Environmental and Social Impact Assessment (EIA/SIA)

Phoni and Balar Islands Resort Project

by Amata International Co., Ltd

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Quality Information

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Revision History

Revision No	Revision date	Reason for Revision	Person Revised
00	07 Aug 2019	Original Release	Mr Syju Alias

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ABBREVIATIONS AND ACRONYMS	
°C	Degree Celsius
APHA	American Public Health Association
ASEAN	Association of South East Asian Nations
NH_3	Ammonia
BOD	Biological Oxygen demand
CDM	Clean Development Mechanism
CCTV	Closed Circuit Television
CPR	Cardiopulmonary Resuscitation
CO	Carbon Monoxide
CO_2	Carbon Dioxide
COD	Chemical Oxygen demand
CSR	Corporate Social Responsibility
CR	Critically Endangered
dB	Decibel
DD	Data Deficient
DICA	Directorate of Investment and Company Administration
DMH	Department of Meteorology and Hydrology
DO	Dissolved Oxygen
DPR	Detail Project report
Dr	Doctor
EAV	Exposure Action Value
ECD	Environmental conservation department
EIA/SIA	Environmental and Social Impact Assessment
EMP	Environmental management Plan
EN	Endangered
ELV	Exposure Limit Value
ESRS	Environmental and Social Review Summary
EVAC	Emergency Voice Alarm Communication system
EX	Extinct
EXW	Extinct in the wild
FAO	Food and Agricultural Organisation
FFI	Flora & Fauna International

HSF	Hanns Seidel Foundation
Ha	Hectare
ICUN	International Union for Conservation of Nature
IFC	International Finance Corporation
ILO	International Labour Organisation
IMO	International Maritime Organisation
IPCC	Inter-Governmental Panel on Climate Change
ISO	International Organisation for Standardisation
KBA	Key Biodiversity Area
km	Kilo Metre
Km/hr	Kilo Metre per hour
Km^2	Square Kilo Metre
KL	Kilo Litre
kV	Kilo Volt
kVA	Kilo Volt Ampere
kWhr	Kilo Watt hour
LDC	Least Developed Countries
m	Metre
m/s^2	Metre per square second
MEA	Ministry of External Affairs
MFA	Ministry of Foreign Affairs
Mg/Nm^3	Milli Gram per Normal cubic Metre
Mg/l	Milli gram per litre
MICS	Multiple Indicator Cluster survey
MJ	Mega Joule
ml	Milli litre
MWhr	Mega Watt Hour
MNPG	Myanmar National Power Grid
MOECAF	Ministry of Environmental Conservation & Forestry
MONREC	Ministry of Natural resources & Environmental Conservation
MOHT	Ministry of Hotel and Tourism
NA	Not Applicable
NDL	Not at Detectable level

NE	Not Evaluated
NRHM	National Rural Health Mission
NIO	National Institute of Oceanography
NOAA	National Oceanic and Atmospheric Administration
NRHM	National Rural Health Mission
NT	Near Threatened
NTU	Nephelometric Turbidity Unit
OHSAS	Occupational Health & Safety Accreditation Series
PHFI	Public Health Foundation of India
PM	Particulate Matter
PPE	Personal protective Equipment
ppm	Parts per million
SEZ	Special economic zones
SIA	Social Impact Assessment
SU	Standard Unit
tCO_2e	Tonne of carbon dioxide equivalent
TJ	Terra Joules
TSS	Total Suspended solids
UNDP	United Nations Development Program
UNFCCC	United Nations Framework Convention for Climate change
UNICEF	United Nations International Children's emergency Fund
US-EPA	United States Environmental Protection Agency
USCS	Unified soil classification system
USD	United States Dollars
UXO	Unexploded Ordinance
WHO	World Health Organisation
WMO	World Meteorological Organisation
WWF	World wildlife Fund

Executive Summary

အမတ အပြည်ပြည်ဆိုင်ရာ ကုမ္ပဏီလီမိတက်
ကျွန်းအခြေပြု ရေငုတ်အပန်းဖြေစခန်း တည်ဆောက်ရေးစီမံကိန်း
ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း EIA နှင့် ပတ်ဝန်းကျင် စီမံခန့်ခွဲမှု အစီအစဉ် EMP
တင်ပြခြင်း အစီရင်ခံစာ အကျဉ်းချုပ်

၁။ ပြည်ထောင်စုသမ္မတ မြန်မာနိုင်ငံတောင်ပိုင်း၊ တနင်္သာရီတိုင်းဒေသကြီး၊ ကော့သောင်းမြို့နယ် အတွင်းရှိဖိုးနီကျွန်းနှင့် ဘာလာကျွန်းတို့တွင် အမတအပြည်ပြည်ဆိုင်ရာ ကုမ္ပဏီလီမိတက် (Amata International Co.,Ltd.)သည် ကျွန်းအခြေပြု ရေငုတ်အပန်းဖြေစခန်း တည်ဆောက်ရေး စီမံကိန်း တည်ဆောက်အကောင်ထည်ဖော်ရန် စိစဉ်လျက်ရှိပါသည်။ စီမံကိန်း အတွက်ရွေးချယ် ထားသော လူနေထိုင်ခြင်းမရှိသည့် ကျွန်းနှစ်ကျွန်းသည် ပင်မကုန်းမြေ(အောင်ဘာကျေးရွာ)မှ ရေမိုင် ၁၅မိုင်ခန့် အကွာတွင်တည်ရှိပါသည်။ကျွန်းနှစ်ကျွန်း၏ကုန်းမြေဧရိယာစုစုပေါင်းမှာ (၇၀၀)ဧကဖြစ်ပြီးအပန်းဖြေ စခန်းအား ကျွန်းတစ်ကျွန်းစီပေါ်တွင် (၁၀)ဧကခန့်စီ နေရာယူ တည်ဆောက်သွားမည် ဖြစ်ပါသည်။ ဖိုးနီကျွန်းသည်(၅၃၀)ဧကကျယ်ဝန်းပြီးဘာလာကျွန်းသည်(၂၂၀)ဧကကျယ်ဝန်းကြပါသည်။ စီမံကိန်း တစ်ခုလုံး၏ ကုန်ကျစရိတ်မြန်မာကျပ်ငွေမှာ (၆၉၀၀)သန်းဖြစ်ပါသည်။ ဖိုးနီကျွန်းနှင့်ဘာလာကျွန်း တို့သည်(၁)ကီလိုမီတာခန့်ကွာဝေးပြီး အပန်းဖြေစခန်းများကို မျက်နှာချင်းဆိုင်တည်ဆောက်ထားပါ သည်။စီမံကိန်းတည်ဆောက်အကောင်ထည်ဖော်မည့် စီမံကိန်းအဆိုပြုသူအမတ အပြည်ပြည်ဆိုင်ရာ ကုမ္ပဏီလီမိတက်(Amata International Co.,Ltd,)သည် စီမံကိန်းတည်ဆောက်ချိန် နှင့် လုပ်ငန်း လည်ပတ်ချိန်များအတွက် ပတ်ဝန်းကျင်နှင့် လူမှုရေးဆိုင်ရာ ထိခိုက်မှုဆန်းစစ်ခြင်း (EIA/SIA) လုပ်ငန်းနှင့် ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှု အစီအစဉ်(EMP)ဖော်ထုတ်ခြင်း လုပ်ငန်းများ ဆောင်ရွက်ရန် အတွက် အတိုင်ပင်ခံကုမ္ပဏီတစ်ခုဖြစ်သော MyAsia Consulting Co.,Ltd. ထံ အပ်နှံဆောင်ရွက် စေခဲ့စေပါသည်။ MyAsia Consulting Co.,Ltd.သည် ပတ်ဝန်းကျင်နှင့် လူမှုရေးဆိုင်ရာ ထိခိုက်မှု ဆန်းစစ်ခြင်း လုပ်ငန်းဆောင်ရွက်ရန် နယ်ပယ်အတိုင်းအတာ သတ်မှတ်ခြင်းနှင့် ဆောင်ရွက်ရမည့် လုပ်ငန်းတာဝန်များကို ပြုစုခြင်း (Scoping Report and Terms of References)တင်ပြလွှာအား (၁၀-၄-၂၀၁၇) ရက်နေ့တွင် တင်ပြခဲ့ပြီးဖြစ်ပါ သည်။ ယခုအခါ တင်ပြပြီးဖြစ်သော Scoping Report နှင့်

Terrms of reference များအား စိစစ်တည်ပြုပြီးဖြစ်သဖြင့် ပတ်ဝန်းကျင်ထိခိုက်မှု ဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်းအခန်း(၅)အရ ယခုပတ်ဝန်းကျင်ထိခိုက်မှု ဆန်းစစ်ခြင်းEIA အစီရင်ခံစာ နှင့် ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှု အစီအစဉ် EMP အား တင်ပြရခြင်းဖြစ်ပါသည်။

၂။ မြန်မာနိုင်ငံတော် အစိုးရသည် ခရီးသွားလုပ်ငန်းအား အစိုးရ၏ စီးပွားရေးနှင့် လူမှုရေးဆိုင်ရာ ပြုပြင်ပြောင်းလဲမည့် ကွန်ယက်လုပ်ငန်းစဉ် Frame work for Economic and Social Reforms (FESR)၏ ဦးစားပေးလုပ်ငန်းအဖြစ် သတ်မှတ်ထားပြီး ကောင်းစွာစီမံခန့်ခွဲပြီး ဖွံ့ဖြိုးတိုးတက်လာပါက ကြီးမား သော စီးပွားရေး အခွင့်အလမ်းများကို ပေါ်ပေါက်စေမည်သာမက စီးပွားရေးနှင့် လူမှုရေးဟန်ချက်ညီညီ တိုးတက်နိုင်သည့်အတွက် ဖြစ်နိုင်ခြေ အလားအလာအရှိဆုံး မြန်မာနိုင်ငံ၏ အရေးအကြီးဆုံး ကဏ္ဍ တစ်ရပ်အဖြစ် သတ်မှတ်ထားပါသည်။ မြန်မာနိုင်ငံအစိုးရ၏ ကြိုတင်မျှော်တွေး လက်ဦးမှုရယူ ဆောင်ရွက်ထားမှုများကြောင့်လည်း ခရီးသွားကဏ္ဍသည် မြန်မာ့စီးပွားရေး ကဏ္ဍများစွာအနက် ကျယ်ပြန့်စွာ ဆောင်ရွက်ထားသော တာဝန်ယူမှု တာဝန်ခံမှုရှိပြီး၊ ရေရည်တည်တံ့ဆောင်ရွက်နိုင်သော လုပ်ငန်းဖြစ်စေနိုင်သည့် မူဝါဒများကို ချမှတ်ထားပြီး ကဏ္ဍတစ်ရပ်အဖြစ် ရပ်တည်လျက်ရှိနေပါသည်။

၃။ စီမံကိန်းအဆိုပြုသူ ကုမ္ပဏီသည် မြိတ်ကျွန်းစုနှင့် နီးကပ်နေသော လူနေထိုင်ခြင်း မရှိသေးသော သဘာဝအတိုင်းရှိနေသည့်ကျွန်းပျိုငယ်(၂)ခုအား သဘာဝအခြေခံ အပူပိုင်းဒေသ ကျွန်းအခြေပြု အပန်းဖြေစခန်းအဖြစ် တည်ဆောက်ရန်ရွေးချယ်ခဲ့ပါသည်။မြိတ်ကျွန်းစုအနီးတွင် အခန်း (၂၂၇)ခန်းပါဝင်သော ကျွန်းအခြေပြု အပန်းဖြေစခန်း (၂)ခု တည်ဆောက်ပြီး လုပ်ငန်းလှည်ပတ်ဆောင်ရွက်မည်ဖြစ်ပါသည်။ မြန်မာအစိုးရရင်းနှီးမြှုပ်နှံမှုနှင့် ကုမ္ပဏီများ ညွှန်ကြားမှုဦးစီးဌာန၏ ထုတ်ပြန်ချက်များ အရ လေ့လာဆဲအဆင့် စီမံကိန်းများကို ချန်လှန်ပါက နိုင်ငံခြားရင်းနှီးမြှုပ်နှံမှုစီမံကိန်း (၄)ခု အပါအဝင် စုစုပေါင်း ကျွန်းအခြေပြုအပန်းဖြေစခန်း စီမံကိန်း (၈)ခု ခွင့်ပြုထားပြီး ဖြစ်ကြောင်း သိရှိရပါသည်။ သို့သော်မည်သည့်ကျွန်းအခြေပြု အပန်းဖြေစခန်းစီမံကိန်းမှ ဆောက်လုပ်ရေးလုပ်ငန်းများ စတင်ခြင်း မရှိသေးကြောင်း တွေ့ရှိရပါသည်။

၄။ စီမံကိန်းဆောင်ရွက်မည့် ကျွန်းသည် ထိုင်းနိုင်ငံရှိ နတ်ဘုံနတ်နန်းတမျှ ကျော်ကြားလှသော အပူပိုင်းဒေသ ခရီးသွားလုပ်ငန်းတည်ရှိရာ ဖူးခက်အပန်းဖြေဧရိယာနှင့် နီးကပ်စွာတည်ရှိပြီး စီမံကိန်းအား စိတ်ကူးရေးဆွဲထားသည် စီမံချက်တွင် မြိတ်ကျွန်းစုအတွင်း အဆင့်မြင့် ခရီးသွားလုပ်ငန်းအဖြစ် ရပ်တည်ရန် ရည်ရွယ်ထားကြောင်း တွေ့ရှိရပေသည်။ ဒေသအတွင်း ခရီးသွားများဝင်ရောက်မှုကိုကြည့်ပါက ၂၀၁၂-ခုနှစ် တစ်နှစ်လုံးအတွက် ၁၁၅၈ ဦးသာဝင်ရောက်ခဲ့ရာမှ ၂၀၁၃-ခုနှစ်(မြန်မာ-ထိုင်းနယ်စပ်) ကော့သောင်းနှင့် ရေနောင်းနယ်စပ်ခရီးသွား ဝင်ထွက်မှု စည်းကမ်း များလျော့ပေါ့ပြုပြင် ပြောင်းလဲချိန်နောက်ပိုင်း တဖြေးဖြေးမြင့်တက်ခဲ့ရာ ၂၀၁၆ဇန္နဝါရီလမှ ဇွန်လအတွင်း ဧည့်သည် ဝင်ရောက်မှု(၁၄၆၇၃၆)ဦး ရှိလာခဲ့ကြောင်း တွေ့ရှိရပါသည်။ ထို့အပြင် မြန်မာနိုင်ငံအတွင်း နိုင်ငံခြား ခရီးသွားတစ်ဦး၏ ပျမ်းမျှနေ့စဉ် ငွေကြေးသုံးစွဲနှုန်းမှာ အမေရိကန်ဒေါ်လာ ၁၇၁ ဖြစ်ကြောင်းတွေ့ရှိရသော်လည်း စီမံကိန်းဒေသအတွင်း ကြုံတင်စီမံခန့်ထားသောခရီးစဉ်ဖြင့် လိုက်ပါလာသော ဧည့်သည် တစ်ဦး၏ ပျမ်းမျှနေ့စဉ် ငွေကြေးသုံးစွဲမှုမှာ အမေရိကန်ဒေါ်လာ ၄၇၈ နှင့် စဉ်းလုံးငှားခရီးစဉ်များ အတွက် အမေရိကန်ဒေါ်လာ ၅၆၄ သုံးစွဲကြကြောင်း တွေ့ရှိရပါသည်။

စီမံကိန်းတွင် သုံးစွဲမည့် သယံဇာတ ပမာဏတွက်ချက်ခြင်း

၅။ စီမံကိန်းတွင် ရေယာဉ်ဆိုက်ကပ်ရန် ဆိပ်ခံတံတား (၁)ခု၊ ဗိုးနိုကျွန်းတွင် တည်းခိုဆောင် (၂၀) နှင့် ဘာလာကျွန်းတွင် (၃၀)ခု စုစုပေါင်းတည်းခိုဆောင် (၅၀)၊ ရေငုပ် အပန်းဖြေစခန်း (Dive Centre)၊ ဝန်ထမ်းရိပ်သာများနှင့် ရုံးအဆောက်အဦးများဆောက်လုပ်မည်ဖြစ်ကြောင်း တွေ့ရှိရပါသည်။ အပန်းဖြေစခန်းအား တနှစ်တွင် ခရီးသွားဧည့်သည်များအတွက် ၈လ ခန့်ကာ ဝန်ဆောင်မှုပေး လည်ပတ်နိုင်ပါသည်။ အပန်းဖြေစခန်းတွင် ရေဆိုးများပြန်လည်သန့်စင်ရန် ရေသန့်စင်စက် (waste water treatment plant)နှင့် ရေသိုလှောင်ထိန်းသိမ်းနိုင်ရန် မိုးရေစုဆောင်း သိုလှောင်စနစ် (rain water harvesting system) များ ပါ တပ်ဆင်သွားမည်ဖြစ်ပါသည်။ အပန်းဖြေစခန်းအတွက် စွမ်းအင်ကို ဒီဇယ်ဆီသုံး မီးစက်များဖြင့် ရယူမည်ဖြစ်ပြီး အမြင့်ဆုံးတနှစ်ဒီဇယ်ဆီလိုအပ်ချက်မှာ

(၇၂၀၀၀)ဂါလံဖြစ်ပါသည်။အပန်းဖြေစခန်း၏စွမ်းအားပြည့်ဝန်ဆောင်မှုပေးချိန်တွင်နေ့စဉ်ရေလိုအပ်မှု ပမာဏမှာ(၁၆၀၀၀)ဂါလံ ဖြစ်ပါသည်။ အပန်းဖြေစခန်းတွင် ဆောက်ရေး လုပ်ငန်း ဆောင်ရွက်သည့် ကာလအတွင်း အလုပ်အကိုင် အခွင့်အလမ်း(၄၀)နေရာ၊ လုပ်ငန်းလည်ပတ်သည့် ကာလတွင် (၆၀) နေရာ ဒေသခံများအား အလုပ်ရရှိစေမည်ဖြစ်ပါသည်။

စိမံကိန်းဆိုင်ရာတင်ပြချက်

၆။ ကျွန်းတစ်ကျွန်းစီပေါ်တွင် villas စံအိမ်ပုံစံ အဆင့်မြင့်တည်းခိုဆောင်နှင့် လုံးချင်းတည်းခို ဆောင်များအား မြေ(၁၀)ဧကစီပေါ်တွင် တည်ဆောက်သွားမည်ဖြစ်ပါသည်။ ဘာလာကျွန်းပေါ်တွင် အဆင့်မြင့် villa ပုံတည်းခိုဆောင် (၂၀)လုံးနှင့် ဖိုးနီကျွန်းပေါ်တွင် ရိုးရိုးလုံးချင်းတည်းခိုဆောင် ၂၀ လုံး တည်ဆောက်သွားမည် ဖြစ်ပါသည်။ ကျွန်းတစ်ကျွန်းစီတွင် အမြဲတမ်းအသုံးပြုနိုင်သော ဆိပ်ခံ တံတား(၁)ခုစီ တည်ဆောက်ပါမည်။ ဘာလာကျွန်းရှိ ဆိပ်ခံတံတားမှာ (၁၅၃.၁၇) မီတာရှည်ပြီး ဖိုးနီကျွန်းပေါ်ရှိတံတားသည် မီတာ(၁၅၀)ရှည်မည်ဖြစ်ပါသည်။ကျွန်းနှစ်ခုလုံးတွင် ဧည့်ကြို ဆောင်နှင့် ဧည့်ခန်း lobby များပါရှိပါမည်။ အဆင့်မြင့် villa ၏ကြမ်းခင်းဧရိယာမှာ ၁၅၉၇.၁၆ စတုရန်းပေ ဖြစ်ပြီး ရိုးရိုးလုံးချင်းတည်းခိုဆောင်၏ ကြမ်းခင်းဧရိယာမှာ (၇၀၃.၄၁)စတုရန်း ပေရှိပါသည်။ ဘာလာကျွန်းပေါ်တွင် စုပေါင်းအသုံးနိုင်သော ရေကူးကန်တစ်ခု တည်ဆောက်မည်ဖြစ်ပြီး ဖိုးနီကျွန်း ပေါ်တွင်တည်းခိုဆောင်တိုင်းတွင်မူ(၁၆၁.၄၆)စတုရန်းပေရှိသော ရေကူးကန်များပါရှိပါမည်။အပန်းဖြေ စခန်းများအား မုတ်သုံမိုးရာသီနှင့် လွတ်ကင်းသောအချိန် တစ်နှစ်လျှင် (၈)လခန့် ဖွင့်လှစ်မည်ဖြစ်ပြီး ရာသီဥတုဆိုးဝါးသော ၄လတွင်ပိတ်ထားမည်ဖြစ်ပါသည်။

၇။ အဆင့်မြင့်တည်းခိုဆောင်နှင့် လုံးချင်းတည်းခိုဆောင်များအား ကျွန်းပေါ်တွင်ကြီးမားသော တည်ဆောက်ခြင်းနှင့်ကွန်ကရစ်ဖျော်ခြင်းများကိုရှောင်ရှားနိုင်ရန်အတွက်ကြိုတင်ပြုလုပ်ပြီး ဆက်စပ် တပ်ဆင်နိုင်သည့် အဆောက်အဦးမျိုး ဆောက်လုပ်သွားမည် ဖြစ်ပါသည်။ အဆောက်အဦးများ တည်ဆောက်မည့် နေရာများသည် အပင်ငယ်များနှင့် ချုံအချို့ကိုသာ ရှင်းလင်းရသော နေရာများ

ဖြစ်ပြီး အပင်ကြီးများ ခုတ်ယူဖယ်ရှားရန် မလိုကြောင်း တွေ့ရပါသည်။ စီမံကိန်းပိုင်ရှင်သည် တောအုပ်အတွင်းရှိ အပန်းဖြေစခန်းပုံစံ တည်ဆောက်ရန်ဆန္ဒရှိသဖြင့် သစ်တောများဖုံးအုပ်ခြင်းကို ဖယ်ရှားရန် မလိုကြောင်း တွေ့ရပါသည်။ ဝန်ထမ်းများနေထိုင်မည့် ဝန်ထမ်းဆောင်အား ဖိုးနီကျွန်း ပေါ်တွင် နေရာရွေးချယ်ထားပါသည်။ ကျွန်းနှစ်ကျွန်းပေါ်တွင် လျှပ်စစ်ဓာတ်အားရရှိရေးအတွက် ဒီဇယ်လျှပ်စစ်ဓာတ်အားပေး စက်များကို အသုံးပြုရပါမည်။ ဤအပန်းဖြေစခန်း စီမံကိန်းသည် တည်ဆောက်ရေး ကာလနှင့် လုပ်ငန်းလည်ပတ်ဆောင်ရွက်သည့်ကာလ နှစ်မျိုးလုံးတွင် ဒေသခံများ အတွက် အလုပ်အကိုင် အခွင့်အလမ်းများ ရရှိနိုင်စေနိုင်ပါ သည်။

၈။ အပန်းဖြေစခန်းတွင် ဧည့်သည်များအား ဝန်ဆောင်မှုပေးဖျော်ဖြေရန်၊ ရှုခင်းကြည့်နိုင်ရန်နှင့် ရေငုတ်ခြင်းများဆောင်ရွက်နိုင်ရန် ခရီးသည်တင်အမြန်ရေယာဉ် ၂ စီး၊ ရှုခင်းကြည့်ရေယာဉ် ၂ စီး၊ ရေငုတ်ယာဉ် ၃ စီး၊ Cabin boat ၃ စီးနှင့် Jet skis ၃ စီးရှိပါသည်။ ထို့အပြင် အလွယ်တကူ ပုံပြောင်းဆက်စပ်အသုံးပြုနိုင်သည့် ရေပေါ် ယာယီဆိပ်ခံ floating pontoon ၃စုံကိုလည်း တပ်ဆင်ရန် စီစဉ်ထားပါသည်။ အောက်စီဂျင်ပြန်လည်ဖြည့်တင်းရေးစက် (၃)လုံးနှင့် 10 KVA ဒီဇယ်သုံး ဓာတ်အားပေး စက်များကိုလည်း တပ်ဆင်အသုံးပြုမည်ဖြစ်ပါသည်။ Membrare Bioreactor (MBR)ကို ရေးဆိုးသန့်စင်စနစ်နှင့် ဆွေးမြေ့စေနိုင်သော အမှိုက်စွန့်ပစ်စနစ်များလည်း ပါဝင်ပါမည်။

၉။ စီမံကိန်းအားအပြည်ပြည်ဆိုင်ရာတွင်အသုံးပြုနေသောကျွန်းအခြေပြုသဘာဝအခြေခံခရီးသွား လုပ်ငန်းဆိုင်ရာ အမြင့်ဆုံး စံချိန်စံညွှန်းများအတိုင်း တည်ဆောက်လည်ပတ်သွားရန် ရည်ရွယ် ထားကြောင်း နှင့် ပတ်ဝန်းကျင်နှင့် သဟဇာတဖြစ်ရန်၊ အမြဲရှင်သန်တည်တံ့ လည်ပတ်နိုင်စေရန် ရည်ရွယ်ထားကြောင်းသိရပါသည်။ ထို့ကြောင့် စွမ်းအင်အသုံးပြုမှုဆိုင်ရာ အပြည်ပြည်ဆိုင်ရာ စံနှုန်း၊ အစားအစာ ဘေးကင်းလုံခြုံမှုစံနှုန်း Food Safety ISO-22000 ၊ လုပ်ငန်းခွင် ဘေးအန္တရာယ် ကင်းရှင်းရေး OHSASစံနှုန်းနှင့်အညီ ဆောင်ရွက်သွားမည်ဖြစ်ပါသည်။ စီမံကိန်း၏အခြေခံ စီမံကိန်း

ပုံစံရေးဆွဲစဉ်ကပင်အဆိုပါ စံချိန်စံနှုန်းများနှင့်ကိုက်ညီစေရန် ထည့်သွင်းစဉ်းစားတွက်ချက် ရေးဆွဲထားပါသည်။

စီမံကိန်းဆိုင်ရာ ရွေးချယ်မှုများနှင့် အစားထိုးပြောင်းလဲဆောင်ရွက်ခဲ့မှုများ

၁၀။ စီမံကိန်းပိုင်ရှင်သည် များစွာသော ရွေးချယ်မှုဆိုင်ရာ အမြင်များကို နည်းပညာဆိုင်ရာအမြင် စီးပွားရေးအမြင်၊ ပတ်ဝန်းကျင်ဆိုင်ရာအမြင်နှင့် ဘေးကင်းလုံခြုံမှုစသည့် ဖြစ်နိုင်ခြေလေ့လာဆန်းစစ် ချက်များပေါ်မူတည်၍ဆောင်ရွက်ခဲ့သည်။အဓိကအားဖြင့်ရွေးချယ်ခဲ့သောအချက်များမှာ အောက်ပါ အတိုင်းဖြစ်ပါသည်။

(က) **အပန်းဖြေတည်းခိုဆောင်အရေအတွက် ဆတ်မှတ်ခြင်း။** စိတ်ကူးရေးဆွဲသော အဆင့်၌ပင် စီမံကိန်းပိုင်ရှင်သည် ကျွန်း(၂)ကျွန်းလုံး၌ အဆင့်မြင့် villa စံအိမ်ပုံ အဆင့်မြင့်တည်းခိုဆောင်(၅၀)တည်ဆောက်ရန်လျာထားခဲ့ပါသည်။ သို့သော်အရင်း အမြစ်များ အသုံးပြုမှုကြောင့် ပတ်ဝန်းကျင်ထိခိုက်နိုင်မှုကိုလျော့ပါးသက်သာ စေရန် အတွက်တည်းခိုဆောင်များ အရေအတွက်ကို လျော့ချခဲ့ပါသည်။ နောက်ဆုံးတွင် ဘာလာကျွန်းပေါ်တွင် အဆင့်မြင့် villa ပုံတည်းခိုဆောင် ၂၀ လုံးနှင့် ဖိုးနီကျွန်းပေါ်တွင် လုံးချင်းတည်းခိုဆောင် (၃၀) တည်ဆောက်ရန်ဆုံးဖြတ်ခဲ့ပါသည်။

(ခ) **တည်းခိုဆောင်များနှင့်ဆိပ်ခံတံတားများ၏တည်နေရာရွေးချယ်ခြင်း။** တည်းခိုဆောင် များ နှင့် ဆိပ်ခံတံတားနေရာများကို ရှင်းလင်းပစ်ရမည့် သစ်ပင်များနှင့် အခြားအပင်များ ဖယ်ရှားရှင်းလင်းမှုနည်းနိုင်သမျှနည်းနိုင်ရန် ရည်ရွယ်၍ ရွေးချယ်ခဲ့ပါသည်။လက်ရှိရွေးချယ်ထားသော ဆိပ်ခံတံတားနေရာများမှမူ ရေအနက်ရရှိစေရန် ထပ်မံ၍ သောင်တူးလုပ်ငန်း ဆောင်ရွက်ခြင်းမှ ရှောင်ရှားနိုင်သည့် နေရာများအား ရွေးချယ်ခဲ့ပါသည်။ လက်ရှိရွေးချယ်ထားသော ဆိပ်ခံတံတားနေရာသည် မည်သည့် သောင်တူးခြင်းမျှ မလိုအပ်သည့်အပြင် သန္တာကျောက်တန်းများကိုလည်း မပျက်စီး

စေနိုင်ကြောင်းတွေ့ရပါသည်။ သစ်ပင်များ ဖယ်ရှားခြင်းကို ရှောင်ရှား နိုင်ရန်နှင့် အမြဲတမ်း ဆိပ်ခံတံတား တည်ဆောက်အသုံးပြုရန် စီမံကိန်းပိုင်ရှင်က သုံးသပ် ဆုံးဖြတ်ခဲ့ပြီး ကျွန်းနှစ်ကျွန်း၏ မျက်နှာချင်းဆိုင်နေရာများတွင် ရွေးချယ်ခဲ့ပါသည်။

(ဂ) **ဧည့်သည်များ၏ ဘေးကင်းလုံခြုံမှုအတွက် အမြဲတမ်းဆိပ်ခံ တံတား တည်ဆောက်ရန် ရွေးချယ်ခြင်း။** မူလစီမံချက်တွင် အမြဲတမ်းဆိပ်ခံတံတားအား ရေပေါ်ယာယီဆိပ်ခံ floaling Jettyအဖြစ်တည်ဆောက်ရန် လျာထားခဲ့သော်လည်း ရေပေါ်ဆိပ်ခံ တံတား ကို အသုံးပြုလေ့မရှိသော ဧည့်သည်များ၏ဘေးကင်းလုံခြုံမှုအတွက် စီမံကိန်းပိုင်ရှင် က ကျွန်းများ၏မျက်နှာချင်းဆိုင်တွင် အမြဲတမ်းဆိပ်ခံတံတားများ တည်ဆောက်ရန် ဆုံးဖြတ်ခဲ့ခြင်းဖြစ်ကြောင်း တွေ့ရှိရပါသည်။

(ဃ) **တည်ဆောက်ရေး နည်းပညာရွေးချယ်ခြင်း။** ကနဦးတွင် စီမံကိန်းပိုင်ရှင်သည် တည်ဆောက်ရေးလုပ်ငန်းအား သမရိုးကျ နည်းလမ်းဖြင့် တည်ဆောက်ရန် စီစဉ်သည်။သို့သော်သုံးသပ်မှုများပြုလုပ်ပြီးနောက်သမရိုးကျနည်းလမ်းဖြင့် တည်ဆောက်ခြင်းသည် ဖုံများထွက်ပေါ်လာခြင်း၊ မြေဆီလွှာ ပျက်စီးစေခြင်းများဖြစ်ပေါ် စေနိုင်ပြီး ကျွန်းအနီးရေပြင်အား ညစ်ညမ်းစေနိုင်ကြောင်း တွေ့ရှိခဲ့ပါသည်။ ယင်းက ပင်လယ်ရေပြင်ရှိ သန္တာများနှင့်သက်ရှိများကိုထိခိုက်စေနိုင်ပါသည်။ကျွန်းအခြေပြု အပန်းဖြေ စခန်းတစ်ခုအတွက်ရေပြင်သန့်ရှင်းကြည်လင်ခြင်း၊ရေနေသတ္တဝါများပြားခြင်းတို့သည် လာရောက်လည်ပတ်သောဧည့်သည်များကို ဆွဲဆောင်နိုင်ယုံသာမကရေငုတ်ဝါသနာ ရှင်များအတွက်ပါ မရှိမဖြစ် လိုအပ်သဖြင့် အသင့်တင်ဆက်ရန် ထုတ်လုပ်ထားပြီး နေရာတွင်ပင် ပြန်လည်တင်ဆက်နိုင်သည့် ဆောက်လုပ်ရေးစနစ်ကို အသုံးပြုရန် ဆုံးဖြတ်ခဲ့ပါသည်။ ထိုသို့တည်ဆောက်ရေး နည်းပညာကို ပြောင်းလဲခြင်းကြောင့်

အသံဆူညံမှု၊ လေထုညစ်ညမ်းမှု၊ မြေဆီလွှာ ယိုယွင်းပျက်ဆီးစေမှုနှင့် ပင်လယ်ရေ ညစ်ညမ်းခြင်းတို့မှ ရှောင်လွှဲနိုင်ခဲ့ပါသည်။

(c) **ရေဆိုးပျောက်ကွယ်စေရန် ရေပြန်လည်အသုံးပြုခြင်းနှင့် အမှိုက်များကို ဆွေးမြေ့စေခြင်း။** လုပ်ငန်းလည်ပတ်စဉ် ကာလတွင် ရေချိုအသုံးပြုမှု များပြား သဖြင့် ဘေးပတ်ဝန်းကျင်ရှိ ကျေးရွာများအတွက်ပါ ရေရှားပါးမှုကြုံတွေ့ရနိုင်ပါ သည်။ မူလစီမံချက်တွင် စီမံကိန်းပိုင်ရှင်သည် ထွက်ရှိလာသော ရေဆိုးများကို သတ်မှတ် စံချိန်စံညွှန်းအတိုင်း သန့်စင်၍ ပင်လယ်အတွင်း စွန့်ပစ်ရန် စီစဉ်ခဲ့ပါ သည်။ သို့သော်လည်း စွန့်ပစ်ရည်လုံးဝမထွက်ရှိစေရန်အတွက် Membrane Bioreactor MBR စနစ်သုံးရေဆိုးသန့်စင်စက်များ အသုံးပြု၍ ထွက်ရှိလာသော ရေများ ပြန်လည် အသုံးပြုနိုင်ရန် စီစဉ်ခဲ့ပါသည်။ ထိုသို့ဆောင်ရွက်ခြင်းကြောင့် ရေဆိုးစွန့်ပစ်မှုကို ရှောင်ရှားနိုင်ယုံသာမက မြေအောက်ရေသုံးစွဲမှုကို လျော့ကျစေပါ လိမ့်မည်။ Organic စွန့်ပစ်ပစ္စည်းများကို ပုတ်သိုးဆွေးမြေ့စေပြီး၊ Inorganic စွန့်ပစ်ပစ္စည်း များကို မီးရှို့ဖျက်ဆီးကာ အမှုန့်ပြုလုပ်စွန့်ပစ်ရန်စီစဉ်ခဲ့ပါသည်။

စီမံကိန်းဆိုင်ရာချဥ်းကပ်ခြင်းနှင့် ပြည်သူလူထုပူးပေါင်းပါဝင်ဆွေးနွေးခြင်း

၁၁။ စီမံကိန်းဆောင်ရွက်မည့်ကျွန်းများသည် လမ်ပိအမျိုးသား အဏ္ဏဝါဥယျာဉ်၏တောင်ဘက် (၁၂) ကီလိုမီတာအကွာတွင် တည်ရှိသည်။ စီမံကိန်းကြောင့် သက်ရောက်မှုရှိသောကျေးရွာများမှာ ညောင်ဝိကျွန်းပေါ်ရှိ ညောင်ဝိကျေးရွာ၊ လမ်ပိအဏ္ဏဝါဥယျာဉ်ရှိ မဂျုဂလက်ကျေးရွာနှင့် ကမ်းခြေရှိ အောင်ဘာကျေးရွာတို့ဖြစ်ပါသည်။ ၎င်းကျေးရွာများသည် စူဇယ်ဘာကိုင်းကျေးရွာအုပ်စုအတွင်း တည်ရှိကြပါသည်။ အဆိုပါကျေးရွာများတွင် ဆလုံလူမျိုးများနေထိုင်ကြပြီး ၎င်းတို့အား Sea Gypsy ပင်လယ်ပျော်များဟုခေါ်ကြပြီး အမျိုးအနွယ်ပျောက်ကွယ်နိုင်ခြေမြင့်မားသည့် လူနေစုတိုင်းရင်းသား မျိုးနွယ်စုများ ဖြစ်ကြပါသည်။ ကျွန်းအခြေပြုအပန်းဖြေစခန်းများ တိုးချဲ့လာမှုက ၎င်းတို့၏ ရပ်တည် ရှင်သန်မှုကို ထိခိုက်နိုင်ပါသည်။

၁၂။ စီမံကိန်းပိုင်ရှင်သည် စိတ်ကူးရေးဆွဲပုံဖော်ဆဲ ကာလကပင် စီမံကိန်းဆိုင်ရာ အကြောင်းအရာ များအား သက်ဆိုင်ရာအစိုးရ၊ ဒေသအာဏာပိုင်နှင့် ဒေသခံပုဂ္ဂိုလ်များအား ရှင်းလင်းချပြခဲ့ပါသည်။ လက်ဦးမှုရယူ၍ စီမံကိန်းဆိုင်ရာ စာရင်းအချက်အလက်များအား စာ/နယ်/ဇင်းများ တွင် ထည့်သွင်းခြင်း Social Media platform နှင့် Website များတွင် ကြေငြာခြင်းများ ပြုလုပ် ခဲ့ပါသည်။

၁၃။ စီမံကိန်းအား ပတ်ဝန်းကျင်ထိခိုက်မှု လေ့လာဆန်းစစ်မည့် ပညာရှင်အဖွဲ့သည် စီမံကိန်း နေရာနှင့်ပတ်ဝန်းကျင်ရှိ မြိတ်ကျွန်းစု အဏ္ဏဝါဥယျဉ်များသို့ ၂၀၁၇ ခုနှစ် ဇန်နဝါရီလအတွင်း သွားရောက်ကွင်းဆင်းခဲ့ပါသည်။ စီမံကိန်းနေရာနှင့် အနီးပတ်ဝန်းကျင်ကျေးရွာများသို့ အကြိမ်ကြိမ် သွားရောက် စစ်တန်းကောက်လေ့လာခဲ့ပါသည်။ စီမံကိန်းကြောင့် သက်ရောက်မှုရှိနိုင်သည့် ဇရိယာ အတွင်း ကော့သောင်းခရိုင်၊ ကော့သောင်းမြို့နယ် စူငယ်ဘာလိုင်းကျေးရွာအုပ်စုအတွင်းရှိ ဖိုးနီနှင့် ဘာလာကျွန်းများမှ သံလိုက်အိမ်မြောင် လက်ဝဲရစ်အတိုင်းတည်ရှိနေသော ကျေးရွာများပါဝင်ပါ သည်။

၁၄။ ၂၀၁၇ ခုနှစ်တွင်၊ ဖေဖော်ဝါရီလ၊ မေလနှင့် အောက်တိုဘာလများတွင်လည်းကောင်း၊ ၂၀၁၈ ခုနှစ် မတ်လတွင်၎င်း ပြည်သူလူထုထံ အသိပေး ပူးပေါင်းဆွေးနွေးခြင်း အခမ်းအနားများကို ကော့သောင်းမြို့၊ကော့သောင်းဟိုတယ်နှင့် မင်္ဂလာဂါးဒင်းဟိုတယ်များတွင်ကျင်းပခဲ့ရာဒေသအတွင်းမှ လွှတ်တော်ကိုယ်စားလှယ်များ၊ နိုင်ငံရေးပါတီအသီးသီးမှ ကိုယ်စားလှယ်များ၊ သက်ရောက်မှု ခံရသော ကျေးရွာနေဒေသခံပြည်သူများ၊ဆလုံမျိုးနွယ်စု ကိုယ်စားလှယ်များ၊ ဒေသအတွင်းရှိ အစိုးရ မဟုတ်သော အဖွဲ့အစည်းများ၊ ဟိုတယ်နှင့်ခရီးသွားလုပ်ငန်း၊ ပြည်တွင်းရေကြောင်း၊ ငါးလုပ်ငန်း ဦးစီး၊သစ်တော၊စိုက်ပျိုးရေးစသည့်လုပ်ငန်းများနှင့်ဆက်စပ်နေသောဌာနဆိုင်ရာကိုယ်စားလှယ်များ တက်ရောက်ပါဝင် ဆွေးနွေးမေးမြန်းခဲ့ကြပါသည်။ အထူးသဖြင့် ကျွန်းအခြေပြု ခရီးသွားလုပ်ငန်း စီမံကိန်းနှင့်တိုက်ရိုက်ထိတွေ့ဆက်စပ်နေသော ညောင်ဝိကျေးရွာ၊မဂျုံဂလက်ကျေးရွာနှင့်အောင်ဘာ

ကျေးရွာမှကျေးရွာကိုယ်စားလှယ်များက ၎င်းတို့၏လူနေမှုဘဝအပေါ်ထိခိုက်လာနိုင်မည့် အခြေအနေများကို မေးမြန်းဆွေးနွေးခဲ့ကြပါသည်။

၁၅။ ကျေးရွာနေဒေသခံများ၏ အဓိကသိလိုသောကိစ္စမှာ စီမံကိန်းများ လည်ပတ်ဆောင်ရွက်ချိန်တွင် စီမံကိန်းရှိနေသောကျွန်းများပေါ်သို့ တက်ရောက်သွားလာခွင့် ဆုံးရှုံးနိုင်မည့်လားဟူသောကိစ္စဖြစ်ပါသည်။ ပုံမှန်အားဖြင့် ကျေးရွာနေဒေသခံပြည်သူများသည် ကျွန်းများပေါ်တက်ရောက်၍ ရေချိုရယူခြင်း၊ ငါးဖမ်းသမားများ ငါးဖမ်းပြီးချိန်များတွင် တက်ရောက်နားယူခြင်းများ ပြုလုပ်လေ့ရှိကြပါသည်။ အထူးသဖြင့် ကုမ္ပဏီလုံခြုံရေးဝန်ထမ်းများက ဧည့်သည်များအနှောက်အယှက်မဖြစ်စေရန် ၎င်းတို့အားမောင်းထုတ်ဖယ်ရှားမည့်အခြေအနေကို စိုးရိမ်နေခဲ့ခြင်းဖြစ်ပါသည်။

၁၆။ ဒေသခံများစိုးရိမ်နေသော အချက်တစ်ချက်မှာကျွန်းပေါ်တွင် လူများရောက်ရှိလာမှုကြောင့် ရေဆိုးနှင့်အမှိုက်များစွန့်ပစ်မှုဖြစ်ပေါ်လာပြီး ၎င်းတို့ကြောင့်သန္တာကောင်များ၊ ငါးများနှင့်အခြား ရေနေသတ္တဝါများကို ထိခိုက်စေကာ တံငါသည်မိသားစုများ၏ နေ့စဉ်စားဝတ်နေရေးနှင့် လူနေမှု ဘဝကို ထိခိုက်နိုင်မည်လားဟူသည့်အချက်ဖြစ်ပါသည်။ အပန်းဖြေစခန်းက ကျွန်းပေါ်ရှိ ရေချိုများကို သုံးစွဲခြင်ဖြင့် ဒေသခံများအတွက်မြေအောက်ရေဆိုးရှားပါးမှုဖြစ်ပေါ်နိုင်ခြင်းမျိုးလည်း ပါဝင်ပါသည်။

၁၇။ စီမံကိန်းအကောင်အထည်ဖော်သည့် Amata International Co.., Ltd. မှ ကျွန်းပေါ်ရှိ တည်ဆောက်ရေး လုပ်ငန်းများကို သေးငယ်သော ဇရိယာ(၁၀)ဧကပေါ်တွင်သာ ဆောက်လုပ်ထားခြင်းဖြစ်ပြီး ကျွန်းအခြားနေရာများတွင်နေရာယူထားခြင်မရှိကြောင်း ဆွေးနွေးပွဲတွင် ပြောကြားခဲ့ပါသည်။ ထို့အပြင် ကျွန်းပေါ်သို့ တက်ရောက်၍ ရေချိုရယူသော ကျေးရွာဒေသခံများနှင့် ငါးဖမ်းသမားများအားမည်သည့်ကန့်သတ်ချက်မျိုးကိုမျှ ဆောင်ရွက်ခြင်းမပြုမည်ဖြစ်ကြောင်း သဘောတူခဲ့ပါသည်။ထို့အပြင်စီမံကိန်းတည်ဆောက်ချိန်တွင်၎င်းလုပ်ငန်းများ လည်ပတ်လုပ်ကိုင်သော အခြေအနေတွင်၎င်းဒေသခံများအတွက်အလုပ်အကိုင်အခွင့်အလမ်းများ ဖေါ်ဆောင်ပေးမည်ဖြစ်ကြောင်း သဘောတူခဲ့ပါသည်။ ဟိုတယ်လုပ်ငန်းနှင့် အသုံးဝင်မည့် အသက်မွေးမှုသင်တန်းများကိုလည်း လုပ်ငန်းခွင်

မဝင်မှိကြိုတင်ဖွင့်လှစ်သင်ကြားပေးမည်ဖြစ်ကြောင်းလည်းစီမံကိန်းအကောင်အထည်ဖော်မည့်ကုမ္ပဏီ တာဝန်ရှိသူများက သဘောတူကမ်းလှမ်းခဲ့ပါသည်။

၁၈။ စီမံကိန်းမှထွက်ရှိလာမည့် အမှိုက်နှင့်ရေဆိုးများနှင့် ပတ်သက်၍ ပင်လယ်ရေကိုပျက်စီးထိခိုက်စေမည့် အမှိုက်စွန့်ပစ်ခြင်းများကိုမပြုလုပ်ဘဲ ဆွေးမြေ့စေသောနည်းလမ်းကို အသုံးပြုမည်ဖြစ်ပြီး၊ ရေဆိုးများအား ပြန်လည်သန့်စင်သုံးစွဲသည့်စနစ်ဖြင့် ရေချိုအသုံးပြုမှုကို လျော့ချသွားရန် စီစဉ်လျက်ရှိကြောင်း ပြောကြားခဲ့ပါသည်။

၁၉။ စီမံကိန်းအဆိုပြုသူသည်အပန်းဖြေစခန်းအားအခြားကျွန်းနေရာများတွင် အကောင်အထည်ဖော်ပြရန် သို့မဟုတ် ကျွန်းများ၏အခြားမျက်နှာစာဖက်တွင် ပြောင်းလဲအကောင် အထည်ဖော်ရန် စဉ်းစား ရွေးချယ်ခဲ့ရပါသည်။ အခြားကျွန်းများပေါ်တွင် စီမံကိန်းအဆိုပြုသူ၏ ဖြစ်တန်စွမ်း ဆန်းစစ်လေ့လာမှု Feasibility Study Report အရ ပင်မကုန်းမြေနှင့်ဖြစ်စေ၊ အဏ္ဏဝါအမျိုးသား ဥယျာဉ်နှင့်ဖြစ်စေ မနီးမဝေးတွင်တည်ရှိနေသဖြင့် ဖိုးနီကျွန်းနှင့် ဘာလာကျွန်းတို့ကို ရွေးချယ်ခဲ့ရခြင်းဖြစ်ပါသည်။ တောရှင်းရမည့်ပမာဏနှင့် ဆိပ်ခံတံတား ဆောက်လုပ်နိုင်သောနေရာများ ဖြစ်သောကြောင့်ကျွန်းနှစ်ကျွန်း၏မျက်နှာချင်းဆိုင်မျက်နှာစာနေရာများအားအဆောက်အဦများ တည်ဆောက်ရန် ဆုံးဖြတ်ရွေးချယ်ခဲ့ခြင်းဖြစ်ပါသည်။

၂၀။ တောပြုန်းပျက်စီးမှုများကို ကုစားရန်အတွက် အပန်းဖြေဥယျာဉ် တစ်ခုတည်ဆောက်ပြီး သစ်ပင်ကြီးမျိုးများ ပြန်လည်စိုက်ပျိုးသွားမည်ဖြစ်သည့်အပြင် မြေသားပြုပြင်မှုကြောင့် ရေစီးရေလာပြောင်းလဲပြီး တိုက်စားမှုများ မဖြစ်ပေါ်စေရေးအတွက် သဘာဝမြက်များ စိုက်ပျိုးခြင်း နှင့် အပေါ်ယံမြေဆီလွှာ မပျက်မစီးစေရန် ထိန်းသိမ်းအသုံးပြုခြင်းတို့ကို ဆောင်ရွက်သွားမည် ဖြစ်ကြောင်းသိရပါသည်။ ပင်လယ်ရေပြင်အတွင်း မြေဆီလွှာများတိုက်စားဆုံးရှုံးခြင်းမှ ကာကွယ်ရန် အတွက်လည်း တည်ဆောက်ရေးကာလတွင် မြေသားတမံ၊ အတားအဆီးများဖြင့် ထိန်းချုပ် သွားမည် ဖြစ်ပါသည်။ အပန်းဖြေစခန်း၏ ရေဆိုးသန့်စင်မှုအတွက် အဏုဇီဝပိုးများ အသုံးပြု၍ သန့်စင်သည့် နည်းပညာ

(Micro Biological Treatment Technology) ဥပမာ–Membrane Bio Reactar (MBR) (၎င်–အလွှာသုံး ပေါင်းဖို)များ ရွေးချယ်အသုံးပြုနိုင်ရန် စဉ်းစား ဆောင်ရွက်သွားမည်ဖြစ်ပါသည်။

စိမံကိန်းကြောင့် ဖြစ်ပေါ်လာမည့် ကောင်းကျိုးသက်ရောက်မှုများ

၂၁။ ကျွန်းအခြေပြု အပန်းဖြေစခန်း တည်ဆောက်ခြင်းအတွက် အောက်ဖော်ပြပါ ကောင်းကျိုးသက်ရောက်မှုများ ဖြစ်ပေါ်စေနိုင်ပါသည်–

(က) စိမံကိန်းကြောင့် တိုက်ရိုက်ဖြစ်စေ သွယ်ဝိုက်၍ ဖြစ်စေ ဖြစ်ပေါ်လာနိုင်သည့် အပန်းဖြေ စခန်းဆိုင်ရာလုပ်ငန်းများ၊ သယ်ယူပို့ဆောင်ရေးလုပ်ငန်း၊ အစားအစာ ရောင်းချခြင်း လုပ်ငန်းနှင့် အမှတ်တရပစ္စည်း ရောင်းချခြင်းလုပ်ငန်းများတွင် အလုပ်အကိုင် အခွင့်အလမ်းများ ဖြစ်ပေါ်စေနိုင်သဖြင့် ဒေသခံပြည်သူများ၏ လူနေမှုဘဝကို ဖွံ့ဖြိုးတိုးတက် စေနိုင်ခြင်း။

(ခ) နိုင်ငံ၏ ခရီးသွားလုပ်ငန်းဖွံ့ဖြိုးတိုးတက်ရေးအတွက် အထောက်အကူ ပြုနိုင်ခြင်း။

၂၂။ တည်ဆောက်ရေးလုပ်ငန်းများဆောင်ရွက်နေစဉ် ကာလတွင် ဒေသခံ ပြည်သူ (၄၀)ဦးခန့် အလုပ်အကိုင်ရရှိစေနိုင်ပါသည်။ လုပ်ငန်းစတင်လည်ပတ်ဆောင်ရွက်သည့် ကာလတွင်မူ အဆိုပါ အရေအတွက်ထက် ပိုမိုသောအလုပ်အကိုင် အခွင့်အလမ်းများကို ဖြစ်ပေါ်စေပြီး ဒေသခံပြည်သူများ၏လူနေထိုင်မှုဘဝနှင့် ဒေသခံအဖွဲ့အစည်းများ၏ လုပ်ငန်းဆောင်တာများကို ထိခိုက်နစ်နာမှုများ မဖြစ်ပေါ် စေနိုင်ကြောင်း တွေ့ရှိရပေသည်။

စိမံကိန်းကြောင့် ဖြစ်ပေါ်လာနိုင်သော ဆိုးကျိုးသက်ရောက်မှုများနှင့် ၎င်းတို့ လျော့ပါးသက်သာ စေရေးနည်းလမ်းများ

၂၃။ စိမံကိန်းကြောင့်ဖြစ်ပေါ်လာနိုင်သောဆိုးကျိုးသက်ရောက်မှုများအား တည်ဆောက်ဆဲ ကာလ (Construction phase) နှင့် လုပ်ငန်းလည်ပတ်သည့် ကာလ (Operational phare) ဟူ၍ နှစ်ပိုင်း ခွဲခြားနိုင်ပါသည်။

တည်ဆောက်ဆဲကာလ

၂၄။ (က) **မြေသားပြုပြင်မှုကြောင့် ဖြစ်ပေါ်လာသော တောပြုန်းမှုများ။**

တည်ဆောက်ဆဲကာလတွင်လိုအပ်သောအဆောက်အဦးများနှင့် လမ်းများ ဖောက်လုပ်တည်ဆောက်ရန်အတွက် စုစုပေါင်းဧက(၇၅၀)ရှိသော ကုန်းမြေဧရိယာများ တွင်ကျွန်းတစ်ကျွန်းတွင် (၁၀)ဧကစီ ခြုံရှင်းရမည်ဖြစ်ပါသည်။ သစ်ပင်ခြုံနွယ်များကို ရှင်းလင်းဖယ်ရှားခြင်းဖြင့် ၎င်းတို့အပေါ်တွင် မှီခိုစားသောက်နေထိုင်ကြသောကျွန်းနေငှက်များနှင့်အခြား တိရစ္ဆာန်များ၏ အရေအတွက်ကို လျော့ကျစေမည် ဖြစ်ပါသည်။ စိမံကိန်းအဆိုပြုသူ ကုမ္ပဏီသည် ခြုံနှင့်အပင်ငယ်များရှိသော နေရာများတွင်သာ တည်ဆောက်ရေး လုပ်ငန်းများ ဆောင်ရွက်ရန် ရွေးချယ်ခဲ့ပါသည်။ လူနေထိုင်ခြင်းမရှိသည့် တောအတွင်းမှ အပန်းဖြေစခန်းဟူသော ပုံရိပ်ရရှိစေရန် သစ်ပင်ကြီးများကို ထိမ်းသိမ်းနေကြောင်းတွေ့ရပါသည်။

(ခ) မြေမျက်နှာသွင်ပြင်ပြောင်းလဲမှုကြောင့် ရေစီးရေလာအပေါ်သက်ရောက်မှု ဖြစ်ပေါ်ခြင်း။

အဆောက်အဦး တည်ဆောက်ရေး လုပ်ငန်းစဉ်ကြောင့် စိမံကိန်းနေရာ၏ မြေနေရာသွင်ပြင်ကို ပြောင်းလဲသွားစေပြီး တည်ရှိနေဆဲ ကျွန်း၏ ရေစီးရေလာ ပုံစံအား ပြောင်းလဲမှုဖြစ်ပေါ်စေနိုင်ပါသည်။ အဓိကအားဖြင့် ရေဖြတ်သန်း စီးဆင်းနိုင်ခြင်း မရှိသည့် ခေါင်မိုးပြားများ၊ ကွန်ကရစ်အပိုင်းများကြောင့် သက်ရောက်မှုများ

ကို ဆုံးဝါးစေပြီး မြေဆီလွှာ၏ ရေထိန်းသိမ်းနိုင်မှုနှင့် မိုးရေစုပ်ယူထားနိုင်စွမ်းတို့ကို လျော့ကျစေမည်ဖြစ်ပါသည်။ထို့ကြောင့် ဆောက်လုပ်ရေးလုပ်ငန်းများ တည်ဆောက်ရာတွင် မူလရေစီး ရေလာကို ထိခိုက်မှုနှင့် မြေဆီလွှာ၏ ရေဓါတ်ထိန်းသိမ်းနိုင်စွမ်း လျော့ကျသွားမှုကို အနည်းဆုံးဖြစ်စေရန် သေချာစေရပါမည်။ အပန်းဖြေစခန်းရှိ အဆောက်အဦးများကို ခပ်ကျဲကျဲဖြန့်ကျက် တည်ဆောက်ရန် စီစဉ်သင့်ပြီး မြေဆီလွှာ ရေဓါတ်မဆုံးရှုံးစေရန် လုံလောက်သော မျက်နှာပြင် ဧရိယာထားရှိခြင်း၊ ရေများစွာ စီးထွက်စီးဝင်ခြင်းများမှ ကာကွယ်ရန် မြက်ပင်စိုက်ပျိုးထားသော ဥယျာဉ်များ အကောင်အထည်ဖော်ခြင်းတို့ကို ပူးပေါင်းဆောင်ရွက်ရမည်ဖြစ်ပါသည်။

(၈) **ရုံးန္တယ်များရှင်းလင်းမှုကြောင့် မြေဆီလွှာတိုက်စားမှုဖြစ်ပေါ်စေခြင်း။**

ရုံးန္တယ်များအား ဖယ်ရှားရှင်းလင်းခြင်းနှင့်မြေတူးခြင်း လုပ်ငန်းများကြောင့် မြေဆီလွှာအား ဖယ်ရှားရှင်းလင်းခြင်းသည် မြေမျက်နှာပေါ်ရှိ ရေစီးဆင်းမှုကို ဖြစ်ပေါ်စေပြီး၊ ၎င်းကြောင့် မြေဆီလွှာတိုက်စားမှုများ (Erosion) ကို ဖြစ်ပေါ်စေပြီး ပင်လယ်ရေပြင်နောက်ကျိခြင်း၊ ရေထွက်ပေါက်များ ကမ်းနားရေပြင်နှင့် ကမ်းနားတွင် ကပ်လျက်တည်ရှိသော သန္တာကျောက်တန်းများပေါ်သို့ မြေသားစုပုံခြင်းများဖြစ်ပေါ်စေပါသည်။ အဆိုပါ အခြေအနေများအား တည်ဆောက်ဆဲကာလ (၁၅-၁၈လ) အတွင်းတွင်သာ၊ အထူးသဖြင့် မြေဆီလွှာ တိုက်စားမှုမဖြစ်ပေါ်စေရေး မြေသား ပြုပြင်ခြင်း (Landscaping) နှင့် ရေစီးရေလာကောင်းမွန်ရေး ဆောင်ရွက်မှုများ ပြုလုပ်မှုမတိုင်မီ အချိန်တွင်သာ ခွင့်ပြုနိုင်မည်ဖြစ်ပါသည်။ မြေသားတူးဖော်ခြင်းနှင့် မြေသားပြုပြင်ခြင်း များကြောင့် မြေဆီလွှာတိုက်စားမှုများ ဖြစ်ပေါ် လာနိုင်ပါကလည်း အတားအဆီများပြုလုပ်ခြင်းဖြင့် မြေများကျွန်းပြင်ပသို့ သွားရောက်စုပုံစေပြီး သန္တာကျောက်တန်းများကို ဖုံးအုပ်မှုမရှိစေရန် ဆောင်ရွက်ရမည်ဖြစ်ပါသည်။

(ဃ) **ရုပ်ကြွင်းလောင်စာအသုံးပြုမှုကြောင့် Green House Gas. (GHG) ဖန်လုံအိမ် အာနိသင်ဖြစ်ပေါ်စေသော ဓါတ်ငွေ့များထွက်ရှိမှု ဖြစ်ပေါ်စေခြင်း။**

တည်ဆောက်ရေးကာလတွင် လျှပ်စစ်မာတ်အားအတွက် ဒီဇယ်မာတ်အား ပေးစက်များအသုံးပြုခြင်း၊တည်ဆောက်ရေးလုပ်ငန်းသုံးစက်ယန္တရားများ လည်ပတ်ခြင်းကြောင့် ရုပ်ကြွင်းလောင်စာများဖြစ်သော မာတ်ဆီ၊ ဒီဇယ်ဆီနှင့် LPG မာတ်ငွေ့ အသုံးပြုမှုဖြစ်ပေါ်လာစေပါသည်။တည်ဆောက်ဆဲကာလတွင် တည်ဆောက် ရေးသုံးစက်ပစ္စည်းယန္တရားများတွင် ရုပ်ကြွင်းလောင်စာများ သုံးစွဲမှုကြောင့် Green House Gas ဓါတ်ငွေ့ထုတ်လွှတ်မှုများ ဖြစ်ပေါ်စေနိုင်ပါသည်။ အဆိုပါ လောင်စာများ မီးလောင်မှုမှ Green house Gas များတွက်ရှိလာပြီး ပတ်ဝန်ကျင်လေထုအတွင်း ဝင်ရောက်ကာ ရာသီဥတု ပြောင်းလဲမှုကို ဖြစ်ပေါ်စေနိုင်ပါသည်။ ရုပ်ကြွင်းလောင်စာသုံး စက်ကရိယာပစ္စည်းများအား ပုံမှန်စစ်ဆေးမှုများ ပြုလုပ်ပြီး ထိရောက်စွာအသုံးပြုနိုင်ရန်ထိန်းသိမ်းရပါမည်။ထို့အပြင်စက်ကရိယာပစ္စည်းများအား လေစစ်နှင့် ဆီစစ်များအား ဓါတ်ငွေ့ထုတ်လွှတ်မှု့ လျော့ပါးစေရန်တပ်ဆင်ရပါမည်။ လေထုအတွင်း GHG စောင့်ကြည့်ထိန်းချုပ်မှု အစီအမံကို ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ် EMP တွင် ရေးဆွဲထားပါမည်။

(c) **ရေချိုသုံးစွဲမှု**။

တည်ဆောက်ရေးကာလတွင်ကွန်ကရစ်ပြုလုပ်ခြင်း၊ဆေးကြောသန့်စင်ခြင်း၊ လုပ်သားများ တကိုယ်ရည်သုံးစွဲခြင်းများကြောင့် ရေသုံးစွဲမှုများ ဖြစ်လာစေ သည်။ သုံးစွဲလိုက်သော ရေများသည် ရေဆိုးအဖြစ်ပြောင်းလဲသွားပြီး ၎င်းတို့က အဏ္ဏဝါဂေဟာစနစ်ကိုပျက်စီးစေပါသည်။ ထို့အပြင် ဒေသခံကျေးရွာများအတွက် ရေရှားပါးမှုဖြစ်စေနိုင်ပါသည်။ ထို့ကြောင့်ပတ်ဝန်းကျင်ဆိုင်ရာစီမံခန့်ခွဲမှု အစီအစဉ်တွင် ရေချိုသုံးစွဲမှုစောင့်ကြည့်မှုနှင့် စီမံခန့်ခွဲမှုအစီအစဉ်ထည့်သွင်း ရေးဆွဲပါမည်။ ရေသုံးစွဲမှုကို ထိန်းချုပ်နိုင်ရန်အတွက် ရေသုံးစွဲမှုကို စောင့်ကြည့်မှတ်တမ်းတင်ရမည် ဖြစ်ပါသည်။

ဖြစ်နိုင်ပါကတည်ဆောက်ရေး လုပ်ငန်းသုံးပစ္စည်းများကို ကြိုတင်တည်ဆောက် ပြုလုပ်ထားသည့် တစိတ်တပိုင်း ပြုလုပ်ပြီး ပစ္စည်းများ တပ်ဆင်ခြင်း စနစ်မျိုးဖြင့် ဆောင်ရွက်သင့် ပါသည်။

(စ) **ဆောက်လုပ်ရေးလုပ်ငန်းများကြောင့် လေထုညစ်ညမ်းမှု ဖြစ်ပေါ်စေခြင်း။**

တည်ဆောက်ရေးကာလတွင် အဓိကညစ်ညမ်းစေသောအရာများမှာ လေထုနှင့်ပါလာသော (Suspended Solid)များဖြစ်ပြီး ဆောက်လုပ်ရေးလုပ်ငန်း များဖြစ်သော ဖောက်ခြင်း(Drilling) ၊စုဆောင်းခြင်း (Grinding) ၊ ဂဟေဆော် ခြင်း (Welding) ၊ ဖြတ်ခြင်း (Cutting) ၊ ကွန်ကရစ်လောင်းခြင်း (Cancreting) စသည်တို့ကြောင့် ဖြစ်ပေါ်စေနိုင်ပါသည်။ ထို့ကြောင့် တည်ဆောက်ရေးကာလတွင် ကွန်ကရစ်လုပ်ငန်းများ လျော့နည်းစေရန်အတွက် အကြိုအင်ဂျင်နီယာ လုပ်ငန်း များဖြင့် ကြိုတင်တည်ဆောက်ထားသော အစိတ်အပိုင်းများဖြင့်သာ တည်ဆောက် သင့်ပါသည်။ ပတ်ဝန်းကျင်ဆိုင်ရာ စီမံခန့်ခွဲမှုအစီအစဉ် EMP တွင် လေအရည် အသွေး စောင့်ကြပ်ထိမ်းချုပ်မှု အစီအစဉ် ထည့်သွင်းပါမည်။

(ဆ) **ဆောက်လုပ်ရေးလုပ်ငန်းများကြောင့် ဆူညံသံများဖြစ်ပေါ်စေခြင်း။**

တည်ဆောက်ရေးကာလတွင် (Impact Hammer) တူကြိုးများ၊ (crane) ဝန်ချီစက်များ၊ (Generatars)မီးစက်များ၊(Compressors) လေမှုတ် စက်များ၊ (Pumps) ရေတွန်းစက်များနှင့် မြေသယ်ယာဉ်များ အသုံးပြုရခြင်း တို့ကြောင့် ဆူညံမှုများ ဖြစ်ပေါ်စေနိုင်ပါသည်။ ဆောက်လုပ်ရေးလုပ်ငန်း ခွင်တွင် ဆူညံမှုအများဆုံးဖြစ်ပေါ်နိုင်သည့် စက်ယန္တရားမှာ လိုအပ်သော စွမ်းအင်ထုတ်ပေး သည့်အတွင်း မီးလောင်အင်ဂျင်(Internal Conbustion Engine) ပင် ဖြစ်ပါ သည်။ အခြားအသံဆူညံမှုကို ဖြစ်ပေါ်စေသော စက်ယန္တရားမှာ စက်မှုနှင့် (Hydronlic Transmission)လုပ်ငန်းများမှ ထွက်ပေါ်လာခြင်း ဖြစ်ပါသည်။ ဆောက်လုပ်ရေး

လုပ်ငန်းများမှ ထွက်ပေါ်လာသော အသံဆူညံမှုများသည် အများအားဖြင့် ခေတ္တ ခဏနှင့် ယာယီပြတ်တောင်းပြတ်တောင်း သဘောမျိုးသာ ဖြစ်ပေါ်စေနိုင်ပါသည်။ တတ်နိုင်သမျှ ဆောက်လုပ်ရေးလုပ်ငန်း သုံးစက်ကရိယာများတွင် အသံလုံစေသော လေစစ် (Silencer) ကဲ့သို့ အသံထိန်း စနစ်များ တပ်ဆင်သင့်ပါသည်။ အသံဆူညံမှု စောင့်ကြည့်သိမ်းဆည်းမှု အစီအစဉ်အား ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှု အစီအမံ EMP တွင် ထည့်သွင်းသွားပါမည်။

(၉) **စွန့်ပစ်အမှိုက်များထွက်ပေါ်လာနိုင်ခြင်း။**

တည်ဆောက်ဆဲကာလတွင်အစိုင်အခဲစွန့်ပစ်ပစ္စည်းများနှင့် စိမ့်ထွက် စွန့်ပစ်ရည်များ ထွက်ပေါ်လာနိုင်သဖြင့် ပင်လယ်ရေပြင်ညစ်ညမ်းမှု မဖြစ်ပေါ်စေရေး နှင့်ကျွန်း၏မြေဆီလွှာပေါ်တွင်စွန်းထင်းမှုမရှိစေရေးဆောင်ရွက်ရမည်။စွန့်ပစ်အမှိုက် စီမံခန့်ခွဲမှု (Waste Management)နှင့် အမှိုက်များ စွန့်ပစ်ဖျက်ဆီးရေး စီမံချက်နှင့် အစီအမံများအား EMP တွင် ထည့်သွင်းရေးဆွဲသွားပါမည်။ ရေချိုနှင့် ရေငံ အရည် အသွေးစစ်ဆေးခြင်းကို တတိယပါတီမှတ်ခွဲခန်းဖြင့် အချိန်သတ်မှတ်စစ်ဆေးရ ပါမည်။

လုပ်ငန်းလည်ပတ်ဆောကာလ

၂၅။ (က) **ရုပ်ကြွင်းလောင်စာအသုံးပြုမှုကြောင့် GHG (Green House Gas) များ ထွက်ပေါ် လာစေခြင်း**

အပန်းဖြေစခန်း လည်ပတ်ရန်အတွက် လိုအပ်သော စွမ်းအင်နှင့်စွမ်းအား အတွက်(Disel)ဒီဇယ်ဆီ၊ LPG (Liquified Petroleum Gas) ရေနံဓါတ်ငွေ့ရည်နှင့် Compressed Netural Gas (CNG) သဘာဝဓါတ်ငွေ့တို့အား အသုံးပြုထုတ်လုပ် ရပါသည်။ ခန့်မှန်းတန်စပတ်လုံး ဒီဇယ်ဆီ သုံးစွဲမှုမှာ (၈၈၇၀၀၀) ဂါလံဖြစ်ပါသည်။ ခန်မှန်းတွက်ချက်ထားသော လောင်စာ လိုအပ်ချက်များသည် စံနှုန်များနှင့ ကိုက်ညီ

ကြောင်းတွေ့ရပါသည်။အသုံးပြုမည့်စက်ကရိယာပစ္စည်းများအားလုံ ထိရောက်သော သုံးစွဲမှု(စက်စွမ်းအားပြည့်လည်ပတ်မှု) ဖြစ်ပေါ်စေရန် ပုံမှန်စစ်ဆေးမှု ထိန်းသိမ်းမှုများ ပြုလုပ်ရမည်ဖြစ်ပါသည်။ ရုပ်ကြွင်းလောင်စာသုံးစွဲမှု ထိမ်းသိမ်းခြင်းနှင့် စီမံခန့်ခွဲမှုအား ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်EMP တွင် ထည့်သွင်းပါမည်။

(ခ) **ရေဆုံးစွဲမှု**။ ဟိုတယ်လုပ်ငန်းများလည်ပတ်ဆောင်ရွက်ရာတွင် ဧည့်သည်များ အဆင်ပြေစွာ တည်းခိုနိုင်ရေး၊ စားရိပ်သာများလည်ပတ်ရေး၊ သန့်ရှင်းရေး၊ အဝတ်လျှော် ဖွတ်ရေးနှင့် အခြားဝန်ထမ်းများ၏ တကိုယ်ရည်သုံးစွဲမှုများအတွက် ရေများစွာ လိုအပ်ပါသည်။ ခန့်မှန်းနေ့စဉ်ရေလိုအပ်ချက်မှာ ဂါလံ (၁၆၄၀၀)ခန့် ဖြစ်ပါသည်။ရေဆိုးပြန်လည် သန့်စင်စနစ်တပ်ဆင်ခြင်းနှင့်မိုးရေ ထိန်းသိမ်းသိုလှောင်သော စနစ်များကြောင်းရေအလွန်အကျွံသုံးစွဲမှုကို လျော့ချနိုင်ပါသည်။ ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှု အစီအစဉ်(EMP) တွင် တွက်ချက်ဖော်ပြရမည်ဖြစ်ပါသည်။

(ဂ) **ရေဆိုးနှင့်စွန့်ပစ်အမှိုက်များထွက်ရှိမှု**။

အပန်းဖြေစခန်းလုပ်ငန်းအား လည်ပတ်ဆောင်ရွက်ချိန် တွင် ထွက်ပေါ်လာသော ထုတ်ပိုးပစ္စည်းများ (Packing Materials)၊ စားကြွင်းစားကျန် များ (Food Surplus) နှင့် သန့်ရှင်းရေးလုပ်ငန်းမှ ထွက်ရှိလာသော စွန့်ပစ်ရည်များကြောင့် အမှိုက်များဖြစ်ပေါ်လာစေသဖြင့် ကောင်းမွန်စွာ သိမ်းဆည်းစွန့်ပစ်ရန် လိုအပ်ပါသည်။ခန့်မှန်းနေ့စဉ် အမှိုက်ထွက်ရှိမှုမှာလုပ်ငန်းစွမ်းအားပြည့် ဆောင်ရွက်ချိန်တွင် ၅၀၀ ကီလိုဂရမ်ခန့်ဖြစ်ပါသည်။ အမှိုက်ပမာဏ၏ ၁၀ ရာခိုင်နှုန်းသည် ပြန်လည်သုံးစွဲနိုင်ပြီး (၈၀)ရာခိုင်နှုန်းသည် စွန့်ပစ်အစားအစာနှင့် ဥယျာဉ်ခြံထွက်ပစ္စည်းများဖြစ်ပြီးဆွေးမြေ့စေသောနည်းဖြင့်ရှင်းလင်းရပါမည်။ ကျန်(၁၀) ရာခိုင်နှုန်းမှာ Inorganic waste များဖြစ်ပြီး မီးရှို့ဖျက်ဆီးပြီး မြေဩဇာအဖြစ်ပြန်လည် အသုံးပြုနိုင်ပါသည်။ ရေဆိုးများအား Membrane Biorector (MBR) စနစ်ဖြင့်

ပြန်လည်ပြုပြင်အသုံးပြုနိုင်မည်ဖြစ်ပါသည်။ စွန့်ပစ်အမှိုက်စီမံခန့်ခွဲမှု အစီအစဉ် (Waste Management Plan) နှင့် စွန့်ပစ်မှု အစီအစဉ်(Disposal)အား တွက်ချက် ဖော်ထုတ်ပြင်ဆင်ခြင်းဖြင့် စွန့်ပစ်အမှိုက်စုပုံခြင်းကို လျော့နည်းစေပါသည်။ အမှိုက် များကိုစွန့်ပစ်ရာတွင်(MARPOL-73/78)လုပ်ထုံးလုပ်နည်းများအတိုင်း ဆောင်ရွက် ရပါမည်။ပင်လယ်ရေနှင့် မြေအောက်ရေများကို နှစ်စဉ်အချိန် သတ်မှတ်စစ်ဆေးခြင်း အား တတိယပါတီမ်ါတ်ခွဲခန်းဖြင့် ဆောင်ရွက်ရပါမည်။

(ဃ) **လေ၊ အသံ ညစ်ညမ်းစေခြင်း နှင့် တုန်ခါမှုများဖြစ်ပေါ်စေခြင်း။**

အပန်းဖြေစခန်း နှင့် သယ်ယူပို့ဆောင်ရေးလုပ်ငန်းများတွင် အသုံးပြုသော စက်ပစ္စည်း ကိရိယာများကြောင့် လေထုညစ်ညမ်းစေခြင်း၊အသံဆူညံမှု ဖြစ်ပေါ်စေ ခြင်းနှင့် တုန်ခါခြင်းများ ဖြစ်ပေါ်စေနိုင်ပါသည်။ လေ၏အရည်အသွေးနှင့် အသံ ဖြစ်ပေါ်မှု အဆင့်များကို တတိယအဖွဲ့ အစည်း၏ မ်ါတ်ခွဲစမ်းသပ်မှုများဖြင့် အချိန်မှန် တိုင်းတာ စစ်ဆေးခြင်းများဖြင့် လေနှင့် အသံထုတ်လွှင့်မှု စီမံခန့်ခွဲမှုအစီအစဉ်ကို ဖော်ထုတ်ခြင်းဖြင့် ထိန်းချုပ်ရမည်ဖြစ်ပါသည်။ ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ် (EMP) တွင် ထည့်သွင်းပါမည်။

(c) **ယာဉ်သွားလာမှုများတိုးတက်လာစေခြင်း။**

အပန်းဖြေစခန်းစီမံကိန်းကြောင့် ပင်လယ်ပြင်နှင့်ဆိပ်ကမ်းသို့ သွားရာ လမ်းတလျှောက်တွင် ယာဉ်သွားယာဉ်လာများ ပိုမိုလာမည်ဖြစ်ပါသည်။ သို့သော် လည်းအခန်း(၅၀)သာ ဧည့်သည်လက်ခံနိုင်သော စီမံကိန်းဖြစ်သဖြင့် သိသာထင်ရှား သောယာဉ်ကြော ယာဉ်လမ်းကြောင်း ကြပ်တည်းမှုများ မဖြစ်ပေါ်နိုင်ပါ။ ကျွန်းနှစ် ကျွန်းပေါင်း ကုန်းမြေဧရိယာ (၇၅၀) ဧကတွင် ကျွန်းတစ် ကျွန်းစီတွင် ဧက(၁၀) ခန့်သာ အပန်းဖြေစခန်းအတွက် အသုံးပြုမည်ဖြစ်သဖြင့် အနီးပတ်ဝန်းကျင်ရှိ

ဒေသခံများနှင့် တံငါများအနေဖြင့် ကျွန်း၏ ကျန်ရှိနေသော အစိတ်အပိုင်းတွင် လွတ်လပ်စွာ သွားလာနိုင်ပြီး ရာသီဥတုဆိုးရွားချိန်တွင် ခိုနားနိုင်မည်ဖြစ်ပါသည်။

(စ) **မီးဘေးမတော်တဆမှုများဖြစ်ပေါ်နိုင်မှုအခြေအနေ။**

အပန်းဖြေစခန်းတွင် မတော်တဆ မီးလောင်မှုဖြစ်ပွားပါက ကျွန်း၏ကျန်ရှိနေသော တောအား မီးကူးစက်လောင်ကြွမ်းမှု ဖြစ်ပေါ်ရန် အခွင့်အလမ်းနည်းပါးပါသည်။ အပန်းဖြေ စခန်းတွင် မီးဘေးလုံခြုံရေး စီမံချက်အား ကြိုတင်ရေးဆွဲထားခြင်းနှင့် ဝန်ထမ်းများအား မီးငြိမ်းသက်မှုစနစ်များကို လေ့ကျင့်သင်ကြားပေးခြင်းများကို ပြုလုပ်ထားရမည်ဖြစ်ပါသည်။ ထို့အပြင် မီးငြိမ်းသတ်ရေးပစ္စည်း ကိရိယာများကို ကောင်းစွာ ထိန်းသိမ်းထားခြင်း၊ မီးဘေးလုံခြုံရေးစီမံချက်တွင် ဧည့်သည်များ၏ ပူးပေါင်းပါဝင်ဆောင်ရွက်နိုင်မှုကိုလည်း ပတ်ဝန်းကျင်၏ စီမံခန့်ခွဲမှုအစီအစဉ်(EMP) တွင်ထည့်သွင်းရေးဆွဲသွားမည်ဖြစ်ပါသည်။

(ဆ) **ကျွန်းပေါ်ရှိ ရေချိုဆယ်ဇာတများအား ကျေးရွာနေပြည်သူများ သုံးစွဲနိုင်မှု လျော့ကျခြင်း**

အပန်းဖြေစခန်း လုပ်ငန်းများ စတင်လည်ပတ်လုပ်ကိုင်သည်နှင့် တပြိုင်နက် ဒေသခံ ပတ်ဝန်းကျင်ကျေးရွာမှ ပြည်သူများကျွန်းပေါ်ရှိ ရေသုံးစွဲနိုင်မှု လျော့ကျ စေနိုင်ပါသည်။ စီမံကိန်းဆောင်ရွက်သည့်ကုမ္ပဏီအနေဖြင့် ပတ်ဝန်းကျင် ကျေးရွာမှ ရေချိုလိုအပ်ပါက ရေချိုထွက်ရှိရာ ကျွန်းပေါ်ရှိနေရာများတွင် ရေချိုလာရောက်ယူ ဆောင်ခွင့်အား ခွင့်ပြုခဲ့ပြီးဖြစ်ပါသည်။ ရေချိုထွက်ရှိရာ စမ်းချောင်းသည် စီမံကိန်း တည်ဆောက်မည့်(၁၀)ဧက(၅)၏အပြင်တွင်ရှိသဖြင့် ဒေသခံပြည်သူများ လိုအပ်ပါက ရေချို လာရောက် ယူဆောင်နိုင်ပါသည်။

(ဇ) **ဖြစ်ပေါ်လာနိုင်ဖွယ် ရေယာဉ်နှင့် Jet Skis များ၏ မတော်တဆမှုများ**

မလိုလားအပ်သော ရေယာဉ်နှင့် Jet Skis မတော်တဆမှုများကြောင့် လူနှင့် ရေနေသတ္တဝါများ သေဆုံးပျက်စီးနိုင်ပါသည်။ ရေယာဉ်နှင့် Jet Skis ငယ်များ၏ ပြုပြင်ထိန်းသိမ်းရေးလုပ်ငန်း အစီအစဉ်နှင့် မတော်တဆဖြစ်မှုများ၊ စိမံခန့်ခွဲရေး အစီအမံများချမှတ်လိုက်နာကျင့်သုံးခြင်းဖြင့် မတော်တဆဖြစ်မှုများကို ရှောင်ရှားနိုင်ပါသည်။ (EMP)တွင် အရေးပေါ် ကြိုတင်ပြင်ဆင် ကာကွယ်ရေးနှင့် တုန့်ပြန်ဆောင်ရွက်ရေး အစီအစဉ်များ ထည့်သွင်းသွားပါမည်။

ဆန်းစစ်ချက်ပေါ်သုံးသပ်တင်ပြချက်

၂၆။ အပန်းဖြေစခန်း စိမံကိန်း၏ တည်ဆောက်ရေးကာလနှင့် လုပ်ငန်းလည်ပတ်ဆောင်ရွက်မည့် ကာလများတွင် ပတ်ဝန်းကျင်ဆိုင်ရာ သက်ရောက်မှုများ ဖြစ်ပေါ်လာနိုင်ကြောင်း တွေ့ရှိရသော်လည်း ပတ်ဝန်းကျင်ဆိုင်ရာ စောင့်ကြည့်လေ့လာမှုအစီအစဉ် (Environmental Monitaring Plan) (EMP)အား စနစ်တကျ ဖော်ထုတ်ရေးဆွဲ၍ စောင့်ကြည့်စစ်ဆေးခြင်းများ ပြုလုပ်သွားပါက ကောင်းစွာ စိမံခန့်ခွဲ ထိမ်းချုပ်နိုင်ကြောင်း တွေ့ရှိရပါသည်။ ထို့အပြင် ရေအရင်းအမြစ်များကို ကောင်းစွာထိန်းသိမ်းနိုင်ရန်အတွက် အဏုဇီဝနည်းပညာကို အခြေခံသောရေဆိုးပြန်လည် သန့်စင်သည့် စနစ် (Micro-Biological based Technology for Waste water Treatment System) နှင့် ထိရောက်သော မိုးရေ စုဆောင်းထိန်းသိမ်းသည် စနစ်များကို အသုံးပြုရမည်ဖြစ်ပါသည်။ နေရောင်ခြည်စွမ်းအင်ကို သုံးစွဲခြင်းဖြင့် ရုပ်ကြွင်းလောင်စာသုံးစွဲမှုနှင့် အသံဆူညံမှုကို လျော့ကျစေပါသည်။ တည်ဆောက်ရေးကာလနှင့် လုပ်ငန်းလည်ပတ်သည့် ကာလများတွင် ပတ်ဝန်းကျင်ဆိုင်ရာ လိုအပ်ချက်များကို ဖြည့်ဆည်းနိုင်ရန်အတွက် ပတ်ဝန်းကျင်စောင့်ကြည့်လေ့လာမှု အစီအစဉ်(EMPs)အရ လိုအပ်သော လေထုအရည်အသွေး၊ ပင်လယ်ရေနှင့် သဘာဝရေချို အရည်အသွေး နှင့် အသံဖြစ်ပေါ်မှု အဆင့်တို့အား အသိအမှတ်ပြုတတိယပါတီ ဓါတ်ခွဲခန်းဖြင့် ပုံမှန်တိုင်းတာ စစ်ဆေးစောင့်ကြည့်ခြင်းများ ပြုလုပ်ရန် လိုအပ်ပါသည်။

၂၇။ ပတ်ဝန်းကျင်စောင့်ကြည့်လေ့လာမှုအစီအစဉ်အရ တည်ဆောက်ရေးကာလနှင့် လုပ်ငန်းများ လည်ပတ်ဆောင်ရွက်သည့်ကာလတွင် အောက်ပါတို့ကို လိုက်နာဆောင်ရွက်ရပါမည်-

(က) ရေဆိုးသန့်စင်ရန်အတွက် Membrane Bio reactor (MBR) ကဲ့သို့ (Micro Biological Treatment Technology) သုံး ရေဆိုးသန့်စင်စက်များ အသုံးပြုခြင်း။

(ခ) သဘာဝရေချိုအရင်းအမြစ် မဆုံးရှုံးစေရန်အတွက် မိုးရေစုဆောင်းသိုလှောင်သည့် စနစ် (Rain Water Harvesting System) ကိုအသုံးပြုခြင်း။

(ဂ) မြေပြုပြင်အလှဆင်ထားသော ဥယျာဉ်အတွင်း ရေထိန်းသိမ်းနိုင်ရန် သဘာဝမြက်ပင်နှင့် မြေဆီလွှာကို ထိန်းသိမ်းစိုက်ပျိုးခြင်း။

(ဃ) ဆောက်လုပ်ရေးလုပ်ငန်းအတွက် ဖယ်ရှားခဲ့သော အပင်ကြိုးများအား ပြန်လည် စိုက်ပျိုး ခြင်း။

(င) တည်ဆောက်ရေးကာလတွင် မြေဆီလွှာတိုက်စားမှု မဖြစ်ပေါ်စေရန် အတားအဆီးများ ပြုလုပ်ခြင်း။

(စ) နှစ်စဉ်ဖြစ်စေ၊ နှစ်ဝက်ဖြစ်စေ လေထုအရည်အသွေး၊ မြေအောက်ရေနှင့် မြေပေါ်ရေ အရည်အသွေး၊ အသံ ဆူညံမှု အဆင့်တို့ကို အသိအမှတ်ပြု တတိယပါတီ ဓါတ်ခွဲခန်းဖြင့် ပုံမှန် စမ်းသပ်စစ်ဆေးမှုများပြုလုပ်ခြင်း။

(ဆ) ရုပ်ကြွင်းလောင်စာ နှင့် ရေချိုသုံးစွဲမှု ထိရောက်မှုရှိမရှိ နှစ်စဉ်ပုံမှန်စောင့်ကြည့် လေ့လာ စစ်ဆေးမှုများပြုလုပ်ခြင်း။

(ဇ) ဆိပ်ကမ်းသို့ ဆိုက်ကပ်မည့် ရေယာဉ်များ (Vessels/Boats) များ၏ ဆိုက်ကပ် ထွက်ခွာရာတွင် MAROL 73/78 လုပ်ထုံးလုပ်နည်းများအတိုင်း လိုက်နာ ကျင့်သုံးခြင်း။

(ဈ) နှစ်စဉ် ကြိုတင်ကာကွယ်ရေးအတွက် ထိန်းသိမ်းမှု အခြေအနေနှင့် အရေးပေါ်အချိန် အတွက် ကြိုတင်ပြင်ဆင်ထားမှုတို့အား စစ်ဆေးခြင်း။

(ည) မီးဘေး လုံခြုံရေး အစီအစဉ်/စီမံချက်များအား လစဉ်စစ်ဆေးခြင်း။

(၄) ဝန်ထမ်းများအား ပတ်ဝန်းကျင်နှင့် အစဉ်ရှင်သန်တည်မြဲမှု ဆိုင်ရာ ပညာပေး လေ့ကျင့်ပေးမှုများအား ပံ့မှန်ဆောင်ရွက်ပေးခြင်း။

၂၈။ သိရှိလမ်းညွှန်နိုင်ပါရန်တင်ပြအပ်ပါသည်။

Executive summary

Amata International Co., Ltd is planning to establish an island resort with dive centre in the Phoni and Balar Islands near Kawthaung Township in Tanintharyi region in Southern Myanmar. The two uninhabited islands chosen for the project are located around 15 nautical miles west off the mainland from Aung Bar village. The islands have a total area of around 750 Acre (Phoni and Balar Island has around 530- and 220-Acre area respectively) of which the resort will cover an area of 10 Acres each in both the islands. The estimated cost for the project is around 6,900 Million Myanmar Kyats. The Islands of Phoni and Balar are separated by a distance of around a kilo metre and the resort facilities on each of the islands will be facing each other.

The project owner, Amata International Co Ltd has engaged the consultants, MyAsia Consulting Co., Ltd to perform the Environmental and Social Impact Assessment (EIA/SIA) study and formulate the Environmental Management Plan (EMP) for the island resort construction and operation. This EIA/SIA report is as per the approved scoping report and the Terms of Reference (ToR) version 03 dated 20/06/2018 made for the assessment. The EIA/SIA study and the report are completed as per the chapter V of the Environmental Impact Assessment Procedure.

As far as the government of Myanmar is concerned, Tourism development is prioritized in the Government's 'Framework for Economic and Social Reforms (FESR) as "potentially one of Myanmar's most important sectors, with tremendous potential to contribute to greater business opportunities and balancing social and economic development if properly managed and developed". Due to many initiatives from the government, the tourism sector among the economic sectors in Myanmar has more widely adopted and published government policies relating to responsible business and sustainability.

The pristine islands near the Mergui archipelago have been getting keen interest from investors for setting up eco-tourism and Tropical Island based resorts. There are two existing island resorts near the Mergui Archipelago with a total of 227 rooms. As per Myanmar Directorate of Investment and Company Administration (DICA), apart from the project under study, there are permits granted to 8 other island resorts of which 4 are foreign investment. However, none of these projects are fully operational yet.

The project location is close to other popular tropical tourist havens such as Phuket in Thailand and the project was conceptualised to tap the luxury tourism market in the Mergui Archipelago region. The number of guest arrivals in the area has increased substantially from a modest total of 1158 arrivals in the whole year 2012, to a whopping 146,736 in the six months period of January to June 2016 after the opening of the Kawthaung-Ranong border (Myanmar-Thailand Border) in 2013. Moreover, when the average money spent per day by a tourist in Myanmar is USD 171, the average daily spent per guest in the project area for scheduled itineraries was USD 478 whereas it was USD564 for chartered trips.

The total number of foreigners that visited Kawthaung for the year 2016-17 was around 300,000 where as in 2015-16 it was around 270,000 and in 2014-15 it was around 225,000. There were around 4,000 visitors in 2016-17 that came to the Mergui archipelago through around 400 chartered trips whereas in the previous three years it was only around 1,500

visitors from around 200 chartered trips. The number of visitors to the project area is expected to rise in the coming years due to many island resorts being set up in the region. The number of arrivals through cruises and border gates are on the rise.

Project Description

The total area that are developed in each of the islands for the villas and cottages are within 10 acres. There will be 20 villas in Balar island and 30 cottages in Phoni island and there will be permanent jetties made on each of the islands. The jetty will be 153.17-metre-long in Balar and 150-metre-long in Phoni island. There will be arrival hall and lobby on each of the islands. The total floor area of the cottages are 703.41 square feet each in Balar and 1,597.16 square feet each in Phoni. There is a common swimming pool planned in Balar island and the cottages in the Phoni Island will have 161.46 square feet individual pools. The resorts will be open for a maximum of 8 months in a year with the 4 months of monsoon being the offseason period.

The villas and cottages shall be made by modular components that will only need assembly at site avoiding large scale construction and concreting. The resort will be constructed by removal of small plants and vegetation alone and there will not be cutting of large trees and clearing the forest. The project owner is making the resort with a theme of cottages amidst forest in an island and hence the removal of forest cover is negligible. The staff accommodation is planned in the Phoni island. The power requirement for the resort will be met by diesel generators on each of the islands. The resort will provide jobs to local people during operational phase and during the construction phase.

There will be 2 passenger speed boats, 3 sightseeing boats, 3 diving boats, 3 cabin boats and 3 jet skis at the resort for entertainment of the guests and sight-seeing and diving. The project proposes to use 3 sets of modular floating pontoons that can be easily constructed and re-configured to be customised as per the requirements. There will be 3 oxygen filling plants and two Diesel generators of capacity 100kVA for power. There will be wastewater treatment plant using the Membrane Bioreactor (MBR) technology and composting system for the solid waste.

The project will operate by the high standards used by the island-based ecotourism sector globally and will aim environmentally friendly, sustainable ways of functioning. The project plans to operate as per the guidance from global standards for energy efficiency, food safety (ISO 22000), Occupational Health & Safety (OHSAS), and Environment (ISO 14001). The design of the project will incorporate these requirements to make it function in a sustainable manner.

Resource consumption estimates for the project

The project resort will have a permanent jetty for docking in the Phoni Island, a total of 50 guest rooms of which 30 are in Phoni and 20 are in Balar, a Dive centre, staff accommodations, and office buildings. The resort will be open to guests and be operational during 8 months in a year and plan to use small air crafts that can land on water. The resort will provide jobs to around 60 people during operational phase and 40 during the construction phase.

The resort will set up water treatment plant to recycle the waste water and will employ rainwater harvesting systems to conserve the water. The resort is expected to consume

16,400 Gallons of water every day at its full capacity which is in line with the consumption pattern of water in other tropical island resorts across the globe.

The estimated power load for the project is around 140kVA. The source of power for the resort will be drawn from Diesel Generators of capacity 100kVA each on the islands considering future development. Additional to the generators, the boats and jet skis used in the resort by guests also will consume fossil fuels for their operation. The estimated maximum consumption of fossil fuels in the project is 88,700 Gallons per year. The resort is planning to have solar power to reduce the fuel consumption.

The resource consumption details are validated by the EIA consultant with the review of the fuel efficiencies of the equipment in the project and found to be reasonable and is not under reported.

The project selection and alternatives

The project owner considered various alternatives and scenarios with respect to the feasibility on technological, economic, environmental, safety parameters. The main alternatives considered were as below.

1. Number of cottages-

Tin the concept stage of the project, the project owner had initially planned to develop 50 villas each on both the islands of Balar and Phoni. But, the extent of environmental impacts related to the resource usage prompted them to change the decision to have fewer rooms for the project. Finally, they decided to have only 20 villas on the Balar Island and have only 30 cottages on the Phoni Island.

2. Location of the cottages and the Jetties-

The selection of the location for the villas and the permanent jetties were based on the extent of deforestation and vegetation removal they will have to do for the construction of the cottages. The current locations for the permanent jetties were selected to avoid the dredging activities for maintaining the depth. The current location does not require any dredging activity and also do not destroy the corals. The extent of deforestation and the feasibility of making jetty to dock on the island was reviewed by the project owner and made the decision to choose the sides that face each other.

3. Permanent Jetties for safety of guests-

The initial plan was to use floating pontoons for the docking on the islands instead of a permanent structure. But considering the safety of guests who may not be experienced to use the floating pontoons safely, the project owner finally decided to have the permanent jetties made on each of the islands facing each other.

4. Change in construction methodology-

The project owner had planned to have the resort constructed with the traditional methods. However, while the reviews were being made, it was seen that the traditional methods will result in lot of dust generation and soil erosion which will result in contamination of the nearby marine waters. This will seriously affect the corals and other marine biota. The island resort has to maintain the pristine waters and corals to attract wealthy tourists and diving enthusiasts and hence the project owner decided to construct the cottages with modular components that will need only the assembly at site. This change in methodology of construction will significantly reduce the noise, air pollution, soil erosion and the resulting water contamination.

5. Water recycling for zero discharge and composting-

The project uses a lot of water during its operational period and may put pressure on the water resources for the nearby villagers. The initial plan of the project owner was to treat the water to acceptable limits set by the authorities and dispose. But they have decided to have zero discharge form the project operations by employing the micro biological treatment technologies such as Membrane Bio Reactor (MBR) for the waste water treatment in the resort. This will reduce the waste water generation as well as the amount of groundwater drawn by the project.

The organic matter in the solid waste will be composted; and a vegetable garden to be maintained in to use the nutrient manure made. This garden can source the fresh vegetables for the salad in the resort reducing food procurement. The metal and plastic can be collected and disposed bi-weekly or monthly to recyclers.

Public Consultation about the project

The project islands are around 12 nautical miles south of Lampi Park. The nearby villages that are in the project affected area are Nyaung Wee in Nyaung Wee Island, Majhun Galet inside the Lampi Park and Aung Bar in the mainland. All the three villages are part of Sun Nge Par Line village tract. The project affected area of these neighbouring villages also has salone people, a sea gypsy community that is a minority group and is considered as vulnerable. The development of the island resorts in the area will affect these people.

The project proponent, since the beginning of the project, right from the concept stage, has kept the government, local authorities and the surrounding neighbourhood about the progress of the project in time. They have taken initiatives to have the news about the project being published in newspapers, social media platforms and websites.

The EIA consultants engaged for the project, MyAsia Consulting Co Ltd have been visiting the Mergui Archipelago islands since January 2017 for the assessment of environmental and social impacts of island resort projects. They have made numerous field surveys of the project islands, and the nearby villages. The affected areas are the villages in the Su Nge Par Line Village tract that encompasses the project islands (Phoni and Balar Islands) and the Lampi Marine National Park.

There have been open forum public hearings conducted in February 2017, May 2017, October 2017 in Kawthaung that include participants form the elected people representatives, political party members, the affected villagers, salon representatives, NGOs operating in the area and the government departments relating to hotel & tourism, marine transport, fisheries, forests, agriculture. Additional to these, there have been numerous sessions held with the villagers of Nyaung wee, Majhun Galet and Aung bar relating to the island resort development and the effect of this on their life.

The major concerns raised by the villagers are about the lack of their access to the project islands once the resorts start operating. The villagers take freshwater from the islands and also use them as a place to rest while they go around fishing in the waters. They are also worried that the security men in the resorts will drive them away from the nearby waters for the privacy of the tourists.

Another worry is the pollution due to the increased human activity in the islands from the waste generation in terms of effluent and solid waste that will endanger the corals, fishes and other aquatic biota affecting the livelihood of the fishermen communities. The resort functioning will also draw lot of groundwater for its use affecting the freshwater availability for the villagers around.

The project owner has agreed in the public meeting in presence of the elected representatives that they will be developing the project only in the small area that is within 10 acres in each of the islands and will leave rest of the islands as it is. They have also agreed that they will not drive away any of the villagers, or fishermen and also will not restrict them to take the freshwater from the islands. The project owner will provide employment to the villagers as far as practically possible during construction as well as during operational phase. The villagers are already undergoing vocational trainings to equip themselves to be ready to be employable in the hospitality sector.

The project will recycle wastewater to avoid the effluent discharges and to reduce the groundwater drawing. Project will use composting to avoid disposal of solid waste in the sea endangering marine life.

Positive Impacts of the Project

The island resort project has many positive impacts such as

- Improvement of the livelihoods of the local population in terms of direct employment in the resort for around 60 local people.
- Development of the tourism sector as a whole due to development of tourism value chain, creating indirect jobs to the people in the region such as transportation, restaurants, eateries, food supplies, equipment sale and lease, retail business and souvenir shops

The construction phase of the project is expected to employ around 40 villagers directly. Once operational, the project will provide more work/jobs to the local people, directly and indirectly all the while not disrupting the livelihood of people and communities.

The Negative Impacts of the Project and the mitigating measures

The negative impacts of the project can be classified as the impacts during the construction phase and the operational phase.

Negative impacts during the Construction phase and their mitigating measures

1. Deforestation for land clearance-

The island resort construction will result in deforestation of around 10 acres area on each of the two islands out of a total of 750 acre (Phoni and Balar Island has an area of around 530 and 220 Acre respectively) to make it suitable for making buildings and roads. This vegetation removal will result in reduction in habitat cover for the birds and animals in the island. The project owner has chosen the areas where it is necessary to remove only the shrubs and small plants. They are maintaining all the big trees as it provides the image of a nature resort in pristine islands.

2. Change in Topography and effect on drainage-

When the development of resort happens, the project owner will change the topography of the land to make it suitable for constructing the cottages and other buildings. This will change the existing pattern of surface drainage, mainly, due to the creation of impermeable surfaces (roofs, pavements, etc.) and the corresponding reduction in the amount percolation in the soil and capacity of the site to absorb rainfall. The construction activities are planned with a spread-out design of the cottages with lot of open spaces with natural soil and grass to enable the drainage of water and percolation to the soil.

3. Soil Erosion of the cleared areas-

The construction activities require the removal of vegetation and excavation works that can leave the soil exposed and vulnerable to erosion by water run offs and wind to pollute the nearby marine waters endangering the coral life. This potential situation should exist only for the duration of the construction works (approximately 15 to 18 months) before landscaping and drainage works reduce the susceptibility to soil erosion. The time period between excavation and landscaping when the erosion vulnerability exists shall be managed by making barriers in between and the edges that will stop soil to be eroded out of the island and to get deposited on the coral reefs. The project owner is making the construction with the modular components that will be assembled at the site.

4. Climate Change from Greenhouse Gas (GHG) Emission-

The construction phase uses diesel generator as its source of power; the construction equipment used at the site also runs on fossil fuels such as Gasoline, Diesel, or LPG. The combustion of these fossil fuels causes release of Greenhouse Gases to the atmosphere causing climate change effect. The mitigation measures are by conserving the fossil fuel usage. The fuel consuming equipment used shall be regularly inspected and maintained for efficient operations. The equipment shall be fitted with appropriate filters and mufflers to

reduce the GHG emissions. The Environmental Management Plan (EMP) developed as per the study include Fossil fuel consumption monitoring and Management.

5. Depletion of Water resources-

The construction activities cause enormous water consumption due to concreting, cleaning, and personal use by the workforce. The used water also become wastewater that can pollute the sea endangering the marine ecosystem. The water use put pressure on the groundwater resources available for the nearby villagers. The water usage shall be monitored to reduce the consumption. The project owner has decided to use cottages made by assembly of modular components so as to have minimum use of concreting. The Environmental Management Plan (EMP) developed as per the study include Water consumption Monitoring and Management.

6. Air pollution from construction-

The major pollutant in the construction phase is suspended solids being air-borne due to various construction activities such as drilling, grinding, welding, cutting, concreting etc. The project owner has decided to use cottages made by assembly of modular components so as to have minimum use of polluting activities such as concreting, aggregate production, and the use of paints, solvents, oil and lubricants. The Environmental Management Plan (EMP) developed as per the study include Air Quality Monitoring and Management.

7. Noise from construction-

The construction phase will make use of a variety of equipment such as Impact hammers, cranes, generators, compressors, pumps and earth movers that will generate noise whilst operations. The most widespread source of noise from typical construction equipment is generally due to internal combustion engines that provide the energy for operation. Other sources of noise associated with the equipment include the mechanical and hydraulic transmission actuation systems that can sometimes produce high sound levels. Construction related noises are usually of a temporary duration and relatively intermittent. All equipment used in construction will be fitted with mufflers to reduce the noise levels. The Environmental Management Plan (EMP) developed as per the study include Noise level monitoring and Management.

8. Generation of waste-

The construction phase will result in solid waste and effluent being generated which needs to be disposed appropriately to avoid the pollution of the marine water and contamination of island soil. The Environmental Management Plan (EMP) developed as per the study include Waste generation and disposal Management. The marine and groundwater quality will be tested periodically by a third-party laboratory.

Negative Impacts during the Operational phase

1. Climate Change from the Greenhouse Gases (GHG) Emissions-

The resort operations will make use of Diesel, Liquefied Petroleum Gas (LPG) and Compressed Natural Gas (CNG) to as a source of power and energy. This includes the fuel for the boats, skis and other equipment. The estimated diesel consumption per year is 88,700 Gallons. This estimation is validated with the specifications of the equipment and found to be reasonable and not under reported. All equipment will be regularly maintained to operate efficiently. The Environmental Management Plan (EMP) developed as per the study include Fossil fuel consumption monitoring and Management.

2. Water usage-

The operation of the hotel needs lot of water for the comfort of the guests, operation of the restaurant, cleaning, laundry and other personal uses by the staff and the maximum estimated consumption is 16,400 gallons per day. This estimation is validated and found to be reasonable and not under reported. The waste water treatment system and the rainwater harvesting will reduce the water usage considerably. The Environmental Management Plan (EMP) developed as per the study include Water consumption monitoring and Management.

3. Wastewater and Solid Waste generation-

The resort operations will result in waste such as packaging materials, food surplus and cleaning effluent that need to be disposed appropriately. The maximum expected solid waste generation is 500 kg per day at the peak of operation. Less than 10% of this waste is recyclable and around 80% will be organic matter such as food waste and garden trash that can be composted. The inorganic waste that is around 10% can be incinerated and the ash can be mixed with the compost. The effluent will be recycled in the membrane bioreactor for zero discharge and hence the effluent let off to the marine waters is not a problem. The Environmental Management Plan (EMP) developed as per the study include Waste generation, and disposal Management. The disposal of waste will be as per the MARPOL 73/78 regulations. The marine and groundwater quality will be tested periodically by a third-party laboratory.

4. Air, noise and vibration emissions-

The machines and equipment used in the resort and the transportation will result in generation of air pollutants, noise and vibrations. The air and noise emission management plan are to be formulated; the air quality and the noise levels will be periodically tested by a third-party laboratory. The Environmental Management Plan (EMP) developed as per the study include air quality and noise level monitoring and management.

5. Fire break-out accidents-

There is minimal chance of fire break accidents that can spread to the rest of the forest in the island. There is a fire management plan to be established and proper training will be given to the employees, fire-fighting equipment will be well maintained, and management of visitors is

part of the plan. The Environmental Management Plan (EMP) developed as per the study include Firefighting and emergency preparedness plan.

6. Reduction in access to the water source in the island to the villagers-

Once the resort is operational, the villagers in the nearby islands may have their access to the water source in the Island reduced. The project owner has promised the villagers in presence of the elected representatives that they will not restrict free access to the water source in the island. The stream of fresh water is outside the 10 acres where the resort construction is planned and hence the access to the water source will continue to be available to the villagers.

7. The potential accidents from Boats and skis-

The unlikely events such as accidents that may happen to the boats or the jet skis may result in loss of life of human beings and the aquatic biota. The maintenance program and the accident management of the boats and skis will be to ensure avoidance of such accidents. The maintenance plan to be formulated. The Environmental Management Plan (EMP) developed as per the study include emergency preparedness and response plan for the boats and vessels.

Assessment Conclusion

The Island resort project in the islands of Balar and Phoni during its construction and operational phase will have environmental impacts that can be managed effectively by regular monitoring through the environmental monitoring plans (EMP) developed. The 9 EMPs are detailed in the section 7 of this report.

Section	Environmental Management Plan
7.4.1	Deforestation and Soil Erosion Management Plan
7.4.2	Fossil fuel Consumption Management Plan
7.4.3	Water Consumption and Conservation Plan
7.4.4	Air Emission, Noise and Vibration Management plan
7.4.5	Waste Management Plan- Effluent and Solid Waste
7.4.6	Occupational Health and Safety management Plan
7.4.7	Firefighting and Emergency preparedness Plan
7.4.8	Boat and Ski Accident Prevention Management Plan
7.4.9	Food Safety and Hygiene Management Plan

The concerns of the affected parties have been suitably addressed making changes to the project design by incorporating wastewater recycling, solid waste composting, and the environmental management plans were formulated after adequate public consultations and stakeholder's engagement. The project owner has agreed to the affected parties that they will not restrict access to the islands, surrounding waters or the freshwater source in Phoni Island.

The EIA Consultants confirm that the project owner has effectively disclosed all the potential negative impacts of the projects to the affected parties including the Moken Sea Gypsies in the language that they are conversant with and comprehend without ambiguities. The project owner has not under reported any negative impacts of the project to mislead the affected parties and elected representatives to take a decision in favour of the project proponent.

The EMPs developed as part of the EIA/SIA study require the resort to periodically test the air quality, marine and freshwater quality, and noise levels, through a recognized third-party laboratory during the construction as well as the operational phase. The purpose is to ensure compliance to the environmental requirements specified in the Myanmar National Emission Quality Guidelines dated 29 December 2015.

The recommended actions for the project are

- Use of Micro Biological based technology, preferably Membrane Bio reactor (MBR) for waste water recycling plant to conserve water and reduce the effluent let off
- Composting at site for solid waste management with a vegetable garden to source the input for salad
- Use of natural grass and soil for water seepage in the landscaped gardens
- Replanting the bigger trees that are removed for construction in the gardens.
- Barriers to be made at the end of the sites to avoid soil erosion during the construction phase from wind and water run off
- Half yearly testing of the air quality, ground and surface water quality, marine water turbidity, and noise levels by a recognized third-party testing laboratory
- Periodic audits to monitor the efficient use of fossil fuels, water, waste management, safety of the equipment and machinery, food safety, and emergency preparedness
- Ensure compliance to MARPOL 73/78 regulations for all the vessels/boats
- Regular training for the staff on environmental and sustainability parameters

It is also recommended that the project owner initiate formation of an association of island resort owners in the Mergui Archipelago and coordinate a community based green tourism initiative to conserve water, conserve the biodiversity, reduce wastage and help the local population.

1.0 Introduction

The purpose of this report is to present the Environmental and Social Impact Assessment (EIA/SIA) study and to establish the Environmental Management Plan (EMP) for the proposed island resort project and dive centre in Phoni (Bo Yar Nyunt Kyun) and Balar Islands to be established near Kawthaung Township in Tanintharyi region in Southern Myanmar by Amata International Co Ltd. The project estimated cost is 6,900 Million Myanmar Kyats (MMK) of which 5,326 Million is for the land and buildings and 1,574 Million is for the equipment and machinery cost.

1.1 Presentation of the Project and its justification

The objective of the proposed island resort project is to tap the luxury tourism market in the Mergui Archipelago region in Sothern Myanmar. The project area is close enough to Phuket and other tropical island destinations in Thailand such as Phang Na, Langkavi, Krabi etc to be visited as an extended tour. The plans of making Kawthaung airport an international airport to handle flights from Thailand and/or Malaysia, can provide a tremendous boom in tourism sector of the region. The islands in the region have pristine beaches and clear shallow waters suitable to make it a prime tropical island destination attracting international tourists. The sea nomads or sea gypsies in the region are also an important attraction.

After the opening of the Kawthaung-Ranong border (Myanmar-Thailand Border), the number of guest arrivals has increased substantially. From a total of 1158 arrival in the whole year 2012, the guest arrivals have increased to 146,736 in the six months period of January to June 2016. The revenue per guest per day is also substantially higher. In 2015, the average daily tourist spent per guest for scheduled itineraries was 478 United States Dollar (USD 478) whereas it was USD564 for chartered trips. The average money spent per day by a tourist in Myanmar is only USD171.

The number of tourist arrivals have been increasing for the last two years after the sharp dip in 2016 to 2.91 Million arrivals from 4.68 Million in 2015. The arrivals in 2017 was 3.44 Million and it increased to 3.55 Million in 2018. The first three months of 2019 had 1.136 Million arrivals showing a 22.4% increase from the arrivals of same period in 2018. The border gate crossings have increased to a whopping 144%. The number of cruises moving from Thailand is also on the increase with more tourists visiting the Mergui Archipelago.

The proposed resort aims to target the wealthy international travellers and diving enthusiasts by offering luxury hospitality amidst natural forests and pristine beaches with many exotic dive sites within a short distance. The dive sites in the Mergui archipelago has high visibility with presence of wide variety of aquatic biodiversity. The Mergui archipelago is approachable by boats from the towns of Kawthaung or Myeik both having domestic airports and seaports. The town of Kawthaung is on the border with Thailand where travellers can cross from Ranong in Thailand by a 40-minute boat ride.

Figure 1-1 Project Area and nearby tourist spots

1.2 Related Projects and Developments

There are many island resorts coming up in the Southern Myanmar region. There are two existing island resorts near the Mergui Archipelago with a total of 227 rooms. They are Grand Andaman Resort[1] in Tha Htay Kyun Island and Myanmar Andaman Resort[2] on McLeod Island. As per Myanmar Directorate of Investment and Company Administration (DICA)[3], apart from the project under study, there are permits granted to 8 other island resorts of which 4 are foreign investment. However, none of them have started the operation yet.

Developer	Plot size (Acre)	Islands	Investment
Amata International Co Ltd	200	Phoni, Balar	Myanmar
Benchmade Asia (Myanmar) Limited	100	Wa Ale Kyun	Foreign
Cocoon Hotel Co Ltd	17	No 115 Island	Myanmar
Domel Island Development	50	Domel Island	Foreign
K Future Co Ltd	700	Bo Nat Kyaw Island	Myanmar
KMOT Co Ltd	158	Hlaing Gu Island	Foreign
Moken International Co Ltd	510	Kyun Phi La, Boywae, Shark	Foreign
TZK Co Ltd	31	Nyaung Oo Phee	Myanmar
United Hotels & Resorts Co Ltd	20	Nga Khin Nyo Gyi	Myanmar

Table 1-1 The list of upcoming island resorts near the Mergui Archipelago

The recently held tourism fare in Kawthaung from 23rd to 25th of March 2018 had promotional stalls from all the upcoming island resort projects, tour operators, diving equipment sellers and agents giving an idea of the future development that is coming in the Archipelago region. The program was well attended and there were many foreign based tourism investors showing keen interest in the tourism sector of the Mergui Archipelago.

[1] http://grandandaman.travel/
[2] http://www.myanmarandamanresort.com/
[3] http://www.dica.gov.mm/

1.3 Presentation of the Project Proponent and the EIA Consultant

Project proponent- Amata International Co Ltd

Amata International Co Ltd is part of the leading resort and hospitality service provider[4] operating in Myanmar named Amata Holding Public Co., Ltd. The organization started with The Amata Resort and Spa, Ngapali Beach, in 2003 as their first hospitality venture, and today the group operates many hotels and resorts across the boutique, premium, mid-market, and value segments. They have resorts located at Ngapali beach[5], Inle Lake[6], Thipaw (Hsipaw)[7] and Bagan[8]. They also operate a hot air balloon adventure tour service[9].

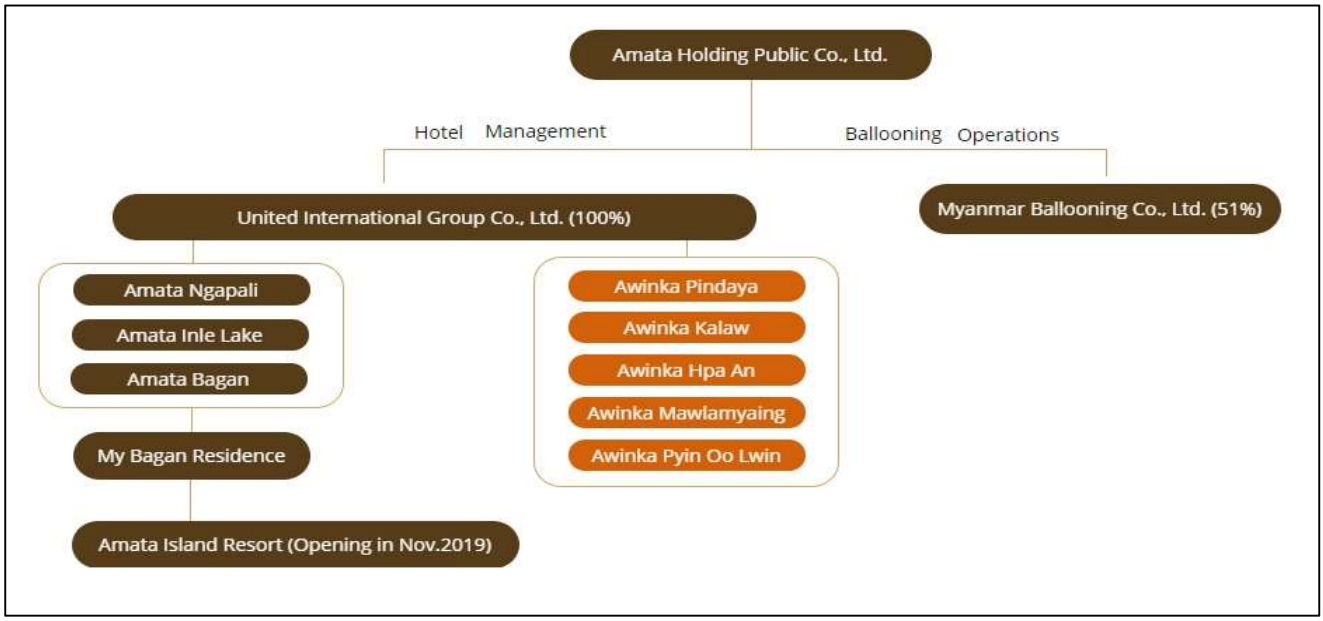


Figure 1-2 Amata Holding Public Co Ltd-Organizational Map

The traveller and user reviews[10] available on the website of international travel and hospitality reviewer "Trip Advisor" has rated the Ngapali resort with an average score of 4 out of 5 from its 400 reviews. 47% of these reviews have rated them as "Excellent" and another 35% have rated "Very Good". Another popular international travel website "Booking.com" has rated them 8.5 out of 10[11] from a review of 166 travellers.

The organisation's vision is to be one of the largest and highest performing entity related to sustainable tourism. As an organisational environmental policy[12], the sustainability and responsible behaviour is a priority for Amata group. They aim to drive sustainability efforts and build resilience into their properties by innovative ways to make optimum use of the limited

[4] http://www.amatahotelgroup.com/
[5] http://www.amataresort.com/
[6] http://www.amatainleresort.com/
[7] http://hsipawresort.com/
[8] http://www.amatabtghouse.com/
[9] http://www.orientalballooning.com/
[10] https://www.tripadvisor.in/Hotel_Review-g612368-d637176-Reviews-Amata_Resort_and_Spa-Ngapali_Rakhine_State.html
[11] https://www.booking.com/hotel/mm/amata-resort-amp-spa-ngapali-beach.html
[12] http://www.amatahotelgroup.com/environmental_policy.html

resources and impact the local communities positively. They design their operations to reduce the carbon emissions, water usage, energy use, waste generation, food wastage and maintain the air quality.

The International Finance Corporation (IFC), a member of the World Bank Group, has provided financial assistance to Amata to expand their chain of hotels in Myanmar. As per the IFC Environmental and social review summary (ESRS)[13], the investment will have impacts which must be managed in a manner consistent with the IFC Performance Standards for

- Assessment and Management of Environmental and Social Risks and Impacts
- Labour and Working Conditions
- Resource Efficiency and Pollution Prevention
- Community Health, Safety and Security
- Biodiversity Conservation and Sustainable Management of Living Natural Resources
- Cultural Heritage

As an organisational environmental policy[14], the sustainability and responsible behaviour is a priority for Amata group. The organisations vision is to be one of the largest and highest performing entity related to sustainable tourism. They aim to drive sustainability efforts and build resilience into their properties by innovative ways to make optimum use of the limited resources and impact the local communities positively. They design their operations to reduce the carbon emissions, water usage, energy use, waste generation, food wastage and maintain the air quality.

Contact Details of the Project Owner- Amata International Co Ltd	
Item	**Description**
Name	U Win Aung, Managing Director
Education	BBA (International Marketing), City University of New York, 1993
Other Positions	1. Executive Member- Myanmar Tourism Federation 2. Executive Member- Myanmar Hotelier Association
DICA Registration	3797/2012-2013 (12/12/2012)[15]
Address	No. 10, Inya Yeiktha Road, Mayangone Township, Yangon, Myanmar
Telephone	+95 1657690, 657050, 657689, +95 98515120, 73242536
E-mail	amatahotelgroup@gmail.com

Table 1-2 The Project proponent details

[13] http://www.amatahotelgroup.com/download/ESRS_ESAP_Amata%20Hotels%20Myanmar.pdf
[14] http://www.amatahotelgroup.com/environmental_policy.html
[15] http://www.dica.gov.mm/en/company/amata-international-company-limited

EIA Consultant- MyAsia Consulting Co Ltd

MyAsia Consulting Co Ltd[16] is based in Myanmar specialising in advisory services related to Environment, Sustainability, Health & Safety and Climate change. The biodatas and qualifications of the EIA study team is provided in the Appendix A of the report. The team has vast experience in assessment of environmental and climate change mitigation projects across South Asian countries. The EIA/SIA study and reporting are as per the chapter V of the EIA Procedure that cover the paragraphs 44 to 70.

EIA Consultant Team for the EIA/SIA Study- MyAsia Consulting Co Ltd			
Name & Contact	**Expertise and role in project**	**Education & qualifications**	**Experience**
Mr Syju Alias +95 9778165216 +91 9820723553 syju28380@gmail.com	EIA & Climate change, ISO 14001, ISO 45001,	MBA- Operations B-Tech- Production Engineering Lead Auditor-ISO 14001 Lead Auditor-ISO 45001 Lead Verifier- Green House Gases Inventory	GHG emission reduction projects validation/verification ISO system audits- Manufacturing, EPC Project Management, mechanical machinery
Mr Imran Ustad +919819002777 syedimr@gmail.com	EIA & Climate Change, Environmental Management	Diploma- Energy Audit & Management MBA- Human resources MSc- Environmental Science Lead Auditor-ISO 14001 Lead Verifier- Green House Gases Inventory	GHG emission reduction projects validation/verification ISO system audits- Petrochemicals, manufacturing
Dr Mon Myat +95 9444065365 +95 9798155771 monmyat8966@gmail.com	Local customs, Environmental Law, Biodiversity, livestock, water treatment and quality	Bachelor of Veterinary Science Diploma- Business law Diploma- English Fisheries & Livestock handling	Jetty & Port Management Fish Factory Management Wastewater treatment Business Management Myanmar Armed forces
Mr VP Kuriakose +91 9895956705 Sherin.kuriakose@gmail.com	Construction expert	Diploma- Civil engineering	Public Works Dept of India- Construction Management

[16] www.myasiaconsulting.com

Mr Lyju Elias +91 8547958932 lyjuelias1@gmail.com	Meteorology, Hydrology expert	Diploma-Meteorology BSc- Mathematics Numerical weather prediction Course- Indian air Force Synergie software for Meteorology- Meteo France Meteorological Instrumentation course- Indian Navy	Indian Navy- Meteorology Instructor, Meteorological procurement manager, Weather & oceanography in charge Meteorology team for Common wealth games, New Delhi 2010
Dr Win Zan +95 9253820552 drwinzan@gmail.com	Public Health	MBBS Public Health Emergency Management HIV/AIDS including ART Basic Life support Advanced coronary support	Site doctor-SOS Myanmar Field Medical officer-IOM Mobile doctor- Cyclone Nargis
Dr San Tha Tun	Mangroves and Marine species	Phd- Marine science Mawlamyine Marine University	Mangrove expert
Dr Mini P Mathai +91 9846852919 thecochincollegekochi2@gmail.com	Botany, Bio Technology, Plant species	Phd- Botany MSc- Botany	Botany expert-Public service commission Bo tech expert- Mahatma Gandhi University Consultant editor-Flower world magazine

Table 1-3 Team Members for the EIA study

The EIA consultant MyAsia Consulting Co Ltd do not hold any stake in the project and the team doing the study is not related to any of the members of the project team. No members in the team and/or any employee of MyAsia consulting Co Ltd have provided any other services for the design, construction or consulting services to the project owner Amata International Co Ltd. The EIA consultant has no conflict of interest in performing the EIA/SIA study.

1.4 Presentation of the Associate Organisations & Laboratories

Laboratory (including accreditations)

Water quality measurement for the freshwater and the marine water was done by AMD[17], the representative of Australian Medical & Diagnostics (Australia) and is an expert in water treatment design, supply and installation. They have more than 200 installations in Myanmar that include large drinking water manufacturers, United Nations Children's Emergency fund (UNICEF)[18] projects, boutique hotels and housing estates. They have a state-of-the-art laboratory to test the water quality in line with the international standards.

The air quality and noise measurements were done by Green EHSS Consulting Co Ltd[19]. They provide services related to baseline monitoring of environmental parameters to a wide range of Industries in Myanmar, Singapore and Canada. They are affiliated to GHG Accounting-Canada[20], Green Canada Asia Consulting Services[21], Ace EHSS Pte Ltd- Singapore[22], Passive Remediation System- Canada and Turnkey Pte Ltd-Canada.

University

The department of Marine Science from the Mawlamyine University was consulted for the EIA study. Dr San Tha Tun, the head of the department provided valuable inputs on the marine species, mangroves, sea grasses, and impacts of developments in coastal zones in Myanmar. He is an advisor for mangrove restoration[23] with the Worldview International foundation. His expertise in mangroves and coastal zone management is vast and he works as consultant and advisor to many international associations and Myanmar government's initiatives.

Dr. Nang Mya Han, professor in the Department of Marine Science at Myeik University, Myeik Myanmar was consulted for the effect of island resort project on the mangroves. She also serves as a mangrove restoration advisor for the Worldview International Foundation and a consultant to Flora and Fauna International. She has worked extensively in various projects relating to the marine life in the Andaman sea and mangroves in particular.

The Department of Botany in Mahatma Gandhi University (MG University), Kerala, India was consulted for the EIA study. Dr Mini P Mathai[24], the Chairman of the Botany Board-MG University and Head of the Department-Botany gave her expertise related to the plant species in the tropical regions, effect of marine water quality on its development and existence. She is Member of the team which won the ICAR team award for outstanding multi-disciplinary team research in Agriculture and Allied Sciences, 1994 - 96 given by Indian Council of Agricultural Research, Government of India.

[17] http://www.amdmyanmar.com/
[18] https://www.unicef.org/
[19] http://greenehss.com/our-services.html
[20] http://www.ghgaccounting.ca/
[21] https://greencanada.co/
[22] http://www.aceehss.com/
[23] http://www.wif.care/about-wif/
[24] http://thecochincollege.edu.in/index.php/site/faculty/10/#visible

1.5 Presentation of the Health Expert and Health Impacts of the Project

The health impacts of the project are sanitation and water borne diseases from the effect on water quality due to the effluent discharge, respiratory diseases from effect on air quality from the air emissions from the use of fossil fuels and hearing problems from noise impacts from the machine operation. The public health expert for the project is Dr Win Zan, MBBS, from Institute of Medicine, Yangon. He has experience of working as the public health expert for many development projects that include the mining and seismic studies. Dr Mon Myat, another team member and a veterinary doctor and an expert for water quality and the biodiversity has assessed the effect on public health and health of animals, fishes and livestock.

The project study made use of the data and reports by international organisations such as United Nations Development Program (UNDP), United Nations Children's Emergency fund (UNICEF), United Nations Framework Convention for Climate change (UNFCC)[25], World Health organisation (WHO)[26], Food and Agricultural Organisation (FAO), International Union for Conservation of Nature (ICUN)[27] and International Finance Corporation (IFC)[28].

[25] http://unfccc.int/2860.php
[26] http://www.who.int/en/
[27] http://www.iucn.org/
[28] http://www.ifc.org/

2.0 Policy, Legal and Institutional Framework

2.1 Corporate Environmental & Social Policies

Sustainable Tourism involving the local communities is what Amata group integrate with their core values of customer satisfaction, quality of service, prevention of environmental pollution and Health & Safety of People. Their vision is to operate in a sustainable manner making development without compromising the health, safety and environmental parameters. They are into luxury resort and hospitality industry for a long time and have demonstrated their commitment to environment and society. They understand that the co-existence with the local people is of prime importance for the successful operations.

There has been various Corporate Social responsible (CSR) programs that the project owner has undertaken for the villagers in the nearby islands. This include the supply of material for waste management, taking awareness sessions about waste handling, segregation and disposal, Involving the villagers of Nyaung wee for the fire drill of the project islands in the construction sites, and providing employment to the villagers in the construction activities of the project site. This is a win win situation for the project owner as well as the local people.

The environmental risk to the business is reduced through working in collaboration with their associates, hotel owners, franchisees, brands, suppliers, business partners and guests. This is done by focusing on critical areas including carbon emissions, energy, food & beverage, indoor environmental quality, supply chain, waste and water. Additionally, they are committed to integrating leading environmental practices and sustainability principles aimed at:

- Conserving natural resources
- Protecting ecosystem biodiversity
- Driving sustainable development
- Minimizing waste and pollution
- Establishing and reporting on key environmental performance indicators
- Raising environmental awareness among our associates, guests and communities

Amata Hotel Group has appropriate systems and process in place to ensure compliance with the policy and with statutory provisions, including addressing grievances. Divisional / Chief Executives, through members of the respective Management Committees, ensure implementation of this policy. Compliance with the Policy is being regularly monitored and evaluated by the Sustainability Compliance Review Committee (SCRC) of the Cooperate Management Committee (CMC). The report of the SCRC is reviewed by CMC every quarter. The CSR & Sustainability of the Board supervise the implementation of this Policy.

The future plans of the project owner in the CSR activities include the vocational training and grooming sessions for the villagers in the hospitality sector so that they can be employed in the resorts and as guides to the tourists. This suits the project owner as well as they get employable staff from the local area reducing attrition. The project owner is also considering the composting of the waste generated in the nearby island in their proposed composting system in the resort as the waste generation in the resorts are much below the design quantity in their system

2.2 Polcy and Legal Framework

All hospitality and related industries and enterprises in Myanmar are under the Ministry of Hotels and Tourism (MOHT)[29] of Myanmar. With assistance from the Hanns Seidel Foundation (HSF)[30], the ministry has published Responsible Tourism Policy in September 2012, Policy on Community Involvement in Tourism in May 2013 and Myanmar Tourism Master Plan (2013-2020) in June 2013. Due to these initiatives, the tourism sector among the economic sectors in Myanmar has more widely adopted and published government policies relating to responsible business and sustainability.

Myanmar tourism Legislation

Law, Act or Regulation	Section	Requirement in the Law
Myanmar Tourism Law	14	• Operate in a responsible and sustainable manner • Safeguard traditions, culture, and environment. • Comply with the provisions outlined in this Law, as well as any other rules, notifications, orders, and directives issued under this Law; • Ensure basic health, security and safety of tourists • Protect the privacy and personal data of Tourists • Pay taxes as per the law to the appropriate department. • Comply with License requirements
	30	Provide the tourism services only with the appropriate License
	31	Do not transfer or accept the Licenses for Tourism
Directives for Coastal Beach Areas		The construction has to be 50-metre away from the highest tide line
		Not to construct more than two stories or higher than the tallest tree or more than 10-metre height.
		Do not make any other massive construction along the beach area
		Choose construction material suitable for beach area
		Avoid construction of high walls and fencing to block the beach
		Do not dig on the beach sand area
		Land allowance of (5) meters for road construction within the hotel environs of every 500 meters for the accessibility of visitors to the beach areas

Table 2-1 Team Members for the EIA study

[29] http://www.myanmartourism.org/index.php
[30] https://www.hss.de/fileadmin/media/downloads/Berichte/121015_Myanmar_Tourism_English.pdf

The Myanmar tourism law[31] was passed on 17th September 2018 with an objective of promoting international and domestic tourism, safeguarding the rights of tourists as well as the service providers, ensuring quality and safety of the services, to increase the employment and to promote community-based tourism. The chapter 10, sections 13 & 14 outlines the rights and responsibilities of the tourism service providers and chapter 14, sections 30 & 31 outlines the restrictions for them. The legislation[32] relates to the hospitality sector that relates to the island resort project includes the Directives for Coastal Beach Areas[33].

Environmental Impact Assessments Related Legislation

The policy of the government is to make development in a sustainable manner taking into account the environmental and social parameters; and to enable this the government has taken keen interest in making relevant legal framework. Any organisation that develops a project in Myanmar, has to comply with the Environmental Conservation Law of 2012 and Environmental Conservation Rules of 2014. The overall responsibility of reviewing the environmental Impact assessments is with the Environmental Conservation Department (ECD) of the Ministry of Natural Resources and Environmental Conservation (MONREC).

The EIA study has to be as per the Myanmar EIA Procedure[34] and the Myanmar National Environmental Quality (Emissions) Guidelines dated 29/12/2015. The chapter V of the procedure specifies the requirements for the EIA/SISA study that covers the paragraphs 44 to 70 of the Procedure. The Myanmar National Environmental Quality (Emissions) Guidelines specify the allowable pollution limits for air, water, soil for each sector.

For the EIA study, the scoping phase requirements are provided in the paragraphs 47 to 54 with the paragraph 49 elaborately detailing the requirements. The EIA investigation is covered in the paragraphs 55 to 61 and the EIA reporting is the paragraphs 62 and 63. The submission is detailed in the paragraphs 64 to 66 and the report review and approval is provided in the paragraphs 67 to 70.

The third-party consultant confirm that they followed the requirements specified by the Myanmar EIA procedure. The sector specific emission guidelines with acceptable threshold values/limits with respect to the degradation of the air quality, water quality, land and noise levels for each sector is provided in this Environmental Quality (Emission) Guidelines. The guidelines published by the IFC is in line with these Guidelines. The section 2.6.4 for *Tourism and Hospitality Development* in this Emission Guidelines is the relevant section applicable or the proposed hotel project additional to the General emission guidelines.

[31] https://tourism.gov.mm/wp-content/uploads/2019/05/Myanmar-Tourism-Law-English-Version.pdf
[32] https://tourism.gov.mm/tourism-legislation/
[33] https://tourism.gov.mm/wp-content/uploads/2019/05/DIRECTIVES-FOR-COASTAL-BEACH-AREAS.pdf
[34] http://www.myanmar-responsiblebusiness.org/resources/environmental-impact-assessment-procedures.html

Law, Act or Regulation	Section	Requirement by the Law
Environmental Conservation Law 2012	14	All the pollution sources in the project to be treated, discharged, deposited as per the requirements of Environmental emission quality guideline Dec 2015
	15	Install onsite facilities to monitor, control, manage, reduce and eliminate pollution resulting from the project
Environmental Conservation Rules 2014	63	Project owner has to apply for prior permission to the ministry
	67	Project owner has to get approval from the ministry regarding environmental Impacts
	69 (a)	project owner should not emit, ask to emit, dispose, ask to dispose, pile up, ask to pile up hazardous substances that may affect the public directly or indirectly
	69 (b)	Project owner shall not carry out any activity which can damage the ecosystem and the natural environment except for the permission of the Ministry for the interests of the people.
EIA Procedure 2015	44 to 70	Environmental Impact assessments- Chapter V
	47 to 54	Scoping phase for the EIA SIA of the project
	55 to 61	EIA Investigation for the Project
	62 to 63	EIA reporting requirements for the Project
	64 to 66	Submission of EIA report
	67 to 70	Review and Approval of the EIA report
Environmental Emission quality guidelines 2015	1.1	Air emissions limits for the project
	1.2	Wastewater discharge limits during construction phase
	1.3	Noise Levels for the Project
	1.4	Odor levels for the Project
	2.6.4	Effluent limits for Tourism and Hospitality Development

Table 2-2 Legal requirements related to Environmental Impact Assessment

The procedure for public participation in the EIA process is still under development and only a draft version is available. The ministry along with their consultants have done several sounds of stakeholder consultations to improve this document.

Figure 2-1 Legal Framework in Myanmar for EIA projects

There are many sector specific procedures and guidelines related to the Hospitality and Tourism Sector that will apply to the project. The laws relating to the island resort projects are as below.

Forest and Land related regulations

Law, Act or Regulation	Section	Requirement in the Law
Myanmar Forest Policy (1995)		Make strategies to follow the Policy of land use, protection and management, forest regeneration and afforestation
The Forest Law (1992)	5	Conserve the reserve forests and mangrove in the Islands
	12	Obtain approval of the Forest Ministry for the project
The Land Acquisition Act (1894)	4	Notification in the gazette for need of the land for project
	5	Conduct necessary investigations about the land suitability
	9	Provide notice at convenient locations near the land if intend for land acquisition
	41	Make agreement to pay for the compensation if any
	42	Publish the agreement with government in the gazette
The Vacant, Fallow and Virgin Lands Management Law-2012	16	Project owner has to use the land for the Island resort project only

Table 2-3 The laws relating to Land and Forest in Myanmar

Conservation of Nature related laws

Law, Act or Regulation	Section	Requirement in the Law
The Protection and Preservation of Cultural Heritage Regions Law (1998), Amended by Law No.1/2009	22	All construction has to be in conformity with the conditions prescribed region wise by the Ministry of Culture in the cultural heritage region.
The Protection and Preservation of Antique Objects Law (2015)	12	Inform the relevant authority if any antique objects found during construction
The Protection and Preservation of Ancient Monuments Law (2015)	12	Inform the relevant authority if antique monuments found during construction
The Freshwater Fisheries Law (1991)	36	Take permission from Fisheries department for construction
	40	Do not harass the fishes or pollute the water
	41	Do not alter the water quality, direction or quantity
The Water Power Act, 1927	3	The project owner should not contaminate Public water
The Underground Water Act, 1930	3	The project owner needs to get a license for drawing groundwater
The Conservation of Water Resources and Rivers Law (2006)	11	Do not contaminate the water with oils, chemicals, soil or use explosives or electricity in water to catch fishes
	12	No silt trapping or blocking
	13	No sand dredging without permission
	21	No lavatories near the river to be made by the construction staff
	22	No piling up of construction material near the bank without approval of directorate
	23 (b)	No building of bridges or structures without approval from the directorate
MARPOL 73/78		The sewage from the vessels, and boats and the garbage should not be thrown to the sea.

Table 2-4 Laws relating to conservation of nature and water resources

Labour and Investment related laws

Law, Act or Regulation	Section	Requirement in the Law
The Myanmar Insurance Law, 1993	16	Requires any business which may pollute the environment to effect compulsory general liability insurance
Myanmar Investment Law (2006)	65 (a)	Follow the responsibilities to comply with the customs, traditions and traditional culture of the ethnic groups
	65 (c)	Follow the stipulations in the granted license
	65 (e)	Inform the commission if any minerals are found in the Land
	65 (f)	Not to change the topography of the land without permission
	65 (g)	Practices to avoid pollution and damage to nature and society
Social security Law 2012	11 (a)	Registration of employees in the social security scheme
	15 (a)	Take care of welfare, during injury and illness
	18 (b)	Contribute for the employee's security fund in the wage
	48 & 49	affect insurance during construction phase by registering at the relevant township social security office
	75	Keep record of attendance, terminations, promotions etc
Protection of National Races Law (2015)	5	explain the Project details to the ethnic races in the project area and ensure grievance redressal if any.
Leave and Holidays Act (1951) (No.58)	3	List of public holidays in a year for the employee
	4	Earned leave of 10 days for 12 months completed workers
	5	6 days of casual leave in a year
	6	Maximum of 30 days of medical leave in a year
Labor Organization Law (2011)	29	Recognize labor organizations and Unions
	30	2 days/month to workers for labor organizational duties
	37	14 days advance notice to workers in case of lock outs
	44	No lock out while trade dispute is under negotiation
Settlement of Labor Disputes Law (2012)	38	Negotiate and coordinate complaint within prescribed time
	39	Do not alter the conditions of service of workers for the period of investigation
	40	No lock out while trade dispute is under negotiation
Minimum Wages Law (2013)	12	Pay minimum wage set by the authorities
	13	Inform the workers of the wage, maintain lists, and report to authorities
Payment of Wages Act (2016)	3	Wage to be paid in MMK or currency recognized by Central Bank
	4	Payment within stipulated time for different jobs
	14	Payment of overtime wages as per the presiding rates
Employment and Skill Development Law (2013)	5	Make contract with the employees within 30 days
	14	Provide occupational training to the employees

Table 2-5 Labour and investment related laws

Public Health and Occupational Health related laws

Law, Act or Regulation	Section	Requirement in the Law
OHS Law 2019	8	Register with Dept of Registration for OHS
	9	Inform the Dept about extension, demolition, modification etc
	12	Appoint a person In-charge for OHS matters and form an OHS committee
	26-a	Assess the risks of Workplace, Process and machines
	26-b	Assess the likelihood of occurrence of hazards
	26-c	Have workers medical checked-up by the Recognized Doctor
	26-d	Improve the Workplace until it is safe and good for health
	26-e	Provide Workers with sufficient PPE, equipment and materials
	26-f	Prescribe precautionary plans and plans for emergency
	26--g	Provide a clinic, doctor, nurse with medicines for workers
	26-h	Make arrangements for OHS trainings for workers
	26-i	Arrange to report to the OHS In-charge of any accidents
	26-j	Arrange to prevent people to eb exposed to risks
	26-k	Arrange to evacuate in case of a potential OHS incident
	26-l	Arrange to Display OHS signs, instructions and guides
	26-m	Arrange to give Precautions when entering hazardous areas
	26-n	Arrange to circulate OHS Manuals and guidelines from government
	26-o	Arrange to make fire safety plan, perform fire drills and train Workers
	26-p	Allow inspection officers to enter and do their enquiries
	26-q	Allow to work only prescribed hours in hazardous areas
	26-r	Incur the expenses for the OHS
	27	Do not dismiss the workers for reporting OHS, refused to work at risky areas, before medical report is given,
	28	If employ do not have social insurance, employer has to pay
	29	Make arrangements for pregnant women and mothers, stop unhealthy people to work and allow to rejoin when healthy
	34	Inform about the OHS accidents, and diseases of workers
	36	Do not tamper or change evidence before inspection after occurrence of an OHS accident

Table 2-6 Occupational Health Law related requirements

Law, Act or Regulation	Section	Requirement in the Law
Factories act 1951		Environmental emissions and Occupational Health and safety of the employees
Public Health Law 1972	3&5	The Project Proponent has to ensure that community and occupational health and safety of the project area is protected
The Prevention and Control of Communicable Disease Law (1995)	3	Immunize the workforce and provide education
	4	abide by the measures undertaken by the Department of Health
	9	Report any outbreak of diseases to the public health department
The Control of Smoking and Consumption of Tobacco Product Law-2006	7	Arrange specific smoking area to keep other areas non smoking
	9	Mark the smoking areas clearly and ensure other areas as non-smoking zones
Myanmar Firefighting Law	25	Have firefighting preparedness with necessary equipment and training for the staff

Table 2-7 Public Health related Legal requirements

Explosives and Petroleum related laws

Law, Act or Regulation	Section	Requirement in the Law
Explosives act 1887	7	Import, transport and use of the explosive item by a License
Explosive substances act 1908	3	Use of Explosives should not endanger lives or property
Myanmar Fire Brigade Law (2015)	25	provide fire safety equipment and make emergency plan
The Petroleum and Petroleum Product Law (2017)	10	License from MONREC for storage and use of petroleum
	15	License from MOEE for storage of more than 500 gallons of petroleum
	30	No Business to run without license for use of petroleum
	31 (b)	Use of warning signs for dangerous petroleum transport and storage
	32	Not to refuse help to authorities if asked
	33	Report to nearest authority of any accidents from petroleum
Myanmar Engineering Council Law (2013)	31	Duties and rights of engineers
	37	Avoid technological works that are dangerous to the public

Table 2-8 Explosives and Petroleum related laws

2.3 Contractual and other Commitments

The project owner does not have any contractual commitments related to the project apart from the lease permit of the island to set up the island resort. The lease covers the whole of two islands Balar and Phoni (Bo Yar Nyunt Kyun) totalling around 700 acres; however, the project owner has decided to only develop the 10 acres each in both the islands for the project resort and leave the rest of the islands as it is.

The project owner has agreed during the public meeting that they will restrict the development of the island resort to the specified area and will leave the rest of the island that include the freshwater source accessible to the villagers in the nearby islands. The project owner also has committed to employ the local people as staff in the resort as part of the community-based ecotourism initiatives.

IFC has provided the project owner with funds to develop ecotourism projects that involve the local communities. Such projects have been successfully implemented in other locations. Similarly, the project resort also expects to be funded partially by international organisations such as the IFC who focus on sustainable development and jobs for the local communities.

2.4 Institutional Framework

Tourism development is prioritized in the Government's "*Framework for Economic and Social Reforms (FESR)*[35]" as "potentially one of Myanmar's most important sectors, with tremendous potential to contribute to greater business opportunities and balancing social and economic development if properly managed and developed". The government officials in the Hotel and tourism department in Kawthaung keep regular interaction with the project developers and help them with necessary information. This has resulted in the project developers having sufficient understanding about the legal and statutory requirements in the sector.

The Myanmar Tourism Federation, formed in 2012 facilitates the communication channel between the private sector and the government. Its official mission is to promote Myanmar as a tourist destination, support sustainable tourism development, welcome and assist investors, and develop human resources for tourism-related industries. Tourism fare for Mergui Tourism was conducted in Kawthaung in March 2018 with active participation from the project developers and potential investors and service providers from nearby international tourist destinations.

2.5 Project's Environmental and Social Standards

The island resort and dive centre plans to operate as per the high standards of sustainable tourism that is followed globally. This covers the quality (ISO 9001:2015), environmental (ISO 14001:2015) and health standards for building and construction, efficient and low energy consuming designs, food safety (ISO 22000:2018), Occupational Health & Safety of the employees (ISO 45001:2018 & OHSAS 18001:2007), and the general environment. The design of the project will incorporate these requirements.

[35] http://www.eaber.org/sites/default/files/FESR%20Official%20Version%20-%20Green%20Cover.pdf

2.6 Health Standards of the Project with Health Impacts

The health impacts due to the project are the water borne diseases due to effluent discharges, respiratory diseases due to depletion in air quality and hearing problems from noise. The guidelines and standards set by organisations used for the assessment were

- World Health Organisation (WHO),
- American Public Health Association (APHA)[36],
- Faculty of Public Health, United Kingdom[37]
- European Commission on Public Health[38]
- National Rural Health Mission (NRHM)[39],
- Public Health Foundation of India (PHFI)[40],
- International Finance Corporation (IFC), and
- Food and Agricultural Organisation (FAO)[41]

[36] https://www.apha.org/what-is-public-health
[37] http://www.fph.org.uk/professional_standards
[38] https://ec.europa.eu/health/
[39] http://nrhm.gov.in/nhm/nrhm/guidelines/indian-public-health-standards.html
[40] http://www.phfi.org/
[41] https://ec.europa.eu/health/

3.0 Project Description

3.1 Project Rationale and Background

The proposed island resort and dive centre project of Amata International Co Ltd will be providing luxury hospitality services to the wealthy tourists that seek tropical islands for their vacations. The project owner has been granted the permit to set up the island resort by the Myanmar Directorate of Investment and Company Administration (DICA) with a lease of two islands Phoni (Bo Yar Nyunt Kyun) and Balar with a total area of 750 acre (Phoni and Balar has an area of 530 Acre and 220 Acre respectively) on which they plan to utilise 10 acres on each of the islands for the resort construction and operation. The guest arrivals have increased substantially in the region after the Thailand Myanmar border was opened in 2013. The Mergui archipelago has had a surge in guest arrivals in the recent times and developing the tourism sector can develop the region in a sustainable manner.

3.2 Project Location, overview map and site layout maps

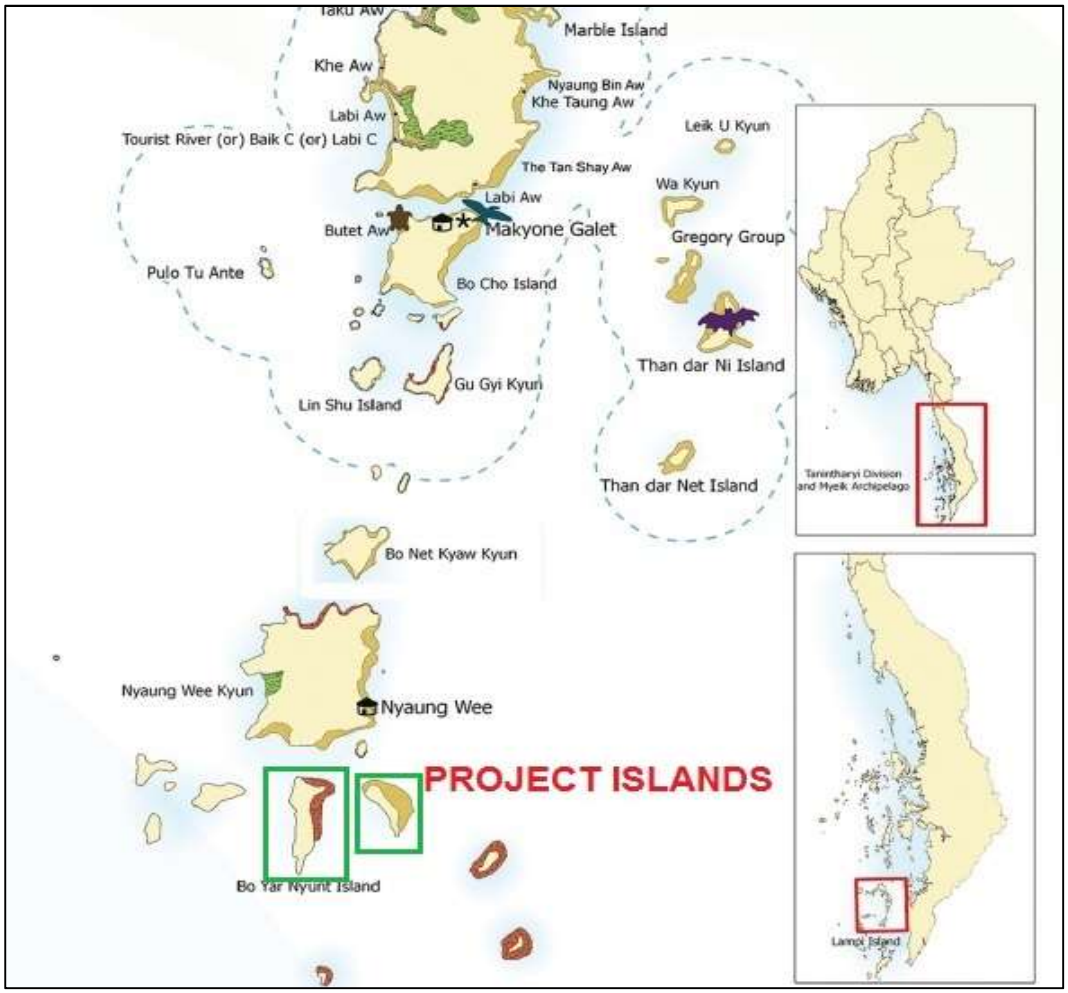


Figure 3-1 Project Islands in the Mergui Archipelago

Both Phoni (Bo Yar Nyunt Kyun) and Balar islands are uninhabited by human beings and is located around 16 nautical miles west off the Aung Bar village, near Kawthaung township in Tanintharyi region in Southern Myanmar. The total area of both the islands has a total area of 750 Acres (Phoni and Balar has an area of 530 Acre and 220 Acre respectively) and is 14 nautical miles south of the Lampi marine national park[42].

Figure 3-2 The geographical coordinates measured on the two project islands

The geographical coordinates of the proposed resort area measured on the Phoni (Bo Yar Nyunt Kyun) Island is $10^0$27'38" North $98^0$13'09" East and Balar Island is $10^0$27'56" North $98^0$14'22" East.

The project area is approachable from Bangkok, Phuket, Ranong and Phang Nga in Thailand that are already busy tourist attractions with lot of international tourist arrivals every year. The tourists visiting these places will have an option to extend their tours to the islands near the Mergui Archipelago that remain unexplored.

The nearest airport to the project site is Kawthaung that is around 50 miles away from Aung Bar village by road. The normal wooden boat ride from Aung Bar takes less than 2 hours whereas the boat rides direct from Kawthaung takes around 5 hours. The speed boats are comparatively faster and can reach the project islands from Kawthaung in two hours' time.

[42] http://www.lampipark.org/

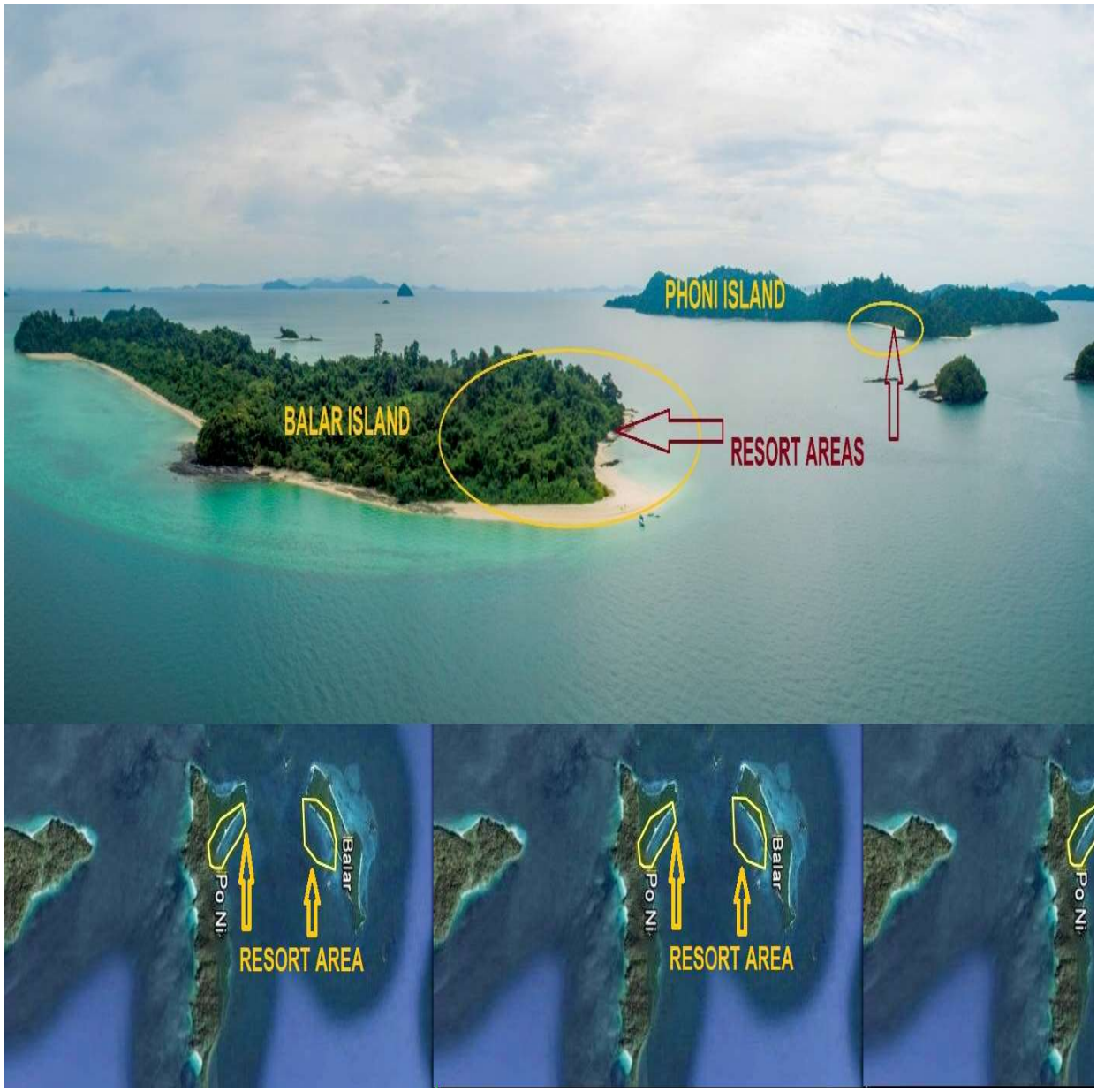


Figure 3-3 The Google Earth view for Balar and Phoni Islands

The plan for the resort and the dive centre is to use the 10 acres on each of the two islands; the North East Corner of Phoni (Bo Yar Nyunt Kyun) Island and on the North West corner of the Balar Island. The resort cottages on each of the islands will be facing each other as shown in yellow circles in the figure 3.3 above.

The resort will have 50 bungalows of which 30 are planned in Phoni (Bo Yar Nyunt Kyun) Island and 20 are in Balar Island, a dive centre, permanent jetties on each of the islands, swimming pool, restaurant, reception & office building and service quarters.

Figure 3-4 Balar Island- North Western shores

Figure 3-5 Phoni (Bo Yar Nyunt Kyun) Island-North Eastern shore

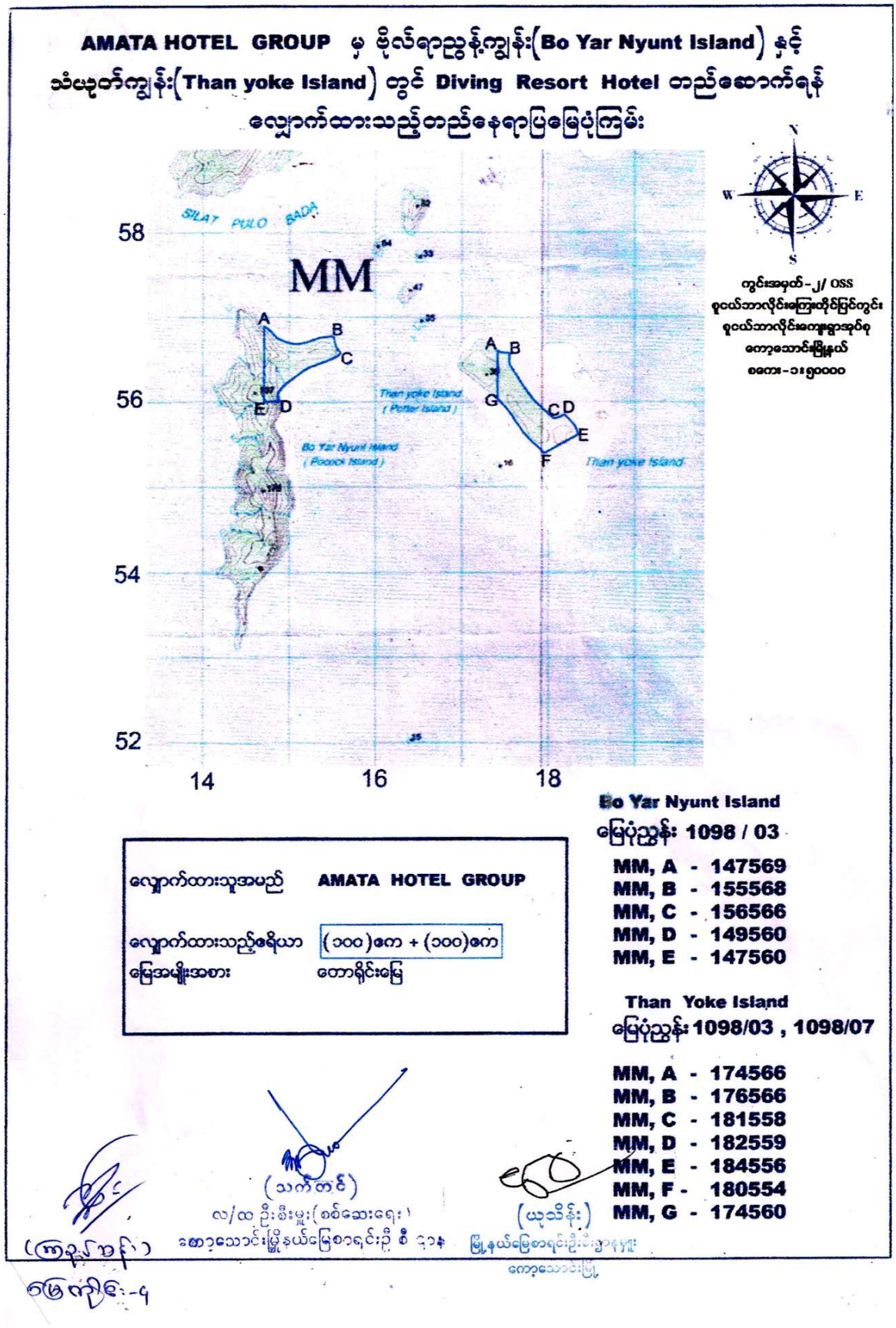


Figure 3-6 The copy of the lease of the land for the project

3.3 Project Development & Implementation Time schedules

The project construction feasibility studies have been completed and a small part of the islands have been cleared of shrubs for making way for exploration of fresh water source and preparation for future construction. The complete construction and the operation of the bungalows will be commenced only after the environmental study completion.

As per the initial plan, the construction of the project was envisaged to start only after the monsoon of 2017 was completed. As per the project management estimate, the construction and landscaping of the first set of cottages in the Phoni Island was targeted to finish by end of December 2017. The cottages are modular components that can be assembled at site with minimum work of concreting, cutting, welding and joining activities.

A fresh water source found on the Balar Island was found to be not recommended for consumption due to high hardness and salinity content. The project owner has cleared the shrubs and has laid foundation for 10 cottages on Phoni Island in December 2017. The construction activities on the Balar Island has commenced after the monsoon of 2018 and the foundations are made. The project owner is expecting to finish the construction in 2019 after the monsoon.

Once the project resort is ready to be serving the customers after the construction phase, it will be open for eight months of the year barring the 4-month monsoon period due to safety considerations. The project owner has not decided on the time when they will decommission the resort. A promotional video made by the project owner can be accessed at https://www.youtube.com/watch?v=uptAHQx9fnQ.

3.4 Description of the Size, Installations and Technology

The project estimated cost is 6,900 Million MMK. The resort, dive centre and recreation centre on the two islands of Balar and Phoni (Bo Yar Nyunt Kyun) will cover 10 acres each and will be facing each other. The resort will have a total of 50 bungalows (20 in Balar and 30 in Phoni), a permanent jetty each on the islands, a dive centre, swimming pool, restaurant, reception & office building and service quarters. There will be waste water recycling plant to treat the effluent for reuse.

The resort will have boats for transporting guests, sightseeing and diving. Jet Skis will be also available for recreational purposes. Floating Pontoon Marina will be used to dock the boats for sightseeing and diving. The modular components that will be used for the cottages will aim at minimum consumption of plastic, glass and steel materials to be sustainable and eco-friendly.

The design will be in such a way that uses a lot of open and empty spaces to aid ventilation and air supply will be prominent. The guidelines and publications provided by the internationally accepted eco-friendly and sustainable ways of design, construction and operation of resorts and buildings such as Green Hotelier, In Habitat, Leadership in energy and environmental design (LEED) and Eco Tropical resorts will be used while making the construction.

3.4.1 Resort Facilities in Balar Island

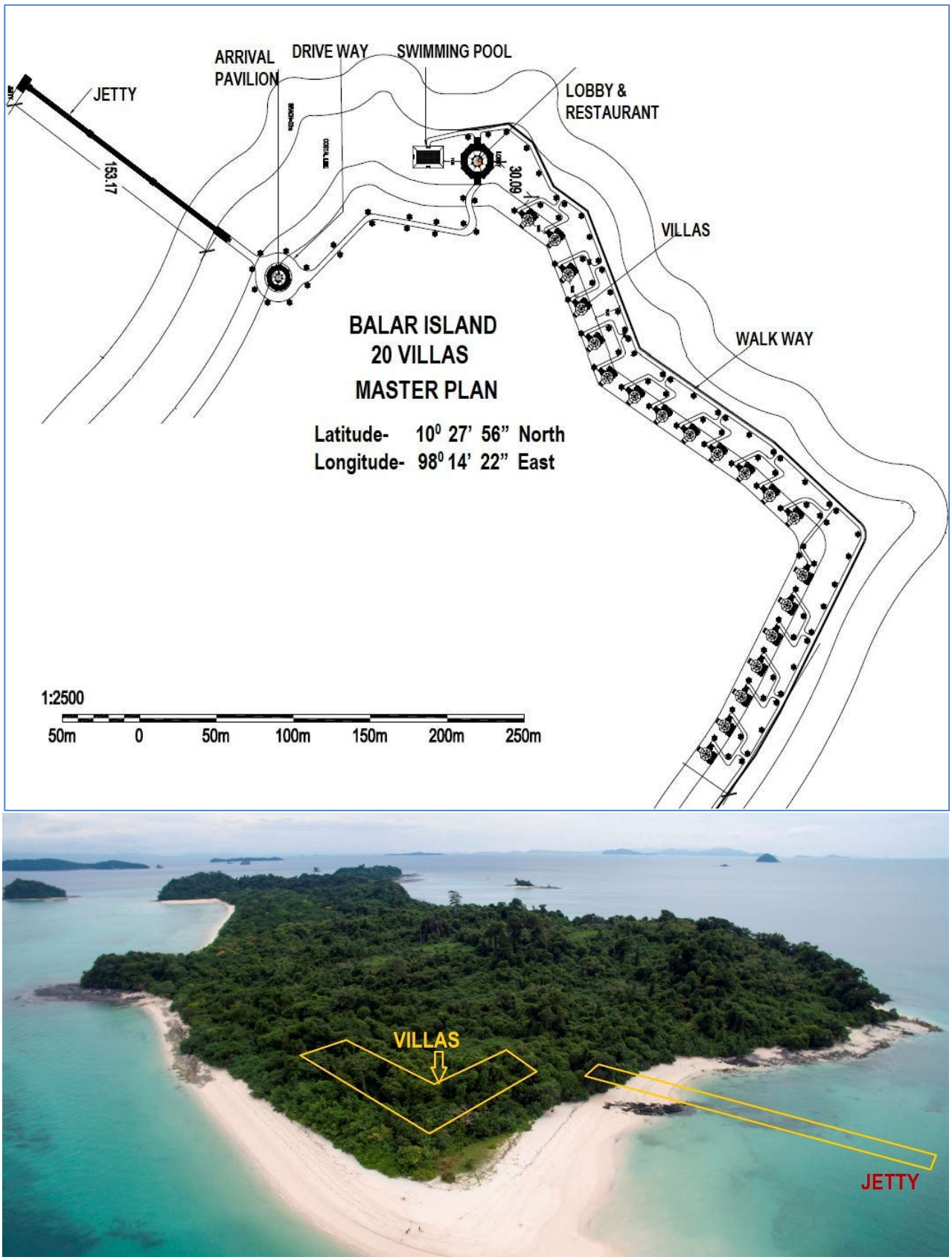


Figure 3-7 The layout map for villas in Balar Island

The permanent jetty planned for the Balar island is 153.17-Metre-long on the North Western side. The jetty does not cover sandy beach and is planned on the area covered with rocks. The depth of water at docking point is more than 10-feet-deep with no requirement for dredging and removal of corals for the jetty construction and maintenance.

The 20 luxury villas in Balar Island is spacious with a total floor area of 703.41 square feet each and a roof area of 494.044 square feet each. Each villa will have a decking area of 203.497 square feet. The geographical co-ordinates of the resort location on Balar Island is $10^0$27'56" North $98^0$14'22" East.

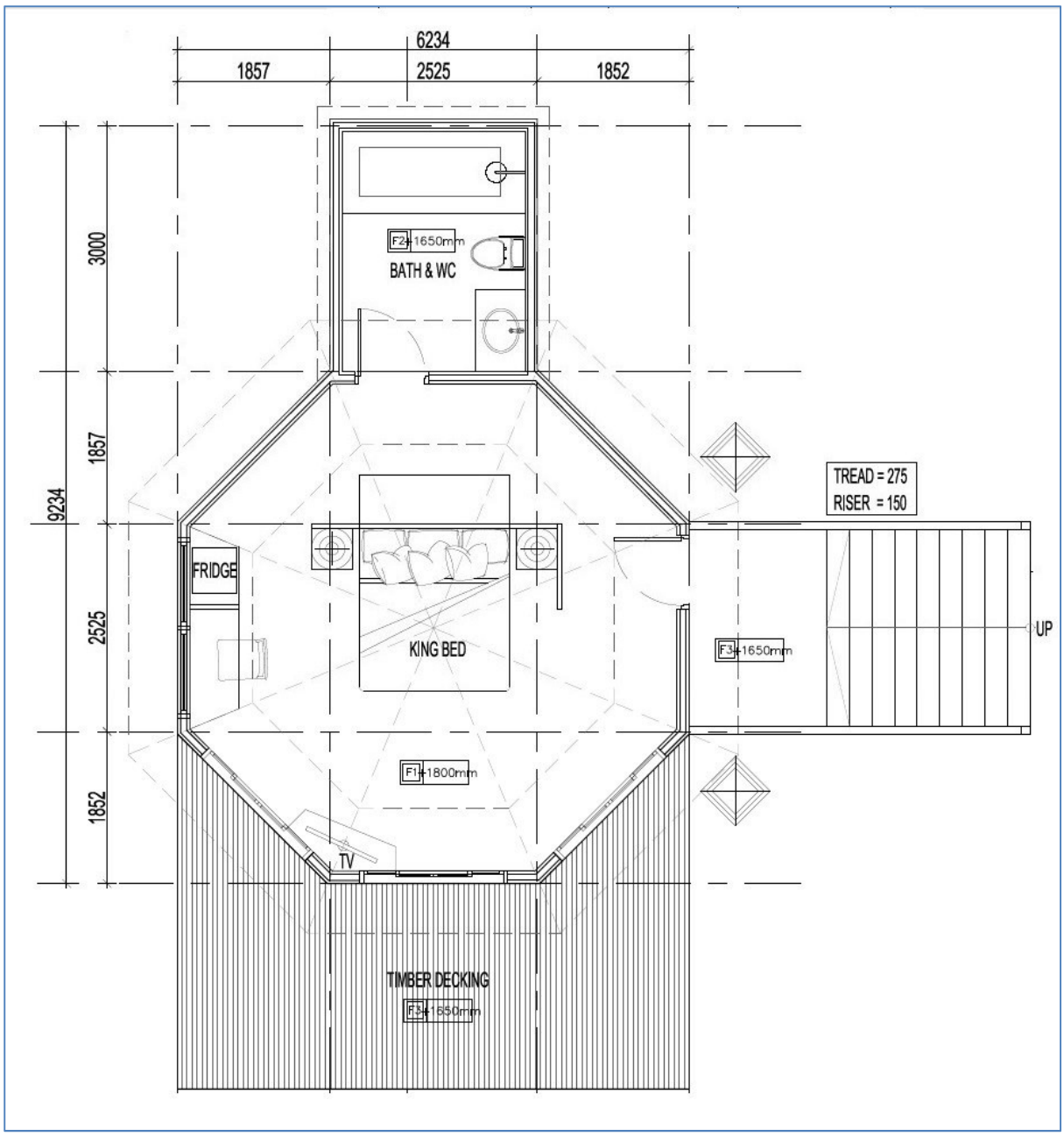


Figure 3-8 Floor Plan of the villa in Balar Island

There is a common swimming pool planned near the lobby and restaurant building for the tourists. There will be a drive way from the arrival pavilion to the lobby building and there will be walk ways along the villas till the swimming pool. The lobby and restaurant building will have a total floor area of 7443 square feet.

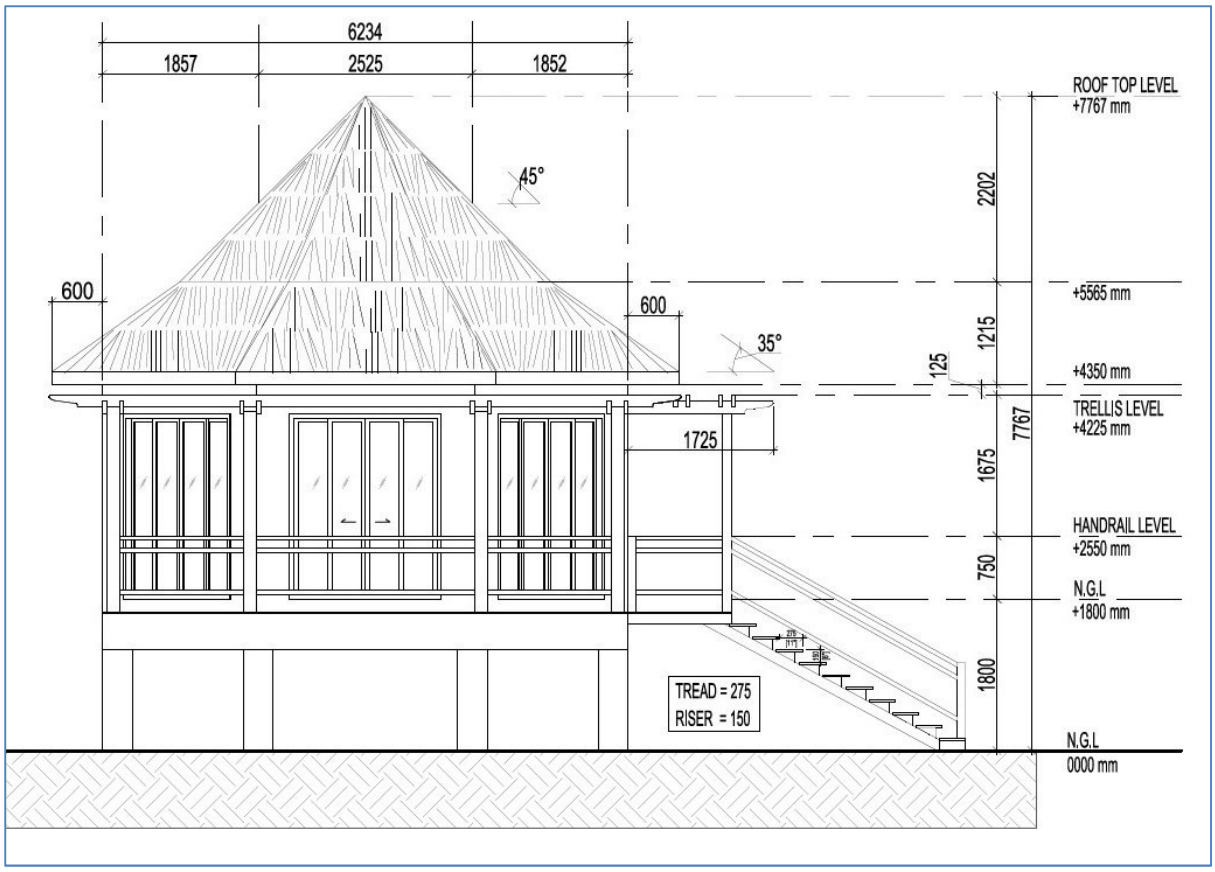


Figure 3-9 The elevation of the villa in Balar island

Balar Bungalow Area in square feet	
Bedroom	314.132
Bathroom and wet area	70.1845
Decking	203.497
Stairs	115.595
Total Indoor Area	384.317
Total Outdoor Area	319.093
Total floor Area	703.410
Total Roof Area	494.044

Table 3-1 The area of the villas planned in the Balar Island

3.4.2 Resort Facilities in Balar Island

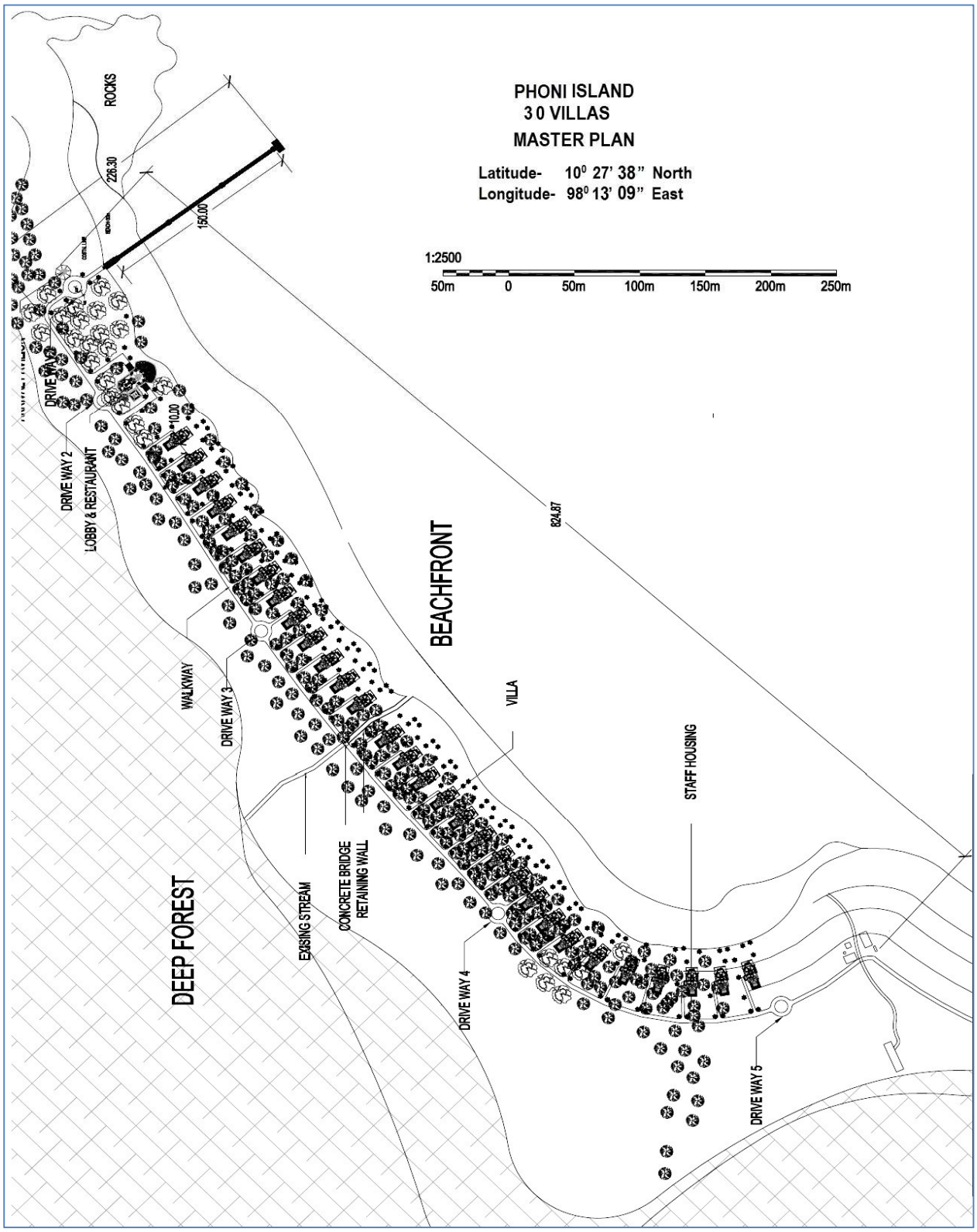


Figure 3-10 The Layout of the cottages in Phoni Island

The permanent jetty planned for the Phoni island is 150-Metre-long on the Eastern side of the island and is located to the North of cottages' location. The jetty does not cover sandy beach and is planned on the area covered with rocks. The depth of water at docking point is more than 10-feet-deep with no requirement for dredging and removal of corals for the jetty construction and maintenance.

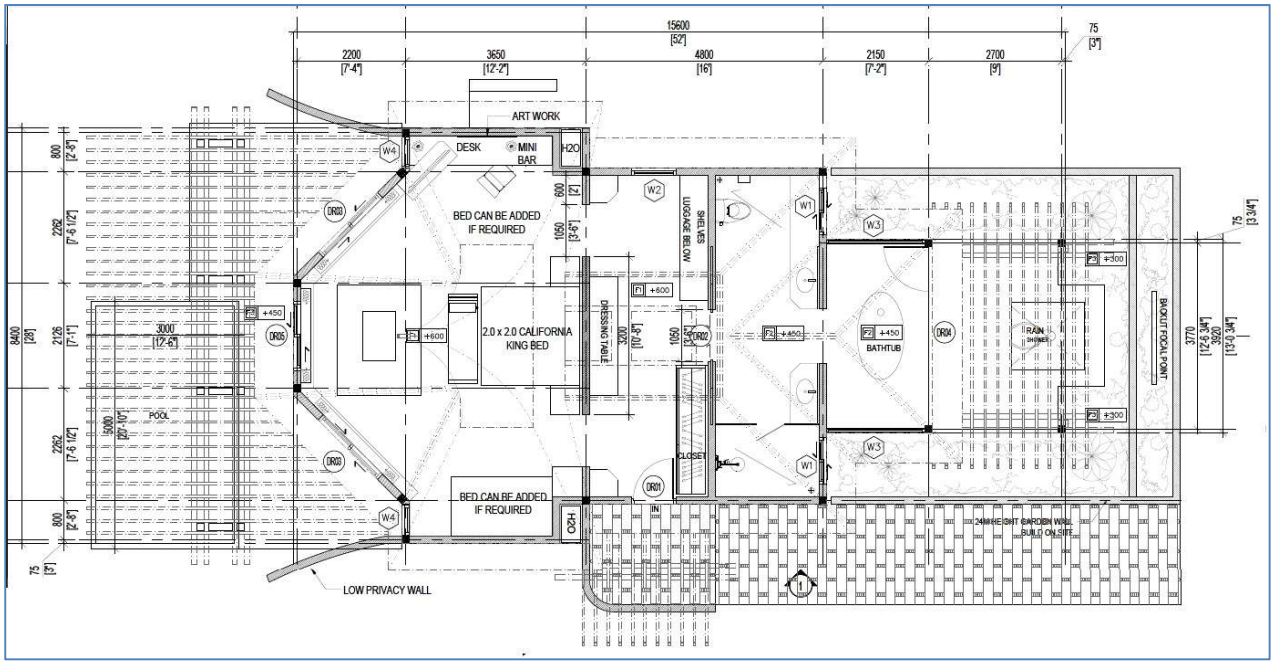


Figure 3-11 The Plan view of the villa in Phoni Island

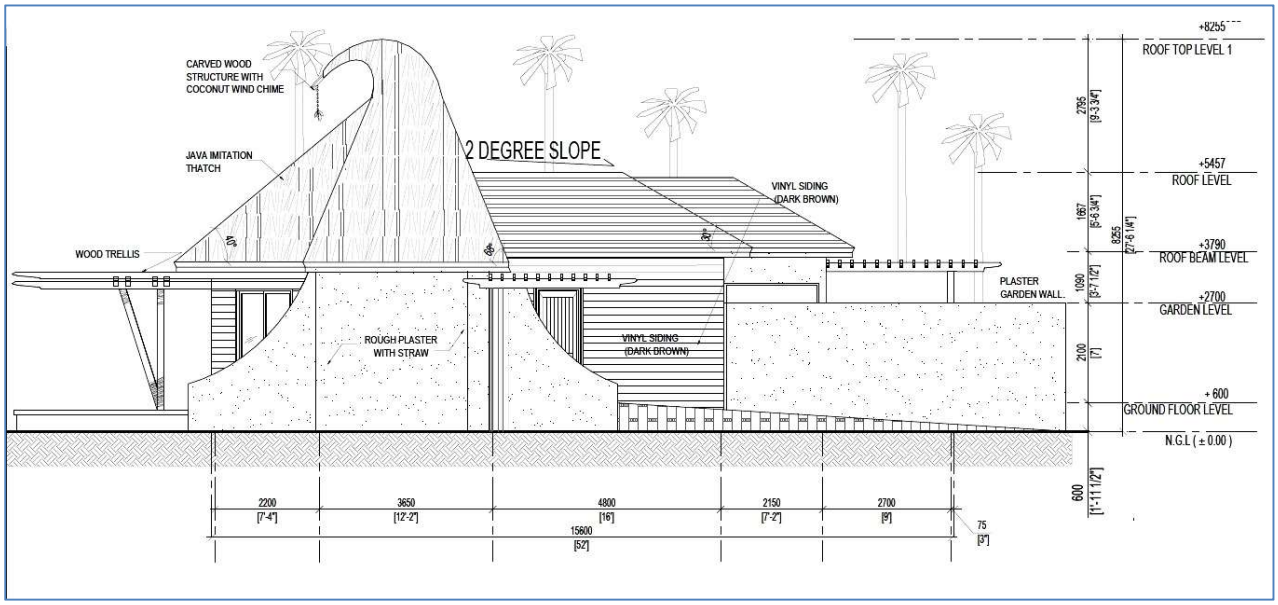


Figure 3-12 Elevation view of the villa in Phoni Island

The 30 cottages in Phoni Island is luxury type with a total floor area of 148.38 square metre (1,597.16 square feet) each and a roof area of 107.31 square metre (1,155.08 square feet) each. Each cottage will have an individual pool of size 15 square metre (161.46 square feet). There will not be any common swimming pool in the Phoni Island.

The geographical co-ordinates of the resort location on Phoni Island is $10^0$27’38” North $98^0$13’09” East.

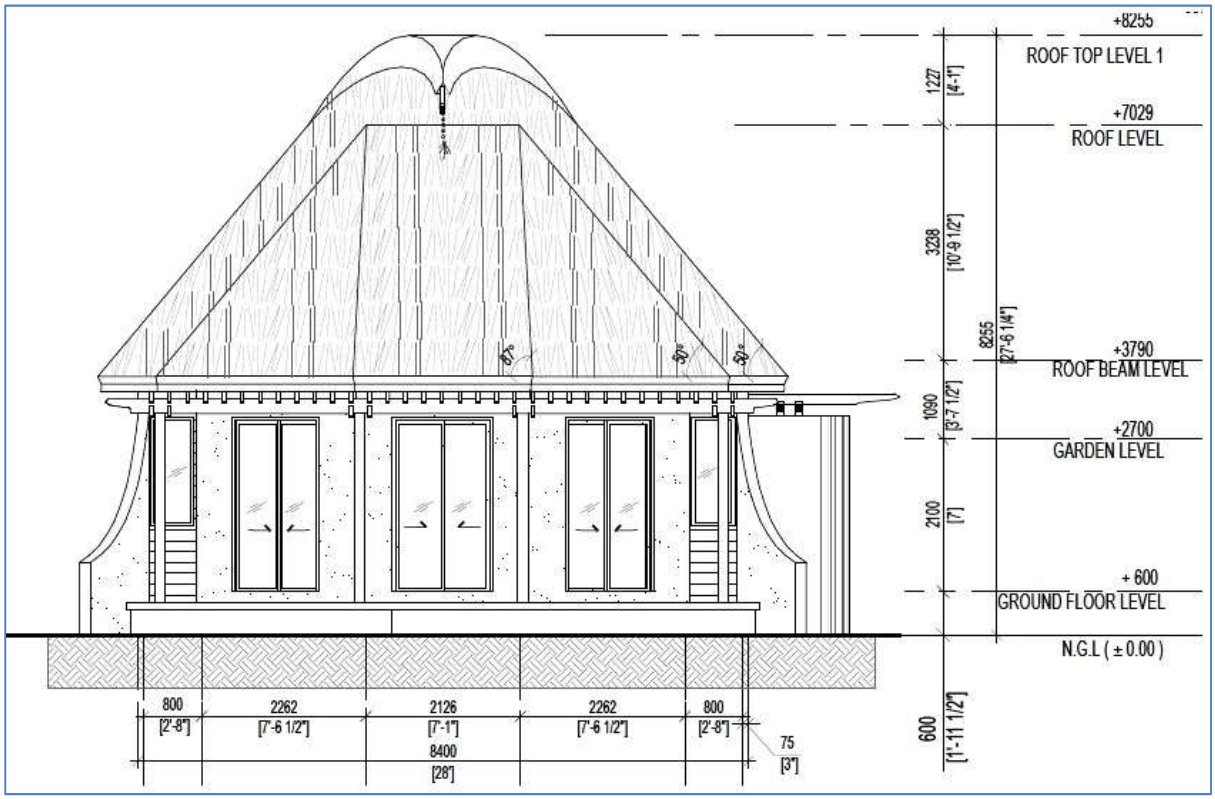


Figure 3-13 The end view of the villa in Phoni Island

Phoni Cottage Area	Square Metre	Square Feet
Bedroom	37.16	399.99
Bathroom	21.16	227.766
Wall in closet	15.60	167.918
swimming pool	15.00	161.46
Decking	21.88	235.516
Outdoor shower	37.59	404.619
Total Indoor Area	73.91	795.567
Total Outdoor Area	59.47	640.135
Total Floor Area	148.38	1,597.16
Total Roof Area	107.31	1,155.08

Table 3-2 The cottage area in the Phoni Island

3.4.3 The Machinery at site

The machinery, equipment and boats planned to be used for the island resort and the diving centre is below. The fuel usage estimate is considering the use of these boats for sight-seeing.

Machinery List	Number
Passenger speed boat	2
Diving Boat	4
Sightseeing speed boat	3
Cabin boat	3
Floating Pontoon Marina	3
Jet ski	3
Oxygen Filling Plant	3

Table 3-3 The machinery and equipment at site during operational phase

3.4.4 The Dive Centre

The Mergui archipelago is known for its many dive sites that attract foreign travellers. There are around 50 dive sites and the depths vary from 5 to 40 metres with a visibility range of 5 to 50 metres[43]. The period from October to May is considered as the main Burma diving season with calm seas and clear skies and even the most remote dive sites being accessible. Due to the plankton blooms during February to May, the Manta Ray and Whale Shark sightings also become frequent.

The proposed resort will have a dive centre that can provide the guests with equipment, and transportation for scuba diving and snorkelling. The resort will have three Oxygen filling plants and will maintain 100 sets of diving equipment such as wet suits, tanks, regulators, fins, gloves, belt and weights and other related items for the guests

[43] http://www.dive-the-world.com/diving-sites-burma.php

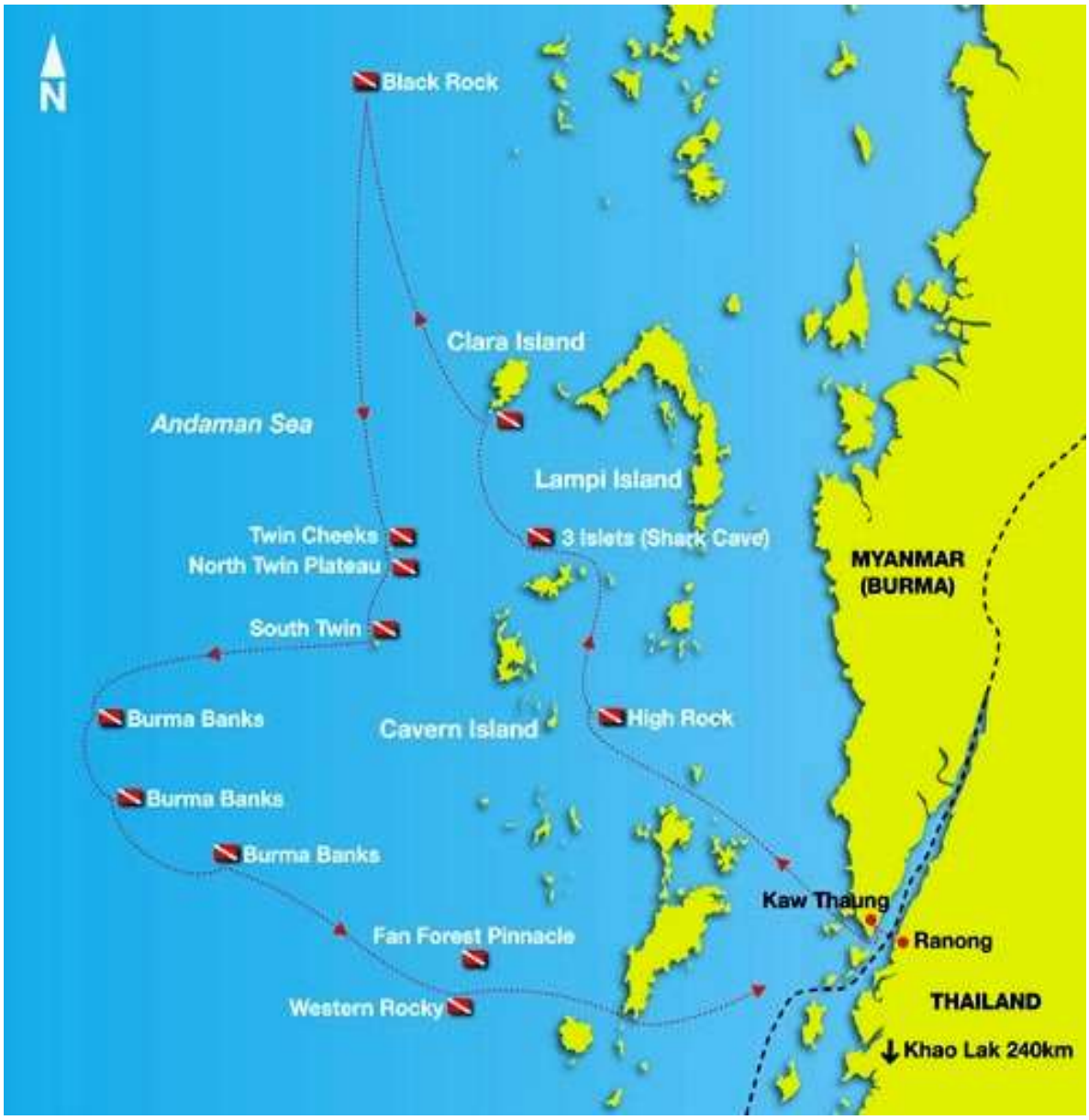


Figure 3-14 The dive sites near the Mergui Archipelago

Figure 3-15 The sightseeing activities-indicative picture

Figure 3-16 The proposed Dive centre pictures-indicative

3.4.5 The Floating Pontoon Marina

The project proposes to use modular floats made of industrial strength high density polyethylene as the jetty to dock the boats while sightseeing and diving. The use of floating jetty makes it convenient for the guests to dock at any point. The floats can be easily constructed and re-configured to be customised as per the requirements. The

innovative slip resistant block system has interlocking sections that connect together forming the pontoon.

Figure 3-17 The Floating Pontoon Marina for docking (Source Versadock, UK)

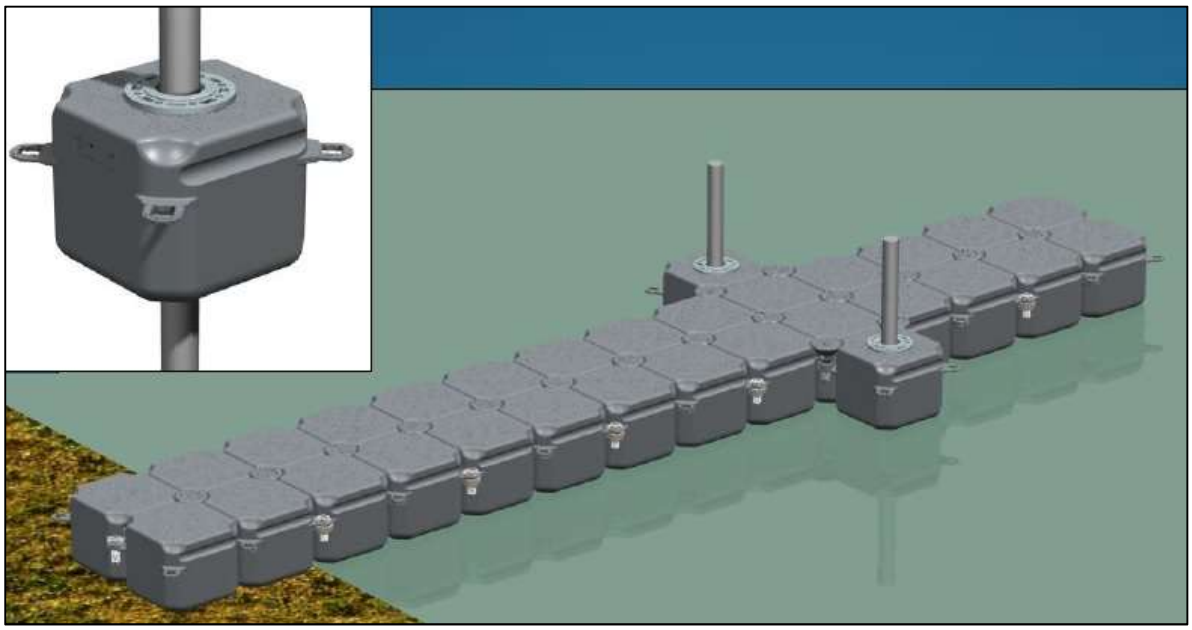


Figure 3-18 The modules for the floating pontoon (Source: Versadock, UK)

The floating Pontoon is designed for the toughest marine environments and manufactured with durable materials. The wall thickness of the modular components is kept at a minimum of 8mm and the floats have been re-engineered to give stronger

radius around the lugs. The latest 2016 technology in pin and nut moulds has added an extra tonne in loading to each, massively strengthening the whole platform. The product range provided in the webpage of Versadock, UK, a leading floating pontoon manufacturer is provided for reference[44].

Figure 3-19 The modular parts forming the floating pontoon-Indicative picture

Figure 3-20 The floating dock (Source- Versadock, UK)

[44] http://versadock.com/product/all-components-nato-refs/

3.4.6 Wastewater Treatment System

The total freshwater requirement at the two islands at its full occupancy is estimated as 16,400 Gallons per day; the waste water discharged from washrooms, toilets and kitchen will be treated at the Sewage treatment plant to be reused. This will ensure a zero discharge from the resort and also will reduce the groundwater intake.

Initially, the plan was to treat the water to comply with the effluent discharge requirements in the environmental emission guidelines dated 29th December 2015 for hospitality sector from the Environmental Conservation Department (ECD) of the Ministry of Natural Resources and Environmental Conservation (MONREC).

Hence, the initial plan for waste water treatment system for the project was the anaerobic technology based where the system can process an input of water with the Biological Oxygen Demand (BOD) of 200 milligram per litre (mg/l) to bring it down to 20 mg/l.

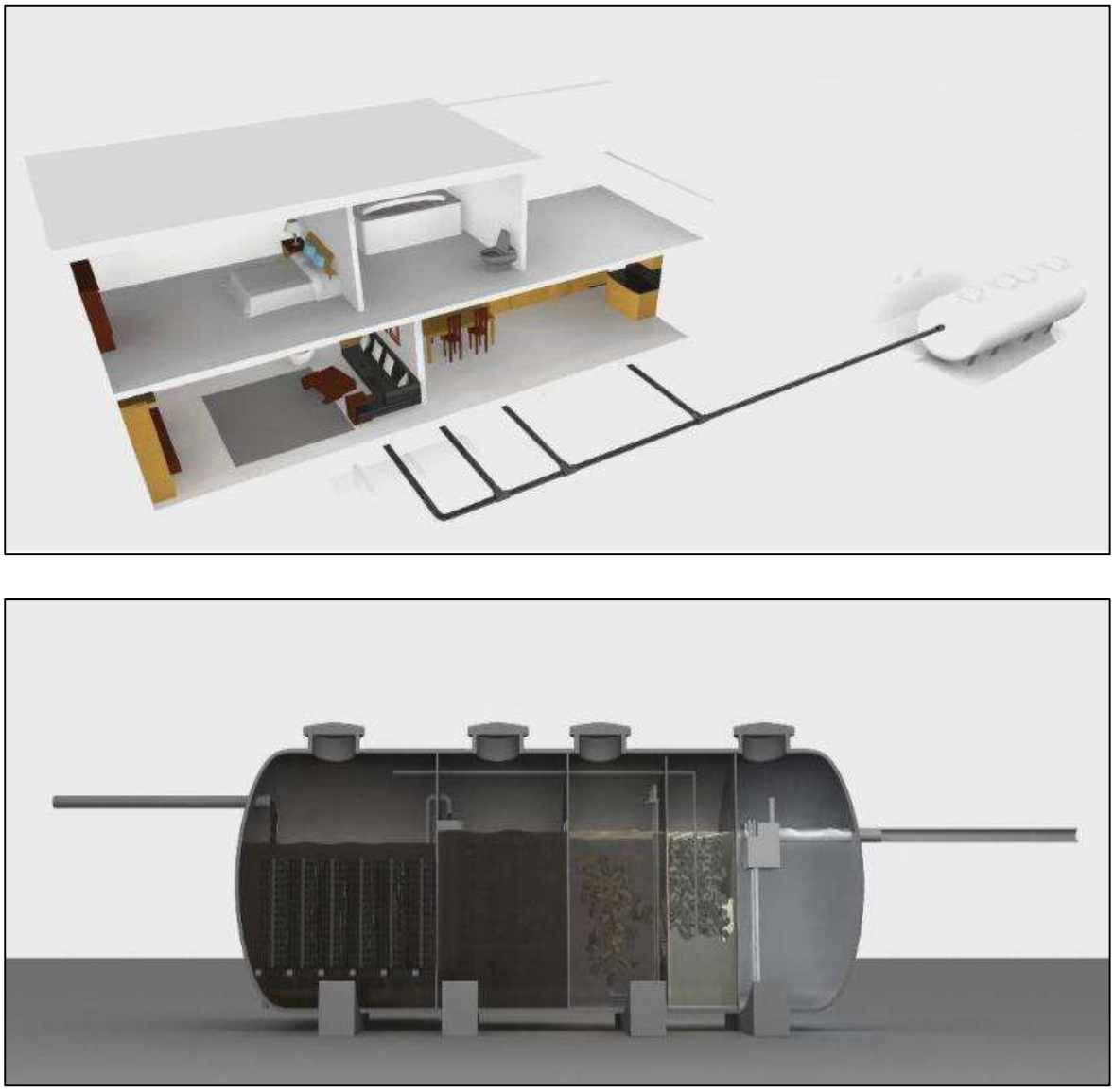


Figure 3-21 Anaerobic system of waste water treatment schematic

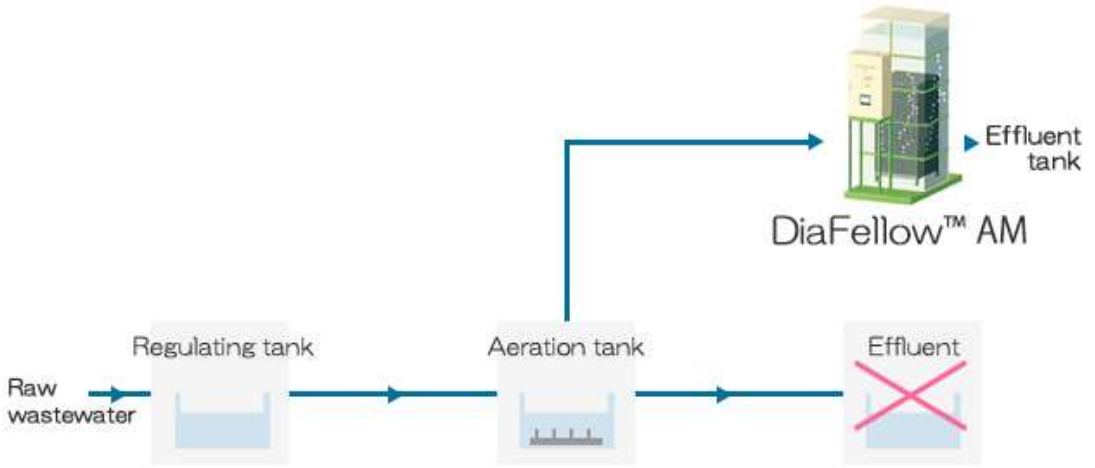


Figure 3-22 Mitsubishi Rayon Membrane Bioreactor system schematic diagram

To ensure the zero discharge of effluent, the use of Micro Biological based technology; preferably the membrane bioreactor (MBR) technology is recommended for the sewage treatment and is currently under the design stage.

The MBR system has many benefits compared to the conventional waste water treatment systems or activated sludge treatment systems related to the quality of the treated water, ease of maintenance, space requirements for installation and operation. This technology is been widely used in tropical island resorts[45] across the globe where the consumption of water is very high to the level of 300 to 320 Gallons per day per guest.

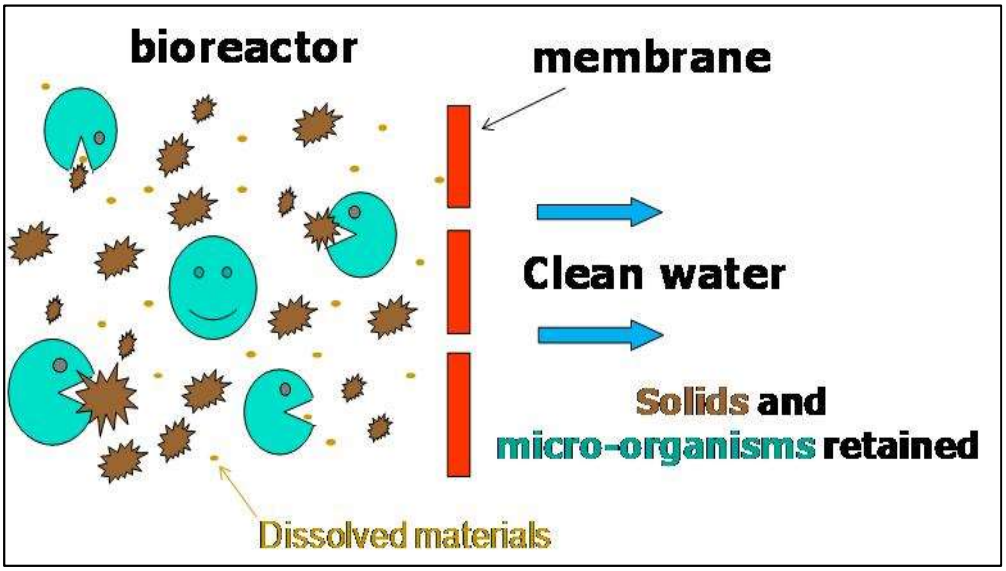


Figure 3-23 Schematic representation of screening by membrane

[45] http://sevenseaswater.com/uploads/_papers/CAWASA2_Membrane_Technology_for_Wastewater_Reuse_28Jun13.pdf

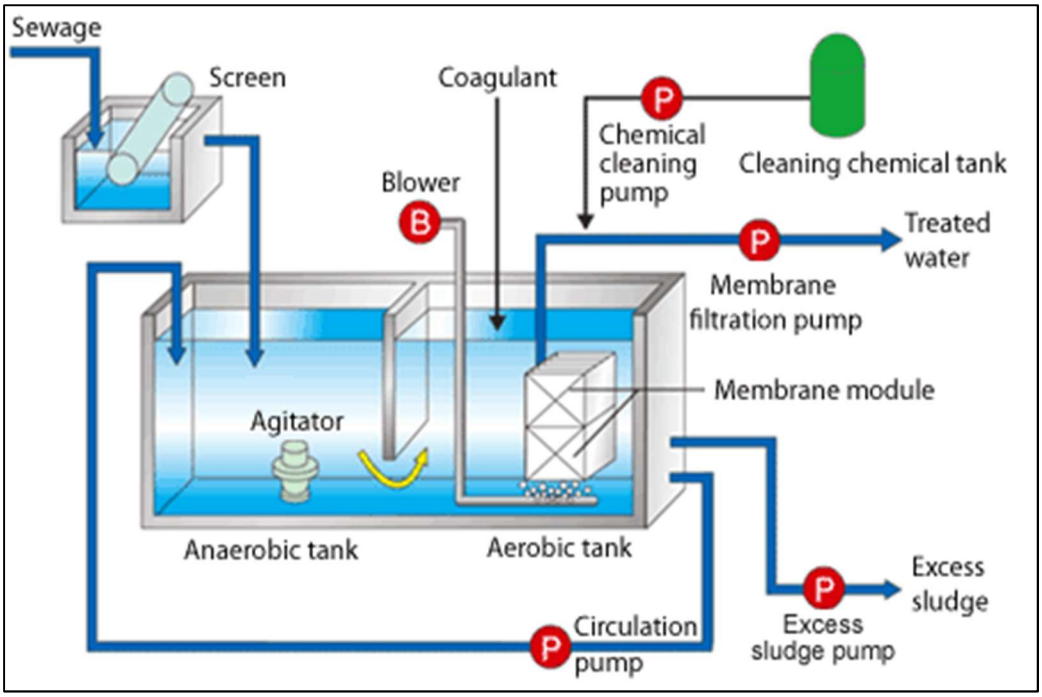


Figure 3-24 Generic Membrane Bioreactor system schematic diagram

The treated wastewater is cleaned with a 0.4 Micron meter (μm) micro bore system, and can be directly recycled using reverse osmosis. Aeration provides additional cleaning power and high flux, maintaining stable operation for long-term use. This technology can clean waste water with high Biochemical Oxygen Demand (BOD) and is energy efficient using less electricity.

3.4.7 Solid Waste Management

The maximum expected solid waste generation is 500 kg per day at the peak of operation. This estimation is based on the global benchmarks in the tropical island resorts in Maldives of around 1.3 Metric tonnes per day average for a large resort of around 220-250 rooms. 80% of the solid waste generated will be organic matter such as the food waste from the resort, and the garden trash from the housekeeping. 10% of the waste will be recyclable item such as the paper, card boards, metal and plastic containers and other packaging material. However, there will be 10% non-recyclable component that needs to be disposed. It is common for the island resorts to dispose the food waste into the sea as it is decomposable. But the project owner has decided not to dump waste into the sea and to compost them to use as manure.

The recyclable items shall be sold off periodically after storage in a designated area. The organic part of the waste will be composted and the non-decomposing parts will be incinerated and the resulting ash will be mixed with the compost. The rest of the waste such as crushed glass will be sent to landfill.

The waste management and disposal plan are formulated to reduce the waste generation. The disposal of waste will be as per the MARPOL 73/78 regulations. The

solid waste estimation is validated during the EIA investigation phase and this estimation is maximum possible with the number of guests in the resort. A solid waste management plan is formulated as part of the EMP in the section 7 of this report.

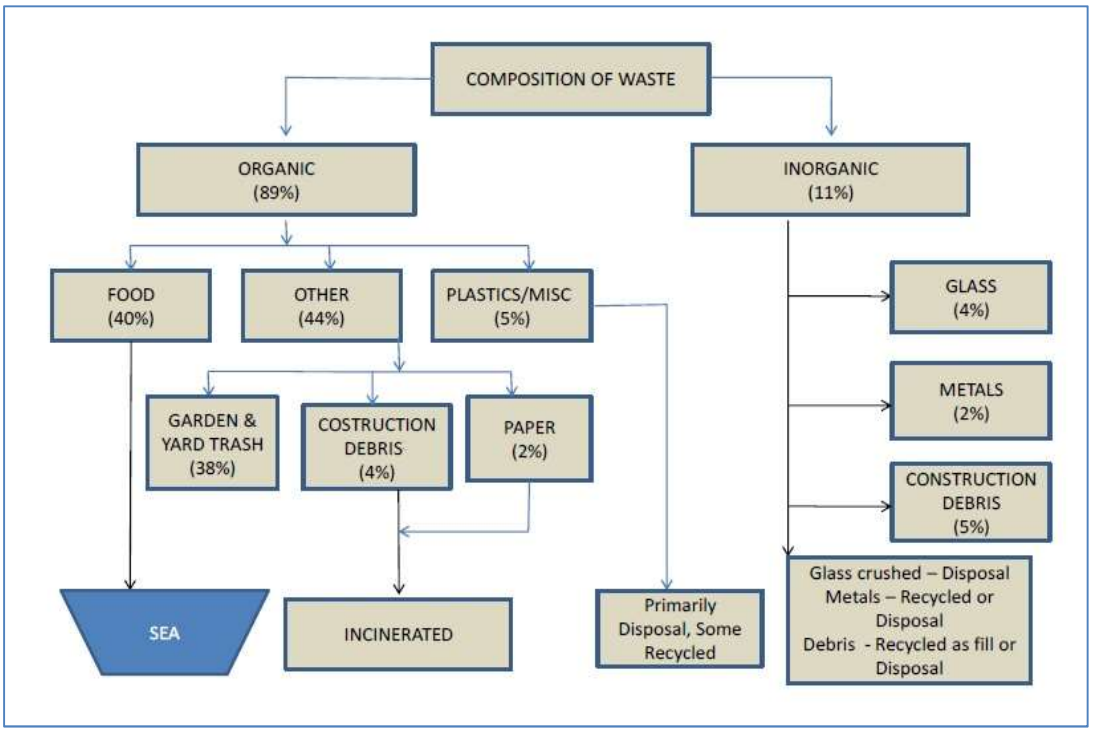


Figure 3-25 Solid waste generation in island resorts in the Maldives Archipelago

3.4.8 Resource requirements for the Project

In any tropical island resort, the resource consumed for its operations are the freshwater usage by the people and the power used to run the machinery and equipment. Since the islands are remote, the grid connectivity is impossible and the power demand is met by running the diesel generators. Additional to this, fossil fuels are consumed by the boats, skis and other transportation equipment. The freshwater required for the operation is drawn from the ground aquifers in the islands. The details of the resource estimation are provided in the section 3.5.3 for Project Operational activities.

Fossil Fuel Requirement

The main energy requirement is for operating the air conditioning at the guest rooms and the common areas as the tropical islands are warm throughout the year. The project will not have any heating units as the location is in a region of warm climate. The other electrical systems in the project are Low voltage power distribution system, Mechanical ventilation systems, General Lighting & small power system, Lightning & Earthing system, Telephone communication system and Local area network and structure cabling, Public address & Emergency Voice Alarm Communication system (EVAC), and Security system that include closed circuit television (CCTV), Access control, Security Alarms and staff communication.

The estimated power load for the project is around 140kVA by the review of the capacities of the electrical equipment planned for the resort. This load is almost equally divided among the resort facilities on each of the islands. The power source for this energy is diesel generators with a capacity of 100kVA each on either of the islands and there will be equipment such as air conditioners, lighting and pumps that consume power.

The diesel consumption also arises out of the use of boats and jet skis in the project. The assumption made is that one of the boats or skis are operational continuously for 12 hours a day for all the 240 days in the operational time (8 months). The fuel consumption rate considered is 50 Litres of diesel per hour which is also on the higher side for conservativeness.

The resort is estimated to consume a total of around 88,700 Gallons of diesel every year. This estimation is based on the assumption that for the operational 240 days in the year, the Diesel generator will be running at full load for half the time and half load for rest of the time. This assumption is a hypothetical case where all of the electrical equipment is operational for 12 hours/day continuously and most of the equipment are operational for the rest 12 hours of the day. These fuel estimations are validated by the EIA consultants.

Water Requirement

The guests and the staff at the resort will be using the water for their bath rooms, laundry, cooking in the restaurant, and swimming pools. Considering that all 50 rooms are occupied for the whole 240 days in the operating season, with 300 Litres per day per room for bath room, 30 Litres per day per guest for laundry, 40 Litres per day per guests for food preparation, 50 litres per day per guest for swimming pool, 100 litres per day for 50 rooms to be air conditioned and 10000 litres a day for gardening and 200 Litres usage per staff per day for 100 staff, The water requirement for the resort is 62,000 litres per day or 16,400 Gallons per day.

This estimation is made by the consideration that 100 guests are at the resort for all 240 days of the year. This water will be drawn from the groundwater resources in the islands. The water usage estimation is validated during the EIA study by the EIA Consultants. The project owner will have rain water harvesting and waste water treatment systems to conserve the water by recycling. This will also ensure zero discharge to the sea.

3.5 Project Description by Phases

3.5.1 Preconstruction activities

The preconstruction activities for the island resort project are the feasibility studies, bathymetry and other marine and terrestrial surveys, sample collection and testing. The seismic study was not performed for the project islands. This EIA/SIA study is also one of these feasibility studies to understand the viability of the project from an environmental and social perspective. The activities performed in the preconstruction phase include travelling around in boats to the project islands and nearby islands, walking through the islands, sample collection in the marine waters and the freshwater sources, air and noise testing at the beach, and inside the islands.

3.5.2 Project Construction activities

The construction phase for the island resort project will include the following activities

- Deforestation of up to 10 acres of land in each of the two islands,
- Making permanent jetties on the two islands,
- Excavation, levelling of land to make it suitable for construction,
- Landscaping the topography for aesthetics, and
- Construction of roads, buildings, and swimming pool
- Workers staying in the island during the construction period

The removal of the vegetation will be on the area encircled in yellow in figure 3.3 in the project description section above. The design of the project is to have the theme of an island resort paradise amidst natural forest and hence, the removal is limited to only the small vegetation and shrubs; the large trees shall be maintained.

There will be two permanent jetties made (one on each island) for safety of the guests. Both these jetties will not require any dredging as the locations have at least 10 feet depth. There is no need to remove corals to make the foundations.

The excavation activities are required to make foundations for the cottages and minor landscaping. The land selected is flat and sparsely vegetated and hence does not require much of excavations. The edges will be blocked with stones and wood to avoid the soil erosion during the construction time from wind. Since the concreting is limited, the waste water run-off is not an issue.

The cottages are made with the modular components that are assembled at site with minimum joining works with very little cutting and welding involved and avoiding of concreting to a large extent saving water, power and money. The design is to have more open spaces making use of natural lighting and ventilation reducing the efforts in construction. The people staying for construction are less than 20 in number and the pressure to the environment due to their life is very limited.

3.5.3 Project Operational activities

The island resort in the two islands during the operation time will be open and provide service to the guests for a maximum of 8 months of the year. The season period is the four months from November to February and the rest of the four months are lean period. The four months of monsoon from May to August are closed out due to safety concerns in sea transportation. The rough seas during monsoon are not suited for tourism activities such as site seeing, diving etc.

The maximum consumption of water is estimated as 16,400 Gallons per day at full occupancy and the diesel consumption for the whole year is estimated to be 88,700 Gallons. These estimations are theoretical usage of 240 days having full occupancy and maximum possible usage. This conservative approach was adopted to determine the maximum possible damage to the environment possible by the project.

The tourists will travel to the islands in speed boats from Kawthaung and will move around the Mergui archipelago for site seeing and diving. There are numerous dive sites in Mergui with good visibility and availability of rare species of marine biota. The Manta ray sharks are spotted in Mergui diving sites. The guests will use the floating pontoons to dock near the diving sites.

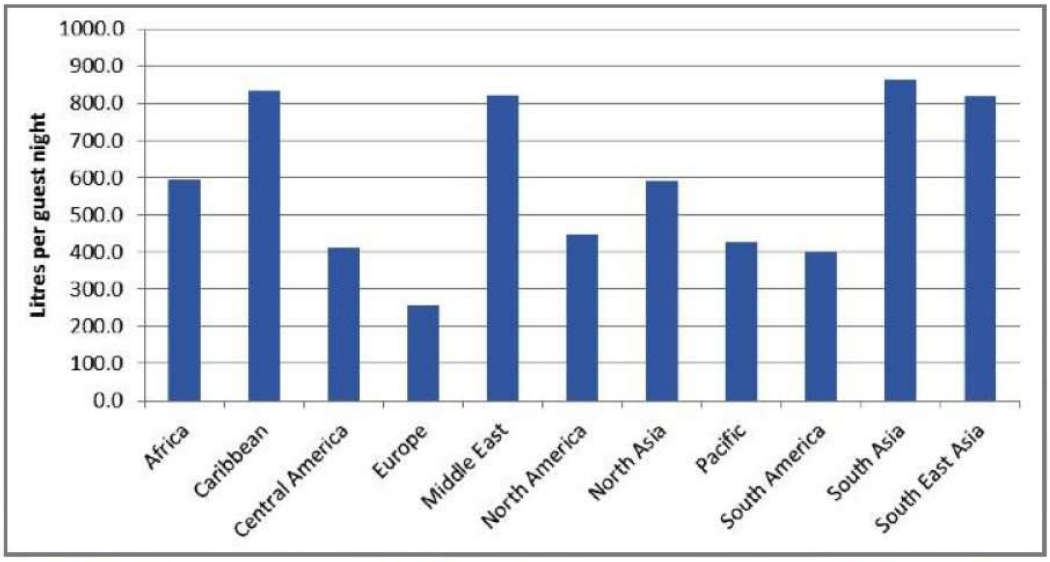
The nearby villagers and the salone people use the nearby waters for fishing and transportation. The project owner has agreed that the villagers will not be driven away for the security of the guests and their access to the freshwater sources will not be restricted by the project owner.

Freshwater consumption

Tourism sector is highly dependent on freshwater resources to support a wide range of regular hotel services and recreational activities such as swimming, diving, fishing, spas and wellness centres, golf courses and maintaining natural landscapes, and lawns. The water consumption per day per guest room is very high for tropical island resorts compared to other type of hotels. The maximum average use per guest room per night ranges up to 2000 Litres[46] per guest room per day across the island resorts.

The popular tropical island resort destinations locations are the Maldives, Thailand, Caribbean mostly where an archipelago is present. The island resorts in these regions have always caused concerns about water usage since it put pressure on the freshwater resources available for the local population. The project wants to develop in a sustainable manner with an aim to community-based tourism as prescribed by the ASEAN. In the case of the project resort, they have a swimming pool and a natural landscape with lawns in the garden. They do not plan to maintain golf course in the resort area.

[46] http://www.globalwaterforum.org/2013/07/16/tourism-and-water-interrelationships-and-management/



Average water usage per guest night in hotels in world regions - a global comparison

Source: EarthCheck Global Data Base

Figure 3-26 Average water use data per guest night across the globe

The maximum possible water consumption per day is estimated as 16,400 Gallons per day. This calculation is based on assuming a very high-water consumption of 300 Litres per guest room, 200 Litres per staff, 3,000 Litres for laundry, 4000 litres for kitchen and restaurant, 5000 Litres for the swimming pool, 10,000 litres to maintain the lawn and 5,200 for the cooling towers for the air conditioning. The resort will not have cooling towers for a centralised air conditioning, but is estimated and added in the calculation as provision for future.

Description	Type	Quantity	Litre/Day	Total Litre/Day
Guest rooms	Number	50	300	15,000
Laundry	cover	100	30	3,000
Restaurant	cover	100	40	4,000
Hotel staff	Number	100	200	20,000
Air conditioning	Number	50	100	5,000
Swimming pool	cover	100	50	5,000
Lawns	Number	1	10,000[47]	10,000
Total				62,000

Table 3-4 The water consumption estimation for the operational phase

[47] 8 to 10 Litre per square meter is the industry norm. The lawn area is within 1,000 square metre

The globally used water consumption norms are 200 Litre/day for guest rooms, 25 Litre/day/cover for laundry, 28 Litre/day/cover for food production, 50 Litre/day for the staff, 40 Litre/day/cover for swimming pool. However, since the project is an island resort with just 50 bungalows, the calculation uses higher values for conservativeness. In the case of tropical tourism, there is an incentive to the project owner in depicting an image of abundance that characterises a "*tropical tourism paradise*" which will result in consumption of more water. The water usage per guest room per day is around 1,200 Litres or 320 Gallons.

The water use of 62,00 litres are rounded off as 16,400 Gallons per day (One United States Gallon is 3.7854 Litres). The waste water generated will be around 80% of the total water consumed. Hence the maximum waste water generation will be around 50,000 Litres which will be treated to allowable effluent levels before being let off. The project owner is also considering a water recycling system to reuse in the toilets, lawns and swimming pools. The rainwater harvesting systems also will conserve the freshwater by making use of the naturally available rain water.

Energy requirements

The islands will not have grid electricity connection and hence will have diesel generator as a source of power for the equipment and machinery at site. The electricity consumption during the full capacity of operation is estimated considering the unit consumption of electricity and the demand factor. Power load estimate is calculated incorporating a diversity factor of 0.65. The total power load requirement during full capacity is estimated at around 140 kVA. This usage is spread across the two project islands and hence will need separate Diesel Generators to cater to each of the islands.

Area	Quantity	kVA/unit	Demand factor	Load (kVA)
Guest rooms	50	3	0.8	120
Fire pump system	1	10	1	10
Hot and cold water	1	15	0.8	12
Internal lighting	100	0.025	1	2.5
Water treatment	1	20	0.8	16
Kitchen	1	20	0.8	16
external lighting	1	20	0.8	16
Laundry	1	20	0.8	16
Swimming pool	1	10	0.8	8
				216.5
Diversity factor				0.65
				140.725

Table 3-5 The power load estimation for the resort

Generator Size	¼ Load (litres/hr)	½ Load (litres/hr)	¾ Load (litres/hr)	Full Load (litres/hr)
80kW / 100kVA	8.3	11.9	16.1	21.4

Table 3-6 Diesel consumption for 100kVA generator[48]

The total capacity of diesel generators that will be used at site is 100kVA on each of the islands. Considering that the two 100kVA generators running at full load for 50% of the time and half load during rest of the time, the total diesel consumption from the generator sets for eight months' time is around 50,670 Gallons as provided below. In actual operations, the usage will be lower as these estimations are taken with extreme scenarios for conservativeness.

Considering that Boat usage for 12 hours run per day for whole 240 days, and an average fuel consumption rate of 50 Litres per hour, the total fuel required is 144,000 litres or 38,041 Gallons per year. The total diesel requirement for the resort operation is estimated as 335,808 Litres per year or 88,711 Gallons per year.

Fuel Use Source	Hours in a year	Litre/hour	Total Litre	Total Gallon
100kVA at full load	2880 (120 days)	21.4[49]	61,632	16,281.50
100kVA at full load	2880 (120 days)	21.4	61,632	16,281.50
100kVA at half load	2880 (120 days)	11.9	34,272	9,053.73
100kVA at half load	2880 (120 days)	11.9	34,272	9,053.73
Boats and skis	2880 (240 days)	50.0	144,000	38,040.89
Total Fuel			335,808	88,711.36

Table 3-7 Diesel consumption for the resort in a year

The total diesel consumption per year estimated for the operational phase is 88,700 Gallons per year considering the operation of 8 months with full capacity and maximum possible usage. The project owner has an incentive to reduce the fuel usage as it directly relates to economic benefits.

3.5.4 Project Decommissioning activities

The island resort in the unlikely event of abandoning will sell off the equipment and machinery at site and bring back all the bio non degradable items for disposal.

[48] https://www.linkedin.com/pulse/diesel-generator-fuel-consumption-chart-litres-kevin-jiang
[49] https://www.ablesales.com.au/blog/diesel-generator-fuel-consumption-chart-in-litres.html

3.6 Project Selection and Comparison of Alternatives

Amata International Co Ltd with an objective to provide services in the luxury resort market in southern Myanmar was looking out for island locations to set up tropical island resorts. The idea was to develop such a project all the while considering development of the local population. The Phoni (Bo Yar Nyunt) and Balar Islands were chosen because of its proximity to Lampi Park and the approachability from the Aung Bar village as well as from Myeik and Kawthaung. The project initially planned to treat the waste water with anaerobic system; but have changed the plan to use a membrane bioreactor system to recycle the water and conserve the water resource.

The project owner and made the decision based on availability of island, docking possibility and minimum deforestation. The baseline scenario is not developing the island resort projects and leaving the islands as it is. The alternative scenarios for the projects are in the project owner's decision to change the initial plans they had for the resort development. This include the change in number of rooms, use of construction methodology, selection of the sites for villas and jetties and the use of water recycling system for zero discharge and conservation.

3.6.1 Methodology for Comparison

The methodology followed for the comparison of the alternatives was by reviewing different scenarios with respect to the feasibility on technological, economic, environmental, safety parameters. The project owner chose the current two islands due to their location; They had reviewed many islands in the Mergui Archipelago and applied for the lease of Phoni and Balar finally. During the course of the project development from the conceptual stage, they have made changes to many things on reasons related to technology, ease of construction, economic savings, safety of the guests, deforestation and excavation requirements, water usage etc. A summary of such alternatives is provided below.

3.6.2 The Comparison of Alternative Scenarios

1. Number of cottages to be built in the Project Resort

The initial concept and plans made at the time of applying for the lease of the islands of Phoni and Balar was to build up at least 50 cottages each on the two islands making a 100-cottage project covering 50 acres each on the islands. The objective and intention were to tap the potential tourism boom anticipated in the Mergui Archipelago. But, a review of the water and fuel resources that will be consumed by the larger number of rooms and the impact that may have on the local population, the top management decided to have fewer rooms in the project.

This issue was discussed with the local authorities and the ministry officials considering the number of island resorts that are under development in the region. The water scarcity issue in the villages and the drawing of freshwater from the islands were discussed with

the villagers during the public meetings held as well. The final plan decided was to have only 20 villas on the Balar Island and have 30 cottages on the Phoni Island.

2. Location of the cottages and the Permanent Jetties-

The project owner reviewed several beachfronts of the islands and the waters nearby to decide on where to have the cottages built up. The idea was to have minimum removal of the vegetation for the villas and find a location for the jetties to be made up. This also had to be decided on the safety of the incoming vessels carrying the guests. There have been many instances of boats capsizing in the Archipelago due to rough waves. The North eastern shore on the Phoni island and North Western shore on the Balar island had little plants and were facing each other.

The current locations for the permanent jetties were selected to avoid the dredging activities for maintaining the depth. The current location does not require any dredging activity and also do not destroy the corals. The extent of deforestation and the feasibility of making jetty to dock on the island was reviewed by the project owner and made the decision to choose the sides that face each other.

3. Permanent Jetties for safety of guests-

The initial plan was to use floating pontoons for the docking on the islands instead of a permanent structure. This was to reduce the environmental issues of making permanent jetties and having to dredge to maintain the depth. But the safety of the guests was of serious concern when using floating structures and the liability of facing an accident being enormous, the decision was changed to consider a permanent jetty for both the islands.

Not to compromise on the safety of guests who may not be experienced to use the floating pontoons safely, the project owner finally decided to have the permanent jetties made on each of the islands facing each other.

4. Change in the Construction methodology-

The project owner had planned to have the resort constructed with the traditional methods of making buildings with concrete walls and steel structures. However, while the reviews were being made, it was seen that the traditional methods will result in lot of pollution, dust generation and soil erosion which will result in contamination of the nearby marine waters. This will seriously affect the corals and other marine biota. The island resort has to maintain the pristine waters and corals to attract wealthy tourists and diving enthusiasts.

Hence the project owner decided to construct the cottages with modular components that will need only the assembly and simple joinery at site. This change in methodology of construction will significantly reduce the noise, air pollution, soil erosion and the resulting water contamination.

5. Water recycling for zero discharge and Solid waste composting-

The island resort project uses a lot of freshwater during its operational period and may put pressure on the water resources for the nearby villagers. The initial plan of the project owner was to treat the water to acceptable limits set by the authorities and dispose. This may result in pollution of the nearby waters hampering the corals and hence the diving sites necessary for the tourism. The water conservation was also a point of discussion during the public meetings where the villagers raised concerns about water scarcity and their access to the freshwater sources in the islands. Another issue is the solid waste generation from food waste and the plastic and metal packaging used.

Finally, the project owner decided to have zero discharge form the project operations by employing the micro biological treatment technologies such as Membrane Bio Reactor (MBR) for the waste water treatment in the resort. This will reduce the waste water generation as well as the amount of groundwater drawn by the project. The organic matter in the solid waste will be composted at site; the nutrient manure can be used to maintain a vegetable garden to source fresh produce for the salad in the resort. The metal and plastic shall be sent for recycling periodically.

Parameter	Project Activity	Alternative to Project
Geographical conditions	Current location	Other location
Economic feasibility	Medium	High
Deforestation	Low	Medium
Ease of docking of boats	Easy	Medium
Safety of the Guests	Safe	Risky
Water Pollution	Low	Medium
Water Consumption	Low	High
Solid waste disposal	Low	High
Dredging	Nil	Low
Employment contribution	Medium	Medium
Project owner expertise	Medium	Medium
Construction feasibility	Moderate	Difficult
Development of region	High	High

Table 3-8 Comparison of alternatives

The project owner has compared the economic feasibility, environmental feasibility, employment generation, safety of guests, contribution to country's economy and environmental impacts in both the scenarios and has made a decision to implement the project.

4.0 Description of the Surrounding Environment

4.1 Setting the Study Limits

The project covers the complete area of the land that consists of the resort area on two islands (around 10 acres each) that include the guest rooms, jetty, office, pool, utilities, workers accommodation and the open spaces. The impact area of the project extends to comprise the whole of two islands, nearby neighbourhood villages, the marine ecosystem near the islands, the dive sites nearby, water transport routes and road traffic in the mainland.

The methods of the environmental and social assessment include the survey of the project land, interviewing local people and workers, reviewing the project data, referring the published data and assessments made by international bodies. The environmental and social study of the impacts will be restricted to this limit.

4.1.1 Spatial scope and its justification

The immediate project affected area are the villages near the Project Islands in the Sun Le Par Line Village tract and the area indirectly affected are the villages in the Mergui Archipelago due to a cumulative impact from the other island resort projects in the area. The reason to select this spatial boundary is with respect to the extent of distance up to which the effect of these environment issues can be experienced or felt distinctively to a significant manner.

Study Area	Spatial Boundary	Construction Time	Operation time
Groundwater Depletion	Project islands and nearby islands	Water usage for construction	Heavy water usage
Marine water Pollution	Nearby Marine waters within 10 Nautical miles	1. Effluent Discharge 2. Soil Erosion	1. Effluent discharge 2. Solid waste dump
Destruction of Corals	Marine waters near Phoni and Balar	1. Effluent Discharge 2. Soil Erosion 3. Jetty Construction	1. Effluent discharge 2. Dredging for depth
Deforestation & Habitat loss	10 Acre each on both the Phoni and Balar	Removal for construction	-
Air Pollution and GHG emissions	20 Nautical miles from Phoni and Balar	1. Fossil fuel usage 2. Dust from construction	1. Fossil fuel usage 2. Transportation
Noise Pollution	Within 5 nautical miles of Phoni and Balar	Construction Equipment usage	Boats, skis and other equipment usage
Restriction of access to villagers	Phoni and Balar islands and nearby waters		Security for the guests/fencing

Table 4-1 The EIA Study areas and spatial boundaries for the project

In case of parameters such as air quality and noise, where the source can affect though the shortest route possible, the consideration will be aerial distance, whereas things like surface water quality where the source have to follow a specific path of the medium, the considered distance will be the distance in the waterbody.

4.1.2 Temporal scope and its justification

The environmental issues will have time period up to which their impact is felt by the receptors, that determine the temporal nature of these impacts. Receptors in the impact area could be human beings, ecosystem, and properties depending on the nature of the issue and the temporal scope for the issues are to be defined. So, the time period till the effect of the source can be distinctively felt or experienced by the receptor is considered as the temporal scope. For e.g., the air emissions from construction will remain only during the construction time. After some period, the effect to the receptors get neutralised when the source become inactive.

The Environmental Issues	Temporal scope	Frequency
Fugitive dust of construction	For 8-10 hours from the emission time	For 3-4 months of construction period
Noise pollution	For few minutes from the emission time	For 3-4 months of construction period
Air pollution from fuel use	For 24 hours from the emission time	Continuous when resort is operational
GHG emission from fuel use	Several years	Continuous when resort is operational
Marine water contamination by debris & soil	For 2-3 days from the emission	For 3-4 months of construction period
Marine water contamination by effluent let off	For 2-3 days from the emission	Continuous when resort is operational
Groundwater contamination by effluent let off	Several years from the emission	Continuous when resort is operational
Depletion of water resources	Till the next rains	Continuous when resort is operational
Depletion of fossil fuel resources	Irreversible	Continuous when resort is operational
Solid waste contamination	Plastics non degradable	Continuous when resort is operational
Degradation of Corals & fish species by pollution	Irreversible	Continuous when resort is operational
Degradation of terrestrial ecosystem	Irreversible	Construction start time
Removal of vegetation	Irreversible	Construction start time
Loss off access to the islands	Till access is given	Continuous when resort is operational
Increase in traffic in the waters	Irreversible	Continuous when resort is operational

Table 4-2 The EIA Study areas and temporal scope

4.2 Method of Study

The objectives of this EIA/SIA study are to assess the levels of risk of the island resort construction and operation and to plan appropriate mitigating measures and formulate effective management plans. These objectives are related to the environment of the region and the social aspects of the people living in the project affected areas. Methodology to carry out environmental & social assessment and study involves following activities:

- Physical Survey and site visit
- Interaction with affected people
- Review of available literature
- Compliance review to statutory requirements
- Baseline environmental monitoring
- Identification and Prediction of Impacts
- Risk Assessment and Management Plan
- Formulation of Environmental Management Plans

4.2.1 Compilation of Secondary Data

The secondary data collected during the study phase were

- The records and data related to the project progress, infrastructure requirement, resource requirements, and communications to the government departments.
- The data, technical specifications and reports available for the equipment to be installed at site
- The data and reports from the Lampi Marine National Park[50]
- The data from the Ministry of Hotels and tourism (MOHT)[51]
- The copy of various laws passed by government of Myanmar that are applicable to the project
- The historical weather and climate data of Kawthaung, Myeik, and site from Meteoblue, World Meteorological Organisation (WMO)[52], National Oceanic and Atmospheric Administration (NOAA)[53], Department of Meteorology and Hydrology (DMH)[54], Myanmar,
- The data and reports related to hotel industry from United Nations Framework Convention for Climate change (UNFCC)[55], World Health organisation (WHO)[56], and International Finance Corporation (IFC)[57].

[50] http://www.lampipark.org/
[51] http://www.myanmartourism.org/
[52] http://www.wmo.int/pages/index_en.html
[53] http://www.noaa.gov/
[54] http://www.dmh.gov.mm/
[55] http://unfccc.int/2860.php
[56] http://www.who.int/en/
[57] http://www.ifc.org/wps/wcm/connect/corp_ext_content/ifc_external_corporate_site/home

- The data on resource consumption in Tropical Island resorts from various international websites such as Global Water Forum[58], Pacific Asia Travel Association (PATA)[59], Green Hotelier[60], World Resources Institute[61], and Kouni[62].
- The specifications and guidelines from United States Environmental Protection Agency[63] (US-EPA) and United States Green Building Council on Leadership in Energy and Environmental Design (LEED) were reviewed[64].
- The technical specifications and guidelines in the website of Mitsubishi Rayon[65], GE Water[66], Hitachi[67], and Goshu Kohsan Co Ltd[68], for review of the Membrane Bioreactor (MBR) sewage treatment for the project.
- The technical specifications, statistics and reports of the seaplanes and floats from the website of Cessna[69], Wipair[70], Aviation Safety Network[71] and European Aviation Safety Agency[72].
- Technical specifications and reports of floating marina and pontoons from the website of Versadock[73],
- Myanmar Tourism statistics for 2012, 2013, 2014 and 2015[74] published by Ministry of Hotel and tourism.
- Energy Efficiency and conservation in hotels-towards sustainable tourism[75] by Department of Energy technology, Sweden
- The data and maps provided in the World Resources Institute[76].
- The international standards ISO 14001:2015, OHSAS 18001:2007, ISO 45001:2018 and ISO 22000:2005

[58] http://www.globalwaterforum.org/
[59] https://www.pata.org/
[60] http://www.greenhotelier.org/
[61] http://www.wri.org/
[62] http://cr.kuoni.com/docs/water_manual_hotels_thailand_0_0_4.pdf
[63] https://archive.epa.gov/greenbuilding/web/html/
[64] http://www.usgbc.org/leed
[65] http://www.mrc.co.jp/sterapore/english/product/am/spec.html
[66] http://www.gewater.com/products/membrane-bioreactor-mbr.html
[67] http://www.hitachi-infra.com.sg/services/environmental_systems/industrial_water/activated_sludge.html
[68] http://www.goshukohsan.com/
[69] http://cessna.txtav.com/
[70] https://www.wipaire.com/
[71] https://aviation-safety.net/
[72] https://www.easa.europa.eu/
[73] http://versadock.com/
[74] http://www.myanmartourism.org/images/tourism-statistics/2015.pdf
[75] http://www.greenthehotels.com/eng/BohdanowiczChurieKallhaugeMartinacHawaii2001.pdf
[76] http://www.wri.org/

4.2.3 Survey for Primary Data Collection

a) For physical and biological surveys

The EIA consultants have made 11 visits to the Mergui archipelago since January 2017 till December 2018 making visits in all kinds of seasons including the monsoon in July 2017. The objective was to perform field survey of the current situation of the project islands and interaction with government authorities and nearby villagers. They reviewed the project data related to the plans, drawings, infrastructure requirement, and had interacted with the project managers. The water samples of surface freshwater in Phoni Island, ground water in both the islands and marine water near the shores of both islands were drawn for laboratory testing. The noise levels were monitored in both the islands at different points.

Figure 4-1 The EIA Consultants with Dr San Tha Tun in Mawlamyine University

The EIA consultants visited the Marine sciences department of the Mawlamyine University to collect data and information on the marine species, vegetation, mangroves in the Mergui Archipelago. The "*Preliminary study on the Mangroves of Lampi Island and adjacent areas, Myeik Archipelago, Tanintharyi Division*" by Dr San Tha Tun was reviewed seeking clarifications from the author himself. The scoping report was made after the inputs from the marine species consultant were made. The contents in the EIA/SIA study report relating to the marine species, mangroves, dune vegetation and sea grass was also reviewed by the consultant expert. The final EIA report contents were also discussed with this expert to make sure that the management plans made will be effective.

The EIA consultants also consulted with Dr Nang Mya Han, Professor and Head of the Marine Science department in the Myeik University who works as advisor to the Mangrove Restoration foundation. She has researched extensively on Mangroves in Tanintharyi and also worked as a consultant to Flora and fauna international in the project region. Her insights were taken in formulating the mitigation plans relating to marine pollution and conserving mangroves.

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The visit made from 15th to 18th May 2017 covered the assessment surveys of the nearby islands to the project islands named Majhun Galet (also written as Makyun Galet), and Nyaung Wee and the Aung Bar village in the mainland. The air quality and the noise levels at the project islands were monitored.

The visit made from 12th to 15th July 2017 for the assessment surveys of the project islands and the nearby islands in the monsoon season with rough waves in the region when the tourist season was completely dormant. The air quality and noise were monitored in Aung Bar village, Majhun Galet village, Nyaung Wee village, Phoni Island, Balar Island and 115 islands. The subsequent visits were used to collect more information and interview more people.

Testing of Water samples

The marine water samples were drawn from the shores of both the islands on 17th March 2017 to test the turbidity, salinity, dissolved oxygen and pH. The consultants monitored the parameters with hand held portable instruments as a preliminary review.

Parameter	Unit	Equipment
Turbidity	NTU	Lutron TU-2016[77]
Salinity	%	Lutron PSA-311[78]
Dissolved Oxygen (DO)	mg/Litre	Lutron DO-5512SD[79]
pH	-	Lutron pH-222[80]

Table 4-3 Water testing with portable equipment during the site visit

The samples of marine water from the shores, ground water from both the islands and surface water from Phoni Island was drawn to be tested by AMD, a third-party laboratory. The parameters tested were as below

[77] http://www.lutron.com.tw/ugC_ShowroomItem_Detail.asp?hidKindID=1&hidTypeID=148&hidCatID=&hidShowID=1032&hidPrdType=&txtSrhData=

[78] http://www.lutron.com.tw/ugC_ShowroomItem_Detail.asp?hidKindID=1&hidTypeID=55&hidCatID=&hidShowID=894&hidPrdType=&txtSrhData=

[79] http://www.lutron.com.tw/ugC_ShowroomItem_Detail.asp?hidKindID=3&hidTypeID=157&hidCatID=&hidShowID=1192&hidPrdType=&txtSrhData=

[80] http://www.lutron.com.tw/ugC_ShowroomItem_Detail.asp?hidKindID=1&hidTypeID=45&hidCatID=&hidShowID=290&hidPrdType=&txtSrhData=

Figure 4-2 The EIA Consultants during their field surveys

Parameter tested	Unit	WHO guidance value
Turbidity	NTU	5
pH	Standard Unit	6.5 to 8.5
Total Dissolved Solids	mg/l	1000
Total Hardness as $CaCO_3$	mg/l	500
Total Alkalinity as $CaCO_3$	mg/l	N/A
Conductivity	µS/cm	N/A
Iron Content	mg/l	0.3
Chloride Content	mg/l	250
Salinity	mg/l	N/A

Table 4-4 Water testing by third party laboratory for samples drawn

Ambient air quality Monitoring

Air ambient quality test was done taking samples from different points near the project islands on 16th to 18th May 2017, and 12th to 14th July 2017. The points selected were Aung Bar village jetty, Majhun Galet village near the library, Nyaung Wee village near the beach, 115 islands near the jetty, Balar Island on North Western shore and Phoni Island on North Eastern Shore. The geographical coordinates of the points selected for the air quality monitoring were as below

Place Name	Latitude North	Longitude East
Aung Bar village Jetty	10^0 34' 02"	98^0 28' 55"
Majhun Galet Village	10^0 40' 46"	98^0 15' 30"
Nyaung Wee village	10^0 29' 45"	98^0 13' 59"
115 Islands	10^0 27' 49"	98^0 10' 55"
Phoni Island	10^0 27' 38"	98^0 13' 08"
Balar Island	10^0 27' 58"	98^0 14' 25"

Table 4-5 Points used for ambient air quality testing during site visit

The parameters tested for air quality monitoring were

Parameter	Measured Unit	Limits[81]
Total Suspended particles	[82]mg/m^3	Not Applicable
Respirable particulate matter PM_{10}	[83]µg/m^3	50 µg/m^3
Respirable particulate matter $PM_{2.5}$	µg/m^3	25 µg/m^3
Sulphur Dioxide (SO_2)	ppm[84]	500 µg/m^3
Oxides of Nitrogen as (NO_2)	Ppm	200 µg/m^3
Hydrogen Sulphide as (H_2S)	Ppm	0.005 ppm
Carbon Monoxide as (CO)	Ppm	9 ppm[85]
Carbon Dioxide as (CO_2)	Ppm	400 ppm
Ozone (O_3)	ppm	0.1 ppm
Humidity	%	Not Applicable

Table 4-6 Parameters for ambient air quality testing during site visit

Noise Monitoring

The noise levels were measured from three points each from the islands on 17th March 2017 and 16th May 2017. The equipment used was AR814 Sound Level Meter[86]. The third-party monitoring of the noise was performed on 12th, 13th and 14th of July 2017 at six points in the project area. The points chosen for the air quality monitoring were used to measure the noise levels.

Place Name	Latitude North	Longitude East
Aung Bar village Jetty	10^0 34' 02"	98^0 28' 55"
Majhun Galet Village	10^0 40' 46"	98^0 15' 30"
Nyaung Wee village	10^0 29' 45"	98^0 13' 59"
115 Islands	10^0 27' 49"	98^0 10' 55"
Phoni Island	10^0 27' 38"	98^0 13' 08"
Balar Island	10^0 27' 58"	98^0 14' 25"

Table 4-7 Points used for noise level monitoring during site visit

[81] http://www.who.int/mediacentre/factsheets/fs313/en/
[82] Milligram per cubic metre
[83] Microgram per cubic metre
[84] Parts per Million
[85] http://www.detectcarbonmonoxide.com/co-health-risks/

[86] http://en.smartsensor.cn/products_detail/&productId=163.html

b) For socio-Economic surveys

The EIA consultants have been visiting the project islands since January 2017 for the environmental and social impacts of island resort projects in the Mergui Archipelago. The affected areas are the villages in the Su Nge Par Line Village tract that encompasses the project islands and the Lampi Marine National Park.

Dates of meetings	Location of meeting
10th January 2017	Aung Bar Village
27th January 2017	Aung Bar Village
06th February 2017	Aung Bar, Majhun Galet and Nyaung Wee villages
7th February 2017	Kawthaung Public meeting
16th March 2017	Aung Bar Village
05th May 2017	Aung Bar Village
17th May 2017	Kawthaung Public meeting
12th July 2017	Aung Bar Village
13th & 14th July 2017	Majhun Galet and Nyaung Wee villages
22nd September 2017	Aung Bar Village
8th October 2017	Majhun Galet, Pulonetontone and Nyaung Wee villages
09th October 2017	Kawthaung Public meeting
25th & 26th March 2018	Aung Bar, Majhun Galet and Nyaung Wee villages
18th December 2018	Aung Bar, Majhun Galet and Nyaung Wee villages

Table 4-8 The socio-economic and public stakeholder meetings conducted

The villages that come in the area near the island resort projects are Aung Bar village, Majhun Galet village, and Nyaung Wee village. Majhun Galet village is in the Bo Kyaw Island that is inside the Lampi marine Park zone. Nyaung Wee village is in the Nyaung Wee Island and Aung Bar village is a coastal village on the mainland from where the project islands can be accessed. The Moken sea gypsies, locally known as “Salon” live in the villages of Majhun Galet and Nyaung Wee.

The consultants during their various site visits as stated in the above table, from January 2017, had performed field surveys of the surrounding neighbourhood and interacted with the government authorities related to Tourism, Forest, Water Resources, Fisheries and General Administration.

They also met with the officers of Nature and wild life conservation Division in Majhun Galet and the activists for conservation of Salons and Lampi Park. The NGO Kannee Family Altruism for ocean clean-up was interviewed to have understanding on the

marine pollution and effect of resorts. The commercial trade associations met were the Kawthaung Merchants Association and Fishery Association for Shallow Waters.

The consultants spent time with the villagers in Aung Bar, Majhun Galet and Nyaung Wee to understand their perceptions on the island resort development, its effect on their livelihood, fishing, transportation etc. The main public hearing was decided to be held on 18th May 2017 during the discussions with the then village tract head of Su Nge Par Line, Mr Htay Naing.

Figure 4-3 The Public meeting at Victoria Cliff

The publicly announced stakeholders' meetings were done at Garden Hotel on 7th February 2017, Kawthaung Hotel on 17th May 2017 and Victoria Cliff on 9th October 2017 inviting government officials and villagers from Aung Bar village, islands Majhun Galet and Nyaung Wee along with the representative of the sea gypsies. The second public meeting was initially planned for 18th May 2017; but to accommodate the request from the villagers and the sea gypsies, it was advanced to 17th May for better participation.

4.2.4 Mapping

The EIA consultant team performed the mapping of the project during the time of field surveys along with the review of the records and established the project location, boundaries, and the project affected area.

4.2.5 Levels of Effort

Qualifications of specialists

The expertise and profile for the EIA study for the project comprised of

- EIA and climate change expert
- Expert on the international standards for environment & occupational safety
- Expert on meteorology, climate and hydrology
- Expert on livestock, fisheries and biodiversity
- Expert on water treatment, and recycling
- Local expert conversant in the native language and customs
- Construction and project management expert
- Expert on Marine species, mangroves and sea grass
- Expert in Botany, and tropical plant species

Time for literature review

The total time spent for literature review is 20-man days for the EIA team. These 20-man days was spread across a period of five months' time. 8-man days for literature survey has been completed for the scoping phase of the study and the rest 12-man days was spent during the EIA/SIA study.

Time for field surveys by specialists

The total time estimated for the field surveys was 25-man days of which 10-man days was spent for the scoping phase of the study. The field visit for the EIA/SIA study team comprised of the EIA specialist, biodiversity expert, water treatment expert and the local expert conversant in the native language. The actual time spent on the surveys was 26-man days including the 6 days spent for the scoping phase.

Time for reporting by specialists

The total time estimated for the reporting of the assessment was 15 days that is spread across a period of 2 months' time after the completion of the field survey and sample collections. The time for collection and testing the samples is not included as it is performed by external laboratories. The testing activities move simultaneously with the reporting time. The actual time spent for the reporting was 16 man days spread across a period of 3 months.

Number of field surveys

The field survey for the EIA/SIA study has to cover the project island and the nearby waters. The review of socio-economic parameters required interactions with people of surrounding villages, non-governmental organisations and the local government departments related to the project. These visits were managed by 11 field surveys, from January 2017 to December 2018 as mentioned in the section above.

4.2.6 Public Administration and Planning

The project resort and its affected area fall in the Kawthaung district of Tanintharyi region. The Tanintharyi region has a total of 3 Districts, 10 Townships, 83 Wards, 264 Village Tracts, 1,250 Villages. The region fares almost at par with the national average in most of the social development indices. However, the poverty rate is 33% compared to the national average of 26%. The population density is low with only 32.5 persons per km^2.

The project island and the affected area are in Kawthaung Township and the affected villages because of the project are Aung Bar, Nyaung Wee Island and Majhun Galet Island. The region in the mainland has lot of rubber and palm oil plantations that resulted in widespread clearance of forest land. The cost of electricity is also comparatively high in the township making industrial development not feasible. The charges for electricity per month in Majhun Galet are 15,000 Myanmar Kyats. The area has good potential to develop as a tourist haven after the Thailand border was opened. The Mergui Archipelago has seen exponential increase in the tourist arrivals in the past two three years.

The marine national park, Lampi Island is very near to the project area and the presence of the national park has resulted in many social and environmental organisations extending their help in developing the region through ecotourism with a community-based framework to make it sustainable. The local government authorities also assist in developing the area though sustainable ecotourism. The main economic activities of the people nearby are based on fisheries in the archipelago and the preservation of this ecosystem is vital in maintaining their livelihoods.

The Moken sea gypsies who are a vulnerable ethnic minority live in the project area; widespread human encroachment inducing development in the islands will seriously cripple their culture and identity. The village tract that covers the project area is Su Nge Par Line with Aung Bar as the main village in it. All developments in the islands are under the supervision from the local authorities to ensure the villagers are not at the receiving end.

4.2.7 Legally Protected National, Regional or State Areas

4.2.7.1 Forest conservation areas (including biodiversity reserved areas)

The project islands are around 12 nautical miles south of the border of the Lampi Marine national park. The project islands are clearly outside the park zone; however, the islands have forest cover all over them as they are not inhabited that may be used by the species in the park as habitat. There are no biodiversity reserved areas in the project islands of Phoni and Balar. The project development is limited to only 10 acre each on the two islands leaving the rest of the islands as it is.

4.2.7.2 Public forests

The project affected islands are covered by forest cover that belongs to the people of Myanmar. However, project does not result in wide spread removal of forest cover for construction or submergence of forest due to change in hydrology. The project development is limited to only 10 acre each on the two islands leaving the rest of the islands as it is.

4.2.7.3 Parks (including marine parks)

The project islands are near to the Lampi Marine national park being located around 12 nautical miles south of the border of the marine park zone.

4.2.7.4 Mangrove swamps

The project islands of Phoni and Balar do not have mangrove sites; however, the nearby islands have identified protected mangrove ecosystem sites. The project will not result in destruction of the mangroves.

4.2.7.5 Other sensitive coastal areas

The project islands are amongst pristine islands and beaches and a coastal zone that is rich in biodiversity and corals reef ecosystem. The coral reef ecosystem in Myanmar is found only in the Southern Rakhine and the Tanintharyi region. The Ayeyarwady delta does not have coral reefs due to high sedimentation. As per Flora and Fauna International (FFI) there are 380 species of corals that support the coastal and marine fisheries. They also act as natural protective barriers, deterring beach erosion, retarding storm waves and are good for tourism as seen in other parts of the globe.

The increase in turbidity in the marine waters due to sediment or waste water discharges can destroy the corals and hence the aquatic ecosystem in the area. So, the project development has to happen without the pollution of the marine waters from the soil run off or the wastewater let off. The project owner is having a zero-discharge system by recycling the waste water generated in the island resort to preserve the pristine waters as they have an incentive to protect the aesthetic nature of the area.

4.2.7.6 Wildlife sanctuaries

There are no wild life sanctuaries in the project area apart from the Lampi marine national park which is already mentioned above.

4.2.7.7 Scientific reserves

There are no scientific reserves in the project area apart from the Lampi Marine national park.

4.2.7.8 Nature reserves

There are no nature reserves in the project area apart from the Lampi Marine national park.

4.2.7.9 Geo-physically significant reserves

There are no geo-physically significant reserves in the project area apart from the Lampi Marine national park.

4.2.7.10 Other nature reserve nominated by the Minister

There are no nature reserves nominated by any ministers in the project area apart from the Lampi Marine national park.

4.2.7.11 Protected cultural heritage areas

The Moken sea gypsies who are a very vulnerable ethnic minority are in the project region. Their culture and identity are at risk because of widespread development in the archipelago. The project owner is committed to not to restrict their movement in the surrounding waters and the project islands for the sake of guests. This has been agreed in the public meetings in presence of elected representatives.

4.2.7.12 Protected archaeological areas or areas of historical significance.

There are no archaeological sites in the area of historical significance.

4.3 Physical Components

The physical components assessed for the project consist of the Climate, Landscape, soil, topography, water resources, and water quality of the project affected area.

4.3.1 Climate/Meteorology

The climate of Kawthaung is tropical (Am as per Köppen climate classification)[87] with significant rainfall during most months of the year and a short dry season. The average annual temperature is 26.9°C and the rainfall here averages 3,681 mm. The driest month is February, with 21 mm of rain. Most precipitation falls in August, with an average of 664 mm. April is the warmest month of the year. The temperature in April averages 28.4°C. In December, the average temperature is 25.9°C. It is the lowest average temperature of the whole year.

The climate data available in Meteoblue[88] for the geographical coordinates of the island shows the same pattern as that of Kawthaung with very slight variance in data. The Meteoblue climate diagrams are based on 30 years of hourly weather model simulations and available for every place on Earth. They give indications of typical climate patterns and expected conditions (temperature, precipitation, sunshine and wind).

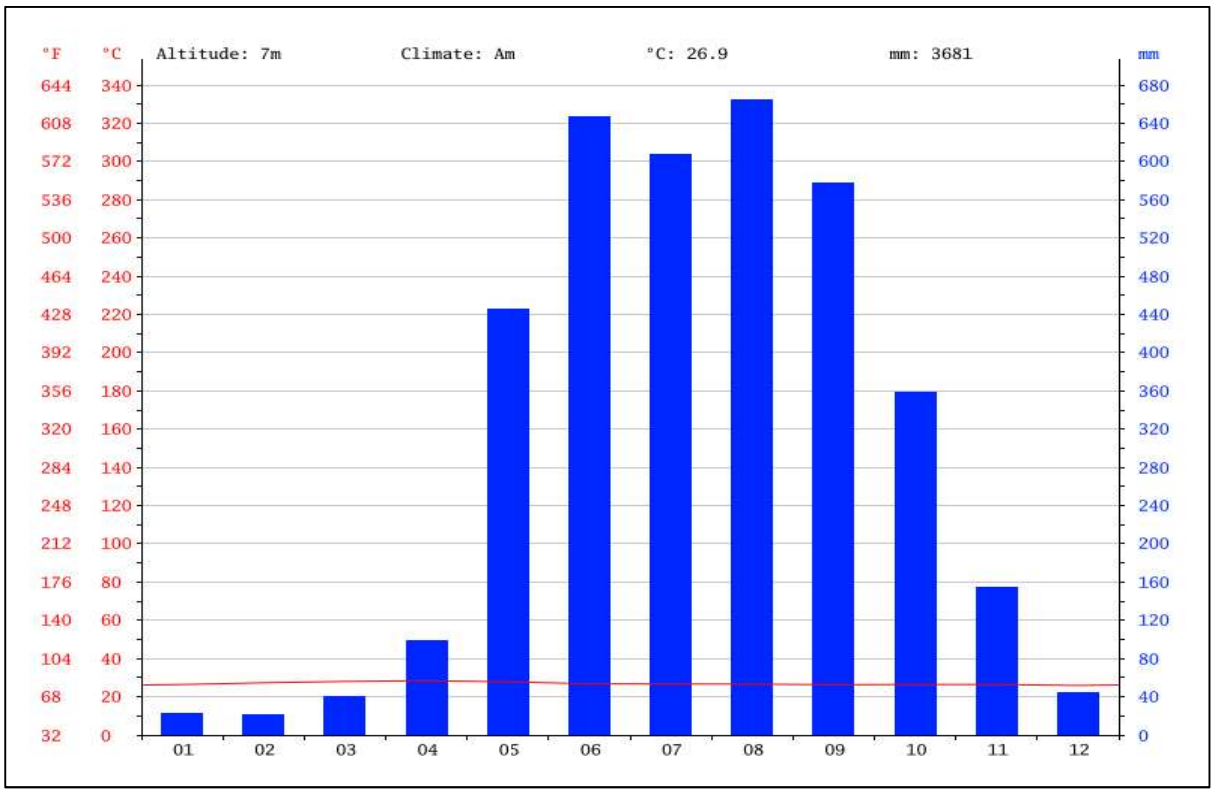


Figure 4-4 Climate graph of the region
Source: Climate Data Organisation. Period 1982 to 2012

[87] http://koeppen-geiger.vu-wien.ac.at/
[88] https://www.meteoblue.com/en/weather/historyclimate/climatemodelled/10.46N98.22E0_Asia%2FRangoon

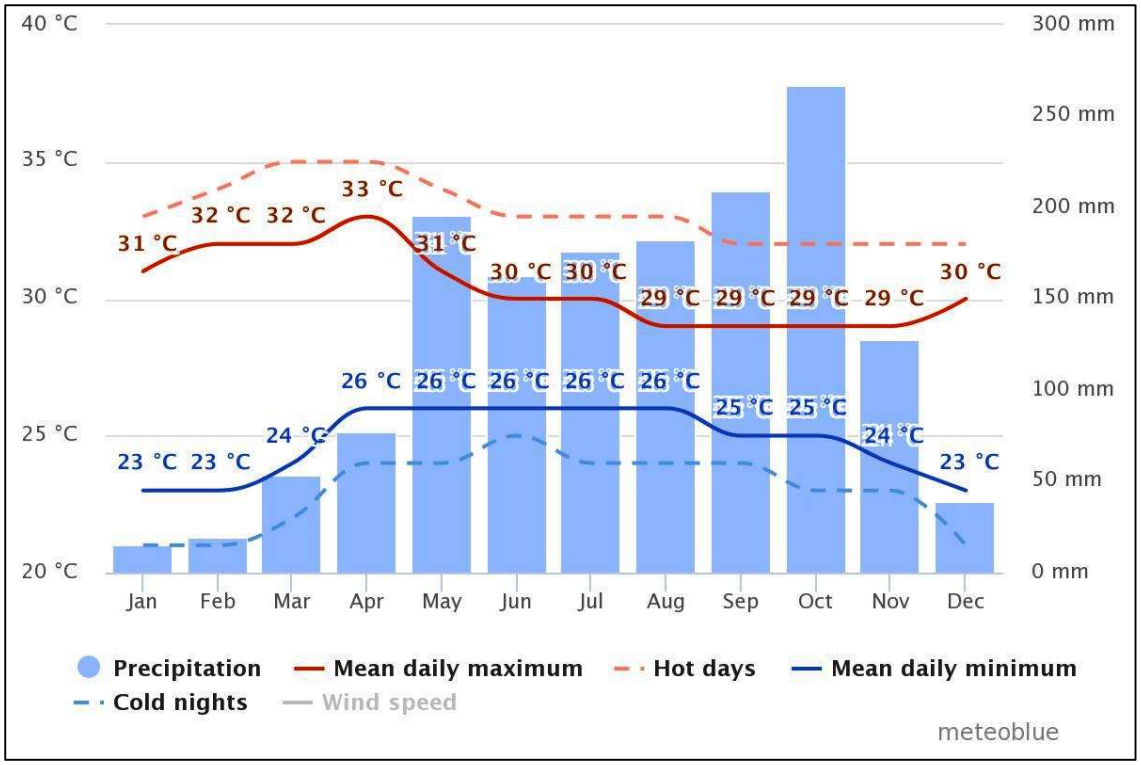


Figure 4-5 Temperature and precipitation data-Project Islands (Source- Meteoblue)

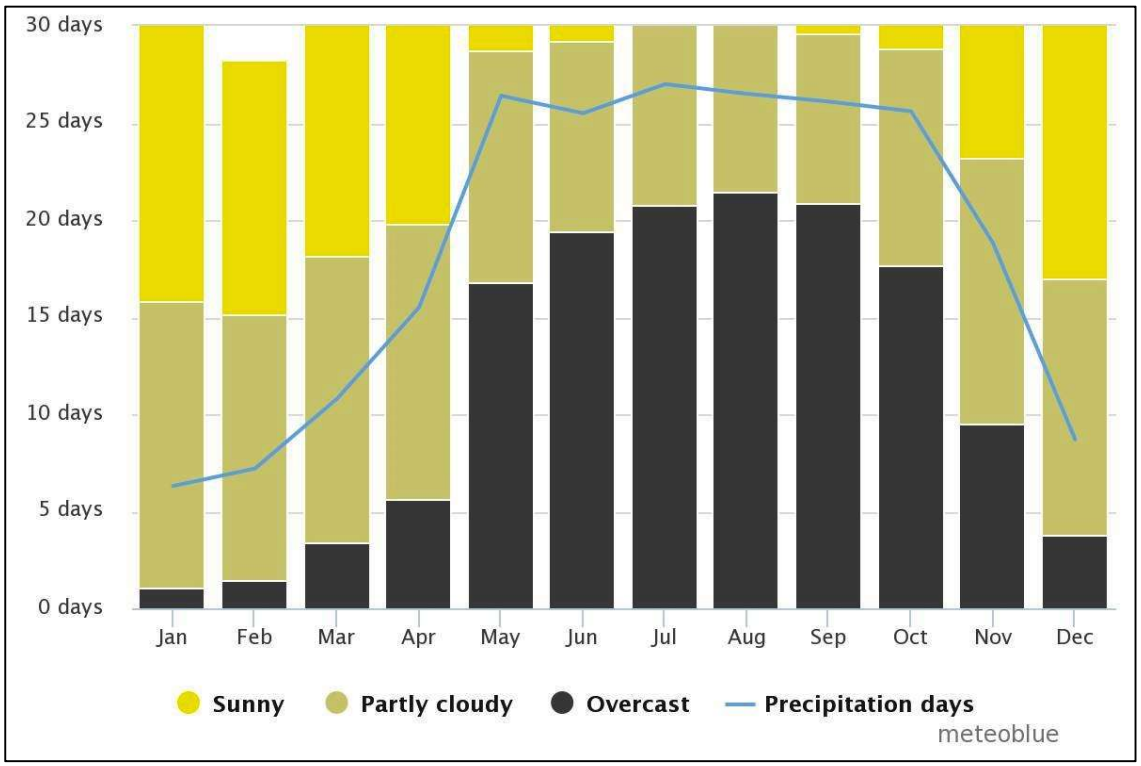


Figure 4-6 Sunny, cloudy and precipitation days (Source- Meteoblue)

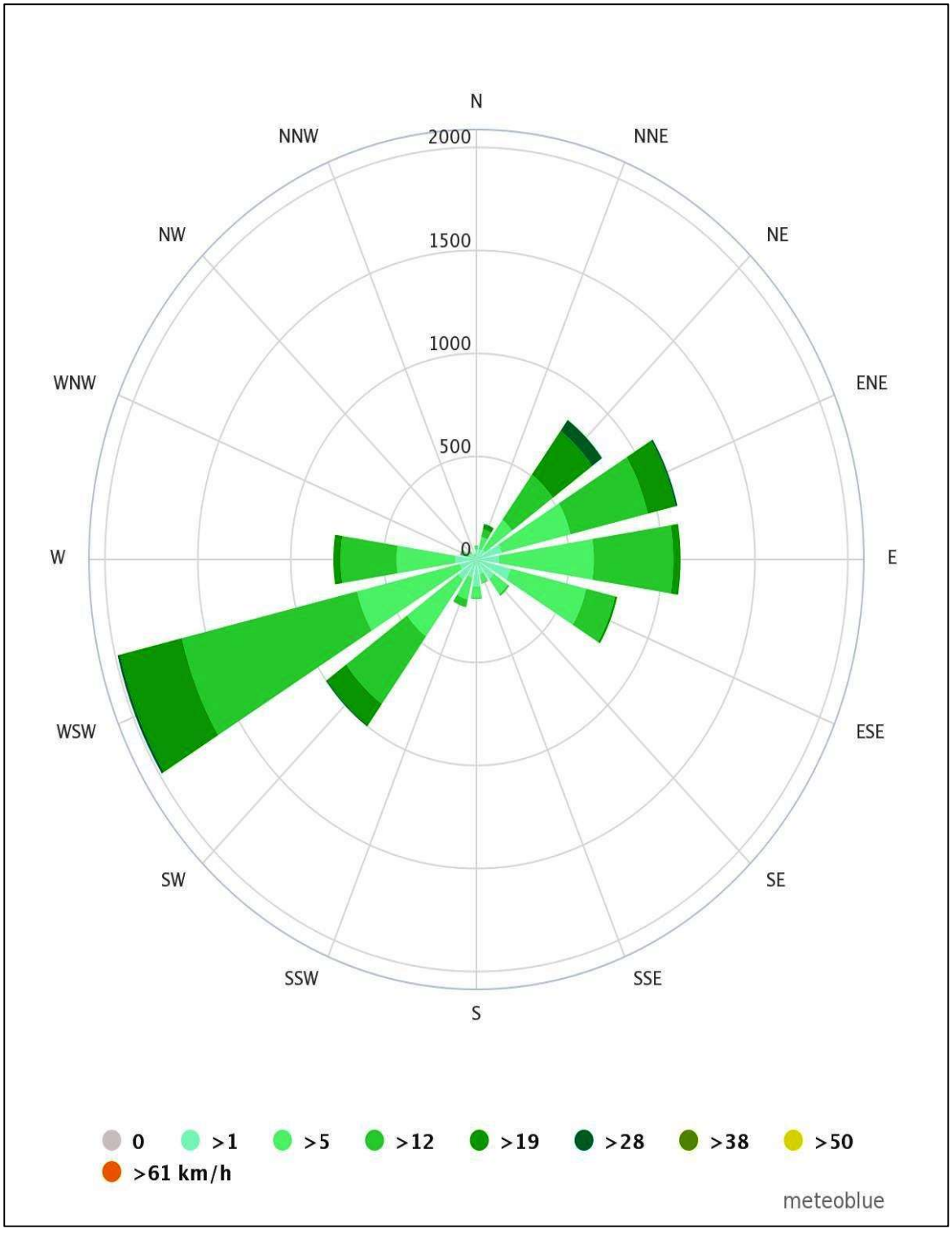


Figure 4-7 Windrose diagram for Island (source Meteoblue)[89]

The project area has a warm climate with high humidity and high rainfall. The area is cloudy during monsoons and since located in the tropics, sunshine time is more. The location is ideal for a tropical island resort.

[89] https://www.meteoblue.com/en/weather/forecast/modelclimate/10.33N98.14E0_Asia%2FBangkok

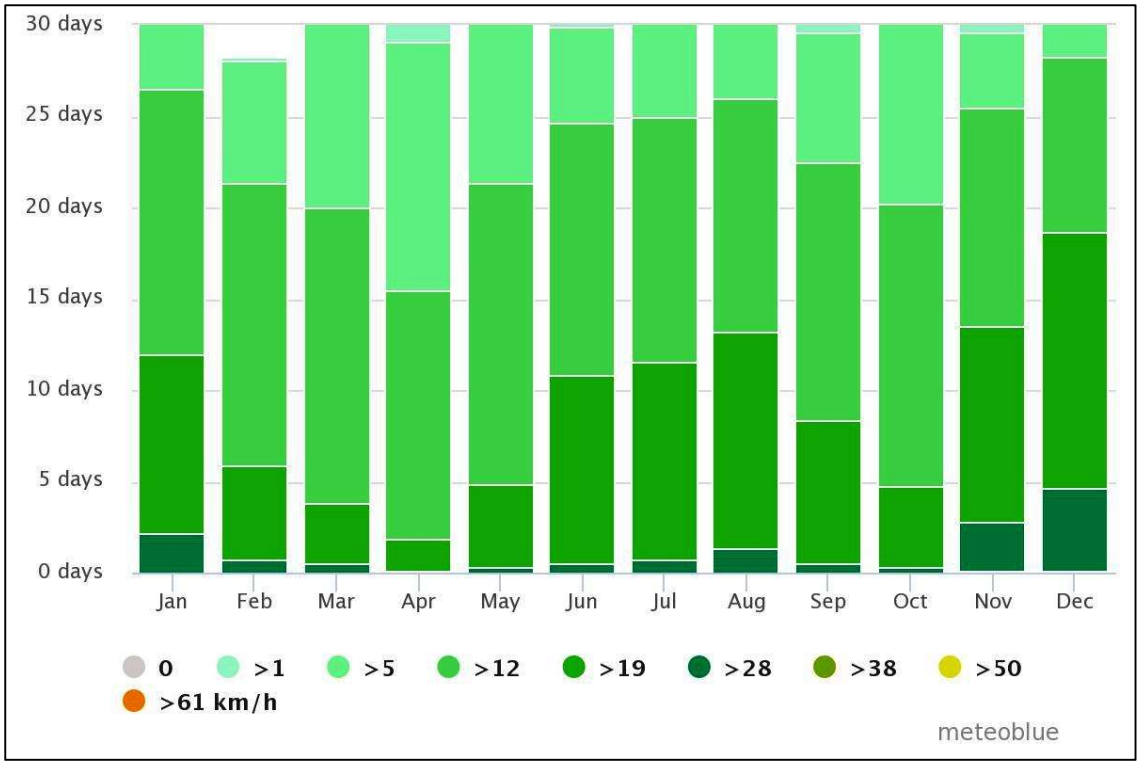


Figure 4-8 Wind speed diagram for Island (source Meteoblue)

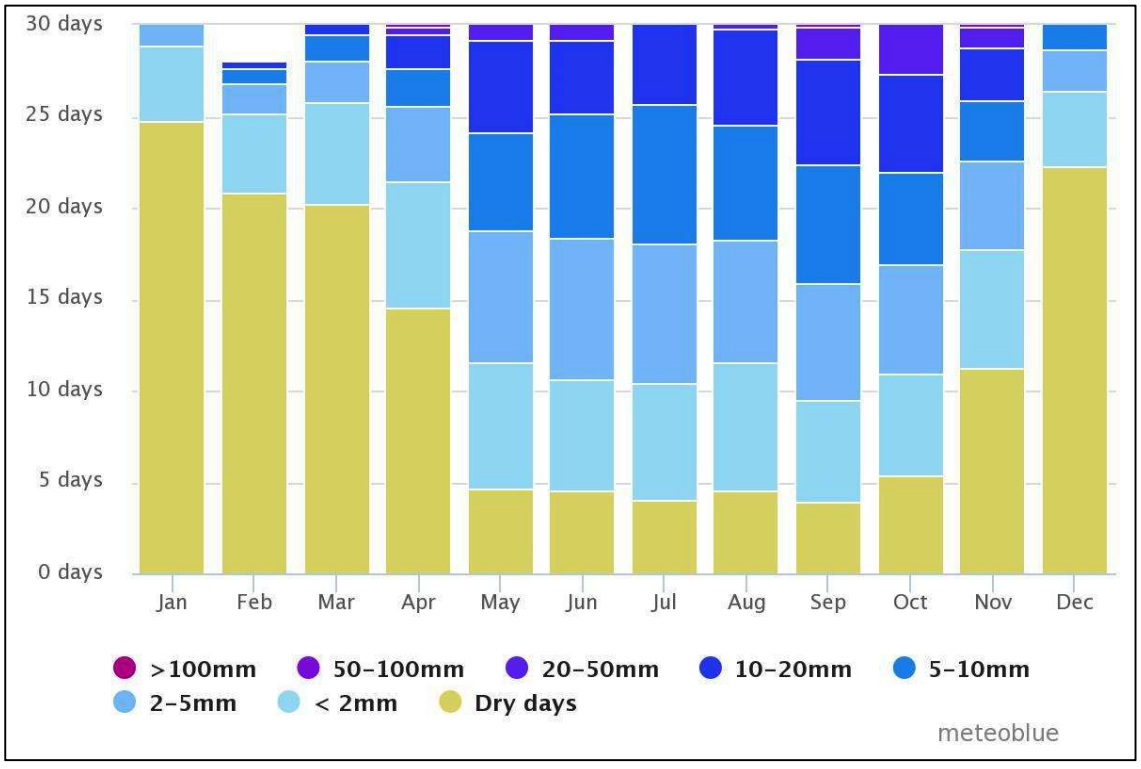
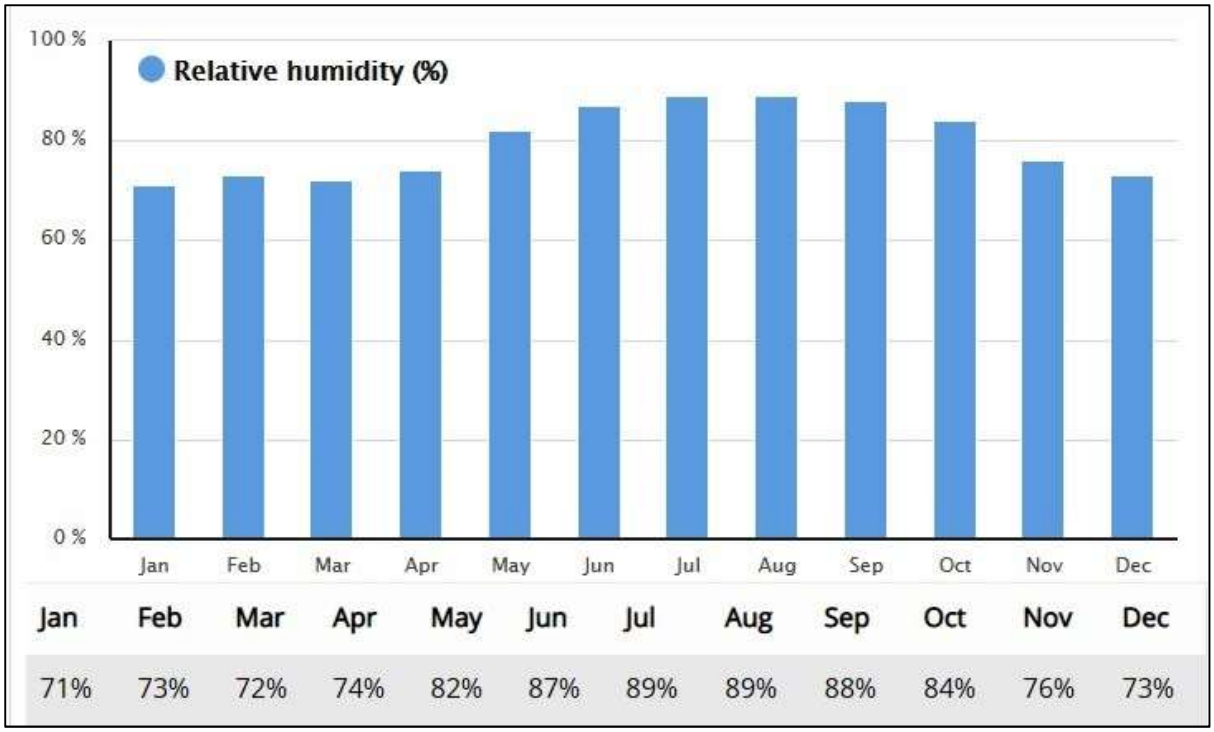


Figure 4-9 Precipitation Amounts diagram for Islands (source Meteoblue)



Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
71%	73%	72%	74%	82%	87%	89%	89%	88%	84%	76%	73%

Figure 4-10 Average monthly Humidity in the Project area

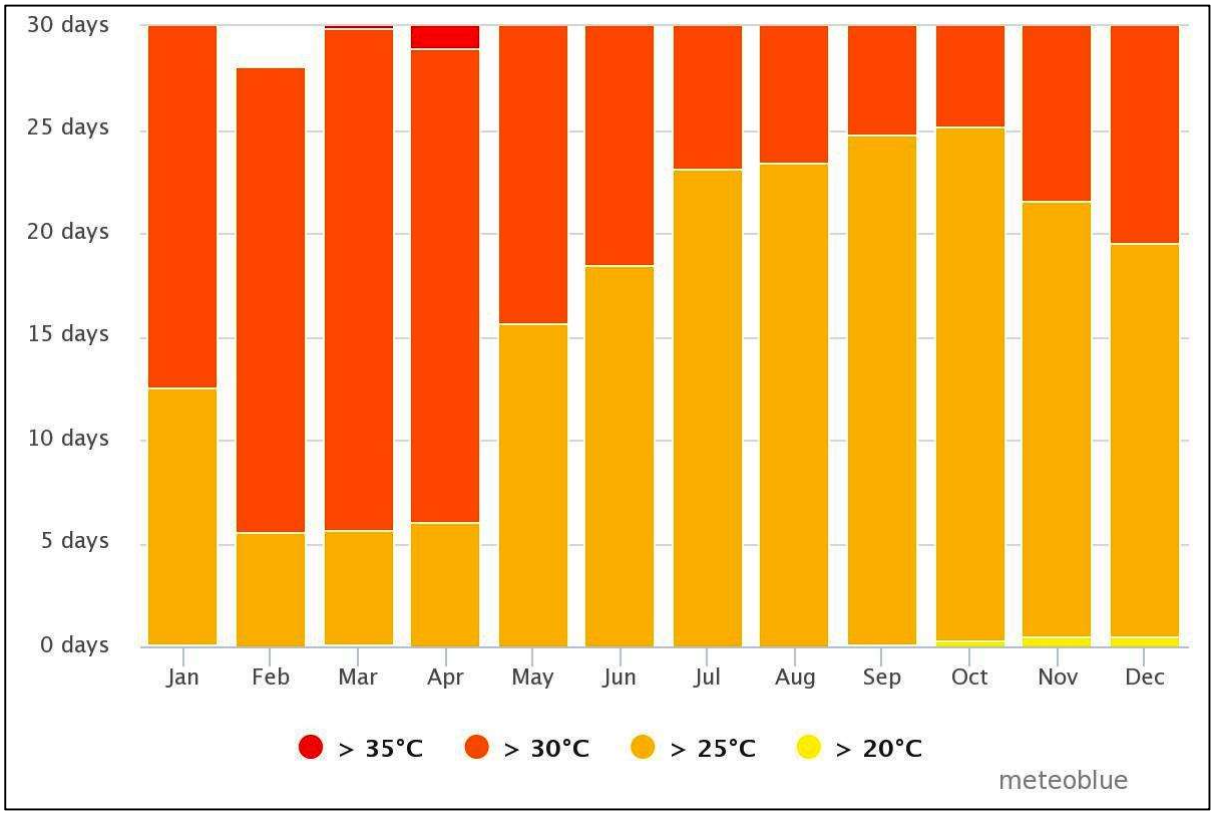


Figure 4-11 Temperature distribution diagram for Islands (Source-Meteoblue)

4.3.2 Topography

The project islands of Phoni and Balar are not inhabited and are fully covered in vegetation by natural forest. There are three hilly points where the elevation is above 100 metre in the Phoni (Bo Yar Nyunt) Island (at 153m, 145m and 120m). The Balar Island is smaller and mostly flat with very little elevation less than 40 metre al throughout. Only three points are above 10m elevation (22m, 30m and 38m). The areas where the project resort development is chosen on the two islands are within 10m of elevation and mostly flat land with little vegetation.

The marine waters between the two islands of Phoni and Balar are shallow with depths varying up to a maximum of 10 metre and mostly ranging between 4 to 7 metre. The marine waters around the islands are also shallow with the depths in Mergui Archipelago ranges within 30 metres at almost all places; however, the dive sites are deeper with even 50metre sites. The depth of marine waters between the Myanmar mainland and the project islands are within 30m.

Figure 4-12 The elevation contour map of the project island s[90]

[90] http://elevationmap.net/kawthaung-myanmar-burma?latlngs=(10.48101786743741,98.23373794555664)

4.3.3 Geology/Seismology

Myanmar is located in a tectonic plate boundary region[91] where the Australian, Indian, Eurasian, and Sunda Plates meet, with a major fault structure "Sagaing Fault line" running north-south up the middle of the country. Even though, the project location is in Southern Myanmar, that has not experienced any earth quakes in the near history, there happened an earth quake on 13th April 2016 of magnitude 6.9 on Richter scale in the upper part of Myanmar.

No seismic survey has been performed for the project islands as seismic risk was not identified as a significant parameter. The seismic study has not been performed as part of the EIA study as well. The project construction in the two islands will not amplify the chances of an earth quake in the region since the construction involves only assembly of modular components. The cottages made for the project are also small in size to cause damage in the event of an earth quake.

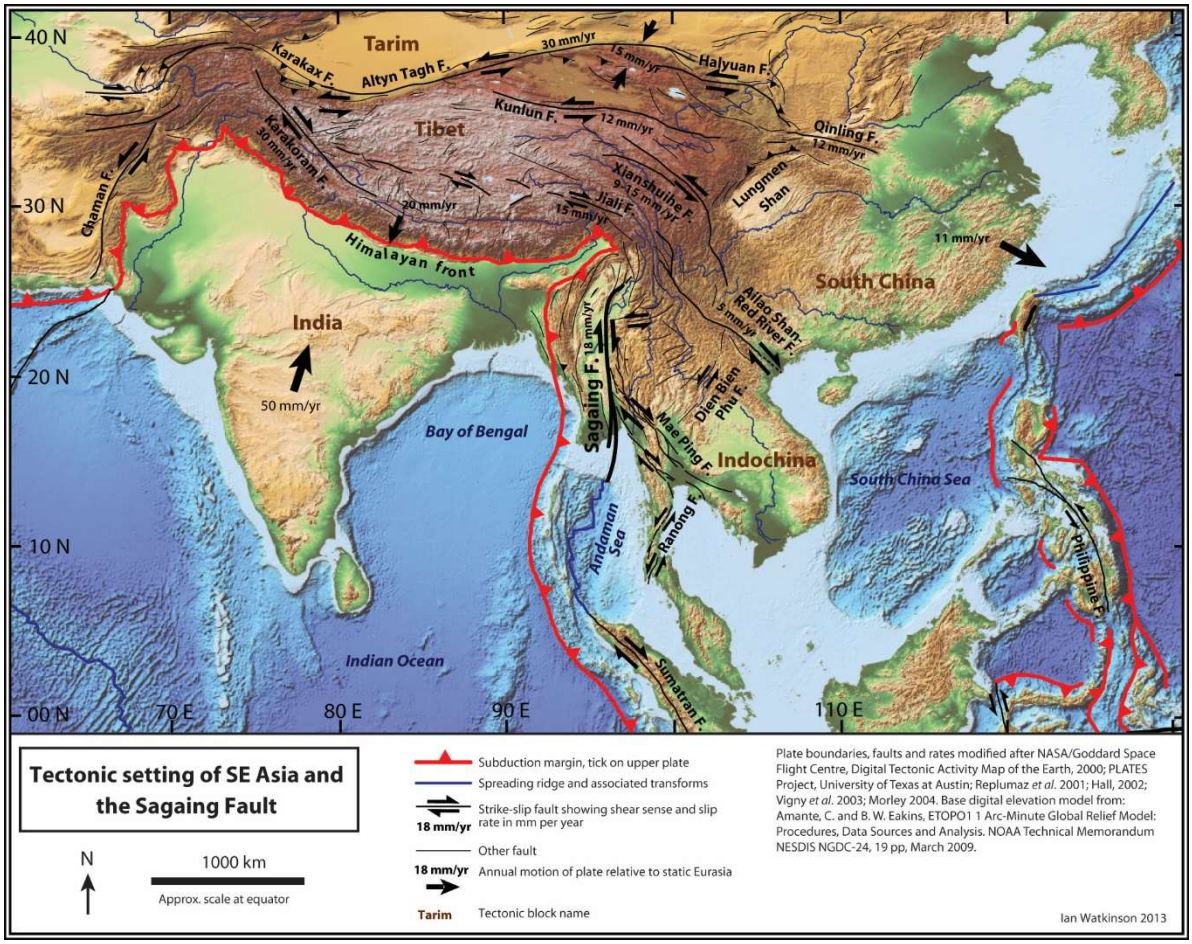


Figure 4-13 The seismic plates in South East Asia[92]

[91] http://tectonicsofasia.weebly.com/burma-plate.html
[92] http://onlinelibrary.wiley.com/doi/10.1002/2016JB012923/full

4.3.4 Natural Hazards

The island resort project is to be built on two islands that are in the Mergui Archipelago located south of the Lampi marine national park. There are only small islands around the project islands of which Nyaung Wee is inhabited. The project does not create a hazard and there are no hazards that need to be removed for the project development.

4.3.5 Hydrology

The tidal levels at the beaches on the project islands vary 8 feet of height between the high tide and low tide. The wave heights are within 2 metres and the direction as plotted on 25th July 2019 is Towards North East.

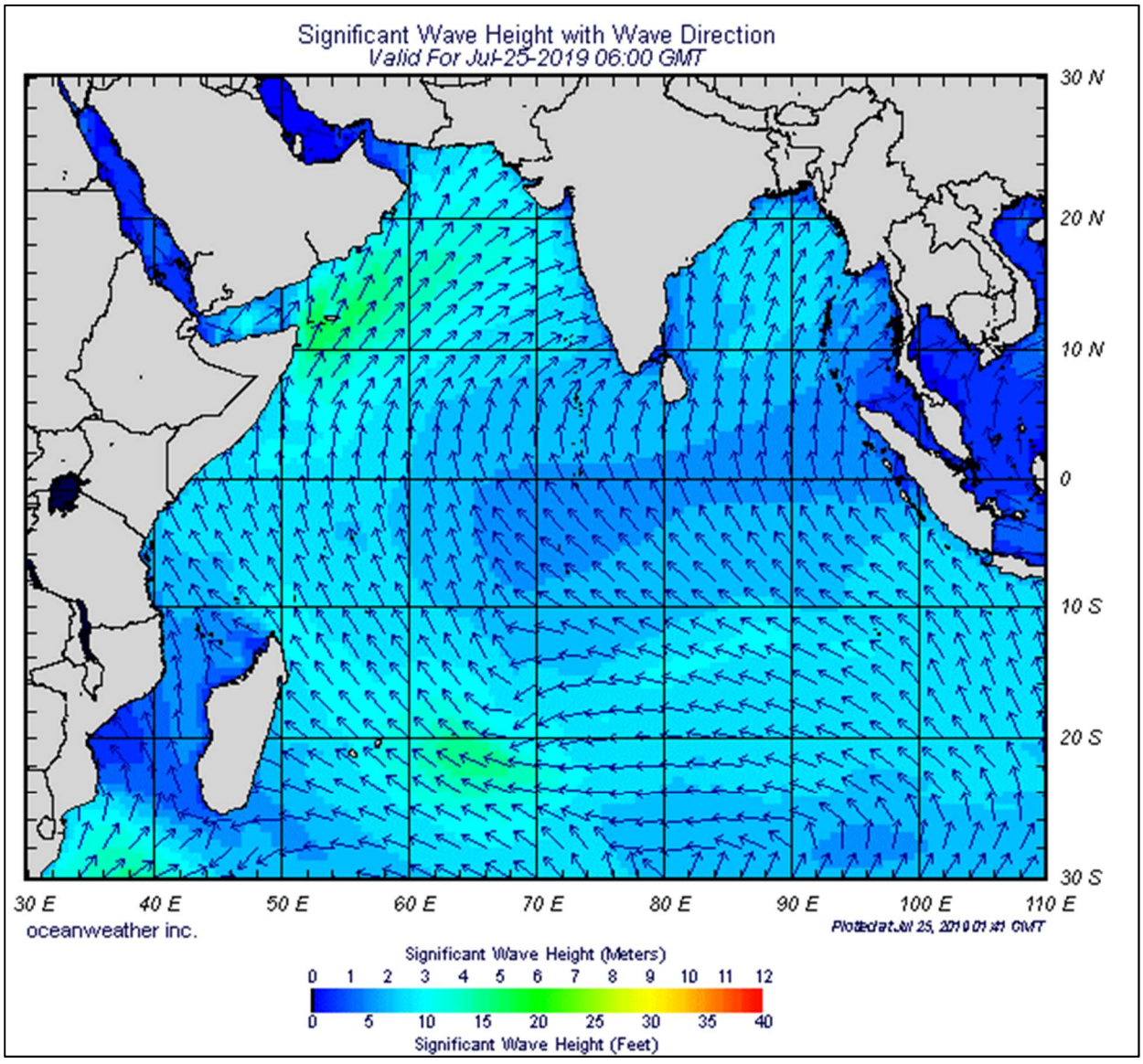
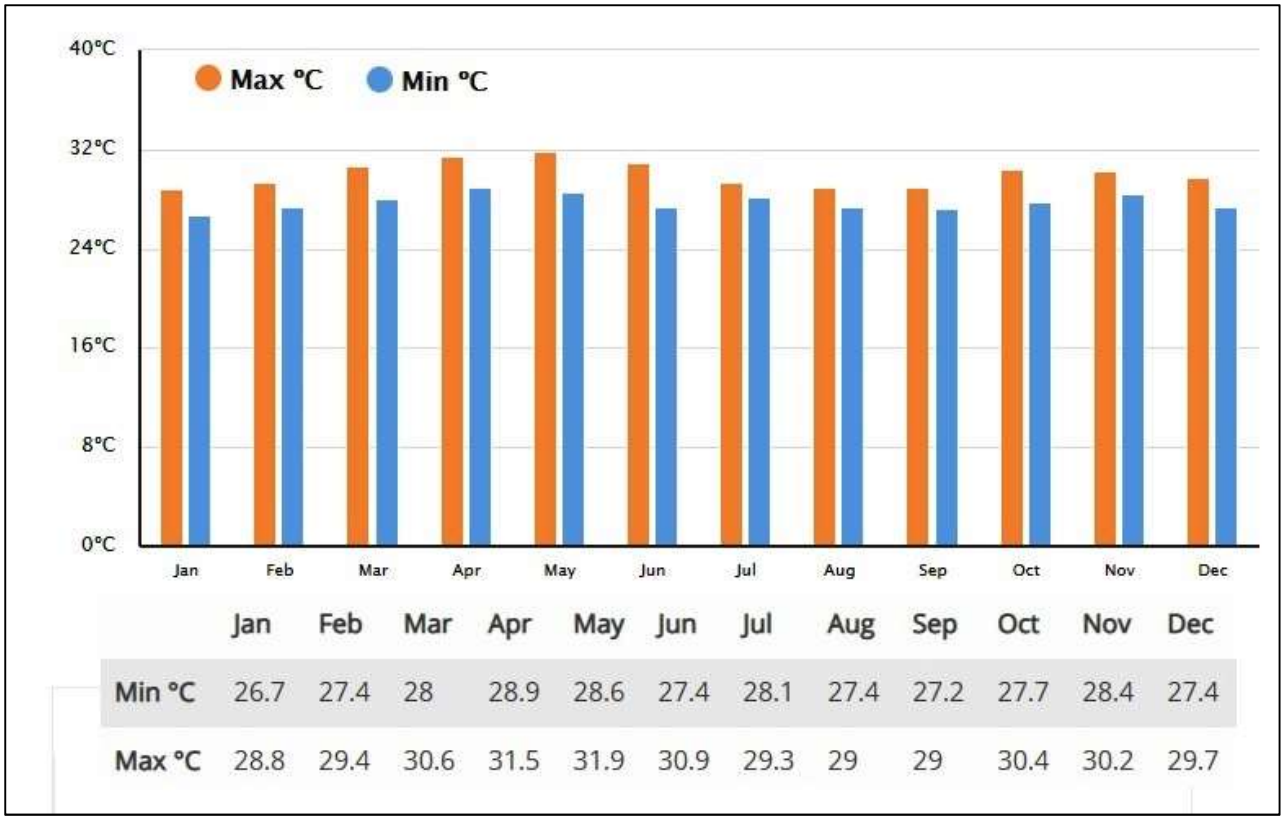


Figure 4-14 The Wave height and direction[93]

[93] https://www.oceanweather.com/data/



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Min °C	26.7	27.4	28	28.9	28.6	27.4	28.1	27.4	27.2	27.7	28.4	27.4
Max °C	28.8	29.4	30.6	31.5	31.9	30.9	29.3	29	29	30.4	30.2	29.7

Figure 4-15 The average Marine water temperatures for Mergui[94]

The surface temperatures of the marine waters are generally varying between 26^{0}C to 32^{0}C[95] throughout the year as the location is only around 10 degrees north of Equator.

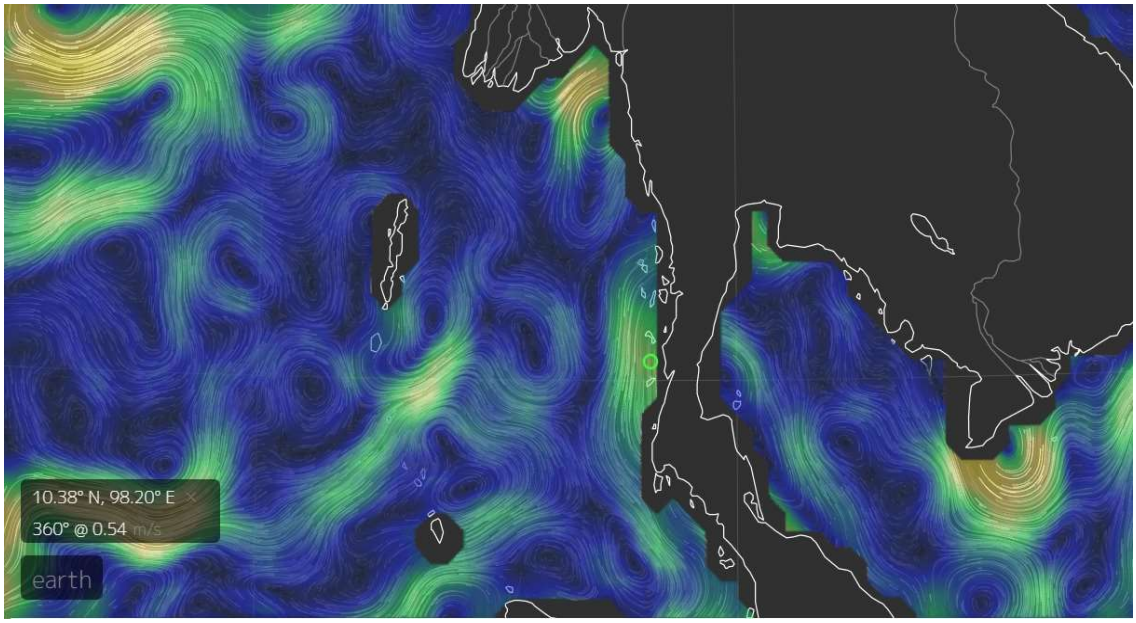


Figure 4-16 The Ocean currents in Mergui; the small green circle is project area

[94] https://www.seatemperature.org/asia/myanmar/myeik-july.htm
[95] https://www.seatemperature.org/asia/myanmar/myeik-july.htm

Fresh water in Phoni Island (Bo Yar Nyunt Kyun)

The surface water source in Phoni Island is on top of the hill and outside the 10-acre area where the resort is being developed. There are no other streams or rivers in the island. This source is accessed by the nearby islanders during peak summer. The resort operations will not restrict or prevent the access to this source for the villagers in the nearby islands and the Moken sea gypsies. A well has been established by the project proponent to draw groundwater which is within 500 Metres of the proposed resort area.

Figure 4-17 The ground water well in Phoni Island established

Freshwater in Balar Island

Figure 4-18 The exploration for freshwater in the Islands

There is no surface freshwater source in the Balar Island and the project proponent has been exploring for the groundwater source in the Island and has found water on 16th March 2017 when the EIA consultants were present. The Moken sea gypsies provided guidance to the exploration team to find the water. However, the water when tested was found to be not usable due to high salinity.

Figure 4-19 Fresh water discovery in Balar Island on 16th March 2017

4.3.6 Soil

Figure 4-20 The sandy clay soil in the island

The project island is covered by sandy clay soil with sands on the beaches and rocky terrain on parts of the shores. The soil analysis is not done for the island during the EIA/SIA study.

Figure 4-21 Rocky terrain on the shores of the project islands

4.3.7 Mineral Resources

The mineral resources are not found or heard of in the in the project zone and any future discoveries are not going to be affected by the project activity. The project owner has the responsibility to hand over any mineral discoveries to the authorities.

4.3.8 Surface and Ground Water Quality

The freshwater sources in the islands are detailed in the section 4.3.5 above for Hydrology. The project resort will be using the ground water from both the islands (the groundwater source in Balar is yet to be discovered). The waste water effluent is recycled to ensure zero discharge to the ground or the marine waters. The project is not going to contaminate the surface and groundwater resources in the project islands.

The water sample from the freshwater sources and the marine water was tested and the results are below. The test results show that the groundwater quality is within acceptable limits as per the WHO guidelines for the stream water and the Ground water in Phoni Island. The analysis from the testing laboratory for the groundwater source discovered in Balar Island shows high turbidity, Iron content and hardness. The recommendation is that if the water is used after treatment, it will be prone to scaling and corrosion.

Type of water	Marine water		Ground water		Stream	Unit	WHO value
Location	Balar	Phoni	Balar	Phoni	Phoni		
Turbidity	3	4	93	24	4	NTU[96]	5
pH	8.3	8.1	5.15	6	6.7		6.5 to 8.5
Total Dissolved Solids	>1990	>1990	1189	53	75	mg/l	1000
Total Hardness	>300	>300	>300	30	30	mg/l	500
Total Alkalinity	153	147	9	42	36	mg/l	N/A
Conductivity	>1990	>1990	>1990	125	193	µS/cm	N/A
Iron	0	0.01	>3.3	0.25	0.11	mg/l	0.3
Chloride	>1000	>1000	780	10	5	mg/l	250
Salinity	29,500	30,000	1150	<585	<585	mg/l	N/A

Table 4-9 The water quality test results summary from AMD

The marine water near the project islands shows low turbidity of 3 and 4 NTU and salinity of 3% (average ocean salinity is 3.5%). The clear waters are good from a tourism perspective as the project targets the travellers that are interested in diving activities

[96] NTU stands for Nephelometric Turbidity Units

4.3.9 Noise Levels

The islands where the project is being conceptualised are remote uninhabited islands and hence are noise free apart from the sound of any occasional fishing boats moving in the sea nearby. The construction phase is expected to increase the noise levels as it involves activities such as drilling, piling, equipment operation, grinding etc; however, the construction phase of the project is planned to be done with pre-engineered modules and structures minimizing the noise.

The contractor will keep a log of noise measurements during the construction work. The equipment will be fitted with mufflers to reduce the noise whilst under operations. In the operation phase, the noise producing equipment such as Diesel Generators shall be installed within noise proof rooms or canopies.

		Phoni Island			Balar Island		
Date	**Time**	**Beach (dB)**	**Resort (dB)**	**Well (dB)**	**Beach (dB)**	**Resort (dB)**	**Inside (dB)**
16 March 2017	11.00-12.00	56	42	36	51	45	32
	14.00-15.00	53	41	34	48	43	24
17 March 2017	08.00-09.00	56	42	32	56	42	24
	11.00-12.00	53	39	35	50	46	26
16 May 2017	11.00-12.00	56	44	38	54	48	32
	14.00-15.00	58	45	32	53	49	33

Table 4-10 Noise level measurements at the project site by the consultants

Place Name	**Latitude North**	**Longitude East**	**Five reading average (dB)**
Aung Bar village Jetty	10^0 34' 02"	98^0 28' 55"	55.80
Majhun Galet Village	10^0 40' 46"	98^0 15' 30"	56.34
Nyaung Wee village	10^0 29' 45"	98^0 13' 59"	51.68
115 Islands	10^0 27' 49"	98^0 10' 55"	53.98
Phoni Island	10^0 27' 38"	98^0 13' 08"	56.34
Balar Island	10^0 27' 58"	98^0 14' 25"	51.28

Table 4-11 Noise level measurements by third party environmental consultant

The noise level measurements were performed at three points each on both the islands on three different days; the first two in March 2017 and the third in May 2017. The points chosen in Phoni Island were the North Eastern beach shore, the proposed resort area, and the ground water well. The points chosen in Balar Island were the North Western beach shore, the proposed project site and around 200 metre inside the island. The values were found to be within the acceptable limits prescribed by the world health organisation and the environmental emission norms set by the ECD.

The third-party measurement of the noise levels of the project area was performed on 12th, 13th and 14th of July at six different points namely the Aung Bar Jetty, Majhun Galet Village, Nyaung Wee village, 115 islands, Balar Island and Phoni Island.

4.3.10 Air quality

The air quality measured data available in the Myanmar Environmental portal shows the Tanintharyi region performing poor compared to other regions of Myanmar. However, the project islands are very remote and are not comparable with these national average surveys of townships and districts. The air quality monitoring at the project area was done with the same six points where the noise levels were monitored.

Parameter Monitored	Aung Bar	Majhun Galet	Nyaung Wee	115 Island	Phoni Island	Balar Island
Total Suspended particles	0.40	0.20	0.20	0.24	0.30	0.20
Respirable particulate matter PM_{10}	5.48	36.72	28.96	20.22	19.18	19.18
Respirable particulate matter $PM_{2.5}$	2.92	19.60	7.50	3.50	4.68	3.40
Sulphur Dioxide (SO_2)	0.00	0.00	0.00	0.00	0.00	0.00
Oxides of Nitrogen as (NO_2)	0.023	0.019	0.013	0.019	0.021	0.023
Hydrogen Sulphide as (H_2S)	0.00	0.00	0.00	0.00	0.00	0.00
Carbon Monoxide as (CO)	0.00	0.228	0.00	0.00	0.00	0.00
Carbon Dioxide as (CO_2)	380	400	397	379	455	477
Ozone (O_3)	0.00	0.00	0.00	0.00	0.001	0.00
Humidity	82.60	81.10	86.50	86.90	89.80	89.80

Table 4-12 Air Quality measurements by third party environmental consultant

The project being developed in uninhabited islands, the quality of air now can be described as fresh. The construction phase is expected to generate dust pollution and the movement of boats and other equipment that uses fossil fuels are going to emit exhaust gases to the atmosphere. In the operation phase, the air quality is going to be affected by the emission from use of fuel for transportation and power.

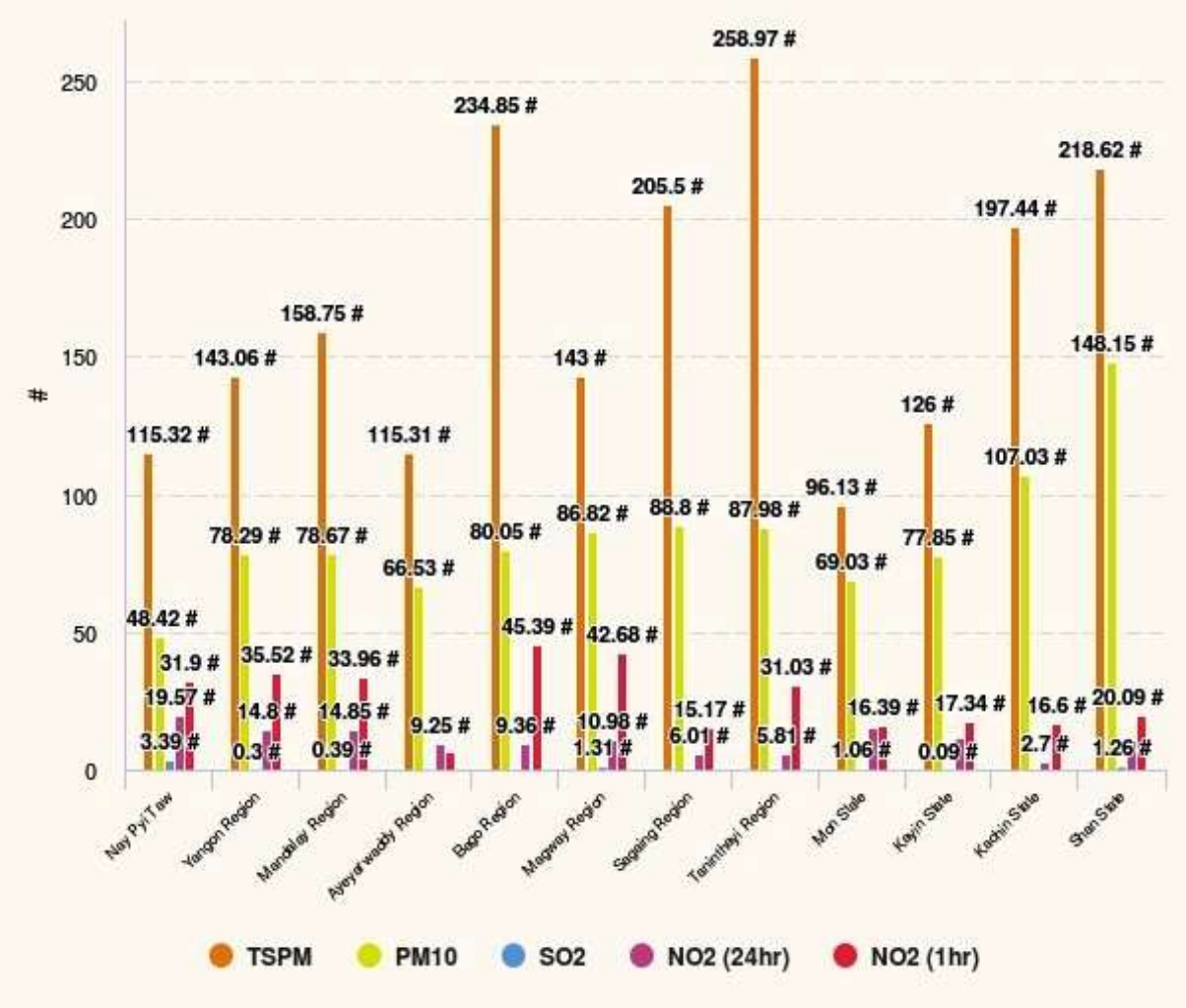


Figure 4-22 Air quality in Myanmar (Myanmar Environmental resource portal)[97]

The air quality monitoring was done by the consultants with portable devices at three points on both the islands as per the wind rose diagram and air movement direction. The points chosen were on the shores of the islands near to the proposed project site. The measurements in the project area were performed in May 2017. The values for respirable particulate matter was were found to be within the limits provided in the WHO guidelines.

[97] http://mya.gms-eoc.org/

Parameter (24-hour average)	Phoni Island			Balar Island			
	1	2	3	1	2	3	Limits[98]
Respirable particulate matter PM_{10}	20.51	22.23	21.01	24.38	28.53	25.32	50
Sulphur Dioxide as SO_2	0.00	0.00	0.00	0.00	0.00	0.00	20
Oxides of Nitrogen as NO_2	0.02	0.02	0.02	0.02	0.02	0.02	40
Carbon Monoxide as CO	NDL[99]	NDL	NDL	NDL	NDL	NDL	2

Table 4-13 The air quality monitoring in the project islands in May 2017

[98] http://www.who.int/mediacentre/factsheets/fs313/en/
[99] NDL is Not at Detectable Level

4.4 Biological Components

The biological components of the project area refer to the animals, birds, fishes, amphibian, plants and other organisms in the project area and an assessment of whether they are endangered due to the project development. The International Union for Conservation of Nature (ICUN)[100] publishes a red list in which they classify the level of threat to extinction faced by a species. The categorisation used by ICUN is version 3.1[101] now and is summarised below. The EIA/SIA report also used the same notation and classification used by the ICUN to express the endangered species in the Project area.

Classification	Notation	Classification	Notation
Extinct	EX	Near Threatened	NT
Extinct in the wild	EXW	Least concern	LC
Critically endangered	CR	Data Deficient	DD
Endangered	EN	Not Evaluated	NE
Vulnerable	VU		

Table 4-14 ICUN classification and notations

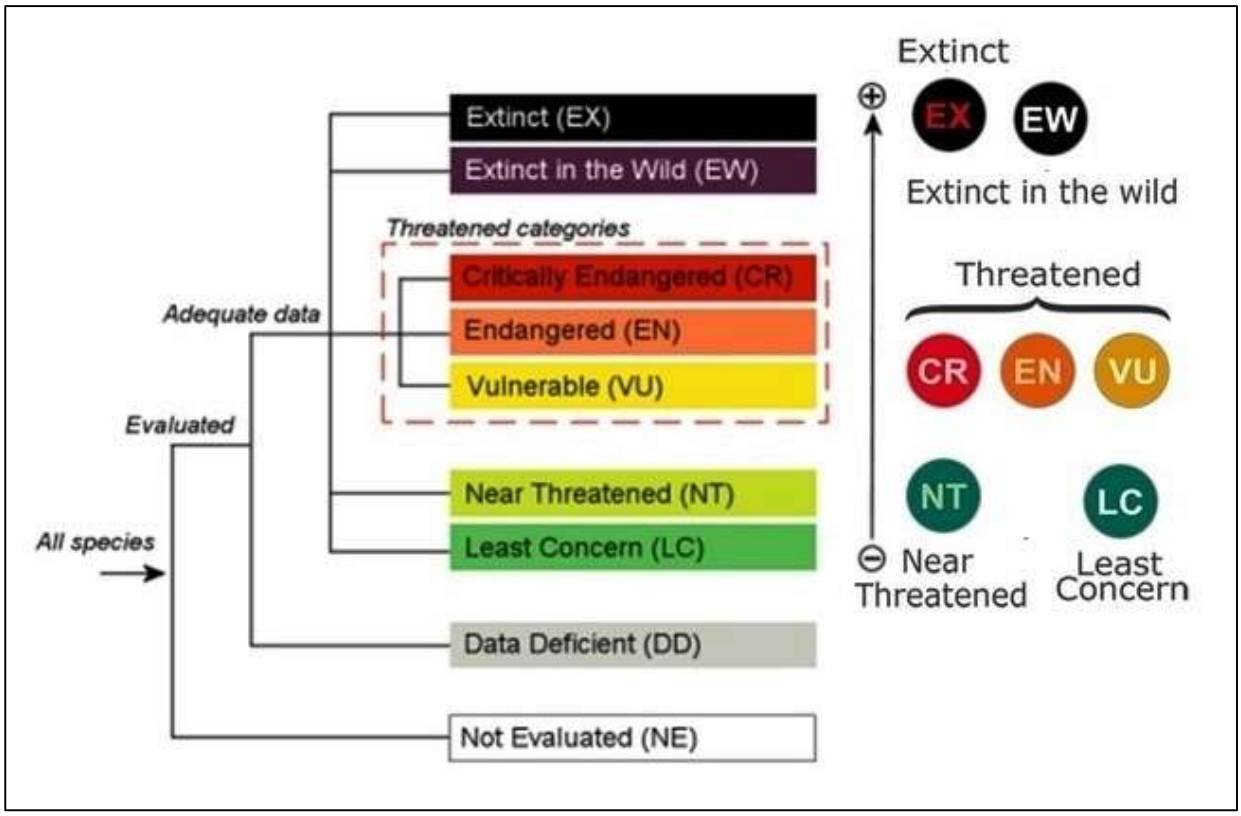


Figure 4-23 ICUN Criteria as per their latest version 3.1 (2001)

[100] https://www.iucn.org/
[101] http://www.iucnredlist.org/static/categories_criteria_3_1

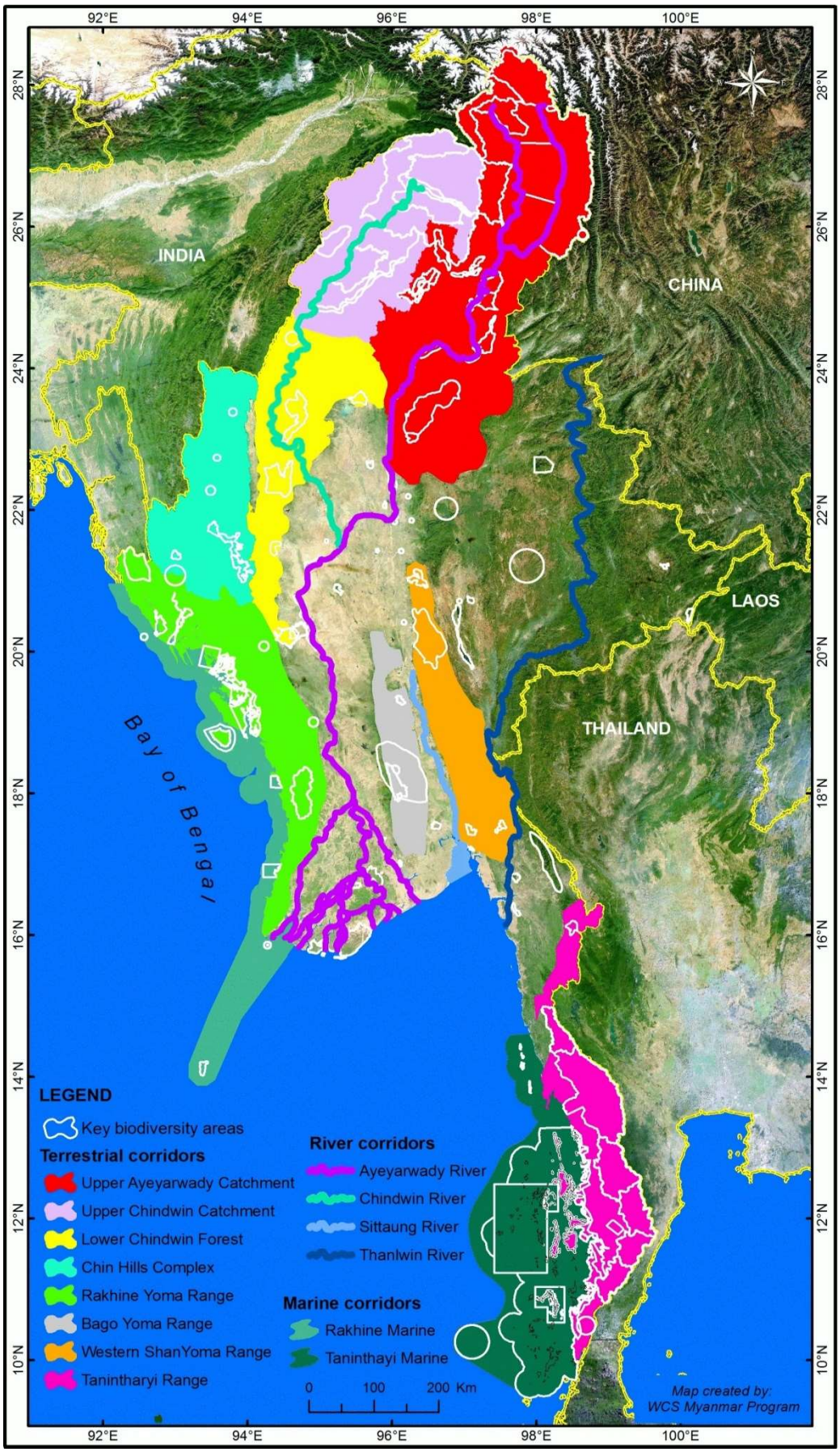


Figure 4-24 The Key Biodiversity corridors of Myanmar

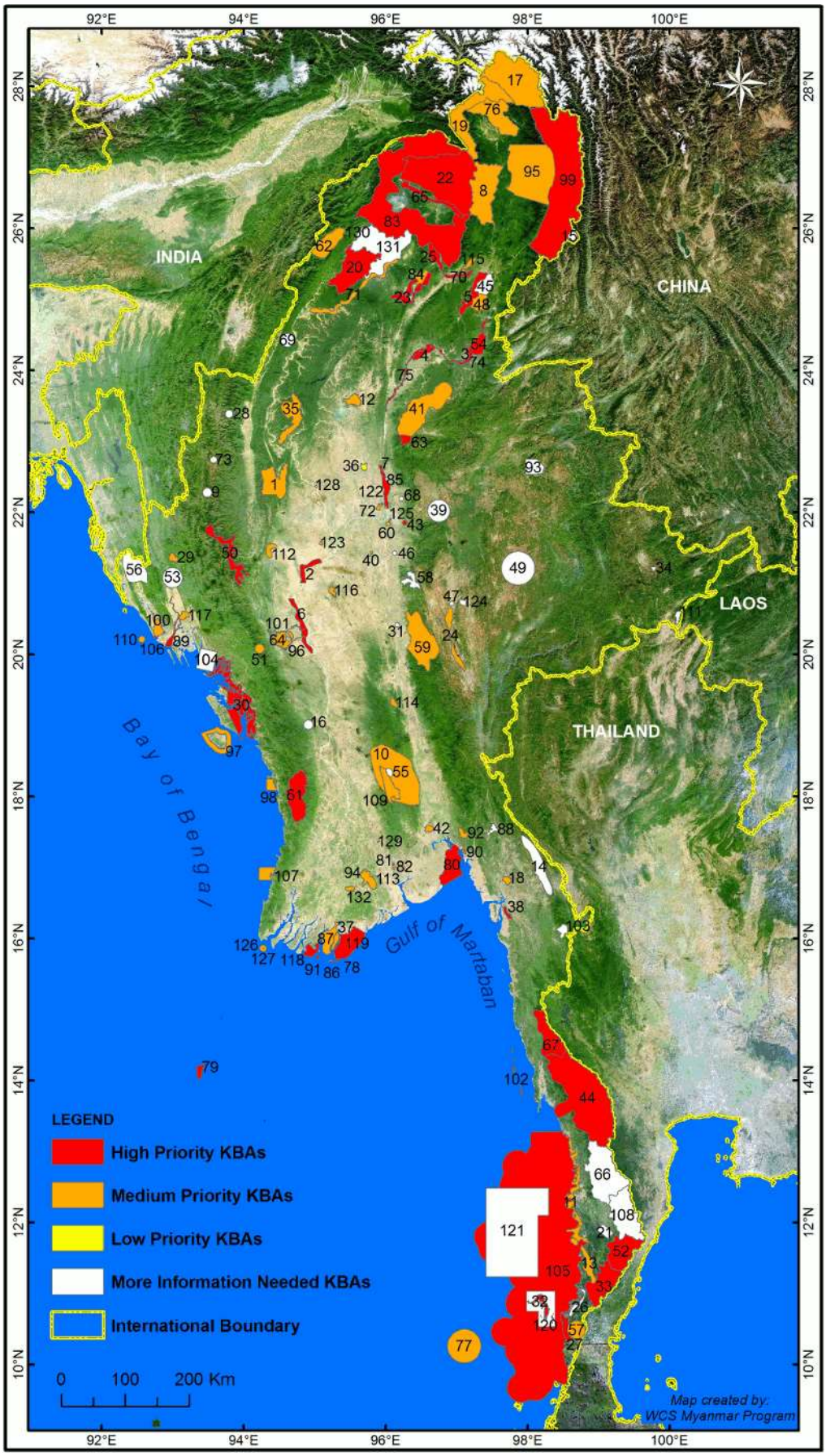


Figure 4-25 Priority of Biodiversity corridors of Myanmar

4.4.1 Terrestrial Ecology/ Wildlife

The terrestrial ecology of the island is rich as it is an uninhabited island in the archipelago. Myanmar's forests are habitats for numerous terrestrial animals of which a summary of terrestrial biodiversity corridors in Myanmar is below. The Tanintharyi corridor is near the project area. However, the mainland is far off from the islands and has very little impact.

Terrestrial Biodiversity Corridors in Myanmar	
Name	**Area (Km^2)**
Chin Hills Complex Corridor	36,272
Bago Yoma Range corridor	16,143
Western Shan Yoma Range Corridor	27,742
Upper Chindwin Catchment Corridor	50,156
Lower Chindwin Forest Corridor	40,087
Tanintharyi Range Corridor	42,880
Rakhine Yoma Range Corridor	47,914
Upper Ayeyarwady Catchment Corridor	101,394
Total	**362,588**

Table 4-15 Terrestrial Biodiversity corridors in Myanmar

There are 77 species of terrestrial mammals of Myanmar listed in the ICUN of which 3 are critically endangered, 19 are endangered, 23 are vulnerable and 15 are near threatened. The three critically endangered species of terrestrial mammals are

Sl No	Scientific Name	Common name	Status in Myanmar
1	Dicerorhinus sumatrensis[102]	Sumatran Rhinoceros	Probably extinct
2	Rhinoceros sondaicus[103]	Javan Rhinoceros	Probably extinct
3	Rhinopithecus strykeri[104]	Myanmar Snub-Nosed Monkey	260-330 numbers

Table 4-16 Critically endangered terrestrial mammals in Myanmar

[102] http://www.iucnredlist.org/details/6553/0
[103] http://www.iucnredlist.org/details/19495/0
[104] http://www.iucnredlist.org/details/13508501/0

None of these terrestrial mammals are found in the project islands or the nearby islands. The mammals in the Lampi marine park are listed in the ICUN red list and their summary is below.

Scientific name	Common name	Status
Elephas maximus	Asian Elephant	EN
Sunda pangolin	Sunda Pangolin	EN
Dugong dugon	Dugong	VU
Macaca nemestrina	Southern Pig-tailed Macaque	VU
Aonyx cinerea	Oriental Small-clawed Otter	VU
Ratufa bicolor	Black Giant Squirrel	NT
Trachypithecus obscurus	Dusky Langur	NT

Table 4-17 The mammals in Lampi marine national park

There are six species of turtles and tortoises that are critically endangered in Myanmar and the in the Lampi Marine National Park, there are three species listed in the ICUN red list; however, their habitat and nesting zones have never been observed or reported in the project island. The project island is outside the Lampi marine National park zone[105] and the site does not feature as having any habitat or nesting site of any of the endangered species of turtles, birds. However, the probability of these species using the islands as a habitat or nesting site cannot be ruled out due to the proximity to the Lampi park.

Scientific name	Common name	Type	Status
Caretta Caretta	Loggerhead Turtle	Turtle	EN
Chelonia Mydas	Green Turtle	Turtle	EN
Lepidochelys Olivacea	Olive Ridley Turtle	Turtle	VU
Indotestudo Elongata	Yellow Tortoise	Herpetofauna	EN
Limnonectes Blythii	Blyth's Giant Frog	Herpetofauna	NT

Table 4-18 The Turtles and Herpetofauna in Lampi marine national park

[105] http://www.lampipark.org/wp-content/uploads/2015/10/map.pdf

4.4.2 Forest/Vegetation Cover

The project islands are densely vegetated with tropical forest; however, there are not many big trees in the project islands where the resort is being developed. The vegetation is mostly the shrubs and short trees.

Figure 4-26 The vegetation in the Phoni Island

Figure 4-27 The vegetation in the Balar Island

Scientific name	Status
Anisoptera curtisii	CR
Dipterocarpus dyeri	CR
Dipterocarpus grandiflorus	CR
Dipterocarpus turbinatus	CR
Hopea helferi	CR
Hopea sangal	CR
Parashorea stellata	CR
Shorea farinosa	CR
Diospyros crumenata	EN
Dipterocarpus alatus	EN
Dipterocarpus costatus	EN
Shorea gratissima	EN
Syzygium zeylanicum	EN
Ternstroemia penangiana	EN
Abarema bigemina	VU
Hopea odorata	VU
Memecylon grande	VU

Table 4-19 The ICUN listed trees in the Lampi marine national Park

4.4.3 Aquatic Biota and Habitats

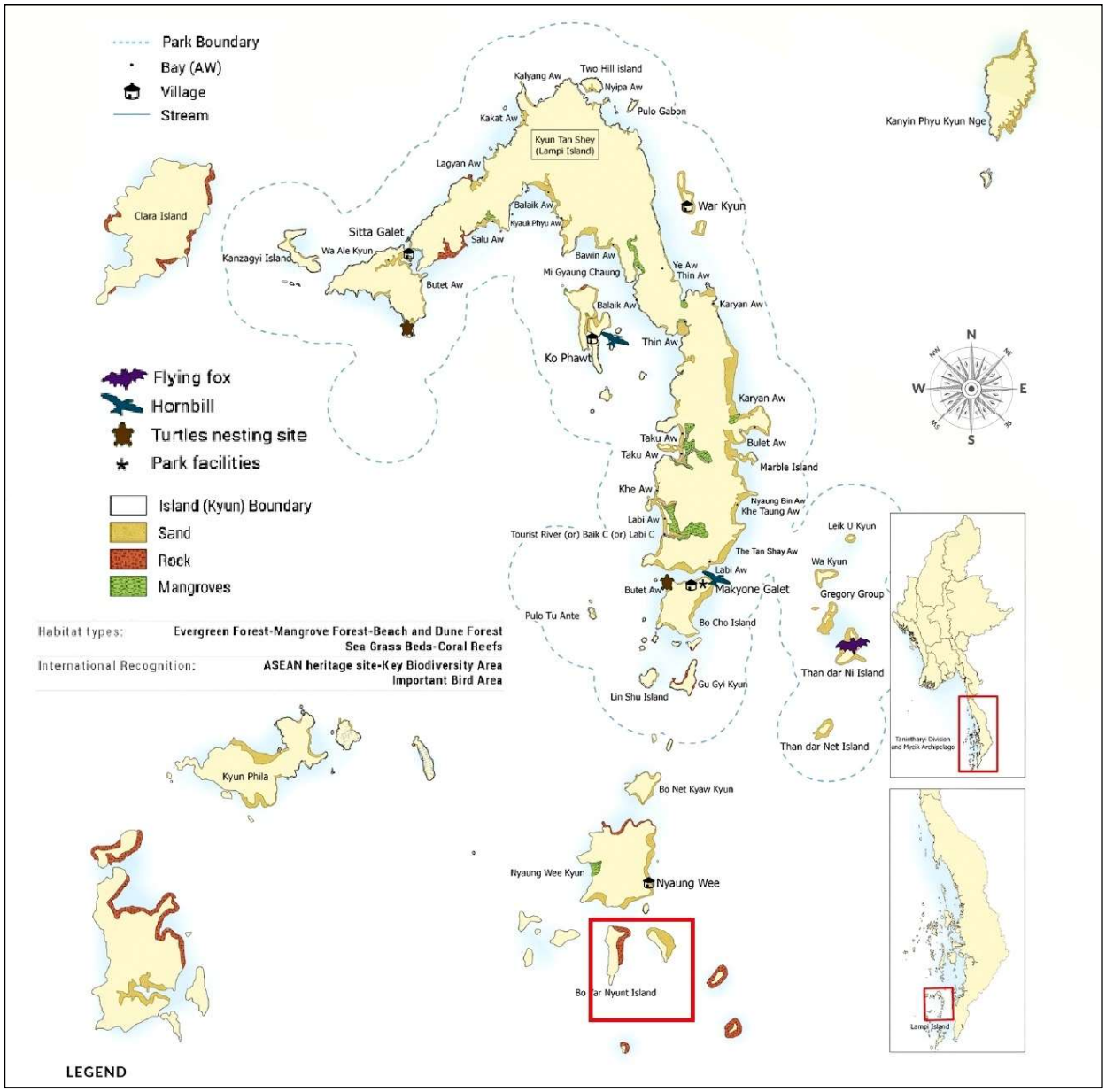


Figure 4-28 The map of protected species in the Lampi; project islands in red box

The project being in islands surrounded by pristine sea that is rich in aquatic biota such as fishes, crustacean, corals, jelly fishes, turtles and their habitats are in the project area. The sedimentation and discharge of waste water can seriously affect the life and habitats around the island.

Mangroves

In Myanmar, there are three major zones where mangroves are found; namely the Rakhine region, Ayeyarwady region and the Tanintharyi region. The project is in the Tanintharyi region in Southern Myanmar. However, the project island does not have identified mangroves and seagrass areas.

Figure 4-29 Mangroves in Rakhine region (Photo by Dr San Tha Tun)

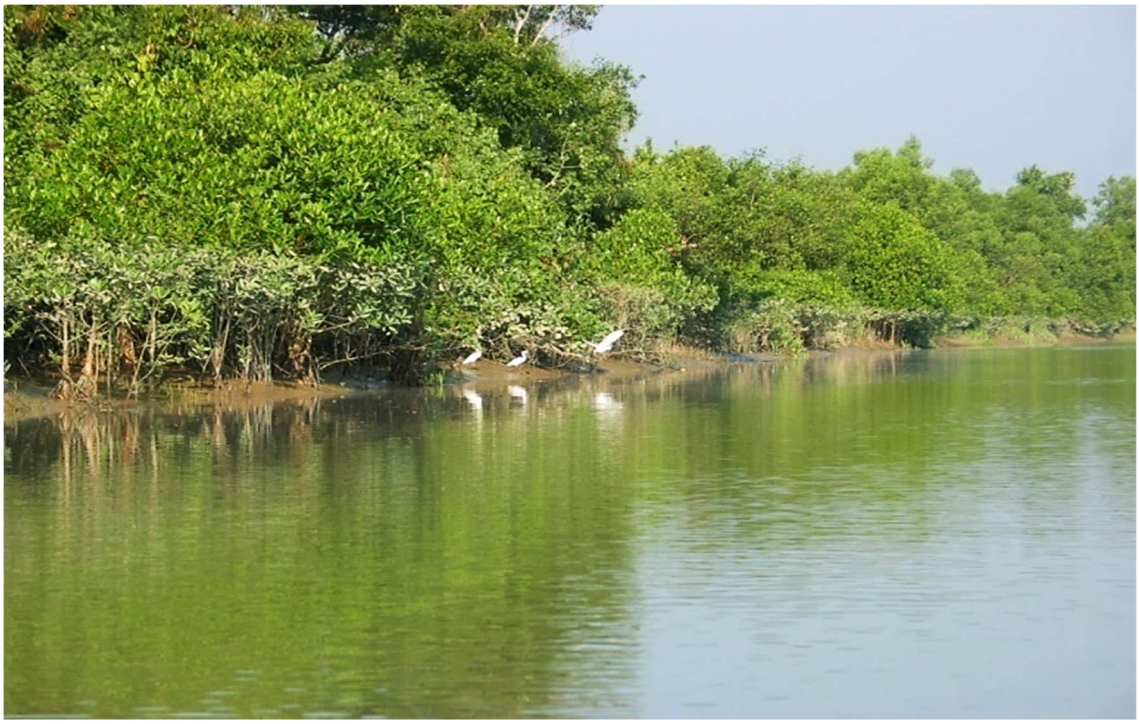


Figure 4-30 Mangroves in Ayeyarwady region (Photo by Dr San Tha Tun)

Figure 4-31 Mangroves in Tanintharyi region (Photo by Dr San Tha Tun)

Rhizophora Mucronata, Rhizophora Apiculata, Ceriops Tagal, Xylocarpus Granatum and Excoecaria Agallocha are most common mangrove species seen in and around Lampi Island

Figure 4-32 Rhizophora Mucronata and Xylocarpus Granatum
(Photo Dr San Tha Tun)

Figure 4-33 Rhizophora Apiculata and Ceriops Tagal (Photo Dr San Tha Tun)

Figure 4-34 Excoecaria Agallocha (Photo Dr San Tha Tun)

Mangroves are essential to the existence of aquatic species as it acts as breeding point for many species of fishes, crabs and other organisms. They also act as a sink to Carbon Dioxide in the atmosphere.

The villagers in Aung Bar, the fishing village on the main land has created a 200-acre mangrove park near to the village in a period of 12 years. They survey every year and make plans about the planting for more area. The village head Mr Myo Oo explains how the fishes and crabs increased in the nearby waters after the park was built by the villagers.

Figure 4-35 The village head of Aung Bar showing the 200 Acre mangrove Park

Figure 4-36 The 200 Acre mangrove Park in Aung Bar

Coral Reefs

The coral reef ecosystem in Myanmar is found only in the Southern Rakhine and the Tanintharyi region. The Ayeyarwady delta does not have coral reefs due to high sedimentation. As per Flora and Fauna International (FFI) there are 380 species of corals that support the coastal and marine fisheries. They also act as natural protective barriers, deterring beach erosion, retarding storm waves and are good for tourism as seen in other parts of the globe

Figure 4-37 The Coral reef Ecosystem in Myanmar.

Figure 4-38 Corals near the Project Islands

The corals require clean and clear waters to survive and increase in turbidity will destroy them. The presence of corals is required for several fish species to breed and also it makes an important tourist attraction ingredient due to its aesthetic characteristics as far as diving and snorkelling activities are concerned.

If the turbidity of the water increases due to the soil erosion from construction or the wastewater let off to the sea, it will result in destruction of these corals around the project islands. Hence the project owner is taking care of this by having a waste water recycling system to ensure zero discharge to the sea.

The waters around the islands are home to several species of fishes, crustaceans, amphibian, and other sea creatures. The project developers in the area are to conserve and take care of the natural biodiversity to mutual coexist so as to tap the tourism potential of the Archipelago and its shallow waters around.

Figure 4-39 A Crustacean found on the beaches

Figure 4-40 A jelly fish left on the beach by the waves

Figure 4-41 sea cucumber dried by villagers in Majhun Galet village

4.4.4 Birds

The Lampi National park is assessed to be home to about 250 species of birds. The ICUN listed Vulnerable and near threatened species of birds are 19 (2 Vulnerable and 17 Near threatened). The project development will remove only less than 10 acres of vegetation form the two islands that are outside the Lampi park and hence the habitat loss for the birds due to the project will be very limited.

Scientific name	Common name	Status
Aceros subruficollis	Plain pouched Hornbill	VU
Spizaetus nanus	Wallace's Hawk Eagle	VU
Rollulus rouloul	Crested Partridge	NT
Caloperdix oculea	Ferruginous Partridge	NT
Megalaima mystacophanos	Red throated Barbet	NT
Buceros bicornis	Great Hornbill	NT
Halcyonamauroptera	Brown winged Kingfisher	NT
Phaenicophaeus diardi	Black Bellied Malkoha	NT
Treron fulvicollis	Cinnamon headed Green Pigeon	NT
Numenius arquata	Eurasian Curlew	NT
Esacus neglectus	Beach Thicknee	NT
Ichthyophaga ichthyaetus	Grey headed fish eagle	NT
Pitta megarhyncha	Mangrove Pitta	NT
Pericrocotus igneus	Fiery Minivet	NT
Aegithina viridissima	Green Lora	NT
Rhinomyias umbratilis	Gray chested Jungle Flycatcher	NT
Anthreptes rhodolaema	Red-throated sunbird	NT
Charadrius peronii	Malaysian Plover	NT
Platysmurus leucopterus	Black Magpie	NT

Table 4-20 The ICUN listed birds in the Lampi Marine national park

Figure 4-42 Brahminy Kite (scientific name-Haliastur Indus); a bird of prey

4.4.5 Wetlands

There is no wetland or marshes in the two project islands. Hence the project development activity is not going to hamper any wetlands and/or marshes.

4.4.6 Protected and Conserved Areas

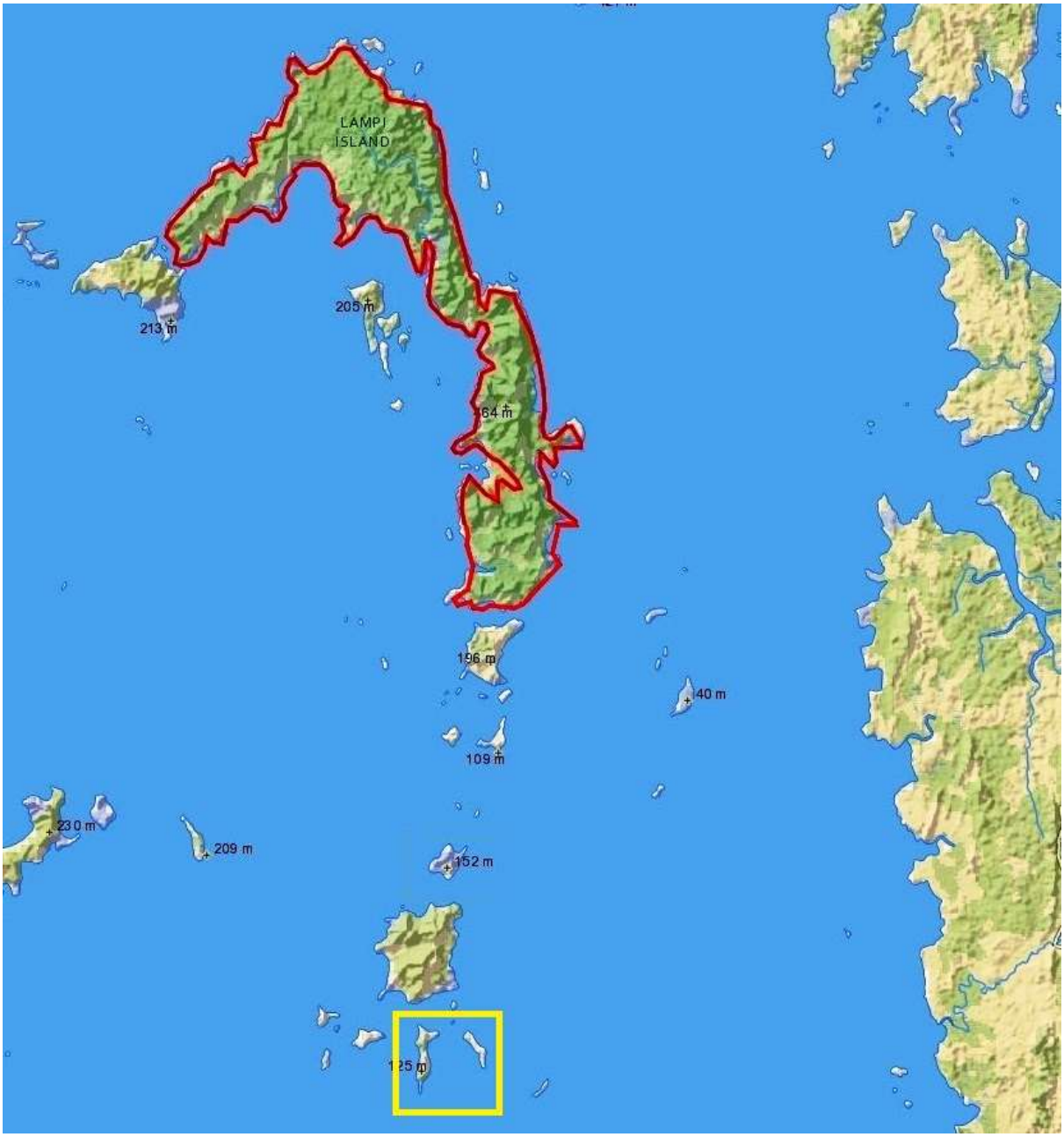


Figure 4-43 Lampi Marine National park in red and Project Islands in yellow box

The Lampi Marine National Park[106] that is an ASEAN heritage park is around 12 Nautical Miles north of the project Islands and the resort operations can adversely affect the marine park if the environmental issues are not controlled. The major issues are the wastewater let off from the resort operations. The project will recycle the wastewater to ensure that there is no effluent let off to the sea.

[106] http://www.lampipark.org/

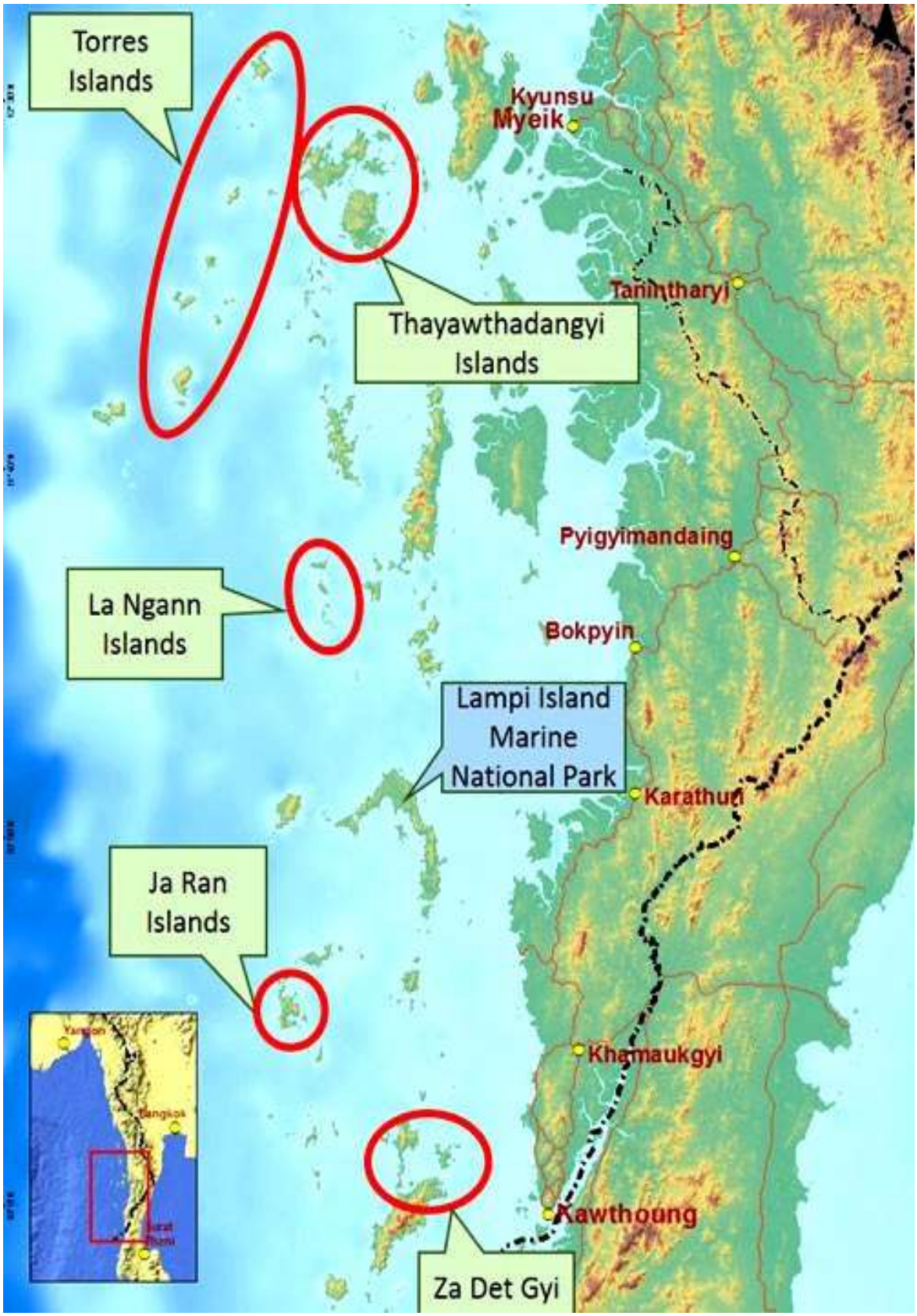


Figure 4-44 Priority sites for conservation identified by Flora and Fauna International

The project islands and the surrounding shallow waters are rich in biodiversity. The deforestation in the islands and the discharge of waste and sediments to the sea will

hamper the biodiversity of the region and hence to be controlled by the developer. The project area is home to many terrestrial mammals, crustaceans, turtles, trees, mangroves, seagrasses, birds, corals, planktons and fishes.

These species are listed in the Annex 2 of the Lampi marine park management plan[107]of which the summary is provided below.

Serial No	Type of species	Number of species
1	Phytoplankton	136
2	Zooplankton	150
3	Mero-plankton	47
4	Seagrass	11
5	Sea weeds	38
6	Forest, Beach and Dune plants	195
7	Mangroves	63
8	Sea Cucumbers	35
9	Gastropods (Molluscs)	50
10	Bivalves (Molluscs)	41
11	Crab (Crustacean)	42
12	Fish	42
13	Amphibian	10
14	Reptile	19
15	Birds	228
16	Mammals	19

Table 4-21 The list of types of species in the project area

Even though the project Islands are not identified as habitat or nesting site for any of the endangered, threatened or vulnerable species, the possibility cannot be ruled out due to the proximity of the Lampi marine park that has many habitat and nesting zones.

[107] http://www.lampipark.org/wp-content/uploads/2015/10/General-management-plan.pdf

4.5 Socio-Economic Components

The socio-economic components for the project comprise of the current status and effect of the project in terms of direct and indirect employment generation. This covers the social profile, demographics, economic activity and livelihoods, jobs, health, infrastructure, housing, water use, roads and transportation, agriculture, aquaculture, small scale industries, tourism, and religion.

Figure 4-45 Nyaung Wee village near the project islands

4.5.1 Administrative Limits

The Mergui Archipelago is located in the Tanintharyi region in Southern Myanmar that borders Thailand on the East and Andaman sea on the West. Tanintharyi region has a total of 10 townships spread across in 3 districts. The project affected area falls within the southernmost district of Kawthaung in the Kawthaung Township.

The project Islands of Phoni and Balar are located in the Su Nge Par Line village tract that comprises 13 villages. Aung Bar is the biggest village in the village tract with four clusters, and is only 16 nautical miles away from the project islands. Other villages near the island are Nyaung Wee which is 3 nautical miles away and Majhun Galet (also written as Makyun Galet) that is 14 nautical miles. The project islands of Phoni and Balar are not inhabited and the nearest villages to the project island are Aung Bar, Nyaung Wee and Majhun Galet. There are 540 households in Aung Bar, 110 in Nyaung Wee and 180 in Majhun Galet.

The administrative organisations and regulatory authorities related to the project activity are the departments of General Administration, Fisheries, Marine Transportation, Environmental conservation and Forestry and the Hotel and Tourism department.

4.5.2 Populations and Communities

As per the 2014 census[108], Tanintharyi region has a population of 1,408,401 of which 700,619 are male and the rest 707,782 are female. The density of population in the region is only 32.5 persons per km^2. The region's literacy rate is 92.8%[109] with a female literacy rate of 91.2%. In the case of Kawthaung, the total population is 116,980 of which 59,507 are male with a rural literacy of 92.4%. There are 25,481 households in the township with a mean size of 4.4 of which 34.5% are female headed.

The villages that are affected by the island resort project are the people living within 20 Nautical miles of the project islands as this may have an effect on their fishing area, access to freshwater sources and employment opportunities. The villagers, village heads and the elders in these villages were consulted and interviewed for making the assessment. This include the Salon representatives.

Village Name	Population	Households
Aung Bar	3,289	511
Nyaung Wee	377	91
Majhun Galet	990	220
Sun Nge Par Line	343	57
Plave Par Line	371	71
Kanpar Mhar Tun	977	217
Aung Myanmar	1,705	279

Table 4-22 Population in the Project affected villages

The people in the neighbourhood villages are mostly involved in fishing and farming as professions. The Moken sea gypsies or the Salone people also live in the project affected islands. They have a unique tradition if living in the sea on wooden boats all seasons except the monsoon period. There are 40 salon families in the village of Majhun Galet and 30 families in Nyaung Wee village. The other villages that has sea gypsy population are Jalan and Zar Dat making a total salon population of 480. They are completely dependent on the sea for their survival.

[108] http://myanmar.unfpa.org/sites/asiapacific/files/pub-pdf/Tanintharyi%20Region%20Census%20Report%20-%20ENGLISH.pdf
[109] http://www.themimu.info/sites/themimu.info/files/documents/Census_Yangon_Report_Eng_2015.pdf

The people in the project affected area are predominantly followers of Buddhism as a religious faith. The Salone sea gypsies follow their own religion.

Figure 4-46 Fishermen village of Aung Bar on the mainland

Figure 4-47 Houses in Majhun Galet village in the Lampi Park

Figure 4-48 Moken sea gypsies in Nyaung Wee Island

4.5.3 Poverty Profile

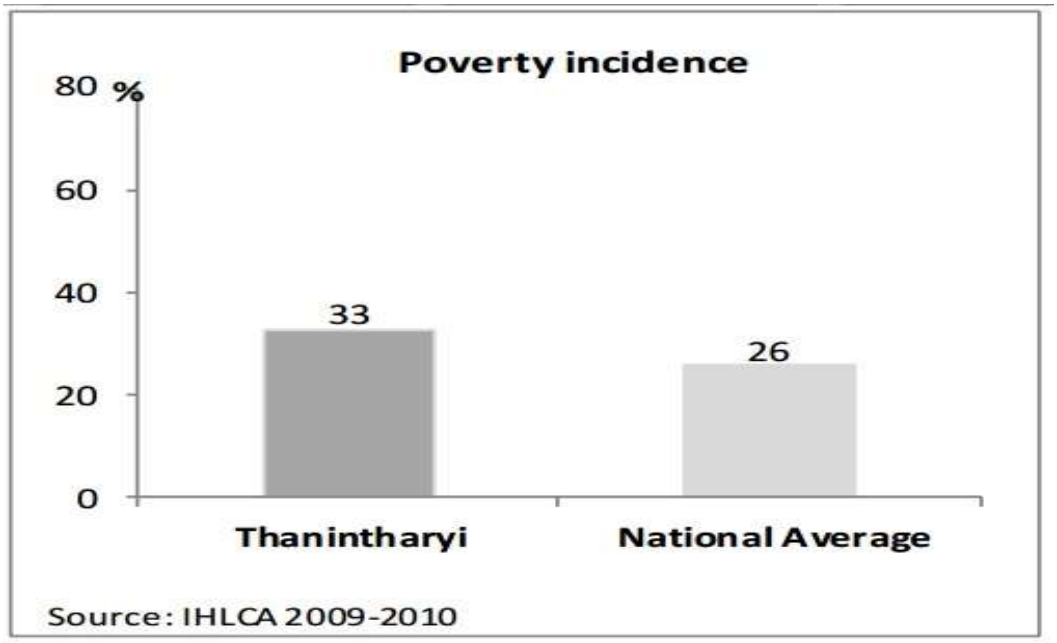


Figure 4-49 Poverty Incidence in Tanintharyi region

Among the 17 states and regions of Myanmar, Tanintharyi Region[110] is ranked 9th in poverty with a poverty rate of 32.6%[111] against a national average of 26%. The project affected area also has a very higher poverty rate compared to the national average as the people find their livelihood by small scale fishing and farming. The salone people have very limited understanding of commerce and trade and hence remain under poverty meeting their daily needs by fishing in the shallow waters.

4.5.4 Economic activities and Livelihoods

The major economic activity in the project affected zone is farming, fishing and boat transport. The people living in the islands have very little to do with farming and is very dependent on the sea for their survival. The squid fishing in the shallow waters is the main income of the fishermen.

Agriculture

Figure 4-50 Rubber Plantations near to majhun Galet village in BoCho Island

Nyaung Wee and Majhun Galet villages in the nearby islands to the project has rubber plantations, betel nuts, banana and paddy cultivations. Aung Bar village in the mainland has palm oil farms nearby additional to the rubber plantations, banana, betel nuts and paddy. The other common tropical crop farmed in the mainland area is sugar cane. The area from Kawthaung towards Myeik for a spread of around 100 miles on the mainland is dominated by palm oil plantations that came up due to oil refineries nearby.

[110] http://www.undp.org/content/dam/myanmar/docs/Publications/PovRedu/MMR_FA1_TargetingVulnerabe.pdf
[111] https://www.unicef.org/myanmar/Tanintharyi_Region_Profile_Final.pdf

The project activity has no significant effect on the agriculture of the nearby villages apart from the pressure on the water resources. Hence the conservation of water is important for the project operations.

Figure 4-51 Palm plantations on the mainland near Aung Bar

Fisheries/Aquaculture

Figure 4-52 Squid Traps in Nyaung Wee island

Fishing is major source of livelihood for the people in the project affected area. The fishermen look out for fishes, squids, sea cucumbers and crabs in the shallow waters with small fishing boats. There are no aquaculture farms in the project affected area.

Figure 4-53 Sea Cucumber in Majhun Galet

Industries and business concerns

There are no industrial enterprises in the project affected area. The project development does not affect any industrial activity in the region and hence not applicable. There are some small-scale businesses such as owning fishing and passenger boats, running small trading shops, eateries and restaurants. There are no big markets or shopping centres in Aung Bar, Majhun Galet and Nyaung Wee.

Mineral Development

There is no mineral development in the project affected areas. The project does not have any negative impacts in the event of a discovery related to minerals or precious stones in the project land.

Employment

People in the project zone are employed mostly in the sectors of agriculture, fishing, and sea transportation. The villagers employed in the government and private jobs are very limited due to low education levels. Myanmar being a developing country is in need for

more employment opportunities and the project can contribute to direct and indirect employment in the region that is backward and under developed.

4.5.5 Education

Figure 4-54 Students in Majhun Galet

Figure 4-55 Mr Ton Aung So, Sea Gypsy student-Myeik University (far right)

The people who live in the project affected zone have high literacy as in the case of rest of Myanmar or the township of Kawthaung; the rural literacy of Kawthaung township is 92.4%. However, the education levels are very low with most of them discontinuing education after the primary or the secondary schooling. Very few people are graduates and hence the employment in public and private enterprises are very limited.

Among the population of 58,581 people in Kawthaung township who are of 25 years age and above, only 137 are post graduates, 3,703 are graduates, and 143 are diploma holders. 7,218 of this population are high school passed, 15,095 are middle school passed and a whopping 26,922 are only primary school completed. The numbers for females are worse than that of males; of the 4,969 people who never attended schooling, 3,031 are women. Even though the number of graduates and post graduates are more or less even in case of male and female, the number of people who completed the high school are significantly more among males than females. When you come to the rural areas such as the project affected area, the numbers are even worse with less of graduates and post graduates.

The government has taken many measures to educate the Salone gypsies; however, very few of them have completed the schooling. There is a school having classes up to 8th grade in Majhun Galet village that has 200 students and 9 teachers. There are schools available in Aung Bar till, high school and for collage education, they have to go to nearby cities of Kawthaung or Myeik. Some NGOs are providing vocational training for the islanders and villagers to work in hospitality and tourism industries as there is an expected boom from the new island resort projects that are coming up in the area.

Figure 4-56 School oin Majhun Galet

4.5.6 Vulnerable Groups- Moken Sea Gypsies or Salone

Moken Sea gypsies are the vulnerable groups in the project affected area who lead a semi nomadic life with very less interaction with the other communities. They live mostly in the sea in wooden boats that are without motors and depend fully on the sea for food. They dwell in the nearby islands during the monsoons and are found mostly around Majhun Galet and Nyaung Wee villages. They fish using spears and can hold their breath under water for significantly longer time periods compared to local fishermen.

Over the period of time, due to many government initiatives, many of them have been educated and has taken up other jobs and livelihoods. The houses have been built for them on the shores of Majhun Galet and Nyaung Wee. However, most of the Salone people prefer to keep away from the other communities.

They have very less expertise on the commerce and trade methods generally in practice and are vulnerable to local fishermen and villagers taking advantage of their lack of knowledge. Some of the Salone people exhibit their diving and fishing skills to the tourists to earn a living. The presence of Salone people in the archipelago is a tourist attraction and their community are shrinking due to cultural influences from other communities.

Figure 4-57 Moken Sea Gypsy children In Majhun Galet Village

Figure 4-58 An elderly Salone Lady in Majhun Galet

Figure 4-59 Salone boats in Nyaung Wee Island

Figure 4-60 Salone spirit poles in Nyaung Wee

Figure 4-61 Salone place of worship in Majhun Galet

Figure 4-62 Salone boats near the Balar Island

Figure 4-63 Salone boats near the 115 Islands

4.5.7 Water Use and Water supply

Figure 4-64 Water storage tank in Nyaung Wee village

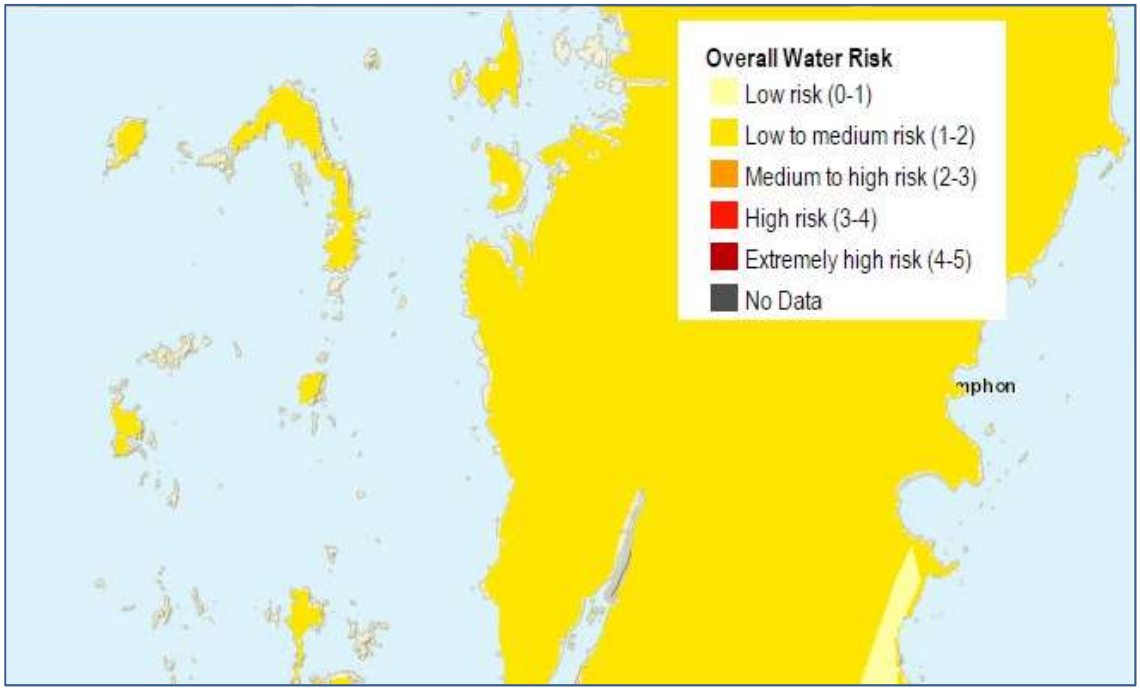


Figure 4-65 Water risk map from World Resource Institute

The project area is classified as “Low risk” and/or “Low to medium risk” by the World Resource Institute[112] for the water resources. The maximum estimated water consumption by the resort is 16,400 Gallons per day at the peak of operations and is explained in the impacts in section above. The project resort will treat waste water to conserve the usage of water. This monitoring of the water usage and the effluent control by recycling are part of the Environmental Management Plan (EMP).

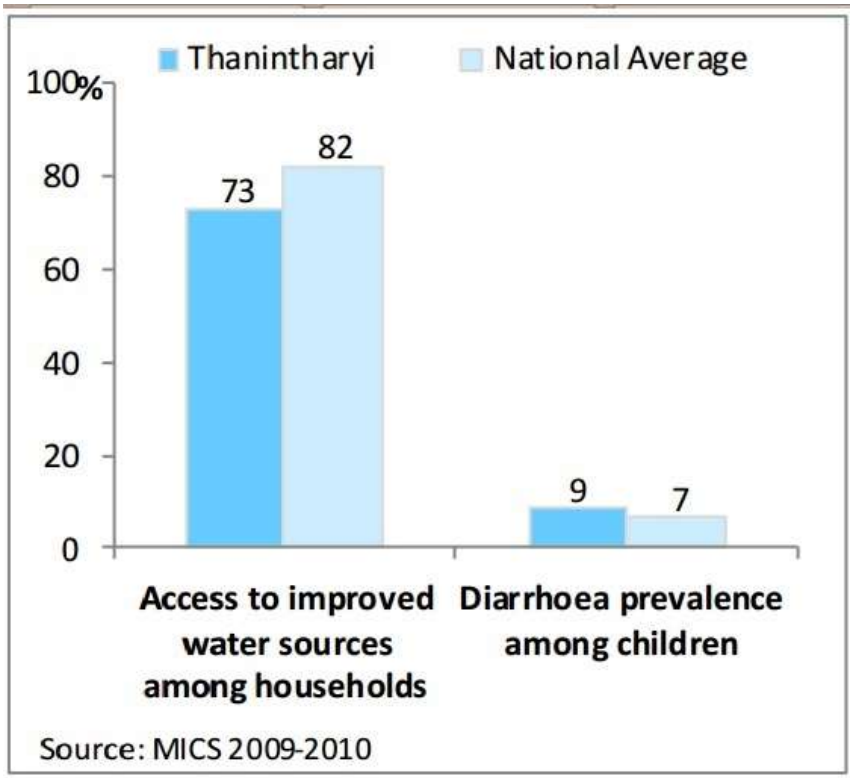


Figure 4-66 Access to improved water resources in Tanintharyi region

The water in the nearby islands is scarce during the peak summer time and they use the uninhabited islands to collect water in some occasions. The project island of Phoni has such a freshwater source accessed by Nyaung Wee villagers. The Aung Bar village has an established tube well to draw ground water and hence the scarcity is not now prevalent in Aung Bar.

The improved water resources for the villagers in the islands are not available and they are dependent on the freshwater sources in their own islands and the nearby islands. The project owner has agreed not to restrict access to the villagers and the salone people who come to draw water. The freshwater source is outside the resort area. The project owner also has the responsibility of not contaminating the freshwater sources by letting out effluent to the ground which they plan to control by waste water recycling.

[112] http://www.wri.org/applications/maps/aqueduct-atlas/#x=98.96&y=8.83&s=ws!20!28!c&t=waterrisk&w=fb&g=0&i=BWS-8!WSV-4!SV-2!HFO-2!DRO-4!STOR-8!GW-4!WRI-8!ECOS-4!MC-8!WCG-4!ECOV-2!&tr=ind-1!prj-1&l=4&b=terrain&m=group&init=y

4.5.8 Energy Sources

The islands are not electrified and connected to the national grid that supplies the electricity. Hence, the sources of energy for the people living nearby are diesel generators, fossil fuels such as kerosene, firewood and agricultural waste. The cost of energy is very high in the islands as the diesel cost is high in the remote islands. The energy cost per month per household in Majhun Galet is at least 15,000 Kyats which is not a small amount in comparison with the kind of earnings they have.

In the Tanintharyi region, 52.1% use firewood and 43.5% use charcoal for cooking. In case of Kawthaung township, 18,116 of the 25,481 households use charcoal and 3,755 use firewood for cooking. Similarly, for the source of lighting, the Kawthaung township depend more on the generator than the rest of the Tanintharyi region and use very less of kerosene in comparison.

Type of Need	Type of Fuel	Number of Households	% of Households	Tanintharyi Average (%)
Cooking Energy	Charcoal	18,116	71.10%	43.50%
	Firewood	3,755	14.74%	52.10%
Lighting Energy	Generator	17,055	66.93%	47.20%
	Kerosene	609	2.39%	17.80%
	Candle	4,955	19.45%	21.90%

Table 4-23 Energy sources in Kawthaung Township (source-census 2014)

The government and some NGOs have taken initiatives to provide solar based lighting for the villagers at subsidised rates and this has resulted in substituting the energy sources in the recent times. Solar lighting is becoming popular in Aung bar and the islands in the archipelago.

Figure 4-67 The consultant with solar equipment for distribution in Aung Bar village

4.5.9 Transportation

The project affected area is full of islands in the shallow sea of up to 30 metre depth and hence the transportation is completely through country boats (speed boats are not economical for the poor fishermen to use). The largest of these country boats can carry a maximum of 50 Tonnes and are diesel driven. There are traders who bring diesel to Aung Bar and the islands from nearby towns and sell in plastic cans of different capacities. There are permanent jetties at Aung Bar village and Majhun Galet village.

Figure 4-68 Country boats in Aung Bar jetty

Figure 4-69 Country boat docking at Majhun Galet jetty

The villagers use motor bikes on the land and bike taxis are available at some points. The village of Aung Bar is connected by road to Kawthaung as well as Myeik and

therefore act as the gateway to the outside world for the numerous islands in the project affected area. The villagers from Majhun Galet and Nyaung Wee travel to Aung Bar if they need to go to the town area.

Figure 4-70 Motor Bikes used by villagers- Aung Bar Jetty

4.5.10 Public Health Components

In Myanmar, the general state of health care can be described as poor with the spending on health care in the country being less than 6% of the GDP that used to be less than 3% before the democratic government came to power. The public healthcare facilities lack basic facilities and related equipment. The location being in the remote part of Southern Myanmar, the condition is much worse in comparison. The region fares slightly worse than the national averages in almost every parameter in health.

The overall health status of Myanmar is unsatisfactory with worst figures among the Southeast Asian countries. They have the lowest life expectancy at birth at 66.61 years and the second highest maternal mortality ratio at 178 per 100,000 live births, under-five mortality at 50.8 per 1,000 live births and infant mortality rates at 40.1 per 1,000 live births. The professional workforce in the health sector in Myanmar is understaffed with way below optimal coverage ratios for doctors, nurses, midwives and technicians.

The medical facilities available in the islands and Aung Bar are very basic and the people will have to travel out in case of a serious illness. It was seen during the field surveys that the people in the island travel to Aung bar in country boats and then take road trip by vans or motor bikes to visit hospitals in Kawthaung. Even the medical stores or

pharmacy in Aung Bar do not have most of the common medicines that are generally expected to be available all the time.

Figure 4-71 The rural health centre in Majhun Galet

Figure 4-72 The health centres in the project area; orange box is project islands

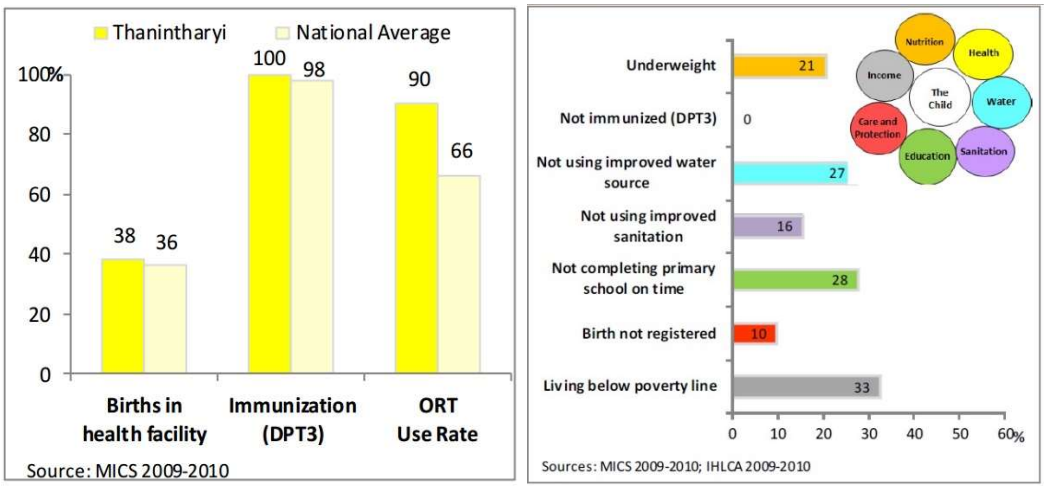


Figure 4-73 Child health data for the Region- MICS 2009-2010

The Kawthaung township's 79.8% of the households has access to improved drinking water facilities and 78.3% of the households has improved sanitation. These figures are better than that of the Tanintharyi region as well as Kawthaung district. But the project area belongs to the rural part of Kawthaung that has a lower value of 63.2% of improved sanitation and 72.7% of improved drinking water resources.

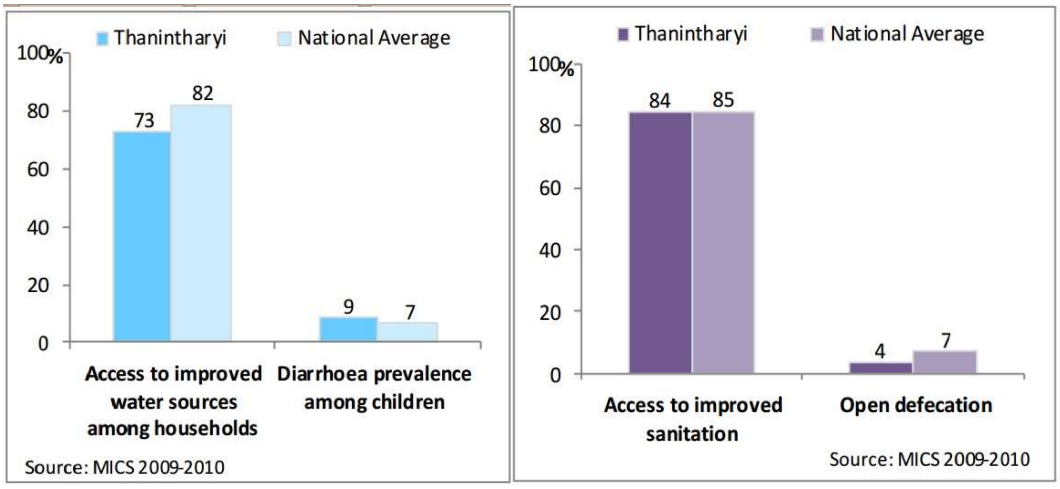


Figure 4-74 The sanitation and improved water sources in the region

The morbidity and mortality rates and their causes are provided below; the major causes were selected for representation such as road accidents, farm injuries, burns/scalds and downing. The parameters Morbidity for a population is calculated per 1000 people and mortality is calculated per 100,000 populations. These numbers for the region are slightly worse compared to the national statistics.

State	Road accident		Farm Injury		Burns/scalds		Drowning	
	Morbidity	Mortality	Morbidity	Mortality	Morbidity	Mortality	Morbidity	Mortality
Tanintharyi	2.35	4.98	1.16	1.79	0.38	0.70	0.12	7.46
Myanmar	1.76	6.06	1.01	0.83	0.37	0.52	0.06	4.43

Table 4-24 Accident and Injury statistics (source Ministry of Health data 2012)[113]

The public health in the project area can be affected by the project development and subsequent operation through two sources; one by the migrant workers in construction spreading epidemics and causing sanitation issues and second by the contamination of marine as well as the groundwater by effluent let off or solid waste dumping. The construction does not require large number of migrant workers as it involves only assembly of components. The maximum number of workers required at the peak of construction period will be 60 of which a significant part will be met by people from nearby villages.

4.5.11 Tourism

Tourists arriving will consume many products and services in Myanmar and boost the businesses downstream. The value chain created by the tourism sector is below. As per the tourism master plan 2013, the estimated job creation from the tourism segment by 2020 is 1,497,801 of which 748,901 are from food and beverage, 299,560 are from transportation and 224,670 from accommodation.

Accommodation	Food & beverages	Transport	Tours	Equipment sale/lease	Other Services
Hotels	Restaurants	Airlines	Guides	Diving	Massage
Resorts	Street food	Boats	Packages	Trekking	Spa
Ecotourism	Small shops	Buses	Ticketing	Fishing	Internet
Inns	Bars	Cars	Shows	Mountaineering	Retail Shops
Homestay	Wine shops	Taxi			Currency exchange

Table 4-25 Tourism value chain created

[113] http://mohs.gov.mm/content/publication/list?category=Annual%20Hospital%20Statistics&pagenumber=1&pagesize=40

Figure 4-75 Tourism statistics for Myanmar (Source: Ministry of Hotel & Tourism)[114]

The tourist arrivals have been increasing over the years. But the tourist arrivals in 2016 show a 38% reduction from that of 2015 due to change in calculating the tourist arrivals by segregation of tourists. As per U Myint Htwe, director from the Ministry of Hotels and Tourism, the tourist arrivals in Myanmar at the end of February 2017 is more than 600,000[115] which is more than that of the figures in 2016.

The island resort projects in the Mergui archipelago have a great impact on the tourism sector with a potential to attract wealthy foreign travellers earning valuable foreign exchange. The tourist arrivals have increased exponentially in the past three year's period after the Thailand-Myanmar border was opened. The wealthy foreigners, who spend their vacations in destinations in Thailand such as Phuket and Ranong, extend their tour to visit the Archipelago. Once the now developing island resorts are operational, the guests in these resorts for diving and sightseeing will boost the overall economy of the area with downstream business in transportation, and food supply.

The total number of foreigners that visited Kawthaung for the year 2016-17 was around 300,000 where as in 2015-16 it was around 270,000 and in 2014-15 it was around 225,000. The tourist arrivals dipped in the year 2017-18 due to news about conflict in other areas; but again, picked up in 2018-19. There were around 4,000 visitors in 2016-17 that came to the Mergui archipelago through around 400 chartered trips whereas in the previous three years it was only around 1,500 visitors from around 200 chartered trips. The number of visitors to the project area is expected to rise in the coming years due to many island resorts being set up in the region.

[114] http://asean.travel/2017/01/24/first-decrease-myanmar-tourism-decade/
[115] http://www.mmtimes.com/index.php/lifestyle/travel/25783-myanmar-registers-more-tourist-arrivals.html

The travel restrictions[116] for international tourists to Tanintharyi is below

1. Package Tours and FITs are allowed to travel by plane and ship vessels to Myeik, Dawei Maungmagan and Kawthaung.
2. Allowed to travel with Entry Permit to Kawthaung area Salone Kyun, Mee Pya Kyun, Seik Lu Kyun, Thahtay Kyun, Sagaing Kyun and Minn Hla Kyun
3. Prior permission is required for Package Tour and FITs travelling by ship vessels to Koon Thi Kyun, Su Lar Nge Kyun, Pah Weh Kyun, La Nagn Kyun , Lampi Kyun, Ma Kyone Galet Kyun,Myauk Taw Win Kyun,Kyun Phee Lar,Nyaung Wee Kyun, Taung Taw Win Kyun, Kyun No.(115), Hlaing Goo Kyun, Nahnat Thi Kyun,Shwe Kyun, Myauk Nee Kyun, Thu Ye Gaung Kyun Su, Auk Kyun Ni nad Myin Kwar Kyun in Myeik, Dawei and Kawthaung regions.

The development of the island resorts in the area will definitely boost the guest arrivals and the people who live nearby can find new livelihoods related to supply of food, transportation, retail shops etc.

[116] http://www.myanmartourism.org/index.php/tourist-information

4.6 Cultural and Heritage Components

4.6.1 Archaeological and historical sites

The ASEAN heritage marine national park Lampi Island in the Mergui Archipelago is only 14 nautical miles from project Islands which are home to the Moken sea gypsies (listed in the *Vulnerable groups in the section 4.5.6* above). The zoning map of the marine national park does not include the project islands of Phoni and Balar. The dotted line that encompasses the Lampi as in the picture below is the zone.

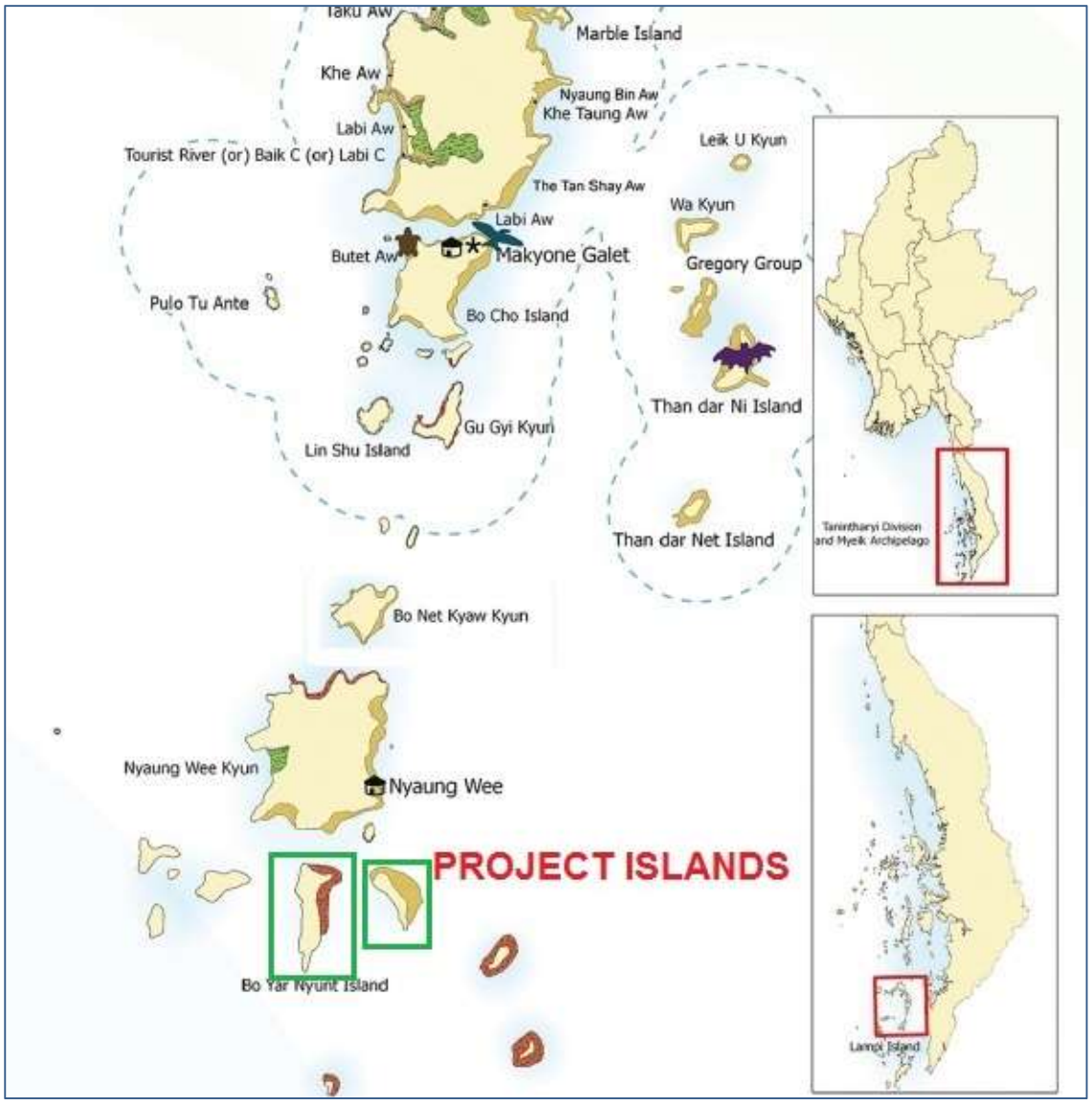


Figure 4-76 Lampi Marine National park and the project islands

The project islands or the nearby islands that constitute the project affected area does not contain any archaeological or historical sites of importance. The project islands are not part of any monuments or sacred areas for any communities in the region. There have been no discoveries of ancient or antique artefacts, remains or fossils in the project islands.

4.6.2 Religious Monuments and Places of Worship

Kawthaung township as well as the project affected area are dotted with monasteries and Pagodas as the rest of Myanmar. There are pagodas in Aung Bar village, Majhun Galet and Nyaung Wee as majority of the people in the area are followers of Buddhism. The Salone people also have their places of worship in both Nyaung Wee as well as Majhun Galet.

Figure 4-77 The pagodas in Aung bar and Majhun Galet

The project islands of Phoni and Balar does not contain any pagodas, temples or any kind of places of worship of any communities. The islands also are not used as a graveyard by any of the communities in the project affected area.

The development of the resort in the two islands will not create any negative influence to the religious places of worship in the nearby villages in any manner.

4.6.3 Visual and Aesthetic

The success of the island resort project lies in the aesthetics of the island and the surroundings where it is located. The project owner has incentives to maintain or enhance the beauty of the tropical islands where the project is being set up. The waters around the resort need to be clear and the beaches should have a pristine look to it for being attractive to the tourists.

Figure 4-78 The view from the beach on the Western shore of Balar Island

The landscape of the project islands will change due to the deforestation of the 10 acres on each of the islands for construction of the cottages. However, the area selected for the resort construction is mainly flat land with no big trees in it. The earth movement and re design of topography will be of minimum effect.

The island resorts will not obstruct any point of view of significant interest to any public and it will not restrict access to the places where villagers want to visit. The project development will not hamper the visual appeal of the area. The project owner has promised to the villagers that the project resort will not restrict the entry into other parts of the islands to the villagers.

4.6.4 Unexploded Ordinance (UXO)

The project affected area was never a conflict zone and the use of landmines and other explosives are not expected.

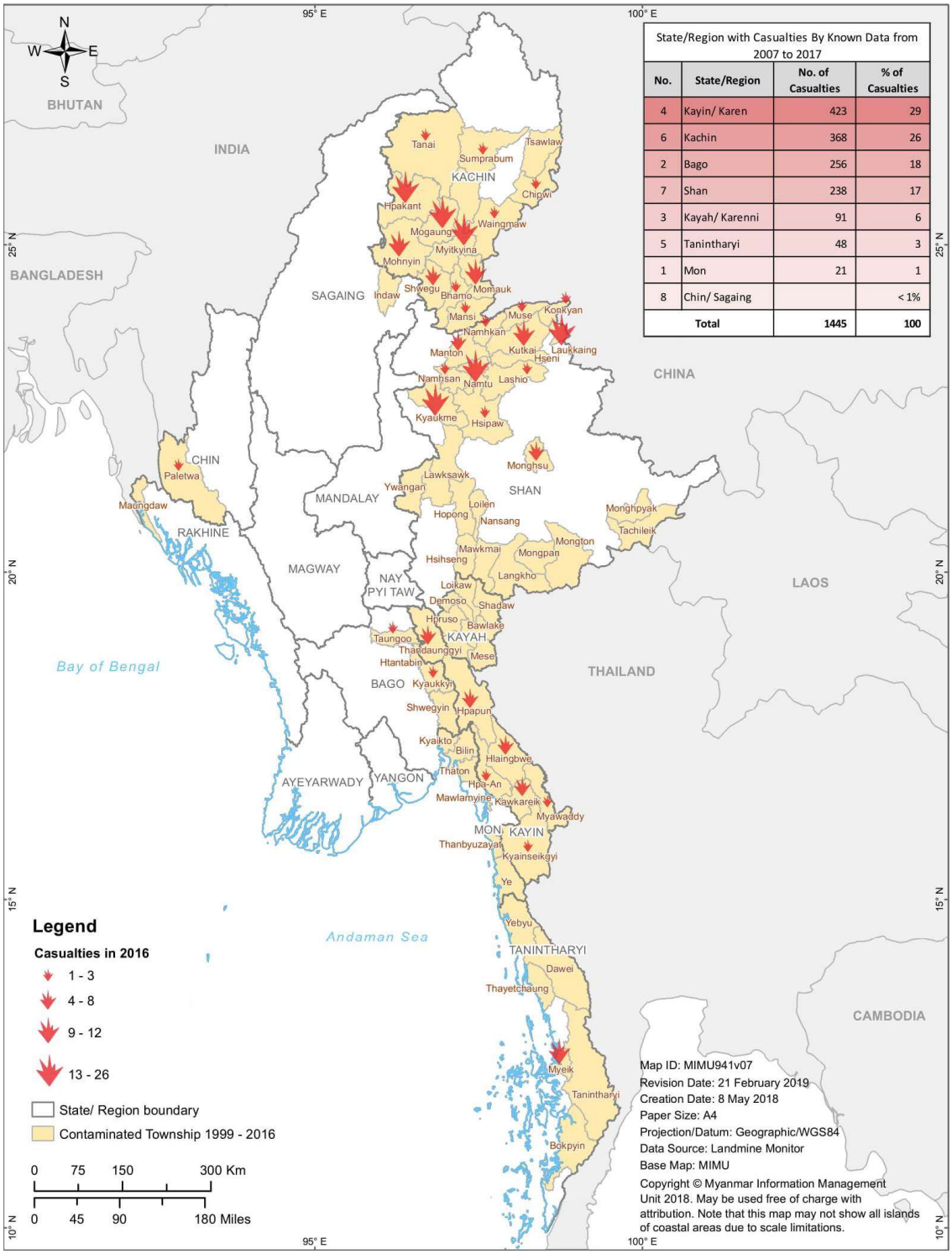


Figure 4-79 The landmine casualties in Myanmar

5.0 Impact and Risk Assessment and Mitigation Measures

5.1 Impact Assessment Methodology

5.1.1 Scope of Assessment

The scope of the impact assessment covers the environmental aspects of the project activity during different phases, adverse effects of each impact, the extent of these impacts, a risk assessment of these aspects and impacts to determine the significance and review of the planned mitigation measures to determine if they are effective. The objective is to formulate effective Environmental Management Plans (EMPs) to mitigate the adverse impacts.

5.1.2 Geographical scope: Study Area Boundaries

Impact	Spatial Boundary	Aspects causing the impact	
		Construction Time	Operation time
Groundwater Depletion	Project islands and nearby islands within 10 nautical miles	Water usage for construction	Heavy water usage
Marine water Pollution	Nearby Marine waters within 10 Nautical miles	1. Effluent Discharge 2. Soil Erosion	1. Effluent discharge 2. Solid waste dump
Destruction of Corals	Marine waters around Phoni and Balar Islands	1. Effluent Discharge 2. Soil Erosion 3. Jetty Construction	1. Effluent discharge 2. Dredging for depth
Deforestation & Habitat loss	10 Acre each on both the Phoni and Balar Islands	Removal for construction	-
Air Pollution and GHG emissions	20 Nautical miles from Phoni and Balar Islands	1. Fossil fuel usage 2. Dust from construction	1. Fossil fuel usage 2. Transportation
Noise Pollution	Within 5 nautical miles of Phoni and Balar Islands	Construction Equipment usage	Boats, skis and other equipment usage
Restriction of access to villagers	Phoni and Balar islands and nearby waters		Security for the guests/fencing

Table 5-1 The Geographical boundaries of impacts

The geographical project boundary for different impacts vary depending on the type of the impact as given in the table above. In case of parameters such as air quality and noise, where the source can affect though the shortest route possible, the consideration will be aerial distance, whereas things like surface water quality or the floods in the downstream waterbody,

where the source have to follow a specific path of the medium, the considered distance will be the distance in the waterbody. All these impacts are affected all within 20 nautical miles from the project islands of Phoni and Balar and hence can be described as the boundary of the project affected area.

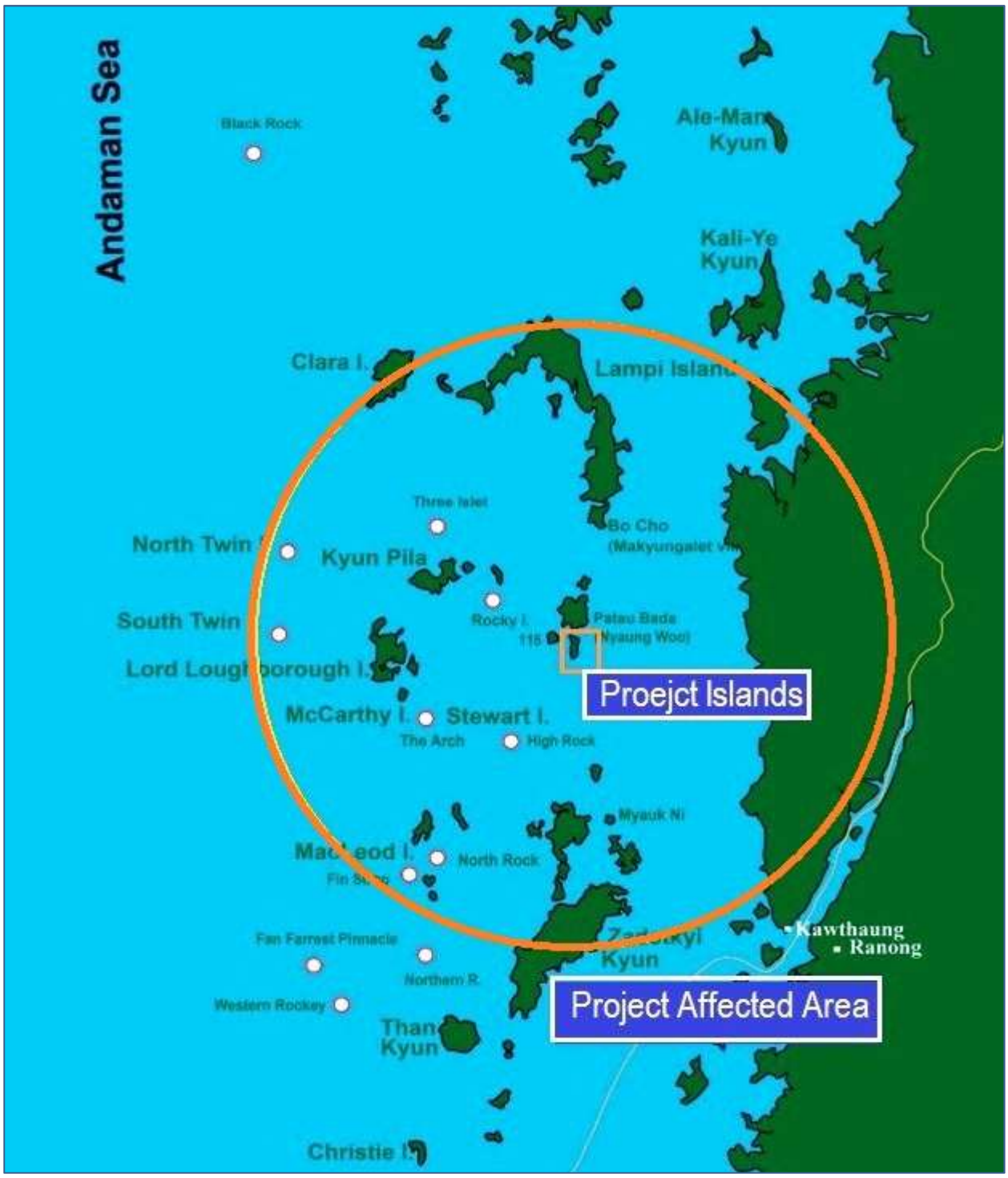


Figure 5-1 Map of the Project Affected zone and the Project islands

5.1.3 Temporal Scope

The environmental issues will have time period up to which their impact is felt by the receptors, that determine the temporal nature of these impacts. Receptors in the impact area could be human beings, ecosystem, and properties depending on the nature of the issue and the temporal scope for the issues are to be defined. So, the time period till the effect of the source can be distinctively felt or experienced by the receptor is considered as the temporal scope. For e.g., the air emissions from construction will remain only during the construction time. After some period, the effect to the receptors get neutralised when the source become inactive.

The Environmental Issues	Temporal scope	Frequency
Fugitive dust of construction	For 8-10 hours from the emission time	For 3-4 months of construction period
Noise pollution	For few minutes from the emission time	For 3-4 months of construction period
Air pollution from fuel use	For 24 hours from the emission time	Continuous when resort is operational
GHG emission from fuel use	Several years[117]	Continuous when resort is operational
Marine water contamination by debris & soil	For 2-3 days from the emission	For 3-4 months of construction period
Marine water contamination by effluent let off	For 2-3 days from the emission	Continuous when resort is operational
Groundwater contamination by effluent let off	Several Years from the emission	Continuous when resort is operational
Depletion of water resources	Till the next rains	Continuous when resort is operational
Depletion of fossil fuel resources	Irreversible	Continuous when resort is operational
Solid waste contamination	Plastics non degradable	Continuous when resort is operational
Degradation of Corals & fish species by pollution	Irreversible	Continuous when resort is operational
Degradation of terrestrial ecosystem	Irreversible	Construction start time
Removal of vegetation	Irreversible	Construction start time
Loss off access to the islands	Till access is given	Continuous when resort is operational
Increase in traffic in the waters	Irreversible	Continuous when resort is operational

Table 5-2 The temporal boundary of the impacts

The issues listed are possible environmental concerns if not planned well by the project owner when they do the construction and operation of the island resort.

[117] https://www.ipcc.ch/site/assets/uploads/2018/02/ar4-wg1-chapter2-1.pdf#table-2-14

5.1.4 General Methodology

The methodology and approach applied for the preliminary identification and assessment of impacts is from interaction and observation during visit made to the site from January 2017 to December 2018, review of data about the project, the review of the records of the communications with interested parties, the past experience from other projects and research about the project activity.

During the EIA study, field surveys were made to assess the project islands, nearby islands and villages, marine waters around, the freshwater sources, and the machines and equipment planned to be used at the resort. The interview and consultations with the people of the villages and related government departments cover the social aspects of the EIA study.

5.1.5 Methodology for the Determination of Significance

The significance of the impacts was determined by reviewing the magnitude and materiality of the impacts to the environment and the people living nearby. The risk assessment was performed based on the international standard for Environmental Management System ISO 14001:2015[118] and the International Risk Assessment Standard ISO 31000:2009[119].

As per the ISO guide 73:2009[120] for vocabulary for the risk assessment,

Risk is defined as "***effect of uncertainty on objectives***".

The aspects and their impacts were reviewed as per the severity and likelihood of occurrence. Severity is the magnitude or the negative consequences of the impact on the environment, flora, fauna and or health of people. The Likelihood is the probability of that impact occurring.

The risk matrix used to denote the risk criteria is provided below. The four levels of severity are Very high, High, Medium and Low with scores 4, 3, 2 and 1 respectively. The four levels of likelihood are Always, Frequent, usual and rare with scores 4, 3, 2 and 1 respectively. The risk is determined as the product of the severity and likelihood of the Impact from that aspect.

Risk=Severity X Likelihood

For example, if the severity of a particular aspect and impact are "High" and the likelihood is "Frequent", the risk is 3 X 3= 9. If the risk value is 4 or more, that aspect is considered as significant.

[118] https://www.iso.org/standard/60857.html
[119] https://www.iso.org/iso-31000-risk-management.html
[120] http://www.iso.org/iso/catalogue_detail?csnumber=44651

Severity/Likelihood	Always (4)	Frequent (3)	Usual (2)	Rare (1)
Very High (4)	16	12	8	4
High (3)	12	9	6	3
Medium (2)	8	6	4	2
Low (1)	4	3	2	1

Significant Aspect	
Non-significant Aspect	

Figure 5-2 Risk criteria matrix used for the aspect impact analysis.

ISO 31000:2009 provides a list on risk treatment as below; Risk treatments that deal with negative consequences are referred to as "*risk mitigation*", "*risk Elimination*", "*risk prevention*" and "*risk reduction*". Risk treatment can create new risks or modify existing risks.

- Avoiding the risk by deciding not to start or continue with the activity that gives rise to the risk
- Accepting or increasing the risk in order to pursue an opportunity
- Removing the risk source
- Changing the likelihood
- Changing the consequences
- Sharing the risk with another party or parties (including contracts and risk financing)
- Retaining the risk by informed decision

The control of risk as per ISO 31000:2009 is by modifying the risk. Controls include any process, policy, device, practice, or other actions which modify risk. The risk that remains after the risk treatment is called as residual risk. To control them, it requires periodic monitoring and review. The formulation of Environmental management plans (EMP) are to ensure that risk is treated adequately.

5.1.6 Modelling, References and Calculations

Air Emissions

The project scenario is an island resort that provides their guests with hospitality services which requires the use of air conditioning, heating and chilling, swimming pools, food and beverage production and transportation. The resort is in a warm tropical region and hence will need air conditioners to cool the rooms; the use of air conditioners in every room will need lot of power to operate. All the power in the resort will be met by Generators using diesel as fuel and the combustion of diesel causes lot of emissions to the air.

The potential air emissions from the resort operations originate from fossil fuel combustion (e.g. Carbon Dioxide, Nitrogen and Sulphur Oxides, and Hydrocarbons) and particulates from Diesel Generator sets, boats, cooking stoves and boilers that use fossil fuels as source of power. The dry cleaning, refrigeration and temperature control systems will result in emission of Volatile organic compounds (VOC).

There are no air emission limits set in the Environmental (emission) guidelines published dated 29th December 2015 specific to the hotel and hospitality sector; however, there is a generic air quality emission guideline prescribed in it in the table below. The listed parameters are the particulate matter in PM_{10} and $PM_{2.5}$, Nitrogen Dioxide, Sulphur Dioxide, and Ozone and are to be monitored every six months by a third-party laboratory.

The air quality shall be periodically monitored and will be part of the Environmental Management Plan (EMP). The guideline values prescribed are same as that of the WHO standard for air quality. The same values are also used by the IFC in their sustainability and EHS guidelines.

Parameter	Averaging Period	Guideline Value (µg/m^3)
Nitrogen Dioxide (NO_2)	1 year 1 hour	40 200
Ozone (O_3)	8-hour maximum	100
Particulate matter PM_{10}	1 year 24 hour	20 50
Particulate matter $PM_{2.5}$	1 year 24 hour	10 25
Sulphur Dioxide (SO_2)	24 hour 10 minute	20 500

Table 5-3 Air Quality Emission Limits

Climate Change effect from Greenhouse Gases (GHG)

The machines and equipment in the resort consume fossil fuels such as diesel, Liquefied Petroleum Gas (LPG) and Compressed Natural Gas (CNG) that are source of emission of greenhouse gases (GHG) to the atmosphere. These emissions to the atmosphere stay in the atmosphere for a long period and causes a Glass house effect or Greenhouse effect by resulting in global warming or Climate Change.

The emissions are two types. The emissions caused by fossil fuel combustion are called as direct emissions and the emissions caused by electricity use are known as indirect emissions. The calculation of the estimated greenhouse gases emissions shall be done using the emission factors provided in the United Nations Framework Convention for Climate change (UNFCCC) and the emissions will be monitored through the use of Environment Management Plan (EMP).

Indirect emissions from the use of electricity

Electricity is produced by the national grid using a mix of various power plants that uses fossil fuels (diesel, coal) and renewable energy (wind, solar and hydropower) as a source of power. So, when electricity is consumed by people and industries, there is an indirect greenhouse gas emission to the atmosphere because the grid has generated a part of the electricity using fossil fuel combustion. This equivalent emission of fossil fuels per unit of electricity varies in different grids as per this ratio mix of renewable and non-renewable power plants. If the grid uses more of renewable sources, the factor will be lower and vice versa.

This calculation is done as per the tool to calculate the emission factor for an electricity system[121] as specified in the United Nations Framework Convention for Climate change (UNFCCC). The grid emission factor to ascertain the amount of indirect emissions for electricity consumption is calculated for Myanmar National grid for the registered emission reduction project with the registered number 7731[122]. The emission factor for electricity consumption is 0.39459 tonne CO_2 equivalent per Mega Watt hour ($tCO_2e/MWhr$).

The island resort does not have any plan to use electricity from any grid or other fossil fuel fired power plants and hence this calculation is not applicable for the project. If the island resort starts using solar panels for lighting and heating requirements, that electricity does not result in greenhouse gas emissions as it is from renewable energy.

Direct emissions from use of Fossil fuels

The project uses fossil fuels such as Diesel, gasoline and/or compressed natural gas (CNG) etc for the operations or the machines or the equipment. Since Diesel is the major fuel used and its emission factor is comparatively higher (Diesel is more environmentally impacting than the other fossil fuels) compared to the other fuels, for conservativeness, the calculations used

[121] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v5.0.pdf
[122] https://cdm.unfccc.int/filestorage/t/m/XVMU7R9ONJBAP2ZGD8L3C4FYE5KHW0.pdf/PDD.pdf?t=cW98b2p4ZTNvfDAqS3b46aGwGIQ2wXPzwhSJ

for Diesel is used for all the fossil fuels. This calculation can be done in two different ways as depicted below.

Calculation 1

The default emission factor for Diesel fuel as per the inter-governmental Panel for Climate Change (IPCC) guidelines is 74,100 $kgCO_2/TJ$[123] or 74.10 $kgCO_2/MJ$. The gross calorific value for Diesel fuel is 44.80 KJ/Tonne whereas the Net Calorific Value is 43.40 KJ/Tonne[124]. The specific density of Diesel fuel is 0.823 kg/Litre and the emission factor of Diesel per volume can be calculated by the product of emission factor, calorific value and specific density.

The emission factor per volume for diesel is calculated as 2.646719$kgCO_2$/Litre or 2.646719tCO_2/KL. This calculation method is as per the guideline "*Tool to calculate project or leakage CO2 emissions from fossil fuel combustion*" provided in the UNFCCC website[125]. This method can be used to calculate the carbon emissions from combustion of any fossil fuel.

74.10 $kgCO_2$/MJ X 43.40 KJ/Tonne X 0.823 kg/Litre = **2.646719tCO_2/KL**

Parameter	Denoted as	Value	Unit
Emission factor of Diesel	EF	74.10	$kgCO_2$/MJ
Net Calorific Value of Diesel	NCV	43.40	KJ/Tonne
Specific Density of Diesel	SD	0.823	kg/Litre
emission factor per weight	EF_w	3.21594	$kgCO_2$/Tonne
Emission factor per volume	EF_v	2.646719	$kgCO_2$/Litre

Table 5-4 Emission factor calculation for Diesel fuel

Calculation 2

As per the United States environmental assessment guidelines, the carbon emission coefficient for diesel consumption[126] is 10.16 $kgCO_2$ equivalents per US gallon; considering that one US Gallon is 3.78541 Litres, for every 1000 litre (KL) of Diesel combustion, there is greenhouse gas emission of 2.6840 tonneCO_2 equivalent (tCO_2e).

Carbon emission coefficient of Diesel=10.16 $kgCO_2$/US gallon

Converting to Litre, the coefficient=10.16/3.78541 $kgCO_2$/Litre=**2.6840$kgCO_2$/Litre**

[123] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_2_Ch2_Stationary_Combustion.pdf
[124] http://www.engineeringtoolbox.com/fuels-higher-calorific-values-d_169.html
[125] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-03-v2.pdf
[126] https://www.eia.gov/environment/emissions/co2_vol_mass.cfm

Comparison of the two calculations

Both the calculations give values that are slightly different. Hence for conservativeness, the higher value of 2.6840kgCO2/Litre is used for the emission estimations in the project. The estimated volume of the fossil fuel usage in Kilo Litre (KL) will be multiplied by this factor to arrive at the greenhouse gas emissions from the combustion of the fossil fuels. For every 1000 litre (KL) of Diesel combustion, there is greenhouse gas emission of 2.6840 tonneCO_2 equivalent (tCO_2e).

The estimates of the consumption of the fossil fuels and the electric power will be multiplied by the corresponding emission factors to estimate the greenhouse gases emissions from the project. Since the island resort project does not use electricity, the calculation of greenhouse gases will be limited to Diesel consumption.

Surface water quality

The effluent discharges to the freshwater source or to the marine water near the island can contaminate these water sources. The effluents in the resort will be as per the limits set in the Environmental (emission) guidelines published dated 29th December 2015. The limits set for the hotel and hospitality industry is as given below

Parameter	Unit	Guideline Value
5-day Biochemical Oxygen Demand (BOD)	mg/l	50
Chemical Oxygen Demand (COD)	mg/l	250
Oil and Grease	mg/l	10
pH	SU	6 to 9
Total coliform bacteria	100ml	400
Total Nitrogen	mg/l	10
Total Phosphorous	mg/l	2
Total Suspended solids	mg/l	50

Table 5-5 The effluent levels for Hospitality Projects

Ground water quality

The effluent discharges to the soil or water bodies will result in contamination of the groundwater. The effluents in the resort will be as per the limits set in the Environmental (emission) guidelines published dated 29th December 2015. The limits set for the hotel and hospitality industry is to be followed

Parameter	Unit	Guideline Value
5-day Biochemical Oxygen Demand (BOD)	mg/l	50
Chemical Oxygen Demand (COD)	mg/l	250
Oil and Grease	mg/l	10
pH	SU	6 to 9
Total coliform bacteria	100ml	400
Total Nitrogen	mg/l	10
Total Phosphorous	mg/l	2
Total Suspended solids	mg/l	50

Table 5-6 The effluent levels set for Hospitality Projects

Noise

The project has noise generating equipment in their operation. To mitigate this potential impact, as far as practically possible, the project will be using sound proof rooms for noise producing equipment such as Diesel Generators and hence there is no significant noise due to the project. The noise level limits are specified by IFC[127] in their OHS guidelines. As per the guideline, no employee should be exposed to a noise level greater than 85 Decibels for duration of more than 8 hours per day without hearing protection.

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

Table 5-7 The noise level limits

127 http://www.ifc.org/wps/wcm/connect/9aef2880488559a983acd36a6515bb18/2%2BOccupational%2BHealth%2Band%2BSafety.pdf?MOD=AJPERES

5.2 Impact Assessment – Phase wise

5.2.1 Negative Impacts in Pre-construction Phase

Potential Impacts

The pre-construction phase involves only survey of the land, soil testing and removal of slight vegetation for determining the feasibility for construction. This EIA study and reporting is also a pre-construction activity. There are no significant impacts from this activity.

Activity/Impact	Water quality	Air Quality	Soil contamination	Noise	habitat loss	Water depletion	Fossil fuel use	Electricity use	Waste generation	Water logging/flooding	Threat to livelihood
Vegetation removal											
Surveys											
Travel											

Significant Impact	
Insignificant Impact	
No Impact	

Figure 5-3 Aspect Impact summary for pre-construction phase

Proposed mitigation measures

The environmental impacts during the pre-construction phase are negligibly small

Residual Impacts

There are no residual impacts from the pre-construction phase

Proposed monitoring

Not Applicable

5.2.2 Negative Impacts in Construction Phase

The construction phase consists of deforestation of 10 acres on each of the islands of Phoni and Balar, construction of the permanent jetty on both the islands, cottages, villas, building and the facility, installation of equipment and machines, required cabling and piping.

Activity/Impact	Water quality	Air Quality	Soil contamination	Noise	habitat loss	Water depletion	Fossil fuel use	Electricity use	Waste generation	Population Increase	Threat to livelihood
Deforestation											
Excavation of soil											
Piling/foundation											
Metal cutting/welding											
Concreting											
Heavy Machinery use											
Painting											
Transportation											

Significant Impact	
Insignificant Impact	
No Impact	

Figure 5-4 Aspect Impact assessment of construction phase

The impacts from the construction period of the resort development and their proposed mitigation measures are

1. Habitat loss from deforestation for land clearance-

The island resort development requires clearing of vegetation for around 10 acres each on the islands of Phoni and Balar to make it suitable for making cottages, buildings and roads. This deforestation in the two islands will result in reduction in habitat cover for the birds and animals in the island. This damage is irreversible as the location cleared will be filled with resort facilities and vegetation is not going to return to the original stage.

The project owner has selected locations on each of the two islands to have the minimum removal of the vegetation. The places where there are not many trees to be removed was searched for. The North eastern shore on the Phoni Island and North western shore of Balar was thus selected when they started the construction in 2017 after the monsoon. They are only clearing of shrubs and small trees in the small area identified for the construction of villas. The rest of the islands will be left as it is and hence will not hamper the habitats significantly.

Figure 5-5 The cottages being assembled in the island

2. Change in Topography and effect on drainage-

When the project is developed by clearing the shrubs and the cottages are built, the topography of the area will change with new buildings and facilities coming up. This will change the existing pattern of surface drainage in the side of island. Mainly, the impact will arise from the creation of impermeable surfaces (roofs, pavements, etc.) and the corresponding reduction in the amount percolation in the soil and capacity of the site to absorb rainfall.

The project owner has selected the location also checking the topography of the land to reduce the amount of excavations and earth removals mainly for the lower cost incentives. The locations selected on the two islands for making the villas are flat and are within 5 metre elevation and hence the change in topography is insignificant. The spaces in between the cottages are left natural with soil and grass without covering them with tiles or any other non-permeable surfaces that will restrict the seepage of water into the ground. Hence the resort development will not result in rainwater being restricted to seep back into the ground to recharge the underground aquifers.

3. Soil Erosion of the cleared areas-

The project development construction phases involve the removal of vegetation and excavation works that will expose soils which could leave them vulnerable to erosion by surface run-off and create the threat of water turbidity and sediment deposition in drains, coastal waters and nearshore coral reefs. The pollution of the marine waters will result in destruction of the coral reefs and subsequently will affect the marine species around. This potential situation should exist only for the duration of the construction works (approximately 15 to 18 months) before landscaping and drainage works reduce the susceptibility to soil erosion.

Figure 5-6 The corals near Phoni islands where the resort construction is on since 2017

The project owner has chosen the locations to have only a very insignificant amount of excavations, mainly to save the cost. The topography of the area is flat where the villas are being built and the excavation work is very limited to result in soil erosion to the marine waters. Since the resort is an island resort where the target customers are diving enthusiasts and nature lovers who appreciate pristine waters and the wide variety of flora and fauna, the project owner has an incentive to maintain the clear marine waters safeguarding them from getting contaminated.

The project owner has started their construction after monsoon in 2017 and had the work going on in between intermittently in both the islands. The construction in Balar started in 2018. The corals around the Phoni and Balar islands are still intact and the marine waters are still clean during the field visits by the EIA consultants in March 2018 and December 2018. The local fishermen in Nyaung Wee which is near to the project islands also confirmed that there has been no cases of marine water pollution from the resort developers or the construction contractors.

4. Greenhouse Gas (GHG) Emission from the fossil fuels used-

The construction equipment uses fossil fuels for power and all the electric machinery at site are run by the diesel generators. Additional to the fuel used for transportation, the project owner has brought in two diesel generators of capacity 4.5kW for power and there is equipment that uses fossil fuels for power when they started off the construction in 2017 after the monsoon.

Figure 5-7 The 4.5 kW Diesel Generator used at Phoni Island

The project owner has changed the methodology of construction from traditional buildings to assembly of modular components. Hence the diesel usage during construction is insignificantly low as the construction activity is only assembly of the components and minor joining works and plastering involving a maximum of 40 people for work in total for both the islands. To reduce the diesel usage, the maintenance of the equipment was made as part of the overall construction plan which is also motivated by financial gains in saving fuel. Since the fuel usage is significantly low, this aspect becomes a non-significant parameter.

5. Depletion of water resources due to heavy usage-

The resort construction will result in water consumption due to concreting, cleaning, and personal use by the workforce. This will also result in lot of waste water from the concrete cleaning and its runoff. The freshwater resources if depleted in large extent will cause draught for the villagers in the islands around. The waste water run off will cause marine pollution too destroying the coral reefs and fish species that breed in it.

The construction plan was made in such a way that concreting was reduced to a minimum by assembly of modular components at site. There is small plastering and finishing activities that uses cement and concrete. There are only around 40 people in total for two islands at site for the construction and their water usage is insignificant for the construction phase. The villagers in Nyaung Wee has confirmed that they have not encountered any type of water shortage.

6. Air pollution from construction-

The major pollutant in the construction phase is suspended solids being air-borne due to various construction activities such as drilling, grinding, welding, cutting, concreting etc. The movement of trucks transporting the excavated earth will also contribute to extensive fugitive dust emissions to the atmosphere.

The project owner had the construction methodology changed to have assembly at site rather than the traditional construction that will hamper the air quality at site. There were no large-scale excavations, landscaping, transportations etc. The measurement of air quality at the islands and nearby villages are well within the acceptable limits set by WHO. The villagers in Nyaung Wee has confirmed that they have not encountered any type of air pollution due to the construction being carried out in the nearby project islands.

7. Noise from construction-

The construction phase will make use of a variety of equipment such as Impact hammers, cranes, generators, compressors, pumps and earth movers that will generate noise whilst operations. The most widespread source of noise from typical construction equipment is generally due to internal combustion engines that provide the energy for operation. Other sources of noise associated with the equipment include the mechanical and hydraulic transmission actuation systems that can sometimes produce high sound levels. Construction related noises are usually of a temporary duration and relatively intermittent.

The Air compressors at the construction sites were fitted with exhaust mufflers and intake mufflers. The Chassis and engine structural vibration was dealt by isolating the engine from the chassis and by covering various sections of the engines. The project owner had the construction methodology changed to have assembly at site rather than the traditional construction that will hamper the noise levels at site. There is no need for piling, excavations, impact hammers etc.

The measurement of noise at the islands and nearby villages are well within 60 decibels while the construction activity was going on. The villagers in Nyaung Wee has confirmed that they have not encountered any type of high noise levels due to the construction being carried out in the nearby project islands.

8. Generation of waste-

The construction phase will result in solid waste and effluent being generated. The waste generated is mostly from the packaging material of the components, and consumables. The disposal of waste at construction sites are generally a trouble area as the contractors used are not regular.

Since the construction methodology was only about assembly of modular components with very limited works of joining and plastering works, the solid waste generation was not an issue. The contractors were instructed to segregate the waste and reuse the packaging material at site for construction as far as practically possible. The waste generated is not significant to have a disposal issue.

Figure 5-8 The solid waste at site in Phoni during the construction period.

Residual Impacts from the construction phase-

The construction phase will not result in any residual impacts and hence not applicable to the construction phase of the island resort project development.

5.2.3 Negative Impacts in Operational Phase

The island resort when it is operational will be functioning for a maximum of 8 months in a year from September to April. The four months of May to August is the monsoon time in the area and is thus unsafe for moving around in the waters. In the operational 8 months period, the four months of November to February is the peak season for tourism in the tropical region. The two resorts in Phoni and Balar has a total capacity of 50 cottages and the impacts are considered with their full capacity for the whole part of the 8 months (240 days) when the resort is operational. This is a hypothetical situation, but considered to assess the maximum possible impacts in a conservative manner.

Activity/Impact	Groundwater quality	Air Quality	Soil contamination	Noise	Traffic increase	Water depletion	Fossil fuel use	Marine Pollution from Effluent	Access to island water	Solid Waste generation	Threat to livelihood
Swimming Pools											
Laundry											
Air conditioning											
Diesel generator											
Food Production											
Cleaning											
Guest rooms											
Recreation											
Transportation											

Significant Impact	
Insignificant Impact	
No Impact	

Figure 5-9 The significant impacts in operational phase

The aspect impact analysis as per the environmental management system ISO 14001:2015 is provided in the table 5.8.

Activity	Aspect	Impact	Severity	Likelihood
Diesel Generator (fuel for whole resort)	Fuel use	Air emissions	High	Frequent
		Fossil fuel depletion	High	Frequent
		Water pollution by spill	Medium	Rare
	Machine use	Noise generation	High	Frequent
		Potential fire	Very High	Rare
Cleaning (whole resort)	Solvents use	Air emissions	Low	Frequent
		Water pollution by effluent	Medium	usual
		Waste Generation	Medium	Frequent
Air Conditioning	Cooling towers	Water depletion	High	Frequent
Laundry	Water usage	Water depletion	High	Frequent
		Pollution from Effluent	High	Frequent
	Machine use	Noise generation	Medium	Rare
Guest Rooms	Water usage	Water depletion	High	Frequent
		Pollution from Effluent	High	Frequent
Pool & Lawn	Water usage	Water depletion	High	Frequent
Kitchen	Cooking	Fossil fuel depletion	High	Frequent
	Cleaning	Water depletion	High	Frequent
		Pollution from Effluent	High	Frequent
Resort functioning	Security	Loss of access to water for villagers	Medium	Usual
	Recreation	Noise generation	Medium	Rare
Transport	Boat & ski usage	Air emissions	High	Frequent
		Noise generation	Medium	Usual
		Traffic congestion	Low	usual
		Fossil fuel depletion	High	Frequent
	Boat & ski Accidents	Loss of life	Very High	Rare

Table 5-8 Aspect Impact analysis for Island resort operations

1. Climate Change Impact from Greenhouse Gases (GHG) Emission from the fossil fuels-

The island resort operations are powered by diesel generators as there is no grid connectivity in the project islands. There are two generators of capacity 100kVA each on the islands to meet the overall power demand of 140kVA. The assumption made is that for 240 days of operational time, half the time (12 hours a day), the generators run on full load and the rest of the time on half load. The diesel consumption for a 100kVA generator at full load per hour is 21.4 litres and at half load per hour is 11.9 litres. Hence 2,880 hours of operation at 21.4 litres and 2,880 hours of operation at 11.9 litres for two generators causes a total maximum consumption of 191,808 litres in a year.

There are passenger boats, jet skis and diving boats that will be used by the guests for sightseeing and transport to the resorts. The assumption made is that average boat operation per day is 12 hours for all the 240 days. The fuel consumption for the boat is considered at 50 litre per hour considering the worst mileage of the boat. 2,880 hours of boat operations at 50 litres per hour makes the total consumption at 144,000 litres per year.

The total fuel usage estimation for the whole year operation of 240 days is 335,808 litres or 88,711 gallons of fuel per year. The estimation of fossil fuel consumption per year made by the project owner was around 80,000 Gallons. The impacts of GHG emissions are calculated for 88,700 Gallons per year for conservativeness.

From the calculation of GHG emissions from diesel consumption provided in the section 5.1.6, the consumption of 1 litre of diesel causes 2.684 kg of Carbon Dioxide equivalent or 2.6840kgCO_2/Litre. The total estimated maximum possible GHG emissions form the resort operation per year is 901.31 tonnes of CO_2 equivalent or 901.31tCO_2e.

To reduce the GHG emissions, the resort should reduce the consumption of diesel at the resort during its operations. The procurement plan of all the electrical equipment at the resort was reviewed by the consultants to ensure that the selection was based on energy efficiency as well. Energy audit of the equipment at site is to performed at least once in two years. The maintenance regime of all the machine and equipment is planned to be regular to have them operating at maximum efficiency all the time. There has to be measurable KPIs related to fuel consumption at the resort. The solar lighting is recommended in the resort for as far as practically possible areas. The environmental Management Plan (EMP) for Fossil fuel consumption is to cover the practices to be followed.

2. Depletion of Water resources due to heavy usage-

The operation of the island resort needs lot of water for the comfort of the guests, operation of the restaurant, cleaning, laundry and other personal uses by the staff and the maximum estimated consumption is 16,400 gallons per day. The assumption made is that each guest room uses 300 litres per day for their bathing, toilet and other in room requirements. The laundry usage per guest as 30 litres per day, restaurant usage as 40 litres per day, 50 litres per guest per day for the swimming pools, 200 litres per hotel staff, 10,000 litres for the gardens, cleaning and other things, and an additional 100 litres per air conditioner if chiller units are installed for the air conditioning. Considering all 50 rooms are occupied with two guests and 100 employees in the resort considered, total daily consumption will be 62,000

litres per day or 16,400 Gallons per day. This water is to be drawn from the groundwater resources in the islands and will put pressure on the water resources on the nearby island of Nyaung Wee.

The recycling of water by membrane bioreactor will reduce this huge water consumption by at least 50%. It will also solve the issue of waste water discharge to the land or the sea. The monitoring of the water consumption is part of the Environmental Management Plan (EMP) formulated during the EIA study.

3. Contamination of Marine Waters or Groundwater by Effluent let off

The water usage of 16,400 gallons of water per day will cause generation of wastewater to the extent of around 80% of the usage and hence the estimated effluent generation is 13,120 Gallons per day. The wastewater let off to the sea will result in destruction of the Corals and several marine species. The tourist visits the islands to enjoy the aesthetic beauty of the area of which pristine waters is a primary expectation. Hence, the project owner also treats this as a business requirement.

The recycling of wastewater to ensure a zero discharge will conserve the marine waters and the groundwater from contamination. The consultants recommend a Membrane Bio reactor technology with a capacity of 90KL per day to recycle the effluent. This technology will efficiently recover the water to be reused in the resort and save considerable water intake as well up to 50%. The groundwater and the marine water around the islands are to be tested at six monthly intervals by third party laboratories to ensure that they are within WHO limits.

4. Solid Waste Disposal to the sea-

The resort operations will result in waste such as packaging materials, food surplus and cleaning effluent that need to be disposed appropriately. The solid waste generation for 50 rooms and restaurants will be within 500kg per day at the peak of operations. Globally, the solid waste generated in tropical island resorts is 1.3 Metric Tonne per day average for a resort with 220-250 rooms. Of this waste generated, 85% to 90% organic matter (mostly food waste, garden trash and packaging material), and the rest inorganic material such as plastic, glass, metal and construction/garden debris.

The four methods to be employed to manage the solid waste are Composting, Vegetable garden, Recycling and Elimination. The recyclable components (metals, plastic) will be less than 10 % of the total waste generated and the rest of the solid waste that is organic is around 80% of the total waste (food waste, garden trash etc). The problem in employing commonly used techniques in the project is the economies of scale. The waste generation is comparatively low for investing in some advanced technologies such as a waste to electricity project.

Composting of the food waste and the organic matter will save transportation costs, soil fertility of the land, and avoid the contamination of the sea. The composting will provide manure and soil to maintain a small vegetable garden that can provide fresh vegetables for the salads in the resort. In many island resorts across the globe, 30% of the salads are from the gardens maintained beside the resorts.

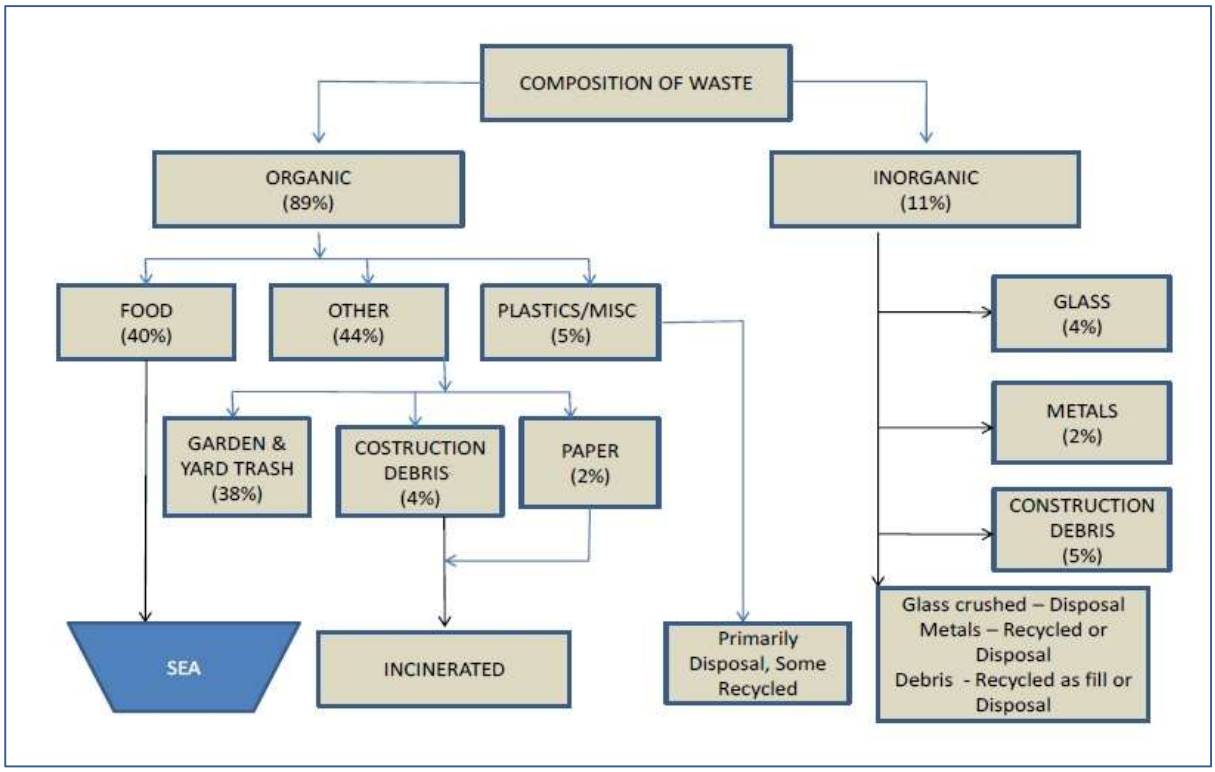


Figure 5-10 Solid waste generation in island resorts in Maldives Archipelago

The metal components and some plastic can be sent out for recycling. If the quantity is too low, they can be collected and disposed biweekly or monthly. The wood waste can be used as charcoal for barbeques. The broken glass and other items that can not be recycled can be crushed and be reused in the resort for repair along with concrete.

The use of disposable single use plastic bottles is to reduce to bare minimum. The water can be served in reusable bottles of glass taken from 20 litre cans. The plastic wrapping of the toiletries to be avoided and be done with paper.

The detail solid waste management is part of the EMP formulated during the EIA study.

5. Air, noise and vibration emissions-

The machines and equipment used in the island resort and for the transportation of guests will result in generation of air pollutants, fugitive dust, noise and vibrations. This will create nuisance to the nearby villagers.

The generators to be employed at the islands will the silent type and the boats and skis are all compliant with the noise requirements. The monitoring of air quality and noise levels by third party is part of the Environmental Management Plan (EMP) formulated in the EIA study.

6. Restriction in access to the villages for local people-

The resort operations will result in the local people unable to access the islands and the nearby waters. The salone people move around in the archipelago and use the uninhabited islands

as resting points. The fishermen also use the islands as stopover points while at sea. The nearby waters to the project islands are also used by the fishermen to hunt for the squids in the shallow waters. The security at the resort may drive them away for the privacy and safety of the guests.

Further, the freshwater source in the Phoni island is used by the villagers in Nyaung Wee during peak summers when there is scarcity of water. They are concerned that if the resort is functioning, they may not be able to take water from the islands.

The project owner has decided to develop only 10 acres each on the islands and leave the rest of the islands as it is without any development or construction activity. They have given this commitment in the public hearing in presence of the elected representatives that they will not restrict the villagers to move around in the waters or the islands and they will not create barricades or fencing.

7. Fire break-out and boating accidents-

There is a chance of a fire break out in the resort accidents that can spread to the rest of the forest in the island. There could be accidents form the boats, skis or any other equipment used in the resort for entertainment that can result in death or injury of the guests or the fishermen.

There will be an emergency preparedness and fire management plan established with proper training given to the employees, maintaining fire-fighting equipment, and visitor management. The boats and skis shall be inspected and maintained regularly with these check points being a part of the EMPs for the vessel management.

Residual Impacts from the Operational phase-

The operation phase of the resort will not result in any residual impacts and hence not applicable to the operational phase of the island resort project.

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5.2.4 Negative Impacts in Decommissioning Phase/Closure

Upon closure or decommissioning of the island resort, the machines and the equipment for utilities shall be sold for reuse elsewhere. When the equipment is found to be non-usable, it will be scrapped. In the unlikely event of abandoning the island resort all the equipment that is not bio degradable shall be removed and disposed. The hazardous waste remaining shall be disposed in a sustainable manner.

5.3 Evaluation of the Mitigation Measures

The mitigation measures are planned to reduce the severity or the likelihood of that particular impact. For example, the likelihood of the marine contamination gets reduced by a large extent when the mitigating measure of wastewater recycling is employed. The idea of the mitigating measure is to bring down the severity or the likelihood of the impact.

Each of the impacts have to be again worked under a risk assessment to check whether the risk has been reduced to an acceptable level. A preliminary risk assessment is done after the consideration of the planned mitigating measures for each of the impacts. This will work only with the backing of a strong monitoring system by EMPs.

The assessment of the impacts and their mitigating measures are analysed deep in the EIA study with respect to the baseline conditions of the site and the assessment of the extent of the possible impacts. The formulation of the EMPs focus on operational procedures and management programs to keep the monitoring robust. The following table shows the re-evaluation of the impacts after the mitigation measures are employed.

Impacts	Mitigating measure	Severity	Likelihood
Marine Pollution	Wastewater treatment	Low	Rare
Marine Pollution	Composting of Solid waste	Medium	Rare
Groundwater Pollution	Wastewater treatment	Low	Rare
Depletion of water	Water recycling,	Medium	Rare
Depletion of fossil fuels	Efficient equipment, Maintenance	Medium	Rare
Solid waste generation	Composting	Medium	Rare
Air emissions	Equipment selection, monitoring air quality	Medium	Rare
Noise emissions	Equipment selection, monitoring noise levels	Medium	Rare
Restriction of Access	Accepted to provide access	Medium	Rare
Accidents	Equipment maintenance, Training	Medium	Rare
Deforestation	Only removal of shrubs	Low	Rare
Soil Erosion	Selection of flat location	Low	Rare

Table 5-9 Re-Evaluation of the risk assessment after the mitigating measures

5.4 Positive Impacts- Job Creation

Any new project in an area brings in new jobs and livelihoods for the people around and is the prime reason for communities inviting new investment and development. The jobs and livelihood improvement in the project area due to the island resort can come from direct as well as indirect employment.

Direct Employment-

The direct employment from the project can happen for 40 people during the construction phase and around 60 during the operation time. The villagers have been already employed in the construction that started in 2017. Construction of the cottages has only the assembly of modular components with minor plastering and joining works. The work in Phoni started after the monsoon in 2017 and the work in Balar started in 2018. The deforestation is only the clearing of the shrubs and small plants. The jobs at the resort while in operation will need some vocational training for the villagers. There are NGOs providing such trainings to equip the islanders to be employable.

Indirect Employment- Tourism Value chain-

Tourism boom in the archipelago will exponentially increase the tourist footfalls. There are around 30 island resort in various stages of development in the region that may serve around 1,500 to 3,000 rooms. The arrival of such a high number during the season period will increase the consumption of goods and services giving a boost in commerce and trade. The value chain created by the tourism sector is below. As per the tourism master plan 2013, the estimated job creation from the tourism segment by 2020 is 1,497,801 of which 748,901 are from food and beverage, 299,560 are from transportation and 224,670 from accommodation.

Accommodation	Food & beverages	Transport	Tours	Equipment sale/lease	Other Services
Hotels	Restaurants	Airlines	Guides	Diving	Massage
Resorts	Street food	Boats	Packages	Trekking	Spa
Ecotourism	Small shops	Buses	Ticketing	Fishing	Internet
Inns	Bars	Cars	Shows	Mountaineering	Retail Shops
Homestay	Wine shops	Taxi			Currency exchange

Table 5-10 Tourism value chain created in the downstream

The tourist arrivals have been increasing over the years. As per U Myint Htwe, director from the Ministry of Hotels and Tourism, the tourist arrivals in Myanmar at the end of February 2017 is more than 600,000[128] which is more than that of the figures in 2016. The island resort projects in the Mergui archipelago have a great impact on the tourism sector with a potential to attract wealthy foreign travellers earning valuable foreign exchange. The tourist arrivals have increased exponentially in the past three year's period after the Thailand-Myanmar border was opened.

The total number of foreigners that visited Kawthaung for the year 2016-17 was around 300,000 where as in 2015-16 it was around 270,000 and in 2014-15 it was around 225,000. The tourist arrivals dipped in the year 2017-18 due to news about conflict in other areas; but again, picked up in 2018-19. There were around 4,000 visitors in 2016-17 that came to the Mergui archipelago through around 400 chartered trips whereas in the previous three years it was only around 1,500 visitors from around 200 chartered trips. The number of visitors to the project area is expected to rise in the coming years due to many island resorts being set up in the region.

[128] http://www.mmtimes.com/index.php/lifestyle/travel/25783-myanmar-registers-more-tourist-arrivals.html

6.0 Cumulative Impact Assessment

6.1 Methodology and Approach

The methodology used for the cumulative impact is the review of all other projects under development that are nearby and/or that may have a relation to this project. The guidelines provided in the handbook of cumulative impact assessments by IFC were referred. The environmental impacts that are experienced such as the climate change, loss of biodiversity, depletion of resources, and depletion in air and water quality are because of the cumulative effect of collection of many anthropogenic activities. To identify these projects that contribute cumulatively, the island resort projects that are within 50 nautical miles from the project are considered.

Valued Environmental and Social Components (VECs)

The environmental and social parameters identified as significant in assessing the risks associated are called the Valued Environmental and Social components. This could be the physical features such as habitats of some species, natural phenomenon or processes such as water cycles or microclimate, social conditions or cultural aspects. The VECs may be affected by the project activity, but the impact could be significantly higher when it is augmented by many projects in the area. The VECs that are vulnerable are the pristine marine waters and its rich biodiversity, Water resources for the villagers and the Climate Change from GHG emissions (which is not just limited to the project area).

6.2 Cumulative Impact Assessment

The first step is to identify the other projects in the area that may have impact to the VECs in the project affected area. The project affected area of Mergui archipelago that are near to the Lampi park within 50 nautical miles of the project islands are reviewed. The other projects are all similar in nature in the hospitality sector as the area has only small islands surrounded by shallow marine waters suitable for tourism development. There are few Pearl farms operating or about to operate in the Mergui archipelago area

6.2.1 Other Projects in the Project Area- Pearl farms

There are four pearl farms in the project area[129] of which two are in the north of Lampi park near to Domel island and other two in the South near to Kawthaung. They are Ashae Tai Pearl and Niino Pearl Culturing Co Ltd on the north and Belpearl Myanmar[130] and Myanmar Andaman Pearl Co Ltd[131] in the south of the project area. Another Pearl farm is being developed in the area south west of Kawthaung around 100 nautical miles away from the project site. The pearl hatcheries do not create any cumulative impact to any of the VECs associated with the project.

[129] http://tanintharyitourism.org/wp-content/uploads/2017/06/Hotels-and-Tourism-Development.pdf
[130] http://www.belpearlauctions.com/aboutus2
[131] https://www.linkedin.com/company/myanmarandamanpearlco.ltd./?originalSubdomain=in

6.2.2 The other island resort projects near the project area

Since the Ranong-Kawthaung border has opened, the tourism potential of the Mergui Archipelago is getting attention of the luxury hospitality sector and there is an interest from overseas enterprises to invest to develop in the island resorts. The area already has two island resorts near the Lampi Park with a total of 227 rooms. Additionally, there is one more island resort next to the project islands on the 115 islands that has been non-operational for a long period, but now undergoing renovation to restart. The operational resorts are the Grand Andaman Resort[132] in Tha Htay Kyun Island and the Myanmar Andaman Resort[133] on McLeod Island. As per Myanmar Directorate of Investment and Company Administration (DICA)[134], there are permits granted to 8 other island resorts of which 4 are with foreign investment. However, none of them have started the operation yet.

Developer	Plot size (Acre)	Islands	Investment
Amata International Co Ltd	20	Phoni, Balar	Myanmar
Benchmade Asia (Myanmar) Limited	100	Wa Ale Kyun	Foreign
Cocoon Hotel Co Ltd	17	No 115 Island	Myanmar
Domel Island Development	50	Domel Island	Foreign
K Future Co Ltd	50	Bo Nat Kyaw Island	Myanmar
KMOT Co Ltd	158	Hlaing Gu Island	Foreign
Moken International Co Ltd	510	Kyun Phi La, Boywae, Shark	Foreign
TZK Co Ltd	31	Nyaung Oo Phee	Myanmar
United Hotels & Resorts Co Ltd	20	Nga Khin Nyo Gyi	Myanmar

Table 6-1 The list of upcoming island resorts near the Mergui Archipelago

Additional to these resorts under construction, there are many resorts under development in various stages as per the Tanintharyi Tourism Development Co Ltd (TTDC)[135]. Five of them are in the Bokpyin township and 12 of them are in the Kawthaung township. These projects will also have pressure on the environment of the archipelago once they are all operational, possibly in a period of 5 years.

[132] http://grandandaman.travel/
[133] http://www.myanmarandamanresort.com/
[134] http://www.dica.gov.mm/
[135] https://tanintharyitourism.org/map/

Hotel Company	Location	Township
Eden Place Co Ltd	Saw Pu Kyun	BokPyin
Global Grand Engineering Co Ltd	Mway Ma Nate Kyun	BokPyin
Aung Zabu Deig Co Ltd	Taw Kyun	BokPyin
Shwe Taung Thiri Co Ltd	Sin Kyun	BokPyin
Harvest Moon Co Ltd	Kaw Ye Nge Kyun	BokPyin
Myanmar Life Hotel Investment Co Ltd	Kaw Ye Kyun	BokPyin
Shwe Taung Thiri Co Ltd	Nget Khar Kyun	Kawthaung
Shwe Taung Thiri Co Ltd	Nar Nat Thee Kyun	Kawthaung
Shwe Taung Thiri Co Ltd	Bo Wel Kyun-1	Kawthaung
Shwe Taung Thiri Co Ltd	Bo Wel Kyun-2	Kawthaung
Shwe Taung Thiri Co Ltd	Jalan Kyun	Kawthaung
Green Vision Construction Co Ltd	Saung Gauk Kyun	Kawthaung
Chin Corp Myanmar Co Ltd	Moe Thauk Kyun	Kawthaung
Myan Shwe Pyi Tractor Co Ltd	Nga Lone Let Phal Kyun	Kawthaung
Supreme Services Co Ltd	Nga Htwe Yue	Kawthaung
NKL Development Co Ltd	Sunge Snanngin Beach	Kawthaung
NKB Co Ltd	Nar Kho Kyun	Kawthaung

Table 6-2 The other resorts in the area under development

6.2.3 The Cumulative Impacts from the projects

The environmental and social parameters that may get affected from the cumulative effects from the different projects that come up in the project area are the pollution of marine waters destroying the corals and other biodiversity of the surrounding area, depletion of water resources due to extensive usage in the island resorts and Climate change effects from Greenhouse gas emissions from the fossil fuel usage. These issues are faced at all the tropical island resort havens across the globe such as the Caribbean, and Maldives. There are many good practices developed by various resort operators to save water, control the waste and the reduce the GHG emissions.

Pollution of Marine Waters from Solid Waste

If all the island resort projects are operational, there will be around 30 or more island resorts operating in the Archipelago within a radius of 50 nautical miles. If we consider 50 to 100 cottages per resort, it will be 1,500 to 3,000 cottages in total serving customers for 240 days in a year. This level of tourist footfall will result in enormous amount of solid waste to the level of 20 to 30 tonnes per day. The amount of non-biodegradable waste will be at least 10% of

this solid waste generation. Even the biodegradable waste will be dumped in the sea as it is not economical to transport to the mainland for disposal.

The resorts should take initiatives such as composting to manage this waste without dumping in the sea. The compost can be used to grow vegetable gardens that will provide the resort with fresh produce for salad. The nearby island resorts can combine their waste management programs to make it cost effective. The resorts also can ban the use of plastics such as single use water bottles that will create a lot of non-biodegradable waste.

Pollution of Marine Waters from Effluent let off

If all the island resort projects are operational, there will be around 30 or more island resorts operating in the Archipelago which will be using enormous amounts water and generating wastewater to the level of 15,000 gallons per day making it around 450,000 gallons per day for 30 resorts. This effluent let off even after treatment to a level within the threshold limits set by the Myanmar national emission quality guidelines will pollute the marine waters that may result in destruction of the corals.

The resorts can recycle the wastewater to have a very limited or zero liquid discharge system there by saving water as well as avoiding effluent let off to the sea or the land. This will ensure that the pristine waters in the archipelago is conserved for the guests to enjoy the aesthetic beauty.

Depletion of Water resources by extensive usage

If all these 30 island resorts are operational, the amount of groundwater intake for the resorts will be to the level of 20,000 gallons per day per resort making it 600,000 gallons per day of water withdrawal. This huge intake will reduce the public water resources available for the villagers in the surrounding islands.

If the wastewater recycling system is employed to reuse the water, the water withdrawal can be reduced up to 50% making it sustainable in the long run.

Climate Change from GHG emissions from fossil fuel usage

The resorts use diesel generators for the power requirements due to the absence of an electricity grid to draw power. The use of diesel is harmful to the environment releasing greenhouse gases to the atmosphere that will eventually augment the climate change problem. The fuel usage in a resort is to the level of 80,000 Gallons of diesel in a year making it 2,400,000gallons per year in total. This will result in GHG emissions of 24,500 tonnes of Carbon Dioxide equivalent (tCO_2e).

The resorts should use solar power as far as practically possible; mostly for the lighting and water heating requirements. The maintenance of the electrical and fuel consuming equipment to be done regularly with an aim to have them operated at higher fuel efficiency. The monitoring of fuel usage to be performed with clear measurable performance indicators.

7.0 Environmental Management Plan

7.1 Legal Framework

7.1.1 Environmental and Social Standards

Amata group is committed to integrating the environmental practices and sustainability principles aimed at conserving natural resources, protecting ecosystem biodiversity, driving sustainable development, minimizing waste and pollution, Establishing and reporting on key environmental performance indicators and Raising environmental awareness among their associates, guests and communities. To enable them to achieve these, Amata takes reference to the international standards for Environmental Management- ISO 14001, Occupational Health and safety- ISO 45001, Energy Management- ISO 5001, and Food safety Management- ISO 22000.

7.1.2 Legal Requirements

The section 2.2 of this report details the legal requirements applicable for the project. This details the sector specific legal requirements that is the tourism related laws, acts, rules and guidance and the common laws that applies to the project such as the Environmental conservation law.

Sector specific Legal requirements

- Myanmar Tourism Law- Section 14, 30 and 31
- Directives of Coastal Beach Areas- Section 1 to 8

Environment Specific Legal Requirements

- Environmental Conservation Law 2012- Section 14 and 15
- Environmental Conservation Rules 2014- Section 63, 67, 69 (a and b)
- EIA Procedure- Chapter V for EIA/SIA
- Environmental Emission Quality Guidelines- Section 1.1, 1.2, 1.3, 1.4 & 2.6.4

Forest and Land Specific Legal Requirements

- Myanmar Forest Law 1992- Section 5 & 12
- The Vacant, Fallow and Virgin Lands Management Law-2012- Section 16
- The Protection and Preservation of Cultural Heritage Regions Law- Section 22
- The Protection and Preservation of Antique Objects Law- Section 12
- The Protection and Preservation of Ancient Monuments Law- Section 12
- The Freshwater Fisheries Law- Section 36,40 & 41
- The Water Power Act- Section 3
- The Underground water Act- Section 3
- The Conservation of Water Resources and Rivers Law-Section 11, 12, 13, 21, 22 & 23 (b)
- MARPOL 73/78- Waste disposal at sea

OHS and Public Health Related Legal Requirements

- Myanmar Occupational health Law 2019- Section 8,9, 12, 26, 27, 28, 29, 34 & 36
- Factories act 1951- Environmental emissions and Safety of Employees
- Public Health Law- Section 3 & 5
- The Prevention and Control of Communicable Disease Law- Section 3, 4 & 9
- The Control of Smoking and Consumption of Tobacco Product Law- Section 7 & 9
- Myanmar Firefighting Law- Section 25

Labor related Legal Requirements

- Myanmar Insurance Law- Section 16
- Myanmar Investment Law- Section 65
- Social Security Law- Section 11 (a), 15 (a), 18 (b), 48, 49 & 75
- Protection of National Races Law- Section 5
- Leave and holidays Act-Section 3, 4, 5, and 6
- Labor Organization Law- Section 29, 30, 37 and 44
- Settlement of Labor Disputes Law- Section 38 39 and 40
- Minimum Wages Law- Section 12, and 13
- Payment of Wages Act- Section 3, 4 and 14
- Employment and Skill Development Law- Section 5 and 14

Electricity and Explosive related Legal Requirements

- Explosives act- Section 7
- Explosive Substances Act- Section 3
- The Petroleum and Petroleum Products Law- Section 10, 15, 30, 31 (b), 32 and 33
- Myanmar Engineering council Law- Section 31 and 37

7.2 Summary of Impacts and Mitigation Measures

The impacts and mitigation measures are detailed in the section 5.2 above.

Potential Impacts	Mitigating measures Planned
Marine Pollution from effluent	Wastewater treatment
Marine Pollution from solid waste	Composting of Solid waste
Groundwater Pollution from effluent	Wastewater treatment
Depletion of water resources	Water recycling,
Depletion of fossil fuels	Efficient equipment, Maintenance
Solid waste generation	Composting
Air emissions	Equipment selection, monitoring air quality
Noise emissions	Equipment selection, monitoring noise levels
Restriction of Access	Accepted to provide access
Accidents	Equipment maintenance, Training
Deforestation	Only removal of shrubs
Soil Erosion	Selection of flat location

Table 7-1 The summary of impacts and mitigation measures

7.3 Overall Budget for Implementation of EMP

The resources required for the implementation of management plans in the island resort project are categorised as the equipment, man hours and third-party cost. This budget involves capital cost for the procurement of the additional machinery and equipment, as well as recurring operational costs such as consumables and repair, salaries, and fee to external providers.

7.3.1 Equipment and Machinery

The major capital cost item will be the investment for the wastewater recycling system, and Composting system for the effluent and the solid waste. The effluent treatment plant that uses a membrane technology will cost around USD 100,000 to 150,000 for the volume of water used at the resort depending on the service provider. The maintenance charges for the treatment system including membrane cost and service cost will be within USD 10,000 per year. The investment for the composting will be within USD 10,000 with a maintenance cost of USD 2,000 per year.

The firefighting system for the two resorts will cost within USD 20,000. The maintenance cost of the system will be around USD 2,000 per year.

To follow the management plans and monitoring systems, the project owner will need to purchase the measuring instruments, testing apparatus and analysis equipment. The cost of monitoring and measuring instruments will be within USD 10,000 and the cost of maintenance, calibration and repair will be within USD 2,000 per year.

7.3.2 Man-hours of Employees

A trained person to deal with environmental and social management aspects will need to be employed for the entire project along with a subordinate to help him/her for daily tasks. He/She would be responsible for all reporting, monitoring, carving out corrective actions and coordination with higher management. Even if this work is being carried out by the existing employees, the cost of man hours will need to be accounted for. A total budget is around 1,500-man hours and the cost for these man hours shall be within USD 20,000 per year including the training time.

7.3.3 Third Party Inspections and Testing

The six-monthly testing by third party bodies will cover the effluent discharge quality, air quality, water quality in the marine waters and the groundwater, noise measurements and vessel inspection. The costing of these third-party services will be around USD 5,000 for the tests every six months and around USD 10,000 for the vessel inspections/verification/certification every year.

7.4 Management and Monitoring Plans

The structure, content and the coverage of the management and monitoring plans were developed during the EIA study phase. The applicability of these EMPs are phase wise as Construction time, Operational time or both.

The EMP structure and layout is:

- Objectives
- Context
- Legal Requirements
- Management Actions
- Monitoring Plans
- Implementation Schedule
- Budgets and Responsibilities

There are total of 9 EMPs as provided below. The emergency preparedness plan is additional to these EMPs.

Sl No	Environmental Management Plan
7.4.1	Deforestation and Soil Erosion Management Plan
7.4.2	Fossil fuel Consumption Management Plan
7.4.3	Water Consumption and Conservation Plan
7.4.4	Air Emission, Noise and Vibration Management plan
7.4.5	Waste Management Plan- Effluent and Solid Waste
7.4.6	Occupational Health and Safety management Plan
7.4.7	Firefighting and Emergency preparedness Plan
7.4.8	Boat and Ski Accident Prevention Management Plan
7.4.9	Food Safety and Hygiene Management Plan

Table 7-2 The List of Environmental Management Plans

7.4.1 Deforestation and Soil Erosion Management Plan

Objective

To describe the overall requirements for monitoring and measurement to ensure that there is adequate control on the deforestation, excavation and soil erosion for the project development.

Context of the Management Plan

The context of this EMP is for the Island resort projects at Phoni and Balar Islands. This is applicable in the construction stage when the vegetation is cleared and the excavation is done to build the cottages on both the islands.

Legal Requirements related

The Myanmar Forest Policy 1995 and Myanmar Forest Law 1992 applies to the deforestation activity and the removal of vegetation has to be performed only after taking approval from the Forest department. The Land acquisition Act 1894 and The Farmlands Law 2012 are not applicable as there is no acquisition of land from farmers for the project.

The Environmental conservation Law 2012 and Environmental Conservation Rules 2014 requires the project owner to avoid any activity that hamper the ecosystem and biodiversity and avoid pollution. Hence the project owner needs to avoid polluting the marine waters by the soil erosion from the land when they remove the vegetation and clear the ground.

Management Actions

- Removal of vegetation will be done in a manner to minimise the cutting of trees; the clearing will be done only at the two locations identified on Phoni and Balar for the cottage construction. The North Eastern shore of the Phoni Island and the North Western shore of Balar Island within 10 acres area on each of the islands.
- From the time of deforestation and excavation till the landscaping is completed, there is chance of soil being eroded to the nearby marine waters; the construction contractor will be briefed on the importance of controlling the soil erosion to the marine waters. The diversion banks or contour banks to be made if necessary.
- If the endangered species of trees as listed in the Lampi park plan[136] are removed, they will be specially marked, numbered and replanted either in the landscapes or in the rest of the island. All bigger trees with circumference more than 80 inches will be replanted. No planting of trees that is brought from outside the Archipelago is to be undertaken. Logs shall be kept of this removal and replanting.
- The removed vegetation that cannot be replanted shall be disposed of to the extent possible as manure for agriculture or as a source of fuel for villagers.
- Develop mulch planting beds to maintain soil moisture and temperature, prevent weed growth and erosion, and protect plant roots and crowns from heat. It also protects the trees' trunks from mechanical damage caused by mowers and trimmers.

[136] http://www.lampipark.org/wp-content/uploads/2015/10/General-management-plan.pdf

- Use the fine-textured (than coarse-textured) mulches to prevent evaporative water loss.
- Prune the hedges of the shrub plants in such a way that smaller width should be on top, with a wider base to allow sunlight to penetrate to the lowest foliage.
- Group the plants (trees, shrubs, perennials, etc.) in mulched beds instead of placing them individually around the yard. This will give a more natural look to the landscape and makes watering and weeds control much easier.
- The landscapes and the lawns will use the natural soil, grass and will leave enough open spaces to ensure the drainage and percolation of water. Limit impervious surfaces to encourage absorption of rainwater into the ground instead of it running off into the storm sewer.
- Alternate the mowing pattern in the lawns to prevent ruts from forming, and it will also give a straighter standing turf.
- The best time to irrigate is at night or early in the morning to conserve moisture and avoid evaporative loss of water.

Monitoring Plans and Responsibility

- The schedule of deforestation and landscaping will be approved by the management of Amata International Co Ltd prior to execution with the review of trees to be replanted, endangered trees, and the list of species to be used in the garden.
- The resort manager or the delegated person by the management of Amata International Co Ltd will be responsible to monitor the vegetation removal, disposal of the removed plants, planting and maintenance. The records of this activity shall be kept.
- A weekly inspection of the landscape during the development will be done by the resort manager with findings recorded and corrective measures taken.
- An audit of the condition shall be performed once every month to control the soil erosion. This audit will also cover the conditions of the diversion banks, permanent structures, and planted trees in the boundaries of the plots. The resort manager shall be responsible to have the audits arranged regularly.

Key Performance Indicator

The marine water quality shall be tested for turbidity by third party laboratory every quarter during the construction period. The locations for water sample drawing are two points each near the construction sites on each of the islands. The turbidity of the water should be within 5 Nephelometric Turbidity Units (NTU).

Budgeted cost

The cost of marine water testing will be within USD 200 per quarter for the four samples in total. The time for the testing is not considered as the cost budgeted covers the time of the third-party testing body.

Audit checklist for Deforestation and Excavations

Area of Inspection	
Date of check	

Check points in Audit	Yes/No?
Has the identified endangered trees been removed; if removed, have they been replanted either in the gardens or the remaining part of the island?	
Is there any invasive alien species planted in the gardens?	
Is the log book for removal and replanting in line with the actual situation in the site?	
Are there enough spaces to allow water seepage in the garden?	
Is any of the marine water testing samples show turbidity levels beyond 5 NTU?	
Are the corrective measures taken as per the findings of the inspections are effective and appropriate?	
Are the staffs managing the gardens aware about the requirements of watering, mowing and related actions?	

Remarks and corrective actions if any

Checked By

7.4.2 Fossil Fuels Consumption Management Plan

Objective

To describe the overall requirements for monitoring and management to ensure that there is adequate control on the fossil fuel consumption to reduce the emission of Greenhouse Gases to the atmosphere.

Context of the EMP

The context of this EMP is for the island resort construction and operation at Phoni and Balar islands where there is fossil fuel consumption from the generators, boats, skis, and all electricity consuming equipment. This is applicable in all stages of all phases of the project.

Legal Requirements

The Environmental conservation rules and Environmental Conservation Law requires the people to control the pollution of the environment and conservation of natural resources. The consumption of fossil fuels results in air pollution as well as greenhouse gas emission to the atmosphere. The project owners are to install measuring and monitoring to reduce these emissions. The Environmental Emission quality guidelines 2015 specifies the air quality levels to be maintained by the project and have it tested by a third-party laboratory.

The Petroleum and Petroleum Product Law 2017 requires the project owner to have a license if they have to store more than 500 Gallons of Petroleum. The transport of petroleum should be performed only with adequate warning signs on the vehicles. The project owner also has the responsibility to report of any accident from the Petroleum products.

Management Actions

- Preventive maintenance of all Generators, equipment, machinery, vehicles, and other equipment has to be done at necessary intervals to have fuel efficiency. Ensure that the engine fuel filters and air cleaners are been replaced or serviced as recommended by the manufacturer
- Avoid vampire power draw by automatic shutdown sockets- it refers to the way electric power is consumed by electronic and electrical appliances while they are switched off (but are designed to draw some power) or in a standby mode.
- Install occupancy and daylight sensors in the common areas so that lights are only on when required.
- Defrost the refrigerators in the kitchen regularly; check the seals on cold rooms and freezers; and keep condensers and evaporators clean. Layout of kitchen to have hot and cold units not near to each other
- Use Induction cookware that transfer heat faster and doesn't heat the ambient air
- Insulate all the hot water lines in the resort to save the heat loss and monitoring water lines with smart, low-cost water meters for leaks (water loss results in energy loss).
- Always procure equipment with higher fuel efficiency and electricity rating.

Monitoring Plans and Responsibility

The monitoring of the monthly fossil fuel consumption shall be done and corrective actions will be taken as deemed necessary. The preventive maintenance schedule and the actual adherence to the plans shall be monitored. The power consumption at each section shall be monitored to determine the points of power wastage.

A yearly maintenance audit of the boats, jet ski, and equipment shall be performed for efficient fuel consumption. The resort manager shall be responsible to have the audits arranged at regular intervals.

A yearly energy audit of the electrical equipment shall be performed for efficient energy consumption. The resort manager shall be responsible to have the audits arranged at regular intervals.

Key Performance Indicator

1. The resort will aim to reduce the fossil fuel usage from the estimated fossil fuel consumption of 88,700 gallons of diesel per year by at least 15%. For monitoring purpose, the pro rata consumption per month (one year is 8 months of operation) shall be used.

2. The adherence to the preventive maintenance plan of the machines and equipment will be at least 95%. The team will have to keep record of the corrective actions and root cause analysis for the discrepancies.

Budgeted cost

The cost of doing these conservation measures do not involve additional machines and equipment. The time spent by the employees for these measures are already covered under their salaries.

To follow the management plans and monitoring systems, the project owner will need to purchase the measuring instruments, testing apparatus and analysis equipment. The cost of monitoring and measuring instruments will be within USD 10,000 and the cost of maintenance, calibration and repair will be within USD 2,000 per year.

Fossil fuel consumption monitoring checklist

Date of check	

Check points for fossil fuel consumption	Yes/No?
Is monthly consumption of fossil fuel abnormal for the period?	
Is the energy audit of the energy consuming gadgets and equipment showing abnormal consumption?	
Is the preventive maintenance schedule adhered to for all equipment?	
Are all the cylinders, flash back arresters, hoses, regulators, nozzles, valves etc are leak free?	
Are the engine fuel filters and air cleaners been replaced or serviced as recommended by the manufacturer?	
Is the fuel storage or gases in cylinders storage near sources of heat or sun?	
Is there any machinery/equipment that showed poor performance in the energy audit? List those machinery or equipment here and provide details of corrective actions below	
Are all the machinery and equipment in energy saving mode?	
Are the operators aware about the need for electricity conservation?	
The energy audit reports for the equipment are satisfactory?	

Equipment name	Rated efficiency	Actual efficiency	Repair required Y/N?

Remarks and corrective actions if any

Checked By

7.4.3 Water Consumption and Conservation Management Plan

Objective

To describe the overall requirements for monitoring and management to ensure that there is adequate control on water consumption and conserve the water resources in the Mergui Archipelago.

Context of the EMP

The context of this EMP is for the island resort project construction and operations where there is water consumption. This is applicable in construction and operation stages of the project.

During construction water would be used for General domestic purposes such as washing, drinking and amenities, Washing down and cleaning equipment at localised work sites, Concreting, Dust reduction measures; and Fire water for use during emergencies

During operational phase, the water will be used for General domestic purposes such as washing, drinking and amenities, Washing down and cleaning equipment at localised work sites, Cleaning of container and reefers and Fire water for use during emergencies

Legal Requirements

There is no specific requirement related to water consumption in Myanmar.

Management Actions

- Preventive maintenance of all pumps, motors, and other plumbing related equipment has to be done at necessary intervals. Monitor the wastewater recycling Plant.
- Use water saving equipment such as low flush toilets, low flow faucets, auto close sensors, and waterless urinals,
- Efficient loading of the laundry machines
- Encourage towel and linen reuse to the guests
- Periodically check for pipeline leaks, missing nozzles, and nozzles that are not working properly; Replace leaking gaskets and plug any holes in the pipeline
- Perform watering of the lawns in the evenings or early mornings to reduce evaporation.

Monitoring Plans and Responsibility

The monitoring of the monthly water consumption shall be done and corrective actions will be taken as deemed necessary. If the consumption goes up with a difference of more than 15%, a review will be undertaken and records kept. The preventive maintenance schedule shall be monitored.

A yearly water consumption audit shall be performed for efficient operations. The resort manager shall be responsible to have the audits arranged at regular intervals.

Key Performance Indicator

1. The resort will aim to reduce the water usage from the estimated water consumption of 16,400 gallons per year by at least 15%. For monitoring purpose, the pro rata consumption per month shall be used.

2. The adherence to the preventive maintenance plan of the pumps, piping, plumbing, laundry will be at least 95%. The team will have to keep record of the corrective actions and root cause analysis for the discrepancies.

Budgeted cost

The cost of doing these conservation measures do not involve additional machines and equipment. The time spent by the employees for these measures are already covered under their salaries.

To follow the management plans and monitoring systems, the project owner will need to purchase the measuring instruments, testing apparatus and analysis equipment. The cost of monitoring and measuring instruments will be within USD 10,000 and the cost of maintenance, calibration and repair will be within USD 2,000 per year.

Water consumption monitoring checklist

Date of check	

Check points for electricity consumption	Yes/No?
Is monthly consumption of water abnormal for the period?	
Is the water recycling plant efficiency being as per the manufacturer's specifications?	
Is the preventive maintenance schedule adhered to for all plumbing related equipment?	
Are the staff aware about the water conservation measures and its need?	
Is there any pipeline leaks, missing nozzles, and nozzles that are not working properly?	
Are there water saving equipment in the plumbing system of the common areas, guest rooms, staff quarters and kitchen?	
Is the laundry machine working efficiently?	

Remarks and corrective actions if any

Checked By

7.4.4 Air Emissions, Noise & Vibration Management Plan

Objective

To describe the overall requirements for monitoring and measurement to ensure that there is adequate control on emissions to the air, noise, and vibration to control pollution.

Context

The context of this EMP is for the island resort operations in Phoni and Balar Islands. This is applicable in the stages of construction, and operation phases of the project.

Legal requirements

There are air emission norms set by the government for air emissions in the Environmental (Emission) guidelines 2015 for the most industries; however, there is no such limits suggested for hotels and hospitality sector. There is a common air quality requirement for any project that become applicable for the project. The noise levels are also described in this guideline for the projects in Myanmar.

The Environmental Conservation rules and Environmental Conservation Law requires the projects to control pollution and takes efforts to monitor, measure and reduce the environmental pollution.

The Factories act, Myanmar Public Health Law and the Occupational health safety requirements have specified the ambient air quality levels and the noise levels the employees or the public may be subjected to in any business concern in Myanmar.

Management Actions

a) Construction phase

- Construction shall be done with pre-engineered structures having assembly at site which will reduce the air, noise and vibration emissions as far as practically possible.
- The machinery and equipment shall be fitted with mufflers to control the air emissions and noise to reduce nuisance to the public and the workers at site.

b) Operational phase

- Use noise reducing panels and canopies for the Diesel generators used at the two islands.
- Provide protective equipment for workers who work near the equipment that emit noise and vibration.
- Monitor periodically the emissions to air, the noise and vibration of the machines.

Monitoring Plans and responsibility

Periodic monitoring of the noise levels, indoor air quality, ambient air quality shall be done. The limits set for the parameters are as below. The resort manager shall be responsible to have these testing done and have a periodic audit of the situation with the checklist in the next page.

Employees should not be exposed to a noise level that is greater than 85 Decibels for duration of more than 8 hours per day without hearing protection. In addition, no unprotected ear should be exposed to a peak sound pressure level (instantaneous) of more than 140 Decibels. The use of hearing protection should be enforced actively when the equivalent sound level over 8 hours reaches 85 Decibels, the peak sound levels reach 140 Decibels, or the average maximum sound level reaches 110 Decibels. Hearing protective devices provided should be capable of reducing sound levels at the ear to at least 85 Decibels. Periodic medical hearing checks should be performed on workers exposed to high noise levels.

The noise level threshold set by the Myanmar emission quality guideline is 55 dB for day time and 45 dB for night time when the third-party testing is performed.

Key Performance Indicator

1. The air quality will be checked for the parameters as per the table 7-3 below by a third-party laboratory once every six months.

Parameter	Averaging Period	Guideline Value (µg/m^3)
Nitrogen Dioxide (NO_2)	1 year 1 hour	40 200
Ozone (O_3)	8-hour maximum	100
Particulate matter PM_{10}	1 year 24 hour	20 50
Particulate matter $PM_{2.5}$	1 year 24 hour	10 25
Sulphur Dioxide (SO_2)	24 hour 10 minute	20 500

Table 7-3 Air Quality Requirements as per the Emission Guidelines

2. The Noise levels will be checked by third party as per the table below once in every six months by the resort management.

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

Budgeted cost

The cost of doing the laboratory testing at the two islands every six months will be within USD 3,000 every six months. Since the testing is performed by third party bodies, the time is already covered in the cost.

To follow the management plans and monitoring systems, the project owner will need to purchase the measuring instruments, testing apparatus and analysis equipment. The cost of monitoring and measuring instruments will be within USD 10,000 and the cost of maintenance, calibration and repair will be within USD 2,000 per year.

Periodic Audit checklist for air emissions, noise and vibration control

Plot No	
Date of check	

Check points for air emissions, noise and vibration control	Yes/No?
Has the periodic testing results crossed the limits set for air emissions?	
Has the periodic testing results crossed the limits set for noise emissions?	
Has the periodic testing results crossed the limits set for vibrations?	
Have the yearly medical reports of any worker shown deterioration?	
Are the employees aware of the hazards of air emission, noise and vibration? List the people interviewed.	
Are there training records available?	

Remarks and corrective actions if any

Checked By

7.4.5 Waste Management Plan- Effluent and Solid Waste

Objective

To describe the overall requirements for monitoring and measurement to ensure that there is adequate control on waste management of solid and liquid waste generated in the resort.

Context of the EMP

The context of this EMP is for the Phoni and Balar Islands resort project. This is applicable in all stages of all phases of the project from construction and Operation. The waste generation management at the dive sites and the sightseeing tours where the guest may visit are also included in this plan. This covers the management of Solid waste as well as the wastewater generation form the Resort.

Legal requirements

The Environmental Conservation Laws and Rules insist that the project owner control and reduce the pollution of environment resulting from the projects in all stages with adequate monitoring and measurement. The Myanmar Emission guidelines section 2.6.4 provide the limits of parameters for the effluent quality for hospitality sector that needs to be tested by a third-party laboratory.

The Public Health Law requires the Project owner to control the health effects arising out of the project emissions such as contamination of water resources or spread of diseases from sanitation issues. The Conservation of Water Resources and Rivers Law 2006, and The Underground Water Act-1930 and Water Power Act 1927 also requires to control the effluent let off to the water bodies even though no limit is prescribed about the effluent quality.

MARPOL 73/78 prohibits the dumping of hazardous waste in the sea by the vessels and boats. The hazardous waste includes the spent oils, sewerage, non-bio degradable items such as plastics, battery, glass etc. The Myanmar National Waste Management Strategy and Action Plan 2018 also aims at Waste Management by reduction and recycling.

Effluent

The waste water discharge from the operations will affect the freshwater in the island and the marine waters in the nearby seas. The resort will have a waste water recycling plant to reuse the water and dispose the sludge as manure. The effluent levels set by the Ministry of environmental Conservation and forestry (MOECAF) as per the emission guidelines for environment dated 29th December 2015 for hospitality industry is as below. These limits are as per the guidance from the IFC documents.

Solid Waste handling and disposal

The solid waste generation in the islands is also big problem, mostly from the plastic packaging. The segregation of plastic, metal, glass and paper shall be done for easy disposal.

Composting to be employed to handle the food waste. The organisation has a plan for waste management, handling, storage and disposal. The waste segregation in the resort will be as below

Area	Hazardous	Non-Hazardous
Operational waste	Finished Oil	Construction waste
	Fuel Oil drags	Cardboard
	Mechanical Oil	Packaging material
	Absorbent	Steel scrap, cut offs
	Lights, tubes	Tubes
	Drums	Wooden pallets
	Plastic waste	
Office Trash	Battery	Furniture
	Glass	Paper & paper board
	Cartridges	Food waste
	Electronic waste	public area garbage

Table 7-4 The Solid waste classification

The waste will be treated and disposed through approved waste management service providers. The employees shall be trained to handle and segregate the waste so that they are not exposed resulting in contaminations

Management Actions

- The wastewater at the resort to be recycled to a zero discharge and avoid effluent let off to the marine waters or the islands.
- Set up a forced aeration composting system that handles all food waste and elements of the garden waste. Maintain a vegetable garden from the compost soil to source for salads for guests.
- Make Charcoal from the wood waste and other dried twigs for barbeque, pizza oven or the campfire at night.
- Broken glass from bottles are to be crushed and used as a replacement for sand in concrete for repairs.
- Metal and some plastic are collected and sent off the island for recycling bi-weekly or monthly as per the quantity.
- The guests will be briefed on the waste management actions required when they check in. This includes the waste generation at the dive sites and sightseeing trips. The conservation of water, option to re-use of towels and linen, use of re-usable bottles for water and waste bin segregation will be explained to the guests. The online booking portal of the Hotel will provide the awareness about the waste management actions and also the link to the Lampi management plan.
- The plastic bottles and other disposable items are to be reduced to the extent possible by using reusable bottles filled from 20 litre cans, paper packing for the toiletries

- The waste generated during the trips from food packaging and beverage cans shall be brought back to the resort for disposal.
- The waste bins for different kind of waste will be placed at suitably at corners for easy visibility. Food waste, plastic, and metals will be separated. Waste audit to be performed to determine the quantities of different types of waste thrown out.
- The resort will not use vinyl sheets and boards for display.
- Monitor the spillage and wastage to minimize the waste generation
- The employees are to be trained in waste handling, composting, storage, segregation and disposal
- Engage approved third party for treatment and disposal of waste generated

Monitoring plans and responsibility

The monitoring of the waste generation shall be done and corrective actions will be taken as deemed necessary. The supervisors will do a bi-weekly inspection and this shall be recorded. The waste management inspection shall be done by supervisors monthly and records shall be kept.

The resort staff who accompanies the guests to the dive sites and sightseeing is responsible to bring back the empty plastic bottles, beverage cans, and other food packaging waste for disposal.

A yearly third-party laboratory test of the effluent shall be performed to determine the discharge water quality as per the values stated above. The resort manager shall be responsible to have these tests and audits arranged at regular intervals.

Key Performance Indicator

1. The resort will have the effluent water tested by third party laboratory as per the parameters below

Parameter	Unit	Guideline Value
5-day Biochemical Oxygen Demand (BOD)	mg/l	50
Chemical Oxygen Demand (COD)	mg/l	250
Oil and Grease	mg/l	10
pH	SU	6 to 9
Total coliform bacteria	100ml	400
Total Nitrogen	mg/l	10
Total Phosphorous	mg/l	2
Total Suspended solids	mg/l	50

Table 7-5 The Effluent limits prescribed by ECD for freshwater

Parameter	Unit	Guideline Value
Ammonia	µg/l	70
Cadmium	µg/l	10
Chromium	µg/l	50
Cyanide	µg/l	7
Dissolved Oxygen	mg/l	4
Lead	µg/l	8.5
Mercury	µg/l	0.16
Oil & Grease	µg/l	0.14
Total Phenol	mg/l	0.12
Bacteria	Faecal coliform/100ml	100

Table 7-6 The Marine water quality as per ASEAN

2. The resort should not have any complaints raised by the authorities for discrepancies in waste disposal. This include the complaints raised by nearby villagers and islands and not only a formal legal notice.

3. The waste water recovered from the treatment plant to be re-used will reduce the estimated water consumption of 16,400 Gallons per day by at least 15%. The monthly water consumption shall be used to check this.

Budgeted cost

The effluent testing performed by the third-party bodies once in every six months will cost within USD 100 for both of the islands.

The effluent treatment plant that uses a membrane technology will cost around USD 100,000 to 150,000 for the volume of water used at the resort depending on the service provider. The maintenance charges for the treatment system including membrane cost and service cost will be within USD 10,000 per year. The investment for the composting will be within USD 10,000 with a maintenance cost of USD 2,000 per year.

To follow the management plans and monitoring systems, the project owner will need to purchase the measuring instruments, testing apparatus and analysis equipment. The cost of monitoring and measuring instruments will be within USD 10,000 and the cost of maintenance, calibration and repair will be within USD 2,000 per year.

Waste Management Audit checklist

Sl No	Questions	Kitchen	Office	Guest rooms	Workers area
1	Waste segregation is performed appropriately?				
2	The waste bins are available in each area				
3	Staff awareness on waste management is OK?				
4	The waste audit log is available and targets set reduction?				
5	Is the area clean and neat?				
6	Packaging material storage is OK?				
7	Scrap storage is OK?				
8	Empty cylinder storage is OK?				
9	Is the consumption of material high?				
10	The spillage records are available?				
11	Any wastage since packet left open?				
12	Disposal of batteries/cartridge is OK?				
	Generic Questions				Yes/No?
1	Are the effluent test reports values within the limits?				
2	Is the waste management contractor is approved? List the names here				
3	The inspection records are available and properly maintained?				
4	Are there any injuries reported due to exposure to hazardous waste?				
5	Spill kits are available near the machines and equipment?				
6	Is the waste generated at dive sites brought back for disposal?				
Remarks					

Supervisor

Date

Spillage Report form

Parameter	Details
Date of Spillage	
Oil/Chemical Name	
Department	
Equipment	
Quantity (Gal/Lit)	
Description of the incident	
Root Cause of spillage	
Correction	
Corrective action	
Training needs if any	

Supervisor

Date

7.4.6 Occupational Health and Safety Management Plan

Objective

To describe the overall requirements for monitoring and management to ensure that there is adequate control on occupational health of the employees, compliance with legal and other requirements, and to achieve objectives and targets.

Context

The context of this EMP is for island resort project construction and operations where the employees and workers are exposed to safety issues related to the equipment, machines, chemicals, waste and fire. This is applicable in all stages of all phases of the project.

Legal Requirements

The Occupational health and safety Law in Myanmar was passed in March 2019. The section 26 details the obligations of the employer that covers having OHS in charge, committee, procedures, risk assessments of the hazards, mitigating measures, emergency preparedness, evacuation drills etc. The requirements are in line with the International Labour Organization requirements for safety of workers.

The Factories Act and the Public health Law also prescribe about the workers conditions in such a way to have a safe and healthy atmosphere for workers as well as the nearby public. The Prevention and Control of Communicable Disease Law-1995 also stipulate about the control of epidemics among the workers and to the public. The Control of Smoking and Consumption of Tobacco Product Law-2006 requires to have designated smoking areas with clear signs to keep rest of the area non-smoking.

The Myanmar Insurance Law-1993, Social security Law 2012, Leave and Holidays Act-1951, Labor Organization Law-2011, Settlement of Labor Disputes Law-2012, Minimum Wages Law-2013, Payment of Wages Act-2016 and Employment and Skill Development Law-2013 lays down the rights of the workers related to insurance, wages, paid leaves, collective bargaining and skill development.

Management Actions

- Employees should be trained in Firefighting, first aid including handling snake bites, using the machines and equipment at site, and handling the chemicals and waste.
- Employees will be trained to have awareness on the safety issues, reporting requirements related to safety, and the use of personal protective equipment (PPE).
- PPE provided shall be of adequate quality and usable condition; it will be inspected periodically and records kept.
- Hazard Identification and risk assessment for the operations shall be reviewed every six months with adequate measures taken.
- Make sure that the first aid kits maintained in the office is replenished in time to avoid shortages. Periodic inspections are to cover the first aid kits as well.

- The contact numbers of the nearby hospitals and health centres should be available in the office and/or the operator area.
- Encourage the workers to report the near misses and incidents.
- Have a grievance redress system for the workers related to wages, payments, leaves, holidays etc. They should be allowed to form labour associations and unions for collective bargaining
- Periodic monitoring of air quality, noise, vibration, and availability of drinking water shall be done.

Activity/Source	Hazard	Likelihood	Severity	Measures Planned
Storage of fuels	Fire accidents	Low	High	Fire equipment, training
Electric connection	Electrocution	Low	High	Safety audits, training
Food Preparation	Food safety incidents	Low	Medium	Food safety Management system
Swimming/Diving	Drowning, injuries	Medium	High	Training
Wildlife in Islands	Snake bite/animal bite	Low	High	First aid, training
Boat transfer	Drowning, injuries	Low	High	Training
Alcohol abuse	Fights/Altercations	Medium	Medium	Training
Poor sanitation	Epidemic diseases	Low	Medium	Inspections/audits
Wet surfaces	Slip, trip and fall	Medium	Medium	Training

Table 7-7 The preliminary Hazard Identification and Risk Assessment for Resort

Monitoring Plans and Responsibility

- The indoor air quality, noise and vibration and the potable water quality shall be periodically checked. The norms specified in the section for Occupational Health & Safety shall be used for this monitoring.
- The limit for noise shall be 85 Decibels for 8-hour duration with a maximum instantaneous value of 140 Decibels.
- The exposure limit values for vibration will be 5m/s^2 with action value set at 2.5m/s^2.
- Conduct a yearly audit of the occupational health and safety situation in the Resort. The resort manager shall be responsible to have this arranged in time.

Key Performance Indicators

1. Safety Incidents and Near Misses reported by employees will have to be recorded and maintained. No fatalities or permanent injuries or injuries resulting in more than 15 days hospitalisation is not to happen to any employees. The safety incidents reported will not have any numerical targets to encourage reporting.

2. Indoor Air Quality will be tested by third party body every six months and the values are to be within the threshold limits as per the table 7-3 as repeated below

Parameter	Averaging Period	Guideline Value (µg/m^3)
Nitrogen Dioxide (NO_2)	1 year 1 hour	40 200
Ozone (O_3)	8-hour maximum	100
Particulate matter PM_{10}	1 year 24 hour	20 50
Particulate matter $PM_{2.5}$	1 year 24 hour	10 25
Sulphur Dioxide (SO_2)	24 hour 10 minute	20 500

3. Noise Levels will be tested by third party body to be within 85 dB at the work areas where the employees are exposed for continuous period.
4. Potable water quality will be tested by third party body every six months. The drinking water quality should be as per the WHO guideline.

Budgeted cost

The testing performed by the third-party bodies once in every six months will cost within USD 3,000 for both of the islands.

To follow the management plans and monitoring systems, the project owner will need to purchase the measuring instruments, testing apparatus and analysis equipment. The cost of monitoring and measuring instruments will be within USD 10,000 and the cost of maintenance, calibration and repair will be within USD 2,000 per year.

Occupational health monitoring checklist

Date of check	

Check points for Occupational health	Yes/No?
Are the indoor air quality, noise and vibration test reports satisfactory?	
Is adequate number of PPE available for the workers and they use it at work?	
The condition of the PPE is satisfactory?	
The first aid kits are maintained in order with adequate supplies?	
Is the number of injuries and lost time due to accidents in the resort abnormal?	
The employees are aware on safe handling of the machines and equipment?	
The contact of the nearby health centres and hospitals available and the employees are aware of it?	
The employees are trained in first aid including handling drowning and snake bites?	
Is there a system of grievance redress mechanism for the workers?	

Remarks and corrective actions if any

Checked By

7.4.7 Firefighting and Emergency preparedness Plan

Objective

To describe the overall requirements for monitoring and measurement to ensure that there is adequate control on fire break out management, and other emergencies.

Context of the EMP

The context of this EMP is for island resort in Phoni and Balar Islands where there is a chance of fire break out. This is applicable in all stages of all phases of the project. The Disaster management and response plan also contain the fire management and evacuation. This plan applies to all employees of Phoni and Balar islands resort and any person occupying the physical resort area, jetty, reception, office, guest rooms, utilities, and accommodation area. The scope of this plan is intended to encompass all hazards. This plan may be consulted when responding to any and all emergencies. When encountering a situation which has not been expressly addressed in this plan, use good judgment and the guiding principles outlined below.

Legal requirements

The firefighting Law 2015 requires the organisations to have equipment for firefighting, have the employees trained to fight fire. The OHS Law 2019 also stipulate on the evacuation drills, fire equipment and training to put out fire to be provided.

Management actions

- The fire procedures for employees will include Storage and handling of inflammable materials, Fire extinguishers, fire hazard identification, housekeeping, fire wardens and fire co-ordinator responsibilities.
- There will be a proper training given to the employees for managing fire and firefighting equipment, alarms, assembly areas, emergency shutdown, evacuation routes etc
- Fire drills shall be conducted at least one in a year
- The assembling point in case of a fire will be the cleared area in front of the office building.
- Fire exits, evacuation routes shall be illuminated or marked in fluorescent colour for visibility. Doors and paths that could be mistaken for fire exits shall be appropriately marked to prevent use in an emergency. The exit doors shall be side hinged and open towards the travel of exit. It must be able to be opened without keys. At a minimum, 2 exits per floor (currently only single floor buildings are planned) shall be provided.
- The storage of fossil fuels and inflammable chemicals shall be fire safe. The gas hoses, regulators, valves shall be inspected for leaks regularly. The cylinders shall be stored in upright position. The cylinders carrying different gases shall be segregated and the employees shall be trained in the colour coding of gas cylinders. Empty cylinders shall be kept separate and no cylinder shall be left open for exposure in the direct sun. All storage areas shall be adequately ventilated. The oxygen and Acetylene cylinders (welding requirements during construction) shall be kept away from other gases maintaining a distance of at least 20 feet or separated by a non-combustible barrier of 5 feet height.

- All electrical equipment shall be energy audited and tested for safe earthing at least once in a year. The recommended wire sizes and insulations shall be used and make shift wiring repairs are not allowed. The fixtures, plugs, circuit breakers and other equipment used shall be approved
- The maintenance of fire-fighting equipment, alarms, extinguishers etc shall be regular. The fire extinguishers shall be inspected monthly and the alarms shall be tested weekly.
- During the construction phase, a hot work permit program will be developed and maintained for all hot works like welding, brazing or cutting. The equipment shall be well maintained to avoid fire risks.
- All fire accidents shall be investigated and corrective actions taken. The near misses and incidents shall be also recorded.
- The visitors in the resort shall be briefed on fire risk and management.
- The emergency contact numbers shall be displayed in all sections.

Monitoring plans and responsibility

- Mock fire drills shall be conducted at least yearly.
- The firefighting equipment shall be checked every month for adequacy and the alarms shall be tested weekly
- There will be an audit done annually to assess the readiness for managing a fire break out. The resort manager shall be responsible to have the audits performed regularly.
- The emergency plan is the responsibility of the resort manager or his/her assistant. This plan will be reviewed and updated at least once annually. Revisions will be made as needed throughout the year. Any suggestions, comments, or questions should be directed to the resort manager or his assistant.

Monitoring plans and responsibility

The mock drills for firefighting and evacuation has to be performed at least once in a year with records kept.
Adherence to the maintenance and inspection plans for the fire fighting equipment shall be 100%

Budgeted Cost

The firefighting system for the two resorts will cost within USD 20,000. The maintenance cost of the system will be around USD 2,000 per year.

Emergency Protocols and Instructions

Fire and Evacuation

In the Event of a fire, pull the Fire Alarm and Call the fire station

If you see smoke or flames, use CARE

- Contain the fire
- Activate the nearest Fire Alarm
- Report the fire to fire station and the police
- Evacuate or extinguish (In most cases, it is best to Evacuate)

Use a Fire Extinguisher only if:

- You have been trained
- You have your back to an unobstructed exit
- You have a fully charged and proper type unit for the fire you are fighting
- The fire is contained, and you have reported the fire
- Everyone else has left the area
- There is little smoke or flames

Never fight a fire if:

- You lack a safe way to escape should your efforts fail
- It has left its source of origin
- You are unsure of the type of extinguisher you need or have
- If you can't control the fire within 30 seconds, abandon your efforts, close the door(s) and evacuate immediately.

Building Evacuation

You should familiarize yourself with the evacuation routes posted in all buildings, machines, office, storage sheds, and accommodation area. If an evacuation order is issued for your building, or if it were necessary to evacuate due to an emergency, fully cooperate with Safety and Security/emergency personnel and:

- Take only the keys, wallets and essential belongings with you
- If possible, wear weather appropriate clothing
- If you are the last one to exit your room close, and lock doors
- Leave the building immediately
- Do not investigate the source of the emergency
- Walk; don't run, to the nearest exit
- Use stairs, not elevators (currently there are no elevators planned in the resort)
- Assist people with special needs
- If there is no immediate danger, persons with disability/mobility limitations should shelter in place and call Safety and Security to report location and number of people needing assistance
- If there is imminent danger and evacuation cannot be delayed, the person with a disability should be carried or helped from the building in the best and fastest manner

(the person with the disability is the best authority as to how to be moved out of the building)

- If you are unable to evacuate, call Safety and Security and report your location
- As you make your way out, encourage those you encounter to exit as well
- Follow instructions of the Safety and Security or other identified emergency personnel
- Wait for instructions before returning to your building after an evacuation

Medical Emergency

If someone is injured or becomes ill:

- Stay Calm
- Dial the hospital or health centre 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 s/he is not moved
- Render first-aid or 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 jetty to flag down the Safety and Security when they reach the vicinity

Hostile armed Intruder (s)

If a hostile armed intruder is outside your building, get to a room that can be locked; close and lock windows and doors and turn off the lights. Try to get everyone down on the floor (so that no one is visible from outside the room).

Call the police and provide information as detail as possible with the exact location, number of intruders, etc.

Stay in place (calls from unfamiliar voices to come out may be the attacker attempting to lure you). Do not respond to any voice commands until you are sure that they come from a Police Officer, or a Safety & Security Officer

If a hostile intruder is INSIDE your building, exit (get out of) the building immediately and notify anyone you may encounter to exit the building immediately. Call the police and provide information as detailed as possible

If exiting the building is not possible, go to the nearest room or office. If you are locked out of all rooms, seek refuge in the nearest restroom, lock yourself in a stall and keep quiet. Close and lock the door and/or block it (try barricading the door with desks and chairs). Call the police and provide information.

Keep quiet and silence the cell phones, watches, alarms etc. Do not answer the door and do not respond to any voice commands until you are sure that they come from a Police Officer, or a Safety & Security Officer

If a hostile intruder enters your office or room or shed, remain calm and dial the police. If you can't speak, leave the line open so the Dispatcher can listen to what's taking place. Try to overpower the intruder only if you are sure of success.

If the hostile intruder leaves your area, and as soon as it is safe to do so, close and lock the door and/or block it (try barricading the door with desks and chairs) and call the police

If you decide to flee during a hostile intruder situation, make sure you have an escape route and plan in mind.

Do not carry anything while fleeing and do not attempt to remove injured people (leave wounded victims where they are and notify authorities of their location as soon as possible).
Move quickly, keep your hands up high and visible and follow the instructions of any Police Officers you may encounter as the police or security staff may treat you as a suspect. Do not leave until you have been interviewed and released

Utility Failure and Natural Disasters

Utility Failures

These may include electrical outages, plumbing failure/flooding, gas leaks, steam line breaks, ventilation problems, etc. For your personal safety, in the event of a utility failure, remain calm and immediately notify Safety and Security.

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

If passengers are trapped in an elevator (currently there is no plan for elevators in the resort), advise them to stay calm and tell them you are getting help. If it is safe for you to stay in the building, stay near the passengers until assistance arrives.
If you are trapped in an elevator, remain calm and use the Call Button of Phone to call for help. Do not try to climb out or exit the elevator without assistance

Floods

Minor or area flooding could occur as a result of a water main break, loss of power to sump pumps, or major multiple rainstorms. For imminent or actual flooding, and only if you can safely do so:

- Secure vital equipment, records, and other important papers
- If present in your area, report all hazardous materials, chemicals to security officers.
- Move to higher, safer ground
- Shut off all electrical equipment
- Do not attempt to drive or walk through flooded areas
- Wait for further instructions on immediate action from Safety 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 security officers
- If you are assisting with flood clean-up, report immediately to Environmental Health and Safety any oil, chemical, or hazardous materials suspected of mixing with flood waters

Storms

In case of a thunderstorms or cyclones,

- Go to underground excavation, 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
- Listen for reports and siren/public address announcements
- Avoid areas with glass windows or doors or areas with large, free-span roofs
- If out in the open, do not wait out the storm in a vehicle and 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

Earthquakes

In the event of an earthquake:

- Stay away from large windows, shelving systems, or tall room partitions and 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
- Do not evacuate until instructed by emergency personnel
- If out in the open, stay in an open area away from buildings, power lines, trees or roadways. If in a car, pull over and stop. Do not park under an overpass or near a building. Be cautious about driving again, in the event roads are damaged

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 Safety and 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
- Cooperate with emergency personnel, keep informed, and remain calm

Fire break out management monitoring checklist

Date of check	

Check points for fire management	Yes/No?
Are the fire equipment maintained in order and the equipment is available in the office, guest rooms, kitchen, and worker's accommodation area?	
The employees are competent to operate the firefighting equipment?	
The alarm testing was done weekly for the period of audit?	
The exits are clearly marked in and the doors that are side hinged are opening towards the exit?	
The employees are aware of the exits to be used in case of emergency?	
The contact numbers of the fire station are provided in the cottages, office, storage sheds and the susceptible areas?	
The fossil fuels and other flammable chemicals storage are adequate enough with proper ventilation.	
The cylinders are segregated with respect to gases and kept in upright positions?	
Employees/operators can differentiate between the gases?	
Any cylinder is near a heat source, steam pipe, hot equipment?	
Are the cylinders, hoses, valves and regulators well maintained and free from worn off or leaks?	
The electrical wiring and earthing have been done properly for all the equipment?	
Is the fire register maintained with near misses and incidents reported?	

Remarks and corrective actions if any

Checked By

7.4.8 Vessel and Boat Management Plan

Objective

To describe the overall requirements for monitoring and measurement to ensure that there is adequate control on safety of the boats, skis and vessels used at the resort.

Context

The context of this EMP is for the boats, jet skis and other vessel operations where there is a chance of an accident or collision resulting in a hull failure. This is applicable in operational phase of the project.

Legal requirements

The boats and skis have to comply to water transportation guidelines. They need to have the equipment safety certifications from the appropriate third-party verification bodies to have their seaworthiness.

Myanmar is signatory to the MARPOL 73/78 convention and hence the disposal of waste into the waters is prohibited. Myanmar is also party to International Convention for the Safety of Life at Sea, 1974 (SOLAS) and the International Maritime Dangerous Goods (IMDG) Code.

Management actions

- The periodic inspections and certification of the seaworthiness of the boats, vessels and other equipment shall be done regularly.
- The crew in the boats will be trained to inspect their vessel for leaks or any other damage including the fire fighting and emergency response equipment.
- The manufacturers maintenance checklist for the boats shall be used for inspections.
- The emergency contact numbers of the Ports and healthcare facilities in Kawthaung and Myeik will be listed in the vessels.
- There will be a 24-hour emergency contact helpline established in which the vessel crew or other vessels can report the accidents or any oil spills they come across to incident response teams.
- The crew will be trained in managing the accidents and any spillage including the use of spill kits.
- The resort and the vessels will maintain the safety equipment and spill containment booms, absorbents and other relate spill management kit with periodic inspections for quality.
- Mock response drills shall be done by the vessels at least once in a year.

Monitoring plans and responsibility

- Mock drills shall be conducted at least yearly with records kept for audits
- The spill response equipment shall be checked every month for adequacy
- There will be an audit done annually to assess the readiness for managing an accident.
- The vessel's captain shall be responsible to have the audits performed regularly.

Key Performance Indicators

Adherence to the mock drills, inspections and audits of the vessels and boats shall be 100%
The third-party verification for the vessels for its seaworthiness will be performed yearly.

Budgeted Cost

The cost of verifications and inspections for the vessels will be within USD 10,000 per year.

Vessel accident management monitoring checklist

Date of check	

Check points for fire management	Yes/No?
The inspection and certification of the seaplanes and boats are done appropriately?	
Are the fire and other emergency equipment maintained in order?	
The employees are competent to operate the emergency equipment?	
The contact points of the ports and townships provided are updated and working?	
The safety and spill response kit/equipment available in the resort and the vessels are in good condition?	
The fossil fuels and other flammable chemicals storage are adequate?	
The crew can differentiate between the gases and other chemicals?	
Any flammable gases or cylinder is near a heat source, steam pipe, hot equipment?	
Are the cylinders, hoses, valves and regulators well maintained and free from worn off or leaks?	
The electrical wiring and earthing have been done properly for all the equipment?	
Is the vessel incident register maintained with near misses and incidents reported?	

Remarks and corrective actions if any

Checked By

7.4.9 Food Safety Management Plan

Objective

To describe the overall requirements for monitoring and measurement to ensure that there is adequate control on food and beverage safety management, compliance with legal and other requirements, and to achieve objectives and targets.

Context of the EMP

The context of this EMP is for island resort hotel operations in Phoni and Balar Islands where there is a chance of vulnerability in the food and or beverage safety. This is applicable in operational phases of the project. The design and construction phase of the hotel is as per the ISO 22000:2018 standard for Food safety management.

The food areas considered for this standard cover the kitchens, food preparation areas, bars, food storage rooms-dry, cold and freezers, receive dock or Loading bay, garbage rooms, dish washing areas and housekeeping pantries.

Legal requirements

There are no regulations in Myanmar related to food safety management part from taking care of Public health safety.

Management actions for food safety

The pre –requisite programs for the food safety in the hotel project are as below

a) Facility Location

Facility boundaries will be clearly defined and controlled. The Access to the site will be controlled.

b) Environment

The facility will identify and take measures to prevent product contamination from local activities that could have adverse impacts. Effective measures will be in place to prevent product contamination from neighbouring properties. These measures will be periodically reviewed. Selection and management of the facility location will allow personnel to identify and control potentially negative impacts of surrounding operations.

c) Outside Grounds and Roof

Equipment stored outside will be placed to prevent pest harbourage and to make the inspection process easier. The weeds and tall grass near the building shall be cleared regularly. Roads, yards, and parking areas will be drained and maintained to prevent standing

water. The roof and structures will be well maintained. Waste containers and compactors will be closed or covered to minimize pest attraction and harbourage.

d) Drains

Drainage is designed and maintained to minimize the risk of product contamination. Drainage direction does not flow from a contaminated area to a clean area and the Drains do not pass over food processing areas. Where open floor drains are provided grids are in place and easy to clean. Equipment and drains are placed in a way that any processing discharges or overspill goes directly into a drain rather than on the floor. In wet process areas, floors are sealed and drained. Drains are trapped and covered. Floor drain covers/grates are easily removable for cleaning and inspection.

e) Layout

Space is maintained between equipment and structures to enable cleaning and maintenance. Routine housekeeping activities are on-going throughout operating hours in production and support areas to maintain a sanitary environment. Equipment shall be designed to minimize contact between the operator's hands and the products.

f) Floors

Process area Floors are made of materials that are impervious easily cleaned and kept in good repair. Wall/floor junctions and corners are designed and maintained to facilitate cleaning. Holes, cracks, and crevices in floor surfaces are periodically repaired to prevent debris from lodging and to avoid pest or microbial harbourage. Floors are designed to meet the demands of facility operations and withstand cleaning materials and methods. Floors shall be designed to avoid standing water.(e.g. sloped to direct the flow of water or effluent toward drains)

g) Walls

Walls are made of materials that are easily cleaned and kept in good repair. Walls are designed, constructed, finished, and maintained to:

- Prevent dirt accumulation
- Reduce condensation and mould growth
- Facilitate cleaning"

Holes, cracks, and crevices in wall surfaces are repaired to prevent debris from lodging and to avoid pest or microbial harbourage.

h) Ceilings and Overhead Structures

Ceilings are made of materials that are easily cleaned and kept in good repair. Access to the void in hollow or suspended ceilings is provided to facilitate cleaning, maintenance, and inspection activities. Ceilings and overheads are designed, constructed, finished, and maintained to:

- Prevent dirt accumulation
- Reduce condensation and mould growth
- Facilitate cleaning"

There is no flaking paint or rust on equipment or overhead structures. Only normal mild oxidation on non-food contact surfaces is acceptable.

i) Equipment and Utensil Construction

All equipment and utensils are designed and made of materials that are easily cleaned and maintained. Ingredient, product-holding, packaging, conveying, processing, and bulk equipment are designed and made of materials that are easily cleaned, inspected, and maintained. Food contact surfaces are corrosion-free, durable, made of non-toxic materials and able to resist repeated cleaning.

Equipment is able to meet established principles of hygienic design, including:

- smooth, accessible, cleanable surfaces, self-draining in wet process areas;
- use of materials compatible with intended products and cleaning or flushing agents;
- framework not penetrated by holes or nuts and bolts."

Piping and ductwork are cleanable, drainable, and with no dead ends. Wet and dry-cleaning programmes are documented to ensure that all kitchen, utensils and equipment are cleaned at defined frequencies. The programmes specify what is to be cleaned (including drains), the responsibility, the method of cleaning, the use of dedicated cleaning tools, removal or disassembly requirements and methods for verifying the effectiveness of the cleaning.

j) Air Makeup Units

Ventilation will be provided in product storage and processing areas to minimize odours, fumes, and vapours. Room air supply quality is controlled to minimize risk from airborne microbiological contamination. Air makeup units are fitted with clean filters and are free of mould and algae. Protocols for air quality monitoring and control are established in areas where products which support the growth or survival of microorganisms are exposed. Ventilation systems will be designed and constructed such that air does not flow from contaminated or raw areas to clean areas. Specified air pressure differentials are maintained. Systems will be accessible for cleaning, filter changing and maintenance. Fans, blowers, filters, cabinets, and plenums will be on the Preventive Maintenance Schedule to prevent mould, the development of microbes, insect activity, and foreign material collection. Exterior air intake ports shall be examined periodically for physical integrity.

k) Water Quality

The facility's water supply is from in house treated water plant and is periodically inspected for the quality of the water. Water, steam, and ice that contacts food and food contact surfaces are regularly monitored to ensure there is no risk to product safety. Water for cleaning or applications where there is a risk of indirect product contact (e.g. jacketed vessels, heat exchangers) meets specified quality and microbiological requirements relevant to the

application. Non-potable water has a separate supply system that is labelled and not connected to the potable water system.

Take measures to prevent non-potable water refluxing into the potable system. Back siphonage and backflow prevention units are identified in the Preventive Maintenance Program. Regular water samples are taken from underground well water supplies and surface water site according to local health department codes and government requirements.

l) Foreign Body Control

Based on the hazard assessment study, measures have been put in place to prevent, control or detect potential contamination such as adequate covers over equipment or containers for exposed materials or products, use of screens, magnets, sieves or filters or use of detection or rejection devices. Product rejections or unusual foreign material findings are investigated and Corrective Actions are taken to identify and eliminate contamination issues.

Foreign material control devices are appropriate to the product or process, and detect metal wear or contamination from the processing equipment. Staples and other items packaging related waste likely to cause product contamination are not used to reseal packaging materials after product sampling. Snap-off blades are not used in food preparation, or raw material storage areas. If foreign material that could damage the kitchen equipment such as sieve, mixers, blenders or scalper screens is found, that equipment will be immediately inspected for damage.

m) Temperature Measuring Devices

Temperature measuring devices, including thermometers, regulating controls, and recording controls, installed on any equipment that sterilizes, pasteurizes, or otherwise prevents pathogenic microorganism growth will be routinely calibrated as per the manufacturer's recommendations. If used in a process critical to food safety, temperature measuring devices will be calibrated to a national standard and the temperature measuring devices will be monitored on a frequent basis.

n) Preventive Maintenance Program

A preventive maintenance programme shall be in place that includes all the food preparation equipment, filters, sieves, mixers, grinders, transportation trolleys etc. Corrective maintenance is carried out in such a way that production on adjoining lines or equipment is not at risk of contamination. Maintenance requests which impact product safety shall be given priority.

The Maintenance Procedures will address the Post-maintenance cleaning, notification to teams handling food production, sanitation, hygiene, and/or quality assurance personnel as appropriate, Tools and parts reconciliation, Records of evaluation and sign-off by authorized personnel. Maintenance personnel will be trained in the product hazards associated with their activities.

o) Temporary Repair Materials

Care will be taken so that the temporary fixes (e.g. Tape, wire, string, cardboard, plastic, and other temporary materials) do not put product safety at risk. A request for replacement by a permanent repair shall be included in the maintenance schedule.

p) Lubricants

Lubricants and heat transfer fluids shall be food grade where there is a risk of direct or indirect contact with the product. Only food-grade lubricants are used on food processing and packaging equipment or on any other equipment where incidental food contact may occur. Lubricants used will be labelled, segregated, and stored in a designated, secure area. Food-grade and non- food-grade lubricants are kept separate from each other.

q) Glass, Brittle Plastics, and Ceramics Control

Adequate lighting is provided in all areas of food processing, storage and production. Light bulbs, fixtures, windows, mirrors, skylights, and other glass suspended over food preparation areas, ingredients, or storage area are protected to prevent breakage. Light fittings and glass are replaced in a way that minimizes the potential for product contamination. Only essential glass will be present in the facility there will be procedures to address glass container breakage in manufacturing, packaging, and storage areas.

r) Cross Contamination Prevention

Incompatible materials (such as raw and finished products) are stored separately to prevent cross contamination. Where required, hand sanitizers, foot baths, or automatic floor sanitizer sprays are provided to prevent microbiological contamination of food and processing areas. Toilet rooms do not open directly into food production, processing, or storage areas.

s) Compressed Air/Product Contact Gases

Gases intended for direct or incidental product contact (including those used for transporting, blowing or drying materials, products or equipment) are from a source approved for food contact use, filtered to remove dust, oil and water. Where oil is used for compressors and there is potential for the air to come into contact with the product, the oil used is food grade. Requirements for filtration, humidity (RH%) and microbiology shall be specified.

t) Cleaning

The facility will have cleaning procedures for all equipment, structures, and grounds that impact the storage, processing, and packaging of food products. This includes cleaning of cleaning equipment. The programs will also contain the post-clean inspections, verifications and checks.

u) Waste Disposal

Containers for waste and inedible or hazardous substances are:

- clearly identified for their intended purpose;
- located in a designated area;
- constructed of impervious material which can be readily cleaned and sanitized;
- closed when not in immediate use;
- locked in cases where the waste may pose a risk to the product.

Provision will be made for the segregation, storage and removal of waste. Licensed contractors will be used to remove waste, where required. Accumulation of waste is not to be allowed in food-handling or storage areas. Removal frequencies is managed to avoid accumulations, with a minimum daily removal. Labelled materials, products or printed packaging designated as waste are disfigured or destroyed to ensure that trademarks cannot be reused. Wastewater treatment systems will be managed and maintained to prevent development of microbial or pest management issues.

v) Pest Control

The building will have barriers in place to protect against birds, rodents, insects, and other pests. External opening windows, roof vents or fan, where present, are insect screened. Windows, doors and skylights that must be kept open for ventilation are screened to prevent pest entry. Storage practices shall be designed to minimize the availability of food and water to pests.

Material found to be infested shall be handled in such a way as to prevent contamination of other materials, products or the establishment. Potential pest harbourage (e.g. burrows, undergrowth, stored items) shall be removed. The detectors and traps are inspected at a frequency intended to identify new pest activity.

Birds will be controlled by exclusion with Nets and appropriate structural modifications
Insect Light Traps will use shatter-resistant lights and will be inspected periodically for maintenance.

w) Personal Hygiene/ Staff facilities

Personnel will wash their hands before beginning work, and after eating, drinking, smoking, using the restroom, or otherwise soiling hands. Staff canteens are managed to ensure hygienic storage of ingredients and preparation, storage and serving of prepared foods. Storage conditions and storage, cooking and holding temperatures, and time limitations, shall be specified. Employees' own food are stored and consumed in designated areas only.

Personnel who work in, or enter into, areas where exposed products and/or materials are handled wear work clothing that is fit for purpose, clean and in good condition. Work wear are laundered at intervals suitable for the intended use of the garments. Work wear provides adequate coverage to ensure that hair, perspiration, etc. cannot contaminate the product.

Hair, beards, and moustaches are protected (i.e. completely enclosed) by restraints unless hazard analysis indicates otherwise. Where gloves are used for product contact, they are clean and in good condition. Use of latex gloves should be avoided where possible. Shoes for use in processing areas will be fully enclosed and made from non-absorbent materials.
Personal cosmetics Items such as nail polish, false nails and Jewellery shall be controlled to avoid food contamination. Employees are required to report illness such as jaundice, diarrhoea, vomiting, fever, skin diseases to the management for possible exclusion from food-handling areas. In food-handling areas, personnel with wounds or burns are required to cover them with specified dressings. Any lost dressings shall be reported to supervision immediately.

x) Approved Supplier Program

The suppliers and contractors shall be evaluated and approved for their quality prior to being engaged. Delivery vehicles are checked prior to, and during, unloading to verify that the quality and safety of the material has been maintained during transit (e.g. integrity of seals, freedom from infestation, existence of temperature records). Materials are inspected, and tested to verify conformity with specified requirements prior to acceptance or use.

y) Food Defence Program

The site will assess the hazard to food products posed by potential acts of sabotage, vandalism or terrorism and shall put in place proportional protective measures. Physical security measures are put in place to help guard help guard against intentional product contamination such as Perimeter fences, Surveillance cameras, Locked doors, Security guard stations, Controlled access and Controlled bulk storage areas.

Monitoring plans and responsibility

Audits shall be conducted once in every six months (half yearly) for the food safety management. The Hotel manager shall be responsible to have the audits performed regularly.

Key Performance Indicators

1. There will not be any food safety incidents affecting the employees or the guests at the resort.
2. Adherence to the audit plan shall be 100%

Budgeted Cost

The initiatives involve only the time by the staff and hence covered in their salaries.

Food safety management monitoring checklist-Resort

Date of check	

Check points for Food safety management	Yes/No?
Are the pre-requisites of the food safety management systems are in place for the hotel that covers the • Hotel facility, premises, kitchens, drains • Infrastructure for food production, • Equipment and machinery, • Cleaning and sanitation schedules, • Pest management, • Supplier approval	
Are these systems adequately followed and updated periodically?	
Is the Hazard analysis and risk assessment performed for the food production, processing and supply to the customers?	
The potential contaminations from physical foreign material, micro-biological organisms, chemical composition or allergens are adequately identified for each process and periodically monitored?	
Are corrective actions taken adequately related to short comings and findings during periodic checks?	
Are the employees and operators aware of the procedures and check points needed in the food management system?	
Are the temperature control system in the equipment, machinery and devices calibrated to give satisfactory performance?	
Is the water quality of the facility that cover the hot and cold water, ice, steam adequate and the periodic check records are available?	
Are there chances of contamination or cross contamination in the food production?	
Is the record keeping for the food safety management adequate and updated with?	
Are the employees and operators competent enough for the quality food production, service and are regularly trained to upgrade them?	
Is there adequate work infrastructure and work wear to enable food safety?	

Remarks and corrective actions if any

Checked By

8.0 Public Consultation & Stakeholder Engagement

8.1 Overview, Methodology and and Approach

The consultation with the affected parties or the stakeholders is an integral part of any EIA study and specifically, the social impact assessment has no meaning if the public consultation is not performed with impartiality and transparency. The process is about disclosing the project details and involving them in determining the environmental and social issues and formulating workable solutions. A poorly performed consultation results in under reporting the negative things (details of destruction of environment) and over reporting the positive things (number of jobs to eb created) to mislead the stakeholders. A stakeholder consultation, when performed transparently with involvement of the affected communities can actually help the project owner in running the project better and the project in study being an island resort near a protected marine national park, the local community involvement is very important for the functioning in future.

The EIA consultants have been visiting the project affected area since January 2017 having made numerous meetings with the villagers in Aung Bar, Nyaung Wee and Majhun Galet. All of these affected villages fall under the village tract od Su Nge Par Line that has 13 villages. The village head of the tract had changed in the start of 2018 and the EIA consultants have made sure that the perceptions of both the heads have been captured. These interactions have resulted in assessing the current socio-economic situation of the villages and the concerns the people have about the project.

There have been public forums conducted in Kawthaung town inviting the people from the islands, elected representatives, government officials and NGOs where the project details were presented and the issues discussed openly. The forums ensured that there is participation from the Moken sea gypsies or the Salone communities in these meetings. The meetings were held with sufficient notice period provided and the content shared to the village heads in advance. Additional to this there were numerous meetings held in Aung Bar, Majhun Galet and Nyaung Wee to discuss about the effect of island resort development. All the meetings were held in Myanmar language with translation to the Salone as necessary.

The EIA consultants have been able to mediate between the villagers and the project owner to give assurance to the affected parties about jobs in the resort, access to project islands and surroundings, effluent let off and freshwater drawing. Since the concept stage, the project owner, Amata International co Ltd has kept the government, local authorities, village heads and the surrounding neighbourhood about the progress of the project without fail. They have taken initiatives to have the news about the project being published in newspapers, social media platforms and websites.

8.1.1 Identification of stakeholders and groups affected by the project

The identification of the stakeholders was performed with the objective of covering all kinds of affected people due to the island resort construction and operation and to obtain their views and perceptions about the project. To identify the stakeholders, the consultants performed research about the Mergui Archipelago, the villages near to the islands of Phoni and Balar namely, Aung Bar, Nyaung Wee and Majhun Galet, the survey reports of the other projects in the region, the social indicators provided in the government published documents such as the Census report, visited the government administration departments in Kawthaung.

The stakeholders identified for the project activity are the people living in the surrounding area of the project islands of Phoni and Balar. They are the villagers of Nyaung Wee, Majhun Galet and Aung Bar, the local government departments related to General administration, Hotel & Tourism, Forests, Environmental Conservation, and fisheries, Marine transport, elected members of Parliaments of the Kawthaung township, the managers of the 115 island resort project, civil societies and NGOs in the region and the ethnic minority groups in the area.

Stakeholder	Reason for Interest in the Project
Villagers from 1. Aung Bar, 2. Nyaung Wee and 3. Majhun Galet	Reduction in Water resources
	Job opportunities from resort
	Pollution from Effluent and solid waste
	Restriction in access to island and waters
	Protection of ethnic minorities- Salones
	Clear the uncertainty about project
Elected Representatives- MPs	Representative of the people
	Access to policy makers
	Economic progress of the region
	Prevent abuse of natural resources
	Protection of ethnic minorities- Salones
	Clear the uncertainty about project
General administration department	Overall responsibility in the areas
	Protection of ethnic minorities- Salones
Marine Transport	Sea Transport related responsibility
Fisheries & Livestock Department	Fisheries related responsibility
Forest department	Forest land related responsibility
Water resources department	River related regulation
Environmental Conservation Department	Prevent Environmental degradation
115 Island Project	Cumulative impacts
Civil societies and NGOs	Prevent Environmental degradation
	Protection of ethnic minorities- Salones

Table 0-1 The stakeholder Identification for the project

8.2 The Public Consultations

The project owner has kept continuous communication with the local NGOs and the local government authorities disclosing the details of the project, development plans and has taken keen interest to have the progress disclosed in the form of publishing in social media platforms and websites.

The EIA consultants, MyAsia Consulting Co Ltd have been visiting the Mergui Archipelago islands since January 2017 for the assessment of environmental and social impacts of island resort projects. The affected areas are the villages in the Su Nge Par Line Village tract that encompasses the project islands (Phoni and Balar Islands) and the Lampi Marine National Park.

Dates of meetings	Location of meeting
10th January 2017	Aung Bar Village
27th January 2017	Aung Bar Village
06th February 2017	Aung Bar, Majhun Galet and Nyaung Wee villages
7th February 2017	Kawthaung Public meeting
16th March 2017	Aung Bar Village
05th May 2017	Aung Bar Village
17th May 2017	Kawthaung Public meeting
12th July 2017	Aung Bar Village
13th & 14th July 2017	Majhun Galet and Nyaung Wee villages
22nd September 2017	Aung Bar Village
8th October 2017	Majhun Galet, Pulonetontone and Nyaung Wee villages
09th October 2017	Kawthaung Public meeting
25th & 26th March 2018	Aung Bar, Majhun Galet and Nyaung Wee villages
18th December 2018	Aung Bar, Majhun Galet and Nyaung Wee villages

Table 0-2 The socio-economic surveys and public stakeholder meetings conducted

The project affected villages that come in the area near the island resort projects are Aung Bar, Majhun Galet (also used as Makyun Galet) and Nyaung Wee. Majhun Galet village is in the Bo Kyaw Island that is inside the Lampi marine Park zone. Nyaung Wee village is in the Nyaung Wee Island and Aung Bar village is a coastal village on the mainland from where the project islands can be accessed. The Moken sea gypsies, locally known as “Salone” live in the villages of Majhun Galet and Nyaung Wee.

The consultants during their various site visits as stated in the above table, from January to December 2018, had performed field surveys of the surrounding neighbourhood and

interacted with the government authorities related to Tourism, Forest, Water Resources, Fisheries and General Administration.

They also met with the officers of Nature and wild life conservation Division in Majhun Galet and the activists for conservation of Salons and Lampi Park. The NGO Kannee Family Altruism for ocean clean-up was interviewed to have understanding on the marine pollution and effect of resorts. The commercial trade associations met were the Kawthaung Merchants Association and Fishery Association for Shallow Waters.

The consultants confirm that the government officials, regulators and the authorities are aware of the project progress. The neighbouring villagers in Aung Bar are also aware of the island resort project. The EIA consultant has published the project on-going study in their website on 18th March 2017 after the field visit for scoping phase which was kept updated after each visit and public meeting.

Figure 0-1 U Htay Naing, the then head of Su Nge Par Line Village tract- 1st meeting

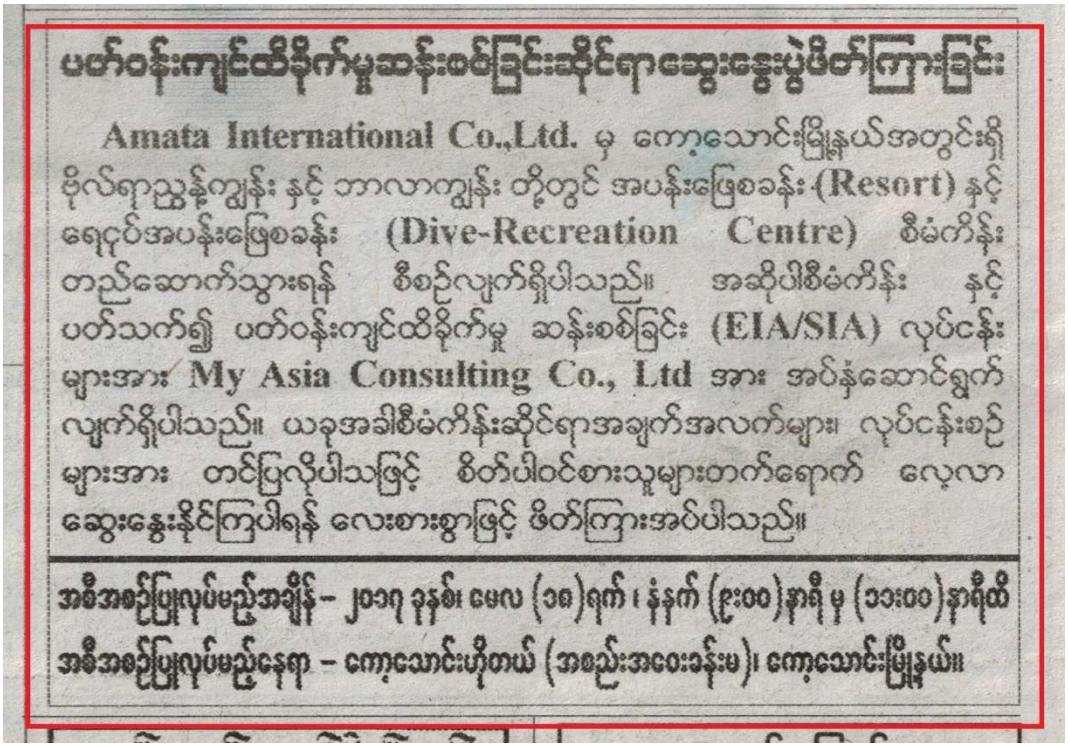
The first time the villagers of Su Nge Par Line village tract attended the public meeting related to EIA/SIA study on island resort projects in their region was on 7th February 2017 where they had raised their concerns about all the upcoming projects. This meeting was conducted in Garden Hotel in Kawthaung. The invitations were done in January 2017 with publishing in the newspaper, putting up notice in the Aung Bar jetty and personal invitations to the head of village tracts, government officials and the elected representatives and personnel from the NGOs and civil societies.

Sr.	Contact Name	Designation	Location
1	U Htay Naing	Village tract head	Aung Bar
2	U Htin Kyaw		Aung Bar
3	U Linn Naing		Padauk Shwe War
4	U Myo Zaw Oo		Annawar
5	U Khin Mg Htwe	Environmental Activist	Majhun Galet
6	U Sein Myint	Teacher	Majhun Galet
7	U Aye Naing	Villager	Majhun Galet
8	U Zaw Htun Aung	Villager	Majhun Galet
9	Ko Ye Linn Aung	Villager	Majhun Galet
10	U Aung Sein	Villager	Nyaung Wee
11	Daw Htay	Villager	Majhun Galet
12	U Thet Naing	NLD Representative	Majhun Galet
13	U Soe Myaing	YatMi Yar Pha	Aung Bar
14	U San Htay	Villager	Nyaung Wee
15	U Htoon Aung	Villager	Nyaung Wee
16	U Ye Yin Naung	Villager	Aung Bar
17	Ko Aye Ko	Villager	Aung Bar
18	U Tin Aung	Representative	Majhun Galet
19	Daw Tin Mar Cho	Villager	Majhun Galet
20	U Nyunt Win	Villager	Majhun Galet
21	U Ye Naing Tun	Villager	Majhun Galet
22	U Lwan Moe	Travel & Tourism	Kawthaung
23	U Myo Lwin	Villager	Aung Bar
24	Ko Tun Tun	Villager	Aung Bar
25	Ko Tun Myint Tun	Villager	Annawar
26	U Thet Naing	Htoo group Island resort	Yangon

Table 0-3 The attendees for the public stakeholder meetings on 7th February 2017

The notification about the second public meeting on 6th May 2017 in English and Myanmar language was published in the social media platforms of the EIA consultants and on 13th May 2017 in the newspaper “Mirror Daily” as invitation to attend and provide their comments. The invitations to government departments, NGOs and the representative of the villagers near the project island was done personally in the days 4th, 5th and 6th of May 2017. The date of stakeholder consultation was fixed after taking the opinion from the villagers near the project site. An invitation in Myanmar language was displayed at the Aung Bar jetty for the villagers.

Figure 0-2 The notice in front of Kawthaung Hotel for the 2nd meeting



ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာဆွေးနွေးပွဲဖိတ်ကြားခြင်း

Amata International Co.,Ltd. မှ ကော့သောင်းမြို့နယ်အတွင်းရှိ ဗိုလ်ရာညွန့်ကျွန်း နှင့် ဘာလာကျွန်း တို့တွင် အပန်းဖြေစခန်း (Resort) နှင့် ရေငုပ်အပန်းဖြေစခန်း (Dive-Recreation Centre) စီမံကိန်း တည်ဆောက်သွားရန် စီစဉ်လျက်ရှိပါသည်။ အဆိုပါစီမံကိန်း နှင့် ပတ်သက်၍ ပတ်ဝန်းကျင်ထိခိုက်မှု ဆန်းစစ်ခြင်း (EIA/SIA) လုပ်ငန်း များအား My Asia Consulting Co., Ltd အား အပ်နှံဆောင်ရွက် လျက်ရှိပါသည်။ ယခုအခါစီမံကိန်းဆိုင်ရာအချက်အလက်များ၊ လုပ်ငန်းစဉ် များအား တင်ပြလိုပါသဖြင့် စိတ်ပါဝင်စားသူများတက်ရောက် လေ့လာ ဆွေးနွေးနိုင်ကြပါရန် လေးစားစွာဖြင့် ဖိတ်ကြားအပ်ပါသည်။

အစီအစဉ်ပြုလုပ်မည့်အချိန် - ၂၀၁၇ ခုနှစ်၊ မေလ (၁၈)ရက်၊ နံနက် (၉း၀၀)နာရီ မှ (၁၁း၀၀)နာရီထိ

အစီအစဉ်ပြုလုပ်မည့်နေရာ - ကော့သောင်းဟိုတယ် (အစည်းအဝေးခန်းမ)၊ ကော့သောင်းမြို့နယ်။

Figure 0-3 The invitation for 2nd stakeholder's meeting- The Mirror Daily-13-05-2017

Figure 0-4 The head of Su Nge Par Line village tract in 2017, U Hytay Naing

Figure 0-5 With U Myo Oo, the current village tract head, Su Nge Par Line

The stake holder's meeting was scheduled in Kawthaung Hotel, Kawthaung for 18th May 2017. However, the villagers requested to change the date to 17th May 2017 due to other engagement.

Sl No	Name	Department/Designation	Village Name
1	U That Naing	Htoo Group of Company	Yangon
2	U Myint Oo	Amata International Co., Ltd.	Yangon
3	Daw Yin Htwe	CEC member-National League for Democracy	Kawthaung
4	Daw San San Mon	CEC member-National League for Democracy	Kawthaung
5	U Myo Tint Htoo	Deputy District officer-Kawthaung	Kawthaung
6	U Myo Zaw Oo	88 Generation	Kawthaung
7	U Tun Myint	Union Solidarity and Development Party (USDP)	Kawthaung
8	U Ba Shwe	CSO Social Services	Kawthaung
9	U Htay Naing	Head- Su Nge Par line village tract	Aung Bar
10	U Kyaw Htun	CSO Welfare-Thaung Phyu village	Kawthaung
11	U Kyaw Khaing	CSO Shwe Pyi Soe welfare association	Kawthaung
12	U Kyaw Khaine	CSO Welfare-Thaung Phyu village,	Kawthaung
13	U Ye Lin Zaw	Activist, ASEAN Heritage Lampi park	Majhun Galet
14	U Seain Myint	Activist	Majhun Galet
15	U Than Htwe	Villager	Majhun Galet
16	U Su Nge	Villager	Majhun Galet
17	U Nyunt Win	Head master-State Middle School	Majhun Galet
18	Daw Kaythe Oo	Villager	Aung Bar
19	Daw The Moet Moet Aye	Villager	Aung Bar
20	Daw Ohma Soe	Villager	Aung Bar
21	Daw Aye Thanda Oo	Villager	Aung Bar
22	Daw Win Sanda	Villager	Aung Bar
23	Daw Maw Maw Lwin	Villager	Aung Bar
24	Daw Than Win	Villager	Aung Bar
25	U Tain Min Hlaing	Villager	Aung Bar
26	Daw Aye Aye Mar	Villager	Aung Bar
27	U Ye Yint naung	Villager	Aung Bar
28	U Nyunt Win	Villager	Nyaung wee
29	U Myo	Villager	Nyaung wee
30	U That Naing Oo	Villager	Nyaung wee

Table 0-4 The list of attendees for the public meeting on 17th May 2017

The presentation was made in English with translation to Myanmar as the attendees could not follow English. The EIA consultant, Dr Mon Myat headed the meeting with explanation about the project operations and the possible impacts. The Project owner, answered the queries raised by the villagers, government officials, and the representatives of the NGOs.

Figure 0-6 The presentation made to the attendees on the project and its impacts

Figure 0-7 Dr Mon Myat explaining the project details and the impacts

The stakeholders' meeting was held from 0930 to 1230 on 17th May 2017 at Kawthaung Hotel in Kawthaung. There were representations from the Moken Sea Gypsies as well. They had raised the concern about the access restrictions to the islands, surrounding waters and its freshwater source in the island due to the project development.

Figure 0-8 The representative of the National League for Democracy-Kawthaung

Figure 0-9 U Myo Tint Htoo, the Deputy District Officer-Kawthaung District

The NGO for environmental conservation from Majhun Galet had concerns about the project progress being disclosed once the construction of the resort starts. They wanted to have the report contents to be also made in Salon language for the benefit of the sea gypsies which was made available by the EIA consultants within June 2017.

Figure 0-10 The villagers listening to the presentation

Figure 0-11 The then head of Su Nge Par Line village tract, U Htay Naing

It was ensured that there is enough women participation in the public meeting as the first meeting had only two ladies attending the meeting. The second meeting had 10 ladies attending and raising questions.

Figure 0-12 The villagers listening to the EIA SIA study presentation

Figure 0-13 The MP speaking in the third public meeting on 9th October 2017

The third meeting was on 9th October 2017 in Victoria Cliff hotel with 30 participants attending.

Sl No	Name	Department/Profession	Location
1	HE Dr Khin Mg Win	Representative to National Hluttaw	
2	HE Dr Khin Zaw	Representative to Pyithu Hluttaw	
3	U Ne Tun	NLD Party EC, Kawthaung District	Kawthaung
4	U Thet Naing	Chairman NLD party, Kawthaung	Kawthaung
5	Daw Yin Htwe	CEC, NLD party, Kawthaung	Kawthaung
6	Daw Aye Mar win	Regional level youth connect-Kawthaung	Kawthaung
7	U Than Nain	Htoo Group of companies	Yangon
8	U Myo Min Soe	Operation Manager for 115 Project	Yangon
9	U Tun Lwin	115 project team	Kawthaung
10	U Than Zaw	115 project team	Kawthaung
11	Ko Kyaw Thu	Shwe Pyi Soe Youth NGO	Kawthaung
12	Ko Tun Win Aung	Shwe Pyi Soe Youth NGO	Kawthaung
13	U Zin Ko Oo	Village administrator-Pulonetontone	Pulonetontone
14	Ko Htin Kyaw	88 peace & transparency NGO	Kawthaung
15	U Myo Zaw Oo	88 Generation NGO	Kawthaung
16	U Juli Win	Administrator-Aung Myanmar village	Aung Myanmar
17	U Ye Myint	Administrator-Aung Myanmar village	Aung Myanmar
18	U Aung Sein	Villager	Nyaung Wee
19	U Ho Sein	Villager	Nyaung Wee
20	U Min Lwin	Chairman-Fishermen Association	Kawthaung
21	U Htay Naing	Administrator-Su Nge Par Line village tract	Aung Bar
22	U Ko Latt	Administrator-Aung Bar village	Aung Bar
23	U Myo Lwin	villager	Nyaung Wee
24	U Htay Aung	villager	Nyaung Wee
25	U Win Then	villager	Nyaung Wee
26	U Htay Lwin	villager	Nyaung Wee
27	U Soe Tun	villager	Aung Myanmar
28	U Nyunt Win	villager	Majhun Galet
29	U Su Nge	villager	Majhun Galet
30	U Zaw Lwin Lay	villager	Majhun Galet

Table 0-5 List of attendees for the meeting on 9th October 2017

Figure 0-14 The public meeting session in progress on 9th October 2017

Figure 0-15 The consultant at Aung Bar with village head and his assistant.

8.2.1 Consultation with the Government Authorities

The consultation with the government departments related to the project was undertaken by the EIA consultant. They had made visits to the MIC and DICA to gather information about the project and also had interviewed the officers to get their perception on the island resort project. The government offices interacted in Kawthaung to seek the project awareness and the project owner's communications were as below

Name	Designation	Departments in Kawthaung
U Ye Htut	Township Officer	Forest
U Myint Shwe	Deputy Director	Fisheries
U Hlan Moe	Assistant Director	Hotel & Tourism
U Than Htay	Deputy Township Officer	Marine Administration
U Myint Thein	Deputy Township Officer	General Administration
U San Oo	District Officer	Waterway Directorate
U Kyaw Moe Lwin	Head officer	Merchants Association, Kawthaung

Table 0-6 Meeting list with the government authorities in Kawthaung

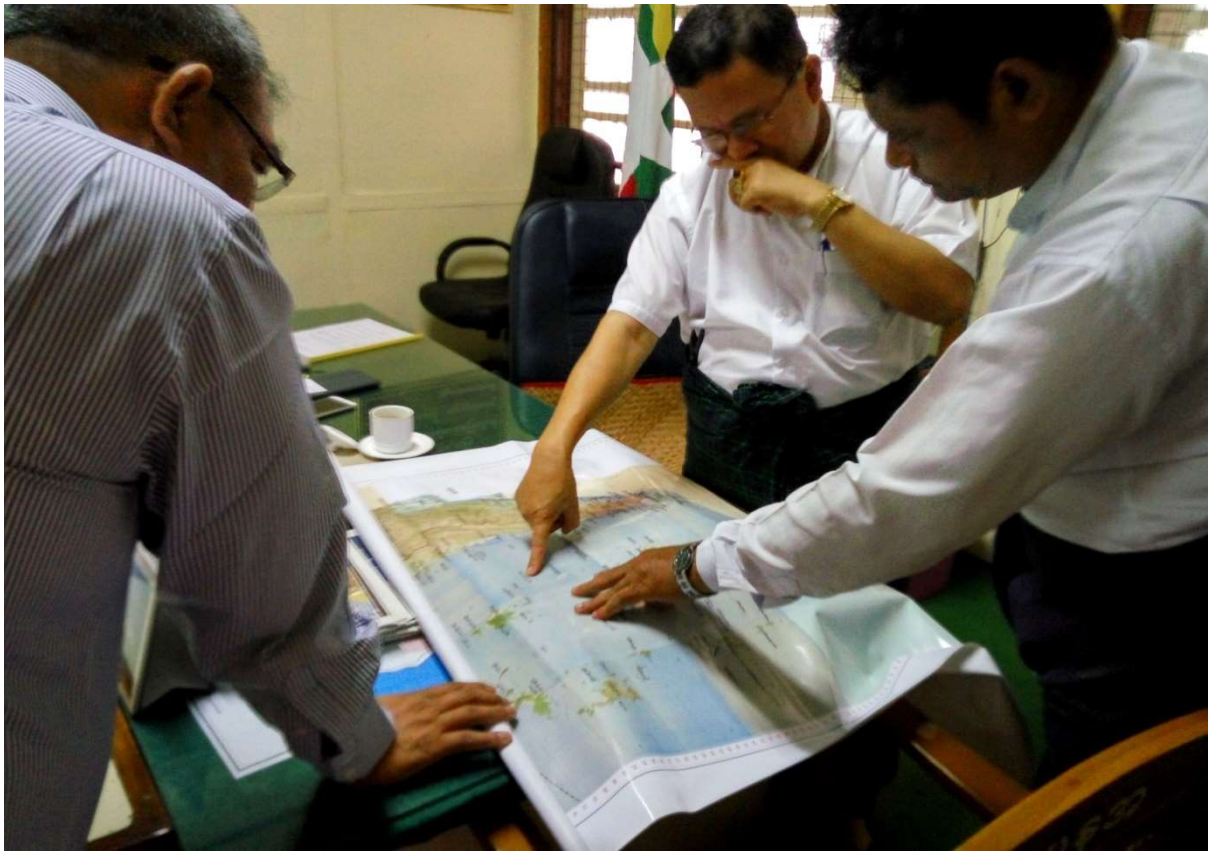


Figure 0-16 The meeting with the General administration department-Kawthaung

The government officers were found to be well aware of the island resort projects and were hopeful that such projects will improve the tourism in the area.

8.2.2 Consultation with the Affected People

Figure 0-17 A Salone sea gypsy girl in Majhun Galet village

Figure 0-18 The school in Majhun Galet village

The groups that are affected by the project are the people in the neighbourhood villages Aung Bar, Nyaung Wee and Majhun Galet. The Moken sea gypsies or Salons in the project area and are also affected party of the development. They had also attended all the three public meetings held in Kawthaung.

Figure 0-19 A Betel leaf seller in Aung bar Village

Figure 0-20 A villager in Majhun Galet preparing the squid traps

Figure 0-21 Youngsters playing pool at Aung Bar village

Figure 0-22 A fisherman in Nyaung Wee village repairing his boat engine

Figure 0-23 The fishermen selling their catch at Aung Bar Jetty

Figure 0-24 The villagers participating in fire drill at 115 Island Project

8.3 Results of Consultations

8.3.1 Meetings with local administrations

The meeting with the local authorities confirmed that the project owner has disclosed the project progress in time to the authorities; mainly for the smooth functioning of the project. The officials in all the government departments related such as the Hotel & Tourism, General administration, Marine transport, Fisheries, and Forest were well aware about the island resort coming up in the islands of Phoni and Balar and they have full knowledge about the public meetings held, the overall opinion and perception of the villagers and the islanders.

The administrators and the elected representatives were present in the public meetings and had raised their concerns in the development of these projects and the effect and impacts to the communities. Due to presence of many stakeholder sessions relating to the Lampi park, the authorities have fair knowledge about the environmental and social issues faced by people and the role of EIA study and the need to enforce the recommendations in the Environmental management Plans (EMPs).

8.3.2 Meetings with affected communities and people

Figure 0-25 Meeting with the village head of Majhun Galet, U Mg San

Summary of the Public Consultations in Kawthaung
Dates of Meeting- 7th February 2017, 17th May 2017 and 9th October 2017
Participants from villages- List provided above
Participants from the Consultant- Dr Mon Myat, Mr. Syju Alias
Concerns raised by the Villagers
Concern 1- The villagers access the freshwater resources in the Phoni island. Additional to that, the fishermen and the Salone people use the islands as resting points sometimes. The marine waters around the two islands of Phoni and Balar are squid fishing points for the Salone. The villagers feel that once the project is operational, these accesses to freshwater, islands and the surrounding marine waters will be restricted by the resort security for the privacy of the guests. ***Reply-*** The Project owner has accepted that the development of the resort will be restricted to only 10 acre each on the islands and they will leave the rest of the islands as it is. The freshwater source is outside the area for cottage development. They have agreed that the security forces in the resort will not drive away any salone or fishermen from the surrounding waters or the project islands. ***Villager's Response-*** Acceptable to the people if the Project owner do as they promise
Concern 2- The priority for Jobs in the construction as well as the operational period to be given to the villagers as they are affected by the project. They are afraid the construction contractor will bring the labor from outside. ***Reply-*** As the location is remote, it is convenient for the Project owner to hire locally than bringing from outside. The project owner has accepted that they will hire as far as practically possible from the villages as they do not want to have an attrition issue. Moreover, the local people will have better knowledge of the islands and the waters. ***Villager's Response-*** Acceptable to the people if the Project owner do as they promise
Concern 3- The resort should not pollute the marine waters or the freshwater resources in the island by dumping solid waste or by letting of wastewater. ***Reply-*** The solid waste management will ensure no dumping in the sea; composting will be done at the site. The wastewater will be treated to avoid the effluent let off ***Villager's Response-*** Acceptable to the people if the Project owner do as they promise
Concern 4- The resort drawing huge amounts of freshwater from the ground will reduce the water resources and hence the conservatory measures to be done ***Reply-*** The water recycling is planned for the resort and also other water efficient methods will be employed for the operation to reduce consumption. ***Villager's Response-*** Acceptable to the people if the Project owner do as they promise

Table 0-7 The summary of concerns raised during the meetings

The EIA consultants during their interactions with the villagers in Aung Bar, Majhun Galet and Nyaung Wee has assessed the perception of villagers about the developing island resort

projects in the region and its effect on their livelihoods. The main concern of the villagers is that once the projects are operational, they may be restricted with access to these uninhabited islands, its surrounding waters and the freshwater sources in the islands. The main livelihood of the sea gypsies is fishing for squids near the islands and they are worried that the project security will drive them away. The fishermen and the sea gypsies use these uninhabited islands as stop over or rest points during their movement around the marine waters.

The project owner has agreed with the villagers that they will not restrict access to any of their resort islands, or its surrounding waters and will not stop the villagers from drawing freshwater from the Phoni Island. They have assured that the development of the resort will be only within the 50 acres identified on each of the islands for resort development. The rest of the islands will be left as it is as a habitat conservatory measure.

The villagers are aware about the job creation potential and the economic development that the projects can bring to the region. Hence the villagers are trying to develop their skills to suit the hospitality market through vocational trainings arranged by the local governmental departments and the NGOs in the region. The villagers are also training themselves to make souvenirs and handicrafts from shells and damaged fishing equipment.

Figure 0-26 The handicrafts made from used fishing equipment left overs

The villagers have confirmed that they have been provided with employment by the island resort developers for the preliminary preparatory work for construction and they have reasonable confidence that the project construction will give them further employment. The project owner has agreed with the village heads that they will source the manpower from local communities for the construction and operations as far as practically possible. The expected direct job creation is around 40 during construction and 60 during operations.

The project owner will communicate the EIA report summary and the formulated EMPs to the neighbouring villagers. The aim is to help each other in case of emergency such as fire accidents or an environmental incident. The project owner will also join the hotel association for smooth operation and link with the authorities. As a means to mitigate the cumulative impacts of many resorts, the project owner also will take initiative to form resort operators association and work in coordination to spread awareness on green tourism.

Figure 0-27 The meeting with villagers in Nyaung Wee village

8.3.3 How the Concerns were taken into account

The EIA consultants focussed on capturing the concerns of the people and were acting as mediators for the negotiations between the affected parties and the Project owner. There were several rounds of discussions on these topics since January 2017 and the project owners finally agreed to have

1. Wastewater treatment for recycling effluent,
2. Composting of Solid Waste to avoid dumping
3. Access to the villagers for the islands and the marine waters
4. Jobs for local villagers in construction and operation

Figure 0-28 U Moe Tain, The of Kannee Family Altruism, NGO for ocean clean-up

Figure 0-29 U Pe Win, The of Fishery Association of Kawthaung for shallow waters

The consultants also interacted with other project developers in the regions; the interviewed projects were that are developed in Bo Nat Kyaw Island (K future Co., Ltd[137]), 115 Islands (Cocoon Hotels Co., Ltd of Htoo Hospitality group[138]) and Nyaung Oo Phee[139] Island (TZK Hotels Ltd). The developer of Nyaung Oo Phee island resort already operates the Victoria Cliff Hotel and Resort in Kawthaung town on the mainland. The representative of the Htoo Hospitality Group attended all the three public meetings held in Kawthaung.

Figure 0-30 The advertisement of Nyaung Oo Phee resort in Kawthaung Jetty

Figure 0-31 The advertisement of Victoria Cliff resort in Kawthaung Airport

137 http://www.kfuture.org/K-Future/profile
138 https://htoohospitality.com/
139 http://www.nyaungoopheeresort.com/

Figure 0-32 Myanmar Andaman Resort picking guests from Kawthaung Airport

Figure 0-33 Grand Andaman Resort boat transporting guests from Kawthaung Jetty

8.4 Disclosure

The assessment outcome and recommendations have to be disclosed to the public in a transparent and timely manner. The project owner as well as the EIA consultant had published the reports relating to the scoping phase in their websites, Facebook pages and LinkedIn pages. The reports had more than 100 views.

The copy of the EIA report including the EMP shall be communicated by the project owner in their websites and other social media platforms. The EIA consultant also will publish the report in their websites and social media pages. The formulated EMP shall be communicated to the nearby villagers in hard copies. The report contents will also be translated to the Salon language for the understanding of the sea gypsies and distributed.

8.4.1 Preparation and dissemination of booklet (Myanmar language)

The presentation was done in Myanmar language for the affected parties as most people cannot follow English during the public consultation. The EIA report summary along with the mitigation measures to be undertaken in Myanmar language was provided to the villagers in hard copies. A translation to Salon language was also done and hard copy was provided to the villagers.

8.4.2 Media

The information about the public consultation was published in the newspaper The Mirror Daily, webpage of the EIA consultant, and webpage of the project owner for better awareness. It was confirmed that the villagers have good understanding of the project progress during the interactions. The scoping report, the visits to the villages and the project islands were all presented with access to public.

8.4.3 Future Plans and Development

The project owner plans to continue with their community service and corporate social initiatives in development of schools, housing, water supply systems and health care for the people of surrounding villages. They have already provided donations of rice and financial assistance to enhance the conditions in the village.

9.0 Conclusions and Recommendations

The proposed island resort and dive centre by Amata International Co.' Ltd in Phoni and Balar Islands will construct a total of 50 guest rooms of which 30 are in Phoni and 20 are in Balar Island, permanent jetties for docking on each of the islands, a common swimming pool, staff accommodations, and office buildings. There are numerous dive sites in the Mergui Archipelago and the dive centre and resort will be able to capitalise on the upcoming tourism market in the southern Myanmar.

The island resort will be open to guests and be operational during 8 months in a year except the four months of monsoon. The project operation is estimated to consume a maximum of 88,700 Gallons of Diesel and a maximum of 16,400 Gallons of water per day. These consumptions are estimated considering maximum occupancy for all the operational days of the resort for conservativeness.

The islands near the Mergui archipelago have caught the attention of resort developers and already two such resorts are operational in the area. The permits have been granted for 8 more island resorts apart from the project under the EIA study. Additionally, there are around 20 other resorts seeking permissions to set up in the project area under the townships of Kawthaung and Bokpyin. Once all these island resorts are operational, the already increasing number of visitors will grow exponentially making it a popular tourist haven in a span of 4- or 5-years' time.

Such a development will provide livelihoods for the villagers nearby directly and indirectly by creating a tourism value chain. The construction phase can give around 40 jobs and the operational phase can generate around 60 jobs to the local population. The tourism value chain will boost the economy and provide indirect jobs in the sectors of trade, restaurants, bars, eateries, souvenir shops, transportation services, equipment sale and lease, and guide services.

However, the tourism boom also come with negative impacts cumulated with around 30 island resort projects in the area. The potential negative impacts of the projects operation and construction phases are

- The Greenhouse Gas emissions from the fuel usage
- The depletion of fossil fuels such as Diesel, a natural and national resources
- The depletion of Freshwater resources, another natural and national resource
- The marine water pollution from waste water discharge to the sea,
- The deforestation of 10 acres of vegetation in each of the islands,
- The potential soil erosion to the marine waters during construction phase,
- The solid waste generation from food, packaging, bottles etc,
- The air and noise emissions from operation and construction phases,
- The restriction of access to island, its surrounding waters and freshwater source,
- The potential fire break-out accidents and forest fires and
- The potential boat and ski accidents

These negative impacts can be managed with proper mitigation measures and regular periodic checks as detailed in the environment Management Plans (EMP) in the section 7 of this report. There are 9 EMPs formulated to control the negative impacts of the project development and operation as provided in the table below

Section	Environmental Management Plan
7.4.1	Deforestation and Soil Erosion Management Plan
7.4.2	Fossil fuel Consumption Management Plan
7.4.3	Water Consumption and Conservation Plan
7.4.4	Air Emission, Noise and Vibration Management plan
7.4.5	Waste Management Plan- Effluent and Solid Waste
7.4.6	Occupational Health and Safety management Plan
7.4.7	Firefighting and Emergency preparedness Plan
7.4.8	Boat and Ski Accident Prevention Management Plan
7.4.9	Food Safety and Hygiene Management Plan

The major concerns raised by the affected villagers are

- Their loss of access to the freshwater resource in the Phoni island
- Their loss of access to the project islands and surrounding marine waters
- The depletion of freshwater resources by excessive usage by resorts
- The pollution of the marine waters from effluent and solid waste disposal
- The job creation from the projects should come to villagers

These concerns have been suitably addressed making changes to the project design by incorporating wastewater recycling, solid waste composting, and the environmental management plans were formulated after adequate public consultations and stakeholder's engagement. The project owner has agreed to the affected parties about not restricting access to the islands, surrounding waters or the freshwater source in Phoni Island.

The EIA Consultants confirm that the project owner has effectively disclosed all the potential negative impacts of the projects to the affected parties that include to the Moken Sea Gypsies in the language that they are conversant with and comprehend without ambiguities. The project owner has not under reported any negative impacts of the project to mislead the affected parties and elected representatives to take a decision in favour of the project proponent.

The recommended actions for the project are

- Use of Micro Biological based technology, preferably Membrane Bio reactor (MBR) for waste water recycling plant to conserve water and reduce the effluent let off
- Composting at site for solid waste management with a vegetable garden to source the input for salad
- Use of natural grass and soil for water seepage in the landscaped gardens
- Replanting the bigger trees that are removed for construction in the gardens.
- Barriers to be made at the end of the sites to avoid soil erosion during the construction phase from wind and water run off
- Half yearly testing of the air quality, ground and surface water quality, marine water turbidity, and noise levels by a recognized third-party testing laboratory
- Periodic audits to monitor the efficient use of fossil fuels, water, waste management, safety of the equipment and machinery, food safety, and emergency preparedness
- Ensure compliance to MARPOL 73/78 regulations for all the vessels/boats
- Regular training for the staff on environmental and sustainability parameters

It is also recommended that the project owner initiate formation of an association of island resort owners in the Mergui Archipelago and coordinate a community based green tourism initiative to conserve water, conserve the biodiversity, reduce wastage and help the local population.

To arrive at the final conclusions and opinion, MyAsia Consulting Co., Ltd carried out review of the project documents, review of reports and technical documents published by international organisations, field surveys and physical on-site assessment of the project site and interviewing the stakeholders. The assessment team confirm that the contents of the report are true to best of their abilities and professional judgement and no omissions or misstatements have been made. The consultant confirm that the assessment was carried out using that degree of care and skill ordinarily exercised under similar circumstances by members of the environmental and social assessment and auditing profession.

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