nyaung Hnitpin, Hlegu Township	
	Occupation:	Rubber Seedlings and Fruit Plants Agricultural Farm	
	Rank:	Farm-worker	
	Tel:	09 7674 33487	


I have lived on this farm as a farm-worker for 4 years. There are one manager and 4 farm-workers working on this farm. My birth-place is Labutta. I stay here alone. There are two other men living with their families. The children from here go to the Primary School in Takutone by bicycle. The children of the manager go to attend school in Hlegu in their car. My salary is 120,000 kyats. The proceeds from the sales of farm-crops and rubber seedlings have to be given to the owner through the manager. Drinking water, water for domestic use and agriculture are obtained from the hand scooped well by pumping up. If the family members are not well, they have to go to the clinic in Ngar Suu Taung Village by hired motorcycle. The motorcycle fee is 3,000 kyats for round trip. We find it difficult to travel during the monsoon because of the ruined roads. If this new industrial zone emerges, it is good to have job-opportunities. I think the socio-economic status will be higher as the locals and their children will get jobs. I don't think the establishment of industrial zone will not have bad impacts on us. If there are favourable job creations, locals will come and join it. As the wells dry up in summer, the water is pumped up from the drains to be used during the months between April and June, the hot months. The water fetched from the wells is used for drinking and for domestic use.

5	Name:	U Kyaw Naing	
	Age:	39	
	Address:	Farm No. 1, 2, Agriculture and Livestock Zone (3), Nyaung Hnitpin Area, Hlegu Township	
	Occupation:	Rubber Seedlings and Fruits & Crops Agricultural Farm	
	Rank:	Manager	
	Tel:	09 7746 00086, 09 4546 00086	


I have worked on this farm for 5 years. I'm a staff-member of the Inter-Myanmar Pacific Co., Ltd. (IMP). The farm block numbers 1, 2, 6, and 8 belong to this company. The owner of this farmyard is Retired Major General Khin Maung Than. My salary is Ks. 300,000. I was once a staff member of the Agriculture Department. Water is available from tube wells that can be dug here. If a 4-inch-diameter well is dug, the water is found at a depth of 100 feet. But the water at this depth can be used only for

agriculture. We cannot drink it because it contains too much iron. The water fit for drinking is found at a depth of 300 feet. The hand-dug well we are now using is dug up to 8 to 10 feet deep. It is dug at a location 50 feet deep from the ditch of the Irrigation Department. When the irrigational canal has no water, the water in the wells dries up. U Maung Maung Kyaw, No 3 Zone Chairman and Yangon Region Chief Minister U Phyo Min Thein have once said an industrial zone will be constructed in the compound of the past Nyaung Hnitpin National Convention venue. If an industrial zone comes into existence, we will have employment opportunities and road links. I don't anticipate any negative impact. As the roads are bad, students and those who have to go to the health care centre are faced with difficulties. The roads become worse during monsoon. If the CSO (corporate social responsibilities) is to be provided, we expect that certain portion is spent on improving roads. We also need a clinic. It will be appropriate if the company making investment does it. I tried to enroll my children at the Nyaung Hnitpin High School. But as there are not enough rooms for incoming students there, I sent my children to a Hlegu private High School. There is Ngar Suu Taung High School, but it is very far and the roads have been ruined. We have to go to the Tagukone monastery for religious activities. We have no graveyard for the funeral rites such as cremation and burial. We go to the Takutone village for such affairs. There are 120 households, with a population of 600, in No. 3 of Agriculture and Livestock Zone. On our farm, a male worker earns Ks. 3,500 and a female worker Ks. 3,000 as daily wages. The general prevailing daily wage for a worker Ks. 6,000.


6	Name:	U Aung Myint Thein	
	Age:	52	
	Address:	Farmyard No 16, Land No 3 of Agriculture and Livestock, Nyaung Hnitpin Area, Hlegu Township	
	Occupation:	Agriculture	
	Rank:	Agriculturist	
	Tel:	09 7672 93779	
<p>Vegetables are grown on this farm. I have worked on a leased land for about 2 years. My birthplace is Letpadan Township. I have four family members including a son and a daughter. If there emerges an industrial zone, the locals including my children will have jobs. I've already heard of building an industrial zone that will bring benefits for us. Currently, people find it difficult to go to school or clinic. If one goes to Main Road No 3 or Highway Road by motorcycle, we have to pay a round-trip fee of Ks. 3,000. The road is good there. It is not convenient to use the road to Tagukone, Ngasutaung and Nyaung Hnitpin villages because it is not in good condition. I have to pay Ks. 50,000 per acre per year to lease this 5-acre farm. If I hire a worker from outside, a worker (male) is to be paid Ks. 5,000 a day and a worker (female) is paid Ks. 4,000 a day respectively. I have no idea whether what would be the impact of the industrial zone.</p>			


7	Name:	U Kyaw Swa	
	Age:	36	
	Address:	Farmyard No. 5, Land No. 3 of Agriculture and Livestock, Nyaung Hnitpin Area, Hlegu Township	
	Occupation:	Agriculture	
	Rank:	Agriculturist (Private)	
	Tel:	09 4202 01041	


I came to this farmyard before 2008. I've known that it is owned by Major General San Sint (Retd.). I haven't known that an industrial zone will be constructed in the complex of Nyaung Hnitpin National Convention. I grow mint and other varieties of flower plants which are sold at Htaukkyant Market. Regarding education, people from this area go to attend the Nyaung Hnitpin High School. We go to the government clinics and private health care centres for medical treatment. It is inconvenient for us to use those ruined roads leading to those places. The situation becomes worse in monsoon. They can be used in summer, though. We hope we will have employment opportunities if there emerges an industrial zone in the vicinity. It will be better if the factories and companies that can export the products from Agriculture and Livestock zone will be included in that zone. The agriculture and livestock zone has no cemetery. We have to use the Takutone graveyard for our funeral rites. We have many difficulties because we have to wade through the water about 2 feet deep during monsoon. The locals here need good roads that can be used in all seasons. Good roads will give us convenient access to deal with the affairs of education, health, society and religion. There are no longer wild animals such as barking deer, samburs, boars, etc. which used to be there. But there are still many species of snakes and birds. The construction of an industrial may have either good or bad impacts on us. We are worried to evacuate from our land as a bad impact.


8	Name:	U Toe Hlaing	
	Age:	39	
	Address:	Farmyard No. 3 and 4, Agriculture and Livestock Zone 3, Nyaung Hnitpin Area, Hlegu Township	
	Occupation:	Agriculture	
	Rank:	Farmyard Watchman	
	Tel:		
	<p>I have 5 family members, including 3 children. I have been working in this farmyard for about 6 years. I grow vegetables and seasonal fruit trees and earn my living by selling them. I use a hand scooped well for the water required for agriculture. That well was 8 feet in depth. It provides us with enough water for agriculture as well as for domestic use. I haven't known that an industrial zone will be built in the complex of Nyaung Hnitpin National Convention. I believe it will bring benefits to our locals and our own children—getting jobs at the industrial zone. My children go to attend the primary school in Takutone village. The high school students have to go to Nyaung Hnitpin High school. If we are sick, we go to a traditional medical practitioner in Takutone Village. There are government clinics in Nyaung Hnitpin and Kyarinn Villages. We need a school and a clinic for our agriculture and livestock zone. The plants grown in this farmyard are known as 'Aurisha' which are now about 5 years old each and the circumference of each is about 12 inches. The stem of the plant can be used as posts in building houses. I have no idea whether there will be good or bad impacts. But I hope there will not be bad impacts. We have no serious diseases here such as malaria, cholera, etc. We only have minor illnesses.</p>		

9	Name:	U Naing Win	
	Age:	45	
	Address:	Farmyard No. 9, Agriculture and Livestock Zone 3, Nyaung Hnitpin Area, Hlegu Township	


	Occupation:	Agriculture	
	Rank:	Farmyard Watchman	
	Tel:	09 3131 0234, 09 7999 21540	
<p>I'm a watchman and grow flower plants and trees. I have been doing agriculture for 7 years. I have 6 family members. My children go to Takutone primary school and Ngar Suu Taung High School. When we are ill, we go to Ngar Suu Taung public health care centre and private clinics. I haven't known that an industrial zone is to be established in the complex of past Nyaung Hnitpin National Convention. Now it has been confirmed as you have just told me about it. The factories that exude odour in the environment should not be included in this new industrial zone. I will not object to this project if there is no factories that release bad smell. We hope we will have good roads if an industrial zone is established. We have to dig tube wells to get water for domestic use and for drinking purposes. Formerly Irrigation Department supplied water and we had to use that water in the drains near our farmyard. Now we get no water from the Irrigation Department and we can only grow Eugenia. We have dug three tube wells in our farmyard. When we went to the Irrigation Department and requested it to supply water, they complied with our request. I haven't got water from there for about 3 years. The most crucial requirement for this locality is water for agriculture and good roads for better transport.</p>			

10	Name:	U Thein Win	
	Age:	57	
	Address:	Farmyard No. 10, Agriculture and Livestock Zone 3, Nyaung Hnitpin Area, Hlegu Township	
	Occupation:	Agriculture	
	Rank:	Farmyard Watchman	
	Tel:	09 4578 32794	
<p>I have worked in this farmyard for 6 years. My birthplace is Kyaiklat. I have five family members including three children. I grow perennial fruit trees such as mango, jackfruit and Eugenia. The owner of this farmyard is Lt. Col San Matu. He gives me Ks 50,000 per month as a watchman. I also grow seasonal plants in some parts here. I have ever heard of establishing a new industrial zone in the complex of Nyaung Hnitpin National Convention. I feel happy to hear that an industrial zone will be constructed because the locals will have jobs. I think the construction of factories will not have bad impacts on us. We find it difficult to deal with health and educational matters because the roads in this area are in bad condition. I want the companies constructing factories to help improve road transport. Currently we get water for drinking as well as for domestic use from the tube well. As the water for agriculture is not available from the irrigated water, it is fetched from the tube well. For this reason, water for agriculture should be provided in all seasons. For the time being, the irrigated water cannot reach the nearby drains starting from January until the end of May and June every year. This has been going on for about 2 or 3 years. I hope the lives of the locals will be much better than the current situation if there emerges an industrial zone.</p>			


11	Name:	U Chit Ko	
	Age:	36	
	Address:	Farmyard No. 11, Agriculture and Livestock Zone 3, Nyaung Hnitpin Area, Hlegu Township	
	Occupation:	Agriculture	
	Rank:	Farmyard Watchman-cum-worker	
	Tel:	09 7984 34654	
<p>I have been working in this farmyard for 4 years. I have 8 family members including 6 children. The owner of the farmyard is U Soe Myint living in Yangon. We grow ram button plants in this farmyard. They have been grown for about 4 years and they are bearing fruits. If they are in 5 year-term, they will bear more fruits. The money earned from selling rambutan fruits is paid to the owner.</p> <p>The owner himself also comes and picks fruits. The farmyard owner gives me Ks 20,000 per month as a watchman's salary. When I work in the farmyard, I get daily wage. A daily-wage earner (male) is given Ks 3,000 a day and a female worker Ks 2,500 a day. My family members work as daily-wage earners. If workers from outside areas are to be hired, a male worker is given Ks 5,000 a day and a female worker, Ks 3000 a day. My children go to attend the post-primary school in Zone 5. If we are sick, we have to go to the midwife in Takutone Village for medical treatment. If we suffer from serious diseases, we have to go to the Ngar Suu Taung health care centre. Sometimes we also need to go to the Hlegu hospital. We find it very difficult to go to Takutone, Ngar Suu Taung and Nyaung Hnitpin villages for health matters in monsoon because the roads to those villages are bad. For those reasons, the roads leading to those villages should be improved to be able to use conveniently in all seasons. As the irrigated water does not reach our farmyard, we dug a hand scooped well to get water for agriculture, for drinking and for domestic use. The well is about 15 feet deep. If the irrigated water is available all the year round, it will be more convenient. We want the irrigated water to be supplied to reach our farmyard. I am happy to hear that an industrial zone will be built in the complex of Nyaung Hnitpin National Convention. I feel happier because people from nearby places will get jobs at the factories. I don't think that construction of factories will have bad impacts on the locality. I hope it will be a good impact on us.</p>			

12	Name:	U Htay Win	
	Age:	43	
	Address:	Farmyard No. 15, Agriculture and Livestock Zone 3, Nyaung Hnitpin Area, Hlegu Township	
	Occupation:	Agriculture	
	Rank:	Farmyard Watchman-cum-worker	
	Tel:	09 7736 87948	
<p>I have worked in this farmyard for 5 years. The owner is Daw Hteik Hteik living in Yangon. The main plants grown in the farmyard are Eugenia trees. They are ordinary. We did not grow ASEAN Eugenia. As the plenty of water is not available, we grow only ordinary Eugenia. We use water the tube well we dug. The irrigated water is available only in monsoon. It hasn't reached here in summer for 3 years. My wife and I myself live here. So there are 2 family members. If we are ill. We go to the Ngar Suu Taung Health Care Centre for medical treatment. I think it is better if an industrial zone emerges in the vicinity. I feel happy because I hope that the locals will get jobs in that</p>			

	zone. I want to object to building factories that exude stink smells. We feel very inconvenient in the Agriculture and Livestock Zone 3 as the smells from the poultry farm and the cowsheds are awful. It is worse in monsoon. We are worried about those awful smells that will cause ill-health. We are worried about those bad smells that will cause ill-health. For those reasons, only the factories that do not pour out bad smell should be built.
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13	Name:	U Kyaw Thu	
	Age:	33	
	Address:	Farmyard No. 18, Agriculture and Livestock Zone 3, Nyaung Hnitpin Area, Hlegu Township	
	Occupation:	Agriculture	
	Rank:	Farmyard Watchman-cum-worker	
	Tel:	09 7882 41569	


I have worked in this farmyard for 2 years. Formerly I lived in my father's farmyard. There are 6 family members including children. My children are in 6th grade, attending the post-primary school in Agriculture and Livestock Zone 3. Next year, they will be in the 7th grade and will have to attend the Nyaung Hnitpin High School. When we are ill, we go to Ngar Suu Taung for medical treatment. In the rainy season, the muddy tracks make it difficult to go there. In summer, the ground tracks are so dusty that we are worried about the dust that may cause harm to our health. We need good roads to Ngar Suu Taung and Nyaung Hnitpin villages and they must be useful in all seasons. We grow perennial trees in our farmyard such as eaglewood, mango and jackfruit. The owner himself comes and picks the fruits. The owner is Police Colonel U Aung Naing (Retired). We grow vegetables in monsoon and in winter. We do it in accordance with the permission of the owner. We grow vegetables and sell them without the need to pay the owner. If there emerges a new industrial zone in the complex of Nyaung Hnitpin National Convention, the locals and the people from the nearby area will get jobs. So I am happy about it. I am worried about the roads that may become worse if there is the traffic of heavy trucks in and out of the construction sites. I have no idea whether there will be other bad impacts. I have heard that an industrial zone will be constructed in the complex of Nyaung Hnitpin National Convention since last year. I haven't got any information this year.

14	Name:	U Saw Le Pin	
	Age:	46	
	Address:	Farmyard No. 18, Agriculture and Livestock Zone 3, Nyaung Hnitpin Area, Hlegu Township	
	Occupation:	Agriculture	
	Rank:	Farmyard Watchman-cum-worker	
	Tel:	09 4517 42451	

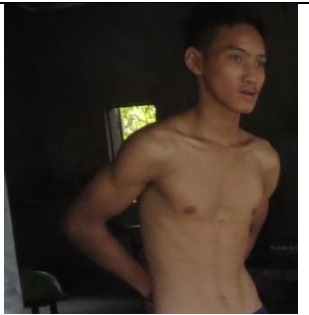
I have been working in this farmyard for 4 years. My birthplace is Labutta. There are 5 family members including 3 children. Two of them, still single are working in this farmyard. The youngest child is attending the post-primary school in the Agriculture and Livestock Zone. I am given Ks 100,000 per month as a salary for a watchman. My two sons earn Ks 70,000 per month each. We grow jackfruit and mango. We fetch water from the pond which is in our farmyard. Water is available from there until the monsoon. The pond is one acre wide. We haven't got irrigated water for a long time.


	<p>If we are ill, we go to the private clinic and the State Health Care Centre in Ngasutaung Village for medical treatment. We have no serious diseases in this area such as malaria, cholera, TB, etc. We only suffer from minor ailments. Our area will be more developed if an industrial zone is established. The area has forests and farms overgrown with bushes in close proximity to our farmyard. I am worried that the fire may break out. If the industrial zone is constructed, the bushes will be cleared and the area will be safe from fire.</p>	
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15	Name:	U Kyaw Htwe	
	Age:	53	
	Address:	Farmyard No. 14, Agriculture and Livestock Zone 3, Nyaung Hnitpin Area, Hlegu Township	
	Occupation:	Agriculture	
	Rank:	Farmyard Watchman-cum-worker	
	Tel:	09 7829 91739	
<p>I have lived in this farmyard for over 1 year. We grow perennial trees in this farmyard such as mango, jackfruit and Eugenia. We have a hand-dug well so as to get water for agriculture, for domestic use and for drinking. It has been dug to a depth of 20 feet. I have 4 family members including myself. If we are ill, we have to go far for medical treatment. A motorcycle that takes us to No 3 Highway Road asks Ks 3000 for a round trip. I hope there will be a good impact on the locals as they will get jobs if an industrial zone emerges in the complex of Nyaung Hnitpin National Convention. I don't think there will be bad impacts. If the water and electric power are available, the living standards of the locals will surely be improved.</p>			


16	Name:	Daw Su Su Naing	
	Age:	37	
	Address:	Farmyard No. 13, Agriculture and Livestock Zone 3, Nyaung Hnitpin Area, Hlegu Township	
	Occupation:	Agriculture	
	Rank:	Wife of Watchman-cum-worker	
	Tel:	09 3169 5568	
<p>I have lived in this farmyard for over 2 years. There are 3 members in my family including a parent-in-law. We grow jackfruit, Ngamauk, pine-apple and mango. We use both a hand-dug well and a tube well for water. The hand-dug well gets dry in summer. The owner gives me a salary for watching his farmyard. The money obtained from selling crops and fruits has to pay to the owner. If we are ill, we go to Tagukone Village for medical treatment. We go there by bicycle. It is inconvenient to go there in monsoon because of the damaged roads. I feel happy to hear that an industrial zone is to be constructed in the complex where the National Convention was held and people may get jobs. This place and its environs will be developed as a whole I have no idea whether there will be bad impacts.</p>			


17	Name:	U Min Lwin	
	Age:	44	
	Address:	Farmyard No. 12, Agriculture and Livestock Zone 3, Nyaung Hnitpin Area, Hlegu Township	
	Occupation:	Agriculture	
	Rank:	Watchman-cum-worker	
	Tel:	09 9655 33752	
<p>I have been working in this farmyard for about 7 years. My birthplace is Yangon. The owner of this farmyard is U Tin Maung Win. We have dug a tube well to get water for agriculture. As the irrigated water is not available, we had to dig it. If we are not well, we go to Ngar Suu Ttaung Health Care Centre for medical treatment. We are faced with difficulties to use the damaged roads to go there especially at night and in monsoon. If the roads are good, we will be convenient. If an industrial zone springs up in the complex of Nyaung Hnitpin Conference, the locals here and people in the vicinity of this place will be sure to get jobs. It can be said that there will be a good impact. I have no idea about any bad impacts.</p>			


18	Name:	Ko Ye Paing	
	Age:	20	
	Address:	Farmyard No. 7, Agriculture and Livestock Zone 3, Nyaung Hnitpin Area, Hlegu Township	
	Occupation:	Agriculture	
	Rank:	Watchman-cum-worker	
	Tel:	09 7916 20343	
<p>I have been working in this farmyard for about 7 years. I live with my parents. There are other members in my family. I grow perennial trees and seasonal vegetables. Perennial trees we grow are mango and jackfruit and seasonal vegetables are aubergine and some flower beds. The crops and flowers are sent to Htaukkyant and Danyingone market. We get water for agriculture from a tube well. The irrigated water is not available. I haven't known that an industrial zone is to be established in the complex of Nyaung Hnitpin National Convention. I know it now. We hope to get jobs thanks to the emergence of factories. if we are given jobs, we want to work there. I have no idea that the construction of factories may have bad impacts. Our area will be sure to get developed compared to the present situation.</p>			

19	Name:	Daw Kay Zin Khaing	
	Age:	25	
	Address:	Farmyard No. 171, Agriculture and Livestock Zone 3, Nyaung Hnitpin Area, Hlegu Township	
	Occupation:	Agricultural farm	
	Rank:	Wife of watchman	
	Tel:	09 7954 71598	
<p>I have lived in this place for 17 years. Formerly we grew lychee for Ve Ve factory. We no longer grow it. We grow Eugenia, flower plants and aubergine like kitchen garden plants, as irrigated water is not available for the plantations, we have dug tube wells to get water. Once the plantations failed due to the lack of water. Now the tube well</p>			


we dug is 60 feet in depth. The cost of drilling is over Ks 100,000. It will be more convenient if the irrigated water is available all year round. I have heard that an industrial zone will be established in the complex of Nyaung Hnitpin Conference. I feel happy as I hope the unemployed will get jobs. We need a health care centre in this place. It costs us a lot as we have to go to Hlegu and Yangon for medical treatment. As the agricultural business is not doing well, we need to pay off our debts. To pay off the debts, we have to cut trees into pieces of firewood. I do not anticipate the construction of an industrial zone will have bad impacts on the locals. I have no idea of what sort of bad impacts will have on us.

20	Name:	Daw Myint Myint Si	
	Age:	50	
	Address:	Farmyard No. 171, Agriculture and Livestock Zone 3, Nyaung Hnitpin Area, Hlegu Township	
	Occupation:	Agricultural farm	
	Rank:	Dependent	
	Tel:	09 7829 51288	
<p>There are 6 members in our family. We have leased 5 acres of land for agriculture from the owner of the farmyard. We grow flowers, gourd, Eugenia, jackfruit and guava. For leasing the land, we have to pay Ks 100,000 annually. Our children at the school going age attend the post-primary school on Zone 3. If we feel ill, we have to go to Yangon for medical treatment. We dug a tube well that gives us the chance of growing plants. We get water for drinking and for domestic use. If there emerge factories in the complex of Nyaung Hnitpin National Convention, we are happy as we will get jobs, although we are relatively old, we need jobs. We do not object to the construction of an industrial zone as it will bring us benefits, we welcome it. But if the owners and workers are from abroad, we do not welcome it. I have no idea how it will have bad impacts on us. We hope our lives will improve compared to the current situation.</p>			


21	Name:	Ko Myint Naing	
	Age:	31	
	Address:	Farmyard No. 171, Agriculture and Livestock Zone 3, Nyaung Hnitpin Area, Hlegu Township	
	Occupation:	Agricultural farm	
	Rank:	Agriculturist	
	Tel:	09 7964 37830	
<p>I have already leased 10 acres of land for agriculture. I grow sugarcane, cucumber, gourd and flowers. Land lease costs me Ks 200,000 per year. I have 5 family members. My children attend Agriculture and Livestock Zone 3 School. We go to Hlegu for medical treatment. We need a health care centre in this locality. My birthplace is Kyonepyaw Township, Ayeyarwady Region. Some children who have no birth certificates cannot attend school. We feel happy to hear that an industrial zone will be established in the complex of Nyaung Hnitpin National Convention. We want to get jobs at factories when they are established. So I do not object to it. I hope the locals and their whole environment will be changed and developed. It will be better than the current situation. I hope there will not be bad impacts on men and their environment.</p>			


22	Name:	U Htay Kyaing	
	Age:	45	
	Address:	Farmyard No. 171, Agriculture and Livestock Zone 3, Nyaung Hnitpin Area, Hlegu Township	
	Occupation:	Agricultural farm	
	Rank:	Agriculture worker	
	Tel:	09 2545 85780	
<p>I have lived here for 2 years. There are six members in my family. One of my children attends Agricultural and Livestock School and another goes to Tagukone School. If we are ill, we go to the Hlegu hospital for medical treatment. I leased 3 acres of land and have been growing Eugenia and other varieties of flowers. We dug a tube well to get water for drinking, agriculture and domestic use. We are happy to hear the emergence of an industrial zone. We want the factories that export our products to be included. It will bring us another chance of getting jobs. So we can have benefits. We hope there will not be bad impacts. We don't want the factories that exude bad smell. We are worried about that.</p>			

23	Name:	Daw Khin Myo Myint	
	Age:	47	
	Address:	Farmyard No. 174, Agriculture and Livestock Zone 3, Nyaung Hnitpin Area, Hlegu Township	
	Occupation:	Agricultural farm	
	Rank:	Dependent	
	Tel:	09 7906 87819	
<p>We have been doing agricultural business for 5 years. There are 7 family members in our family. We have leased 5 acres of land. We have to pay Ks 25,000 per acre for leasing land every year. We grew flowers, gourd, lettuce and cucumber. We sell them at Danyingone market. Sometimes people who resell them come and buy them here. Our children attend the post-primary school in Agriculture and Livestock Zone 3. If we are ill, we go to the Hlegu hospital for medical treatment. We find it very difficult to use the road to Hlegu as it is not usable in monsoon. I am happy to know that an industrial zone will spring up in the complex of Nyaung Hnitpin National Convention. I hope this area will develop more than before and our lives will improve. We are worried that the factories that pour out awful smell will be included. We are also worried about losing our shelter if the owners sell their land that we have leased currently. We want the employers who will give us jobs at the factories in the industrial zone and provide shelters for us.</p>			


24	Name:	U Jain	
	Age:	47	
	Address:	Agriculture and Livestock Zone 3 to the south of the complex of National Conference, Nyaung Hnitpin Area, Hlegu Township	
	Occupation:	Agriculture	
	Rank:	Watchman	
	Tel:	09 9761 47765	


I have lived in this farmyard for 4 years. The owner of the farmyard is Daw Hlaing Myo Htet, whom I am familiar with. So I became a watchman. She gives me Ks 70,000 per month for watching the farmyard. We grow cashew, mango, cucumber, lady's fingers, etc. I have the right to sell those fruits and earn the money. There are 4 members in my family. One of my children is attending the Agriculture and Livestock Zone 3 School. If we are ill, we go to Hlegu for medical treatment. I have previously known that an industrial zone is to be established in the complex of Nyaung Hnitpin National Convention. As for me, I'm happy. I think people may get jobs at the factories. The socio-economic lives of the locals may also be improved. We may have a lot to gain from the emergence of an industrial zone. I have no idea of what bad impacts there will be. We have dug 3 tube wells to get water for drinking, domestic use and agriculture. Each of them is 75 feet in depth.


25	Name:	Daw Than Sint	
	Age:	62	
	Address:	Agriculture and Livestock Zone 3 to the south of the complex of National Conference, Nyaung Hnitpin Area, Hlegu Township	
	Occupation:	Agriculture	
	Rank:	Dependent	
Tel:	—		
<p>My birthplace is Hinthada. I have lived in this farmyard for about 14 years. I am a watchman and grow trees and plants to earn my living. There are 3 members in my family. I grow gourd, cucumber, beans and flowers. I cut trees into firewood and sell them. The owner of this farmyard is Colonel Khin Myint. The money earned from growing vegetables is not enough for us to make a living. We have to be frugal. We sometimes suffer from a total loss due to low prices of our agricultural products. Traders from Htaukkyant market come and buy vegetables here. We dug a tube well to get water for drinking, domestic and agricultural use. If there arises an industrial zone, the land prices may go up and the owner may sell his land. The locals are sure to get jobs because of the emergence of an industrial zone. We are deeply worried that we may lose our shelter and our livelihood. As an old person, I have a rare chance to be given a job.</p>			


26	Name:	U Soe Naing	
	Age:	44	
	Address:	Agriculture and Livestock Zone 3 to the south of the complex of National Conference, Nyaung Hnitpin Area, Hlegu Township	
	Occupation:	Agriculture	
	Rank:	Watchman	
Tel:	09 4581 15518		
<p>I have worked and lived in this farmyard for over 10 years. My birthplace is Hinthada Township. There are 4 members in my family. We grow such vegetables as cucumber, marrow, gourd and lettuce and flowers. We sell them at Htaukkyant market. If we are ill, we go to the Hlegu hospital for medical treatment. I have already heard that an industrial zone is to be established in the complex of Nyaung Hnitpin National Convention. I welcome it because people will get jobs if there arises an industrial zone. My life has not changed although I have been growing vegetables and flowers. I am worried that we will lose our livelihood and shelter once the industrial complex is established. The prices of the land may go up due to the emergence of an industrial</p>			


zone. As a consequence, the owner may feel like selling out his land. By then, we are likely to lose our place to live and work to earn a living.

27	Name:	U Saw Thu Aung	
	Age:	54	
	Address:	Farmyard to the south of the complex of Conference, Agriculture and Livestock Zone 3, Nyaung Hnitpin Area, Hlegu Township	
	Occupation:	Agriculture, Tetlan Sein Lae Oo Company	
	Rank:	Farmyard manager	
	Tel:	09 4202 13197	
<p>I have worked in this farmyard for over 10 years. We grow fruit trees such as honey orange, pomelo and Nagamauk in the farmyard. The farmyard is 30 acres in total. I feel happy to know that an industrial zone is to be established in the complex of Nyaung Hnitpin Conference. On the other hand, the area forested and overgrown with weeds in this complex will be cleared and we don't have to be worried about fire anymore. There are 3 members in my family. My child attends the No 3 Agriculture and Livestock Zone School. When we are ill, we go to Ngar Suu Taung Village health care center and Hlegu hospital for medical treatment. I'm sure many locals will get jobs if there arises an industrial zone that will have a good impact on them. Their lives will be improved. We are afraid of the bad smell spread in the air that may have bad impacts on the health of the locals. I am also concerned about polluted water from the industrial zone that may have disastrous impacts on the environment. We also need a good system of discarding the rubbish in dustbins and of sewage disposal. But as this industrial zone project is to be implemented through the G to G agreement, I hope everything will be put in order. There are 2 permanent staff members and 18 daily wage-earners in this farmyard. A man earning a daily wage of Ks 3,000 and a woman Ks 2,500.</p>			


28	Name:	Daw Tin Tin San	
	Age:	52	
	Address:	The Western part of the complex of Conference, Agriculture and Livestock Zone 3, Nyaung Hnitpin Area, Hlegu Township	
	Occupation:	Agriculture	
	Rank:	Dependent	
	Tel:	09 4202 13197	
<p>I have lived here for 18 years. My husband was a staff member of Telecommunication Department in the complex of Conference. He got retired in 2017. The owner of our farmyard is Colonel Aung San. We live here watching farmyard. There are 6 members in our family. One of our children is now working at Hmawbi Industrial Zone. He goes there by commuter bus. Two students attend Nyaung Hnitpin High School. People face difficulties in going to school or work as the roads are damaged in monsoon. I now come to know that an industrial zone is to be established in the complex of Nyaung Hnitpin National Convention. We are sure the locals will get jobs thanks to the emergence of an industrial zone. I'm hoping that our children will be able to shift their jobs from Hmawbi to this area. I think educational and health sector will be much more improved. We welcome the emergence of an industrial zone. I have no idea of whether the emergence of an industrial zone has the bad impact on us or not.</p>			

29	Name:	Ko Myat Moe Naing	
	Age:	27	
	Address:	Farmyard No. 979, Agriculture and Livestock Zone 3, Nyaung Hnitpin Area, Hlegu Township	
	Occupation:	Video Production Yard	
	Rank:	Watchman and Worker	
	Tel:	09 2520 78027	
<p>I have been a watchman in this farmyard for 5 years. There are 3 members in my family. One of my children will attend the Nyaung Hnitpin High School this year starting from the kindergarten. I worked as a watchman and my wife opens a shop at the corner of the road selling goods. I myself have a motorcycle repair shop. The roads here are so muddy and damaged in the rainy season that we find it very difficult to use them. I hope roads will become much better if there emerges an industrial zone. People in the vicinity will also get jobs. There will be a better road link; health and educational sectors will consequently be improved a lot. I fear that the factories that exude bad smell will harm the health of the locals. The current crucial issues are bad roads and having difficult of access to health facilities. I want the roads to be become all-weather ones. Another requirement is a clinic. I have no objection to the construction of an industrial zone.</p>			


30	Name:	U Kumara	
	Age:	31	
	Address:	Promotion of Sasana (The Teaching of the Buddha) Ayemyayeithar Pakokku Monastery	
	Occupation:	Religion	
	Rank:	Assistant Presiding Monk	
	Tel:	09 4025 44652	
<p>This monastery has been built for 10 years. I have been presiding at this monastery for 4 years. My objective is to launch a school of Buddhist scriptures. But I haven't achieved my objective because Buddhism is not flourishing in this area at the moment. If an industrial zone is established in the complex of Nyaung Hnitpin Conference, the area will be developed and the population will increase. And then the number of monks and novices will increase. There are only 2 novices at the monastery. I'm also worried that the factories which are unbearably noisy and those which exude awful smell may be included in the establishment of the industrial zone. In monsoon, the roads are so damaged that we find it difficult to go on an alms-round. I want those roads to be repaired when the industrial zone is constructed. We also need a health care centre. A tube well has been dug to get water for drinking and domestic use at the monastery. The monastic complex is 20 acres in its area. We applied for changing the land type of 5 acres to a religious land and have been given permission. For these reasons I do not object to the establishment of an industrial zone. I welcome it as it will have good impacts on us. Systematic implementation shall not have had impacts.</p>			

31	Name:	U Kyaw Win	
	Age:	59	
	Address:	The Western part of the complex of Conference, Agriculture and Livestock Zone 3, Nyaung Hnitpin Area, Hlegu Township	
	Occupation:	Cow-Breeding Yard	
	Rank:	Manager	
	Tel:	09 2502 29043	

I have worked in this cow breeding farm for about 7 years. It is 25 acres in its area. There are 20 workers on this farm. We have about 100 dairy and beef cattle. I have already known about the forthcoming construction of an industrial zone in the complex of Nyaung Hnitpin National Convention. The roads will be better if there emerges an industrial zone. People in close proximity will get jobs. The agricultural farmers in this locality are not doing well. They sometimes suffer from financial losses. Their living conditions haven't been changed for the better. But there should be a systematic management of getting rid of awful smell, disposal of polluted water, rubbish and sewage. I am worried about the environment impacts.


32	Name:	Ma Thein Htay Oo	
	Age:	32	
	Address:	Universe Farmyard, The western part of the complex of Conference, Agriculture and Livestock Zone 3, Nyaung-Hnitpin Area, Hlegu Township	
	Occupation:	Agricultural Farmyard	
	Rank:	Watchman and Worker	
	Tel:	09 9709 94148	

I have lived in this farmyard for about 4 years. I work here as a watchman and worker. I get a monthly salary of Ks 120,000 as a watchman and worker. We cultivate a nursery of Malaysian padauk. Other trees such as mango, cashew, and guava are grown in the farmyard in Takutone Village where the manager lives. Our farmyard is 50 acres in total. The owner of the farmyard is Daw Than Than Htay. If we are ill, we go to Ngar Suu Taung rural clinic or Hlegu hospital. I haven't known that factories will be established in the complex of Nyaung Hnitpin Conference. Now I come to know about that and I'm happy. I'm also happy that people will get jobs if the factories are constructed. I also want to work there. There are 4 members in our family. My children are too young to attend schools. I welcome the construction of factories because my family will have more income than the present time of we get jobs at the industrial zone. I have no idea of what bad impacts there will be.


33	Name:	U Myo Thant	
	Age:	69	
	Address:	Farmyard No. 131, Agriculture and Livestock Zone 3, Nyaung Hnitpin Area, Hlegu Township	
	Occupation:	Survey and Land Records Department	
	Rank:	Head of Township Department (Retired)	
	Tel:	09 9739 93031	

I have lived in this farmyard since 2008. I bought 2.5 acres of land and have been growing seasonal fruit trees. There are 5 members in my family. My children are now government employees. I was formerly the township head of the Land Records Department and I have retired from it. I haven't known that an industrial zone will be established in the complex of Nyaung Hnitpin Conference. I welcome this construction because many people will get jobs if the industrial zone springs up. But the factories to be established should be the ones which do not have negative impacts on the environment. Currently, a chicken farm of Agriculture and Livestock Zone 3 close to our yard has dumped dead chicken and rotten eggs. We are very displeased about it and we don't want factories that will have bad impacts on the environment and that emit bad smell. If there will no negative environmental impact, we don't object to the project. Water supply, electric power and improved roads are required for the present situation to be significantly improved. We only grow seasonal plants and vegetables as much as we can. In the past, we hired many workers but we suffered losses. Since then we haven't hired any worker. We cannot walk along the roads around this area

in monsoon as they all are damaged due to the traffic of heavy trucks loaded with tons of goods. In constructing the industrial zone we are worried that roads will be more damaged if they don't follow relevant rules and regulations. The builders of the industrial zone should systematically implement the project. And once the industrial complex is established, it should properly be maintained.

34	Name:	U Kyaw Soe	
	Age:	40	
	Address:	Takutone Village, Hlegu Township	
	Occupation:	Head of Hundred Households	
	Tel:	09 2500 41552	


I was born in this village. We had some first-hand experience of flooded fields in our childhood. The water flowed from Takutone Inn (lake) into the Ngamoeyeik Creek. Even though it was flooded, water did not flow into the village. The fields were full of flood waters but it subsided after 2 or 3 days. But later in the present period, when it is flooded, the water reaches the village. It has happened like that for about 4 years. There are floods on village roads and inside the house compounds, rising up to over one feet. Hand-dug wells are deluged. Only after about one week, it subsides. There have been floods due to the entrepreneurs of agricultural and livestock breeding zones who divert the flow of water, blocking or unblocking the drains as they like. The drains they dug are also too narrow.


35	Name:	U Aye Kyaw	
	Age:	40	
	Address:	Sonekone Village, Hlegu Township	
	Occupation:	Head of Hundred Households	
	Tel:	09 7954 53349	


There were floods when we were young. The fields were full of flood waters and it flowed into the village. I had some experiences of witnessing the water rising right up to about one feet. It subsided after about one week. And then the water ran down into the Zone No. 2 and Zone No.3.

For the time being, there are floods every year. But the water does not flow into the villages as it happened in my childhood. The water does not flow into the village after making embankments on the main roads at the entrance of the village. There have been floods only in the fields. The water normally subsides after about one week.

36	Name:	Daw Sandar Oo	
	Age:	38	
	Address:	Kyarinn Anauk Village, Hlegu Township	
	Occupation:	Head of Hundred Households	

	Tel:	09 7836 19636	
	<p>I was born in this village. We experienced flooding in monsoon when we were young, studying in the primary school level. There were floods in the fields and the water reached only up to the fringe of the village. The flood waters in the field subsided after about one week. These days, the flooding becomes normal, damaging the plantations. After the water subsides, plants are grown again. There have been flooding more or less and it happens every year.</p>		

37	Name:	Daw Than Nu	
	Age:	52	
	Address:	Kyarinn Ashe Village, Hlegu Township	
	Occupation:	Headmistress, Middle School	
	Tel:	09 4201 59596	
	<p>I was born in this village. I have never seen floods and inflow of water into the village as far as I remember. But there have been floods since 2015. The water does not flow into the village. I have seen the flood waters running high above the lower parts of the main causeway. It subsided after 7 days. The flood waters flow into the Innkapaw Inn (Fishery) that is situated to the east of Kyarinn Ashe Village. We experience floods about once a year.</p>		

38	Name:	U Soe Aung	
	Age:	55	
	Address:	Nyaung Hnitpin Village, Hlegu Township	
	Occupation:	Village-tract Administrator	
	Tel:	09 4304 0242	
	<p>I was born in this village. There have never been floods so far since we were very young. Even today there are absolutely no floods. Sometimes some water flows into the field outside our village when it rains heavily. But it rarely happens. Although it is flooded, it subsides immediately. There have been no harm to the economy and no buildings damaged of due to flooding.</p>		

39	Name:	U Hla Tun	Photo Not Taken
	Age:	60	
	Address:	Agricultural and Livestock Breeding Zone No 3. Nyaung Hnitpin Village, Hlegu Township	

	<p>I have been living at No 45-46 in the Agricultural and Livestock Breeding Zone No 3 for 23 years. Now, I live in another place. I have been here before the holding of Nyaung Hnitpin Convention and since 1990s. By then there was no agricultural and breeding zone. The Zone emerged later in 2000. There have been no flooding. Even though it is flooded because of heavy rains, it flows out within a few hours. Zone No 3 does not suffer flooding. Zone No 2 usually experience floods. Zone No. 2 is located to the west of the main motor road, at the back of the Convention Complex. I think flooding takes place due to the ponds dug up by businessmen, reinforcing embankments, and blocking the drains.</p>
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4.11.3.5 Village Profile Overview

Total 6 villages were covered for social baseline data collection and these villages are **Kyarkansu village**, Nyayung Hnitpin Village tract, Hmawbi township (which is 3.91 km away from the project area), **Nyaung Hnitpin Village**, Nyaung Hnitpin Village tract, Hmawbi Township (which is 5 km away from the project area), **Takutone Village**, Kyarinn Village tract, Hlegu Township (which is 1.54 km away from the project area), **Sonekone Village**, Kyarinn Village tract, Hlegu Township (which is 3.67 km away from the project area), **Kyarinn Ashe Village**, Kyarinn Village tract, Hlegu Township (which is 4.33 km away from the project area), and **Kyarinn Anauk Village**, Kyarinn Village tract, Hlegu Township (which is 4.13 km away from the project area). The distance between each village and project site is shown in figure 4.69.

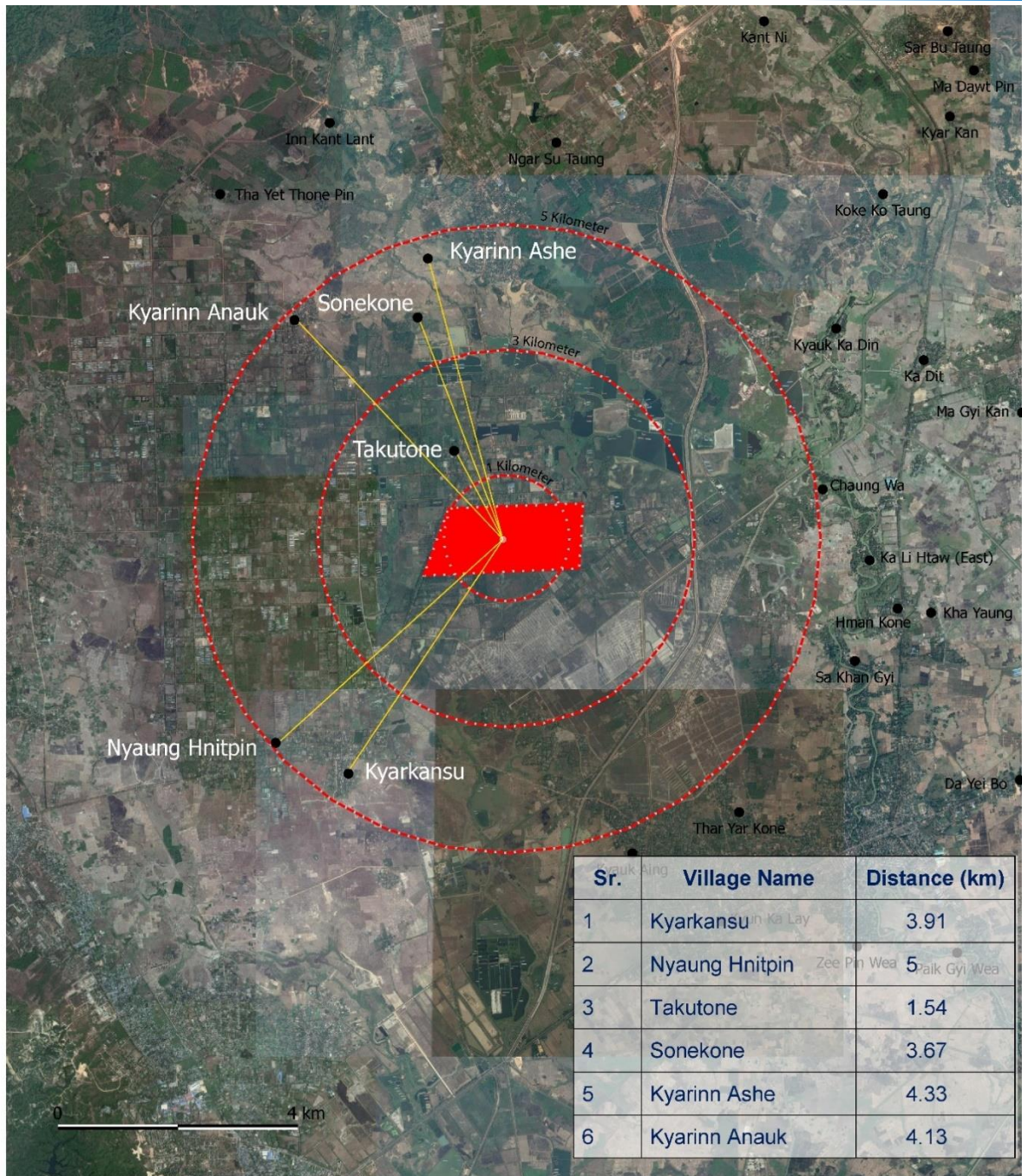


Figure 4. 69: Map showing distance between Project Area and villages for conducting Social Impact Assessment

4.11.3.5.1 Profile of Kyarkansu Village, Nyaung Hnitpin Village tract, Hmawbi Township


Population:		1600
Number of households:		320 households
Number of houses:		300 houses
Nationality:		Myanmar
Religion:		Buddhism
Education		
1	High School (Branch):	Nil
2	Number of teachers:	Nil
3	Number of students:	Nil
	a 5 th grade	Nil
	b 4 th grade	Nil
	c 3 rd grade	Nil


	d	2 nd grade	Nil
	e	1 st grade	Nil
	f	Kindergarten	Nil
Health			
1	25-bed hospital:		Nil
2	Village dispensary:		Nil
3	Doctor:		Nil
4	Nurse:		Nil
5	Midwife:		Nil
6	Auxiliary midwife:		Nil
7	Midwife (not scientifically trained):		2
Business			
1	Grocery:		7
2	Car rental service:		4
3	Trishaw:		Nil
4	Agriculture:		Gourd, groundnut, paddy, cucumber, acacia, water cress
5	Fishery (motorboat/schooner):		Nil
6	Livestock breeding:		Pig, chicken
7	Hotel:		Nil
8	Lodge:		Nil
Social activities			
1	Fire-fighting station:		Nil
2	Bank:		Nil
3	Library:		1
4	Recreation centre:		Nil
5	Village market:		Nil
6	Football ground:		Nil
7	Monastery:		3
8	Pagoda:		3
9	Spirit shrine:		1
10	Preschool:		1
Security			
1	Police station:		Nil
2	Military unit/post:		Nil
Transportation			
1	Car (private-owned)		Nil
2	Bus		Nil
3	Rental car		3
4	Motorcycle (Passenger transport)		15
5	Motorcycle (private-owned)		150
6	3-wheel motorcycle		Nil
7	Trailer Jeep		5
8	Trishaw		Nil
Telecommunication			
1	Landline phone		Nil
2	Mobile phone		300
3	Television set		150
4	Radio		Nil
General			
1	Households using electricity		180
2	Households not using electricity		120
3	Availability (hand-scooped well)		Nil
4	Tubewell		250


Overview



Figure 4. 70: Kyarkansu Village Buildings

1		Name:	U Vicitta
		Age:	56
		Address:	Kyarkansu Village, Nyaung Hnitpin Village Tract, Hmawbi Township, Yangon Region
		Occupation:	Buddhist Monk
		Rank:	Presiding Monk
		Hand phone:	09 4203 07708
<p>I have been presiding at this village monastery and disseminating the Sasana (the Teachings of the Buddha) for a long time. I have not formerly known about the establishment of an industrial zone in the complex of Nyaung Hnitpin Convention. Although the locals will get jobs due to the emergence of the industrial zone, I am worried that the polluted water and pungent smell the factories produce will have a damaging impact on the natural environment and the men's health. Currently there is an animal feed factory near this village. The pungent smell that this factory produces is giving trouble to the locals. It will cause damage to people later. The workers at the factories should be provided with compensation payment if they are injured. Slaughterhouses should not be included in the plan of factories. The government and those setting up factories must be accountable for the bad impacts on social and natural environment and for the compensation to the workers. If the above-mentioned requirements can be fulfilled, I will not object to the establishment of the industrial zone.</p>			

2	Name:	U Tun Wai	
	Age:	47	
	Address:	Kyarkansu Village, Nyaung Hnitpin Village Tract, Hmawbi Township, Yangon Region	
	Occupation:	Agricultural Business, member of village administration	
	Rank:	Head of Hundred Households	
	Hand phone:	09 4500 56073	
<p>I was born in this village. There are 6 family members. I run my own agricultural business. I grow paddy, cucumbers, and gourds. I have not known about the establishment of Nyaung Hnitpin industrial zone. I feel happy to know it now. If an industrial zone appears, people in the vicinity will get jobs. The village will be developed and the roads will be greatly improved. I am worried about the pungent smell and the polluted water from the industrial zone. They will do harm to people in nearby areas. I do not have to object to it if it does not do any harm to the people in the environment. It needs to be managed and implemented without any harm to men. I request the project developers and those who will establish the industrial zone to offer us a rural dispensary and a primary school. They should also help improve roads in the village.</p>			

3		Name:	U Kyaw Htwe
		Age:	30
		Address:	Kyarkansu Village, Nyaung Hnitpin Village Tract, Hmawbi Township, Yangon Region
		Occupation:	Agricultural Business
		Rank:	Head of Ten Households
		Hand phone:	09 4202 72004

	<p>I was born in this village. There are 4 family members. I run my own agricultural business. I grow paddy and Kinponchin (species: Concinna). I have not known about the establishment of an industrial zone in the complex of Nyaung Hnitpin Convention. When the industrial zone is completed, people from our village will get jobs. The roads and the living conditions of the people will be greatly improved. But I am anxious that the polluted water and the pungent smell produced by the factories will do harm to the health of the people in the nearby areas. I do not have to object to it if the industrial zone is set up without causing such harm. I welcome it. Those who are establishing the industrial zone should contribute to the development of our village.</p>
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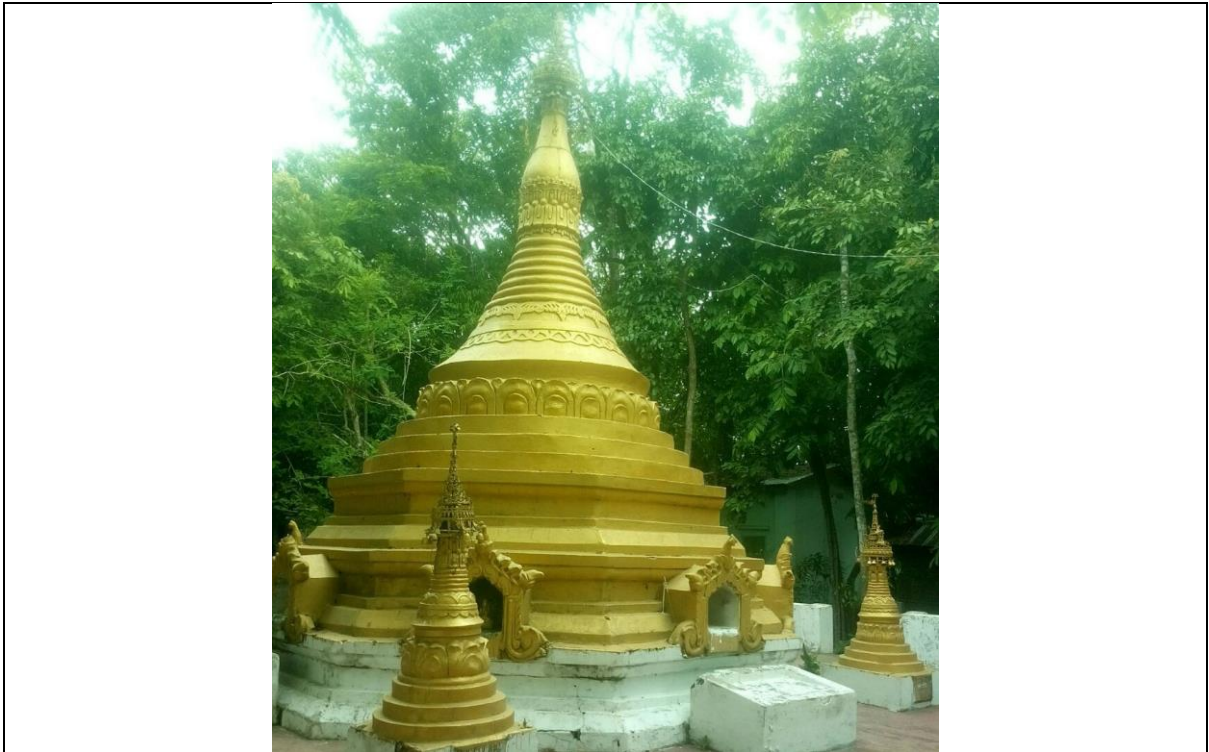
4		Name:	Daw Kyi Than
		Age:	50
		Address:	Kyarkansu Village, Nyaung Hnitpin Village Tract, Hmawbi Township, Yangon Region
		Occupation:	Agricultural Business, Department of Health
		Rank:	Auxiliary midwife
		Hand phone:	09 4202 52420
<p>I was born in this village. There are 6 family members. My main business is agriculture. I am an auxiliary midwife. I heard about the establishment of an industrial zone in the complex of Nyaung Hnitpin Convention last year. I am not sure which country will come and set it up. If the industrial zone is really established, the locals will get jobs and their social status will be improved. I am anxious that the waste dumped by the factory will have bad impacts on the water and air in our environment. It may also harm the health of people in the nearby area. For these reasons, those who are constructing factories should follow set guidelines to cause minimum negative impacts on the environment and the people. There has been no serious disease in this village. They suffer from normal illnesses. I don't have a record of a child that dies at birth.</p>			

4.11.3.5.2 Profile of Nyaung Hnitpin Village, Nyaung Hnitpin Village tract, Hmawbi Township

Population:		3126	
Number of households:		655 households	
Number of houses:		640 houses	
Nationality:		Myanmar	
Religion:		Buddhism	
Education			
1	High school (Branch):	1	
2	Number of teachers:	35	
3	Number of students:	1318	
	a	10 th grade	49
	b	9 th grade	91
	c	8 th grade	137
	d	7 th grade	124
	e	6 th grade	119
	f	5 th grade	171
	g	4 th grade	114
	h	3 rd grade	130
	i	2 nd grade	116
	j	1 st grade	130
	k	Kindergarten	137

Health		
1	25-bed hospital:	Nil
2	Village dispensary:	1
3	Doctor:	Nil
4	Nurse:	Nil
5	Midwife:	1
6	Auxiliary midwife:	1
Business		
1	Grocery:	15
2	Car rental service:	33
3	Trishaw:	Nil
4	Agriculture:	Acacia, gway-tauk (bitter leaves), cucumber, gourd, eggplant, mustard, paddy
5	Fishery (motorboat/schooner):	Nil
6	Livestock breeding:	Pig, chicken, quail
7	Hotel:	Nil
8	Lodge:	Nil
Social activities		
1	Fire-fighting station:	Nil
2	Bank:	Nil
3	Library:	1
4	Recreation centre:	Nil
5	Village market:	Nil
6	Football ground:	1
7	Monastery:	1
8	Pagoda:	2
9	Spirit shrine:	1
Security		
1	Police station:	Nil
2	Military unit/post:	Nil
Transportation		
1	Car (private-owned)	1
2	Bus	Nil
3	Rental car(Light Truck)	16
4	Motorcycle (Passenger transport)	50
5	Motorcycle (private-owned)	250
6	3-wheel motorcycle	7
7	Trailer Jeep	10
8	Trishaw	Nil
Telecommunication		
1	Landline phone	Nil
2	Moblile phone	1200
3	Television set	300
4	Radio	5
General		
1	Households using electricity	400
2	Households not using electricity	60
3	Availability (hand-scooped well)	Nil
4	Tubewell	200

Overview



Pagoda



Monastery



Buddhist Ordination Hall




Community Hall




Shrines for guardian spirits




Figure 4. 71: Nyaung Hnitpin Village Buildings


1	Name:	U Than Oo	
	Age:	57	
	Address:	Nyaung Hnitpin Village, Nyaung Hnitpin Village Tract, Hmawbi Township, Yangon Region	
	Occupation:	Agriculture	
	Rank:	Grower of Kinponchin (Concinna), sour leaf vegetable	
Hand phone:	09 4250 18226		
<p>I have lived in this village since I was young. There are 4 family members. I grow Kinponchin (Concinna) on this farm. I sell the sprigs of Kinponchin at the Htaukkyant and Danyingone Railway Station markets. I have heard about an industrial zone to be built. I do not know where it would be built. I feel happy now to hear the exact information of the industrial zone to be set up in the complex of Nyaung Hnitpin National Convention. When the industrial zone emerges, people from nearby villages will get jobs. I am sure the road transport as well as the living conditions of the people will be greatly improved. When the factories actually run, there may be harmful products from them. The polluted air and water may have bad impacts on the environment. For these reasons, the wastes must be systematically treated so as not to harm the environment. They have to be in conformity with prescribed rules and regulations. I do not object to the establishment of the industrial zone if it is done in conformity with set rules and regulations. I want to suggest that the company that is to set up the industrial zone should help meet the needs of the development of this village.</p>			

2		Name:	U Myo Naing Oo
		Age:	58
		Address:	Nyaung Hnitpin Village, Nyaung Hnitpin Village Tract, Hmawbi Township, Yangon Region
		Occupation:	Department of Education
		Rank:	Headmaster
		Hand phone:	09 7788 53745
<p>I was born in Pyinmana. I have taken this responsibility for over 2 months. There are 4 family members. I am living with my nephews now. I have not known about the establishment of an industrial zone in the complex of Nyaung Hnitpin Convention. The locals will get jobs thanks to its establishment. The roads as well as the social status of the people will be greatly improved. As for bad impacts, the polluted water, pungent smell and industrial wastes are systematically managed I do not have to object to the setting up of the industrial zone. I have no objection to it. What I want to ask the companies establishing the industrial zone is to provide our school with enough school benches as we don't have enough of them. As the subsidy of the government is not enough, the company that is to set up the industrial zone is requested to help us in this respect.</p>			


3	Name:	Daw Lwin May Than	
	Age:	38	
	Address:	Nyaung Hnitpin Village, Nyaung Hnitpin Village Tract, Hmawbi Township, Yangon Region	
	Occupation:	Department of Health	
	Rank:	Midwife	
Hand phone:	09 4480 22106		
<p>I am from Minhla Township, Bago Region. There are 9 family members. I have been serving as a health staff for 19 years. I feel happy to know that an industrial zone is to be</p>			

set up in the complex of Nyaung Hnitpin National Convention. The locals will get jobs. As many people will be employed, their social conditions will be improved. The road transport will be much better. The polluted air and contaminated water will have bad impacts on the environment if harmful industrial wastes are disposed of from the industrial zone. Providing health care services will be a challenging task as there will more and more people working and living in the area. I want to suggest that the establishment of the industrial zone should be systematically managed so as not to pollute the water and the air. Moreover, the dumping of polluted water should also be properly managed not to harm the natural environment. Wastes should also be disposed in accordance with set rules and regulations.

4		Name:	U Kan Myint
		Age:	58
		Address:	Nyaung Hnitpin Village, Nyaung Hnitpin Village Tract, Hmawbi Township, Yangon Region
		Occupation:	Agricultural Business, member of Village Administration
		Rank:	Head of Hundred Households
		Hand phone:	09 7968 04634
<p>I was born in this village. There are 6 family members. I run my own agricultural business. I grow eggplants, cucumbers, mustards and gourds. I have heard about the establishment of an industrial zone in the immediate vicinity. But I do not exactly know its exact location. I feel happy to hear that an industrial zone is to be set up in the present complex of Nyaung Hnitpin National Convention. People here barely meet their basic needs. I hope that both skilled and non-skilled workers will be given jobs. I am concerned that the zone may cause air pollution and dump polluted water having bad impacts on the health of the locals. I am also concerned that foreigners from the zone may fall in love with local women. What I am worried is that they may leave the women behind without marrying them legally. Another thing I have concerns are that there may clashes between people who profess different faiths. In addition, I want to suggest the company to build a station hospital as the factory workers may need medical treatment. The company should also help us repair our roads that they will become much better than the present situation. I do not object to the setting up of an industrial zone.</p>			

5	Name:	Daw Hla Thein	
	Age:	55	
	Address:	Nyaung Hnitpin Village, Nyaung Hnitpin Village Tract, Hmawbi Township, Yangon Region	
	Occupation:	Agriculture	
	Rank:	Agricultural worker, Leader of Women's Affairs Association	
	Hand phone:	09 7814 31788	
<p>I was born in this village. There are 4 family members. I have not heard of establishing an industrial zone in the complex of Nyaung Hnitpin Convention. There are high school and university graduates and casual labourers in this village. They have still been unemployed. I hope they will get jobs if the industrial zone emerges. I am happy because they will have to work under shelter as those manual labourers had to work under the sun in the past. The educated will have the kind of jobs that suit their status. That is why I am happy to have an industrial zone. I am not sure what bad impacts there will be. I do not want the factories that produce pungent smell to be included. I do not object to it if it</p>			

does no harm to the people and natural environment. The task of paving the village main road with concrete has not been finished yet. We request the company establishing the industrial zone to help complete it. The jobless, landless and homeless should be provided with jobs as well as shelter for them.

6		Name:	U Soe Aung
		Age:	55
		Address:	Nyaung Hnitpin Village, Nyaung Hnitpin Village Tract, Hmawbi Township, Yangon Region
		Occupation:	Agriculture, Administration
		Rank:	Village Administrator
		Hand phone:	09 4304 0243
<p>I was born in this village. There are 10 members in my family. I grow paddy. I have heard about creating an industrial zone in the complex of Nyaung Hnitpin National Convention. One of the companies said to me that a factory is to be built in this complex. So I showed them around the area. The unemployed will be sure to have jobs if there arises an industrial zone. The roads will be sure to be improved if an industrial zone arises. We won't be experiencing power cutoffs. Men will be of high social status. For these reasons, I welcome the establishment of the industrial zone. Building factories should also have least impacts on the natural and social environment. The factory that produces polluted water and pungent smell should not be included. There are landless and homeless people in our village and they should be offered jobs when the factories are completed. Shelter should also be provided for them. I have no objection to it if the wastes dumped by the factories will not do serious harm to the environment. If so, I support it.</p>			

4.11.3.5.3 Profile of Takutone Village, Kyarinn Village tract, Hlegu Township

Population:		570
Number of households:		120 households
Number of houses:		120 houses
Nationality:		Myanmar
Education		
1	Middle School (Branch):	1
2	Number of teachers:	11
3	Number of students:	255
	a 8 th grade	23
	b 7 th grade	26
	c 6 th grade	33
	d 5 th grade	27
	e 4 th grade	25
	f 3 rd grade	33
	g 2 nd grade	50
	h 1 st grade (Kindergarten)	38
Health		
1	25-bed hospital:	Nil
2	Village dispensary:	Nil
3	Doctor:	Nil
4	Nurse:	Nil
5	Midwife:	Nil
6	Auxiliary midwife:	1

Business		
1	Grocery, food shop, cafeteria:	8
2	Rental car	1
3	Trishaw:	Nil
4	Agriculture:	Gourd, eggplant, cucumber, peas, roselle, flowers, eugenia sprigs
5	Fishery (motorboat/schooner):	Nil
6	Livestock breeding:	Pig, chicken, fish
7	Hotel:	Nil
8	Lodge:	Nil
Social activities		
1	Fire-fighting station:	Nil
2	Bank:	Nil
3	Library:	Nil
4	Recreation centre:	Nil
5	Village market:	Nil
6	Football ground:	Nil
7	Monastery:	1
8	Pagoda:	1
Security		
1	Police station:	Nil
2	Military unit/post:	Nil
Transportation		
1	Car (private-owned)	Nil
2	Bus	Nil
3	Rental car	1
4	Motorcycle (Passenger transport)	20
5	Motorcycle (private-owned)	40
6	Trishaw	Nil
Telecommunication		
1	Landline phone	Nil
2	Mobile phone	250
3	Television set	60
4	Radio	5
General		
1	Households using electricity	84
2	Households not using electricity	36
3	Availability (hand-scooped well)	70
4	Tubewell (pedal-driven)	10

Overview







Monastery and pagoda	Basic Education Middle School (Branch)
	
Basic Education Middle School (Branch)	Grocery

Figure 4. 72: Takutone Village Buildings

Overview

1		Name:	U Obasa
		Age:	26
		Address:	Takutone Village Monastery, Hlegu Township
		Occupation:	—
		Designation:	Assistant Presiding Monk
		Hand phone:	09 2649 23980
<p>My birthplace is Kyaiklat Township, Ayeyarwaddy Region. I have been residing at this monastery for about a year. I have already heard about the construction of an industrial zone in the Nyaung Hnitpin National Convention complex. The religious lands or buildings are not involved in the area in which the industrial zone is to be built. There are one monastery, 2 stupas and a rest house in this village. All the villagers are Buddhists. There is no one who professes other religions. We have hand-dug wells as well as tube wells. We have electricity from the national grid. I am happy that people from this village will get jobs when there arises an industrial zone. As a consequence, the economy of the villagers will improve a lot. If the socio-economic condition of the villagers has become much better, people will also engage in more meritorious deeds. Most of the villagers earn their living through agriculture. They grow seasonal vegetables, flower plants and Eugenia trees. There are some others working for factories and workshops. What we need in our village are a rest house at the cemetery, and good roads. We have to wade through the water during the rainy season. I want to request the project developers to help us repair the existing roads.</p>			


2	Name:	U Kyaw Thu	
	Age:	42	
	Address:	Agriculture & Livestock Breeding Zone 2, Takutone Village, Hlegu	
	Occupation:	Agriculture and Livestock Breeding	
	Designation:	Businessman (who owns his business), Vice Chairman of Village Funeral Rites Association	
Hand phone:	09 9763 08000		


I have lived in this village for over 17 years. My birthplace is Khayan Township, Ayeyarwady Region. The place where there are agricultural and livestock breeding zones and that are close to the Nyaung Hnitpin National Convention complex are vacant lands. In 2003, the lands were confiscated by the Union Solidarity and Development Association and the buildings for the national convention were constructed within two years—2004 and 2005. In 2006 and 2007, national conventions were held in these USDP-owned buildings. The Constitution was approved in 2008. This village is the closet to the Nyaung Hnitpin Convention complex. It is about 3,600 feet away from the complex. The village has over 100 houses. Formerly, there was no primary school. We had a primary school in 2008. Now, it has become an affiliated middle school. There are classes up to eighth grade. If there is an industrial zone in Nyaung Hnitpin, the locals will get jobs. So I welcome it. Most of the people from this village earn their living through agriculture. There are a few livestock breeders. They breed chickens. I have fifty acres of Eugenia trees. There are high school as well as university graduates in this village. Some people have to work in the industrial zones in Hmawbi, Hlegu, etc. When the industrial zone is completed, the standard of living of people from this village will change. I wish the developers of the industrial zone would contribute to the development of our village and to the increase of knowledge and technology.


3		Name:	Daw Hnin Wai Aung
		Age:	49
		Address:	Takutone Village, Hlegu Township, Kyarinn Village Tract
		Occupation:	Health Department (and a shop-keeper)
		Designation:	Auxiliary midwife
		Hand phone:	09 7671 48201

This village is my birthplace. There is no Rural Health Centre (RHC) in this village. There is an RHC in Kyarinn Village. I am a midwife under the Kyarinn Health Department. Kalihtaw Village also has an RHC. There has been no serious disease breakout in this village. People suffer from minor ailments due to changes in weather. The mortality rate of newly born babies was fairly high in 2015. It has declined since 2016 and it is only about 10% in 2017. The rate of malnutrition in children was about 30% in 2015. It dropped to about 10% in 2017. The Health Department is helping to nourish the children with the support of the World Health Organization (WHO). Malnourished children are being offered financial assistance, medications, milk powder and clothes. But what they have received is still not enough for them. Vaccination against infections is enough. As we have no rural dispensary in our village, we find it very difficult, when someone is ill at night and in monsoon, to look for a place where there is a dispensary. We need a dispensary in this village. In this village, every house uses a fly-proof flush toilet. If an industrial zone is established in the complex of Nyaung Hnitpin National Convention, I feel happy because the locals will get more jobs. Some have to go far from this village to earn their living. If the industrial complex is constructed, they will be able to work in this area. I hope our health, education and economy will be significantly improved. I will not object to the establishment of this industrial zone. We welcome and recommend it.

4	Name:	U Tun Yee
	Age:	60
	Address:	Takutone Village, Hlegu Township
	Occupation:	Agriculture
	Designation:	Villager elder

	Hand phone:	09 3131 7675	
<p>I have lived in this village since my childhood. This village had existed since before we regained independence. This village was destroyed due to the conflict between Kayin and Myanmar after the independence was regained. When U Ne Win government assumed power in 1962, the village was reestablished with about 10 houses. There are now over a hundred houses, I'm happy to hear that an industrial zone is going to be established in the complex of Nyaung Hnitpin National Convention. As this village is close to the complex, I hope that people from the village will get jobs at the factories. The villagers had their own pieces of farmland in the past and worked on their farms for their livelihoods. Nowadays, most of them become employees working for others. There are only a few people who own farmlands. Only one or two villagers own their farmland. Most of them work as daily-wage earners doing casual work in agriculture and livestock breeding zones 1, 2 and 3. They earn about Ks 5,000 or 6,000 a day. Masons and construction workers earn more. On completion of the factories, we expect that our villagers will be offered jobs. If there arises an industrial zone, the zone will have good impact on the whole area and I am not sure whether if there will be bad impacts.</p>			

5	Name:	U Kyaw Soe	
	Age:	40	
	Address:	Takutone Village, Kyarinn Village Tract, Hlegu Township	
	Occupation:	Shop Keeper, Village Administration	
	Designation:	Head of a Hundred Households	
	Hand phone:	09 2500 41552	
<p>I was born in this village. I have lived in this village since my childhood. There are five members in my family. There are about 150 houses in this village. I am working towards the development of our village in cooperation with village elders and villagers. Having an affiliated middle school in our village, there are high school and university graduates. We have no rural dispensary but a auxiliary midwife. Villagers have lost their land and farm which were confiscated at the beginning of the agriculture and livestock breeding zone. Now those who confiscated the lands are leasing them to the agriculture and livestock breeders at Ks 30,000 per acre per year. Most of the people in this village rely on agriculture for their livelihoods as they are now working as hired labourers in the agriculture and livestock breeding zone. There are those who go and work at the factories and workshops in other places by commuter bus. They mostly believe in Buddhism. So there are religious buildings, monasteries, zedis and pagodas. There is no other religion. It will be more convenient for the villagers to get jobs if there arises an industrial zone in the complex of Nyaung Hnitpin National Convention. As a result, they no longer need to go for and work in other places for these reasons; we welcome the construction of the industrial zone. We feel happy on behalf of the villagers as there have been requirements to improve the education and health sectors in this village, we wish the companies building factories would help fulfill those requirements.</p>			

6	Name:	Daw Khin Khin Myaing	
	Age:	49	
	Address:	Takutone Village, Hlegu Township	
	Occupation:	Department of Education	
	Designation:	Headmistress of the Middle School (Branch), Takutone Village	
	Hand phone:	09 7954 77330	
<p>My birthplace is South Okkalapa, Yangon. I am now taking responsibility as the headmistress of the Middle School (Branch) in Takutone Village. There are 4 family members. My husband belongs to the Hmawbi telecommunication military unit. When the school closes, I go to live in that military quarter. I have not previously known about the industrial zone to be established in the complex of the Nyaung Hnitpin Convention. People from this village will get jobs if the industrial zone is constructed. So I am happy. I am sure the whole area including this village will be totally changed. I hope that the main changes will be good roads and the social life will simultaneously be improved. I think the bad impacts may be due to the dumping of polluted water from the factories and air pollution. Confiscating land will not happen, I think. So it needs to avoid any harm. The constructions of two school rooms remain unfinished in any school. As Ninth Grade classes are going to be first opened in this academic year, we need some more school rooms and school benches. The company that will invest in the industrial zone and the government should help meet the needs of our village in cooperation with village elders and authorities concerned. I will not object to the construction of this industrial one if there is no harm to the locals and their socio-economic life. I welcome it if it has good impacts.</p>			

4.11.3.5.4 Profile of Sonekone Village, Kyarinn Village tract, Hlegu Township

Population:		392	
Number of households:		110 households	
Number of houses:		116 houses	
Nationality:		Myanmar	
Education			
1	Primary school:	1	
2	Number of teachers:	5	
3	Number of students:	39	
	a	5 th grade	8
	b	4 th grade	6
	c	3 rd grade	9
	d	2 nd grade	6
	e	1 st grade (Kindergarten)	10
Health			
1	25-bed hospital:	Nil	
2	Village dispensary:	Nil	
3	Doctor:	Nil	
4	Nurse:	Nil	
5	Midwife:	Nil	
6	Auxiliary midwife:	Nil	
Business			
1	Grocery:	Nil	
2	Car rental service:	Nil	
3	Trishaw:	Nil	
4	Agriculture:	Gourd, groundnut, paddy	
5	Fishery (motorboat/schooner):	Nil	
6	Livestock breeding:	Pig, chicken	
7	Hotel:	Nil	

8	Lodge:	Nil
Social activities		
1	Fire-fighting station:	Nil
2	Bank:	Nil
3	Library:	Nil
4	Recreation centre:	Nil
5	Village market:	Nil
6	Football ground:	Nil
7	Monastery:	1
8	Pagoda:	1
9	Spirit shrine:	1
Security		
1	Police station:	Nil
2	Military unit/post:	Nil
Transportation		
1	Car (private-owned)	Nil
2	Bus	Nil
3	Rental car	Nil
4	Motorcycle (Passenger transport)	14
5	Motorcycle (private-owned)	30
6	3-wheel motorcycle	3
7	Trailer Jeep	1
8	Trishaw	Nil
9	Bullock-cart	5
Telecommunication		
1	Landline phone	Nil
2	Moblile phone	150
3	Television set	70
4	Radio	Nil
5	Sky Net	3
General		
1	Households using electricity	110
2	Households not using electricity	6
3	Availability (hand-scooped well)	1
4	Tubewell	50

Overview



Monastery and pagoda





Guardian spirit shrine



Figure 4. 73: Sonekone Village Buildings

1		Name:	U Aye Kyaw
		Age:	40
		Address:	Sonekone Village, Kyarinn Village Tract, Hlegu Township
		Occupation:	Agriculture and Livestock Breeding, Village administration
		Designation:	Head of Hundred Households
		Hand phone:	09 7954 53349
<p>This village is my birthplace, and I have lived here since my childhood. There are 5 members in my family. I run an agriculture and livestock breeding business. I grow seasonal vegetables and breed chickens and swines. We have a primary school but no rural dispensary and female nurse. I have a leading role to play in festive occasions, funerals, electricity supply and road communication of my village in cooperation with village elders and villagers, I have not formerly heard of establishing an industrial zone in the complex of Nyaung Hnitpin Convention. I have come to know it now, I hope most of the villagers will get jobs if it is an industrial zone, the villagers will no longer be casual labourers outside the area of the village as there are a number of people taking manual jobs. For them, I feel happy to have an industrial zone. It is to be positively said that the establishment of an industrial zone will have good impact on our community. I have no idea of what seems to be negative about it.</p>			
2	Name:	U Tin Shein	
	Age:	65	
	Address:	Sonekone Village, Kyarinn Village Tract, Hlegu Township	
	Occupation:	Agriculture	

	Designation:	Village Elder	
	Hand phone:	09 2505 23125	
	<p>I have lived in this village since my childhood. It is my birthplace. There used to be teak forests in the immediate vicinity. In addition, there also were other wood trees—<i>in</i> (dipterocarpus tuberculosis) and <i>kanyin</i> (dipterocarpus alatus). In the past, those nearby forests were inhabited by wild animals such as elephants, tigers, muntjac, samburs, wild cats and mongoose. Those flora and fauna have become extinct now. I have 5 family members. I work on a paddy farm land and also grow groundnut. I haven't known that an industrial zone is to be built in the complex of Nyaung Hnitpin National Convention. I am sure our villagers will get jobs if the industrial zone appears. Many of our villagers have limited formal education and they work as manual labourers. There are a few high school and university graduates. The project developer and factories in the industrial complex should offer jobs to them. We have a primary school. But we do not have a rural dispensary. If possible, the companies establishing the industrial zone should provide a dispensary and better roads for our village. I do not object to the construction of an industrial zone as it will have good impacts on our village and its environment. We welcome it. I do not know if there will be any bad impact. I have no idea as to what bad impacts will come out.</p>		

3	Name:	Daw Khine Nwe Yi	
	Age:	46	
	Address:	Sonekone Village, Kyarinn Village Tract, Hlegu Township	
	Occupation:	Department of Education	
	Designation:	Headmistress of Primary School	
	Hand phone:	09 7954 53354	
	<p>My birthplace is in Maubin Township. I have been taking responsibility as the headmistress of the primary school for 10 years. I live in this village. There are 4 teachers including myself and one worker in this school. There are altogether 39 students at our school. The government had this school constructed in fiscal 2004-2005 as we can now see. The Partner Myanmar NGO offered the water storage tank in front of the school to collect rain water. I have not previously known that a new industrial zone will be established in the complex of Nyaung Hnitpin National Convention. The construction of a new industrial zone is sure to have good and bad impacts. The good impacts are that many of the locals will get jobs and the roads will be greatly improved. Now, people from the village have to go far and work in Hlegu and Hmawbi townships and Yangon, Htaukkyant and Mingaladon industrial zones. They will no longer need to go far to work if an industrial zone exists. I hope that skilled persons as well as the manual labourers will be offered jobs in their appropriate positions; it is rather difficult to say that it will have only bad impacts. What I really want to say is that the management needs to do no harm to men and their environment.</p>		

4.11.3.5.5 Profile of Kyarinn Ashe Village, Kyarinn Village tract, Hlegu Township

Population:		2137	
Number of households:		480 households	
Number of houses:		470 houses	
Nationality:		Myanmar	
Religion:		Buddhism	
Education			
1	Middle School (Branch):	1	
2	Number of teachers:	12	
3	Number of students:	408	
	a	7 th grade	36
	b	6 th grade	54
	c	5 th grade	46
	d	4 th grade	39
	e	3 rd grade	48
	f	2 nd grade	54
	g	1 st grade	56
	h	KG	75
Health			
1	25-bed hospital:	Nil	
2	Village dispensary:	1	
3	Doctor:	Nil	
4	Nurse:	Nil	
5	Midwife:	1	
6	Auxiliary midwife:	Nil	
Business			
1	Grocery:	12	
2	Car rental service:	Nil	
3	Trishaw:	Nil	
4	Agriculture:	Paddy, cucumber, nut, mustard, rubber	
5	Fishery (motorboat/schooner):	Nil	
6	Livestock breeding:	Swine, chicken and fish	
7	Hotel:	Nil	
8	Lodge:	Nil	
Social activities			
1	Fire-fighting station:	Nil	
2	Bank:	Nil	
3	Library:	1	
4	Recreation centre:	Nil	
5	Village market:	Nil	
6	Football ground:	Nil	
7	Monastery:	2	
8	Pagoda:	2	
Security			
1	Police station:	Nil	
2	Military unit/post:	Nil	
Transportation			
1	Car (private-owned)	Nil	
2	Bus	Nil	
3	Rental car	Nil	
4	Motorcycle (Passenger transport)	25	
5	Motorcycle (private-owned)	480	
6	3-wheel motorcycle	2	
7	Trailer Jeep	Nil	

8	Trishaw	Nil
Telecommunication		
1	Landline phone	Nil
2	Moblile phone	1200
3	Television set	280
4	Radio	40
General		
1	Households using electricity	400
2	Households not using electricity	70
3	Availability (hand-scooped well)	70
4	Tubewell	400

Overview



Two monasteries and pagodas



Basic Education Middle School (Branch)




Renovation of the Primary School in Kyarinn Ashe Village was carried out by the development funds of the Pyidaungsu Hluttaw.
 The value of funds: MMK 5 million
 Renovation started: January 24, 2014
 Renovation completed: February 25, 2014






Figure 4. 74: Kyarinn Ashe Village Buildings

1	Name: Age: Address: Occupation: Designation: Hand phone:	U Myint Kyaw 49 Kyarinn Ashe Village, Kyarinn Village Tract, Hlegu Township Administration Village Tract Administrator 09 540 0908	
<p>My birthplace is Kyarinn Ashe Village. There are 5 members in my family. I run my own grocery store to earn my living. Currently I am taking responsibility as the Village Tract Administrator. I have heard that an industrial zone is to be established in the complex of Nyaung Hnitpin Convention. I do not know which country is implementing it. If the industrial zone emerges, the whole area will be changed and the roads will be improved compared to the present situation. If the roads becomes much better, it will consequently improve our social status. I feel happy as the locals will get jobs. If the businesses flourish, the rule of law will improve. The establishment of the industrial zone may have good impacts as well as bad impacts. The construction of the industrial zone should be systematically implemented under the supervision of the developers in order that bad impacts will not cause any harm to the natural environment as well as the social life. If there is no harm to natural and social environment, we welcome the industrial zone construction. I feel joy as I hope many locals will get jobs.</p>			

2	Name:	Daw Than Nu	
	Age:	52	
	Address:	Kyarinn Ashe Village, Kyarinn Village Tract, Hlegu Township	
	Occupation:	Department of Education	
	Designation:	Headmistress of the Middle School (Branch)	
	Hand phone:	09 4201 59596	
<p>I was born in this village. There are 5 members in my family. Currently, I am taking responsibility as the headmistress of the Middle School (Branch) in Kyarinn Ashe Village. I have heard about building an industrial zone in the complex of Nyaung Hnitpin Convention. I feel happy because I hope the high school and university graduates as well as unskilled labourers will get jobs if an industrial zone is established. There are jobless people although they have passed 11th Grade (matriculation) examination. Some of them are now working with the village monastic school. As there is no nursery school, the company implementing the project should provide a daycare centre for the village. If there is a nursery, people in this village will be more convenient to work outside their houses. When the industrial zone is finished, some young people will get jobs and will be able to spend more money. I'm concerned that they will be using narcotic drugs if they have no jobs. The construction of the industrial zone will have good impacts on our village. It is difficult to say if there will be bad impacts. I want to suggest that the project developers need to manage it in order not to harm natural and social environments.</p>			
3	Name:	Daw Tin Moe Thwe	
	Age:	27	
	Address:	Kyarinn Ashe Health Department (Branch), Kyarinn Ashe Village, Hlegu Township	
	Occupation:	Health Department	
	Designation:	Supervisor Level 2	
	Hand phone:	09 7983 23928	
<p>My birthplace is Darbein, Hlegu Township. Our family is an extended one. There are seven members including father, mother, brothers and sisters in my family. I have been taking responsibility (as a health staff member) in this village for over 4 months. I am now living in the rural health department (Branch) quarter with my younger brother. There has been no serious disease in this village. In the past, some of them suffered from malaria. However, they no longer have it. I haven't known before that an industrial zone is to be set up in the complex of Nyaung Hnitpin Convention. I feel happy that the locals, young and old alike, will get jobs if an industrial zone is established. The social status of the locals will be improved and the roads will become much better. The industrial zone may probably cause harm to the natural environment. The builders of the factories need to be responsible for not harming the earth, air and water in the natural environment. There is no doctor to take care of health in this village. We have only a midwife. If someone suffers from a disease, we have to go to the hospitals and health care centres in Yangon or Hlegu. Patients in an emergency situation find it difficult to go to town because the roads are bad. The builders of the factories should help improve roads.</p>			
4	Name:	Daw Than Than Win	
	Age:	48	
	Address:	Kyarinn Ashe Village, Kyarinn Village Tract, Hlegu Township	
	Occupation:	Own shop	
	Designation:	Shopkeeper	

	Hand phone:	09 2634 67583	
<p>I was born in this village. There are only 2 members in my family. I haven't heard about the establishment of an industrial zone in the complex of Nyaung Hnitpin National Convention. I feel happy because people from our village and nearby villages will get jobs if an industrial zone is set up. I am not sure if the industrial zone will have bad impacts. I think our shop will also sell much better than the present. It is needed to improve roads for the local development. The present roads are so damaged that they cannot be properly used. Those are worse in monsoon. When the industrial zone is completed, this place will be more populated. We will be able to enjoy a growing business as we sell better. We do not have to be worried about emissions from the industrial zone as it is rather far from our village. But I am worried that the harmful by-products may cause harm to the natural and social environments of the villages close to the zone. Those who set up factories should take proper measures so that there will be no bad impacts.</p>			

5	Name:	Daw Tin Than	
	Age:	60	
	Address:	Kyarinn Ashe Village, Kyarinn Village Tract, Hlegu Township, Yangon Region	
	Occupation:	Fishery	
	Rank:	Worker	
	Hand phone:	09 7737 11814	
<p>We have lived in this village for a long time. There are 4 members in my family. I haven't known that an industrial zone is to be set up in the complex of Nyaung Hnitpin National Convention. When the industrial zone is completed, the social status of the people, young and old alike, from the villages in the vicinity will be improved. I have a daughter working in the business of packaging plum jam. Now, she earns Ks 3,000 a day. If the industrial zone emerges, I want her to work at the zone. I think it will be more convenient for her to work at a factory than to take any job that comes by. So I support the establishment of the industrial zone. My son has already passed the matriculation exam. He aims to work at the industrial zone. I have no idea of whether the establishment of the industrial zone will have bad impacts on the environment. It will depend on what kind of factories are to be built and how they will be built.</p>			

4.11.3.5.6 Profile of Kyarinn Anauk Village, Kyarinn Village tract, Hlegu Township

Population:		1850	
Number of households:		370 households	
Number of houses:		350 houses	
Nationality:		Myanmar	
Religion:		Buddhism	
Education			
1	Middle School (Branch):	1	
2	Number of teachers:	12	
3	Number of students:	204	
	a	7 th grade	23
	b	6 th grade	23
	c	5 th grade	37
	d	4 th grade	28
	e	3 rd grade	19
	f	2 nd grade	24
	g	1 st grade	25
	h	KG	25
Health			
1	25-bed hospital:	Nil	
2	Village dispensary:	Nil	
3	Doctor:	Nil	
4	Nurse:	Nil	
5	Midwife:	Nil	
6	Auxiliary midwife:	1	
Business			
1	Grocery:	20	
2	Car rental service:	5	
3	Trishaw:	Nil	
4	Agriculture:	Paddy, eggplant, cucumber ,nut, mustard, roselle, chilly	
5	Fishery (motorboat/schooner):	Nil	
6	Livestock breeding (small scale):	30	
7	Hotel:	Nil	
8	Lodge:	Nil	
Social activities			
1	Fire-fighting station:	Nil	
2	Bank:	Nil	
3	Library:	Nil	
4	Recreation centre:	Nil	
5	Village market:	Nil	
6	Football ground:	1	
7	Monastery:	1	
8	Pagoda:	4	
9	Spirit shrine:	1	
Security			
1	Police station:	Nil	
2	Military unit/post:	Nil	
Transportation			
1	Car (private-owned)	Nil	
2	Bus	Nil	
3	Rental car	2	
4	Motorcycle (Passenger transport)	100	
5	Motorcycle (private-owned)	300	

6	3-wheel motorcycle	Nil
7	Trailer Jeep	3
8	Trishaw	Nil
Telecommunication		
1	Landline phone	Nil
2	Moblile phone	700
3	Television set	300
4	Radio	50
General		
1	Households using electricity	200
2	Households not using electricity	150
3	Availability (hand-scooped well)	200
4	Tubewell	2

Overview



Pagodas

Monastery

Community Hall for religious purposes

Wayside public resthouse

The gateway to the monastery


Shrines for guardian spirits



Figure 4. 75: Kyarinn Anauk Village Buildings

1	Name:	Daw Moe Moe Myint	
	Age:	31	
	Address:	Kyarinn Anauk Village, Kyarinn Village Tract, Hlegu Township, Yangon Region	
	Occupation:	Health Department	
	Rank:	Auxiliary midwife	
	Hand phone:	09 4202 01191	
<p>This village is my birthplace. There are 3 family members. I am involved in the health care of this village. When the Health Assistant sends for me for help, I have to go to Kalihtaw Health Department. If an industrial zone is to be set up in the complex of Nyaung Hnitpin National Convention, people from the nearby villages will get jobs. I do not object to the establishment of the industrial zone as it will benefit this area and the country. If there are factories that will harm the natural as well as the social environments, I would like to suggest that the developers of the factories need to implement it in such a way that it will have minimum impacts on the natural and social environment.</p>			
2	Name:	Daw Khine Zar Mon	
	Age:	30	
	Address:	Kyarinn Anauk Village, Kyarinn Village Tract, Hlegu Township, Yangon Region	
	Occupation:	Department of Education	
	Rank:	Teacher, middle school teacher	
	Hand phone:	09 7818 20731	
<p>This village is my birthplace. There are 3 family members. I have been working as a teacher for 12 years. I have never heard about the establishment of the industrial zone in the complex of Nyaung Hnitpin National Convention. If the industrial zone is set up, the roads in this area will be greatly improved and the communication links will be much</p>			

better. People will get jobs. As there will be more job opportunities, students will learn more to have better jobs. However, I am a bit worried that that they will become less interested in their education and become eager to work in a factory. As more and more people will be moving into the area, I am worried about the clashes that would occur between people of different religious faiths. The factories that produce dangerous industrial waste should not be built as they will have bad impacts on men and their environment. I do not accept the idea of having an industrial zone in which such bad factories are to be built.

3		Name:	U Sein Lwin
		Age:	53
		Address:	Kyarinn Anauk Village, Kyarinn Village Tract, Hlegu Township, Yangon Region
		Occupation:	Agricultural and Livestock Breeding
		Rank:	Village Elder, Chairman of Parent-Teacher Association
		Hand phone:	09 7820 02082
		<p>My birthplace is Phoyingale village, Hlegu Township. I have lived in this village for 33 years. I ge married here. There are 4 family members. I haven't heard before that an industrial zone is to be created in the complex of Nyaung Hnitpin Convention. I feel happy and unhappy at the same time. I am happy because locals, young and old alike, will get jobs. My worries are that it will have bad impacts on the health of people in our vicinity due to the polluted air and water that might be disposed of from the factories. It is required to manage and implement the establishment of the industrial zone so that there will not be any harm to the men and natural environment due to the harmful wastes from the factories to be built. We need a day nursery and a rural dispensary in our village. I want to request the company that is to set up the industrial zone to help provide a tube well for drinking water and a reservoir. I welcome it and do not object to the establishment of the industrial zone if it causes no harm to man and his environment.</p>	



CHAPTER 5. IMPACT AND RISK ASSESSMENT AND MITIGATION MEASURES

5.1 Overview

This chapter presents assessments of potential environmental impacts of proposed KMIC Project in Hlegu Township, Yangon Region during pre-construction, construction, operation and decommission phases. These environmental impacts are related to physical, biological, and social aspects and including but not limited to pollution (air quality, surface and ground water quality, waste, soil contamination, sedimentation, hydrology, soil erosion, noise and vibration) social environment (living and livelihood, local conflict, misdistribution benefit and damage, existing infrastructures and services, water usage), natural environment (flora, fauna and biodiversity, ecosystem), health and safety (risks for infectious diseases such as AIDS/HIV, occupational health and safety, community health and safety), emergency (flood risk, risk of fire, earth quake, storms) and climate change and greenhouse gases effects. The risk assessment and mitigation measures for the potential environmental impacts are also described.

5.2 Impact Assessment

Assessment refers to the interpretation of the significance of anticipated changes relating to the proposed project. Impact interpretation is based upon the systematic application of definition of “significance”: E.g., waste-discharge standards (effluent limitation) from particular facilities. The application of professional judgment in the context of assessing impacts is a pivotal role in our work.

Another basis for impact assessment is public input; this input could be received through the conduct of public meetings and interviews with residents in surrounding area of the project site. As the general public can often delineate important environmental resources and values for the particular areas, and these are also considered essential in impact assessment. The assessment of short- and long-term potential impacts is made on the basis of information collected from existing sources supplemented by the field data. Impacts are also differentiated as direct or indirect – those that arise directly from the proposed project, and those that arise because of secondary activities induced by the project. Impacts are also categorized in relations with different implementation phases: Pre-construction phase, Construction phase, Operation phase and Decommissioning phases.

5.3 Impact Assessment Methodology

5.3.1 Identification of the Potential Impacts

There are several methods applied to assist in the identification. These include checklists, map overlays, public consultation and professional judgement based on information collected from existing sources supplemented by the field data.

The interaction-matrix method developed by Leopold et al (1971) is used as an example. The Leopold Matrix contains the list of actions and environmental items. Each action and its potential for creating an impact on each environmental item are considered.

The project activities and related potential negative environmental impacts are generally mentioned in the sample matrix table below. The specific details of project activities and the potential impacts caused by these activities for different project phases are described in the following respective sections.

Table 5. 1: Matrix for project activities and the related negative environmental impacts

Project Activities	Environmental Parameters														
	Topography	Air Quality	Noise and vibration	Surface Water Quality	Ground Water Quality	Soil Quality / Contamination	Soil Erosion	Generation of solid waste	GHG emissions	Flora, fauna and ecosystem	Living and livelihood	Landscape and scenery	Occupational health and safety	Emergency Risk	Community Health and Safety
Site clearing and levelling	x	x	x	x		x	x	x	x	x	x	x	x	x	x
Transportation and storage of construction materials/equipment		x	x	x		x		x	x	x	x		x	x	x
Construction Activities (including equipment and machine use)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Influx of labor and construction of temporary houses				x				x			x		x	x	x
Transportation and disposal of construction waste and debris		x	x	x	x	x		x	x				x		x
Operation of project activities		x	x	x	x	x		x	x		x		x	x	x
Wastewater disposed from different industries and project facilities				x	x	x							x		x
Solid waste generation from operation of project activities				x	x	x		x					x		x
Emissions from		x							x				x	x	x

different industries														
Demolition work		x	x	x		x		x	x		x		x	x

Comprehensive literature reviews and published information helps for impact identification as well. Impact prediction is also accomplished by the use of look-alike (analogous) information on actual impacts from similar types of projects and based on professional judgment.

5.3.2 Nature and Characteristics Impacts

There can be different nature of impacts with different characteristics which include:

- Positive and negative: Negative impacts harm, degrade or impair the ecosystem health and the health and quality of life of people who live and work in the affected ecosystems. Some impacts can be perceived to be neutral, whilst others are positive.
- Direct and Indirect: Direct impacts are created directly by a project action. Indirect impacts result from subsequent impacts caused by the direct impacts. Direct impacts are more easily identifiable and quantifiable than indirect impacts.
- Long term and short term: Some impacts occur only during the construction phase of the project (short term), others persist to the operational phase (medium term) and others linger on long after the project has been decommissioned (long term).
- Recurring and Non-Recurring: Some impacts occur repeatedly in space and time, while others occur only once.
- Regional and Local: Some impacts cover large areas whilst others are restricted to a small area.
- Cumulative and Non-cumulative: Cumulative impacts result when impacts from one activity combine with those from another activity to produce a greater impact or a different impact. Non-cumulative impacts do not accumulate in space and in time.
- Reversible and Irreversible: This refers to the permanence of an impact. Impacts maybe reversible by natural means at natural rates (e.g. sand deposition) or through human intervention (e.g. reforestation). However, some impacts are irreversible such as the elimination of particular wildlife habitats through urban development.

5.3.3 Assessment of Impact Significance

This section describes the impact assessment process undertaken to evaluate the level of risk to environmental, socio-economic and health receptors from activities associated with the proposed project. This description provides an account of the identification of potential impacts and benefits and the evaluation of their significance.

The assessment of the level of impact significance requires consideration of the impact level in relation to the receptor sensitivity. The impact assessment is based on four categories of impact significance level as described in the following table. These address the level of mitigation that is considered appropriate to be applied for a given impact.

The degree of significance depends upon the level (i.e. magnitude, extent and duration) of impacts and the sensitivity of the resource value that they may impact. The criteria used to define the significance ranking of impacts on a qualitative basis are mentioned in the table below.

Table 5. 2: Criteria used to determine Impact Significance

Criteria	Score	Detail
Extent	3	High – Area of impact is beyond 5 km and impact extends to regional and national level
	2	Medium – Area of impact is beyond the project area but is in a limited area of 1-5 km

	1	Low – Area of impacts is in the project area within a radius of 1 km
Duration	3	Long Term – Permanent impact and impact will remain after decommissioning of the project. Impact occurs in long term duration (> 5 years)
	2	Medium Term – Impact can be reversible over time (1-5 years), period of impact occurrence is within the project period, impact occurs over mid-term duration (1-5 years)
	1	Short Term – Impact can be quickly reversible (< 1 year), period of impact occurrence is less than the project period, impact occurs in short-term duration (< 1 year)
Magnitude	3	High – Exceeds regulatory standards, changes the original structure of the environmental or social system or ecosystem
	2	Medium – Within regulatory standards, but changes some factors in the environmental or social system or ecosystem but does not change the structure
	1	Low – within regulatory standards, with small changes in some factors for the environmental or social system or ecosystem but does not change the structure
		Negligible – no detectable impact on the environment or socio-economic conditions
Receptor Sensitivity	3	High – High value/sensitivity receptor or resource, rare or endangered species or habitat impacted on a national or international level, exceeding standards, large permanent change in human use and quality of life values at a regional level, long-term or no reversible.
	2	Medium - Medium value/sensitivity receptor or resource, impact disturbs an area that has a value for conservation or causes change in species diversity. Impact important on a local or regional level, within standards, moderate change in human use and quality of life values at moderate level over a long-term duration, reversible over medium-term.
	1	Low - Low value/sensitivity receptor or resource, impact disturbs degraded area or slightly disturbs area with value for conservation, causes small changes in species and diversity, within standards, small local change in human use and quality of life values over a short- term duration, reversible over short-term.
		Negligible – no detectable sensitivity

Source: Adapted from Nigel Rossouw (2003); Sippe (1999); and United Nations University (2007)

Impact Level = Magnitude + Extent + Duration

Table 5. 3: Impact Level Score

Total Score for Impact Level	Impact Level	Score
7-9	High	3
4-6	Medium	2
1-3	Low	1

The above matrix method is used to consider the Impact Level and Receptor Sensitivity as follows:

SIGNIFICANCE = IMPACT LEVEL SCORE X RECEPTOR SENSITIVITY

Table 5. 4: Impact Significance Evaluation

Significance Level of Environmental Impact			Impact Level Score		
			Low 1	Medium 2	High 3
Receptor Sensitivity	Low	1	Negligible (1)	Low (2)	Low (3)
	Medium	2	Low (2)	Medium (4)	Medium (6)
	High	3	Low (3)	Medium (6)	High (9)

Table 5. 5: Categories of Impact Significance

Significance Level	Definition
High (7-9)	Impact is classified as high and can cause numerous effects. Major impacts affect an entire population or species in sufficient magnitude to cause a decline in abundance and/or change in distribution. Large permanent change in human use and quality of life values at a regional and national level. Fatality from an accident or occupational illness. Impacts cannot be managed or resolved by any mitigation measures.
Medium (4-6)	Impact may result in changes that affect the value of resources and environment. Moderate impacts affect a portion of a population and may bring about a change in abundance and/or distribution but does not threaten integrity of population. Impact may affect moderate change in human use and quality of life values at a local and regional level over a long-term duration. Major injury or health effects (including Permanent Partial Disability). Mitigation measures are required to manage or reduce the potential impacts and monitoring measures are required to determine effectiveness of mitigation measures.
Low (2-3)	Impact may result in changes in resources and environment, but this change does not decrease value of these resources and environment. Minor impacts affect individuals within a population over a short period of time. Local change in human use and quality of life values over a short-term duration. Minor injury or health effects (Lost Time Injury). Impact can be managed and resolved by implementation of general mitigation measures.
Negligible (1)	Impact has no effect.

5.3.4 Identification and Assessment of Potential Environmental Impacts

The KMIC project will consist of industrial area (including food and beverages processing, textile and garment, logistics, and assembly plant), residential area, villa, commercial, IT park, Gas station, public facility (road, park, buffer green belt, management center, public support facility), substation, wastewater treatment plant and water purification plant.

Currently, the detailed information of the buildings and facilities proposed to be included in the project is not yet available and hence the potential environmental impacts for each and every

project activity cannot be identified in this stage. However, based on the past experience of the EIA consultancy team, base line data collection, discussion with public and professional judgement, the potential environmental impacts of the proposed project were identified and these would cover the significant and larger extent of the possible impacts. Each project in the industrial complex will also carry out individual EIA or IEE according to the decision made by ECD.

Generally, the identification and assessment of potential environmental impacts will encompass the pre-construction, construction, operation and decommissioning phases of proposed projects.

5.3.4.1 Potential Environmental Impacts during Pre-Construction Phase

There are no negative impacts on physical, biological and social environment for the pre-construction (planning) phase of the project. According to the assessment made by EIA/SIA team and discussion with the community (public engagement events) in that area, the following social issues but not limited to: land acquisition, involuntary resettlement, conflict of interest, loss of income, and degrading of living and livelihood were not raised by the public. The community made no objection on the project and they welcomed the project and hoped to get job in the project.

5.3.4.2 Potential Environmental Impacts during Construction Phase

Type of impact, impacted Environment and Environmental parameters	Score				Significance level of Impact = Impact Level Score x Receptor Sensitivity
	Extent	Duration	Magnitude	Receptor Sensitivity	
- PE					
Soil Degradation	1	1	1	2	2 (Low)
Soil Erosion	1	1	1	1	1 (Negligible)
Topography	1	1	1	1	1 (Negligible)
Air Pollution (including dust emission)	2	2	2	2	4 (Medium)
Greenhouse gas emissions	1	1	1	2	2 (Low)
Surface water/ Ground water contamination	2	2	2	2	4 (Medium)
Noise and vibration	2	2	2	1	2 (Low)
Solid waste generation	2	2	2	2	4 (Medium)
Changes to Natural Resources	2	3	2	2	6 (Medium)
Traffic flow	2	2	2	2	4 (Medium)
- BE					
Protected Area	-	-	-	-	N/A
Loss of wildlife (Endangered species – IUCN Red List)	-	-	-	-	N/A
Destruction of vegetation and expelling of wildlife to other places	1	2	1	1	2 (Low)
Disturbance to aquatic organisms and aquatic habitats	1	2	2	2	4 (Medium)
- SE					
Existing social infrastructures and services	2	2	2	2	4 (Medium)
Landscape and scenery	1	1	1	1	1 (Negligible)
Risks for infectious diseases such as AIDS/HIV	2	3	2	2	6 (Medium)
Occupational health and safety (Risk of injuries and accidents to workers)	2	2	2	2	4 (Medium)
Emergency risk (earthquake, risk of fire)	1	1	1	1	1 (Negligible)
Community Health and Safety	2	2	2	2	4 (Medium)

Type of impact

(-) represents Negative Impact

Impacted Environment

(SE) represents Social Environment, (PE) represents Physical Environment, and (BE) represents Biological Environment

Impact Level Score is the combination of the ratings credited to magnitude, extent and duration.

Negative Impacts

Physical Environment

Soil Degradation

The proposed development project is to be constructed on 555.81 acre of flat and swampy area which is located in Nyaung Hnitpin Livestock and Agricultural Zone 3. The project civil engineering works need to excavate, fill and cut a large quantity of volume of soil to get a correct slope and gradient at borrowed area and levelling at filling areas as per design. The top soil nutrient layers will be cut and removed and in some places soil from different places will be mixed. This will lead to the degradation of soil. The stacking of solid wastes, piling of construction materials, improper handling and stacking of soil, oil and lubricant spills from changing, repairing and removing parts of motor-powered construction machines, vehicles and instruments can cause contamination and degradation of soil. The significance level of impact is low.

Soil Erosion

The rainfall and the surface runoff can cause the soil erosion and especially it can happen when the excavated or borrowed soil are stacked on bare land. The significance level of impact is negligible.

Topography

The topography of some parts of project area may be changed because of the project buildings and structures. The significance level of impact is negligible.

Air Pollution (including dust emission)

The construction of proposed KMIC project will generate substantial quantities of dust at the construction site and its surroundings. The sources of dust emission will include site preparation, leveling, earthwork in excavation, landscaping, concrete mixing and vehicles which transport building materials and workers. Transportation of building materials from various sites to proposed work site will be used dusty branch road which turned to right from main road way of situated zone area. Emission of dust may lead to impact on workers and surrounding area during construction phase. The dust emission will be accentuated during winter and summer times.

Diesel combustion of construction machineries such as loaders, excavators, trucks, dumpers, bulldozers, backhoes, compactors, road rollers, graders, management vehicles, diesel generators and heavy-duty machineries will emit air pollutants such as carbon monoxide (CO), sulfur oxide (SO_x), particulate matter (PM₁₀, PM_{2.5}), and nitrogen oxide (NO_x). Such emissions and air pollution will affect human health such as respiratory problems. The significance level of impact is medium.

MSR survey team observed and collected samples at proposed site on (25 April 2017). Air quality Haz-scanner machine is installed at the proposed site (Coordinate 17° 8' 48.93"N, 96° 10' 12.93"E). Analytical data of air quality is analyzed and operated by Occupational and Environmental Health Laboratory experts, Ministry of Health.

Greenhouse gas emissions

The greenhouse gases such as carbon dioxide (CO₂), and nitrous oxide would be generated from the construction machineries and vehicles traffic during the construction phase. It can lead to the global warming and contribute to climate change. The significance level of impact is low.

Surface water/Ground water contamination

The construction process of concrete foundations at the proposed project and other infrastructures will need to excavate surface earth. The deeply excavated foundation will pass through water layers and underground waterbody. The building process of these foundation needs to use cement and hardener chemicals and these materials will reach to ground water. Consequently, temporary contamination of ground water will occur during concrete construction. The negative impacts during construction phase, especially in rainy season are surface water and ground water contamination by stacking of solid waste, oil spill, improper storage of fuel oil, chemical and hazardous materials, piling of construction materials, transporting of materials and improper sewage disposal. The designated earthwork will change and contaminate the water layers and water ways.

The motor- powered construction machines on site will need to be regularly serviced. This requires continuous oiling to minimize the usual corrosion or wear and tear. Changing spare parts, repairing and removing parts need to be cleaned and washed by oil and lubricants. The oil and lubricant spills during these works can contaminate the surface water.

Existing groundwater range is about 1 meter depth at a surface water collected lake which is at the west north of the proposed land near main road. The significance level of impact is medium.

Noise and vibration

Delivering of building materials by trucks, and operating earth moving machines, excavators, loaders, bulldozers, backhoes, metal cutters, compressors and concrete mixers will contribute a certain level of noise and vibration within the construction site and surrounding area. Higher noise level within the site can impose adverse impact on health of workers, and those are in vicinity of the project site. As crawling type earth moving machineries vibrate earth surface heavily, it can impose negative impact on natural habitat and native animals. The significance level of impact is low.

Solid waste generation

During construction phase, large quantities of solid waste from site clearing, tree leaves, roots, cut logs, and other disposed materials will be generated as a result of the excavation and grading earth level at the site. Construction phase solid waste will consist of rejected parts of pre-casted concrete, solid components, surplus materials, rejected materials, papers, containers, broken bricks, solvent containers, empty paint drums, surplus oil and waste from workers. Such solid waste will be detrimental to the environment through blockage of drainage system, choking of water bodies, and also have negative impact on human and animal health. This may be accentuated by the fact that some of the waste materials contain hazardous substances such as paints, solvent, cement, adhesives, and chemicals. Some of waste materials including plastic containers and plastic bags are not biodegradable and can have long term effects on the environment. The significance level of impact is medium.

Changes to Natural Resources

During construction phase, a large volume of water will be required for different construction activities of different buildings and sanitary and washing purposes as well. The excessive and unsystematic utilization of water will impose negative impacts on the water resources and their sustainability.

A large amount of fuel will be used for the project to transport construction materials, run the construction vehicles and machineries and other associated activities. These fuels are fossil

fuels and generally considered as non-renewable resources and the excessive use of these fossil fuels may have serious environmental implications.

At the same time, the project will use high consumption of electricity. The electricity will be supplied by government and installed from 230kV twin bundle double circuit Line from Tower No.142 Myaungtagar – Kamarnat National Grid. Total estimated consumption is 50 MW in operation phase. Hydropower and natural gas are natural resources of the country. In this regard, high consumption of electricity is negatively impacted to natural resources and their sustainability.

Some of the building materials such as hardcore, ballast, aggregates, rough stones, and sand will be obtained from quarries, sand yards, and mines and also the raw materials for making building materials such as mild steel, roofing sheet, brick, cement, glazed tile and shuttering wood will also be extracted from natural resource banks, namely, sea shore, rivers, hills, land and forest. Since substantial quantities of these materials will be required for construction work, the availability and sustainability of such resources will be affected in several ways. The significance level of impact on changes to natural resources is medium.

Traffic Flow

During construction phase heavy machineries will be working at proposed site and only vehicles of office staffs and visitors will use access road way which is 9.14-kilometer distance from Yangon-Mandalay express high-way. During construction phase of proposed project, a few traffic congestions may occur by vehicles of construction site and vehicles of entry and exit to industrial zone. The significance level of impact is medium.

Biological Environment

Protected areas

There is no protected area in the proposed project area and surroundings.

Loss of wildlife

There is no IUCN Red listed threatened species in the proposed project area and surroundings.

Destruction of vegetation and expelling of wildlife to other places

Conversion of vegetation-covered land into industrial compound of the KMIC project will involve land leveling and removal of trees and plants over the whole project site. This action will cause negative impact on wildlife and ecosystem of the current landscape and the area's vegetation which is largely composed of scrub, herbs, and grasses. No timber tree is present.

This means a negative impact on the current function of the fragile ecosystem of shrub-herb and semi-aquatic environment where terrestrial and aquatic organisms depend the formed food chain, as vegetation provides habitat and cover for organisms, as well as providing the stability of soil. The situation will force other wildlife migrate to other habitable places. The animals currently living in the project area will disappear. Animals such as long distance flying birds, some rodents, butterflies, bat and some mammals are enable to overcome the impact of habitat destruction, but some animal such as earth-dwelling arthropods, small insects and unmovable plants will face termination of life. The significance level of impact is low.

Disturbance to aquatic organisms and aquatic habitats

Aquatic ecosystem of Hpaya Stream and project-site's surrounding waterways will be changed both in terms of drainage capacity and pollution level by faster run off from the project site and its waste water discharge.

Potential toxic effects to plants and animals as a result of air or water pollutant discharges or waste-disposal activities of industries will also have negative impact on surrounding ecological function. Therefore, number and species of current level existence of fishes and invertebrates

including aquatic insects will decline along with the reduction of microorganisms. The significance level of impact is medium.

Social Environment

Existing social infrastructures and services

The existing social infrastructures and services such as health care center, clinic, school, market, shop, and emergency services for public safety will be accessed by additional construction workers during the construction phase and the availability of the services provided by these infrastructures and facilities for additional people is considerable and it can be a negative impact. The significance level of impact is medium.

Landscape and scenery

The existing landscape and scenery (general appearance of the nature) will be totally changed. This significance level of impact is negligible.

Risks for infectious diseases

The influx of construction workers from different areas of the country could bring different infectious diseases like Hepatitis, Malaria, Tuberculosis, and HIV/AIDS. These infectious diseases could spread between the workers and the local community and there is a possibility to increase the risks. The significance level of impact is medium.

Occupational Health and Safety (Risks of accidents and injuries to workers)

During construction of the proposed project, it is expected that construction workers are likely to have accidental injuries and hazards due to human and workplace interactions. Because of the intensive engineering and construction activities, metal grinding and cutting, concrete work, scaffolding, steel erection and fastening, piling and welding and electricity using, traffic accidents, handling of heavy-duty machines and other works, construction workers will be exposed to risks of accidents and injuries. Such injuries can result from accidental falls from high elevations, injuries from using hand tools and construction equipment cuts from sharp edges of metal sheets and collapse of building sections among others. The significance level of impact is low. It's recommended an appropriate approach to ergonomics be sought Personal Protective Equipment (PPE) should be issued to all workers on site. Trainings on Fire Management, First Aid, occupational Health and Safety also be conducted occasionally. The significance level of impact is medium.

Emergency Risk

During construction phase the improper storage and handling of fuels (loading, unloading), vehicle transporting petroleum products involving in accidents (collision, overturning), defective oil tightness integrity or incomplete closing of valves and connections, and not following no-naked flames warning signs will pose a risk of fire and explosion. There is also a possibility that if earthquake occurs the construction work structures would be collapsed. The significance level of impact is negligible.

Community Health and Safety

It is anticipated that there will be an impact on community health and safety because of influx of construction workers (who might bring the infectious diseases) and increase of vehicle traffic (vehicular exhaust emissions can cause the pollution – related diseases including respiratory problems, heart diseases, stroke, lung cancer, and chronic obstructive pulmonary disease). The increase of traffic and operation of construction machineries can also cause accidents to the local community and the injuries and even death is possible and hence the safety of the community is threatened. The significance level of impact is medium.

Positive Impact

There are several potential positive impacts in social environment. These are mentioned below.

Creation of employment opportunities

Several employment opportunities will be created by different construction activities of the project. This will be a significant positive impact to the community nearby.

Provision of market for supply of building materials

The project will require supply of large quantities of building materials which will be sourced locally. This provides a market for building materials suppliers such as sand, gravel, stones, woods and hardware stores and individual with such materials.

Increased business opportunities

Requirement of a large number of project staff members and workers will create a market for various goods and services, leading to several business opportunities for small-scale traders such as food stalls near the construction site.

Living and livelihood

The increase of job opportunities as construction workers, technicians or increased business opportunities or provision of market for supply of building materials can positively change the living standards and livelihood of the community to some extent.

Existing social infrastructures and services

The social infrastructures will be improved due to the project (for instance. a new school will be built for the project as part of CSR program).

Improved security in the neighboring area

During construction phase, security persons will check and go around the perimeter of the project. They will serve 24 hours duty at site, and this will lead to improvement of security at surrounding area.

5.3.4.3 Potential Environmental Impacts during Operation Phase

Type of impact, impacted Environment and Environmental parameters	Score				Significance level of Impact = Impact Level Score x Receptor Sensitivity
	Extent	Duration	Magnitude	Receptor Sensitivity	
- PE					
Soil Degradation	2	2	2	2	4 (Medium)
Air Pollution (including dust emission)	2	1	2	2	4 (Medium)
Greenhouse gas emissions	2	2	2	2	4 (Medium)
Surface water/Ground water contamination	2	2	2	2	4 (Medium)
Increased water demand	2	3	2	2	6 (Medium)
Noise and vibration	2	2	2	2	4 (Medium)
Increased Solid waste generation	2	2	2	2	4 (Medium)
Increased wastewater generation	2	2	2	2	4 (Medium)
Hazardous waste generation	1	2	2	2	4 (Medium)
Changes to Natural Resources	2	2	2	2	4 (Medium)
Increased Traffic flow	2	2	2	2	4 (Medium)
Foul Odor and Vectors	1	2	2	2	4 (Medium)
- BE					
Changes to terrestrial flora and fauna	1	1	1	1	1 (Negligible)
Changes to aquatic flora and fauna	2	2	2	2	4 (Medium)
- SE					
Inconveniency with socio-economic change	1	1	1	2	2 (Low)
Community Health and Safety	2	2	2	2	4 (Medium)
Risk of injuries and accidents to workers	2	2	2	2	4 (Medium)
Light intrusion	1	2	2	2	4 (Medium)
Increased Emergency risk (risk of fire)	2	2	2	2	4 (Medium)

Negative Impact

Physical Environment

Soil Degradation

During operation phase, top soil layer can be degraded by domestic wastewater, oil leaks and spills from generators, transformer failure of electricity sub-station, process of usage, producing, storing, disposing and handling of oil, chemical, hazardous materials of different industries and factories (garment and textile, food and beverages processing, and assembling factories), pollution from stormwater runoff, leachate from improper dumping of solid waste, improper maintenance of water supply and wastewater system, drainage system, vehicles and equipment. The car parking, offices, wastewater treatment plant and other proposed project developments can also degrade the soil condition because of oil leaks and spills from the generators and other machinery and some activities of the developments. The significance level of impact is medium.

Air Pollution (including Dust Emission)

The fugitive dust emission can occur mainly because of the vehicular movement within the project area. The air quality can be chiefly impacted by the emissions of the factories and industries. The significance level of impact is medium.

Greenhouse gas emissions

The activities and sectors associated with the project: transportation, industry, commercial and residential will emit the greenhouse gases to the atmosphere and these gases are carbon dioxide, nitrous oxide, and fluorinated gases respectively. The significance level of impact is medium.

Surface water/Ground water contamination

During monsoon season, ground water level is higher than winter and summer times. Ground water and surface water will be contaminated because of handling of oil and solid waste. Without proper care, dumping solid waste may cause ground water and surface water sources contaminated and also form breeding area of mosquitoes and flies that will impose adverse effect on the health of people in these areas.

The water quality can be degraded by domestic wastewater, oil leaks and spills from generators, transformer failure of electricity sub-station, process of usage, producing, storing, disposing and handling of oil, chemical, hazardous materials of different industries and factories, pollution from stormwater runoff, leachate from dumping of solid waste, improper maintenance of water supply and wastewater system, drainage system, vehicles and equipment. The car parking, offices, water purification plant, wastewater treatment plant and other proposed project developments can also degrade the water quality because of oil leaks and spills from the generators and other machinery and some activities of the developments. The significance level of impact is medium.

Increased water demand

The amount of water consumption will be increased for the operation phase of the project due to different project structures and facilities.

The developer estimated total water usage demand is 10,000m³ (2,641,721 gallons) per day, in which industrial plots will be using 8,000 m³ (2,113,376 gallons) per day and living plots will be using 2,000 m³ (528,344 gallons) per day. The developer planned to get water from Kalihtaw dam which is 20 kilometer away from KMIC project.

Excessive use of water and unnecessary use of water may negatively impact the water resource. Kalihtaw Dam is currently supplying to Nyaung Hnitpin Livestock and Agricultural Zone. The significance level of impact is medium.

Noise and vibration

The impacts of noise and vibration by residents, traveling vehicles and industrial processes are expected during the operation stage. Delivering raw materials and products by cargo trucks and such as factories operating machinery, will contribute high level of noise and vibration within the site and surrounding area. Elevated noise level within the site can affect the workers. The significance level of impact is medium.

Increased Solid waste generation

The project is expected to generate enormous volume of solid waste during its operation phase. The bulk of solid waste generated during the operation of the project will consist of papers, plastic bags, glass, metal, textiles, used containers, organic waste and disposed by workers, kitchen, room services, landscaping, cutting grass, trimming trees, annual painting, decoration and maintenance works. Such waste can be detrimental to the environment through blockage of drainage system, pipes, choking of water body and negative impacts on animal health. Some of these waste materials especially the plastic/ polythene are not biodegradable, can cause long- term injurious effects to the environment. The significance level of impact is medium.

Increased wastewater generation

The wastewater disposed from different project buildings, facilities and developments will be increasing during the operation phase. Among them, the industrial wastewater will have more negative impact on the surrounding environment. The significance level of impact is medium.

Hazardous waste generation

The hazardous waste can be largely generated from different processes of industries. The significance level of impact is medium.

Changes to Natural Resources

During operation phase, more energy, and water will be utilized for different project activities and it will have impacts on natural resources to a certain extent. The developer is planned to use government electrical supply which will be installed from 230kV twin bundle double circuit line from Tower No.142 Myaungtagar – Kamarnat National Grid. For back-up source, the developer will use diesel generators. Since electricity generation involves utilization of natural resources such as hydropower, natural gas and diesel fuels, excessive electricity consumption will strain the resources and have negative impact on their sustainability. The significance level of impact is medium.

Increased Traffic Flow

During operation phase of the proposed project, many raw materials will be distributed to the respective ware house of the compound. Cargo trucks will enter and exit along the road way carrying raw materials and delivering finished products. Office vehicles and buses also will be using the access road. Existing road is not wide enough for industrial zone. The developer planned to upgrade 2 lane road to 4 land road. The significance level of impact is medium.

Foul Odor and Vectors

Especially, the sludge and bio-solid handling in the wastewater treatment plant and waste dumping ground are the sources of foul odor and they can attract the vectors. The significance level of impact is medium.

Biological Environment

Changes to terrestrial flora and fauna

Due to operation works terrestrial flora and fauna will be impacted. The significance level of impact is negligible.

Changes to aquatic flora and fauna

Due to operation works aquatic flora and fauna will be impacted. The significance level of impact is medium.

Social Environment

Inconveniency with socio-economic change

This impact will be resulted from increased activities with growing economy spilled from the development of the industrial zone. Residents may need to give up their current means of livelihood and adapt themselves to new ways of making a living that come along with the development. They will also have to interact with migrant population, who will be visiting or residing in their areas. The significance level of impact is low.

Community Health and Safety

There will be food and beverages processing, textile and garment factories and vehicle spare parts and electronic parts installation factories, operating in the industrial complex. The emissions and waste disposed from these factories may have impact on the health of communities. The increased traffic flow due to the project operation will possibly threaten the safety of surrounding communities on account of traffic accidents. The significance level of impact is medium.

Risk of injuries and accidents to workers

During operation of the proposed project, it is expected that operation workers are likely to have accidental injuries and hazards due to human and workplace interactions. The workers will be exposed to risks of accidents and injuries at maintenance and operation. Such injuries can result from accidental falls from high elevations, injuries from hand tools and operation equipment cuts from sharp edges of metal sheets and collapse of building sections among others. It's recommended an appropriate approach to ergonomics be sought Personal Protective Equipment (PPE) should be issued to all workers on site. Trainings on Fire Management, First Aid, occupational Health and Safety also be conducted occasionally. The significance level of impact is medium.

Light Intrusion

The light pollution resulting from the substation's security lighting at night is also considered as impact on the neighboring properties. The significance level of impact is medium.

Increased Emergency Risk

The fire risk can be most expected from operation of different project activities. The fire occurrences are associated with the activities of gas station such as fuels receipt, fuels storage and vehicles supply. For the electricity sub-station, a failure of one or more transformers could cause fire and spillage of the purified mineral oil used for insulation and coolant. In the case of a fire, the products of combustion would be released to the surrounding environment and these products are mainly carbon soot, carbon monoxide and carbon dioxide. The significance level of impact is medium.

Positive Impact

There will be some positive impacts in the social environment and these impacts can be seen below.

Optimal Land Use

The land will be used as the industrial complex to full potential for the benefit of the local and regional people. It will also be beneficial for the nation.

Creation of employment opportunities

Total 100,000 job opportunities will be created. Local workers, local graduates will have a chance to get employment at operational phase of this project. This will help reduce the unemployment problem of people including graduates residing nearby. The skills development training programs will be provided to those who need them and improved living conditions with the development of local economy.

Increased business opportunities

The requirement of a large number of project staff members and workers for the project operation will create a market for various goods and services, leading to several business opportunities for small-scale traders such as food stalls near the project area.

Increase in Revenue to Region and Union governments

Through payment of relevant taxes such as properties tax, income tax and other fees to local authorities, revenue department and other related offices, the Region and Union government will earn revenue. Implementation of the KMIC project will contribute to national industrial growth and GDP will also be increased.

Improvement of social infrastructure and services

After completion of construction phase and starting operation phase, the company will contribute surrounding area by developing and providing assistance to schools, clinics, roads, bridges and other infrastructure works and services as CSR program. This will lead to improvement of surrounding villages by developing the proposed project.

Provision of quality fuel (gas) at a reasonable price

The quality fuel (gas) could be purchased in the local area at a reasonable price and consequently the transportation costs for goods and persons will be lowered.

Improving aesthetic by planting flowers and landscaping

The project will include green areas (parks and gardens) for the public and the aesthetical value of the area would be increased.

5.3.4.4 Potential Environmental Impacts during Decommissioning/Closure Phase

Type of impact, impacted Environment and Environmental parameters	Score				Significance level of Impact = Impact Level Score x Receptor Sensitivity
	Extent	Duration	Magnitude	Receptor Sensitivity	
- PE					
Air Pollution (including Dust Emission)	2	2	2	2	4 (Medium)
Greenhouse gas emissions	1	1	1	2	2 (Low)
Surface water/Ground water contamination	2	2	2	2	4 (Medium)
Noise and vibration	2	2	2	1	2 (Low)
Waste generation (Solid, Wastewater, Hazardous)	2	2	2	2	4 (Medium)
- SE					
Living and Livelihood	2	3	2	2	6 (Medium)
Risks for Infectious disease such as AIDS/HIV	2	3	2	2	6 (Medium)
Occupational Health and Safety	2	2	2	2	4 (Medium)
Community Health and Safety	2	2	2	2	4 (Medium)

Negative Impacts

Physical Environment

Air Pollution (including Dust Emission)

The demolishing of buildings and structures will cause dust emission and the emission gases from construction vehicles travelling around the area during the decommissioning and closing phase will cause air pollution. The significance level of impact is medium.

Greenhouse gas emissions

The exhaust emission of construction vehicles (including trucks for collecting demolition waste) can emit greenhouse gases and it will lead to the global warming. The significance level of impact is low.

Surface water/ground water contamination

The surface water and ground water can be contaminated due to wastewater quality caused by demolition work. The significance level of impact is medium.

Noise and vibration

The noise and vibration can occur from manual work or machinery and vehicles during the demolition work. The significance level of impact is low.

Waste generation (Solid, wastewater and Hazardous)

The hazardous and non-hazardous solid waste will be generated from demolition work. The significance level of impact is medium.

Social Environment

Living and Livelihood

Due to the termination of the operation of the project, some people would lose their job and income as well. Therefore, their living and livelihood will be impacted and changed. The significance level of impact is medium.

Risks for Infectious disease such as AIDS/HIV

There will be a flux of workers from local or other regions for the demolition work and the risk for communicable and vector-borne diseases are expected among the workers and the surrounding local people. The significance level of impact is medium.

Occupational Health and Safety

The occupational health and safety are expected because of the demolished work. The significance level of impact is medium.

Community Health and Safety

The community health and safety can be impacted due to the influx of labors for demolishing buildings and structures. The significance level of impact is medium.

Positive Impacts

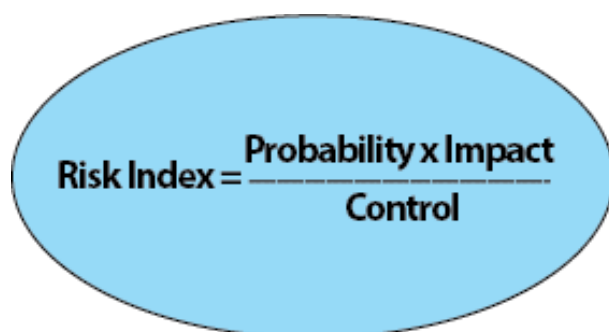
As the positive impact, the natural habitat, land cover or vegetation could be regenerated. After the demolition and closure of the project, the damaged land could be reclaimed and revegetated, and it will regenerate the natural habitat, land cover and vegetation. Consequently, the decline of aquatic and terrestrial fauna and flora can be reversed.

5.3.5 Risk Assessment

Risk is analyzed by estimating the likelihood of the event occurring and the consequences or impact of the event if it does occur as well as the amount of control one has over the event. The probability of occurrence means the probability of an adverse event occurred, seriousness of impact is also the severity of degradation caused by the impact and degree of control is to what extent the degradation which could result from loss of control can be managed or detectable.

Table 5. 6: Risk Assessment Criteria

Probability of occurrence		Seriousness of Impact		Degree of Control	
Almost certain	8	Major	8	High	2.5
Likely	6	High	6	Moderate	2
Moderate	4	Moderate	4	Low	1.5
Unlikely	2	Low	2	None	1



Risk Index	
Low Risk	2-12
Moderate Risk	13-18
Significant Risk	19-36
High Risk	37-64

Risk Index	Definition
Low	A risk at this level – if it occurs – will have a minor impact on achieving desired results, to the extent that one or more stated outcome objectives will fall below goals but well above minimum acceptable levels.
Moderate	A risk at this level – if it occurs – will have a moderate impact on achieving desired results, to the extent that one or more stated outcome objectives will fall well below goals but above minimum acceptable levels.
Significant	A risk at this level – if it occurs – will have a significant impact on achieving desired results, to the extent that one or more stated outcome objectives will fall below acceptable levels.
High	A risk at this level – if it occurs – will have a severe impact on achieving desired results, to the extent that one or more of its critical outcome objectives will not be achieved.

5.3.5.1 Construction Phase

Impact	Probability of occurrence	Seriousness of Impact	Degree of Control	Risk Index	RISK LEVEL
Physical Environment					
Soil Degradation	8	4	2	16	Moderate Risk
Soil Erosion	6	4	2	12	Low Risk
Topography	4	2	2.5	3.2	Low Risk
Air Pollution (including Dust Emission)	8	6	2	24	Significant Risk
Greenhouse gas emissions	6	6	2	18	Moderate Risk
Surface water/Ground water contamination	8	6	2.5	19.2	Significant Risk
Noise & Vibration	8	6	2	24	Significant Risk
Solid waste generation	8	6	2	24	Significant Risk
Changes to Natural Resources	6	4	2	12	Low Risk
Traffic Flow	8	4	2	16	Moderate Risk
Biological Environment					
Destruction of vegetation and expelling of wildlife to other places	6	4	2	12	Low Risk
Disturbance to aquatic organisms and aquatic habitats	6	4	2	12	Low Risk
Social Environment					
Existing social infrastructures and services	6	4	2	12	Low Risk
Landscape and scenery	6	4	2	12	Low Risk
Risks for infectious diseases such as AIDS/HIV	8	4	2	16	Moderate Risk
Occupational health and safety	8	4	2	16	Moderate Risk
Emergency risk (earthquake, risk of fire)	6	4	2	12	Low Risk
Community Health and Safety	6	4	2	12	Low Risk

5.3.5.2 Operation Phase

Impact	Probability of occurrence	Seriousness of Impact	Degree of Control	Risk Index	RISK LEVEL
Soil Degradation	6	4	2	12	Low Risk
Air Pollution (including dust emission)	8	4	2	16	Moderate Risk
Greenhouse gas emissions	6	4	2.5	9.6	Low Risk
Surface water/Ground water contamination	6	4	2	12	Low Risk
Increased water demand	8	4	2	16	Moderate Risk
Noise and vibration	8	4	2	16	Moderate Risk
Increased Solid waste generation	8	4	2	16	Moderate Risk
Increased wastewater generation	8	4	2	16	Moderate Risk
Hazardous waste generation	8	4	2	16	Moderate Risk
Changes to Natural Resources	8	4	2	16	Moderate Risk
Increased Traffic flow	8	6	2.5	19.2	Moderate Risk
Foul Odor and Vectors	6	4	2	12	Low Risk
Biological Environment					
Changes to terrestrial flora and fauna	6	4	2	12	Low Risk
Changes to aquatic flora and fauna	4	4	2	8	Low Risk
Social Environment					
Inconveniency with socio-economic change	6	4	1.5	16	Moderate Risk
Community Health and Safety	6	4	2.5	9.6	Low Risk
Risk of injuries and accidents to workers	6	4	2.5	9.6	Low Risk
Light intrusion	6	4	2	12	Low Risk
Increased Emergency risk (risk of fire)	6	4	2	12	Low Risk

5.3.5.3 Decommissioning Phase

Impact	Probability of occurrence	Seriousness of Impact	Degree of Control	Risk Index	RISK LEVEL
Physical Environment					
Air Pollution (including Dust Emission)	8	6	2	24	Significant Risk
Greenhouse gas emissions	6	4	2	12	Low Risk
Surface water/Ground water contamination	6	4	2	12	Low Risk
Noise and vibration	8	4	2	16	Moderate Risk
Waste generation (Solid, Wastewater, Hazardous)	8	6	2	24	Significant Risk
Social Environment					
Living and Livelihood	8	4	2	16	Moderate Risk
Risks for Infectious disease such as AIDS/HIV	6	4	2	12	Low Risk
Occupational Health and Safety	6	4	2	12	Low Risk
Community Health and Safety	6	4	2	12	Low Risk

5.4 Mitigation Measures

This section outlines the necessary mitigation measures that will be adopted to prevent or minimize significant negative environmental impacts associated with the activities of the project during Construction Phase, Operation Phase and Decommissioning Phase.

5.4.1 Mitigation Measures for Construction Phase

5.4.1.1 Mitigation Measures for Physical Environmental Impacts

Soil Degradation

The soil degradation during construction phase will be mitigated by the following measures: avoidance of unnecessary cutting and removing of trees and vegetation, controlling earthwork and compacting loose soil, installation and construction of drainage structure properly, landscaping, ensuring supervision of excavation activities (especially during rainy season), providing soil erosion control and conservation structure where necessary, restriction of access only to construction site yard and monitoring and maintenance of drainage system.

Topsoil should only be exposed for minimal periods of time and adequately stockpiled to prevent the topsoil loss and runoff. It must be ensured that the stockpiles generated on site must be used as natural material for landscaping of the work site and to develop in-situ stormwater attenuation or abutments, rather than stockpile for disposal as a waste material. The stripped top soil prior to any construction activities will be reused to rehabilitate disturbed areas. Topsoil will be kept separate from overburden and will not be used for building purposes or maintenance or road maintenance/works.

Soil Erosion

In the rainy season of during construction phase, soil erosion will be occurred due to the construction activities, surface and stormwater runoff. During rainy season, to control soil erosion and land slide at site, it is needed to control the velocity of rain water and it will be made to ensure that levelling the drains can be minimized at construction phase. Construction of concrete drains at steep levels and proper gradient at temporary drain can control the velocity of rain water and unnecessary erosion. The clearance of vegetation will be minimized to avoid exposure of soil, only alien vegetation which constitutes the majority of vegetation on site, must be removed – where there is work/construction. The areas susceptible to erosion will be protected with mulch or a suitable alternative.

Topography

The shape and features of land surfaces will be maintained as much as possible by designing and constructing buildings and structures of the project.

Air Pollution (including Dust Emission)

Dust emission during construction phase will be minimized through restricted speed control of earth moving machines, transport buses and traffic within the project site. Pouring water on road ways at site and excavated area, cutting area, filling area and compacting area will reduce rising of dust in dry season. The contractor will install a wash deck at the exit way of the site to remove mud from vehicles which may become dust around the site and along the main road. Trucks need to be installed with proper covers when carrying sand, river shingles and cement to avoid falling down along the main road and emission of particulates. Notice and caution signs of “Dusty Area” will be erected around the project areas for the awareness of the people. The workers will be provided with facial masks to wear in the project site.

The air pollution mitigation measures which will be adopted by the project are regular maintenance of construction plants and equipment, prohibiting unnecessary driving and moving at site and idling of vehicles, strictly prohibition of open fire burning of materials or wastes, permanent monitoring to minimize emissions of pollutant, ensuring using no materials and substances emitting toxic and carcinogenic substances, and proper storage of chemical and emitted construction materials. There will be a notice to the workers and surrounding environment that it is the “Expected Air Pollution Area”. Caution signs to wear masks will be posted and the workers will be provided with masks to wear. The visitors to the site have also to wear the masks.

Greenhouse gas emissions

The mitigation measures for reducing greenhouse gas emissions are conducting training to raise the awareness of drivers, operators and concerned staff on greenhouse emissions and mitigation measures, prohibiting unnecessary driving and moving at site and idling of vehicles and construction machineries as well, the regular maintenance of vehicles and machineries will be done, the efficient use of vehicles (car-pooling and if possible a truck will be used for two purposes at the same time – unloading of building materials and loading of construction wastes) and machineries will be applied. The construction engineers and project managers will formulate the construction management procedures including the efficient use of construction vehicles and machineries and it will ensure the reduction of greenhouse gas emissions during the construction phase.

The site offices will be designed and constructed as much as possible to get the natural light and ventilation.

Surface water/Ground water contamination

In order to reduce or avoid the surface and ground water contamination, the sedimentation basin will be built on a construction site to capture the disturbed soil which is washed off during rainfall and lead to protection of the water quality of surface and ground water. The sand traps will also be constructed to settle the sand at the bottom and store the deposited sand. The systematic stacking and piling of materials on site, the regular solid waste disposal at the dumping site designated by the local municipality, avoidance of hazardous wastes disposal in drinking-water sources, adopting the proper waste management system, regular maintenance and check of the machineries, vehicles and sources which can cause oil spill and hazardous chemical spills (if found, the immediate repair and cleansing will be conducted), systematic storage of fuels and filling station at construction site yard compound, handling and disposal of new oil and used oil waste, provision of impervious basement at operation area to prevent oil spill when heavy machineries are working, daily checking to earth moving machines by motor transport officer before start engines, and providing a good pavement at machine workshop and garage are the mitigation measures for the project to avoid the surface/ground water contamination.

The proper sanitation system for the construction workers and project staff will also be applied and that system covering the following aspects: considering and calculation of the set-back distances for sanitation facilities in relation to travel time to aquifer, locating sewers outside drinking-water sources, ensuring sufficient distance (at least 2 m) between base of latrine pit, soakaway or infiltration trench and highest water table, constructing and maintaining vault latrine pits impermeable, fitting sewers with linings to reduce breakage, fitting waste stabilization ponds with linings, maintaining on-site sanitation facilities in good condition and encouraging to use, preventing sewer leakage and implementation of adequate final disposal of sludge as permitted by the local municipality.

Noise and vibration

The drivers and operators of construction vehicles and machineries will be trained how to reduce the noise from their operations, and the construction activities will be restricted in night times. The regular maintenance of vehicles and machineries and wearing the ear mufflers (hearing protection devices) can also protect the noise and vibration. The noise will be strictly maintained within the noise level (National Environmental Quality Emission Guidelines) set by Ministry of Natural Resources and Environmental Conservation.

The following measures will also be adopted: using sound absorb, sound proof engines at construction site and proper maintenance, enclosing noisy outdoor engines and generators in sound proof wall or buildings, regular checking and maintenance to silencers of engines and conserving trees around the site as some buffers against noise.

Solid waste generation

The following practices will be exercised as mitigation measures: avoidance of unnecessary cutting and removing of vegetation plants, developing drawing and land survey map to follow as drawing of landscaping procedure, producing a precise construction drawing to avoid unnecessary cutting and filling of earth work and excavation work, ensuring calculation and estimation of materials requirement to avoid excessive purchase, ensuring purchase of materials and stacking at collection yard and ware houses, providing dust bins and skips at appropriate places painting different colors for hazardous substances and biodegradable substances, providing facilities for proper handling and storage of construction materials to reduce the amount of waste caused by damage or exposure, periodically disposal of solid waste at permitted dumping sites and proper loading and unloading at garbage truck and educating workers to dispose waste properly. If possible, the recycling and refurbishment of solid waste will be done to reduce the amount and volume of construction debris.

Non-Hazardous Solid Waste Management Plan

Waste Transfer Plots

The waste transfer plots are used to collect the refuse and to reload their waste into a garbage truck of a professional company authorized by KMIC JVC. The transfer plots may have stationary compactors, recycling bins, material recovery facility, transfer containers and trailers, transfer packer trailers, or mobile equipment. It is designed with drainage of paved areas and adequate water hydrants for maintenance of cleanliness and fire control and other concerns like land scaling, weight scales, traffic, odor, dust, litter and noise control. Some wastes would be used for composting.

Final collection of Waste

The contractor will have an arrangement with a professional company authorized by KMIC JVC to treat waste.

Note: The 3Rs (Reduce, reuse and recycle) practice would be applied in the project and trainings related to the non-hazardous solid waste management will be conducted for the workers.

During construction, the following construction hazardous wastes may be generated.

1. Wastes from Use of Coatings (Paints, Varnishes and vitreous enamels), Adhesives and Sealants and removal of paint and varnish;
2. Wastes from Use of adhesives and sealants (including waterproofing products);
3. Oil Wastes and wastes of liquid fuels (Waste hydraulic oils, Waste engine, gear and lubricating oils, Waste insulating and heat transmission oils, Oil/water separator (grease trap) contents, fuel oil and diesel, petrol, other fuels (including mixture));
4. Waste Organic Solvents, Refrigerants and Propellants;
5. Waste Packaging, absorbents, wiping cloths, filter materials and protective clothing;
6. Wastes from vehicle maintenance (Oil filters, components containing mercury, components containing PCBs, explosive components (for e.g. air bags), brake pads containing asbestos, brake fluids, antifreeze fluids containing hazardous substances);
7. Wastes from electrical and electronic equipment (transformers and capacitors containing PCBs, discarded equipment containing chlorofluorocarbons, HCFC, HFC, discarded equipment containing free asbestos, hazardous components removed from discarded equipment) - Hazardous components from electrical and electronic equipment may include accumulators and batteries, mercury switches, glass from cathode ray tubes and other activated glass, etc.;
8. Gases in pressure containers and discarded chemicals;
9. Batteries and accumulators (lead batteries, Ni-Cd batteries, mercury-containing batteries, separately collected electrolyte from batteries and accumulators);
10. Wastes from transport tank, storage tank and barrel cleaning (wastes containing oil and wastes containing other hazardous substances);

11. Aqueous liquid wastes destined for off-site treatment (aqueous liquid wastes containing hazardous substances and aqueous concentrates containing hazardous substances);
12. Construction and Demolition wastes (mixtures of, or separate fractions of concrete, bricks, tiles and ceramics containing hazardous substances, glass, plastic and wood containing or contaminated with hazardous substances, bituminous mixtures containing coal tar, coal tar and tarred products, metal waste contaminated with hazardous substances and cables containing oil, coal tar and other hazardous substances);
13. Soil, stones and dredging spoil;
14. Insulation materials and asbestos-containing construction materials;
15. Gypsum-based construction materials contaminated with hazardous substances; and
16. Municipal Wastes (Household waste and similar commercial, industrial and institutional wastes) including separately collected fractions: solvents, acids, alkalines, pesticides, fluorescent tubes and other mercury-containing waste, discarded equipment containing chlorofluorocarbons, oil and fat (excluding edible oil and fat), paint, inks, adhesives and resins containing hazardous substances, detergents containing hazardous substances and wood containing hazardous substances.

Hazardous waste generation

The hazardous waste generated will be managed by the Hazardous Solid Waste Management plan as mentioned below.

Hazardous Solid Waste Management Plan

The hazardous waste management plan contains the following procedures and processes.

Waste minimization (Reduction at source)

Source reduction includes material substitute and good management practice. The construction workers and staff in the compound will be encouraged to utilize chemical waste minimization (waste reduction) techniques to reduce the volume and toxicity of chemical wastes produced in the project compound.

Minimizing quantities of ordering chemicals – This can also reduce potential chemical exposure to personnel, thus minimizing the risks and severity of accidents.

Substitution – Substitution of a non-hazardous or less hazardous chemical in place of a hazardous chemical is a commonly used method of reducing waste. For e.g. Changing a cleaning agent from a toxic, flammable solvent to an appropriate soap or detergent solution, and the use of water-based paints and cements over solvent based.

Collection, Transportation and Disposal of Hazardous Waste

All waste stored together must be compatible. Guidelines for segregation of chemicals as found in the Laboratory Safety Manual must be adhered to. Generally, classes, i.e. ignitable, corrosives, toxics, and reactive, would be segregated. This information will be listed on the label of each chemical or on the MSDS. Mixing of wastes that represent different hazard classes must be avoided.

The transportation of hazardous waste can pose a threat to the public and to promote safety and protect the public's health, four basic control measures will be followed for the movement of hazardous waste from a source to disposal site: hazardous waste manifest, labelling, haulers, and incident and accident reporting.

The hazardous waste will be separately kept in the waste transfer station and EPC contractor will be responsible for handling and disposing of hazardous waste.

The waste storage areas will be located within the facility and sized to the quantities of waste generated, and have a hard, impermeable floor with drainage, and designed for cleaning/disinfection with available water supply. The storage area will be secured by locks

with restricted access and designed for access and regular cleaning by authorized cleaning staff and vehicles. It will also be protected from sun, and inaccessible to animals/rodents.

Changes to Natural Resources

In order to reduce the natural resources depletion, calculation and estimation of material requirement will be ensured to avoid excessive purchase, and the accurate quantities of materials will be ordered and collected. The efficient use of fuel, electricity, water and office stationery will be applied. During rainy season of construction phase, rain water will be collected and used for concrete curing works, pouring water on roadways and washing purpose. The reusable materials will be reused by the project. The recyclables will be sent to the local recyclers.

Traffic flow

The mitigation measures such as proper planning of transportation of construction materials (will reduce unnecessary traffic congestion), provision of traffic management staff at site and junctions, installation of road signs and traffic signals at along the way of work site, main road, cross roads, approach roads, to notify stakeholders of the development, enforcing speed limit to all vehicles which are transporting materials and accessing the site. The project will also follow the following practices.

- Emphasizing safety aspects among drivers;
- Improving driving skills and requiring licensing of drivers;
- Adopting limits for trip duration and arranging driver rosters to avoid overtiredness; and
- Avoiding dangerous routes and times of day to reduce the risk of accidents.

Regular maintenance of vehicles and use of manufacturer approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure.

5.4.1.2 Mitigation Measures for Biological Environmental Impacts

Destruction of vegetation and expelling of wildlife

The plants in this site and surrounding and the potential impact on animals may not be necessarily significant either as the animals around the site would have run away with fear by the activities of construction and move further away into nearby forests. Therefore, the developer will make the proper demarcation of the project area that would be affected by construction works. This is aimed at ensuring that any disturbance to flora and fauna is restricted to the actual project area and avoid spillover effects on the neighboring areas. There will also be strict control of construction vehicles to ensure the avoidance of unnecessary disturbance of vegetation. The mitigation measures (for e.g. replantation with native species, leaving native trees/plants and supporting Environmental Education and Public Participation and Environmental Protection activities through CSR programs) would be adopted.

Disturbance to aquatic organisms and aquatic habitats

The decline of biodiversity (loss of species in aquatic environment) will be mitigated by banning fishing in fish spawning season and electric shock catching.

The following mitigation measures to minimize the negative impact to the biological environment will also be adopted by the developer:

- All the marginal and common lands available in the nearby area would be brought into a plantation program giving priority to native species for good green cover.
- Biological mitigation measures which were suggested for impacts to vegetation is providing the implementation of revalidation programs elsewhere outside of the project site which store top soil for reapplication. Replacing or restoring the vegetation is the most critical of all mitigation activities if the environmental impacts to the biological environment are to be minimized.
- Community Forestry (people's committee at village level) would be placed in the center of redevelopment efforts so as to provide protection of common property resources, local employment, and local people's participation (including women).
- Raising public awareness upon presence of healthy ecosystems where trees and wildlife including micro-organisms and invertebrates should be present to maintain food-chains, food-webs, and biogeochemical cycles balanced would be strengthened assisting with an environmental education program.

5.4.1.3 Mitigation Measures for Social Environmental Impacts

Existing social infrastructures and services

The existing social infrastructures and services will be upgraded and expanded as CSR program of the project to meet the needs of the local people and the additional construction workers.

Landscape and scenery

The architectural design, height and color of the buildings and structures will be developed by taking the visual impacts of these structures into account. The factors related to the design of the building structures, distance between the viewer and these buildings, setting of the tower including the space between these buildings and the viewer, the degree to which these buildings are visible, and the disposition and visual preferences of those who observe these buildings and structures will also be assessed before designing and construction stages.

The visual impacts of the electricity substation will be mitigated by the control measures:

- ✓ Placing the structures in such a manner as to maximize the buffer zone between the structures and the roads
- ✓ The retention of as much existing vegetation as possible, specifically the existing mature trees in the area

- ✓ The establishment of climbing plants on sections of the perimeter fencing for safety and security considerations. Such planting will be done with specific viewpoints in mind and be used to break the monolithic nature or soften the visual impact of the development from those specific viewpoints.
- ✓ All lighting, especially perimeter security lighting will be shielded to minimize light spillage and pollution. No direct light sources will be seen from outside the site.
- ✓ Signage will be simple and unobtrusive

Risks for infectious diseases such as AIDS/HIV

The project will follow the general EHS guidelines set by International Finance Corporation, World Bank Group. The interventions for communicable diseases will be as follows: providing surveillance and active screening and treatment of workers, preventing illness among workers in local communities (undertaking health awareness and education initiatives, training health workers in disease treatment, conducting immunization programs for workers in local community to improve health and guard against infection, providing health services), providing treatment through standard case management in on-site or community health care facilities, promoting collaboration with local authorities to enhance access of workers families and the community to public health services and promote immunization. For the vector-borne diseases, the mitigation measures are prevention of larval and adult propagation through sanitary improvements and elimination of breeding grounds close to human settlements, elimination of unusable impounded water, increase in water velocity in natural and artificial channels, implementation of integrated vector control programs, promoting use of repellents, clothing, netting and other barriers to prevent insect bites, use of chemoprophylaxis drugs by non-immune workers and collaborating with public health officials to help eradicate disease reservoirs, monitoring and treatment of circulating and migrating populations to prevent disease reservoir spread, collaboration and exchange of in-kind services with other control programs in the project area to maximize beneficial effects, educating project personnel and local residents on risks, prevention and available treatment, monitoring communities during high-risk seasons to detect and treat cases, distributing appropriate education materials and following safety guidelines for the storage, transport and distribution of pesticides to minimize the potential for misuse, spills, and accidental human exposure.

Occupational health and safety (Risk of injuries and accidents to workers)

The company has guidelines and procedures for occupational health and safety. (Please see in the Annex section).

Emergency risk (risk of fire, earthquake)

The company has guidelines and procedures for emergency risk responses. (Please see in the Annex section).

Community Health and Safety

The project will follow the general EHS guidelines set by International Finance Corporation (IFC), World Bank Group.

Parameter	Control Measures
Water Quality	Drinking water sources – at all times be protected.
	Delivery of water to the community or to users of facility infrastructure – water quality needs to comply with National Acceptability Standards (or in their absence the current edition of with WHO Drinking Water Guidelines)
Water Availability	Potential effect of groundwater or surface water abstraction for project activities would be properly assessed accounting for seasonal variability and projected changes in demand in the project area.

<p>Structural Safety of Project Infrastructure</p>	<p>Buffer strips or other methods of physical separation around project sites will be included to protect the public from major hazards associated with hazardous materials incidents or process failure, as well as nuisance issues related to noise, odor or other emissions.</p> <p>The siting and safety engineering criteria will be incorporated to prevent failures due to natural disasters.</p> <p>Myanmar National Building Code (2016) will be applied to ensure structures are designed and constructed in accordance with sound architectural and engineering practice, including aspects of fire prevention and response.</p> <p>Hazardous materials storage, handling and use will be managed to reduce or eliminate consequences of the potential off-site release.</p>
<p>Life and Fire Safety</p>	<p>The new buildings and facilities which can be assessed by the public will be designed, constructed and operated in full compliance with Myanmar National Building Code (2016), Myanmar Fire Services Department regulations and other local legal/insurance requirements.</p>
<p>Traffic Safety</p>	<p>Adoption of best transport safety practices across all aspects of project operations with the goal of preventing traffic accidents and minimizing injuries suffered by project personnel and the public.</p> <ul style="list-style-type: none"> • Emphasizing safety aspects among drivers • Improving driving skills and requiring licensing of drivers • Adopting limits for trip duration and arranging driver rosters to avoid overtiredness • Avoiding dangerous routes and times of day to reduce the risk of accidents <p>Regular maintenance of vehicles and use of manufacturer approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure.</p> <p>Where the project may contribute to a significant increase in traffic along existing roads, or where road transport is a significant component of a project, the following measures will be applied:</p> <ul style="list-style-type: none"> • Minimizing pedestrian interaction with construction vehicles • Collaboration with local authorities (traffic police unit) and local communities to improve signage, visibility and overall safety of roads, particularly along stretches located near schools or other locations (hospital). Collaborating with local communities on education about traffic and pedestrian safety (e.g. school education campaign) • Coordination with emergency responders (Government hospital or local social and health associations) to ensure that appropriate first aid is provided in the event of accidents • Using locally sourced materials, whenever possible, to minimize transport distances. Locating worker camps close to project sites and arranging worker transport system to minimizing external traffic • Employing safe traffic control measures, including road signs and flag persons to warn of dangerous conditions
<p>Transport of Hazardous Materials</p>	<p>Project will have procedures ensuring the compliance with local laws and requirements applicable to the transport of hazardous materials. The procedures will be:</p>

	<ul style="list-style-type: none"> • Proper labeling of containers, including the identity and quantity of the contents, hazards, and shipper contact information • Providing a shipping document (e.g. shipping manifest) describing the contents of the load and its associated hazards in addition to the labeling of the containers. • Ensuring that the volume, nature, integrity and protection of packaging and containers used for transport are appropriate for the type and quantity of hazardous material and modes of transport involved • Ensuring adequate transport vehicle specifications • Training employees involved in the transportation of hazardous materials regarding proper shipping procedures and emergency procedures • Using labeling and placarding (external signs on transport vehicles) as required • Providing the necessary means for emergency response
Disease Prevention	Communicable Diseases and Vector-Borne Diseases – Please see in the “Risks for infectious diseases such as AIDS/HIV” section above.
Emergency Preparedness and Response	If there is a risk to the local community from a potential emergency arising at the project site, the company will inform the community through the communication measures, namely, informing the local authorities, communicating details of the nature of emergency, communicating protection options (evacuation, quarantine), providing advices on selecting an appropriate option and vehicle mounted speakers.

5.4.2 Mitigation Measures for Operation Phase

5.4.2.1 Mitigation Measures for Physical Environmental Impacts

Soil Degradation

To mitigate soil degradation due to the oil (purified mineral oil used for insulation and coolant) leaks of the transformer, the industrial complex will have bunded detention ponds to contain an oil spill. To avoid soil degradation by wastewater, the wastewater treatment plant will be constructed in the project area and that plant will treat the domestic and industrial wastewater before discharging to the waterway nearby.

The project will construct a structure (building) to receive the solid waste generated from different activities and facilities. The building will have a hard, impermeable floor with drainage, and designed for cleaning/disinfection with available water supply. The storage area will be secured by locks with restricted access and designed for access and regular cleaning by authorized cleaning staff and vehicles. It will also be protected from sun, and inaccessible to animals/rodents. The solid waste will be temporarily stored in skips before collection of the local municipality is done.

Each development will have the following procedures adopted for oil spills mitigation.

- All development/activity - related machinery will be thoroughly checked not to leak oils on the ground and regular maintenance of the machinery will be done.
- All maintenance works will be carried out in a designated area and where oil spills are totally restrained from reaching the ground. Such areas will be cemented and enclosed to avoid storm water from carrying away oil into the soil.
- Car wash areas and other places handling oil activities within the site will be well managed and the drains from these areas controlled.

Air Pollution (including Dust Emission)

Dust emission during operation phase will be minimized through restricted speed control of transport buses and traffic within the project site.

The emissions of the factories and industries will be controlled by different technologies and technical measures not to exceed General Guidelines for Air Emissions described in National Environmental Quality Emission Guidelines. For the parameters not included in the National Environmental Quality Emission Guidelines, "Air Quality Guidelines for Europe, 1997. WHO Regional Publications, European Series No. 23. World Health Organization" will be followed.

All fuel will be sourced from trusted sources that have employed the necessary steps to eliminate lead and reduce Sulphur content.

Greenhouse gas emissions

The greenhouse gas emissions can be controlled by energy use efficiency, process modification, selection of fuels or other materials, the processing of which may result in less emission, application of emission control techniques, if possible. For the time being, the exact information of type of industries to be allocated in the project is not available and hence the specific control measures for every single factory and manufacturing cannot be mentioned at this point. There will be an EIA process for individual industrial development and project activities. Residents and staff/employee of residential areas and offices and other development/facilities will do the following practice:

- Using natural light as much as possible (and using energy efficient electrical appliances like energy - saving light bulbs)
- Keeping windows shut when HVAC is in use, but employing natural ventilation whenever possible
- Unplugging TVs, AV equipment, and phone chargers when not in use
- Turning off the lights and computer when leaving the office
- Recycling and/or reusing as many waste materials as possible
- Biking or walking to work if possible (OR) arranging bus for the workers
- Using the environmentally friendly airconditioners and refrigerators to avoid or reduce the emission of fluorinated gases

Surface water/Ground water contamination

The wastewater treatment plant will be constructed in the project area and that plant will treat the domestic and industrial wastewater before discharging to the waterway nearby. The project will construct a structure (building) to receive the solid waste generated from different activities and facilities. The structure will have a hard, impermeable floor with drainage, and designed for cleaning/disinfection with available water supply. The storage area will be secured by locks with restricted access and designed for access and regular cleaning by authorized cleaning staff and vehicles. It will also be protected from sun, and inaccessible to animals/rodents. The solid waste will be temporarily stored in skips before collection of the local municipality is done.

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- All development/activity - related machinery will be thoroughly checked not to leak oils on the ground and regular maintenance of the machinery will be done.
- All maintenance works will be carried out in a designated area and where oil spills are totally restrained from reaching the ground. Such areas will be cemented and enclosed to avoid storm water from carrying away oil into the soil.
- Car wash areas and other places handling oil activities within the site will be well managed and the drains from these areas controlled.

Increased water demand

Residents and responsible persons of each development/facility will be encouraged to use rainwater harvesting tanks to collect rainwater if possible. The water connections, pipes and taps will be checked regularly to avoid any leaks and wastages.

Noise and vibration

In the operation stage, the potential main sources of noise and vibration are processing factories and assembling factories, wastewater treatment plant, and residential area and commercial area. If necessary, the sound barrier, and sound absorbing materials will be prepared and installed at the facilities. The vibration control devices for equipment and design of the structure to disconnect between the sources and ground will be considered and applied as needed. The outside standard working hours such as weekend, evening or night-time works will be controlled and limited. If there is no negative impact on the community, these works will be allowed. However, the noise level of operation of all facilities and structures will be within the acceptable limit stipulated in National Environmental Quality Emission Guidelines.

Increased Solid waste generation

During operation phase, a large quantity of solid wastes will be generated, and solid waste will be collected separately for industrial waste and domestic waste. Some types of organic waste from industrial solid waste and domestic solid waste will be sorted for reusing and recycling if possible. The project will accept and implement the basic concept of 3Rs (Reduce, Reuse and Recycle) for reducing solid waste generation and it has developed the Non-hazardous solid waste management plan to be followed by every tenant, worker and staff of the project. The non-hazardous solid waste management plan contains the following procedures and processes.

Non-Hazardous Solid Waste Management Plan

Waste minimization (Reduction at source)

Source reduction includes technological efficiency, material substitute and good management practice.

Waste segregation and storage

The domestic waste (general waste), and recyclable wastes would be segregated and disposed in the relevant dust bins by the tenants with their own arrangement in their project compound. The tenants' storage of solid waste shall be allowed with KMIC JVC's prior approval only when it is stored in solid waste receptacles or trash containers which must be large enough to facilitate storage and collection and which must be installed within their plots.

Waste collection

The waste generated by residents, staff and employees would be collected on a daily basis by the cleaners and stored in the waste dumping facilities provided by each tenant. The system requires use of a special container, truck container pick-up equipment, and replacement of the container.

Final collection of Waste

The tenants shall have their arrangement with a professional company authorized by KMIC JVC to treat solid waste.

Note: The 3Rs (Reduce, reuse and recycle) practice would be applied in the whole compound and especially in offices, industries, and commercial areas where office stationeries and different reusable and recyclable materials are being used. Trainings related to the non-hazardous solid waste management will be conducted for all concerned persons.

Increased wastewater generation

The design of sewage collection and treatment for the proposed project is a central control system and all sewage and wastewater will be collected at the treatment plant. The effluent levels of final treated water to be disposed to waterway will be following the National Environmental Quality Emission Guidelines.

The observation and checking to sewage treatment plant and its disposal will be done regularly. The backup generator or alternate source of power will be used in case of power failure.

Maintenance and Operation planning of Wastewater treatment

The plan of wastewater treatment will cover the following: outline of maintenance and operation planning, purpose and a range of application, basic features, operation and management of facilities, operation and management of wastewater treatment facility and emergency plans.

Outline of maintenance and operation planning

Division	Maintenance and operation planning
Main points	<ul style="list-style-type: none"> ○ Economic operation that can consider stability and efficiency ○ Safety and cleanliness ○ Maintaining and improving of facility performance ○ Economic management of facility operation ○ Establishing duty system ○ Energy-saving management
Maintenance points	<ul style="list-style-type: none"> ○ Daily Maintenance (Short-term maintenance and long-term maintenance) ○ Preventing overload operating ○ Establishing emergency plan ○ Managing and securing fair return reserve stocks ○ Writing and analyzing operation log ○ Writing and analyzing record of machinery performance ○ Establishing plan of fair operation through regular wastewater analysis

Purpose and a range of application

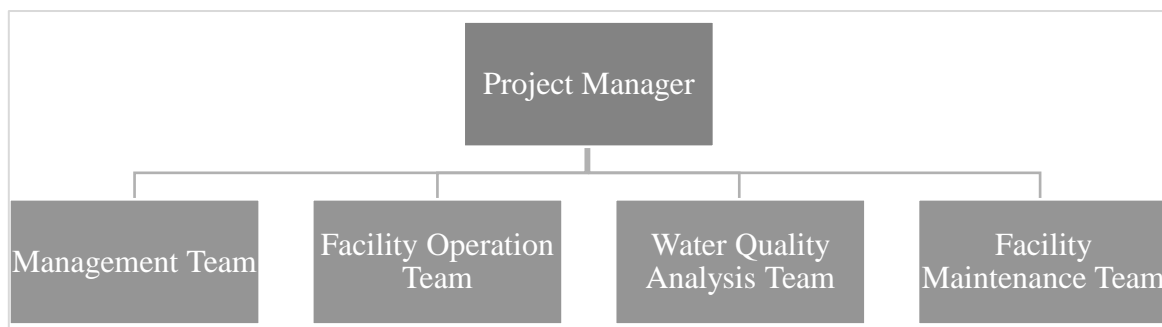
The purpose of operation and planning of maintenance is prompt work process and effective maintenance work. A range of application of planning is wastewater pipes, mediation pumping station and wastewater treatment.

Basic features

The basic features are:

- Organizing integrated management system to monitor and control wastewater treatment facility.
- Setting emergency plan for emergency situation

Organization chart of maintenance and operation management



Operation and management of facilities

Writing maintenance guideline within a month from construction date. The guideline includes maintenance features and problem that occurred during the trial operation.

1. Primary treatment facility (Mechanical biological treatment included)

Facility that removes grit in inflow wastewater in order to prevent pipe closing.

Operation and management of primary treatment facility

Grit Chamber Facility	<ul style="list-style-type: none"> ○ Plan for preventing sedimentation Inflow sewage flow ○ Operation of screen facility ○ Operation of sand removal machine ○ Coating regularly as a precaution of corrosive gas exposure or inundation
Inflow pump station Facility	<ul style="list-style-type: none"> ○ Water level surveillance of pump sump ○ Maintenance of pump structure ○ Change of Operation by changing inflow time and season ○ Operation control of pump ○ Standard inspection of inflow pump operation (starting duty should be within the range of 6 times per hour) ○ Frequent inspection of abnormal noise and vibration
Primary sedimentation Tank	<ul style="list-style-type: none"> ○ Scheme to maintain optimum C/N, C/P of biological reactor ○ Inspection of noise and vibration of sludge collector

2. Secondary treatment facility

Treatment facility that processes nutritive salts and organic in sewage, by biological way with microorganism.

Operation and management of secondary treatment facility

Biological Reactor Facility	<ul style="list-style-type: none"> ○ Measure for bulking of activated sludge ○ Measure for floatation of activated sludge ○ Regular calibration inspection of DO, MLSS measuring instrument ○ Inspection of start-up time of reduced-voltage starter
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3. Tertiary treatment facility

Operation and management of tertiary treatment facility

Filter Facility and Recycling Facility	<ul style="list-style-type: none"> ○ Inspection of backwashing period of filter facility ○ Inspection of speed and filter resistance of backwashing ○ Inspection of delivery pressure and functioning condition of water supply facility
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4. Odor treatment facility

Management of deodorization facility

Deodorization Facility	<ul style="list-style-type: none"> ○ Inspection standard of normal operability of deodorization fan ○ Problem of operation, measure, inspection method and replacement period of filler
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5. Sludge conditioning process

Operation and management of sludge conditioning process

Dewatering Facility	<ul style="list-style-type: none"> ○ Operating condition inspection of mechanical filtration ○ Inspection of VVVF automated operation
Chemical Dissolving Facility	<ul style="list-style-type: none"> ○ Storage, inspection and handling key point of chemical ○ Setting dissolving and dosing period by automatic control of chemical dissolving facility

6. Other management and operation facilities

Operation and management of other facilities

Automatic operation and maintenance facilities	<ul style="list-style-type: none"> ○ Instrumentation facility precision reliability ○ Securing measuring instrument and spares to replace in case of situation of failure and deterioration
Water quality management	<ul style="list-style-type: none"> ○ Outline and purpose of water quality, equipment specification of laboratory and handling key points ○ Standard and items for water quality (Test list, number of times, management index) ○ Sampling (way to sample, location, quantity and precaution) and water quality management method

7. Electricity and instrumentation facility

Operation and management of electricity and instrumentation facility

Electric facility	<ul style="list-style-type: none"> ✓ Outline: Design outline and system explanation of electrical facility, power distribution facility and power plant facility ✓ General handling: ordinary requirements, safety regulations and provisions for service interruption ✓ Receiving power facility and service interruption: corrective measure for situations (before starting receiving power facility, in operation, service interruption) ✓ Receiving power facility and power distribution facility: operation requirements, working characteristic of circuit breaker, transformer, receiving power facility and power
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	<p>distribution facility</p> <ul style="list-style-type: none"> ✓ Load Facility: system explanation of electric heat, lighting, telephone program, fire alarm apparatus and load facility ✓ Maintenance and inspection standard: requirements for daily inspection, regular inspection and special inspection
Instrumentation Facility	<ul style="list-style-type: none"> ➤ Outline: outline explanation of instrumentation facility detect converter, monitoring and control equipment, centralized control system and Automation system equipment ➤ General handling: ordinary requirements, safety regulations and provisions for service interruption ➤ Maintenance and inspection standard: inspection standard of each instrumentation facilities ➤ Maintenance and inspection of facilities ➤ Instrumentation measuring instrument: maintenance and inspection method of detection converter, flowmeter, densitometer and water gauge ➤ Control equipment: maintenance and inspection method of computer control section (control section and transmission section)

8. Sewage pipes

Operation and management of sewage pipe and pump station facilities

Sewage Pipes	<ul style="list-style-type: none"> ✓ Establishing plan for effective leakage management ✓ Preventing sedimentation of soil in pipes
Relay pump station Facility	<ul style="list-style-type: none"> ✓ Water level surveillance of pump sump ✓ Maintenance of pump structure ✓ Change of operation by changing inflow time and season ✓ Operation control of pump ✓ Standard inspection of inflow pump operation (starting duty should be within the range of 6 times per hour) ✓ Frequent inspection of abnormal noise and vibration

Operation and Management of Wastewater treatment facility

1. Management method of wastewater treatment facility

- Regular inspection for maintenance of facility.
- Management by designating staffs for each facility.
- Setting management plan for flexible response by inflow sewage change.
- Planning facility safety management plan annually

2. Water quality analysis of wastewater treatment facility

- ✓ Discharge water and inlet raw water sampling (Sampling should consider time of sewage inflow)
- ✓ Water quality analysis of discharge water
- ✓ Water quality analysis of inlet raw water

- ✓ Water quality inspection (If autonomous water quality inspection is not available, consigned inspection can be conducted.)
- ✓ Corrective measure of water quality inspection result (If result exceeds inlet raw water quality standard, cause analysis is needed for improvement measure). Analysis should be repeated until it meets inlet raw water quality standard.

3. Management of linked treatment water (outflow, sewage and landfill leachate)

- ❖ Water quality control plan of individual discharger (Discharge standard of Myanmar environmental conservation law should be applied)
- ❖ Water quality control plan of linked treatment water (sewage and landfill leachate)

If sewage and landfill leachate are treated as linked, flowmeter that can measure inflow water automatically should be installed.

4. Treatment of wastewater sludge

Myanmar environmental conservation law should be applied to treat sludge occurred by wastewater treatment facility.

5. Details of stopping operation of wastewater treatment facility

Individual wastewater discharger that is informed to stop operation of wastewater treatment facility should control wastewater by stopping operation of facility until normal operation of facility.

Emergency Plans

Emergency plans for wastewater treatment facility

Emergency Plans	Contents
Emergency plans for normal operation	<p>Proper control (alarm system, facility changeover) is automatically initiated when minor error occurs in major section of facility.</p> <p>After initiating proper action, facility should be controlled by operator primarily when emergency shutdown is needed caused by critical malfunction of facility.</p> <p>In preparation of decreased response capabilities of operator, automatic emergency shutdown control method is needed after a period of time.</p>
Emergency plans for service interruption of receiving power line	<p>Common-emergency two-circuit receiving power system will be used. By automatic load transfer switches (ALTS), it is able to operate normally with instantaneous changeover.</p>

Emergency plans for service interruption by transformer accident	In the case of service interruption by transformer accident, system automatically switches into emergency transformer to operate overall facilities normally.
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Hazardous waste generation

The hazardous waste generated will be managed by the Hazardous Solid Waste Management plan as mentioned below.

Hazardous Solid Waste Management Plan

The hazardous waste management plan contains the following procedures and processes.

Waste minimization (Reduction at source)

Source reduction includes technological efficiency, material substitute and good management practice. The employees and staff of all factories, industries and offices in the compound will be encouraged to utilize chemical waste minimization (waste reduction) techniques to reduce the volume and toxicity of chemical wastes produced in the project compound.

Minimizing quantities of ordering chemicals – This can also reduce potential chemical exposure to personnel, thus minimizing the risks and severity of accidents.

Recycling – Many materials treated as chemical waste are actually surplus chemicals that are reusable. The unopened or unwanted chemicals would be transferred to laboratories and related industries where they may be used.

Substitution – Substitution of a non-hazardous or less hazardous chemical in place of a hazardous chemical is a commonly used method of reducing waste. For e.g. Changing a cleaning agent from a toxic, flammable solvent to an appropriate soap or detergent solution, and the use of water-based paints and cements over solvent based.

Waste Collection

All waste stored together must be compatible. Guidelines for segregation of chemicals as found in the Laboratory Safety Manual must be adhered to. Incompatible waste (oxidizers and organic solvents, for example) generated by a single laboratory would be separated by storing these materials in separate cabinets or shelves. Generally, classes, i.e. ignitable, corrosives, toxics, and reactive, should be segregated. This information will be listed on the label of each chemical or on the MSDS. Mixing of wastes that represent different hazard classes must be avoided.

Transportation and Disposal of Hazardous Waste

The transportation of hazardous waste can pose a threat to the public and to promote safety and protect the public's health, four basic control measures will be followed for the movement of hazardous waste from a source to disposal site: hazardous waste manifest, labelling, haulers, and incident and accident reporting.

The hazardous waste will be separately kept in some plots set up by each tenant until a professional company collects waste. The tenants shall have their arrangement with a professional company authorized by KMIC JVC to treat solid waste. Respective tenants will be responsible for handling and disposing of hazardous waste.

The waste storage areas will be located within the facility and sized to the quantities of waste generated, and have a hard, impermeable floor with drainage, and designed for cleaning/disinfection with available water supply. The storage area will be secured by locks with restricted access and designed for access and regular cleaning by authorized cleaning staff and vehicles. It will also be protected from sun, and inaccessible to animals/rodents.

Changes to Natural Resources

Each activity of the project operation will efficiently use the energy, fuel, water, raw materials for production, and office stationeries etc. The mitigation and control measures mentioned in this whole chapter for every implementation which can potentially impact the Environment will also help reduce the depletion of natural resources.

Increased Traffic flow

The mitigation measures such as provision of traffic management staff at project area and surroundings, installation of road signs and traffic signals at along main road, cross roads, approach roads, enforcing speed limit to all vehicles which are transporting materials and accessing the site will be applied. The transportation for the factory workers will be considered and they will also be encouraged to use bicycles.

Foul Odor and Vectors

The main source to release foul odor and attract vectors is the wastewater treatment plant. The sludge and bio-solid handling is usually the most significant source of odor release and good sludge management is required. All raw sludge and bio solids will release odor largely dependent upon age.

One of the options is to thermal dry the primary sludge with the use of the biogas generated in the anaerobic digestion process. If this is done, then this impact is negated entirely. The process of dewatering also reduces odor.

At the preliminary treatment (Degritting), flies will be attracted and as mitigation measures, skips would be covered to minimize vector attraction. Contents of skips to be stabilized with lime.

5.4.2.2 Mitigation Measures for Biological Environmental Impacts

Changes to terrestrial flora and fauna

Replantation of native species and leaving native trees/plants as much as possible will be adopted to reduce the negative changes to terrestrial flora and fauna. The restored natural habitat will be conserved and protected from any activities of operation phase. The project will continue this activity through the operation phase as much as possible.

Changes to aquatic flora and fauna

The decline of biodiversity (loss of species in aquatic environment) will be mitigated by banning fishing in fish spawning season and electric shock catching. The wastewater disposed to the waterways will be treated to the acceptable limit.

5.4.2.3 Mitigation Measures for Social Environmental Impacts

Inconveniency with socio-economic change

Some people will meet with difficulty, especially at the initial stage and vocational trainings would be provided to the local people to be fit with skills requirement with project activities and needs.

Community Health and Safety

The project will follow the general EHS guidelines set by International Finance Corporation (IFC), World Bank Group.

Parameter	Control Measures
Water Quality	Drinking water sources – at all times be protected.
	Delivery of water to the community or to users of facility infrastructure – water quality needs to comply with National

	Acceptability Standards (or in their absence the current edition of with WHO Drinking Water Guidelines)
Water Availability	Potential effect of groundwater or surface water abstraction for project activities would be properly assessed accounting for seasonal variability and projected changes in demand in the project area.
Hazardous materials Management	<p>Buffer strips or other methods of physical separation around project sites will be included to protect the public from major hazards associated with hazardous materials incidents or process failure, as well as nuisance issues related to noise, odor or other emissions.</p> <p>Hazardous materials storage, handling and use will be managed to reduce or eliminate consequences of the potential off-site release.</p>
Traffic Safety	<p>Adoption of best transport safety practices across all aspects of project operations with the goal of preventing traffic accidents and minimizing injuries suffered by project personnel and the public.</p> <ul style="list-style-type: none"> • Emphasizing safety aspects among drivers • Improving driving skills and requiring licensing of drivers • Adopting limits for trip duration and arranging driver rosters to avoid overtiredness • Avoiding dangerous routes and times of day to reduce the risk of accidents <p>Regular maintenance of vehicles and use of manufacturer approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure.</p> <p>Where the project may contribute to a significant increase in traffic along existing roads, or where road transport is a significant component of a project, the following measures will be applied:</p> <ul style="list-style-type: none"> • Minimizing pedestrian interaction with vehicles • Collaboration with local authorities (traffic police unit) and local communities to improve signage, visibility and overall safety of roads, particularly along stretches located near schools or other locations (hospital). Collaborating with local communities on education about traffic and pedestrian safety (e.g. school education campaign) • Coordination with emergency responders (Government hospital or local social and health associations) to ensure that appropriate first aid is provided in the event of accidents • Using locally sourced materials, whenever possible, to minimize transport distances. Locating worker camps close to project sites and arranging worker transport system to minimizing external traffic • Employing safe traffic control measures, including road signs and flag persons to warn of dangerous conditions
Transport of Hazardous Materials	<p>Project will have procedures ensuring the compliance with local laws and requirements applicable to the transport of hazardous materials. The procedures will be:</p> <ul style="list-style-type: none"> • Proper labeling of containers, including the identity and quantity of the contents, hazards, and shipper contact information

	<ul style="list-style-type: none"> • Providing a shipping document (e.g. shipping manifest) describing the contents of the load and its associated hazards in addition to the labeling of the containers. • Ensuring that the volume, nature, integrity and protection of packaging and containers used for transport are appropriate for the type and quantity of hazardous material and modes of transport involved • Ensuring adequate transport vehicle specifications • Training employees involved in the transportation of hazardous materials regarding proper shipping procedures and emergency procedures • Using labeling and placarding (external signs on transport vehicles) as required • Providing the necessary means for emergency response
Disease Prevention	Communicable Diseases and Vector-Borne Diseases – Please see in the “Risks for infectious diseases such as AIDS/HIV” section above.
Emergency Preparedness and Response	If there is a risk to the local community from a potential emergency arising at the project site, the company will inform the community through the communication measures, namely, informing the local authorities, communicating details of the nature of emergency, communicating protection options (evacuation, quarantine), providing advices on selecting an appropriate option and vehicle mounted speakers.

Risk of injuries and accidents to workers

The project will follow its general procedures and guidelines for Occupational Safety and Health. (Please see in the Annex section).

A clinic with qualified staff members will be located on the administration office during operation.

Light intrusion

The fence of the electricity substation will be high enough to mitigate the light intrusion to the neighboring areas and community. There will also be a buffer area between the substation and the residential area and other sensitive areas.

Increased Emergency risk

The emergency response plans will be strictly applied to all stakeholders of the project.

5.4.3 Mitigation Measures for Decommissioning and Closure Phase

5.4.3.1 Mitigation Measures for Physical Environmental Impacts

Air Pollution (including Dust Emission)

The control techniques the project will implement for the reduction and control of air pollution and dust emission from decommissioning site include: minimizing dust from material handling sources, such as conveyors and bins, by using covers and/or control equipment (water suppression, bag house, or cyclone), minimizing dust from open area sources, including storage piles, by using control measures such as installing enclosures and covers, and increasing the moisture content, applying water or non-toxic chemicals to minimize dust from vehicle movements, selectively removing potential hazardous air pollutants, such as asbestos, from existing infrastructure prior to demolition, speed reduction for traffic, and avoiding open burning of solid waste.

Greenhouse gas emissions

The mitigation measures for reducing greenhouse gas emissions are conducting training to raise the awareness of drivers, operators and concerned staff on greenhouse emissions and mitigation measures, prohibiting unnecessary driving and moving at site and idling of vehicles and construction machineries as well, the regular maintenance of vehicles and machineries will be done, the efficient use of vehicles (car-pooling) and machineries will be applied. The construction engineers and project managers will formulate the construction management procedures including the efficient use of construction vehicles and machineries and it will ensure the reduction of greenhouse gas emissions during the demolition phase.

Surface water contamination

The wastewater from demolition site will be treated by the treatment plant before discharging to the creek nearby.

Noise and vibration

The control measures for noise and vibration are: planning activities in consultation with local communities so that activities with the greatest potential to generate noise are planned during periods of the day that will result in least disturbance, using noise control devices, such as temporary noise barriers and deflectors for impact and blasting activities, and exhaust muffling devices for combustion engines, and avoiding or minimizing project transportation through community areas.

Waste generation (Hazardous and Non-Hazardous Solid Waste)

The procedures and practices described in Hazardous and Non-Hazardous Solid Waste Management Plans by the Project will be followed for the waste generated from demolition work.

5.4.3.2 Mitigation Measures for Social Environmental Impacts

Living and Livelihood

The Employment Contract between workers and the concerned company (employer) will be prepared according to the existing Myanmar Labor Law. In this way, the worker's labor right will be protected by confirming termination service. In case the termination service will be preceded unfairly, workers can request authorities from labor office to settle and resolve the situation.

Risks for Infectious disease such as AIDS/HIV

The project will follow the general EHS guidelines set by International Finance Corporation, World Bank Group. The interventions for communicable diseases will be as follows: providing surveillance and active screening and treatment of workers, preventing illness among workers in local communities (undertaking health awareness and education initiatives, training health workers in disease treatment, conducting immunization programs for workers in local community to improve health and guard against infection, providing health services), providing treatment through standard case management in on-site or community health care facilities, promoting collaboration with local authorities to enhance access of workers families and the community to public health services and promote immunization. For the vector-borne diseases, the mitigation measures are prevention of larval and adult propagation through sanitary improvements and elimination of breeding grounds close to human settlements, elimination of unusable impounded water, increase in water velocity in natural and artificial channels, implementation of integrated vector control programs, promoting use of repellents, clothing, netting and other barriers to prevent insect bites, use of chemoprophylaxis drugs by non-immune workers and collaborating with public health officials to help eradicate disease reservoirs, monitoring and treatment of circulating and migrating populations to prevent disease reservoir spread, collaboration and exchange of in-kind services with other control programs in the project area to maximize beneficial effects, educating project personnel and

local residents on risks, prevention and available treatment, monitoring communities during high-risk seasons to detect and treat cases, distributing appropriate education materials and following safety guidelines for the storage, transport and distribution of pesticides to minimize the potential for misuse, spills, and accidental human exposure.

Occupational Health and Safety

The company will follow its Occupational Health and Safety Plan and Procedures.

Community Health and Safety

The project will follow the general EHS guidelines for Community Health and Safety set by International Finance Corporation, World Bank Group.

Parameter	Control Measures
Water Quality	Drinking water sources – at all times be protected.
	Delivery of water to the community or to users of facility infrastructure – water quality needs to comply with National Acceptability Standards (or in their absence the current edition of with WHO Drinking Water Guidelines)
Water Availability	Potential effect of groundwater or surface water abstraction for project activities would be properly assessed accounting for seasonal variability and projected changes in demand in the project area.
Traffic Safety	<p>Adoption of best transport safety practices across all aspects of project operations with the goal of preventing traffic accidents and minimizing injuries suffered by project personnel and the public.</p> <ul style="list-style-type: none"> • Emphasizing safety aspects among drivers • Improving driving skills and requiring licensing of drivers • Adopting limits for trip duration and arranging driver rosters to avoid overtiredness • Avoiding dangerous routes and times of day to reduce the risk of accidents <p>Regular maintenance of vehicles and use of manufacturer approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure.</p> <p>Where the project may contribute to a significant increase in traffic along existing roads, or where road transport is a significant component of a project, the following measures will be applied:</p> <ul style="list-style-type: none"> • Minimizing pedestrian interaction with construction vehicles • Collaboration with local authorities (traffic police unit) and local communities to improve signage, visibility and overall safety of roads, particularly along stretches located near schools or other locations (hospital). Collaborating with local communities on education about traffic and pedestrian safety (e.g. school education campaign) • Coordination with emergency responders (Government hospital or local social and health associations) to ensure that appropriate first aid is provided in the event of accidents

	<ul style="list-style-type: none"> • Using locally sourced materials, whenever possible, to minimize transport distances. Locating worker camps close to project sites and arranging worker transport system to minimizing external traffic • Employing safe traffic control measures, including road signs and flag persons to warn of dangerous conditions
Transport of Hazardous Materials	<p>Project will have procedures ensuring the compliance with local laws and requirements applicable to the transport of hazardous materials. The procedures will be:</p> <ul style="list-style-type: none"> • Proper labeling of containers, including the identity and quantity of the contents, hazards, and shipper contact information • Providing a shipping document (e.g. shipping manifest) describing the contents of the load and its associated hazards in addition to the labeling of the containers. • Ensuring that the volume, nature, integrity and protection of packaging and containers used for transport are appropriate for the type and quantity of hazardous material and modes of transport involved • Ensuring adequate transport vehicle specifications • Training employees involved in the transportation of hazardous materials regarding proper shipping procedures and emergency procedures • Using labeling and placarding (external signs on transport vehicles) as required • Providing the necessary means for emergency response
Disease Prevention	<p>Communicable Diseases and Vector-Borne Diseases – Please see in the “Risks for infectious diseases such as AIDS/HIV” section above.</p>
Emergency Preparedness and Response	<p>If there is a risk to the local community from a potential emergency arising at the project site, the company will inform the community through the communication measures, namely, informing the local authorities, communicating details of the nature of emergency, communicating protection options (evacuation, quarantine), providing advices on selecting an appropriate option and vehicle mounted speakers.</p>

5.5 Characterization and Assessment of Residual Impacts

The project will apply careful design and planning in combination with the mitigation measures and hence there are no significant adverse impacts to the physical, biological and socio-economic environments. For several valued Environmental and Social Components, no adverse environmental effects were identified that could result from routine activities during any of the project phases. However, there will be some residual impacts predicted.

The residual impacts are the impacts which remain after the implementation of the mitigation measures described. The predicted residual adverse impacts are considered for each project phase (Construction, Operation and Decommissioning/Closure). The residual impacts and their significance are determined by the professional judgement and expertise based on the nature of impacts, namely, magnitude, duration, and reversibility.

Level of Magnitude	Description
High	Impact is high enough to cause numerous effects.
Medium	Impact may result in changes that affect the value of resources, social-cultural, economic and environment.
Low	Impact may result in changes in resources and environment, but this change does not decrease value of these resources, social-cultural, economic and environment.
Nil	Impact has no effect.

Duration	Description
Long term	Beyond the construction phase for years or the operational life of project or permanent
Medium term	1-2 years
Short term	(0-12 months) and intermittent

Reversibility	Description
Reversible	Capable of re-establishing the original condition after a change or being impacted
Irreversible	Incapable of re-establishing the original condition after a change or being impacted

Level of Significance	Description
Major	Potential impact could threaten the long-term sustainability of the resource. Additional research, monitoring, and/or recovery initiatives should be considered.
Medium	Potential impact could result in a decline of a resource in terms of quality/quantity, such that the impact is considered moderate in its combination of magnitude, aerial extent, duration, and frequency, but does not affect the long-term sustainability. Additional research, monitoring, and/or recovery initiatives may be considered.
Minor	Potential impact may result in a localized or short-term decline in a resource during the life of the Project. Typically, no additional research, monitoring, and/or recovery initiatives are considered.
Minimal	Potential impact may result in a small, localized decline in a resource during the construction phase of the Project and should be negligible to the overall baseline status of the resource.

5.5.1 Residual Impact Assessment for Construction Phase

No.	Impact	Magnitude	Duration	Reversibility	Level of Significance
Physical Environment					
1	Effects on watercourses (erosion, sediment loading, stormwater discharges, oil and fuel spills and leaks)	Low	Intermittent and Short term	Reversible	Minor

2	Groundwater Contamination (due to uncontrolled site and road runoff, accidental release of fuel chemicals and hazardous materials)	Low	Intermittent and Short term	Reversible	Minimal
3	Air Pollution (Emissions of gaseous pollutants from diesel powered construction equipment, vehicles and machineries)	Low	Intermittent and Short term	Reversible	Minimal
4	Dust Emission (from excavating and moving earth, construction equipment and machinery, vehicles)	Low	Intermittent and Short term	Reversible	Minimal
Social Environment					
1	Community Health and Safety	Low	Long term	Reversible	Minimal

5.5.2 Residual Impact Assessment for Operation Phase

No.	Impact	Magnitude	Duration	Reversibility	Level of Significance
Physical Environment					
1	Degradation of groundwater quality due to accidental and chronic spills and release of chemical and hazardous materials	Low	Intermittent and Short term	Reversible	Minimal
Social Environment					
1	Community Health and Safety	Low	Intermittent and Short term	Reversible	Minimal
2	Risk of injuries and accidents to workers	Low	Intermittent and Short term	Reversible	Minimal
3	Light intrusion	Low	Intermittent and Short term	Reversible	Minor

5.5.3 Residual Impact Assessment for Decommissioning/Closure Phase

No.	Impact	Magnitude	Duration	Reversibility	Level of Significance
Physical Environment					

1	Effects on watercourses (erosion, sediment loading, storm water discharges, oil and fuel spills and leaks)	Low	Intermittent and Short term	Reversible	Minimal
2	Air Pollution (Emissions of gaseous pollutants from diesel powered construction equipment, vehicles and machineries)	Low	Intermittent and Short term	Reversible	Minimal
3	Dust Emission (from excavating and moving earth, construction equipment and machinery, vehicles)	Low	Intermittent and Short term	Reversible	Minimal
Social Environment					
1	Community Health and Safety	Low	Intermittent and Short term	Reversible	Minimal

Although the residual impacts are expected for construction, operation and decommissioning/closure phases as described in the tables above. The level of significance of these residual impacts are minor and minimal. Therefore, no additional research, monitoring, and/or recovery initiatives are considered and these impacts are negligible to the overall baseline status of the resource.



CHAPTER 6. CUMULATIVE IMPACT ASSESSMENT

Cumulative impacts from different projects (in combination with the project being assessed) whereby the impact may arise from the combined action of a number of different projects, in combination with the project being assessed, on a single environmental parameter (receptor/resource). This can include multiple impacts of the same or similar type from a number of projects upon the same environmental receptor/resources.

Methodology

In order to carry out the Cumulative Impact Assessment (CIA), the following steps were followed:

1. Identification of other existing and future private and public projects and developments;
2. Determining Valued Environmental and Social Components (VECs) for which cumulative impacts will be assessed and managed;
3. Determining Spatial and Temporal Boundaries;
4. Establishing the Baseline Information of VECs;
5. Assessment of Cumulative Impacts and their significance on VECs; and
6. Management of Cumulative Impacts.

6.1. Identification of other existing and future Projects and Activities

The existing activities and businesses around the proposed project site are livestock farms, fish farms, and agricultural production businesses.

The other planned or reasonably foreseeable development activities and projects that might interact in a cumulative way with potential activities from the Industrial Complex development are food and beverages processing factories, textile and garment factories, vehicle spare parts and electronic parts installation factories, construction materials factory and logistics.

The construction of electrical substation, water purification plant and upgrading of existing access roadway to 4-lane carriage ways with mid-island and sidewalks by Ministry of Construction are also taken into account as future projects for cumulative impact assessment.

Flood is the potential natural external factor which can influence the condition of VEC.

6.2 Determining Valued Environmental and Social Components

The following Valued Environmental and Social Components (VECs) were identified for cumulative impacts of the above-mentioned projects in combination with the project being assessed. The affected community were also consulted to define the VECs to be assessed.

1. Air
2. Soil
3. Receiving waterbody for disposing treated wastewater (Kalihtaw creek)
4. Water resource/watershed (Kalihtaw dam)
5. Wildlife populations and habitats (biodiversity)

6. Social conditions like Community health and safety and infrastructure and facilities

6.3 Determining Spatial and Temporal Boundaries

The duration of impacts considered on VECs is the lifetime of the proposed project, including the construction and operation phases. The potential effects of the proposed project cannot extend beyond the lifetime of project and hence this temporal boundary is the most conservative timeframe.

The geographic boundaries for VECs (Air, Soil, wildlife populations and habitats and social conditions) for which cumulative impacts were assessed are 5 km radius of the project site. The geographic boundary for analysis of receiving water (Kalihtaw creek) of treated wastewater is 2 km downstream from the point of discharge to the creek. The geographic boundary for water resource is the boundary of the Kalihtaw dam. The spatial boundary was defined based on the facts that the area that will be directly affected by the project, potential VECs for cumulative impact assessment, and the distance an effect can travel.

6.4 Establishing Baseline Information of VECs

The baseline information of VECs are the existing information for ESIA because such information provided a sufficient basis for a complete assessment of cumulative impacts.

6.5 Assessment of Cumulative Impacts and their significance on VECs

The potential cumulative impacts are

1. The incremental contribution of pollutant emissions in air;
2. Increases in pollutant concentrations in waterbody (Kalihtaw creek where treated wastewater is disposed);
3. Increases in pollutant concentrations in soil;
4. Reduction of amount of water in a watershed/water resource (Kalihtaw Dam) due to multiple withdrawals;
5. Interference with wildlife movement or habitat loss; and
6. Induced social impacts like in-migration, more traffic congestion and accidents, community health problems.

In order to determine the significance of cumulative impacts, some limits of acceptable change in VEC condition are needed to which incremental effects can be compared. There is not always an objective technique for determining thresholds and professional judgement was relied upon. The significance of cumulative impacts was determined by the impact assessment methodology for determining potential environmental impacts for ESIA (Ref. 5.3.3 Assessment of Impact Significance) in conjunction with professional judgement and based on the Environmental Management Plan of the project and appropriate mitigation measures for related impacts. It is also believed that the reasonably foreseeable projects will have and follow the sound Environmental Management Plans and appropriate mitigation measures for related impacts.

Potential Cumulative Impacts during Construction Phase

Type of impact	Score				Significance level of Impact = Impact level score x Receptor Sensitivity
	Extent	Duration	Magnitude	Receptor Sensitivity	

Incremental contribution of air pollutants	2	1	1	1	2 (Low)
Increase in pollutant concentrations in water body	2	2	1	1	2 (Low)
Increase in pollutant concentrations in soil	1	1	1	1	1 (Negligible)
Reduction of amount of water in watershed	2	1	1	1	2 (Low)
Interference with wildlife movement or habitat loss	2	2	1	1	2 (Low)
Induced social impacts	2	2	1	1	2 (Low)

Potential Cumulative Impacts during Operation Phase

Type of impact	Score				Significance level of Impact = Impact level score x Receptor Sensitivity
	Extent	Duration	Magnitude	Receptor Sensitivity	
Incremental contribution of air pollutants	2	2	1	1	2 (Low)
Increase in pollutant concentrations in water body	2	2	1	1	2 (Low)
Increase in pollutant concentrations in soil	1	2	1	1	2 (Low)
Reduction of amount of water in watershed	2	1	1	1	2 (Low)
Interference with wildlife movement or habitat loss	2	2	1	1	2 (Low)
Induced social impacts	2	2	1	1	2 (Low)

The cumulative impact assessment has not identified any cumulative impacts that are considered to be significant (i.e. high significance) and in need of mitigation measures, monitoring or management. The impacts are within the ability of the resource to absorb such changes.

6.6 Management of Cumulative Impacts

The significance of cumulative impacts is low and negligible and however, based on the review of potential impacts and mitigation measures mentioned in different phases, it is unlikely that the construction and operation of the KMIC project and associated infrastructure will result in significant adverse environmental or socio-economic impacts, including cumulative impacts. The Environmental Monitoring and Management plan for different phases of the project will also help minimize or avoid the cumulative impacts.

The cumulative impacts typically result from the actions of multiple stakeholders, it is necessary to engage with these stakeholders for effective collaboration and coordination.

Therefore, the project developer plans to initiate collaborative engagement in impact management with others including project proponents, government agencies, affected communities, Environmental NGOs, conservation groups, and expert groups for the following programs where they exist:

- Collaborative protection and enhancement of regional areas to preserve biodiversity;
- Collaborative engagement in other regional cumulative impact management strategies;
- Participation in regional monitoring programs to assess the realized cumulative impacts and efficacy of management efforts.



CHAPTER 7. ENVIRONMENTAL MANAGEMENT PLAN

7.1 Environmental Management and Monitoring Plan (Construction and Operation Phases)

Environmental impact	Mitigation measures and aspects for monitoring	Responsibility for		Mitigation and Monitoring Phase	Recommended frequency of monitoring
		Mitigation monitoring and maintenance during construction	Mitigation monitoring and maintenance during operation	Construction/ Operation	
Soil Degradation	<ul style="list-style-type: none"> Avoidance of unnecessary cutting and removing of trees and vegetation Controlling earthwork and compacting loose soil Installation and construction of drainage structure properly Ensuring supervision of excavation activities Keeping the removed topsoil and reusing to rehabilitate disturbed areas 	Contractor	-	Construction	Daily
	<ul style="list-style-type: none"> Installation of bunded detention ponds to contain oil spills Treatment of wastewater before discharging to waterways Following the procedures of using, storing and handling the chemicals, oil, grease and hazardous materials (if any) – including training of safety usage 	-	Developer, Tenants	Operation	Monthly
Soil Erosion	<ul style="list-style-type: none"> Construction of concrete drains at steep levels and proper gradient at temporary drain Minimizing clearance of vegetation Protecting areas susceptible to erosion with mulch or a suitable alternative 	Contractor	-	Construction	Daily
Topography	<ul style="list-style-type: none"> Designing and constructing buildings and structures as much as possible to maintain shape and features of land surfaces 	Architect, Civil Engineer, Contractor	-	Construction	Once (Design Stage)
Dust Emission	<ul style="list-style-type: none"> Control speed and operation of construction vehicles Proper cover of trucks carrying construction materials Prohibition of idling of vehicles Water should be sprayed earth moving work place and main roads 	Contractor	-	Construction	Daily

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	<ul style="list-style-type: none"> Restriction of speed control of transport buses and traffic within the project site 	-	Developer, Tenants	Operation	Daily
Air pollution	<ul style="list-style-type: none"> Regular maintenance of construction plants and equipment 	Contractor	-	Construction	Monthly
			Developer, Tenants	Operation	Monthly
	<ul style="list-style-type: none"> Engage sensitive workers Provide masks and PPE Worker to understand about hazardous gas emission Inspection and observation of air quality 	Contractor	-	Construction	Monthly
	<ul style="list-style-type: none"> Measuring air quality 	Contractor	-	Construction	Every six months
	<ul style="list-style-type: none"> Using quality fuel which contains reduced or no lead and Sulphur content Following National Environmental Quality Emission Guidelines (For the parameters not included in the guidelines, "Air Quality Guidelines for Europe, 1997. WHO Regional Publications, European Series No. 23. World Health Organization" will be followed) and the rules, regulations and guidelines set by the respective Ministry by individual project 	-	Developer, Tenants	Operation	Monthly
	<ul style="list-style-type: none"> Measuring air quality 	-	Developer, Tenants	Operation	Every six months
Greenhouse gas emission	<ul style="list-style-type: none"> Conducting training to raise the awareness of drivers, operators and concerned staff on greenhouse emissions and mitigation measures Prohibiting unnecessary driving and moving at site and idling of vehicles and construction machineries as well Regular maintenance of vehicles and machineries Efficient use of vehicles (car-pooling and if possible a truck will be used for two purposes at the same time – unloading of building materials and loading of construction wastes) and machineries Formulating the construction management procedures including the efficient use of construction vehicles and machineries Designing and construction of site offices as much as possible to get the natural light and ventilation 	Contractor	-	Construction	Weekly
	<ul style="list-style-type: none"> Using natural light as much as possible (and using energy efficient electrical appliances like energy - saving light bulbs) Keeping windows shut when HVAC is in use, but employing natural ventilation whenever possible Unplugging TVs, AV equipment, and phone chargers when not in use Turning off the lights and computer when leaving the office Recycling and/or reusing as many waste materials as possible 	-	Developer, Tenants	Operation	Monthly

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	<ul style="list-style-type: none"> Biking or walking to work if possible (OR) arranging bus for the workers Using the environmentally friendly airconditioners and refrigerators to avoid or reduce the emission of fluorinated gases 				
Surface water/Ground water contamination	<ul style="list-style-type: none"> Building sedimentation basin on a construction site to capture the disturbed soil which is washed off during rainfall Construction of sand traps to settle the sand at the bottom and store the deposited sand Systematic stacking and piling of materials on site, the regular solid waste disposal at the dumping site designated by the local municipality Avoidance of hazardous wastes disposal in drinking-water sources Adopting the proper waste management system Regular maintenance and check of the machineries, vehicles and sources which can cause oil spill and hazardous chemical spills (if found, the immediate repair and cleansing will be conducted) Systematic storage of fuels and filling station at construction site yard compound, handling and disposal of new oil and used oil waste Provision of impervious basement at operation area to prevent oil spill when heavy machineries are working Daily checking to earth moving machines by motor transport officer before start engines Providing a good pavement at machine workshop and garage Applying the proper sanitation system for the construction workers and project staff Checking sewer connections and pipes regularly to avoid any leaks 	Contractor	-	Construction	Monthly
	<ul style="list-style-type: none"> Measuring water quality 	Contractor	-	Construction	Every six months
	<ul style="list-style-type: none"> Treating wastewater to the acceptable limit according to the National Environmental Quality Emission Guidelines Storing solid waste in a temporary storage building having a hard, impermeable floor with drainage and designed for cleaning/ disinfection with available water supply Adopting oil spills mitigation procedures 	-	Developer, Tenants	Operation	Monthly
	<ul style="list-style-type: none"> Measuring water quality 	-	Developer, Tenants	Operation	Every six months
Increased water demand	<ul style="list-style-type: none"> Checking water connections, pipes and taps regularly to avoid any leaks and wastages 	-	Developer, Tenants	Operation	Monthly

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<p>Noise and vibration</p>	<ul style="list-style-type: none"> • Training drivers and operators of construction vehicles and machineries to reduce the noise from their operations, and the construction activities will be restricted in night times • Regular maintenance of vehicles and machineries and wearing the ear mufflers (hearing protection devices) • The construction noise will be strictly maintained within the noise level (National Environmental Quality Emission Guidelines) set by Ministry of Natural Resources and Environmental Conservation • Using sound absorb, sound proof engines at construction site and proper maintenance, enclosing noisy outdoor engines and generators in sound proof wall or buildings, regular checking and maintenance to silencers of engines and conserving trees around the site as some buffers against noise. 	<p>Contractor</p>	<p>-</p>	<p>Construction</p>	<p>Once (24 hours)/month</p>
	<ul style="list-style-type: none"> • Installing sound barrier and sound absorbing materials at the factories as needed • Applying vibration control devices for equipment and design of the structure as needed • Limiting outside standard working hours (weekend, evening or night-time works) • Ensuring that noise level of operation of all facilities and structures within the acceptable limit stipulated in National Environmental Quality Emission Guidelines 	<p>-</p>	<p>Developer, Tenants</p>	<p>Operation</p>	<p>Monthly</p>
	<ul style="list-style-type: none"> • Measuring sound level 	<p>-</p>	<p>Developer, Tenants</p>	<p>Operation</p>	<p>Every six months</p>
<p>Solid waste generation</p>	<ul style="list-style-type: none"> • Avoidance of unnecessary cutting and removing of vegetation plants • Developing drawing and land survey map to follow as drawing of landscaping procedure, producing a precise construction drawing to avoid unnecessary cutting and filling of earth work and excavation work • Ensuring calculation and estimation of materials requirement to avoid excessive purchase • Ensuring purchase of materials and stacking at collection yard and ware houses • Providing conservancy structures, dust bins and skips at appropriate places painting different colors for hazardous substances and biodegradable substances • Providing facilities for proper handling and storage of construction materials to reduce the amount of waste caused by damage or exposure 	<p>Contractor</p>	<p>-</p>	<p>Construction</p>	<p>Monthly</p>

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	<ul style="list-style-type: none"> Periodically disposal of solid waste at permitted land fill area or dumping sites and proper loading and unloading at garbage truck and educating workers to dispose waste properly If possible, the recycling and refurbishment of solid waste will be done to reduce the amount and volume of construction debris. Practicing Non-hazardous and Hazardous Solid Waste Management Plan 				
Increased solid waste generation	<ul style="list-style-type: none"> Adopting 3R (Reduce, Reuse and Recycle) practice Practicing Non-Hazardous and Hazardous Solid Waste Management Plan 	-	Developer, Tenants	Operation	Monthly
Increased wastewater generation	<ul style="list-style-type: none"> Installation of wastewater treatment facility to treat wastewater before disposal All other development, industries and activities would have to follow the guidelines and standards set by Ministry of Natural Resources and Environmental Conservation and other respective Ministries. 	-	Developer, Tenants	Operation	Monthly
Hazardous waste generation	<ul style="list-style-type: none"> Practicing Hazardous Solid Waste Management Plan 	Contractor	-	Construction	Monthly
	<ul style="list-style-type: none"> Practicing Hazardous Solid Waste Management Plan 	-	Developer, Tenants	Operation	Monthly
Changes to Natural Resources	<ul style="list-style-type: none"> Ensuring calculation and estimation of material requirement to avoid excessive purchase Ordering and collection of the accurate quantities of materials Efficient use of fuel, electricity, water and office stationery The reusable materials will be reused by the project. The recyclables will be sent to the local recyclers. (Adopting 3 R Practice) 	Contractor	-	Construction	Monthly
	<ul style="list-style-type: none"> Efficient use of energy, fuel, water, raw materials and office stationeries etc. 	-	Developer, Tenants	Operation	Monthly
Traffic Flow	<ul style="list-style-type: none"> Proper planning of transportation of construction materials Provision of traffic management staff at site and junctions Installation of road signs and traffic signals at along the way of work site, main road, cross roads, approach roads, to notify stakeholders of the development Enforcing speed limit to all vehicles which are transporting materials and accessing the site Discussion with the traffic police unit there to make necessary arrangements not to worsen the existing traffic condition in the town <p>Traffic Safety:</p>	Contractor	-	Construction	Daily

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	<ul style="list-style-type: none"> • Adoption of best transport safety practices across all aspects of project operations with the goal of preventing traffic accidents and minimizing injuries suffered by project personnel and the public. • Emphasizing safety aspects among drivers • Improving driving skills and requiring licensing of drivers • Adopting limits for trip duration and arranging driver rosters to avoid overtiredness • Avoiding dangerous routes and times of day to reduce the risk of accidents • Regular maintenance of vehicles and use of manufacturer approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure. 				
Increased Traffic Flow	<ul style="list-style-type: none"> • Provision of traffic management staff at project area and surroundings • Installation of road signs and traffic signals at along main road, cross roads, approach roads • Enforcing speed limit to all vehicles which are transporting materials and accessing the site • Arranging transportation for factory workers (or) Encouraging them to use bicycles 	-	Developer, Tenants	Operation	Monthly
Foul Odor and Vectors	<ul style="list-style-type: none"> • Thermal drying the primary sludge with the use of biogas generated in the anaerobic digestion process • Process of dewatering • Covering the skips • Stabilizing the contents of skips with lime 	-	Developer, Tenants	Operation	Monthly
Destruction of vegetation and expelling of wildlife	<ul style="list-style-type: none"> • Making the proper demarcation of project area that would be affected by construction works • Controlling construction vehicles to ensure the avoidance of unnecessary disturbance of vegetation • Replantation with native species, leaving native trees/plants • Supporting Environmental Education and Public Participation and Environmental Protection activities through CSR programs 	Contractor	-	Construction	Monthly
Changes to terrestrial flora and fauna	<ul style="list-style-type: none"> • Replantation of native species and leaving native trees/plants • Conservation of the restored natural habitat 	Contractor	-	Construction	Monthly
Disturbance to aquatic	<ul style="list-style-type: none"> • Banning fishing in fish spawning season and electric shock catching 	Contractor	-	Construction	Monthly

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organisms and aquatic habitats					
Changes to aquatic flora and fauna	<ul style="list-style-type: none"> Banning fishing in fish spawning season and electric shock catching Treating wastewater before disposing to waterways 	-	Developer, Tenants	Operation	Monthly
Existing social infrastructure and services	<ul style="list-style-type: none"> Upgrading the existing social infrastructures, services and facilities and/or building new social infrastructures and services 	Contractor (under CSR program of developer)	-	Construction	Monthly
Inconveniency with socio-economic change	<ul style="list-style-type: none"> Providing vocational trainings to the local people to be fit with skills requirement with project activities and needs 	-	Developer, Tenants	Operation	Monthly
Landscape and scenery	<ul style="list-style-type: none"> Developing the architectural design, height and color of the buildings and structures by taking the visual impacts of these structures into account <p>For visual impacts of electricity substation</p> <ul style="list-style-type: none"> Placing the structures in such a manner as to maximize the buffer zone between the structures and the roads The retention of as much existing vegetation as possible, specifically the existing mature trees in the area The re-establishment of some agricultural activity around the substation depending on the proposed land use The establishment of climbing plants on sections of the perimeter fencing for safety and security considerations. Such planting will be done with specific viewpoints in mind and be used to break the monolithic nature or soften the visual impact of the development from those specific viewpoints. All lighting, especially perimeter security lighting will be shielded to minimize light spillage and pollution. No direct light sources will be seen from outside the site. Signage will be simple and unobtrusive 	Contractor/Architect/Designer/Engineer	-	Construction	Once
Risks for infectious diseases such as AIDS/HIV	Following the general EHS guidelines set by IFC, World Bank Group. Interventions for communicable diseases	Contractor	-	Construction	Monthly

	<ul style="list-style-type: none"> • Providing surveillance and active screening and treatment of workers • Preventing illness among workers in local communities (undertaking health awareness and education initiatives, training health workers in disease treatment, conducting immunization programs for workers in local community to improve health and guard against infection, providing health services) • Providing treatment through standard case management in on-site or community health care facilities • Promoting collaboration with local authorities to enhance access of workers families and the community to public health services and promote immunization <p>Interventions for vector-borne diseases</p> <ul style="list-style-type: none"> • Prevention of larval and adult propagation through sanitary improvements and elimination of breeding grounds close to human settlements • Elimination of unusable impounded water, increase in water velocity in natural and artificial channels • Implementation of integrated vector control programs • Promoting use of repellents, clothing, netting and other barriers to prevent insect bites • Use of chemoprophylaxis drugs by non-immune workers and collaborating with public health officials to help eradicate disease reservoirs • Monitoring and treatment of circulating and migrating populations to prevent disease reservoir spread • Collaboration and exchange of in-kind services with other control programs in the project area to maximize beneficial effects • Educating project personnel and local residents on risks • Prevention and available treatment, monitoring communities during high-risk seasons to detect and treat cases • Distributing appropriate education materials and following safety guidelines for the storage, transport and distribution of pesticides to 				
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	minimize the potential for misuse, spills, and accidental human exposure				
Occupational safety and health	<ul style="list-style-type: none"> • Company has guidelines and procedures (Please see in the Annex section) and generally the following aspects are covered: • Guidelines and procedures for organizing the site (planning the work, organizing the work, common facilities to be provided, site access, public safety, lighting, site tidiness, storage areas, fire safety) • Preventive measures for accidents or injuries from excavations, working at height, moving, lifting and handling loads, site vehicles and mobile plants operation, chemicals use, handling and storage • Protective Equipment (Safety helmet, footwear, goggles and safety spectacles, gloves and protective clothing, other protective equipment) • Emergency procedures and preparedness (company's emergency personnel contact information, evacuation plan including exit routes, evacuation signals and sirens, location of eyewash stations and showers, fire extinguishers) • Providing First Aid kits and training on how to use them • Accident/Injury Reporting procedures • Training (Orientation) for all employees and workers 	Contractor	Developer, Tenants	Construction Operation	Monthly
Emergency risk	<p>Company has guidelines and procedures (Please see in the Annex section) and generally the following aspects are covered:</p> <p>Fire Safety Management</p> <ul style="list-style-type: none"> • Practical Fire Safety Arrangements, Planning, Organization and Control, Monitoring and Review <p>Fire Emergency Plan</p> <ul style="list-style-type: none"> • Training and Training Provision, Information Distribution, Procedures to follow when discovering a fire and hearing the fire alarm, Contacting Emergency Services, Identify processes, machines or power which must be shut down, Emergency Services Liaison Procedures, Specific Information for the Emergency Services, Escape Routes, Assembly Points, Identify Persons especially at risk, , Evacuation Arrangements for disabled people, staff with specific responsibilities, firefighting, fire control panel, contingency plans and Re-entering the building. (also including Fire Safety Maintenance Checklist, Fire Safety Training Program) 	Contractor	-	Construction	Every three months

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	<p>Emergency Response Plan for</p> <ul style="list-style-type: none"> • Utility Failures (electrical outages, plumbing failure, gas leaks, steam line breaks, ventilation problems, elevator failures) • Earthquakes • Floods • Storms and Tornadoes • Medical Emergency • Shelter in place/Safe shelter 				
Increased Emergency Risk	<ul style="list-style-type: none"> • Applying emergency response plans to all stakeholders of project 	-	Developer, Tenants	Operation	Monthly
Community Health and Safety	<p>Following the general EHS guidelines set by IFC, World Bank Group.</p> <p>Water Quality</p> <ul style="list-style-type: none"> • Drinking water sources – at all times be protected. • Delivery of water to the community or to users of facility infrastructure – water quality needs to comply with National Acceptability Standards (or in their absence the current edition of with WHO Drinking Water Guidelines) <p>Water Availability</p> <ul style="list-style-type: none"> • Potential effect of groundwater or surface water abstraction for project activities would be properly assessed accounting for seasonal variability and projected changes in demand in the project area. The higher demand of water use by health care facilities will be taken into account. <p>Structural Safety of Project Infrastructure</p> <ul style="list-style-type: none"> • Buffer strips or other methods of physical separation around project sites will be included to protect the public from major hazards associated with hazardous materials incidents or process failure, as well as nuisance issues related to noise, odor or other emissions. • The siting and safety engineering criteria will be incorporated to prevent failures due to natural disasters. • Myanmar National Building Code (2016) will be applied to ensure structures are designed and constructed in accordance with sound architectural and engineering practice, including aspects of fire prevention and response. • Hazardous materials storage, handling and use will be managed to reduce or eliminate consequences of the potential off-site release. <p>Life and Fire Safety</p>	Contractor	Developer, Tenants	Construction Operation	Monthly

	<ul style="list-style-type: none"> • The new buildings and facilities which can be assessed by the public will be designed, constructed and operated in full compliance with Myanmar National Building Code (2016), Myanmar Fire Services Department regulations and other local legal/insurance requirements. <p>Traffic Safety</p> <ul style="list-style-type: none"> • Adoption of best transport safety practices across all aspects of project operations with the goal of preventing traffic accidents and minimizing injuries suffered by project personnel and the public. • Emphasizing safety aspects among drivers • Improving driving skills and requiring licensing of drivers • Adopting limits for trip duration and arranging driver rosters to avoid overtiredness • Avoiding dangerous routes and times of day to reduce the risk of accidents • Regular maintenance of vehicles and use of manufacturer approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure. <p>Transport of Hazardous Materials</p> <p>Project will have procedures ensuring the compliance with local laws and requirements applicable to the transport of hazardous materials. The procedures will be:</p> <ul style="list-style-type: none"> - Proper labeling of containers, including the identity and quantity of the contents, hazards, and shipper contact information - Providing a shipping document (e.g. shipping manifest) describing the contents of the load and its associated hazards in addition to the labeling of the containers. - Ensuring that the volume, nature, integrity and protection of packaging and containers used for transport are appropriate for the type and quantity of hazardous material and modes of transport involved - Ensuring adequate transport vehicle specifications - Training employees involved in the transportation of hazardous materials regarding proper shipping procedures and emergency procedures 				
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	<ul style="list-style-type: none"> - Using labeling and placarding (external signs on transport vehicles) as required - Providing the necessary means for emergency response <p>Disease Prevention Communicable Diseases and Vector-Borne Diseases – Please see in the “Risks for infectious diseases such as AIDS/HIV” section above.</p> <p>Emergency Preparedness and Response If there is a risk to the local community from a potential emergency arising at the project site, the company will inform the community through the communication measures, namely, informing the local authorities, communicating details of the nature of emergency, communicating protection options (evacuation, quarantine), providing advices on selecting an appropriate option and vehicle mounted speakers.</p>				
Light Intrusion	<ul style="list-style-type: none"> • Fencing electricity substation high enough • Having buffer area between substation and residential area and other sensitive areas 	-	Developer, Tenants	Operation	Monthly

7.2 Environmental Management and Monitoring Plan (Decommissioning/Closure Phase)

Environmental impact	Proposed mitigation and aspects for monitoring	Responsibility for	Mitigation and Monitoring Phase	Recommended frequency of monitoring
		Mitigation monitoring and maintenance during decommissioning	Decommissioning	
Air Pollution (including Dust Emission)	<ul style="list-style-type: none"> Minimizing dust from material handling sources, such as conveyors and bins, by using covers and/or control equipment (water suppression, bag house, or cyclone) Minimizing dust from open area sources, including storage piles, by using control measures such as installing enclosures and covers, and increasing the moisture content Applying water or non-toxic chemicals to minimize dust from vehicle movements, selectively removing potential hazardous air pollutants, such as asbestos, from existing infrastructure prior to demolition, speed reduction for traffic Avoiding open burning of solid waste 	Contractor	Decommissioning	Monthly
Greenhouse gas emissions	<ul style="list-style-type: none"> Conducting training to raise the awareness of drivers, operators and concerned staff on greenhouse emissions and mitigation measures Prohibiting unnecessary driving and moving at site and idling of vehicles and construction machineries as well Regular maintenance of vehicles and machineries Formulating the construction management procedures including the efficient use of construction vehicles and machineries 	Contractor	Decommissioning	Monthly
Surface water contamination	<ul style="list-style-type: none"> Treating the wastewater from demolition site before discharging to the waterway 	Contractor	Decommissioning	Monthly
Noise and vibration	<ul style="list-style-type: none"> Planning activities in consultation with local communities so that activities with the greatest potential to generate noise are planned during periods of the day that will result in least disturbance Using noise control devices, such as temporary noise barriers and deflectors for impact and blasting activities, and exhaust muffling devices for combustion engines Avoiding or minimizing project transportation through community areas 	Contractor	Decommissioning	Monthly
Waste generation (Hazardous and Non-	<ul style="list-style-type: none"> Adopting the mitigation measures used for the construction phase 	Contractor	Decommissioning	Monthly

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hazardous Solid waste)				
Living and livelihood	<ul style="list-style-type: none"> • Preparing the employment contract between workers and the concerned company according to the Myanmar Labor Law (workers' labor right will be protected by confirming termination service) • Workers request government authorities (labor office) to settle and resolve the situation provided that the termination service is not fair 	Contractor	Decommissioning	As needed
Risks for infectious diseases	<p>Following the general EHS guidelines set by IFC, World Bank Group.</p> <p>Interventions for communicable diseases</p> <ul style="list-style-type: none"> • Providing surveillance and active screening and treatment of workers • Preventing illness among workers in local communities (undertaking health awareness and education initiatives, training health workers in disease treatment, conducting immunization programs for workers in local community to improve health and guard against infection, providing health services) • Providing treatment through standard case management in on-site or community health care facilities • Promoting collaboration with local authorities to enhance access of workers families and the community to public health services and promote immunization <p>Interventions for vector-borne diseases</p> <ul style="list-style-type: none"> • Prevention of larval and adult propagation through sanitary improvements and elimination of breeding grounds close to human settlements • Elimination of unusable impounded water, increase in water velocity in natural and artificial channels • Implementation of integrated vector control programs • Promoting use of repellents, clothing, netting and other barriers to prevent insect bites • Use of chemoprophylaxis drugs by non-immune workers and collaborating with public health officials to help eradicate disease reservoirs • Monitoring and treatment of circulating and migrating populations to prevent disease reservoir spread • Collaboration and exchange of in-kind services with other control programs in the project area to maximize beneficial effects • Educating project personnel and local residents on risks • Prevention and available treatment, monitoring communities during high-risk seasons to detect and treat cases 	Contractor	Decommissioning	Monthly

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	<ul style="list-style-type: none"> Distributing appropriate education materials and following safety guidelines for the storage, transport and distribution of pesticides to minimize the potential for misuse, spills, and accidental human exposure 			
Occupational Health and Safety	<p>Company has guidelines and procedures (Please see in the Annex section) and generally the following aspects are covered:</p> <ul style="list-style-type: none"> Guidelines and procedures for organizing the site (planning the work, organizing the work, common facilities to be provided, site access, public safety, lighting, site tidiness, storage areas, fire safety) Preventive measures for accidents or injuries from excavations, working at height, moving, lifting and handling loads, site vehicles and mobile plants operation, chemicals use, handling and storage Protective Equipment (Safety helmet, footwear, goggles and safety spectacles, gloves and protective clothing, other protective equipment) Emergency procedures and preparedness (company's emergency personnel contact information, evacuation plan including exit routes, evacuation signals and sirens, location of eyewash stations and showers, fire extinguishers) Providing First Aid kits and training on how to use them Accident/Injury Reporting procedures Training (Orientation) for all employees and workers 	Contractor	Decommissioning	Monthly
Community Health and Safety	<p>Following the general EHS guidelines set by IFC, World Bank Group.</p> <p>Water Quality</p> <ul style="list-style-type: none"> Drinking water sources – at all times be protected. Delivery of water to the community or to users of facility infrastructure – water quality needs to comply with National Acceptability Standards (or in their absence the current edition of with WHO Drinking Water Guidelines) <p>Water Availability</p> <ul style="list-style-type: none"> Potential effect of groundwater or surface water abstraction for project activities would be properly assessed accounting for seasonal variability and projected changes in demand in the project area. The higher demand of water use by health care facilities will be considered. <p>Hazardous materials Management</p> <ul style="list-style-type: none"> Buffer strips or other methods of physical separation around project sites will be included to protect the public from major hazards associated with hazardous materials incidents or process failure, as well as nuisance issues related to noise, odor or other emissions. 	Contractor	Decommissioning	Monthly

	<ul style="list-style-type: none"> • Hazardous materials storage, handling and use will be managed to reduce or eliminate consequences of the potential off-site release. <p>Traffic Safety</p> <ul style="list-style-type: none"> • Adoption of best transport safety practices across all aspects of project operations with the goal of preventing traffic accidents and minimizing injuries suffered by project personnel and the public. • Emphasizing safety aspects among drivers • Improving driving skills and requiring licensing of drivers • Adopting limits for trip duration and arranging driver rosters to avoid overtiredness • Avoiding dangerous routes and times of day to reduce the risk of accidents • Regular maintenance of vehicles and use of manufacturer approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure. <p>Where the project may contribute to a significant increase in traffic along existing roads, or where road transport is a significant component of a project, the following measures will be applied:</p> <ul style="list-style-type: none"> • Minimizing pedestrian interaction with vehicles • Collaboration with local authorities (traffic police unit) and local communities to improve signage, visibility and overall safety of roads, particularly along stretches located near schools or other locations (hospital). Collaborating with local communities on education about traffic and pedestrian safety (e.g. school education campaign) • Coordination with emergency responders (Government hospital or local social and health associations) to ensure that appropriate first aid is provided in the event of accidents • Using locally sourced materials, whenever possible, to minimize transport distances. Locating worker camps close to project sites and arranging worker transport system to minimizing external traffic • Employing safe traffic control measures, including road signs and flag persons to warn of dangerous conditions <p>Transport of Hazardous Materials</p> <p>Project will have procedures ensuring the compliance with local laws and requirements applicable to the transport of hazardous materials. The procedures will be:</p> <ul style="list-style-type: none"> • Proper labeling of containers, including the identity and quantity of the contents, hazards, and shipper contact information 			
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	<ul style="list-style-type: none"> • Providing a shipping document (e.g. shipping manifest) describing the contents of the load and its associated hazards in addition to the labeling of the containers. • Ensuring that the volume, nature, integrity and protection of packaging and containers used for transport are appropriate for the type and quantity of hazardous material and modes of transport involved • Ensuring adequate transport vehicle specifications • Training employees involved in the transportation of hazardous materials regarding proper shipping procedures and emergency procedures • Using labeling and placarding (external signs on transport vehicles) as required • Providing the necessary means for emergency response <p>Disease Prevention</p> <p>Interventions for communicable diseases</p> <ul style="list-style-type: none"> • Providing surveillance and active screening and treatment of workers • Preventing illness among workers in local communities (undertaking health awareness and education initiatives, training health workers in disease treatment, conducting immunization programs for workers in local community to improve health and guard against infection, providing health services) • Providing treatment through standard case management in on-site or community health care facilities • Promoting collaboration with local authorities to enhance access of workers families and the community to public health services and promote immunization <p>Interventions for vector-borne diseases</p> <ul style="list-style-type: none"> • Prevention of larval and adult propagation through sanitary improvements and elimination of breeding grounds close to human settlements • Elimination of unusable impounded water, increase in water velocity in natural and artificial channels • Implementation of integrated vector control programs • Promoting use of repellents, clothing, netting and other barriers to prevent insect bites • Use of chemoprophylaxis drugs by non-immune workers and collaborating with public health officials to help eradicate disease reservoirs • Monitoring and treatment of circulating and migrating populations to prevent disease reservoir spread 			
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	<ul style="list-style-type: none"> • Collaboration and exchange of in-kind services with other control programs in the project area to maximize beneficial effects • Educating project personnel and local residents on risks • Prevention and available treatment, monitoring communities during high-risk seasons to detect and treat cases • Distributing appropriate education materials and following safety guidelines for the storage, transport and distribution of pesticides to minimize the potential for misuse, spills, and accidental human exposure <p>Emergency Preparedness and Response</p> <ul style="list-style-type: none"> • If there is a risk to the local community from a potential emergency arising at the project site, the company will inform the community through the communication measures, namely, informing the local authorities, communicating details of the nature of emergency, communicating protection options (evacuation, quarantine), providing advices on selecting an appropriate option and vehicle mounted speakers. 			
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7.3 Environmental Monitoring Plan with estimated budget (Construction Phase)

Potential Impact	Monitoring Item	Monitoring Means	Allocated Budget per year (MMK)
Physical Environment			
Soil Degradation	<ul style="list-style-type: none"> Monitoring of mitigation measures and aspects for monitoring in Environmental Management Plan table 	Inspection and Observation	500,000 (included in construction cost)
Soil Erosion	<ul style="list-style-type: none"> Efficiency of erosion control measures Drains, waterways Vegetation and plants Concrete Aprons, concrete drains Deformation by erosion 	Inspection and Observation	500,000 (included in construction cost)
Topography	<ul style="list-style-type: none"> Monitoring of design of buildings and structures 	Inspection and Observation	This is included in design cost.
Dust Emission	<ul style="list-style-type: none"> Monitoring of mitigation measures and aspects for monitoring in Environmental Management Plan table Amount of dust on road side tree leaves Breathing Air 	Inspection and Observation	1,000,000 (included in construction cost)
Air Pollution	<ul style="list-style-type: none"> Monitoring of mitigation measures and aspects for monitoring in Environmental Management Plan table Content of PM_{2.5}, PM₁₀, NO₂, SO₂, CO in air 	Inspection, observation measuring air quality	2,500,000 (included in construction cost)
Greenhouse gas emissions	<ul style="list-style-type: none"> Monitoring of mitigation measures and aspects for monitoring in Environmental Management Plan table Content of CO₂ in air 	Inspection, observation measuring air quality	2,500,000 (included in construction cost)
Surface water/Ground water contamination	<ul style="list-style-type: none"> Monitoring of mitigation measures and aspects for monitoring in Environmental Management Plan table 	Inspection, observation measuring water quality	3,000,000 (included in construction cost)

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	<ul style="list-style-type: none"> Water quality test for temperature, pH, SS, DO, BOD₅, COD, total coliform bacteria, oil and grease 		
Noise and vibration	<ul style="list-style-type: none"> Monitoring of mitigation measures and aspects for monitoring in Environmental Management Plan table Noise and vibration level Traffic (on-site vehicles) count 	Inspection, observation measuring and counting	2,000,000 (included in construction cost)
Solid waste generation	<ul style="list-style-type: none"> Monitoring of mitigation measures and aspects for monitoring in Environmental Management Plan table Amount and kind of solid waste 	Inspection and observation	2,000,000 (included in construction cost)
Changes to natural resources	<ul style="list-style-type: none"> Monitoring of mitigation measures and aspects for monitoring in Environmental Management Plan table 	Inspection and observation	2,000,000 (included in construction cost)
Traffic flow	<ul style="list-style-type: none"> Monitoring of mitigation measures and aspects for monitoring in Environmental Management Plan table 	Inspection and observation	1,500,000 (included in construction cost)
Biological Environment			
Destruction of vegetation and expelling of wildlife	<ul style="list-style-type: none"> Monitoring of mitigation measures and aspects for monitoring in Environmental Management Plan table 	Inspection and observation	1,000,000 (included in construction cost)
Disturbance to aquatic organisms and aquatic habitats	<ul style="list-style-type: none"> Monitoring of mitigation measures and aspects for monitoring in Environmental Management Plan table 	Inspection and observation	1,000,000 (included in construction cost)
Social Environment			
Existing social infrastructures and services	<ul style="list-style-type: none"> Monitoring of mitigation measures and aspects for monitoring in Environmental Management Plan table 	Observation and inspection	Part of CSR program and cost will be covered by the program

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Landscape and scenery	<ul style="list-style-type: none"> Monitoring of mitigation measures and aspects for monitoring in Environmental Management Plan table 	Observation and interviewing the affected people	Some cost will be covered by design cost. 1,000,000 (included in construction cost)
Risks for infectious diseases such as AIDS/HIV due to influx of workers	<ul style="list-style-type: none"> Monitoring of mitigation measures and aspects for monitoring in Environmental Management Plan table Workers' awareness on infectious diseases 	Inspection, observation and interviewing	9,500,000 (included in construction cost)
Occupational safety and health (Risk of injuries and accidents to workers)	<ul style="list-style-type: none"> Monitoring of mitigation measures and aspects for monitoring in Environmental Management Plan table Record of accidents and infectious disease 	Inspection, observation and interviewing	
Emergency risk (risk of fire, earthquake)	<ul style="list-style-type: none"> Monitoring of mitigation measures and aspects for monitoring in Environmental Management Plan table 	Inspection and observation	
Community Health and Safety because of construction activities and increased traffic	<ul style="list-style-type: none"> Monitoring of mitigation measures and aspects for monitoring in Environmental Management Plan table Record of accidents and infectious diseases 	Inspection, observation and interviewing	

7.4 Environmental Monitoring Plan with estimated budget (Operation Phase)

Potential Impact	Monitoring Item	Monitoring Means	Allocated Budget per year (MMK)
Physical Environment			
Soil Degradation	<ul style="list-style-type: none"> Monitoring of mitigation measures and aspects for monitoring in Environmental Management Plan table 	Inspection and Observation	2,500,000 (included in maintenance cost)
Dust Emission	<ul style="list-style-type: none"> Monitoring of mitigation measures and aspects for monitoring in Environmental Management Plan table 	Inspection, observation	2,000,000 (included in maintenance cost)
Air Pollution	<ul style="list-style-type: none"> Monitoring of mitigation measures and aspects for monitoring in Environmental Management Plan table Content of NO₂, SO₂, CO, PM_{2.5}, PM₁₀ in air 	Inspection, observation	4,000,000 (included in maintenance cost)
		measuring	
Greenhouse gas emissions	<ul style="list-style-type: none"> Monitoring of mitigation measures and aspects for monitoring in Environmental Management Plan table Content of greenhouse gases in air (CO₂, hydrofluorocarbons etc.) 	Inspection, observation	3,500,000 (included in maintenance cost)
		measuring	
Surface water/Ground water contamination	<ul style="list-style-type: none"> Monitoring of mitigation measures and aspects for monitoring in Environmental Management Plan table 	Inspection, observation	2,000,000

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	<ul style="list-style-type: none"> Water temperature, pH, SS, DO, BOD5, COD, colour and odour, Total Nitrogen, Total Phosphorus, Sulphide, oil and grease, total coliform bacteria, formaldehyde, phenols, free chlorine, heavy metals such as zinc, chromium, arsenic, copper, mercury, cadmium, barium, lead and nickel Discharge water from each source to the waterways 	measuring	(included in maintenance cost)
Increased water demand	<ul style="list-style-type: none"> Monitoring of mitigation measures and aspects for monitoring in Environmental Management Plan table 	Inspection and observation	1,500,000 (included in maintenance cost)
Noise and vibration	<ul style="list-style-type: none"> Monitoring of mitigation measures and aspects for monitoring in Environmental Management Plan table 	Inspection and observation	2,000,000 (included in maintenance cost)
		measuring	
Increased solid waste generation	<ul style="list-style-type: none"> Monitoring of mitigation measures and aspects for monitoring in Environmental Management Plan table 	Inspection and observation	3,000,000 (included in maintenance cost)
Increased wastewater generation	<ul style="list-style-type: none"> Monitoring of mitigation measures and aspects for monitoring in Environmental Management Plan table 	Inspection and observation	2,500,000 (included in maintenance cost)
Hazardous waste generation	<ul style="list-style-type: none"> Monitoring of mitigation measures and aspects for monitoring in Environmental Management Plan table 	Inspection and observation	3,000,000 (included in maintenance cost)
Changes to Natural Resources	<ul style="list-style-type: none"> Monitoring of mitigation measures and aspects for monitoring in Environmental Management Plan table 	Inspection and observation	1,000,000 (included in maintenance cost)
Increased traffic flow	<ul style="list-style-type: none"> Monitoring of mitigation measures and aspects for monitoring in Environmental Management Plan table Traffic count 	Inspection, observation and counting	1,500,000 (included in maintenance cost)

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Foul Odor and Vectors	<ul style="list-style-type: none"> Monitoring of mitigation measures and aspects for monitoring in Environmental Management Plan table 	Inspection and observation	2,000,000 (included in maintenance cost)
Biological Environment			
Changes to terrestrial flora and fauna	<ul style="list-style-type: none"> Monitoring of mitigation measures and aspects for monitoring in Environmental Management Plan table 	Inspection and observation	1,000,000 (included in maintenance cost)
Changes to aquatic flora and fauna	<ul style="list-style-type: none"> Monitoring of mitigation measures and aspects for monitoring in Environmental Management Plan table 	Inspection and observation	1,000,000 (included in maintenance cost)
Social Environment			
Inconveniency with socio-economic change	<ul style="list-style-type: none"> Monitoring of mitigation measures and aspects for monitoring in Environmental Management Plan table 	Inspection and observation	2,000,000 (included in maintenance cost)
Risk of injuries and accidents to workers	<ul style="list-style-type: none"> Monitoring of mitigation measures and aspects for monitoring in Environmental Management Plan table 	Inspection and observation	13,500,000 (included in maintenance cost)
Increased Emergency risk (risk of fire)	<ul style="list-style-type: none"> Monitoring of mitigation measures and aspects for monitoring in Environmental Management Plan table 	Inspection and observation	
Community Health and Safety because of project operation activities and increased traffic	<ul style="list-style-type: none"> Monitoring of mitigation measures and aspects for monitoring in Environmental Management Plan table 	Inspection and observation	
Light Intrusion	<ul style="list-style-type: none"> Monitoring of mitigation measures and aspects for monitoring in Environmental Management Plan table 	Inspection and observation	2,000,000 (included in maintenance cost)

7.5 Environmental Monitoring Plan with estimated budget (Decommissioning Phase)

Potential Impact	Monitoring Item	Monitoring Means	Allocated Budget per year (MMK)
Physical Environment			
Dust Emission and Air Pollution	<ul style="list-style-type: none"> Monitoring of mitigation measures and aspects for monitoring in Environmental Management Plan table 	Observation and inspection	5,000,000
Greenhouse gas emissions	<ul style="list-style-type: none"> Monitoring of mitigation measures and aspects for monitoring in Environmental Management Plan table 	Observation and inspection	
Surface water contamination	<ul style="list-style-type: none"> Monitoring of mitigation measures and aspects for monitoring in Environmental Management Plan table 	Observation and inspection	1,000,000
Noise and vibration	<ul style="list-style-type: none"> Monitoring of mitigation measures and aspects for monitoring in Environmental Management Plan table 	Observation and inspection	1,000,000
Solid waste generation (Hazardous and Non-Hazardous)	<ul style="list-style-type: none"> Monitoring of mitigation measures and aspects for monitoring in Environmental Management Plan table 	Observation and inspection	1,500,000
Social Environment			
Living and livelihood	<ul style="list-style-type: none"> Monitoring of mitigation measures and aspects for monitoring in Environmental Management Plan table 	Observation	2,000,000
Risks for infectious diseases such as AIDS/HIV due to influx of workers	<ul style="list-style-type: none"> Monitoring of mitigation measures and aspects for monitoring in Environmental Management Plan table 	Observation and inspection	9,500,000
Occupational safety and health (Risk of injuries and	<ul style="list-style-type: none"> Monitoring of mitigation measures and aspects for monitoring in Environmental Management Plan table 	Observation and inspection	

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accidents to workers)			
Community Health and Safety because of demolition activities and increased traffic	<ul style="list-style-type: none"> Monitoring of mitigation measures and aspects for monitoring in Environmental Management Plan table 	Observation and inspection	

7.6 Development Effectiveness Indicators (Construction and operation Phase)

Indicator	Monitoring Item	Monitoring Means	Recommended frequency of monitoring	Responsible Person During construction	Responsible Person During Operation
Direct Employment	<ul style="list-style-type: none"> Total number of employees working directly for the Project Enterprise 	Reviewing	Yearly	Contractor/ Developer	Developer/ Tenants
Female Employment (%)	<ul style="list-style-type: none"> Total female employment as a percentage of total employees in the Project Enterprise. 	Reviewing	Yearly	Contractor/ Developer	Developer/ Tenants
Taxes and Fees	<ul style="list-style-type: none"> Tax receipts and documents related to taxes and fees paid to the Government 	Reviewing and Inspection	Yearly	Contractor/ Developer	Developer/ Tenants
E&S Management Systems	<ul style="list-style-type: none"> Tracking whether the Project Enterprise is compliant with E&S Management System active and in place. 	Inspection, Observation and Measuring	Yearly	Contractor/ Developer	Developer/ Tenants
Purchases from domestic suppliers	<ul style="list-style-type: none"> The annual purchase of goods and services of the Project Enterprise 	Inspection	Yearly	Contractor/ Developer	Developer/ Tenants



CHAPTER 8. PUBLIC CONSULTATION AND DISCLOSURE

8.1 1st Public Consultation for establishing KMIC Project

The first public consultation meeting for KMIC Project was conducted on 8 February 2019 at Zone (3) Meeting Hall, Agricultural and Livestock Breeding Zone (3), Nyaung Hnitpin Agricultural and Livestock Breeding Zonal Area, Hlegu Township, Yangon Region. The meeting started at 1 pm.

U Aung Lin (MSR) acted as M.C at the ceremony. He introduced MSR Company experts with the attendees and read out the agenda. The agenda and the list of attendees are mentioned below.

Discussions

1. **U Maung Maung Kyaw**, Chairman

Agricultural and Livestock Breeding Zone (3)
Nyaung Hnitpin Agricultural and Livestock Zonal Area
Hlegu Township

Regarding the discussion held today, you might have known about why public consultation was held. MSR Company is carrying out Environmental Impact Assessment (EIA) and Social Impact Assessment (SIA) in order that an Industrial Complex will be able to be established in the nearby Nyaung Hnitpin National Convention Complex through the cooperation between KMIC Development Co., Ltd. (KMIC JVC) and Myanmar Government. The project will be explained to the people in the neighbourhood and the people's suggestions and feedbacks will be included in the report. So, this discussion is held for this purpose. The experts from MSR will explain in every detail. As for me, I invited those living in the zone. We have to pay attention to the experts and ask them to clarify what they explain. I express my thanks to all of you.

2. **U Aung Lin**, SIA in – Charge
ESIA Department, MSR
Yangon

We're from MSR – Myanmar Survey Research Company in Myanmar, it's a research company. Our company is a third party. It's not a governmental organization. We do marketing research and economic research, Environmental Impact Assessment. For the purpose of setting up an industrial complex in this Nyaung Hnitpin National Convention Complex over one year ago, 3 Sub-troupes, including 10 members in each from ESIA Department of MSR Company have been here for 6 times and finished doing assessments. One of these 3 sub-troupes is a sub- troupe that conducts assessments by taking measurements of water, wind and earth. They have carried out a study. Another team is the one that makes an assessment of whether or not there is an impact on trees and wild life in the neighbourhood and in the complex. They finished studies on what sort of trees and creatures.

Another team is the one led by me that makes Social and Economic Impact Assessment. Our team went to the people's residences in the neighbourhood and has carried out studies into their livelihoods, foods, economic, social, and educational and health situation. Now, today our team leaders will give explanation to the people attending here. As the industrial complex is internationally standardized project, we' ve carried out studies over one year and there have also been queries put by the people against fastest implementation. First of all, may I express my thanks to you for coming to listen to our explanation. I also make a request to share our explanation to those who cannot attend this discussion. This time, the

limited population has been invited according to the situation of the hall. When the discussion takes place next time, the discussion will be widely held. Next time, authorities concerned of Township level and Regional level will also be invited.

The project that has international status has been made known to people. The suggestions of the people have been obtained. The company carrying out the project needs to understand the people's requirements. The company needs to know what people's requirements the company needs to know, what people's requirements are and what difficulties they are facing. If so, the construction company must know what are to be carried out and what responsibilities to be taken. I request you all to make further suggestions about our findings and discussions about emergence of this industrial zone through concerted effort. May I conclude here and thank all of you.

3. **U Ko Ko Soe Lwin Thaw**, Secretary
GIS & IT Specialist
ESIA Department, MSR

I'll give a brief presentation about this project. This project will be implemented through the cooperation between Ministry of Construction, Myanmar Government and KMIC JVC and the project will be implemented on 500 acres of land. Ministry of Construction will provide plot of land, transportation, electricity and water. For these matters, Myanmar Government will get loan with less interest from Korean Government. Myanmar Government will lease them the land. Korean Government will provide fund and implement the project from the start to the end. The implementation of the project will be of benefit to the Region Government, people and local residents.

Phase 1 of this project will include a garment factory and food production factory. Another sector is logistics that will include spare parts and accessories producing factory, construction material producing factory. In phase 2, there will be buildings for inhabitants, IT Training Schools, and other training schools. Phase 1 has been planned to start in later 2020. As there has been some negotiations with Myanmar Government, it is to be started in later 2020. Our EIA, and SIA Report will be submitted to the Government in April this year. I conclude my portion of presentation here. Thank you all.

4. **U Phone Myint Tun**, Engineer
ESIA Department, MSR
Yangon

Mingalaba (Be auspicious!) My name is U Phone Myint Tun. I'm a retired engineer from the armed forces. MSR Company assesses the impact of the project on socio- economic life of the people in the project area and its neighborhood and on physical environment. The Project is to shape the design to be emerged as shown with picture. There will be buildings for inhabitants. The remaining portion will be an industrial zone including factories. People earn their living through agriculture and livestock breeding in this area. If there emerges an industrial zone, there will be in need of human labour. The locals in the neighborhood will get jobs. The emergence of factories may bring in benefits as well as bad impact. What our MSR does is to assess the guidelines to be followed by the developer to create improved and changed situation by implementing the project without any deterioration of the formal socio-economic and physical situation. We also make carrying out a study of do's and don'ts for impact assessment that is to be included and mentioned in the report. The assessments of wind, water and land were recorded a year ago. The assessment is necessarily carried out in order that air pollution, water pollution and land slide may not occur when the situation is changed due to the implementation of this project. We have records of water and land. We have recorded the situation of the air pollution after taking measurements.

Once the project starts, water will be fetched from the nearby dam as allowed by the concerned department. Electricity will be provided by the Government. Arrangements will be

made so as not to reduce the power of electricity being consumed by the locals as the factory takes it. Water is to be used after being purified by the built-in water purifier. The wastewater will be discarded after being systematically treated by wastewater treatment plant. We make an assessment in order that the project to be implemented has no bad impact on socio-economic life of the locals in the vicinity and physical situation. We want to get the project completed. That is why we have made assessments.

This is our first presentation. When the public consultation is held for the next time, the detailed facts of the factories will be presented.

There will be better transportation and in people will be in good health will have good education and good socio- economic life if this area will be changed into on industrial zone from the status of agriculture and livestock breeding. We'll make presentation on how arrangements will be made to have less or no bad impact. What I explain now is study on physical situation and how to have good impact. You may suggest and discuss something that you do not understand or if there is anything necessary.

5. **U Kyan Dyne Aung**, Environmental Engineering Management Specialist
ESIA Department, MSR

I'll give an explanation about legal section. If is something about the regulation to be followed by the company that is implementing the project when it is doing so. There are laws and by laws that which facts are to be assessed in carrying out Environmental Impact Assessment and Social Impact Assessment. We have to assess how the project can have bad or good impact on water, soil, air and land. If the project has bad impacts, the arrangement to get it deteriorated or to get it eradicated must be followed. Although this project is a joint venture between KMIC JVC and Myanmar Government, the project company has, as it is an overseas company, to comply with the investment law. If to follow the provision that waste and wastewater of the factory must be discarded only if they have been purified by the wastewater treatment plant to the limited extent. It is also to follow the agreements and law signed by Myanmar Government in cooperation with international organization and other nations.

There are mainly four sections in writing a report to carry out a project. The first section is about pre-construction. The second section will cover the process of construction including the ground is being levelled and the foundation is being dug. After the construction, there is a third part covering the findings of the studies on how men can be harmed or how those injuries or harms can be prevented when the project is put into operation. The last one, when the term of the project is over and there is no more operation of the factory, is the management plan of how to remove factories and buildings must be included in the report. When the factory emerges, the management plan of how to eradicate possible bad impact will be included and written in the report. The one who implement the project has to take responsibilities to carry out the written presentation in the report. Fund must be allocated for each phase management plan and an organization/team needs to be formed to carry out each sector. Not only project developer but also factories involved and companies in this industrial complex have to follow the report. Factories wise and company wise teams must be formed in carrying out the EMP. People's opinions, views, concerns and suggestions are crucial and these will be taken into account for the development of EMP. We've to accept communities' suggestions. What I want to explain is enough. Thank you.

6. **U Aung Lin**, SIA in- Charge
ESIA Department, MSR.

I'm the leader of the team that makes the assessment of the impact on the socio-economic life. We've to carry out the studies of the lives of villagers in the vicinity of the project area. There are things that the villagers themselves have no idea. But we've to obtain the knowledge of them to be included and mentioned in the report. This report is presented to the Ministry of Natural Resources and Environmental Conservation and the owner of project to

read by themselves. After reading this report, the ministry makes a remark about whether or not this project should be implemented. There are totally a population of about 10,000 including people living close to proposed KMIC project and those living in both village tracks. We've interviewed village elders, those that belong to administration and the Venerable Sayadaws presiding in monasteries out of them and recorded what they have answered. There are 57 informants. This survey provides us with a lot of findings. Most of them go to Hmawbi, Hlegu and Yangon and work there as they are unemployed. If there emerges an industrial zone, they said they want to get jobs. As there is no health-care service center, they have to go to Ngar Suu Taung clinic and Hlegu hospital for receiving medical treatments. But during the rainy season, the roads are so bad that they have difficulties. If the factories run, population will increase and there will be so densely populated. So, they presented that they need a hospital.

Another difficulty is that those living in the zone have no graveyard if there arises a funeral. As the circular roads around the zone are too bad in the rainy season, the school going children are in trouble. As the water is not enough for agriculture, the water from tube-wells is being used. For drinking water, they need clean and fresh drinking water. They have presented that they need jobs and needs to be given training since construction of the Industrial Complex started. They said they feel worried about the inclusion of chemical factories and the inclusion of chemicals in discarded wastewater. They suggested not including such factories. There will be over 200 factories in the industrial zone- including garment factories, car spare parts and accessories factory and transportation service.

What I view is that they need jobs. There are villages where there is no hospital and clinic for health, no primary school for education, road-communication needs to be much improved. The project implementing company will fulfil the requirements of villages by using Corporate Social Responsibility (CSR) fund. For that matter we've suggestion to be given the purpose of holding this meeting and giving explanation is to make people know what they should know, and people side may make suggestion at this meeting. So, you may query your requirements and make suggestion. Thank you all.

7. **U Phone Myint Htun**, Engineer
ESIA Department, MSR.

We'd like to encourage the people attending here to discuss your opinion and give suggestions. Your opinion may be different from ours. We're never concerned with the company implementing project nor the government. We're said to be bystanders. We're a third-party organization. We hold a meeting and give explanation for the benefits of the people. So, you may feel free to query what you want to know and give suggestions.

8. **U Maung Maung Kyaw**, Chairman
Nyaung Hnitpin Agriculture and Livestock Breeding Zone (3)
Hlegu Township

There is one thing to be worried about. It's the matter of electricity. After the emergence of the industrial complex, the factories will use a lot of power and we're worried about being lack of electricity for agriculture and livestock breeding.

9. **Mr. Shin Hyo Sub**
Chief Representative
LH Yangon Representative Office, Yangon

All Mingalaba! (Be auspicious to all!). I'm a staff member of L.H. Company owned by Korean Government. I am a Chief Representative of LH Yangon Representation Office. Thank you very much.

10. **U Than Myint**
Agricultural and Livestock Breeding Zone (3)

Nyaung Hnitpin Area, Hlegu Township

Nyaung Hnitpin Agricultural and Livestock Breeding Zone No.1, 2 and 3 were started implementation in 2000. Zone 3 started business in 2004. The entrepreneurs have collectively paid the road tax and electricity bill since the zone started running. We have to get our area electrified at our own expense. We perfectly had 230 volts from 2004 to 2008. Now, we have not had enough voltage for a long time. Electricity often goes out. Sometimes comes and sometimes goes out. As the light goes out, water cannot be put up to the plantation. Water cannot be poured on to the plantation. As the plants are not poured with water, they die. Water does not flow through drains. Water is not available. When people die there is no graveyard where dead person can be buried or cremated. If there is a plan, we'd like to request the company implementing the industrial complex to fulfil those requirements. The main requirement of our zone is to have good internal zone roads. School boys and school girls find it very difficult to go to school in mud during the monsoon. I present it to let the company, construction zone with the government know it. Thank you.

11. **U Aung Lin**, SIA in- Charge
ESIA Department, MSR.

The presentation of U Than Myint will be added and presented in the report. We'll present it because the other sectors will run smoothly if the road communication is good.

12. **U Phone Myint Htun**, Engineer
ESIA Department, MSR.
Yangon

May I give you a little more explanation about better road- communication that U Than Myint presented. There is a plan to build a 4- lane- road from No.3 crossroad to Nyaung Hnitpin along the main road situated in front of the project complex. It is nearly 10 miles long. The separate electric current will be used for industrial zone. So the electric current the locals are now using will not be taken. So the electric power will not be reduced.

13. **U Aung Lin**, SIA in – Charge
ESIA Department, MSR
Yangon

I want to present road affairs. Road has 2 sectors. The entrance road to the industrial complex and internal roads in the zone. The Ministry of Construction has to promote the status of the main entrance road and the company to build industrial complex has to take responsibilities for internal roads. Regarding electricity, the electric power will be taken from the government's national grid. It will start with 66 KW increasing step by step until the whole industrial complex can be powered.

14. **Daw Thazin Nwe**, Interpreter
LH Yangon Representative Office
Yangon.

You needn't be worried about the reduction in electricity. But an industrial zone cannot be built only with the electric power in the current given to the quarters and agricultural and live-stock Breeding. For industrial zone-specific electric power must be provided. But there is no connection with the electric current, now in use. The Ministry of Construction will take responsibilities for road, water and electricity outside the complex. KMIC JVC will carry out building roads, providing water and electricity inside the complex of industrial complex. The internal and external plan will be simultaneously carried out.

15. **U Maung Maung Kyaw**, Chairman
Nyaung Hnitpin Agriculture and Livestock Breeding Zone (3)
Hlegu Township

We're worried about the difference between the faint light in the zone in the neighbourhood and villages and the bright light in the complex of industrial complex. I've ever seen in some areas before. It is unfair. What I want to say is that people and village in our neighbourhood want to share the electric current taken for industrial complex. If industrial complex develops, the villages and the local residents in its vicinity have to be in higher status. That is why I present it.

16. **U Aung Lin**, SIA in- Charge
ESIA Department, MSR

Enough electricity and better road- communication – the development sector of village and local residents in the neighbourhood of the complex by constructing an industrial complex. People are asking for them. People living in the neighbourhood of the complex have electrified themselves at their own expense. Lamp posts and cables have been bought through self-reliance. Water must be provided through water pipes until it reaches home. To provide them all must be written and mentioned in the report.

17. **U Sai Zeyar Min**
Nyaung Hnitpin Village, Hlegu Township

I want to present road- communication. I've heard that the status the main road will be raised in building this industrial complex. I want to know whether or not the status of this road is raised until it reaches Ngar Suu Taung. The workers will have to use this road when they go to factories in the industrial complex. Many of the workers will be from our village tract.

There is another thing I'd like to suggest. When I study the plan of the industrial complex project plan, there is one thing lacking. There should be a workers' recreation center either inside or outside the industrial complex. That is why I want to give a suggestion that a sports ground, or a park or a swimming pool in this plan for the workers to overcome stress and strain in this plan.

18. **U Myint Kyaw**, Administrator
Kyarinn Village Tract
Hlegu Township

My name is U Myint Kyaw and I am an Administrator for Kyarinn Village Tract. The management section is out of question in constructing an industrial complex through the cooperation between Korea and Myanmar. What I want to make a request is to think of road communication, health, social affairs and employment of local residents. I'd like to request again to employ local young people as an accountant, a computer user, or a basic worker according to their respective status. There are 7 villages in my village tract. I have to take responsibilities for agricultural and livestock breeding zone 2 and zone 3. There are total 1,300 houses. There are totally a population of about 6,000 including the population in the village legally recognized by the Ministry of Home Affairs and those in the other villages that are not legally recognized by the Ministry of Home Affairs. There are many workers available from my village tract. What I mainly want to say is that the main road from No.3, crossroad to Ngar Suu Taung needs to be built until it reaches Ngar Suu Taung village. As the road is narrow, accidents often occur during the rainy season. That is why I suggest extending this road. Thank you.

19. **U Than Myint**
Nyaung Hnitpin Agriculture and Livestock Breeding Zone (3)
Hlegu Township

The heads of the State invited foreign investment even by going abroad. In some places, they might need to communicate humbly. Even when the foreign investment comes, it is inconvenient for them because the workers here protest against them. What we need is to change the mind – set of Myanmar people. The company that comes here to do business has

to actually play its role. And the people here should be provided with employment opportunities and other responsibility.

20. **U Kan Myint**
Nyaung Hnitpin Village
Nyaung Hnitpin Village Tract
Hlegu Township

I'm U Kan Myint from Nyaung Hnitpin Village. There is a village known as Phayarthonsu in Nyaung Hnitpin village Tract. There is no primary school in that village. And it has many houses. They need a primary school for children's education. I'd like to suggest that the company to construct the industrial zone is requested to carry out it if the company can help them.

21. **Daw Hnin Yi Win**, Mid- wife
Rural – Health Department
Kyarinn Village Tract
Hlegu Township

I'm from Kyarinn Village Tract Rural – Health Department. I'm taking responsibilities of the health affairs of a population about of 800, including those from Agricultural and livestock Breeding zone (2) and zone (3). I've to travel for health affairs in the zonal area during the monsoon. The roads in the zonal area are of red ochre. In monsoon, they become muddy and people find it difficult to go on it. Students going on them have difficulties. Zone No. (3) has a population over of 1,350. Most muddy roads are inside the zone. So repairing these roads should be put into consideration.

22. **Daw Thazin Nwe**, Interpreter
LH Yangon Representative Office
Yangon.

I want to inform you of the training school. Giving training is included in our programme. Those have been drawn as plans in the programme. I cannot say for sure it will be carried out. Another thing is employment matter. I've heard that people in the neighbouring villages and in this agricultural and livestock breeding zone want to be employed. Don't be worried about that. We're the ones to be worried about that. We're worried about getting workers as our industrial complex needs to employ about 100,000 workers.

23. **U Phone Myint Htun**, Engineer
ESIA Department, MSR
Yangon

Local people might have heard what Daw Thazin Nwe has just said. People here are worried about not getting job. The KMIC JVC gets worried about not getting enough workers because they need about 100,000 workers. People here no need to be worried about. Even though everyone joins the job, there still in need of more workers. The basic level factory workers only need to be literate or have primary level education. It has been said that there are programmes to give training regarding factories. After the training, the high or low positions will be determined by their respective skills. There will be some positions that need expertise. I want to say don't be worried about getting jobs.

24. **Mr. Shin Hyo Sub**
Chief Representative
LH Yangon Representative Office, Yangon

I work with LH Company, and Korea LH Company has been carrying out industrial zones for about 20 years. What is to be first put into consideration when an industrial zone is to be implemented in Korea is that the industrial project must not have bad and dangerous

impact on the people in the neighborhood and people must be developed the same as the industrial zone.

Now, people from Korea ask me whether or not there are enough population and enough workers in the neighborhood of the industrial complex. When an industrial complex emerges, environmental development also follows immediately. It will bring many things that help the neighbouring region. So I'd like to say to local people to help together to the emergence of an industrial complex. Korean government gives us much help from behind to make this industrial complex come into being. I want to say I'll keep on trying to fast implement the industrial zone. Thank you.

25. **U Maung Maung Kyaw**, Chairman
Nyaung Hnitpin Agriculture and Livestock Breeding Zone (3)
Hlegu Township

I've heard that the industrial complex will include garment factories. I want to know if the investment will come from only Korea or from other places and if the workers from Myanmar or those from other countries can come. For example, is it possible for Thai to come and work here? Because people from Thailand come and see this zone. They returned as nothing is carried out here. So I ask you. Another thing I want to ask has been only garment factory can be included and not any other else. Why I ask this question is that one of my friends wants to lease land and build a factory to produce spare parts of the tractors.

26. **Daw Thazin Nwe**, Interpreter
LH Yangon Representative Office
Yangon.

Any citizen can come and invest here. There is no restriction. To build the factory in the place specified is what we temporary have drawn as a plan. But this cannot be restricted. If a factory is to be built, someone can lease the land for 50 years. Our KMIC JVC side will provide infrastructure. As we are carrying out G to G project, nobody can come and do something as they wish.

27. **U Maung Maung Kyaw**, Chairman
Nyaung Hnitpin Agriculture and Livestock Breeding Zone (3)
Hlegu Township

Factories will be built on 550 acres of land for establishing an industrial complex through Korea – Myanmar Cooperation. According to the programme of the Chief Minister of Yangon Region, Agricultural and livestock Breeding Training School will be built on the remaining 30 acres of land, taking place in the former Convention buildings. The Training School together with the industrial complex in this area will be simultaneously developed. The other zones are trying to provide themselves with water. Water is being carried along the drains that link to Kalihtaw Dam. The drains are crossing zone (2). Through the reliance on this project, the other people will have the right to use more water. In trying to get water for this project as well as for these zones, the drains may cross your compounds and fences. So all have to contribute to it and not to refuse the drainage system crossing your areas. Even though drains have been dug since 2000, the trees in some places beside the drains have even rather grown up. These trees should be felled when it is necessary to extend the drains. Be mindful of which should be gain priority to- tree or water. I do request to share this message to other people and may I conclude my presentation here.

The public consultation was over at 3:00 pm.

Public Consultation Meeting Agenda

- 1) Reading out the agenda and announcement is made that the ceremony has opened.

- 2) Nyaung Hnitpin Agricultural and Livestock Breeding Zone (3), Chairman U Maung Maung Kyaw delivers an opening speech.
- 3) U Aung Lin from MSR provides an explanation for carrying out EIA and SIA.
- 4) U Ko Ko Soe Lwin Thaw from MSR offers an explanation of project affairs.
- 5) U Phone Myint Htun (Engineer) from MSR offers an explanation of physical affairs.
- 6) U Kyan Dye Aung from MSR offers an explanation of policy and environmental management.
- 7) U Aung Lin from MSR offers explanation of Social Impact Assessment (SIA) and Environmental Impact Assessment (EIA).
- 8) Attendees query what they want to know and give suggestions.
- 9) Those concerned answer the queries.
- 10) Local people attending there are served with food and drinks.
- 11) Concluding remark is delivered and announcement is made that the public consultation is over.

The list of attendees at the public consultation on establishing KMIC Project is mentioned in the table below.

Table 8. 1: List of attendees at the public consultation on KMIC Project

No.	Name	Designation	Address	Phone No.	Signature
1.	U Than Myint	Road Administrator			
2.	U Win Myint	Administrator of Ten Households	Kyarinn Ahshe Village		
3.	U Maung Htay	Road Administrator	Zone (3)		
4.	U Myint Swe				
5.	U Tin Moe				
6.	U Kyaw Thu Win		Zone (3)		
7.	U Win Aye		Takutone Village		
8.	U Khin Maung Phyu		Zone (3)		
9.	U Tun Wai				
10.	U Mon Gyi				
11.	Ko Kyaw Soe Naing		Zone (3)		
12.	Ko Zaw Aung				
13.	U Win		Kyarinn Anauk Village		
14.	U Kyaw Hsan Min	Road Administrator	Takutone Village		
15.	U Win Oo		Zone (3)		
16.	U Thuya Zaw		Zone (3)		
17.	Daw Tin Moe Khaing				
18.	Ko Pyae		Zone (3)		
19.	U Maung Myint		Zone (3)		
20.	U Maung Maung Kyaw	Chairman	Zone (3)		
21.	U Khin Myint	Administrator of 100 Households	Ngar Suu Taung Village		
22.	U Sai Zeyar Min				
23.	U Than Htike Oo	Administrator of 10 Households	Sonekone Village		

24.	U Tin Win	Village Elder			
25.	U Chit Shwe	Village Elder			
26.	U Aung Than Htoo	Administrator of 10 Households			
27.	U Aye Kyaw	Administrator of 100 Households	Sonekone Village		
28.	U Aung Myint Thein		Zone(3)		
29.	Daw E' Htun		Zone (3)		
30.	Khin Maung Win		Zone (3)		
31.	Myo Thant Htun		Zone (3)		
32.	U Thein Shwe		Zone (3)		
33.	U Aung Htin		Zone (3)		
34.	U Than Naing		Zone (3)		
35.	U Aung Naing OO	Administrator of 100 Households	Kyarkansu Village		
36.	U Win Than	Administrator of 100 Households	Kyarkansu Village		
37.	U La Win	Village Elder	Kyarkansu Village		
38.	U Myint Kyaw	Administrator	Kyarinn Ahshe Village		
39.	U Kan Myint	Administrator of 100 Households	Nyaung Hnitpin Village		
40.	U Soe Aung	Administrator	Nyaung Hnitpin Village		
41.	U Pyone Cho	Village Elder			
42.	U Win Maw Htun	Administrator of 100 Households	Kyarkansu Village		
43.	U Myint Aung	Administrator of 100 Households	Kyarkansu Village		
44.	U Tin Ngwe	Administrator of 100 Households	Kyarkansu Village		
45.	U Aung Lin	SIA in- Charge	MSR, Yangon	09 400977121	
46.	U Phone Myint Htun	Engineer	MSR, Yangon		
48.	U Ko Ko Soe Lwin Thaw	Secretary, EIA Dept.	MSR, Yangon		
49.	U Kyan Dyne Aung	Environmental Specialist	MSR, Yangon		
50.	U Ohn Kyaing	SIA Team, Member	MSR, Yangon	09 799139844	
51.	U Ye Min Aung	Logistics	MSR, Yangon		
52.	U Ko Sai	Logistics	MSR, Yangon		

8.2 Findings and Recommendations

Findings

1. As there is only one primary school in Nyaung Hnitpin Agriculture and Livestock Zone (3), it is found that Middle School is needed.
2. It is observed that the workers experience difficulties to work in Hmawbi, Hlegu and Htauk Kyant townships. When the industrial complex is developed, they should be hired to employ in the complex.
3. It is found that a dispensary/hospital is needed because it is difficult for the people to go to Ngar Suu Taung village for medical treatment.
4. The cultivators at Zone (3) cannot get the water supply from Kalihtaw dam, it is found that water from this dam should be provided.
5. It is necessary to provide a cemetery land for the people who are living in Nyaung Hnitpin Agriculture and Livestock Zone (3) because they don't have land for burial.
6. It is necessary to upgrade the roads for the people because the roads outside of Nyaung Hnitpin Convention Center are bad.
7. People worry for their health because there will be factories that produce bad odor in the Industrial complex. So that they don't want to build such factories in the zone.
8. People want agricultural and livestock processing export companies in the industrial complex because the complex itself is used for agriculture and livestock breeding.
9. It is necessary for people to access to clean drinking water because they have to use water from the well and tube well.
10. Tenant worry for losing lands when the landlords sell their lands with high price when the industrial complex is developed.
11. People worry for degradation of cultivated land because of chemical and industrial wastes from the Industrial complex.
12. People and Buddhist monks worry that there will be slaughter houses in the Industrial complex.
13. Though the agricultural zone has been established, it is found that there is not enough reservoir water so that people have to rely on the well.

Recommendations

1. Although the households can access to the electricity, they experience power outage. Therefore, it is recommended that electricity supply grid should be upgraded.
2. Roads near the industrial complex are very poor in condition so that they can't be used in the raining season. The road network among villages should be developed as CSR Plan.
3. There are no ambulance and good dispensary / hospital for emergency health issues, therefore the ambulance and good dispensary / hospital are needed.
4. Although it is a cultivated zone, some places in the zone don't access to the water supply for cultivation. So, they can't be useful for cultivation. Therefore, it will be more convenient for local people if they are provided water for cultivation.
5. Trainings should be provided the local people so that local workers can be easily recruited when the industrial complex is developed.
6. As there is lack of job opportunity in the region, the local people migrated to work. When the industrial complex is developed, they might come back for working at the area. Therefore, advanced preparations should be carried out.
7. There can be heavy floods in the raining season in the region, therefore advanced preparation should be carried for better drainage system for the Industrial complex.
8. Industrial complex should include factories for production of value-added agricultural and livestock products. Agricultural and livestock breeding should be expended by providing modern technical skills.
9. Local people want the developer to start the industrial complex as soon as possible. The developer needs to engage with the local people.
10. When the industrial complex is developed, it is suggested that a recreation center

or a playground should be included for the wellbeing of the workers.
KMIC JVC will set up a website for KMIC and release all the relevant information including but not limited to the ESIA report and other monitoring reports.



Figure 8. 1: U Aung Lin (MSR) making an announcement that the ceremony opens



Figure 8. 2: U Maung Maung Kyaw, Chairman of Zone (3), Nyaung Hnitpin Agricultural and Livestock Breeding Zone, Hlegu Township, delivering an opening speech



Figure 8. 3: U Aung Lin (SIA in-Charge, MSR), explaining ESIA needs to be carried out



Figure 8. 4: U Ko Ko Soe Lwin Thaw, Secretary, ESIA Department, explaining project



Figure 8. 5: U Phone Myint Tun, Engineer, explaining physical affairs



Figure 8. 6: U Kyan Dye Aung, Environmental Engineering Management Specialist, explaining EMP



Figure 8. 7: U Aung Lin, SIA in-Charge, explaining SIA implementation



Figure 8. 8: Discussion of U Than Myint, Zone (3), Nyaung Hnitpin Agricultural and Livestock Breeding Zone, Hlegu Township



Figure 8. 9: U Sai Zeyar Min, Ngar Suu Taung Village, giving suggestions



Figure 8. 10: U Myint Kyaw, Administrator, Kyarinn Village Tract giving suggestions



Figure 8. 11: U Kan Myint, Nyaung Hnitpin Village, giving suggestions



Figure 8. 12: Daw Hnin Yi Win, Mid-wife, Rural Health Department, Kyarinn Village Tract, giving suggestion



Figure 8. 13: Daw Thazin Nwe, LH Yangon Representative Office, explaining about Project



Figure 8. 14: Mr Shin Hyo Sub, Chief Representative, LH Yangon Representative Office, answering communities' questions



Figure 8. 15: : Local people, Departmental Heads, Administrators of village tracts, attending public consultation

8.3 2nd Public Consultation for establishing KMIC Project

The second public consultation meeting was planned to organize on 23 March 2020 and some invitations were already sent to the invitees. Yet, in light of the WHO designation of COVID-19 as a global pandemic and the Myanmar President's Office recommendation to avoid large gatherings, it is important to take necessary measures to prevent and limit the spread of coronavirus in Myanmar and hence the planned public consultation meeting was postponed. Therefore, the public consultation meeting can only be held when the virus is totally controlled, and mass gatherings are allowed by Myanmar Government.



CHAPTER 9. CONCLUSION

The Industrial Complex project proposed by the KMIC JVC has strategic value on many fronts. As Myanmar believes that the establishment of industrial complexes/zones throughout the country will contribute to the development of the national economy, it could also be said that the Project is strategic in the economic sense. The Project will contribute to the economic development of the commercial city, Yangon of Myanmar and, thence, to the economic development of the country. The economic cooperation between the two countries will also be strengthened.

The Project will seek to develop the socio-economic conditions of the people living in the region. There is no denying that, once the Project is implemented, it will substantially enhance mutually beneficial Myanmar-Korea trade. It also has the huge potential of attracting investors from inside and outside the country by establishing a favourable investment environment. At the micro-economic level, the Project will promote entrepreneurship and create job opportunities.

In terms of the living environment, most of the impacts could be controlled and limited in and around the project area. Major negative impacts such as but not limited to air pollution, surface water/ground water contamination, wastewater generation, solid waste generation, traffic flow are expected for construction, operation and decommissioning phases but their significance levels are medium as highest. However, implementation of appropriate mitigation and management plan will minimize these impacts.

In terms of the natural environment, the major negative impact is the clearance of existing vegetation during construction phase, though no sensitive ecological protection area is involved. However, implementation of appropriate mitigation measures, such as creating green areas and sodding of public spaces as soon as possible and keeping the existing environmental conditions as much as possible will minimize the impact on the ecosystem.

In terms of the social environment, the existing social infrastructures and services, risks for infectious diseases, occupational health and safety and community health and safety are expected. However, implementation of appropriate mitigation and management plan, such as to manage working conditions during the construction work and to provide security and maintain safety prevention measures during construction/operation phase will minimize these impacts.

On the other hand, some positive impacts of the Project such as increase in job opportunities and improvement of social infrastructure are also expected. There are no land issues for the project and the community living nearby villages are pleased to see the project implementation as early as possible. They would like to get employment in the project.

The residual impacts, effects on watercourses, groundwater contamination, air pollution, dust emission, community health and safety, are expected but their level of significance is minimal and minor. Therefore, no additional research, monitoring, and/or recovery initiatives are considered and these impacts are negligible to the overall baseline status of the resource.

The cumulative impacts could be expected due to different activities of livestock farms, fish farms, and agricultural production businesses in the surrounding area of the proposed project. Yet, the cumulative impact assessment has not identified any cumulative impacts that are considered to be significant (i.e. high significance) and in need of mitigation measures, monitoring or management. The impacts are within the ability of the resource to absorb such changes. The cumulative impacts typically result from the actions of multiple stakeholders, it is necessary to engage with these stakeholders for effective collaboration and coordination. Therefore, the project developer plans to initiate collaborative engagement in impact management with others including project proponents, government agencies, affected communities, Environmental NGOs, conservation groups, and expert groups for the programs such as collaborative protection and enhancement of regional areas to preserve biodiversity, collaborative engagement in other regional cumulative impact management strategies, and participation in regional monitoring programs to assess the realized cumulative impacts and efficacy of management efforts, wherever applicable.

In consideration of the result of the EIA study for the Project, the Environmental Management Plans (EMPs) including adequate mitigation measures to reduce the negative impacts and Environmental Monitoring Plan including budget allocation are proposed for each phase of the Project: construction, operation and decommissioning phases. For the pre-construction phase, no negative impacts are judged for physical, biological and social environment. It is confirmed that the environmental, social and health impacts of the Project were assessed, and the Environmental Management Plan formulated properly. In the process of EIA, opportunity of public involvement was ensured and comments from the public and MONREC were reflected into the EIA Report. Thus, the EIA was completed in accordance with the requirements of the EIA Procedure properly for the project proponent to follow the EMP accordingly.



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APPENDICES

Appendix 1: Fire Safety Management and Fire Emergency Plan

FIRE SAFETY MANAGEMENT AND FIRE EMERGENCY PLAN

FIRE SAFETY MANAGEMENT

1 INTRODUCTION AND SCOPE

- 1.1 Fire is a hazard in any part of the premises. Its consequences include the threat to the lives or health and safety of relevant persons, damage to or loss of property and severe interruption to normal business activities or opportunities.
- 1.2 Managing the risk of fire demands and fire safety precautions based on a combination of appropriate prevention and protection measures depending upon building use and occupancy.
- 1.3 This fire safety management and fire emergency plan applies to all premises which are to any extent under the control of the **The KMIC Development Co., Ltd. (KMIC JVC)** as the employer and owner. Its requirements extend to all persons at those premises including staff, guests and contractors whether permanently or temporarily engaged.
- 1.4 **KMIC JVC** will, so far as is reasonably practicable, and in accordance with legal obligations and standards, in respect of every premises to:
 - provide and maintain passive and active fire prevention, protection and measures according to the purpose or use of the building, the numbers of occupants and the activities or processes undertaken therein;
 - provide comprehensible and relevant information to staff and others, through the provision and availability of emergency instructions or fire safety plans and the risks identified by relevant risk assessments;
 - provide a programme of fire safety training;
 - carry out and keep under review a fire risk assessment to analyse building and process fire risks, the existing preventive and protective measures and to identify areas for improvement;
 - have in place a programme of works to improve or maintain the existing fire safety specifications;
 - identify a sufficient number of persons, whether staff, security or others, to be present at all times the building is occupied with responsibility for initiating the fire evacuation procedure and provide information and assistance to the fire service;
 - where appropriate, to prepare and keep under review risk assessments in relation to the use, storage, handling, disposal and transportation of dangerous substances and ensure that, so far as is reasonably practicable, the risks associated with dangerous substances are reduced or controlled.

2 PRACTICAL FIRE SAFETY ARRANGEMENTS

2.1 As part of a holistic fire safety management system, in addition to the management action outlined below, considerations of passive and active fire precautions are essential.

2.2 Passive fire precautions are concerned with the physical conditions in premises which are designed to facilitate containment of fire by design, construction and layout, effective communication and safe evacuation. In particular,

- materials specification, design, construction and inspection of buildings, fire doors and escape routes taking into account the needs of service users, people with disabilities, contractors, the public, etc;
- appropriate safe and secure location of building services e.g. gas and electricity;
- provision of clear fire safety signage for escape routes and final exits in conformity with the Myanmar Fire Brigade rules and Myanmar National Building Code (2016).
- provision of prominently located fire action notices (e.g. by fire alarm manual break glass points) to inform people of the action to be taken in the event of fire; and
- education and training of staff in fire safety arrangements, in particular evacuation procedures and drills.

2.3 Active fire precautions are those features of the fire safety management system that detect and operate in the event of a fire, including fire alarm systems, emergency lighting systems and firefighting equipment. In particular,

- the installation, maintenance, inspection and weekly testing of fire alarms;
- the appropriate design, location, operation, monthly inspection and annual testing of adequate (emergency) lighting systems for fire escape routes;
- the provision, use, appropriate type and location, and annual maintenance of portable fire extinguishers.
- A quarterly / six monthly / annual premises fire safety inspection will be carried out.

2.4 The fire safety arrangements will be based on the followings:

- Effective planning, organisation, control, monitoring and review of protective and preventative measures
- Fire safety risk assessments and building audits
- Fire safety systems and maintenance
- Fire warden and staff training
- Fire evacuation drills
- Building design, alterations and commissioning

3 PLANNING

- 3.1 Fire risk assessments are a requirement and a structured approach to determining the risk of fire occurring in a premise or from a work activity, and identifying the precautions necessary to eliminate, reduce or manage the risk. The outcome of the risk assessment must be incorporated in the fire emergency plan.
- 3.2 Fire Risk Assessments must be carried out and reviewed regularly (recommended to be annually) or when there is any building alteration or change of occupation and use of the premises, or following a fire incident/emergency, etc.
- 3.3 The risk evaluation and appropriate control measures to be taken into account will include those practical fire safety arrangements outlined above.
- 3.4 Risk assessments must take into account those who could be affected, e.g. numbers involved, their location, physical and mental capabilities and employees of organizations with whom a workplace is shared. The significant findings of the fire safety risk assessment will be made known to all other responsible persons as appropriate.
- 3.5 Where appropriate, an individual Personal Emergency Evacuation Plan (PEEP) must be developed for staff or service users who have known disabilities that will impact on their ability to evacuate the particular premises.
- 3.6 Maintenance of fire safety systems include:
- Fire detection and warning system
 - Emergency lighting
 - Firefighting facilities
 - Emergency routes and exits
 - Fire safety signs and notices
 - Portable electrical appliances (PAT) and premises installation testing (5 yearly)
- 3.7 Fire Warden and staff training will be provided through a competent trainer. It is the responsibility of all Fire Wardens to attend one refresher training annually on one of the dates available. A sample fire safety training programme can be found in Appendix 3.
- 3.8 Fire evacuation exercises will be carried out each term / 3 monthly, 6 monthly / annually within individual premises. The purpose of these exercises is to educate premises occupants in the correct manner of evacuating a building in the event of an emergency situation and to meet legal obligations. All evacuations will be conducted by the Fire Wardens. Pre and post de-briefing sessions will accompany each evacuation drill.
- 3.9 Provisions will be made for the safe evacuation of disabled people.
- 3.10 Fire evacuation of a building will be in accordance with established procedures in the fire emergency plan. In the event of a fire alarm outside of normal business hours, building occupants are to evacuate the building. All staff, guests and contractors will be made aware of the fire procedures.
- 3.11 All building design work shall comply with relevant codes and standards. New building works and refurbishment projects that include fire safety equipment and systems will be sanctioned by the concerned government departments.
- 3.12 Testing of building passive and active fire evacuation systems are to be conducted by the responsible Fire Department officer at agreed appropriate times during normal hours and in line with current standards. All building fire wardens will be trained in the use of the evacuation system and operate from pro-forma instructions.
- 3.13 Fire wardens will report any faults or problems to the Manager.
- 3.14 A fire safety log book will be kept to record the details of all tests on passive and active preventative and protective measures, as well as training and fire drills.

4 ORGANIZATION AND CONTROL

- 4.1 Specific named individual responsibility for overall responsibility for Fire Safety, maintenance, Emergency Plans and Staff Training can be found in this plan.
- 4.2 Managers / Section Heads / Department Managers with responsibility for premises or parts of premises will:
- ensure that this Policy and/or any departmental fire safety policies/codes of practice that complement this Policy are in place, properly implemented and reviewed.
 - ensure that a Responsible Person is appointed for all of their premises to oversee and implement fire safety arrangements, and ensure that they are competent and appropriately trained to undertake their duties;
 - ensure that arrangements are in place for the completion of fire risk assessments, including, where appropriate, technical surveys in respect of fire protection;
 - ensure that fire, security, and health and safety arrangements at each premise are complementary;
 - ensure that fire risk assessments are carried out for all their workplaces, and for specific activities such as hot working involving welding, cutting, work with bitumen, etc;
 - ensure, in conjunction with the outcome of the fire risk assessment that the optimum number and type of fire extinguishers are installed in appropriate locations;
 - ensure that fire alarm and detection systems, emergency lighting and fire extinguishers are appropriately located and properly maintained;
 - ensure that a robust and effective emergency plan is in place at each location to safely evacuate all persons, whether employees, visitors or service users and this emergency plan must take into account people with mobility, some sensory and some learning impairments, including those with temporary impairments, which will affect their ability to use stairs or otherwise evacuate premises promptly. the plan must be internally deliverable and not reliant on the Fire and Rescue Service to complete the evacuation;
 - arrange for the emergency plan to be issued to their employees, guests, etc. to inform them what to do in the event of fire, particularly safe evacuation;
 - arrange for a competent responsible person to be nominated to oversee and implement fire safety arrangements at their workplace(s) on their behalf;
 - ensure that if there is any doubt about the provision of new or replacement fire extinguishers;
 - ensure that staff are appropriately trained in fire safety procedures to reflect the requirements of the fire risk assessment;
 - ensure that a copy of the current fire risk assessment for their premises is readily accessible, its provisions complied with;
 - ensure that fire risk assessments are reviewed at least annually or whenever there is any building alteration, change of occupation or use of the premises or following an incident involving fire;
 - ensure that effective arrangements are in place for contacting the emergency services;
 - ensure that the Fire and Rescue Service are aware of any significant hazards associated with the premises e.g. oxygen cylinders, storage of petrol, etc; and
 - confirm that their quarterly premises fire safety inspections address fire safety arrangements.
- 4.3 The Competent Persons (who must be competent to carry out this role) must:
- assist and support with the preparation and review (at least annually) of fire safety risk assessments;
 - ensure compliance with the outcomes of the Fire Risk Assessment and that the necessary control measures are implemented;
 - prepare and review the emergency plan issued to all staff;
 - ensure information on fire safety arrangements is available to service users and guests;

- ensure all staff and, where appropriate, contractors are instructed in the emergency plan;
- arrange and review fire drills at a frequency of not less than six months;
- specify and rehearse the arrangements for assisting guests, disabled people or those with temporary physical impairments to safely evacuate the premises. Where appropriate, a PEEP must be developed;
- ensure Fire Alarms are regularly tested at the recommended frequency e.g. weekly;
- monitor that fire alarm systems, detection devices, emergency lighting and fire extinguishers are appropriately and regularly maintained;
- keep the fire log book or equivalent up to date;
- ensure that fire action notices (displayed as a minimum at fire alarm call points) and fire signage are appropriate and kept up to date;
- ensure all escape routes are kept clear of obstructions and that access to fire extinguishers and fire alarms is not impeded;
- ensure that the annual testing of portable electrical equipment and periodic testing (5 yearly) of the fixed electrical installations has been carried out, and
- ensure that quarterly fire safety inspections of the premises are carried out and that these address fire safety arrangements.

4.4 Employees must:

- ensure they are familiar with the emergency plan for their workplace and co-operate by participating in fire evacuation/drill procedures and by observing practical fire safety arrangements;
- know, and co-operate with, the responsible person for their workplace;
- report to their manager or supervisor any concerns about fire safety;
- be familiar with all escape routes;
- not wedge fire doors open, nor block or obstruct them;
- be aware of the action to be taken on discovering a fire, hearing a fire alarm, for raising the alarm (including the location of fire alarm call points) and calling the fire and rescue service;
- promptly evacuate the premises, in accordance with the emergency plan, to a place of safety without putting themselves and others at risk, and NOT attempt to extinguish a fire unless they have been specifically trained; and
- comply with the No Smoking legislation.

5 MONITORING

5.1 The following Key Performance Indicators will be used to monitor the effectiveness of the Fire Safety Management Plan: -

- i. Number of fires recorded annually / number of fire related incidents.
- ii. Achieving set schedules and time frames (evacuation drills and building audits).
- iii. Measuring the number of Fire Service call outs against cause.
- iv. Number and nature of enforcement, alterations or prohibition notices from statutory authorities.
- v. Quarterly / six monthly/ annual premises inspection and meetings to ensure actions and progress are made.
- vi. Annual audit of all fire systems by the manager.

6 REVIEW

- 6.1 Annual audit of all fire systems by the manager to ascertain compliance with not only statutory provisions but with this Fire Safety Management Plan.
- 6.2 Active reviews will take place quarterly prior to any likely accident or event.
- 6.3 Reactive reviews will take place following a fire safety event occurring.
- 6.4 A review will also be undertaken following a fire, changes to the premises construction and facilities, new procedures, new equipment, new materials and changes in staff numbers and roles.

7 Fire Emergency Plan

All aspects of the plan will consider out of hours occupation and identify where there would be differences e.g. personnel; locked doors; different escape routes etc.

7.1 Training and Training Provision

Identify any training needed and how it will be provided. This will include the following:

- Staff identified as trained in the use of fire equipment.
- Staff identified as trained in the use of the fire panel.
- Staff identified to register guests at the assembly point(s).
- Staff identified as having duties specific to the type of evacuation.
- Method of ensuring everyone understands how to operate the fire alarm.
- Method of ensuring everyone has sufficient instruction and training for fire evacuation.
- Method of ensuring guests / contractors have sufficient information on procedures in the event of an emergency evacuation.

7.2 Information Distribution

Detail the method(s) of informing personnel (incl. guests / contractors) of escape routes. This will include the following:

- Instruction
- Training
- Emergency exit / route signage
- Fire action Notices
- Include method of informing personnel of an alternative escape route should the main one be blocked or inaccessible. (Consideration should also be given to a route that leads past a potential arson attack areas, such as near rubbish skips.)
- The Emergency Plan

7.3 What People / Staff Should Do If They Discover a Fire

- Raise the alarm by operating the nearest fire alarm call point
- Evacuate to a safe place
- DO NOT USE THE LIFT (unless it has been designated as a refuge or part of the emergency escape route)
- Trained personnel to tackle the fire only where appropriate
- Where appropriate check toilets and close windows and doors on the way out
- If have responsibilities for assisting persons with Personal Evacuation Plans respond as required following the actions as identified in the Plan
- Leave the building by the nearest exit
- Do not stop or return to collect personal belongings
- Ensure visitors are escorted from the building to the assembly point
- Close any doors en-route without delaying your escape
- You must remain at the assembly place
- Return to the building only when authorised to do so

7.4 What People / Staff Should Do If They Hear the Fire Alarm

If a person also has responsibilities for assisting persons with Personal Evacuation Plans respond as identified in the Plan. If not then:

- Leave the building by the nearest exit
- Close any doors en-route without delaying your escape
- Do not stop or return to collect personal belongings
- Do not use any fire fighting equipment unless you have been trained
- Do pass any information to the building responsible person at the assembly point
- Remain at the assembly place
- Return to the building only when authorised to do so

7.5 Contacting the Emergency Services

Detail:

- Who will contact the emergency services?
- What are the means of calling the emergency services? For example, by mobile telephone or landline
- Include a method in the event of a power failure

7.6 Identify Processes, Machines or Power That Must Be Shut Down

This would include the following where appropriate:

- Staff responsible for ensuring any hot work equipment is turned off
- Technology departments
- Welding
- Cookery
- Kitchen

7.7 Specific Arrangements for Any High-Risk Areas

For Example:

- Boiler room
- Chemical storage areas
- Gas storage
- Generators
- Work processes

7.8 Emergency Services Liaison Procedures

- Who will liaise with the emergency services on arrival?
- What information will they have and how will they get it?
- How will the person, identified above, direct the emergency services to the emergency? i.e. will they meet them at the gate or at a pre-determined place?
- How will the emergency services be able to identify this person? e.g. hi-viz vest, armband etc
- If anyone is missing and where they were last seen

7.8.1 Specific Information for the Emergency Services

How will the emergency services be given specific information such as:

- Type of emergency
- Location of the fire / incident
- Missing persons
- Flammable material stores
- Location of high risk areas
- Any unusual activities such as building works or temporary structures
- Hazardous work process

7.8.2 Location of information

Detail:

- Where will the information be kept on risks

E.g. Maps / sketches / alarm identification?

- For example - held near the fire panel.

7.8.3 Accounting for Personnel

- How will all people be accounted for?
- How will the manager be informed?
- Who will ensure that all personnel are accounted for?
- How will this be managed if there is more than one assembly area?
- What is the procedure if someone is missing?

- How are the emergency services informed? (Note: Only the Fire Service personnel with appropriate breathing apparatus can enter the building if there is a person identified as missing)

7.9 Escape Routes

A map or diagram will be included for ease of reference. Include other relevant information such as details of fire fighting equipment provided, location of designated 'Safe Refuges', types and location of emergency exit signs, locations of manual break glass points and emergency lighting.

7.10 Assembly Points

Give the locations of assembly points, including:

- the point where guests/ contractors must assemble
- Identify how each assembly area is recognised
- Identify who should be in each assembly area e.g. groups or departments or sections
- Identify the locations of any designated safe refuges
- Where possible provide plans or schematic diagrams

7.11 Identify Persons Especially at Risk

- Identify lone workers, contractors and the areas where they may be at risk
- Include methods of escape and identify how they will be located
- If there is sleeping accommodation on site, identify the method of ensuring that they are safely out of the building and accounted for

7.12 Evacuation Arrangements for Disabled People

The safe and effective evacuation of disabled people needs careful thought. Management procedures need to be in place which takes account of the various scenarios that may arise. For example, the procedures adopted for people with a disability are employed in the building will be different to those for person with a disability visiting the building that will be unfamiliar with its layout.

Systems of evacuation that may be implemented include:

- **Progressive Horizontal Evacuation.** This system can be used in buildings with a phased alarm system. It involves a person passing from one 'fire compartment' into another that is not part of the initial evacuation zone. A 'fire compartment' is a part of a building separated from other parts of the same building by fire-resisting walls, ceilings, floors and doors of 60 minutes fire resisting construction.
 - **Evacuation by Stairs.** This method involves the use of equipment such as special evacuation chairs but is usually only possible if people are being evacuated downwards or horizontally.
- Use of Refuges.** Relatively safe waiting areas for short periods. They are not areas where disabled people should be left alone indefinitely until rescued by the fire brigade or until the fire is extinguished. *(This should not be confused with the use of refuges in progressive horizontal evacuation)*

A refuge is an area that is separated from the fire by a fire-resisting construction and has access via a safe route to a final fire exit and be clearly marked up with appropriate signage. It provides a temporary space for people to wait for others who will then help them evacuate.

Identify the method of ensuring that persons with any disability (permanent or temporary) are evacuated or taken to a designated 'Safe Refuge' (if one is in place), until they can be evacuated in safety. Identify what communication channels will be used to ensure that persons in the 'Safe Refuge' are kept informed about what is happening.

Designate responsibilities for persons at special risk and:

- Who is responsible for ensuring that personnel at special risk are conducted to a place of safety or refuge until they can be evacuated in safety?
- Have they had any specific training e.g. using the 'evacuation chair'?

7.13 Staff with Specific Responsibilities

Give the name (post) and duties of identified personnel in the event of a fire or other emergency. E.g. the fire marshals / fire wardens, ushers

This would include backup personnel in the event that identified personnel are not available.

7.14 Overall Control

- Who is in overall control of the emergency situation and what are their responsibilities?
- Who records the emergency situation and actions taken?

A senior person would be nominated to:

- Take overall control of the evacuation
- Ensure that other people with specific duties have taken relevant action
- Account for all persons in the premises
- Liaise with the Fire Department
- Initiate any additional response in relation to the care of people with special needs

7.15 Fire Marshals and Fire Wardens

Fire marshals / fire wardens are valuable in any premises and vital in large ones. Fire Marshals / Fire Wardens will always be given responsibility for a specific area, i.e. a floor or a section, and will have general duties in an evacuation such as:

- Who are the Fire Wardens and what are their responsibilities?
- Do they 'sweep' the building on their way out?
- Do they carry out 'first aid' fire fighting if trained and safe to do so?
- How do they ensure they do not work alone and put themselves at risk?
- Proceed to the assembly point close doors on route
- Helping the person in overall control of the evacuation by confirming their area has been checked

7.16 Fire Fighting

- Who is trained to use the fire fighting equipment?
- What are their responsibilities?
- Where is fire fighting equipment located?

7.17 Fire Control Panel

- Who will check the fire panel?
- What is their next step?
- What do they do with the information?
- Who is responsible for silencing and resetting the panel and on what occasions?

7.18 Contingency Plans

Have contingency plans for when life safety systems such as evacuation lifts, fire-detection and warning systems, sprinklers or smoke control systems, emergency lighting or building power system are out of order.

As part of the emergency plan it is good practice to prepare post-incident plans for dealing with situations that might arise such as those involving:

- unaccompanied children;
- people with personal belongings (especially valuables) still in the building;
- people wishing to rejoin friends;
- getting people away from the building (e.g. to transport);
- inclement weather; or
- the building cannot be re-entered / reoccupied.

7.19 Re-Entering the Building

- How people be prevented from re-entering the building?
- How will people know when they can re-enter the building?
- Note: If the emergency services have been called then the Fire Department Officer is responsible for giving permission for re-entry to the building

EXAMPLE FIRE SAFETY MAINTENANCE CHECKLIST

	YES	NO	N/A	COMMENTS
Daily Checks				
Escape Routes				
Can all fire exits be opened immediately and easily?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Are fire doors clear of obstruction?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Are escape route clear?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Fire Warning Systems				
Is the main indicator panel showing "normal"?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Are whistles, gongs or air horns in their correct place?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Escape Lighting				
Are luminaries and exit signs in good condition?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Is the emergency lighting and signs working normally?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Fire fighting Equipment				
Are all fire extinguishers in place?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Are all fire extinguishers clearly visible?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Are all fire hydrants accessible for the fire service?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Weekly Checks				
Escape Routes				
Do all emergency fastening devices work correctly?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Are fire doors clear of obstruction?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Are all external escape routes clear?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Fire Warning Systems				
Did the fire alarm work correctly when tested?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Did staff and all others hear the alarm working?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Did any linked fire protection system operate correctly?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Did visual alarms, pagers or vibrating pads work?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Do voice alarms work and was the message understood?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Escape Lighting				
Are charging indicators visible and illuminated?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Fire fighting Equipment				
Are all fire fighting equipment in working order?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Are all fire extinguishers mounted 1 - 1½ metres?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Monthly Checks			
Escape Routes			
Do all electronic release mechanisms work correctly?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Do all automatic doors “failsafe” in the open position?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are all self-closing devices working correctly?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are all door seals and intumescent strips in good condition?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are all external stairs in good condition and non-slip?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Do all roller shutters for compartmentation working correctly?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Do all internal fire doors close against their rebate / stop?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Escape Lighting			
Do all luminaries and exit signs working when tested?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are emergency generators working correctly?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fire fighting Equipment			
Is the “pressure” in stored pressure extinguishers correct?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

YES | NO | N/A | COMMENTS

Three Monthly Checks			
General			
Are emergency tanks / ponds at their normal / correct level?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are vehicles blocking fire hydrants or access to them?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Additional items from manufacturers requirements?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Six Monthly Checks			
General			
Have sprinkler systems been tested by a competent person?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Have release and closing mechanisms on fire resisting compartment doors and shutters been tested?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fire Warning Systems			
Has the system been checked by a competent person?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Escape Lighting			
Do all luminaries work for a third of their rated value?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Annual Checks			
Escape Routes			
Do all fire doors work correctly?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Is escape route compartmentation in good condition?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fire Warning Systems			
Has the system been checked by a competent person?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Escape Lighting			
Do all luminaries operate on test for their full duration?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Has the system been checked by a competent person?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fire fighting Equipment			
Has all equipment been checked by a competent person?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Miscellaneous

Have dry / wet risers been tested by a competent person?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Has smoke control systems been tested by a competent person?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Has external access for the fire and rescue service been checked for availability at all times?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Have any fire fighters switches been tested?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are fire assembly points clearly indicated by signs?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

EXAMPLE FIRE SAFETY TRAINING PROGRAMME

All employees will receive adequate fire safety training and all fire safety training sessions will be delivered by a competent person. There will be one / two fire drills per year to test the fire safety training.

Fire Safety Training Sessions

New Employees:	Induction Programme
Current Employees:	One / Two training session per year
Fire Wardens:	One / Two training session per year specific to their duties
Managers:	One / Two training session per year specific to their duties and including fire safety risk assessment, responding to fire hazards, fault reporting procedures, liaising with the fire service, record keeping, induction of new staff, fire safety policies and procedures.

Fire Safety Training Topics

- The significant findings from the fire risk assessment and fire safety policies;
- What to do on discovering a fire;
- How to raise the alarm, including the locations of fire alarm call points (break glass points);
- The action to take upon hearing the fire alarm;
- The evacuation procedure for alerting guests, residents and visitors including, where appropriate, directing them to exits and assembly points at a place of total safety;
- The arrangements for calling the fire and rescue service;
- The location and, where appropriate, the correct use of portable fire extinguishers and fire-fighting equipment;
- Knowledge of escape routes including stairways and especially those not in regular use;
- How to open all emergency exit doors;
- The appreciation of the importance of fire doors, keeping them closed and not wedged open to prevent the spread of smoke and heat, keeping escape routes unobstructed;
- Where appropriate, isolating electrical power and gas supplies and stopping machines and processes;
- The safe use of and risks from storing and working with highly flammable and explosive substances;
- General fire precautions, fire awareness and good housekeeping practices;
- The no smoking policy (where applicable);
- Special provisions for assisting disabled people and any training needed;
- Identifying fire hazards and fire incidents reporting procedures; and
- Equipment fault reporting procedures.

Appendix 2: Emergency Response Plan

Emergency Response Plan

The **KMIC JVC** is committed to the safety and well-being of its staff, employees and visitors. With this commitment, the Consortium established an emergency response plan and the emergency response team to manage and respond the emergency conditions.

The summary of the plan including procedures and practices to be followed in responding to emergency situations, namely, utility failure and fire and natural disaster like earthquake, storm, and floods is as follows:

Utility Failures

These include electrical outages, plumbing failure, gas leaks, steam line breaks, ventilation problems, elevator failures, etc. and when the utility failures occur, the people who are using these utilities or facing with these incidents have to follow the following procedures.

- Remain calm
- Immediately notify Security in the compound at given phone number
- If the building must be evacuated, follow the instructions on Building Evacuation
- Unplug all electrical equipment (including computers) and turn off light switches
- Use a flashlight: Do not light candles or use other kinds of flames for lighting
- Laboratory personnel:
 - Secure all experiments, unplug electrical equipment, and shut off research gases prior to evacuating
 - Close all fume hoods and chemical containers
- Elevators:
 - Remain calm
 - Use the Call Button of Phone to call for help
 - Do not try to climb out or exit the elevator without assistance

Fire

The detailed procedures are described in Fire Safety Management and Fire Emergency Plan.

Earthquakes

In the event of an earthquake:

- Stay away from large windows, shelving systems, or tall room partitions
- Get under a desk, table, door arch, or stairwell
- If none of these is available: move against an interior wall and cover your head with your arms
- Remain under cover until the movement subsides
- After the shaking stops, survey your immediate area for trapped or injured persons and ruptured utilities (water, gas, etc.)
- If damage has occurred in your area, inform Safety and Security immediately
- If it is safe to do so, remain at your location and await further instructions from responsible personnel
- Do not evacuate until instructed by emergency personnel
- After an earthquake:
 - Put on enclosed shoes to protect against broken glass
 - If the power is out use a flashlight. Do not light a match or candle
 - Be alert for safety hazards such as fire, electrical wires, gas leaks, etc.
 - Check on others. If there are injuries or other urgent problems, report them to Security
- Give or seek first aid. Assist any disabled persons in finding a safe place for them

- Evacuate if the building seems unsafe or if instructed to do so:
- Use stairs, not elevators
- Unplug small electrical appliances
- Bring keys, purses, wallets, warm clothing
- Be prepared for aftershocks
- Cooperate with emergency personnel, keep informed, and remain calm

Floods

Minor or area flooding in the compound could occur as a result of a water main break, loss of power to sump pumps, or major multiple rainstorms.

- Secure vital equipment, records, and other important papers
- Move to higher, safer place
- Shut off all electrical equipment
- If in a lab, secure all laboratory experiments
- Do not attempt to drive or walk through flooded areas
- Wait for further instructions on immediate action from responsible staff and Security
- If the building must be evacuated, follow the instructions on Building Evacuation
- Do not return to your building if you have been evacuated by flooding until you have been instructed to do so by responsible personnel
- If you are assisting with flood cleanup, report immediately to Environmental Health and Safety unit any oil, chemical, or radioactive materials suspected of mixing with flood waters

Storms and Tornadoes

If storms and tornadoes happen

- Go to a basement, or lower floor of interior hallway or corridor (preferably a steel-framed or reinforced concrete building)
- Seek shelter under a sturdy workbench or heavy furniture if no basement is available
- Avoid:
 - Top floors of buildings
 - Areas with glass windows or doors
 - Auditoriums, gymnasiums, cafeterias, or other areas with large, free-span roofs
- If out in the open:
 - Cars -do not wait out the storm in a car; cars are not safe in tornadoes
 - Move away from the path of the tornado at a right-angle direction
 - Lie flat in the nearest depression, ditch, or ravine if there is no time to escape

Medical Emergency

If someone is injured or becomes ill:

- Stay Calm
- Dial **the nearest hospital or ambulance department number** and explain the type of emergency, the location, condition, and number of victims
- Let the dispatcher know of any safety hazards - chemical spill, fire, fumes, etc.
- Do not hang up unless told to do so by the dispatcher
- Do not move the victim unless there is danger of further injury if she/he is not moved
- Render first-aid or Cardiopulmonary Resuscitation (CPR) only if you have been trained

- Do not leave the injured person except to summon help
- Comfort the victim until emergency medical services arrive
- Have someone stand outside the building to flag down the ambulance and/or Safety and Security when they reach the vicinity

Shelter in Place/Safe Shelter

Shelter in place is useful when evacuation is not an option. Refuge is sought in an interior room with few or no windows. It is helpful to identify these locations within the department ahead of time and to ensure employees are familiar.

- Stop operations in the building.
- If there are visitors in the building, provide for their safety by asking them to stay—not leave. When public safety officials provide directions to shelter in place, they want everyone to take those steps immediately, where they are.
- Close and lock all doors, windows, and other openings to the outside.
- If necessary/possible, turn off heating or cooling system.
- Select interior room(s) above the ground floor with the fewest windows and vents. The room(s) should be large enough for everyone to sit comfortably and quietly. Use multiple rooms if necessary.
- Stay away from windows and doors.
- Remain calm and await further instructions.

DO NOT leave the room until directed to do so by a public safety official.

Note: There will be an orientation or training (including refresher course) related to the emergency response plan and procedures for all staff and employees every six months. Also, the practical exercise will be conducted on a regular basis. The emergency plan would be updated as needed.

Appendix 3: Attendance List for First Public Consultation Meeting on 8 February 2019

ညောင်နယ်ပင် Industrial Complex တည်ဆောက်ရေးအတွက် ပြည်သူလူထုနှင့် တွေ့ဆုံဆွေးနွေးပွဲသို့ တက်ရောက်သူများစာရင်း

စဉ်	အမည်	ရာထူး	နေရပ်	ဖုန်းနံပါတ်	လက်မှတ်
၁	ဦးစောစောလင်း	SA. စွယ်စုံကုမ္ပဏီ	MSR - ဂွန်ကုန်ဖြူ	၀၅ ၈၅၁၃၀၈၀	<i>[Signature]</i>
၂	ဦး မင်းမင်းစွန်း	ကမ္ဘာ့စီးပွား	" "		
၃	ဦး ကျော်စွန်းစော	ကမ်းခြေ၊ EIA ဌာန	" "		
၄	ဦး ကျော်စွန်းစော		" "		
၅	ဦး စိုးစိုးကျော်	SA စွယ်စုံကုမ္ပဏီ	" "	၀၅ ၇၇၇၁၃၇၈၄၄	<i>[Signature]</i>
၆	ဦး မင်းမင်းစွန်း	Logistic	" "		
၇	ဦး ကျော်စွန်း	"	" "		
၈	ဦး သန်းမြင့်	လမ်းဖွဲ့	အင်း (၃)		<i>[Signature]</i>
၉	ဦး ဝင်းမြင့်	ကမ္ဘာ့စီးပွား	ကြာမင်းကမ္ဘာ့		<i>[Signature]</i>
၁၀	ဦး မောင်ကျော်	လမ်းဖွဲ့	အင်း (၃)		<i>[Signature]</i>
၁၁	ဦး မြင့်စွန်း				<i>[Signature]</i>
၁၂	ဦး စောစော		အင်း (၃)		<i>[Signature]</i>
၁၃	ဦး ကျော်စွန်းစော		ကမ္ဘာ့စီးပွား		<i>[Signature]</i>
၁၄	ဦး ဝင်းကျော်		အင်း (၃)		<i>[Signature]</i>
၁၅	ဦး စောစော				<i>[Signature]</i>
၁၆	ဦး စွန်းစော		"		<i>[Signature]</i>
၁၇	ဦး စွန်းစော		အင်း (၃)		
၁၈	ဦး ကျော်စွန်းစော				<i>[Signature]</i>
၁၉	ဦး ကျော်စွန်းစော				<i>[Signature]</i>
၂၀	ဦး ဝင်း		ကြာမင်းကမ္ဘာ့		<i>[Signature]</i>
၂၁	ဦး ကျော်စွန်းစော	လမ်းဖွဲ့	ကမ္ဘာ့စီးပွား		<i>[Signature]</i>
၂၂	ဦး ဝင်း		အင်း (၃)		<i>[Signature]</i>
၂၃	ဦး ကျော်စွန်းစော		အင်း (၃)		<i>[Signature]</i>
၂၄	ဦး ကျော်စွန်းစော		အင်း (၃)		<i>[Signature]</i>

စဉ်	အမည်	ရာထူး	နေရပ်	ဖုန်းနံပါတ်	လက်မှတ်
၂၅	ဖိုးဝင်း		အင်း (၁)		
၂၆	အောင်စိန်		အင်း (၂)		
၂၇	ဦးကျော်ကျော်	ဥက္ကဋ္ဌ	။		
၂၈	ဦးကျော်စွာ	ဧည့်သည်	ငါးမာပိုင်		
၂၉	ဦးစိုင်းကျော်စွာ		#		
၃၀	ဦးသန်းထိုက်	ဝေအိမ်အဖွဲ့	စင်္ကြံ		
၃၁	ဦးတင်ဝင်း	ရပ်ကွက်	။		
၃၂	ဦးချစ်စွာ	ရပ်ကွက်	။		
၃၃	ဦးကျော်စွာ	ဝေအိမ်အဖွဲ့	။		
၃၄	ဦးကျော်စွာ	ရပ်ကွက်	စင်္ကြံ		
၃၅	ဦးကျော်စွာ		အင်း (၁)		
၃၆	ဒေါ်ဒီအိမ်		အင်း (၁)		
၃၇	အောင်စိန်		အင်း (၁)		
၃၈	ဦးသန်းထိုက်		အင်း (၁)		
၃၉	ဦးသန်းထိုက်		အင်း (၁)		
၄၀	ဦးကျော်စွာ		အင်း (၁)		
၄၁	ဦးသန်းထိုက်		အင်း (၁)		
၄၂	ဦးကျော်စွာ	ရပ်ကွက်	ကျောက်စင်္ကြံ		
၄၃	ဦးကျော်စွာ	ရပ်ကွက်	။		
၄၄	ဦးကျော်စွာ	ရပ်ကွက်	။		
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၄၆	ဦးကျော်စွာ	ရပ်ကွက်	ကျောက်စင်္ကြံ	၀၉ ၇၆၈၀၆၆၇	
၄၇	ဦးကျော်စွာ	။	။	၀၉ ၇၆၈၀၆၆၇	
၄၈	ဦးကျော်စွာ	ရပ်ကွက်	။	၀၉ ၄၇၀၅၅၅၅	

စဉ်	အမည်	ရာထူး	နေရပ်	ဖုန်းနံပါတ်	လက်မှတ်
၄၉	ဒိုးဖိုးစို	ရယ်စာ၊ ရယ်စာ	ဆွေစံရွာပင်ရွာ		
၅၀	ဒိုးဖိုးစို	ဥက္ကဋ္ဌ	ဧကန်ရွာ	၀၉၇၃၁၀၁၆၄၃	
၅၁	ဒိုးဖိုးစို		ဧကန်ရွာ		
၅၂	ဒိုးဖိုးစို		ဧကန်ရွာ		
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Appendix 4: Monthly Rainfall (mm) and Monthly Mean Maximum and Minimum Temperature (C) (2014 - 2018)



DEPARTMENT OF METEOROLOGY AND HYDROLOGY

MONTHLY RAINFALL (mm)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2014	0	0	0	0	182	390	760	547	249	82	180	0
2015	0	0	Trace	29	256	358	828	315	264	197	25	0
2016	38	1	23	0	387	310	581	509	332	208	6	0
2017	Trace	0	0	98	319	427	643	491	326	328	10	0
2018	2	0	0	35	26	434	666	562	303	280	42	1

" Trace " The amount of rainfall which cannot be measured.

"1mm=0.04 inch"

MONTHLY MEAN MAXIMUM TEMPERATURE (°C)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2014	31.9	34.3	37.5	37.8	34.8	30.8	29.8	30.0	31.2	33.1	30.0	32.9
2015	31.9	34.5	37.6	38.0	36.0	31.8	30.9	30.8	31.8	32.4	34.5	33.5
2016	31.8	34.7	37.1	38.8	37.2	30.8	30.6	30.4	31.9	31.9	33.7	33.1
2017	32.7	34.9	36.9	36.1	35.0	31.8	29.8	30.2	32.6	32.6	34.7	32.7
2018	33.0	34.9	37.1	38.1	35.8	30.9	29.9	30.2	32.1	32.8	33.2	32.9

MONTHLY MEAN MINIMUM TEMPERATURE (°C)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2014	14.4	16.5	18.7	24.1	24.8	24.4	23.7	23.8	23.9	23.2	21.3	19.2
2015	17.1	16.3	19.9	23.6	25.0	24.6	24.6	24.7	24.7	24.0	21.8	18.1
2016	14.6	18.1	22.1	24.0	24.6	24.9	24.9	24.8	23.8	24.2	21.9	20.3
2017	18.4	18.2	20.2	23.4	25.2	24.9	24.5	24.7	24.7	24.0	22.6	18.8
2018	17.9	17.4	21.0	23.5	24.1	23.9	23.6	23.4	23.2	22.4	19.9	19.3

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မိုးလေဝသနှင့်လေပေဒဏ်ညွှန်ကြားမှုဦးစီးဌာန

Appendix 5: Monthly Mean Wind Speed and Wind Direction at (06:30) and (12:30) hrs M.S.T (2014 – 2018)



DEPARTMENT OF METEOROLOGY AND HYDROLOGY

STATION: HMAWBI

MONTHLY MEAN WIND SPEED(mph) AT (06:30)hrs M.S.T

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2014	0.5	0.7	0.9	0.9	0.8	0.8	1.4	0.5	0.4	0.5	0.5	0.0
2015	0.2	0.7	0.6	0.4	0.4	0.8	1.4	0.2	0.2	1.0	0.4	0.3
2016	0.5	0.4	0.5	0.2	0.6	1.0	0.6	1.4	0.4	0.1	0.2	0.5
2017	0.2	0.5	0.3	0.9	1.5	0.7	1.2	0.6	0.3	0.5	0.0	0.2
2018	0.1	0.1	0.2	0.6	0.6	1.3	0.9	0.5	0.8	0.5	0.0	0.0

MONTHLY MEAN WIND DIRECTION AT (06:30)hrs M.S.T

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2014	NE	NE	NE	E	SE	SE	SE	SE	SW	E	SE	Calm
2015	NE	NE	SE	SE	SW	SE	SE	SW	SE	E	NW	NW
2016	E	E	E	SE	SE	SE	SE	SE	SE	SE	NW	NW
2017	NE	E	W	SW	SW	SE	SW	SE	SE	SE	Calm	NW
2018	E	E	SW	SW	SE	SE	SW	S	SE	SE	Calm	Calm

MONTHLY MEAN WIND SPEED(mph) AT (12:30)hrs M.S.T

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2014	3.1	3.1	3.8	4.7	3.8	3.4	3.1	3.5	2.9	2.2	1.7	1.9
2015	2.9	3.0	3.1	3.5	3.2	3.4	4.7	3.6	4.5	3.3	2.0	2.2
2016	2.6	3.2	3.2	4.5	4.3	4.3	3.9	4.7	3.1	3.0	3.2	3.0
2017	3.3	4.2	4.2	4.0	3.9	4.3	3.2	3.2	2.6	2.7	2.4	2.8
2018	2.7	3.5	3.6	3.5	3.6	4.9	0.5	0.5	4.2	2.9	2.2	2.6

MONTHLY MEAN WIND DIRECTION AT (12:30)hrs M.S.T

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2014	NE	NE	SW	SW	SW	SW	SW	SW	SW	SE	SE	NE
2015	NE	SE	SE	SW	SW	SE	SW	SW	SW	SE	NW	N
2016	NW	E	SE	SE	SW	SE	SW	SW	SW	E	NW	NE
2017	NE	SE	SW	SW	SE	SW	SW	SW	SW	SE	E	E
2018	NW	SE	SW	SW	SE	SW	SW	SW	SW	E	NE	E

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Appendix 6: Monthly Mean Wind Speed and Wind Direction at (09:30) hrs and (18:30) hrs M.S.T (2014 – 2018)



DEPARTMENT OF METEOROLOGY AND HYDROLOGY

STATION : HMAWBI

MONTHLY MEAN WIND SPEED(mph) AT (09:30)hrs M.S.T

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2014	2.7	1.8	2.3	3.6	3.1	3.2	3.3	2.6	2.7	2.0	1.4	1.4
2015	1.8	2.5	2.3	2.4	2.4	2.4	3.3	3.1	3.3	2.7	1.9	1.7
2016	2.0	0.3	2.2	3.8	2.7	3.2	2.9	3.2	1.8	2.1	2.2	1.9
2017	2.1	2.6	2.6	2.7	2.9	2.9	2.4	2.4	2.1	1.9	1.9	1.9
2018	1.3	2.8	2.3	2.5	2.8	3.3	3.6	3.5	2.9	2.1	1.9	2.0

MONTHLY MEAN WIND SPEED(mph) AT (18:30)hrs M.S.T

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2014	0.7	1.8	2.1	3.5	3.3	2.1	2.9	2.3	2.2	0.6	0.1	0.0
2015	0.3	0.7	2.6	3.6	3.5	1.9	2.8	1.7	2.7	0.5	0.4	0.6
2016	0.9	1.0	2.8	4.8	3.9	2.4	1.9	2.4	2.4	1.2	0.7	0.3
2017	0.7	1.6	3.5	2.8	3.6	2.9	2.1	2.4	2.2	0.5	0.3	0.1
2018	0.6	0.9	2.4	2.5	3.4	3.1	2.4	3.2	1.4	0.2	0.0	0.2

MONTHLY MEAN WIND DIRECTION AT (09:30)hrs M.S.T

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2014	NE	SW	SW	SW	S	SW	SE	SW	SW	SE	NE	SE
2015	NE	SW	SW	SW	SW	SW	SW	SW	SW	SE	NW	NW
2016	NW	SW	SW	SW	SW	SE	SE	SE	SE	E	NE	NE
2017	N	SE	SE	SW	SE	SE	SW	SW	SW	SE	E	E
2018	E	SE	SE	SW	SE	S	SW	SW	SW	E	E	NW

MONTHLY MEAN WIND DIRECTION AT (18:30)hrs M.S.T

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2014	NE	SW	SW	SW	S	SW	SE	SW	SW	SE	NE	SE
2015	NE	SW	SW	SW	SW	SW	SW	SW	SW	SE	NW	NW
2016	NW	SW	SW	SW	SW	SE	SW	SW	SW	SW	SE	NW
2017	NW	SW	SW	SW	SW	SW	SW	SW	SW	SE	SE	E
2018	NW	SW	SW	SW	SE	SW	SW	SW	SW	SW	Calm	SW

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Appendix 7: Monthly Mean Relative Humidity at (06:30) hrs, (09:30) hrs, (12:30) hrs and (18:30) hrs M.S.T (2014 – 2018)



DEPARTMENT OF METEOROLOGY AND HYDROLOGY

STATION : HMAWBI

MONTHLY MEAN RELATIVE HUMIDITY (%) AT (09:30)hrs M.S.T

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2014	68	73	74	72	77	89	94	93	89	80	78	70
2015	71	71	73	69	75	87	90	90	86	84	77	72
2016	70	73	79	94	76	88	91	91	92	88	80	75
2017	71	70	72	73	81	87	93	92	89	89	80	71
2018	67	71	75	72	78	92	95	95	89	86	79	81

MONTHLY RELATIVE HUMIDITY(%) at (18:30)hrs M.S.T

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2014	56	47	44	50	73	92	95	93	89	87	82	73
2015	61	46	55	51	69	90	91	93	91	89	82	71
2016	61	52	51	46	65	87	90	89	90	89	81	71
2017	60	45	40	54	70	89	91	89	89	92	86	73
2018	57	48	46	46	72	91	97	96	90	88	89	80

MONTHLY RELATIVE HUMIDITY(%) at (06:30)hrs M.S.T

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2014	95	95	97	95	96	98	99	99	95	96	95	95
2015	93	93	94	96	96	98	97	97	98	97	95	94
2016	94	94	95	94	95	96	98	99	99	98	95	94
2017	89	93	95	94	95	98	98	98	98	99	93	91
2018	93	94	94	94	96	99	99	99	99	99	99	96

MONTHLY RELATIVE HUMIDITY(%) at (12:30)hrs M.S.T

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2014	40	39	35	48	63	82	88	86	78	68	65	50
2015	45	37	48	47	57	77	84	84	76	74	60	50
2016	43	42	46	45	56	81	85	84	79	75	64	54
2017	46	37	36	50	66	80	87	85	76	80	64	51
2018	47	41	43	43	62	85	89	87	79	73	64	59

Chmar
30.8.19
ဒေါက်တာခင်ဝင်းမော်
လက်ထောက်ညွှန်ကြားရေးမှူး
မိုးလေဝသနှင့်ဇလဗေဒညွှန်ကြားမှုဦးစီးဌာန

Appendix 8: Soil Test Result (July 2019)

DEPARTMENT OF AGRICULTURE (LAND USE)
SOIL INTERPRETATION OF RESULTS
Myanmar Survey Research Co., Ltd (12.7.2019)

Division - ရန်ကုန်
Township - လှည်းကူး၊ ညောင်နယ်

Sheet No. 1
Sr No. S-1-4/18-19

Sr No.	Sample plot	Depth in inches	pH Soil : Water 1 : 2.5	EC Soil : Water 1 : 2.6	Texture	Organic Carbon	Total N	CEC	Available Nutrients	
									P	K ₂ O
	Nyaung Hnit Pin Industrial Complex Project									
1	TS - 7 (နံ့အရွှေ့ပိုင်း)	0 - 12	Strongly acid	Very low	Silt Loam	Medium	Low	Low	Low	Low
2	TS - 8 (နံ့အနီး)	0 - 12	Strongly acid	Very low	Silty Clay Loam	Medium	Very Low	Low	Low	Low
3	TS - 9 (စိုက်ပျိုးရေးစုံ - ဘ)	0 - 12	Strongly acid	Very low	Silty Clay Loam	Medium	Very Low	Low	Low	Low
4	TS - 10 (နံ့အတွင်း)	0 - 12	Extremely acid	Very low	Silt Loam	Medium	Low	Low	Low	Low


(ခင်ဝင်းမာ)
ဒု-ဥက္ကဋ္ဌကြားရေးမှူး
ဓါတ်ခွဲခန်းတာဝန်ခံ
မြေအသုံးချရေးဌာနခွဲ

DEPARTMENT OF AGRICULTURE (LAND USE)
SOIL ANALYTICAL DATA SHEET

Sheet No. 1
Sr No. S-1-4/18-19

Myanmar Survey Research Co., Ltd (12.7.2019)

Division - ရန်ကင်း
Township - လှိုင်ဘေး၊ ရွှေဘိုခရိုင်

Sr No.	Sample plot	Depth in inches	Moisture %	pH Soil: Water 1: 2.5	EC Soil: Water 1: 2.6	Texture				Organic Carbon %	Humus %	Total N %	CEC meq/100g	Exchangeable Cations meq/100g					Available Nutrients mg/100g		
						Sand %	Silt %	Clay %	Total %					Ca ⁺⁺	Mg ⁺⁺	Na ⁺	K ⁺	H ⁺	Al ⁺⁺⁺	P ppm	K ₂ O
1	Nyaung Hnit Pin Industrial Complex Project TS - 7 (နံဘေးရံ ဝိုင်း) TS - 8 (နံဘေးရံ) TS - 9 (နံဘေးရံ - ဝ) TS - 10 (နံဘေးရံ)	0 - 12	1.75	4.52	0.03	12.04	63.90	22.69	98.63	2.92	4.92	0.14	6.86	5.52	0.68	0.38	0.23	0.05	Not Detected	2.05 (O)	9.21
2		0 - 12	1.90	4.50	0.02	10.21	65.96	22.47	98.64	2.81	4.25	0.18	9.86	4.12	0.69	0.30	0.15	0.08	4.57	3.10 (B)	6.89
3		0 - 12	1.84	5.00	0.10	11.93	62.19	24.88	99.00	2.40	2.40	0.19	8.96	3.26	0.69	0.52	0.12	0.07	4.20	3.54 (B)	9.16
4		0 - 12	2.05	4.98	0.04	13.30	63.05	22.62	98.97	2.93	2.93	0.11	6.73	2.90	0.69	0.33	0.23	0.08	2.50	4.20 (B)	10.29

B = Bray & Kurtz Method
O = Olsen Method



(ခရိုင်အဖွဲ့)
အထွေထွေအဖွဲ့
မြေစမ်းသပ်ရေးဌာန

DEPARTMENT OF AGRICULTURE (LAND USE)
SOIL INTERPRETATION OF RESULTS
Myanmar Survey Research Co., Ltd (12.7.2019)

Sheet No. 1
 Sr No. S-1-4/18

Division - ရန်ကင်း
 Township - လှည်းကူး၊ ညောင်နစ်ဝင်

Sr No.	Sample plot	Depth in inches	pH	EC	TDS	SAR	RSC	Dorminant Salts
1	Nyaung Hnit Pin Industrial Complex Project TS - 7 (နံအရှေ့ပိုင်း) TS - 8 (နံအနီး) TS - 9 (ပိုက်ပျိုးရေခဲ - ဝ) TS - 10 (နံအတွင်း)	0 - 12	Strongly acid	Very low	Low	Not Detected	Not Detected	CaCl ₂
2		0 - 12	Strongly acid	Very low	Low	Not Detected	Low	Ca(HCO ₃) ₂
3		0 - 12	Strongly acid	Very low	Low	Low	Not Detected	NaCl, CaCl ₂
4		0 - 12	Strongly acid	Very low	Low	Not Detected	Not Detected	CaSO ₄ , CaCl ₂


 (ခင်ဝင်းမာ)
 ဒု-ညွှန်ကြားရေးမှူး
 မြေပုံရေးရာဇဝန်ခံ
 မြေအသုံးချရေးဌာနခွဲ

**Department of Agriculture
Land Use Division
Soil analytical Laboratory
Heavy Metal analysis
Soil Interpretation of Results**

Name of Owner and Address Myanmar Survey Research Company Limited

Project name Naung Hnitpin Industrial Complex Project,
Hlegu Township, Yangon Region.

Place of Sampling Naung Hnitpin Industrial Complex Project,
Hlegu Township, Yangon Region.

Designation of Sample HV - 5 Eastern of Project Site
17° 08' 29" N 96° 10' 45" E

Soil Depth within 1 Meter

Heavy Metal Contaminants	Laboratory Finding (ppm)	Maxium Permitted Level (ppm)
Nickel (Ni)	Not detected	35
Chromium (Cr)	Not detected	100
Cadmium (Cd)	Not detected	0.8
Lead (Pb)	Not detected	85
Iron (Fe)	809.8	250

ppm - parts per million

- Source of reference standard: F.A.O Soil Bulletin 65 & guidelines used in Netherland.

**Department of Agriculture
Land Use Division
Soil analytical Laboratory
Heavy Metal analysis
Soil Interpretation of Results**

Name of Owner and Address Myanmar Survey Research Company Limited

Project name Naung Hnitpin Industrial Complex Project,
Hlegu Township, Yangon Region.

Place of Sampling Naung Hnitpin Industrial Complex Project,
Hlegu Township, Yangon Region.

Designation of Sample HV - 6 Near Project Area
17° 07' 50" N 96° 09' 17" E

Soil Depth within 1 Meter

Heavy Metal Contaminants	Laboratory Finding (ppm)	Maxium Permitted Level (ppm)
Nickel (Ni)	Not detected	35
Chromium (Cr)	Not detected	100
Cadmium (Cd)	Not detected	0.8
Lead (Pb)	Not detected	85
Iron (Fe)	950.8	250

ppm - parts per million

- Source of reference standard: F.A.O Soil Bulletin 65 & guidelines used in Netherland.

**Department of Agriculture
Land Use Division
Soil analytical Laboratory
Heavy Metal analysis
Soil Interpretation of Results**

Name of Owner and Address Myanmar Survey Research Company Limited

Project name Naung Hnitpin Industrial Complex Project,
Hlegu Township, Yangon Region.

Place of Sampling Naung Hnitpin Industrial Complex Project,
Hlegu Township, Yangon Region.

Designation of Sample HV - 7 Farmer Harvest Zone - 1
17° 08' 52" N 96° 09' 34" E

Soil Depth within 1 Meter

Heavy Metal Contaminants	Laboratory Finding (ppm)	Maxium Permitted Level (ppm)
Nickel (Ni)	Not detected	35
Chromium (Cr)	Not detected	100
Cadmium (Cd)	Not detected	0.8
Lead (Pb)	Not detected	85
Iron (Fe)	900.2	250

ppm - parts per million

- Source of reference standard: F.A.O Soil Bulletin 65 & guidelines used in Netherland.

Appendix 9: Air Quality Test Report (July 2019)



**Department of Agriculture
Land Use Division
Soil analytical Laboratory
Heavy Metal analysis
Soil Interpretation of Results**

Name of Owner and Address	Myanmar Survey Research Company Limited
Project name	Naung Hnitpin Industrial Complex Project, Hlegu Township, Yangon Region.
Place of Sampling	Naung Hnitpin Industrial Complex Project, Hlegu Township, Yangon Region.
Designation of Sample	HV - 8 Near Project Area 17° 08' 54" N 96° 10' 12" E
Soil Depth	within 1 Meter

Heavy Metal Contaminants	Laboratory Finding (ppm)	Maxium Permitted Level (ppm)
Nickel (Ni)	Not detected	35
Chromium (Cr)	Not detected	100
Cadmium (Cd)	Not detected	0.8
Lead (Pb)	Not detected	85
Iron (Fe)	850.4	250

ppm - parts per million

- Source of reference standard: F.A.O Soil Bulletin 65 & guidelines used in Netherland.

LIVE Environmental Assessment Group

No.72, Baho Road, Sanchaung Township, Yangon, Myanmar. Ph: 09 799170072, 09 420107816, 09 5014535

Project Name: KMIC Industrial Complex
Site Address: Kyar Kan Su Village, Hlegu Township, Yangon, Myanmar.
Site Location: Latitude 17° 6' 37'' N and Longitude 96° 8' 34'' E
Start Date & Time: 17-7-2019 / 8:55 am **Reported Date:** 25-7-2019
Reg.No: July 1911

Air				
Parameter	Reference Value	Result	Guideline	Remark
PM ₁₀ (24 Hr) µg/m ³	50 µg/m ³	41.7	WHO	
PM _{2.5} (24 Hr) µg/m ³	25 µg/m ³	20.4	WHO	
NO ₂ (1 Hr) µg/m ³	200 µg/m ³	66.5	WHO	
SO ₂ (24 Hr) µg/m ³	20 µg/m ³	26.6	WHO	
O ₃ (8 Hr) µg/m ³	100 µg/m ³	10.9	WHO	
CO (8 Hr) ppb	9000 ppb	196.3	US.EPA	

Instruments : Hazscanner

Signed by



Dr. Khaing Khaing Soe

LIVE Environmental Assessment Group


No.72, Baho Road, Sanchaung Township, Yangon, Myanmar. Ph: 09 799170072, 09 420107816, 09 5014535

Project Name: KMIC Industrial Complex
Site Address: Kyar Kan Su Village, Hlegu Township, Yangon, Myanmar.
Site Location: Latitude 17° 6' 37" N and Longitude 96° 8' 34" E
Start Date & Time: 17-7-2019 / 8:55 am **Reported Date:** 25-7-2019
Reg.No: July 1911

Air				
Parameter	Reference Value	Result	Guideline	Remark
VOCS (1 Hr) ppb	44 ppb	41	California EPA	
HC ppm		504		
CH ₄ ppm		4569		
RH %		50		
WDir Deg.		166		
WSpM kph		0.33		

Instruments : Hazscanner

Signed by



Dr. Khaing Khaing Soe

Appendix 10: Noise Level Result (July 2019)

LIVE Environmental Assessment Group

No.72, Baho Road, Sanchaung Township, Yangon, Myanmar. Ph: 09 799170072, 09 420107816, 09 5014535

Project Name: KMIC Industrial Complex
Site Address: Kyar Kan Su Village, Hlegu Township, Yangon, Myanmar.
Site Location: Latitude 17° 6' 37'' N and Longitude 96° 8' 34'' E
Start Date & Time: 17-7-2019 / 8:55 am **Reported Date:** 25-7-2019
Reg.No: July 1911

Noise					
<i>L_{eq} in dBA</i>			<i>L_{max} in dBA</i>		
Day	Night	Total	Day	Night	Total
42	33	40.8	27	22.6	26

Receptor	One Hour LAeq (dBA)a	
	Day Time 07:00 – 22:00 (10:00 - 22:00 for Public holidays)	Night Time 22:00 – 07:00 (22:00 - 10:00 for Public holidays)
Residential, institutional educational	55	45
Industrial, commercial	70	70

National Environmental Quality (Emission) Guidelines
 Instruments : Sound Level Meter (Extech)

Signed by



Dr. Khaing Khaing Soe

Appendix 11: Water Test Result (Ground Water 2)



Occupational and Environmental Health Laboratory

No. (250), Lower Kyeemyindine Road, Ahlone Township, Yangon, Myanmar.
 Tel: +9567-431139, 431138, +951-221387, 210844,
 Fax: +9567-431139, +951-223824

Sample Name: Water	Received Date: 11.7.2019
	Reported Date: 5.8.2019
	Reg no: 200/2019
Site Name: GW2 Ground Water တက္ကတိုင်းရွာ စာသင်ကျောင်း အဝိုင်းတွင်းရေ။	

Analyses	Ref: value	Unit	Result	Method
Color	15	*TCU	1	Platinum Cobalt Method
Turbidity	5	*NTU	0.1	Absorption Method
Arsenic	0.05	mg/L	0.013	Atomic Absorption Spectrophotometer (Graphite Furnace Method)
Copper	2	mg/L	0.003	Inductively Coupled Plasma- Optical Emission Spectrometric Method
Fluoride	1.5	mg/L	0	SPADNS Method
Lead	0.01	mg/L	0.002	Atomic Absorption Spectrophotometer (Graphite Furnace Method)
Manganese	0.4	mg/L	1.864	Inductively Coupled Plasma- Optical Emission Spectrometric Method
Magnesium	150	mg/L	31.48	Inductively Coupled Plasma- Optical Emission Spectrometric Method
Chloride	250	mg/L	2.2	Argentometric Method
Total Hardness	500	mg/L as CaCO ₃	241	Unit Dose Vials Method
Iron	1	mg/L	3.154	Inductively Coupled Plasma- Optical Emission Spectrometric Method
pH	6.5 – 8.5		6.6	Ion selected Electrode Method
Sulphate	250	mg/L	0	Barium Chloride Method
Total Dissolved Solid	1000	mg/L	175	Ion selected Electrode Method
Zinc	3	mg/L	0	Zincon Method
Mercury	0.001	mg/L	0.00	Inductively Coupled Plasma- Optical Emission Spectrometric Method
Bacterial Growth (Total Coliform)	3	*CFU/100ml	5	Compact Dry Plate
Bacterial Growth (Faecal Coliform)	0	*CFU/100ml	1	Compact Dry Plate
Chlorine (Residual)	4	mg/L	0	DPD Tablet Method
Electro conductivity	-	µmhos/cm	250	Ion selected Electrode Method
Nitrate	-	mg/L	0	Zinc Reduction Method
Phenol	-	mg/L	0	Aminoantipyrine Method

*TCU- True Color Unit , *1 MPN (Most Probably Number) = 1 CFU (Coliform Forming Unit)

*NTU- Nephelometric Turbidity Unit, Reference: National Drinking Water Quality Standard

Tested by

oml
 OH (Lab)
 Daw Ohnmar Hla
 MLT - I

OEHD lab results - 2019/Drinking Water

Checked by

ayethin
 Daw Aye Aye Thinn
 Laboratory Officer

Signed by

Dr. Kay Khine Aye
 Dr. Kay Khine Aye
 Deputy Director

Occupational and Environmental Health Division

Appendix 12: Water Test Result (Ground Water 1)



Occupational and Environmental Health Laboratory

No. (250), Lower Kyeemyindine Road, Ahlone Township, Yangon, Myanmar.
 Tel: +9567-431139, 431138, +951-221387, 210844,
 Fax: +9567-431139, +951-223824

Sample Name: Water	Received Date: 10.7.2019
	Reported Date: 5.8.2019
	Reg no: 199/2019
Site Name: GW1 Ground Water Project Area အနီး Tube Well ဦးကျော်စွာရိပ်ခြံ။	

Analyses	Ref: value	Unit	Result	Method
Color	15	*TCU	1	Platinum Cobalt Method
Turbidity	5	*NTU	0.1	Absorption Method
Arsenic	0.05	mg/L	0.006	Atomic Absorption Spectrophotometer (Graphite Furnace Method)
Copper	2	mg/L	0.000	Inductively Coupled Plasma- Optical Emission Spectrometric Method
Fluoride	1.5	mg/L	0	SPADNS Method
Lead	0.01	mg/L	0.0012	Atomic Absorption Spectrophotometer (Graphite Furnace Method)
Manganese	0.4	mg/L	0.103	Inductively Coupled Plasma- Optical Emission Spectrometric Method
Magnesium	150	mg/L	9.674	Inductively Coupled Plasma- Optical Emission Spectrometric Method
Chloride	250	mg/L	1.4	Argentometric Method
Total Hardness	500	mg/L as CaCO ₃	228	Unit Dose Vials Method
Iron	1	mg/L	1.688	Inductively Coupled Plasma- Optical Emission Spectrometric Method
pH	6.5 – 8.5		6.4	Ion selected Electrode Method
Sulphate	250	mg/L	0	Barium Chloride Method
Total Dissolved Solid	1000	mg/L	126	Ion selected Electrode Method
Zinc	3	mg/L	0	Zincon Method
Mercury	0.001	mg/L	0.161	Inductively Coupled Plasma- Optical Emission Spectrometric Method
Bacterial Growth (Total Coliform)	3	*CFU/100ml	7	Compact Dry Plate
Bacterial Growth (Faecal Coliform)	0	*CFU/100ml	2	Compact Dry Plate
Chlorine (Residual)	4	mg/L	0	DPD Tablet Method
Electro conductivity	-	µmhos/cm	180	Ion selected Electrode Method
Nitrate	-	mg/L	0	Zinc Reduction Method
Phenol	-	mg/L	0	Aminoantipyrine Method

*TCU- True Color Unit , *1 MPN (Most Probably Number) = 1 CFU (Coliform Forming Unit)

*NTU- Nephelometric Turbidity Unit, Reference: National Drinking Water Quality Standard

Tested by

OH (Lab)
 Daw Ohnmar Hla
 MLT - I

OEHD lab results -2019/Drinking Water

Checked by

Daw Aye Aye Thinn
 Laboratory Officer

Signed by

Dr. Kay Khine Aye
 Deputy Director

Occupational and Environmental Health Division

Appendix 13: Water Test Result (Kalihtaw Dam)



Occupational and Environmental Health Laboratory

No. (250), Lower Kyeemyindine Road, Ahlone Township, Yangon, Myanmar.
 Tel: +9567-431139, 431138, +951-221387, 210844,
 Fax: +9567-431139, +951-223824

Sample Name: Water	Received Date: 10.7.2019
	Reported Date: 5.8.2019
	Reg no: 198/2019
Site Name: SW3 Kali Htaw Dam	

Analyses	Ref: value	Unit	Result	Method
Color	15	*TCU	1	Platinum Cobalt Method
Turbidity	5	*NTU	0.1	Absorption Method
Arsenic	0.05	mg/L	0.011	Atomic Absorption Spectrophotometer (Graphite Furnace Method)
Copper	2	mg/L	0.000	Inductively Coupled Plasma- Optical Emission Spectrometric Method
Fluoride	1.5	mg/l	0	SPADNS Method
Lead	0.01	mg/L	0.0009	Atomic Absorption Spectrophotometer (Graphite Furnace Method)
Manganese	0.4	mg/L	0.56	Inductively Coupled Plasma- Optical Emission Spectrometric Method
Magnesium	150	mg/L	10.57	Inductively Coupled Plasma- Optical Emission Spectrometric Method
Chloride	250	mg/L	0.5	Argentometric Method
Total Hardness	500	mg/L as CaCO ₃	189	Unit Dose Vials Method
Iron	1	mg/L	5.804	Inductively Coupled Plasma- Optical Emission Spectrometric Method
pH	6.5 – 8.5		6.6	Ion selected Electrode Method
Sulphate	250	mg/L	1.0	Barium Chloride Method
Total Dissolved Solid	1000	mg/L	77	Ion selected Electrode Method
Zinc	3	mg/L	0	Zincon Method
Mercury	0.001	mg/L	0.00	Inductively Coupled Plasma- Optical Emission Spectrometric Method
Bacterial Growth (Total Coliform)	3	*CFU/100ml	5	Compact Dry Plate
Bacterial Growth (Faecal Coliform)	0	*CFU/100ml	1	Compact Dry Plate
Chlorine (Residual)	4	mg/L	0.01	DPD Tablet Method
Electro conductivity	-	µmhos/cm	110	Ion selected Electrode Method
Nitrate	-	mg/L	0	Zinc Reduction Method
Phenol	-	mg/L	0.04	Aminoantipyrine Method

*TCU- True Color Unit , *1 MPN (Most Probably Number) = 1 CFU (Coliform Forming Unit)

*NTU- Nephelometric Turbidity Unit, Reference: National Drinking Water Quality Standard

<p>Tested by</p> <p><i>OH (Lab)</i> Daw Ohnmar Hla MLT - I</p> <p>OEHD lab results -2019/Drinking Water</p>	<p>Checked by</p> <p><i>Daw Aye Aye Thinn</i> Daw Aye Aye Thinn Laboratory Officer</p>	<p>Signed by</p> <p><i>Dr. Kay Khine Aye</i> Dr. Kay Khine Aye Deputy Director Occupational and Environmental Health Division</p>
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Appendix 14: Water Test Result (Drain Water 1)



Occupational and Environmental Health Laboratory

No. (250), Lower Kyeemyindine Road, Ahlone Township, Yangon, Myanmar.
 Tel: +9567-431139, 431138, +951-221387, 210844,
 Fax: +9567-431139, +951-223824

Sample Name: Waste Water	Received Date: 10.7.2019
	Reported Date: 5.8.2019
	Reg no: 202/2019
Site Name: DW1 Drain Water Project Area အနီးမြောင်းရေ	

Analyses	Ref. Value	Unit	Results	Method
pH	6-9	-	6.3	Ion Selected Electrode Method
BOD	30	mg O ₂ /L	10.5	5 Day BOD Test Method
COD	125	mg/L	26	Close Reflex Method
Total Dissolved Solid	-	mg/L	35	Ion selected Electrode Method
Nitrate	-	mg/L	0	Zinc Reduction Method
Mercury	0.01	mg/L	0.000	*ICP-OES
Arsenic	0.1	mg/L	0.015	Atomic Absorption Spectrophotometer (Graphite Furnace Method)
Oil and Grease	10	mg/L	5.07	Standard method
Phenol	0.5	mg/L	0	Aminoantipyrine Method
Sulphate	-	mg/L	0	Barium Chloride Method
Chloride	-	mg/L	0.9	Argentometric Method
Chromium	0.5	mg/L	0.00	*ICP-OES
Cadmium	0.1	mg/L	0.00	*ICP-OES
Lead	0.1	mg/L	0.0003	Atomic Absorption Spectrophotometer (Graphite Furnace Method)
Turbidity	-	*NTU	0.1	Absorption Method
Iron	3.5	mg/L	3.276	*ICP-OES
Total Chlorine	0.2	mg/L	0.09	DPD Tablet Method
Copper	0.5	mg/L	0.00	*ICP-OES
Bacterial Growth (Total Coliform)	400	*CFU/100ml	0	Compact Dry Plate
Bacterial Growth (Faecal Coliform)	-	*CFU/100ml	0	Compact Dry Plate
Fluoride	20	mg/L	0	SPADNS Method
Manganese	-	mg/L	0.712	*ICP-OES
Magnesium	-	mg/L	1.669	*ICP-OES
Total Hardness	-	mg/L as CaCO ₃	0	Unit Dose Vials Method
Color	-	*TCU	1	Platinum Cobalt Method
Electro conductivity	-	µmhos/cm	50	Ion selected Electrode Method

*TCU- True Color Unit, *1 MPN (Most Probably Number) = 1 CFU (Coliform Forming Unit)

*NTU- Nephelometric Turbidity Unit, Reference: National Environmental Quality (Emission) Guidelines

*ICP-OES- Inductively Coupled Plasma- Optical Emission Spectrometric Method

Tested by

Checked by

Signed by

OH
 OH (Lab)
 Daw Ohnmar Hla
 MLT- I

ayethinn
 Daw Aye Aye Thinn
 Laboratory Officer

Dr. Kay Khaing Aye
 Dr. Kay Khaing Aye
 Deputy Director
 Occupational and Environmental Health Division

OEH Laboratory Results- 2019/ Waste Water

Appendix 15: Water Test Result (Drain Water 2)



Occupational and Environmental Health Laboratory

No. (250), Lower Kyeemyindine Road, Ahlone Township, Yangon, Myanmar.
 Tel: +9567-431139, 431138, +951-221387, 210844,
 Fax: +9567-431139, +951-223824

Sample Name: Waste Water	Received Date: 10.7.2019
	Reported Date: 5.8.2019
	Reg no: 203/2019
Site Name: DW2 Drain Water Zore 3 လမ်းနှင့် ငါးဆူတောင် ဆောင်နှစ်ပင် ကားလမ်းထောင့် မြောင်းရေ	

Analyses	Ref: Value	Unit	Results	Method
pH	6-9	-	6.4	Ion Selected Electrode Method
BOD	30	mg O ₂ /L	8.2	5 Day BOD Test Method
COD	125	mg/L	12	Close Reflex Method
Total Dissolved Solid	-	mg/L	7	Ion selected Electrode Method
Nitrate	-	mg/L	0	Zinc Reduction Method
Mercury	0.01	mg/L	0.000	*ICP-OES
Arsenic	0.1	mg/L	0.016	Atomic Absorption Spectrophotometer (Graphite Furnace Method)
Oil and Grease	10	mg/L	2.76	Standard method
Phenol	0.5	mg/L	0.21	Aminoantipyrine Method
Sulphate	-	mg/L	3.0	Barium Chloride Method
Chloride	-	mg/L	1.2	Argentometric Method
Chromium	0.5	mg/L	0.058	*ICP-OES
Cadmium	0.1	mg/L	0.000	*ICP-OES
Lead	0.1	mg/L	0.0005	Atomic Absorption Spectrophotometer (Graphite Furnace Method)
Turbidity	-	*NTU	0.1	Absorption Method
Iron	3.5	mg/L	6.259	*ICP-OES
Total Chlorine	0.2	mg/L	0.16	DPD Tablet Method
Copper	0.5	mg/L	0.008	*ICP-OES
Bacterial Growth (Total Coliform)	400	*CFU/100ml	0	Compact Dry Plate
Bacterial Growth (Faecal Coliform)	-	*CFU/100ml	0	Compact Dry Plate
Fluoride	20	mg/L	0	SPADNS Method
Manganese	-	mg/L	0.184	*ICP-OES
Magnesium	-	mg/L	7.992	*ICP-OES
Total Hardness	-	mg/L as CaCO ₃	6	Unit Dose Vials Method
Color	-	*TCU	1	Platinum Cobalt Method
Electro conductivity	-	µmhos/cm	10	Ion selected Electrode Method

*TCU- True Color Unit , *1 MPN (Most Probably Number) = 1 CFU (Coliform Forming Unit)

*NTU- Nephelometric Turbidity Unit , Reference: National Environmental Quality (Emission) Guidelines

*ICP-OES- Inductively Coupled Plasma- Optical Emission Spectrometric Method

Tested by

omlt
 OH (Lab)
 Daw Ohnmar Hla
 MLT - J

Checked by

ayethi
 Daw Aye Aye Thinn
 Laboratory Officer

Signed by

[Signature]
 Dr. Kay Khaing Aye
 Deputy Director
 Occupational and Environmental Health Division

OEHD Laboratory Results- 2019/ Waste Water

Appendix 16: Water Test Result (Drain Water 3)



Occupational and Environmental Health Laboratory

No. (250), Lower Kyeemyindine Road, Ahlone Township, Yangon, Myanmar.

Tel: +9567-431139, 431138, +951-221387, 210844,

Fax: +9567-431139, +951-223824

Sample Name: Waste Water	Received Date: 11.7.2019
	Reported Date: 5.8.2019
	Reg no: 204/2019
Site Name: DW3 ငါးဆူတောင် ရွာကန်နယ်ပင် ကားလမ်းဘေး Project Area အနီး မြောင်းရေ	

Analyses	Ref. Value	Unit	Results	Method
pH	6-9	-	7.0	Ion Selected Electrode Method
BOD	30	mg O ₂ /L	2.2	5 Day BOD Test Method
COD	125	mg/L	6	Close Reflex Method
Total Dissolved Solid	-	mg/L	14	Ion selected Electrode Method
Nitrate	-	mg/L	0	Zinc Reduction Method
Mercury	0.01	mg/L	0.000	*ICP-OES
Arsenic	0.1	mg/L	0.015	Atomic Absorption Spectrophotometer (Graphite Furnace Method)
Oil and Grease	10	mg/L	1.23	Standard method
Phenol	0.5	mg/L	0.38	Aminantipyrine Method
Sulphate	-	mg/L	5.0	Barium Chloride Method
Chloride	-	mg/L	1.4	Argentometric Method
Chromium	0.5	mg/L	0.013	*ICP-OES
Cadmium	0.1	mg/L	0.000	*ICP-OES
Lead	0.1	mg/L	0.0001	Atomic Absorption Spectrophotometer (Graphite Furnace Method)
Turbidity	-	*NTU	1.0	Absorption Method
Iron	3.5	mg/L	10.96	*ICP-OES
Total Chlorine	0.2	mg/L	0.11	DPD Tablet Method
Copper	0.5	mg/L	0.000	*ICP-OES
Bacterial Growth (Total Coliform)	400	*CFU/100ml	10	Compact Dry Plate
Bacterial Growth (Faecal Coliform)	-	*CFU/100ml	2	Compact Dry Plate
Fluoride	20	mg/L	0	SPADNS Method
Manganese	-	mg/L	1.334	*ICP-OES
Magnesium	-	mg/L	8.008	*ICP-OES
Total Hardness	-	mg/L as CaCO ₃	11	Unit Dose Vials Method
Color	-	*TCU	5	Platinum Cobalt Method
Electro conductivity	-	µmhos/cm	20	Ion selected Electrode Method

*TCU- True Color Unit , *1 MPN (Most Probably Number) = 1 CFU (Coliform Forming Unit)

*NTU- Nephelometric Turbidity Unit , Reference: National Environmental Quality (Emission) Guidelines

*ICP-OES- Inductively Coupled Plasma- Optical Emission Spectrometric Method

Tested by

OH (Lab)
Daw Ohnmar Hla
MLT - I

Checked by

Daw Aye Aye Thinn
Daw Aye Aye Thinn
Laboratory Officer

Signed by

Dr. Kay Khaing Aye
Dr. Kay Khaing Aye
Deputy Director
Occupational and Environmental Health Division

OEHD Laboratory Results- 2019/ Waste Water

Appendix 17: Water Test Result (Drain Water 4)



Occupational and Environmental Health Laboratory

No. (250), Lower Kyeemyindine Road, Ahlone Township, Yangon, Myanmar.
 Tel: +9567-431139, 431138, +951-221387, 210844,
 Fax: +9567-431139, +951-223824

Sample Name: Waste Water	Received Date: 11.7.2019
	Reported Date: 5.8.2019
	Reg no: 205/2019
Site Name: DW4 ငရိုးရိပ်ဆည်ရေမြောင်း အနီး မြောင်းရေ	

Analyses	Ref: Value	Unit	Results	Method
pH	6-9	-	6.4	Ion Selected Electrode Method
BOD	30	mg O ₂ /L	24.4	5 Day BOD Test Method
COD	125	mg/L	14	Close Reflex Method
Total Dissolved Solid	-	mg/L	14	Ion selected Electrode Method
Nitrate	-	mg/L	0	Zinc Reduction Method
Mercury	0.01	mg/L	0.000	*ICP-OES
Arsenic	0.1	mg/L	0.012	Atomic Absorption Spectrophotometer (Graphite Furnace Method)
Oil and Grease	10	mg/L	0.59	Standard method
Phenol	0.5	mg/L	0.03	Aminoantipyrine Method
Sulphate	-	mg/L	0	Barium Chloride Method
Chloride	-	mg/L	0.7	Argentometric Method
Chromium	0.5	mg/L	0.000	*ICP-OES
Cadmium	0.1	mg/L	0.000	*ICP-OES
Lead	0.1	mg/L	0.0017	Atomic Absorption Spectrophotometer (Graphite Furnace Method)
Turbidity	-	*NTU	1.0	Absorption Method
Iron	3.5	mg/L	4.463	*ICP-OES
Total Chlorine	0.2	mg/L	0.08	DPD Tablet Method
Copper	0.5	mg/L	0.001	*ICP-OES
Bacterial Growth (Total Coliform)	400	*CFU/100ml	15	Compact Dry Plate
Bacterial Growth (Faecal Coliform)	-	*CFU/100ml	3	Compact Dry Plate
Fluoride	20	mg/L	0	SPADNS Method
Manganese	-	mg/L	0.546	*ICP-OES
Magnesium	-	mg/L	4.65	*ICP-OES
Total Hardness	-	mg/L as CaCO ₃	0	Unit Dose Vials Method
Color	-	*TCU	5	Platinum Cobalt Method
Electro conductivity	-	µmhos/cm	20	Ion selected Electrode Method

*TCU- True Color Unit , *1 MPN (Most Probably Number) = 1 CFU (Colliform Forming Unit)

*NTU- Nephelometric Turbidity Unit , Reference: National Environmental Quality (Emission) Guidelines

*ICP-OES- Inductively Coupled Plasma- Optical Emission Spectrometric Method

Tested by

omh
 OH (Lab)
 Daw Ohnmar Hla
 MLT - I

Checked by

ayethin
 Daw Aye Aye Thinn
 Laboratory Officer

Signed by

Dr. Kay Khaing Aye
 Dr. Kay Khaing Aye
 Deputy Director
 Occupational and Environmental Health Division

OEHD Laboratory Results- 2019/ Waste Water

Appendix 18: Water Test Result (Drinking Water)



Occupational and Environmental Health Laboratory

No. (250), Lower Kyeemyindine Road, Ahlone Township, Yangon, Myanmar.
 Tel: +9567-431139, 431138, +951-221387, 210844,
 Fax: +9567-431139, +951-223824

Sample Name: Drinking Water	Received Date: 10.4.2019
Address: Nyaung Hnitpin Industrial Complex Project, Hlegu Township.	Reported Date: 10.5.2019
Site Name: ပုဇွန်တောင်ချောင်း လက်ဝဲကျေးရွာအနီး	Reg no: 108/2019

Analyses	Ref: value	Units	Results	Method
Arsenic ✓	0.05	mg/L	0	Arsenator
Chloride ✓	250	mg/L	1.0	Argentometric Method
Color ✓	15	*TCU	5	Platinum Cobalt Method
Chlorine	4	mg/L	0.14	DPD Tablet Method
Copper ✓	2	mg/L	0.005	Inductively Coupled Plasma- Optical Emission Spectrometric Method
Fluoride ✓	1.5	mg/L	0.0	SPADNS Method
Hardness ✓	500	mg/L as CaCO ₃	68	Unit Dose Vials Method
Iron ✓	1	mg/L	0.09	Bipyridyl Method
Lead ✓	0.01	mg/L	0.000	Inductively Coupled Plasma- Optical Emission Spectrometric Method
Mercury ✓	0.001	mg/L	0.000	Inductively Coupled Plasma- Optical Emission Spectrometric Method
Magnesium ✓	150	mg/L	16.80	Inductively Coupled Plasma- Optical Emission Spectrometric Method
Nitrate ✓	50	mg/L	0.0	Zinc Reduction Method
pH ✓	6.5 – 8.5		7.9	Ion selected Electrode Method
Sulphate ✓	250	mg/L	3	Barium Chloride Method
Turbidity ✓	5	*NTU	1.0	Absorption Method
Total Dissolved Solid ✓	1000	mg/L	140	Ion selected Electrode Method
Zinc ✓	3	mg/L	1	Zincon Method
BOD ✓	-	mgO ₂ /L	58.1	5 Day BOD Test Method
COD ✓	-	mg/L	18.8	Close Reflex Method
Oil and Grease ✓	-	mg/L	2.62	Standard method
Electro conductivity ✓	-	μS/cm	200	Ion selected Electrode Method
Phosphate ✓	-	mg/L	2	Vanadomolybdophosphoric Acid Method

*TCU – True Color Units , *NTU- Nephelometric Turbidity Unit

Reference: National Drinking Water Quality Standard

Tested by

OH (Lab)
aw Ei Thwe Phy
MLT - G(II)

Checked by

[Signature]
Daw Aye Aye Thinn
 Laboratory Officer

Signed by

[Signature]
Dr. Kay Khaing Aye
 Deputy Director
 Occupational and Environmental Health Division

Appendix 19: Water Test Result (Drinking Water)



Occupational and Environmental Health Laboratory

No. (250), Lower Kyeemyindine Road, Ahlone Township, Yangon, Myanmar.

Tel: +9567-431139, 431138, +951-221387, 210844,

Fax: +9567-431139, +951-223824

Sample Name: Drinking Water	Received Date: 10.4.2019
Address: Nyaung Hnitpin Industrial Complex Project, Hlegu Towndhip.	Reported Date: 10.5.2019
Site Name: ကြာအင်းဆောင်း (၆)မိုင်(၂)စာလုံ ရန်ကုန်-မန္တလေး အမြန်လမ်းအနီး။	Reg no: 107/2019

Analyses	Ref: value	Units	Results	Method
Arsenic	0.05	mg/L	0	Arsenator
Chloride	250	mg/L	4.9	Argentometric Method
Color	15	*TCU	10	Platinum Cobalt Method
Chlorine	4	mg/L	0.07	DPD Tablet Method
Copper	2	mg/L	0.008	Inductively Coupled Plasma- Optical Emission Spectrometric Method
Fluoride	1.5	mg/L	0.0	SPADNS Method
Hardness	500	mg/L as CaCO ₃	57	Unit Dose Vials Method
Iron	1	mg/L	0.19	Bipyridyl Method
Lead	0.01	mg/L	0.000	Inductively Coupled Plasma- Optical Emission Spectrometric Method
Mercury	0.001	mg/L	0.000	Inductively Coupled Plasma- Optical Emission Spectrometric Method
Magnesium	150	mg/L	14.32	Inductively Coupled Plasma- Optical Emission Spectrometric Method
Nitrate	50	mg/L	0.0	Zinc Reduction Method
pH	6.5 – 8.5		7.2	Ion selected Electrode Method
Sulphate	250	mg/L	8	Barium Chloride Method
Turbidity	5	*NTU	0.1	Absorption Method
Total Dissolved Solid	1000	mg/L	196	Ion selected Electrode Method
Zinc	3	mg/L	2	Zincon Method
BOD	-	mgO ₂ /L	20.5	5 Day BOD Test Method
COD	-	mg/L	8.3	Close Reflex Method
Oil and Grease	-	mg/L	1.06	Standard method
Electro conductivity	-	µS/cm	280	Ion selected Electrode Method
Phosphate	-	mg/L	3	Vanadomoybdophosphoric Acid Method

*TCU – True Color Units, *NTU- Nephelometric Turbidity Unit

Reference: National Drinking Water Quality Standard

Tested by

Checked by

Signed by

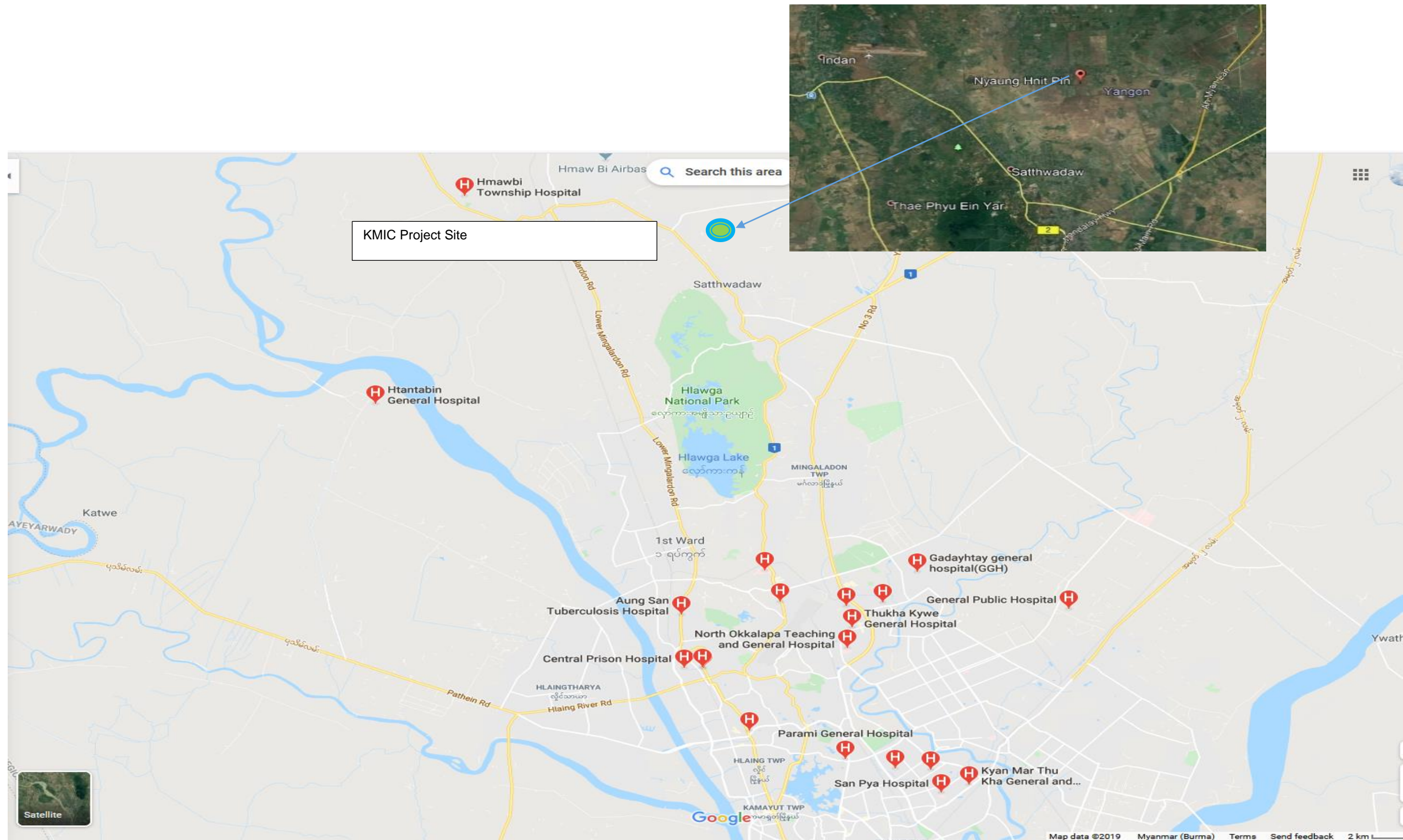
OH (Lab)
Daw Ei Tuno Phyo
MLT - GC(II)

Daw Aye Aye Thinn
Laboratory Officer

Dr. Kay Khaing Aye
Deputy Director
Occupational and Environmental Health Division

OEHD Laboratory Results- 2019/ Drinking Water (Nyaung Hnitpin)

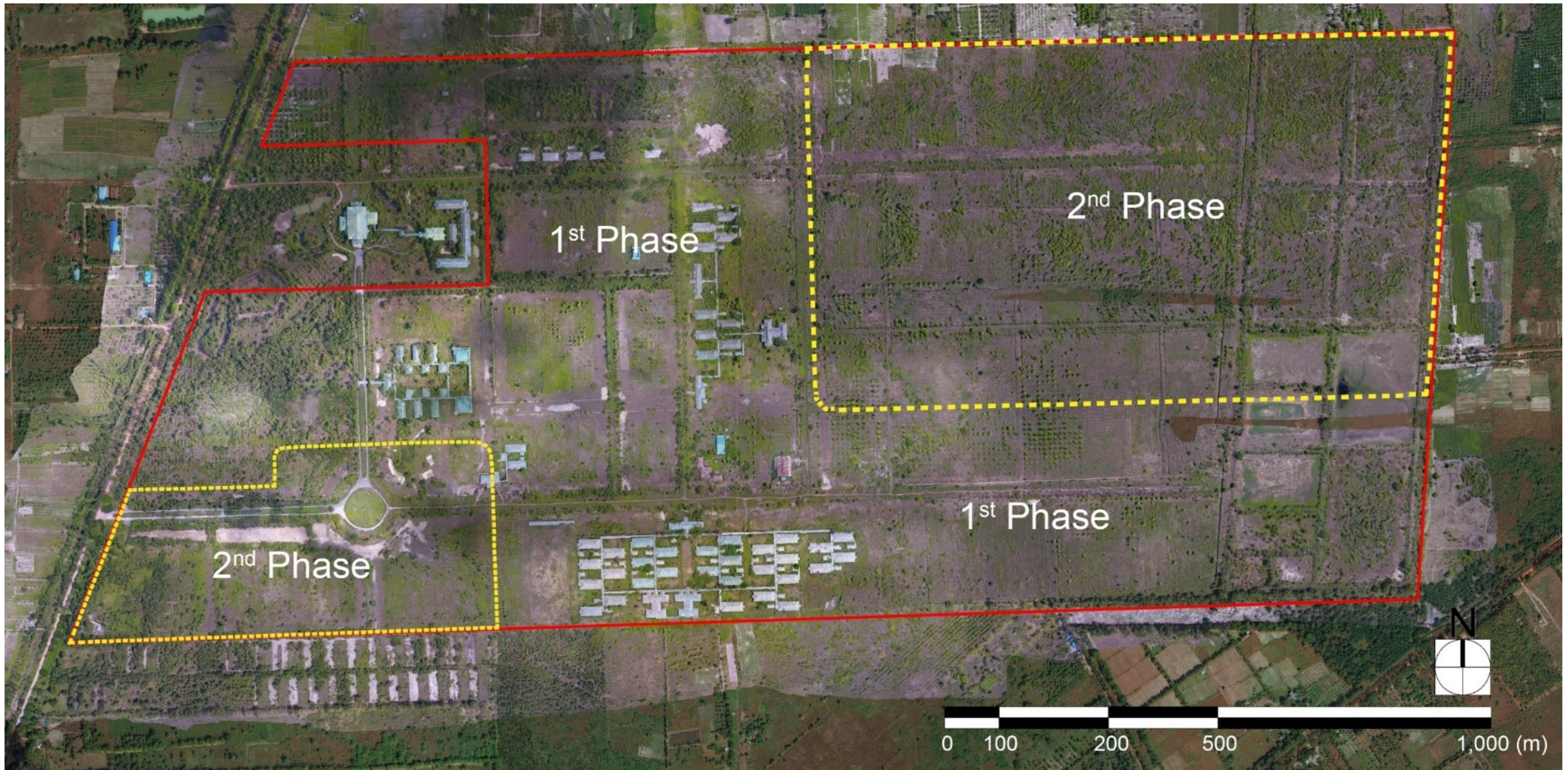
Appendix 20: Hospitals around Project Site



Appendix 22: Aerial Photo of Existing Project Site (taken by MSR Drone Team)



Appendix 23: Aerial Photo of Existing Project Site showing Project Phased Plots (taken by MSR Drone Team)



Appendix 24: Project Summary

Industrial Area	1,593,119	70.8
Residential Area	80,898	3.6
Villa	23,810	1.1
Commercial Area	10,987	0.5
Technopark (IT Park)	23,529	1.0
Gas Station	1,447	0.1
Public Facility Site	515,498	22.9
Road	258,588	11.4
Retention Canal	25,062	1.1
Park	82,928	3.7
Buffer Green Belt	94,506	4.2
Management Center	8,797	0.4
Public Support Facility	6,141	0.3
Substation	8,650	0.4
Wastewater Treatment Plant	19,749	0.9
Water Purification Plant	11,077	0.5

	Total	1st Phase	2nd Phase
Total	2,249,288	100.0	1,273,514
Industrial Area	1,593,119	70.8	876,708
Residential Area & Villa	104,708	4.7	-
Commercial Area	10,987	0.5	7,148
Other Facility Site	540,474	24.0	389,658

Master Plan

S = 1 : 8,000

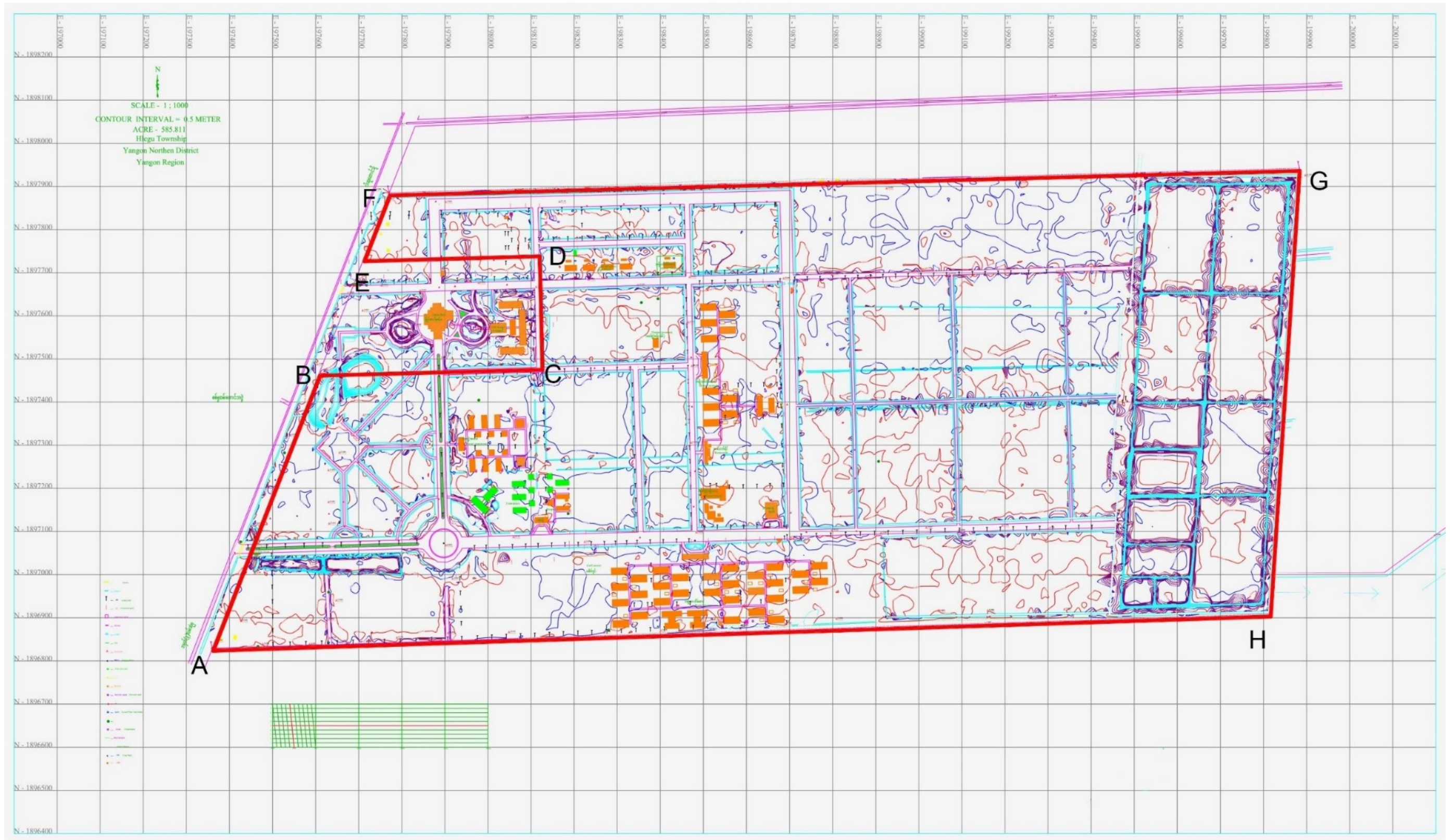
※ Exclusion site : 121,406 m²



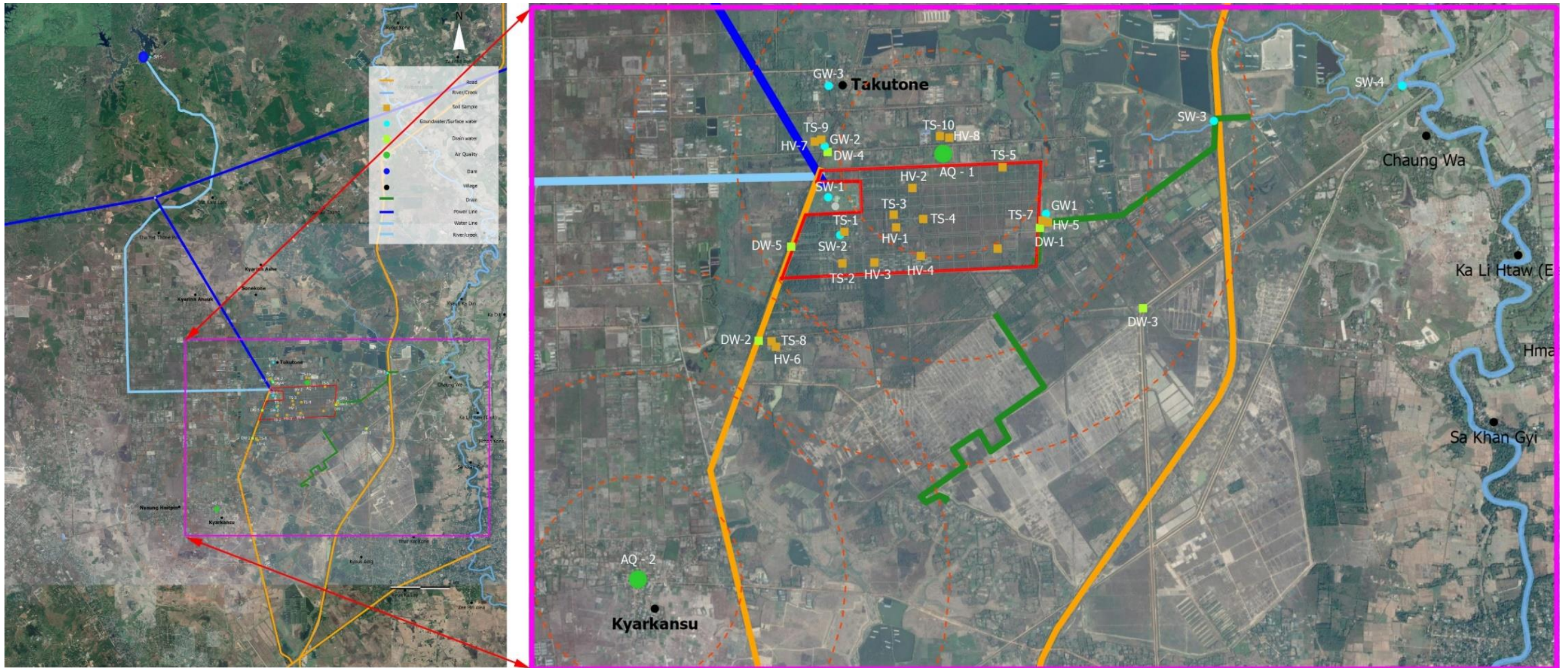
Appendix 25: Project Layout Plan (Artist Impression)



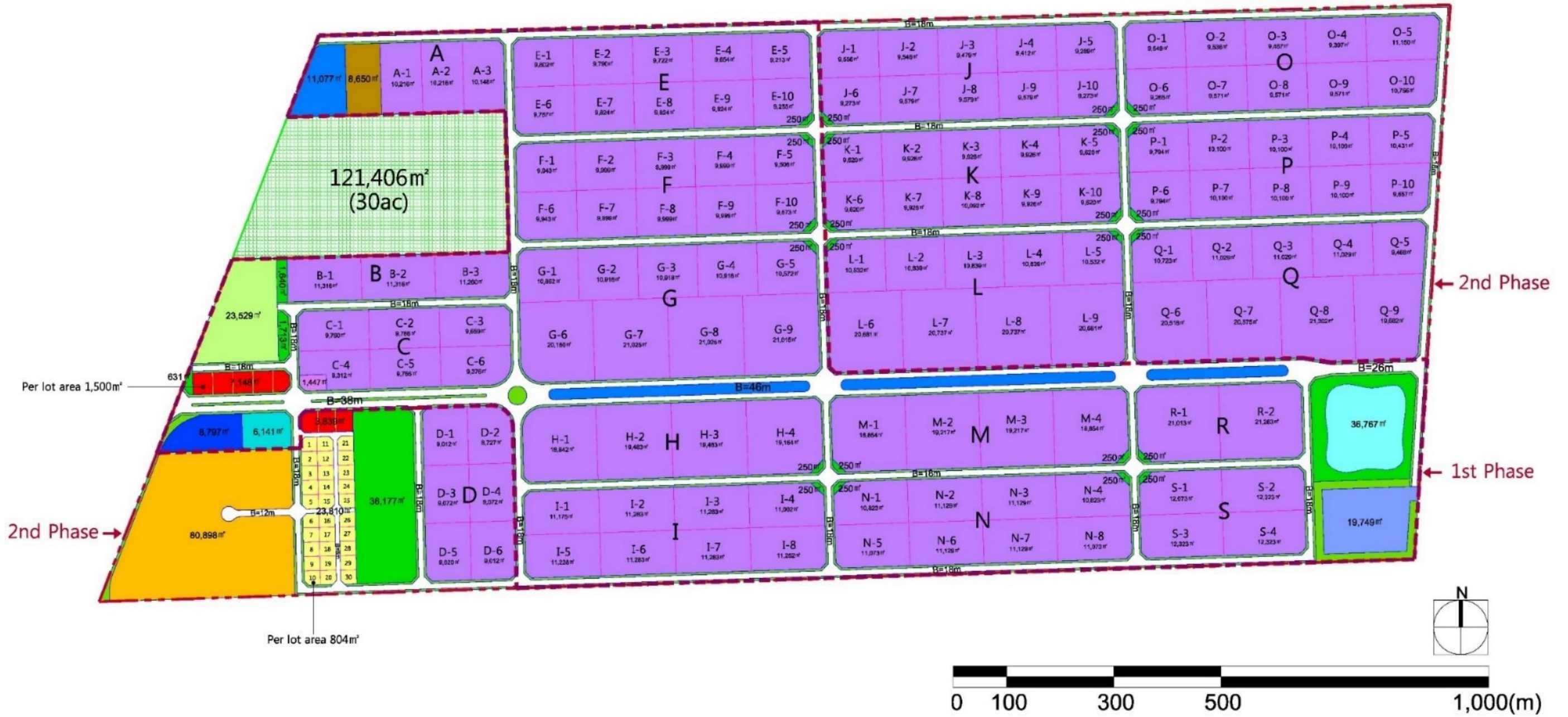
Appendix 26: Topographical Map of Project Site



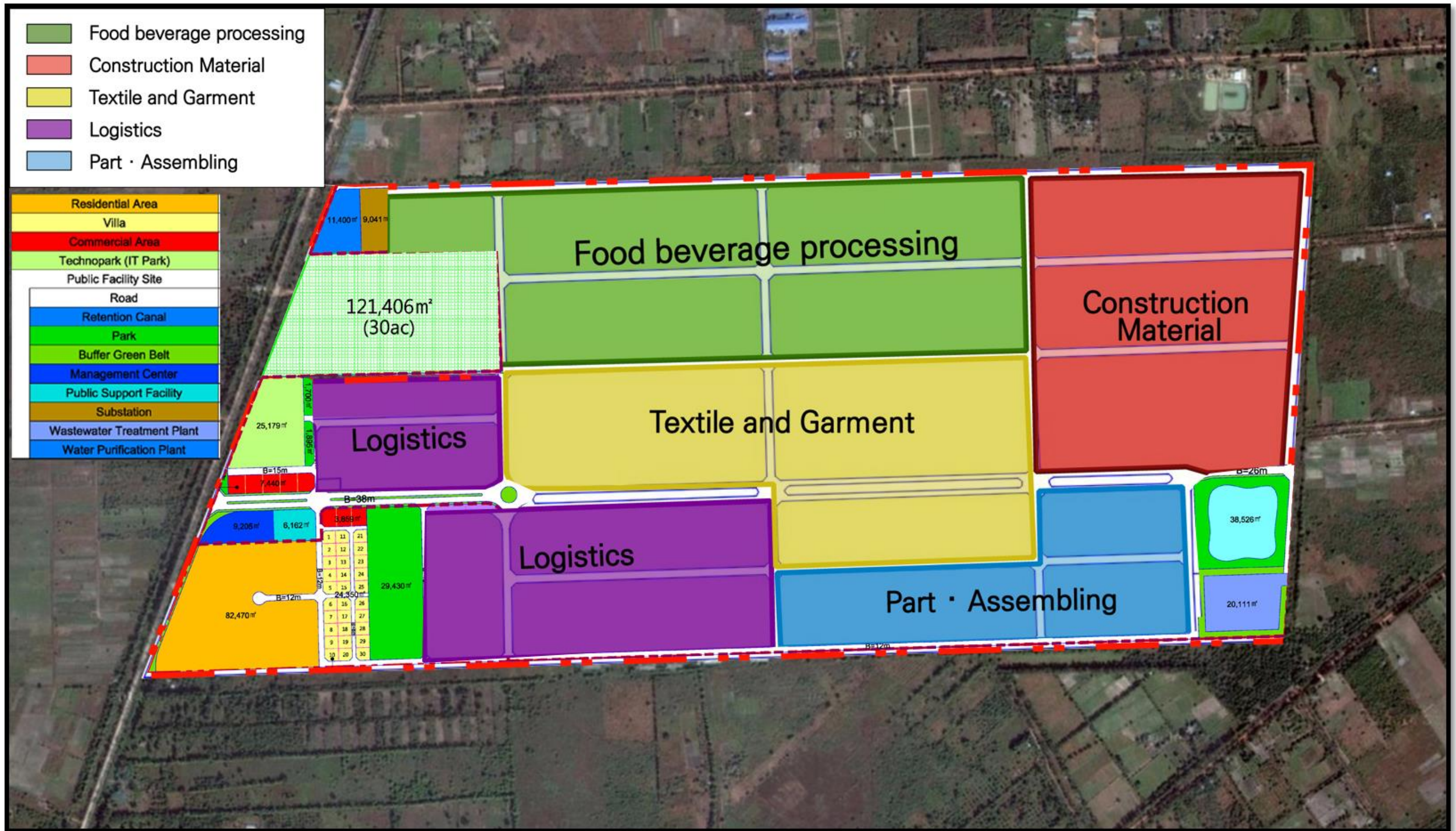
Appendix 27: Study Limit Map



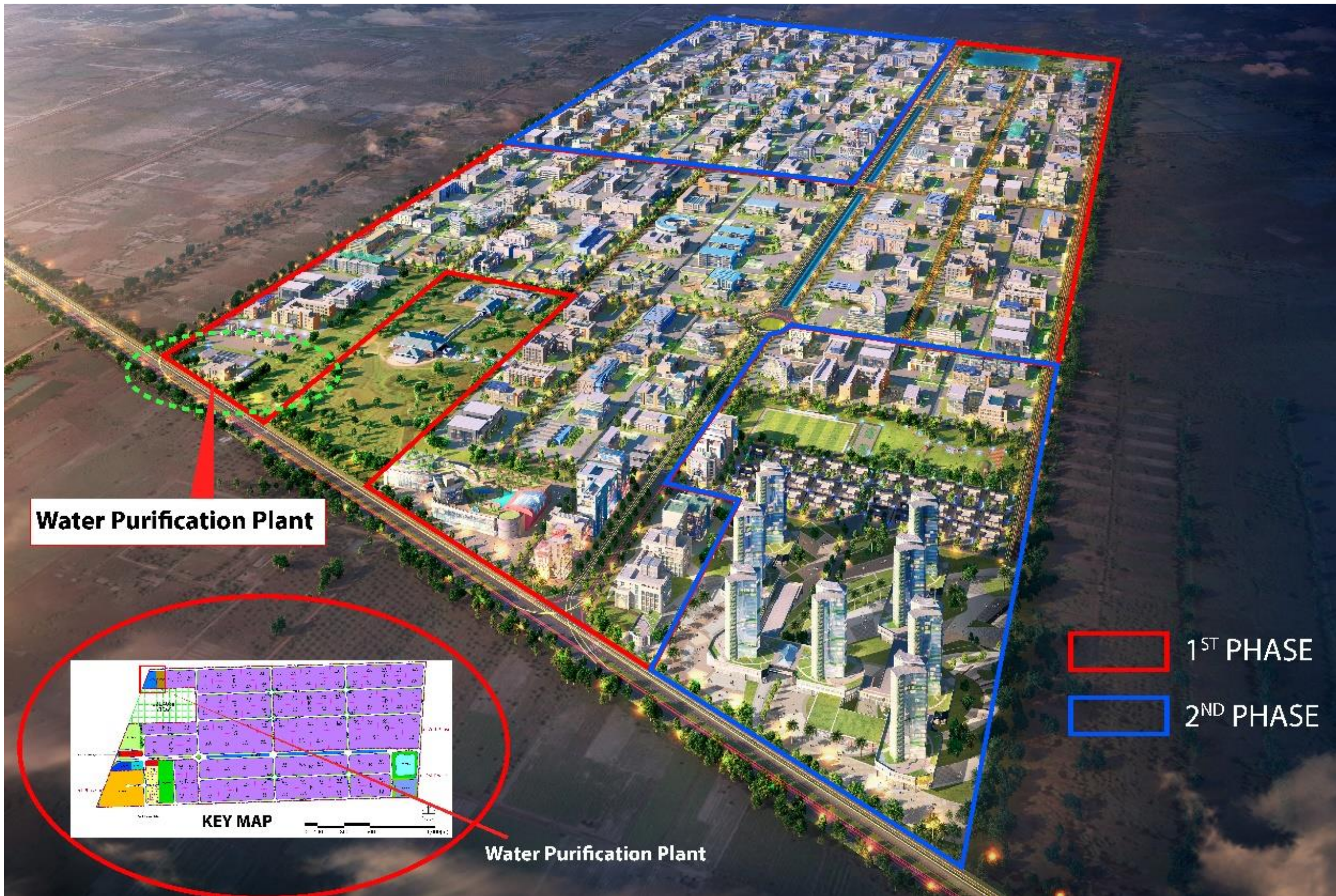
Appendix 28: Lot Layout and Land Use Plan Drawing



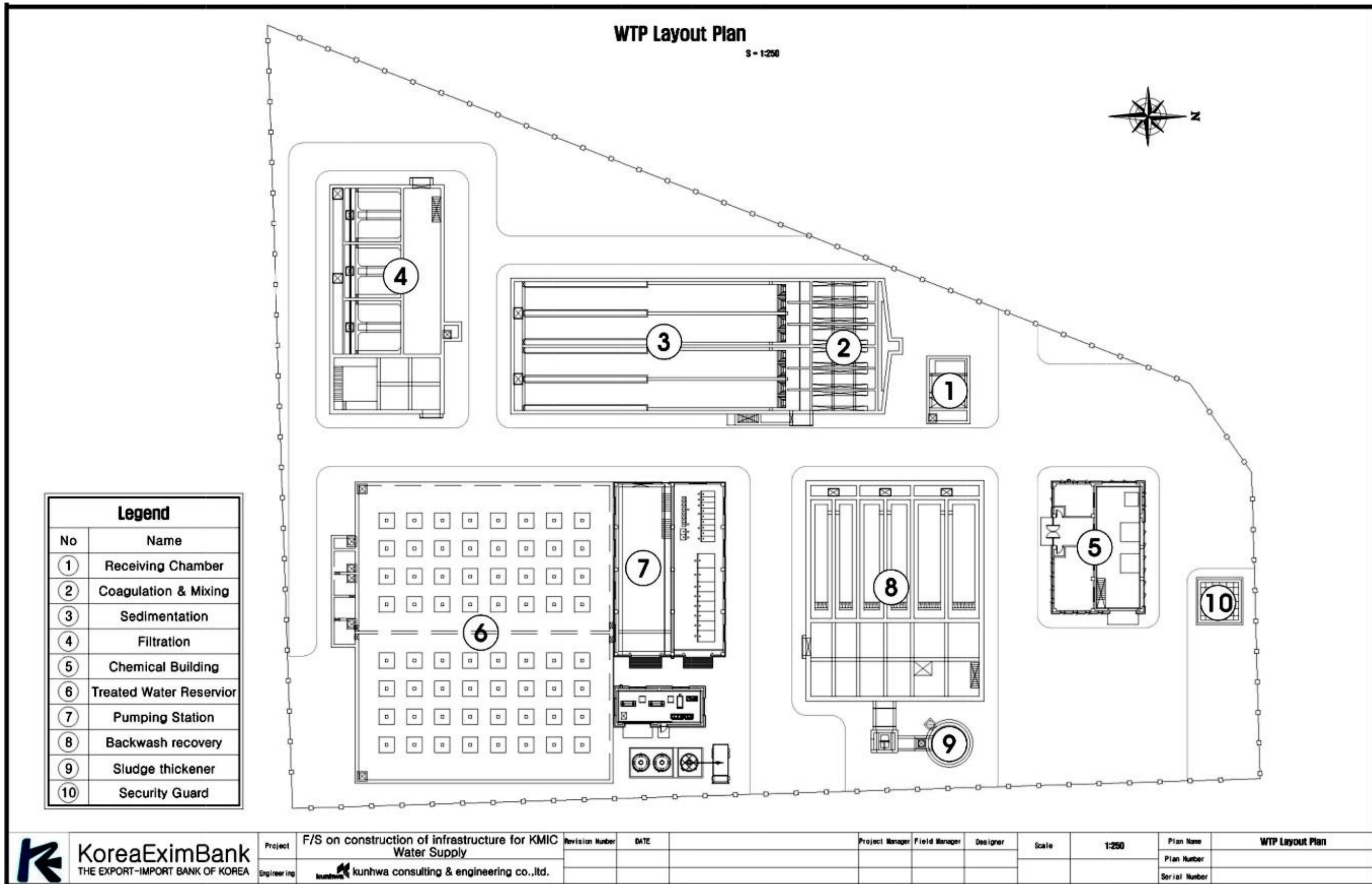
Appendix 29: Lot Layout and Land Use Plan showing proposed Factories and Facilities



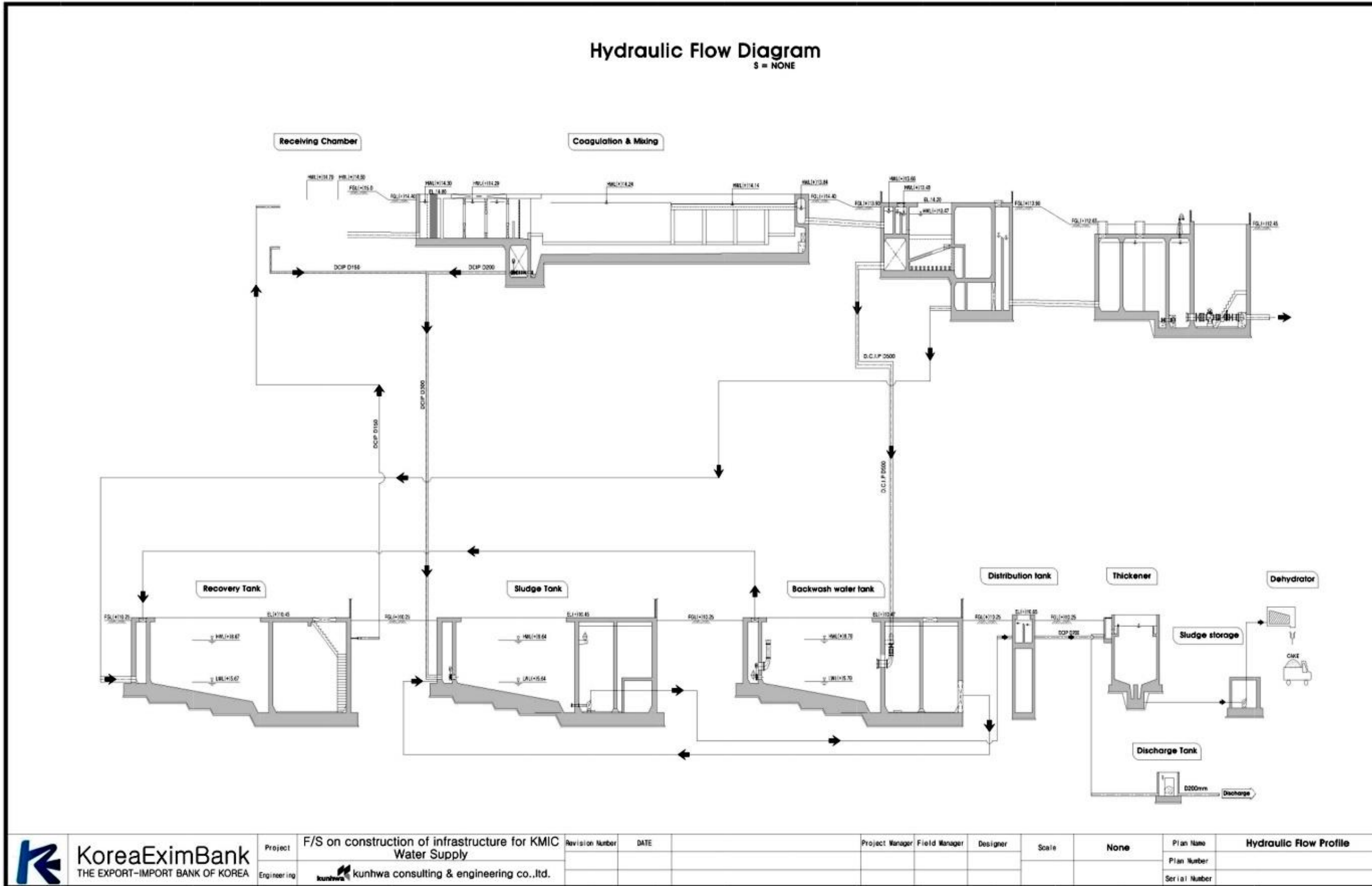
Appendix 32: Location Map of Water Purification Plant



Appendix 33: Water Purification Plant Layout Plan



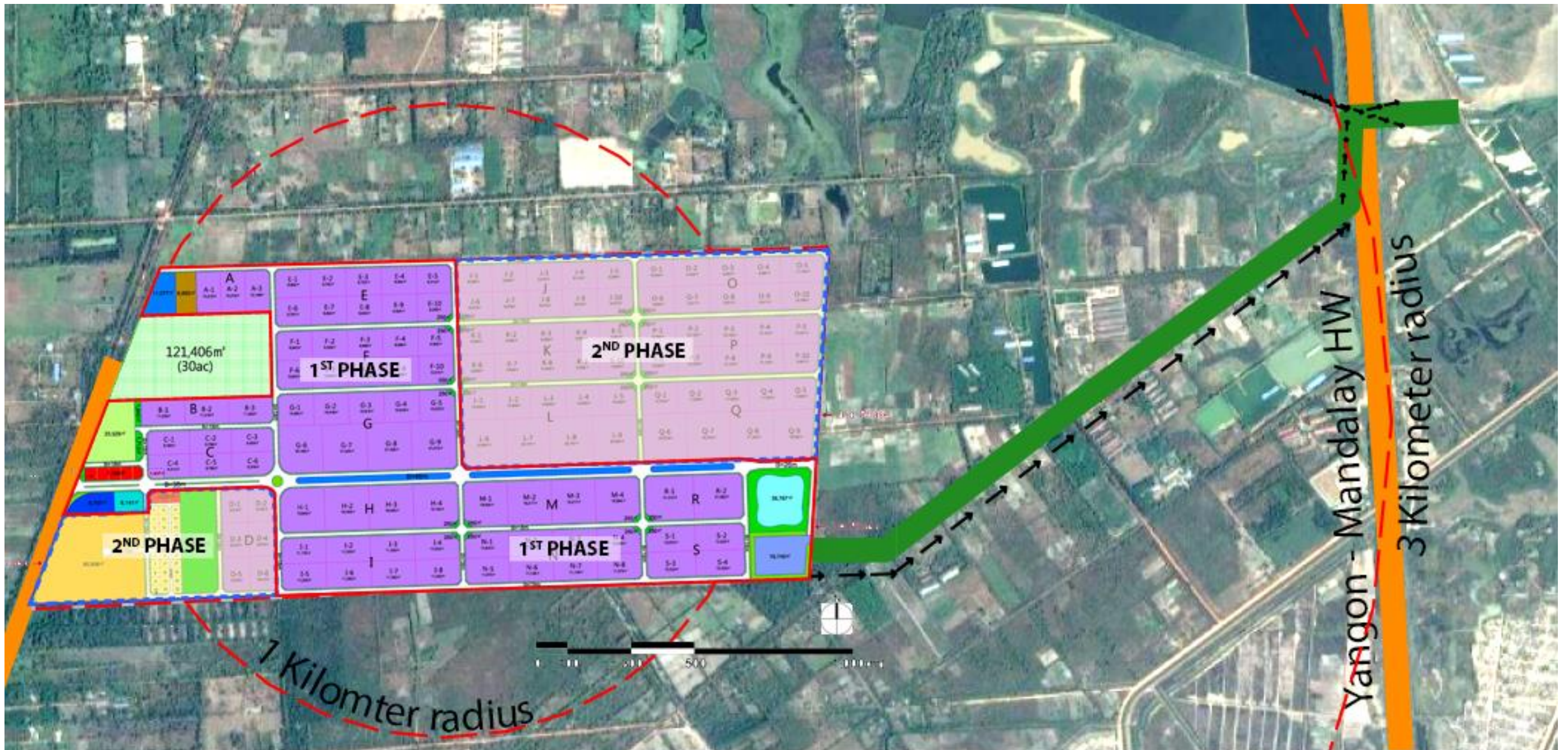
Appendix 34: Hydraulic Flow Diagram



Appendix 35: Wastewater Treatment Plant Location Map



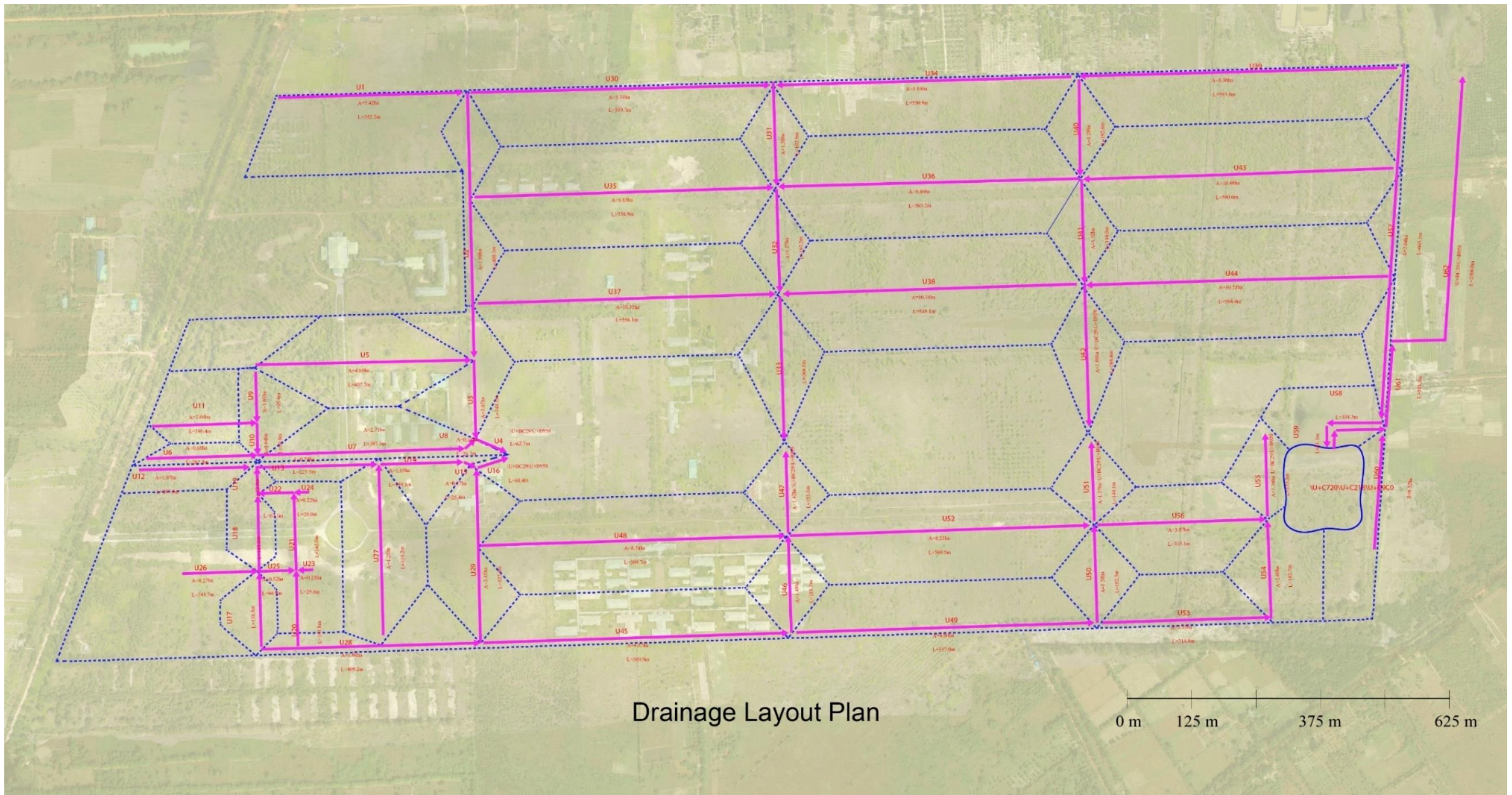
Appendix 36: Proposed Drainage



Appendix 37: Wastewater System Plan



Appendix 38: Drainage Layout Plan



Drainage Layout Plan

Appendix 39: Interviewees List and their Locations Map

