

## **1. EXECUTIVE SUMMARY**

### **1.1 Summary of Introduction**

Pyi Phyo Tun International Co., Ltd (PPT) built soft-shell crab farming in Pahtaw-Pahtet Island, Pahtet Village, Kyunsu Township, Myeik District, Thanitharyi Region. The proposed farming was built in 2004, and has been produced soft-shell crabs with 17 ponds operational as raw materials for the cold storage factory and a capacity to fit in 1.5million crabs per farming cycle. In Myanmar, as per the comments of the Ministry of the Natural Resources and Environmental Conservation (MONREC), Annex 1 of the EIA (Environmental Impact Assessment) Procedure dated 29<sup>th</sup> December 2015, an Initial Environmental Examination (IEE) is required for the proposed soft-shell crab farming.

#### **(a) Aim and Objective of the IEE Report**

The objectives of the IEE report are to:

- (i) assess the project's potential positive and negative, direct and indirect impacts to physical, biological, socioeconomic, and physical cultural resources in the vicinity of the project area,
- (ii) identify the stakeholders, hold consultation meeting with project affected people and consider their concerns in the implementation of the project,
- (iii) present mitigation measures to help reduce and/or mitigate, and/or compensate for the negative environmental impacts from the proposed project,
- (iv) describe the monitoring measures and reporting procedures to ensure the operations of the project meet with proposed mitigation measures, and
- (v) identify the responsible person or team to proceed the proposed mitigation and monitoring measures.

#### **(b) Description of Project Proponent**

The following are the brief information about the project proponent.

Company Name	Pyi Phyo Tun International Company Limited (PPT)
Project Type	Soft-shell crab farming
Project location	Pahtaw-Pahtet island, Kyunsu Township, Myeik District
Company Address	No.15, 11 <sup>th</sup> Street, Lanmadaw Township, Yangon

Contact Person	Dr. Aung Lwin Phone number- 095 – (1) 2300460, 2300480 Fax-95-(1) 2300480 Email - fishmealppt@yangon.net.mm
Company Type	Public Company Limited

### **(c) IEE Service Provider**

Ever Green Tech Environmental Services and Training Co., Ltd. (EGT) has been appointed by PPT to prepare the IEE and to provide assistance in related activities. This IEE report is prepared by EGT to assess the potential impacts of the proposed project and to formulate, implement and monitor the environmental protection measures in the phases of its construction, operation and decommissioning in order to reduce the environmental impacts. Below is the background information on Ever Green Tech Environmental Services and Training Co., Ltd., (Third party) who drawn up the IEE.

<b>Ever Green Tech Environmental Services &amp; Training Co., Ltd.</b>	
Company Name	Ever Green Tech Environmental Services and Training Co., Ltd.
Company Registration Number	3344/2015-2016 (Ygn)
Transitional Third Party Registration Number	0047
Contact Address	No.1/9, 16 <sup>th</sup> Quarter, Hlaing Township, Yangon
Telephone Number	09-5099230, 09-5099232
Company E-mail	<a href="mailto:md@evergreentechmyanmar.com">md@evergreentechmyanmar.com</a> <a href="mailto:green.evergreentech@gmail.com">green.evergreentech@gmail.com</a>
Contact person	Dr. Kyaw Swar Tint Principal Environmental Consultant 09-797111000 <a href="mailto:11kyawswar@gmail.com">11kyawswar@gmail.com</a>

### **(d) EIA Study Team and Their Responsibilities**

Below is the information of EIA team and their responsibilities.

<b>Name</b>	<b>Degree</b>	<b>Responsibility and Report Writing</b>	<b>Experiences</b>	<b>Registration as Consultant at ECD</b>
1. Dr. Kyaw Swar Tint	Ph.D. (Mining)	Noise and Environmental Management	At least 7 yrs experiences in environmental related field	In progress
2. Dr. Thein Tun	Ph.D. (Metallurgy)	Soil Quality	At least 4 yrs experiences in environmental related field	Free land Consultant
3. Dr. Myo Min Tun	Ph.D. (Metallurgy)	Air Quality	At least 4 yrs experiences in environmental related field	Free land Consultant
4. Dr. Pyi Phy Kyaw	Ph.D. (Archeology)	Cultural and Heritage Impact Assessment	At least 3 yrs experiences in environmental related field	In progress
5. Dr. Kyaw Zay Moe	Ph.D. (Botany)	Flora Diversity	At least 3 yrs experiences in environmental related field	In progress
6. Dr. Ko Myint	Ph.D. (Zoology)	Fauna Diversity	At least 3 yrs experiences in environmental related field	Registered Consultant at ECD, No. 0037
7. Dr. Khon Aung	M.B.B.S (Ygn)	Occupational Safety and Health	At least 5 yrs experiences in environmental related field	Free land consultant
8. U Min Aung	M.Sc. (Chemistry)	Water Quality	At least 5 yrs experiences in environmental related field	In progress
9. Ms. Thazin Htwe	M.S. (Environmental Assessment and Management); Dip in Applied Psychology	Public Consultation and Participation	At least 3 yrs experiences in environmental related field	In progress
10. Ma Nandar Nwe	M.S. (Environmental Assessment and Management); Dip in Applied Psychology	Risk Assessment and Management	At least 3 yrs experiences in environmental related field	In progress

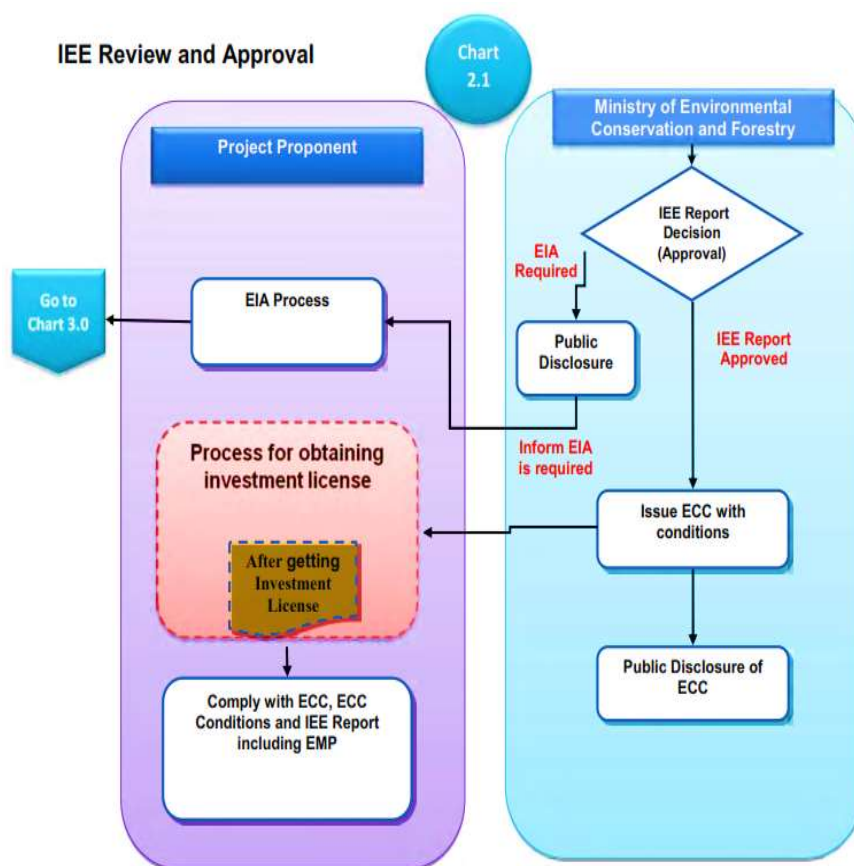
11. Mg Yaw Ma Nar	B.Sc. (Forestry), Dip. In EIA/EMS	Environmental Baseline Study	At least 3 yrs experiences in environmental related field	Free land Consultant
12. Ma May Thet Zaw	M.E. (Civil)	Water Resources Management and Hydrology	At least 3 yrs experiences in environmental related field	Free land Consultant
13. U Aung Naing Tun	L.L.B, M.B.A, M.A (B.L), M.A (TEFL)	Laws and Regulations	At least 4 yrs experiences in environmental related field	Free land Consultant

## **1.2. Summary of Policy, Legal and Other Requirements**

### ***(a) National Requirements***

The IEE has been undertaken in accordance with the Myanmar Environmental Impact Assessment Procedure, which was promulgated on December 29, 2015, according to the Environmental Conservation Law 2012 and Environmental Conservation Rules 2014. Environmental Conservation Department (ECD) is the most legally responsible agency for approval of IEE. An overview of the approval of the IEE process (from the EIA Procedure, 2015) is shown in the following figure.





*Figure - IEE Review and Approval Process*

According to the above figure, IEE report has to be submitted to ECD (Nay Pyi Daw) through ECD (Tanintharyi). After the review process IEE report have been granted by ECD and will issue Environmental Compliance Certificate (ECC).

***(b) Laws and Regulations Related to the Proposed Project***

Myanmar has promulgated several laws and regulations safeguarding of the natural environment. The following table describes laws and regulations which are directly or indirectly associated with the proposed project.

***Table - Relevant Environmental Laws and Regulations in Myanmar***

<b>Laws and Regulations</b>	<b>Year</b>
Constitution of the Republic of the Union of Myanmar (Articles 24,45,349,359)	2008
Environmental Conservation Law (Law No.7(o), 14,15,24,25,29)	2012
Environmental Conservation Rules (Rule 55, 69 (a), (b))	2014
EIA Procedures (Article 102 to 110, 113, 115, 117)	2015
National Environmental Quality (Emission) Guidelines (Section 2.1.9)	2015

The Protection of rights of National Race Law, (Law No. 5)	2015
Myanmar Investment Law (Law No. 50(d), 51, 73)	2016
Labour Organization Law, (Law No. 1,7 to 11)	2011
The Settlement of Labour Dispute Law, (Law No. 38, 39, 40, 51)	2012
Employment and Skill Development Law, (Law No. 5, 14, 30(a,b))	2013
The Leave and Holiday Act, 1951 (Law Amended July, 2014)	2014
Minimum Wages Law (Law No. 12, 13 (a to g))	2013
Payment of Wages Act (Law No. 3,4, 5, 14, 8 with 7,10)	2016
The Myanmar Insurance Law (Law No. 15, 16)	1993
The Social Security Law (Law No. 11(a), 15(a), 18(b), 48, 49, 75)	2012
Workman Compensation Act	1951
Myanmar Fire Force Law, (Law No. 25)	2015
National Food Law	1997
Public Health Law (Law No. 3, 5)	1972
The Myanmar Tourism Law (Section 6 ,7 ,8,9 and 10)	1990
Private Industrial Enterprise Law	1990
Forest Law	1992
Protection of Wildlife and Wild Plants and Conservation of Natural Areas Law	1994
Protection and Preservation of Cultural Heritage Regions Laws (Law No. 15, 16)	1998
Prevention and Control of Communicable Diseases Law (Law No. 3, 4, 9, 11)	1995
The Control of Smoking and Consumption of Tobacco Product Law (Law No. 9)	2006
Conservation of Water Resources and Rivers Law (Law No. 8, 11(a), 13, 19, 24(b), 30)	2006
Myanmar Port Authority Law	2015
Agricultural Land Law	2012
The Protection and Preservation of Antique Objects Law (Law No. 12,15 20)	2015
The Protection and Preservation of Ancient Monuments Law (Law No. 12,15 20)	2015
The Prevention of Hazard from Chemical and Related Substances Rules (Law No. 8,15,16,17, 20, 22, 23, 27)	2013
The Freshwater Fisheries Law (Law No. 36,40,41)	1991
Automobile Law Pyidaungsu Hluttaw Law No. 55/2015	2015
The Myanmar Engineering Council Law (Law No. 20,24,25, 31(a), 37)	2013

### **1.3. Summary of Project Description**

#### ***(a) Background***

The proposed project is invested by PPT and aimed to produce soft-shell crabs as raw materials for the cold storage factory to distribute to local and foreign countries.

#### ***(b) Product***

The soft-shell crab farming produces soft-shell crabs with 17 operational ponds. The farm produces an average of 60 tons per month. The finished products are distributed to both local and foreign countries.

***(c) Production Capacity***

The project produces approximately 60 tons of soft-shell crabs per month. But generally, the production rate depends on the seasonal rates of crab production.

***(d) Land Use***

The project covers total land area of 80 acres. The project area was surrounded by the industrial land, forest land and some residential areas.

***(e) Project Location***

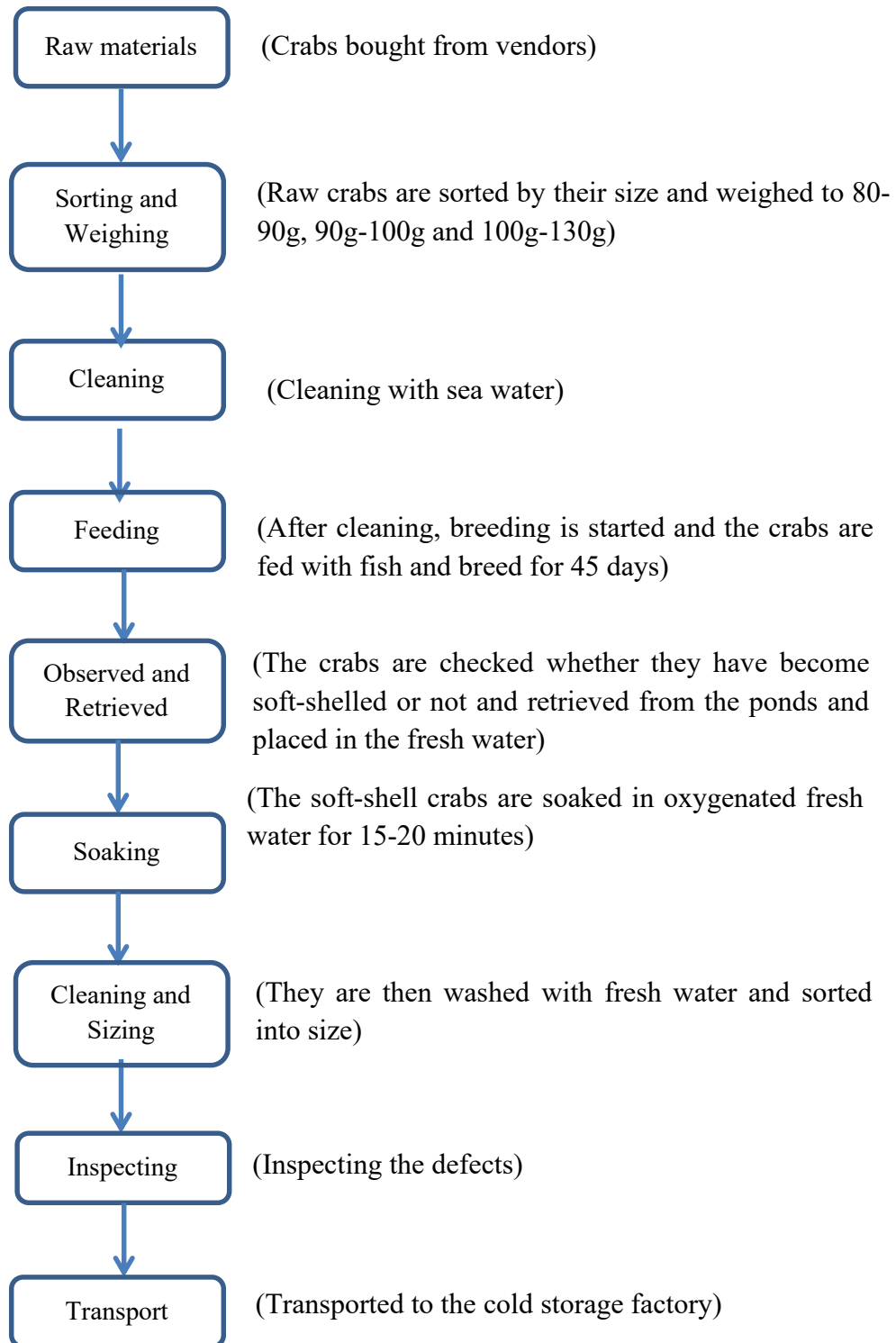
The project is located at the Pahtaw-Pahtet island, Pahtaw Village, Kyunsu Township, Myeik District, Thanitharyi Region, at the coordinates of 12°26'31.94"N Latitude and 98°34'43.91"E Longitude as shown in the following figure.



Figure - The Location of Soft-shell Crab Farming

**(f) Summary of Production Process**

The followings are the summary of process description.



*Figure – Flow Chart of Process of Soft-shell crab Farming*

***(g) Summary of Construction and Operation Process***

The following phases are considered in conducting of IEE for the soft-shell crab farming.

***(i) Pre-construction Phase***

Pre-construction phase will include tree cutting, site clearing and earth filling (sand filling) activities for soft-shell crab farming.

***(ii) Construction Phase***

Construction phase will include construction of foundation of (i) soft-shell crab farming, (ii) jetty (iii) internal drainage system and (iv) road.

***(iii) Operation Phase***

Soft-shell crabs in Myeik, southern Myanmar, are an important export industry. The raw material for the soft shell crab are bought from the vendors and they are collected between 80-130. After sorting and weighting the crabs, they are salted with sea water in the buckets. After cleaning, breeding is started and the crabs are fed with fish and breed for 45 days. To prevent the shells from getting hard, the crabs are removed from the brackish water within an hour or two of molting. The soft-shelled crabs are soaked in oxygenated fresh water which contains chlorine concentration of 10ppm for 15 to 20 minutes before being sent to the cold storage factory. Before being transported, the crabs are covered up with wet cloth (soaked in fresh water).

***(iv) Decommissioning Phase***

Although the proposed project is long-term project, decommissioning of the project would occur at the end of its lifespan. The goal of project decommissioning will be to remove the wood structures, disconnecting the pumps, filters and electrical equipment, removing the rocks and other debris from the bottom of the pond, removing the pond lining and land filling the ponds, and return the site to a condition as close to a pre-construction state as feasible. The physical removal of the structures and equipment will be the reversal of the construction process. All areas disturbed by the proposed project will be restored to pre-project conditions and/or to conditions acceptable to the CDC (Kyun Su and/or Myeik) rule and regulations. During decommissioning phase, all structures and equipment will be dismantled and removed. The major activities that will be required for the decommissioning of the proposed project are:

- (a) Removal of rocks and other debris from the bottom of the pond,
- (b) Removal of pond lining,
- (c) Equipment and electrical supply system removal, and
- (d) Land filling the pond as close to a pre-construction state.

## **1.4. Summary of Surrounding Environment**

The key findings from the baseline study will be as follow:

### ***1.4.1. Summary of Baseline Study***

#### ***(a) Ambient Air Quality***

According to the monitoring results, the concentrations of PM<sub>2.5</sub> and PM<sub>10</sub> are below the Myanmar Emission Guideline (MEG) value, WHO guideline value and NAAQS. For gases emissions, comparing with the MEG value, WHO guideline value and NAAQS, the concentration of all gases were within the acceptable limit for industrial, residential, rural and other areas. For carbon dioxide, no guideline values were provided for the ambient air quality.

#### ***(b) Existing Noise Level***

The existing noise level in or within the Pahtaw village are lower than the permissible level for residential area. The noise level near the the proposed project was higher than other sampling points during the daytime.

#### ***(c) Existing Water Quality***

According to the above table, the groundwater testing result is compared with National Drinking Water Quality Standards and it has shown that all the measurements value are below its guideline value.

The sea water result is compared with National Drinking Water Quality Standards and the amount of total dissolved solid is above the permissible limits of 1000mg/L. The amount of chlorine and electro conductivity are above the permissible limits of 250mg/L and 1500 µmhos/cm.

#### ***(d) Existent Socio-economic Environmental***

The proposed project is situated in rural area although it is located to Myeik Township (urban area). So, the life style of nearest residents in Pathaw-Pahtet Island is peaceful and isolated. The social services for education, health care, sewage system, available of safe drinking water are relatively good. The most important socio-economic impacts will be public anxiety due to bad smell (Odor) from the proposed project.



***(e) Existent Biodiversity Environment***

Survey resulted that plants and animals in both terrestrial and aquatic environments are low in the project area. But some animal population in the surrounding place of the project area which is considered as affected area of the project activities is fairly abundant such as birds and Resus monkey. Sample collection was conducted in the field with scientific and systematically. A total of (147) flora species from (52) families and (11) species of phytoplankton are recorded. Three Red List species of plants such as *Myristica malabarica* (Kywe-thwe) as vulnerable status (VU), *Vatica maingayi* (Kanyin-kyaung-che) as critical endangered status (CR) and *Dipterocarpus kerrii* King. (Sibin) as endangered status (EN) were recorded as threatened species in the surrounding area of the project site which should be conserved. Seven species of mangrove plants are recorded and the forest status are investigated as scattered forests. Nevertheless, these mangrove communities are essentially important to conserve for their ecological and environmental health. As phytoplankton, a total of (11) species was recorded with fairly population so that water quality in the present situation will be favorable condition for other aquatic animal survivals. Among these (11) species, Species of *Coscinodiscus radiates* Ehrenberg, *Thalassiosira punctigera* (Castracane) Hasle; and *Melosira nummuloides* Agardh were recorded as top three species as important to nutrient level. In fauna (46) species comprises of (16) amphibian and reptile, (10) species of birds, (17) species of fish, (3) species of zooplankton are recorded during the survey. Stingray fish species *Himantura walga* in the marine water and the turtle Genus *Cylemy* in the forest of Pahtaw mountain were reported which are described as near threatened species (NT) in IUCN Red List. These two species should be protected. A number of the bird, Black Eared Kite *Milvus lineatus* is about 200 found in and surrounding area of the project site. This species is indicator and top predator species which need to protect for ecological process. Three species of zooplanktons were recorded with fairly population density which indicated that the water quality in the present is favorable condition for aquatic organisms in food chain and food web system. As a conclusion, the proposed project is considered may be affected with low significant impact on terrestrial and aquatic environment. The extent of the impact on fauna and flora is anticipated as only in the site specific and duration of the impact is assumed as temporal or permanent.

***(f) Cultural and Heritage***

Assessment works have been done with the seven potential places that are mostly found as religious context and local community. For the national level of cultural heritage nomination,



there is no trace of outstanding cultural heritage. In addition, there is no special finding of local or regional commemorative value of cultural heritage concerning the archaeological or anthropological or cultural heritage context. But the main things are mostly concerned with the local community and their religious places as well as their traditional or seasonal festivals. The cultural significance and possible impact are not so much serious around the project area. Additionally, the type of project could be acceptable without mitigation because the low and minimum threat will only be happened.

#### **1.4.2. Vicinities around the Proposed Project**

The nearest environmentally sensitive areas of the soft-shell crab farming are shown in the following table and figure.

<b>No.</b>	<b>Legend</b>	<b>Vicinity</b>	<b>Description</b>	<b>Distance (km)</b>
1.	1	Nearest Public Residents	Pahtaw Village	0.6 km
2.	2	Nearest Water Body	Andaman Sea	0.1 km
3.	3	Nearest Densely Populated Area	Myeik	1.75 km
4.	4	Nearest Cultural and Hesitate Site	TaungPaw Pagoda Shwethalyaung Pagoda	0.17 km 1.34 km
5.	5	Nearest Airport	Myeik Airport	4.24 km
6.	6	Nearest Road	Myeik-Kyaukphyar Road [NH-8 Rd]	1.73 km



Figure - Vicinities around the Proposed Project

### **1.4.3. Extent of the IEE Study**

All of the IEE study was conducted within the 1.5 kilometer (km) radius (3km diameter) around the proposed project. The reasons for conduction 1.5km around the proposed project are to cover (1) the impacts zone during emergency case (fire), and (2) the impact zone due to bad smell (Odor).



*Figure - Local Residences within 3km around the Proposed Project*

### **1.4.4. Local Residences around the Project**

Although the project was located in Kyun Su Township, the nearest local residences within 3km radius of the project are:

- (a) Pahtaw Village;
- (b) Pahtet Village; and
- (c) Kan Nar Quarter.

Pathaw village and Pahtet village are located in Kyun Su Township and Kan Nar Quarter is situated in Myeik Township.

### **1.5. Summary of Environmental Impacts and Mitigation Measures**

Based on the view of the proposed development, the principle impacts to the ambient environment during the operational phase are the odor release from the farming processes and the wastewater discharge.



### ***Odor from Soft-shell crab Farming Process***

Odor will be generated from the decaying of crab during farming step. Odor can be caused by the decomposition of organic materials after death and that also depends on the quality and freshness of the crab. Organic material decomposition of crab produces several pungent chemicals mainly ammonia. Exposure to Odors results in physiological stresses that may result in a variety of symptoms including headache, nausea, loss of appetite and emotional disturbance.

### ***Wastewater Discharge***

The water in the ponds is exchanged not periodically, but after the water quality is checked. If the water quality is not good for the crab hatchery, the sea water from the reservoir is pumped to the ponds. And that also depends on the pH and the color of the water in the ponds. If pH is over 8.0, ammonia toxicity can be problematic. Effluents from the ponds are typically enriched in suspended solids, nutrients, and biochemical oxygen demand (BOD) with concentrations largely depending on whether the management is intensive or semi intensive. If the nutrients are enriched, the receiving water would be eutrophication. But the amount of wastewater released from the farming is much smaller than the ambient water body (the sea).

The summary of environmental impacts during pre-construction, construction, operation and decommissioning phase are as follow:

**Summary of Anticipated Impacts and Mitigation Measures**

The following table shows mitigation measures for anticipated impacts in all phases,

Anticipated Impacts	Source	Mitigation Measures	Intensity of Mitigation	Responsibility
<b>Pre-Construction Phase</b>				
Impacts on Air Environment	Fugitive dust emissions	-Watering the site regularly by using handheld spray to suppress dust emissions during truck movement; -Prohibiting the burning of vegetation or waste on site	Minor	Pre-construction services provider
	Gaseous emission	- Use machineries with good engine with low sulphur content fuel	Minor	Pre-construction services provider
	Noise level in dB(A)	- Use sound proof machines	Minor	Pre-construction services provider
Impacts on Surface Water Environment	- Soil erosion and sedimentation of earth working activities - Improper handling of fuel oil and lubricant	- Avoid leakage of oil & lubricant, maintenance of machines. - limit unnecessary earthworks	Minor	Pre-construction services provider
Impacts on Soil and Ground Water Environment	Potential to soil contamination	Proper waste management system, Reuse earth materials removed as bottom layer of the ponds	Minor	Pre-construction services provider
	Potential to ground water pollution	Dispose solid wastes according to CDC (Myeik) and CDC (Kyunsu)	Minor	Pre-construction services provider
Impacts on Biodiversity	Impacts on flora diversity	Avoid tree cutting as much as possible and replanting the trees	Minor	Pre-construction services provider
	Impacts on fauna diversity	Avoid working at night	Minor	Pre-construction services provider
	Impacts on aquatic lives	Raise environmental awareness to workers	Minor	EMMT

Impacts on Socio-Economic Environment	Potential to Increase in household income	Job creation	Minor	EMMT
<b>Construction Phase</b>				
Impacts on Air Environment	Dust generation	- Water spraying of or covering all exposed areas and access roads;	Minor	Construction services provider
	Gaseous emissions	- Regular equipment maintenance, reduce construction time, good engine vehicles will be used.	Minor	Construction services provider
	Noise level in dB(A)	- Avoid running construction machineries at the same time. - Avoid working at night.	Minor	Construction services provider
Impacts on Surface Water Environment	Construction Debris	Temporary settling pond, limit unnecessary earth works, connect wastewater channel to the septic tank	Minor	Construction services provider
	Oil and Grease	Avoid any leakage of oil and lubricant	Minor	Construction services provider
	Domestic Wastes	Use proper waste management system	Minor	Construction services provider
Impacts on Soil and Ground Water Environment	Leakage of fuel oil and lubricants	- Care should be taken not to leak during the handling of fuel oil and lubricants - Store over concrete floor or impermeable pad	Minor	Construction services provider
	Construction debris and domestic Wastes	Solid wastes according to the rules and regulations of CDC (Kyunsu)	Minor	Construction services provider
Impacts on Biodiversity	Cutting of trees	- Avoid tree cutting as much as possible	Minor	Construction services provider
	Cutting of trees, wastes and noise	Avoid working at night Dispose wastes properly	Minor	Construction services provider
Impacts on Socio-Economic Environment	(a) Job Creation	Unskilled and semi-skilled job opportunities should be offered to the locals as much as possible	-	EMMT
	(b) Skill development for local people	Providing training programs	-	EMMT

	(c) Impacts Associated with Population Influx	Population influx can be minimized by the use of labor force	-	EMMT
	Health Impacts (a) Air-borne diseases	Providing medical check-up for workers who are susceptible of air-borne diseases	Minor	EMMT
	(b) Dust emission exposing locals and workers with bronchial and other respiratory tract diseases	- Spraying water - Restricting vehicle speeds	Minor	EMMT
	(c) Water borne diseases	- Avoid construction during rainy seasons - All areas of fuel storage will be banned to prevent hydrocarbon pollution of surface water	Major	EMMT
	(d) Infection from mosquito	- Avoid construction during rainy season - Proper temporary or permanent drainage system will be compensated	Moderate	EMMT
	(e) Sexually transmitted infections	Provide information and education about safe sex and implement HIV control program for migrant construction workers	Minor	EMMT
	(f) Health impact related to increase in noise level such as hearing loss, impairment and stress	- Reduce speed limits for trucks in project area to reduce noise level - Avoid working at night	Minor	EMMT
<b>Operation Phase</b>				
Impacts on Air Environment	Vehicular and dust emissions	- Use good engine condition - Conduct regular engine check and maintenance - Spraying water	Minor	EMMT
	Odor	- Immediately dispose of the decayed crabs after the working shift is done - Remove leftover food materials - Empty the bins containing dead crabs from the processing area routinely - Place the dead crabs in the closed container from the processing to the dumping site	Moderate	EMMT
	Noise	- Installation of sound suppressive devices on motors and pumps	Moderate	EMMT

Impacts on Surface Water Environment	Wastewater discharge	- Sedimentation - Screens should be mounted at the point of the discharge to the sea water - Liquid effluents arising from operations will be treated to the applicable EQG guideline prior to discharge	Moderate	EMMT
Impacts on Soil and Ground Water Environment	Wasted crab shells	- Wasted crab shells are used as landfill	Major	EMMT
	Domestic solid waste	Segregation, storage at source and collection of the waste management system	Minor	EMMT
Impacts on Biodiversity	Impacts on fauna diversity	Landfill and improve the land forms with native vegetation and plants	Minor	EMMT
	Impact on flora diversity	Proper waste management system	Minor	EMMT
Impacts on Socio-Economic	Visual Impact	- Keep clean the area near the farming every day and implement suitable waste management system.	Minor	EMMT
	Job creation and skill development	- 300 employment opportunities for local people - Skill development for the local people	Moderate	EMMT
	General health and safety impacts	- First aid kits will be kept ready at all public places - A car or boat kept 24-hour standby to send to the nearby hospitals or clinics within the few minutes, in case of injury	Minor	EMMT
Utilities Consumption	Electricity	Install energy and water meters, Use LED lights, Installation of timers and thermostats,	Major	EMMT
	Domestic water	Implementing water efficient fixtures, Awareness campaign, Proper methods of water use	Minor	EMMT
<b>Decommissioning Phase</b>				
Impacts on Air Environment	Fugitive Dust generation	Spraying water	Minor	EMMT
	Gaseous emissions	Use machineries with good engine with low sulphur content fuel	Minor	EMMT



	Noise level in dB(A)	Avoid working at night	Minor	EMMT
Impacts on Surface Water	Wastes from demolition	- Avoid doing demolition activities during monsoon season	Minor	EMMT
	Oil and Lubricants	- Avoid any leakage of oil and lubricant - Check machineries maintenance on regular basis	Minor	EMMT
	Domestic wastes from workers	- Connect wastewater channel to the septic tank	Minor	EMMT
Impacts on Soil and Ground Water	Leakage of fuel oil and lubricants	- Store fuel tank and lubricant container over concrete floors - Use machinery of good condition and check maintenance	Minor	EMMT
	Demolition wastes and domestic wastes	Waste disposal according to the rule and regulations of CDC (Mawlamyine), administrative office of industrial zone	Minor	EMMT

### **1.6. Summary of Environmental Management and Monitoring Plan**

The following are the brief description of environmental management and monitoring plan.

**Environmental Monitoring Plan**

<b>Discharge Source</b>	<b>Parameter</b>	<b>Monitoring Frequency</b>	<b>Proposed Monitoring Locations</b>	<b>Responsibility</b>	<b>Estimated Cost/Frequency</b>	<b>Available Third-Party Agency</b>
<b>Pre-Construction Phase (3 months)</b>						
Air Pollution	PM <sub>10</sub> , PM <sub>2.5</sub> , CO, CO <sub>2</sub> , NO <sub>2</sub> , SO <sub>2</sub>	Once	One monitoring point at nearest resident	EMM Team	100000 kyats	Every Third-Party Monitoring Agency
Noise	Noise level in dB(A)	Once	One monitoring point at nearest resident	EMM Team	50000 kyats	Every Third-Party Monitoring Agency
Water Quality	Ph, Colour, Turbidity, Suspended Solid, Oil and Grease	Once	Two monitoring points at seawater and tube well near the project	EMM Team	100000 kyats	-
<b>Construction Phase (1 year)</b>						
Air Pollution	PM <sub>10</sub> , PM <sub>2.5</sub> , CO, CO <sub>2</sub> , NO <sub>2</sub> , SO <sub>2</sub>	Once	One monitoring point at nearest resident	EMM Team	100000 kyats	Every Third-Party Monitoring Agency
Noise	Noise level in dB(A)	Once	One monitoring point at nearest resident	EMM Team	50000 kyats	Every Third-Party Monitoring Agency
Water Quality	Ph, Colour, Turbidity, Suspended Solid, Oil and Grease	Once	Two monitoring points at seawater and tube well near the project	EMM Team	100000 kyats	-

<b>Operation Phase (1 year)</b>						
Odor	Ammonia, Amines and amides and Organic and inorganic sulphides including mercaptans and hydrogen sulphide (as total	Everyday	At project site At nearest residents	EMM Team	With own gas detector (300000 kyats)	-
Noise	Noise Level Meter	Monthly	One point at the entrance of the project (as receptor)	EMM Team	50000 kyats	Every Third-Party Monitoring Agency
Water Quality (Effluent Level)	pH, Biological Oxygen Demand (BOD), Active ingredients/Antibiotics, Chemical Oxygen Demand (COD), Temperature increase, Total Suspended Solids, Total Coliform Bacteria, Total Nitrogen, Total phosphorus, and Oil and Grease	Monthly	Wastewater from soft shell crab ponds	EMM Team	100000 kyats	-
<b>Overall Estimated Cost = 2,600,000 kyats</b>						

## **1.7. Summary of Public Consultation and Participation Process**

Different techniques of consultation and participation with public were used during the IEE study. These included interviews with local people during household survey (socio-economic survey) and public meetings as follows:

### ***(a) Household Survey***

Household surveys were conducted in the following local residents:

- (a) Local residents in Pahtaw Village;
- (b) Local residents in Pahtet Village; and
- (c) Local residents in Myeik Township (Local people in Kan Nar Area).

### ***Most Public Needs and Concerns during Household Survey***

During household survey, the most important positive outcomes from the project expected by the local people and most of their concerns about proposed project are as follow:

<b>Village Name</b>	<b>Most Public Needs</b>	<b>Most Pubic Concerns</b>
Pahtaw	<ul style="list-style-type: none"><li>• Expanding and upgrading of village road</li><li>• Supporting for health care facilities, water supply and electricity</li><li>• Improvement of the Pagodas in Pathaw-Pahtet Island</li></ul>	<ul style="list-style-type: none"><li>• Odor from soft shell crab farming</li></ul>
Pahtet	<ul style="list-style-type: none"><li>• Supporting for health care facilities and water supply</li><li>• Full time electricity</li><li>• Development to the Shwethalyaung Pagoda</li></ul>	-
Kan Nar (Myeik)	<ul style="list-style-type: none"><li>• Maintenance of the Kan Nar road</li><li>• Provide trash bin along the Kan Nar Road</li></ul>	<ul style="list-style-type: none"><li>• Increased in traffic due to</li></ul>

### ***(b) Public Meetings***

First and second public meetings were held as essential part of public consultation and participation process as follow:

***(i) First Public Meeting***

First public meeting was held in Pahtet Village. Some types of public consultations techniques (discussion with power point, session through discussions and suggestion letter writing) were used during the meeting. List of participants, meeting minutes and suggestion letters of first public meeting are shown in Appendix A.

***(ii) Second Public Meeting***

Second public meeting was held at Department of Fishery (Myeik) to inform the public about the environmental impacts of proposed project and to create opportunities and mechanisms whereby the public can participate and raise their viewpoints (issues, comments, and concerns) with regard to the proposed development. Some types of public consultations techniques (discussion with power point, session through discussions and suggestion letter writing) were used during the meeting. List of participants, meeting minutes and suggestion letters of second public meeting are shown in Appendix B.

**1.8. Conclusion**

The IEE study will describe the key anticipated environmental and social impacts of the proposed project. Moreover, proper mitigation measures for anticipated impacts in all phases and good environmental management practices are also described. The most public concerns about the proposed project are bad smell (Odor) and all of the environmental impacts can be mitigated to acceptable level by proper mitigation measures described in this report. So, it can be concluded that the proposed project needs not to conduct comprehensive EIA and all of the important thing for impact assessment, mitigation measures and management practices are presented in this IEE report. To summarize, the proposed project can be allowed to operate if the developer (PPT) will do all of the mitigation and enhancement measures described in this report.

## **2. INTRODUCTION**

### **2.1. Purpose and Background**

Pyi Phyto Tun International Company Limited (PPT) was built soft-shell crab farming located in Pahtaw-Pahtet Island, Kyun Su Township, near Myeik District, Thanintharyi Region, Republic of the Union of Myanmar. According to the Environmental Conservation Law, 2012 and Environmental Impact Assessment Procedure, 2015, the proposed project will have to prepare IEE. Ever Green Tech Environmental Services and Training Co., Ltd. (EGT) was appointed by PPT to prepare the IEE and to provide assistance in related activities. This IEE report is prepared to assess the potential impacts of the proposed project and to formulate, implement and monitor the environmental protection measures in the phases of its construction, operation and decommissioning in order to reduce the environmental impacts or have to minimum impacts to the environment.

### **2.2. Description of Project Proponent**

The following are the brief information about the project proponent.

Company Name	Pyi Phyto Tun International Company Limited (PPT)
Project Type	Soft-shell crab farming
Project location	Pahtaw-Pahtet island, Kyunsu Township, Myeik District
Company Address	No.15, 11 <sup>th</sup> Street, Lanmadaw Township, Yangon
Contact Person	Dr. Aung Lwin Phone number- 095 -(1) 2300460 , 2300480 Fax-95-(1) 2300480 Email - fishmealppt@yangon.net.mm
Company Type	Public Company Limited

### **2.3. The Aim of the Proposed Project**

The developer statements publicly that the proposed project will need in Myanmar due to the following reasons:

- (a) To export the aquatic products to foreign countries as enrichment products,
- (b) To reduce wasting of obtained raw aquatic products,
- (c) To improve national foreign currency income,
- (d) To improve employment opportunities for local people,

- (e) To improve the educational, health and social status of local residents and obtain safe and better life, and
- (f) To get benefits for both customers and supplier together with increasing employment opportunities for local people as well as resulting in government revenues.

#### **2.4. Aim and Objectives of the IEE Report**

The objectives of the IEE report are to;

- (i) assess the project's potential positive and negative, direct and indirect impacts to physical, biological, socioeconomic, and physical cultural resources in the vicinity of the project area,
- (ii) identify the stakeholders, hold consultation meeting with project affected people and consider their concerns in the implementation of the project,
- (iii) present mitigation measures to help reduce and/or mitigate, and/or compensate for the negative environmental impacts from the proposed project,
- (iv) describe the monitoring measures and reporting procedures to ensure the operations of the project meet with proposed mitigation measures, and identify the responsible person or team to proceed the proposed mitigation and monitoring measures.

#### **2.5. Study Team**

Below is the background information on Ever Green Tech Environmental Services and Training Co., Ltd., (Third party) who drawn up the IEE.

<b>Ever Green Tech Environmental Services &amp; Training Co., Ltd.</b>	
Company Name	Ever Green Tech Environmental Services and Training Co., Ltd.
Company Registration Number	3344/2015-2016 (Ygn)
Contact Address	No.14, Thiri Mying (8 <sup>th</sup> ) Street, 13 <sup>th</sup> Quarter, Hlaing Township, Yangon
Telephone Number	09-5099230; 09-5099232
Company E-mail	md@evergreentechmyanmar.com green.evergreentech@gmail.com



Contact person	Dr. Kyaw Swar Tint Principal Environmental Consultant 09-797111000 11kyawswar@gmail.com
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## 2.6. Scope for IEE Study

This IEE report identifies the potential environmental and social impacts that could be associated with the proposed project activities including those of an indirect and cumulative nature. The study area for IEE covers within 1.5km radius (3km diameter) which cover all of the project operational areas (soft-shell crab farming), including where supporting activities (jetty and roads). The reason to conduct within 3km sector is to cover air emissions of odor from soft-shell crab farming process.



*Figure 2.1- Local Residences within 3km around the Proposed Project*

## 2.7. Data Collections

Although the proposed project was situated in Kyun Su Township, it is nearer to Myeik Township rather than Kyun Su. So, the project related secondary data are sourced from both of Kyun Su and Myeik. The project related data, factory layout plans and design parameter were provided by PPT. Secondary data on demographic distribution in the area were sourced from Head of Local Administration Offices (Kyun Su and Myeik) and data on public health



were sourced from Public Health Departments (Kyunsu and Myeik). Primary data for public concerns, socio-economic and health profiles were conducted by household survey.

## **2.8. Structure of the Report**

The IEE for proposed project is structured as follows:

**Section 1: Executive Summary** – Summary of the IEE report in both Myanmar and English languages

**Section 2: Introduction** – provides the introduction and background of the proposed project, introduces the Proponent, objectives and scope;

**Section 3: Policy, Legal and Institutional Framework** – provides details of applicable Environmental legislation; National regulations are reviewed and summarized;

**Section 4: Description of the Project and Alternatives.** – provides details of the proposed project including design features, proposed infrastructure, project inputs and outputs and alternatives considered;

**Section 5: Description of the Surrounding Environment**– provides a summary of knowledge about the existing physical, biological, social and cultural Environment in the study area that the project may influence;

**Section 6: Impact Assessment and Mitigation Measures** – describes the impact assessment methodology and the PP process, summarizes the potential environmental and social impacts associated with the proposed project;

**Section 7: Anticipated Residual and Cumulative Impacts** – describes general and specific mitigation measures to reduce, or avoid residual and cumulative impacts to environmental and social receptors associated with the proposed project;

**Section 8: Environmental Management Plan (EMP)** – describes the EMP draws together the possible mitigation measures; group them logically into components with common themes; define the specific actions required and timetable for implementation; identifies training needs, institutional roles and responsibilities for implementation; develops a monitoring programme and estimates the costs of the measures.

**Section 9: Public Consultation and Disclosure Process** – describes the objectives of public consultation and results of consultations in an IEE to be followed during the Impact Assessment phases;

**Section 10: Conclusion**– summarizes conclusions that are made based on the assessment of the IEE Study.

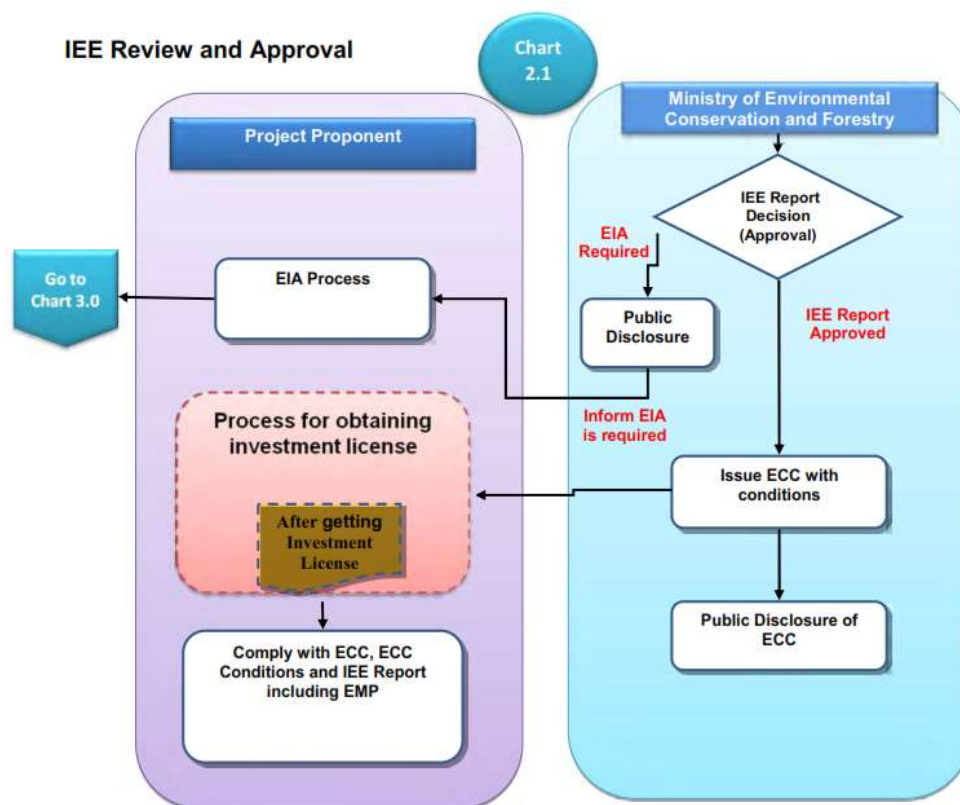
### 3.0. POLICY, LEGAL AND OTHER REQUIREMENTS

This chapter sets out the relevant legal and policy context in Myanmar and documents the environmental and social standards with which the project has to comply with, as well as the international standards that the project will follow.

#### 3.1. National Requirements

The IEE has been undertaken in accordance with the Myanmar Environmental Impact Assessment Procedure which was promulgated on December 29<sup>th</sup>, 2015, and provides legislation for environmental and social governance of economic development in Myanmar, under the Environmental Conservation Law 2012 and Environmental Conservation Rules 2014 of the National Environmental Policy for Myanmar 1994.

In addition, the IEE assessment was undertaken in accordance with Myanmar's National Environmental Quality (Emission) (NEQ) Guidelines which were promulgated on December 29<sup>th</sup>, 2015. The guidelines include noise and vibration, air emissions, and effluent discharges. An overview of the approval of the IEE process (from the EIA Procedure, 2015) is shown in the following figure.



**Figure 3.1. IEE Review and Approval Process**

### **3.2. Developer’s Environmental, Social and Health Policies**

The main policy and commitment of PPT will be identified in the following points:

- the protection of public safety, the health and safety of the workforce and the local communities;
- the protection of the environment and the conservation of biodiversity and ecosystems;
- the compliance with Myanmar laws, regulations and industrial standards regarding the environment, health, safety and hygiene at work in all of our operations;
- seek and achieve continuous improvement in our processes, consistent with our strategic objectives and priorities, by adopting the most advanced systems for environmental protection and energy efficiency; and
- creating a culture in which PPT employees, Contractors and Visitors share these commitments and understand that working safely is a condition of employment.

#### **3.2.1. PPT’s Sustainability Policy**

PPT’s sustainability model is “To operate in a sustainable manner means to create value for stakeholders, and to use resources so that the needs of future generations will not be compromised, respecting people, the environment and the society as a whole.” PPT adheres to a sustainability policy, which is composed of the following principles:

- *Stakeholder relations* – “Engaging stakeholders and involving them in company’s business are both prerequisites for sustainability and for the construction of reciprocal value.”
- *Human Rights* – “The respect of Human Rights represents the basis for an inclusive growth of societies, of the territories and, consequently, of the companies that work there.”
- *Relations with communities and contribution to local development* – “Dialogue, the respect of local communities, the evaluation of impacts are all preconditions for an effective cooperation, targeted at creating territorial value.”
- *Climate strategy* – “To satisfy the world’s energy demand, by containing, at the same time, emissions of gases that have an impact on climatic change, is one of the greatest challenges of modern society.”

### **3.2.2 PPT's Quality Policy**

The Quality Policy is published in this Quality Manual, and is placed in suitable locations around the factory and customer access areas.

- To produce Seafood in accordance with the International Standards.
- To produce New Products and Value Added Products.
- To increase of Export Products processing 25% annually.
- To follow strictly implemented system.
- To avoid the customer complaints by prevention elimination and reduction to acceptable level and always standby position for inspection from concern authorities.
- To fulfill Microbiological and Chemical Standard laid down by DOENHL, EU, and Export Countries Regulations.

### **3.3. Laws and Regulations Related to the Proposed Project**

Myanmar has promulgated several laws and regulations concerning protection of the environment. The following table describes laws and regulations directly or indirectly associated with the proposed project.

*Table 3.1. Relevant Environmental Laws and Regulations in Myanmar*

<b>Laws and Regulations</b>	<b>Year</b>	<b>Purposes</b>
Constitution of the Republic of the Union of Myanmar (Articles 24,45,349,359)	2008	- To conserve the natural environment, - To prevent and upgrade the rights and lives of the workers
Environmental Conservation Law (Law No.7(o), 14,15,24,25,29)	2012	- To enable to implement the Myanmar National Environmental Policy; - To enable to lay down the basic principles and give guidance for systematic integration of the matters of environmental conservation in the sustainable development process;
Environmental Conservation Rules (Rule 55, 69 (a), (b))	2014	- To implement correctly according to the environmental management plan
EIA Procedures (Article 102 to 110, 113, 115, 117)	2015	- To develop the environmental impacts and to draw the environmental management plan;

National Environmental Quality (Emission) Guidelines (Section 2.3.1.3)	2015	These national Environmental Quality (Emission) Guidelines (hereafter referred to as Guidelines) provide the basis for regulation and control of noise and vibration, air emissions, and liquid discharges from various sources in order to prevent pollution for purposes of protection of human and ecosystem health.
The Protection of rights of National Race Law, (Law No. 5)	2015	Consists of four bills, as submitted to the legislature; Buddhist Women's Special Marriage Bill, Religious Conversion Bill, Monogamy Bill and Population Control Bill.
Myanmar Investment Law (Law No. 50(d), 51, 73)	2016	To develop responsible investment businesses which do not cause harm to the natural environment and the society for the benefit of the Union and its citizens
Factories Act, 1951(Pyidaungsu Hluttaw Law No. 12/2016) (Section 3,4)	2016	Has been enacted for affairs concerning with health, safety, working time of employees. -Mentions responsibilities of employer and manager regarding waste disposal, ventilation, extreme temperature, dust and gas generation, minimum space for each worker, lighting, portable drinking water and toilets for employees. -States responsibilities of employer and manager concerning with machine guarding, personal protective equipment, housekeeping, aisles and exits, chemical storage and fire protection system to avoid accident.
Labour Organization Law, (Law No. 1,7 to 11)	2011	This Law was enacted, to protect the rights of the workers, to have good relations among the workers or between the employer and the worker, and to enable to form and carry out the labour organizations systematically and independently
The Settlement of Labour Dispute Law, (Law No. 38, 39, 40, 51)	2012	The Pyidaungsu Hluttaw hereby had enacted this Law for safeguarding the right of workers or having good relationship between employer and workers and making peaceful workplace.
Employment and Skill Development Law, (Law No. 5, 14, 30(a,b))	2013	- To facilitate employment which is appropriate to the age and ability of the job seeker - To help workers obtain employment and to provide stability of employment and skills development for employees - To help employers obtain appropriate employees
The Leave and Holiday Act, 1951 (Law Amended July, 2014)	2014	- To allow worker for leave and holiday allowances, religious or social activities with earn allowance, and benefits for Health allowances. - Concerned workers: Daily wage workers/ temporary workers/permanent workers.
Minimum Wages Law (Law No. 12, 13 (a to g))	2013	This Law was enacted to meet with the essential needs of the workers, and their families, who are working at the commercial, production and service, agricultural and livestock breeding businesses and with the purpose of increasing the capacity of the workers and for the development of competitiveness,

Payment of Wages Act (Law No. 3,4, 5, 14, 8 with 7,10)	2016	<p>(a) Pay in local currency or foreign currency recognized by the Central Bank of Myanmar. This may be in cash, check or deposit into the bank account of Employee.</p> <p>(b) Moreover, pay can be in the means of...</p> <p>(1) Totally in cash OR half the cash and half in things set according to the local price to those employees working in trade, manufacturing and service sectors.</p> <p>(2) Totally in cash OR half the cash and half in things set as local price according to local traditions or common agreement to those working in agriculture and livestock sectors. But, this must be for the sake of the employees and their families. And, it also must be reasonable/fair.</p> <p>(3) An employee shall receive the payment for 60 days when he/she is in Alternative Civil Service.</p>
The Myanmar Insurance Law (Law No. 15, 16)	1993	<p>(a) to overcome financial difficulties by effecting mutual agreement of insurance against social and economic losses which the people may encounter, due to common perils;</p> <p>(b) to promote the habit of savings individually by effecting life assurance, thus contributing to the accumulation of resources of the State;</p> <p>(c) to win the trust and confidence of the people in the insurance system by providing effective insurance safeguards which may become necessary in view of the social and economic developments.</p>
The Social Security Law (Law No. 11(a), 15(a), 18(b), 48, 49, 75)	2012	The employers and workers shall co-ordinate with the Social Security Board or insurance agency in respect of keeping plans for safety and health in order to prevent employment injury, contracting disease and decease owing to occupation and in addition to safety and educational work of the workers and accident at the establishment.
Workman Compensation Act	1951	To protect personal injury caused to a workman by accident arising out of and in the course of his employment and to compensate in accordance with the provisions of Workman Compensation Act
Myanmar Fire Force Law, (Law No. 25)	2015	<p>-To take precautionary and preventive measure and loss of state own property, private property, cultural heritage and the lives and property of public due to fire and other natural disasters</p> <p>-To organize fire brigade systemically and to train the fire brigade</p> <p>-To prevent from fire and to conduct release work when fire disaster, natural disaster, epidemic disease or any kind of certain danger occurs</p> <p>-To educate, organize an inside extensively so as to achieve public corporation</p> <p>-To participate if in need for national security, peace for the citizens and law and order</p>
National Food Law,	1997	<p>a) Recommendation on imported and exported food</p> <p>b) Post market surveillance (risk assessment)</p> <p>c) HACCO along with general practice for food inspectors and manufactures</p> <p>d) Food safety training for restaurants, street, vendors, etc.</p>
Public Health Law (Law No. 3, 5)	1972	To promote and safeguard public health and to take necessary measures in respect of environmental health.



Private Industrial Enterprise Law	1990	To narrow down the gap between rural development and urban development by the development and improvement of industrial enterprises; to avoid or reduce the use of technical know-how which cause environmental pollution; to cause the use of energy in the most economical manner.
Forest Law	1992	To implement forest policy and environmental conservation policy, to promote public cooperation in implementing these policies, to develop the economy of the State, to prevent destruction of forest and biodiversity, to carry out conservation of natural forests and establishment of forest plantations and to contribute towards the fuel requirement of the country.
Protection of Wildlife and Wild Plants and Conservation of Natural Areas Law	1994	To protect wildlife, wild plants and conserve natural areas, to contribute towards works of natural scientific research, and to establish zoological gardens and botanical gardens.
Protection and Preservation of Cultural Heritage Regions Laws (Law No. 15, 16)	1998	To implement the protection and preservation policy with respect to perpetuation of cultural heritage that has existed for many years; to protect and preserve the cultural heritage regions and the cultural heritage.
Prevention and Control of Communicable Diseases Law (Law No. 3, 4, 9, 11)	1995	To prevent the outbreak of Communicable Diseases, by implementing following project activities:- (a) immunization of children by injection or orally; (b) immunization of those who have attained majority, by injection or orally, when necessary; (c) carrying out health educative activities relating to Communicable Disease.
The Control of Smoking and Consumption of Tobacco Product Law (Law No. 9)	2006	-To convince the public that health can be adversely affected due to smoking and consumption of tobacco product and to cause refraining from the use of the same; -To protect from the danger which affects public health adversely by creating tobacco smoke-free environment; -To obtain a healthy living style of the public including child and youth by preventing the habit of smoking and consumption of tobacco product;
Conservation of Water Resources and Rivers Law (Law No. 8, 11(a), 13, 19, 24(b), 30)	2006	To conserve and protect the water resources and rivers system for beneficial utilization by the public; to prevent environmental impact.
Myanmar Port Authority Law	2015	“Any person who by himself or another so casts or throws any ballast or rubbish or any such other thing or so discharges any oil or water mixed with oil, or the master of any vessel from which the same is so cast, thrown or discharged, shall be punishable with fine not exceeding fifty thousand kyats, and shall pay any reasonable expenses which may be incurred in removing the same”.
Agricultural Land Law	2012	To protect the rights of the people who are working on the farm.

<p>Boiler Law (Law No. 3,4,13)</p>	<p>2015</p>	<p>To obtain boilers in compliance with Myanmar Standards or International Standards To prevent the country and citizens from hazards caused by boiler accidents To use boilers in compliance with Myanmar Standards or International Standards within the country To develop boiler technology and to produce experts capable of manufacturing, handling, repair, and maintenance of boilers To optimize the use of boilers through effective utilization of fuel energy To reduce the environmental, social and health impacts through long-lasting use of boilers.</p>
<p>The Protection and Preservation of Ancient Monuments Law (Law No. 12,15 20)</p>	<p>2015</p>	<p>To implement the policy of protection and preservation for the perpetuation of ancient monuments; To protect and preserve ancient monuments so as not to deteriorate due to natural disaster or man-made destruction; To uplift hereditary pride and to cause dynamism of patriotic spirit by protecting and preserving ancient monuments; To have public awareness of the high value of ancient monuments; To protect and preserve ancient monuments from destruction; To search and maintain ancient monuments; To carry out in respect of protection and preservation of ancient monuments in conformity with the International Convention and Regional Agreement ratified by the State.</p>
<p>the Prevention of Hazard from Chemical and Related Substances Rules (Law No. 8,15,16,17, 20, 22, 23, 27)</p>	<p>2013</p>	<p>Performing the sticking pictogram for being least the health impacts and accident injuries in the occupational area according to the prescribed standards and norms of the Globally Harmonized System GHS); Making the necessary arrangements to be safety of the occupational area and issuing orders and directives for preventing and decreasing the accident; Laying down the proliferation plans on knowledge, and safety of chemical and related substances to administrators, license holders, public and workers; Cooperating with local and foreign governmental departments, organizations and non-governmental organizations in respect of safety management for chemicals hazard.</p>
<p>The Freshwater Fisheries Law (Law No. 36,40,41)</p>	<p>1991</p>	<p>To further develop the fisheries; To prevent the extinction of fish; To safeguard and prevent the destruction of freshwater fisheries waters; To obtain duties and fees payable to the State; To manage the fisheries and to take action in accordance with the Law.</p>
<p>Automobile Law Pyidaungsu Hluttaw Law No. 55/2015</p>	<p>2015</p>	<p>For the safe driving of motor vehicles in public areas through registration according to official rules and regulations. To provide driving licenses for driving particular types of motorized vehicles after qualification checks. For the easy flow of road users and for the protection against road risks and vehicle perils. To avoid traffic congestion and to use high technology transportation systems efficiently in order to implement protection against road risks and vehicle perils.</p>



		To reduce environmental pollution caused by motor vehicles.
The Myanmar Engineering Council Law (Law No. 20,24,25, 31(a), 37)	2013	To uphold and upgrade the dignity, ethics and quality of the Myanmar citizen engineers, graduate technicians and technicians who are practicing engineering works; To explore using engineering technology and information technology combined the good methods, research and development activities by which the natural resources and human resources of the State may be beneficially applied with least impact environment; To carry out guidance and supervision, and to take necessary actions for fulfillment of the requirements of stipulated technical standard, proper method, free from danger, keeping ethic and being dutiful in the fields of engineering and technology education, researches and services; To service engineering and technology related functions and duties beneficial for the State assigned by the relevant Ministry and relevant organizations.

**Table 3.2. Legal Commitments of Environmental Laws and Regulations**

<b>Law Name and Section</b>	<b>Legal Commitments</b>
<b>Constitution of the Republic of the Union of Myanmar, 2008</b>	
Section 24	The project proponent has to follow the section 24 of the Constitution of the Republic of the Union of Myanmar.
Section 45	The project proponent has to follow the section 45 of the Constitution of the Republic of the Union of Myanmar.
Section 349	The project proponent has to follow the section 349 of the Constitution of the Republic of the Union of Myanmar.
Section 359	The project proponent has to follow the section 359 of the Constitution of the Republic of the Union of Myanmar.
<b>Environmental Conservation Law, 2012</b>	
Section 7 (o)	The project proponent has to manage according to the Section 7.
Section 14	The project proponent has to carry out treating of emitting substances which cause pollution in the environment in accord with stipulated environmental quality standards.
Section 15	The project proponent has to install or use an on-site facility or controlling equipment in order to monitor, control, manage, reduce or eliminate environmental pollution.
Section 24	The project proponent has to follow the Ministry terms and condition relating to environmental conservation.
Section 29	The project proponent has to follow the rules, notifications, orders, directives and procedures issued under this Law.
<b>Environmental Conservation Rules,2014</b>	
Rule 55	The project proponent has to comply the rule 55 of preparing and implementation of environmental impact assessment with stipulated

	terms and conditions approved by Ministry within time stipulated by Ministry.
Rule 69 (a, b)	The project proponent has to follow the rule of not to pollute the environment, not to cause damage to the ecosystem.
<b>EIA Procedures, 2015</b>	
Article 102 to 110	The project proponent has to report the monitoring included in EIA procedure article 102 to 110.
Article 113	The project proponent has to comply with the determination of Ministry if environmental obligations are not being complied by project proponent.
Article 115	The project proponent has to cost all the inspection and monitoring of project according to article 115 of EIA Procedure.
Article 117	The project proponent has to follow the Ministry program described in Article 117 of EIA procedure.
<b>National Environmental Quality (Emission) Guidelines, 2015</b>	
Section 2.3.1.3	Section 2.3.1.3 The project proponent has to comply with the National Environmental Quality (Emission) Guidelines.
<b>The Protection of rights of National Race Law, 2015</b>	
Section 5	The project proponent has to completely be informed, coordinated and performed with the relevant local ethnic groups in the case of development works, major projects, businesses and extraction of natural resources will be implemented within the area of ethnic groups.
<b>Myanmar Investment Law, 2016</b>	
Section 50 (d)	The project proponent has to invest according to the section 50 (d) of Myanmar Investment Law.
Section 51	The project proponent has to comply with section 51 of Myanmar Investment Law.
Section 73	The project proponent has the type of insurance specified in the rules in any insurance business authorized to conduct insurance business in the State.
<b>Factories Act 1951(Pyidaungsu Hluttaw Law No. 12/2016)</b>	
Section 3	The project proponent has to comply with section 3 of the Factories Act.
Section 4	The project proponent has to comply with section 4 of the Factories Act.
<b>Labor Organization Law, 2011</b>	
Section 1	The project proponent has to comply according to the section 1 of Labor Organization Law.
Section 7	The project proponent has to comply for dispute between employer and worker with section 7 of the Labor Organization Law.
Section 8	The project proponent has to comply for dispute between employer and worker with section 8 of the Labor Organization Law.
Section 9	The project proponent has to comply for dispute between employer and worker with section 9 of the Labor Organization Law.
Section 10	The project proponent has to follow the section 10 of the labor organization law by giving permission to draw the constitution or rules of the labor organization containing the terms and approval of the majority of members.
Section 11	The project proponent has to comply with section 11 of the Labor Organization Law.
<b>The Settlement of Labor Dispute Law, 2012</b>	
Section 38	The project proponent has to comply with section 38 of Labor Dispute Resolution Law.

Section 39	The project proponent has to comply with section 39 of Labor Dispute Resolution Law.
Section 40	The project proponent has to comply with section 40 of the Labor Dispute Resolution Law.
Section 51	The project proponent has to comply with section 51 of Labor Dispute Resolution Law.
<b>Employment and Skill Development Law, 2013</b>	
Section 5	The project proponent has to employ according to section 5 of Employment and Skill Development Law.
Section 14	The project proponent has to carry out training programs in accord with the work requirement in line with the policy of the skill development team to develop the skill relating to the employment for the workers who are proposed to appoint and working at present.
Section 13 (a, b)	The project proponent has to pay money not less below 0.5% of salary, total wages paid to the level of worker supervisor and the workers below such level in such work monthly without fail as the contribution to the fund. The project proponent has to ensure that put in money paid has to not be deducted from the wage or salary of the workers.
<b>The Leave and Holiday Act, 1951 (Law Amended July, 2014)</b>	
Section 3	The project proponent has to comply for the holiday of worker according to section 3 of 1951 Leave and Holidays Act.
Section 5	The project proponent has to comply in related to leave of worker according to section 3 of 1951 Leave and Holidays Act.
Section 14	The project proponent has to comply with section 14 of 1951 Leave and Holidays Act.
Section 16	The project proponent has to comply with section 16 of 1951 Leave and Holidays Act.
<b>Minimum Wages Law, 2013</b>	
Section 12	The project proponent has to pay wage according to section 12 of Minimum Wages Law.
Section 13 (a to g)	The project proponent has to carry out with section 13 of Minimum Wages Law.
<b>Payment of Wages Act, 2016</b>	
Section 3	The project proponent has to pay the wages according to section 3 of Payment of Wages Act.
Section 4	The project proponent has to pay the wages according to section 4 of Payment of Wages Act.
Section 5	The project proponent has to difficulty to pay the wages according to Section 4 sub-section (c) because of significant happenings, including natural disaster, the employer must report to the Department with solid evidence that wages will be paid at the mentioned day upon the workers' agreement.
Section 7	The project proponent has to comply according to section 7 of Payment of Wages Act.
Section 8	The project proponent has to comply according to section 8 of Payment of Wages Act.
Section 10	The project proponent has to comply according to section 10 of Payment of Wages Act.
Section 14	The project proponent has to allow the presiding overtime rate for an employee carries as set by the Law of Payment of Wages Act
<b>The Myanmar Insurance Law, 1993</b>	

Section 15	The project proponent has to follow compulsory Third Party Liability Insurance with the Myanmar Insurance.
Section 16	The project proponent has to comply with section 16 of the Myanmar Insurance Law.
<b>The Social Security Law, 2012</b>	
Section 11 (a)	The project proponent has to comply in accordance with section 11 of the Social Security Law, 2012.
Section 15 (a)	The project proponent has to pay Social Security Fund described in section 15 of the Social Security Law, 2012.
Section 18 (b)	The project proponent has to deduct contributions to be paid by worker from his wages together with contribution to be paid by him and pay to the social security fund.
Section 48	The project proponent has to comply with section 48 of the Social Security Law, 2012.
Section 49	The project proponent has to comply with section 49 of the Social Security Law, 2012.
Section 75	The project proponent has to prepare and keep records described in section 75 of the Social Security Law, 2012 and lists correctly and submit to the relevant township social security office in accord with the stipulations. The project proponent has to inform the relevant township social security office if the matters described in section 75b arise and submit records of work and lists if requested by inspectorate or official assigned by the Social Security Head Office and various levels of Regional Social Security Office under this Law.
<b>Workman Compensation Act, 1951</b>	
Section 3	The project proponent has to liable to pay compensation in accordance with section 3 of the Workmen's Compensation Act if personal injury is caused to a workman by accident arising out of and in the course of his employment
<b>Myanmar Fire Force Law, 2015</b>	
Section 25	The project proponent has to comply according to law no. 25 of Myanmar Fire Force Law by forming the reserve fire brigade and providing fire safety equipment.
<b>National Food Law, 1997</b>	
Section 7	The project proponent has to comply with authorities according to the section of 7 of this law
Section 9	The project proponent has to get a license from the Public Health Department.
<b>Public Health Law, 1972</b>	
Section 3	The project proponent has to allow the government to improve the health of the working population and advising on the health issues described in section 3 of 1972 Union of Myanmar Public Health Law to protect the health of the working population.
Section 5	The project proponent has to follow the organizations formed under this law to inspect and instruct the project at any time.
<b>Private Industrial Enterprise Law, 1990</b>	
	The project proponent has to comply according to Private Industrial Enterprise Law.
<b>Forest Law, 1992</b>	
Section 12	The project proponent has to get approval of the Ministry to carry out any development work or economic scheme within forest land or forest covered land.
Section 12	The project proponent has to get approval of the Ministry to carry out any development work or economic scheme within forest land or forest covered land.

<b>Protection of Wildlife and Wild Plants and Conservation of Natural Areas Law, 1994</b>	
Section 7	The project proponent has to comply according to Protection of Wildlife and Wild Plants and Conservation of Natural Areas Law
<b>Protection and Preservation of Cultural Heritage Regions Laws, 1998</b>	
Section 15	The project proponent has to comply with the Regional Conservation Committee in accordance with the stipulations, to obtain the prior approval that there is no harm to the cultural heritage area.
Section 16	The Project proponent has to comply with the section 16 of the Protection and Preservation of Cultural Heritage Regions Laws.
<b>Prevention and Control of Communicable Diseases Law, 1995</b>	
Section 3	The project proponent has to follow the Ministry of Health to prevent the spread of infectious diseases.
Section 4	The project proponent has to comply with the provisions of Article 3 of the Ministry of Health and the Department of Health regarding the prevention and control of communicable diseases.
Section 9	The project proponent has to comply with the section 9 of Prevention and Control of Communicable Diseases Law.
Section 11	The project proponent has to allow the health officer according to section 11 of Infectious Disease Prevention and Control Law for the prevention of spread of infection diseases.
<b>The Control of Smoking and Consumption of Tobacco Product Law, 2006</b>	
Section 9	The project proponent has to carry out the task according to section 9 of the Control of Smoking and Consumption of Tobacco Product Law.
<b>Conservation of Water Resources and Rivers Law, 2006</b>	
Section 8	The project proponent shall not be carried out any act or channel shifting with the aim to ruin the water resources and rivers and creeks.
Section 11 (a)	The project proponent has to follow the prohibitions from the section 11 of Conservation of Water Resources and Rivers Law.
Section 13	The project proponent has to follow the prohibitions from the section 13 of Conservation of Water Resources and Rivers Law.
Section 19	The project proponent shall not be disposed of any substance into river- creek that may cause damage to waterway or change of water course from the bank.
Section 24 (b)	The project proponent has to follow the prohibitions from the section 24 (b) of Conservation of Water Resources and Rivers Law.
Section 30	The project proponent has to follow the prohibitions from the section 30 of Conservation of Water Resources and Rivers Law.
<b>Myanmar Port Authority Law, 2015</b>	
Section 19	The project proponent has to comply according to the Myanmar Port Authority Law.
<b>Agricultural Land Law, 2012</b>	
Section 30 (b)	The project proponent has to comply according to the Agricultural Land Law.
<b>Boiler Law, 2015</b>	
Section 3	The project proponent has to follow according to the section 3 of the Boiler Law.
Section 4	The project proponent has to comply according to the section 4 of the Boiler Law.
Section 13	The project proponent has to comply according to the section 13 of the Boiler Law.

<b>The Protection and Preservation of Ancient Monuments Law, 2015</b>	
Section 12	The project proponent has to promptly inform the relevant Ward or Village-Tract Administrative Office when he finds an ancient monument.
Section 15	The project proponent has to apply to get prior permission to the Department when the project is within the specified area of an ancient monument.
Section 20	The project proponent does not have to carry out discarding chemical substance and rubbish which can affect an ancient monument and the environment within the specified area of an ancient monument or of a listed ancient monument without a written prior permission.
<b>The Prevention of Hazard from Chemical and Related Substances Rules, 2013</b>	
Section 15	The project proponent has to carry out inspection and training according to section 15 of Prevention of Hazard from Chemical and Related Substances Law.
Section 16	The project proponent has to comply Section 16 of Prevention of Hazard from Chemical and Related Substances Law.
Section 17	The project proponent has to put the insurance in accordance with the prescriptive stipulations to be able to pay the compensation, if the impact and damage is occurred on the Human Being and Animals or the environment in respect of the chemical and related substances businesses.
Section 20	The project proponent has to comply Section 20 of Prevention of Hazard from Chemical and Related Substances Law.
Section 22	The project proponent has to abide the regulations consisted in the registration certificate furthermore shall also abide the order and instructions issued occasionally by the Central Supervisory Board.
Section 23	The project proponent has to comply Section 23 of Prevention of Hazard from Chemical and Related Substances Law.
Section 27	The project proponent has to control and decrease the hazard of the chemical and related substance according to section 27 of Prevention of Hazard from Chemical and Related Substances Law.
<b>The Freshwater Fisheries Law, 1991</b>	
Section 36	The project proponent shall not erect, construct, place, maintain or use any obstruction such as a dam, bank or weir in a freshwater fisheries waters without permission.
Section 40	The project proponent shall not cause harassment of fish and other aquatic organisms or pollution of the water in freshwater fisheries waters.
Section 41	The project proponent shall not alter the quality of water, volume of water or the water -course in a leasable fishery, reserved fishery and creeks contiguous thereto or in water-courses.
<b>Automobile Law Pyidaungsu Hluttaw Law, 2015</b>	
Section 55	The project proponent has to comply according to the section 55 of Automobile Law.
<b>The Myanmar Engineering Council Law, 2013</b>	
Section 20	The project proponent has to comply according to the section 20 of Myanmar Engineering Council Law.
Section 24	The project proponent has to follow the section 24 of Myanmar Engineering Council Law.
Section 25	The project proponent has to follow the section 25 of Myanmar Engineering Council Law.
Section 31 (a)	The project proponent has to follow the section 31 of Myanmar Engineering Council Law.
Section 37	The project proponent has to follow the section 37 of Myanmar Engineering Council Law.



### 3.4. International Agreements and Conventions

In addition to the domestic laws listed above, Myanmar is also a signatory to the following international conventions, and these may have relevance to the proposed survey activities. Refer to the following table.

**Table 3.3. International Agreements and Conventions Relevant to the Proposed Project**

<b>International Agreements and Conventions</b>	<b>Status</b>	<b>Purposes</b>
Vienna Convention for the Protection of the Ozone Layer, 1985	1998	Aims at the protection of the ozone layer, including requirements for limiting the production and use of ozone depleting substances.
Montreal Protocol on Substances that Deplete the Ozone Layer, 1989	1993	Aims at the protection of the ozone layer, including requirements for limiting the production and use of ozone depleting substances.
Basel Convention, 1989	2015	The Convention regulates the trans boundary movements of hazardous wastes and provides obligations to its parties to ensure that such wastes are managed and disposed of in an environmentally sound manner.
United Nations Framework Convention on Climate Change (UNFCCC), New York, 1992 and Kyoto Protocol 1997	1995 and 2005	Provide a framework for intergovernmental efforts to tackle climate change. Recognises that the climate system is a shared resource whose stability can be affected by industrial and other emissions of carbon dioxide and other greenhouse gases.
Convention on Biological Diversity, Rio de Janeiro, 1992	1994	Aims to promote national policies for the conservation of wild flora, fauna and habitat that needs to be included in planning policies. The three main goals are: (1) the conservation of the biological diversity; (2) the sustainable use of its components; (3) fair and equitable sharing of the benefits.
Asia Least Cost Greenhouse Gas Abatement Strategy (1998 ALGAS)	1998	Develop national and regional capacity for preparation of GHG inventories. Assist in identifying GHG abatement options and preparation of a portfolio of abatement projects for each country.
United Nations Agenda 21	1997	Formed by the National Commission for Environmental Affairs (NCEA) in Myanmar. Provides a framework of programmes and actions for achieving sustainable development in the country. Building on the National Environment Policy of Myanmar, takes into account principles contained in the Global Agenda 21. Myanmar Agenda 21 also aims at strengthening and promoting systematic environmental management in the country.
Relevant ILO Conventions in force in Myanmar <ul style="list-style-type: none"> <li>• C1 Hours of Work (Industry)</li> <li>• C14 Weekly Rest (Industry)</li> <li>• C17 Workmen's Compensation (Accidents)</li> </ul>		Sets out legal instruments drawn up by the ILO's constituents (governments, employers and workers) and setting out basic principles and rights for workers.



<ul style="list-style-type: none"> <li>• C19 Equality of Treatment (Accident Compensation)</li> <li>• C26 Minimum Wage Fixing Machinery</li> <li>• C29 Forced Labour Convention</li> <li>• C42 Workmen's Compensation (Occupational Diseases) Revised 1934</li> <li>• C52 Holidays with Pay</li> <li>• C87 Freedom of Association and Protection of the Right to Organize</li> </ul>		
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### **3.5. National and International Guidelines for Proposed Project**

National Guidelines and Internal standard guidelines are referred for Environmental Management Plan of the proposed soft-shell crab farming project.

1. Environmental Impact Assessment Procedure (2015)
2. National Environmental Quality (Emission) Guidelines (2015) for Aquaculture
3. World Health Organization Guideline Value, Global Update 2005
4. National Ambient Air Quality Standard (NAAQS), USEPA
5. IFC Guidelines for Waste Management Facilities, 2007
6. IFC Guidelines for Water and Sanitation, 2007
7. IFC Guidelines for Community Health and Safety
8. IFC Guidelines for Occupational, Health and Safety

### **3.6. Environmental Quality (Emissions) Guideline for Proposed Project**

This guideline applies to semi-intensive and intensive commercial aquaculture production of aquatic species, including crustaceans, mollusks, seaweeds and finfish.

**Table 3.4 - Effluent Levels for Aquaculture**

<b>Parameter</b>	<b>Unit</b>	<b>Guideline Value</b>
5 day Biological oxygen demand	mg/l	50
Active ingredients / Antibiotics	To be determined on a case specific basis	
Chemical oxygen demand	mg/l	250
Oil and grease	mg/l	10
pH	S.U. <sup>a</sup>	6-9
Temperature increase	°C	<3 <sup>b</sup>
Total coliform bacteria	100ml	400

Total nitrogen	mg/l	10
Total phosphorus	mg/l	2
Total suspended solids	mg/l	50

<sup>a</sup> Standard unit

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

**Table 3.5 – National Emission Quality Guideline**

Parameter	Averaging Period	Guideline Value $\mu\text{g}/\text{m}^3$
Nitrogen dioxide	1-year	40
	1-hour	200
Ozone	8-hour daily maximum	100
Particulate matter PM <sub>10</sub> <sup>a</sup>	1-year	20
	24-hour	50
Particulate matter PM <sub>2.5</sub> <sup>b</sup>	1-year	10
	24-hour	25
Sulfur dioxide	24-hour	20
	10-minutes	500

**Table 3.6 - National Ambient Air Quality Standards (NAAQS), Central Pollution Control Board**

Sr. No	Pollutant	Time Weighted average	Concentration in Ambient Air	
			Industrial, residential, rural and other areas	Industrial, residential, rural and other areas
1	Sulphur Dioxide	Annual	50	20
		24 hours	80	80
2	Nitrogen Dioxide	Annual	40	30
		24 hours	80	80
3	PM <sub>10</sub> ( $\mu\text{g}/\text{m}^3$ )	Annual	60	60
		24 hours	100	100
4	PM <sub>2.5</sub> ( $\mu\text{g}/\text{m}^3$ )	Annual	40	40
		24 hours	60	60
5	Ozone O <sub>3</sub> ( $\mu\text{g}/\text{m}^3$ )	8 hours	100	100
		1 hour	180	180
6	Lead ( $\mu\text{g}/\text{m}^3$ )	Annual	0.5	0.5
		24 hours	1.0	1.0
7	Carbon monoxide ( $\mu\text{g}/\text{m}^3$ )	8 hours	2	2
		1 hour	4	4
8	Ammonia ( $\mu\text{g}/\text{m}^3$ )	Annual	100	100
		24 hours	400	400
9	Benzene ( $\mu\text{g}/\text{m}^3$ )	Annual	5	5

10	Benzo (a) pyrene (ng/m <sup>3</sup> )	Annual	1	1
11	Arsenic (ng/m <sup>3</sup> )	Annual	6	6
12	Nickel (ng/m <sup>3</sup> )	Annual	20	20

Note: Whenever and wherever monitoring results on two consecutive days of monitoring exceed the limits specified above for the respective category, it shall be considered adequate reason to institute or continuous monitoring and further investigation.

**Table 3.7 - WHO Air Quality Guidelines**

Pollutant	Averaging Time	WHO 2005 Air Quality Guidelines Values
PM <sub>2.5</sub> (µg/m <sup>3</sup> )	Annual	10
	24-hour <sup>a</sup>	25
PM <sub>10</sub> (µg/m <sup>3</sup> )	Annual	20
	24-hour <sup>a</sup>	50
O <sub>3</sub> (µg/m <sup>3</sup> )	Peak season <sup>b</sup>	N/A
	8-hour <sup>a</sup>	100
NO <sub>2</sub> (µg/m <sup>3</sup> )	Annual	40
	24-hour <sup>a</sup>	N/A
	1-hour	200
SO <sub>2</sub> (µg/m <sup>3</sup> )	24-hour <sup>a</sup>	20
	10-minute	500
CO (mg/m <sup>3</sup> )	24-hour <sup>a</sup>	N/A
	8-hour	N/A
	1-hour	N/A

### Noise Level

According to the NEQG that has been prescribed by Ministry of Environmental Conservation and Forestry on 29<sup>th</sup> December, 2015, under Chapter 1 (General Provision), Section 1, sub-section 1.3 mentioned the following requirements for noise levels;

**Table 3.8 – Noise Level set in NEQG**

Receptor	One Hour LAeq (dBA)	
	Daytime (7:00-22:00) (10:00-22:00 for public holidays)	Night time (22:00-7:00) (22:00-10:00 for public holidays)
Residential, institutional, educational	55	45
Industrial, commercial	70	70

### **3.7. Statement of Commitments**

We, PPT Co., Ltd commit to comply with the followings:

- a) Comply with the commitments of the environmental and socio-economic development revealed in the Initial Environmental Examination report.
- b) Acknowledge and comply the laws, regulations and guidelines associated with the project, included in the report.
- c) Comply and proceed the alternative methods, mitigation measures and monitoring plans included in the report for the reduction of the negative environmental impacts; and take responsibility for the environmental impacts due to non-compliance of the commitment.
- d) Give priorities for the occupational health and safety of the workers.
- e) Utilize the exact amount of fund as stated in proposed expenditure for cooperate social responsibility funds.
- f) Take responsibility for all of the works and absence of the contractors, sub-contractors, officers and representatives of the company in operating the processes.
- g) Take responsibility to support after discussion for the impacted people to ensure for their stable livelihood not lower than before the project; and resettlement and rehabilitate the impacted local people, government organizations and other related people and organizations.
- h) We, (PPT) commit to follow the environmental commitments, mitigation measures, management plans illustrated in the EIA report. We also commit to follow the Environmental Conservation Laws 2012, and the Environmental Conservation Rules 2015.

(Signature)

Name -

Position -

Date -

### **3.8. Commitments of the Environmental Assessment Practitioner**

The EIA report was written by Ever Green Tech Environmental Services and Training Co., and the report was planned by the following criteria;

- (a) The drawn the IEE complied with the National Constitution, Environmental Conservation Law, IEE Procedures, and National Environmental Quality Guidelines.
- (b) This IEE also complied with the existing or future Labor laws, Occupational Health and Safety Laws, and related Rules and Procedures.
- (c) These environmental impact protection procedures are designed of incident avoiding, mitigation and replacing for the project proponent who commits to follow the environmental impact protection procedure.
- (d) This environmental management report is systematically planned not only for environmental impact protection procedures and occupational safety and health but also emergency management planning and social welfare programs.
- (e) All facts including in this report are systematically surveyed without bias. As a third party, we commit and take full responsibility for all of the factors described in this report.

### **3.9. Penalties and Administrative Punishment**

PPT will keep an eye on the penalties and other administrative punishment granted in IEE Procedures in Myanmar.

No	Non-Compliance	Penalties	Specific Administrative Punishment of the Ministry
1.	Failure or delay in timely sub-mission of reports within Period prescribed by Ministry	100 to 500 US\$ or equivalent Myanmar Kyat + 10-25 US\$/ day unit cured or equivalent Myanmar Kyat	-Issue Enforcement Notice
2.	Obstruction or interference with an official in the course of their duties	250 to 5,000 US\$ or equivalent Myanmar Kyat	-Issue Enforcement Notice -Criminal prosecution
3.	Failure to provide information to the Ministry or any representative	1,000 to 5,000 US\$ or equivalent Myan-mar Kyat	-Suspension of Approval of EMP, EMP-CP, EMP -OP in whole or in part
4.	Failure to provide information to the Ministry Inspector or any representative when requested in regard to inspection and monitoring	250 to 5,000 US\$ or equivalent Myanmar Kyat	-Issue Enforcement Notice
5.	Undertaking or allowing any preparatory or other construction works without the prior approval by the Ministry of a reserved EMP or EMP-CP	1,000 to 5,000 US\$ or equivalent Myanmar Kyat +50 to 500 US\$/ day until cured or equivalent Myan-mar Kyat	-Criminal prosecution
6.	Operating/implementing without a permit, or approval by the Ministry of an EMP or EMP-Op	1,000 to 5,000 US\$ or equivalent Myan -mar Kyat +50 to 500 US\$/ day unit cured or equivalent Myan-mar Kyat	- Criminal prosecution
7.	Non-compliance with an Enforcement Notice or Suspension Notice issued by the Ministry	2,000 to 10,000 US\$ or equivalent Myan -mar Kyat +100-500 US\$/day unit cured or equivalent Myan-mar Kyat	-Suspension of Approval of EMP, EMP-CP or EMP-OP in whole or in part -Revocation of Approval of EMP, EMP-CP or EMP-OP in whole or in part
8.	Failure to notify to the Ministry of any knowledge of any event of an imminent of Environmental damage	1,000 to 5,000 US\$ or equivalent Myan-mar Kyat	- Issue Enforcement Notice - Suspension of Approval of EMP, EMP-CP or EMP-OP in whole or in part -Revocation of Approval of EMP, EMP-CP or EMP-OP in whole or in part

9.	Failure to take reasonable steps to prevent an imminent threat of damage to the Environment, social, human health, livelihoods, or property, where application based on the EMP, EMP-CP or EMP-OP	2,500 to 10,000 US\$ or equivalent Myanmar Kyat	-Issue Enforcement Notice - Suspension of Approval of EMP, EMP-CP or EMP-OP in whole or in part -Revocation of Approval of EMP, EMP-CP or EMP-OP in whole or in part
10.	Non-compliance with conditions in ‘the ECC and allowable Emission Limit Values	1,000 to 10,000 US\$ or equivalent Myanmar Kyat	-Issue Enforcement Notice - Suspension of Approval of EMP, EMP-CP or EMP-OP in whole or in part -Revocation of Approval of EMP, EMP-CP or EMP-OP in whole or in part
11.	Failure to take pay compensation amounts required in respected in respect of social impacts	1,000 to 10,000 US\$ or equivalent Myanmar Kyat	-Issue Enforcement Notice - Suspension of Approval of EMP, EMP-CP or EMP-OP in whole or in part -Revocation of Approval of EMP, EMP-CP or EMP-OP in whole or in part
12.	Failure to fully restore social conditions upon resettlement	1,000 to 10,000 US\$ or equivalent Myanmar Kyat	-Issue Enforcement Notice - Suspension of Approval of EMP, EMP-CP or EMP-OP in whole or in part -Revocation of Approval of EMP, EMP-CP or EMP-OP in whole or in part

**Notes:**

1. All penalty amounts set forth in this Annex are denominated in United states Dollars (US\$) and are subject to annual inflation adjustment
2. Abbreviations are as follows;  
 EMP =Environmental Management Plan,  
 EMP-CP = Environmental Management Plan – Construction Phase,  
 EMP-OP = Environmental Management Plan –Operational Phase



## **4. DESCRIPTION OF PROJECT AND ALTERNATIVES**

### **4.1. Project Background**

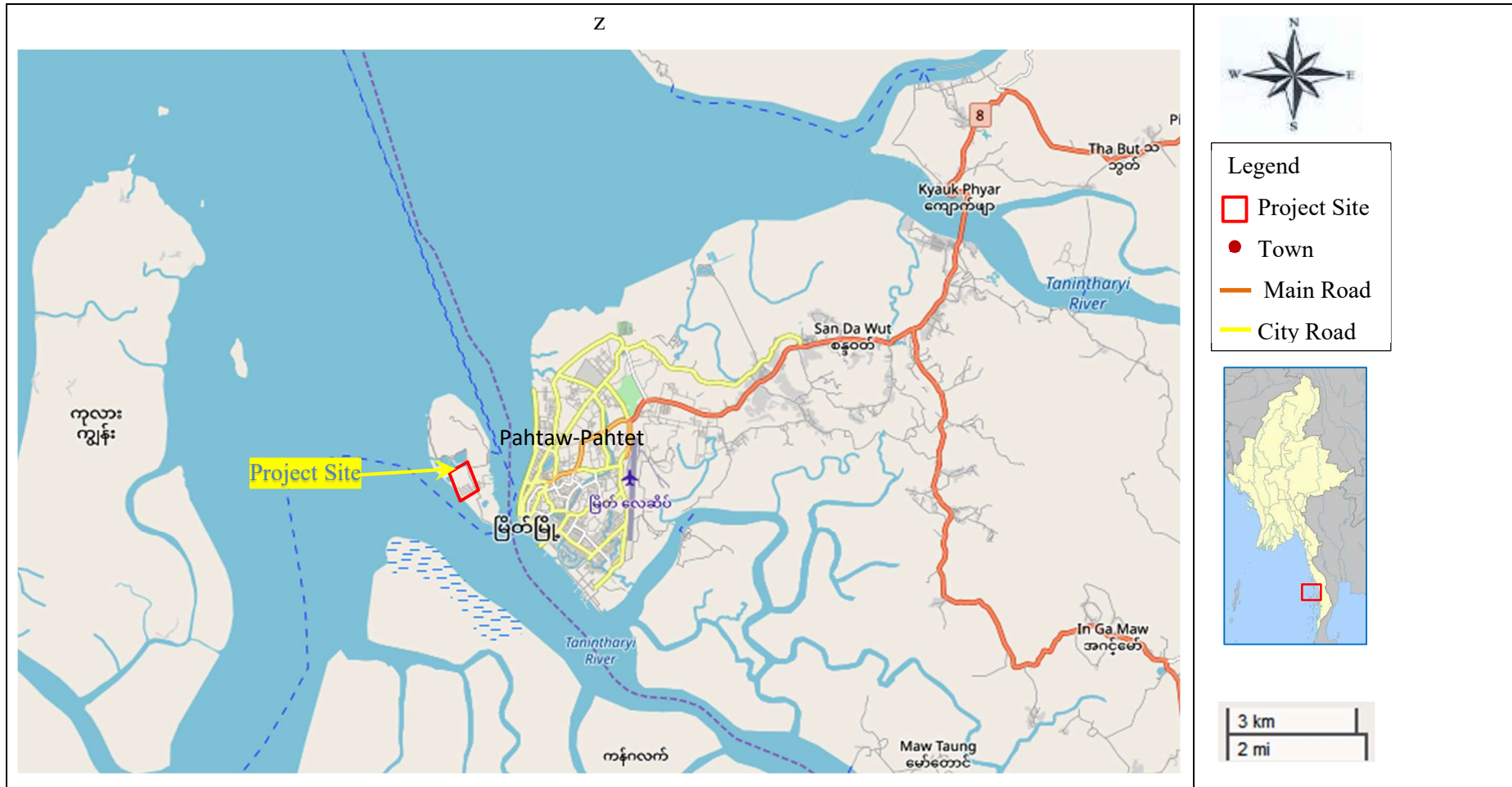
PPT will operate soft-shell crab farming, which was built in 2004, producing soft-shell crabs for the cold storage factory to make the finished products of frozen soft-shell crabs. The operation of the project starts in 2005 and running till now.

### **4.2. Production Rate**

The proposed project produces an average of 60 tons of soft-shell crabs per month. But generally, the production rate depends on the seasonal rates of crabs.

### **4.3. Location of the Project**

The proposed project is located on the Pahtaw-Pahtet island, Pahtet village, Kyun Su Township, Myeik District, Thanitharyi Region, at the coordinates of 12°26'49.65"N Latitude and 98°34'33.83"E Longitude and covering a total land area of 80 acres. The location map of project area is shown in the following figure.

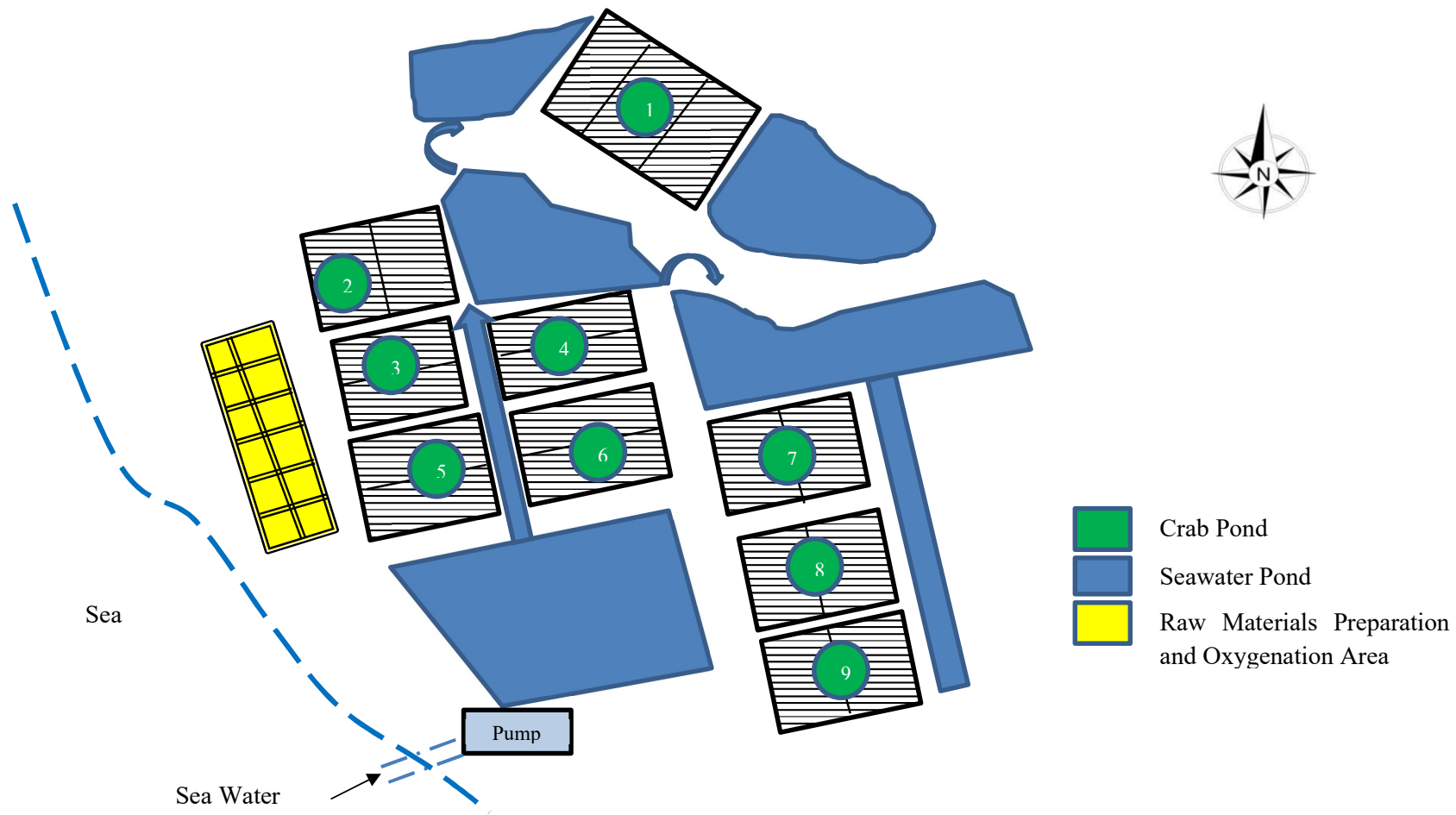


*Figure 4.1. The Location Map of Proposed Soft-shell crab Farming*



*Figure 4.2. Satellite View of Soft-shell Crab Farming*





*Figure 4.3. Layout Plan for Soft-Shell Crab Factory*

#### 4.4. Facts Concerning the Project

No	Facts	Description
1.	Project Area	80 acres
2.	Raw Materials	Raw crabs from vendors of nearby villages
3.	Products	Soft-shell crabs
4.	Production (Monthly)	Approximately 60 tons
5.	Water sources	Pumped Water, Sea Water
6.	Electrical power consumption	50 KVA
7.	Electrical power source	Self-Generator (Combined Generator for the Whole Island)
8.	Solid waste management system	Wasted hard shells are used in landfill. Recyclable domestic waste will be recycled. Other domestic waste will be disposed of in a domestic waste disposal site as directed by CDC (Kyunsu and/or Myeik)
9.	Job opportunities during operation phase	Total of 300 employees that include specialists, male and female labors

#### 4.5. Process Description of Soft-shell Crab Farming

##### 4.5.1. Guidelines for Soft-shell Crab Farming

The followings are the general guidelines for soft-shell crab farming:

- Each crop cycle of crab production requires 45 days until the shell hardened. The selection of seed crab size is the important factor to be considered because the crabs weighed more than 130g need more time for the molting stage. The crabs' size of 80-130g are selected.
- The depth of the pond should be between 1.5-2m.
- To get more yield, the water quality is the most important thing. The water quality is considered with the main factors: temperature, pH, salinity and dissolved oxygen.
- The temperature of water has a strong influence on survival rate of crabs and that must be less than 30°C. The recommended temperature is in the range of 22-28°C.

- pH must be in the range of 6.5-8. If pH of water is decreased, lime can be used to stabilize pH. A pH around 8 is the optimum for crab farming because the accepting water body (sea water) for wastewater discharge is already in alkalinity. It will have a potential impact on accepting sea water environment if the pH is not in the limited range.
- Salinity is a key water quality parameter that contributes to the survival of mud crabs. The recommended value of salinity of water is 5ppm above/below of harvesting water. The sudden drop of salinity is occurred mostly in between 30th-day to 45th-day, so care must be taken more within those days.
- The amount of dissolved oxygen in water should be above 7mg O<sub>2</sub> L<sup>-1</sup>. This can be controlled by using aeration.

#### **4.5.2. Farming Facilities**

Farming facilities for soft-shell crab include a roofed bridge constructed across the pond for servicing, inspection, and collection of crabs during the operation; an area for weighing, sampling, acclimation, holding newly harvested soft-shell crabs in aerated freshwater, and stocking of trays.

#### **4.5.3. Soft-shell Crab Farming Process**

The proposed project can produce an average of 60 tons of soft-shell crabs per month.

**Step 1** - Captured from the sea, the crabs are sorted into specific sizes and weighed by balance. When buying the crabs, they were collected between 80-130 g and send the crabs, smaller than the specified size, to the sea. After sorting and weighing the crabs, they are salted with sea water in the buckets.



Figure – Sizing of Crabs



Figure – Weighing the Crabs





Figure - Cleaning the Raw Crabs

**Step 2** - For farming, the seed crabs are introduced in individual boxes and started breeding in a pond. Each pond is 300 feet wide and can hold up to 100 floats. Each crab float can hold up to 600 crabs, and each pond can hold 50,000 to 60,000 numbers of crabs. It takes about 45 days to breed in a hatchery to reach a specified size and be exported for sale. Trash fish minced into pieces of an inch size is used as food for the crabs and fed every other day. The crabs are checked 1:30 hr interval to monitor the molting status. The workers typically remain seated on the platforms situated in the middle of the pond, accessing a row of containers using a rope under the platform to observe each crab for indications of molting. Workers are assigned into morning shift (6:00 am to 5:30 pm) and night shift (5:30 pm to 6:00 am), and operating with a workforce of 100 in the morning shift and 70 in the night shift. These workers observe the immature crab of specified size when they are still soft-shelled and retrieve the shelled figures from the ponds and place them in a bucket of fresh water for a while.



Figure - Crab Farming Basket



Figure - Crab Farming Floats

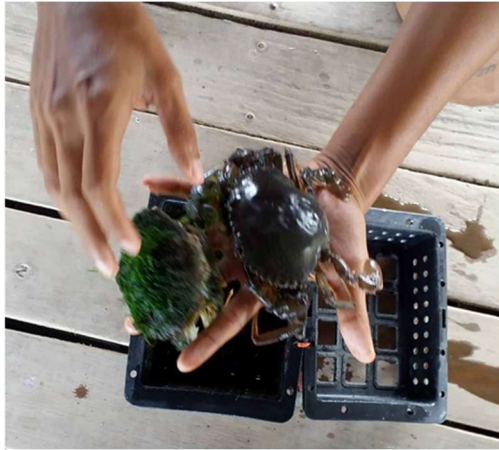


Figure - Soft Shell Crab Produced from Farming Process



Figure - Adding of Soft-shell Crabs into Fresh Water

**Step 3** - The soft-shelled crabs are soaked in oxygenated fresh water which contains chlorine concentration of 10ppm for 15 to 20 minutes before being sent to the cold storage factory. Soft-shelled crabs are kept in fresh water to soften the shells as they harden when stored in seawater, and without oxygen those crabs can die. So, they need to be oxygenated and kept in fresh water before sending to the cold storage factory. The soft-shell crabs, which are placed in oxygen for enough time, are sent to the cold storage factory every 2 hours. Before being transported, the crabs are covered up with wet cloth (soaked in fresh water).

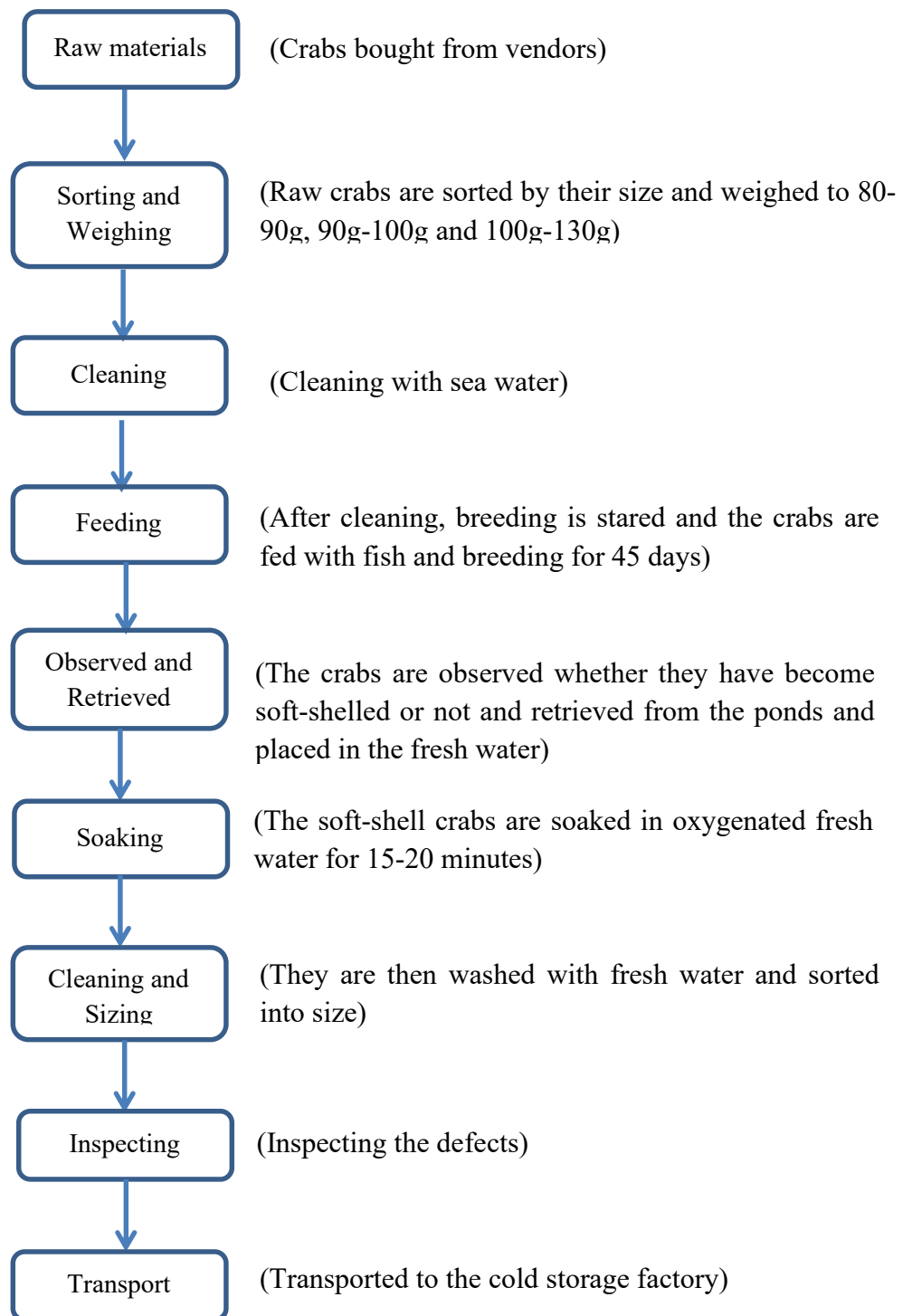


Figure - Oxygenated Fresh Water Tank



Figure - Soaking of Soft-shell crab into Oxygenated Fresh Water

The process flow diagram of soft-shell crab farming is described clearly as follows.



**Figure 4.4 – Flow Chart of Soft-shell Crab Farming**





*Figure 4.5 – Photo Diagram of Soft-shell crab Farming Process*

#### **4.5.4. Potential for Co-culture with Fish**

Since soft shell crab production is practiced in boxes occupying the surface level for ponds, there is a potential for integration with fish culture under the caged crabs in the same pond. The recommended fishes for polyculture system include tilapia, mullet and milkfish. Among them, tilapia would be the best because (i) tilapia are a popular farmed fish, (ii) they can be produced in various location, water system, temperature and salinities, (iii) they have fast growth rate and (iv) they have high market demand. For co-culture farming, bottom dwelling species can be stocked to enhance farm production and income. Also, fish can serve as aerators that improve water quality and can grave phytoplankton, fila mentous algae, and macrophytes in ponds as well as periphytons attached in the crab boxes, thereby serving to clean boxes biologically and reducing farming costs.

#### 4.6. Maintenance of Water Quality

Pond water deteriorates due to the accumulated wastes, hence it is important to maintain good water quality. The water depth in the pond should be maintained at 1-2 m. the other parameters are shown in the following table.

Parameter	Value
Temperature	27-32°C
Salinity	16-30ppt
Dissolved oxygen	≥ 5ppm
pH	6.5-7
Transparency	30cm
Organic matter	1-10percent

#### 4.7. Machinery and Equipment

Components of proposed project are show follow;

*Table- Motor Vehicle for Proposed Project*

Sr.No.	Particular	Qty
1.	Auto mobile	2
2.	3RC Truck	2

#### *Equipment*

Equipment that are needed in the operation of soft-shell crab farm are as follows:

- Magnetic air compressor      1no.
- Submersible pump                3nos.
- Generator                            2nos.
- Weighing scales                    5nos.

#### 4.8. Employee Statement

The following table shows the employee statement and working cycle.

Labors required during Pre-construction Phase	
Site clearing labors	10 members
Labors required during Construction Phase	
Construction labors	30 members

<b>Labors required during Operation Phase</b>	
Factory Labors (Male)	100 members
Factory Labors (Female)	200 members
Total	300 members
<b>Labors required during Decommissioning Phase</b>	
15 labors	
<b>Working hours</b>	
Morning time	6:00am to 5:30pm (Breaktime 12:30pm to 1:00pm)
Evening time	5:30pm to 6:00am (Breaktime 12:30pm to 1:00am)

#### **4.9. Implementation Schedule**

The implementation time for the whole project will be as follow:

Pre-construction	3 months
Construction	2003-2004
Operation	2005-Present
Decommission	6 months

#### **4.10. Factory Products and By-Products**

The proposed project produces an average of 60 tons of soft-shell crabs per month. But this rate generally depends on the seasonal rate of crabs. Those crabs from farming are transported to the cold storage factory to make frozen soft-shell crabs. Some by-products such as decayed crabs and wasted crab shells are generated.

##### **4.10.1. Feasible Use of Wasted Crab Shells**

A large quantity of hard-shell crabs is generated in soft-shell crab production, and at present, these are discarded in landfills. Those crustacean shells contain 20-50 percent calcium carbonate, 20-40 percent protein, and 15-40 percent chitin that could potentially use for water treatment as well as fertilizers and animal feed production.

#### **4.11. Utilities Consumption**

##### **(a) Water Usage Pattern**

The farming process uses a large amount of water for the farming processes, and both sea water and fresh water are used. The crabs are breeding in sea water and after the molting stage; the crabs are washed with fresh water. Fresh water is used for soaking of soft-shell crabs not to



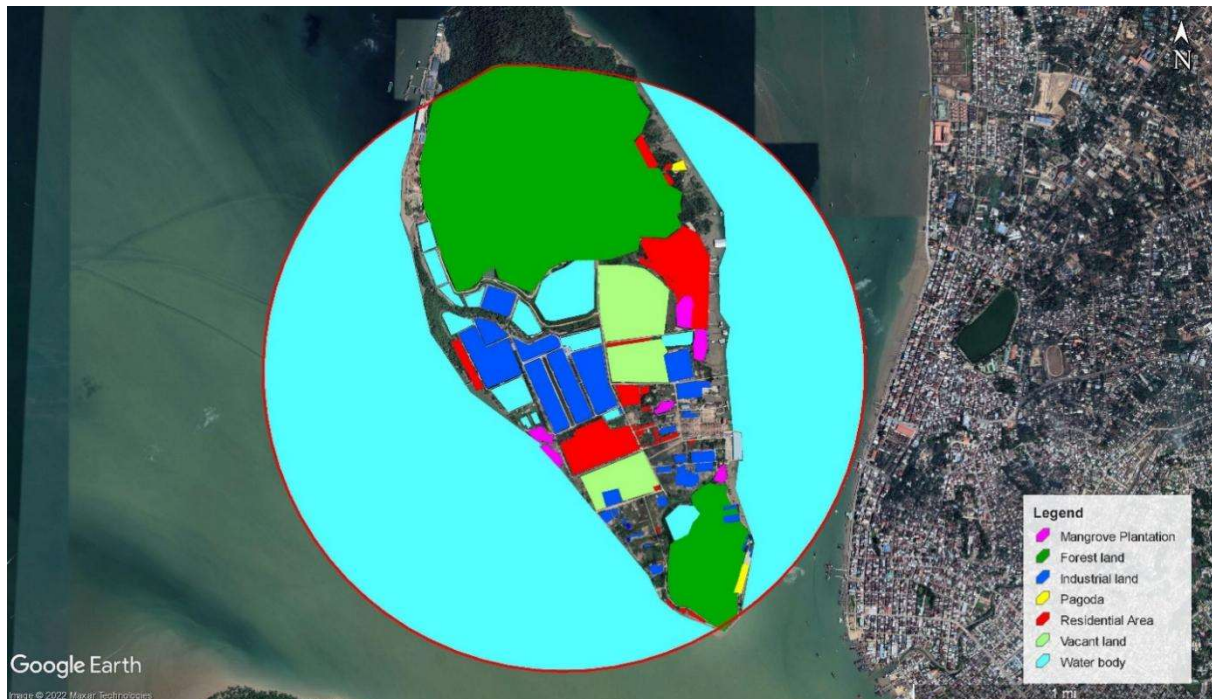
harden the shells, washing of baskets and domestic use. The water in the ponds is exchanged whenever the water quality is decreased. Drinking water will be providing by outsource suppliers.

***(b) Energy Required***

Electricity is important in managing the farm especially during daily harvest where soft-shell crabs are held in buckets with aerated freshwater. The proposed project is intended to get required electricity supply form 350 kVA generators. Electric power will be used for the purpose of to run the production machinery and to provide lighting. The total estimated demand for electricity will be 50 KVA.

**4.12. Land Use**

The land use and land cover within 3km boundary of the proposed project is as follow:



**Figure 4.6 – Land Use for Soft Shell Crab Factory**

<b>Land Use</b>	<b>Percentage (%)</b>
Water Body	37.68
Residential Area	14.60
Forest land	11.97
Pagoda	1.07
Industrial land	20.64
Mangrove Plantation	7.66
Vacant land	6.37

The most land use type is industrial land and important land type is mangrove plantation area.

## **5.0. DESCRIPTION OF SURROUNDING ENVIRONMENT**

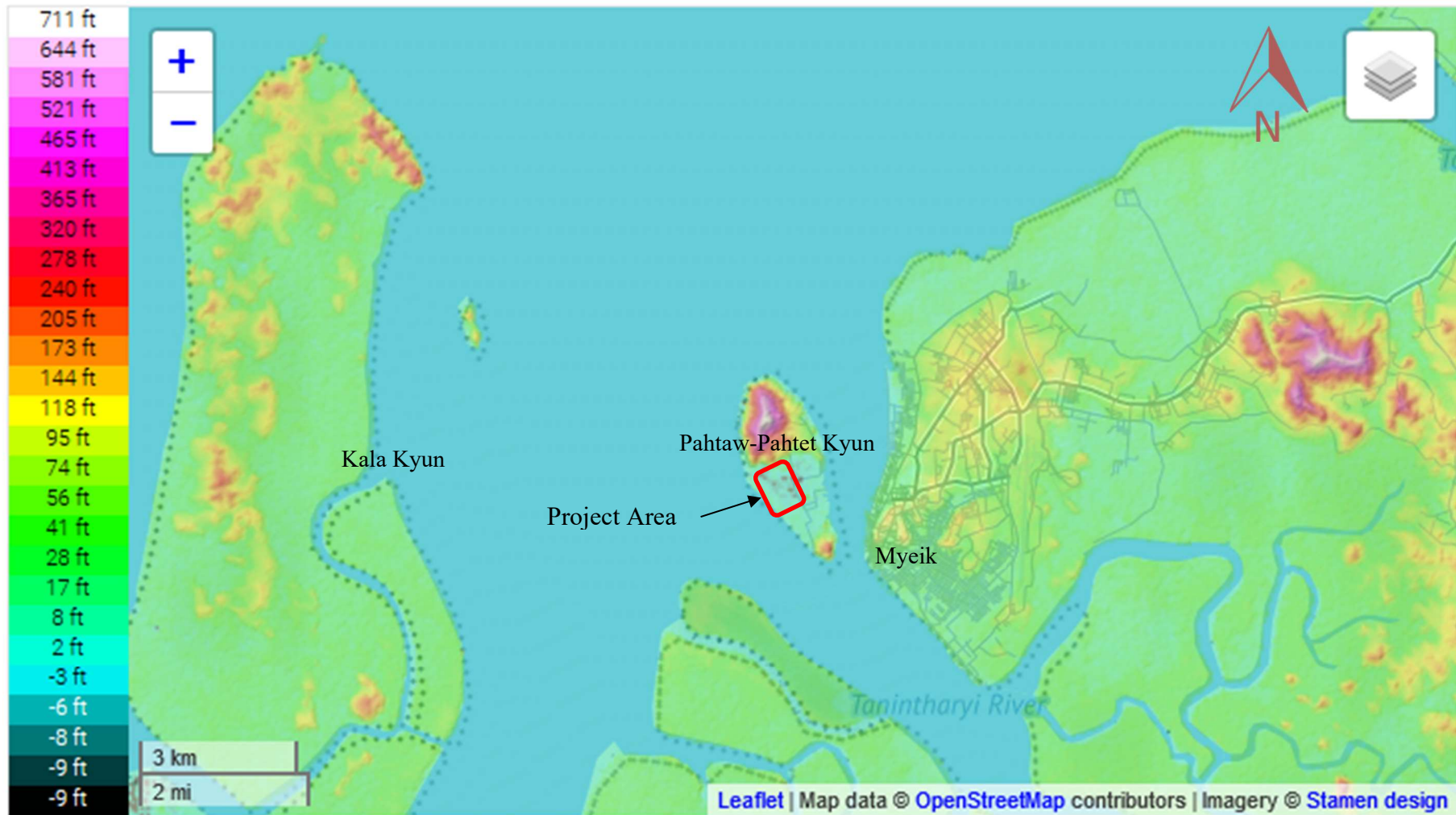
### **5.1. Topography**

The topography of Tanintharyi coast is greatly influenced by tectonic movement and volcanic activity resulting from the docking of the Indian tectonic plate with the Eurasian plate in the early Miocene. The twisting of the Eurasian plate as the Indian plate dragged its margins northwards formed many rocky shorelines and the rocky headlands and capes jutting out into the sea. The region's granitic islands began as intrusions of hot magma that rose through weak spots in the Earth's crust hundreds of million years ago, working their way through thick layers of sedimentary rock laid down at least 100 million years earlier still.

The project site is located on a coastal strip at the base of the Pahtaw-Pahtet Island (Figure 5.1). Here the limestone hills to the westslope eastwards from an altitude of 77 m (245 ft) high of the top.

The project site south of the main road is relatively flat with a low-lying flat area close to sea level in east and rising to a height of 5 m (17 ft) in the central section of the site. From the northeast the land rises gently towards the east. Here the elevation at the coastline is in the order of 1.5 m (5 ft) (Figure 5.2).

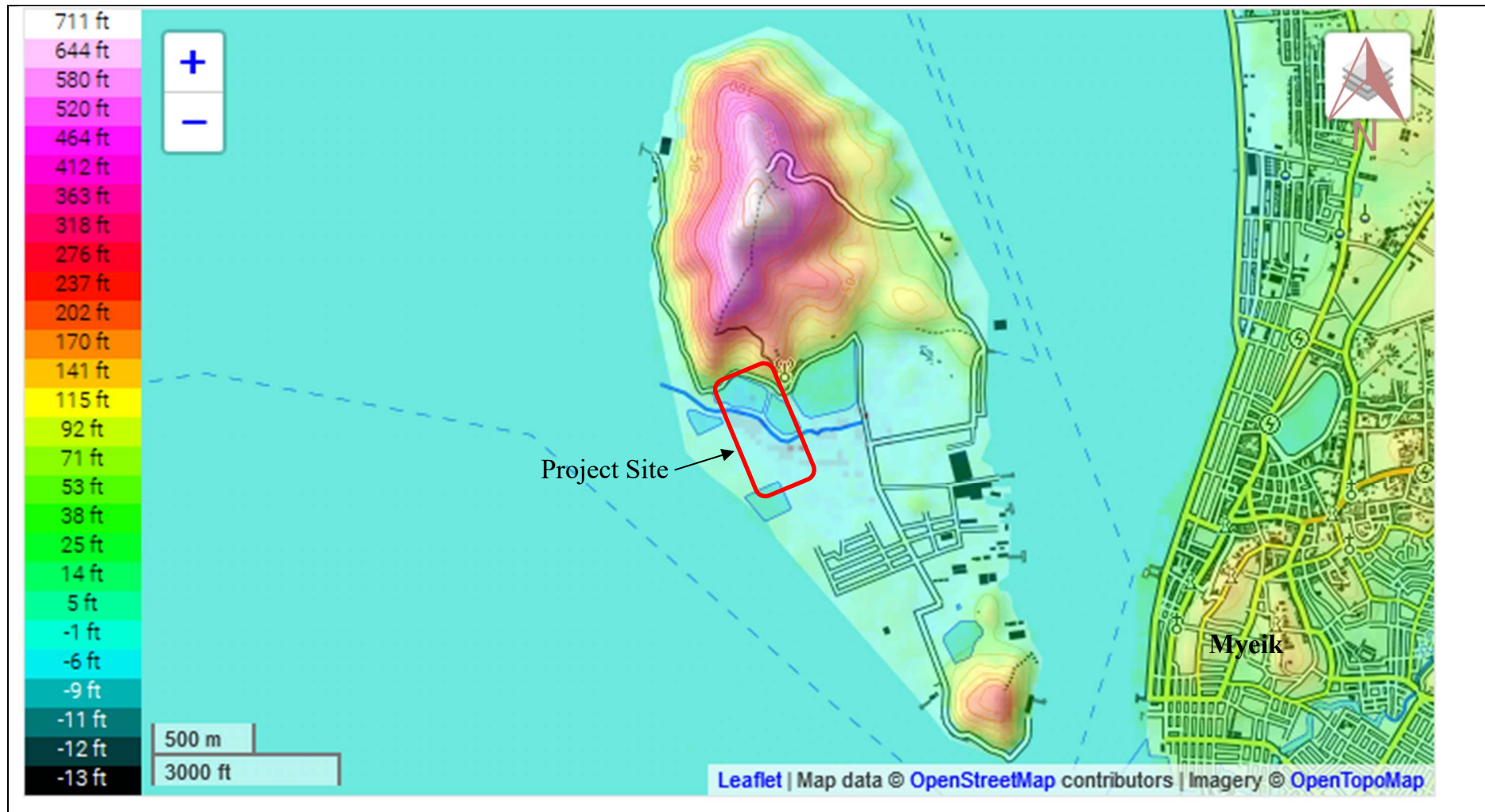
The project site itself is relatively flat and has distinct drainage features on the slopes. Storm runoff from the slopes is intercepted by the east-west running main road and therefore should prevent any significant storm runoff from flowing onto the site.



Source: <http://en-us.topographic-map.com>

Figure 5.1. Digital Elevation Map of Project Area





Source: <http://en-us.topographic-map.com>

Figure 5.2. Site Topography

## **5.2. Geology**

The investigated area lies on the southern part of Shan-Taninthayi massif and northern continuation of Taninthayi ranges, it is covered with Late Paleozoic rocks. The western part of the study area, which is in Taungnyo Range, is Carboniferous rock units (Taungnyo Series) arranged and systematically described (Leicester, 1930). Further up to the northwestern part, also in Mottama Range, Late Permian rocks (Martaban Beds, Pascoe, 1959) and Mesozoic granitic rocks are exposed. Along the Tanintharyi area, quaternary deposit of gray and gray swampy soil and red brown forest soil types are present. Soil Map of Tanintharyi region is shown in Figure 5.3.

The project site is underlain by limestones belonging to the coastal formation, which are found at depths below ground level. The soil at the surface of the project site consists of a layer of reddish-brown silty clay and coarse to fine calcareous sand that is up to 6 meters deep.

This soil type covers the entire site and overlays four different other soil types, the areal distribution of which is shown in Figure 5.3. These consist of dense calcareous sand, sand gravels, compact to dense medium to fine sands, soft peaty clays and compact sands.

The Coastal Group of limestones consists of a variety of limestones deposited in shallow coastal environments comprised of reef deposits, limestone muds, and gravels, colluvium and rubbly reworked materials. Further to the south the Coastal Group limestones are overlain by limestones belonging to the Montpelier Formation.

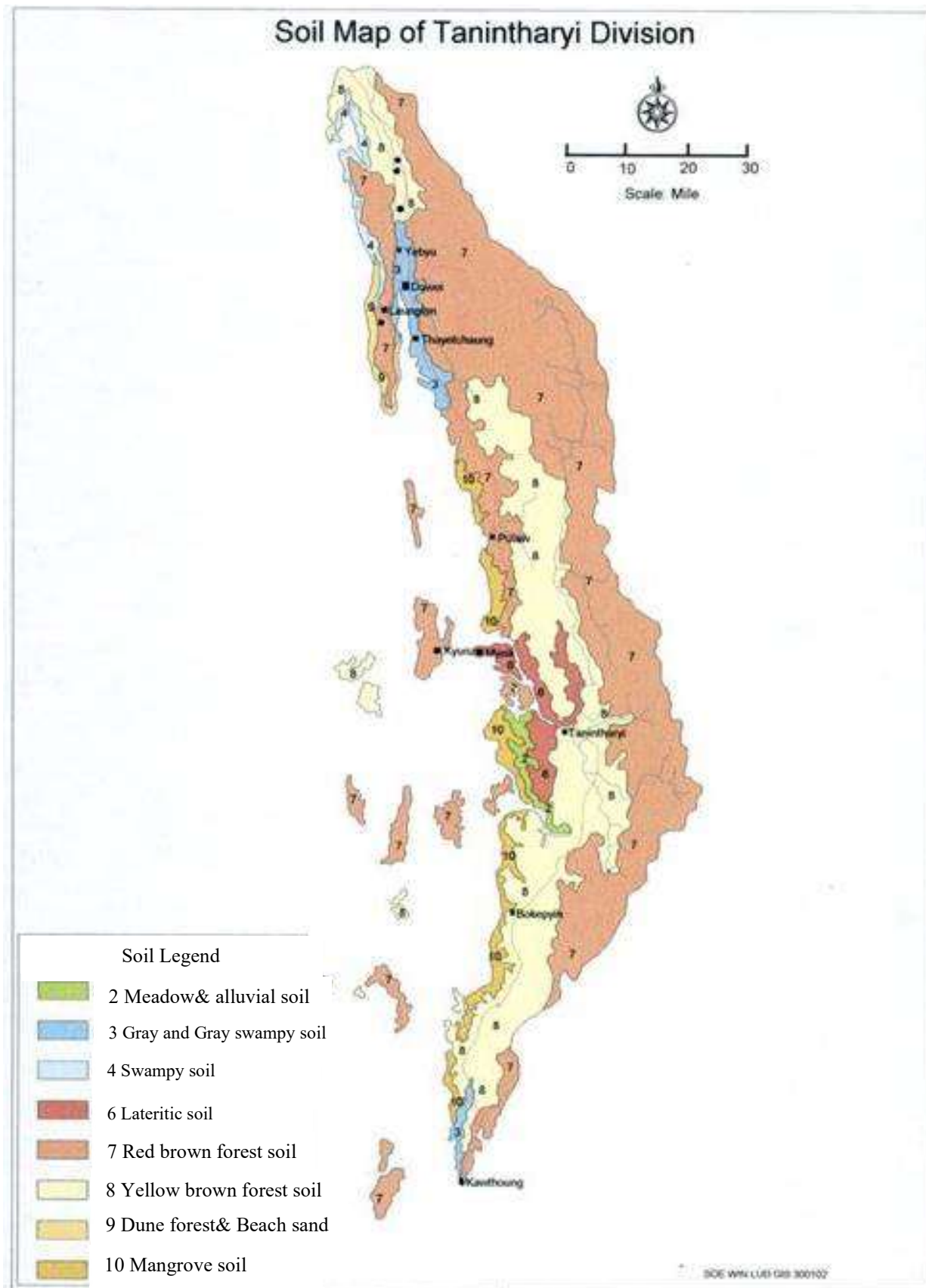


Figure 5.3. Soil Map of Tanintharyi Region

### **5.3. Hydrology**

#### **5.3.1. Surface Water**

The Tanintharyi Coastal area is the longest coastal zone of Myanmar and is bounded by Andaman Sea in the west. This coastal zone covers south of the Gulf of Motta up to the mouth of Pakchan River. It also includes Myeik Archipelago and Andaman Sea. Myeik Archipelago extends from Mali Island to Similand Island and contains about 800 islands covering an area of about 34,340 sqkm and is lying up to 30km off shore. Some islands also exist at the northern part of this coastal area. The length of the mainland coast is about 1,200 km and the total land area is about 43,344 sqkm. The coastal plain is narrow and gradually rises towards the east to become the Tanintharyi Yoma with 2,073meter high Myint Moe Let Khat Taung as the highest peak. The vertical temperature distribution in sea waters showed a maximum at the surface layer and then decreased with depth. However, salinity increased gradually with Country report on pollution. The thermo cline zone of the Tanintharyi coast was presented at 50meter depth to 230meter depth. The Great Tenasserim River or the Tanintharyi River is a major river of southeastern Burma. It flows through the Tanintharyi Region, past the town of Tanintharyi, and enters the sea at Myeik (Mergui). The river rises from the Tenasserim Range at an altitude of 2,074 m (6,804 ft), and flows into the Andaman Sea. The river banks are characterized as almost perpendicular in some areas. Islands dot the river in the low land areas. Rapids occur in narrow areas of the channel. The tide is felt 10 mi (16 km) above Tanintharyi. The Tenasserim plains to the north are drained by a series of short rivers and tributaries. The tributaries include Tonbyaw Creek, Thuggoo River, as well as the Hti-phan-ko stream on the Great Tenasserim's right bank. Soil erosion is reported in the upland ridges of the region.



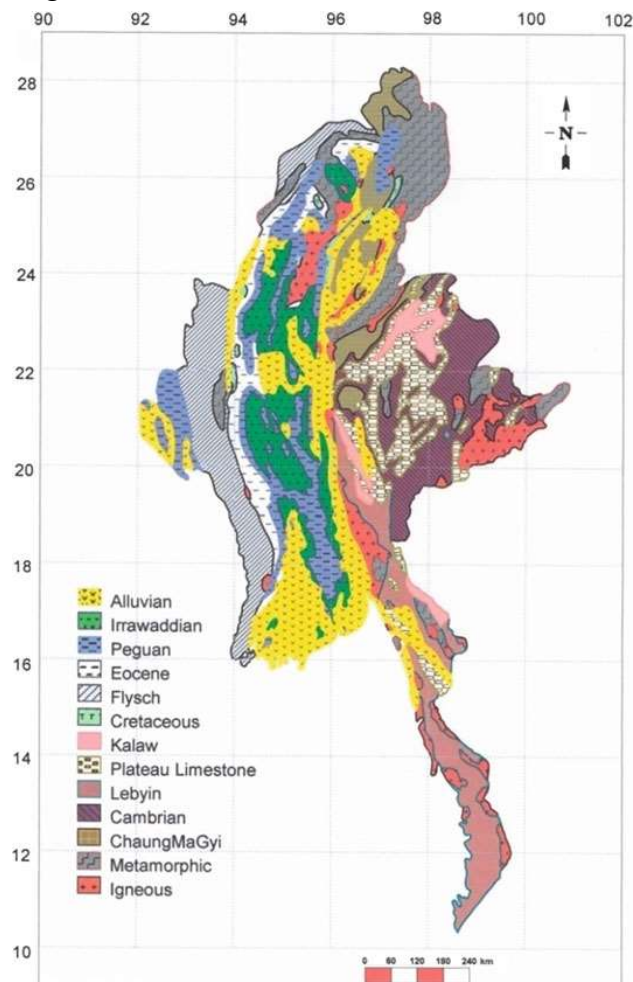
*Figure 5.4 - Surfacewater of Tanintharyi Region*

#### **5.3.2 Groundwater**

The major aquifers of Myanmar range from Precambrian to Recent age and vary from coastal and north-south trending tectonically controlled basins. The major groundwater recharge is



from monsoonal rainfall, which extends from June to September, ranges up to 3050 mm in the deltaic area, 3810 mm in the north, ~2000 mm in the eastern mountainous region, and only 760 mm in the central dry zone. The largest aquifer is the Irrawaddy river basin, which like the IGBM basin is the most prolific aquifer, however, much of the aquifers of the basin have been identified to have groundwater enriched with as (Figs. 5.5). The other aquifers are in the Thanlwin, the Chindwin, and the Sittaung rivers. The total groundwater potential of Myanmar is ~495 km<sup>3</sup>/year, respectively. The groundwater use in Myanmar is mostly for agriculture purposes, ranging up to ~90%, the rest ~10% being used in industrial practices and domestic purposes. On the basis of stratigraphic unit, Myanmar has eleven different types of aquifers. Depending on their lithology and depositional environment, groundwater from those aquifers varies in quality and quantity. Of these, groundwater from alluvial and Irrawaddian aquifers is more potable for both irrigation and domestic uses.

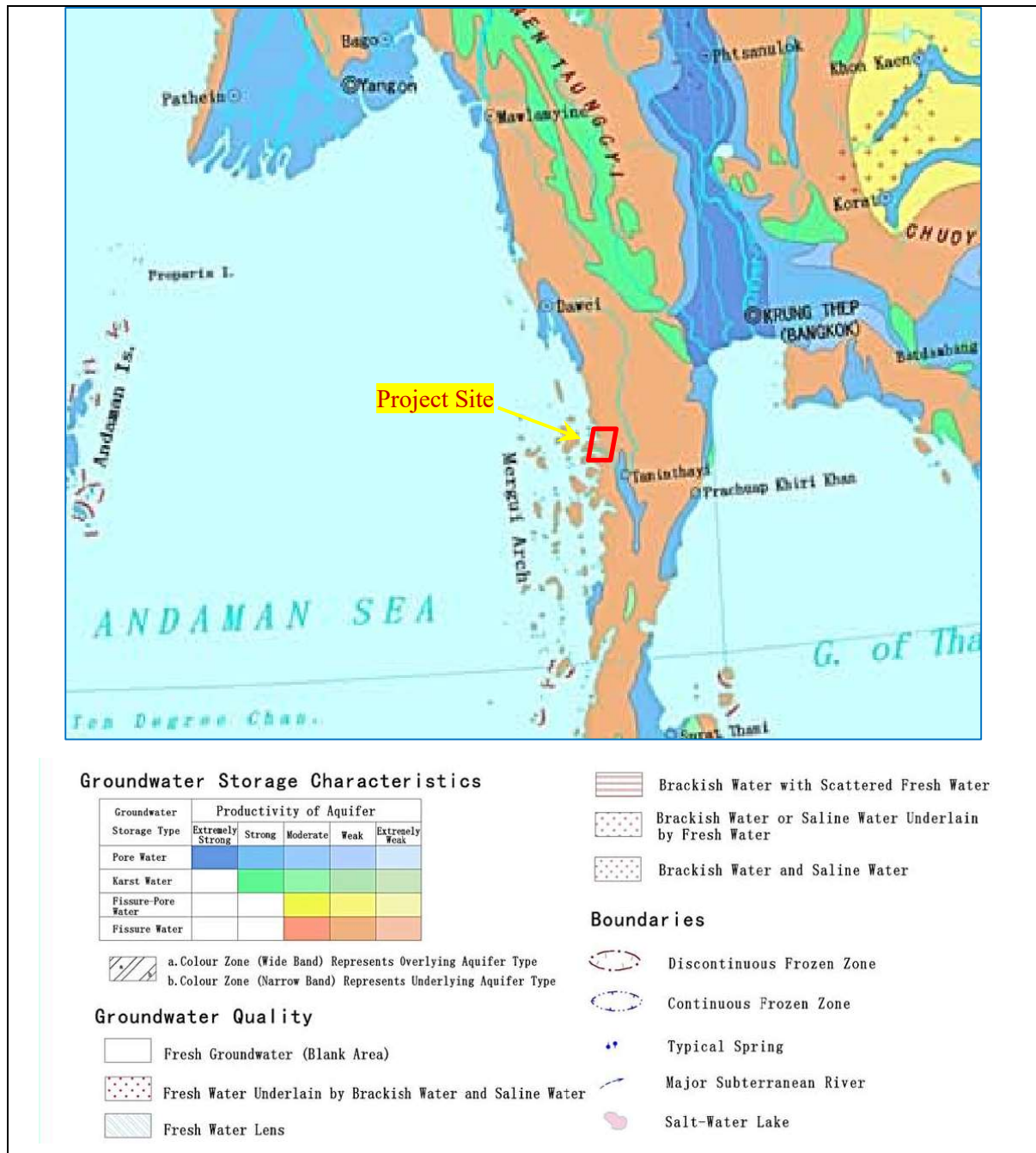


*Figure 5.5- Aquifers in Myanmar. [Source WRUD]*

### **5.3.3 Groundwater Resource in Tanintharyi Region**

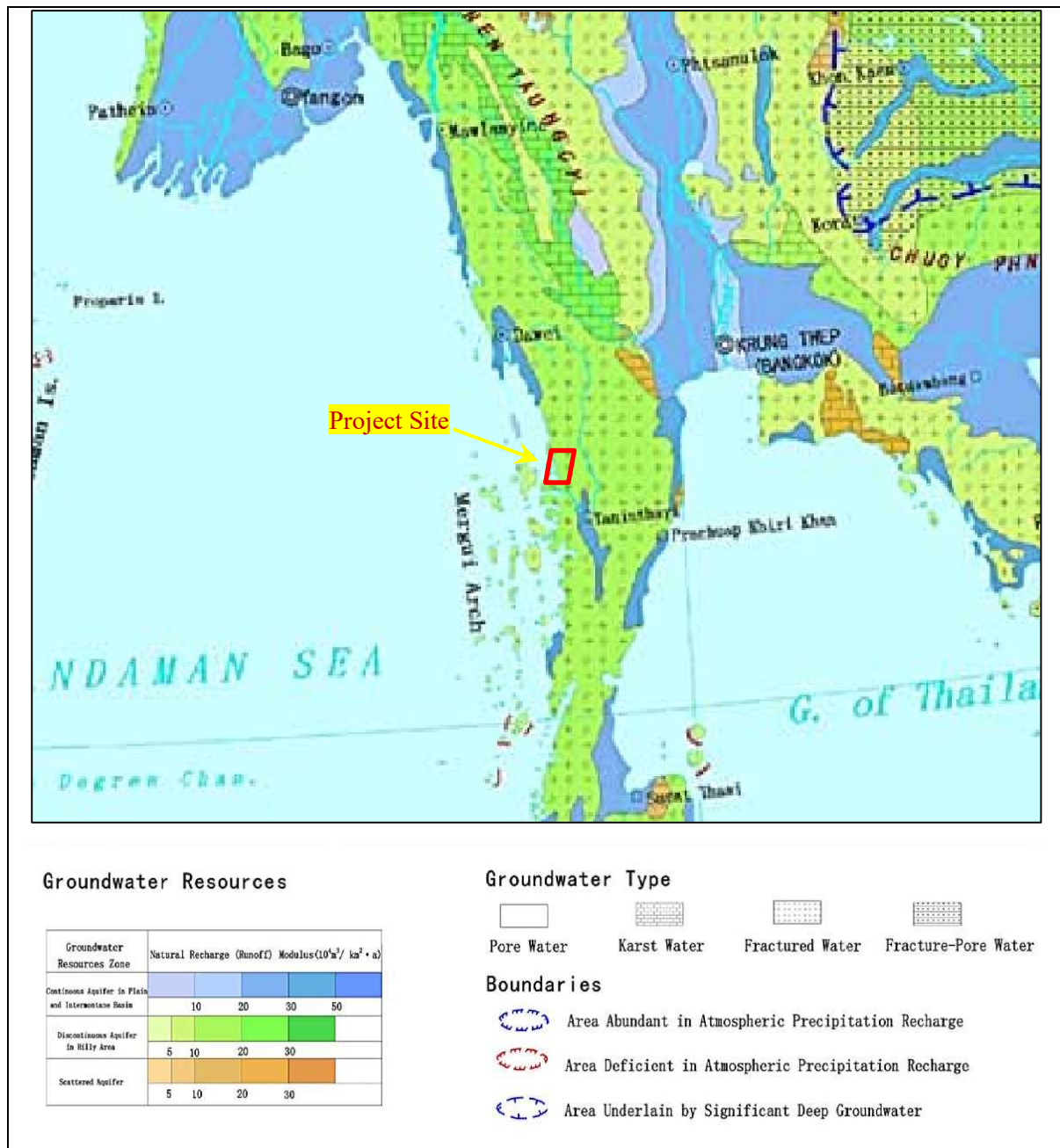
Groundwater occurs mainly in limestone of the Carboniferous–Permian age. In the eastern part of the area, it lies in beds of Mesozoic and Precambrian ages. Groundwater in volcanic rocks is found in the southeastern part. Generally, it is fresh and mostly suitable for drinking and

irrigation. To exploit economically, drilling method may be limited. The following Figure 5.6 and Figure 5.7 shows, a Hydrogeological Map, and Groundwater Resources Map, reference from the China Geological Survey has organized the publication of a document titled “Groundwater Serial Maps of Asia”, which was compiled by the Institute of Hydrogeology and Environmental Geology of CAGS in 2012, and summarizes research on groundwater systems in Asian countries, including Myanmar.



Source: Adapted from Groundwater Serial Maps of Asia”, which was compiled by the Institute of Hydrogeology and Environmental Geology of CAGS in 2012

**Figure 5.6- Hydrogeological Map of Project Area**



Source: Adapted from *Groundwater Serial Maps of Asia*, which was compiled by the Institute of Hydrogeology and Environmental Geology of CAGS in 2012

**Figure 5.7- Groundwater Source in Project Area**

Based on these maps, the productivity of aquifers near the project area can be classified as groundwater storage characteristic is *Moderate Fissure Water*, and groundwater type is *Fractured Water*. The groundwater quality is considered *Fresh Groundwater*. Groundwater resources classifications consist of *Discontinuous Aquifer in Hilly Area*, with Natural Recharge Modulus ranging from 100,000-300,000m<sup>3</sup>/km<sup>2</sup>-yr.

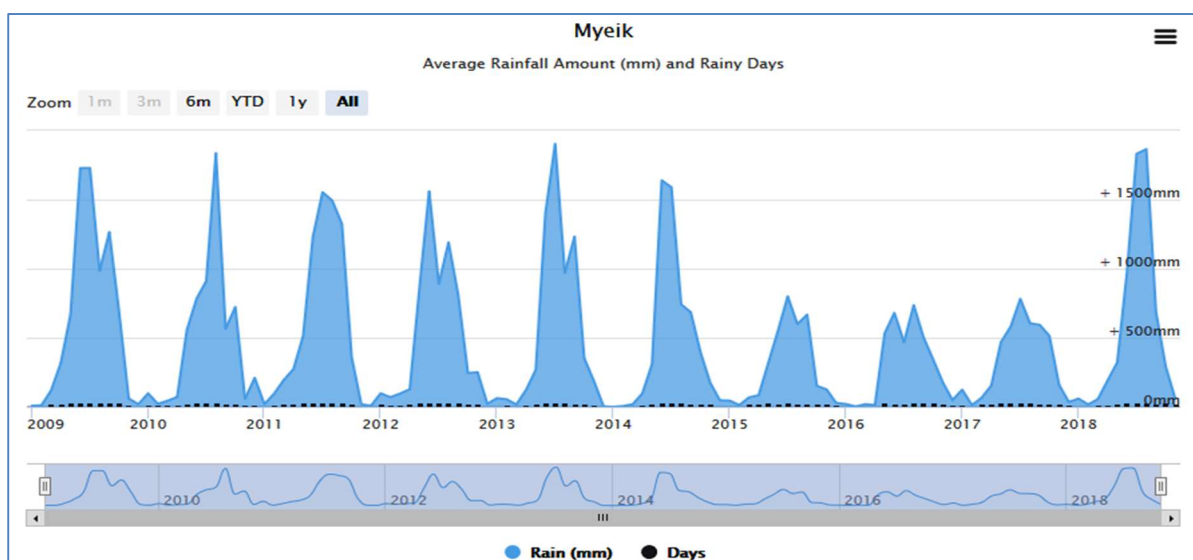
## 5.4. Climate and Meteorology

Tanintharyi region has a tropical climate. The region has only slight changes in temperature. Myeik has temperate weather, as it is located in the low latitude zone and near the sea. The dry season of the area in which the project lies starts in February and ends in May. The rainy season starts in June and ends in September and the cold season follow with the cooler, drier months of October to January. Some important meteorological data which are collected from Meteorological Station (Myeik) are as follow:

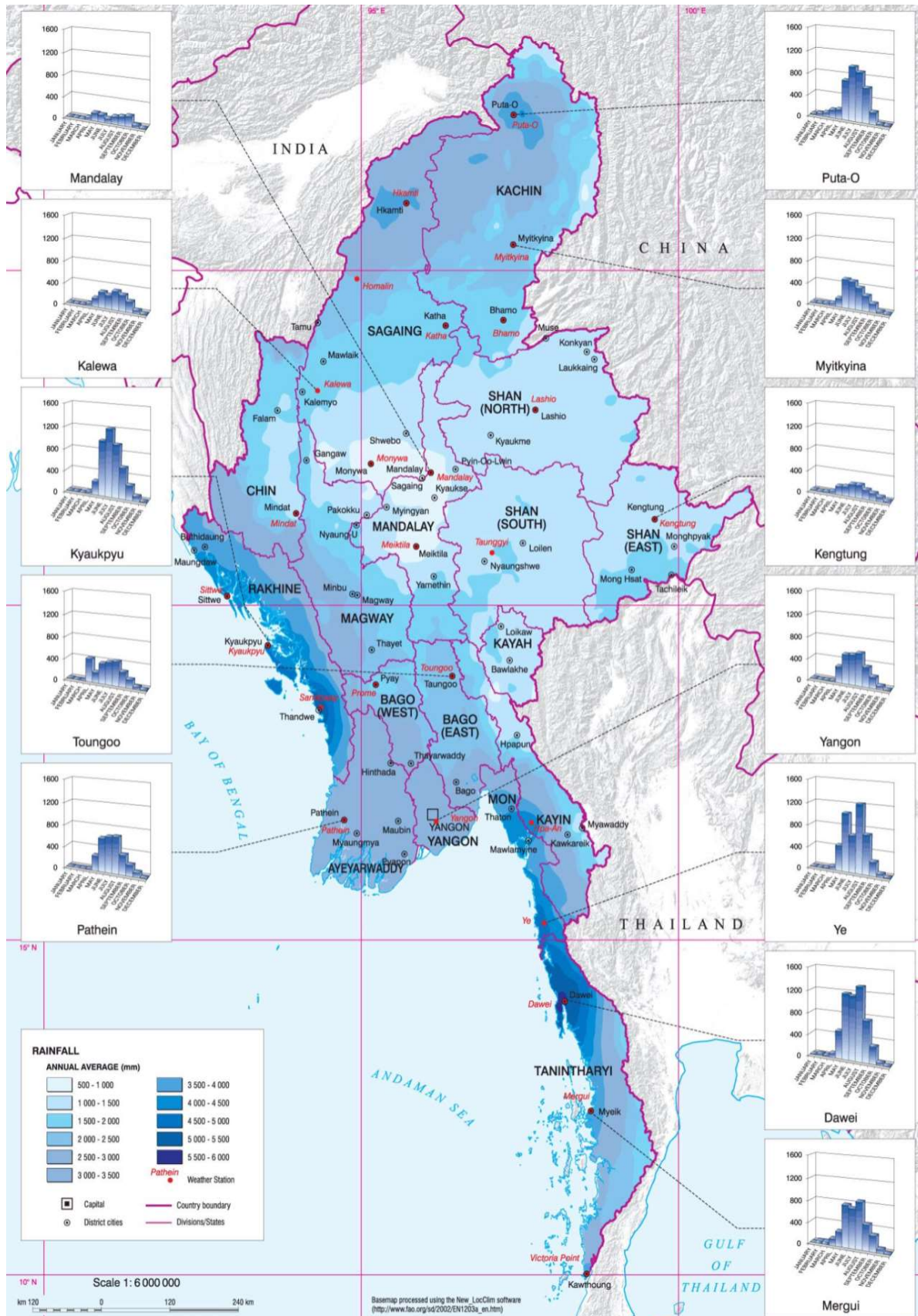
### 5.4.1. Rainfall

The project area is warm and wet season with the highest temperature (37°C) and lowest temperature (14.5°C). Yearly rainfall and temperature are as follow:

No.	Year	Rainfall		Temperature	
		Raining Days	Total Rainfall	Summer	Winter
				Maximum	Minimum
1	2012	183	169.58	35.5	23.0
2	2013	182	185.39	35.5	15.5
3	2014	149	181.66	35.5	14.5
4	2015	151	171.34	36.5	18.5
5	2016	162	146.26	35.5	17.0
6	2017	13	6.95	37.0	20.5







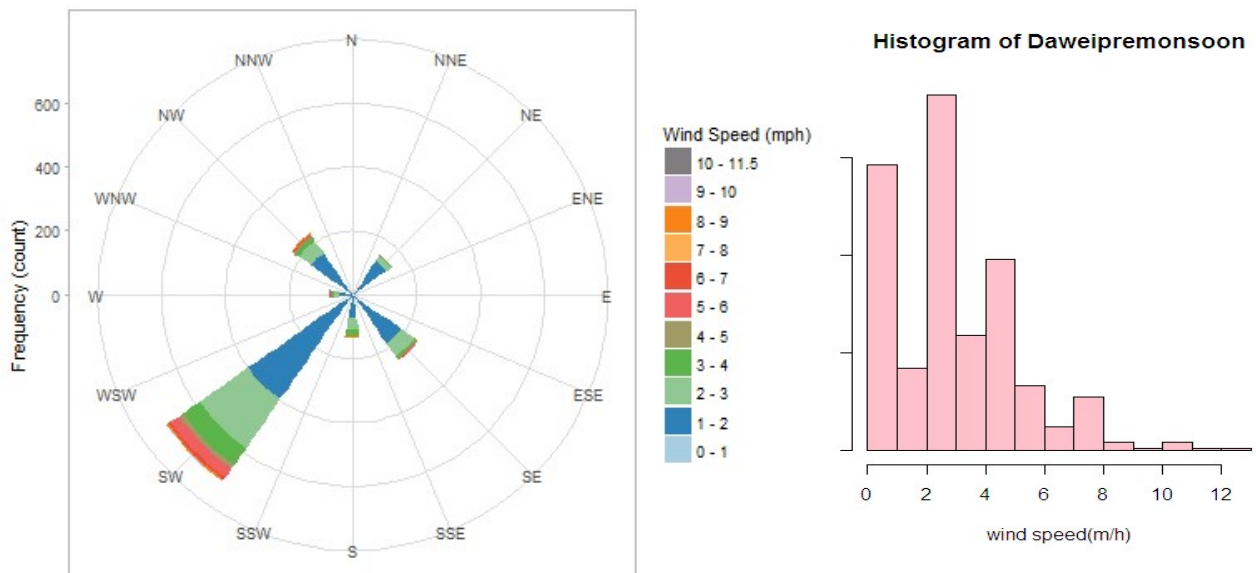
[Source: [http://dwms.fao.org/atlas/myanmar/atlas\\_en.htm](http://dwms.fao.org/atlas/myanmar/atlas_en.htm)]

Figure 5.8. Rainfall Map of Myanmar with Monthly Distribution Patterns

### 5.4.2 Wind

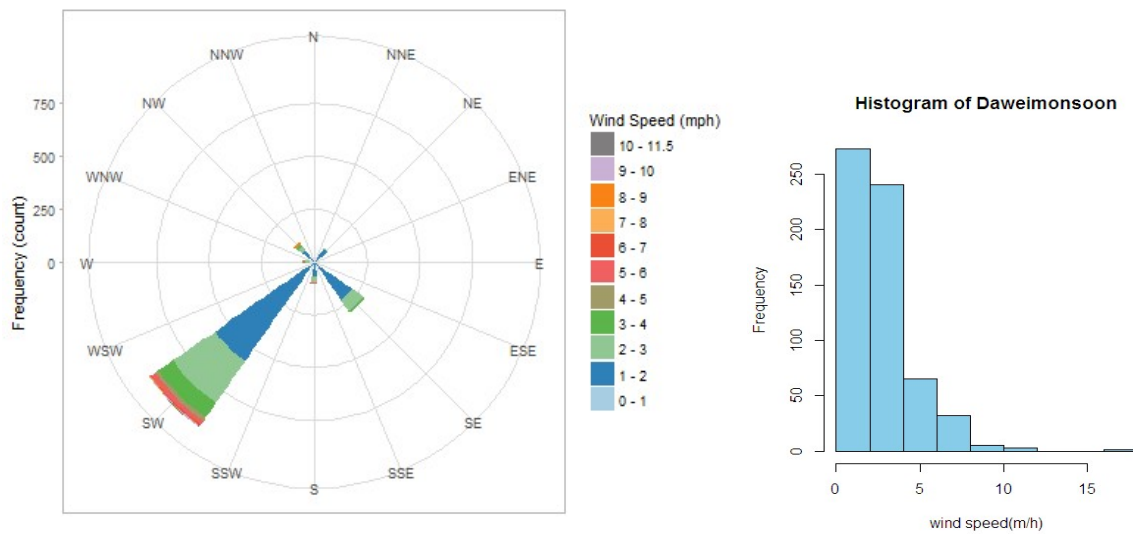
Winds approach the project area primarily from the east and northeast. Long-term wind data obtained from the station of Myeik (Department of Meteorology and Hydrology Myanmar) located 1 mile east of the site.

During the pre-monsoon months of onset date to June, the wind blew Southeast, South and Southwest direction over the country. In the Southwest monsoon months of July and August, the wind blew South and Southwest direction and in the post monsoon months of September to withdrawal date, the wind blew from North and Northeast direction over the country. For the wind speed, the coastal areas have stronger wind than the inland areas and also stronger wind prevailed monsoon season than the pre and post monsoon. Figures 5.5 to 5.7 show the results for the wind direction and speed representing the regions of Myeik during the study period 2001-2010 (10yrs). The data indicates that greater than 4 mph of the wind speed are more frequently from the southwest in pre-monsoon season and monsoon season. In post monsoon season southwest, southeast and northeast sectors are greater than 4 mph of wind speed.

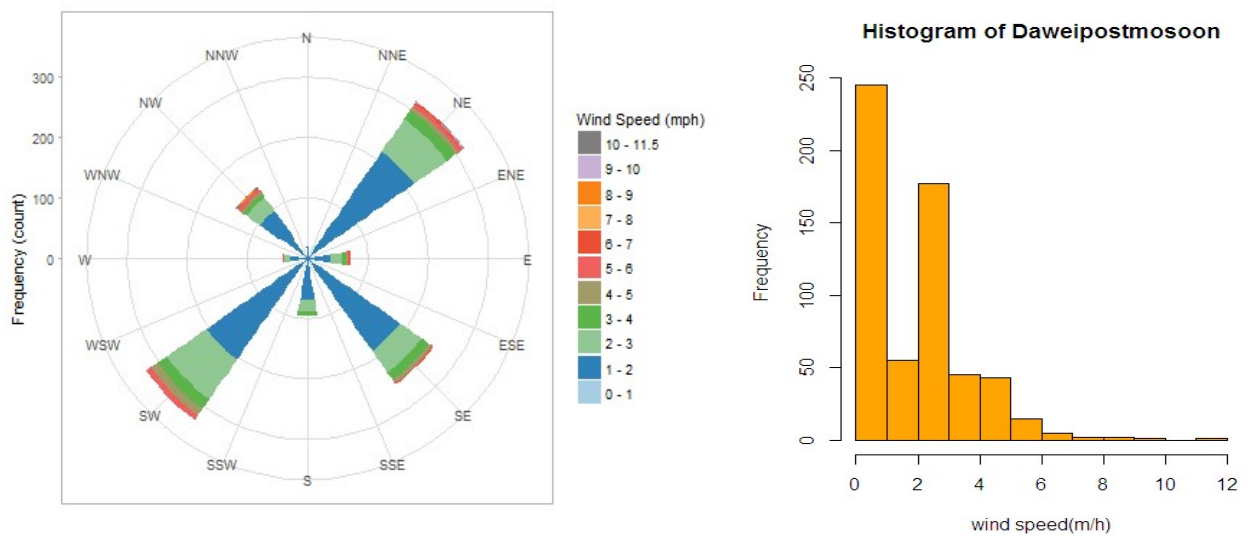


**Figure 5.9. Wind Rose and Frequency of Wind Speed for Pre-monsoon Season**

(Source: Myanmar Climate Report, No. 9/2017)



**Figure 5.10- Wind Rose and Frequency of Wind Speed for Monsoon Season**  
(Source: Myanmar Climate Report, No. 9/2017)



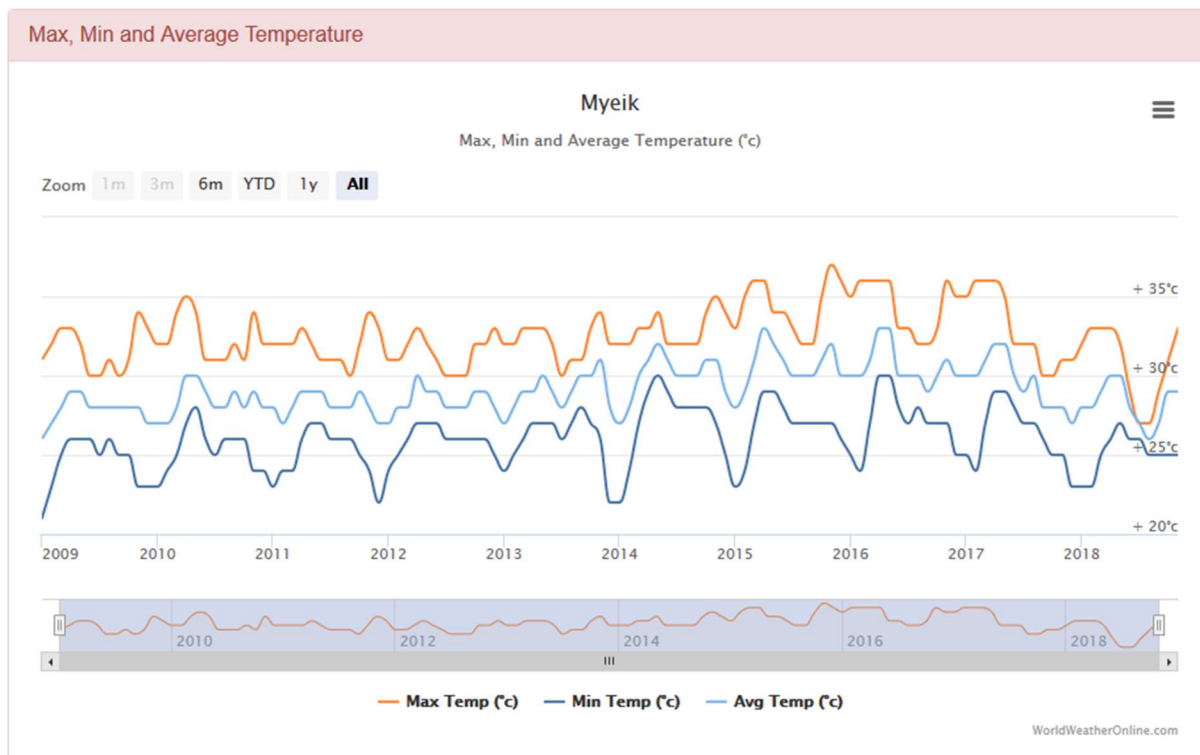
**Figure 5.11- Wind Rose and Frequency of Wind Speed for Post Monsoon Season**  
(Source: Myanmar Climate Report, No. 9/2017)

### 5.4.3 Temperature Trends

It was very clear from temperature trend analysis that the maximum temperature showed increasing trends and decreasing trend for minimum temperature over all parts of the years in the project site.



The deviation for  $T_{max}$  was calculated following the formula:  $T_{maxn} - T_{max}$ , and the deviation for  $T_{min}$  was calculated by  $T_{minn} - T_{min}$ , where “n” represents each year and “normal” is the  $T_{max}$  or  $T_{min}$  normals calculated for the period 2009-2018



Source: [www.worldweatheronline.com/myeik-weather-averages/tenasserim/mm.aspx](http://www.worldweatheronline.com/myeik-weather-averages/tenasserim/mm.aspx)

**Figure 5.12 - Maximum and Minimum Temperature Deviation Trend over Myeik**

## 5.5 Oceanography

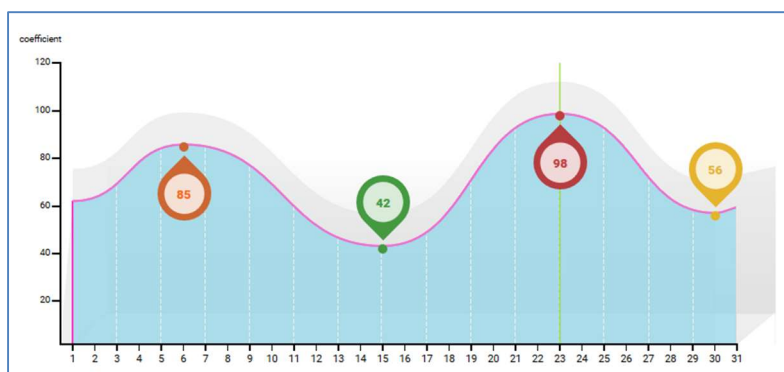
The project area including Myeik archipelago, lies in the Andaman Sea off the coast of southern Tanintharyi, consists of some large offshore islands, and the near-shore areas between these and the coastline are marshy and partly covered with mangrove forests.

### 5.5.1 Waves

Wave climates at the project site are consistent with the local wind conditions. Predominant waves are from the easterly and westerly directions. Current wave conditions of Project area is *significant height*, about 14% of waves will be higher than the significant wave height (about 1 in every 7 waves). The average wave height is 0.1m. The project seashore has a smooth beach slope and is very little potential to wave impacts. The waves on the shore can be slightly affected by the orientation of the coastline and the seabed of the beaches, although in most cases they are usually equivalent.

### 5.5.2 Tides

Tidal variation at Myeik is relatively low. The tide at the project site will only depend on the situation of the moon (especially in full moon day). The following graph shows the *progression of the tidal coefficient* in the month of *December of 2018*. These values give us a rough idea of the tidal amplitude in Myeik, forecast in December. Large coefficients indicate important high and low tides; major currents and movements usually take place on the sea bed. But bear in mind that this tidal amplitude may be greatly affected by the weather.

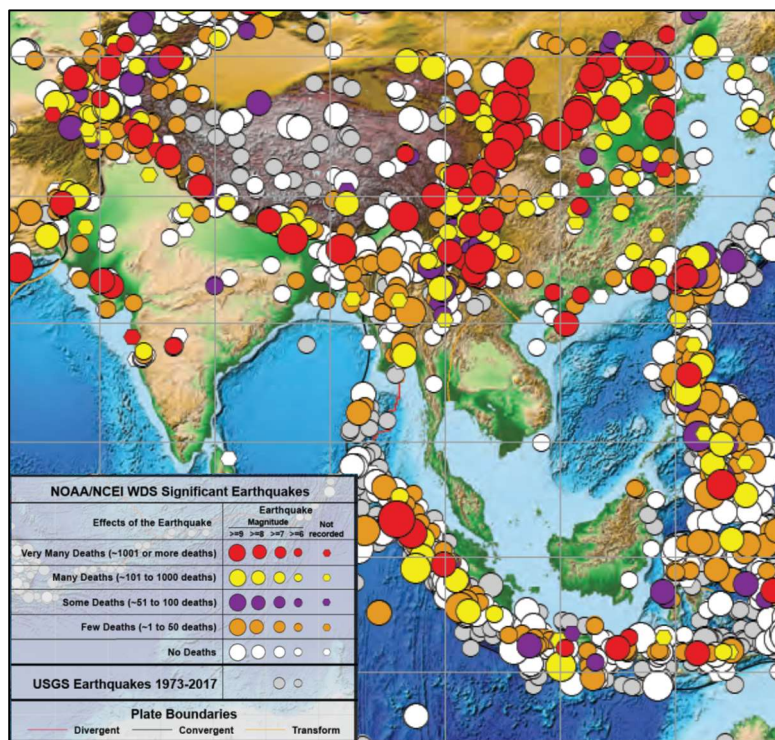


*Figure 5.13 - Progression of the Tidal Coefficient in Myeik Area*

### 5.6 Seismicity

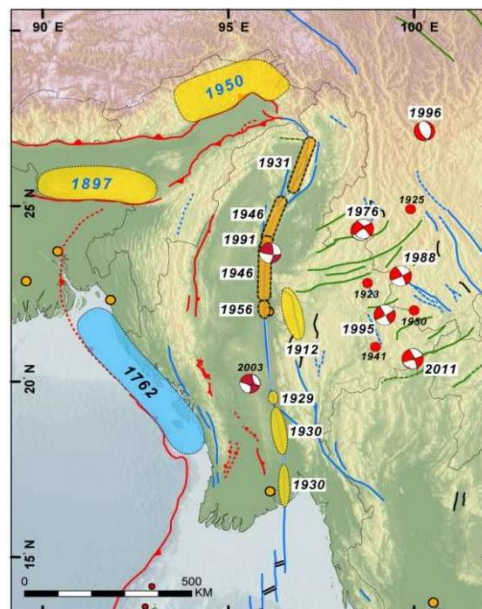
Myanmar is an earthquake-prone country because it lies in a one of the world major earthquake belt, Alpid Belt, which extends from northern Mediterranean through Iran, Himalaya region and Myanmar. Most of the earthquake in central and delta region of Myanmar have resulted from movement of Sagaing Fault which extends from the northwest of Katha, through Sagaing, along the eastern flank of Pegu Yoma and finally into the western Gulf of Martaban for a distance of about 600 miles. Structurally, Hpa-pon fault and Three - pagoda fault are situated at the northern and southern part of the area and their trend in nearly NW - SE direction. Earthquake intensity in the area can be seen in Figure 5.14. The approach is mainly empirical and historical in the sense that it makes use of past seismic events and history to make educated guesses about region wide intensities in the future. Recent earthquakes include one in April 2016 near Mawtaik on the India and Sunda (Eurasia) plates at 6.9 magnitudes on the Richter scale, as well as a magnitude 6.8 earthquake that occurred on the Sagaing fault in Myanmar on November 11, 2012. The Sagaing fault is a major fault in Southeast Asia between the India and Sunda (Eurasia) plates. This strike-slip fault (side-to side motion) is part of a broad zone of deformation that includes the India Asia collision zone to the north and extension of the Andaman Sea to the south. The November 11 earthquake and its four aftershocks (with magnitudes ranging from M-5 to M-5.8) occurred north of the city of Mandalay, along a stretch of

the Sagaing fault. A map of earthquakes in the SE Asian region is shown in Figure 5.14 and a historical earthquake map of Myanmar is shown in Figure 5.16.



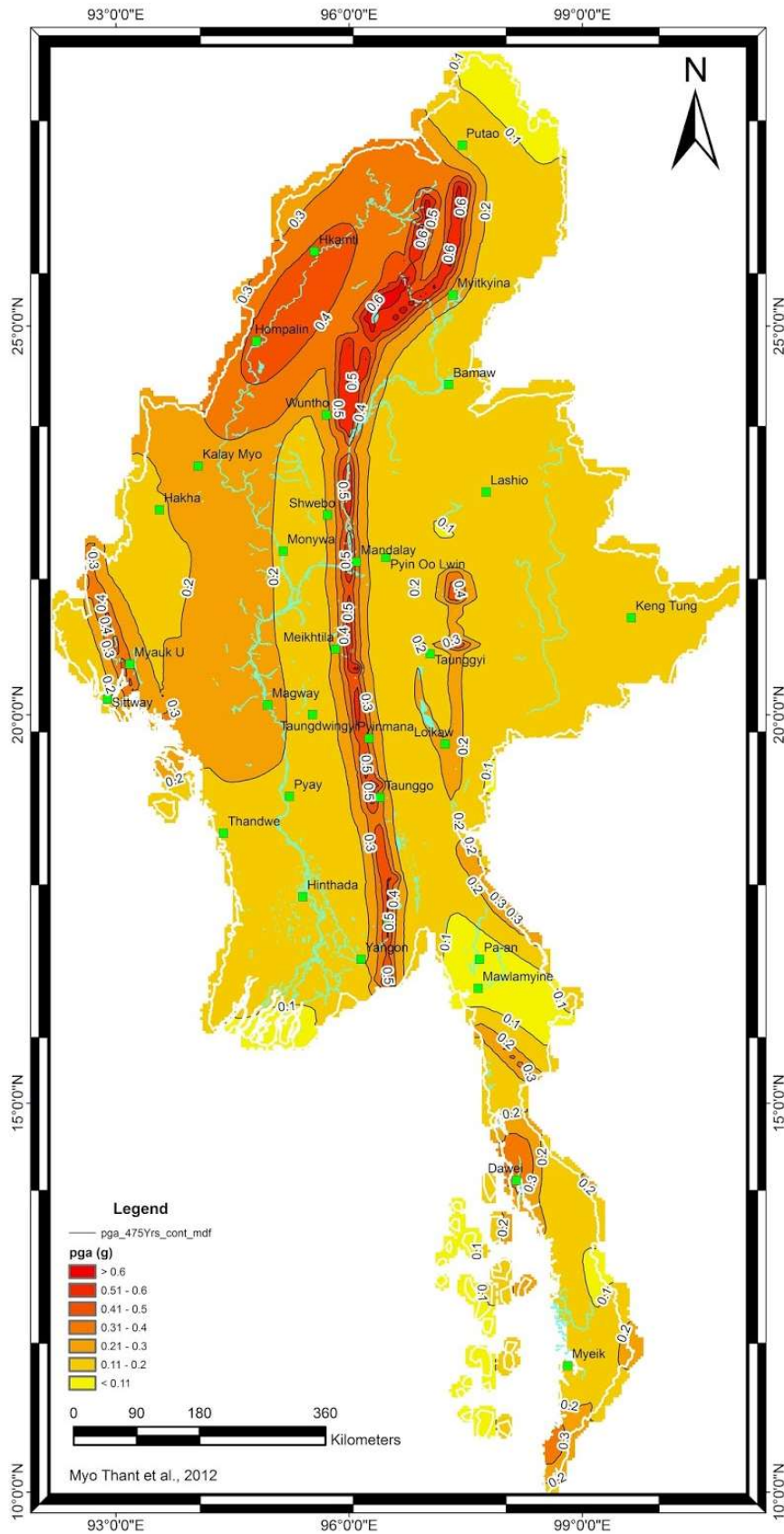
[Source: USGS]

**Figure 5.14- Map of Significant Earthquakes 2150 B.C. to A.D. 2017**



[Source: <http://www.earthobservatory.sg/news/strong-quake-myanmar#.U4wBIncxXmQ>,  
Accessed 2016]

**Figure 5.15. Neotectonic Map of Myanmar**



[Source: Myo Thant et al., 2012]

**Figure 5.16- Seismic Zone Map of Myanmar (PSHA Map, 2012)**



As per map the proposed project is located within the Zone II (Moderate zone) of earthquake hazard, as shown in probabilistic seismic hazard Assessment Map (PSHA Map) of Myanmar showing expected peak ground acceleration (PGA) values with 100% probability in 500 years.

### **5.7. Tsunamis**

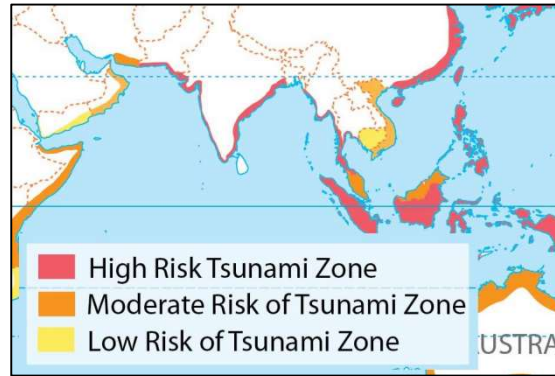
In Myanmar there were records of moderate tsunamis, generated by two large magnitude earthquakes, which originated in the Andaman-Nicobar Islands [these are the 31 December 1881 Car Nicobar Earthquake (7.9 Richter scale [RS]) and the 26 June 1941 Andaman Island Earthquake (7.7 RS)]. The tsunami generated by the giant 2004 Sumatra Earthquake also caused moderate damage in some parts of the Myanmar Coast. It is evident that Myanmar is vulnerable to hazards from moderate and large tsunami along its long coastline.

Previous Indian Ocean tsunamis have not been properly documented. The southern Tanintharyi Coast, consists of some large offshore islands, and the near-shore areas between these and the coastline are marshy and partly covered with mangrove forests. This setting therefore provides partial protection from tsunami waves. However, the northern Tanintharyi Coast is generally flat and sandy areas. Thus, this area is comparatively more vulnerable to the tsunami hazard. The probable earthquake and tsunami hazards along the Myanmar coastal areas are summarised in the following table.

**Table 5.1 - Probable Earthquake and Tsunami Hazards along the Myanmar Coastal Areas**

<b>Coastal Region</b>	<b>Area</b>	<b>Earthquake Hazard (Modified Mercalli Intensity Scale)</b>	<b>Tsunami Hazard</b>
Rakhine Coast	Northern Part	Strong Zone with MMI 8	Moderate
	Southern Part	Moderate Zone with MMI 7	Moderate
Delta Area	Ayeyarwady Delta	Moderate Zone with MMI 7	Moderate
	Sittaung Estuary	Severe Zone with MMI 8 - 9	Moderate
Tanintharyi Coast	Northern Part	Moderate Zone with MMI 7	Moderate
	Southern Part	Moderate Zone with MMI 7	Light

*Source: Hazard Profile of Myanmar (2009)*



Source: World Tsunami Zones ([www.mapsofworld.com](http://www.mapsofworld.com))

**Figure 5.17- Tsunami Risk in the Bay of Bengal**

By studying the above facts and figures, there will be moderate impact of Tsunami on the proposed project.

### 5.8. Traffic Study

Since the project is near located in the relatively populated municipal area (Myeik) and the nature of the project is highly interrelated with the traffic conditions, IEE team took a traffic study and prepared vehicle movements summaries at the vicinity of the project. The purpose of the traffic study is to summarize the counts of vehicle movements through Kanner road and to know the peak period hours. This type of volume summary is used in making decisions regarding the movement making, traffic circulation patterns, capacity analysis, and vehicle classification.



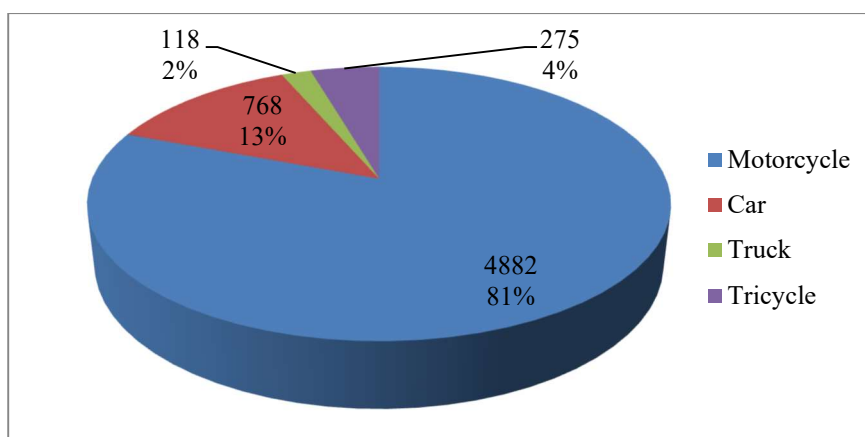
**Figure 5.18 - Accounting Point of Vehicle Movement in Google Map**



**Table 5.2 - Summary of Vehicle Movements in Weekend Day**

SUMMARY OF VEHICLE MOVEMENTS					
LOCATION: Kanner Rd					
TOWNSHIP: Myeik			CITY: Myeik		
OBSERVER: IEE Team			DATE: 29.9.2018 (Sat)		
WEATHER: Clear			Weekend Day		
REMARK:					
VEHICLE MOVEMENTS					
TIME	Types of Vehicles				Total
BEGIN	Motorcycle	Car	Truck	Tricycle	
7:00(Am) -10:00 (Am)	1297	227	39	85	1648
11:00(Am) -2:00 (Pm)	996	98	21	68	1183
4:00(Pm) -7:00 (Pm)	1380	261	30	75	1746
7:30(Pm) -9:30 (Pm)	1149	182	28	47	1406
Traffic Volume					<b>5983</b>
4:00(Pm) -7:00 (Pm)	Peak Period Hours		<b>1746</b>		
Peak Period Traffic Volume					
4:00(Pm) -7:00 (Pm)	1380	261	30	75	1746

According to the traffic count result in weekend day, morning peak hour occurs at 7:00-9:00 am, midday peak at 11:00 am-2:00 pm, and evening peak at 4:00-7:00 pm and night peak at 7:30-9:30 pm. At morning peak hour, peak volume is 1648 vehicles. In this period, vehicles coming from Kanner road as the time is inbound hours at the beginning of weekend day. At midday peak hour, peak volume is 1183 vehicles. In this period, vehicles moving in all inbound and outbound directions were about the same amount. At evening peak hour, peak volume is 1746 vehicles. Comparing to morning peak volume, the peak volume recorded between 4:00-7:00 pm is significantly high. And Weekend day peak volume is 5983 vehicles.

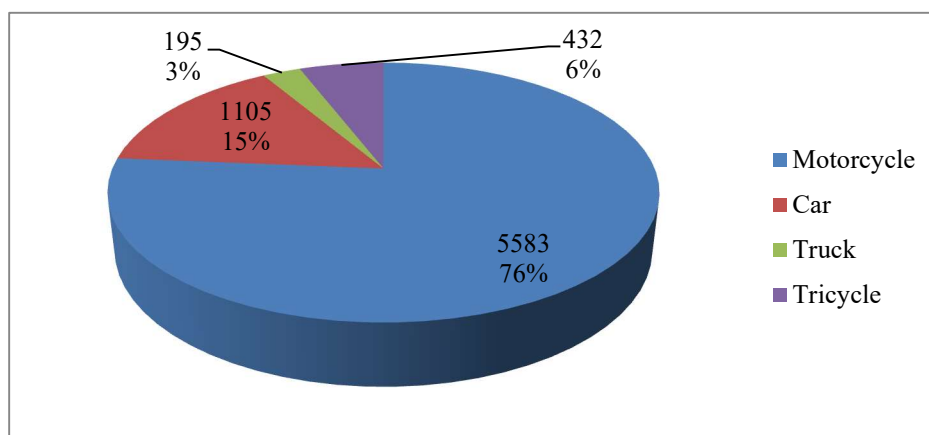


**Figure 5.19 - Types of Vehicles used percentage in Weekend Day at Kanner Road**

**Table 5.3 - Summary of Vehicle Movements in Work Day**

SUMMARY OF VEHICLE MOVEMENTS					
LOCATION: Kanner Rd					
TOWNSHIP: Myeik			CITY: Myeik		
OBSERVER: IEE Team			DATE: 28.9.2018 (Fri)		
WEATHER: Clear			Work Day		
REMARK:					
VEHICLE MOVEMENTS					
TIME	Types of Vehicles				Total
BEGIN	Motorcycle	Car	Truck	Tricycle	
7:00(Am) -10:00 (Am)	1740	386	70	118	2314
11:00(Am) -2:00 (Pm)	1046	154	39	98	1337
4:00(Pm) -7:00 (Pm)	1528	307	57	129	2021
7:30(Pm) -9:30 (Pm)	1224	258	29	87	1598
Traffic Volume					<b>7270</b>
7:00(Am) -10:00 (Am)	Peak Period Hours			<b>2314</b>	
Peak Period Traffic Volume					
7:00(Am) -10:00 (Am)	1740	386	70	118	

According to the traffic count result in work day, morning peak hour occurs at 7:00-10:00 am, midday peak at 11:00 am-2:00 pm, evening peak at 4:00-7:00 pm and night peak at 7:30-9:30 pm. At morning peak hour, peak volume is 2314 vehicles. In this period, vehicles coming from Kanner road as the time is inbound hours at the beginning of work day. At midday peak hour, peak volume is 1337 vehicles. In this period, vehicles moving in all inbound and outbound directions were about the same amount. At evening peak hour, peak volume is 2021 vehicles. Comparing to morning peak volume, the peak volume recorded between 7:00-10:00 am is significantly high. So, the vehicle movements in work day is greater 1.7% generation rate of in Weekend day vehicles volume.



**Figure 5.20 - Types of Vehicles used percentage in Working Day Kanner Road**

## **5.9. Existing Socio-economic Conditions**

Although the proposed project is located in Phthaw-Pahtat Island in Kyun Su Township, it is very close to Myeik Township and so the township profiles are described for not only for Kyun Su but also for Myeik.

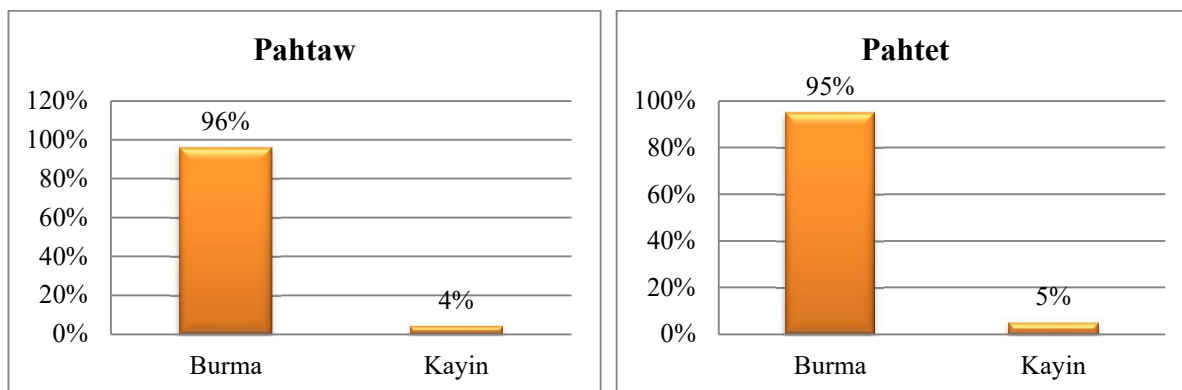
### **5.9.1. Socio-economic Profile by Primary Data Collection**

The socio-economic profile of nearest local residents by primary data collection are as follow:

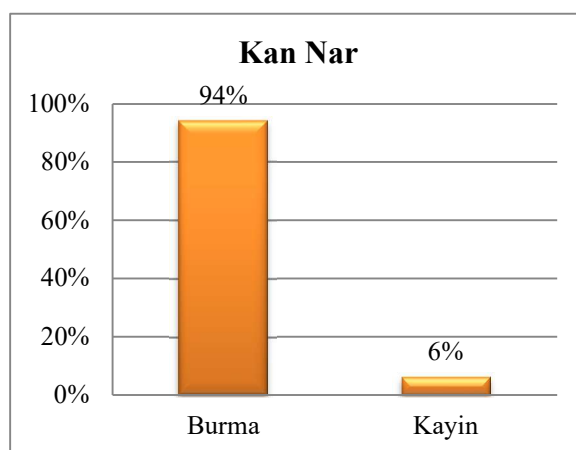
#### **(a) Major Ethnic Groups**

Within the village of project affected area, Burma is the major ethnic group. The only one dominant religion of the people in the project area is Buddhism nearly 95% and other such as Christian; are nearly 5%. According to the survey result, most of the people are Myanmar and Buddhism.

#### **(i) Pahtaw-Pahtet Island**

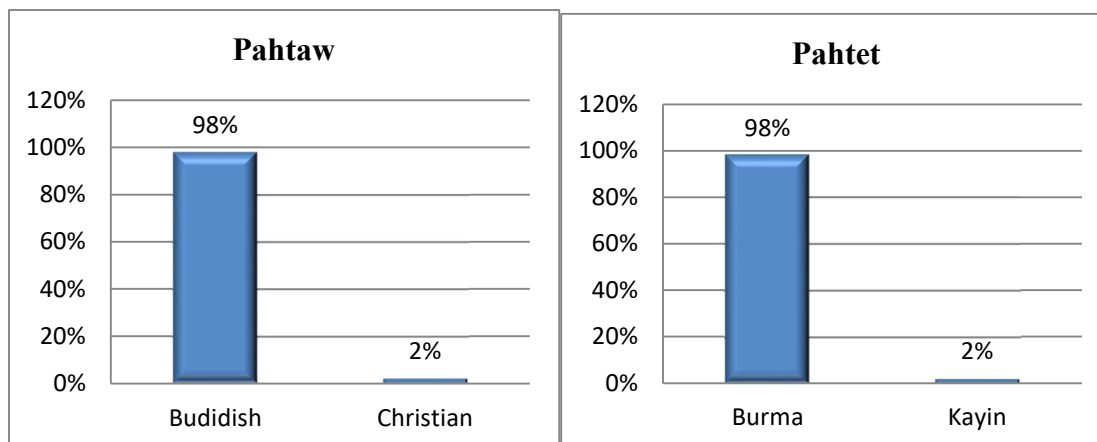


#### **(ii) Myeik (Kan Nar)**

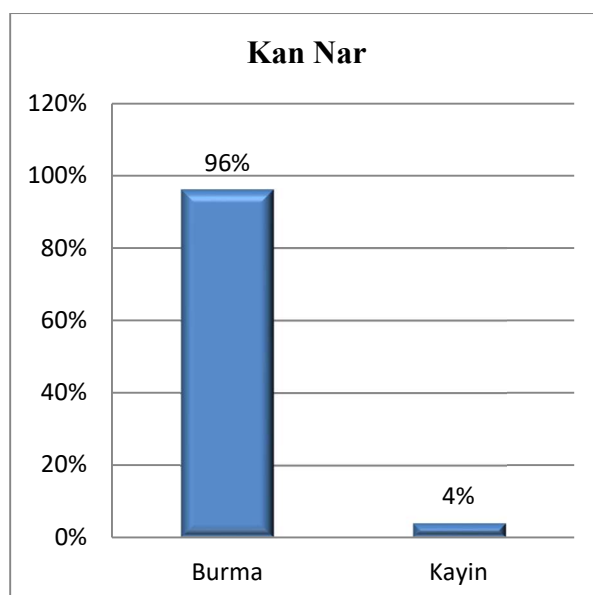


## (b) Religious Groups

### (i) Pahtaw-Pahtet Island



### (ii) Myeik (Kan Nar)

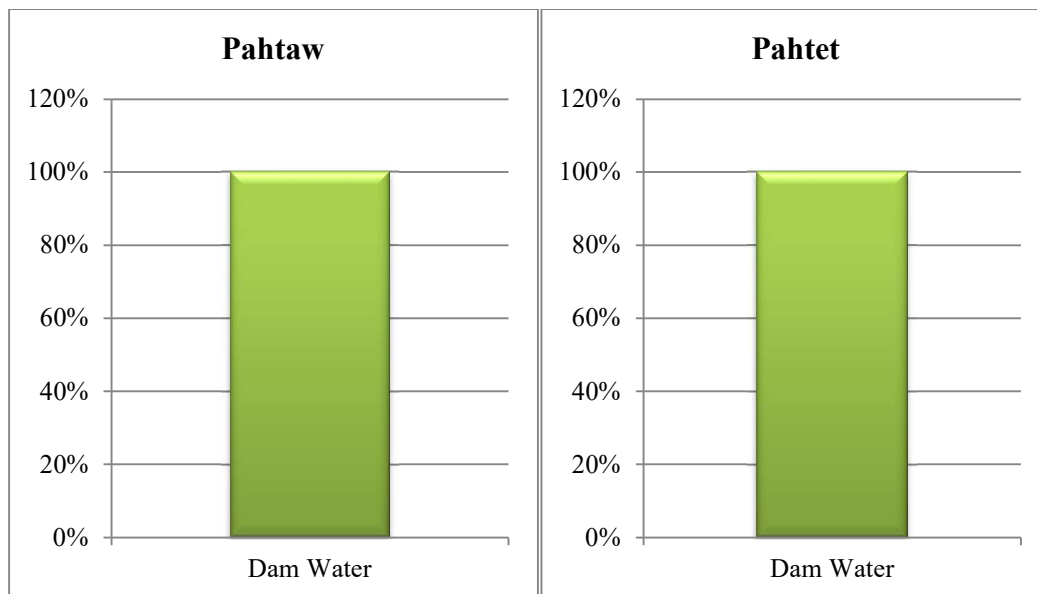


According to the above facts and figures, most of the people in study area are Burma and Buddish.

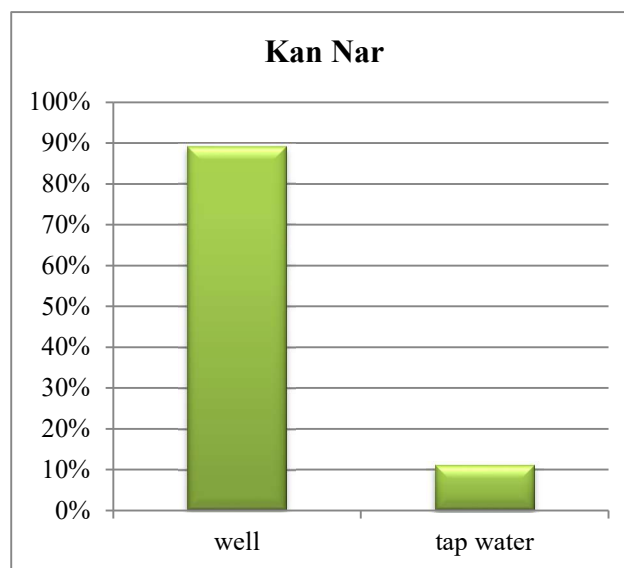
## (c) Domestic Use of Water

Domestic water sources used by the local communities during the survey in the project area are provided in the following figures. All of people in Pahtaw and Pahtet Villages use dam water (storage water from dam) as domestic water and the people in Kan Nar area mostly use well as for domestic usage.

*(i) Pahtaw-Pahtet Island*

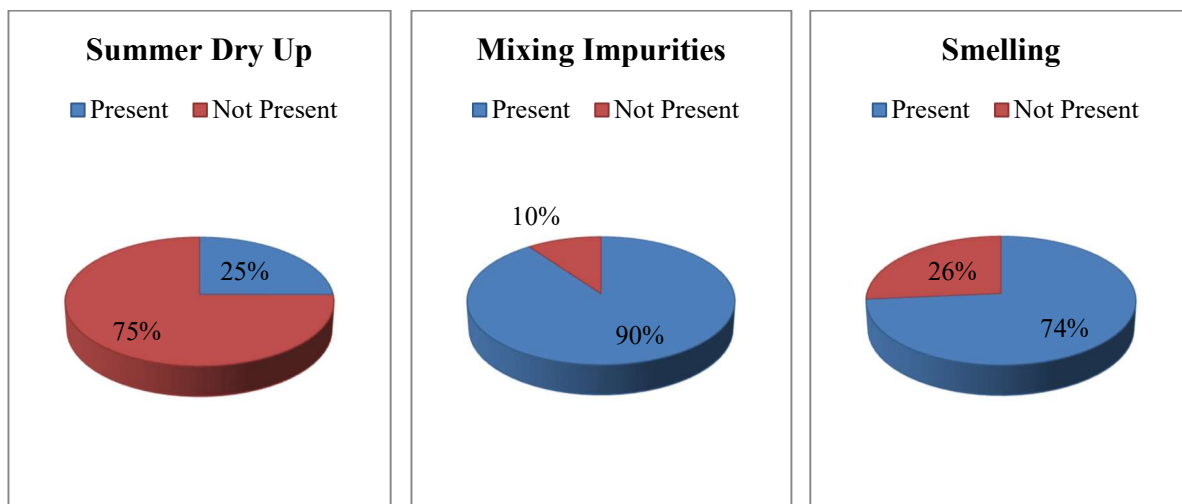


*(ii) Myeik*



Accessing of clean and safe water is crucial to the health population and thus have a direct impact on the quality of life of local community.

According to the survey, there have less potential to dry up during summer, high in mixing impurities and smelling of domestic water used. The following figures shown the answers of respondents in percentage on the existing quality of domestic water.



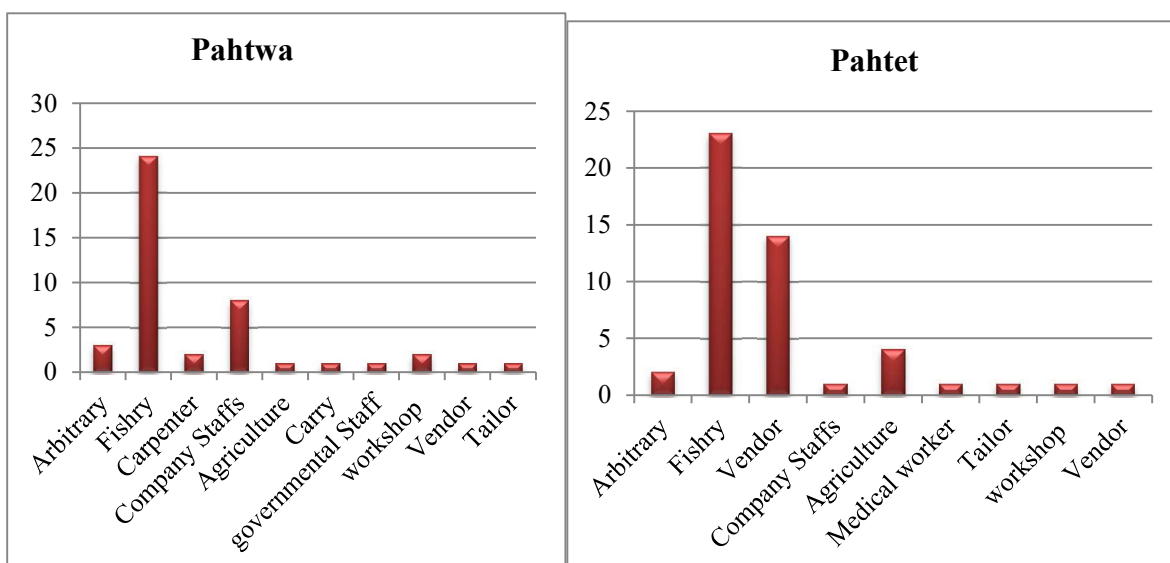
**(d) Drinking Water**

Purified drinking water (bottled water) is the main source of the villages. The villagers buy and use this bottled water from purified drinking water plant located in the island. Most people living in Kan Nar area also use bottled water and some use well water after boiling and filtering.

**(e) Livelihood and Occupational Pattern**

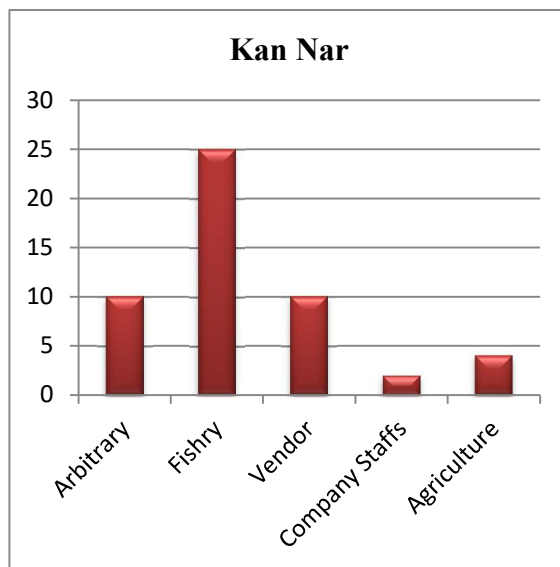
Most of residents in the proposed project are fishermen followed by company staffs, vendor and arbitrary.

**(i) Pahtaw-Pahtet Island**



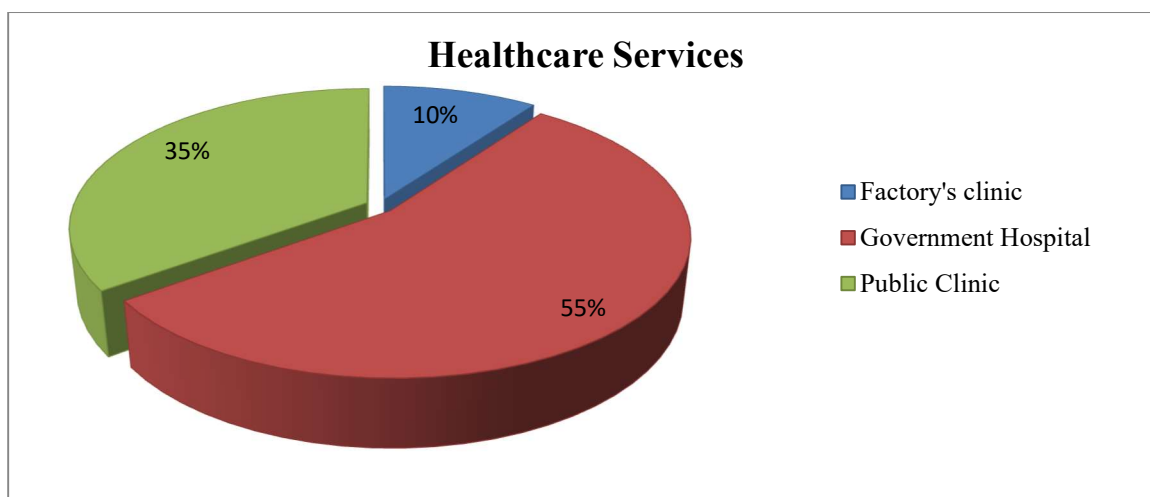


**(ii) Myeik (Kan Nar)**



**(f) Healthcare Services**

In the survey, there were three types of healthcare centers people in the project area usually go for their illness and disease. As shown in the following figure, government hospitals in Myeik township were the most common centers people attended (55%), followed by public clinic (35%) and private (factory) clinic in Pathaw-Pahtet island (10%). Most of people in Kan Nar area are easily accessible for medical service at Myeik township.



According to the household questionnaires, most local people in Pahtaw-Pahtet island answered that it is a little difficult to go to clinic and hospital in Myeik Township. So, they want to have health care facilities near the village.

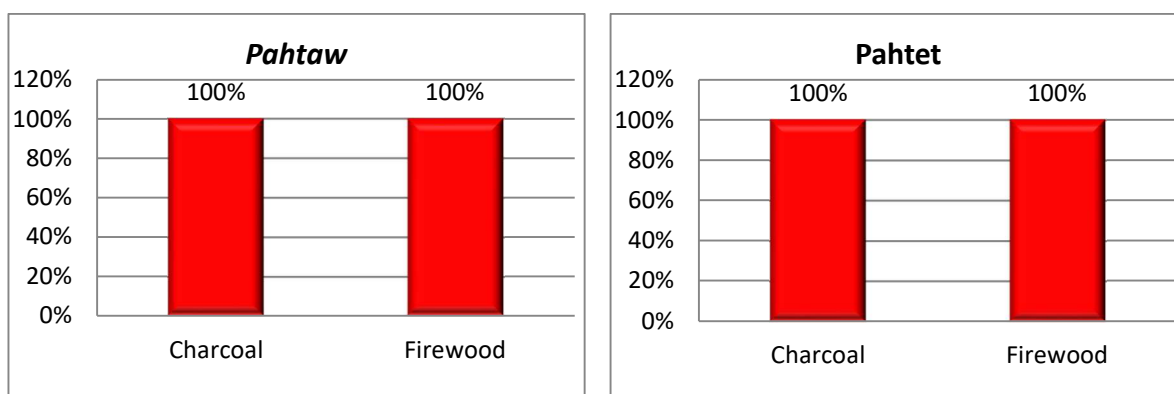
### **(g) Energy Sources for Lighting**

Primary data from household survey revealed that the sources of energy for lighting in the villages are mainly the electricity from village generator and other is from solar energy. Some of the villagers are not accessible to electricity and use candle for lighting. But in Kan Nar area, there is accessible for electricity and some people use battery for lighting.

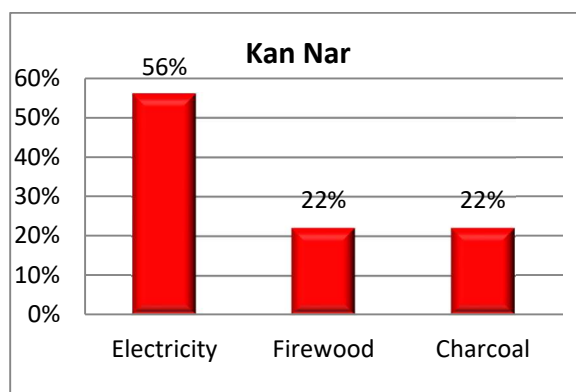
### **(h) Energy Sources for Cooking**

Primary data from field survey show that firewood and charcoal were the main source for cooking fuel in the proposed project area. According to household survey, the only Kan Nar area gets electricity for cooking but some people still depend on firewood and charcoal.

#### **(i) Pahtaw-Pahtet Island**



#### **(ii) Myeik (Kan Nar)**



### **(i) Types of Transportation**

According to household survey, the main transportation vehicles between town and the villages are vessels and most local people use motorcycle within the villages in the Pahtaw-Pahtet Island. In the Kan Nar area of Myeik, the main transportation is carried out by cars and motorcycle.

**Ferry Boat**

Three ferry boat for conveying passengers and goods, especially for workers who works in Pathaw-Pahtet Island from Myeik as a regular service of 10 to 15 times per a day. As per count result approximately (816) and (1120) amount of people travel in weekend day and work day, respectively.

**(j) Most Public Needs and Concerns during Household Survey**

During socio-economic survey, immediate community needs and concerns about the project were assessed. The most important positive outcomes from the project expected by the local people and most of their concerns about proposed project are as follow:

**(i) Pathaw and Pahtet Villages**

Village Name	Most Public Needs	Most Public Concerns
Pahtaw	<ul style="list-style-type: none"> <li>• Expanding and upgrading of village road</li> <li>• Supporting for health care facilities,</li> <li>• Water supply and electricity</li> </ul>	<ul style="list-style-type: none"> <li>• Odor</li> </ul>
Pahtet	<ul style="list-style-type: none"> <li>• Supporting for health care facilities and water supply</li> <li>• Electricity on full time</li> <li>• Maintenance to the Shwethalyaung Pagoda</li> </ul>	<ul style="list-style-type: none"> <li>• Odor</li> </ul>

**(ii) Myeik**

Name	Most Public Needs	Most Public Concerns
Kan Nar	<ul style="list-style-type: none"> <li>• Maintenance of the Kan Nar road</li> <li>• Settle Trash Bin along the Kan Nar Road</li> </ul>	<ul style="list-style-type: none"> <li>• Odor</li> <li>• Traffic</li> <li>• Solid waste alongside the seashore</li> </ul>

All of these data are local people needs and concerns that were got from household survey in Pahtaw Village, Pahtet Village and Kan Nar Quarter within the limited borders (3km).

## 5.9.2 Socio-economic Profile by Secondary Data Collection

### (a) Population

#### (i) Kyunsu Township

The project is located in Pahtet Vilage, Kyunsu Township, near Myeik district in Taninthayi Region. In 2017, there are about 175,000 people in Kyunsu Township as shown in the following Table. In Kyunsu Township, there are fewer females than males with 102 males per 100 females. The majority of the people in the Township live in rural areas with only (3.4%) living in urban areas. The population density of Kyunsu Township is 36 persons per square kilometre.

#### *Population of Kyunsu Township*

Township	Total (Male/Female)				Total (Urban/Rural)			Households
	Male	Female	Total	Sex Ratio	Urban	Rural	Urban Population (%)	
Kyunsu	88756	86478	175234	1.02	5779	169455	3.4	30665

*Source: Kyunsu Township Administrative Offices*

#### (ii) Myeik Township

The project is located in Kyun Su Town, near Myeik Township at Myeik District in Taninthayi Region. In 2018, there are about 255,000 people in Myeik Township as shown in the following Table. The percentage of urban population is about 40.5% in township.

*Table - Population of Myeik Township*

Township	Total (Male/Female)				Total (Urban/Rural)			Households
	Male	Female	Total	Sex Ratio	Urban	Rural	Urban Population (%)	
Myeik	125167	130629	255,769	50.9	21548	32801	40.5	54349

*Source: Myeik Township Administrative Offices*

### (b) Ethnicity

#### (i) Kyunsu Township

Most of the people who live in these townships are Bamar, followed by Kayin and Salone people. A small number of Mon and Rakhine are live in Kyunsu Township. The races residing in Kyunsu Township are shown in the following Table.

**Table - Races in Kyunsu Township**

<b>No.</b>	<b>Race</b>	<b>Number</b>	<b>%</b>
1	Kachin	-	-
2	Kayar	-	-
3	Kayin	16130	9.20
4	Chin	2	0.001
5	Mon	27	0.015
6	Bamar	155201	88.57
7	Rakhine	20	0.011
8	Shan	1	0.0001
9	Salone	656	0.0374
10	China	5	0.002
11	Indian	27	0.015
12	Pakistan	-	-
13	Bangladeshi	-	-
14	Other	3165	1.81
<b>Total</b>		175234	100

*Source: Kyunsu Township Administrative Offices*

**(ii) Myeik Township**

Most of the people who live in these townships are Bamar, followed by Kayin, Mon, and China people. A small number of Kachin and Shan are live in Myeik Township. The races residing in Myeik township are shown in the following Table.

**Table - Races in Myeik Township**

<b>No.</b>	<b>Race</b>	<b>Number</b>	<b>%</b>
1	Kachin	17	0.006
2	Kayar	-	-
3	Kayin	8470	3.31
4	Chin	20	0.008
5	Mon	3121	1.22

6	Bamar	235412	92.03
7	Rakhine	915	0.36
8	Shan	21	0.008
9	China	207	0.08
10	Indian	163	0.06
11	Pakistan	59	0.02
12	Bangladeshi	47	0.02
13	Other	40	0.02
<b>Total</b>		255,769	100

*Source: Myeik Township Administrative Offices*

### *(c) Religion*

#### *(i) Kyunsu Township*

The different kinds of religion present in Kyunsu Township are shown in in the following Table. All of 88.72% of the people living in the township are Buddhists. There are many religious places in the region including one historic and well-known pagodas, 46 pagodas and 154 monasteries for Buddhists.

*Table - Religion in Kyunsu Township*

<b>Township</b>	<b>Religion</b>	<b>Buddhist</b>	<b>Christian</b>	<b>Hindu</b>	<b>Muslim</b>	<b>Animist</b>	<b>Total</b>
Kyunsu	Number	155466	16130	9	2973	656	175234
	(%)	88.72	9.21	0.005	0.02	0.38	100.0

*Source: Kyunsu Township Administrative Offices*

#### *(ii) Myeik Township*

The different kinds of religion present in Myeik Township are shown in in the following Table. All of 86.5% of the people living in the township are Buddhists. There are many religious places in the region including four historic and well-known pagodas, 272 pagodas and 153 monasteries for Buddhists.

*Table - Religion in Myeik Township*

<b>Township</b>	<b>Religion</b>	<b>Buddhist</b>	<b>Christian</b>	<b>Hindu</b>	<b>Muslim</b>	<b>Total</b>
Myeik	Number	221188	8238	1158	25162	255796
	(%)	86.5	3.22	0.45	9.83	100.0

*Source: Myeik Township Administrative Offices*



**(d) Land Use**

**(i) Kyunsu Township**

Land uses in Kyunsu Township are shown in in the following Table. Kyunsu Township mainly use its land for agriculture followed by grazing land area.

**Table - Land Use of Kyunsu Township**

Land Category	Kyunsu	
	Acres	%
Agricultural Land	65200	5.54
Forest and Natural Area	200439	17.03
Grazing land	1815	0.16
Industrial Land	35	0.002
Settlement Land	3874	0.33
Wastelands /wild land	5528	0.47
Forest wild	541269	46.00
Mining	12866	1.09
River/creek	81785	6.95
Other	263828	22.42
Total Area	1176626	100.00

*Source: Kyunsu Township Administrative Offices*

**(ii) Myeik Township**

Land uses in Myeik Township are shown in in the following Table. Myeik Township mainly use its land for agriculture followed by grazing land area.

**Table - Land Use of Myeik Township**

Land Category	Myeik	
	ha	%
Agricultural Land	89228	25.5
Forest and Natural Area	75111	21.4
Grazing land	10879	3.1
Industrial Land	172	0.05

Settlement Land	9197	2.63
Wastelands	7124	2.0
Forest wild	39389	11.2
wild land	83283	23.7
Other	42941	12.25
Total Area	350367	100.00

*Source: Myeik Township Administrative Offices*

### **Living Profile**

#### **(i) Kyunsu Township**

##### **(a) Type of Housing Unit**

The majority of the households in Kyunsu Township are wooden houses (50.2%) followed by bamboo houses (33.7%). Meanwhile, some 32.2 % of urban households live in bamboo houses while 51.0 per cent of rural households live in wooden houses as follow:

**Table - Conventional households by type of housing unit by urban/rural**

<b>Residence</b>	<b>Total</b>	<b>Apartm ent/</b>	<b>Bungal ow/</b>	<b>Semi- pacca</b>	<b>Wood en</b>	<b>Bam boo</b>	<b>Hut2- 3</b>	<b>Hut1y ear</b>	<b>Othe r</b>
Total	32,988	1.4	0.8	2.7	50.2	33.7	8.5	1.0	1.7
Urban	1,142	29.2	4.3	5.5	26.4	32.2	1.7	0.6	0.1
Rural	31,846	0.4	0.6	2.6	51.0	33.8	8.7	1.0	1.8

Source: Department of Population, Ministry of Immigration and Population “The 2014 Myanmar Population and Housing Census–Taninthayi Region-Kyunsu TownshipReport” October2017

##### **(b) Water Usage**

In Kyunsu Township, 58.9 per cent of households use improved sources of drinking water (tap water/piped, tube well, borehole, protected well/spring and bottled water/water purifier). The proportion using improved sources of drinking water is 63.6 percent while total average is 69.5 percent. Some 30.3 percent of the households use water from protected well/spring and 26.0 percent use water from unprotected well/spring. Some 41.1 percent of the households use water from unimproved sources. In rural area, 42.3 percent of the households use water from unimproved sources.

**Table - Source of Drinking Water in Kyunsu Township**

Source of drinking water		Total	Urban	Rural
Tapwater/Piped		18.7	26.8	18.4
Tubewell, borehole		7.7	2.9	7.9
Protected well/Spring		30.3	46.0	29.7
Bottledwater/Water purifier		2.2	15.2	1.7
<i>Total improved drinking water</i>		<i>58.9</i>	<i>90.9</i>	<i>57.7</i>
Unprotected well/Spring		26.0	5.6	26.8
Pool/Pond/Lake		1.3	0.8	1.3
River/stream/canal		2.5	0.3	2.5
Waterfall/Rainwater		10.9	2.4	11.2
Other		0.4	-	0.5
<i>Total unimproved drinking water</i>		<i>41.1</i>	<i>9.1</i>	<i>42.3</i>
Total	Percent	100.0	100.0	100.0
	Number	32,988	1,142	31,846

Source: "The 2014 Myanmar Population and Housing Census – Tanintharyi Region-Kyunsu Township Report"

### (c) Lighting

In Kyunsu Township, 11.2 percent of the households use electricity for lighting. The percentage of households that use electricity in Tanintharyi Region is 8.0 per cent. The use of candle for lighting is the highest in the township with 30.8 percent. In rural areas, 31.4 per cent of the households use candle for lighting.

**Table - Conventional Households by Source of Lighting by Urban/Rural**

Source of lighting	Total	Urban	Rural
Electricity	11.2	74.0	9.0
Kerosene	26.2	4.6	27.0
Candle	30.8	15.6	31.4
Battery	0.9	0.4	0.9
Generator(private)	28.6	5.1	29.4
Watermill(private)	0.4	-	0.4

Solarsystem/energy		0.7	0.2	0.7
Other		1.1	0.1	1.1
<b>Total</b>	<b>Percent</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>
	<b>Number</b>	<b>32,988</b>	<b>1,142</b>	<b>31,846</b>

Source: Department of Population, Ministry of Immigration and Population “The 2014 Myanmar Population and Housing Census–Tanintharyi Region-Kyunsu Township Report” October 2017

#### **(d) Cooking Fuel**

In Kyunsu Township, households mainly use wood-related fuels for cooking with 48.6 percent using firewood and 49.7 percent using charcoal. Only 0.4 percent of households use electricity for cooking. In rural areas, 49.7 percent of households use firewood and 48.6 percent use charcoal.

*Table - Conventional Households by Type of Cooking Fuel by Urban/Rural*

Type of cooking fuel		Total	Urban	Rural
Electricity		0.4	1.9	0.3
LPG		<0.1	0.2	<0.1
Kerosene		0.6	-	0.6
Bio-Gas		0.2	0.6	0.2
Firewood		48.6	15.8	49.7
Charcoal		49.7	80.1	48.6
Coal		0.4	1.3	0.4
Other		0.2	0.1	0.2
<b>Total</b>	<b>Per cent</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>
	<b>Number</b>	<b>32,988</b>	<b>1,142</b>	<b>31,846</b>

Source: Department of Population, Ministry of Immigration and Population “The 2014 Myanmar Population and Housing Census–Tanintharyi Region-Kyunsu Township Report” October 2017

#### **(ii) Myeik Township**

##### **(a) Type of Housing Unit**

The majority of the households in Myeik Township are living in wooden houses (46.5%) followed by households in bamboo houses (29.7%). Some 47.3 per cent of urban households and 46.0 per cent of rural households live in wooden houses.

**Table - Conventional households by type of housing unit by urban/rural**

Residence	Total	Apartment/ Condominium	Bungalow/ Brickhouse	Semi-pacca house	Wooden house	Bamboo house	Hut2-3 years	Hut1year	Other
Total	54349	3.9	9.5	7.5	46.5	29.7	2.0	0.5	0.4
Urban	21548	2.2	15.7	11.2	47.3	23.1	0.2	0.1	0.2
Rural	32801	5.0	5.4	5.0	46.0	34.1	3.1	0.8	0.6

Source: Department of Population, Ministry of Immigration and Population “The 2014 Myanmar Population and Housing Census–Tanintharyi Region-Kyunsu Township Report” October 2017

### **(b) Water Usage**

In Myeik Township, 84.9 percent of households use improved sources of drinking water (tap water/piped, tube well, borehole, protected well/spring and bottled water/water purifier). Compared to other townships in Tanintharyi Region, it is the highest and it is also higher than the Union average (69.5%). Some 30.1 per cent of the households use water from bottled water/water purifier and 23.4 percent use water from protected well/spring. Some 15.1 percent of the households use water from unimproved sources. In rural areas, 22.7 percent of the households use water from unimproved sources for drinking water.

**Table - Source of Drinking Water in Myeik Township**

Source of drinking water	Total	Urban	Rural
Tapwater/Piped	20.7	30.8	14.0
Tubewell, borehole	10.7	13.1	9.2
Protected well/Spring	23.4	5.6	35.1
Bottled water/Water purifier	30.1	47.0	19.0
<b>Total improved drinking water</b>	<b>84.9</b>	<b>96.5</b>	<b>77.3</b>
Unprotected well/Spring	9.3	0.2	15.3
Pool/Pond/Lake	0.2	-	0.3
River/stream/canal	1.0	-	1.7
Waterfall/Rainwater	1.7	-	2.7
Other	2.9	3.2	2.7
<b>Total unimproved drinking water</b>	<b>15.1</b>	<b>3.4</b>	<b>22.7</b>

<b>Total</b>	<b>Percent</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>
	<b>Number</b>	<b>54,349</b>	<b>21,548</b>	<b>32,801</b>

Source: Department of Population, Ministry of Immigration and Population “The 2014 Myanmar Population and Housing Census–Tanintharyi Region-Kyunsu Township Report” October2017

### **(c) Lighting**

In Myeik Township, 10.5 percent of the households use electricity for lighting. The percentage of households that use electricity in Tanintharyi Region is 8.0 per cent. The use of generator (private) for lighting is the highest in the township with 55.0 per cent. In rural areas, 37.2 per cent of the households use generators (private) for lighting.

*Table - Conventional households by source of lighting by urban/rural*

<b>Source of lighting</b>	<b>Total</b>	<b>Urban</b>	<b>Rural</b>
Electricity	10.5	6.2	13.4
Kerosene	11.8	0.6	19.1
Candle	19.4	8.3	26.6
Battery	0.4	0.4	0.4
Generator(private)	55.0	82.3	37.2
Watermill(private)	1.2	0.9	0.8
Solarsystem/energy	1.4	0.1	2.4
Other	0.2	0.2	0.2
<b>Total</b>	<b>Percent</b>	<b>100.0</b>	<b>100.0</b>
	<b>Number</b>	<b>54,349</b>	<b>21,548</b>

Source: Department of Population, Ministry of Immigration and Population “The 2014 Myanmar Population and Housing Census–Tanintharyi Region-Kyunsu Township Report” October2017

### **(d) Cooking Fuel**

In Myeik Township, households mainly use wood-related fuels for cooking with 30.5 percent using firewood and 64.5 percent using charcoal. Only 1.4 percent of households use electricity



for cooking. Some 47.2 percent of households in rural areas use firewood and 49.5 percent use charcoal.

*Table - Conventional households by type of cooking fuel by urban/rural*

Type of cooking fuel		Total	Urban	Rural
Electricity		1.4	1.9	1.1
LPG		0.9	1.8	0.4
Kerosene		0.2	<0.1	0.3
Bio-Gas		1.4	2.3	0.8
Firewood		30.5	5.1	47.2
Charcoal		64.5	87.3	49.5
Coal		0.5	0.8	0.4
Other		0.5	0.8	0.3
<b>Total</b>	<b>Per cent</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>
	<b>Number</b>	<b>54,349</b>	<b>21,548</b>	<b>32,801</b>

Source: Department of Population, Ministry of Immigration and Population “The 2014 Myanmar Population and Housing Census–Tanintharyi Region-Kyunsu Township Report” October 2017

### *Occupational Patterns*

#### *(i) Kyunsu Township*

Data shows that fisheries is the common livelihood means of households in Kyunsu Township. The other main economic activities in the area are, agriculture, trade, public services, and livestock. According to official statistics, Kyunsu has a total of 81,615 people as the township workforce and 59,014 are employed with an unemployment rate of 27.69%. Per capita income in the township is estimated to be 972,210 Kyats in 2014-2015.

*Table - Occupational Patterns*

Government Employee	Services	Agriculture	Livestock	Trade	Industry	Fisheries	Arbitrary
2176	551	3467	483	703	91	6685	44858

**Table - Employment**

Workforce	Employed	Unemployed	Unemployment rate
81,615	59,014	22,601	27.69%

**Table - Per Capital Income**

Year	Income
2014-15	972,210 Ks.
2015-16	-
2016-17	-

**(ii) Myeik Township**

Data shows that trade is the common livelihood means of households in Myeik Township. The other main economic activities in the area are fisheries, trade, public services, agriculture and arbitrary. According to official statistics, Myeik has a total of 140,655 people as the township workforce and 127,670 are employed with an unemployment rate of 9.23%. Per capita income in the township is estimated to be 1935,166 Kyats in 2014-2015 and 2077,592 Kyats in 2015-2016.

**Table - Occupational Patterns**

Government Employee	Services	Agriculture	Livestock	Trade	Industry	Fisheries	Arbitrary	Others
4614	4052	689	266	4307	618	9739	30209	2536

**Table - Employment**

Workforce	Employed	Unemployed	Unemployment rate
140,655	127,670	12,985	9.23%

**Table - Per Capital Income**

Year	Income
2014-15	1935,166 Ks.
2015-16	2077,592 Ks
2016-17	-

**Education**

**(i) Kyunsu Township**

Over fifteen percent of the total township population is students. For education sector, although primary school education is compulsory and fee-free, school enrollment rate of 5-year-olds is relatively half over of (100%) in the overall township. Percentage of students passing the matriculation is 16.29%. The teacher-student ratios are 1:67 in BEPS, 1:20 in BEMS, and 1:36 in BEHS. Data on education and literacy report that literacy rate in Kyunsu Township was 100%.

**Table - Educational Infrastructure**

School	No. of Schools	No. of Teachers	No. of Students	Teacher/ Student Ratio
BEHS	6	238	6193	1:36
BEHS (Extan)	8	219	4969	1:22
BEMS	1	10	206	1:20
BEMS (Extan)	26	362	9791	1:27
Post (BEPS)	36	275	8024	1:29
BEPS	66	350	23475	1:67
Monastery school	14	51	1098	1:21
Preschool	6	14	180	1:12

**Table - School Enrollment**

No. of 5 yrs-old children			Enrollment			Enrollment Rate
Male	Female	Total	Male	Female	Total	
3306	3131	6437	3306	3131	6437	100%

**Table - Matriculation Pass Rate**

2015-16			2016-2017		
Sit	Pass	Pass Rate	Sit	Pass	Pass Rate
841	137	16.29	927	No. Info.	No. Info.

**Table - Literacy Rate**

Population	above 15 years of age	Literate	Literacy Rate
175,234	70,100	70,100	100%

**(ii) Myeik Township**

Over sixteen percent of the total township population is students. For education sector, although primary school education is compulsory and fee-free, school enrollment rate of 5-year-olds is relatively half over of (100%) in the overall township. Percentage of students passing the matriculation is 31.35%. The teacher-student ratios are 1:19 in BEPS, 1:32 in BEMS, and 1:31 in BEHS. Data on education and literacy report that literacy rate in Myeik Township was 100%.

**Table - Educational Infrastructure**

School	No. of Schools	No. of Teachers	No. of Students	Teacher/ Student Ratio
Higher Education	4	268	7226	1:27
BEHS	11	702	21988	1:31
BEHS (Extan)	10	341	10831	1:32
BEMS	6	179	5652	1:32
BEMS (Extan)	11	186	4838	1:26
Post (BEPS)	22	237	7319	1:31
BEPS	83	436	8001	1:19
Monastery school	8	145	4970	1:34
Preschool	14	33	660	1:20

**Table - School Enrollment**

No. of 5 yrs-old children			Enrollment			Enrollment Rate
Male	Female	Total	Male	Female	Total	100%
3782	3529	7311	3894	3571	7465	

**Table - Matriculation Pass Rate**

2015-16			2016-2017		
Sit	Pass	Pass Rate	Sit	Pass	Pass Rate
5193	1628	31.35	5904	No. Info.	No. Info.

**Table - Literacy Rate**

Population	above 15 years of age	Literate	Literacy Rate
255,796	150,814	168001	100%

### **Healthcare Profile**

#### **(i) Kyunsu Township**

In public health sector, the ratios of medical service personnel and local population indicate the existing conditions of the insufficient health care facilities, especially for rural people. According to secondary data available, the most common diseases include Diarrhoea, Hepatitis, malaria, stomach ailment, and tuberculosis. It was also found out that there was substantial amount of incidence of Diarrhoea, and Malaria in the township. As also noted in the following table, there are one 25-bedded township hospital and five 16-bedded station hospital. There are also 39 rural healthcare centers and sub- centers. Infrastructures for health care services are also seemed to be insufficient especially for rural people.

**Table - Healthcare Facilities**

Population	No. of Doctors	Ratio	No. of Nurses	Ratio	No. of Healthcare Assistant	Ratio
175,234	6	1:29205	26	1:6739	5	1:35047

**Table - Hospitals**

Sr. No.	Hospital	Govt./Private	Bed
1.	Township hospital (Kyunsu)	Govt.	25
2	Station Hospital (Kan Maw)	Govt.	16
3	Station Hospital (Sa Khan Thit)	Govt.	16
4	Station Hospital (Maung Hlaw)	Govt.	16
5	Station Hospital (BarlaPine)	Govt.	16
6	Station Hospital (Yae Kan Taung)	Govt.	16

**Table - Healthcare Centers**

Sr. No.	Type of Healthcare Center	No. of Healthcare Center
1.	Rural Healthcare Center	6
2.	Rural Healthcare Sub-Center	33

**Table - Common Diseases**

Sr. No.	Disease	Incidence
1.	Malaria	484
2.	Diarrhoea	2614
3.	TB	122
4.	Stomach Ailment	698
5.	Hepatitis	27

**Table - HIV/AIDS**

2015-16		2016-17	
Infected	Dead	Infected	Dead
-	-	-	-

**Table - Health Indices**

No. of Maternal	No. of Infant	Per 1000			
		Birth Rate	Maternal Mortality Rate	Infant Mortality Rate	Abortion Rate
4395	3289	22.6	1.9	15.7	0.2

**(ii) Myeik Township**

In public health sector, the ratios of medical service personnel and local population indicate the existing conditions of the insufficient health care facilities, especially for rural people. According to secondary data available, the most common diseases include Diarrhoea, Hepatitis, malaria, stomach ailment, and tuberculosis. It was also found out that there was substantial amount of incidence of Diarrhoea, and stomach ailment in the township. As also noted in the following table, there is 100-bed township hospital. There are also 32 rural healthcare centers and sub- centers. Infrastructures for health care services are also seemed to be insufficient especially for rural people.



**Table - Healthcare Facilities**

Population	No. of Doctors	Ratio	No. of Nurses	Ratio	No. of Healthcare Assistant	Ratio
255,796	89	1:2874	40	1:6394	10	1:25579

**Table - Hospitals**

Sr. No.	Hospital	Govt./Private	Bed
1.	Township hospital (Myeik)	Govt.	100

**Table - Healthcare Centers**

No.	Type of Healthcare Center	No. of Healthcare Center
1.	Rural Healthcare Center	6
2.	Rural Healthcare Sub-Center	26

**Table - Common Diseases**

Sr. No.	Disease	Incidence
1.	Malaria	68
2.	Diarrhoea	2381
3.	TB	949
4.	Stomach Ailment	826
5.	Hepatitis	1

**Table - HIV/AIDS**

2015-16		2016-17	
Infected	Dead	Infected	Dead
162	9	46	-

**Table - Health Indices**

No. of Maternal	No. of Infant	Per 1000			
		Birth Rate	Maternal Mortality Rate	Infant Mortality Rate	Abortion Rate
5894	5858	19.8	0.34	6.15	2.2

### 5.10. Living Environment

The environmental baseline study (the conditions of air quality, water quality and noise levels) will describe in this chapter. The locations of the baseline study are shown in figure are below. Environmental baseline parameters such as air quality, noise and water quality of the existing project are measured on site before the start of the project activities. Air quality and noise are measured at the project location with the relevant devices with frequencies according to the Standard Operating Procedures. Water samples are collected and some parameters of water quality are measured on site and some parameters are sent to respective laboratories.



**Figure 5.21 - Locations of Environmental Baseline Study Monitoring**

Location	GPS Coordinate	
SW	N12°27'33.10"	E98°34'17.75"
GW	N12°27'26.28"	E98°34'21.37"
AN1	N12°26'55.86"	E98°35'02.83"
AN2	N12°26'57.22"	E98°35'04.61"
AN3	N12°26'25.51"	E98°34'51.68"

### **5.10.1 Ambient Air Quality**

ESIA Team used Haz Scanner EPAS air quality monitoring station to detect ambient air quality inside the project. The methodology used by IEE Team is as follow:

#### **(a) Monitoring Parameters**

The parameters for ambient air quality monitoring were SO<sub>2</sub>, NO<sub>2</sub>, CO<sub>2</sub>, CO, H<sub>2</sub>S, O<sub>3</sub>, PM<sub>2.5</sub> and PM<sub>10</sub>.

#### **(b) Methodology**

Determination and analysis of ambient air qualities were conducted by using Haz-Scanner Environmental Perimeter Air Station (EPAS).



### **Haz-Scanner EPAS Air Quality Monitoring Station**

Sampling rate of air quality was recorded automatically every one minute for important gases (Sulfur dioxide, Nitrogen dioxide, Carbon dioxide, Carbon monoxide, Hydrogen sulfide, Particulate matter, Hydrogen sulfide and Ozone) to describe ambient air quality. Sampling pump was adjusted to 2 liter/min. Different analysis methods are integrated in the instrument, such as particulates 90° Infrared Light Scattering for particulate matters (PM<sub>10</sub>, PM<sub>2.5</sub>), electrochemical sensors for toxic gases (SO<sub>2</sub>, NO<sub>2</sub>, CO, H<sub>2</sub>S), NDIR (optional sensor) for (CO<sub>2</sub>) and Gas Sensing Semiconductor- GSS technology (optional sensor) for O<sub>3</sub>.

#### **Important Gases for Ambient Air Quality**

No.	Parameters	Analysis Methods
1.	Sulfur dioxide (SO <sub>2</sub> )	Electrochemical sensors
2.	Nitrogen dioxide (NO <sub>2</sub> )	Electrochemical sensors
3.	Carbon Dioxide (CO <sub>2</sub> )	NDIR (optional sensor)

4.	Carbon monoxide (CO)	Electrochemical sensors
5.	Hydrogen Sulfide (H <sub>2</sub> S)	Electrochemical sensors
6.	Particulate matter 2.5 (PM <sub>2.5</sub> )	Infrared Light Scattering
7.	Particulate matter 10 (PM <sub>10</sub> )	Infrared Light Scattering
8.	Ozone (O <sub>3</sub> )	Gas Sensing Semiconductor- GSS technology (optional sensor)

**(c) Location of Air Quality Monitoring Points**

The air quality monitoring was conducted inside the project site. This station was set in a flat area, located inside the proposed project site.



**Air Quality Monitoring at Day Time (7:00 am to 7:00 pm)**



**Air Quality Monitoring at Night Time (7:00 pm to 7:00 am)**

#### **(d) Monitoring Period**

Air quality was monitored by 12 hours for day time and 12 hours for night time. Detailed for measurements are shown in following table.

#### **Duration of Air Quality Monitoring**

<b>Monitoring Points</b>	<b>Duration</b>
Night Time	(07:00 pm to 07:00 am)
Day Time	(07:00 am to 07:00 pm)

#### **(e) Air Quality Monitoring Results**

The air quality monitoring results obtained by every minute were combined to make average values for day time (12 hours) and night time (12 hours) for evaluation and comparison with standard values. The followings are the results from Haz-Scanner Software (Haz-Scanner 6.0.1) for day time air quality monitoring.

#### **Average Ambient Air Quality Monitoring Results of Day Time**

<b>Parameters</b>	<b>Unit</b>	<b>Measured Values</b>
Barometric Pressure	mBar	1021
CO	$\mu\text{g}/\text{m}^3$	395
CO <sub>2</sub>	$\mu\text{g}/\text{m}^3$	1045
H <sub>2</sub> S	$\mu\text{g}/\text{m}^3$	0.00
NO <sub>2</sub>	$\mu\text{g}/\text{m}^3$	4.76
O <sub>3</sub>	$\mu\text{g}/\text{m}^3$	29.5
PM <sub>10</sub>	$\mu\text{g}/\text{m}^3$	47.13
PM <sub>2.5</sub>	$\mu\text{g}/\text{m}^3$	23.48
SO <sub>2</sub>	$\mu\text{g}/\text{m}^3$	20.4

#### **Average Ambient Air Quality Monitoring Results of Night Time**

The followings are the results from Haz-Scanner Software (Haz-Scanner 6.0.1) for night time air quality monitoring.

<b>Parameters</b>	<b>Unit</b>	<b>Measured Values</b>
Barometric Pressure	mBar	1049

CO	$\mu\text{g}/\text{m}^3$	307
CO <sub>2</sub>	$\mu\text{g}/\text{m}^3$	1104
H <sub>2</sub> S	$\mu\text{g}/\text{m}^3$	0.00
NO <sub>2</sub>	$\mu\text{g}/\text{m}^3$	6.4
O <sub>3</sub>	$\mu\text{g}/\text{m}^3$	22.62
PM <sub>10</sub>	$\mu\text{g}/\text{m}^3$	32.72
PM <sub>2.5</sub>	$\mu\text{g}/\text{m}^3$	17.46
SO <sub>2</sub>	$\mu\text{g}/\text{m}^3$	21.5

### **(f) Comparison with Corresponding Guidelines Values**

Monitoring results are compared with Myanmar Emission Guideline (2015); World Health Organization Guideline Value (Global Update 2005); National Ambient Air Quality Standard Central Pollution Control Board, Ministry of Environment and Forests, 2003) as shown in following table.

Pollutants	Day Time (12 hours)	Night Time (12 hours)	MEG Value	WHO Guideline Value	NAAQS	
					Industrial, residential, rural and other areas	Industrial, residential, rural and other areas
CO <sub>2</sub> ( $\mu\text{g}/\text{m}^3$ )	1045	1104	-	-	-	-
CO ( $\mu\text{g}/\text{m}^3$ )	395	307	5(mg/Nm <sup>3</sup> )	-	2000 (8 hour) 4000 (1 hour)	2000 (8 hour) 4000 (1 hour)
H <sub>2</sub> S ( $\mu\text{g}/\text{m}^3$ )	0.00	0.00	2 (30 min) for Agriculture, Livestock and Forestry	-	-	-
NO <sub>2</sub> ( $\mu\text{g}/\text{m}^3$ )	4.72	6.4	200 (1 hour)	200 (1 hour)	40 (Annual)	30 (Annual)
O <sub>3</sub> ( $\mu\text{g}/\text{m}^3$ )	29.5	22.62	100 (8 hour)	100 (8 hour)	-	-
PM <sub>10</sub> ( $\mu\text{g}/\text{m}^3$ )	47.13	32.72	50 ( $\mu\text{g}/\text{m}^3$ ) (24 hour)	50 ( $\mu\text{g}/\text{m}^3$ ) (24 hour)	60 (annual)	60 (annual)
PM <sub>2.5</sub> ( $\mu\text{g}/\text{m}^3$ )	23.48	17.46	25( $\mu\text{g}/\text{m}^3$ ) (24 hour)	25( $\mu\text{g}/\text{m}^3$ ) (24 hour)	40 (annual)	40 (annual)
SO <sub>2</sub> ( $\mu\text{g}/\text{m}^3$ )	20.4	21.5	500 (10 min)	500 (10 min)	80 (24 hour)	80 (24 hour)



**Note:**

- MEG = Myanmar Emission Guideline 2015  
 WHO Guideline = World Health Organization Guideline Value, Global Update 2005  
 NAAQS = National Ambient Air Quality Standard, 2003 (Central Pollution Control Board, Ministry of Environment and Forests)

According to the monitoring results, the concentrations of PM<sub>2.5</sub> and PM<sub>10</sub> are below the Myanmar Emission Guideline (MEG) value, WHO guideline value and NAAQS. For gases emissions, comparing with the MEG value, WHO guideline value and NAAQS, the concentration of all gases were within the acceptable limit for industrial, residential, rural and other areas. For carbon dioxide, no guideline values were provided for the ambient air quality. The project site is located in a little far from the residential area and different industries (dried fish factory, dock yard, cold storage etc.) has been identified within the area. The primary sources of air pollution are therefore anticipated to include gaseous emission from these industries and dust arising from unpaved roads and vehicle movements, and domestic fuel burning from rural households (fuel wood and charcoal for cooking and space heating).

**5.10.2 Water Quality**

The characteristics of PPT’s water samples (location point GW) are presented in the following Table. These tables have desirable as well as permissible limits of National Drinking Water Quality Standard for each parameter.

**Table 5.4 - Summary of Ground Water Quality Testing Results**

Analyses	Ref: Value	Unit	Results	Method
Color	15	TCU	Nil	Platinum Cobalt Method
Turbidity	5	NTU	Nil	Absorption Method
Arsenic	0.05	mg/L	0.00	Arsenator
Chloride	250	mg/L	17.60	Argentometric Method
Hardness	500	mg/L as CaCO <sub>3</sub>	10.00	Unit Dose Vials Method
Iron	1	mg/L	0.15	Bipyridyl Method
pH	6.5-8.5		6.99	Ion selected Electrode Method

Total Dissolved Solid	1000	mg/L	30.80	Ion selected Electrode Method
Sulphate	250	mg/L	1.00	Barium Chloride Method
Magnesium	150	Ppm	2.40	Magnecol Method
Electro conductivity	1500	µmhos/cm	44.00	Ion selected Electrode Method

According to the above table, the groundwater testing result is compared with National Drinking Water Quality Standards and it has shown that almost all the measurements except arsenic value are below its guideline value.

### **Sea Water Quality**

The following Table shows testing results of sea water quality (location point SW) near the proposed project.

**Table 5.5 - Sea Water Quality near the Proposed Project**

<b>Analyses</b>	<b>Ref: Value</b>	<b>Unit</b>	<b>Results</b>	<b>Method</b>
Color	15	TCU	1	Platinum Cobalt Method
Turbidity	5	NTU	0.05	Absorption Method
Arsenic	0.05	mg/L	0	Arsenator
Chloride	250	mg/L	370	Argentometric Method
Hardness	500	mg/L as CaCO <sub>3</sub>	240	Unit Dose Vials Method
Iron	1	mg/L	0.16	Bipyridyl Method
pH	6.5-8.5		6.2	Ion selected Electrode Method
Total Dissolved Solid	1000	mg/L	>4000	Ion selected Electrode Method
Sulphate	250	mg/L	98	Barium Chloride Method
Magnesium	150	Ppm	56.0	Magnecol Method
Zinc	3	mg/L	0.03	Zincon Method
Electro conductivity	1500	µmhos/cm	>6000	Ion selected Electrode Method

According to the above table, the sea water result is compared with National Drinking Water Quality Standards and it has shown that almost all the measurements except chlorine, total dissolved solid and electro conductivity are below its guideline value. The amount of total dissolved solid is above the permissible limits of 1000mg/L. The amount of chlorine and

electro conductivity are above the permissible limits of 250mg/L and 1500 µmhos/cm. So, according to the result, it is not suitable to use for drinking water purposes

### 5.10.3 Noise Level

Given the generally island nature of the existing environment, noise levels can be predicted to be low. Primary contributions to noise as observed in the project area include diesel generators, and vehicular traffic. Noise receptors would include individual residents, schools, and wild and domesticated animals.

Construction noise mainly comes from the construction machinery working and construction materials transportation, such as the roar of the motor vehicle and the noise of the trumpet, the construction noise will seriously affect the neighboring residents work and rest, especially at night. According to the limit of noise at boundary of construction and its measuring method in different construction stage.

To monitor the existing noise level, the (IEE) team used TES-1353H Integrating Sound Level Meter which is applicable with IEC61672-1: 2003, IEC60651: 1979, ANSI S1.4: 1983 and IEC60804: 1985 standards. Existing noise level are monitoring in both day time (07:00 to 22:00) and night time (22:00 to 07:00).

The results of noise levels (Leq) are shown in the following Table. The noise levels at AN1 located near project site was at 57.8 dB(A) during daytime and at 44.3 dB(A) during nighttime. On the other hand, the noise levels at AN2 located in Pahtaw village about eastside 1.7 km away from the project area was at 50.4 dB(A) during daytime, and at 41.6dB(A) during nighttime. The noise level at AN3 located in Pahthet village was 50.4 dB(A) during daytime and 41.6 dB(A) during night time.

**Table 5.6 - Noise Level Monitoring Results**

Receptors and distances from project		Existing noise levels monitored by integrated noise level meter (dBA)	
		Daytime	Nighttime
AN1	Near Farming	57.8	44.3
AN2@2	Pahtaw village	48.7	40.9
AN3	PahtetVillage	50.4	41.6

MEG Target Value*	Residential, institutional, educational	55	45
	Industrial, commercial	70	70

So, the existing noise level in or within the Pahtaw village are lower than the permissible level for residential area. The noise level near the the proposed project was higher than other sampling points during the daytime.

### **5.11. Existing Biodiversity Environment**

Biodiversity boosts ecosystem productivity where each species, no matter how small, all have an important role to play. For example, A larger number of plant species means a greater variety of crops. Greater species diversity ensures natural sustainability for all life forms. Biodiversity is under serious threat as a result of human activities. The main dangers worldwide are population growth and resource consumption, climate change and global warming, land use for habitat conversion and urbanisation, invasive alien species, over-exploitation of natural resources and environmental degradation. Thus, with those reasons, biodiversity sustainability and conservation plans are more important for balance of nature and future perspectives.

Biodiversity impact assessment is meant to predict the biodiversity impacts and to find out the mitigation measures. The project of Land-Dockyard activities and its operation will have an impact on both terrestrial and aquatic biodiversity. The mitigation measures are important to mitigate the impact of the project. Survey investigated the specific impacts, duration, and extent. The purposes of survey are to identify:

- the important issues and impacts are potentially affected on flora and fauna,
- the information necessary for decision-making; and
- the facts to support the mitigation measures and management plan.

### **National law for protection of biodiversity**

Regards on biodiversity conservation, Myanmar's Environmental laws relating to biological conservation and management issued by the Ministry of Natural Resources and Environment Conservation (MONREC) are listed below (Table 5.7).

**Table 5.7 - Environmental law related to biodiversity conservation**

1. The Territorial Sea and Maritime Zones Law, 1977	Measures for the protection of marine and coastal zone environments and for the conservation of marine biological diversity
2. The Forest Law, 1992/ (2018)	Provisions to conserve water, soil, biological diversity and the environment; sustain forest produce yields; protect forest cover; establish forest and village firewood plantations; sustainably extract and transport forest products
3. Biodiversity and Protected Area Law 2018	Provision of biodiversity and wildlife protection, natural areas conservation, carrying out the protection and conservation of biodiversity, ecosystems and protected areas as well as protection of migratory birds in accordance with International Conventions acceded by the State, protecting the endangered species of wildlife and their natural habitats and contribution for the development of research on natural science.

### **Impact levels**

#### Impact classification

Impacts were classified into four categories: Small, Moderate, Large and Very large followed by the Bureau of Land Management by the US (2016).

**Table 5.8 - Classification of impact levels and caused event on biodiversity**

	<b>Impact level</b>	<b>Caused events</b>
1	Low (L)	This is an impact that is limited to the immediate project area, affects a relatively small proportion of the local population (less than 10%), and does not result in a measurable change in carrying capacity or population size in the affected area.
2	Moderate (M)	This is an impact that extends beyond the immediate project area, affects an intermediate proportion of the local population (10 to 30%), and results in a measurable but moderate (not destabilizing) change in carrying capacity or population size in the affected area.
3	High (H)	This is an impact that extends beyond the immediate project area, could affect more than 30% of a local population, and could result in a large, measurable, and destabilizing change in carrying capacity or population size in the affected area.
4	Very High (VH)	This is an impact that extends beyond the immediate project area, could affect more than 50% of a local population, and could result in a very large, measurable, and destabilizing change in carrying capacity or population size in the affected area.

### **Biological environment of the project area**

The project site is located at N 12° 26' 28.14" and E 98° 35' 10.7664" on the Island between Pahtaw and Pahtet Mountains in Kyunsu Township of Myeik in Thanintharyi Region (Figure 1). This island is separated by Myeik River from Myeik Town. Project site is situated at about 1km from the strand road of Myeik. The project site has 200 ft x 960 ft (1.78 ha) on the land. The grassland vegetations, some planted trees, parts of mountain forest, small patch of mangroves and marine environment (Myeik Rive) are in the surrounding area of the project site. According to the survey, the status of biodiversity (birds, reptiles, mammals and mountainous natural plant and mangrove plants) nearby 1km from the project site in both terrestrial and aquatic environment are small. But the birds like a little egrets and Black Eared Kites are commonly found around the project area. Three Red list species of plants with little small number are recorded in the adjacent of the Pahtaw forest. Stingray fish and turtle are reported inhabit near the project area which is described as near threatened species (NT) in IUCN red list. Rhesus macaque or long tail macaque (*Macaca mulatta*) and squirrels are observed in the forest of Pahtaw mountain, outside the project area. Surrounding area of the project site and Phahtaw and Phahtet Islands are rich of natural resources with its beauty which should be taken measures in management plans for protection of environmental sustainability and its unique ecosystem when implemented the infrastructure development there.

### **Parts of marine ecosystem**

#### **Estuary Ecosystem**

The term “estuary” typically describes the shallow, sheltered area of a river mouth where freshwater intermingles with saltwater as it enters the sea, although the term can also refer to other areas with flowing brackish waters, such as lagoons or glades. The degree of salinity varies with the tides and the volume of outflow from the river. The organisms inhabiting estuaries are specially adapted to these distinct conditions; hence, the diversity of species tends to be lower than in the open ocean. However, species which generally inhabit neighboring ecosystems may occasionally be found in estuaries. Estuaries also serve an important function as nurseries for many types of fish and shrimp (<https://sciencing.com> › *Nature*).

#### **Mangrove Ecosystem**

Some tropical and subtropical coastal areas are home to special types of saltwater swamps known as mangroves. Mangroves may be considered part of shoreline ecosystems or estuary ecosystems. Mangrove swamps are characterized by trees that tolerate a saline environment; whose roots systems extend above the water line to obtain oxygen. Mangroves host a wide



diversity of life, including sponges, shrimp, crabs, jellyfish, fish, birds and even crocodiles (<https://sciencing.com> › *Nature*).

## **METHODOLOGY**

### **Field work**

Based on the characterizations of the biological environment, the faunal and floral groups that might be impacted by the proposed project activities are investigated under field work. The targeted study groups of flora and fauna are as follow:

- Flora (grassland vegetation, mangroves, plants and phytoplanktons)
- Avifauna;
- Mammals;
- Herpetofauna (Reptiles and Amphibia)
- Fish
- Zooplankton

### **Data collection of plant species**

In data collection, walk-through-surveys were conducted across the project site and its surrounding areas for 1 km. Plants were recorded and listed from the project site, 1000ton cool storage campus, Pahtaw village, Pahtet village, Sinmayinthar village and mangrove habitats (Figure 5.22).

Phytoplanktons were collected from similar places of zooplankton sites with plankton net. Phytoplankton identification were carried out by light microscope with 1000X using emerging oils. To clarify the plant species diversity and to calculate the important value index (IVI) of the project area, (15) quadrats (3m x 3m) in the grassland vegetation and (10) quadrats (25m x 25m) in the forest areas of Pahtet and at the base hill of Pahtaw mountain were set up. Sampling points of these quadrats were also described in Figure (5.22).

In flora surveys, laid down the quadrats, specimen collection, pressing and interview were carried out (Figure 5.23). After field trip, plant identification was conducted based on available literatures such as key to the families of the flowering plants, issued by Department of Botany, Yangon University (1994), Backer *et. al.*(1963), Kress *et. al.* (2003), Gardner *et al.* (2000) etc., and verification was conducted by recorded field photographs and some useful internet websites.

A Google map from iTouchMap.com (<https://itouchmap.com/latlong.html>) was used to show the different biodiversity features, mangrove habitats, grassland vegetations, villages, industrial parts, sampling points for quadrats, zooplankton and phytoplankton collection sites and forests of Pahtaw and Pahtet. Different line colors are used by Adobe Photoshop (7.0) to prominent the different zones of the flora observation (Figure 5.22). The coordinate points of mangrove habitats and sampling points were recorded by Global Positioning System (GPS) (Table 5.9). The threatened levels of plant species of the project area were checked and described their present conservation status in accordance with “The IUCN Red List of Threatened Species, 2016” (<http://www.iucnredlist.org/details/199856/0>).

### **Data collection of animal species**

Direct observation in the field was taken to collect the primary data and information. Secondary data and interview survey were also used for manipulation and for the reference. For terrestrial animal species, five groups such as birds, reptiles, amphibians, mammals and insects were targeted to collect the samples while the four groups for the fishes, birds, benthic and zooplankton fauna were main target to gather the sample in the aquatic environment. Appropriate biological survey methods for each kind of animal are used to collect the data and information. Specimen collection was taken around 1km radius of the project area. For the secondary data, the information of animal presence was obtained about 3km radius of the project area. Identification and list of animal species inhabiting in the surrounding area are made. Observed frequency and abundance of individual species of animals are also recorded. Interview survey was taken with fisherman to investigate fish species richness and abundance. Direct observation and counting of monkey known as Rhesus macaque or long tail macaque (*Macaca mulatta*) was made during the study period. Benthic fauna sampling including along the coastal river at different zones of mudflat were collected by using hand net and observation. Some specimens were recorded by photograph.

### **Data collection of Herpetofauna**

The Survey work mainly involved walking and visual inspection. No traps or Snares were used. Snakes and other reptiles including lizards are observed in their habitats (resting and foraging habitats). Guide books and camera were used to identify the snake species. Interview survey was also used for information.

### **Observation on Avifauna**

Random Point count method was used for the bird survey and took the photograph of birds. Birds were studied using the point count methods using the field guide books with help of the binoculars, camera and GPS. Species identification, observed numbers of birds, habitat utilization was examined. Point count and opportunistic methods were used to census the species richness and point counting was used to get the relative measure of bird abundance. Identification of birds were confirmed using Kyaw Nyunt Lwin and Khin Ma Ma Thwin (2004).

### **Data Collection of Fish**

Fish specimens were collected with the help of fishermen who they are fishing along the coastal waters nearby the project area. Fish sample collection was made by use of drifted gill net, trammel-net and line & hook fishing. Identification was made by FAO (2012) and Fishbase 2015.

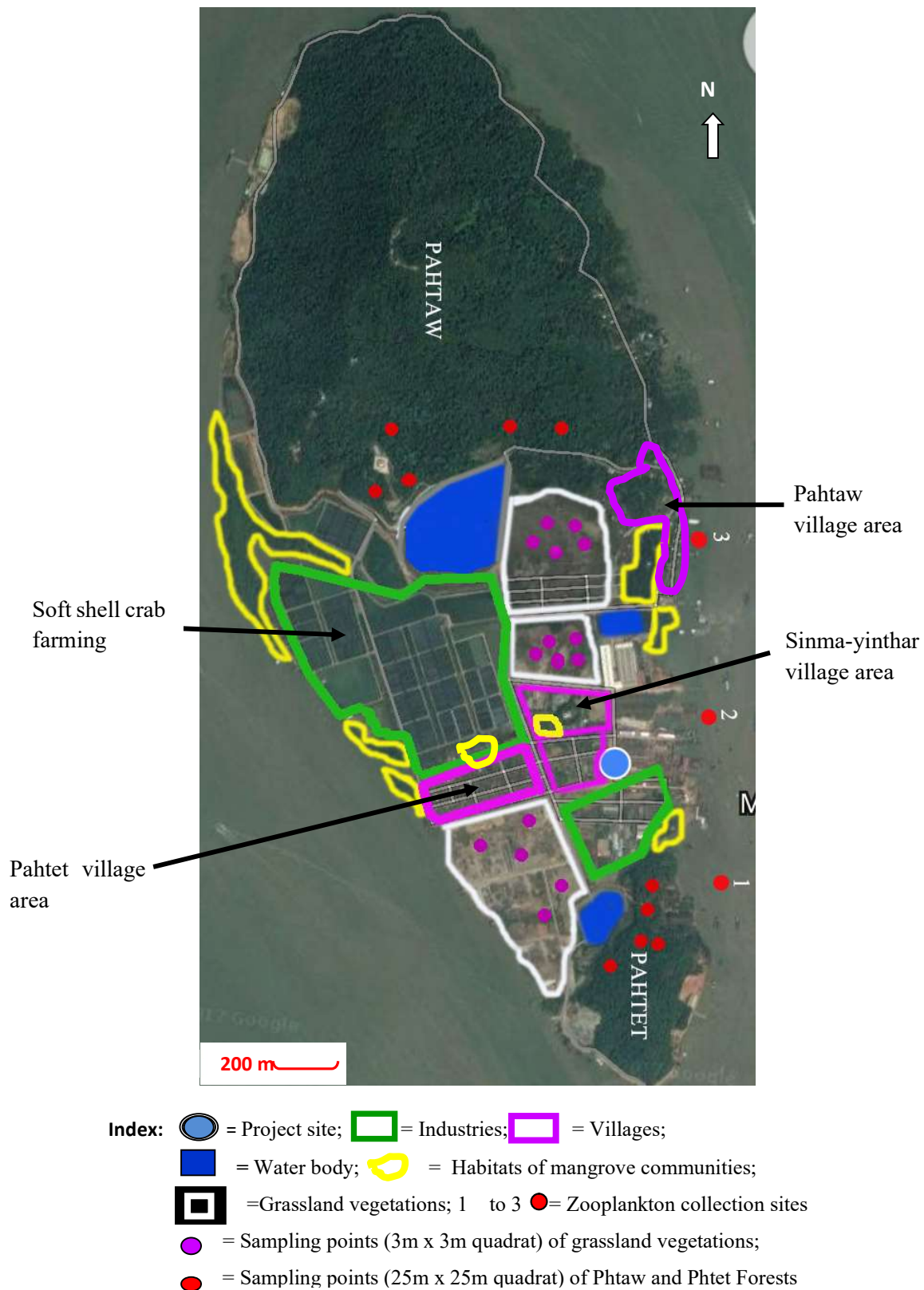
### **Collection and preservation of zooplankton samples**

To be collected the zooplanktons, a total of 75 liters of water was being filtered with plankton net (mesh size 190 $\mu$ m) carried out in each sampling site (Figure 5.22 and 5.24). The hauling distance was 60cm long near the surface water. At each study sites triplicate samples were carefully transferred to a small vial. The inside of the net was washed so as to collect any sticking plankton. A few drops of formalin were put to narcotize the animals and when they became motionless and settled down, the supernatant water was discarded slowly and concentrated samples were collected. All samples were preserved in 5% formaldehyde solution (Nauwerk 1963; Anderson and Green 1976). The taxonomical identification and numbers of population abundance of water sample were done by drop count method under the microscope. Taxonomic identification was carried out following Sharma(1999a) and Khan (2003).

### **Data analysis**

Data analysis is made by descriptive statistical analysis through Microsoft excel. Impact analysis is conducted followed by the standard guideline. Identification and determination of the potential impacts such as impact levels such as magnitude, extent and duration on biodiversity caused by the proposed project is made. Based on the type of the project, impact levels are identified into three categories such as low, moderate, high and very high for the proposed project. The factors are used in determining impact significance and magnitude, these factors are 1. area of influence, 2. percentage of resource affected, 3.

persistence of impacts, 4. sensitivity of resources, 5. status of resources, 6. regulatory status, and 7. social values



**Figure 5.22 – Map of the project site and its environment**





Walk-through-survey to record and list for plants (1)



Walk-through-survey to record and list for plants (2)



Plant collection



Press



Quadrat set up (25m x 25m) in the Pahtaw forest



Quadrat set up (25m x 25m) in Pahtet forest



Quadrat set up (3m x 3m) in grassland vegetation



Interviewing with local people

**Figure 5.23 - Field activities of plant survey**





Fish sample collection with gill net



Zooplankton and phytoplankton collection by plankton net



Specimen preservation (for zooplankton and phytoplankton) with formalin in plastic vial

**Figure 5.24 - Collection fish sample and zooplankton**

**Table 5.9 – Sampling points of grassland, Pahtaw and Pahtet vegetations**

No	Latitude	Longitude
<b>Project Site</b>		
1	N 12° 26' 28.14"	E 98° 35' 10.7664"
<b>Sampling points of Grassland vegetation (3mx3m)</b>		
1	N 12° 26' 10.5174"	E 98° 35' 2.2164"
2	N 12° 26' 13.3836"	E 98° 35' 3.2958"
3	N 12° 26' 16.2486"	E 98° 34' 58.1196"
4	N 12° 26' 20.853"	E 98° 34' 58.1982"
5	N 12° 26' 18.1356"	E 98° 34' 52.2516"
6	N 12° 26' 38.3274"	E 98° 34' 56.8848"
7	N 12° 26' 36.8154"	E 98° 34' 58.4292"
8	N 12° 26' 37.1184"	E 98° 35' 1.9818"
9	N 12° 26' 39.5334"	E 98° 35' 2.6016"



10	N 12° 26' 40.8906"	E 98° 35' 0.438"
11	N 12° 26' 50.0928"	E 98° 34' 55.3398"
12	N 12° 26' 49.4916"	E 98° 34' 58.7382"
13	N 12° 26' 51.45"	E 98° 35' 3.372"
14	N 12° 26' 52.8102"	E 98° 35' 1.2114"
15	N 12° 26' 52.962"	E 98° 34' 58.1196"
<b>Sampling points of Pahtaw Forest (25mx25m)</b>		
1	N 12° 27' 3.1896"	E 98° 34' 59.2026"
2	N 12° 27' 2.7648"	E 98° 34' 52.2516"
3	N 12° 26' 56.2776"	E 98° 34' 40.818"
4	N 12° 26' 59.5962"	E 98° 34' 38.19"
5	N 12° 26' 54.7686"	E 98° 36.9546"
<b>Sampling points of Pahtet Forest (25mx25m)</b>		
1	N 12° 26' 16.2468"	E 98° 35' 14.496"
2	N 12° 26' 14.0634"	E 98° 35' 13.4154"
3	N 12° 26' 11.724"	E 98° 35' 13.3404"
4	N 12° 26' 11.2704"	E 98° 35' 15.27"
5	N 12° 26' 8.7072"	E 98° 35' 10.1718"
<b>Zooplanktons and Phytoplanktons</b>		
1	N 12° 26' 48.0228"	E 98° 35' 7.659"
2	N 12° 26' 43.9866"	E 98° 35' 10.9818"
3	N 12° 26' 19.5462"	E 98° 35' 14.1504"

## **RESULTS (FLORA)**

Plant survey was carried out for 1 km range from the core area of project site. The surroundings of project area are mainly occupied with slightly thin by grassland vegetation, mangrove vegetation and the two forests. Vegetation was not occurred in the project site. Plant species at margins as fence, the planted species in the 1000ton cool storage campus, natural plant species of mangrove communities, natural plant species from sampling points of grassland vegetations and Pahtaw and Pahtet forests were also recorded and listed.

In this survey, a total of (147) plant species from (52) families was recorded in which tree species were (48.29%), followed by shrub and herb (each 12.93%), small tree (11.56%), climber (6.80%), grasses (4.08%), bamboo (2.72%) and finally fern (0.68%) included (Figure 5.25 and Table 5.8). The most significant family of the project area was Fabaceae with (16)

species, followed by Malvaceae with (13) species and finally Poaceae with (11) species (Table 5.10 and Figure 5.25).

A total of (83) species from Pahtaw forest, followed by (56) species from Pahtet forest, (44) species from Pahtaw village, (38) species from grassland vegetations, (36) from Sinmayinthar village, (30) species from mangrove communities with (7) species of mangrove plants (Figure 6), (29) species from 1000 ton cool storage campus, (27) species from Pahtet village and (22) species from fence of project site were recorded as listed plant species at present (Table 5.10). A total of (11) phytoplankton species were collected and identified in which a total of top (3) species were mentioned with figures (Figure 5.28, 5.29 and Table 5.11).

According to IUCN red list (2016), the three tree species of *Myristica malabarica* (Kywe-thwe) as vulnerable status (VU), *Vatica maingayi* (Kanyin-kyaung-che) as critical endangered status (CR) and *Dipterocarpus kerrii* King. (Sibin) as endangered status (EN) were recorded as threatened species. These species are essential to conserve for plant diversity.

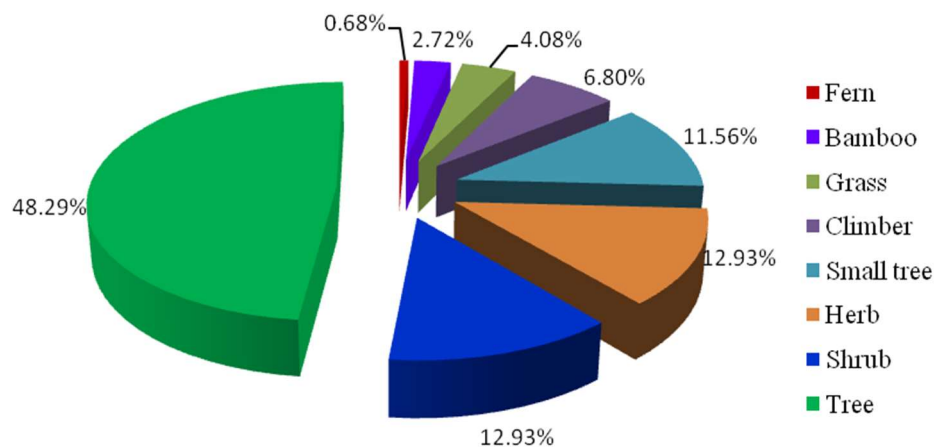


Figure 5.25 - Habit composition of observed plant species



Figure 5.26 - Project site and its surroundings: (a) project site; (b) fence plant species (c) grassland vegetation and Pahtaw village; (d) grassland vegetation near Pahtet village; (e) mangrove community near Sinmayinthar village; (f) mangrove community at Myeik river; (g) Pahtaw forest; (h) Pahtet forest



*Nypa fruticans* (Dani)





*Sonneratia alba* (Lame)



*Avicennia officinalis* (Thame-net)



*Rhizophora mucronata* (Byu-chidauk)

**Figure 5.27 - Some plant species of mangroves**

Table 5.10 - Recorded plant species together with the Family names, Myanmar names, Habits, their sites and IUCN status.

No.	Scientific Name	Family	Myanmar Name	Habit	Areas of listed plant species						Study Areas			IUCN Status
					1	2	3	4	5	6	7	8	9	
1	<i>Acacia auriculiformis</i> A.Cunn.ex Ben	Fabaceae=16	Aurishaa	Tree		√	√		√				√	NL
2	<i>Acacia mangium</i> Willd.	Fabaceae	Nil	Tree								√		NL
3	<i>Acanthus ilicifolius</i> L.*	Acanthaceae=2	Khayar	Shrub=19						√				NL
4	<i>Achyranthes aspera</i> L.	Amaranthaceae	Kyet-mauk-pyan	Herb							√			NL
5	<i>Acrostichum aureum</i> L.	Pteridaceae=1	Nil	Fern=1					√	√	√	√	√	NL
6	<i>Adenanthera pavonina</i> L.	Fabaceae	Ywe-gyi	Tree								√	√	NL
7	<i>Albizia procera</i> (Roxb.) Benth.	Fabaceae	Sit	Tree			√	√				√	√	NL
8	<i>Albizia saman</i> F. Muell.	Mimosaceae=4	Thinbaw-kokko	Tree		√	√		√					NL
9	<i>Alternanthera sessilis</i> (L.) R. Br.	Amaranthaceae=2	Pazun-sar	Herb	√						√	√		NL
10	<i>Anacardium occidentale</i> L.	Anacardiaceae=5	Thiho-thayet	Tree		√	√						√	NL
11	<i>Anthocephalus morindaefolius</i> Korth.	Rubiaceae=1	Ma-u	Tree								√	√	NL
12	<i>Archidendron pauciflorum</i> (Jack) Nielsen.	Fabaceae	Danyin	Tree			√					√	√	NL
13	<i>Areca catechu</i> L.	Arecaceae=6	Kunthi-pin	Small tree		√						√		NL
14	<i>Artocarpus heterophyllus</i> Roxb.	Moraceae=8	Peinne	Tree		√	√		√			√	√	NL

Table 5.10 Contd. (a)

No.	Scientific Name	Family	Myanmar Name	Habit	Areas of listed plant species						Study Areas			IUCN Status
					1	2	3	4	5	6	7	8	9	
15	<i>Artocarpus lakoocha</i> Roxb.	Moraceae	Myauk-palote	Tree								√		NL
16	<i>Arundo donax</i> L.	Poaceae=11	Kyu	Grass=6							√	√	√	NL
17	<i>Avicennia officinalis</i> L.*	Avicenniaceae=1	Thame-net	Tree						√				NL
18	<i>Barringtonia procera</i> (Miers) R.Knuth	Lecythidaceae=1	Kye	Tree			√					√		NL
19	<i>Bauhinia monandra</i> Kurz.	Caesalpiniaceae=2	Swe-daw	Tree		√	√	√	√					NL
20	<i>Borassus flabellifer</i> L.	Arecaceae	Htan	Tree			√							NL
21	<i>Bouea burmanica</i> Griff.	Anacardiaceae	Ma-yan	Tree			√					√	√	NL
22	<i>Bruguiera malabarica</i> Arnold*	Rhizophoraceae=1	Byu-kyettet	Small tree						√				NL
23	<i>Canavalia turgida</i> Wight & Arn.	Fabaceae	Nil	Climber				√						NL
24	<i>Carex tavoyensis</i> Nelmes	Cyperaceae	Nil	Herb							√			NL
25	<i>Carica papaya</i> L.	Caricaceae=1	Nget-pyaw	Small tree		√	√		√					NL
26	<i>Cassia alata</i> L.	Fabaceae	Pwesay-meziali	Shrub					√	√			√	NL
27	<i>Cassia fistula</i> L.	Fabaceae	Ngu-gyi	Tree		√	√		√					NL
28	<i>Ceiba pentandra</i> (L.) Gaertn.	Bombacaceae=1	Le-moh-pin	Tree		√	√							NL
29	<i>Centipeda minima</i> (L.) A. Br. & Asch.	Asteraceae=5	Chay-sat	Herb	√						√			NL



Table 5.10 Contd. (b)

No.	Scientific Name	Family	Myanmar Name	Habit	Areas of listed plant species						Study Areas			IUCN Status
					1	2	3	4	5	6	7	8	9	
30	<i>Cephalostachyum burmanicum</i> R. Parker & C.E.	Poaceae	Kyat-wa	Bamboo=4			√		√				√	NL
31	<i>Cephalostachyum virgatum</i> Kurz.	Poaceae	Wa-byauk	Bamboo					√				√	NL
32	<i>Chloris barbata</i> Sw.	Poaceae	Sin-ngo-myat	Grass	√						√			NL
33	<i>Cinnamomum pachyphyllum</i> Kosterm.	Lauraceae	Kayaway	Tree								√		NL
34	<i>Cinnamomum</i> sp.	Lauraceae=4	Nil	Tree			√					√		NL
35	<i>Cocos nucifera</i> L.	Arecaceae	Ohn	Tree	√	√	√	√	√					NL
36	<i>Cocos romanzoffiana</i> Cham.	Arecaceae	Thinbaw-ohn	Tree		√								NL
37	<i>Cyclea peltata</i> Hook. F. & Thomson	Menispermaceae=2	Gwedauk-hmwe-sok	Climber						√				NL
38	<i>Cynodon dactylon</i> (L.) Pers.	Poaceae	Mye-sa	Grass	√						√	√		NL
39	<i>Cyperus arenarius</i> Retz.	Cyperaceae=6	Nil	Herb						√	√	√		NL
40	<i>Cyperus compressus</i> L.	Cyperaceae	Wetlar-myat	Herb						√	√	√		NL
41	<i>Cyperus difformis</i> L.	Cyperaceae	Nil	Herb	√						√			NL
42	<i>Cyperus macer</i> C.B. Clarke	Cyperaceae	Nil	Herb						√	√			NL
43	<i>Cyperus multispicatus</i> Boeck.	Cyperaceae	Nil	Herb						√	√	√		NL

Table 5.10 Contd. (c)

No.	Scientific Name	Family	Myanmar Name	Habit	Areas of listed plant species						Study Areas			IUCN Status	
					1	2	3	4	5	6	7	8	9		
44	<i>Delonix regia</i> (Boj. Ex Hook.) Raf.	Fabaceae	Seinban-gyi	Tree		√	√		√				√	NL	
45	<i>Dendrocalamus brandisii</i> Kurz.	Poaceae	Wabo-gyi	Bamboo		√	√						√	NL	
46	<i>Dinochloa maccllelandii</i> Gamble.	Poaceae	Wa-nwe	Bamboo			√	√		√			√	√	NL
47	<i>Dipterocarpus kerrii</i> King.	Dipterocarpaceae=5	Sibin	Tree									√	EN	
48	<i>Eclipta alba</i> (L.) Hassk.	Asteraceae	Kyeik-hman	Herb	√							√	√	NL	
49	<i>Elaeocarpus robustus</i> Roxb.	Elaeocarpaceae=1	Tawmagyi	Tree									√	√	NL
50	<i>Emblica officinalis</i> Gaertn.	Phyllanthaceae=2	Zibyu	Tree			√						√	NL	
51	<i>Eremochloa ciliatifolia</i> Hack.	Poaceae	Nil	Grass								√		NL	
52	<i>Eriachne pallescens</i> R. Br.	Poaceae	Nil	Grass								√	√	NL	
53	<i>Eucalyptus albens</i> Benth.	Myrtaceae	Eu-ca-lit	Tree		√	√	√	√				√	NL	
54	<i>Eugenia</i> sp.	Myrtaceae=8	Thabye-wah	Tree									√	√	NL
55	<i>Eugenia oblata</i> Roxb.	Myrtaceae	Thabye-ni	Tree			√						√	√	NL
56	<i>Eupatorium Odoratum</i> L.	Asteraceae	Bizat	Shrub	√				√					√	NL
57	<i>Euphorbia heterophylla</i> L.	Asteraceae	Kywe- kyaung- myin-si	Shrub								√		NL	
58	<i>Excoecaria agallocha</i> L.*	Euphorbiaceae=5	Tayaw	Small tree=18				√		√			√	√	NL

Table 5.10 Contd. (d)

No.	Scientific Name	Family	Myanmar Name	Habit	Areas of listed plant species						Study Areas			IUCN Status
					1	2	3	4	5	6	7	8	9	
59	<i>Excoecaria oppositifolia</i> Griff.	Euphorbiaceae	Kalaw-ga	Small tree									√	NL
60	<i>Ficus chartacea</i> Wall.	Moraceae	Tha-phan	Shrub			√		√	√				NL
61	<i>Ficus glomerata</i> Roxb.	Moraceae	Ye-thahpan	Tree			√					√		NL
62	<i>Ficus oligodon</i> Miq.	Moraceae	Ka-aung	Tree			√			√		√		NL
63	<i>Ficus ribes</i> Reinw.	Moraceae	Nil	Tree								√	√	NL
64	<i>Ficus rumphii</i> Bl.	Moraceae	Nyaung-phyu	Tree	√		√		√				√	NL
65	<i>Garcinia merguensis</i> Wight.	Clusiaceae=1	Khet-mya	Small tree								√	√	NL
66	<i>Garcinia microstigma</i> Kurz.	Hypericaceae=1	Taung-thale	Small tree								√		NL
67	<i>Getonia floribunda</i> Roxb.	Combretaceae=2	Gyut-nwe	shrub								√		NL
68	<i>Gisekia phanaceoides</i> L.	Gisekiaceae=1	Gangala	Herb	√						√			NL
69	<i>Gluta renghas</i> L.	Anacardiaceae	Lay-tha-yet	Tree								√		NL
70	<i>Gmelina arborea</i> Roxb.	Lamiaceae=3	Yemane	Tree								√	√	NL
71	<i>Grewia hirsuta</i> Vahl.	Malvaceae=13	Kyet-tayaw	Small tree				√				√		NL
72	<i>Grewia serrulata</i> DC.	Malvaceae	Nil	Small tree				√		√		√		NL
73	<i>Gyrocarpus jacquinii</i> Gaertn.	Hernandiaceae=1	Pinle-thit-kauk	Tree								√		NL
74	<i>Heliotropium indicum</i> L.	Boraginaceae=1	Sin-hna-maung	Herb							√	√		NL

Table 5.10 Contd. (e)

No.	Scientific Name	Family	Myanmar Name	Habit	Areas of listed plant species						Study Areas			IUCN Status
					1	2	3	4	5	6	7	8	9	
75	<i>Hibiscus macrophyllus</i> Roxb.	Malvaceae	Taung-petwun	Small tree			√		√	√		√	√	NL
76	<i>Hibiscus surattensis</i> L.	Malvaceae	Taw-chin-baung	Shrub								√		NL
77	<i>Homonoia riparia</i> Lour.	Euphorbiaceae	Ye-chanya	Shrub				√		√	√		√	NL
78	<i>Hopea oblongifolia</i> Dyer.	Dipterocarpaceae	Tanyin-byan	Tree								√		NL
79	<i>Hygrophila phlomoides</i> Nees.	Acanthaceae	Migyaung-kunbat	Herb	√					√	√			NL
80	<i>Hyptis suaveolens</i> (L.) Poit.	Lamiaceae	Taw-pin-sein	Herb	√						√			NL
81	<i>Indigofera</i> sp.	Fabaceae	Meyaing	Shrub	√						√			NL
82	<i>Ipomoea aquatica</i> Forssk.	Convolvulaceae=1	Ye-kazun	Climber=10	√						√		√	NL
83	<i>Isachne dispar</i> (Trin.) Trin.	Poaceae	Yethe-mankha	Herb=19							√			NL
84	<i>Jasminum multiflorum</i> (Burm.f.) Andrews	Oleaceae=1	Tawsabe	Climber						√	√	√	√	NL
85	<i>Lagerstroemia speciosa</i> (L.) Pers.	Lythraceae	Pyin-ma	Tree		√	√	√	√				√	NL
86	<i>Leucaena glauca</i> (L.) Benth.	Mimosaceae	Bawsagaing	Small tree		√	√	√	√					NL
87	<i>Litsea laurifolia</i> (Jacq.) Kurz.	Lauraceae	Ondon	Tree			√					√		NL
88	<i>Litsea salicifolia</i> (Nees.) Hook. f.	Lauraceae	Tagu-shwe-wah	Tree								√		NL

Table 5.10 Contd. (f)

No.	Scientific Name	Family	Myanmar Name	Habit	Areas of listed plant species						Study Areas			IUCN Status
					1	2	3	4	5	6	7	8	9	
89	<i>Lophopetalum fimbriatum</i> Wight	Celastraceae=1	Taung-yemane	Tree								√	√	NL
90	<i>Macaranga tanarius</i> Muell. Arg.	Euphorbiaceae	Pada	Tree			√			√			√	NL
91	<i>Macaranga triloba</i> Muell. Arg.	Euphorbiaceae	Nil	Tree				√				√		NL
92	<i>Madhuca longifolia</i> (J. Konig) J.F. Macbr.	Sapotaceae	Kan-zaw	Tree								√		NL
93	<i>Maesa paniculata</i> A. DC.	Primulaceae=1	Nil	Small tree								√	√	NL
94	<i>Malvastrum coromandelianum</i> (L.) Garcke	Malvaceae	Taw-pilaw	Herb				√			√	√		NL
95	<i>Mangifera indica</i> L.	Anacardiaceae	Tha-yet	Tree		√	√	√	√					NL
96	<i>Melastoma malabathricum</i> L.	Melastomataceae=2	Kyet-gale	Shrub							√	√	√	NL
97	<i>Memecylon grande</i> Cogn.	Melastomataceae	Taung-phyu	Shrub						√			√	NL
98	<i>Mikania micrantha</i> H.B.K.	Asteraceae	Nil	Climber	√	√					√			NL
99	<i>Mimosa pudica</i> L.	Mimosaceae	Tikayon	Herb	√			√	√		√			NL
100	<i>Mimusop elengi</i> L.	Sapotaceae=3	Khayay	Tree		√	√	√	√			√		NL
101	<i>Moringa oleifera</i> Lam.	Moringaceae=1	Dan-da-lun	Tree	√	√		√	√			√		NL
102	<i>Myristica malabarica</i> Lam.	Myristicaceae=1	Kywe-thwe	Tree								√		VU

Table 5.10 Contd. (g)

No.	Scientific Name	Family	Myanmar Name	Habit	Areas of listed plant species						Study Areas			IUCN Status
					1	2	3	4	5	6	7	8	9	
103	<i>Nephelium laurinum</i> Blume.	Spindaceae=1	Taw-kyet-mauk	Tree								√		NL
104	<i>Nypa fruticans</i> Wurmb.*	Arecaceae	Dani	Small tree			√		√	√				NL
105	<i>Palaquium obovatum</i> (Griff.) Engl.	Sapotaceae	Pinle-byin	Tree			√					√	√	NL
106	<i>Phragmites vallatoria</i>	Poaceae	Kyu-a	Grass						√			√	NL
107	<i>Phyllanthus niruri</i> L.	Phyllanthaceae	Yaung-ma-ywet	Shrub				√			√			NL
108	<i>Physalis minima</i> L.	Solanaceae=1	Bauk-pin	Herb	√						√			NL
109	<i>Pithecellobium dulce</i> (Roxb.) Benth.	Mimosaceae	Tayok-magyi	Tree		√			√					NL
110	<i>Pterocarpus macrocarpus</i> Kurz.	Fabaceae	Padauk	Tree		√	√	√	√					NL
111	<i>Ravenala madagascariensis</i> Sonn.	Strelitziaceae=1	Ohn-nget-pyaw	Tree		√								NL
112	<i>Rhizophora mucronata</i> Lam.*	Rhizophoraceae	Byu-chidauk	Small Tree								√		NL
113	<i>Sageraea elliptica</i> (A.DC.) Hook. f.	Annonaceae=1	Thabut	Tree								√	√	NL
114	<i>Salacca secunda</i> Griff.	Arecaceae	Yin-ngan	Small tree		√			√	√			√	NL
115	<i>Samadera indica</i> Gaertn.	Simaroubaceae=1	Ka-thae	Tree								√		NL
116	<i>Schima wallichii</i> (DC.) Korth.	Theaceae=1	Thityah	Tree								√	√	NL



Table 5.10 Contd. (h)

No.	Scientific Name	Family	Myanmar Name	Habit	Areas of listed plant species						Study Areas			IUCN Status	
					1	2	3	4	5	6	7	8	9		
117	<i>Schleichera trijuga</i> Willd.	Sapindaceae=1	Gyo-nyin	Tree								√		NL	
118	<i>Semecarpus</i> sp.	Anacardiaceae	Chee	Tree								√	√	NL	
119	<i>Shorea gralissima</i> Dyer.	Dipterocarpaceae	Mi-chaung-chee	Tree								√		NL	
120	<i>Shorea obtusa</i> Wall.	Dipterocarpaceae	Thit-ya	Tree								√	√	NL	
121	<i>Sida spinosa</i> L.	Malvaceae	Thabyetsi-pin	Shrub	√				√		√	√		NL	
122	<i>Sida subcordata</i> Span.	Malvaceae	Katsi-ne	Herb					√		√			NL	
123	<i>Smilax</i> sp.	Smilacaceae=1	Nil	Climber					√				√	NL	
124	<i>Sonneratia alba</i> J. Smith.*	Lythraceae=2	Lame	Tree=70						√				LC	
125	<i>Stephania japonica</i> (Thunb.) Miers	Menispermaceae	Yele	Climber					√	√		√	√	NL	
126	<i>Streblus asper</i> Lour.	Moraceae	Okhne	Small tree		√	√		√			√		NL	
127	<i>Strophostyles helvola</i> (L.) Elliott.	Fabaceae	Taw-peyaing	Climber				√				√	√	√	NL
128	<i>Syzygium cerasoides</i> (Roxb.) Raiz.	Myrtaceae	Thabye-gyin	Tree			√					√	√	NL	
129	<i>Syzygium cymosum</i> DC.	Myrtaceae	Thabye-htat-taya	Tree								√		NL	
130	<i>Syzygium malaccense</i> (L.) Merr.& L.M. Perry	Myrtaceae	Thabye-phyu	Tree			√					√	√	NL	
131	<i>Syzygium</i> sp.	Myrtaceae	Thabye-gyi	Tree		√						√	√	NL	

Table 5.10 Contd. (i)

No.	Scientific Name	Family	Myanmar Name	Habit	Areas of listed plant species						Study Areas			IUCN Status
					1	2	3	4	5	6	7	8	9	
132	<i>Talipariti tiliaceum</i> (L.) Fryxell	Malvaceae	Ye-ngan-shaw	Small tree			√	√		√	√	√		NL
133	<i>Tamarindus indica</i> L.	Caesalpiniaceae	Magyi	Tree		√	√	√	√					NL
134	<i>Terminalia catappa</i> L.	Combretaceae	Banda	Tree		√	√	√	√					NL
135	<i>Thespesia lampas</i> (Cav.) Dalzell & A. Gibson.	Malvaceae	Thinbaung-shaw	Shrub			√	√		√		√	√	NL
136	<i>Thespesia populnea</i> (L.) Sol. Ex Correa	Malvaceae	Pinle-swedaw	Small tree						√			√	NL
137	<i>Toona ciliata</i> M. Roem.	Meliaceae=1	Thit-ka-toe	Tree								√	√	NL
138	<i>Triumfetta annua</i> L.	Malvaceae	Katsine	Shrub	√						√		√	NL
139	<i>Triumfetta rhomboidea</i> Jacq.	Malvaceae	Katsine-galay	Shrub	√								√	NL
140	<i>Uraria lagopodioides</i> (L.) DC.	Fabaceae	Kyaungme-pan	Shrub	√					√	√			NL
141	<i>Urena lobata</i> L.	Malvaceae	Wetchi-pane	Shrub					√			√		NL
142	<i>Vatica maingayi</i> Dyer.	Dipterocarpaceae	Kanyin-kyaung-che	Tree								√		<b>CR</b>
143	<i>Vigna adenantha</i> (G. Mey.) Marechal	Fabaceae	Pe-yaing	Climber									√	NL
144	<i>Vigna lutea</i> (Sw.) A. Gray	Fabaceae	Beach pea	Shrub						√			√	NL
145	<i>Vigna marina</i> (Burm.) Merr.	Fabaceae	Pe-dalet-yaing	Climber				√				√	√	NL

**Table 5.10 Contd. (j)**

No.	Scientific Name	Family	Myanmar Name	Habit	Areas of listed plant species						Study Areas			IUCN Status
					1	2	3	4	5	6	7	8	9	
146	<i>Vitex pubescens</i> Vhal.	Lamiaceae	Kyet-yo	Tree								√		NL
147	<i>Zizipus jujube</i> (L.) Mill & Lam.	Rhamnaceae=1	Zi	Tree		√	√	√	√			√		NL
<b>147 species</b>		<b>52 family</b>			<b>22</b>	<b>29</b>	<b>44</b>	<b>27</b>	<b>36</b>	<b>30</b>	<b>38</b>	<b>83</b>	<b>56</b>	

**1** Fence plants of the project site

**2** 1000 ton cool storage campus

**3** Pahtaw village

**4** Pahtet village

**5** Sinmayinthar village

**6** Mangrove habitats

√ Recorded place

\* mangrove plant species

**7** Data of grassland vegetations from 15 quadrats (3m x 3m)

**8** Data of Pahtaw Forest Area from 5 quadrats (25m x 25m)

**9** Data of Pahtet Forest Area from 5 quadrats (25m x 25m)

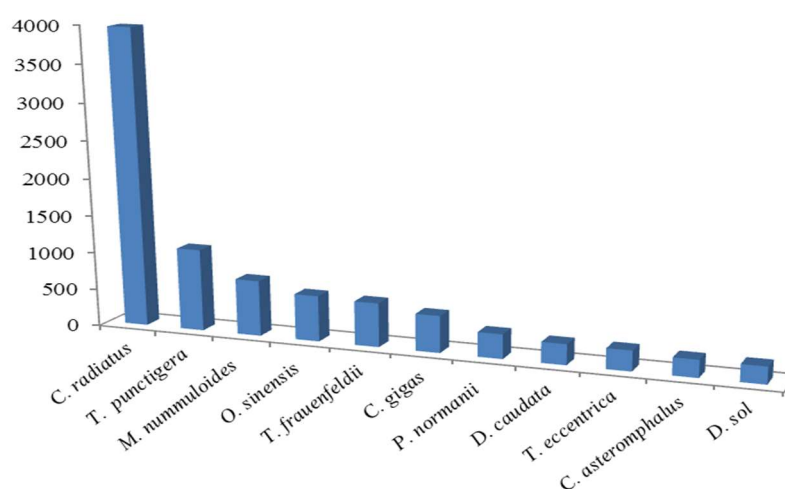
NL : Not listed in IUCN red list; LC: Least Concern; DD: Data Deficient; CR: Critical endangered; VU: Vulnerable; EN: Endangered

### Phytoplankton

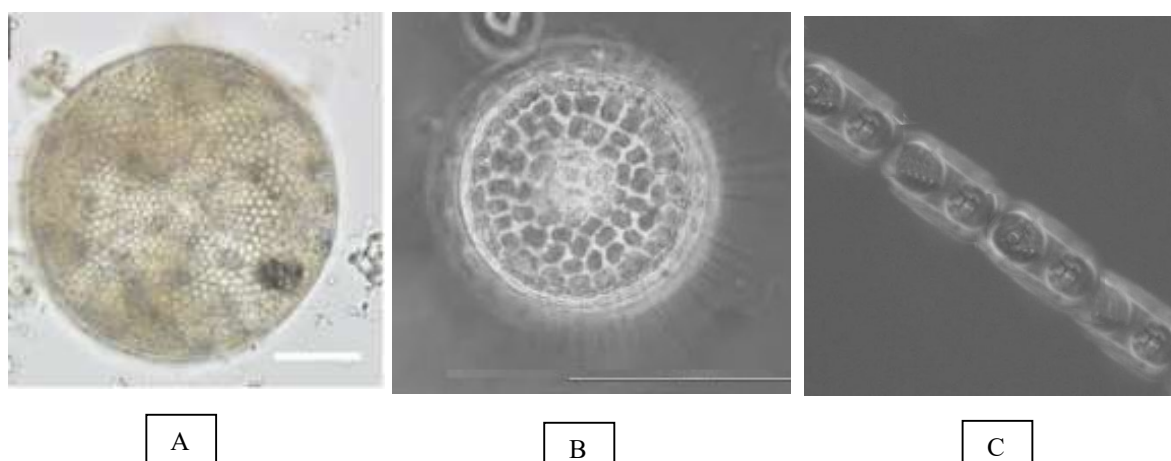
A total of (11) plankton species was collected and identified. Top three species of phytoplankton was mentioned in Figure (5.28 & 5.29) and Table (5.11). All recorded species are common and widely distributed in costal water. All these species are essentially important for other aquatic animals and nutrient cycle. Scientists stated that phytoplankton are unicellular and mostly microscopic in size. They are drifting photosynthesize organisms and generating much of the oxygen into their environment. They are carbon sink for the earth and form primary producer in the food chain. They are the main primary producers in the epipelagic food web. The abundance of phytoplankton deals with the abundance of herbivorous zooplankton and fishes. Moreover, phytoplankton were used as an indicator species to indicate inshore and offshore fishing ground, the occurrence of water pollution, red tides, etc. On the other hand, they are also the indicators of the condition of waters mass.

**Table 5.11 - Recorded phytoplankton species from Costal water nearby the project area**

Species	Rank (in abundance)
<i>Coscinodiscus radiatus</i> Ehrenberg	1
<i>Thalassiosira punctigera</i> (Castracane) Hasle	2
<i>Melosira nummuloides</i> Agardh	3
<i>Odontella sinensis</i> (Greville) Grunow	4
<i>Thalassionema frauenfeldii</i> (Grumow) Hallegraeff	5
<i>Coscinodiscus gigas</i> Ehrenberg	6
<i>Pleurosigma normanii</i> Ralfs	7
<i>Dinophysis caudata</i> Saville-Kent	8
<i>Thalassiosira excentrica</i> (Ehrenberg) Cleve	9
<i>Coscinodiscus asteromphalus</i> Ehrenberg	10
<i>Ditylum sol</i> (Schmidt) Cleve	11



**Figure 5.28 - Species of phytoplanktons**



**Figure 5.29 - Top (3) species of phytoplankton: (A) *Coscinodiscus radiatus* Ehrenberg; (B) *Thalassiosira punctigera* (Castracane) Hasle; and (C) *Melosira nummuloides* Agardh**

### Discussion for plants

A total of (147) plant species from (52) families was observed. Among them, (83) species from Pahtaw forest, followed by (56) species from Pahtet forest, (44) species from Pahtaw village, (38) species from grassland vegetations, (36) species from Sinmayinthar village, (30) species from mangrove communities, (29) species from 1000 ton cool storage campus, (27) species from Pahtet village and (22) species from fence of project site were recorded and listed.

The plant communities of around the project area are margins of the two forests (Pahtaw and Pahtet), grassland vegetation and mangrove communities. Plant important value index (I.V.I) from the two forests will not be described in this scoping report. A total of (83) species from Pahtaw forest and (56) from Pahtet forest are recorded from (10) sampling points (30m x 30m). Forests are nowadays played an important role in environmental protection. It has a long history of protection forests in mountain areas, where they help to prevent soil erosion, landslides and avalanches, and where they are important in maintaining the water quality of rivers draining forested catchments. Forests are very important to maintain because of their top ten reasons of absorbing and storing carbon, home to people, source of jobs and livelihoods, wood for furniture, lumber, firewood and other products, habitat for mammals, birds and insects, preventing flooding, conserving soil and water, regulating regional climate, natural beauty and finally trails for hiking, snow sports, bird-watching, recreation, tourism and educational activities (Web. 1). Therefore, forests of Pahtaw and Pahtet are needed to conserve for the forest ecosystem of project area. In flora survey, the three tree species were recognized

as threatened levels of IUCN red list which species are *Myristica malabarica* (Kywe-thwe) (VU status), *Vatica maingayi* (Kanyin-kyaung-che) (CR status) and *Dipterocarpus kerrii* King. (Sibin) (EN status). Observed these species were from the margin of the Pahtaw forest. The resting plant species are not included in threatened categories of IUCN red list (2016).

In (30) plant species of mangrove communities, (7) species are recorded as mangrove plants which are *Acanthus ilicifolius* (Khayar), *Avicennia officinalis* (Thame-net), *Bruguiera malabarica* (Byu), *Excoecaria agallocha* (Tayaw), *Nypa fruticans* (Dani), *Sonneratia alba* (Lame), and *Rhizophora mucronata* (Byu-chidauk).

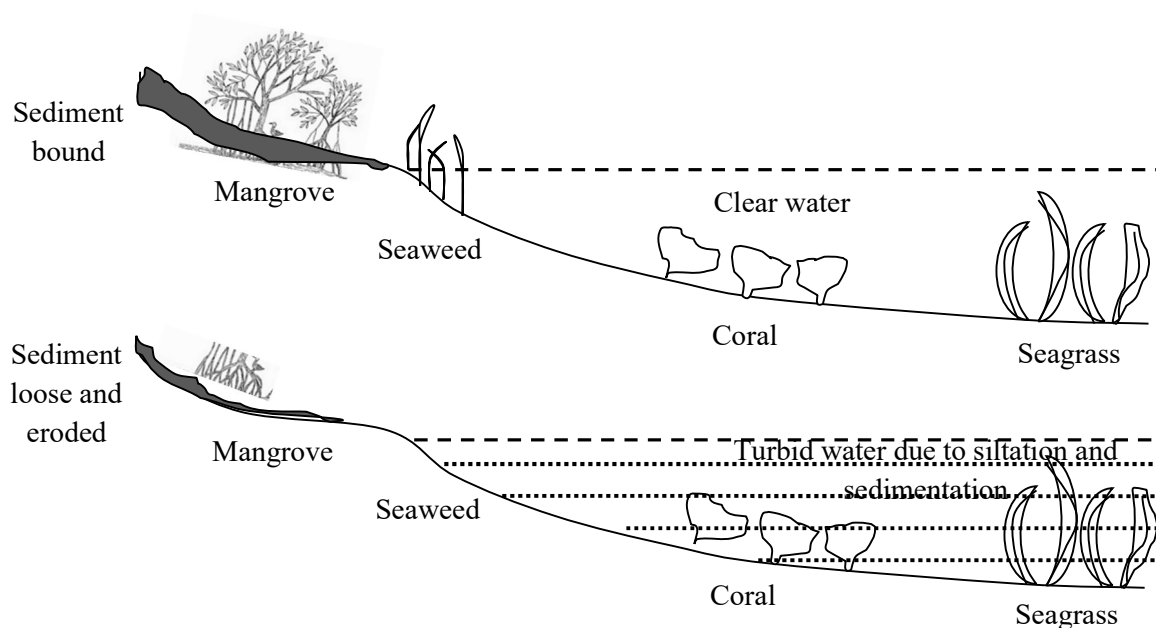
Actually, mangroves protect shorelines from damaging storm and hurricane winds, waves, and floods. Mangroves also help prevent erosion by stabilizing sediments with their tangled root systems. They maintain water quality and clarity, filtering pollutants and trapping sediments originating from land (Web. 2). Mangrove forests are home to a large variety of fish, crab, shrimp, and mollusk species. These fisheries form an essential source of food for thousands of coastal communities around the world. The mangrove forests also serve as nurseries for many fish species, including coral reef fish. Moreover, many animals find shelter either in the roots or branches of mangroves. Mangroves serve as rookeries, or nesting areas, for coastal birds (Web 3). Mangrove swamps act as traps for the sediments, and sink for the nutrients. The root systems of the plants keep the substrate firm, and thus contribute to a lasting stability of the coast. The ecosystem provides a source of food, breeding grounds and nurseries for many food fishes and shellfishes, and they do very often encourage and attract other kinds of wildlife. They further help in offering protection to other associated flora and fauna of the ecosystems including the islands. The mangrove ecosystems are highly productive and comparable to good agricultural land. Benefits of mangroves are 25 fold higher than that of paddy cultivation (Kathiresan *et. al*, 2005). Therefore, all these mangrove species are very important to maintain for mangrove ecosystem of the project area.

In addition, mangroves can be improved the coastal water quality. Mangroves can be removed pollutants and particulate matter from land-based sources. Mangroves are filtering these materials from water before they reach seaward coral reef and seagrass habitats because mangrove root systems slow water flow and facilitating the deposition of sediment (Web 4 and Figure 5.30). As economic benefits, the mangroves supply forestry products (firewood, charcoal, timber, honey *etc.*) and fishery products (fish, prawn, crab, mollusk *etc.*). *Nypa* leaves are used to thatch roofs, mats and baskets. Shells of mangrove molluscs are used to manufacture lime. Mangroves attract honey bees and facilitate apiculture activities in some



areas. Mangrove extracts are used in indigenous medicine. *Bruguiera* species (leaves) are used for reducing blood pressures and *Excoecaria agallocha* for the treatment of leprosy and epilepsy. Roots and stems of *Derris trifoliata* are used for narcotizing fishes, whereas *Acanthus ilicifolius* is used in the treatment of rheumatic disorders. Seeds of *Xylocarpus* species have antidiarrhoeal properties and *Avicennia* species have tonic effect, whereas *Ceriops* produce hemostatic activity. Barks of *Rhizophora* species have astringent, antidiarrhoea and antemetic activities. Tender leaves of *Acrostichum* are used as a vegetable and a beverage is prepared from the fruits of *Sonneratia* spp. Extracts from mangroves seem to have a potential for human, animal and plant pathogens and for the treatment of incurable viral diseases like AIDS (Kathiresan *et. al*, 2005). In fact, observed mangrove plant species of *Acanthus ilicifolius* (Khayar), *Avicennia officinalis* (Thame-net), *Bruguiera malabarica* (Byu), *Excoecaria agallocha* (Tayaw), *Nypa fruticans* (Dani) and *Sonneratia alba* (Lame) will be provided economic, medicinal and ecological values in accordance with Kathiresan (2005), and thus these species should be maintained and plantation should be carried out for project development.

According to observation, phytoplankton communities of costal water of the project area were good in condition and abundance with rich species diversities. Species of *Coscinodiscus radiates* Ehrenberg, *Thalassiosira punctigera* (Castracane) Hasle; and *Melosira nummuloides* Agardh. were recorded as top three species among other phytoplankton species. Based on the finding of Yin Yin Htay (2013), the phytoplankton of Pahtaw-Pahtet Waters stands the second most abundance species diversity which account for 65.92 % (comprises 89 species from the recorded 135 species of phytoplankton from Myeik Coastl Water) of phytoplankton species in Myeik Coasta Area. So it can be concluded that the environmental conditions, the water quality and nutrient of Pahtaw-Pahtet Area were favor for the survival of phytoplankton communities in this region which will in turn provide as food for other fishery resources.



**Figure 5.30 - Mangroves can be improved coastal water quality**

## RESULTS (FAUNA)

Five fauna groups are classified according to their presence in the surrounding area of the project site. The study is to investigate their abundance status and possible impacts caused by the project activities. According to survey result, the abundance of individual recorded species in terrestrial habitat in and around the project area is low except Black Eared Kite. However aquatic fauna species are intentionally observed as ecological important which includes fish, benthos and zooplanktons. Stingray fish was recorded which listed IUCN as nearly threatened species (NT) during the observation period. Five fauna groups are as follows:

- Herpetofauna (Reptiles and Amphibians)
- Avifauna
- Mammals
- Fish
- Zooplankton

### Herpetofauna (Amphibian and reptiles)

Herpetofauna with low population and small diversity are recorded. A total of 16 species belong to 11 families were recorded during the survey (Table 5.12). The abundance status of individual species based on observed frequency was recorded as small. All recorded amphibians and reptiles are common species and a turtle of Genus *Cyrtlemys* are classified as

Red Data species. The turtle suggested that it seem to be a leaf turtle found in the forest of Phathaw mountain in last six month which should be protected. Regard ecology of those herpetofauna species, they are widely distributed animals and they inhabit similar habitats in this region. Amphibians and reptiles are one of the important members of aquatic and terrestrial ecosystems as they serve as both predators and prey.

**Table 5.12 - Recorded amphibian and reptile species (16 species) in the buffer zone and the project area**

Sr. No	Family	Common name	Scientific name	Conservation status IUCN 2016	Habitats	Abundance status
<b>Frog and Toad</b>						
1	Dicroglossidae	Indian cricket frog	<i>Fejervarya limnocharis</i>	LC	Grass/pond	S
2	Dicroglossidae	Chinese edible frog	<i>Hoplobatrachus rugulosa</i>	LC	Shrub/pond	S
3	Microhylidae	Painted bull frog	<i>Kaloula pulchra</i>	LC	Pond	S
4	Rhacophoridae	Common tree frog	<i>Polypedates leucomystax</i>	LC	Shrub/pond	S
5	Bufoidea	Asian common toad	<i>Duttaphrynus melanostictus</i>	LC	Under log	S
<b>Snake</b>						
1	Colubridae	Water snake	<i>Xenochrophis flavipunctatus</i>	LC	Pond	S
2	Colubridae	Long-nosed whip snake	<i>Ahaetulla nasuta</i>	LC	Shrub/Tree	S
3	Colubridae	Copper head racer	<i>Elaphis radiatus</i>	LC	Shrub/grass	S
4	Colubridae	Indo-Chinese Rat Snake	<i>Ptyas korros</i>	LC	Shrub/grass	S
5	Elapidae	Banded krait	<i>Bungarus fasciatus</i>	LC	Shrub/pond	S
6	Elapidae	Monocellate cobra	<i>Naja kaouthia</i>	LC	Shrub/grass	S
7	Pythonidae	Burmese python	<i>Python molurus</i>	LC	Forest/shrub	S
<b>Lizard</b>						
1	Agamidae	Garden fence lizard	<i>Calotes versicolor</i>	LC	Shrub	S
2	Gekkonidae	Tockay	<i>Gekko gekko</i>	LC	Tree	S
3	Varanidae	Clouded monitor	<i>Varanus bengalensis</i>	LC	Tree	S
<b>Turtle</b>						
1	Geoemydidae	Leaf turtle	<i>Cyemys</i> sp	NT	Forest	S

Notes: S= small number <50, M= moderate number >50, L= larger number >100

## **Birds**

A total of 10 species of bird belongs to 8 families are recorded around the project area (Table 5.13 and Figure 5.31). Among them Black-eared Kite *Milvus lineatus* was observed as large number about 300 individuals around the area. This species is also found as widely distributed in this region. Indian pond heron *Ardeola grayii* is observed as second large number after Blackeared Kite in the project area. This species is also commonly distributed in this region verbally reported by local people. Some recorded species are mentioned in figure (5.31). No migratory and threatened species are observed during the observation period. Birds are taking play in ecological important role as they serve as in food-chain and food web, seed dispersal and propagation, pollination, pest control and rodent control.

Table 5.13 - Recorded bird species (10 species) nearby the project area

	Family	Common name	Scientific name	Conservation status (IUCN 2016)	Habitats	Abundance Status
1	Accipitridae	Black-eared Kite	<i>Milvus lineatus</i>	LC	Terrestrial/aquatic	L
2	Columbidae	Spotted dove	<i>Streptopelia chinensis</i>	LC	Terrestrial	S
3	Dicruridae	Black drongo	<i>Dicrurus macrocercus</i>	LC	Terrestrial	S
4	Phalacrocoracidae	Little black cormorant	<i>Phalacrocorax sulcirostris</i>	LC	Aquatic/Freshwater	S
5	Sturnidae	Common myna	<i>Acridotheres tristis</i>	LC	Terrestrial	S
6	Pycnonotidae	Red whiskered bulbul	<i>Pycnonotus jocosus</i>	LC	Terrestrial	S
7	Passeridae	House sparrow	<i>Passer domesticus</i>	LC	Terrestrial	M
8	Ardeidae	Little egret	<i>Egretta garzetta</i>	LC	Aquatic	S
9	Ardeidae	Great egret	<i>Ardea alba</i>	LC	Aquatic	S
10	Ardeidae	Indian pond heron	<i>Ardeola grayii</i>	LC	Aquatic	M

Notes: S= small number <50, M= moderate number >50, L= larger number >100





Black-eared Kite *Milvus lineatus*



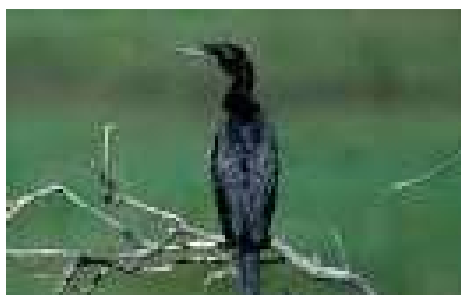
Little egret *Egretta garzetta*



*Ardeola grayii*



*Streptopelia chinensis*



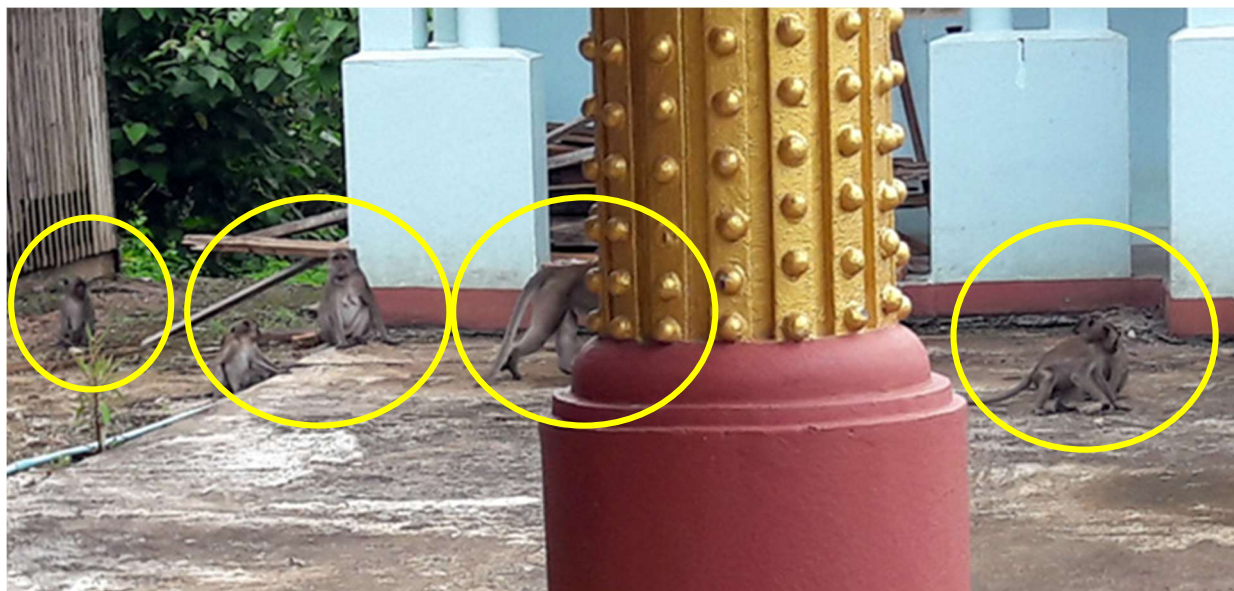
*Phalacrocorax sulcirostris*

**Figure 5.31 - Some recorded birds around the project area**

### **Mammals**

Mammal species are not observed in the project area. But some mammal species such as monkeys known as Rhesus macaque or long tail macaque (*Macaca mulatta*) and squirrels are observed out of the range of the project site in the forest on the Pahtaw Mountain. About 75-100 individual numbers of monkey are estimated during the survey period. This species is one of the best-known species of Old World monkeys. It is listed as Least Concern in the IUCN Red List of Threatened Species in view of its wide distribution with large population, and its tolerance of a broad range of habitats. This species should be protected. Native to South, Central, and Southeast Asia, Rhesus macaque have the widest geographic ranges of

any nonhuman primate, occupying a great diversity of altitudes and a great variety of habitats, from grasslands to arid and forested areas, but also close to human settlements.



**Group of monkeys at the base hill and near the pagoda**

### **Fish**

Fish sample collection was made with the help of fisherman who are fishing with gill net and, rode and hook. Those people are fishing for their home consumption. No commercial fishing was observed around this area. Both commercial fish and small fish with small population are recorded during the survey period. A total of 17 species under 15 families were recorded (Table 5.14 and Figure 5.32). Caroun croaker *Johnius carouna*, Spotted scat *Scatophagus argus*, Needlefish *Hyporhamphus limbatus*, Rayfin fish *Raiamas sp* and Gangetic mystus *Mystus cavasius* were collected as moderate and large number (Table 5.14). All recorded fishes are common species and widely distributed in this region. But the sting-ray fish or mangrove whipray (*Himantura walga*), a cartilaginous fish in the family Dasyatidae was recorded. It is a demersal fish and is found in coastal water. The IUCN has assessed it as being "near-threatened" (Figure 5.32).

**Table 5.14 - Recorded fish species (17 species) Myeik River nearby the project area**

Sr. No	Family	Common name/local name	Scientific name	IUCN 2017)	Habitats	Abundance status
1	Disyatidae	Mangrove whipray	<i>Himantura walga</i>	NT	River	S
2	Sparidae	Goldsilke seabream/Nga Wetma	<i>Acanthopagrus berda</i>	LC	River	S
3	Polynemidae	Indian Threadfin/Ka Ku Yan	<i>Polinemus indicus</i>	LC	River	S
4	Litadae	Seabass/Kakatit	<i>Lates calcarifer</i>	LC	River	S
5	Sciaenidae	Caroun croaker/Nga Poke thin	<i>Johnius carouna</i>	LC	River	M
6	Scatophagidae	Spotted scat/Nga pathon	<i>Scatophagus argus</i>	LC	River	L
7	Gobiidae	Golden tank goby/Kathaboe	<i>Glossogobius aureus</i>	LC	River	S
8	Hemiramphidae	Needlefish/ Nga Phaung Yoe	<i>Hyporhamphus limbatus</i>	LC	River	M
9	Mugilidae	Large scale mullet/Kabilu	<i>Chelon macrolepis</i>	LC	River	S
10	Plotosidae	Canine Catfish eel/Nga Khu	<i>Plotosus canius</i>	LC	River	S
11	Cynoglossidae	Fourlined tonguesole/Nga Hway Shar	<i>Paraplagusia bilineata</i>	LC	River	M
12	Ambassidae	Bald glassy	<i>Ambassis gymnocephalus</i>	LC	River	M
13	Gerreidae	Whipfin silver-biddy	<i>Gerres filamentosus</i>	LC	River	S
14	Terapontidae	Tiger Bass	<i>Threapon jarbua</i>	LC	River	M
15	Bagridae	Gangetic mystus/Nga Zin Yaing	<i>Mystus cavasius</i>	LC	River	L
16	Serranidae	Cloudy groper/Kyauk nga	<i>Epinephelus erythrurus</i>	LC	River& rocky shore	S
17	Dasyatidae	Dwarf whipray/leik kyauk	<i>Brevitrygon walga</i>	LC	River in bottom	S

Notes: S= small number <50, M= moderate number >50, L= larger number >100; LC= Least concerned, NT= Near Threaten



Indian Threadfin *Polinemus indicus*



Seabass *Lates calcarifer*



Goldsilk seabream *Acanthopagrus berda*



Spotted scat *Scatophagus argus*



*Gerres filamentosus*



*Threapon jarbua*



*Plotosus canius*



*Himantura walga*

**Figure 5.32 - Some recorded fishes from Myiek River nearby the project area**

### Zooplankton

Zooplankton collection was carried out as important task to investigate the water quality in the Myeik River nearby the project area. A total of 3 species of zooplankton in microscopic were sampled from three sampling sites (Table 5.15 and Figure 5.33). Zooplanktons are heterotrophic plankton. Plankton is organism drifting in oceans, seas, and bodies of fresh water. These organisms serve as an intermediary species in the food chain, transferring energy from



planktonic algae (primary producers) to the larger invertebrate predators and fish who in turn feed on them. As well as providing an essential link in the food chain, the diversity of species, amount of biomass and abundance of zooplankton communities can be used to determine the health of an ecosystem.

**Table 5.15 - Recorded zooplankton species (5 species) in the Myeik River nearby the project area.**

Sr. No	Phylum	Class	Order	Family	Species
<b>Micro-zooplanktons</b>					
1	Arthropoda	Maxillopoda	Copepoda	Calanoidae	<i>Calanus finmarchicus</i>
2	Arthropoda			Cyclopoidae	<i>Cyclopid sp</i>
3	Arthropoda	Malacostraca	Amphipoda	Hyperridae	<i>Hyperia macrocephala</i>



*Calanus finmarchicus,*



*Cyclopid sp*



*Hyperia macrocephala*

**Figure 5.33 - Recorded micro-zooplanktons from the Myeik River around the project area**

### **Red Data Faunal Species**

There were recorded for two species of nearly threatened species around the project area. The survey recorded the threatened species of the stingray fish *Himantura walga* which is described in IUCN as near threatened species (NT). Leaf turtle Genus *Cyclemys* was caught in last six month reported by a villager which is also described as Near Threatened species (NT) in IUCN Red list 2017. All these two species should be protected.

### **BIODIVERSITY MANAGEMENT PLAN \ MONITORING PLAN**

1. Monitor on both flora and fauna (mangrove vegetation, birds and Rhesus monkey) status and reporting system should be taken bi-annually throughout the constructional and operational phases.

2. Conduct the wildlife conservation awareness activities through talks or billboard and monitor the waste management system.
3. Monitor and reporting for the natural vegetation conservation and protection of wild animals (birds and Rhesus monkey) with environmental conservation purposes.
4. Monitor and reporting of the implementation of the recommendation/mitigation measures for waste disposal system (including solid and waste particles), as the waste disposals of Dockyard could be affected on very soft aquatic organisms such as zooplankton and phytoplankton as well as fish community, when large volume of concentration of this kind of discharge may cause the bioaccumulation and biomagnification processes.

## **CONCLUSION**

Survey resulted that the terrestrial plants and animals are very low in and around the project area. A total of (147) flora species from (52) families and (11) species of phytoplankton are recorded. Three red list species of *Myristica malabarica* (Kywe-thwe) as vulnerable status (VU), *Vatica maingayi* (Kanyin-kyaung-che) as critical endangered status (CR) and *Dipterocarpus kerrii* King. (Sibin) as endangered status (EN) were recorded as threatened species which all species should be protected. These species were collected from the forest of Pahtet mountain which is located about 0.3 km from the project site. These plants should be maintained for plant conservation. Seven species of mangrove plants are recorded and the forest status are scattered forests. Nevertheless, these mangrove communities are essentially important to conserve for their ecological and environmental health. Mangrove plants have the ability to filtrate the water contamination (include water toxic) and absorb the carbons from the atmosphere larger than other plant species because of their peculiar root system. Moreover, they are important nursery ground for aquatic organisms and shelter or housing for the birds. Recorded mangrove species are *Acanthus ilicifolius* (Khayar), *Avicennia officinalis* (Thame-net), *Bruguiera malabarica* (Byu), *Excoecaria agallocha* (Tayaw), *Nypa fruticans* (Dani), *Sonneratia alba* (Lame), and *Rhizophora mucronata* (Byu-chidauk) around the project area. In phytoplankton observation, a total of (11) species was recorded. Phytoplankton species can be said that fairly population so that water quality will be favorable condition for other aquatic animal survivals. Among these (11) species, Species of *Coscinodiscus radiates* Ehrenberg, *Thalassiosira punctigera* (Castracane) Hasle; and *Melosira nummuloides* Agardh. were recorded as top three species.



In fauna (45) species comprises of (15) amphibian and reptile, (10) species of birds, (17) species of fish, (3) species of zooplankton are recorded during the survey. Stingray fish species *Himantura walga* and Box tortoise were recorded which are described as near threatened species (NT) in IUCN Red List. A number of the bird, Black Eared Kite *Milvus lineatus* is about 300 found in and surrounding area of the project site. This species is indicator and top predator species which need to protect for ecological process. 3 species of zooplanktons were recorded with fairly population density. They are taking part as an important role in aquatic ecosystem and to investigate water quality. The survey result showed that the water quality in the present situation is favorable condition for aquatic organisms in food chain and food web system. As a conclusion, the proposed project is considered may be affected with low significant impact on terrestrial and aquatic environment. However, the discharges of Dockyard such as solid and liquid wastes will be polluted in the sea water near the project site in turn of which will be affected on aquatic plants and organisms in the water, when large volume of concentration of this kind of discharge may cause the bioaccumulation and biomagnification processes. The extent of the impact on fauna and flora is investigated as only in the site specific and duration of the impact is assumed as temporal or permanent.

## REFERENCES

- Bellan-Santini, D, Karaman G.S., Ledoyer, M., Myers, A.A., Ruffo, S. and Vader, W. 1998. The Amphipoda of the Mediterranean, Part 4. Memoires de l 'Institut Oceanographique, Monaco 13: XXVII- XLIV, 815-959.
- Bernatzky, A. (1978). *Tree Ecology and Preservation, Development in Agricultural and management Forest Ecology*, 2 Elsevier Scientific Publishing Co. New York.
- BirdLife International (2018) Species factsheet: Collocalia fuciphaga. Downloaded from <http://www.birdlife.org> on 25/05/2018
- Bureau of Land Management by the United States of America (2016). Classification of environmental impacts caused by the project development.
- Cox et al (2002). Photograph guide to snakes and other reptiles of Thailand and Southeast Asia.
- Curtis, J. T. and McIntosh R. P. (1950). The interrelations of certain analytic and synthetic phytosociological characters, *Ecology* 31: 434-455.
- Department of Forestry 1994. Wildlife Protection law.
- FishBase 2016. List of Myanmar fish (marine and fresh water).
- Gardner, S, P. Sidisunthorn & V. Anusarnsunthorn (2000). A Field Guide to Forest Trees of Northern Thailand. Funded by IUCN, The world bank, Toyota Thailand Foundation, Kobfai Publishing Project.
- Kress. W. J, A. D. Robert, E. Farr, and D. Yin Yin Kyi (2003). A Checklist of the Trees, Shrubs, Herbs, and Climbers of Myanmar. Smithsonian Institution, Washington DC. U.S.A.
- KyawNyuntLwin and Khi Ma MaThwin (2004). Birds of Myanmar.
- Kathiresan, K & S Z Qasim (2005), Importance of Mangrove ecosystem, Centre of Advanced Study in Marine Biology Annamalai University, ISBN-10: 8170750792

Marco Vannini and Stefano Cannicci, 1997. Notes on the macro-benthos of Kanya mangrove. Ministry of Natural Resources and Environmental Conservation 2012. Myanmar Environmental Law.

Ministry of Natural Resources and Environmental Conservation 2014. Myanmar Environmental Rule.

Ramesh Kumar, S., T. Arumugam, *et. al.* (2013). Use of Plant Species in Controlling Environmental Pollution. Bulletin of Environment, Pharmacology and Life Sciences, Vol.2 (2) January 2013: 52-63.

Sharpe DM Stearns F Leitner L A Dorney JR. 1986. Fate of natural vegetation during urban development of rural landscapes in southeastern Wisconsin. Urban Ecology.

Southeastern Forests and Climate Change Project Learning Tree (2015). Carbon Storage Calculation - Activity 8. University of Florida.

Vas. I, 2010. A Field Guide to the reptiles of South-East Asia.

Myanmar Forest Law 1992/2018.

Biodiversity and protected area law 2018.

Woo-Shin Lee *et. al* (2018). Field guide to the Water Birds of Asian.

U Hoke Lin (2018). Birds of Myanmar: Natural behavior and outstanding characteristics.

Papaioannou. D., 2004. Environmental implications, related to the shipbuilding and ship repairing activity in Greece.

<http://www.iucnredlist.org/photos/2017>. <https://www.floridamuseum.ufl.edu/southflorida/habitats/mangroves/importance-mangroves/> (Web. 1)

[http://wwf.panda.org/about\\_our\\_earth/blue\\_planet/coasts/mangroves/mangrove\\_importance/](http://wwf.panda.org/about_our_earth/blue_planet/coasts/mangroves/mangrove_importance/) (Web. 2)

## **5.12. Cultural Heritage Setting**

### **(a) Introduction**

In this Pathaw-Pathat island, the most interesting factors are different types of floral and fauna on behalf of cultural heritage places. There are some pilgrims who cross the water to go to the religious places on the island. There is a popular edifice of reclining Buddha images in colossal size at the foot of the Pathat Mountain. The assessment shows that the landmark of Myeik coastal area is these two points of Pathaw and Pathat mountains on the island. The landfill area between these two points cannot be related to the ancient cultural heritage like archaeological or historical context. But the local community should be considered that their spiritual and religious traditions would continuously depend on the religious landscapes shown the seven potential points in the map.

Most of the religious landscapes are totally reconstructed by the new donation plan or specific donors. In this assessment, the seven main points are mainly focus on the Pathat Mountain at the south of the island. The project area is located along the seashore and the parameter demarcated for the assessment area extends to reach the foot of Pathaw Mountain. Within the parameter the nearest point to the project boundary is the site of P4, Sin Ma Yin Thar stupa

and monastery complex. Likewise, the farther points are not outstanding for the cultural heritage assessment as well as the impact threat.

### **(b) Assessment and Measurement of Cultural Significance and Impact Threat**

According to the cultural map shown in the scope, there are seven main points and now, the rapid assessment shows particularly for the value of cultural heritage and degree of impact as follows:

#### ***(1) P1 = Shwe Thar Hlaung Colossal Reclining Buddha***

It is located at the southern part of the island and at the foot of Pathat Mountain. Buddha image is reclining towards the south and facing towards the east. The colossal Buddha image was newly renovated at the foot of the Pathat Mountain and the pilgrims mostly come by boat and pay homage to the Buddha. Assessment shows that the cultural significance is minimum but the religious pilgrimages of local communities. The impact threat cannot be challenged by the project operation stage due to the 800m away from this shrine.



***Figure - Shwe Thar Hlaung Reclining Buddha Image***

#### ***(2) P2 = Ye Le Phaya (Pagoda on the small island)***

It is located at the south of reclining Buddha image. Traditionally it is known as Ye Le Phaya meanth the pagoda built on the small island. It is totally surrounded by water and one small bridge connecting to the main shrine. This pagoda place was totally new donated by the local community. The cultural significance is low but religious dedication can also be considered for the local peoples.



*Figure- Ye Le Phaya (Pagoda on the small island)*

***(3) P3 = Pathat Stupa***

Pathit Mountain is located in the southern part of the island. It is smaller than the Pathaw Mountain located in the north. By the time of assessment fieldwork, it was not yet renovated or reconstructed by recent peoples. Although a monastery located at the foot of this pagoda, it was not yet maintained. In this site, assessment shows the age of this religious complex as the last donation was of 1991s. The cultural significance was measured as the minimum while the impact threat is reversible and limited.



*Figure - Pathat Pagoda Complex in the Lack of Maintenance*



*Figure - The Last Donation Records of Pathat Pagoda Complex*



***(4) P4 = Sin Ma Yin Thar Stupa***

This pagoda complex is the nearest to the northwest of the project area and it is 175m away from the project area. The mound it is located is likely a small island at the middle of waterlogging area between Pathaw and Pathit mountains. Later, this area was landfilled by the recent developers to become the settlement area of local community. Nowadays the entire landfilled area is already changed to be village and settlement area as well as some project areas. Only in the Sin Ma Yin Thar pagoda complex, some big trees could be seen as the woodland together with the natural mound composed by the stone and artificial platform.

Sin Ma Yin Thar pagoda complex involves the monastery and stupa donated by the local community. Recently the Naga Buddha was already built by the recent donors. The cultural significance shows the minimum value with the impact threat is reversible and limited.



***Figure- The Religious Site of Sin Ma Yin Thar Pagoda Complex***

***(5) P5 = Mahavisuddhi Pagoda***

It is located on the slop at the foot of the Pathaw Mountain. It is c.1200m away form the project boundaty. Although it could be the old one in previous time, nowadays it was totally changed as the new architectural composition of pagoda. The developers who planned some construction and business projects donated this pagoda in 2008. Recently the local people usually come to this place for their religious purposes. Some pilgrims are willingly coming to this environment and celebrate their religious ceremony. The tangible cultural value is low but the intangible value can mostly be considered. The cultural value is minimum and threat can easily be reversible and limited.



*Figure- The Mahavisuddhi Pagoda newly built in 2008*

**(6) P6 = Htan Nyi Naung Monastery**

This monastery is locally known as Htan Nyi Naung (twin-palm-trees). It is c.1300m away from the northern boundary of the project area. It is located on the high cliff like the rock cape. It is protruding toward the seashore in the east. In this monastery complex, there are some small stupas, huge standing Buddha image, and some other iconographic composition of spiritual and religious tradition. Cultural heritage cannot be measured as high level because of the recent dedication of local community. It shows the low in cultural value and threat is reversible and limited.



*Figure- Htan Nyi Naung Monastery Complex*





*Figure- Htan Nyi Naung Monastery Complex*

*(7) P7= Christian Church*

The place of Christian community was found in the territory of Pathaw village. It is 800m away from the northern boundary of the project area. This religious site is located on the higher mound. The catholic missionary built this complex and crucified cross was founded at the top of the mound. Depending on the religious purpose, the place of Catholic Church is important for the local Christian society. But, assessment shows that the cultural significance of Catholic Church cannot be measured as the high value. It is also minimum value and threat is reversible and limited.



*Figure-The Place of Roman Catholic Church in Pathaw Village*

### **Matrix Information**

Matrix I is the measurement of cultural significance or attributes and threat that can be collected as baseline information about cultural heritage. It shows the low or minimum in value. Then, Matrix II\_ the measurement of the severity impact\_ shows the degree of minimal level. Finally, Matrix III\_ the measurement of the acceptability\_ shows the acceptable indicators with the references of value of heritage asset and the degree of impact.

### **(c) Conclusion**

The final assessment report shows the *acceptable* indicator in the situation of heritage asset that can be measured as the low or minimum value while the degree of impact is minimal. In contrary, there are seven potential points around the territory of project area to be considered with the local community and their religious places. Although the heritage matrixes show the acceptable indicator, the intangible cultural heritage can be realized that the relationship of local community and their religious purposes like seasonal festivals or donation ceremonies. These seven places of religious complexes should carefully be considered to maintain and support the local ceremonies and festivals. If some threats or negative impacts may happen on these places by some cases of the project operation and decommissioning stages, developers and authorities should be responsible to compensate for lost or damage or the aggrieved suffering. Additionally, in the near future, the more religious complexes may be come out, the more the developers should be responsible for their local religious purposes.

## **6. ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES**

An impact can be defined as any change in the physical-chemical, biological, cultural and/or socio-economic environmental system that can be attributed to human activities. Impacts therefore may be positive (beneficial) or negative (adverse). They may also be direct or indirect, long-term or short-term, and extensive or local in effect.

### **6.1. Phases for IEE Study**

This IEE study aims to identify the potential positive and negative impacts (both biophysical and social) associated with the proposed project. Anticipated environmental impacts for the proposed fish mill will be conducted into the entire life of the project. To cover the entire life of the project, it is necessary to conduct impact assessment for four major phases as follow:

- (a) Phase I: Pre-construction Phase (during the pre-construction period),
- (b) Phase II: Construction Phase (during the construction period),
- (c) Phase III: Operation Phase (during the operation period), and
- (d) Phase IV: Decommissioning Phase (after the operation period).

### **6.2. Impact Assessment Methodology**

#### ***(a) Impact Identification***

Impacts were identified during screening process and combined with environmental baseline study and site survey to make clear.

#### ***(b) Impact Evaluation***

Professional judgment will ideally be used in conjunction with the different value judgments expressed by various stakeholders. The choice of significance criteria needs to be aligned with a country's political culture and socio-economic framework. The three broad forms of recognition or determination of impact significance are summarized in Table below.

***Table 6.1. Determination of Impact Significance***

<b>Forms of Recognition</b>	<b>Criteria</b>
Technical recognition	The importance of an environmental resource or attribute is based on scientific or technical knowledge or judgment of critical resource characteristics.
Public recognition	Segments of the public recognize the importance of an environmental resource or attribute. Public recognition may take the form of support, conflict or opposition. Public action may be expressed formally (e.g. letters) or informally (e.g. protest action).

Institutional recognition	The importance of an environmental attribute or resource is acknowledged in the laws, plans or policy statements of government agencies or private groups.
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*Source: Canter (1996)*

The significances of the impacts were determined by using an index matrix that is based on four criteria of magnitude (M), Duration (D), Extend (E) (area) and Probability (P). According to the association of impact assessment – IAIA guidelines, the following terms are used to determine the effects and degrees of the impact.

***Significant Point = (Magnitude+Duration+Extend) × Probabililty***

Significant Point (SP)	Impact Significance
< 15	No impact (-)
15-29	Low impact (U)
30-44	Moderate significant (C)
45-59	High significant (B)
> 60	Very high significant (A)

#### Magnitude

- If the impact is only insignificant, the index value is 1.
- If the impact is small and will have no effect, the index value is 2.
- If the impact is moderate and will result in minor changes, the index value is 3.
- If the impact is high and will result in significant changes, the index value is 4.
- If the impact is very high and will result in permanent changes, the index value is 5.

#### Duration

- If the impact is between 0-1 year in limited time of the project duration, index value is 1.
- If the impact is between 2-5 year in limited time of the project duration, index value is 2.
- If the impact is between 6-15 year in limited time of the project duration, index value is 3.
- If the impact is the life of operation in the project duration, index value is 4.
- If the impact is over the project duration, index value is 5.

#### Extend (Area)

- If the impact occurs within the site, the index value is 1.
- If the impact occurs nearby limited area, the index value is 2.

- If the impact is limited to the local area, the index value is 3.
- If the impact is limited to the national stage, the index value is 4.
- If the impact is limited to the international stage, the index value is 5.

Probability

- If the impact is not going to happen, the index value is 1.
- If the impact is improbable, the index value is 2.
- If the impact is probable, the index value is 3.
- If the impact is highly probable, the index value is 4.
- If the impact is definite, the index value is 5.

**(c) Criterion for Impact Mitigations (Hierarchy for Mitigation Measures)**

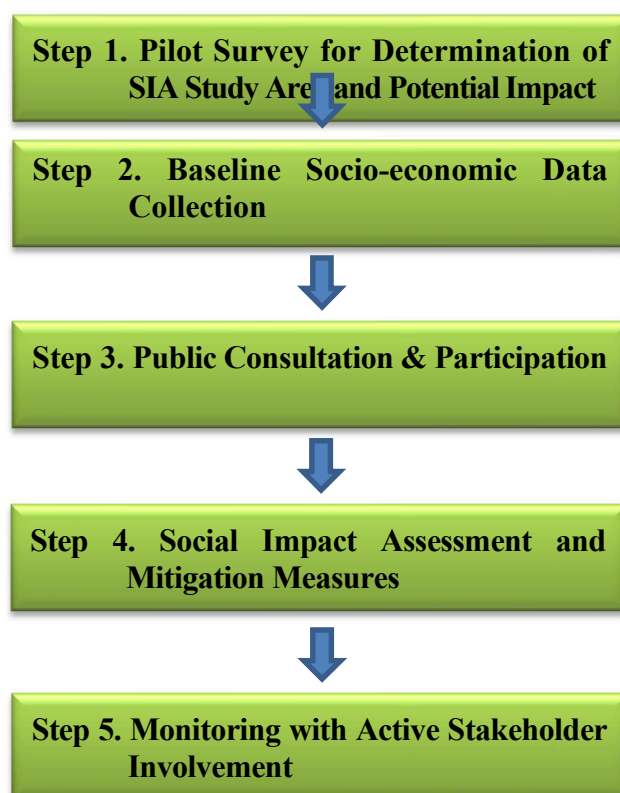
Practicable mitigation and management measures were recommended in accordance with the IFC’s management hierarchy. Management measures sought to avoid, and if avoidance is not possible, then reduce, restore, compensate/offset negative impacts, enhance positive impacts and assist project design. Requirement of mitigation measures will be considered by the intensity of impact significance as follow:

**Mitigation Requirement for Impact Significance**

No.	Impact Significance	Mitigation Requirement
1	Very Low (Negligible)	Minor or no mitigation required
2	Low	Required minor mitigations
3	Low to Moderate	Require more or less additional mitigations
4	Moderate	Require a number of additional mitigations
5	Moderate to High	Require a number of additional mitigation or modification of the project design
6	High	Require additional mitigations plus modification of the project design or alternative action may be required

**6.2.1. Social Impact Assessment Methodology**

The first phase of the Social Impact Assessment (SIA) will provide a baseline description of the study area, specifically focusing on the communities living and working in close proximity to the proposed development. The potential impacts of the proposed development on the social environment will be identified and assessed in terms of an agreed assessment methodology in the IEE phase. Mitigation measures will be proposed to enhance the positive impacts and reduce the significance of the negative impacts. Socioeconomic impact assessment for proposed project was conducted by the following procedures.



### **Main Steps in SIA Study**

#### **Step 1: Pilot Social Survey for Determination of SIA Study Area and Potential Socio-economic Impacts**

Pilot survey was done for determination of SIA study area and study area was considered after the discussions with key informers project managers from PPT and the heads of Village General Administrative Offices of nearest villages. Google Map and census are also used for the determination of SIA study area during pilot survey.

#### **Step 2: Baseline Socio-economic Data Collection**

To assess the baseline socio-economic conditions that may result from the development of the proposed project, the SIA team employed both quantitative and qualitative approaches as follow:

##### ***Primary Data Collection by Household Survey***

The collection of primary data consisted of focus group discussions and household surveys in the target study areas. Household sample survey was conducted to evaluate primary socio-economic conditions of the project area and to understand the mood, perceptions and extent of preparedness of the people towards the proposed project. The household survey was carried



out to tap the baseline socio-economic conditions of project area and to assess project perceptions and attitudes of the local people over a period of five days. The accuracy of primary data collection was based on the accuracy, number of surveyed household and experiences of surveyors. To get the accurate data, primary data collection was conducted by social specialist, social consultants, local authorities and local people.

#### **(a) Survey Team**

The team was formed with researchers from social, medical, and engineering sciences having research experiences in the field of social impact assessment and social management planning.

#### **(b) Development of Survey Questionnaire**

Socioeconomic aspects to be included in questionnaire were based on site visits and issues identified by interviews with local people and village heads during pilot survey. Items were formulated by the consultants and reviewed by social assessment team members as to clarity of item wordings and relevance to the socioeconomic domains measured. The survey questionnaire was designed to collect information as to the following household characteristics:

- household composition (age, gender, educational status, religion, ethnicity, language used and marital status);
- occupations;
- ownership of agricultural fields and livestock;
- energy sources and facilities;
- agricultural and other economic activities;
- daily movement patterns;
- income and expenditure patterns;
- access to and use of community services/facilities and natural resources;
- health and nutrition; and
- views/concerns/suggestions on the proposed project.

#### **(c) Recruitment and Training**

The enumerators were received a training program prior to commencing with the fieldwork. The training program included a briefing on the objectives of the survey, socioeconomic aspects to be measured, interview techniques as well as a detailed explanation of each question and its relevance to the survey objectives, how to pose the question and how to code the answer. Discussions were also held among participants about the socioeconomic conditions and initial questionnaire items were revised based on the discussion results. A set of guidelines were given

to each enumerator for administration of survey questionnaire. In the field data collection activities, the enumerators were supervised by experienced supervisors with household survey.

#### **(d) Data Collections**

The project related data, factory layout plans and design parameter are will be provided by Pyi Phy Tun International Co., Ltd (PPT). Secondary data on demographic distribution in the area will be collected from Head of Local Administration Office (Kyunsu) and data on public health will be collected from Public Health Department (Kyunsu/Myeik). Primary data for public concerns, socio-economic and health profiles will be conducted by household survey.

#### **(e) Data Analysis**

In household survey data collection period, field supervisors checked and ensured the control of data quality. During field surveys, information obtained through household survey and interviews was corroborated through direct observation by the study team aiming at assessing social and cultural infrastructure existed in the project area, physical assets of people, and living conditions. Observations were backed up by photographic records. Quantitative data were coded and processed using SPSS statistical package. Qualitative data were coded using standard methods.

### **6.2.2. Health Impact Assessment Methodology**

There is no universally agreed formula for assessing public health significance, although assessments are mostly based on a subjective judgment about the magnitude of the potential health impacts (size of the affected population and scale of the positive or negative health impact); its likelihood of occurrence; and the degree of confidence in the impact actually occurring (based on scientific and other evidence of the health impact occurring in similar circumstances elsewhere).

#### **Health Impact Evaluation Techniques**

	<b>Likelihood of Occurrence of Health Impact</b>			<b>Health Impact Rating</b>
	Low	Medium	High	
<b>Magnitude of Health Impact</b>	Unlikely to occur	Likely to occur sometimes	Likely to occur often	
None	No significance	No significance	No significance	0
Low	Very Low	Low	Medium	1
Medium	Low	Medium	High	2
High	Medium	High	Very High	3

When analyzing health impacts, it is important to consider the magnitude, likelihood and public health significance of the potential impacts. This analysis involves expert judgment based on a consideration of the evidence gathered and its applicability to the local context and the specific project.

Distributional, health equity and inequality impacts are analyzed by examining how particular sub-groups within a population, particularly vulnerable groups, are likely to be affected by the project. The scoping and community profiling steps are likely to have already identified potentially vulnerable groups through existing local information on these individuals/groups or through community surveys and meetings with key informants e.g. community leader, community health worker or local NGO.

Health equity/inequality impacts occur when the project's benefits and harms are unevenly distributed. This includes where the risk is equally distributed, such as air pollution, but the impact is disproportionate – affecting particularly children, older people and those with existing ill health.

Analysis of health impacts involves systematically determining the range of potential impacts, their relative importance and where, when and how likely they are to occur. The information for the HIA was obtained from the primary data collection (household survey), literature review, community profile and Health Data from Public Health Department (Myeik) as well as knowledge and expertise of the HIA Consultant of IEE Team.

### **6.3. Anticipated Impacts and Mitigation Measures during Pre-construction Phase**

As the proposed project is about 80 acres, site clearing and ground leveling is necessary. Since the proposed project is farming, there is no need for the heavy machine. So, the environmental impacts during pre-construction phase of proposed project will not be significant due to the requirement of low number of workforce and heavy machinery (approximately 10 workers, 2 trucks and 1 dozer) for minor site clearing activities. The pre-construction phase will take approximately as 3 months and all of the impacts during pre-construction phase are short-term, temporary and will not be significant. However, the proposed project will cut some trees in the project area for the construction of roofed corridors and other facilities.

#### **6.3.1. Impacts on Air Environment during Pre-construction Phase**

The impacts on air quality during pre-construction phase will be fugitive dust generation vehicular emissions and noise as follow:

### ***(a) Fugitive Dust Generation***

During pre-construction phase, the main source of air pollution will be dust generation due to the operation of dozer and trucks for site clearing activities. The nearest residents will have impact of particulate matter smaller than 10 microns (such as PM<sub>2.5</sub>). Dust generation can cause temporary public nuisance and impact on workers' health. The sensitive receptors are considered to be within a 100m radius of the proposed site due to minor site clearing activities. But the impact is not significant because the nearest resident is 1580 m and these distances will be enough distance for dust depression. Moreover the soil type in the project site is sandy and not too much PM are expected to emit during the pre-construction activities. The nature of dust generation during pre-construction phase will be short term, temporary and will not be significant.

### ***(b) Vehicular Emissions***

The gaseous emissions (CO<sub>2</sub>, CO, and SO<sub>2</sub>) will emit into the atmosphere from the operation of vehicles (dozer & trucks) and machineries during the pre-construction phase (including both on-site and off-site of the project).

### ***(c) Increase in Noise Level***

Site clearing and earth working vehicle (1 dozer) and delivery vehicles (2 trucks) traveling to and from the site will produce noise which increase existing noise in pre-construction phase. All of the predicted noise level during pre-construction phase will be based on Patrick Breyse, and Peter S.J. Lees., School of Public Health, Johns Hopkins University, Bloomberg, 2006. The calculations also based on the noise levels of typical construction equipments prepared by "Handbook of Noise Control" as follow:

### **Typical Construction Equipment Noise Emission Levels**

<b>Equipment Type</b>	<b>Noise Level (dBA at 50 Feet)</b>
Dozer	87
Truck (Medium and Heavy)	84

**Source: Harris, C.M. "Handbook of Noise Control," McGraw Hill, New York, 1979**

The predicted noise level at nearest residents can be calculated by the addition of existing noise level and additional noise from pre-construction phase. Based upon a 6-dBA drop-off rate per doubling of distance, the existing noise level from the project and predicted noise level at nearest receptors are as follow:

$$L_2 = L_1 - |20 \cdot \log\left(\frac{r_1}{r_2}\right)|$$

Where,  $r_1$  = reference distance, in decibels (dB)

$r_2$  = another distance

$L_1$  = sound pressure level at reference distance ( $r_1$ )

$L_2$  = sound pressure level at another distance ( $r_2$ )



**Figure 6.1- Distance between the Project Site and nearest Residents**

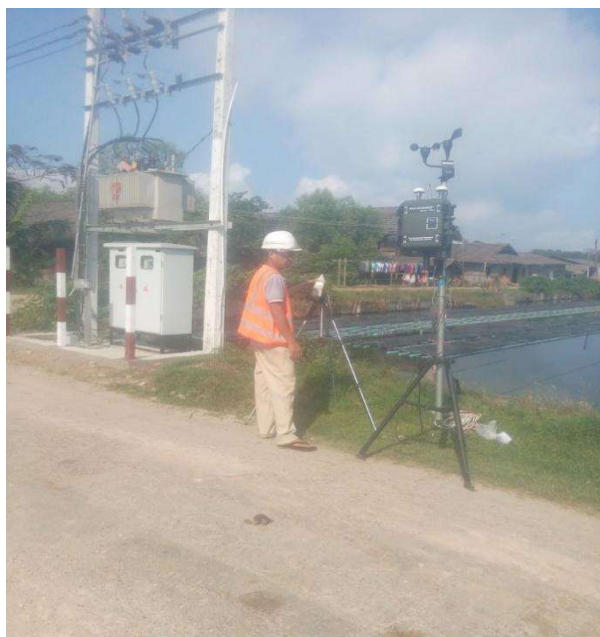
**Predicted Noise Levels during Pre-construction Phase**

Receptors and distances from project	Existing noise levels monitored by integrated noise level meter (dBA)		Calculated noise level at site (dBA)		Reduced noise level at receptors due to Distance (dBA)	Predicted cumulative noise level at receptors (dBA)		Allowable noise level (existing noised level + 3dBA) (dBA)	
	Day Time	Night Time	Day Time	Night Time		Day Time	Night Time	Day Time	Night Time
Pahtaw Village 0.77 km	48.7	40.9	85.2	-	44.1	49.2	40.9	51.7	43.9
Pahtet Village 0.16 km	50.4	41.6			42.3	51.0	42.2	53.4	44.6



According to the above table, there is no impacts of noise on nearest residents (residents in Pahtaw and Pahtet Villages) and all of the predicted noise levels during day time and night time are lower than the allowable limit (existing noise level plus 3dB).

Although the predicted noise levels are based on calculations and the actual noise level may a little change due to the other factors (seasonal wind direction and wind speed), these changes will not be expected to will not affect on nearest local residents. However, nosie level will be impact on pre-construction workers.



*Noise Level Monitoring in Pathaw Village*



*Noise Level Monitoring in Pahtet Village*



### **Significance of Impacts on Air Environment during Pre-construction Phase**

According to the impact assessment of air environment (the nature of low impact in pre-construction state, number of machineries used, the distance from local residents and minor earth works), the nature of impact on air quality during pre-construction phase will be temporary and will not be significant as follow:

Anticipated Impact	Sources	Magnitude	Duration	Extend (Area)	Probability	Total	Category
Fugitive dust generation	Sand filling and vehicles movement	2	1	2	3	15	Low Impact (U)
Vehicular emission	vehicles movement	2	1	3	4	24	Low Impact (U)
Noise	Noise from dozer and trucks	2	1	1	4	16	Low Impact (U)

### **Consideration of Mitigation Measures Requirement for Air Environment**

The requirement of mitigation measures for air environment due to the consideration of impact rating and public concerns are as follow:

No.	Parameters	Receptor	Impact Rating	Public concern during public consultation process	Mitigation requirement	Mitigation Scale	Responsibility
1.	Fugitive Dust Generation	Local residents	Low Impact (U)	No	Yes	Minor	Pre-construction service provider(s)
2.	Vehicular Emission	Global warming	Low Impact (U)	No	Yes	Minor	Pre-construction service provider(s)
3.	Noise	Workers	Low Impact (U)	No	Yes	Minor	Pre-construction service provider(s)

### **Mitigation Measures for Impacts on Air Environment**

PPT will do or will ensure the construction service providers(s) to do the following mitigation measures as part of contract agreements.

***(a) Mitigation Measures for Dust Generation***

Dust will be efficiently countered by sprinkling of water during pre-construction phase. The nearest source of water for dust control is sea water from the sea. The dust control strategies are as follow:

***Actions for Dust Control during Pre-construction Phase***

<b>Fugitive Dust Source Category</b>	<b>Dust Control Actions</b>
Earth-moving	<ul style="list-style-type: none"> <li>▪ For any earth moving which is more than 30 m from all property lines, conduct watering as necessary to prevent visible dust emissions from exceeding 100 cm in length in any direction.</li> </ul>
Disturbed surface areas (except completed grading areas)	<ul style="list-style-type: none"> <li>▪ Apply dust suppression in a sufficient quantity and frequency to maintain a stabilized surface;</li> <li>▪ Areas, which cannot be stabilized, as evidenced by wind driven dust, must have an application of water at least twice per day to at least 80 percent of the unstabilized area. Damping down shall take place on a continual basis.</li> </ul>
Disturbed surface areas (completed grading areas)	<ul style="list-style-type: none"> <li>▪ Apply water to at least 80 percent of all inactive accessible disturbed surface areas on a daily basis when there is evidence of wind driven fugitive dust.</li> </ul>
Track-out control	<ul style="list-style-type: none"> <li>▪ Downwash of trucks (especially tyres) prior to departure from site.</li> </ul>

***(b) Mitigation Measures for Vehicular Emission***

Due to the impact rating and public concern on vehicular emission, there will require minor mitigation measures such as plan to reduce in loading and unloading time and plan to reduce in idle time during working hours. All of the vehicles used during pre-construction phase will be in good conditions and will use good quality fuel (low sulphur content).

***(c) Mitigation Measures for Noise***

According to the requirement of minor mitigation measures for noise during pre-construction phase, mitigation measures will only require to avoiding working at night. Impacts of noise on workers will be minimized by providing of earplug to all workers and prepare awareness program about the impacts of noise to human health.

### **6.3.2. Impacts on Surface Water Environment during Pre-construction Phase**

During pre-construction phase, impacts on water environment may be surface water pollution in nearest water body (sea water) due to soil erosion and sedimentation of earth working activities. Leakage of fuel oil and lubricants from vehicles used in pre-construction phase will also impact on surface water pollution.

#### **Insignificant of Impacts on Surface Water Environment during Pre-construction Phase**

There will have very little impact on surface water pollution due to the high permeability of sand earth moving material and the nearest surface water body is sea water. So, impact on surface water will be low probability and not significant as follow:

Anticipated Impact	Sources	Magnitude	Duration	Extend (Area)	Probability	Total	Category
Increase in turbidity, oil in surface water	Erosion, sedimentation and oil leakage	2	1	2	2	10	No Impact (-)

#### **Consideration of Mitigation Measures Requirement for Surface Water Environment during Pre-construction Phase**

The intensity requirement of mitigation measures surface water environment according to the consideration of impact rating and public concerns are as follow:

No.	Parameters	Receptor	Impact Rating	Public Concern during Public Consultation	Mitigation Requirement by Impact Evaluation	Mitigation Scale	Responsibility
1.	Sedimentation and oil leakage	Nearest sea water	No Impact (-)	Yes	Yes	Minor	Pre-construction service provider(s)

#### **Mitigation of Impact on Surface Water Quality during Pre-construction Phase**

No mitigation measures are required for surface water pollution during pre-construction phase according to the impact evaluation on surface water environment.

### **6.3.3. Impacts on Soil and Ground Water Environment during Pre-construction Phase**

Impacts on soil and ground water environment during pre-construction phase of proposed project will include the following:

***(a) Impacts on Soil Quality***

A small number of domestic wastes will be produced from workers. Moreover, some biomass (unsuitable soil materials) will produce from tree cutting and site clearing activities during pre-construction phase. All of these solid wastes will have impact on soil quality. Leakage of fuel oil and lubricant will also impact on soil quality during pre-construction phase.

***(b) Impacts on Ground Water Quality***

Impact on ground water will be low probability and negligible because of the nature and duration of pre-construction activities.

**Significance of Impacts on Soil and Ground Water Environments during Pre-construction Phase**

Domestic wastes from pre-construction workers will be minimal due to the small number of workforce (about 20 people). Since the project area is about 80 acres, the amount of scrub produced would be large and also the amount of removal of tree trunks and debris. The leakage of fuel and lubricant will be low probability and small amount. So, impacts on soil and ground water environment during pre-construction phase will be negligible as shown in the following table.

Anticipated Impact	Sources	Magnitude	Duration	Extend (Area)	Probability	Total	Category
Potential to soil contamination	Domestic wastes unusable materials in soil, lubricant	3	2	1	2	10	No Impact (-)
Potential to ground water pollution	Domestic wastes, unusable materials in soil, lubricant	3	2	3	2	16	Low Impact (U)

**Consideration of Mitigation Measures Requirement for Soil and Ground Water Environment during Pre-construction Phase**

The intensity requirement of mitigation measures for soil and ground water environment according to the consideration of impact rating and public concerns are as follow:

No.	Parameters	Receptors	Impact Rating	Public Concern during Public Consultation	Mitigation Requirement by Impact Evaluation	Mitigation Scale	Responsibility
1.	Potential to soil contamination	Soil in project site	No Impact (-)	No	Yes	Minor	Pre-construction service provider(s)
2.	Potential to ground water pollution	Ground water at project site	Low Impact (U)	No	Yes	Minor	Pre-construction service provider(s)

### **Mitigation Measures for Impact on Soil and Ground Water Environment during Pre-construction Phase**

The earth materials removed from the site clearing can be used as the bottom layer of the ponds. According to the need of the minor mitigation measures, PPT will systematically dispose solid wastes according to the rules and regulations of CDC (Myeik) and CDC (Kyun Su). Fuel oil and lubricant will be stored over concrete floor and handle with care not to leakage. If leakage occurs, clear by fabrics and will dispose carefully.

#### **6.3.4. Impacts on Biodiversity Environment**

Anticipated Impacts on biodiversity environment during pre-construction phase will be as follow:

##### ***(a) Impacts on Flora Diversity***

In pre-construction phase, significant points are very low as the initial stage of the project activities. However, there will necessary to cut mangrove for the purpose of ponds, and farming facilities construction.

##### ***(b) Impacts on Fauna Diversity***

Cutting down of some trees at the project site can affect the habitats of birds, butterflies, and reptiles. Increase in noise during pre-construction phase may affect the feeding, breeding and movement of wildlife in near area. Human activities such as noise, site preparation, taking measurements and transportation of materials will disturb the animal behavior and movement, land contamination will disturb the animals.

***(c) Impacts on Aquatic Lives***

There will have impact on aquatic lives for a short time if domestic waste and debris during pre-constructoin phase are disposed directly to the sea. Improper handling of fuel oil will leakage to the sea and impact on aquatic lives.

**Significance of Impacts on Biodiversity Environment during Pre-construction Phase**

Significant points will be anticipated based on the presence of flora and fauna status in and around the project area. The points are assumed with the respective measuring factors in the left column of the following table. In pre-construction phase, significant points are very low as the initial stage of the project activities. According to the analysis, the points are non-significant affected on flora and fauna as shown in the following table.

***Table - Significant Points in the Respective Flora and Fauna Groups through Measuring Factors***

Factors affected on biodiversity	M	S	ST	Amphibians & Reptiles	Fishes	Birds	Small mammal	Zooplankton
<b>Area of influence</b>	1-25%	1-25%	1-25%	1-25%	1-25%	1-25%	1-25%	1-25%
<b>percentage of resource affected</b>	1-25%	1-25%	1-25%	1-25%	1-25%	1-25%	1-25%	1-25%
<b>sensitivity of resources</b>	1-25%	1-25%	1-25%	1-25%	1-25%	1-25%	1-25%	1-25%
<b>status of resources</b>	Important	normal	normal	normal	normal	normal	normal	normal
<b>regulatory status</b>	normal	Normal	normal	normal	normal	normal	normal	normal
<b>Social value</b>	normal	Normal	normal	normal	normal	normal	normal	normal

**Notes:** M=Mangrove vegetation, S=Shrub vegetation, ST= Scatter trees, A&R=Amphibian and reptiles,

**Significant points**

Low=1-25%, Moderate= 26-50%, High= 51-75%, Very High=>76%

According to the impact assessment for biodiversity environment, mangrove area is the most ecologically sensitive area.

Anticipated Impact	Sources	Magnitude	Extend	Duration	Probability	Total	Category
Impacts on Flora Diversity	Site clearing and tree cutting	3	1	5	4	36	Moderate Significant (C)



Impacts on Fauna Diversity	Tree cutting, Noise	2	2	1	2	10	No Impact (-)
Impacts on aquatic lives	Solid waste, fuel oil leakage and mangrove clearing	3	2	5	4	40	Moderate Significant (C)

### **Consideration of Mitigation Measures Requirement for Biodiversity Environment during Pre-construction Phase**

The requirement of mitigation measures for biodiversity environment according to the consideration of impact rating and public concerns are as follow:

Parameters	Receptor	Impact Rating	Public Concern during Public Consultation	Mitigation Requirement by Impact Evaluation	Mitigation Scale	Responsibility
Impacts on Flora Diversity	Flora species	Moderate Significant (C)	Yes	Yes	Sensible	Pre-construction service provider(s)
Impacts on Fauna Diversity	Fauna species	No Impact (-)	No	Yes	Minor	Pre-construction service provider(s)
Impacts on aquatic lives	Aquatic species	Moderate Significant (C)	Yes	Yes	Sensible	Pre-construction service provider(s)

### **Mitigation Measures for Impacts on Biodiversity Environment during Pre-construction Phase**

According to the impact evaluation, minor to sensible mitigation measures are required for biodiversity environment during pre-construction phase. So, PPT will (i) avoid tree cutting as much as possible or will do replantation if there will have to cut down trees, (ii) replantation of mangrove species (iii) avoid working at night, and (iv) raise environmental conservation awareness among the workers.

#### **6.3.5. Impacts on Socio-economic during Pre-construction Phase**

During pre-construction phase, the following positive and negative socio-economic impacts will occur.

**(a) Positive Socio-economic Impacts during Pre-construction Phase**

The potential positive socio- impacts during pre-construction phase are as follow:

**Job Creation**

The proposed project will provide about 20 temporaries directly or indirectly jobs (site clearing, tree cutting, transportation, services for food and soft drink, etc.) related to the proposed project during pre-construction phase.

***Impact Significance of Job Creation without Enhancement Measures during Pre-construction Phase***

According to the primary data collection, most of the young people in Pathaw and Pahtet villages are going to the foreign boarder city (Thailand) for working before the project development. So, most of the pre-construction workers will be migrant workers (not from nearest villages) and so job creation during pre-construction phase can be considered as very low without enhancement measures as follow:

Anticipated Impact	Sources	Impact Type	Magnitude	Duration	Extend (Area)	Probability	Total	Category
Potential to Increase in household income	Jobs opportunities in pre-construction site	Positive (+)	2	1	2	3	10	No Impact (-)

***Enhancement Measures for Job Creation during Pre-construction Phase***

PPT will appoint or will encourage pre-construction contractor and sub-contractors to use local labor force (at least 50%). The proposed project will be included in contract agreement.

***Impact Significance of Job Creation after Enhancement Measures during Pre-construction Phase***

The impact will become very low to low after enhancement actions as follow:

Anticipated Impact	Sources	Impact Type	Magnitude	Duration	Extend (Area)	Probability	Total	Category
Potential to Increase in household income	Jobs opportunities in pre-construction site	Positive (+)	2	1	2	3	15	Low Impact (U)

#### **6.4. Anticipated Impacts and Mitigation Measures during Construction Phase**

The construction period is expected to be about one year. Construction of proposed project will include (1) construction of temporary dike, (2) construction of foundation, (3) leveling pond bottom, (4) construction of wooden structures and working shed, and (6) road dike. Therefore, the major activities during construction phase will include:

- (a) Vehicular movement,
- (b) Loading and unloading construction materials,
- (c) On site storage of construction materials,
- (d) Connection of power supply system,
- (e) Maintenance of construction machinery, and
- (f) Disposal of solid wastes from both construction site and workers etc.

According to the above activities, construction of proposed project can potentially affect the natural environment and local communities. Moreover, construction activities will be disturbed to wildlife. The following construction operations and considerations, which could have a particularly significant impact, have been included in the assessment of disruption due to construction:

- (a) The scale of earth movements;
- (b) The storage and treatment of surplus material before removal;
- (c) The likelihood of night-time working;
- (d) Number, type and routes of vehicle movements;
- (e) Storage and re-use of materials;
- (f) Duration and nature of construction activities;
- (g) Advance works by utilities if required;
- (h) Materials logistics such as origin of materials and routes to site;
- (i) Quantities of materials required and an estimate on quantities to be discarded;
- (j) Identification of wastes that will be generated including sources; and
- (k) The likelihood of contaminants being encountered.

##### **6.4.1. Impact on Air Environment during Construction Phase**

Impacts on air quality during construction phase will be as follow:

- (a) Fugitive dust generation from transportation and construction activities,
- (b) Vehicular emissions related to the transportation of personnel and construction materials, and
- (c) Noise from construction machineries.

***(a) Fugitive Dust Generation***

The fugitive dust emissions (very fine particulates) will be emitted from transportation of construction materials and construction activities. These activities will affect neighborhoods (especially for local residents beside the public road to the project site) though construction is not a long term.

***(b) Gaseous Emissions***

The gases emissions (CO<sub>2</sub>, CO, and SO<sub>2</sub>) will be emitted from the operation of vehicles and machinery into the atmosphere during the construction phase (including both on-site and the public roads).

***(c) Increased in Noise Level***

For the proposed project, the major noise generating sources during the construction phase will be movement of trucks, welding and generator. If most of the construction machineries (generator, truck etc.) are running at the same time, this cumulative noise level can increase to 89.5 dB(A) at 15 m (about 50 feet) distance as follow:

$$\begin{aligned}
 Leq = SPL_{site} &= 10 \log \left( \frac{10^{8.5} + 10^{8.4} + 10^{9.0} + 10^{8.5}}{4} \right) \\
 &= 89.5 \text{ dBA}
 \end{aligned}$$

***Table - Typical Construction Equipment Noise Emission Levels***

<b>Equipment Type</b>	<b>Noise Level (dBA at 50 Feet)</b>
Truck (Medium and Heavy)	84
Welding	90
Generator	<85

*Source: EPA, 1 971; "Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances". NTID 300.1*

The predicted noise level at nearest villages during construction phase can be predicted as follow:

Receptors and distances from project	Existing noise levels monitored by integrated noise level meter (dBA)		Calculated noise level at site (dBA)		Reduced noise level at receptors due to Distance (dBA)	Predicted cumulative noise level at receptors (dBA)		Allowable noised level (existing noised level + 3dBA) (dBA)	
	Day Time	Night Time	Day Time	Night Time		Day Time	Night Time	Day Time	Night Time
Pahtaw Village 0.77 km	48.7	40.9	91.7	-	47.1	50.9	40.9	51.7	43.9
Pahtet Village 0.16 km	50.4	41.6			45.2	51.6	42.2	53.4	44.6

### *Significance of Impacts on Air Environment during Construction Phase*

Impacts on air environment during construction phase will not be significant because the proposed project will only use 2 trucks for transportation of construction materials and one generator for construction and no heavy machinery (pilling machine, crane, backhoe etc.). Most of the construction activities will be carried out by human activities.

Anticipated Impact	Sources	Magnitude	Duration	Extend (Area)	Probability	Total	Category
Fugitive dust emission	Construction activities	2	1	1	3	12	No Impact (-)
Vehicular emission	Construction activities	2	1	1	4	16	Low Impact (U)
Noise	Noise from construction equipment	2	1	2	4	20	Low Impact (U)

### *Consideration of Mitigation Measures for Air Environment during Construction Phase*

The requirement of mitigation measures for air environment according to the consideration of impact rating and public concerns are as follow:

No.	Parameters	Receptor	Impact Rating	Public Concern through Public Consultation Processes	Mitigation Requirement by Impact Evaluation	Mitigation Scale	Responsibility
1.	Dust generation	Workers at site	No Impact (-)	No	Yes	Minor	Construction service provider(s)

2.	Gaseous emissions	Local communities	Low Impact (U)	No	Yes	Minor	Construction service provider(s)
3.	Noise	Workers at site	Low Impact (U)	No	Yes	Minor	Construction service providers

### **Mitigation Measures for Air Environment during Construction Phase**

PPT will do the following mitigation measures for air environment during construction phase.

#### ***(a) Mitigation Measures for Dust Generation***

PPT will control dust by sprinkling of water at site during construction phase. And this activity will make by water spraying truck outside of the project site (along the public road), twice a day.

#### ***(b) Minimizing Gaseous Emissions***

Certain mitigation measures will be adopted to limit atmospheric impacts to as great an extent as possible during construction phase. For instance, the transportation of personnel and materials will be scheduled such as to avoid periods of peak flow where congested conditions are more likely, and to reduce the overall number of vehicular movements. In addition to careful traffic management, close adherence to the recommended maintenance regime will be applied to both on-site and off-site vehicles.

**Reduction of SO<sub>2</sub> and CO Emissions:** Low sulphur content and good engine condition vehicles will be used.

**Improved Maintenance:** Significant emission reduction will achieve through regular equipment maintenance.

**Reduction of On-site Construction Time:** Rapid on-site construction will reduce the duration of traffic interference and therefore, reduce emissions from traffic delay. Off-site fabrication of structural components will also enhance the quality of work, as the production takes place in controlled settings and external factors such as weather and traffic do not interfere.

#### ***(c) Mitigation Measures for Noise***

For minor mitigation measures, it is necessary to avoid the following activities:

- running construction machineries at the same time; and
- working at night.



#### **6.4.2. Impacts of Surface Water Environment during Construction Phase**

Potential construction-induced impacts to surface water quality will be soil erosion and sedimentation resulting from excavation and grading activities necessary for the construction of infrastructure especially in rainy seasons. Drainage and seepage from construction waste dumping site will have potential to surface water pollution. Mobilization and transport of soil particles due to construction activities may result in sedimentation of surface drainage networks, which may result in impacts to the water quality in nearest sea water via drains. In addition, handling of fuel oil, other oil products, chemicals and lubricants may constitute a risk for pollution of surface water. It will be more evidence in rainy seasons (June to September). Waste generated from construction activity will also have potential to surface water pollution and will include construction debris and waste from construction workers.

##### ***(a) Construction Debris***

Waste materials (pallets, packing crates, etc) will be produced during construction period. Mainly, soil materials are released from excavating for the construction of farming ponds. All of the construction wastes will have potential to soil and water pollutions if they are not properly managed. Drainage and seepage from construction waste dumping site will have potential to surface water pollution.

##### ***(b) Oil and Grease***

Trucks and cars can leak fuel oil during transportation of construction materials and workers during construction phase. Moreover, lubricants and grease from construction machineries can also leak during construction phase. All of the fuel oil and lubricants can cause surface water pollution (increase in oil and grease content in sea water) for a while.

##### ***(c) Domestic Wastes from Construction Workers***

A small amount of domestic waste will be generated from construction workforce (about 30 workers). The establishment of labour camps will also affect on environment through improper waste (solid & garbage /sewage) disposal. A man can produce 0.4 kg per day of solid waste and the total waste produced from construction workers will be as follow:

$$\begin{aligned}\text{Total Domestic Waste Produced during Construction Phase} &= 30 \times 0.4 \text{ kg} \\ &= 12 \text{ kg / day}\end{aligned}$$

### **Significance of Impacts on Surface Water Environment during Construction Phase**

Impact on water environment during construction phase will not be significant due to the amount of wastewater produced during construction phase (the volume of nearest surface water body, sea water body, is very much greater than the volume of wastewater disposed by construction site). Moreover, soil type within the project site is sandy with high porosity.

Anticipated Impacts	Sources	Magnitude	Duration	Extend (Area)	Probability	Total	Category
Surface Water Pollution	Construction Debris	2	1	2	2	10	No Impact (-)
	Oil and Lubricants	2	1	2	2	10	No Impact (-)
	Domestic Wastes	2	1	2	2	10	No Impact (-)

### **Consideration of Mitigation Measures Requirement for Surface Water Environment during Construction Phase**

The intensity of mitigation measures for surface water environment according to the consideration of impact rating and public concerns are as follow:

No.	Parameters	Impact Rating	Public Concern through Public Consultation Processes	Mitigation Requirement by Impact Evaluation	Required Mitigation Scale	Responsibility
1.	Construction Debris	No Impact (-)	No	Yes	Minor	Construction Service Provider(s)
2.	Oil and Grease	No Impact (-)	No	Yes	Minor	Construction Service Provider(s)
3.	Domestic Wastes	No Impact (-)	No	Yes	Minor	Construction Service Provider(s)

### **Mitigation Measures for Surface Water Pollution**

According to the above impact identification and evaluation on surface water quality, there will need minor mitigation measures. PPT will not start construction in rainy seasons. PPT will construct settling pond if construction is started in rainy seasons. Domestic wastes from the workers are disposed off according to the rules and regulations of CDC(Myeik) and CDC (Kyunsu). Moreover, PPT will prevent sea water pollution during construction phase as follow:

No	Construction Activities	Mitigation Measures
1.	Earth Working	- Avoid earth working and excavation during monsoon season. - Limit unnecessary earthwork - Prevent over excavation - Temporary sediment pond on the water way to the sea - Top soil should be stockpiled temporarily for later use on the site
2.	Stacking and Loading Areas	- All stacking and loading areas will be provided with proper drains to prevent run off from the site to enter any water body.
3.	Waste Water from the Site	- Waste water channels from the site should be connected to septic tank during construction to prevent wastewater from entering the nearest water bodies.
4.	Leakage of Oil and Lubricants	- Avoid any leakage of oil and lubricant from vehicles and machineries used in construction phase
5.	Phase Wise Construction	- Working in a small area at a point of time (phase wise construction)
6.	Vegetation	- Vegetation of bare areas after the construction state

### **6.4.3. Impacts on Soil and Ground Water Environment during Construction Phase**

Impact of soil and groundwater environment during construction phase will be leakage of fuel oil, leakage of lubricants and disposal of wastes.

#### ***(a) Leakage of Fuel Oil and Lubricants***

Potential contamination of soil and groundwater during construction phase could possibly occur as a result of leaking of fuel and lubricants from construction equipment and/or temporary on-site storage facilities. Handling of fuel oil, other oil products, chemicals and lubricants may constitute a risk for pollution of soil and ground water.

#### ***(b) Construction Debris and Domestic Wastes***

During construction phase, construction debris such as packing materials and domestic wastes from construction workers will produce. There will have potential to soil contamination and ground water pollution if these solid wastes are not properly disposed. Moreover, seepage and drainage from construction waste dump site will also impact on soil and ground water qualities.

### **Significance of Impacts on Soil and Ground Water Environment**

Construction related impacts to soil and groundwater in project site will be minor, temporary low possibility due to the construction period and not necessary to build steel and concrete structures, and the significance of impacts is shown in the following table:

Anticipated Impact	Sources	Magnitude	Duration	Extend (Area)	Probability	Total	Category
Soil and Ground Water Pollution	Leakage of fuel oil and lubricants	2	1	1	2	8	No Impact (-)
	Construction debris and Domestic Wastes	2	1	2	2	10	No Impact (-)

### **Intensity of Mitigation Measures for Soil and Ground Water Quality**

The requirement of mitigation measures for soil and ground water environment according to the consideration of impact rating and public concerns are as follow:

No.	Parameters	Impact Rating	Public Concern through Public Consultation Processes	Mitigation Requirement by impact evaluation	Required Mitigation Scale	Responsibility
1.	Leakage of fuel oil and lubricants	No Impact (-)	No	Yes	Minor	Construction Service Providers
2.	Construction debris and domestic Wastes	No Impact (-)	No	Yes	Minor	Construction Service Providers

### **Mitigation Measures for Impacts on Soil and Ground Water Environment**

According to the above consideration for required mitigation measures, there will be minor mitigation measures such as disposed of solid wastes according to the rules and regulations of CDC (Myeik) and/or rules to reduce impacts of solid wastes during construction phase. Care should be taken not to leak during the handling of fuel oil and lubricants. All of the fuel tank and lubricants container have to store over concrete floor or impermeable pad. Every machinery used in construction phase should be in good conditions.

#### **6.4.4. Impacts on Biodiversity Environment during Constructiton Phase**

The anticipated impacts on biodiversity during construction phase of proposed project will be as follow:

##### **(a) Impact on Flora Diversity**

Generation of dust, lighting and noise from mototrs and pumps will disturb the animal behavior and movement, land contamination by the construction activities will disturb the animals'

behavior. If waste disposal during construction is not properly done, there will be increased in the habitat loss of native species. In addition, herbaceous and grass communities in the project site will be removed from as a result of clearance for construction.

#### ***(b) Impact on Fauna Diversity***

Clearing away trees and natural vegetation can cause hazards to the habitats of birds and butterflies. Noise due to construction activities at the site involving human and vehicular movement will disturb aril and wild animals in the area. And land contamination by the construction activities will disturb the animal behaviour. If waste disposal during construction is not properly done, there will be increased in the habitat loss of native species. Terrestrial micro flora and fauna at the site are also affected. Although the project is adjacent to sea, there will be no impact on aquatic lives in the sea because waste water produced from construction site will be little amount from small area and will sink into the sandy soil.

#### **Significance of Impacts on Biodiversity Environment**

##### **Significance of Impacts on Flora Diversity**

Unmanaged grassland is a frequent habitat in the area and is not of any particular conservation importance. The project site is near the settlement area; therefore, there will be no concerns for wild life disturbance as there is no suitable habitat in terms of suitable natural flora cover and related fauna. The various areas of improved grassland do not have any conservation value. The total carbon sequestration of herbs and grass communities in proposed factory will be very little. So that loss of carbon stock by proposed project is very low.

##### **Significance of Impacts on Fauna Diversity**

The impact on fauna diversity will be minimal due to the site had already cleared by human activities for proposed project area and no fauna species are found within the project site (direct impact zone). However, there will be a little impact on surrounding fauna diversity (indirect impact zone), due to the construction noise. Significant points were anticipated based on the presence of flora and fauna status in and around the project area. The points are also determined by the type of the project. The points are assumed with the respective measuring factors in the left column of the following table. According to the analysis, the points are non-significant affected on flora and fauna.

**Significant points in the respective flora and fauna groups through measuring factors**

Factors affected on biodiversity	M&P	S & G	T & ST	Amphibians & Reptiles	Fishes	Birds	Small mammal	Zooplankton and phytoplankton
Area of influence	1-25%	1-25%	1-25%	1-25%	1-25%	1-25%	1-25%	1-25%
percentage of resource affected	1-25%	1-25%	1-25%	1-25%	1-25%	1-25%	1-25%	1-25%
sensitivity of resources	1-25%	1-25%	1-25%	1-25%	1-25%	1-25%	1-25%	1-25%
status of resources	important	normal	normal	normal	normal	normal	normal	normal
regulatory status	normal	normal	normal	normal	normal	normal	normal	normal
Social value	normal	normal	normal	normal	normal	normal	normal	normal

**Notes:** M&P=Mangrove vegetation and phytoplankton, S & G=Shrub vegetation and grass land; T & ST= Tree and small trees, A&R=Amphibian and reptiles,

**Significant points**

Low=1-25%, Moderate= 26-50%, High= 51-75%, Very High=>76%

**Consideration of Mitigation Requirement for Biodiversity Environment**

Impacts are low status on existing flora and fauna according to result of analysis. Impacts are investigated in site specific (SP) and short term (St).

**Impact levels, extent and duration on flora and fauna in the proposed project area**

Sr. No	Biological groups	Impact Levels				Extent			Duration		
		L	Mo	H	VH	R	L	Sp	Lt	Mt	St
1	Amphibian and reptiles	✓	-	-	-	-	-	✓	-	-	✓
2	Birds	✓	-	-	-	-	-	✓	-	-	✓
3	Fishes	✓	-	-	-	-	-	✓	-	-	✓
4	Mammals	✓	-	-	-	-	-	✓	-	-	✓
5	Zooplankton	✓	-	-	-	-	-	✓	-	-	✓
6	Mangroves & Phytoplankton	✓	-	-	-	-	-	✓	-	-	✓
7	Shrubs & grasses	✓	-	-	-	-	-	✓	-	-	✓
8	Trees & small trees	✓	-	-	-	-	-	✓	-	-	✓

**Mitigation Measures for Impacts on Biodiversity Environment during Construction Phase**

It is necessary to avoid tree cutting, dispose wastes properly and avoid working at night to reduce impacts on flora and fauna diversities. Mitigation measures should be carried out during the constructional and operational phase as below:



- Conserve the plants and vegetation as possible as which existing around the project area,
- Create the green belt (mangrove tree in the water and native plants on the land) in surrounding area of the project site for recreational and habitat conservation for terrestrial animals (birds, Rhesus monkey) as well as for the aquatic organisms (water birds, fish, crab),
- Raise environmental conservation awareness among the visitors and workers (not to kill the birds and monkey which are protected by law),
- Avoid killing of wild animals such as long-tailed crab eating monkey and birds (black kites) as they are protected by wildlife law,
- Manage the waste disposals which should be conducted systemically with the purpose in conserve aquatic ecosystem in healthy level for environmental protection.

#### **6.4.5. Impact on Human Environment during Construction Phase**

Impacts on human environment will include socio-economic and health impacts. The anticipated socio-economic and health impacts on human environment during construction phase are as follow:

##### **6.4.5.1. Anticipated Socio-economic Impacts during Construction Phase**

During construction phase, the following positive and negative socio-economic impacts will occur.

##### ***(a) Positive Socio-economic Impacts during Construction Phase***

The potential positive social impacts during construction phase are as follow:

##### ***Job Creation***

The proposed project will provide about 30 temporary employment opportunities for local people during construction phase.

##### ***Significant of Impact on Job Creation without Enhancement Measures***

Local people in Pahtaw and Pahtet Villages have limited condition for job creation rather than fishing and manufacturing works. Most of the young people are going to Thailand (Boarder City) for seeking job. As construction workforce for fish powder mill will be foreign workers

(Chinese and Japanese). So, job opportunities for local people in Pathaw and Pahtet Villages can be considered as low due to small number of without enhancement measures as follow:

Anticipated Impact	Impact Type	Magnitude	Duration	Extend (Area)	Probability	Total	Category
Potential to Increase in household income	Positive (+)	2	1	3	3	18	Low Impact (U)

### **Enhancement Measures for Job Creation**

PPT will ensure job opportunities for local people by the following enhancement measures.

- (a) PPT will ensure construction contractor to use local labor force in concrete structure and other facilities as part of tender requirements.
- (b) As there is no construction company or skillful workforce steel structure in nearest villages, most of the skillful construction workers will be foreign workers (own workers from fish mill powder construction company may be Chinese and Japanese), semi-skilled and no-skill jobs will be offered to the local communities as much as possible.
- (c) As the population of females is slightly higher than that of males in the nearest villages (most of the male partaner are going to Thailand (Htee Khee) for jobs), employment opportunities for construction works will also be created to ensure that the local female population also has equal chance for these opportunities (Gender Equality).

### **Impact Significance of Job Creation after Enhancement Measures**

After enhancement measures for job opportunities, this kind of impact will become moderate after enhancement actions as follow:

Anticipated Impact	Impact Type	Magnitude	Duration	Extend (Area)	Probability	Total	Category
Potential to Increase in household income	Positive (+)	3	1	3	4	28	Low Impact (U)

According to the above impact rating for job opportunities during construction phase, the positive impact for job opportunities can be boosted after enhancement measures. Moreover, job opportunities are one of the most public needs according to the primary data collection. So, PPT will ensure job opportunity for local people during construction phase.

### **Skill Development for Local People**

Local people hired by the proposed project would remain in communities with skills acquired during project construction including construction, woodwork, concrete work, steel/metal work and masonry. Communication skills for local people will also improve in office works during construction period. This is a positive and long-term socio-economic benefit.

### **Impact Significance of Skill Development without Enhancement Measures**

Most of the sub-contractors for minor construction works in nearest villages are not too familiar with modern construction technique. So, the impact significance of local skill development during construction phase without enhancement measures can be considered low as follow:

Components	Sources	Impact Type	Magnitude	Duration	Extend (Area)	Probability	Total	Category
Local skill development	Construction works	Positive (+)	3	4	3	2	20	Low (+30)

### **Enhancement Measures for Skill Development after Enhancement Measures**

PPT will do enhancement measures for local skill development as follow:

- (a) Training programs (e.g. maintaining of vehicles, wiring, masonry building etc.) will be implemented prior to and during the construction phase because majority of the local people may not be adequately skilled to qualify for positions requiring skilled labor, if required.
- (b) Local construction sub-contractors will be chosen as first priority during tender process.
- (c) PPT will encourage construction contractors and sub-contractors to stimulate local skill development as part of tender requirement.

### **Impact Significance of Skill Development after Enhancement Measure**

Skill development for local people will be great benefit for local engineers at Myeik Township. However, it will be a little hard to ensure local skill development for nearest villages during construction phase because most of the young people are willing to work in boarder city (Thailand). So, the impact significance of local skill development during construction phase can be considered as moderate after enhancement measures as follow:

Components	Sources	Impact Type	Magnitude	Duration	Extend (Area)	Probability	Total	Category
Local skill development	Construction works	Positive (+)	3	5	3	3	33	Moderate Significant (C)

### **(b) Potential Negative Socio-economic Impacts during Construction Phase**

The potential negative socio-economic impacts during construction phase are as follow:

#### **Impacts Associated with Population Influx**

The increase of population during construction phase will increase temporary pressure on existing infrastructure and services including health, food, shelter, water, transport and recreational facilities in Pahtaw-Pahtet Island.

#### **Significance of Impacts Associated with Population Influx without Mitigation Measures**

As proposed project is very close to urban area (Myeik) and little number of workers (about 30 people), there will have little impact on local health care facilities and local food consumption. However, the proposed project will not use in the existing facilities in Phthaw-Pahtet Island and all of the workers from other region are going to Myeik by ferry. However, there will be a little impact on local food availability during construction time. Impact significances related to population influx during construction period will be as follow:

Anticipated Impact	Magnitude	Duration	Extend (Area)	Probability	Total	Category
Increase pressure on housing, recreational facilities, and water	2	1	1	2	8	No Impact (-)
Increase pressure on health care facility	3	1	3	3	21	Low Impact (U)
Increase pressure on adequate amount of local food	2	1	2	2	10	No Impact (-)

#### **Mitigation Measures for Impacts Associated with Population Influx**

No mitigation measures are required for pressure on housing, recreational facilities and water for additional workers because the impact rating is very low. Similarly, impact

significant of pressure on local food consumption is very low and it can be solved by providing food to workers during construction time. All of the impacts associated with population influx will be minimized by the use of local labor force. Own health care facilities will be supported to additional workers during construction period.

### **Significance of Impacts Associated with Population Influx after Mitigation Measures**

All of the impacts due to increase in population can be mitigated by appointing local construction workers and it will also reduce pressure on health care facilities for construction workers. So, impact on health care facility due to population influx will be very low after mitigation measures as follow:

Components	Magnitude	Duration	Extend (Area)	Probability	Total	Category
Increase pressure on health care facility	2	1	3	2	12	No Impact (-)

#### **6.4.5.2. Potential Health Impact and Mitigation Measures for Construction Phase**

During construction phase, the anticipated health related impacts are as follow:

##### **(a) Increased Infection of Air-borne Diseases**

An influx of construction workers from other places (Chinese and Japanese) can lead to overcrowded conditions where air-borne diseases such as tuberculosis, influenza and meningitis can spread easily.

##### **Significant of Impact for Infection of Air-borne Diseases**

According to the secondary health data collection, infections of TB is one of the common diseases in Myeik Region. So, impact rating for air-borne diseases will be considered as follow:

Who will affected?	Magnitude/Consequence of impact			Likelihood/Probability of impact			Health Impact Significance Rating		
	Low	Medium	High	Unlikely to occur	Likely to occur sometimes	Likely to occur often	Low	Medium	High
People in nearest residents	√	-	-	-	√	-	√ (HIR 1)	-	-
Construction workers	-	√	-	-	√	-	-	√ (HIR 2)	-

***Mitigation Measures for Infection of Air Borne Diseases***

This potential impact will be minimized by providing medical check for workers who are susceptible infection of air-borne diseases for both local and foreign workers.

***(b) Fugitive Dust Emissions***

Dust will expose the construction workers and some local people in nearest villages to bronchial and other respiratory tract diseases.

***Significant of Impacts for Fugitive Dust Emissions***

The impact will be mainly on construction workers within the project and very little on local people in nearest villages.

Who will affected?	Magnitude/Consequence of impact			Likelihood/Probability of impact			Health Impact Significance Rating		
	Low	Medium	High	Unlikely to occur	Likely to occur sometimes	Likely to occur often	Low	Medium	High
People in nearest residents	√	-	-	-	√	-	√ (HIR 1)	-	-
Construction workers	-	√	-	-	√	-	-	√ (HIR 2)	-

***Mitigation Measures for Fugitive Dust Emission***

Dust during construction phase will be controlled by:

- (a) Restricting vehicle speeds;
- (b) Watering roadways; and
- (c) Wheel or body washing.

***(c) Increase Infection of Water Borne Diseases***

The incidence rate of water borne diseases such as cholera and diarrhea will increase if there will be no proper sanitation practices at the construction site. Improper waste disposal of construction debris will also have potential to increase water borne diseases. Project activities could become sources of pollution, as a result of infiltration into the surface stream. The possible negative impacts considered significant are:

- Loose soil from earthworks may be washed into stream.



- Irresponsible dumping of domestic solid waste can lead to underground water contamination, due to contaminants emanating from various products into the groundwater and filtering through to the aquifers. This will be a particular problem during the rainy season.
- Potential surface water pollution can emanate from waste products generated by construction activities entering the surface drainage.

***Impact Significance for Increase Infection of Water Borne Diseases***

According to the secondary data collection, infections of water borne diseases such as diarrhea are still the most public healthcare problems in Myeik Region and so the impact will be considered as medium as follow:

Who will affected?	Magnitude/Consequence of impact			Likelihood/Probability of impact			Health Impact Significance Rating		
	Low	Medium	High	Unlikely to occur	Likely to occur sometimes	Likely to occur often	Low	Medium	High
People in nearest residents	√	-	-	√	-	-	√ (HIR 1)	-	-
Construction workers	-	√	-	-	√	-	-	√ (HIR 2)	-

***Mitigation Measures for Increase Infection of Water Borne Diseases***

According to the rural area, proper sanitation system has to be provided for construction workers during construction period. Construction debris will be disposed at suitable location that does not impact on local water resources. Construction activities will ensure that no loose soil is permitted into watercourses and stockpiles are located away from surface water (Sea water). All mixing of cement will be carried out in a designated area away from surface water and areas of potential runoff. All areas of fuel storage will be banned to prevent hydrocarbon pollution of surface water.

***(d) Potential to Increase Infections from Mosquito***

The blockage of drainage system (especially in front of project site) during construction phase will cause bleeding zone for mosquitoes and can cause potential to cause infections from mosquitoes especially in rainy season.

***Impact Significance of Infections from Mosquito***

The impact can be rated as medium because malaria is still a health problem in Myeik Region.

Who will affected?	Magnitude/Consequence of impact			Likelihood/Probability of impact			Health Impact Significance Rating		
	Low	Medium	High	Unlikely to occur	Likely to occur sometimes	Likely to occur often	Low	Medium	High
People in nearest residents	√	-	-	√	-	-	√ (HIR 1)	-	-
Construction workers	-	√	-	-	√	-	-	√ (HIR 2)	-

***Mitigation Measures for Infections from Mosquito***

Proper temporary or permanent drainage system will be compensated as the blocked of drainage system during construction phase. Ensure that there are no stagnant pools of water during the construction phase. Provide local people with impregnated mosquito nets and/or better access to malaria prophylaxis and treatment as part of compensation program to reduce infections from mosquito.

***(e) Increase Risk of Sexually Transmitted Infections***

During construction phase, the improved economic status of the area and the influx of new people, living away from their families, can also lead to an increased risk of sexually transmitted infections such as HIV/AIDS, 198onorrhea and chlamydia. Major outbreaks of infectious diseases can have a devastating effect not only on or near the project site but also on local communities.

***Impact Significance of Increase Risk of Sexually Transmitted Infections***

Impact rating for sexually transmitted infection can be considered as moderate in Myeik Region.

Who will affected?	Magnitude/Consequence of impact			Likelihood/Probability of impact			Health Impact Significance Rating		
	Low	Medium	High	Unlikely to occur	Likely to occur sometimes	Likely to occur often	Low	Medium	High
Local people in Myeik Region	-	√	-	-	√	-	-	√ (HIR 2)	-

***Mitigation Measures for Increased Risk of Sexually Transmitted Infections***

Review sexually transmitted infection clinic access and education to reduce spread of sexually transmitted infections within the community. Provide information and education to workers about safe sex and implement HIV control for migrant construction workers.

***(f) Health Impact Related to Increase in Noise Level***

Construction activities normally generate a lot of noise. Noises will also arise from various construction machinery at site. Both acute loud noise and chronic lower level noise have been associated with a variety of negative health effects. Hearing loss and impairment are known to occur as a result of exposure to acute, high decibel noise (greater than 85 dB). Noise annoyance can lead to stress related impacts on health such as feelings of displeasure, interference with thoughts, feelings, and activities and disturbed sleep and can have impacts on mood, performance, fatigue, and cognition.

***Impact Significance of Increase in Noise Level***

The impact will be considered as low for local people due to the distance of nearest villages and medium to construction workers inside the construction site as follow:

Who will affected?	Magnitude/Consequence of impact			Likelihood/Probability of impact			Health Impact Significance Rating		
	Low	Medium	High	Unlikely to occur	Likely to occur sometimes	Likely to occur often	Low	Medium	High
People in nearest residents	√	-	-	-	√	-	√ (HIR 1)	-	-
Workers at site	-	√	-	-	-	√	-	-	√ (HIR 2)

***Mitigation Measures Health Impact Related to Increase in Noise Level***

1. Reduce speed limits for trucks in the project area to reduce noise level.
2. Alert residents of anticipated noise, including time, duration, decibel levels, and machinery to be used to protect public health.
3. Avoid working at night.

## **6.5. Anticipated Impacts and Mitigation Measures in Operation Phase**

The anticipated environmental impacts during operation phase of the proposed project will be as follows:

### **6.5.1. Impacts on Air Environment during Operation Phase**

The following are the anticipated impacts on air environment during operation phase of the proposed project.

#### ***(a) Vehicular and dust emissions***

In the proposed project, fugitive dust will be generated from vehicles for transportation of raw crabs to the farming and finished products of soft-shell crabs to the cold storage factory. The soft-shell crabs are sent to the cold storage factory every two hours. And, also CO<sub>2</sub>, CO, NO<sub>x</sub>, and SO<sub>2</sub> are emitted from the vehicles. The receptors will be residents along the public road.

#### ***(b) Odor Releases***

Odor is the most significant impact of air pollution in soft-shell crab farming. Odor can be caused by the decomposition of organic materials after death, from the moulted hard shells and uneaten food in the baskets. And it also depends on the quality and freshness of the crab. Organic material decomposition of crab produces several pungent chemicals such as trimethylamine and ammonia. Exposure to odors results in physiological stresses that may result in a variety of symptoms including headache, nausea, loss of appetite and emotional disturbance.

#### ***(c) Noise***

During the operation phase, noise will produce from transportation vehicles carrying raw materials and final products. Moreover, there are a number of noise sources, such as pumps, and motors which are situated near the project site. Generally, the noise from the motors are 80 to 83dB from three feet away. So, the impact of noise from the machineries would not be significant.

### **Impact Significance on Air Environment during Operation Phase**

Significant of impact on air environment during operation phase will be considered as follow:

Anticipated Impact	Sources	Magnitude	Duration	Extend (Area)	Probability	Total	Category
Air pollution	Fugitive dust from transportation	3	4	2	4	36	Moderate Significant (C)
	Gaseous emissions from vehicle movement	3	4	3	4	40	Moderate Significant (C)
	Odor	4	4	3	5	55	High Significant (B)
	Noise from vehicles	2	4	2	4	32	Moderate Significant (C)

***Consideration of Mitigation Measures Requirement for Air Environment during Operation Phase***

The requirement of mitigation measures for air environment according to the consideration of impact evaluation and public concerns are as follow:

No.	Parameters	Impact Rating	Public Concern through Public consultation Processes	Mitigation requirement by impact evaluation	Required Mitigation Scale	Responsibility
1.	Fugitive dust from transportation	Moderate Significant (C)	No	Yes	Slight	PPT
2.	Gaseous emissions from vehicle movement	Moderate Significant (C)	No	Yes	Slight	PPT
3.	Odor	High Significant (B)	Yes	Yes	Very Sensible	PPT
4.	Noise from vehicles	Moderate Significant (C)	No	Yes	Slight	PPT

**Mitigation Measures for Impacts on Air Environment**

PPT will do the following mitigation measures to reduce impacts on air quality during operation phase.

***(a) Mitigation Measures for Vehicular and Dust Emissions***

Dust from vehicular movement will be controlled by upgrading of internal roads inside the site to asphalt road or concrete road and watering along the public road at least twice a day. For minor mitigation measures, PPT will do the following to reduce gaseous emissions from vehicles.

- (i) Use good engine condition;
- (ii) Conduct regular engine check and maintenance;
- (iii) Use low sulphur content diesel and petroleum.

***(b) Mitigation Measures for Odor Emissions***

The main source of odor release is from the decay of death bodies of crabs and also from the leftover food in the floats. The crabs in the boxes are checked carefully whether it is dead or not, and leftover food materials are simultaneously removed. Bins containing dead crabs should be emptied from the processing area routinely and managed to prevent the buildup of smell, flies or vermin. Packing dead crabs in strong plastic bags is a good initial preventive measure. Removal of dead crabs from the processing site to a waste dump needs to be undertaken regularly.

For odor control, PPT will do the following mitigation measures as special requirements.

- Remove leftover food materials simultaneously;
- Remove dead crabs in disposal container when inspecting and use them as landfill;
- Dispose moulted hard shells and recycled as fertilizers or animal feed; and
- Enclose containers of moulted hard shells and dead crabs before they are disposed;
- Choose suitable location according to wind direction for chopping fish for the crab feeding.

***(c) Mitigation Measures for Noise***

No mitigation measures for vehicle movement during operation phase according to the impact evaluation. But it is necessary to control noise from motor and pumps during operation phase and will maintain motors and pumps on a regular basis.

**Impact Significance on Air Environment after mitigation measures**

Anticipated Impact	Sources	Magnitude	Duration	Extend (Area)	Probability	Total	Category
Air pollution	Fugitive dust from transportation	2	4	2	3	24	Low Impact (U)



	Gaseous emissions from vehicle movement	2	4	3	3	27	Low Impact (U)
	Odor	3	4	3	4	40	Moderate Significant (C)
	Noise from vehicles	2	4	2	3	24	Low Impact (U)

### **Residual Impact on Air Environment during Operation Phase**

After mitigation measures, odor will have residual impact during operation phase and further mitigation measures for residual impact will be carried out.

### **6.5.2. Impacts on Surface Water Environment**

The water in the ponds is exchanged not periodically, but after the water quality is checked. If the water quality is not good for the crab hatchery, the sea water from the reservoir is pumped to the ponds. Effluents from soft shell crab ponds are typically enriched in suspended solids, nutrients, and biochemical oxygen demand (BOD) with concentrations largely depending on whether the management is intensive or semi-intensive. If the nutrients are enriched, the receiving water would be eutrophication.

### **Impact Significance of Surface Water Quality**

Although there will produce wastewater with high organic load, the receiving water is sea water and so the severity of impact will be moderate as follow:

	Sources	Magnitude	Duration	Extend (Area)	Probability	Total	Category
Surface water pollution	Contaminated water from factory operations	3	4	2	4	36	Moderate Significant (C)

### **Consideration of Mitigation Measures Requirement for Surface Water Environment during Operation Phase**

Even if the sea water effluent represents by far the largest part of the total liquid pollution, it usually causes no problem, as the polluting components are easily decomposed, as their

concentration is normally low and as the receiver conditions in the sea are generally favourable. The requirement of mitigation measures for surface water environment according to the consideration of impact evaluation and public concerns are as follow:

No.	Parameters	Impact Rating	Public Concern through Public Consultation Processes	Mitigation Requirement	Required Mitigation Scale	Responsibility
1.	Surface water pollution	Moderate Significant (C)	Yes	Yes	Very Sensible	PPT

### **Mitigation Measures for Impact on Surface Water Quality**

The wastewater discharged from the ponds can be treated by sedimentation and the screens should be mounted at the point of the discharge to the sea water. The amount of water discharged is not comparable to the receiving water body (sea water). Liquid effluents arising from operations will be treated to the applicable EQG guideline prior to discharge.

### **Impact Significance on Surface Water Environment after mitigation measures**

	Sources	Magnitude	Duration	Extend (Area)	Probability	Total	Category
Surface water pollution	Contaminated water from factory operations	2	4	2	3	24	Low Impact (U)

### **Residual Impact on Surface Water Environment during Operation Phase**

After proper mitigation measures, the significance level will remain Low so there will be no residual impact.

### **6.5.3 Impacts on Soil and Ground Water Environment**

Solid waste produced from farming and decaying of crabs will impact on the soil contamination. The major solid wastes from soft shell crab farming is the moulted hard shells. Domestic wastes from workers' dromitories will be released during farming process of soft-shell crabs.

***(a) Wasted Crab Shells***

The major solid wastes from the farming is the wasted crab shells. And the dead crab bodies are also generated during the moulting stage. These solid wastes should be disposed of properly.

***(b) Domestic Wastes***

Solid wastes will be produced from workers’ dormitories during operation phase of proposed project.

**Significance of Impact on Soil and Ground Water Quality**

The significance of the impacts on soil and ground water quality during the operational processes is as follow:

Anticipated Impact	Sources	Magnitude	Duration	Extend (Area)	Probability	Total	Category
Soil and Ground Water Pollution	Wasted crab shells	4	4	2	4	40	Moderate Significant (C)
	Domestic solid waste	2	4	1	4	28	Low Impact (U)

**Consideration of Mitigation Requirement for Soil and Ground Water Quality**

Intensity of mitigation measures for soil and ground water environment during operation phase according to the public concerns and impact evaluation are as follow:

Parameters	Impact Rating	Public Concern through Public consultation Processes	Mitigation requirement by impact evaluation	Mitigation Intensity	Responsibility
By-product from farming	Moderate Significant (C)	No	Yes	Slight	PPT
Domestic solid waste	Low Impact (U)	No	Yes	Slight	PPT

**Mitigation Measures for Impacts on Soil and Groundwater Environment during Operation Phase**

Mitigation measures for impacts on soil and groundwater qualities will be as follow:

***(a) Mitigation Measures for Wasted Crab Shells***

At present, the wasted crab shells are used as landfill. The crustacean shells of seed crabs contain 20-50 percent calcium carbonate, 20-40 percent protein and 15-40 percent chitin. If possible, they can also be used as organic fertilizers to increase plant growth and animal feed. The presence of chitin helps to increase in disease resistance of plants, maturation, color and size of leaf and fruits.

***(b) Mitigation Measures for Domestic Waste***

Recyclable process wastes are recycled. Domestic wastes will be collected in separate bins and empty on day-to-day basis to avoid any undesirable working condition and environmental impacts. Based on the different waste types, these solid wastes will be collected and segregated in their dedicated rubbish bins, and regular and proper disposal will be done in accordance with Kyunsu Township Municipal guidelines. The philosophy of solid waste management will be to encourage the four R (4R) of waste i.e. waste reduction, reuse, recycling, and recovery (materials & energy). Impacts on domestic solid waste will be reduced by the segregation, storage at source and collection of the waste management system.

***Segregation and Storage at Source:*** Segregation or sorting waste at its source will be practiced in order to encourage reuse/recycling. With segregation at source, recyclables do not lose their commercial value due to cross contamination. Waste generated at the proposed project will be segregated as inert cum mixed waste, recyclables and waste from changing lubricant oil. The entire waste stream from the complex will be stored and collected separately.

***Collection:*** The recyclables from proposed project will be given to the waste itinerant buyers or rag pickers, whereas segregated bio-degradable waste and inert cum mixed waste will be sent to the nearest landfill site for processing and final disposal.

**Impact Significance on Soil and Groundwater after mitigation measures**

Anticipated Impact	Sources	Magnitude	Duration	Extend (Area)	Probability	Total	Category
Soil and Ground Water Pollution	Wasted crab shells	3	4	2	3	27	Low Impact (U)

### **Residual Impact**

After mitigation measures, the significance level for soil and ground water pollution due to wasted crab shells will remain low.

#### **6.5.4. Impacts on Biodiversity Environment during Operation Phase**

Lighting and noise from operation phase of the proposed project will impact on behavior and movement of animal and aquatic lives nearby. Moreover, soil and water pollution due to solid and liquid wastes disposed will affect on fish diversity and population, mangrove vegetation and other aquatic life forms.

#### **Significance of Impacts on Biodiversity Environment during Operation Phase**

Impact significance was anticipated based on the presence of flora and fauna in and around the project area. According to the analysis, the points are low-significant affected on flora and fauna in this stage. The points are assumed with the respective measuring factors in the left column of the following table.

*Table - Significant Points in the Respective Flora and Fauna Groups through Measuring Factors*

Factors affected on biodiversity	M & P	S & G	T & ST	Amphibians & Reptiles	Fishes	Birds	Small mammal	Benthos & Zooplankton
Area of influence	1-25%	1-25%	1-25%	1-25%	1-25%	1-25%	1-25%	1-25%
percentage of resource affected	1-25%	1-25%	1-25%	1-25%	1-25%	1-25%	1-25%	1-25%
sensitivity of resources	1-25%	1-25%	1-25%	1-25%	1-25%	1-25%	1-25%	1-25%
status of resources	Important	normal	normal	normal	normal	normal	normal	normal
regulatory status	Normal	normal	normal	normal	normal	normal	normal	normal
Social value	Normal	normal	normal	normal	normal	normal	normal	normal

**Notes:** M & P=Mangrove vegetation and phytoplankton, S & G=Shrub vegetation and grass land, T & ST= Tree and small trees, A&R=Amphibian and reptiles,

#### **Significant Points**

Low=1-25%, Moderate= 26-50%, High= 51-75%, Very High=>76%

So, impacts are low status on existing flora and fauna according to result of analysis. Impacts are investigated in site specific (SP) and short term (St) as follow.

**Table - Impact levels, extent and duration on flora and fauna in the proposed project area**

Sr. No	Biological groups	Impact Levels				Extent			Duration		
		L	Mo	H	VH	R	L	Sp	Lt	Mt	St
1	Amphibian and reptiles	✓	-	-	-	-	-	✓	-	-	✓
2	Birds	✓	-	-	-	-	-	✓	-	-	✓
3	Fishes	✓	-	-	-	-	-	✓	-	-	✓
4	Mammals	✓	-	-	-	-	-	✓	-	-	✓
5	Benthos and Zooplankton	✓	-	-	-	-	-	✓	-	-	✓
6	Mangroves & Phytoplankton	✓	-	-	-	-	-	✓	-	-	✓
7	Shrubs & grasses	✓	-	-	-	-	-	✓	-	-	✓
8	Trees & small trees	✓	-	-	-	-	-	✓	-	-	✓

L = Low, Mo = Moderate, H = High, VH = Very High, L = Local, Sp = Site Specific, Lt = Long Term, Mt = Medium Term, St = Short Term (National Planning Commission, GON and IUCN-The World Conservation Union, 1993)

### **Consideration of Mitigation Requirement for Biodiversity Environment during Operation Phase**

Even if the sea water effluent represents by far the largest part of the total liquid pollution, it usually causes no problem, as the polluting components are easily decomposed, as their concentration is normally low and as the receiver conditions in the sea are generally favourable.

### **Mitigation Measures for Impacts on Biodiversity Environment during Operation Phase**

In this stage, the following mitigation will be carried out:

- Removing the rubbishes, plastics and other pollutants from the land of project area,
- Land fill and improve the land form with native vegetation and plants, and
- Replantation inside the project area.

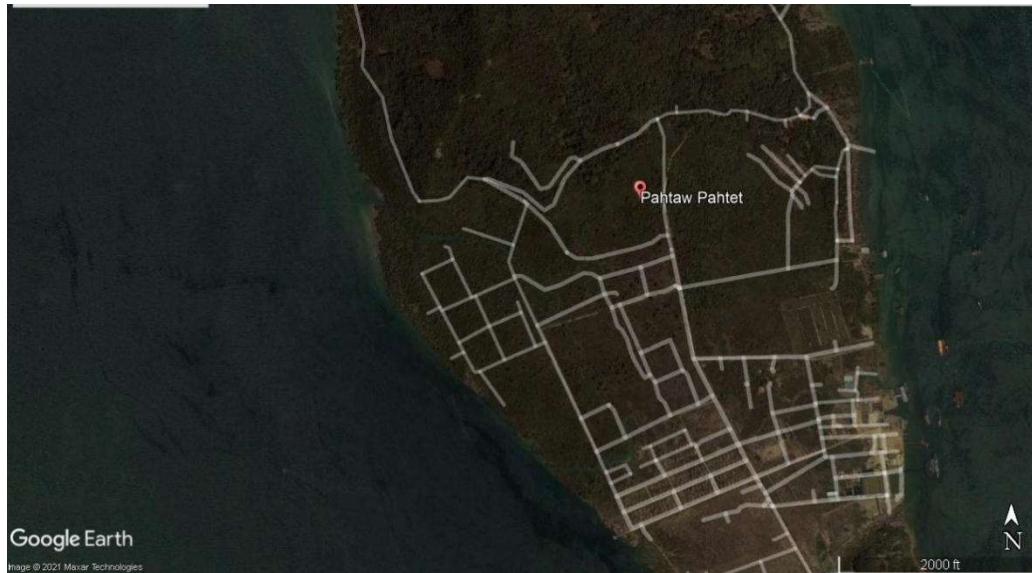
### **6.5.5. Impact on Human Environment during Operation Phase**

Impacts on human environment will include visual impact, socio-economic and health impacts. The anticipated socio-economic and health impacts on human environment during operation phase are as follow:

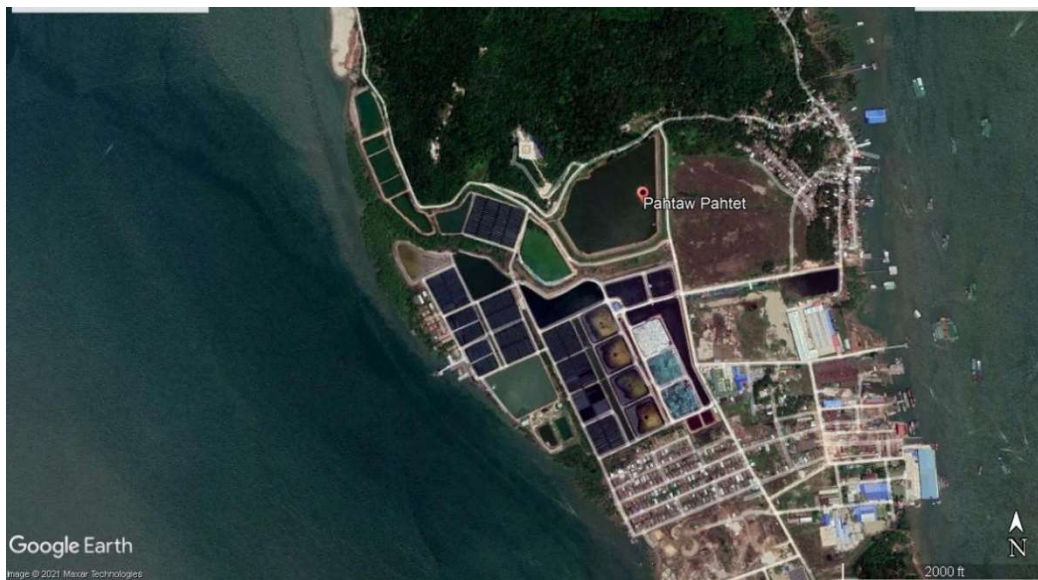


### **6.5.5.1. Visual Impact**

Although the soft-shell crab farming was built in the south-west of the island and it can't be easily visible from the shoreline of Myike Township (nearest urban area), it will still impact on the natural beauty of Pathaw Island as follow:



**Before the Project in Plan View**



**After the Project in Plan View**

As shown in the above figures, the original landscape before the construction of factory is fully covered with trees and the island didn't get the damage of the human effect. The new building and roads along the shoreline of the project will cause caused significant changes visual along the shore of island.

### **Mitigation Measure for Visual Impacts**

The environment near the farming will be kept clean every day and implement suitable waste management system. The solid wastes are disposed of by day to day basis. At the end of the project, the whole area must be replanted and rehabilitated with the native plant species. The area of the proposed project will be managed of safe and clean for every day.

### **6.5.6. Anticipated Socio-economic Impacts during Operation Phase**

During operation phase, the following positive and negative socio-economic impacts will occur.

#### **Positive Socio-economic Impacts during Construction Phase**

The potential positive social impacts during construction phase are as follow:

#### ***Job Creation***

The proposed project will provide about 300 employment opportunities for local people during the operation of the soft-shell crab farming.

#### **Significant of Impact on Job Creation**

Local people in Pahtaw and Pahtet Villages have limited condition for job creation rather than fishing and manufacturing works. Most of the young people are going to Thailand (Boarder City) for seeking job. So, job opportunities for local people in Pathaw and Pahtet Villages can be considered as low due to small number of without enhancement measures as follow

Anticipated Impact	Impact Type	Magnitude	Duration	Extend (Area)	Probability	Total	Category
Potential to Increase in household income	Positive (+)	2	4	3	3	27	Low Impact (U)

#### ***Enhancement Measures for Job Creation***

PPT will ensure job opportunities for local people by the following enhancement measures.

- (a) PPT will ensure to employ local people in the operational process of dried fish and prawn factory, so the jobs will be offered to the local people as much as possible.
- (b) As the population of females is slightly higher than that of males in the nearest villages (most the male partners are going to Thailand (Htee Khee) for jobs), employment opportunities for operational works should also be created to ensure that the local female population should also has equal chance for these opportunities (Gender Equality).

### **Impact Significance of Job Creation after Enhancement Measures**

After enhancement measures for job opportunities, this kind of impact will become moderate after enhancement actions as follow:

Anticipated Impact	Impact Type	Magnitude	Duration	Extend (Area)	Probability	Total	Category
Potential to Increase in household income	Positive (+)	3	4	3	4	40	Moderate Significant (C)

### **Skill Development for Local People**

Local people hired by the proposed project would remain in communities with skills acquired during project operation including woodwork, masonry, handling and disposal of raw materials, and environmental awareness. Communication skills for local people will also improve in office works during operation pahse. This is a positive and long-term socio-economic benefit.

### **6.5.7. General Safety and Health Impacts during Operation Phase**

General safety and health impacts on the employee may include slip, trip and fall during carrying loads and sometimes food poison and other minor health problems can happen while working. All of the workers will suffer headache and sickness due to the inhalation bad smell (odor) from the soft-shell crab farming.

### **Mitigation Measures for Workers' Safety and Health during Operation Phase**

PPT believes that commitment on health and safety of staffs and employees is the most important parameter to make its business with a great success. To avoid or minimize health and safety risks, daily housekeeping and cleaning services around project area and even outdoor greening and landscaping will be carried out regularly. For the health and emergency medical care of all employees, the first aid kits will be kept ready at all public places of the proposed project and a car or boat kept 24-hour standby to send to the nearby hospitals or clinics within the few minutes, in case of injury. PPT will do the following mitigation measures for odor control.

- (a) Workers will be rotated at every 4 hours to reduce inhalation of odor and will be taken a rest in rest room at least 30 minutes.
- (b) PPT will construct workers' rest room with air conditioning system.
- (c) Regular medical check will be provided for all workers at project site quarterly.

### **6.5.8 Impacts of Utility Consumption**

#### ***(a) Water Usage***

Water is the chief source in soft shell crab farming. The proposed project uses a large amount of sea water and a few amounts of fresh water for aeration. The water in the pond is exchanged immediately after the water quality is decreased so it is not periodically. There would be no problem in local water consumption because the proposed project uses water from the reservoir and sea water. Drinking water will be provided by outsource suppliers.

#### ***(b) Energy Required***

The proposed project is intended to get required electricity supply form self-generator. Electric power will be used for the purpose of to run the motors and pumps for pumping water form the sea to the ponds, and to provide lighting. The total estimated demand for electricity will be 50 KVA.

### **Significance of Impact on Utilities Consumption**

The impact significant for utilities consumption will be considered as follow:

Anticipated Impact	Parameters	Magnitude	Duration	Extend (Area)	Probability	Total	Category
High Utilities Consumption	Electricity	4	4	3	4	44	Moderate Significant (C)
	Water	2	4	2	4	32	Moderate Significant (C)

### **Consideration of Mitigation Measures for Utilities Consumption**

Intensity of mitigation measures for high utilities consumption during operation phase according to the public concerns and impact evaluation are as follow:

Parameters	Impact Rating	Public Concern through Public consultation Processes	Mitigation requirement by impact evaluation	Mitigation Intensity	Responsibility
Electricity	Moderate Significant (C)	Yes	Yes	Major	PPT
Water	Moderate Significant (C)	No	Yes	Minor	PPT

### **Mitigation Measures for Impacts of Utilities Consumption**

According to the intensity of impact requirement, there will need mitigation measures for water and electricity consumption as follow:

#### ***(a) Water Consumption***

PPT will need to install water meter to inspect the water usage. Domestic water consumption will be minimized by implementing water efficient fixtures such as 3 liters WC flushing cistern, sensor operated urinals and taps to minimize the wastage of water together with other water conservation measures if feasible. Furthermore, to ensure ongoing water conservation, an employee education and awareness program will be introduced for the employees. Dry type urinals will also be used selectively. The following are specific measures:

- (a) Awareness campaign to disseminate knowledge on strategies and technologies that can be used for water conservation;
- (b) New employees will be issued standard water information packed. The information should include water conservation plans, water conservation methods being adopted in the complex and a list of essential and nonessential water uses;
- (c) Manager of proposed factory shall periodically remind the staff for water conservation efforts; and
- (d) Proper methods of water use will be placed in the toilets and other areas of water consumption.

#### ***(b) Electricity Consumption***

PPT will need to install electricity meter, timers and thermostats, and use LED lights. A reduction in energy consumption is also an important consideration in a pollution prevention program and in lowering the operational cost. There are several methods that can be employed to help conserve electricity, which include:

- (a) Install energy and water meters to measure and control consumption throughout the facility;
- (b) Implementing good housekeeping measures such as turning off equipment and lights when not in use;
- (c) Use LED lights and/or lower wattage lamps;
- (d) Using more efficient equipment when replacing old equipment (such as motors and pumps); and

- (e) Preventative maintenance of operational processes and pipes so as to improve efficiency and minimize losses.

### **Impact Significance on Utility Consumption after Mitigation Measures**

Anticipated Impact	Parameters	Magnitude	Duration	Extend (Area)	Probability	Total	Category
High Utilities Consumption	Electricity	2	4	3	3	27	Low Impact (U)
	Water	2	4	2	3	24	Low Impact (U)

### **Residual Impact**

After mitigation measures, the significance level for utility consumption will remain low so there will be no residual impact.

## **6.6. Anticipated Impacts and Mitigation Measures during Decommissioning Phase**

The decommission of the proposed project will include (1) dismantling of equipment like pumps, filters and electrical equipment, (2) removing rocks and other debris from the bottom of the pond, (3) removing the pond lining, (4) disposal of resulting materials, and (5) filling the hole with a mix of topsoil, or materials such as sand or stone to aid drainage.

### **6.6.1. Impact on Air Environment during Decommissioning Phase**

Impacts on air environment during decommissioning phase will be as follows:

- (a) Fugitive dust generation from transportation and demolition activities;
- (b) Vehicular emissions related to the transportation of personnel and solid construction wastes; and
- (c) Noise from the machineries.

#### **(a) Fugitive Dust and Gaseous Emissions**

Dust will be generated from the vehicular movement. Vehicular emissions from the movement of trucks, vehicles and motorcycles and dust from the ground can occur during the decommissioning phase. The operation of machinery and construction equipment is also likely to generate gaseous emissions. These activities will affect neighborhoods (especially for local residents beside the public road to the project site) though the decommissioning period is not a long term.



***(b) Increased in Noise Level***

Construction noise is expected to generate at the demolition site. The activities that are ear marked to generate noise are loaders, excavators and cranes among others. If most of the construction machineries (generator, trucks, etc.,) are running at the same time, this cumulative noise can increase to 85.9dB (A) at 15m (about 50 feet) distance as follow:

$$Leq = SPL_{site} = 10 \log \left( \frac{10^{8.4} + 10^{9.0} + 10^{8.5}}{4} \right)$$

$$= 85.9 \text{ dBA}$$

***Table - Typical Construction Equipment Noise Emission Levels***

<b>Equipment Type</b>	<b>Noise Level (dBA at 50 Feet)</b>
Truck (Medium and Heavy)	84
Welding	90
Generator	<85

*Source: EPA, 1 971; "Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances". NTID 300.1*

***Significance of Impacts on Air Environment during Decommissioning Phase***

The significance of impacts on air environment during decommissioning phase will be as follow:

Anticipated Impact	Sources	Magnitude	Duration	Extend (Area)	Probability	Total	Category
Gaseous emission	Decommissioning activities	2	1	2	3	15	Low Impact (U)
Noise	Noise from construction equipment	2	1	1	4	16	Low Impact (U)

***Consideration of Mitigation Measures Requirement for Air Environment during Decommissioning Phase***

The requirement of mitigation measures for air environment according to the consideration of impact rating and public concerns are as follow:

No.	Parameters	Receptor	Impact Rating	Public Concern through Public Consultation Processes	Mitigation Requirement by Impact Evaluation	Mitigation Scale	Responsibility
1.	Gaseous emissions	Local communities	Low Impact (U)	No	Yes	Minor	Construction service provider(s)
2.	Noise	Workers at site	Low Impact (U)	No	Yes	Minor	Construction service providers

### **Mitigation Measures for Air Environment during Decommissioning Phase**

PPT will do the following mitigation measures of air environment during decommissioning phase.

#### ***(a) Mitigation Measures for Gaseous Emissions***

Certain mitigation measures will be adopted to limit atmospheric impacts to as great an extent as possible during decommissioning phase. For instance, the transportation of personnel and materials will be scheduled such as to avoid periods of peak flow where congested conditions are more likely, and to reduce the overall number of vehicular movements. In addition to careful traffic management, close adherence to the recommended maintenance regime will be applied to both on-site and off-site vehicles.

Reduction of SO<sub>2</sub> and CO Emissions: Low sulphur content and good engine condition vehicles will be used.

#### ***(b) Mitigation Measures for Noise***

For minor mitigation measures, it is necessary to avoid the following activities:

- running construction machineries at the same time; and
- working at night.

### **6.6.2. Impacts on Surface Water Environment during Decommissioning Phase**

Waste generated from demolition activities will have potential to surface water pollution and will include construction debris and wastes from the workers. Drainage and seepage from construction waste dumping site during decommissioning phase will have impact on surface water pollution. Mobilization and transport of soil materials may result in impacts to the water quality in nearest sea water. It will be more evidence in rainy seasons (June to September).

***(a) Wastes from Demolition***

Waste materials (pallets, steel structure off-cuts, and concrete waste) will be produced during this decommissioning phase. If those wastes are not properly managed, there will have potential to impacts on surface water pollutions.

***(b) Oil and Lubricants***

Fuel oil from trucks and cars, and lubricants and grease from machineries can leak during decommissioning phase. This leakage can cause surface water pollution for a while.

***(c) Domestic Wastes from Workers***

A small amount of domestic waste will be generated from demolition workforce. The establishment of labour camps will also affect on environment through improper waste (solid & garbage /sewage) disposal.

**Significance of Impacts on Surface Water Environment**

Impact on water environment during decommissioning phase will not be significant since the volume of nearest surface water body, sea water body, is very much greater than the volume of wastewater disposed from the site. Moreover, soil type within the project site is sandy with high porosity.

Anticipated Impacts	Sources	Magnitude	Duration	Extend (Area)	Probability	Total	Category
Surface Water Pollution	Construction Debris	2	1	2	2	10	No Impact (-)
	Oil and Lubricants	2	1	2	2	10	No Impact (-)
	Domestic Wastes	2	1	2	2	10	No Impact (-)

**Consideration of Mitigation Measures Requirement for Surface Water Environment**

The intensity of mitigation measures for surface water environment according to the consideration of impact rating and public concerns are as follow:

No.	Parameters	Impact Rating	Public Concern through Public Consultation Processes	Mitigation Requirement by Impact Evaluation	Required Mitigation Scale	Responsibility
1.	Construction Debris	No Impact (-)	No	Yes	Minor	Construction Service Provider(s)
2.	Oil and Lubricants	No Impact (-)	No	Yes	Minor	Construction Service Provider(s)
3.	Domestic Wastes	No Impact (-)	No	Yes	Minor	Construction Service Provider(s)

### **Mitigation Measures for Impacts on Surface Water Environment**

PPT will conduct the following measures to prevent surface water pollution during decommissioning.

#### ***(a) Wastes from Demolition***

The demolition activities should not start during monsoon season. All stacking and loading area will be provided with proper drains to prevent run off from the site to enter any water body. The wastes must be disposed in accordance with the rules and regulations from CDC (Myeik).

#### ***(b) Oil and Lubricants***

Any leakage of oil and lubricants from vehicles and machineries used in decommissioning phase should be avoided. Regular maintenance of those machineries should be conducted.

#### ***(c) Domestic Wastes from Workers***

Waste water channels from the site should be connected to the septic tank during the decommissioning to prevent wastewater from entering the nearest water bodies.

### **6.6.3. Impacts on Soil and Ground Water Environment during Decommissioning Phase**

Impact of soil and groundwater environment during decommissioning phase will be leakage of fuel oil, leakage of lubricants and disposal of wastes.

#### ***(a) Leakage of Fuel Oil and Lubricants***

Potential contamination of soil and groundwater during decommissioning phase could possibly occur as a result of leaking of fuel and lubricants from machineries and/or temporary on-site

storage facilities. Handling of fuel oil, other oil products, chemicals and lubricants may constitute a risk for pollution of soil and ground water.

***(b) Demolition Wastes and Domestic Wastes***

During decommissioning phase, there will have potential to soil contamination and ground water pollution if the solid wastes from demolition activities are not properly disposed. Moreover, seepage and drainage from waste dump site will also impact on soil and ground water qualities.

**Significance of Impacts on Soil and Ground Water Environment**

Wastes produced from the demolition have potential to impacts on soil and groundwater in project site. This will be minor, temporary low possibility due to the decommissioning period, and the significance of impacts is shown in the following table:

Anticipated Impact	Sources	Magnitude	Duration	Extend (Area)	Probability	Total	Category
Soil and Ground Water Pollution	Leakage of fuel oil and lubricants	2	1	1	2	8	No Impact (-)
	Demolition wastes and Domestic Wastes	2	1	2	2	10	No Impact (-)

**Consideration of Mitigation Measures Requirement for Soil and Ground Water Quality**

The requirement of mitigation measures for soil and ground water environment according to the consideration of impact rating and public concerns are as follow:

No.	Parameters	Impact Rating	Public Concern through Public Consultation Processes	Mitigation Requirement by impact evaluation	Required Mitigation Scale	Responsibility
1.	Leakage of fuel oil and lubricants	No Impact (-)	No	Yes	Minor	Construction Service Providers
2.	Demolition wastes and domestic wastes	No Impact (-)	No	Yes	Minor	Construction Service Providers

### **Mitigation Measures for Impacts on Soil and Ground Water Environment**

According to the above consideration for required mitigation measures, there will be minor mitigation measures such as disposed of solid wastes according to the rules and regulations of CDC (Myeik) and/or rules to reduce impacts of solid wastes during decommissioning phase. Care should be taken not to leak during the handling of fuel oil and lubricants. All of the fuel tank and lubricants container have to store over concrete floor or impermeable pad. Every machinery used in decommissioning phase should be in good conditions.



## 7. ANTICIPATED RESIDUAL AND CUMULATIVE IMPACTS

### 7.1 Cumulative Impacts and Mitigation Measures

#### (a) Depletion of Mangrove Area as Cumulative Impact

Although the project will merely use 80 acres, there will have deforestation and depletion of mangrove area as cumulative impact because there already had other industries and will be used 70.63 acres of the whole island (at least 25% of the whole project area). Therefore, a lot of forest areas will have to be removed for other industrial purposes. According to those actions, deforestation and depletion of mangrove area will emerge as cumulative impacts. The gradually changes of forest area near the proposed project is shown in the following figures.



Figure 7.1 - Forest Area before the Project in 2001



Figure 7.2 - Forest Area after the Projects in 2019

***(b) Surface Water Pollutions Cumulative Impact***

Although there will have very little impact on surface water environment during operation phase (the volume of waste water compared to the volume of sea water). Waste water from various industries in Pathaw and Pahtet Islands will be impact on surface water quality (sea water quality) around the islands.

***(c) Soil Contamination as Cumulative Impacts***

Solid wastes generate from various industries at Pathaw and Pahtet Islands will be combined as cumulative impact for soil contamination if they are not properly disposed.

***(d) Odor Emissions as Cumulative Impacts***

As there will have another odor emission source such as dried fish factory and other sea food production factories, odor will be impact as cumulative impact.

***(e) Visual Impact as Cumulative Impact***

All of the factories located in Phathaw-Pahtet Island will need to cut trees and mangrove and so there will have impacts on visual as cumulative in both plan view and side view from the sea.

**Mitigation Measures for Cumulative Impacts**

***(a) Mitigation Measures for Deforestation***

PPT will give attention about deforestation of the whole Pahtaw-Pahtet Island. It needs to implement forest plantation as 30% of the area that developer used for the project in the island.

***(b) Mitigation Measures for Wastewater***

PPT will implement wastewater treatment system not only for the soft-shell crab farming but also for the other factories located in Pathaw-Pahtet Island.

***(c) Mitigation Measures for Odor Emissions***

According to the assessment, the seasonal wind direction of the proposed project is from North-West to South-East. So, PPT will plant native tree species to prevent odor and gas emission along the shore line of the island. The following figure shows the proper location for tree plantation to reduce Odor to nearest local residents along the shoreline.



**Figure 7.3 – Suggestion of Tree Plantation Area for Odor Emission**

#### ***(e) Mitigation Measures for Visual Impacts***

Visual impacts will be prevented during the planning process for the proposed project and managed during operations through the installation of natural visual barriers such as vegetation. Landscape management and site restoration plans will be in place with recommended mitigation measures such as replacement planting, and vegetation barriers. The location and color of bulk storage facilities will be selected with consideration of visual impacts.

#### **7.2. Anticipated Residual Impacts and Mitigation Measures**

According to the impact examination, all of the environmental impacts related to pre-construction, construction, operation and decommissioning phases can be reduced by proper mitigation measures. However, odor from the soft-shell crab farming will still leave as residual impact inside acceptable levels after mitigation measures.

#### **Mitigation Measures for Residual Impacts**

The residual impact will be controlled by plantation (greenbelt development). Plants can serve as a sink for noise, gaseous pollutants and reduce the flow of dust and so green belt will be

considered as compensatory plantation for residual impact of dust, noise and gaseous emissions.

The following are the advantages of greenbelt development:

- (a) Green belts insure a minimum distance between the industrial sources of pollution and the receptors/ residential areas, prone to the health hazards of industrial pollution.
- (b) Green belts can absorb noise caused by the industry.
- (c) Trees not only assimilate carbon dioxide and release oxygen but also play an important role in trapping some obnoxious gases and particulate matters in the air. Hence, green belt functions both as filter and sink for contaminants.
- (d) Green belts can improve the local microclimate. These occur mainly through their influence on wind, temperature and humidity.
- (e) Green belts provide picnic spot and recreation grounds.
- (f) In the dryer part of the area, the trees reduce the effect of dryness, desiccate hot wind, and increase the availability of soil moisture.

### **Greenbelt Development for the Proposed Project**

#### ***(a) Plant Selection for Proposed Project***

Any particular species of plant which may be needed in that area from the point of view of soil conservation, moisture conservation, pollution control, dust control, wildlife habitat etc. may also be given preference while deciding the species to be included in the greenbelt. The following aspects are important while selecting the plant species:

- (a) The species will be fast growing and having thick canopy cover,
- (b) It will be perennial and evergreen and should have large area index,
- (c) It will be indigenous and suitable to local climatic conditions,
- (d) It will be efficient in absorbing pollutants without significant effects on plant growth, and
- (e) It will be fruit yielding trees, if possible, especially in wasteland areas.

The appropriate plants for soft-shell crab farming are Yae-Ta-Ma (*Polyalthislongifoia*), Kha-Yae (*Mimusops elengi L.*) and Mango (*Mangifera indica*). All of these species have relatively high noise and gas absorbance index and can be available in local market. Heat tolerance species will be planted due to the intense heat and recommended heat tolerance species is Banda (*Terminalia catappa L.*).

***(b) Proposed Layout Plan for Greenbelt Development***

Under plantation programme, it will be developed plantation all along the boundary of project area and all free space around the project site. Development of lawns, small ornamental flowering plants, seasonal plants etc. will not be counted as a part of greenbelt in the conservation plan. Plantations will be done at a spacing of 5 x 5 m of at least two rows in zip-zap shape. The efforts to improve the survival of the saplings and their healthy growth will be taken up like watering, fencing, keeping watch and ward and seeking guidance from the Forest Department (Kyunsu/Myeik) and Environmental Conservation Department (Myeik). The detailed plan for greenbelt development for at least five years will be taken guidelines from Forest Department (Myeik). The following figure shows the conceptual plan for green belt development.





**Figure 7.4 - Conceptual Layout Plan for Green Belt Development**



### **7.3. Medical Checkup Program for Cummulative and Residual Impacts**

Regularly medical checkup for short and long terms effect of gaseous emissions with the cooperation with Department of Public Health (Kyun Su) will conduct regularly for workers and nearest local residents as part of the compensation program for residual impacts.

## **8. ENVIRONMENTAL MANAGEMENT PLAN (EMP)**

In order to manage the physical, biological and sociological impacts identified in the impact assessment, Pyi Phyto Tun International Company Limited (PPT) has committed to implement an environmental management plan of the project (EMP). This management plan will form the basis for the development of an integrated management system for environmental and community issues. EMP is a site-specific plan developed to ensure that the project is implemented in an environmentally sustainable manner where all contractors and subcontractors, including consultants, understand the potential environmental impacts arising from the proposed project and take appropriate actions to properly manage that risk. EMP also ensures the project implementation is carried out in accordance with the design by taking appropriate mitigation actions to reduce adverse environmental impacts during its life cycle. EMP for proposed factory will include the following essential parts.

- (a) Environmental Management and Monitoring Plan;
- (b) Disaster Management Plan;
- (c) Odor Management Plan;
- (d) Waste Management Plan;
- (e) Traffic Management Plan
- (f) Occupational Health and Safety Plan;
- (g) Plant Restoration Plan; and
- (h) Community Development Plan.

### **8.1 Environmental Management Plan**

Detailed of environmental impacts and mitigation measures during pre-construction phase, construction phase, operation phase and decommissioning phase were described in Section 6. This chapter will only describe summary of environmental impacts and mitigation measures in all phases as shown in the following table. The following table shows estimated cost for mitigation measures for anticipated impacts in all phases.

**Table 8.1 – Environmental Management Plan**

Anticipated Impacts	Source	Mitigation Measures	Intensity of Mitigation	Responsibility	Estimated Cost/Frequency
<b>Pre-Construction Phase</b>					
Impacts on Air Environment	Fugitive dust emissions	-Watering the site regularly by using handheld spray to suppress dust emissions during truck movement; -Prohibiting the burning of vegetation or waste on site	Minor	Pre-construction services provider	Cost of handheld spray = 20000 kyats/one
	Gaseous emission	- Use machineries with good engine with low sulphur content fuel	Minor	Pre-construction services provider	-
	Noise level in dB(A)	- Use sound proof machines	Minor	Pre-construction services provider	-
Impacts on Surface Water Environment	- Soil erosion and sedimentation of earth working activities - Improper handling of fuel oil and lubricant	- Avoid leakage of oil & lubricant, maintenance of machines. - limit unnecessary earthworks	Minor	Pre-construction services provider	-
Impacts on Soil and Ground Water Environment	Potential to soil contamination	Proper waste management system, Reuse earth materials removed as bottom layer of the ponds	Minor	Pre-construction services provider	-
	Potential to ground water pollution	Dispose solid wastes according to CDC (Myeik) and CDC (Kyunsu)	Minor	Pre-construction services provider	-
Impacts on Biodiversity	Impacts on flora diversity	Avoid tree cutting as much as possible and replanting the trees	Minor	Pre-construction services provider	Cost of replanting trees cannot be identified accurately.
	Impacts on fauna diversity	Avoid working at night	Minor	Pre-construction services provider	-
	Impacts on aquatic lives	Raise environmental awareness to workers	Minor	Pre-construction services provider	Estimated cost for holding awareness environmental program = 200000 kyats

Impacts on Socio-Economic Environment	Potential to Increase in household income	Job creation	Minor	Pre-construction services provider	-
<b>Construction Phase</b>					
Impacts on Air Environment	Dust generation	- Water spraying of or covering all exposed areas and access roads;	Minor	Construction services provider	Estimated cost of petrol used in vehicles to spray access roads = 10000 kyats/day
	Gaseous emissions	- Regular equipment maintenance, reduce construction time, good engine vehicles will be used.	Minor	Construction services provider	-
	Noise level in dB(A)	- Avoid running construction machineries at the same time. - Avoid working at night.	Minor	Construction services provider	-
Impacts on Surface Water Environment	Construction Debris	Temporary settling pond, limit unnecessary earth works, connect wastewater channel to the septic tank	Minor	Construction services provider	Estimated cost for building sedimentation pond & septic tank = 2,000,000 kyats
	Oil and Grease	Avoid any leakage of oil and lubricant	Minor	Construction services provider	-
	Domestic Wastes	Use proper waste management system	Minor	Construction services provider	-
Impacts on Soil and Ground Water Environment	Leakage of fuel oil and lubricants	- Care should be taken not to leak during the handling of fuel oil and lubricants - Store over concrete floor or impermeable pad	Minor	Construction services provider	-
	Construction debris and domestic Wastes	Solid wastes according to the rules and regulations of CDC (Kyunsu)	Minor	Construction services provider	-
Impacts on Biodiversity	Cutting of trees	- Avoid tree cutting as much as possible	Minor	Construction services provider	-
	Cutting of trees, wastes and noise	Avoid working at night Dispose wastes properly	Minor	Construction services provider	Estimated cost = 50000 kyats/time

Impacts on Socio-Economic Environment	(a) Job Creation	Unskilled and semi-skilled job opportunities should be offered to the locals as much as possible	-	Construction services provider	-
	(b) Skill development for local people	Providing training programs	-	Construction services provider	Estimated cost for holding training programs = 500,000 kyats/program
	(c) Impacts Associated with Population Influx	Population influx can be minimized by the use of labor force	-	Construction services provider	-
	Health Impacts (a) Air-borne diseases	Providing medical check-up for workers who are susceptible of air-borne diseases	Minor	Construction services provider	5000 kyats/time
	(b) Dust emission exposing locals and workers with bronchial and other respiratory tract diseases	- Spraying water - Restricting vehicle speeds	Minor	Construction services provider	The cost has been already mentioned above
	(c) Water borne diseases	- Avoid construction during rainy seasons - All areas of fuel storage will be banned to prevent hydrocarbon pollution of surface water	Major	Construction services provider	-
	(d) Infection from mosquito	- Avoid construction during rainy season - Proper temporary or permanent drainage system will be compensated	Moderate	Construction services provider	-
	(e) Sexually transmitted infections	Provide information and education about safe sex and implement HIV control program for migrant construction workers	Minor	Construction services provider	5000 kyats/time
(f) Health impact related to increase in noise level such as hearing loss, impairment and stress	- Reduce speed limits for trucks in project area to reduce noise level - Avoid working at night	Minor	Construction services provider	-	

Operation Phase					
Impacts on Air Environment	Vehicular emissions and dust	<ul style="list-style-type: none"> <li>- Use good engine condition</li> <li>- Conduct regular engine check and maintenance</li> <li>- Spraying water</li> </ul>	Minor	EMMT	Cost of spraying water is already mentioned above. If spraying water is in site, handheld spray will be used and if it is to be sprayed on road during transportation, petrol will be used to run the vehicles. Overall cost cannot be identified accurately.
	Odor	<ul style="list-style-type: none"> <li>- Immediately dispose of the decayed crabs after the working shift is done</li> <li>- Remove leftover food materials</li> <li>- Empty the bins containing dead crabs from the processing area routinely</li> <li>- Place the dead crabs in the closed container from the processing to the dumping site</li> </ul>	Moderate	EMMT	-
	Noise	<ul style="list-style-type: none"> <li>- Installation of sound suppressive devices on motors and pumps</li> </ul>	Moderate	EMMT	Estimated cost of sound suppressive devices installing = 600,000 kyats
Impacts on Surface Water Environment	Wastewater discharge	<ul style="list-style-type: none"> <li>- Sedimentation</li> <li>- Screens should be mounted at the point of the discharge to the sea water</li> <li>- Liquid effluents arising from operations will be treated to the applicable EQG guideline prior to discharge</li> </ul>	Moderate	EMMT	Estimated cost of sedimentation pond has been mentioned above.
	Wasted crab shells	<ul style="list-style-type: none"> <li>- Wasted crab shells are used as landfill</li> </ul>	Major	EMMT	-



Impacts on Soil and Ground Water Environment	Domestic solid waste	Segregation, storage at source and collection of the waste management system	Minor	EMMT	-
Impacts on Biodiversity	Impacts on fauna diversity	Landfill and improve the land forms with native vegetation and plants	Minor	EMMT	100000 kyats
	Impact on flora diversity	Proper waste management system	Minor	EMMT	100000 kyats
Impacts on Socio-Economic	Visual Impact	- Keep clean the area near the farming every day and implement suitable waste management system.	Minor	EMMT	-
	Job creation and skill development	- 300 employment opportunities for local people - Skill development for the local people	Moderate	EMMT	-
	General health and safety impacts	- First aid kits will be kept ready at all public places - A car or boat kept 24-hour standby to send to the nearby hospitals or clinics within the few minutes, in case of injury	Minor	EMMT	Estimated cost of first aid kit = 50000 kyats/kit
Utilities Consumption	Electricity	Install energy and water meters, Use LED lights, Installation of timers and thermostats,	Major	EMMT	-
	Domestic water	Implementing water efficient fixtures, Awareness campaign, Proper methods of water use	Minor	EMMT	-
<b>Decommissioning Phase</b>					
Impacts on Air Environment	Fugitive Dust generation	Spraying water	Minor	EMMT	The estimated cost has been already mentioned above.
	Gaseous emissions	Use machineries with good engine with low sulphur content fuel	Minor	EMMT	-
	Noise level in dB(A)	Avoid working at night	Minor	EMMT	-

Impacts on Surface Water	Wastes from demolition	- Avoid doing demolition activities during monsoon season	Minor	EMMT	-
	Oil and Lubricants	- Avoid any leakage of oil and lubricant - Check machineries maintenance on regular basis	Minor	EMMT	-
	Domestic wastes from workers	- Connect wastewater channel to the septic tank	Minor	EMMT	The estimated cost has been already mentioned above.
Impacts on Soil and Ground Water	Leakage of fuel oil and lubricants	- Store fuel tank and lubricant container over concrete floors - Use machinery of good condition and check maintenance	Minor	EMMT	-
	Demolition wastes and domestic wastes	Waste disposal according to the rule and regulations of CDC (Mawlamyine), administrative office of industrial zone	Minor	EMMT	-
<b>Total Estimated Cost = 5,450,000 kyats</b>					

## **8.2. Environmental Monitoring Plan**

The parameters base on EMP to be monitored; location of the monitoring sites; frequency and duration of monitoring, responsibilities and estimated cost for each of the monitoring parameters are presented in the following table.

**Table 8.2 - Environmental Monitoring Plan**

Discharge Source	Parameter	Monitoring Frequency	Proposed Monitoring Locations	Responsibility	Estimated Cost/Frequency	Available Third-Party Agency
<b>Pre-Construction Phase (3 months)</b>						
Air Pollution	PM <sub>10</sub> , PM <sub>2.5</sub> , CO, CO <sub>2</sub> , NO <sub>2</sub> , SO <sub>2</sub>	Once	One monitoring point at nearest resident	EMM Team	100000 kyats	Every Third-Party Monitoring Agency
Noise	Noise level in dB(A)	Once	One monitoring point at nearest resident	EMM Team	50000 kyats	Every Third-Party Monitoring Agency
Water Quality	Ph, Colour, Turbidity, Suspended Solid, Oil and Grease	Once	Two monitoring points at seawater and tube well near the project	EMM Team	100000 kyats	-
<b>Construction Phase (1 year)</b>						
Air Pollution	PM <sub>10</sub> , PM <sub>2.5</sub> , CO, CO <sub>2</sub> , NO <sub>2</sub> , SO <sub>2</sub>	Once	One monitoring point at nearest resident	EMM Team	100000 kyats	Every Third-Party Monitoring Agency
Noise	Noise level in dB(A)	Once	One monitoring point at nearest resident	EMM Team	50000 kyats	Every Third-Party Monitoring Agency
Water Quality	Ph, Colour, Turbidity, Suspended Solid, Oil and Grease	Once	Two monitoring points at seawater and tube well near the project	EMM Team	100000 kyats	-
<b>Operation Phase (1 year)</b>						
Odor	Ammonia, Amines and amides and Organic and inorganic sulphides including mercaptans and hydrogen sulphide (as total)	Everyday	At project site At nearest residents	EMM Team	With own gas detector (300000 kyats)	-
Noise	Noise Level Meter	Monthly	One point at the entrance of the project (as receptor)	EMM Team	50000 kyats	Every Third-Party Monitoring Agency

Water Quality (Effluent Level)	pH, Biological Oxygen Demand (BOD), Active ingredients/Antibiotics , Chemical Oxygen Demand(COD), Temperature increase, Total Suspended Solids, Total Coliform Bacteria, Total Nitrogen, Total phosphorus, and Oil and Grease	Monthly	Wastewater from soft shell crab ponds	EMM Team	100000 kyats	-
<b>Overall Estimated Cost = 2,600,000 kyats</b>						

Note: If monitoring results show constantly (3 consecutive years) and significantly (e.g. less than 75 percent) better than the required levels, frequency of monitoring can be reduced (IFC, World Bank, 2007)

### **8.3. Management and Monitoring Sub-Plans**

#### **8.3.1. Environmental Management and Monitoring Plan**

The purpose of environmental monitoring is to evaluate the effectiveness of implementation of Environmental Management Plan (EMP) by Environmental Management and Monitoring Team (EMMT) in order to periodically monitor the important environmental parameters within the impact area, so that any adverse effects are detected and timely action can be taken. Main objectives of environment monitoring plan include:

- (1) Identify all environment changes which may cause adverse effects on environment by the project implementation;
- (2) Monitor discharge sources (gas emission, waste water and solid waste) and operation of environmental protection equipment in order to ensure that these activities will comply with legislative requirements;
- (3) Check monitoring process and inspect installation system and equipment in respect of pollution prevention and control;
- (4) Prevent potential incidents;
- (5) Propose appropriate environment protection measures based on results of environmental monitoring;
- (6) Overcome and repair all weak-points based on results of environment monitoring program.

##### **8.3.1.1. Environmental Management Team**

Apart from having an Environmental Management Plan, it is necessary to have a permanent staff charged with the task of ensuring its effective implementation of mitigation measures. PPT will organize the environmental management team for environmental management during construction and operation phases. The environmental officer or environmental coordinator will have to be fully responsible for environmental affair and environmental management. The following management team will be organized for the proposed factory.

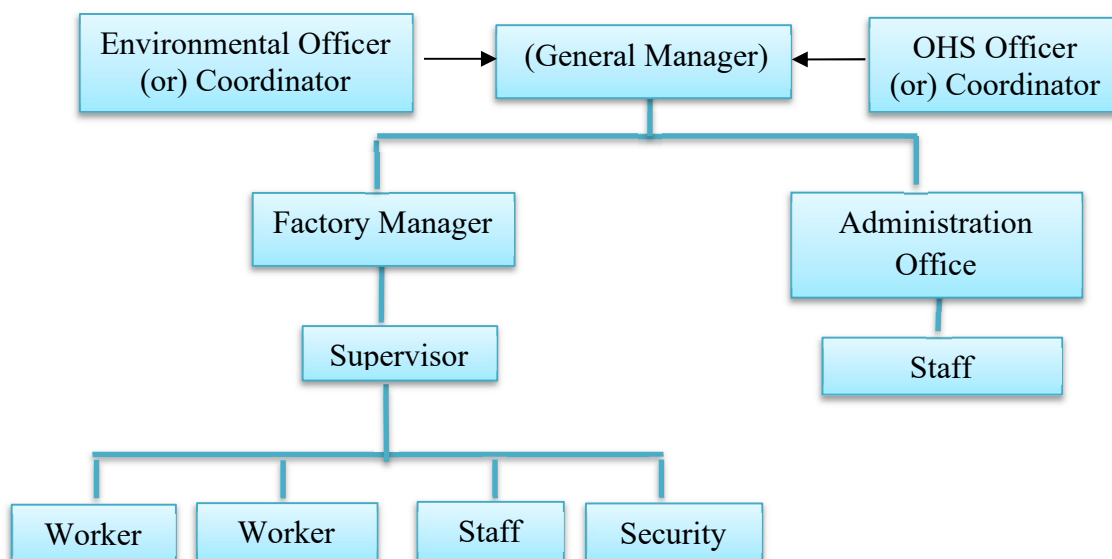
***Table 8.3 - Environmental Monitoring Team for Soft Shell Crab Farming***

<b>No.</b>	<b>Group Member</b>	<b>Quantity</b>	<b>Remark</b>
1.	Environmental Officer (or) Coordinator	1	To be appointed
2.	Occupational Health and Safety Officer (or) Coordinator	1	To be appointed
3.	Factory Manager	1	Appointed



4.	Supervisor	1	Appointed
5.	Helpers	2	Appointed

According to the above table, PPT will need to be reorganized the current organization structure of as follow:



*Environmental Management Team for Soft Shell Crab Farming*

According to the above table, PPT will assign environmental officer (or) coordinator and occupational health and safety officer (or) coordinator with the following responsibilities:

***(a) Environmental Officer***

PPT will be appointed environmental officer not only for soft shell crab farming but also for all the factories in Pathaw-Pahtat Isands. The major duties and responsibilities of the environmental officer or person-in-charge for environmental monitoring of proposed project will be as given below:

- (a) To implement the environmental management plan,
- (b) To assure regulatory compliance with all relevant rules and regulations,
- (c) To ensure regular operation and maintenance of pollution control devices,
- (d) To minimize environmental impacts of operations by strict adherence to the EMP.
- (e) To initiate environmental monitoring as per approved schedule.
- (f) Review and interpretation of monitored results and corrective measures in case monitored results are above the specified limit,

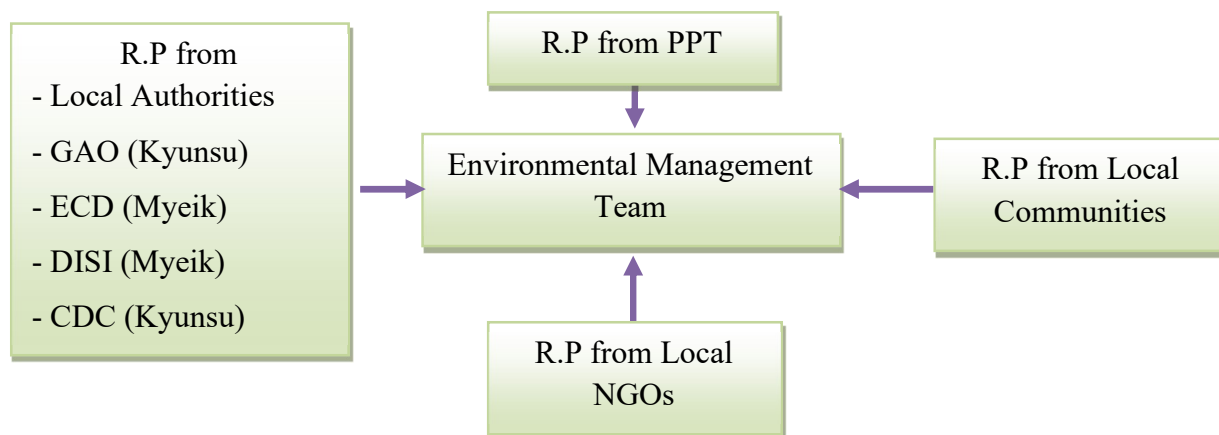
- (g) Maintain documentation of good environmental practices and applicable environmental laws as ready reference,
- (h) Maintain environmental related records,
- (i) Coordination with regulatory agencies, external consultants, monitoring laboratories,
- (j) Maintain of log of public inconvenience and the action taken,
- (k) Ready to solve any complaints from local people about environmental and social issues especially in waste water and traffic.

***(b) OHS Coordinator***

Factory manager will be assigned factory manager of soft-shell crab farming as OHS coordinator. Training program will be completed.

**8.3.1.2. Environmental Monitoring Team**

Environmental monitoring team will be organized representatives from environmental management team, representative persons from General Administrative Office (GAO, Kyunsu/Myeik), Environmental Conservation Department (ECD, Myeik), Directorate of Industrial Supervision and Inspection Department (DISI, Kyunsu/Myeik), City Development Committee (CDC, Kyunsu/Myeik), local communities and local NGOs as proposed as follow:



Note: should participate , R.P = Representative Person

**Environmental Monitoring Team for Monthly Monitoring**

**8.3.1.3. Parameters, Responsibilities, and Estimated Cost for Mitigation and Monitoring**

Monitoring will be conducted daily by the environmental management team of proposed factory. Moreover, monitoring will also be done monthly or quarterly by monitoring team or by the registered third-party monitoring agency. Monitoring frequency will be sufficient to provide representative data for the parameter being monitored. Monitoring data will be

analyzed and reviewed at regular intervals and compared with the operating standards so that any necessary corrective actions can be taken. Monitoring will be carried out throughout all project implementation phases and the responsibilities for monitoring for construction and operation phases.

### **Important Factors for Environmental Monitoring**

The following issues will be considered during the environmental monitoring.

- (a) Monitoring will be done by registered third party monitoring agency or proposed environmental monitoring team of the proposed team. At least three representatives from proposed monitoring team will be participated in every monitoring process.
- (b) By studying the wind rose, the most dominant wind direction and wind speed for every season can be predicted and monitoring for dust, noise and gas emissions will be carried out at that wind direction.

#### **8.3.1.4. Environmental Management Training Program**

Environmental management training program is an important part in EMP. Training and human resource development is an important link to achieve sustainable operation of the facility and environmental management.

##### ***(a) Training Program for Construction Phase***

During construction phase, PPT or construction contractor(s) will ensure that project staffs are trained on labor safety and environment protection during construction phase.

##### ***(b) Training Program for Operation Phase***

In operation phase, all staff of proposed project will be trained on environment safety throughout training courses to be familiar with operation processes and guidelines, fire fighting exercises and practices, etc. Project Management Board will be established and maintain training programs that are regularly updated to help staff at all levels and related functional departments are aware of their responsibility on environment protection. For successful functioning of the project, relevant EMP's will be communicated to the following groups of people:

##### ***Employees***

Employees will be made aware of the importance of safety, waste segregation and storage, and energy conservation. This awareness will be provided through leaflets and periodic in house

meetings. They will be informed about their responsibilities for successful operation of various environmental management schemes inside the premises.

### **Site Staff**

Relevant personnel at site will be trained for:

- (a) Collection, segregation and storage of the solid and waste generated during operation,
- (b) Operation and maintenance of sewage treatment plant and reclamation system,
- (c) Requirements of the emergency response plan in case of an emergency,
- (d) Techniques for waste minimization, water conservation and energy conservation,
- (e) Applicable environmental, health and safety regulations and compliance requirements,
- (f) Functioning of the environmental management system including environmental monitoring, reporting and documentation needs.

### **8.3.1.5. Record Keeping**

Record keeping and reporting of performance is an important management tool for ensuring sustainable operation. Records will be maintained for regulatory, monitoring and operational issues. Typical record keeping requirements for the site is summarized in following table.

**Table 8.4 - Record Keeping Requirements**

<b>Parameter</b>	<b>Particulars</b>
Resources used	- Daily quantity of electrical power consumption through power meter - Daily quantity of seed crabs use - Daily quantity of water use for farming process and domestic use through water meter
Solid waste handling and disposal	- Decayed crabs and wasted crab shells are used as landfill - Daily quantity and management of domestic solid waste from workers' dormitory
Monitoring and survey	-Records of all monitoring carried out as per the finalized monitoring protocol
Complaints from nearest residents	- Records of all complainants about the wastewater and odor from the nearest villages
Employee health and safety record	- Daily record for accidents at the workplace

Others	<ul style="list-style-type: none"><li>- Equipment inspection and calibration records, where applicable</li><li>- Vehicle maintenance and inspection records</li></ul>
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#### **8.3.1.6. Environmental Audits and Corrective Action Plans**

To assess whether the implemented EMP is adequate, PPT will conduct periodic environmental audits. Environmental audit is an independent and objective oriented examination of whether the practice complies with expected standards. Broadly, environmental audit means a check on some aspects of environmental management, and implies some kind of testing and verification. There are two levels of Environmental Audits, i.e. Environmental Impact Audit and Environmental Management Audit. Environmental Impact Audit involves comparing the impacts predicted in an IEE with those that actually occur after implementation of the project while Environmental Management Audit involves checks against adherence to plans, mitigation measures and general compliance of terms and conditions. These audits will be followed by Corrective Action Plans (CAP) to correct various issues identified during the audits.

#### **8.3.1.7. Reporting Monitoring Results**

Results of recorded in files to monitor and audit monitoring will be carried out strictly as required by the related national regulations and the monitoring results of required parameters will be reported biannually to ECD (Myeik), General Administrative Office (GAO, Kynu Su), MOI (Myeik), and Department of Fisheries (Myeik).

### **8.3.2. Disaster Management Plan**

#### **1. Objective**

The overall objective of a disaster management plan is to make use of the combined resources created or available at the site and/or off-site services to achieve the following:

- To minimize the effects the accident on people and property;
- Effect the rescue and medical treatment of casualties;
- Safeguard other people, outside the project boundary
- Evacuate people to safe areas with utmost care and with minimum casualties;
- Inform and collaborate with statutory local and state authorities;
- Initially contain and ultimately bring the incident under control;

- Preserve relevant records and equipment for the subsequent enquiry into the cause and circumstances of the emergency;
- Investigate and take steps to prevent recurrence of similar incidents

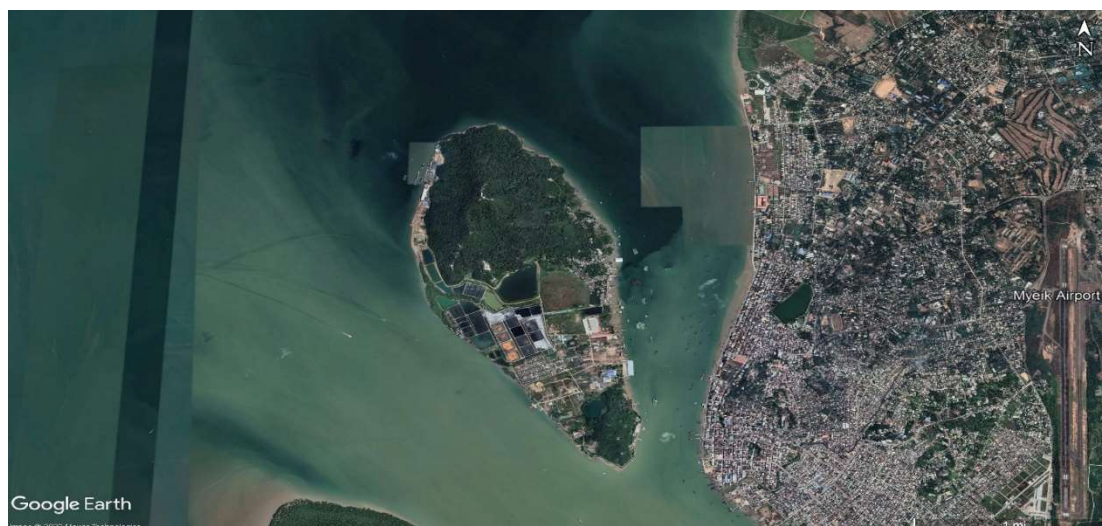
## 2. Legal Requirements

The laws and regulations relevant to the disaster risk and management plan include:

Laws and Regulations	Legal Requirements
<b>Natural Disaster Management Law, 2013</b>	
Section 9 (a)	The project proponent has to follow the National Committee in the case of natural disaster and implementing natural disaster management.
<b>Myanmar Fire Force Law, 2015</b>	
Section 25	The project proponent has to comply according to law no. 25 of Myanmar Fire Force Law by forming the reserve fire brigade and providing fire safety equipment.

## 3. Overview Map

The tidal flood can be occurred near the proposed project area, it should be consicious and thoroughly made any structures that must be resisted the flood. The satellite image of proposed project in shown in the figure below.



**Figure – Proposed Project and Surrounding Environment**

According to the above figure, the proposed project is surrounded by the sea. Dangerous conditions or events that threaten or have the potential for causing injury to life or damage to property or the environment can cause due to the seashore environment. Hazards can be



categorized in various ways, but based on the origin, they worldwide are basically grouped in two broad headings:-

1. Natural Hazards (hazards with meteorological, geological or even biological origin)  
e.g. Tidal Flood, Tsunamis, Cyclone, Lightning strikes etc.
2. Man-made Hazards (hazards with human-caused or technological origin)  
e.g. Fire & Explosions

#### **4.Types of Disasters**

Dangerous conditions or events that threaten or have the potential for causing injury to life or damage to property or the environment is called hazard. Hazards can be categorized in various ways, but based on the origin, they worldwide are basically grouped in two broad headings:-

1. Natural Hazards (hazards with meteorological, geological or even biological origin)  
e.g. Tidal Flood, Tsunamis, Cyclone, Lightning strikes etc.
2. Manmade Hazards (hazards with human-caused or technological origin)  
e.g. Fire & Explosions

#### ***(a) Vulnerability***

Vulnerability may be defined as the probability of exposure of a village, city or a community to a hazard. A society or project may be vulnerable to various hazards to different extents depending upon various reasons including environmental, geographical, social, economic etc.

#### ***(b) Disaster***

A disaster occurs when a hazard such as earthquake, flood or windstorm coincides with a vulnerable situation. It is hence the product of are two main components: Hazard and Vulnerability. A disaster seriously disrupts the normal functioning of a society, causing widespread human, material, economic or environmental losses that exceed the society's capability to cope without external relief.

#### **8.3.2.1. Standard Operating Procedures**

Standard Operating Procedures have been laid down to guide project authorities and staff to be prepared for disasters and act positively in times of disasters. As disasters can be of various types, separate standard operating procedures have been developed for each kind. These

procedures have been prepared with the aim to guide the authorities and staff through the following stages with regards to disaster:

- 1) Precautionary measures
- 2) Disaster Preparedness Onsite
- 3) Disaster Preparedness Offsite
- 4) Emergency response in the event of disaster
- 5) Relief and Rehabilitation
- 6) Evacuation

### **(1) Precautionary Measures**

Precautionary measures for any disaster are to be taken by all the users/visitors of the proposed factory. Hence the measures mentioned below are to be meticulously followed by occupants of the proposed project. To be well informed about such precautions a printed booklet will be kept in each factory.

#### ***(i) Flood Hazard***

The proposed project is situated at the shoreline of the island so that the floods can potential affect for the worse case. Tidal variation at Myeik is relatively low. The tide at the project site will only depend on the situation of the moon (especially in full moon day). Tidal flood is also the potential risk for the proposed project area.

#### ***Mitigation Measure***

- Sewage and storm water systems to be checked at regular intervals for their proper functioning.
- Provision will be made to harvest most of the rain water from the proposed site. This will reduce the water shortage as well as runoff water on the site.

#### ***(ii) Cyclones***

Tanintharyi region has a tropical climate. The region has only slight changes in temperature. Myeik has temperate weather, as it is located in the low latitude zone and near the sea. The proposed project will have potential hazard of cyclone at the start and the end of rainy sesason.

#### ***Mitigation Measure***

Periodical checking of all factory buildings for structural faults and carry out timely repair as to,

- Keep some wooden boards ready so that glass windows can be boarded if needed.

- Periodical removal of dead wood or dying trees close to the villas to be undertaken.
- Hurricane lanterns filled with kerosene, battery operated torches and enough dry cells will always be made available during emergencies.
- Keep some extra batteries for transistors.
- Keep some dry non-perishable food always ready for emergency use.
- Periodic checking of all buildings for structural faults, to secure loose tiles, and to carry out timely repairs, will be resorted.

### *(iii) Tsunamis*

Tsunamis are caused by earthquakes or other seismic eruptions on ground of an oceans and can cause massive tidal waves, which run with enormous force on land, causing great devastation. The proposed factory is located on Pahtaw-Pahtet Island, one of the main islands in Myeik Archipelogo, situated near Myeik Township and connected with Andamen Sea. Thus, this area is comparatively more vulnerable to the tsunami hazard.

### *Mitigation Measure for Tsunami*

Although a tsunami cannot be prevented, the effect of a tsunami can be reduced through community preparedness, timely warnings, and effective response. In general, if you think a tsunami may be coming, the ground shakes under your feet or you hear there is a warning, tell your relatives and friends, and move quickly to higher ground.

**Actions Before:** Determine Risk, Increase Knowledge, Safeguard, Plan

General All-Hazard Actions:

- Determine the disaster risks in your locale and the hazards that accompany them.
- Increase your knowledge about the emergency warning signals and alert notifications used in your community.
- Instruct family members how to shut off water, gas and electricity to your house.
- Make the necessary property preparations to reduce the damage from the hazard.
- Acquire a backup generator in case of a prolonged power failure.
- Check into insurance (property, health, life, and hazard type).
- Make the necessary financial arrangements in case of a sudden evacuation and power outage that shuts down local ATMs and banks.
- Organize important documents and records and store them in a portable lock box or safe-deposit box.

- Perform home inventory video taping and store tape in a portable lock box or safe-deposit box.
- Develop an Emergency Communication Plan with evacuation plan and ask an out-of-state person to serve as the "family contact".
- Assemble a shelter-in-place Emergency Supplies Kit.
- Assemble a mobile Emergency Supplies Kit that can serve as a “grab and go” bag.
- Get a family member trained in first aid and CPR.
- Make the necessary preparations and arrangements for pets, seniors, and the disabled.
- Familiarize yourself with the emergency plans of your family member's employment building, school, day care center, or nursing home.

**Hazard Specific Actions:**

- Find out if your house is in danger and know the height of your street above sea level.
- Be familiar with warning signs (earthquakes, ground rumbling, or rapid rise and fall of coastal waters).
- Ensure all family members know how to respond.
- Make evacuation plans with more than one route and pick an elevated inland location.

**Actions During:** Safety Basics, Evacuation, Shelter in Place

- Listen to radio for emergency and evacuation information.
- Climb to higher ground as soon as warning of a tsunami is released.
- Stay away from the beach - if you can see the wave, you are too close to escape it.
- Do not assume that one wave means the danger is over - the next wave may be larger than the first.
- Stay out of the area and do not return until authorities say it is safe to do so.

**Actions After:** Get Disaster Relief, Clean-up, Salvage

- Stay tuned to radio for emergency information.
- Help injured or trapped persons and give first aid where appropriate.
- Do not move seriously injured persons unless they are in immediate danger of further injury.
- Stay out of damaged buildings.
- Enter home with caution, checking for electrical shorts and live wires.
- Do not use appliances or lights until properly checked by an electrician.
- Open windows and doors to help dry the building.

- Shovel mud while it is still moist to give walls and floors an opportunity to dry.
- Check food supplies, throwing out all fresh food that may be contaminated and have tap water tested by local health department.

#### *(iv) Lightning Strikes*

As mentioned above in the cyclone, the proposed project will have the potential hazard as lightning strikes during the raining season.

#### *Mitigation Measure*

If Outdoors

- Seek shelter in a hardtop (metal-bodied) vehicle or solid building but not open structures or tents
- Do not take shelter under trees
- Fishing rods, Umbrellas and other metal rods to be avoided
- Distance should be maintained from fences, metal poles, clotheslines etc.
- If on boat or swimming, one should aim to reach the shore as soon as possible

If Indoors

- Disconnect external aerial and power leads to radios and television sets. Disconnect computers and power leads.
- Draw all curtains and keep clear of windows, electrical appliances, pipes and fixtures (e.g. avoid using bath, shower and electrical equipment's)
- Avoid using telephones, in case of emergency, calls should be brief.
- Avoid touching metal, brick or concrete or tiled floors.

#### *(v) Fire & Explosions hazard*

There will increase in potential to fire and explosion hazard due to the nature of industry. It can cause the fire hazard due to the industry near the project area.



**Figure – Other Industries near the proposed project site**

### ***Mitigation Measures for Fire & Explosions***

- Good house-keeping.
- Compulsory use of ashtrays while smoking.
- Welding /Cutting jobs to be carried out under strict supervision.
- Fire Rescue drills to be carried out at regular intervals.

Since fires of different classes require specific precautionary measures to be taken in each case, precautionary measures to be taken for different classes of fires are listed below.

### ***Precaution Measures for Electrical Fires***

The following basic precautions are recommended:

- Install only appliances that have the label of a recognized testing laboratory.
- Switches and fuses to conform to correct rating of circuit.
- Use only surge protectors or power strips that have internal overload protection and have ISI or BEE label
- Use light bulbs that match the recommended wattage on the lamp or fixture.
- High voltage points and instruments to be secured and labeled prominently.
- Avoid putting cords where they can be damaged or pinched by furniture, under rugs and carpets, or across doorways.
- Replace any electrical tool if it causes even small electrical shocks, over heats, shorts out or gives off smoke or sparks.



- Routinely check your electrical appliances and wiring. Replace all worn, old or damaged appliance cords immediately. Do not try to repair them.
- Electrical work should be done only by a qualified electrician. Call an electrician if you have any of the following:
  - Recurring problems with blowing fuses or tripping circuit breakers
  - A tingling feeling when you touch an electrical appliance
  - Discolored or warm wall outlets or switches
  - A burning smell or rubbery odor coming from an appliance
  - Flickering lights
  - Sparks from a wall outlet
  - Cracked or broken wall outlets
- Keep clothes, curtains, and other items that can catch fire at least three feet from all portable electric motors.

## **(2) Disaster Preparedness Onsite**

The plan will include alarm equipment's and other measures and the budget for capital and running cost of the plan.

### ***Fire Alarms/Other Measures***

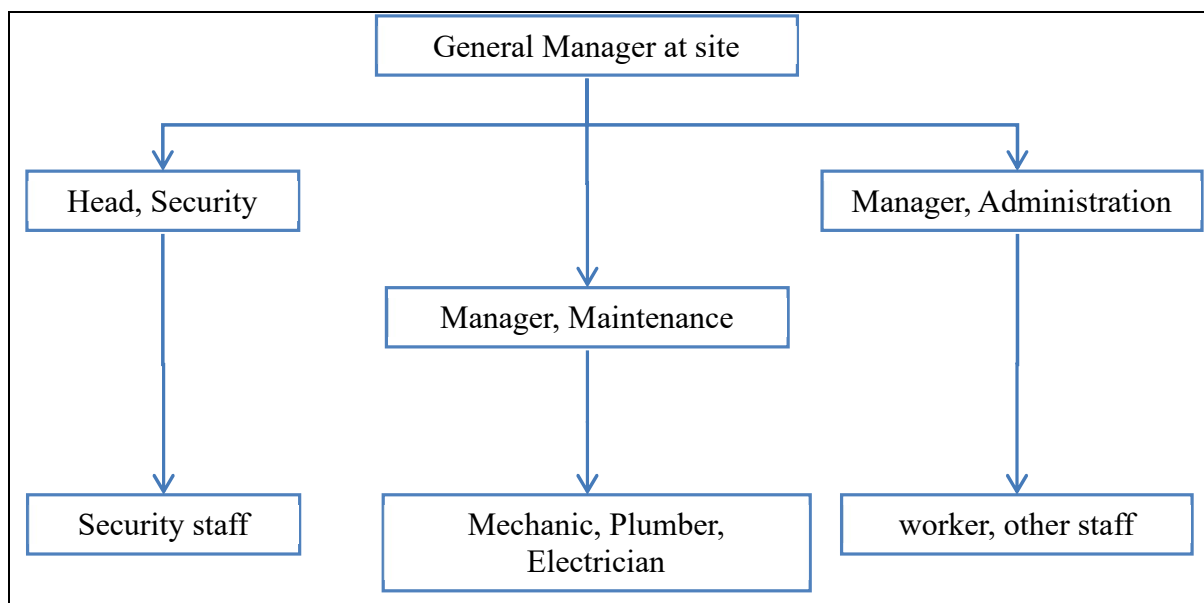
Given the location of the factory, it is important to have a proper fire management system. Fire could take place from various accidents; one of them being faulty electrical materials. Hence all electrical wiring of the proposed building would be made as per Government standards. Also, maintenance of the wiring will be carried out at regular intervals through a professional electrician. Fire alarm will be installed in every building. An alarm system will be developed so that all the worker/staff will be informed and trained with regard to the actions taken and operations necessary to efficiently use the system. To meet the requirements, the following measures will be taken:

- Posters indicating evacuation routes will be displayed in all rooms/factory building etc. of the factory clearly indicating the position of the poster with 'You are here' mark. Route of evacuation will be indicated by way of arrows, leading to the assembly point.
- Fire and smoke alarms will be installed in all covered places such as rooms, working area, offices, etc. The functioning of these fire alarms will be checked every week by the factory security staff.
- Courtyard will be paved suitably to bear the load of fire engines.

- Electrical meter room will be sealed with non-combustible materials.
- The lighting in all fire escape routes will be based on independent circuits backed by DG sets.
- Underground and overhead water storage tanks having appropriate capacity will be provided for fire fighting.
- Automatic water sprinklers will be installed in all internal covered spaces.
- Fire Hydrants, Fire Hoses and Fire Extinguishers will be installed throughout the factory as mandated by the Fire Fighting Department (Myeik).
- Portable fire extinguishers of dry chemical powder will be provided in the electric meter rooms.
- Lightning conductors and other equipment's mandatory as per existing Government Rules will be installed.

***Onsite DMP Team***

The structure of the team is given below. During the operational phase of the factory, name of the authority and their contact details will be included in the following chart. This will be part of DMP kit which will prominently placed and accessible to all.



***Onsite DMP Team***

### **(3) Emergency Equipment's**

The site security officer will maintain a list of emergency handling equipment including details of fire extinguishers their validity and potency, protective clothing, and personal protective equipment for emergency handlers etc. The major hospitals, clinics, emergency services will be kept in the knowledge of all concerned. Fire fighting related water tank with adequate water quantity and system with fire hoses will be kept readily available. All the location of fire extinguisher will be displayed by a notice board.

#### **Disaster Emergency Kit**

An emergency kit will be prepared which will have following items:

**Table 8.5 - Emergency Kit and Items and Numbers**

Sr. No.	Emergency Kit Item	Numbers
1.	First aid kit and Whistle	1 for each room/boiler/warehouse/Q.C Lab /control room/working area
2.	Portable fire extinguisher	1 on 75 ft apart of each floor of each building
3.	Safety ropes	5

The emergency kit will be augmented frequently after its check regularly. The project proponent will provide a disaster emergency kit which will consist of:

1. Battery operated torch
2. Extra batteries
3. Battery operated radio
4. First aid kit and manual
5. Candles and matches in a waterproof container
6. Knife
7. Chlorine tablets or powdered water purifiers.
8. Can opener
9. Essential medicines
10. Thick ropes and cords
11. Sturdy shoes

### ***Medical and Related Resources***

The medical managements for the possible emergency situation essentially consist of First Aid facility. The security manager must maintain the staff including sweepers, security persons, etc. so that during medico emergency equal weight age will be given to all the members of the society. Also, Security manager will keep the numbers of emergency. Hospitals, so that doctors will be connected at the earliest at the time of medical emergency. These numbers will be prominently displayed on the notice board and can be accessed by the members in absence of security manager.

### ***Drills***

Mock drills activating the Disaster Preparedness Plan will be conducted periodically for ensuring its efficiency during emergency as well as refinement and updation. These drills based on the plan will help achieve its objectives. Head, security will be the main coordinator for making people aware of the situation and emergency condition response.

Fire extinguishers will be placed in all floors of all factory building. Every member of staff will be given training on how to use these fire extinguishers. Working of these fire extinguishers will be evaluated every year by a qualified and trained person. If any faulty equipment is observed or any further improvement is needed then it will be repaired. Proper evacuation plan will be chalked for the factory. The map for the evacuation plan for each factory will be displayed in the respective places. A mock demonstration for evacuation of workers/ staffs will be carried out at interval of every six months. These mock drills would be performed in presence of qualified professional. Information will be given to all the members of staff on how react in case of disaster.

### ***(4) Emergency Response in the Event of Disaster***

In case of emergency due to any type of disaster, a quick and immediate response is essential. This response depends on the actions taken by individuals to avoid or mitigate the adverse effects of a disaster and to undertake search and rescue operations. Following are the actions which will be taken in various emergent situations.

#### ***(i) Action in the event of Fire***

Extinguishing fires: A small fire at the point of leakage will be extinguished by enveloping it with a water spray or a suitable smothering agent such as CO<sub>2</sub> or DCP (Dry Chemical Power).

Trained staff will be engaged in combating fire. Fire fighting personnel working close to un-ignited vapour clouds or close to fire, will be protected continuously by water sprays.

#### **(ii) Actions in case of Flood**

The factory management will take all necessary precautions in consultation with the State weather and disaster management authorities.

#### **(iii) Lightning strike**

Apply immediate heart massage and mouth-to-mouth resuscitation to lightning victims until medical help arrives.

#### **(5) Relief and Rehabilitation**

Relief authorities at the site will:

- Encourage self-help in every activity of their day-to-day living.
- Provide assistance for identification/assessment of human and material loss.
- Provide assistance in maintenance of law and order.
- Provide assistance in maintaining sanitation standards and in disposal of waste.
- Promote cultural and recreational activities for mental health.

##### **(i) Measures during Earthquake**

- Relief authorities will: Conduct a week-long survey to locate quake related hazards/damages in the factory.
- Work with local emergency services and officials to help affected people and those likely to be affected.
- Provide tips for conducting earthquake drills.

##### **(ii) Actions to be taken to prevent impact of Cyclone**

- All of employee and staff will be advised to stay tuned to weather advisories broadcast on radio or TV. Radios and TVs in factory canteen/restaurants etc. will also be activated for the benefit of residents/guests.
- All windows and external doors of the factory complex will be shut and appropriately secured to withstand high wind speeds.
- Hurricane lanterns, torches and other emergency lights will be made available.

- All loose and unsecured materials which can fly and cause damage due to strong winds, will be removed to safe locations and/or securely fastened.
- Electrical mains will be switched off except for emergency utilities.
- The management will be continuously in touch with the State Disaster Management Authority and scrupulously follow its instructions with respect to the need for evacuation of the factory or any other eventuality.

### **8.3.2.2. Evacuation Plan for the Soft-Shell Crab Farming**

A standard response plan that is to be following by any personal that comes across an emergency situation such as fire needs to follow RACE.

RACE method of Evacuation Plan:

*R - Remove All Persons In Danger!*

*A - Always Pull The Alarm and Call the Emergency Services.*

*C - Contain The Fire By Closing the Windows and Doors.*

*E - Extinguish the Fire Only if You Are Trained and Confident.*

Followed by this primary response, the evacuation of public vulnerable to fire hazard is the most important step during any emergency fire. Proper co-ordination, prior basic knowledge on how to act in a situation is also essential. The guidelines given below are for the local evacuators and evacuees as well as planners and designers of the emergency response.

- Guidelines for Evacuation In-charge
- Evacuation and Exit Routes for each working area

An assigned on-duty employee will be evacuation in-charge who will command and coordinate the situation.

- The number of exit routes will be adequate, normally two or more depending on: Exit discharge will lead directly outside or to a street, walkway, refuge area, public way, or open space with access to the outside and the area will be large enough.
- Exit stairs that continue beyond the level on which the exit discharge is located will be interrupted at that level by doors, partitions, or other effective means that clearly indicate the direction of travel leading to the exit discharge.
- Exit doors will be able to open from the inside at all times without keys, tools, or special knowledge.
- Exit route will support the maximum permitted occupant load for each floor served.



- Capacity must not decrease in the direction of exit route travel to the exit discharge.
- Ceiling will be at least 7-1/2 ft. high with no projection reaching a point less than 6 ft. - 8 in. from floor.
- An exit access will be at least 28 in. wide at all points.
- Objects that project into the exit route will not reduce the width of the exit route to less than the minimum width requirements for exit routes.
- The assembly point has sufficient area to accommodate persons (0.3 m<sup>3</sup>/person)
- The plans given below shows the refuge area that can be preferred and the service area that can be useful as a junction for escape route.
- The terrace area shown in the plan is open to sky that can accommodate sizable people in case of disaster, also the fire escape passage is provided as an exit route.

### ***Training Program for Emergency Response Plan***

**Table 8.6 – Training Program for Emergency Response Plan**

<b>No.</b>	<b>Category</b>	<b>Number of Staff to be trained</b>	<b>Frequency</b>
1.	Fire	All staffs must be trained.	Once before construction phase and twice a year throughout the operation.
2.	Flood (Tidal Flood & Tsunami)		

### **8.3.3. Odor Management Plan**

As Odor is the most public concern and so it is necessary to control odor during emergency case when odor emission control devices in place are out of work. The odor response procedure will include analysis of actions in the case of Odor control techniques or devices breakdown or malfunction. Immediate arrangements will be made to divert Odor streams to another suitable arrestment plant. Failure to provide suitable temporary arrestment plant may lead to the suspension of the process and consequently emergency standby arrangements should be detailed in the odor response procedure. This may include:

- suspending process operations;
- reducing the scale of high Odor intensity process operations, for example stopping cooking operations or reducing throughput;
- used odor absorber or effective odor eliminator such as odor absorbing air sponge during emergency case.

Moreover, the following odor management measures will be done during emergency case of odor.

### 1. Objectives

The purpose of Odor Management Plans (OMPs) and outlines the elements consider to be essential. Odor management at some sites which have a high potential for Odor pollution can be a major challenge. Accordingly, OMPs for these sites will need to be detailed and robust. Conversely, sites with a low Odor potential will require comparatively simple and concise OMPs.

OMPs should be designed to:

- employ appropriate methods, including monitoring and contingencies, to control and minimise odor pollution;
- prevent unacceptable odor pollution at all times;
- reduce the risk of Odor releasing incidents or accidents by anticipating them and planning accordingly.

All OMPs will need to consider sources, releases and impacts, and use these to identify cost-effective opportunities for odor management.

### 2. Legal Requirements

Laws and Regulation	Legal Requirements
<b>National Environmental Quality (Emission) Guidelines, 2015</b>	
Section 2.3.1.3	The project proponent has to comply with the National Environmental Quality (Emission) Guidelines.

### 3. Overview Map

The satellite image for the proposed project is shown in the following figure.



**Figure – Satellite Image for Soft Shell Crab Farming**

#### **4. Monitoring, investigating and reporting**

The operator should monitor emissions, make tests and inspections of the activity. The need for scope of testing, (including the frequency and time of sampling), will depend on local circumstances.

- The operator should keep records of inspections, tests and monitoring, including all non-continuous monitoring, inspections and visual assessments. Records should be:
  - kept on site;
  - kept by the operator for at least two years; and
  - made available for the regulator to examine.
- If any records are kept off-site they should be made available for inspection within one working week of any request by the regulator.

#### ***Information required by the regulator***

The regulator needs to be informed of monitoring to be carried out and the results. The results should include process conditions at the time of monitoring.

A summary of the data from continuous monitoring of the performance of the odor arrestment plant and the particulate matter arrestment plant should be submitted to the regulator at least every 6 months, identifying the times, dates and duration of alarm events.

#### ***Emissions of odor***

Whilst problems are ongoing, a boundary check should also be made at least once per day/shift, by the operator, when an installation is being operated. The time, location and result of these checks, along with weather conditions such as indicative wind direction and strength, should be recorded. Once the source of the emission is known, corrective action should be taken without delay and where appropriate the regulator may want to vary the permit in order to add a condition requiring the particular measure(s) to be undertaken.

Where it is installed any Odor arrestment equipment should be inspected at least once a day to verify correct operation and to identify any malfunctions. Depending upon the type of any arrestment plant used this inspection should include:

- identification of any leaks in air handling equipment and ductwork
- in the case of scrubbing equipment, thermal oxidisers and other combustion equipment, the inspection should include verification of the operation of any continuous monitoring equipment, the presence of any blockages and also identification of any leaks of either odorous air or liquid.

### ***Start up and shutdown***

Higher emissions may occur during start-up and shut-down of a process. These emissions can be reduced, by minimising, where possible, the number of start-ups and shut-downs and having adequate procedures in place for start-up, shut-down and emergency shut-downs.

- The number of start-ups and shut downs should be kept to the minimum that is reasonably practicable.
- All appropriate precautions must be taken to minimise emissions during start-up and shutdown.

### ***Summary of best available techniques***

The following table provides a summary of the best available techniques that can be used to control the process in order to meet the emission limits and provisions

<b>Table - Summary of control techniques</b>		
<b>Substance</b>	<b>Sources of odor</b>	<b>Control techniques</b>
Odor	Decayed crabs, effluent and waste	Control of raw material quality Segregate and dispose the decayed crabs and
Odor	Vehicles	Washing of vehicle surfaces (material contact) within buildings as above
Odor Sulphur oxides Carbon	Waste gas from odor arrestment plant	Odor - Final dispersion to ensure no offensive Odor at sensitive receptors. Sulphur oxides-Limit sulphur in fuel.

### ***Training***

Staff at all levels need the necessary training and instruction in their duties relating to control of the process and emissions to air. In order to minimise risk of emissions, particular emphasis should be given to control procedures during start-up, shut down and abnormal conditions.

- All staff whose functions will impact on air emissions from the activity should receive appropriate training on those functions. This will include:
  - awareness of their responsibilities under the permit;
  - steps that are necessary to minimise emissions during start-up and shutdown;
  - actions to take when there are abnormal conditions, or accidents or spillages that could, if not controlled, result in emissions.

- The operator will maintain a statement of training requirements for each post with the above-mentioned functions and keep a record of the training received by each person. These documents will be made available to the regulator on request.

### **Maintenance**

Effective preventative maintenance plays a key part in achieving compliance with emission limits and other provisions. All aspects of the process including all plant, buildings and the equipment concerned with the control of emissions to air will be properly maintained. In particular:

- The operator will have the following available for inspection by the regulator:
- a written maintenance programme for all pollution control equipment; and
- a record of maintenance that has been undertaken.

## **8.3.4. Waste Management Plan**

### **1. Objectives**

The purpose of the waste management plan is the following:

- To develop action plans for achieving the objectives of the waste management plan;
- Monitor discharge sources (waste water and solid waste) and operation of environmental protection equipment in order to ensure that these activities will comply with legislative requirements; and
- To provide guidance on how to minimize, handle, contain, control, re-use, recycle and dispose of all waste generated.

### **2. Legal Requirements**

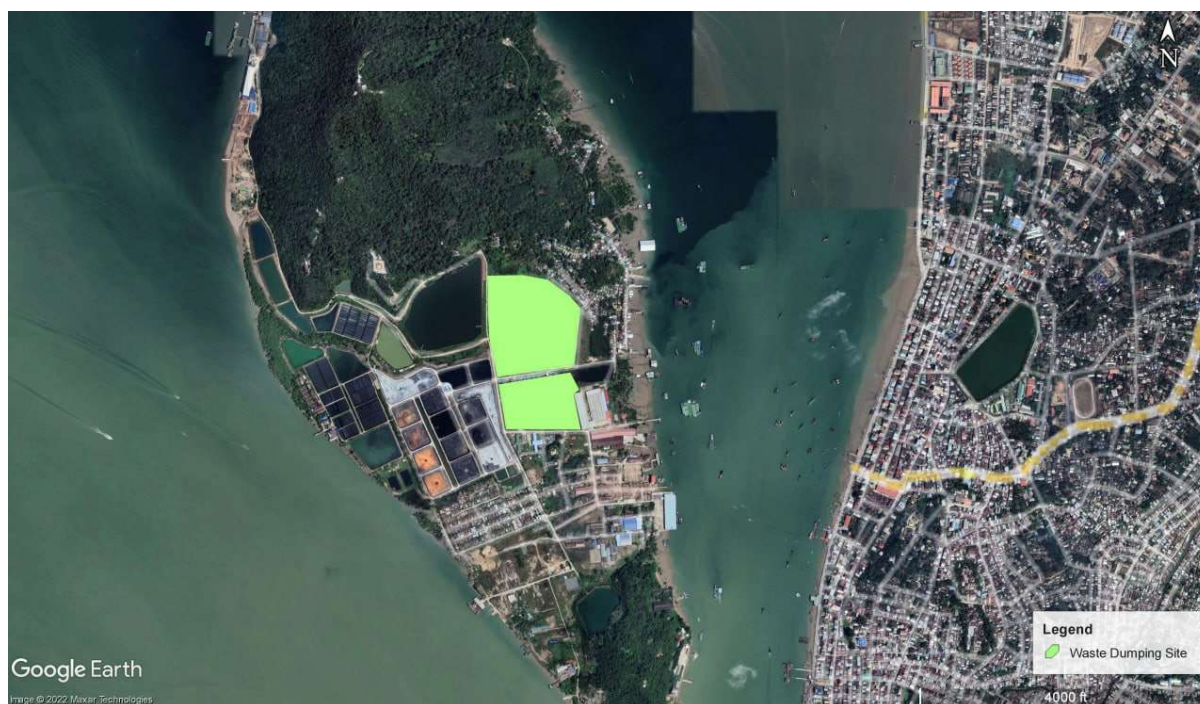
<b>Laws and Regulations</b>	<b>Legal Commitments</b>
<b>The Prevention of Hazard from Chemical and Related Substances Rules, 2013</b>	
Section 15	The project proponent has to carry out inspection and training according to section15 of Prevention of Hazard from Chemical and Related Substances Law.
Section 16	The project proponent has to comply Section 16 of Prevention of Hazard from Chemical and Related Substances Law.
Section 17	The project proponent has to put the insurance in accordance with the prescriptive stipulations to be able to pay the compensation, if the impact and damage is occurred on the Human Being and Animals or the environment in respect of the chemical and related substances businesses.
Section 20	The project proponent has to comply Section 20 of Prevention of Hazard from Chemical and Related Substances Law.



Section 22	The project proponent has to abide the regulations consisted in the registration certificate furthermore shall also abide the order and instructions issued occasionally by the Central Supervisory Board.
Section 23	The project proponent has to comply Section 23 of Prevention of Hazard from Chemical and Related Substances Law.
<b>Conservation of Water Resources and Rivers Law, 2006</b>	
Section 8	The project proponent shall not be carried out any act or channel shifting with the aim to ruin the water resources and rivers and creeks.
Section 11 (a)	The project proponent has to follow the prohibitions from the section 11 of Conservation of Water Resources and Rivers Law.
Section 13	The project proponent has to follow the prohibitions from the section 13 of Conservation of Water Resources and Rivers Law.
Section 19	The project proponent shall not be disposed of any substance into river- creek that may cause damage to waterway or change of water course from the bank.
Section 24 (b)	The project proponent has to follow the prohibitions from the section 24 (b) of Conservation of Water Resources and Rivers Law.
Section 30	The project proponent has to follow the prohibitions from the section 30 of Conservation of Water Resources and Rivers Law.

### 3. Overview Maps

The proposed waste dumping sites for the waste management plan is shown below.



**Figure 8.1 – Proposed Waste Dumping Sites for the proposed factory**

### 4. Management and Monitoring Plans

- The waste management plan will thus have a positive contribution in reducing disposal costs and an overall contribution to integrated waste management according to the rules



and regulations of CDC. Adherence to the waste management plan should be exercised by all employees, contractors and service providers to ensure proper waste management is applied. This will be undertaken when appointed and through regular auditing. Service providers and contractors are required to furnish evidence of proper waste management (i.e. classification, quantities and disposal).

- To help manage waste effectively, the Project has committed to implementing the "hierarchy of waste management" with a focus on waste prevention; and then a decreasing focus on waste reuse; recycling; recovery and elimination.

waste prevention; and then a decreasing focus on waste reuse; recycling; recovery and elimination.

#### **(i) Solid Waste Disposal**

**During Pre-construction Phase**, solid wastes from tree-cutting and site clearing activities were generated along with domestic wastes from pre-construction workers. However, domestic wastes from workers and debris from earth working activities can be managed in the following ways:

- Domestic waste generated shall be cleaned up in time and collected every day.
- Food waste can be reused as farmyard manure.
- The rest of the waste should be transported to the garbage dump for disposal.
- Other domestic waste will be disposed of in a domestic waste disposal site as directed by CDC (Kyunsu and/or Myeik).
- Wastes which cannot be reused or recycled, such as debris from excavation works which cannot be reused in foundation works, will be disposed of in a permitted disposal facility.

**During Construction Phase**, domestic wastes from construction workforce, improper disposal of waste such as garbage from labor camps and debris from construction activities were generated in this phase. Management of these solid wastes can be controlled with the same ways as above.

**During Operation Phase**, solid wastes will be produced from decaying crabs during collection stage. These decayed crabs can have high impact on the local residents due to its odor. In addition, domestic wastes from workers and its camp will also be generated in this phase. The decayed crabs can be discharged to dumping areas or can be used as landfills or organic fertilizers. The shells of the decayed crabs are compostable except their meat and fat. These

materials must be washed off thoroughly and discharged at the dumping site where the remaining crab shells will be left to dry and crush into small pieces; which can create a sustainable fertilizer. For domestic wastes, they can be managed with the same way as above.

### *(ii) Liquid and Sanitary Waste Disposal*

**During Pre-construction Phase** – Liquid wastes produced from labors, and leakage or mishandling of fuel from use of vehicles can be generated during this phase. In addition, sanitary wastes and sewage generated from site were collected through underground pipes into a holding tank, from where the sewage is routed to an onsite septic tank. Handling ways of fuel oil in order from preventing leakage or mishandling are mentioned below.

**During Construction Phase** – Liquid wastes from construction activities, workers and leakage or mishandling of fuel oil, grease or lubricant were produced from site and they were disposed the same as in pre-construction phase.

**During Operation Phase** – Effluents of soft-shell crab ponds will pollute the seawater but due to the easily decomposition of polluting components, there will be no problem. In addition, effluents can be treated by sedimentation. Sanitary wastes from the workers will be disposed the same as in above phases.

**During Decommissioning phase** - Liquid waste will produce from the maintenance and cleaning of the machineries and equipment and toilet facilities for the onsite labors. However, these impacts may not be large extent because the time is very limited. Sanitary wastes will be handled the same as above.

### **Lubricants**

#### **Handling**

- Prevent small spills and leakage to avoid slip hazard.
- Prevent small spills and leakage to avoid slip hazard. Material can accumulate static charges which may cause an electrical spark (ignition source).
- When the material is handled in bulk, an electrical spark could ignite any flammable vapors from liquids or residues that may be present (e.g., during switch-loading operations).
- Use proper bonding and/or earthing procedures. However, bonding and earthing may not eliminate the hazard from static accumulation.
- Consult local applicable standards for guidance.

### **Storage**

- Do not store in open or unlabeled containers.
- Store in cool, dry, ventilated area, away from heat and ignition sources. Use good personal hygiene. Always keep the container close and the type of container used to store the material may affect static accumulation and dissipation.

### **Diesel Oil**

#### **Handling**

- Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk. DO NOT reuse empty containers without commercial cleaning or reconditioning. Ground/bond line and equipment during pumping or transfer to avoid accumulation of static charge. Do not breathe gas/vapour/spray. In case of insufficient ventilation, wear suitable respiratory equipment.
- If ingested, seek medical advice immediately. Avoid contact with skin and eyes. Practice good personal hygiene. Wash hands after handling and before eating. Launder work clothes frequently. Discard saturated leather goods.
- Diesel is a flammable liquid and is dangerous unless handled and stored properly. Children and pets should have no access to the storage tanks to avoid accidents. Adult access to the tanks should be limited to only those who need access for refueling or maintenance of the tanks.
- The fuel should be stored in an isolated area away from residences. An above-ground container may be installed in a building or under a lean-to. This location helps prevent water from harming the tank and prevents radiant heat from evaporating the diesel.

#### **Storage**

- Store at cool, ventilated and specified place.
- Store in tightly closed containers in cool, dry, isolated, well-ventilated area, and away from incompatibles. Ground all equipment containing material.
- Keeping the fuel away from ignition sources is important. While diesel has a higher ignition point than gasoline, it is still flammable. Any electrical outlets nearby should be rated for explosions. No smoking should be allowed within 50 to 100 feet of the storage area.
- If a small amount of diesel fuel needs to be restored, keep it in portable 5-gallon gas cans that can take to the gas station. For larger amounts, store in special storage containers, such as 55-gallon drums or a stand-alone tank.

- Larger diesel tanks, made of metal or specially formulated polyethylene, can be installed above ground or below ground, depending on the site and local regulations. These tanks can also be mounted on the back of trucks when necessary. The exact size of the tank is, of course, dependent on how much fuel needs to be stored.

### **Disposal Considerations**

- Preferred waste management priorities are: (1) recycle or reprocess; (2) incineration with energy recovery; (3) disposal at licensed waste disposal facility. Ensure that disposal or reprocessing is in compliance with government requirements and local disposal regulations. Consult local or regional authorities.
- On large scale absorb and landfill, allow for atmospheric evaporation.

### **Fuel Oil**

#### **Handling**

- Precautions for safe handling: Provide adequate ventilation. Use personal protective equipment as required.
- Do not breathe vapor/aerosol. Avoid contact with skin, eyes and clothing. Take any precaution to avoid mixing with combustibles. Ensure proper process control to avoid excess waste discharge (temperature, concentration, pH, time).
- Do not allow to enter into surface water or drains. Obtain special instructions before use. (Do not handle until all safety precautions have been read and understood.).
- Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Ensure equipment is adequately earthed. Use explosion-proof equipment. Use only non-sparking tools.
- Product may release Hydrogen Sulphide: A specific assessment of inhalation risks from the presence of hydrogen sulphide in tank head spaces, confined spaces, product residue, tank waste and waste water, and unintentional releases should be made to help determine controls appropriate to local circumstances.
- Hygiene measures: Keep good industrial hygiene. Wash hands immediately after handling the product. When using, do not eat, drink or smoke. Keep away from food, drink and animal feeding stuffs. Separate working clothes from town clothes. Take off contaminated clothing. Wash contaminated clothing before reuse.

### **Storage**

- Conditions for safe storage, including any incompatibilities
- Technical measures: Store in a dry, cool and well-ventilated place. Bund storage facilities to prevent soil and water pollution in the event of spillage.
- Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
- Product may release Hydrogen Sulphide: A specific assessment of inhalation risks from the presence of hydrogen sulphide in tank head spaces, confined spaces, product residue, tank waste and waste water, and unintentional releases should be made to help determine controls appropriate to local circumstances.
- Packaging materials: Keep only in the original container. Suitable material: Carbon steel. Stainless steel.
- Unsuitable material: synthetic material.

### **Disposal Considerations**

- Do not allow to enter into surface water or drains. Dispose of empty containers and wastes safely. Refer to manufacturer/supplier for information on recovery/recycling. Recycling is preferred to disposal or incineration.
- If recycling is not possible, eliminate in accordance with local valid waste disposal regulations.
- Additional information: Handle contaminated packages in the same way as the substance itself. Dispose of contaminated materials in accordance with current regulations. Do not pierce or burn, even after use. Never use pressure to empty container.

### ***Transport and Disposal***

Evidence presented that the transporter is a registered licensed professional driver. Transport to an approved treatment, storage, or disposal facility (TSDF) is required. Transported by truck should be over public highway. Highway shipment is the most common because road vehicles can gain access to most industrial sites and approved TSDFs.

### ***Environmental Precautions***

Keep out of drains, sewers, ditches, and waterways. Minimize use of water to prevent environmental contamination Do not flush to sewer or allow entering waterways. Use

appropriate Personal Protective Equipment (PPE). Methods for Clean-Up: Scoop up material and place in a disposal container. Provide ventilation. Any concerns should be documented and fixed. If there are any spills, clean up and disposed of properly. Waste analysis and waste determination records should be kept. Among several options available for hazardous waste management, the most desirable method is to reduce the quantity of waste at its source or to recycle the materials for some other productive use.

**Table - Waste Inventory**

<b>Waste type</b>	<b>Waste characteristic</b>	<b>Source</b>	<b>Likely treatment/disposal</b>
Oil and lubricants	Regulated waste	Machinery oil changes and lubrication	Recycling
Sewage	Regulated waste	Factory workers	Sewage Treatment
By-product of the factory hard shells of crabs	General waste	Production process	Landfills and other uses.

### **8.3.5. Traffic Management Plan**

#### **1. Objective**

The primary objectives of this Traffic Management Plan are:

- To ensure efficiency and safety of the movement of people, goods, or vehicles.
- To manage potential adverse impacts on traffic flows and pedestrian movements to ensure road and pedestrian network performance is maintained at an acceptable level.

‘Traffic’ in this sense refers to the interaction of vehicles, mobile plant (machinery) and pedestrians. Areas where pedestrians are exposed to the risk of a collision between mobile plant and vehicles should be identified, for example, in a warehouse where forklifts and workers both operate.

#### **2. Legal Requirements**

<b>Laws and Regulations</b>	<b>Legal Commitments</b>
<b>The Highways Law, 2015</b>	
Section 7 (i)	The project proponent has to get approval for the construction of billboard for constructing something by crossing the highways and construction within the boundaries of the highway.



<b>Automobile Law, 2015</b>	
Section 49	Project proponent has to comply with section 49 of Automobile Law in driving at the public area.
<b>Vehicle Safety and Motor Vehicle Management Law, 2020</b>	
Section 9 (a)	The project proponent has to follow the Ministry for determining and restricting the areas where motor vehicles used in the country are allowed to travel.
Section 12 (c)	The project proponent has to follow the Ministry in relation to the initial registration of motor vehicles.
Section 14 (r)	The project proponent has to set the speed for the safe movement of vehicles traveling on public roads.
Section 18 (a)	The project proponent has to maintain the vehicle and repair in accordance with the standards prescribed by the Department in order to drive safely.
Section 81 (g)	The project proponent has to carry out the loading or transporting of dangerous goods in the motor vehicle in accordance with the stipulations.

### 3. Overview Map

The traffic management plan consideration combined with the geographical location of the project is shown in the following figures.



### 4. Management Plan

#### (a) Construction Phase

Construction site vehicle incidents should be prevented by the effective management of transport operations throughout the construction process. Key issues in dealing with traffic management on site are:

- Keeping pedestrians and vehicles apart
- Minimizing vehicle movements
- People on site
- Turning vehicles
- Visibility
- Signs and instructions

### **Keeping pedestrians and vehicles apart**

The majority of construction transport accidents result from the inadequate separation of pedestrians and vehicles. This can usually be avoided by careful planning, particularly at the design stage, and by controlling vehicle operations during construction work.

The following actions will help keep pedestrians and vehicles apart:

**Entrances and exits** – separate entry and exit gateways for pedestrians and vehicles should be provided;

**Walkways** – firm, level, well-drained pedestrian walkways that take a direct route should be provided where possible;

**Crossings** – where walkways cross roadways, a clearly signed and lit crossing point should be provided where drivers and pedestrians can see each other clearly;

**Visibility** – drivers driving out onto public roads should be made sure that they can see both ways along the footway before they move on to it;

**Obstructions** – walkways should not be blocked so that pedestrians have to step onto the vehicle route; and

**Barriers** – a barrier should be installed between the roadway and walkway.

### **Minimizing vehicle movements**

Good planning can help to minimize vehicle movement around a site. For example, landscaping to reduce the quantities of fill or spoil movement.

To limit the number of vehicles on site:

Car and van parking for the workforce and visitors should be provided away from the work area;

Entry to the work area should be controlled; and

Storage area should be planned so that delivery vehicles do not have to cross the site.

## **People on site**

Employers should take step to make sure that all workers are fit and competent to operate the vehicles, machines and attachments they use on site by, for example:

- Checking when recruiting drivers/ operators or hiring contractors;
- Training drivers and operators;
- Managing the activities of visiting drivers.

People who direct vehicle movements (signalers) must be trained and authorized to do so. Accidents can also occur when untrained or inexperienced workers drive construction vehicles without authority. Access to vehicles should be managed and people alerted to the risk.

## **Turning vehicles**

The need for vehicles to reverse should be avoided where possible as reversing is a major cause of fatal accidents. One-way systems can reduce the risk, especially in storage areas. A turning circle could be installed so that vehicles can turn without reversing.

## **Visibility**

If vehicles reverse in areas where pedestrians cannot be excluded, the risk is evaluated and visibility becomes a vital consideration. The following list should be considered:

- Aids for drivers** – mirrors, CCTV cameras or reversing alarms that can help drivers to see movement all around the vehicle;
- Lighting** – so that drivers and pedestrians on shared routes can see each other easily. Lighting may be needed after sunset or in bad weather;
- Clothing** – pedestrians on site should wear high-visibility clothing.

## **Sign and instructions**

All drivers and pedestrians must know and understand the routes and traffic rules on site. Standard road signs should be used where appropriate. Induction training for drivers, workers and visitors should be provided and instructions should be sent out to visitors before their visit. Pedestrian routes should be:

- Kept clear and free of tripping hazards
- Segregated from vehicle routes
- Adequately signed
- Provided with crossing points that have a clear view

Vehicle routes should be;

- Segregated from pedestrian routes
- Designed to minimize reversing
- Suitable for the vehicles that need to use them with appropriate speed limits
- Designed to avoid steep gradients and sharp bends
- Designed with ramps, signage, and berms as required
- Designed to take into account loading and unloading areas

Hoarding, barriers, lighting and signs will be required at startup. As construction progresses, pedestrian and traffic routes will change and barriers, traffic cones, and signs will need to be moved to ensure that there is adequate pedestrian and vehicle separation. Fixed barriers should be used to separate vehicles from pedestrian walkways and to protect loading and unloading areas on site. To avoid traffic accidents as much as possible, transportation vehicles to and from the construction site should not be operated during peak hours if possible.

#### **(b) Operation Phase**

A traffic management plan is needed to minimize inconvenience and help ensure road users and workers remain as safe as possible.

- To avoid crowding in parking area, parking fees should be charged based on how long one uses the parking.
- The speed of vehicles will be limited inside the station compound to avoid accidents.
- Pedestrian roadways will be provided to avoid accidents.
- Drop off/ pickup areas should also be provided and passenger cars should be allowed to stop in these areas for only limited amount of time.
- Road markings and signs will be installed. The road markings are a tool to provide guidance and information for drivers to drive safely and smoothly and for pedestrians to walk safely.
- On-street parking will be restricted outside the station to avoid traffic congestion and unwanted accidents.
- Traffic officers will be assigned to solve any problems regarding traffic. They are greatly important roles to ensure safety and smooth traffic flow and the assigned officers should be trained properly before assigning to the post.

### **8.3.6. Occupational Safety and Health Management Plan**

This occupational health and safety management plan consists of emergency and first-aid procedures, medical precautionary measures, maintenance and troubleshooting precautions, housekeeping, safety awareness and safety training.

#### **1. Objectives**

The primary objectives of this plan are:

- To secure the health, safety and welfare of employees and other people at work.
- To eliminate workplace risks at the source, and
- To involve employers, employees and the organizations that represents them in the formulation and implementation of health, safety and welfare standards.

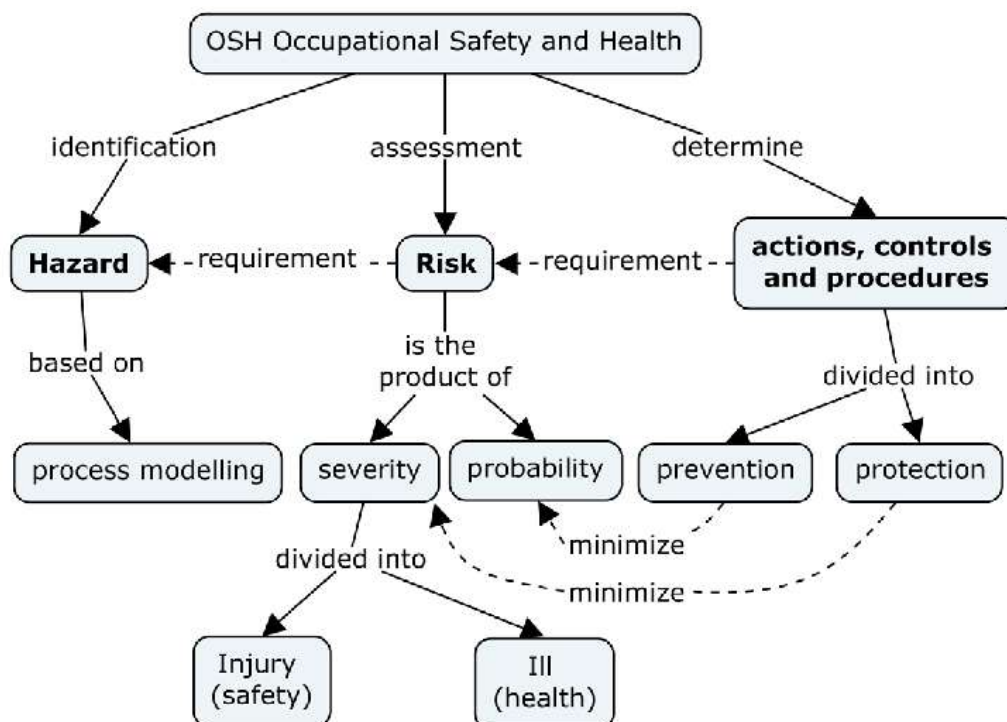
#### **2. Legal Requirements**

<b>Laws and Regulations</b>	<b>Legal Commitment</b>
<b>Public Health Law, 1972</b>	
Section 3	The project proponent has to allow the government to improve the health of the working population and advising on the health issues described in section 3 of 1972 Union of Myanmar Public Health Law to protect the health of the working population.
Section 5	The project proponent has to follow the organizations formed under this law to inspect and instruct the project at any time.
<b>Occupational Safety and Health Law. 2019</b>	
Section 12	(A) The project proponent has to appoint the person in charge of occupational safety and health to closely monitor the safety and health of the workers according to the type of work. (B) The project proponent has to form occupational safety and health committee, consisting of workers' representatives, in accordance with the provisions of the Ministry.
Section 14	The project proponent has to follow Rules and regulations issued under this law.
Section 16	The project proponent has to allow the inspection officers for inspection of safety and health conditions of the workplaces.
Section 17	The project proponent has to allow inspectors for conducting the actions described in section 17 of Occupational Safety and Health Law.
Section 18	The project proponent has to report the inspection officers any injuries to the workplace for reasons described in section 18 of Occupational Safety and Health Law
Section 26	The project proponent has to perform the tasks described in section 26 of Occupational Safety and Health Law.
Section 27	The project proponent does not have to dismiss or demote an employee for the reason described in section 27 of Occupational Safety and Health Law.
Section 34	The project proponent has to be responsible for occupational injury, dangerous event, in case of serious work injury and if an employee suffers from a specified occupational disease.

Section 36	The project proponent has to follow the inspecting officer for any workrelated injuries, dangerous events, occupational diseases, workplace poisoning
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### 3. Overview and Layout Map

The contemplation for the occupational safety and health for this sub-plan is considered as shown in the figure below.



**Figure – Mind Map of Occupational Health and Safety Risk**

### 4. Occupational Health and Safety Management Plan

Occupational health and safety management plan for the proposed project will include the following:

- (ii) Emergency and First-aid Procedures
- (iii) Medical Precautionary Measures
- (iv) Maintenance and Troubleshooting Precautions
- (v) Housekeeping
- (vi) Safety awareness
- (vii) Safety training



### **(i) Emergency and First-aid Procedures**

When an accident occurs at the work site, it is essential that the proper steps are taken to secure the safety of the injured person. These steps include:

**Getting medical care:** The first and most important steps to follow after a work site injury are assessing and treating the damage. Even if the injury seems minor, a medical professional should diagnose and treat the injury before the injured person attempts to return to work. A minor bump on the head could mask a concussion, or a bruised abdomen could be a sign of internal injuries.

**Taking note of where, when, and how the accident occurred:** If the victim is physically capable, he should make sure to record the significant aspects of the accident, including time, place, and potential cause.

**Reporting the injury:** The injured person absolutely must inform his supervisor, or superior of the accident as soon as possible. Make sure to record the name and position of the person who accepted the report and the date the report was submitted.

**First-aid program** should include the following elements:

- **Emergency medical services (EMS) response time:** Contact local EMS or nearest hospital to assess the response time to the facility in an emergency. This will help to determine whether or not employees should be trained in first-aid on site. If an EMS or ambulance from nearest hospital can reach workers at the site within 3 to 4 minutes in a life-threatening emergency, then the EMS is considered “in near proximity” to the workplace. If this is the case, then employees trained in first-aid are not required (but are still recommended) on site.
- **Trained personnel:** Employees who have taken first-aid training course should be assigned responsibility for providing first aid. Employers should ensure that at least one of their employees takes a first-aid course or arrange for such a program to be taught at the workplace. It is recommended that 15 to 20 percent of the workforce should be trained in first aid.
- **Written procedure:** Have a qualified medical professional provide written “standing orders” for basic first-aid treatment procedures. Have the doctor designate what is to be done in the case of a serious injury and what hospitals are to be used for emergency treatment. Local police and fire telephone numbers should be prominently displayed in enough places so that all employees can access them.

- **First-aid kit:** First-aid supplies must be easily accessible when they are required. The contents of the first-aid kit must be stored in a sealed weatherproof container with individual sealed packages for each type of item and must be checked by the employer before being sent out on each job and at least weekly to ensure that expended supplies are replaced.
- **Communications:** Let everyone in the organization know who the trained first-aid personnel are; state that these persons are the only ones who should render first-aid assistance. Be sure to keep the list up-to-date. Also, publicize the names and phone numbers of local police and fire departments, as well as others outside the organization who should be called.
- **Medical log:** Maintain a medical or first-aid log convenient to your first-aid kits; ensure that every use of the first-aid kit, even for giving out a bandage, is noted, including: date, time, person receiving treatment, person giving treatment, what injury or symptom was treated, what treatment was given, and first-aid materials used.
- **Appropriate means of transporting injured workers to medical aid:** If a worker is injured, after the first-aid procedure, choose the transportation mode to transport the injured worker to be able to arrive at a medical aid as fast as possible.

First aid is immediate, temporary treatment given in the event of accident or illness.

**Eye:** Contact lenses, if worn, should be removed. Irrigate the eyes immediately with large amounts of water for 15 minutes. Occasionally hold the eyelids apart to insure complete irrigation. Apply a dry protective dressing. Call for emergency medical assistance.

For “flash burns” cover the eye with cold (preferably iced) compresses for 5 to 10 minutes; then repeat. Apply a dry protective dressing. Call a physician. Don’t rub the eye. Don’t use ointments or drops unless prescribed by a physician.

**Skin:** For skin contact with irritants, flush the areas with large amounts of water, and then wash with soap and water. Remove contaminated clothing. If mucous membranes are irritated, flush with water. Wash cuts and scrapes with mild soap and water. Avoid contamination. Apply a dry sterile dressing.

For thermal burns, cold water is an effective first aid measure. If skin is not broken, immerse burn part in clean cold water or apply clean ice to relieve pain. Do not disturb or open blisters. Prevent contamination. Bandage loosely with a clean dry dressing. Call for emergency medical assistance.

**Electrical Shock and Electrical Burns:** Disconnect and turn off power. Remove victim from contact. Use no conducting materials if the rescuer must resort to pulling the victim from the live contact. The rescuer must first protect himself by use of insulated materials such as gloves. If not breathing, administer CPR as soon as electrical contact is broken. Call for emergency medical assistance. Continue CPR until spontaneous breathing has been restored or until a physician arrives. Administer oxygen. Keep comfortably warm. Keep horizontal until there is no further evidence of shock. Treat electrical burns as thermal burns. For electrical burns apply clean, cold (iced) compresses. Prevent contamination. Cover with a clean, dry dressing. Call for emergency medical assistance.

## **(ii) Medical Precautionary Measures**

The following medical precautionary measures are recommended for the proposed project.

- (a) Periodic health examinations are recommended with the cooperation with Public Health Office (Myeik). The potential health effects of nonwork related factors, such as smoking, must be considered.
- (b) An effective educational, training, and industrial hygiene program should be instituted. The program should cover the following: (a) the nature and potential hazards of welding, cutting and gouging; (b) proper and safe use of equipment; and (c) emergency and first aid procedures.
- (c) Medical personnel should be available on-site or by phone for advice and consultation. Emergency phone numbers should be posted near the telephones. At least one person on each shift should be trained in first aid, as well as qualified to administer oxygen and cardiopulmonary resuscitation (CPR).
- (d) The following should be readily available: (a) first aid supplies approved by a physician; (b) stretchers and blankets for transportation; (c) oxygen inhalation equipment; and (d) approved instant acting eye washes and showers.
- (e) Good personal hygiene practices are very important. Employees should wash their face and hands before eating, and it is recommended they not be permitted to eat, drink, or smoke in the work area. Food and beverages should not be stored in the work area. Contaminated clothing should be changed.

- (f) Protection against skin conditions, such as chemical burns, rashes, and dermatitis can be provided by appropriate protective clothing and equipment, as well as the use of protective creams or lotions.

### **(iii) Maintenance and Troubleshooting Precautions**

Faulty or improperly maintained equipment can cause property damage, physical injury, or possibly death by fire or electrical shock. Here is a list of some important items to check when troubleshooting or maintaining equipment.

- (a) Stop operating immediately if equipment is malfunctioning.
- (b) Do not perform any maintenance unless you are qualified to perform such work.
- (c) Make test readings carefully.
- (d) Protect the equipment from heat, excessive wet conditions, oil or grease, corrosive atmospheres, and inclement weather.
- (e) Replace parts only with manufacturer's recommended replacement parts.
- (f) Keep all protective devices and covers in position.

### **(iv) House Keeping**

The following measures shall be practiced at the proposed project site.

- (a) Regular cleaning of the floors with service water.
- (b) Keeping all de-dusting systems in perfect working conditions to avoid dust accumulation inside and outside the project area.
- (c) Avoid dumping of wastes, damaged equipment and items anywhere inside the plant affecting aesthetics and increasing risk of fire and other hazards.
- (d) Keeping ventilation systems of premises in perfect working condition to avoid ingress of dust inside the pressurized room.
- (e) Maintaining hygienic conditions in areas like canteens, near drinking water sources and toilets.
- (f) Maintaining green belt along the factory boundaries to suppress noise, fugitive dust and to improve the aesthetics.
- (g) Developing a positive outlook in the employees for improving the working place, both in factory and office or laboratory clean and well maintained.

**(v) Safety Awareness**

Safety awareness must be promoted among project managers and employees by:

- (a) Imparting regular training.
- (b) Installing/displaying safety caution boards and safety posters mentioning Do’s & Don’ts at different vulnerable locations.
- (c) Arranging safety & housekeeping competition etc.
- (d) To procure and maintain personal protective equipment in good working condition.

**(vi) Safety Training**

Training programmes in safety and accident prevention will be organized at all levels of employees with a view to familiarize them with the general safety rules, safety procedures in various operational activities and to update their knowledge in safety and accident prevention, industrial hygiene and emergency equipment. These training programmes will be conducted periodically in a planned manner to refresh their knowledge. Training shall be imparted for:

- (a) Safe working and maintenance practices.
- (b) Use of proper tools and tackles.
- (c) Use of personal protective equipment.
- (d) Handling emergency situation.

**8.3.7. Plant Restoration Plan**

**1. Objective**

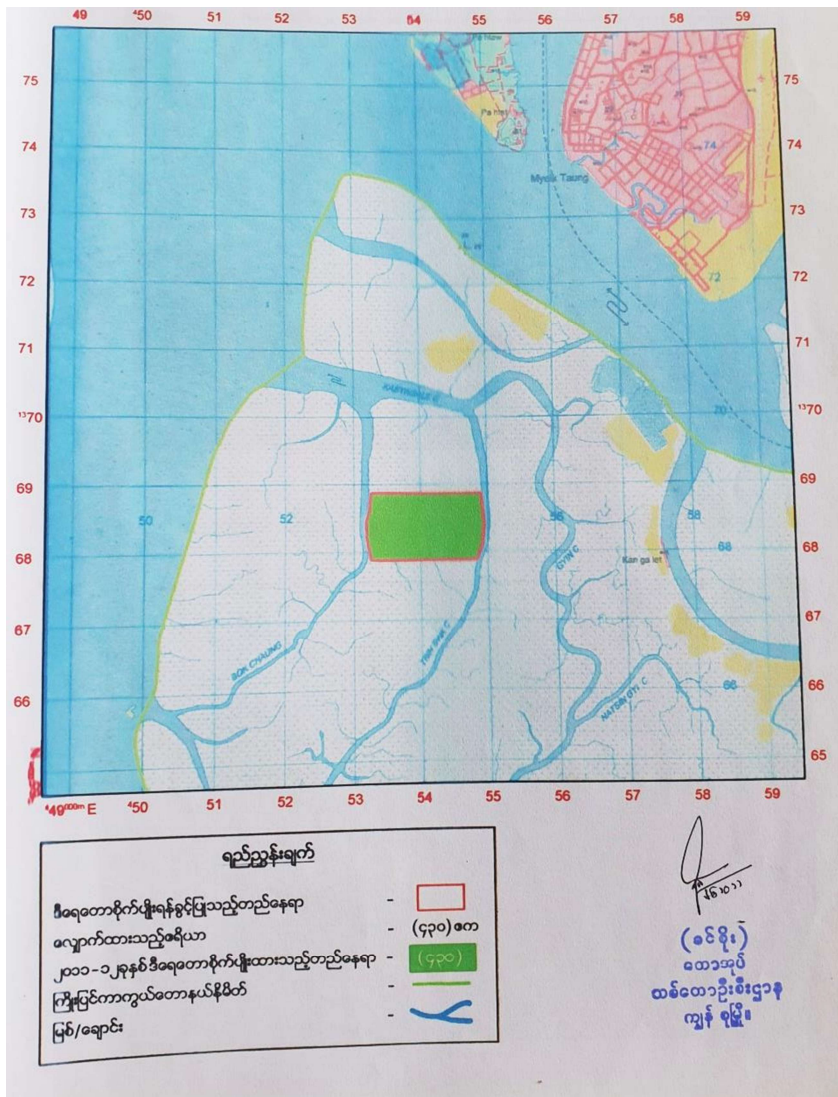
The objective of plant restoration plan is to recover biodiversity and important ecological processes nearby the proposed project area that has been degraded due to its temporary land use and other activities. PPT has also prepared private mangrove replantation near the seashore.

**2. Legal Requirements**

<b>Laws and Regulations</b>	<b>Legal Commitments</b>
<b>Forest Law, 2018</b>	
Section 12	The project proponent has to get approval of the Ministry to carry out any development work or economic scheme within forest land or forest covered land



### 3. Overview Map and Cost Estimation for Mangroves Plantation



The following are the cost estimation for mangrove plantation.

No.	Description	Cost/Acre (Kyat)	Total Acre	Total Cost (Kyat)	Remark
1.	Site clearing	3000	430	1290000	
2.	Preparation for plantation	6000	430	2580000	
3.	Seed and plants	50000	430	21500000	
4.	Planting	35000	430	15050000	
5.	Transportation	-	-	90000	
			Total cost	40510000	



#### **4. Suitable Plant Selection**

Any particular species of plant which may be needed in that area from the point of view of soil conservation, moisture conservation, pollution control, dust control, wildlife habitat etc. may also be given preference while deciding the species to be included in the greenbelt. Mangrove species will also be planted near the seashore area.

The following aspects are important while selecting the plant species:

- (a) The species should be fast growing and having thick canopy cover,
- (b) It should be perennial and evergreen and should have large area index,
- (c) It should be indigenous and suitable to local climatic conditions,
- (d) It should be efficient in absorbing pollutants without significant effects on plant growth, and
- (e) It should be fruit yielding trees, if possible, especially in wasteland areas.

#### **5. Implementation Schedule**

The startup time of plant and forest restoration is during the rainy season of startup year. Detail implementation schedule is determined with the help of Department of Forestry (Myeik).

#### **6. Implementation Plan**

Plant and forest restoration area is determined according to Forest Rule described below.

- (A) Cultivation in watersheds and tropics where forests have been destroyed.
- (B) Watershed area and planting with suitable local plants to re-establish natural habitats and habitats.
- (C) Co-ordination with land use and appropriate cultivation methods depending on climate, region and soil conditions.

For temporary land use, the restoration area is its temporary land use areas and for permanent land use, the restoration area is determined with the help of Ministry of Forest and it can be commonly along its railway alignments.

#### **7. Rule and Responsibilities**

All land preparation activities will be conducted by field coordinator with the assistance field assistants and hired local workers from the local communities. In order to prepare the land for

restoration, an initial soil analysis would need to be conducted to assess the soil quality. Poor quality soil that are compacted and low in organic matter will require more time, money, water and fertilizer to maintain plants. Poor soil conditions also contribute to water quality issues by shedding runoff during rainfall events.

Production of planting lines and holes will be conducted by engaged technical workers from the community, led by the field assistant and it will involve the following activities:

- Information signs will be constructed, and the area will be marked out with bamboo poles along with planting lines for holes to be dug
- Weeding of land and digging of planting holes
- Water barriers will be built along sloping grounds to prevent over-drainage
- The land will be fertilized with a chemical organic treatment

#### **(i) Field Coordinator**

Field coordinator has direct responsibility for the field assistants who will report to them. Field coordinator is responsible for undertaking the following aspects of implementation.

- Lead field works (planting)
- Make routine field visits into the restoration sites for ongoing monitoring

#### **(ii) Field assistant**

Field assistants will be responsible for managing inputs from the local workers, and will report to the field coordinators. Field assistants may be recruited from the local workforce but are expected to have experience of managing a nursery and managing a restoration planting plan.

Specific responsibilities of the field assistants include:

- Organizing nursery management by local workers
- Organizing tree planting by local workers
- Inputs to the field coordinators' reports

#### **(iii) Local workers**

Local workers will be recruited from local communities. These local residents already have typically high levels of knowledge about the forest, native species, and tree planting. The local workers will be guided and supervised by field assistant.

**Core responsibilities of the local workers will be:**

- Seedlings and tree sapling production
- Watering and weeding saplings
- Preparation of restoration sites including making planting holes
- Tree sapling planting
- Identification and replacement of dead saplings as required.

**8. Monitoring and Evaluation**

Monitoring of the implementation is planned and organized in two phases:

- Short-term monitoring – year one to five after planting
- Long-term monitoring – year five onwards to year fifteen after planting

**(i) Short-term Monitoring**

Short-term monitoring will be undertaken over a minimum of five years. The aim of the monitoring is to assess the survival rate of the plants.

Monitoring Focus	Target	Monitoring Location	Frequency	Responsibility
Planting survival rate	Plant survival rate >90%	At areas undergoing rehabilitation	For periods after planting: First six months –daily Six to 18 months after planting - monthly Second to fifth year - quarterly	Field coordinator to be appointed by project developer

**(ii) Long term Monitoring**

The long-term monitoring should be undertaken over a minimum period of fifteen years. The objectives of long-term monitoring are similar to short-term monitoring. The monitoring frequency is quarterly.

**8.3.8. Community Development Plan**

**1. Objectives**

A community development plan aims to:

- supporting people with disabilities to maximize their physical and mental abilities, to access regular services and opportunities, and to become active contributors to the community and society at large;

- activating communities to promote and protect the human rights of people with disabilities for example by removing barriers to participation;
- Facilitating capacity building, empowerment and community mobilization of people with disabilities and their families.

## 2. Legal Requirements

Laws and Regulations	Legal Requirements
<b>Village Regional Development Law, 2019</b>	
Section 11	Project proponent has to comply with the right of rural people in accordance with section 11 of Village Regional Development Law.

## 3. Overview Map

The nearby residential areas along the proposed project are shown in the following figure.



**Figure – Residential Areas near the Proposed Project**

The community development plan will include (i) capacity building program and (ii) Corporate Social Responsibility (CSR) program.

### **8.3.8.1. Capacity Building Program**

PPT will conduct the following capacity building program for local community development.

#### **(a) Animal Husbandry**

Villages near the factory mostly raise chicken for eggs and meat. Modern animal husbandry will be introduced to the villagers. Modern animal husbandry can produce more and earn much more.

- Well-fed animals grow more quickly, they become bigger, yield more meat. They can be sold at a better price.
- Animals produce manure. Your soil will become richer and better. Your harvests will be better. You will make more money.
- Animals that are well fed and looked after are healthy. They have more young ones and your herd will be better and bigger. You can sell animals and earn more money.

#### **How to improve animal husbandry**

If animal husbandry is to produce more, the animals must be raised in a different way.

- A farmer who wants to earn more money must look after his animals himself.
- He must both grow crops and look after his animals.
- The farmer must learn to look after animals.
- Chicken must be raised in a stress-free environment so that they can produce larger eggs and higher quality meat.
- There should be enough space for them to roam so that they can forage for bugs and other critter.

He must:

- Feed them better: especially the young animals; he must lay in reserves for the dry season; give the animals enough to drink.
- look after them better:
- Build a shelter for them, protect the animals against parasites and diseases, and look after them if they are hurt.



### **(b) Training Program for Job Opportunities**

All training programs for the locals will be based on the employment opportunities and the training will be mainly associated with construction techniques and machinery works that should be done before the actual construction phase. Since the location of the project is in the industrial area and most nearby locals will be given more employment opportunities on construction site.

In the awareness of unemployment for local people, the training associated with construction techniques and heavy machinery driving will be done before the actual construction phase because the lack of the experience can be substituted by the other experienced labor workers. The villagers will be given more job opportunities mainly work on construction site. However, women in the villages will not be suitable for construction works. So, job opportunities will also be created for women.

Unskilled or semi-skilled men and women are hired from nearby villages and are trained to handle day-to-day work procedures. To become a certified heavy machine operator, there should be at least 12 weeks training program and 2-week practical work. If villagers are not trained beforehand, they will not be certified for such works and only get manual labor works. When they are certified, they can also work in large construction sites in the future as well. The special training program such as making handicrafts, sewing clothes, broom making, etc. will be given to women. After the training program, they will be capable of making handicrafts, clothes and broom which can be sold in the market.

### **8.3.8.2. Corporate Social Responsibility (CSR) Program**

Contribution at random places with no records will have some social problem due to the lack of transparency. So, PPT will have CSR program to contribute and manage CSR fund effectively.

### **Developer's Policies for Socio-economic Development of Local People**

The PPT's policies for local socio-economic development are shown in the following table.

<b>No.</b>	<b>Description</b>	<b>Company's Policy</b>
1.	Local Community Development Policy	Appoint local people with relevant skills as much as possible and at least 50% of local people will be appointed during operation phase.



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2.	Corporate Social Responsibility (CSR) Policy	Contribute at least 2 percent of the annual net profit after tax as CSR fund
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**(i) CSR Fund**

PPT will set up fixed CSR fund for local community development. CSR activities will be accomplished not only by financial assistance but also by technical assistance and manpower in some donations to retain good relationship with local communities.

**(ii) CSR Officer (or) Coordinator**

PPT will assign CSR officer who is closely communicate with local people in order to manage the contributions of CSR fund effectively. CSR officer is not only intended for the proposed soft-shell crab farming but also for the whole factories in Pathaw-Pahtet Island. HR manager may be assigned as CSR officer. CSR officer will donate CSR fund after the discussion with representative people from nearest villages, local authorities not only for Kyunsu but also for Myeik, local CBOs and NGOs. Allocated percent of CSR fund is based on local community needs according to the public survey as follow:

**(iii) Allocated CSR Budget**

The following development activities are based on the needs of the local people for the socio-economic development during the public consultation meetings. The proposed development activities will be beneficial to the nearby areas. The following development activities are as follow:

**Table 8.7 - Allocated CSR Budget**

<b>No.</b>	<b>Activities</b>	<b>Proposed allocated percent of CSR budget</b>	<b>CSR Activities</b>
1.	Supporting to upgrading of village road	15%	.A good transportation route is one of important task during the community development as transportation plays a huge role in every towns and villages. PPT will help in maintaining the roads and bridges for the locals in order for them to travel conveniently and will also take part in constructing new roads and bridges. Moreover, PPT will help local communities by making free transportation to Myeik Township and Pathaw-Pahtet Island. So, they can also reduce transportation fees when they go and sell their agricultural products and sea foods at Myeik Township.
2.	Supporting to improve water supply system to nearest villages	15%	To promote community health an easily accessible water supply will be provided by water pond sufficient safe water to meet community needs. Sometimes the best option for improving water quality is to treat water in the home by boiling. Bringing water to a rolling boil will destroy pathogens in the water and make it safe to drink. Therefore, the knowledge sharing will be done for improving the local people’s hygiene and for avoiding the diarrhea especially in the children.
3.	Supporting to get full time electrical power to nearest villages	15%	The fuel is generally of poor quality, and energy is used inefficiently; the power supply is unreliable and access to it limited. This not only has an adverse effect on economic productivity; more importantly, it also affects people’s quality of life and is having a strong impact on the environment. The unsustainable use of locally sourced biomass and an increasing dependence on fossil fuels are causing environmental degradation at local (land degradation), regional (air, water and soil pollution) and global levels (greenhouse gas – GHG emissions contributing to climate change). Providing solar energy make an improvement of rural economies with new sources of revenue, employment and business opportunities, product and policy innovation, capacity building, and, most notably, affordable energy.

4.	Supporting to improve education in nearest villages	15%	<p>Distribution of education materials and financial aid or scholar grants to the students who are economically deprived in the nearest villages in this region will have a great benefit for students. All of the school in Pathaw-Pahtet Villages will prepare as free of charge and will provide required stationery for all students at the beginning of the school day.</p> <p>CSR will provide 15% of the funds for educational purposes as the nearby areas have plenty of children who are willing to attend schools. Educational facilities such as books, pencil case, bags and many more will be provided to the children and the remaining funds will go to the schools for its development.</p>
5.	Donation to health care facilities in nearest villages	15%	<p>Health care facilities of proposed project will be assessed to nearest local people with lowest price or free of charge as part of CSR program. Ambulance for emergency case will be provided for local people in nearest villages.</p> <p>PPT will hold health education program for locals to raise awareness in the community. Particularly, health issues related to population growth such as sexually infected diseases, covid and so on will be included in the program along with the ways to take precautions against those diseases. With the help of PPT and local authorities, the program will not only be beneficial to the community wellness but also create a safe environment to the community.</p> <p>The main objective is to avoid or minimize risks to and impacts on the health and safety of the local community during the project life cycle from both routine and non-routine. This is done by providing the local clinics, and supporting the facility requirements.</p>
6.	Contribution to local NGOs and CBOs	5%	<p>PT will cooperate with local NGOs and CBOs not only in nearest villages but also in Myeik Region in the activities to improve regional, religious, and all-round developments. Some percentage of CSR fund will provide regularly to NGOs and CBOs in local communities as deposit.</p> <p>CSR program will contribute 5% of the funds to NGOs and CBOs as those organizations are helping and doing good deeds in rural areas which are facing financial problems to carry out development for its community. NGOs and CBOs help in every corner to the locals who are in needs of help so PPT will contribute to those organizations as a helping hand to the those in needs.</p>

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7.	Supporting to free funeral service and social welfare society's aid	10%	10% of the CSR funds will go to social welfare society's aid such as free funeral services, healthcare ambulance and so on. Those services have been aiding the locals who could not afford or when they face emergency health cases.
8.	Participating Government Schemes of Welfare	10%	PPT will actively participate in implementation of government schemes for welfare of the society of the not only in Myeik but also for Kyunsu regions.
	Total	100%	

Note: Budget allocation can be changed according to the public needs and allocation will be made after the discussion with local communities.

#### **8.3.8.3. Declare the Contribution of CSR Fund**

All of the CSR activities and contribution programs will be declared to public by means of local media, company annual report or company's website on a regular basis. Audit on contribution of CSR fund will be carried out together with environmental and social audits through independent external audit team for transparency.

## **9. PUBLIC CONSULTATION AND DISCLOSURE**

### **9.1 Importance of Public Consultation and Information Disclosure**

The opinions of the local people, social organizations and stakeholders with the development of the proposed project have been taken into account in the IEE. The public consultation indicated the transparency of IEE's proponents to the local people. Consultation meetings were held with various stakeholders including communities near project area, administrative, community based and social organizations. The results getting from the consultations meeting and negotiations with environmentally and socially of the affected people were taken into consideration in evaluation of impacts, design of mitigation measures and monitoring plans. Negotiation with related governmental organizations was also done. All feedbacks from public consultation meetings were well addressed and considered in the formulation of EMP, environmental monitoring plan and CSR plan.

### **9.2. Data Collection**

The primary data for environmental, social and health profiles were collected by household survey during study period. The project data, factory layout plans and design parameter are provided by Pyi Phyo Tun International Company Limited (PPT). Some secondary data on demographic distribution in the area are sourced from local government offices of Myeik and Kyunsu.

### **9.3. Public Consultation and Participation Process**

Integral to the impact assessment is the process of stakeholder engagement which has been ongoing. The public participation process included:

- (i) Identifying interested and affected parties (stakeholders);
- (ii) Informing and providing the stakeholders with sufficient background and technical information regarding the proposed development;
- (iii) Creating opportunities and mechanisms whereby they can participate and raise their viewpoints (issues, comments, and concerns) with regard to the proposed development;
- (iv) Giving the stakeholders feedback on process findings and recommendations; and
- (v) Ensuring compliance to process requirements with regards to the environmental and related legislation.



The IEE includes the activities undertaken during detailed design stage to engage the stakeholders, and planned information disclosure measures and processes for carrying out consultation with affected people and facilitating their participation during implementation stage. Three rounds of engagements have been undertaken as follow:

**Table 9.1 - Public Consultation and Stakeholder Engagement Process**

<b>Round</b>	<b>Method</b>	<b>Stakeholders</b>
<b>Round 1: Information sharing and issues identification</b>	(a) Conduct house hold survey  (b) Leaflet were distributed during household survey.	Village leaders and local people in project affected area, local non-government and community-based organizations.
<b>Round 2: Public Meetings (First public meeting)</b>	(a) Invitation letters, handout, and report for current situation were distributed.  (b) Posters and presentations were used during the meeting.	Key stakeholders in civil society, Government officials, supporting committees for Thanitharyi Region Government, NGO's, INGO and CBO's, community leaders, and local people
<b>Round 3: (Second public meeting)</b>	(a) Invitation letters, handout, and report for current situation were distributed.  (b) Posters and presentations were used during the meeting.	Key stakeholders in civil society, Government officials, supporting committees for Thanitharyi Region Government, NGO's, INGO and CBO's, community leaders, and local people
<b>Round 4: Public disclosure process</b>	(a) Distribution of executive summary and IEE report	Civil society, NGO's and CBO's, Government officials, community leaders

#### **9.4. Household Surveys as Part of Public Consultation and Participation Process**

Household survey was conducted to evaluate primary socio-economic conditions of the project area and to understand the mood, perceptions and extent of preparedness of the local people towards the proposed project. The household survey was carried out to tap the baseline socio-economic conditions of project area and to assess project perceptions and attitudes of the local people over a period of five days. To get the accurate data, primary data collection was conducted by social specialist, social consultants together with local authorities and local people as follow:

<b>No.</b>	<b>Participants</b>	<b>Degree</b>	<b>Responsibilities</b>
1.	Dr. Kyaw Swar Tint	Ph.D. (Mining)	Team Leader
2.	Dr. Thein Tun	Ph.D. (Metallurgy)	Public Relation
3.	U Aung Naing Tun	L.L.B	Legal Requirement
3.	Ma Nandar Nwe	M.S. in EAM (YTU)	Social Consultant
4.	Ma Thazin Htwe	M.S. in EAM (YTU)	Social Consultant
5.	Mg Yaw Ma Nar	B.Sc. (Forestry); Dip. in EIA/EMS	SIA Team Coordinator

#### **Sample Size Determination**

The number of households selected to take part in the survey was determined using the Pagoso Formula (Lauraya & Sala, 1995). The method estimates sample size  $n$  from, population size  $N$  and sampling error  $E$  using the following formula:

$$n = \frac{N}{1+NE^2}$$

In order to have a clear understanding about the sampling error “E” value, the correlation between sample size and “E” value were presented in the following table. Gay (1978) as cited by Sevilla et al (1978) offers some minimum acceptable sizes descriptive research, 5% for a smaller population as small as 500 and below and 4% of the population for a larger population as large as 1,500.

**Table: Correlation between Sample Size and Sampling Error**

Population	Margin of Error					
	1%	2%	3%	4%	5%	10%
500	NA	NA	NA	NA	222	83
1,500	NA	NA	638	441	316	94
2,500	NA	1,250	769	500	345	96
3,000	NA	1,364	811	517	353	97
4,000	NA	1,538	870	541	364	98
5,000	NA	1,667	909	556	370	98
6,000	NA	1,765	938	566	375	98
7,000	NA	1,842	959	574	378	99
8,000	NA	1,908	976	580	381	99
9,000	NA	1,908	989	584	383	99
10,000	5,000	2,000	1,020	588	388	99
50,000	8,333	2,333	1,087	617	387	100

*Source: Acceptable Sizes & Error- Updated from Glenn D. Israel, 2003*

The sampling error will be considered depending upon the percentage of confident level set. This study aimed to set the confident level at 95% and the sampling error at 5% accordingly for small population size of below and around 500. According to the above calculation, approximately a total of 149 households took part in the study as follow:

**Table 9.2 - Stratified Systematic Sample for Study Strata**

No	Quarter	No. of Households	Sample Size
1.	Pahtaw	120	43
2.	Pahtet	180	52
3.	Kan Nar(Myeik)	157	52



*Figure 9.1- Some Recorded Photos during Household Survey*

**Most Public Needs and Concerns during Household Survey**

During household survey, the most important positive outcomes from the project expected by the local people and most of their concerns about proposed project are as follow:

Village Name	Most Public Needs	Most Pubic Concerns
Pahtaw	<ul style="list-style-type: none"> <li>Expanding and upgrading of village road</li> </ul>	<ul style="list-style-type: none"> <li>Odor</li> </ul>

	<ul style="list-style-type: none"> <li>• Supporting for health care facilities, water supply and electricity</li> <li>• Maintenance of the Pagoda on the Hill</li> </ul>	
Pahtet	<ul style="list-style-type: none"> <li>• Supporting for health care facilities and water supply</li> <li>• Electricity on full time</li> <li>• Maintenance to the Shwethalyaung Pagoda</li> </ul>	No public concern
Kan Nar (Myeik)	<ul style="list-style-type: none"> <li>• Maintenance of the Kan Nar road</li> <li>• Provide rubbish bin along the Kan Nar Road</li> </ul>	Odor Increased in traffic

## **9.5. Public Meetings**

Public meeting were held two times as essential part of the public participation process as follow:

### **9.5.1. First Public Meeting**

First public meeting was held in Pahtet Village. There were about 80 people from local communities who are directly or indirectly affected by the proposed project are attended in this meeting. The aims of the first public meeting are:

- (i) To knowledge share about the process and procedure of IEE;
- (ii) To disclose publicly about the potential environmental and social impacts of the proposed project;
- (iii) To discuss about the alternative ways and possible mitigation measures to avoid the potential impacts;
- (iv) To clarify about the public needs and concerns.

Attendance list, meeting minuts and suggestion letters of first public meeting are shown in Appendix A.





**Figure 9.2- Recorded Photos during First Public Meeting**

### **Summary of First Public Meetings**

The key discussions during public meetings are the waste water discharge system from the Soft-Shell Crab factory, discharge wastewater away from the residential areas and about the CSR program.

#### **9.5.2. Second Public Meeting**

Second public meeting was held at Department of Fishery (Myeik). There were about 270 people from Government officials, supporting committees for Thanitharyi Region Government, NGO's, INGO and CBO's, community leaders, and local people who are directly or indirectly affected by the proposed project are attended in this meeting. The aims of the first public meeting are:

- (i) To discuss the alternative ways to avoid environmental impacts;
- (ii) To announce-the anticipated impacts of proposed projects;
- (iii) To discuss about mitigation measures for these impacts; and
- (iv) To discuss about the management and monitoring plan.

Attendance list, meeting minuts and suggestion letters of first public meeting are shown in Appendix B.





**Figure 9.3- Recorded Photos during Second Public Meeting**

### **Summary of Second Public Meetings**

We held the second Public Meeting at Department of Fishery (Myeik) in (20.9.2018). There are about 270 people from Government officials, supporting communities from Thanitharyi Region Government, NGO's, INGO and CBO's, community leaders, and local people who are directly or indirectly affected by the proposed project. The key discussions during public meetings are not to damage to the coastal region, knowledge sharing sections about the methods for the small business and about the CSR program.

### **Results of Consultations**

#### **Key Findings from the Public Meetings Related to the Proposed Project**

The followings are the summary of key findings from public meetings:

- Not to damage to the coastal region
- Wastewater discharge system
- Not to discharge the wastewater near the residential areas

- Arrange to replant the island with native plants
- Collect the detail amount of CSR Fund annually
- To cultivate mangrove forests that can withstand floods

### **9.5.3. Public Disclosure Process**

Meeting minutes was distributed to all participants during second public meeting. Summary of IEE report in Myanmar Language was also distributed to all key stakeholders as public disclosure process.

Draft IEE report was distributed to all key stakeholders and will be made available for public comment for a period of 30 days in the following ways:

- By raising comments during a series of public meetings where the content of the draft IEE Report will be presented;
- By completing a comment sheet made available together with the report at the public places, and by submitting additional written comments, by email or fax, or by telephone, to the Green Tech Office.

All comments and issues raised during the comment period on the draft IEE report will be added to the comment and response report that will accompany the Final Report.

### **Future Program for Public Participation, Consultation and Environmental Monitoring**

The developer will make public consultation meeting at least two times per year. Moreover, intermittent consultation meeting will also make according to the necessarily. The future public participation program will include the following factors.

<b>No.</b>	<b>Factors for Future Public Meetings</b>	<b>Frequency</b>
1.	Water pollution due to Wastewater	Every 6 months
2.	Air Pollution	Every 6 months
3.	Soil Contamination by solid waste disposal	Every 6 months
3.	Job Opportunities (Appointed persons and plan for jobless local people)	Ever year
4.	The use of CSR fund	Every year

## **9.6. Grievance Redress Mechanism (GRM)**

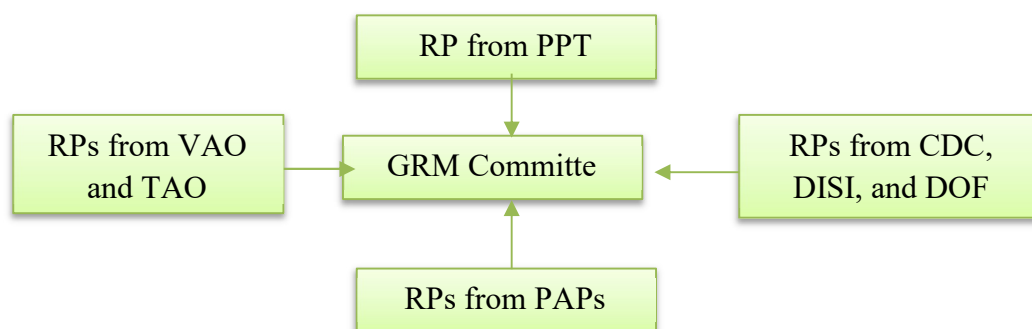
A grievance redress mechanism (GRM) will be made available to parties who have grievances or are not satisfied with any part of the development of proposed project and adverse impact especially for odour.

The GRM is also an integral part of the monitoring and information system. It aims to ensure that feedback is received, that the voices from the poor and marginalized groups are heard, and that the issues raised are resolved effectively and expeditiously. It helps ensure that vulnerable households are treated equitably.

The GRM will be accessible to diverse members of the community and stakeholders. Multiple types of media, including face-to-face meetings, written forms, telephone conversations, or e-mail, will be available for raising issues, concerns and grievances. Villagers will be encouraged to seek clarification or remediation through the mechanism if they have any questions or complaints/ grievances.

### **9.6.1. Grievance Redress Committee (GRC)**

In order to address grievances, a Grievance Redress Committee (GRM) will be formed for dealing with any grievances as they arise if needed. This will include representatives from project developer (PPT), representatives from Village Administrative Office (VAO) of nearest project sites, representatives from Land Use Department (if necessary), representatives from Township Administrative Office, and PAPs as follow:



- RP = Representative person
- VAO = Village Administrative Office
- TAO = Township Administrative Office
- CDC = City Development Committee

DISI = Directorate of Industrial Supervision and Inspection  
PAP = Project Affected Persons

## **Role and Responsibility of GRM Team**

### **The GRM**

The proposed GRM follows the existing approach taken for managing complaints about local issues by members of the public in Myanmar. Residents' complaints or concerns are generally taken to local government (village and township level) representatives for resolution; therefore, this system is integrated into the GRM.

In their capacity as implementing agencies, PPT will establish a Public Complaints Unit (PCU) within the PMU early during project implementation prior to the start of planning and design of sub-projects and prior to negotiations for public complains. The PCU will deal with complaints from affected people and stakeholders throughout implementation of the project. This will include nearby residents, factory workers, and will involve village and township level government.

The PMU will be the key contact point for local government representatives who may require information about the project or who have an issue they would like to discuss. The PMU will issue public notices and leaflets in local languages early in the subproject design process to inform people and organizations within the project area of the GRM. The PCU's phone number, fax, address, email address will be disseminated.

The PMU will maintain a complaints database which indicates the household making the grievance, the nature of the issue, the date the report was received and also dealt with and the result. Dispute receipt and resolution will be reported regularly in project quarterly reports.

### **Responsible Persons for GRM**

Name	U Myat Noe
Position	Factory Manager
Contact Number	

### **Record Keeping for GRM**

The following records will be documented in manager of dried fish and prawn factory and copy in PPT main office.

- Number of complaints/ grievances registered.
- Percentage of grievances resolved.
- Percentage of grievances resolved within stipulated time period.

- Time required to resolve complaints.
- Percentage of complainants satisfied with response and grievance redress.
- Percentage of project beneficiaries that have access to the GRM.

Dispute receipt and resolution will be reported regularly in project quarterly reports.

### **9.6.2. Grievance Mechanism Procedures**

The procedure for handling grievances will be as follows.

(i) The affect person should file his grievance in writing, to the Village Leader. The grievance note should be signed and dated by the aggrieved person. Where the affected person is unable to write, he should obtain assistance to write the note and emboss the letter with his/her thumbprint.

(ii) The Head of Village Administrative Office or Village Leader shall notify the Grievance Committee and respond within 14 days during which any meetings and discussions to be held with the aggrieved person shall be conducted. If the grievance relates to valuation of assets, an independent value will be requested to revalue the assets, and this may necessitate a longer period of time. In this case, the aggrieved person will be notified by the VOC’s head or Village Leader that his/her complaint is being considered.

(iii) If the aggrieved person does not receive a response or is not satisfied with the outcome within the agreed time, he/she may lodge his/her grievance to the Local General Administration Department.

Table - Township, district and state level committees for the grievance redress mechanism.

No	Committee Member	Member Role
<b>Township Level Redress Committee (TRC)</b>		
	A person elected from citizen	Chairperson
	A person elected from experts	Member
	A person elected from CSOs	Member
	Deputy admin officer – township level (General Administrative Department)	Member
	Township level officer	Member
<b>District Level Redress Committee (DRC)</b>		
	A person elected from citizen	Chairperson
	A person elected from experts	Member
	A person elected from CSOs	Member
	Deputy admin officer – district level (General Administrative Department)	Member
	District level officer	Member
<b>State Level Redress Committee (SRC)</b>		
	The president appointed mayor as a minister	Chairperson
	In Yangon, there are four districts and each district can elect one representative	4 Members
	Appointed from government	4 Members

## **GRM Steps and Timeframe**

Procedures and timeframes for the grievance redress process are as follows:

Stage 1: Access to GRM. If a concern arises, the affected person will resolve the issue of concern directly with the contractor, or make his/her complaint known to either the PCU directly, or through the local village or township government, whichever level of authority he/she is most comfortable with;

Stage 2: Official Complaint to PCU. If a complaint is filed at local government level, the government representative will submit an oral or written complaint to the PCU. For an oral complaint the PCU must make a written record. For each complaint, the PCU must assess its eligibility. If the complaint is not eligible, for instance it is determined that the issue is outside the scope of the project, PCU will provide a clear reply within five working days to the affected person;

Stage 3: PCU Complaint Resolution. The PCU will register the complaints informing the respective local and district government, the PMU and contractors. The PCU, with support of the social specialist and other PICs depending on the issue will take steps to investigate and resolve the issue. This may involve instructing the contractor to take corrective actions. Within seven days of the redress solution being agreed upon, the contractor should implement the redress solution and convey the outcome to the PMU;

Stage 4: Stakeholder Meeting. If no solution can be identified by the PCU or if the affected person is not satisfied with the suggested solution under Stage 3, within two weeks of the end of Stage 3, the PCU will organize a multi-stakeholder meeting under the auspices of the head of local government, where all relevant stakeholders will be invited. The meeting will result in a solution acceptable to all, and identify responsibilities and an action plan. PPT will implement the agreed redress solution and convey the outcome to the PMU within seven working days. The invitees to this meeting will depend on the nature of the complaint. For example, if the complaints relate to health, land disputes, or labor issues, the appropriate specialist in this field will be invited to the stakeholder meeting. This may include officers from the Department of Agricultural Land Management and Statistics (land rights issues), Myanmar Chamber of Commerce (business/commercial issues), various non-government organizations (NGOs) (gender or equity issues), Ministry for Ethnic Affairs (if ethnic group household involved), Ministry of Health (health issues), Ministry of Environmental Conservation and Forestry (environmental issues), and Ministry of Labor (labor issues); and

Stage 5: District Administration Officer Resolution. If the multi-stakeholder meeting cannot resolve the problem, and the affected person remains unsatisfied, the PMU will set up a meeting with the District Administration Officer to identify a solution.



## **10. CONCLUSION**

The IEE study will describe the key anticipated environmental and social impacts of proposed project. Moreover, proper mitigation measures for all anticipated impacts and good environmental management practices are also described. The most public concerns about the proposed project is bad smell (odor) and that can be mitigated by proper mitigation measure. The major pollution is the wasted crab shell of the seed crabs and that can be mitigated by using as landfill. Moreover, minor to moderate environmental and social impacts that are anticipated by IEE team and appropriate mitigation measures are also described in this IEE report. However, PPT will care about the nature of cumulative and long term impact on surface water pollution and soil contamination due to the present of other industries in Pathaw-Pathat Island although the project have no significant impact on surface water pollution and soil contamination. So, it can be concluded that the proposed project need not to conduct comprehensive EIA and the findings in this IEE report will cover all of the environmental and social impacts related to the proposed project. According to the IEE study, the proposed project can be allowed to operate if the developer (PPT) will do all of the mitigation and enhancement measures described in this report.

**APPENDICES**

**APPENDIX A  
FIRST PUBLIC MEETING**

ATTENDANCE LIST OF FIRST PUBLIC MEETING

စဉ်	အမည်	အဖွဲ့/အဖွဲ့ဝင်အမည်	ဆက်သွယ်ရန်လိပ်စာ/ဖုန်းနံပါတ်	လက်မှတ်
၁	ဦးဦးစာအုပ်စာတိုက်	လက်ဆောင်ပေးပို့ပေးသူ/အဖွဲ့ဝင်	zarni2480@gmail.com ၀၉၄၄၅၀၉၇၇၇၇	
၂	ဦးစိုးမိုးမာမာ	ဦးစိုးမိုး (အဖွဲ့ဝင်)	၀၇၀၀၇၈၀၄၀၅	
၃	ဦးစိုးမိုးမာမာ	ECD, Myeik District / SO	၀၉-၂၀၈၅၄၀၀၅၇	
၄	ဦးစိုးမိုးမာမာ	" / DSO	၀၉-၇၇၈၀၄၄၅၅၅၇	
၅	ဦးစိုးမိုးမာမာ	ပရိသတ် / ပထမဆုံးအဖွဲ့ဝင်		
၆	ဦးစိုးမိုးမာမာ	" "		
၇	ဦးစိုးမိုးမာမာ	" "		
၈	ဦးစိုးမိုးမာမာ	" "		
၉	ဦးစိုးမိုးမာမာ	" "		
၁၀	ဦးစိုးမိုးမာမာ	ဒုတိယအဖွဲ့ဝင်	၀၉၂၅၅၂၀၅၂၀၅	

စဉ်	အမည်	အဖွဲ့/အဖွဲ့ဝင်အမည်	ဆက်သွယ်ရန်လိပ်စာ/ဖုန်းနံပါတ်	လက်မှတ်
၁၁	ဦးစိုးမိုးမာမာ	ဦးစိုးမိုးမာမာ	၀၇-၂၅၀၄၆၆၆၆၆	
၁၂	ဦးစိုးမိုးမာမာ	ဦးစိုးမိုးမာမာ	၀၇၄၆၀၀၅၅၅၅	
၁၃	ဦးစိုးမိုးမာမာ	ဦးစိုးမိုးမာမာ	၀၇၂၅၅၂၀၅၂၀၅	
၁၄	ဦးစိုးမိုးမာမာ	ဦးစိုးမိုးမာမာ	၀၇-၄၂၂၅၅၅၅၅	
၁၅	ဦးစိုးမိုးမာမာ	"	၀၇၇၇၇၇၇၇၇	
၁၆	ဦးစိုးမိုးမာမာ	ဦးစိုးမိုးမာမာ	၀၇/၇၇၅၅၅၅၅၅	
၁၇	ဦးစိုးမိုးမာမာ	ဦးစိုးမိုးမာမာ	၀၇-၄၂၂၅၅၅၅၅	
၁၈	ဦးစိုးမိုးမာမာ	Sea View Condo	၀၇-၂၅၄၈၂၈၂၈၂	
၁၉	ဦးစိုးမိုးမာမာ	PPT	၀၇-၂၅၆၆၆၆၆၆	
၂၀	ဦးစိုးမိုးမာမာ	PPT	၀၇၂၅၅၅၅၅၅	

စဉ်	အမည်	အဖွဲ့/အဖွဲ့ဝင်အမည်	ဆက်သွယ်ရန်လိပ်စာ/ဖုန်းနံပါတ်	လက်မှတ်
၂၁	ဦးစိုးမိုးမာမာ			
၂၂	ဦးစိုးမိုးမာမာ	ဦးစိုးမိုးမာမာ	၀၇၄၇၅၅၅၅၅	
၂၃	ဦးစိုးမိုးမာမာ	ဦးစိုးမိုးမာမာ	၀၇၅၅၅၅၅၅၅	
၂၄	ဦးစိုးမိုးမာမာ	men TV media	၀၇ ၄၅၅၅ ၅၅ ၅၅	
၂၅	ဦးစိုးမိုးမာမာ	ဦးစိုးမိုးမာမာ	၀၇ ၅၅၅၅ ၅၅ ၅၅	
၂၆	ဦးစိုးမိုးမာမာ	ဦးစိုးမိုးမာမာ	၀၇၅၀၅၀၅၀၅	
၂၇	ဦးစိုးမိုးမာမာ	ဦးစိုးမိုးမာမာ	၀၇၇၇၀၇၇၇၇	
၂၈	ဦးစိုးမိုးမာမာ	ဦးစိုးမိုးမာမာ	၀၇၇၇၅၅၅၅၅	
၂၉	ဦးစိုးမိုးမာမာ	လက်ဆောင်ပေးပို့ပေးသူ	၀၇၂၅၅၅၅၅၅	
၃၀	ဦးစိုးမိုးမာမာ	ဦးစိုးမိုးမာမာ	၀၇၄၅၅၅၅၅၅	

စဉ်	အမည်	ရာထူး/လုပ်ငန်းကြံ့ခိုင်ရေးအမည်	ဆက်သွယ်ရန်လိပ်စာ/ဖုန်းနံပါတ်	လက်မှတ်
၃၃	ဦးစိုးမင်း	အုပ်စုစာရင်းအကျဉ်းချုပ်	၀၉-၄၀၂၅၅၂၅၄၅	
၃၄	ဦးကျော်စွာ	ရင်းနှီးမြှုပ်နှံရေးမှူး	၀၉ ၈၇၂ ၇၃၃၄	
၃၅	ဦးကျော်စွာ	အုပ်စုစာရင်းအကျဉ်းချုပ်		
၃၆	ဦးကျော်စွာ	အုပ်စုစာရင်းအကျဉ်းချုပ်		
၃၇	ဦးကျော်စွာ	အုပ်စုစာရင်းအကျဉ်းချုပ်		
၃၈	ဦးကျော်စွာ	အုပ်စုစာရင်းအကျဉ်းချုပ်		
၃၉	ဦးကျော်စွာ	အုပ်စုစာရင်းအကျဉ်းချုပ်		
၄၀	ဦးကျော်စွာ	အုပ်စုစာရင်းအကျဉ်းချုပ်		

စဉ်	အမည်	ရာထူး/လုပ်ငန်းကြံ့ခိုင်ရေးအမည်	ဆက်သွယ်ရန်လိပ်စာ/ဖုန်းနံပါတ်	လက်မှတ်
၄၁	ဦးကျော်စွာ	အုပ်စုစာရင်းအကျဉ်းချုပ်	၀၉ ၄၄၅၅၀၀၀၁၅	
၄၂	ဦးကျော်စွာ	အုပ်စုစာရင်းအကျဉ်းချုပ်	၀၉၄၂၆၃၂၈၆၅၅	
၄၃	ဦးကျော်စွာ	အုပ်စုစာရင်းအကျဉ်းချုပ်	၀၉ ၂၅၇၇၂၂၂၂၂	
၄၄	ဦးကျော်စွာ	အုပ်စုစာရင်းအကျဉ်းချုပ်	၀၉၂၅၃၄၄၇၆၈၆	
၄၅	ဦးကျော်စွာ	အုပ်စုစာရင်းအကျဉ်းချုပ်	၀၉၇၈၂၅၂၂၂၂၂	
၄၆	ဦးကျော်စွာ	အုပ်စုစာရင်းအကျဉ်းချုပ်	၀၉၂၅၃၃၃၃၃၃	
၄၇	ဦးကျော်စွာ	အုပ်စုစာရင်းအကျဉ်းချုပ်	၀၉၇၅၅၅၅၅၅၅	
၄၈	ဦးကျော်စွာ	အုပ်စုစာရင်းအကျဉ်းချုပ်	၀၉၂၅၃၃၃၃၃၃	
၄၉	ဦးကျော်စွာ	အုပ်စုစာရင်းအကျဉ်းချုပ်	၀၉၇၅၅၅၅၅၅၅	
၅၀	ဦးကျော်စွာ	အုပ်စုစာရင်းအကျဉ်းချုပ်	၀၉၇၅၅၅၅၅၅၅	

စဉ်	အမည်	ရာထူး/လုပ်ငန်းကြံ့ခိုင်ရေးအမည်	ဆက်သွယ်ရန်လိပ်စာ/ဖုန်းနံပါတ်	လက်မှတ်
၅၁	ဦးကျော်စွာ	P-PPT	၀၉၂၆၂၂၆၆၆၆၆	
၅၂	ဦးကျော်စွာ	PPT	၀၉၇၈၂၅၂၅၂၅၂	
၅၃	ဦးကျော်စွာ	OFF / ED	၀၉၄၂၂၂၂၂၂၂၂	
၅၄	ဦးကျော်စွာ	AMP Fishmeal		
၅၅	ဦးကျော်စွာ	"		
၅၆	ဦးကျော်စွာ	"		
၅၇	ဦးကျော်စွာ	"		
၅၈	ဦးကျော်စွာ	"		
၅၉	ဦးကျော်စွာ	"		
၆၀	ဦးကျော်စွာ	"		

စဉ်	အမည်	ရာထူး/လုပ်ငန်းအမျိုးအစား	ဆက်သွယ်ရန်လိပ်စာ/ဖုန်းနံပါတ်	လက်မှတ်
၆၁	ဦးစောင့်စောင့်	ဓနိရေးရှာ	၀၇-၄၄၅၂၁၃၀၅၇	
၆၂	ဦးစောင့်စောင့်	-	၀၉ ၅၀၇၈၄၁၉၈၄	
၆၃	ဦးစိန်ဝင်း	အိတ်စီ	၀၇၇၃၁၃၀၂၃၃	
၆၄	Zaw Moe Od	Eleven Market	၀၇၂၅၄၄၇၄၂၈၁	
၆၅	ဒေါ်အေးအေး	AMP - Fishmeal	၀၇၂၅၄၈၂၇၅၇၀	
၆၆	ဒေါ်အေးအေး	AMP - fishmeal	၀၇၂၅၄၇၇၇၇၄၅	
၆၇	ဒေါ်အေးအေး	AMP - fishmeal	၀၇၂၅၄၈၂၇၅၇၀	
၆၈	ဒေါ်အေးအေး	AMP - fishmeal	၀၇၄၀၇၇၀၃၇၇၇	
၆၉	ဒေါ်အေးအေး	AMP fishmeal	၀၇၄၀၇၅၈၂၇၅၇၀	
၇၀	ဒေါ်အေးအေး	AMP fishmeal		

**ပြည့်ဖြိုးထွန်းကုမ္ပဏီမှ ပထော်ပထက်ကျွန်းပေါ်တွင်တည်ဆောက်မည့်  
 ဂဏန်းပျော့မွေးမြူရေးစီမံကိန်းအတွက် ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း (IEE) ဆိုင်ရာ  
 လူထုတွေ့ဆုံပွဲဆွေးနွေးမှုမှတ်တမ်း**

အခြေခံပညာအထက်တန်းကျောင်း (ပထက်)

၂၅/၈/၂၀၂၁

ပထော်ပထက်ကျေးရွာအနီးတွင်တည်ဆောက်လည်ပတ်မည့် ဂဏန်းပျော့မွေးမြူရေးလုပ်ငန်းအတွက် ကနဦးပတ်ဝန်းကျင်ဆိုင်ရာ စုံစမ်းစစ်ဆေးခြင်း (Initial Environmental Examination, IEE) ဆိုင်ရာ လူထုတွေ့ဆုံပွဲတွင်ပညာရှင်များ၊ ဌာနဆိုင်ရာအကြီးအကဲများ၊ ရပ်မိရပ်ဖများမှဆွေးနွေးမှုများမှာ-

**ဦးမင်းဦး (ဥက္ကဋ္ဌ၊ ကျွန်းစုမြို့နယ်)**

- တက်ရောက်လာသောဌာနဆိုင်ရာတာဝန်ရှိသူများ၊ ရပ်မိရပ်ဖများ၊ ဒေသဆိုင်ရာလူမှုအဖွဲ့ အစည်းများမှ ပုဂ္ဂိုလ်များအား အထူးပင်ကျေးဇူးတင်ရှိပါကြောင်း
- ပတ်ဝန်းကျင်နှင့် စက်မှုလုပ်ငန်းများစပ်ဆက်အရေးပါမှုအား အများသိရှိပြီးဖြစ်သဖြင့် ယခုကဲ့သို့ ဆန်းစစ်မှုများ ဆောင်ရွက်ခြင်းအား ဝမ်းသာပါကြောင်း
- အများအတွက်အကောင်းဆုံးဖြစ်စေမည့်နည်းလမ်းများအား ဝိုင်းဝန်းဆွေးနွေးပေးကြပါရန် တိုက်တွန်း ပြောကြားပါကြောင်း ပြောကြားပါသည်။

**ဦးမြတ်နိုး (မန်နေဂျာ၊ ဂဏန်းပျော့မွေးမြူရေးလုပ်ငန်း)**

- ကုမ္ပဏီစတင်တည်ထောင်သည်မှ လက်ရှိအချိန်အထိဆောင်ရွက်လျက်ရှိသောလုပ်ငန်းများအကြောင်းအား ရှင်းလင်းတင်ပြပါသည်။
- ဂဏန်းပျော့မွေးမြူရေးလုပ်ငန်းအတွက် ဂဏန်းကုန်ကြမ်းမှ အဆင့်ဆင့် ထုတ်လုပ်မွေးမြူပုံများကို ရှင်းလင်း တင်ပြပါသည်။



- ကုမ္ပဏီမှဒေသတွင်းလူမှုဖွံ့ဖြိုးတိုးတက်ရေးအတွက် ဆောင်ရွက်ထားရှိမှုများတင်ပြဆွေးနွေးပါသည်။

**ဒေါက်တာကျော်စွာတင့် (Ever Green Tech;)**

- ပတ်ဝန်းကျင်ထိခိုက်မှုလေ့လာဆန်းစစ်မှု ပြုလုပ်ခြင်း ရည်ရွယ်ချက်
- ထိခိုက်မှုဆန်းစစ်ခွင့်ရှိသော တတိယအဖွဲ့အစည်းများ၏ လိုက်နာရမည့်ကျင့်ဝတ်များနှင့် လုပ်ထုံးလုပ်နည်းများ
- ပတ်ဝန်းကျင်မူလအရည်အသွေးများအား မှတ်တမ်းတင်ထားရှိခြင်း
- ဂဏန်းပျော့မွေးမြူရေးမှထွက်ရှိလာသော စွန့်ပစ်ရေအား **National Guideline** နှင့်အညီစောင့်ကြည့်လေ့လာခြင်း
- စီမံကိန်းကြောင့်ဖြစ်ပေါ်လာနိုင်သော သဘာဝပတ်ဝန်းကျင်နှင့် ဒေသခံများ၏လူမှုစီးပွားအပေါ် အကျိုးသက်ရောက်မှုများနှင့် လျော့နည်းအောင်လုပ်ဆောင်မည့်နည်းလမ်းများအားဆွေးနွေးတင်ပြခြင်း
- ပတ်ဝန်းကျင်ထိခိုက်မှုစောင့်ကြည့်ရေးအစီအစဉ်များနှင့် စောင့်ကြည့်ရေးအဖွဲ့ ဖွဲ့စည်းခြင်းများအား ရှင်းလင်းတင်ပြပါသည်။

**ဒေါက်တာကိုမြင့် (အကြံပေး၊ Ever-Green Tech)**

- စီမံကိန်းကြောင့် ကုန်းနေ၊ ရေနေသတ္တဝါများအပေါ် ထိခိုက်နိုင်မှုများ
- ထိခိုက်နိုင်မှုလျော့ကျစေရန်ကာကွယ်ဆောင်ရွက်ရမည့်လုပ်ငန်းစဉ်များ
- အပင်နှင့် သတ္တဝါမျိုးစိတ်များ၊ ရေသယံဇာတများ၏ လက်ရှိဖြစ်တည်မှု အခြေအနေများ
- ကာကွယ်ဆောင်ရွက်ရမည့် အခြေအနေများအား တင်ပြဆွေးနွေးပါသည်။

**ဒေသခံရပ်မိရပ်ဖများ၊ ဌာနဆိုင်ရာတာဝန်ရှိသူများမှ မေးမြန်းဆွေးနွေးချက်များ**

**ဦးမြတ်ကိုကို(စည်ပင်သာယာရေးကော်မတီ၊ မြိတ်မြို့နယ်)**

- လုပ်ငန်းရှင်အနေဖြင့် လူမှုစီးပွားဖွံ့ဖြိုးရေးများဆောင်ရွက်နေသည်ကို တွေ့ရှိရပါကြောင်း၊ အခြားလုပ်ငန်းရှင်များမှ ပူးပေါင်းမှုနည်းနေသည်ကို တွေ့ရှိရပါကြောင်း
- ဒေသဖွံ့ဖြိုးရေးအား တာဝန်ယူမှုအပြည့်ဖြင့် ဆောင်ရွက်ပေးကြစေလိုကြောင်း ဆွေးနွေးပါသည်။

**ဦးဇော်နည် (ခရိုင်ဦးစီးမှူး၊ စက်မှုကြီးကြပ်၊ မြိတ်ခရိုင်)**

- တင်ပြဆွေးနွေးမှုများကောင်းမွန်ပါကြောင်း၊ ရေလေမြေအသံ ထိခိုက်မှုများ စောင့်ကြည့်ရေးအဖွဲ့ ဖွဲ့စည်းရာတွင် ဆောင်ရွက်ရမည့် လုပ်ငန်းစဉ်များ ထည့်သွင်းပေးရန် လိုအပ်မည်ဖြစ်ပါကြောင်း၊
- ပတ်ဝန်းကျင် ဒေသခံများ ပိုမိုနားလည်နိုင်ရန် ဖြန့်ဝေပေးစေလိုပါကြောင်း
- ထိခိုက်မှု စံချိန်စံညွှန်းများ၏ သတ်မှတ်ချက်များ သိရှိနိုင်ရန် ဆွေးနွေးပေးစေလိုပါကြောင်း၊
- အသံထိခိုက်မှု တိုင်းတာရေး နည်းစနစ်များ၊ ရေထုထိခိုက်မှု နှင့် ပါဝင်မှုများသန့်စင်မှု နည်းစနစ်များ၊ လေထုထိခိုက်မှုနှင့် သန့်စင်မှုနည်းစနစ်များ သိရှိနိုင်ရန် ဖြန့်ဝေပေးစေလိုကြောင်း ဆွေးနွေးပါသည်။

**ဒေါက်တာကိုမြင့် (အကြံပေး၊ Ever-Green Tech)**

- ရေအရည်အသွေးနှင့်ပတ်သက်၍ ပင်လယ်ရေ၏ သဘောသဘာဝအရ ရေထုကြီးမားသော ပင်လယ် အနေဖြင့် pH ပြောင်းလဲမှုအား ခံနိုင်ရည်ရှိပါကြောင်း၊ ထုထည်သေးသော ချောင်း ကန်များအနေဖြင့် ခံနိုင်ရည်မရှိပါကြောင်း ဆွေးနွေးပါသည်။

**ဒေါက်တာကျော်စွာတင့် (Ever Green Tech;)**

- ထိခိုက်မှုစံချိန်စံညွှန်းများအား ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာနမှ ထုတ်ပြန်ထားမှုများရှိပါ ကြောင်း၊
- အသံဆူညံမှုအား နေ့နှင့်ည ခွဲခြားထားပါကြောင်း၊
- ရေအရည်အသွေးသတ်မှတ်ချက်များအားလည်း လုပ်ငန်းအမျိုးအစားအလိုက် ခွဲခြားထုတ်ပြန်ပေး ထားပါကြောင်း၊ လက်ခံမည့်ရေထုအပူချိန်ထက် ၃ ဒီဂရီထက်ပို၍ မပူရန် သတ်မှတ်ပါကြောင်း၊
- အချိန်နှင့်ကွက်သောအားဖြင့် အားလုံးရှင်းမပြနိုင်သည်ကို တောင်းပန်ပါကြောင်း၊ ပတ်/ထိန်း ဦးစီးဌာန website တွင် လေ့လာနိုင်ရန် တင်ထားပါကြောင်း၊
- စောင့်ကြည့်ရေးအဖွဲ့ဖွဲ့စည်းနိုင်ရန် သက်ဆိုင်ရာအဖွဲ့အစည်းများမှ ပူးပေါင်းပေးရန် လိုအပ်ပါ ကြောင်း ဆွေးနွေးပါသည်။

**ဦးမြတ်နိုး (မန်နေဂျာ၊ ဂဏန်းပျောမွေးမြူရေးလုပ်ငန်း)**

စီမံကိန်းတာဝန်ရှိသူမှကျေးဇူးတင်စကားပြောကြားရာတွင်တွေ့ဆုံပွဲသို့တက်ရောက်ပေးပါသော တာဝန်ရှိ လူကြီးမင်းများ၊ ရပ်မိရပ်ဖများအား ကျေးဇူးအထူးတင်ရှိပါကြောင်းနှင့် ကိုယ်စိတ်နှလုံးချမ်းသာကြပါစေ ကြောင်း၊ လိုအပ်ချက်များအား ထောက်ပြပေးသဖြင့် ကျေးဇူးတင်ပါကြောင်း၊ ကုမ္ပဏီအနေဖြင့် ပထော်ပ ထက်ကျွန်းပေါ်တွင်လုပ်ငန်းဆောင်ရွက်နေသောလုပ်ငန်းများအတွက် ပတ်ဝန်းကျင်ဆန်းစစ်မှုများဆောင် ရွက်သွားမည်ဖြစ်ပါကြောင်း၊ ဒီရေတောများစိုက်ပျိုးထိန်းသိမ်းလျက်ရှိကြောင်း၊ အဆင်မပြေမှုများရှိပါက ပွင့်ပွင့်လင်းလင်း လာရောက်ဆွေးနွေးနိုင်ပါကြောင်း ပြောကြားသွား ပါသည်။



**APPENDIX- B  
SECOND PUBLIC MEETING**

ATTENDANCE LIST OF SECOND PUBLIC MEETING

စဉ်	အမည်	ရာထူး/လိပ်စာ/အိမ်အမှတ်	ဆက်သွယ်ရန်လိပ်စာ/ဖုန်းနံပါတ်	လက်မှတ်
၁	ဒေါ် မိုးမင်းဝင်း			
၂	ဒေါ်အောင်အိ			
၃	ဒေါ်စောမောင်			
၄	ဒေါ်အေးမင်းထွန်း			
၅	ဒေါ်အေးမိုးဝင်း			
၆	ဒေါ်မင်းဦး			
၇	ဒေါ်စုအိအိ			
၈	ဒေါ်အုပ္ပာအိ			
၉	မစွန်းဦး			
၁၀	မအောင်စု			

စဉ်	အမည်	ရာထူး/လိပ်စာ/အိမ်အမှတ်	ဆက်သွယ်ရန်လိပ်စာ/ဖုန်းနံပါတ်	လက်မှတ်
	ဒေါ်စောမောင်	ပထမ		
	ဒေါ်အုန်းစော	ပထမ		
	ဒေါ်စောအိအိ	ပထမ		
	ဒေါ်အိအိ	ပထမ		
	ဒေါ်အိအိ	ပထမ		
	ဒေါ်အိအိ	ပထမ		
	ဒေါ်အိအိ	ပထမ		
	ဒေါ်အိအိ	ပထမ		
	ဒေါ်အိအိ	ပထမ		
	ဒေါ်အိအိ	ပထမ		
	ဒေါ်အိအိ	ပထမ		

စဉ်	အမည်	ရာထူး/လိပ်စာ/အိမ်အမှတ်	ဆက်သွယ်ရန်လိပ်စာ/ဖုန်းနံပါတ်	လက်မှတ်
	ဒေါ်အိအိ	ပထမ		
	ဒေါ်အိအိ	ပထမ		
	ဒေါ်အိအိ	ပထမ		
	ဒေါ်အိအိ	ပထမ		
	ဒေါ်အိအိ	ပထမ		
	ဒေါ်အိအိ	ပထမ		
	ဒေါ်အိအိ	ပထမ		
	ဒေါ်အိအိ	ပထမ		
	ဒေါ်အိအိ	ပထမ		
	ဒေါ်အိအိ	ပထမ		

စဉ်	အမည်	ရာထူး/လုပ်ငန်းအမျိုးအစား	ဆက်သွယ်ရန်ဖိစက်/ရန်ပုံငွေ	လက်မှတ်
	ကိုမင်းကို	ပထမ		၂၄
	ဒေါ်စု	"		၃
	မောင်ဇော်	"		၅
	မောင်အောင်	"		၃၃
	ကိုအောင်စိုး	"		၁၅
	ဒေါ်စု	"		၃
	ဒေါ်အောင်စု	"		၃၆
	ဒေါ်အောင်စု	"		၃၆
	ဒေါ်အောင်စု	"		၃၆
	ဒေါ်အောင်စု	"		၃၆

စဉ်	အမည်	ရာထူး/လုပ်ငန်းအမျိုးအစား	ဆက်သွယ်ရန်ဖိစက်/ရန်ပုံငွေ	လက်မှတ်
	မောင်အောင်စု	ပထမ		၁၄
	ကိုအောင်စု	ပထမ		၃၆
	မောင်အောင်စု	ပထမ		၃၆
	"မောင်အောင်စု	"		၃၆
	"မောင်အောင်စု	"		၃၆
	"မောင်အောင်စု	"		၃၆
	မောင်အောင်စု	"		၃၆
	မောင်အောင်စု	"		၃၆
	မောင်အောင်စု	"		၃၆
	မောင်အောင်စု	"		၃၆

စဉ်	အမည်	ရာထူး/လုပ်ငန်းအမျိုးအစား	ဆက်သွယ်ရန်ဖိစက်/ရန်ပုံငွေ	လက်မှတ်
	မောင်အောင်စု	ပထမ		၃၆
	မောင်အောင်စု	ပထမ		၃၆
	မောင်အောင်စု	ပထမ		၃၆
	မောင်အောင်စု	"		၃၆
	"မောင်အောင်စု	"		၃၆
	"မောင်အောင်စု	"		၃၆
	မောင်အောင်စု	"		၃၆
	မောင်အောင်စု	ပထမ	၀၇-၇၇၆၀၄၄၄၅၅၇	၃၆
	မောင်အောင်စု	"	၀၇-၂၅၀၄၇၀၂၅၆	၃၆
	မောင်အောင်စု	ပထမ		၃၆



စဉ်	အမည်	ရာထူး/လုပ်ငန်းအမျိုးအမည်	ဆက်သွယ်ရန်လိပ်စာ/ဖုန်းနံပါတ်	လက်မှတ်
	ဒေါ်အိအိအိ	၂၀၀၈		အိအိ
	"အေးအေးအေး"	"		အေးအေး
	ကျွန်းကျွန်း	"		ကျွန်းကျွန်း
	ဒေါ်အေးအေးအေး	"		အေးအေး
	"အေးအေးအေး"	"		အေးအေး
	"အေးအေးအေး"	"		အေးအေး
	အေးအေးအေး	"		အေးအေး
	အေးအေးအေး	"		အေးအေး
	အေးအေးအေး	"		အေးအေး
	အေးအေးအေး	"		အေးအေး

စဉ်	အမည်	ရာထူး/လုပ်ငန်းအမျိုးအမည်	ဆက်သွယ်ရန်လိပ်စာ/ဖုန်းနံပါတ်	လက်မှတ်
	ဒေါ်အေးအေး	၂၀၀၈		အေးအေး
	အေးအေးအေး	"		အေးအေး
	"အေးအေးအေး"	"		အေးအေး
	အေးအေးအေး	"		အေးအေး
	ဒေါ်အေးအေး	"		အေးအေး
	အေးအေးအေး	"		အေးအေး
	အေးအေးအေး	"		အေးအေး
	"အေးအေးအေး"	"		အေးအေး
	ဒေါ်အေးအေး	"		အေးအေး
	အေးအေးအေး	"		အေးအေး
	အေးအေးအေး	"		အေးအေး

စဉ်	အမည်	ရာထူး/လုပ်ငန်းအမျိုးအမည်	ဆက်သွယ်ရန်လိပ်စာ/ဖုန်းနံပါတ်	လက်မှတ်
	ဒေါ်အေးအေး	၂၀၀၈		အေးအေး
	"အေးအေးအေး"	"		အေးအေး
	"အေးအေးအေး"	"		အေးအေး
	"အေးအေးအေး"	"		အေးအေး
	ဒေါ်အေးအေး	"		အေးအေး
	အေးအေးအေး	"		အေးအေး
	ဒေါ်အေးအေး	"		အေးအေး
	"အေးအေးအေး"	"		အေးအေး
	ဒေါ်အေးအေး	"		အေးအေး
	"အေးအေးအေး"	"		အေးအေး
	ဒေါ်အေးအေး	"		အေးအေး

စဉ်	အမည်	ရာထူး/ကိုယ်စားပြုအဖွဲ့အစည်း	ဆက်သွယ်ရန်လိပ်စာ/ဖုန်းနံပါတ်	လက်မှတ်
	ဖာဖါဒေသ	ပထက် (A.M.P)		၇
	ပာပာဒါ	ပထက် (A.M.P)		၁၁
	ပုဗ္ဗသီရိပျော်	ပထက် (A.M.P)		Theingsi
	ဒေါ်စိုးမူ	ပထက်		
	ဒေါ်အေးစွယ်	ပထက်		
	ဦးအောင်ကျ	ပထက်	098769264	
	ဦးသန်းစင်	ပထက်	098760863	
	ဒေါ်ဇေဇေ	ပထက်		
	« ခင်မိုး	ပထက်		၄
	« ယုတ္တ	«		၄

စဉ်	အမည်	ရာထူး/ကိုယ်စားပြုအဖွဲ့အစည်း	ဆက်သွယ်ရန်လိပ်စာ/ဖုန်းနံပါတ်	လက်မှတ်
	ဒေါ်အေးအေး	ပထက်		၇၆
	« စားသိ	«		၁၃
	« စောပင်	«		၁၆
	« အိုင်အိုင်	«		၃၆
	« အောင်စိန်	«		၆၆
	« အောင်စိန်	«		၈၆
	ဒေါ်အေး	«		၃
	« အောင်	«		၃
	ဒေါ်အေး	«		၆၆
	« အိုင်	«		၃၆

စဉ်	အမည်	ရာထူး/ကိုယ်စားပြုအဖွဲ့အစည်း	ဆက်သွယ်ရန်လိပ်စာ/ဖုန်းနံပါတ်	လက်မှတ်
	ဒေါ်အေးအေး	ပထက်		၆
	ဦးအောင်	ပထက်		၆
	ဒေါ်အေးအေး	ပထက်		၁၃
	ဒေါ်အေးအေး	«		၆
	ဒေါ်အေးအေး	«		၆
	ဒေါ်အေးအေး	«		၆
	ဒေါ်အေးအေး	«		၆
	ဒေါ်အေးအေး	«		၆
	ဒေါ်အေးအေး	«		၆
	ဒေါ်အေးအေး	«		၆

අයි	නම	ආදාය/මිලියනලක්ෂවලින්	සන්නිවේදන/දුරකථන	ලිපිනය
	බේලිගොඩ	0.00		බේලිගොඩ
	දිසානායක	"		දිසානායක
	බේලිගොඩ	"		බේලිගොඩ
	බේලිගොඩ	"		බේලිගොඩ
	බේලිගොඩ	"		බේලිගොඩ
	බේලිගොඩ	"		බේලිගොඩ
	බේලිගොඩ	"		බේලිගොඩ
	බේලිගොඩ	"		බේලිගොඩ
	බේලිගොඩ	"		බේලිගොඩ
	බේලිගොඩ	"		බේලිගොඩ

අයි	නම	ආදාය/මිලියනලක්ෂවලින්	සන්නිවේදන/දුරකථන	ලිපිනය
	දිසානායක	0.00	097883 44922	දිසානායක
	දිසානායක	0.00		දිසානායක
	දිසානායක	0.00		දිසානායක
	දිසානායක	0.00	09780 384256	දිසානායක
	දිසානායක	0.00		දිසානායක
	දිසානායක	0.00		දිසානායක
	දිසානායක	0.00		දිසානායක
	දිසානායක	0.00		දිසානායක
	දිසානායක	0.00		දිසානායක
	දිසානායක	0.00		දිසානායක

අයි	නම	ආදාය/මිලියනලක්ෂවලින්	සන්නිවේදන/දුරකථන	ලිපිනය
01	දිසානායක	0.00		දිසානායක
02	දිසානායක	"		දිසානායක
	දිසානායක	"		දිසානායක
	දිසානායක	"		දිසානායක
	දිසානායක	"		දිසානායක
	දිසානායක	"		දිසානායක
	දිසානායක	"		දිසානායක
	දිසානායක	"		දිසානායක
	දිසානායක	"		දිසානායක
	දිසානායක	"		දිසානායක







စဉ်	အမည်	ရာထူး/လုပ်ကိုင်ကြည့်ရှုသူအမည်	ဆက်သွယ်ရန်လိပ်စာ/ဖုန်းနံပါတ်	လက်မှတ်
	စင်္ကြံအိမ်ထောင်ရေး	ပထမ		
	မိုးဝင်း	လက်		၃၃
	ဒေါ်ခင်မာမာ	လက်		
	ဒေါ်ခင်မာမာ	လက်		
	မောင်မောင်	လက်		၃၃
	မောင်မောင်	လက်		၃၃
	မောင်မောင်	လက်		၃၃
	မောင်မောင်	လက်		၃၃
	မောင်မောင်	လက်		၃၃
	မောင်မောင်	လက်		၃၃
	မောင်မောင်	လက်		၃၃

စဉ်	အမည်	ရာထူး/လုပ်ကိုင်ကြည့်ရှုသူအမည်	ဆက်သွယ်ရန်လိပ်စာ/ဖုန်းနံပါတ်	လက်မှတ်
	မောင်မောင်	လက်		၆၃
	မောင်မောင်	လက်		၆၃
	မောင်မောင်	လက်		၆၃
	မောင်မောင်	လက်		၆၃
	မောင်မောင်	လက်	၀၇၅၀၆၅၇၇	
	မောင်မောင်	လက်		၆၃
	မောင်မောင်	လက်		၆၃
	မောင်မောင်	လက်		၆၃
	မောင်မောင်	လက်		၆၃
	မောင်မောင်	လက်		၆၃

စဉ်	အမည်	ရာထူး/လုပ်ကိုင်ကြည့်ရှုသူအမည်	ဆက်သွယ်ရန်လိပ်စာ/ဖုန်းနံပါတ်	လက်မှတ်
၁	ဒေါ်ခင်မာမာ	ကျေးဇူးတင်ပေးသူ	၀၇၅၆၆၆၆၆၆	
၂	မောင်မောင်	Senior Reporter Dawei Watch / ၀၇၅၆၆၆၆၆၆	၀၇၅၆၆၆၆၆၆	
၃	မောင်မောင်	မောင်မောင်	၀၇ ၂၅၄၇၂၂၅၂၅	



စဉ်	အမည်	ရာထူး/ကိုင်စားခြင်းအမည်	ဆက်သွယ်ရန်လိပ်စာ/ဖုန်းနံပါတ်	လက်မှတ်
	သန့်.သိန်းလှ	အဖေ	၀၅ ၄၅၀၇၀၀၂၆၁	
	ဒေါ်မျိုးမျိုးသစ်	အမိ	၀၅၄၅၀၇၀၇၆၅၅	
	အောင်စိုးစိုး	အဖေ	၀၇၉၅၄၀၂၄၅၉၈	
	ဒေါ်ခင်ခင်	ဒေါ် ဖု./ အဖေ.ပ.ခင်စိုး	၀၅၄၂၁၀၅၂၀၄	
	ဒေါ်အိမ်အိမ်	ဒေါ်အိမ်အိမ်အိမ်အိမ်အိမ်	၀၅၄၄၃၁၇၀၄၇	
	ဒေါ်အိမ်အိမ်	ဒေါ်အိမ်အိမ်အိမ်အိမ်အိမ်	၀၅ ၂၅၀၅၂၇၇၄၇	

စဉ်	အမည်	ရာထူး/ကိုင်စားခြင်းအမည်	ဆက်သွယ်ရန်လိပ်စာ/ဖုန်းနံပါတ်	လက်မှတ်
	ဒေါ်ခင်ခင်	ပထက်		
	" ဒုတိယအဖေ	ပထက်		
	" ဒုတိယအမိ	ပထက်		
	" ဒုတိယအဖေ	ပထက်		
	" ဒုတိယအမိ	ပထက်		
	" ဒုတိယအဖေ	"		
	" ဒုတိယအမိ	"		
	ဒေါ်အိမ်အိမ်	"		
	ဒေါ်အိမ်အိမ်	"		
	ဒေါ်အိမ်အိမ်	"		

စဉ်	အမည်	ရာထူး/ကိုင်စားခြင်းအမည်	ဆက်သွယ်ရန်လိပ်စာ/ဖုန်းနံပါတ်	လက်မှတ်
၁	ဒေါ်ခင်ခင်	ပထက်	၀၅၂၆၁၁၉၈၂၇၇	
၂	ဒေါ်အိမ်အိမ်	"		
၃	ဒေါ်အိမ်အိမ်	"		
၄	" ဒုတိယအဖေ	"		
	" ဒုတိယအမိ	"		
	" ဒုတိယအဖေ	"		
	" ဒုတိယအမိ	"		
	ဒေါ်အိမ်အိမ်	"		
	ဒေါ်အိမ်အိမ်			
	" ဒုတိယအဖေ			



ပြည်မြို့ထွန်းကုမ္ပဏီမှ ပထော်ပထက်ကျွန်းပေါ်တွင်တည်ဆောက်မည့်  
ဂဏန်းပျော့မွေးမြူရေးစီမံကိန်းအတွက် ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း (IEE) ဆိုင်ရာ  
လူထုတွေ့ဆုံပွဲဆွေးနွေးမှုမှတ်တမ်း

ငါးလုပ်ငန်းဦးစီးဌာန(မြိတ်မြို့)

၂၀/၉/၂၀၁၈

ပထော်ပထက်ကျေးရွာအနီးတွင် တည်ဆောက်လည်ပတ်မည့်ဂဏန်းပျော့မွေးမြူရေးလုပ်ငန်းအတွက်  
ကနဦးပတ်ဝန်းကျင်ဆိုင်ရာ စုံစမ်းစစ်ဆေးခြင်း (Initial Environmental Examination, IEE)  
ဆိုင်ရာ လူထုတွေ့ဆုံပွဲတွင်ပညာရှင်များ၊ ဌာနဆိုင်ရာအကြီးအကဲများ၊ ရပ်မိရပ်ဖများမှဆွေးနွေးမှုများမှာ-

ဦးဇာနည်(ခရိုင်ဦးစီးမှူး၊ စက်မှုကြီးကြပ်ရေးဦးစီးဌာန)

- စက်မှုလုပ်ငန်းနယ်ပယ်တိုင်းတွင် ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်းအစီအစဉ်သည် အရေးကြီးကြောင်း နှင့် လုပ်ဆောင်သင့်ကြောင်းတိုက်တွန်းပြောကြားခဲ့ပါသည်။
- ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုလုပ်ငန်းစဉ်ဖြင့်စီမံကိန်းလုပ်ဆောင်ခြင်းဖြင့်ဒေသခံဖွံ့ဖြိုးတိုးတက်ပြီးနိုင်ငံတော် ကလည်းအခွန်အခလည်းရရှိနိုင်ကြောင်းဆွေးနွေးတင်ပြသွားသည်။

ဦးမြတ်နိုး (မန်နေဂျာ၊ ဂဏန်းပျော့မွေးမြူရေးလုပ်ငန်း)

- ပြည်မြို့ထွန်းကုမ္ပဏီ၏လုပ်ငန်းစတင်ပုံ၊ ရည်ရွယ်ချက်နှင့် လည်ပတ်ခြင်းလုပ်ငန်းစဉ်များအား ရှင်းလင်း ပြောကြားခဲ့ပါသည်။
- ဂဏန်းပျော့မွေးမြူရေးလုပ်ငန်းစတင်ပုံ၊ စီမံကိန်းရည်ရွယ်ချက်နှင့် သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေး လုပ်ငန်းစဉ်များနှင့် ပတ်သတ်၍ တင်ပြဆွေးနွေးခဲ့ပါသည်။
- ကုမ္ပဏီမှ ကျေးလက်ဒေသလူမှုဖွံ့ဖြိုးတိုးတက်ရေးအတွက် ဆောင်ရွက်ပေးခဲ့ပုံများအား တင်ပြဆွေးနွေး ခဲ့သည်။

ဒေါက်တာကျော်စွာတင့် (Ever Green Tech;)

- ပတ်ဝန်းကျင်ထိခိုက်မှုလေ့လာဆန်းစစ်မှု ပြုလုပ်ရခြင်း ရည်ရွယ်ချက်
- ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းလုပ်ငန်းစဉ်များ လုပ်ထုံးလုပ်နည်းများအကြောင်းများအား ဒေသခံ ပြည်သူများနားလည်သဘောပေါက်အောင်ရှင်းလင်းတင်ပြခြင်း
- စီမံကိန်းကြောင့်ပတ်ဝန်းကျင်ထိခိုက်မှုများအား ကွင်းဆင်းလေ့လာစစ်ဆေးပြီးထိခိုက်မှုများနှင့် ၎င်းကို လျော့ချနိုင်သည့်နည်းလမ်းများအားရှင်းလင်းပြောကြားခဲ့ပါသည်။

ဒေသခံရပ်မိရပ်ဖများ၊ ဌာနဆိုင်ရာတာဝန်ရှိသူများမှ မေးမြန်း ဆွေးနွေးချက်များ

**ဒေသခံတစ်ဦး (မြိတ်မြို့)**

- လွန်ခဲ့သောနှစ်များက ဆီအုန်းစိုက်ပျိုးရေး စီမံကိန်းများကြောင့် တနင်္သာရီတိုင်းဒေသခံများ အထိနာခဲ့ကြကြောင်း။
- မိမိအနေဖြင့် အလားတူဖြစ်ရပ်မျိုးဖြစ်မည်ကို စိတ်ပူမိကြောင်း။
- သာမန်လုပ်သားမှ ကျွမ်းကျင်လုပ်သား၊ ထိုမှတစ်ဆင့် စီးပွားရေးလုပ်ငန်း အသေးစားပိုင်ရှင် စသည်ကဲ့သို့ အဆင့်ဆင့် လမ်းညွှန်ပေးနိုင်သည်အထိ ဆောင်ရွက်စေချင်ကြောင်း။
- လုပ်ငန်းဆောင်ရွက်ရာတွင် လိုင်စင်ရရှိပြီးမှဆောင်ရွက်ခြင်း ဟုတ်မဟုတ် သိလိုပါကြောင်း ဆွေးနွေးမေးမြန်းပါသည်။

**ဒေါက်တာကျော်စွာတင့် (အကြံပေး၊ Ever Green Tech)**

- ယခုစီမံကိန်းနှင့် ယခင်ဆီအုန်းစိုက်ပျိုးရေး စီမံကိန်းများမှာ ကွဲလွဲပြီး မြေကိုပြုပြင်ပြောင်းလဲ၍ ရောင်းချသုံးစွဲသည့်အနေအထားမတွေ့ရကြောင်း။
- ယခင်အတွေ့အကြုံများအရ ဒေသခံများဟာ ထိုဒေသမှစီမံကိန်းများအတွင်း ဝင်ရောက်လုပ်ကိုင်ခွင့် ရရှိကြသဖြင့် အသိပညာများတိုးပွား၍ အမြင်ကျယ်လာသည်ကို တွေ့ရပါကြောင်း။
- ထိုမှတစ်ဆင့် ကိုယ်ပိုင်လုပ်ငန်းရှင်များ အဆင့်ဆင့်တိုးတက်၍ ဖြစ်လာနိုင်ကြောင်း။
- ဒေသန္တရဖွံ့ဖြိုးတိုးတက်ရေးရန်ပုံငွေကို အသုံးပြုပြီး ဒေသခံထွက်ကုန်များကို တန်ဖိုးမြင့်တက်စေပြီး ဒေသခံများကို အသေးစားအလတ်စားစီးပွားရေးများ အကောင်အထည်ဖော်နိုင်အောင် ပံ့ပိုးပေးမည်ဖြစ်ပါကြောင်း။
- ငါးလုပ်ငန်းနှင့်ပတ်သက်သည်များကို စီမံကိန်းတာဝန်ရှိသူများမှ ဖြေကြားပေးမည်ဖြစ်ပါကြောင်း ပြန်လည်ရှင်းလင်း ဆွေးနွေးပါသည်။

**ဦးမြတ်နိုး (မန်နေဂျာ၊ ဂဏန်းပျော့မွေးမြူရေးလုပ်ငန်း)**

- ငါးဦးစီးဌာနနှင့် စည်ပင်ဌာနများမှ လုပ်ငန်းလိုင်စင်များရရှိထားပြီး နိုင်ငံတော်မှချမှတ်ထားသော ဥပဒေ၊ နည်းဥပဒေများနှင့်အညီ ဆောင်ရွက်လျက်ရှိကြောင်း။
- ရင်းနှီးမြုပ်နှံမှုနှင့် ကုမ္ပဏီများညွှန်ကြားမှုဦးစီးဌာနမှလည်း လုပ်ငန်းလိုင်စင် ရရှိပြီးဖြစ်ပါကြောင်း ပြန်လည်ရှင်းလင်း ဆွေးနွေးပါသည်။

**ဦးဝင်း**

- ဤကဲ့သို့ ကုမ္ပဏီများပေါ်ပေါက်လာခြင်းမှာ ဒေသဖွံ့ဖြိုးရေးအတွက် ကောင်းမွန်ကြောင်း။
- ပတ်ဝန်းကျင်ထိခိုက်မှုကာကွယ်လျှော့ချမှု တင်ပြချက်များမှာကောင်းမွန်ပါကြောင်း။
- လက်တွေ့တွင် တင်ပြချက်များအတိုင်း အတိအကျ လုပ်ကိုင်နိုင်မှုရှိမရှိနှင့် မည်သူမည်ဝါက အလေးထားပြီး စောင့်ကြည့်ဆောင်ရွက်မည်ကို သိရှိလိုကြောင်း။
- ပတ်ဝန်းကျင်ထိခိုက်သိမ်းစားရေး စောင့်ကြည့်လေ့လာရေးအဖွဲ့ကို မည်သူများဖြင့် ဖွဲ့စည်းထားသည်ကို သိလိုပါကြောင်း မေးမြန်းဆွေးနွေးထားပါသည်။

**ဒေါက်တာကျော်စွာတင့် (အကြံပေး၊ Ever Green Tech)**

- ပတ်ဝန်းကျင်ထိခိုက်သိမ်းစားရေးစောင့်ကြည့်လေ့လာရေးအဖွဲ့ကို သက်ဆိုင်ရာဌာနများမှ တာဝန်ရှိသူများ၊ လုပ်ငန်းဆိုင်ရာတာဝန်ရှိသူများ၊ ဒေသဆိုင်ရာအုပ်ချုပ်ရေးမှတာဝန်ရှိသူများနှင့် အခြားစိတ်ပါဝင်စား၍ ပါဝင်လိုသူများ စုပေါင်းဖွဲ့စည်း၍ အဆိုပြုထားသော အချိန်ကာလအလိုက် လုပ်ကိုင်စစ်ဆေး ဆောင်ရွက်သွားမည်ဖြစ်ပါကြောင်း ပြန်လည်ဖြေကြား ဆွေးနွေးခဲ့ပါသည်။

**ဒေသခံတစ်ဦး**

- ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း တင်ပြချက်တွေအပေါ်မှာ သက်ဆိုင်ရာကုမ္ပဏီမှ တိတိကျကျ လိုက်နာဆောင်ရွက်ဖို့ မျှော်လင့်ပါကြောင်း။
- တိကျပြတ်သားတဲ့ အချိန်ကာလတ်သတ်မှတ်ပြီးဆောင်ရွက်ခြင်းအားဖြင့် ပတ်ဝန်းကျင်အတွက် သာမက သက်ဆိုင်ရာကုမ္ပဏီအတွက်ပါ အပြန်အလှန်အကျိုးရှိစေမည် ဖြစ်ကြောင်း။
- CSR ရန်ပုံငွေကို သတ်သတ်မှတ်မှတ်ထားရှိပြီး နှစ်စဉ်စုဆောင်းရေး ဆောင်ရွက်စေချင်ပါကြောင်း။
- အသေးစားလုပ်ငန်းငယ်များ လုပ်ကိုင်စေနိုင်မည့် နည်းလမ်းများကို ကုမ္ပဏီအနေဖြင့် ဒေသခံများအား အတတ်နိုင်ဆုံး ပညာပေးအစီအစဉ်များလုပ်၍ ဆောင်ရွက်စေလိုပါကြောင်း အကြံပြုဆွေးနွေးပါသည်။

**ဒေါက်တာကျော်စွာတင့် (အကြံပေး၊ Ever Green Tech)**

- CSR ရန်ပုံငွေမှာ အနည်းဆုံးမည်မျှရှိရမည်ဟု သတ်မှတ်ထားပြီးဖြစ်ကြောင်း။
- CSR ၏ အနှစ်သာရတစ်ခုမှာ ဒေသတစ်ခု၏ လူ့စွမ်းအားအရင်းအမြစ် ဖွံ့ဖြိုးတိုးတက်စေရန် အင်အားပေးခြင်းဖြစ်ပါကြောင်း။
- သို့ဖြစ်ပါ၍ လူ့စွမ်းအားအရင်းအမြစ် ဖွံ့ဖြိုးတိုးတက်စေရန် တတ်နိုင်သလောက် အဆိုပြုသွားမည်ဖြစ်ပြီး လုပ်ငန်းရှင်အနေနှင့် သေချာစွာအစီအစဉ်ချ၍ လုပ်ရမည်ဖြစ်ကြောင်း ပြန်လည်ဆွေးနွေးခဲ့ပါသည်။

**ဒေသခံတစ်ဦး(မြိတ်မြို့)**

- စီမံကိန်းဆောင်ရွက်သည့်ကျွန်းမှာ မြိတ်မြို့အတွက် အလွန်အရေးကြီးလှသော ကျွန်းဖြစ်သဖြင့် ကျွန်းအား ထိခိုက်မည့် မည်သည့်ကိစ္စမဆို လက်ခံမည်မဟုတ်ကြောင်း။
- ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်သောအဖွဲ့အား ဒေသခံပြည်သူများအားလုံးမှ ဘက်လိုက်မှု ယုံကြည်နိုင်မှု ရှိမရှိ သိချင်ပါကြောင်း မေးမြန်းဆွေးနွေးခဲ့ပါသည်။

**ဒေါက်တာကျော်စွာတင့် (အကြံပေး၊ Ever Green Tech)**

- ကျွန်းပေါ်တွင် ရှိရင်းစွဲအပင်များအတိုင်း စိမ်းလန်းစိုပြေစေရန် စီစဉ်ထားရှိကြောင်း။
- ရေအတက်အကျ ခံနိုင်ရည်ရှိသည့် ဒီရေတောများလည်း စိုက်ပျိုးရန် စီစဉ်ထားပါကြောင်း။
- အစီရင်ခံစာပြီးဆုံးသည့်အခါတွင် မထုတ်ပြန်မီ အစီရင်ခံစာအနှစ်ချုပ်အား သက်ဆိုင်ရာ ဌာနများသို့ တင်ပြရ ပါကြောင်း။
- တာဝန်ရှိသူများမှ အဆင့်ဆင့်စစ်ဆေး ပြင်ဆင်ပြီးမှသာလျှင် အစီရင်ခံစာ ထွက်ပေါ်လာခြင်းဖြစ်၍ ဘက်လိုက် မှုကင်းမည် ဖြစ်ပါကြောင်း ပြန်လည်ရှင်းလင်း ဆွေးနွေးပါသည်။

**ဦးမြတ်နိုး (မန်နေဂျာ- ဂဏန်းပျော့မွေးမြူရေးလုပ်ငန်း)**

စီမံကိန်းတာဝန်ရှိသူမှ ကျေးဇူးတင်စကားပြောကြားရာတွင် တွေ့ဆုံပွဲသို့တက်ရောက်ပေးပါသော တာဝန်ရှိသူ ကြီးမင်းများ၊ ရပ်မိရပ်ဖများအား ကျေးဇူးအထူးတင်ရှိပါကြောင်း၊ ပြည့်ဖြိုးထွန်း အင်တာနေရှင်နယ်ကုမ္ပဏီ လီမိတက်မှဆောင်ရွက်သော ဂဏန်းပျော့မွေးမြူရေးလုပ်ငန်း၏ ကနဦး ပတ်ဝန်းကျင်ဆန်းစစ်ခြင်းကို သက်ဆိုင်ရာဆန်းစစ်သည့်အဖွဲ့မှ တင်ပြသည့်အပေါ် ကြွရောက်လာသည့် လူကြီးမင်းများမှ ဝင်ရောက်ဆွေးနွေး ပေးသည့်အတွက် လွန်စွာဝမ်းမြောက်မိပါကြောင်း၊ လိုအပ်ချက်များအား ထောက်ပြပေးသဖြင့် ကျေးဇူးတင်ပါ ကြောင်း၊ ကုမ္ပဏီအနေဖြင့် ပထော်ပထက် ကျွန်းပေါ်တွင် လုပ်ငန်းဆောင်ရွက်နေသော လုပ်ငန်းများအတွက် ပတ်ဝန်းကျင်ဆန်းစစ်မှုများ ဆောင်ရွက်သွားမည်ဖြစ်ပါကြောင်း၊ ဒေသဖွံ့ဖြိုးရေးလုပ်ငန်းများအား ထပ်မံ ဆောင်ရွက်သွားမည် ဖြစ်ပါကြောင်း၊ အဆင်မပြေမှုများရှိပါက ပွင့်ပွင့်လင်းလင်း လာရောက်ဆွေးနွေးနိုင်ပါ ကြောင်း ပြောကြားသွား ပါသည်။







**APPENDIX- C  
OFFICIAL PERMISSION LETTERS**



ကုမ္ပဏီမှတ်ပုံတင်လက်မှတ်  
Certificate of Incorporation

ပြည့်ဖြိုးထွန်း အင်တာနေရှင်နယ် ကုမ္ပဏီလီမိတက်  
PYI PHYO TUN INTERNATIONAL COMPANY LIMITED  
Company Registration No. 164028682

မြန်မာနိုင်ငံကုမ္ပဏီများအက်ဥပဒေ ၁၉၁၄ ခုနှစ် အရ  
ပြည့်ဖြိုးထွန်း အင်တာနေရှင်နယ် ကုမ္ပဏီလီမိတက်  
အား ၁၉၉၄ ခုနှစ် ဇူလိုင်လ ၇ ရက်နေ့တွင်  
အစုရှယ်ယာအားဖြင့် တာဝန်ကန်သတ်ထား သည့် အများနှင့်မသက်ဆိုင်သောကုမ္ပဏီ  
အဖြစ် ဖွဲ့စည်းမှတ်ပုံတင်ခွင့် ပြုလိုက်သည်။

This is to certify that  
PYI PHYO TUN INTERNATIONAL COMPANY LIMITED  
was incorporated under the Myanmar Companies Act 1914 on 7 January  
1994 as a Private Company Limited by Shares.

ကုမ္ပဏီမှတ်ပုံတင်အရာရှိ  
Registrar of Companies  
ရင်းနှီးမြုပ်နှံမှုနှင့်ကုမ္ပဏီများညွှန်ကြားမှုဦးစီးဌာန  
Directorate of Investment and Company Administration





Companies Online

https://www.myco.dica.gov.mm/Corp/EntityProfile.aspx?id=4...



DIRECTORATE OF INVESTMENT AND COMPANY  
ADMINISTRATION (/en)

Myanmar Companies Online (MyCO)

English (/Corp/EntityProfile.aspx?id=4c04ed64-f65f-4c3e-9d5a-8fee01828570&lang=en-US) | မြန်မာ (/Corp/EntityProfile.aspx?id=4c04ed64-f65f-4c3e-9d5a-8fee01828570&lang=my-MM)

### COMPANY PROFILE

+ NEW FILING

ORDER DOCUMENTS

PRINT CERTIFICATE

Company Name (English)

PYI PHYO TUN INTERNATIONAL COMPANY LIMITED

Company Name (Myanmar)

ပြည်ပြိုထွန်း အင်တာနေရှင်နယ် ကုမ္ပဏီလီမိတက်

Registration Number

164028682

Registration Date

07/01/1994

Company Type

Private Company Limited by Shares

Status

Registered

Foreign Company

No

Small Company

Yes

FILING HISTORY (.../FormControls/#CompanyProfileTabFilingHistory)

ADDRESSES (.../FormControls/#CompanyProfileTabDetails)

OFFICERS (.../FormControls/#CompanyProfileTabDirectors)

SHAREHOLDINGS (.../FormControls/#CompanyProfileTabShares)

COMPANY AUTHORITY (.../FormControls)

Companies Online

<https://www.myco.dica.gov.mm/Corp/EntityProfile.aspx?id=4...>

/#CompanyProfileTabEntityAuthority)

MEMBERS (.../FormControls/#CompanyProfileTabMembers)

DOCUMENTS (.../FormControls/#CompanyProfileTabDocuments)

Type	Address	Effective Date
Principal Place Of Business In Union	No 15, 11 St Lanmadaw Tsp Yangon, Yangon, Myanmar 11131	17/09/2018
Registered Office In Union	11 St No 15, Lanmadaw Tsp, Yangon, Myanmar 11131	17/09/2018

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Companies Online

<https://www.myco.dica.gov.mm/Corp/EntityProfile.aspx?id=4...>

DICA ADDRESS:  
No. 1, Thitsar Road  
Yankin Township, Yangon

PROUDLY SUPPORTED BY:



Japan  
Fund for  
Poverty  
Reduction



From  
the People of Japan

POWERED BY: Paradigm Apps

Companies Online

<https://www.myco.dica.gov.mm/Corp/EntityProfile.aspx?id=4...>

/#CompanyProfileTabEntityAuthority)

MEMBERS (../FormControls/#CompanyProfileTabMembers)

DOCUMENTS (../FormControls/#CompanyProfileTabDocuments)

Name	Type	Nationality	N.R.C. (For Myanmar Citizens)	Effective Date
HLA THAN	Director	Myanmar	6/MAAHYA(N)057303	
KHIN THAN YI	Director	Myanmar	6/MAAHYA(N)027115	
MYAT THIRI KHAING	Director	Myanmar	12/LAMATA(N)035236	
DR. AUNG LWIN	Director	Myanmar	12/AHLANA(N)033879	
HSU THIRI NWE	Director	Myanmar	12/LAMATA(N)033421	
MYAT KOKO	Director	Myanmar	6/MAMANA(N)144704	
MYINT MYINT KYU	Director	Myanmar	6/MAAHYA(N)011598	
THET SANDAR	Director	Myanmar	12/DAGANA(N)023444	
TIN WAR	Director	Myanmar	6/MAAHYA(N)056432	

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Companies Online

<https://www.myco.dica.gov.mm/Corp/EntityProfile.aspx?id=4...>

/#CompanyProfileTabEntityAuthority)

MEMBERS (.../FormControls/#CompanyProfileTabMembers)

DOCUMENTS (.../FormControls/#CompanyProfileTabDocuments)

Total Shares Issued by Company

4003000

Currency of Share Capital

MMK

### ULTIMATE HOLDING COMPANY

Company Name

Registration Number

Jurisdiction of Incorporation

### SHARE CAPITAL STRUCTURE

Share Class	Class Title	Total No. Shares	Total Amount Paid	Total Amount Unpaid
ORD	Ordinary	4,003,000	4,003,000,000	0

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Companies Online

<https://www.myco.dica.gov.mm/Corp/EntityProfile.aspx?id=4...>

/#CompanyProfileTabEntityAuthority)

MEMBERS (.../FormControls/#CompanyProfileTabMembers)

DOCUMENTS (.../FormControls/#CompanyProfileTabDocuments)

Account Number	Account Name	Status	Request Date
101740929 (/secured /ca/clientprofile.aspx?id=1017409)	Pyi Phyo Tun International Company Limited	Active	12/09/2018

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Companies Online

<https://www.myco.dica.gov.mm/Corp/EntityProfile.aspx?id=4...>

/#CompanyProfileTabEntityAuthority)

MEMBERS (.../FormControls/#CompanyProfileTabMembers)

DOCUMENTS (.../FormControls/#CompanyProfileTabDocuments)

### Individual Members

Name	Nationality	N.R.C / Passport Number
DAW HSU THIRI NWE	Myanmar	12/LAMATA(N)033421
DAW KHIN THAN YI	Myanmar	6/MAAHYA(N)027115
DAW MYAT THIRI KHAING	Myanmar	12/LAMATA(N)035236
DAW MYINT MYINT KYU	Myanmar	6/MAAHYA(N)011598
DAW THET SANDAR	Myanmar	12/DAGANA(N)023444
DAW TIN WAR	Myanmar	6/MAAHYA(N)056432
DR. AUNG LWIN	Myanmar	12/AHLANA(N)033879
U HLA THAN	Myanmar	6/MAAHYA(N)057303
U MYAT KO KO	Myanmar	6/MAMANA(N)144704

### Corporate Members

Name	Registration Number	Jurisdiction Of Incorporation
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**APPENDIX D**  
**TEST RESULTS (WATER)**





The Republic of The Union of Myanmar  
 Ministry of Health and Sports  
 Department of Medical Services  
**National Health Laboratory**  
 No.(35) Hmaw Kon Daik Street, Dagon Township, Yangon.  
 Ph : 371957 Fax : 371925

**LABORATORY REPORT**

**WATER CHEMICAL ANALYSIS REPORT**


Name : Pyl Phyo Tun Int'L Co Ltd Lab. Code No. : 1838  
 Date of Receipt : 24.11.1017 Date of Report : 4.12.2017  
 Reg. No : 137 Reg: Vol. No : 20  
 Address : No.15,11th street , Lamadaw Township Yangon  
 Source of Water : ရေသန့်ရေး

Test	Result	Unit	Maximum Permissible Limit
Colour (TCU)	Nil	Pt-Co	20
Turbidity	Nil	NTU	5
Total dissolved solvents (TDS)	30.80	mg/l	1000
Chloride	17.60	mg/l	250
Total hardness (as Ca CO <sub>3</sub> )	10.00	mg/l	500
Iron	0.15	mg/l	1
pH	6.99		6.5-8.5
Sulphate	1.00	mg/l	400
Calcium	2.40	mg/l	200
Magnesium	1.12	mg/l	150
Electrical conductivity	44.00	µs/cm	1500
Arsenic	0.00	ppm(mg/l)	≤ 0.05

**Remark**

Within maximum permissible limit.

Technician

  
 Dr. Swe Setk  
 Senior Consultant Pathologist  
 Head of Clinical Pathology  
 National Health Laboratory  
 Yangon