EIA CEMENT - MYANMAR

SUMMARY

1) Introduction

This EIA report was prepared for Mawlamyine Cement Limited (MCL) by Resource & Environment Myanmar (REM) Co., Ltd. for the assessment of environmental and social impacts which will be generated by cement production plant and its integrated facilities.

The cement production process involves-

1) Mining; crushing and grinding of raw materials (principally limestone and clay)
2) Calcinating the materials in a rotary kiln
3) Cooling the resulting clinker
4) Mixing the clinker with gypsum
5) Milling
6) Packaging
7) Storing and Bagging of the cement products
8) Transport

The process generates a variety of wastes, including dust, which is captured and recycled to the process. The process is very energy-intensive, and there are strong incentives for energy conservation.[1]

Therefore, EIA report preparation is required according to EIA procedures (Myanmar), 2015 due to likely to have potential for adverse impacts from multiple components and various pollution sources with the integration of mitigation and EMP plans for the characterized significant high risks and adverse environmental and social impacts, regardless of its size and production magnitude.

2) Location of the Proposed MCL Project

The proposed MCL cement project which is established by a collaborative work of SCG cement and Pacific Link Cement Industry **(**PLCI**)**, was located in Mon state at the southeastern part of Myanmar.

The cement plant site is located at Pya Taung area, approximately 0.86 km north of the Kwan Ngan village, east bank of Ataran River, in Kyaikmaraw Township, Mawlamyine District, Mon state of the Union of Myanmar. The cement plant is located between 16º21’44” and 16º22’05” N latitude and between 97º49’25” and 97º50’17” E longitude.

Table 1: The Coordinate Location of the Proposed MCL Project

No.	Project Proponent	Latitude	Longitude
1	Cement Plant	16°21'56.53"N	97°50'11.26"E
2	Coal Fired Power Plant	16°21'55.07"N	97°49'58.73"E
3	Limestone Quarry	16°21'25.25"N	97°48'14.24"E
4	Jetty	16°21'26.11"N	97°50'2.49"E
5	Worker Camp	16°22'9.57"N	97°49'33.64"E

[1] Pollution Prevention and Abatement Handbook, WORLD BANK GROUP Effective July 1998

The geographical location of the cement plant site in the following Figure 1.

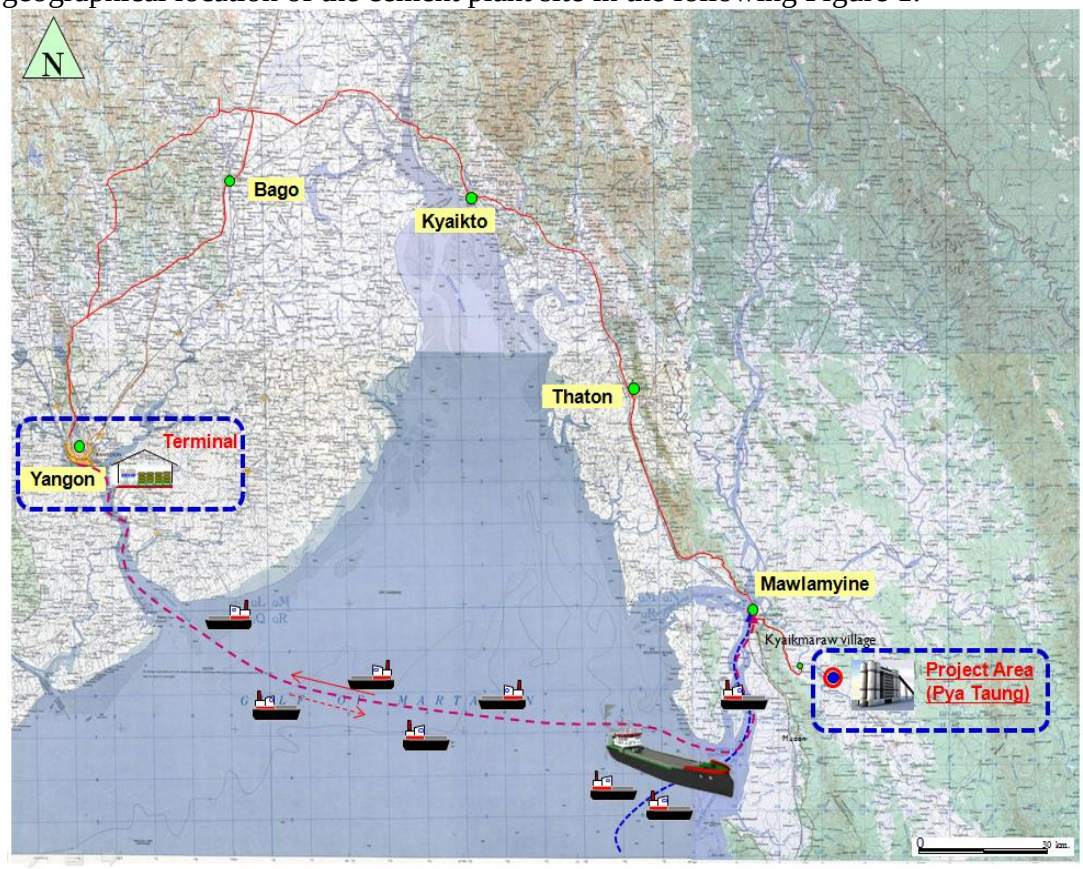


Figure 1: Geographical Location of MCL Cement Plant

The estimated area required for the cement plant and its related facilities including reserves of raw material and Jetty is approximately 1,400 acres. The preliminary layout of cement plant can be seen in Figure 2.

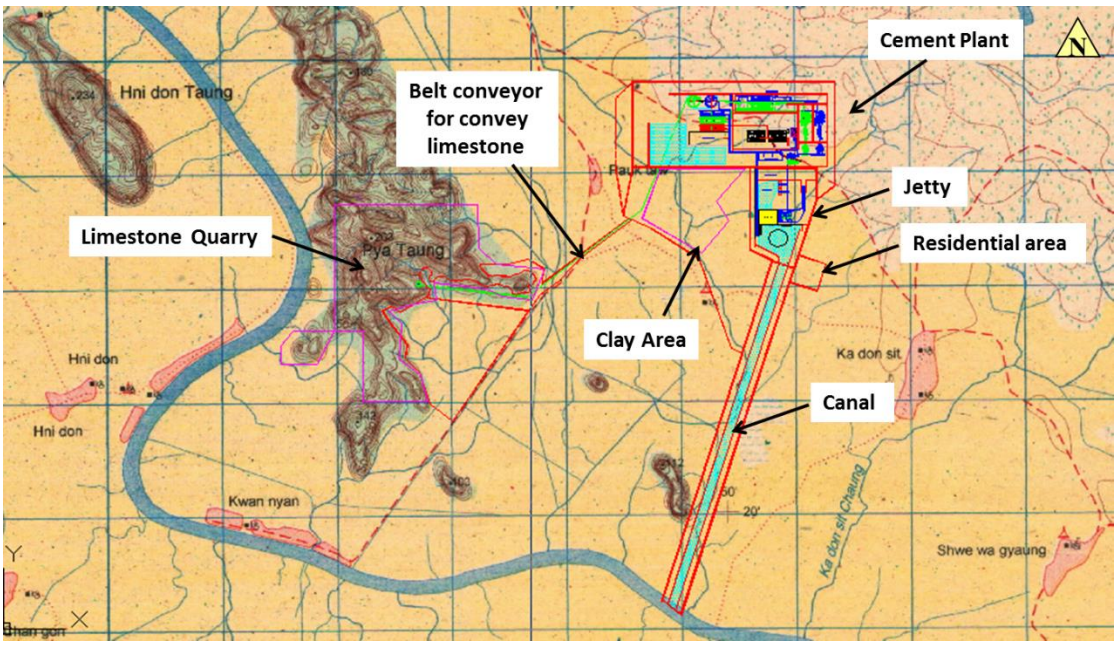
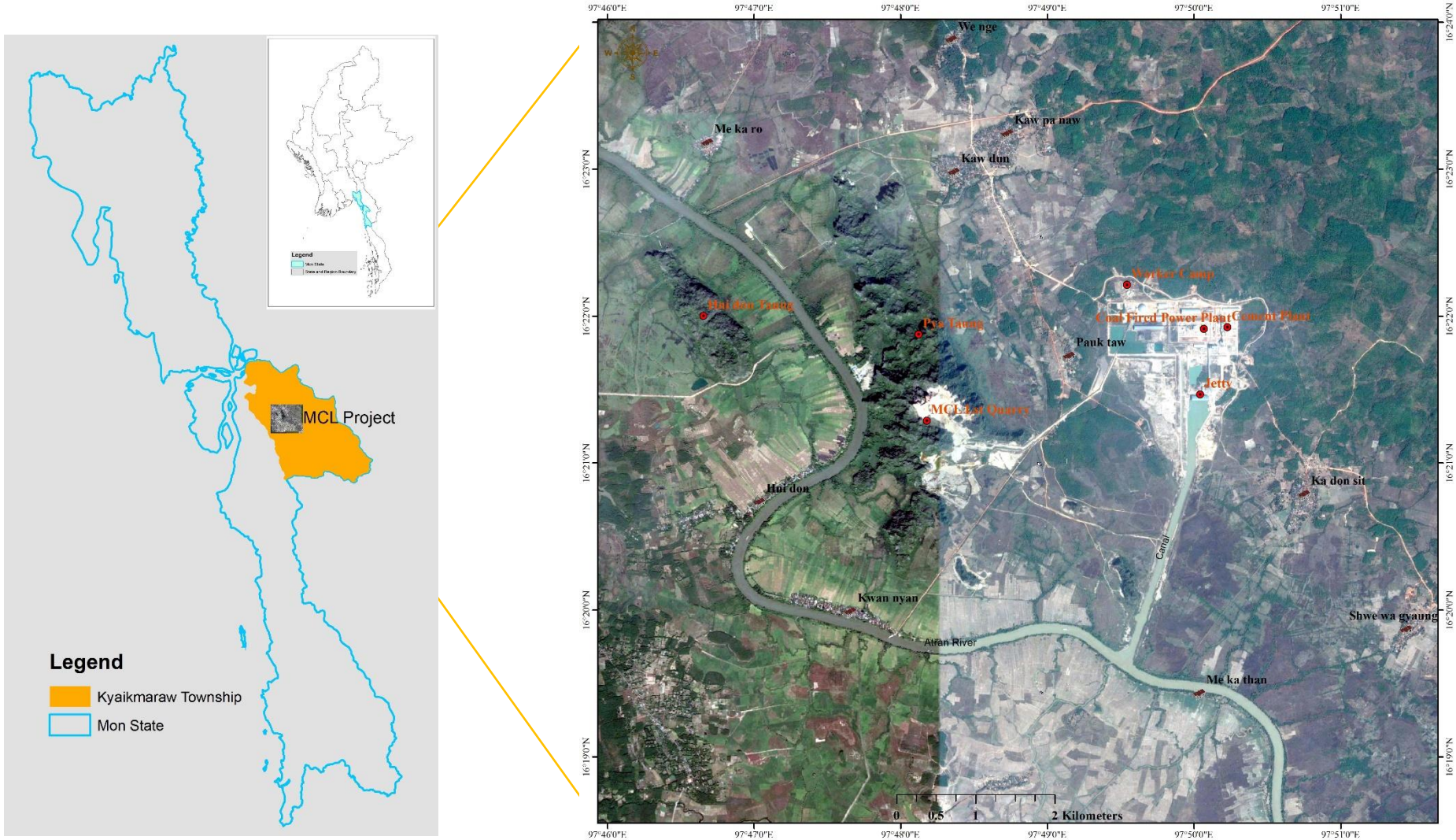


Figure 2: Preliminary Layout of Cement Plant & its Facilities

3) Topography of the Proposed MCL Project

The isolated hill of the Pya Taung is exposing in the plain near the Ataran River. It is generally N-S trending and lofty vertical sided. It can be seen the middle portion of the Pya Taung is widen and the extremity of the southern and northern portion is narrowed. Its highest point is at 263 m above sea level. It is situated distinctly in the plain which is the between of the Ataran river and the area of hill-ridges. The Ataran River is bounded in the west of Pya Taung and flows uniquely from SE to NW in general. The hill-ridges are generally also NW-SE trending.



Source: Google Earth Satellite Images (2017)

Figure 3: Location Map of MCL Cement Project

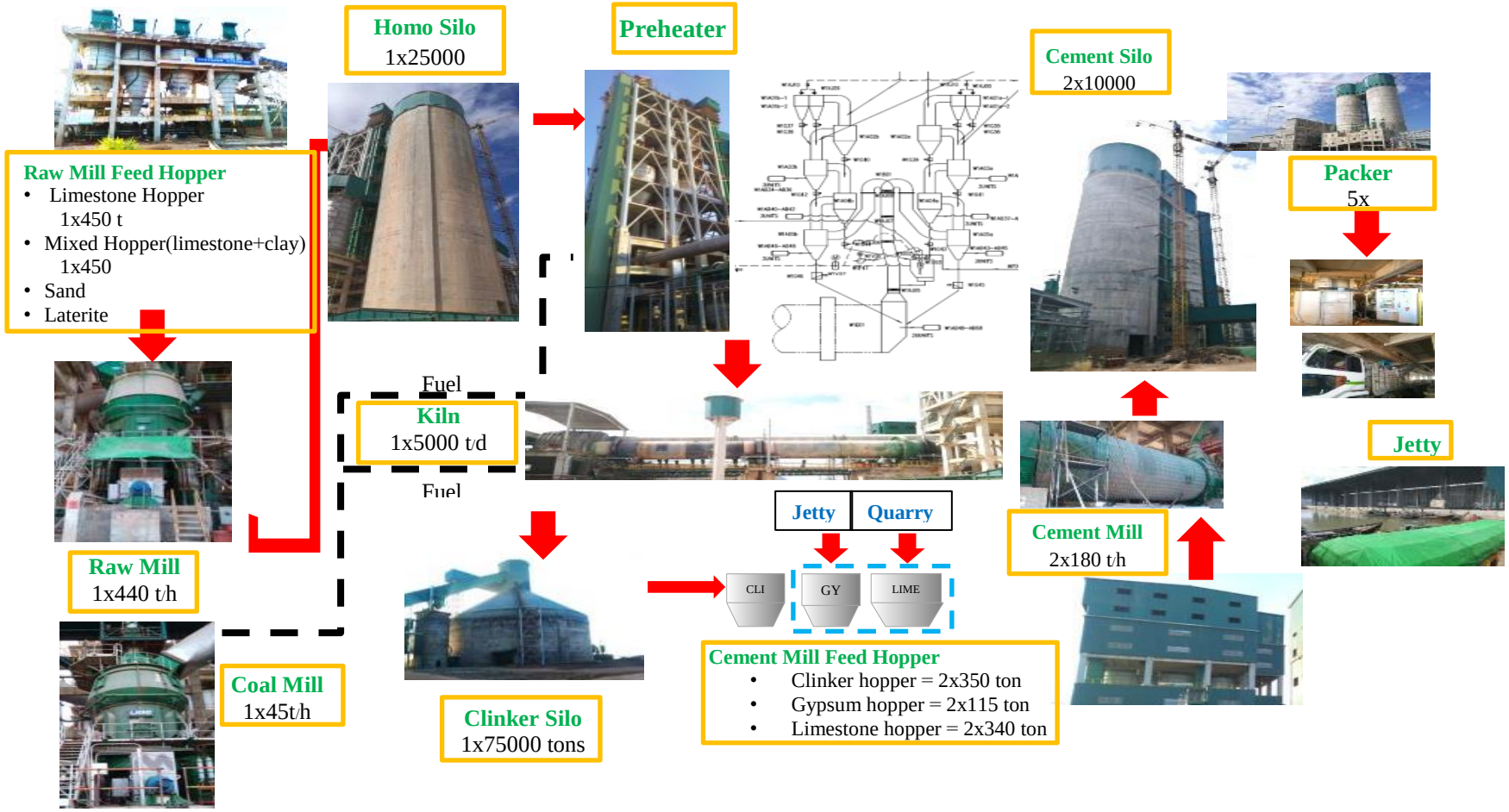


Figure 4: Main Process Flow for Cement production and Associated Facilities

Figure 5: Plant Layout Overview of Cement Factory Compound

Figure 6: Layout Overview of Raw Materials Storage Area

Figure 7: Plant Layout Overview of Packing Plant and Delivery Area

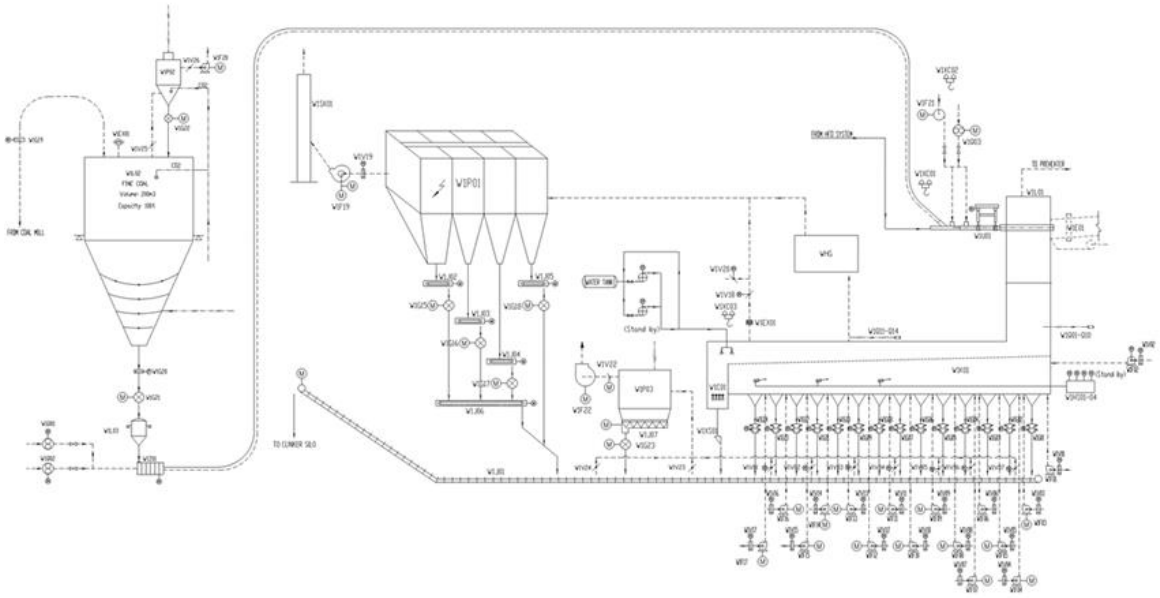


Figure 8: Layout of EP Cooler Stack

Table 2: Air Emissions Monitoring Results from Main Cement Stacks (2018)

Parameters	Jan	Feb	Mar	April	May	Jun	July	Aug	Sep
SO_2	35.14516	25.15793	24.77419	26.41333	24.8619	23.048	55.512	73.672	74.21875
No_x	255.2806	178.4674	247.1935	236.42	150.8714	159.728	146.772	270.936	267.95625
Dust	24.86129	23.73214	22.93226	27.15433	29.01905	28.232	30.332	32.408	33.15

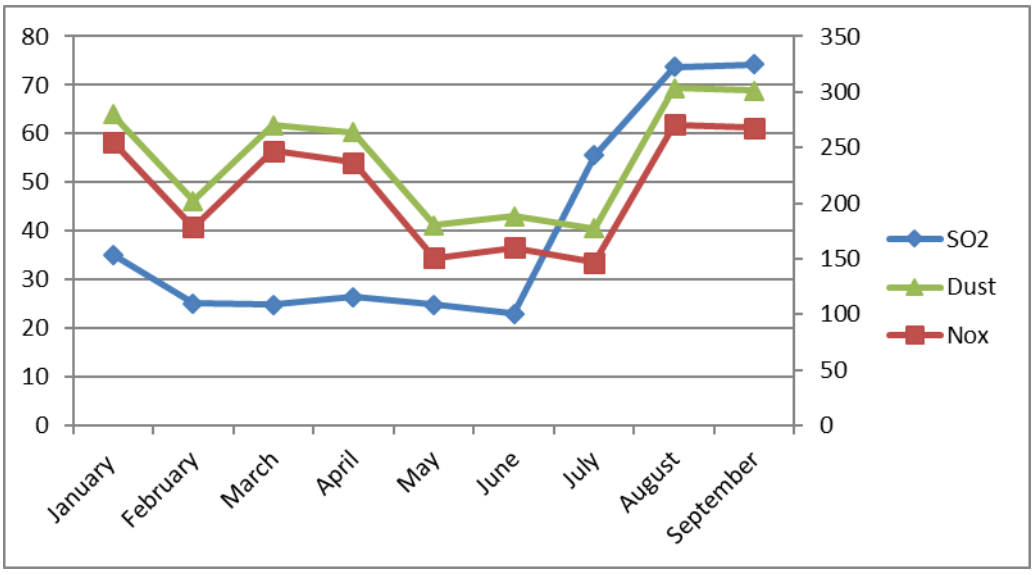


Figure 9: Air Emissions (NO_x, SO_2 and Dust) from Cement Main Stacks

4) Raw Materials Conception for the Proposed MCL Project

The following table shows the consumption of raw material per year for the present cement manufacturing project.

Table 3: Consumption of Raw Materials per Year

Items	% Dry Basis	% Moisture	Consumption per Year
Limestone	78.34	1	2.1 MTon (approx.)
Clay	12.51	20	0.5 MTon (approx.)
Sand*	5.54	15	0.15 MTon (approx.)
Laterite	3.6	10	0.15 MTon (approx.)
Gypsum	Hlaingbwe, Hpa-an		0.10 MTon (approx.)
Coal	IndonEIA and Local coal		0.35 MTon (approx.)

4.1) Water Usage

Raw Water Pond #1 capacity**:** 250,000 m^3
Raw Water Pond #2 capacity**:** 150,000 m^3
Estimate daily water usage**:** 5,500 m^3
Daily water return**:** 2000 m^3 **(**from industrial**)**
Actual Daily usage**:** 3500 m^3

- Monthly usage**:** 3500 m^3 x 30= 105,000 m^3
- Reserve raw water pond #1 = 250,000 m^3. Can use for 71 days**.**
- During Raining Season **(**June, July, August, Sep**) (**No need to fill up water**)**
- Oct, Nov, Dec, Jan, Feb, Mar, April, May **(**enough reserve water from Pond #1 for Oct and Nov**)**
- Need to fill water from Pond #2 to Pond #1 from **(**Dec, Jan, Feb, Mar, April, May**)**
- Reserve water from Pond #2 **(**capacity**):** 150,000 m^3. Can use for 42 days **(**Dec and Jan**)**
- Actual need to fill water for 4 months **(**Feb, Mar, April, May**)**
- Total needed water from Ataran River**:** 105,000 m^3 x 4 month = 420,000 m^3 per Year

5) Cement Manufacturing Process

The cement manufacturing process is dry process that uses fuel less than other process and rarely use water in cement manufacturing process.

Cement production process involves the following steps.

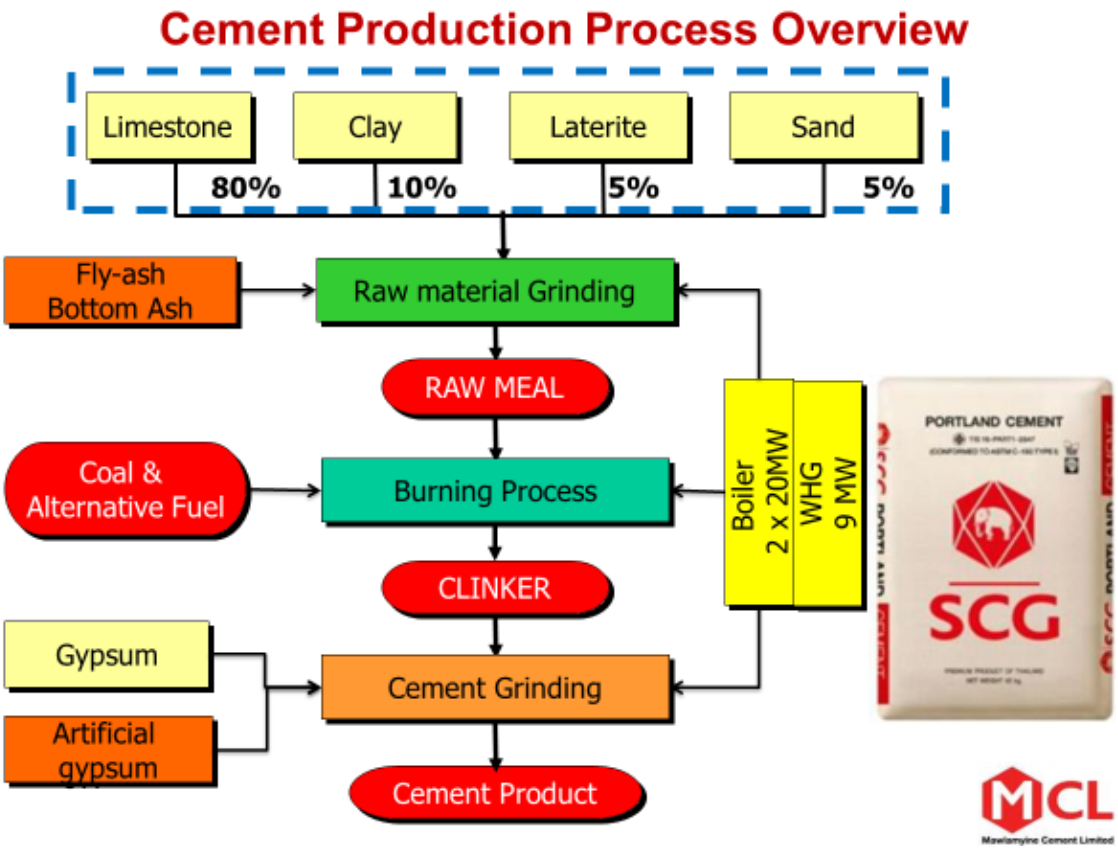


Figure 10: Cement Production Process

Cement Plant with a capacity of 5,000 metric tons of clinker per 24 hours a day (1.8 million tons of cement per year) covers the process from limestone crushing to cement packing as well as loading facilities and consists of two parts as follows.

1) Cement Plant

Cement Plant and its facilities are located at Pya Taung near Ataran River in Kyaikmaraw Township, Mon state. The estimated area required for the cement plant and its facilities including reserves of raw material and Jetty is approximately 1,400 acres. Cement, in-bulk and in-bags is transported by barges through Ataran River and through Andaman Sea to the Cement Terminal.

2) Cement Terminal

Cement Terminal and its facilities are located in the cargo port located on the riverbank in Yangon. The estimated area required for all terminal facilities is approximately 40 acres.

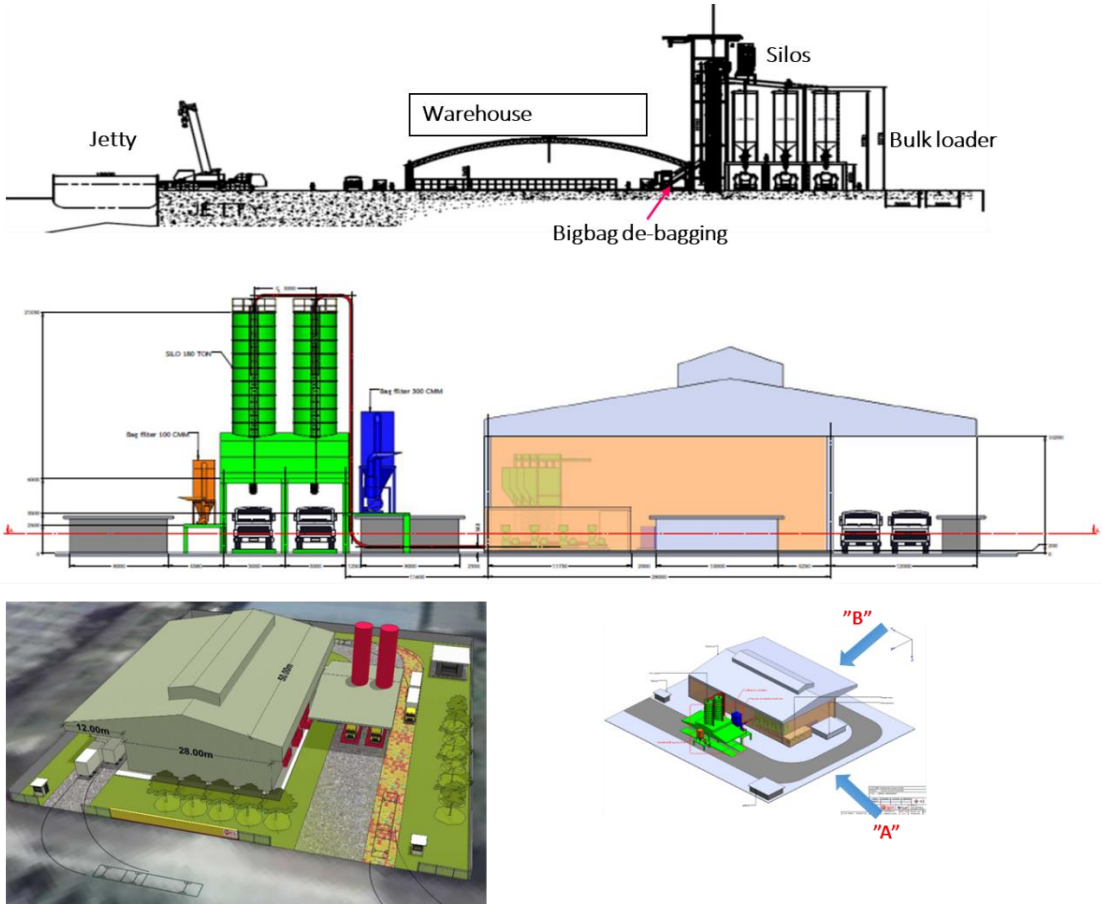


Figure 11: MCL Cement Terminal in Yangon

The three main types of cements are proposed to produce by MCL as the followings;

1) OPC Small 80-85%
2) Masonry 10-15% and
3) Mix cement 10-15%

Figure 12: Various Type of Final Cement Products

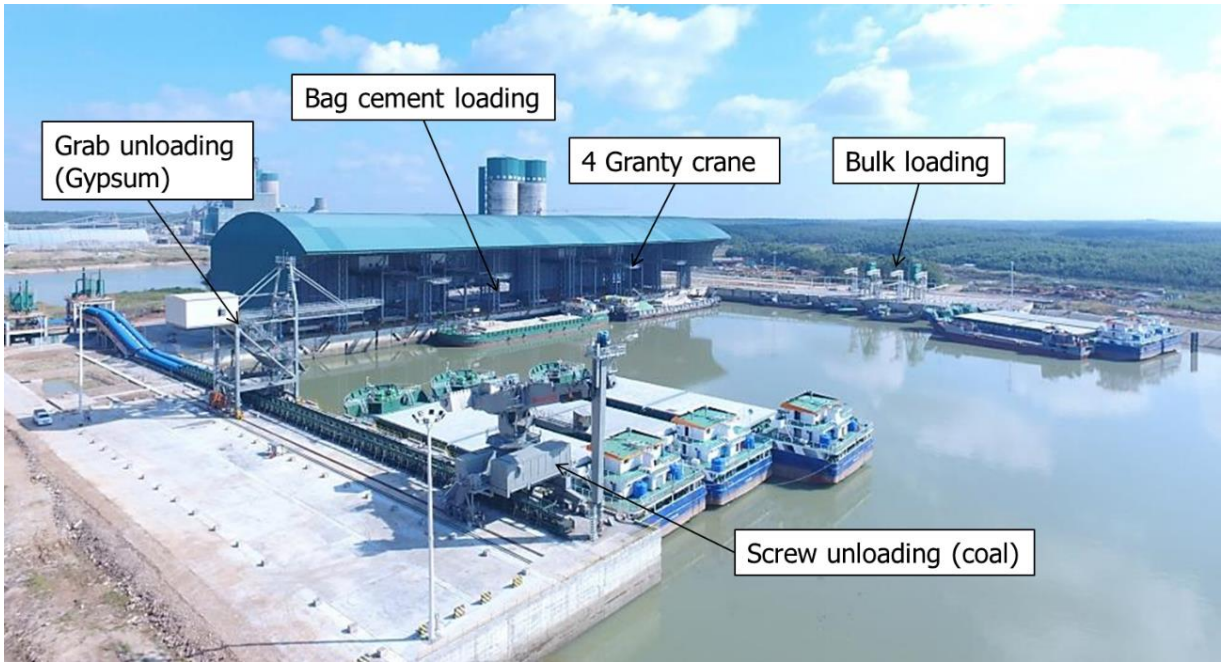


Figure 13: Current Status of MCL Jetty

6) Project Alternatives

6.1) Cement Production Method

Compared to Wet Cement process, MCL's choice was dry cement processing due to the following positive favors:

Table 4: Differences between Wet and Dry Cement Processes[2]

Differences	Wet Process	Dry Process
1. Mixing of raw materials	Wash mill with 35-50 % of water	Dry stage in Blenders
2. Materials existing the mill	Slurry and have flow-ability characteristics	Kiln Feed
3. Size of Kiln	Big	Small
4. Fuel Consumption	High (350 kg of coal per ton of cement produced)	Low (100 kg of coal per ton of cement produced)
5. Production Cost	High	Less

Although the capital cost of dry process is higher because of using blenders, and the production process is more complicated than the wet process, MCL Co., Ltd, established a dry cement process due to lower fuel consumption and shorter time of process than the wet.

[2] https://wecivilengineers.wordpress.com/2018/03/28/difference-between-wet-and-dry-process-of-cement/

6.2) Alternative for Main Cement Machine

The alternative selection for main cement machines were proceeded by examining cement manufacturing technologies and alternative criteria with respect to system features such as general description, operation, installation, ease of operation, operation cost, ease of maintenance, maintenance cost, less energy use, versatility and upgrading and the benefits of installing those machines in cement manufacturing plant operations.

The selective alternative systems of the machines used in MCL cement plant were as follows.

1) Raw Mill (Vertical Roller Mill)

This selection was mainly based on the lowest power consumption and it was also the mature technology for raw material grinding of cement plant.

2) Cement Mill (Roller Press +Tube Mill)

The pre-grinding roll crusher (or another called as "the roller press") with tube mill and high efficiency separator. This type of cement mill is optimum solution in term of Low power consumption (as benefit of pre-grinding system).

Flexibility for producing different kind of product which is superior than the vertical cement mill which has lower power but has difficulty in operation with different type of cement products. (cement product is vary depending of required strength and properties as well as the customer requirement).

Robust and easy to maintenance than the vertical cement mill.

3) Clinker Cooler (Grate Cooler)

The main function of cooler helps to recuperate heat from clinker and also to crush the clinker to the acceptable feed size for cement mill. These 3rd generation stationary grate cooler with low wear parts, low cooler loss, low maintenance and power, no fall through and high efficiency. These coolers could also be referred to as Cross Bar Coolers because they are highly flexible for new construction and upgrades, horizontal clinker transport and improved transportation efficiency.

4) Kiln (Pre-calciner)

Pre-calciner kiln with 5 stages-preheater cyclones and 3rd generation Grate Cooler. This combination provides the benefit as low fuel consumption and low power consumption as well as the waste gas can be use as the heat source for produce the electricity in Waste heat power generation system (WHG). Moreover, this type of kiln used low fuel and power consumption thus in turn always lead lower emission of NO_x, CO_2, SO_x than other types of kiln.

6.3) Alternative Power Supply

Waste Heat Power Generator (WHG): This alternative is a self-power generation using waste heat from cement process to generate electricity. It can supply approximately 20% of total power consumption in the plant.

In this alternative, 9-Megawatt Waste Heat Power Generator is provided. The hot gas from the Clinker Cooler and the Suspension Preheater is carried to the Air Quenching Cooler Boiler (AQC boiler) and Suspension Preheater Boiler (SP boiler), respectively.

Waste Heat Power Generator not only recovers energy from Rotary Kiln, but also indirectly reduces the Green House Gas (GHG) emission like CO_2 from power generated. The waste heat recovery process does not affect the heat consumption or fuel consumption of the Rotary Kiln. For construction period, this project expects to use totally 4,500 KVA diesel generation where 9,000 liters per day of diesel is consumed.

Waste Heat Recovery System (Maximum: 9MW, Normal Operation: 6.5 MW)

a. Boiler Specification*:* Natural Circulation Type
Suspension Preheater Boiler:
Rated Steam Generation: 26.4 tph
Rated Working Pressure: 1.6 MPa
Rated Steam Temperature: 313 °C
Inlet Flue Gas Volume: 350,000 Nm^3/h
Inlet Flue Gas Temperature: 330°C
Efficiency of Heat Recovery: 34.8%

b. Air Quenching Cooler Boiler *:*
Rated HP Steam Generation: 21.4 tph
Rated HP Steam Temperature: 1.6 MPa
Rated HP Steam Temperature: 365 °C
Rated LP Steam Generation: 3.7 tph
Rated LP Steam Temperature: 0.5 MPa
Rated LP Steam Temperature: 200 °C
Inlet Flue Gas Volume: 225,000 Nm^3/h
Inlet Flue Gas Temperature: 380°C
Efficiency of Heat Recovery: 74.5%

c. Turbo-generator Specification*:* Condensing Turbine Type
Rated Power Output: 9,000 kW
Rated Speed: 3,000 rpm
Rated Voltage: 10.5 kV
Inlet Steam Condition: 44.5 tph, 1.6 MPa, 320°C
Rotational Direction: Clockwise

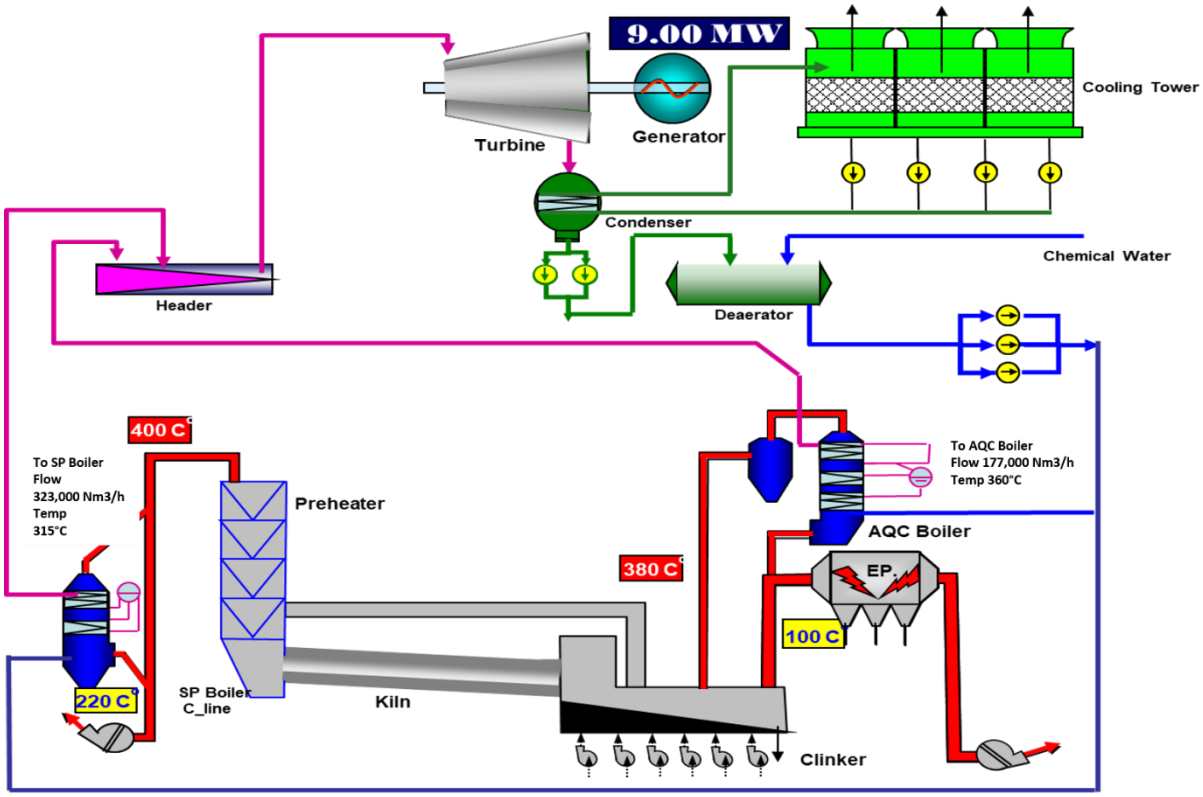


Figure 14: Schematic Diagram of MCL Waste Heat Generation Process

7) Project Schedule

2 years for construction and installation Details of machine test run period as attached file "project schedule and plant layout".

The construction period is about 2 years and the progress of construction activities are presented n Figure 14 and 15.

April 28, 2016
Limestone Crusher Test Run

May 08, 2016
Start Power Generation from Boiler

Jul 18, 2016
Coal Mill First Load Run

Figure 15: Schedule of MCL's Construction and Machines Uploads

Jul 26, 2016
Raw Mill First Load Run

Aug 12, 2016
Kiln Firing

Apr 1, 2017
Commercial run

Figure 16: Schedule of Operating Machines Uploads

8) Legislative Framework

8.1) Overview of Myanmar Legislation

Myanmar issued a new EIA (Environmental Impact Assessment) procedure on 29 December 2015, which defines the requirements for the EIA and states that: *"An EIA investigation shall consider all biological, physical, social, economic, health, cultural and visual-components of the environment, together with all pertinent legal matters relating to the environment (including land use, resources use, and ownership of and rights to land and other resources) that may be affected by the Project during all project phases including pre-construction, construction, operation, decommissioning, closure, and post-closure; and shall identify and assess all Adverse impacts and risks that potentially could arise from the project."*

8.2) EIA Process

Three different steps are foreseen for the EIA process which are described in the following sections:

- Screening Phase;
- Scoping Phase; and
- EIA Investigation and Report Preparation.

1) Screening Phase

Screening is the first step of a complete EIA process. The MOECAF (now MONREC) is empowered and has the exclusive authority to define the screening criteria for a project. Guidance is provided as to which projects or activities should carry out an Initial Environmental Examination (IEE) or EIA. If, as a result of that determination, an IEE or an EIA is required, then the proponent of the project or activity has to prepare, obtain approval for, and implement an appropriate Environmental Management Plan (EMP) in respect of the proposed project or activity.

Therefore, limestone production project in this case is deeply concerned about the land and resource use and affected on the biological and visual components of the environment and potentially related to cultural and social impacts from mining activity, particularly such as, Dynamite explosion and machinery noise and air emissions from the limestone extraction process activities. Therefore, EIA investigation work for limestone production has strongly proposed to be done.

2) Scoping Phase

All EIA type projects are required to undergo the Scoping Phase. The project proponent shall be responsible to ensure that the Scoping and the preparation of the Terms of Reference (ToR) for the EIA report are undertaken in a professional manner and in accordance with any applicable guidelines issued or adopted by the MONREC.

As part of the scoping, the project proponent shall ensure that the following public consultation and participation process is carried out with the followings.

- Disclose information about the proposed project to the public and civil society through local media, including by means of the prominent posting of legible sign boards and advertising boards at the Project Site which are visible to the public; and
- Arrange the required complement of consultation meetings as advised by the MOECAF, with local communities, potentially PAPs, local authorities, community-based organizations, and civil society.

The project proponent shall prepare a scoping report and ToR for the EIA investigations and submit the completed Scoping Report and ToR to the MONREC for review and approval.

3) EIA Investigation and Report Preparation

The Project Proponent has to ensure that the EIA investigation properly addresses all adverse impacts and is undertaken in accordance with the approved TOR. The EIA investigation shall consider all biological, physical, social, economic, health, cultural and visual components of the environment, together with all pertinent legal matters relating to the environment (including land use, resources use, and ownership of and rights to land and other resources) that may be affected by the Project during all project phases, including pre-construction, construction, operation, decommissioning, closure, and post-closure; and shall identify and assess all adverse impacts and risks for environment, social and, if relevant, health that potentially could arise from the Project.

The EIA Procedure does not address the social impacts of involuntary resettlement or which relate to indigenous people. Separate procedures shall be issued by responsible ministries, and in the absence of such procedures all such Projects shall adhere to international practice on involuntary resettlement and indigenous people.

The Project Proponent is obliged to use, comply with and refer to applicable national standards, international standards adopted by the Government and/or the MONREC, or, in the absence of relevant national or adopted international standards, such standards as may be agreed with the MONREC.

The EIA Report shall consider the views, concerns, and perceptions of stakeholders, communities and individuals that could be affected by the Project or who otherwise have an interest in the Project. The EIA should include the results of public consultations and negotiations with the affected populations on the environmental and social issues. Public concerns should also be taken into account in assessing impacts, designing mitigation measures, and selecting monitoring parameters.

The MONREC shall within 10 days after submission disclose the EIA Report to civil society, PAPs, concerned government organizations, and other interested stakeholders. The MONREC shall submit the EIA Report to the EIA Report Review Body for comment and recommendations and also arrange for public consultation meetings at national and State/ Regional/ local levels where the Project Proponent shall present the EIA Report. All received comments and recommendations, including those of the EIA Report Review Board, will be collected and reviewed by the MONREC prior to making a final decision on approval of the EIA Report.

The MONREC shall deliver its final decision within 90 days from the receipt of the EIA Report. All costs incurred in completing to the EIA Report disclosure and review, including the public participation process, shall be borne by the Project Proponent. Upon completion of its review of the EIA Report, the MONREC will issue an ECC or inform the Project Proponent of its decision to reject the EIA Report and publically disclose its decision.

8.3) International Standards and Applicable Guidelines

In addition to the applicable host Country Laws, this ESIA Report presents the Project impacts and mitigation measures with explicit reference to the following international standards and guidelines:

- IFC performance standards - PS (2012);
- WB Group's EHS guidelines, as applicable to the project, including EHS General Guidelines; and
- ESIA Cement Industry Guidelines developed by WBCSD within CSI.

8.4) National Laws and Regulations

The project proponent, MCL shall comply the all National Laws that related to the project activities**.** The followings are the list of laws and regulations that applied and commits to follow related to the present project.

1) National Environmental Policy (1994)
2) Constitution of the Union of Myanmar (2008)
3) The Environmental Conservation Law (2012)
4) The Protection and Preservation of Ancient Monuments Law (2015)
5) Environmental Conservation Rules (2014)
6) Environmental Impact Assessment Procedure (2015)
7) Myanmar Investment Law (2016)
8) Protection the Rights of Ethnic Nationalities Law (2015)
9) The Electricity Law (2014)
10) Public Health Law (1972)
11) The Fire Services Law (1997)
12) Myanmar Engineering Council Law (2013)
13) The Myanmar Insurance Law (1993)
14) The Factories Acts (2016)
15) The Fire Force Law (2015)
16) Workmen's Compensation Act (1923)
17) The Leaves and Holiday Act (1951, partially revised in 2014)
18) The Minimum Wages Law (2013)
19) Labour Organization Law (2011)
20) The Petroleum Act (1934)
21) The Petroleum Rules (1937)
22) The Prevention of Hazard from Chemical and Related Substances Law (2013)
23) The Boiler Law (2015)
24) The Prevention and Control of Communicable Diseases Law (1995)
25) The Control of Smoking and Consumption of Tobacco Product Law (2006)

26) The Motor Vehicles Law (2015) and Rules (1987)
27) The Protection and Preservation of Antique Objects Law (2015)
28) The Protection of Wildlife, Wild Plants and Conservation of Natural Area Law (1994)
29) The Protection and Preservation of Cultural Heritage Regions Law (1998)
30) The Forest Law (1992)
31) The Law on Standardization (2014)
32) The Export and Import Law (2012)
33) Employment and Skill Development Law (2013)
34) The Settlement of Labour Dispute Law (2012)
35) The Consumer Protection Law (2014)
36) Highways Law (2015)
37) The Law Relating to Aquaculture (1989)
38) The Freshwater Fisheries Law (1991)
39) Explosive Substance Act (1908)
40) The Social Security Law (2012)
41) Environmental and Social Impact Assessment Guidelines (2014)
42) The Conservation of Water Resources and Rivers Law (2017)
43) The Farmland Law (2012)
44) The Vacant, Fallow and Virgin Lands Management Law (2012)
45) The Ethnic Rights Protection Law (2015)
46) Workmen Compensation Act (1923)
47) The Payment of Wages Law (2016)
48) National Environmental Quality (Emission) Guidelines (2015)
49) Mon State Municipal Laws (2017)
50) The Explosive Act-1 [India Act Iv, 1884.] (1887)

8.5) Environmental and Social Impact Assessment Methodology

The present Report was developed following the ESIA guidelines and included:

- a clear description of the proposed Project including the objectives, design concepts and proposed natural resources uses;
- description of the Project alternatives and selection criteria;
- description of the baseline conditions in the Project area to cover the physical location, environmental settings, social and economic issues;
- a description of the legal, policy and institutional framework within which the proposed project will be implemented;
- details of the anticipated impacts to the environment, social and economic aspects of the area covered by the project;
- appropriate mitigation and/or corrective measures; and
- development of a framework ESMP presenting the Project activities, potential impacts, and mitigation actions to be taken to bring the Project in line with the IFC standards.

The main objective of this methodology was to identify impacts resulting from the proposed Project to be determined on the basis of the baseline conditions established during the field works and the secondary informative data from desktop reviewing the cement related documented references.

8.6) MCL's Pollution Control Framework for Proposed Cement Project

In addition to compliance with the existing legal policies, regulation and guidelines, MCL had its own Sustainability Development Policy and environmental management plan. Indeed, MCL had been established by collaborative work of SCG cement **(**Thailand**)** and Pacific Link Cement Industry **(**PLCI**)**. SCG already got certification of ISO 14001 series for Sustainable Development Policy and MCL also handled to develop the proposed project by operating the manufacturing processes in sustainable policy and guidelines **(**see in MCL announcement described as follow**)**.

MCL
Mawlamyine Cement Limited

Announcement MCL 009/2016

SUSTAINABLE DEVELOPMENT POLICY (Safety, Environment, CSR)

Mawlamyine Cement Limited establish safety to our employees and contractors, preserve the environment and collaborate with local government and surrounding communities in order to be environmental friendly factory and be a good citizen in Mon state under corporate governance.

Mawlamyine Cement Limited has therefore implemented the Sustainable Development policy as the followings:

1. Align SCG Safety Principle to develop Safety Management Program
2. Promote safety caring culture with uncompromising on safety standard
3. Safety is everybody's accountability
4. Control air emission and noise to conform to the relevant standards by implementing Pollution Prevention and Clean Technology.
5. Reduce natural resource consumptions; increase the efficiency of energy by improving the operation to reduce the environmental impacts.
6. Improve waste management by applying 3R's (Reduce, Reuse, Recycle) management and comply with legal requirements.
7. Prevent pollution by improving operation effectiveness and efficiency and increase more green areas.
8. Coordinate with government, external organizations and communities to conserve environment and natural resources for sustainable development.
9. Increase more satisfaction from surrounding communities by implementing CSR program and stakeholder engagement program.

The Sustainable Development policy is communicated within Mawlamyine Cement Limited to make all employees understood and well implemented.

The policy, objective and target of the environmental management system are maintained, reviewed and revised at least once a year via regular Management Review meeting.

Managing Director
Mawlamyine Cement Limited
March 4, 2016

Mawlamyine Cement Limited
No.136/137, Pyay Road, Saw Bwar Gyi Gone, Insein Township, Yangon, Myanmar.

1) Environmental Caring Policy of Proposed MCL Project

It had been stated as: "**Any employee who is careless and makes the standard value of pollution (SOx, NOx, Dust and Noise) exceed standardization shall be punished by the company. The highest penalty would be termination.**"

Other Safety plans and employee management plan will be described in Chapter 2 which was stated as Legal Framework and the attached Annexes.

2) MCL Commitments and EIA Implementation Team

In support and approval of EIA, the Resource & Environment Myanmar Ltd**.** had collected and analyzed physical, biological and social data such as people's perceptions, concern, opinion, and expectation on the project for the approval of clean environment and guiltless society during and after the development of the project.

Any type of development activity has both beneficial and adverse impacts on the environment in which it operates. The impacts are identified and evaluated by the project proponents to reduce their negative impacts and maximize the positive effects on the surrounding environment. The proposed project is being expected to meet the cement requirement for the construction and industries in the surrounding areas and also in different parts of Myanmar. The proposed project will generate an optimum employment generation for the local population. Full pledged Environmental Management Plan for the proposed cement project shall be constituted with qualified Engineers and Technicians.

According to the technical study and the environmental, social and health impacts assessment, the MCL Cement project will have positive impact on the Environment if the recommended Environmental Monitoring, Health, Safety & Environmental Management Plan **(**EMP**)** are fully integrated by the project proponents.

3) MCL's Organization Structure

Cement factory operation was mainly responsible by Mawlamyaine Cement Limited and the maintenance, monitoring and EIA implementation works are implemented by the instruction of sectors to sectors**.** Sustainable and organization development department will mainly control the proper implementation of EMP and HSE plans and they will also play a role in stakeholder consultation and public relation. MCL organization chart is presented as follow.

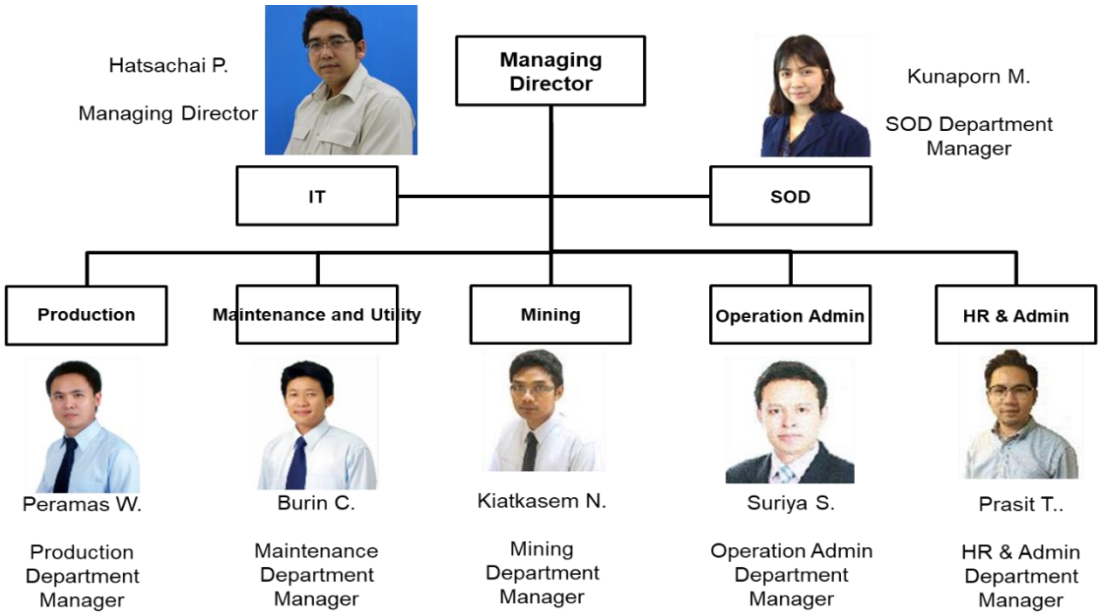


Figure 17: MCL Organization Structure for Top Management Role

Figure 18: MCL Organization Structure for Sustainable Development Department

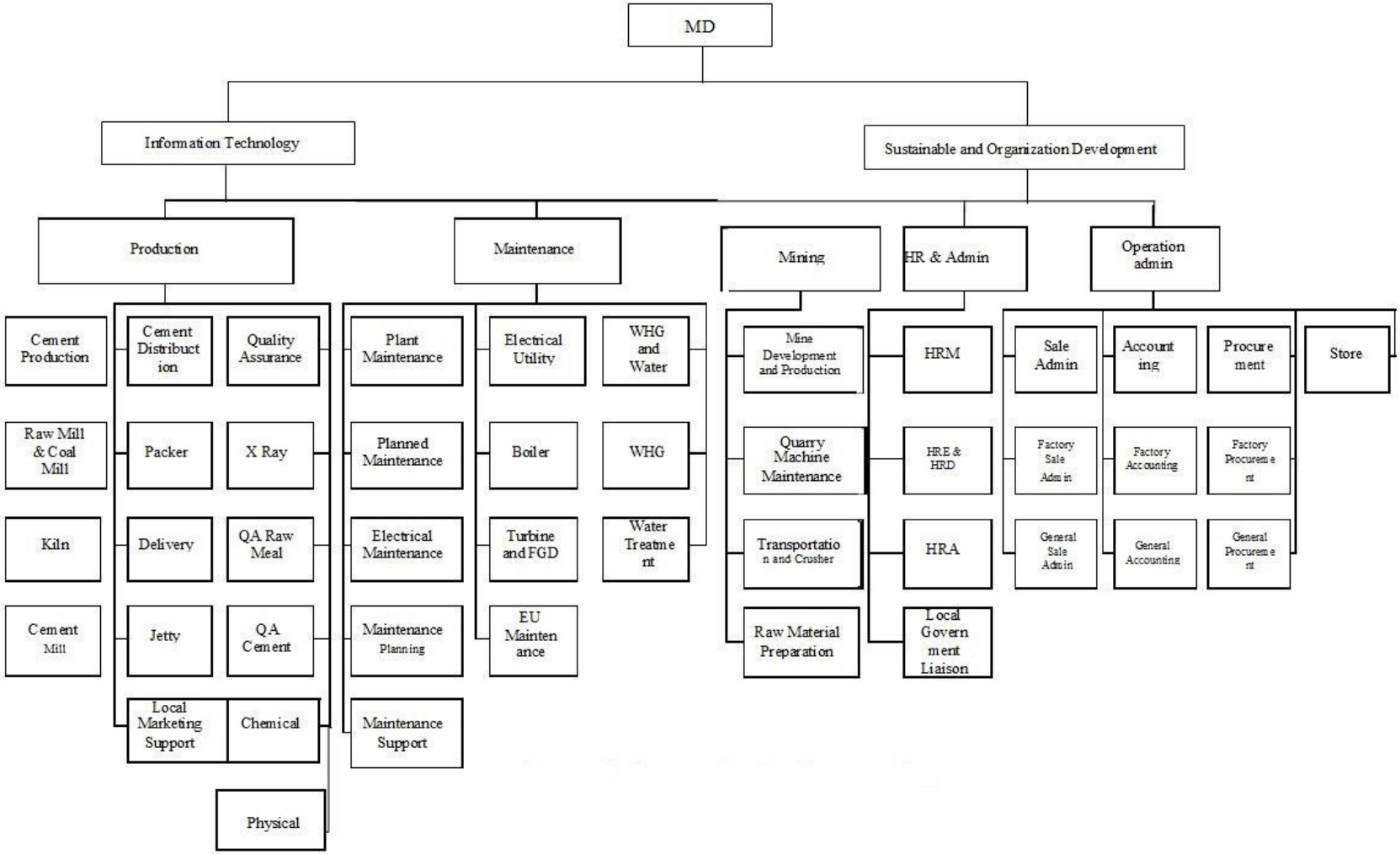


Figure 19: Overall MCL's Organization Structure

Table 5: Organizational Tasks and Responsibility of MCL's Implementation Team

Role	Responsibility
Top management (Safety and Health Committees	Set the policy, rules and regulations for safety and environment programs
SOD manager	Management of CSR, Environmental Team, Safety Team
CSR team	Communities relation, Government Relation, Communities Development programs, Education, Religions and other correspondent activities
Environment Team	Inbound and outbound monitoring process, plantation, waste management
Safety team	Employees' and workplace safety such as fire safety, workplace safety, vehicles and road safety
Liaison Officer	-To liaise with the different stakeholders from government offices, communities and other associated organization like consultants, NGOs, etc. -To receive the grievances/complaints related with the project activities via suggestion box, on call, email or by person and address and close the complaints according with the adequate communication and management actions

In support and approval of EIA, the Resource & Environment Myanmar Ltd**.** had collected and analyzed physical, biological and social data such as people's perceptions, concern, opinion, and expectation on the project for the approval of clean environment and guiltless society during and after the development of the project.

Any type of development activity has both beneficial and adverse impacts on the environment in which it operates. The impacts were identified and evaluated by the project proponents to reduce their negative impacts and maximize the positive effects on the surrounding environment. The proposed project is being expected to meet the cement requirement for the construction and industries in the surrounding area and also in different parts of Myanmar. The proposed project will generate an optimum employment generation for the local population. Full pledged Environmental Management Plan for the proposed cement project shall be constituted with qualified Engineers and Technicians.

According to the technical study and the environmental, social and health impacts assessment, the MCL Cement project will have positive impact on the Environment if the recommended Environmental Monitoring, Health, Safety & Environmental Management Plan **(**EMP**)** are fully integrated by the project proponents.

Table 6: Air Emissions Levels for Global Cement Manufacturing Industries

Pollutants	Units	Guideline Value
Particulate Matter (new kiln system)	mg/Nm^3	30[a]
Particulate Matter (Existing Kiln)	mg/Nm^3	100
Dust (Other point sources incl. clinker cooling, cement grinding)	mg/Nm^3	50
SO_x	mg/Nm^3	400
NO_x	mg/Nm^3	600
HCl	mg/Nm^3	10[b]
Hydrogen Fluoride	mg/Nm^3	1[b]
Total Organic Carbon	mg/Nm^3	10
Dioxin-furans	mg TEQ/Nm^3	0.1[b]
Cadmium & Thallium	mg/Nm^3	0.05[b]
Mercury (Hg)	mg/Nm^3	0.05[b]
Total Metals	mg/Nm^3	0.5

NOTES:
***** Emissions from the kiln stack unless otherwise noted. Daily average values corrected to 273 K, 101.3 kPa, 10 percent O_2, and dry gas, unless otherwise noted.

a) 10 mg/Nm^3 if more than 40 percent of the resulting heat release comes from hazardous waste.
b) If more than 40 percent of the resulting heat release comes from hazardous waste, average values over the sample period of a minimum of 30 minutes and a maximum of 8 hours.
c) Total Metals = Arsenic (As), Lead (Pb), Cobalt (Co), Chromium (Cr), Copper (Cu), Manganese (Mn), Nickel (Ni), Vanadium (V), and Antimony (Sb)

Table 7: Wastewater Effluent Levels of Cement and Lime Manufacturing

Parameters	Unit	Discharge Standard for Industry
pH	-	6-9
TDS	mg/l	3000 mg/l
TSS	mg/l	50 mg/l
pH	S.U	6-9
Temperature	˚C	<3[a]

9) Impact Assessment, Mitigation and Management Plans

Proposed MCL project had its own environmental management plan and CSR management programs. Indeed, MCL was operated by integrated environmental management system and every production process have been integrated by control units for environmental monitoring and management.

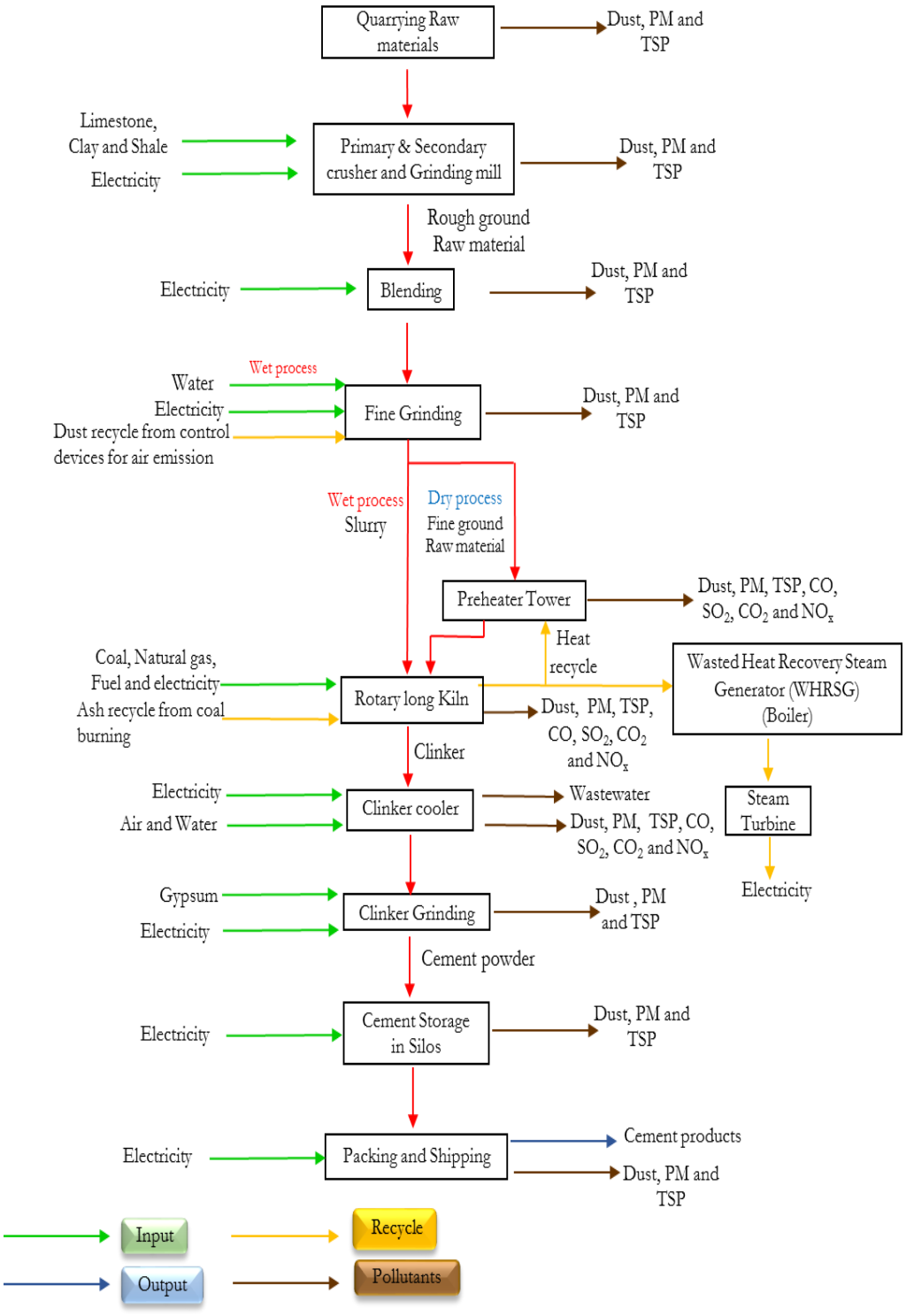


Figure 20: Potential Impacts from Overall Process Flow for Wet and Dry Cement Production

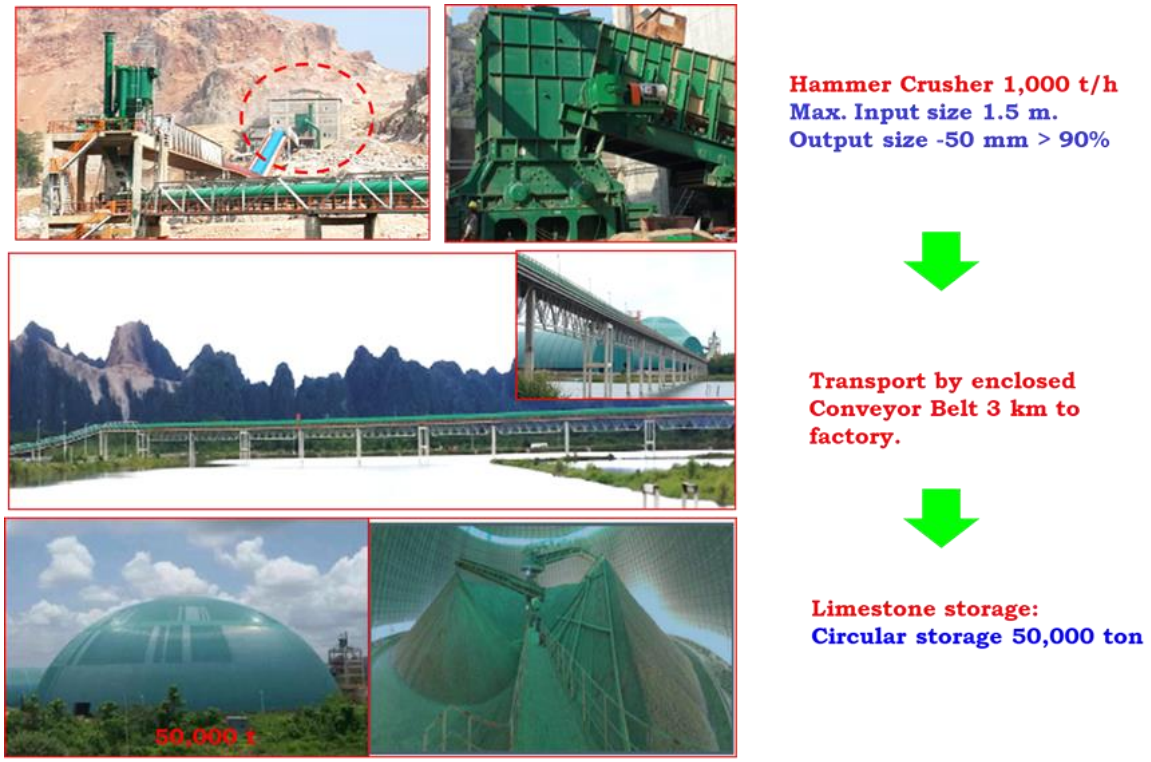


Figure 21: Limestone Crushing and Transportation

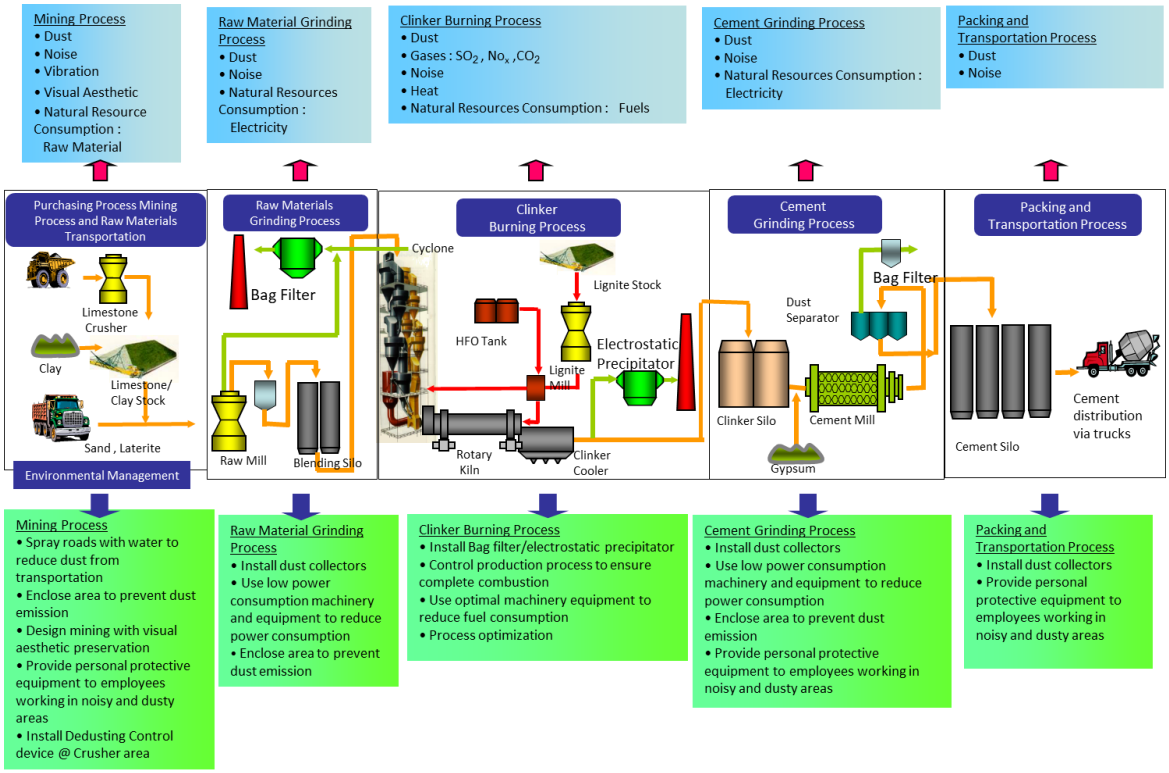


Figure 22: Overview Installation of Cement Manufacturing Process with Assessment of Impacts and their Mitigation Measures for Environmental Management

10) Main Emission Control Machines

MCL**'**s cement factory also includes three main emission control machines as below.

i) Main Bag Filter
ii) Main EP Clinker Cooler
iii) Grab and Screw Unloading

10.1) Main Bag Filter

It works to remove the dust from flue gases when the gas passes through, dust particulates are trapped. It is installed at main stack for emission control.

Specification:

Type	- Bag Filter
Gas Volume	- 788,000 m^3/h
Dust Load	- Input 50 g/m^3, Output <10 g/m^3
Filtration area	- 13,680 m^2
Power requirement	- BF Fan – 1,400 kW

Figure 23: Bag Filter used in MCL's Cement Plant

10.2) Main EP Clinker Cooler

Main Electrostatic Precipitator **(**EP**)** is installed at Clinker to control the particulate matters**.** It is used electrostatic forces to separate the dust from the exhaust gas by means of discharge from clinker.

Specification:

Type	- Electrostatic Precipitator (EP)
Capacity (max)	- 760, 000 m^3/h
Filtration area	- 20,687 m^2
Power requirement	- BF Fan – 800 kW (VSD)
Emission	- 30 mg/Nm^3, DB max

Figure 24: EP Clinker Cooler used in MCL's Cement Plant

10.3) Grab and Screw Unloading

Specification (Grab):

Type	- Grab unloading
Manufacturer	- CITIC
Capacity (DB)	- 300 t/h
Electrical load	- 0.5 MW

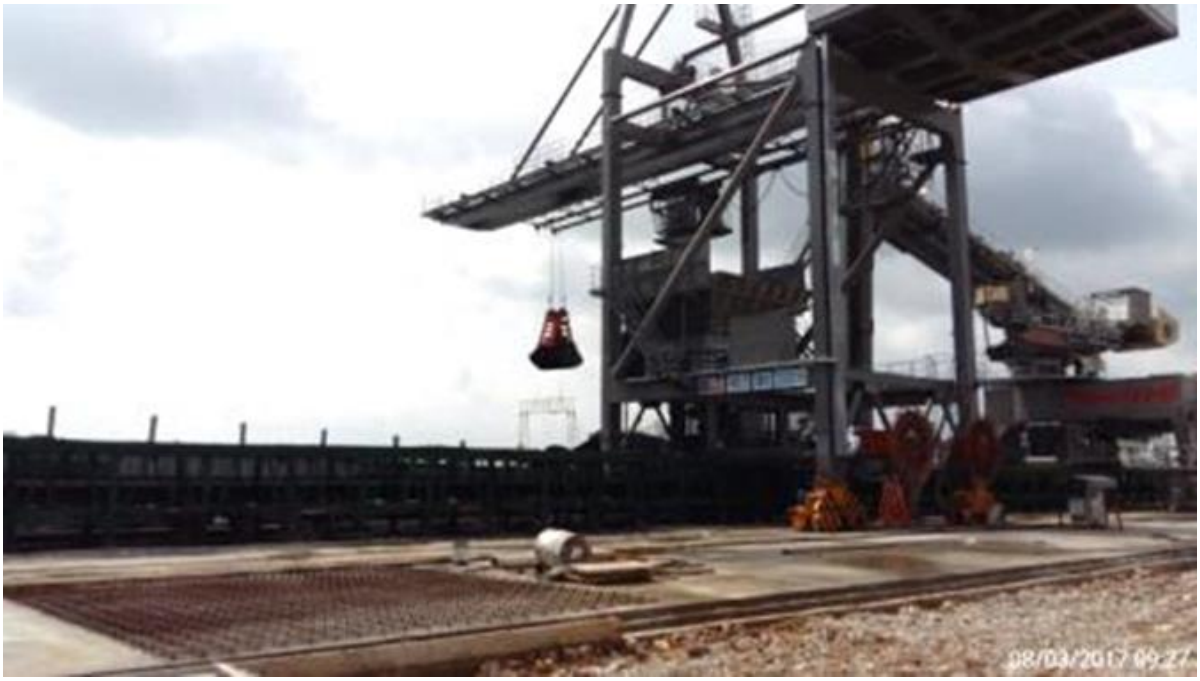


Figure 25: Grab used in MCL's Cement Plant

Specification (Screw Unload):

Type	- Screw unloading
Manufacturer	- Swirtel
Capacity (DB)	- 500 t/h
Electrical load	- 1.6 MW

Figure 26: Screw Unload used in MCL's Cement Plant

11) Main Pollution Sources and its Characteristics

The production process uses dry process. Thus, major air emissions include **Total Suspended Particulate (TSP), Sulfur dioxide (SO_2) and Nitrogen Oxides (NO_x)**, can be controlled by bag filters and Electro Static Precipitators (ESP), except for the only the emissions generated from clinker such as Greenhouse gases, **CO_2, CO** and Heavy Metals such as **Mercury** which might come from the use of raw materials, fossil fuels, and waste fuel.

i) Major Air Emissions and Impacts Mitigation & Management

Air emissions in cement manufacturing are generated by the handling and storage of intermediate and final materials, and by the operation of kiln systems, clinker coolers, and mills.

a) Dust emission Control

Bag filter is used for flue gas dust removal, belt transfer point, crusher area, whose dust removal efficiency is 99.99%.

Table 8: Main Emission Control Machines

Items	Types	Flow
1. Main Bag Filter	Bag Filter	788,000 m^3/h
2. Main EP Clinker Cooler	Electrostatic Precipitator (EP)	760, 000 m^3/h
3. Screw Unloading for coal	Screw unloading	500 t/h
4. Grab unloading for gypsum	Grab unloading	500 t/h

Table 9: Installation Units of Bag Filters in Proposed MCL Project

Section	No. of Bag Filters	Required Air (m3/h)	Bag Filter Capacity (m3/h)	Diff (%)	Remark
Limestone Transportation (Mining)	5	37,200	65,461	43	
Raw Material Transportation & Raw Mill	22	111,273	175,260	37	
Raw Coal Transportation & Coal Mill	14	76,106	118,560	36	
Kiln	9	42,962	94,680	55	
Clinker Transportation	13	45,708	122,880	63	
Gypsum Transportation	13	50,037	55,800	10	
Cement Mill	10	75,653	102,480	26	
Packer	16	124,714	195,300	36	
Summary	**102**	**563,653**	**930,421**	**39**	

ii) Noise Control

Low noise equipment is on priority in design, and sound insulation cover, or sound insulation level shall be set up in rotating machinery and equipment, silencer shall be installed at the FD fan inlet and boiler ignition and steam exhaust mouth to reduce noise pollution to the environment.

i) Air Fan with Silencer

ii) Steam Blow Pipe with Silencer

Figure 27: MCL's Mitigation Measure Units for Noise

iii) Wastewater Discharges and Control

Generation of wastewater is mainly only from utility operations for cooling purposes in different phases of the process (e.g. bearings, kiln rings) because MCL project used the dry cement process. Process wastewater with high pH and suspended solids may be generated in some operations (cooling). However, MCL use proper circulation system for water and all of the discharge water from cement plant will be circulated for cooling purpose and there will be no discharge of process water into the surface water and ground water as shown Water Recirculation System in the following figure.

Demineralized Water Treatment System

Makeup water of boiler is handled by two stage RO+EDI desalination system according to main equipment type, parameter and makeup water quality requirements with system capacity 2*20t/h.

Circulating Cooling Water System

Open circulating system of mechanical ventilation cooling tower made of FRP (Glass Fiber Reinforced Plastics) is used for circulating cooling water system. 4 set of mechanical ventilation cooling towers of 3000m^3/h are selected, totaling 12,000 m^3/h in cooling water, and temperature difference ΔT=10℃, 5 set circulating pumps with the parameter is as follows: 3170 m^3/h、0.22MPa、250kW、10kV, 4 working 1 standby.

Figure 28: MCL's Water Control Systems

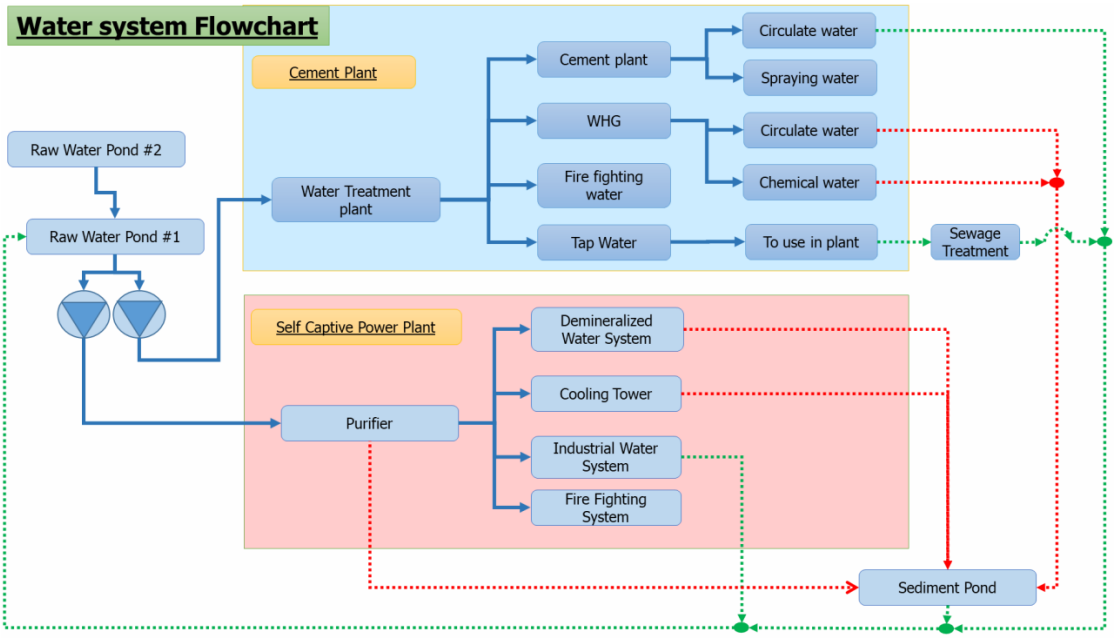


Figure 29: MCL's Water Circulation System

12) MCL's Mitigation and Monitoring Program

In this case, there was no need for any Ecological Offset Plan for MCL cement activity because of lack of the endangered species in plant or animals in MCL cement plant and its associated area according to the survey results. And supposed MCL area is far enough from Archaeological and religious area in historical evidences and there wasn't found any new cultural heritage area around the cement plant.

MCL has committed to fully protection of the environment in the proposed project area with developing and implementation of environmental management plan which will act as an adequate tool to mitigate the potential adverse impact and enhance the beneficial impacts associated with Cement Project during the construction and operation phase.

Environmental protection is the major requirement for the MCL's cement project area. In consistent with company's environment protection policy and recommended international best practices, this plan focus on the systematic formulation of control measures and implementing of those in various stages of the project.

As principal objective of EMP is to develop an effective management tool that will ensure that diverse ranges of environmental and social components observed through earlier environmental impact assessment process are systematically mitigated through effective managing and monitoring mechanism. This will assist MCL to achieve its environmental and social goals with the principle of avoiding potential damage, costly remedial action and adverse public concerns. In addition, this toll will help project for enhancing benefits, compliance with company policy host country legislations and internationally accepted best industrial practices. This environmental management plan outlines the appropriate and effective management and mitigation measures so as to alleviate the environmental and social concerns which have identified in the impact assessment section of this report. In addition, this report has integrated environmental protection strategy into the project.

The elements of biological, physical and human system receptors which are concerned of being disturbance of proposed project for construction and operation period is mentioned as follows.

- Terrestrial Biodiversity
- Air Quality
- Water Quality
- Noise and Vibration
- Waste Management
- Landscape and visual intrusion
- Health and Safety
- Social Dimensions

This document shall be treated as a dynamic and live document. Reviewing, revising and updating are subject to do as deemed necessary in line with the variation of proposed activities described in this document ensuring its remains appropriate to ongoing aspects of project.

12.1) Role and Responsibilities

Being owner of this document, MCL will hold ultimate responsibility and shall fully exercise in developing, reviewing, updating and effective implementing of this document. If the measures set up in it does not meet or follow accordingly, company will redefine as necessary until full satisfaction is achieved.

Responsibilities for the implementation of environmental social considerations lie with SCG management. Management shall be accountable for delivering commitments made in this document.

Finding from the continuous monitoring of environmental management plan is subject to be reviewed periodically and as deemed necessary by management. Based on the result, management shall be able to take necessary remedial actions and to enforce to adopt adequate performance strategy toward the continual improvement of the environmental management system.

12.2) Terrestrial Biodiversity

During the construction period, loss of vegetation and habitat are highly expected in plant construction area due to the site clearance and removal activities**.** In order to minimize the disturbance to local flora and fauna species, following mitigation and recommendation are provided to take necessary actions.

12.3) Preconstruction

- Receive the necessary permit prior to the commencement of construction
- Minimize vegetation clearance and habitat disturbance by demarcating the clearing boundaries
- Unnecessary cleaning the trees is to avoid
- Environmental awareness training to be given to all workers for the preservation of local biodiversity species and induct the nature of the sensitivity of project area
- Site Specific instruction/protocol for identifying and relocation of plant and wildlife species if necessary, shall be provided to all workers with education materials including photographs

12.4) Construction

- Ensure all native fauna is not intentionally harmed as a result of construction works
- Night work activity shall be avoided as possible as it can be in working day time
- Project site boundaries shall be regularly checked ensuring unnecessary habitat and vegetation do not happen in the project area
- Relocate the native fauna specie to the area where same habitat system is provided for those
- Designate a fauna catcher on site prior to commence of area clearing with the anticipation of removing fauna to a nearest location where same habitat exists
- Regular monitoring and auditing the performance of environmental monitoring activities by competent environmentalist
- Instruction given to all drivers and workers to take care from causing incidents of fauna fatalities by the movement of construction vehicles and machine
- Hunting and catching the local wildlife is strictly prohibited**.**
- To construct sediment control system, such as using fencing during raining period to avoid disturbance to surrounding habitats of unaffected area
- Where technically feasible and practicable, new plants are to be grown as early as possible during the construction phase of project. New vegetation in the project area should use native species and the use of exotic species should be not be allowed
- Works areas in temporarily affected areas shall be reinstated with tree/shrub/ grass upon completion of the works

12.5) Operation

- Maintain and implement the ongoing environmental monitoring mechanism
- Continue the development of green belt development
- All machinery shall be turned off if they are not in use
- Regular maintenance to be scheduled for the equipment which emitting unwanted noise
- Use of low-noise engines and installing noise muffler and silencers
- Noise emission shall be maintained as per guideline (general emission < 85 dB(A), Impulse < 115 db(A) from 1.5 m distance, 85 dB(A) from building, 70 db(A) from plant boundaries at all time of operation)
- Workers must be equipped with earplugs or earmuffs as appropriate and wearing must be enforced whenever working in the noisy environment
- Appropriate training shall be given to the employees on the noise abatement methodology
- Transportation of raw materials and products to and from the site should be well covered to prevent air pollution

12.6) Green Belt Development Plan

In order to attenuate the air pollution, one of the mitigation measure, known as green belt program which also act as a noise barrier, will be developed in the project area.

The recommended locations where this plantation should occur are around the plant boundary, road side, open land and other areas where there is no facilities is intended to build.

In selection of the plant species, it is highly recommended to use ever green local plant species as possible.

Not only in buffer zone, but in other available areas where ever possible, plant species of aesthetic value, fruit bearing, and birds attracting tree will be planted.

Establishing a tree plantation program, it would benefit the abatement of noise and dust emission. Other than that, it would be converted the project area into a possible park for the nearby villages and project staff for recreation.

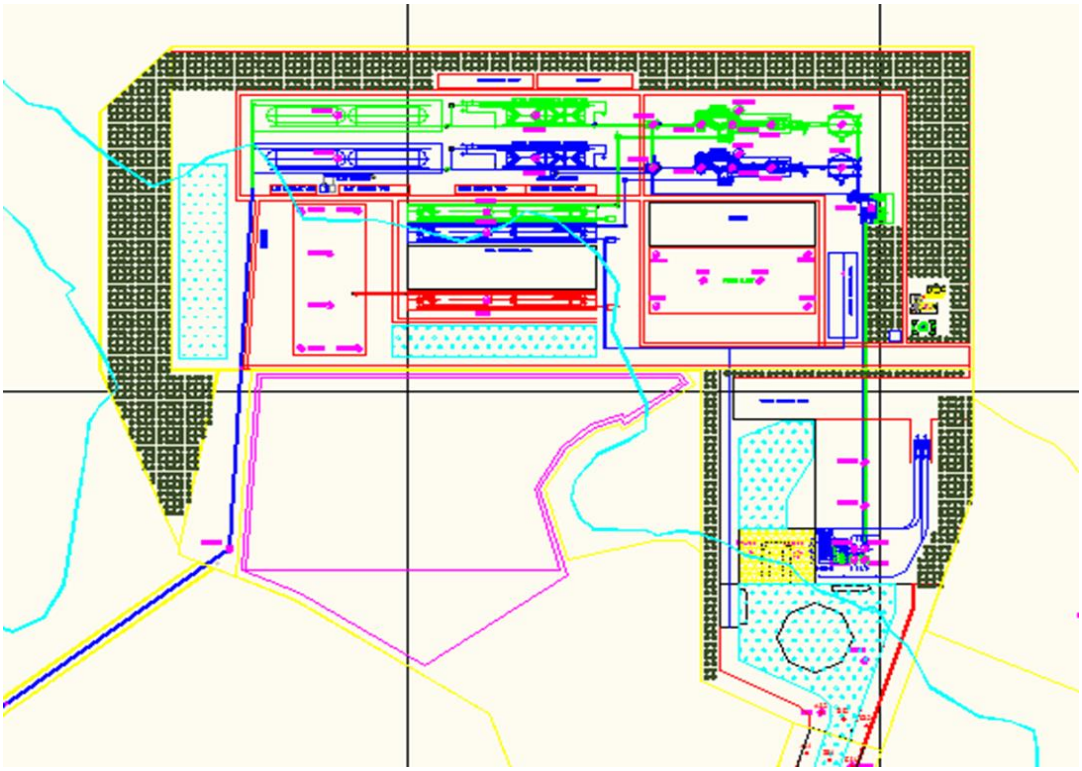


Figure 30: Green Belt Area (Buffer Zone)

12.7) Water and Wastewater

Issues	Mitigation Measure	Monitoring Program
Water ▪ Stormwater runoff ▪ Surface water ▪ Groundwater	▪ Flood management : Drainage system ▪ Water reservoir (Internal use) ▪ Re-circulate cooling water	▪ Surface water monitoring ▪ Groundwater monitoring ▪ Baseline data gathering
Wastewater (W/W) ▪ W/W from coal stockpile ▪ W/W from Power plant (Backwash water)	▪ Pavement coal storage area ▪ Ensure zero discharge of water from any facility into the surrounding areas ▪ Install w/w treatment i.e. grease & oil trap, sedimentation pond	▪ Effluent water sampling (All point source discharges) ▪ Groundwater boreholes

12.8) Internal Waste for Cement Operation

Issues	Mitigation Measure	Monitoring Program
Solid wastes ▪ Fly ash ▪ Bottom ash ▪ Gypsum	▪ Alternative Raw Material in cement process i.e. fly ash, gypsum ▪ Ash & Gypsum storage facility → Indoor storage to prevent leachate from rain	▪ Fly ash & Gypsum Sampling ▪ Quality Control
Liquid wastes ▪ Used oil ▪ Chemicals	▪ Alternative Fuel in cement process i.e. used oil, some chemicals	▪ Quality control

12.9) Waste Management

- Adopted 3Rs Program (Reduce, Reuse, Recycle) in order to maximize resource use
- Aligned with SCG's policy especially ZERO waste to landfill
- a waste management plan shall be developed including requirements for separation, handling and disposal of all waste generated;
- all hazardous materials shall be stored in clearly labeled containers;
- storage and handling of hazardous materials should be in accordance with national and local regulations appropriate to their hazard characteristics;
- waste shall be separated on site and waste storage areas shall be roofed and bounded to prevent potential cross-contamination;
- spent oils (including transformer oil) shall be recycled;
- fire prevention systems and secondary containment shall be provided for storage facilities, where necessary, to prevent fires or releases of hazardous materials;
- all waste shall be disposed of in line with local requirements at a suitable and licensed waste disposal facility; and
- suitable disposal sites shall be identified with capacities for disposal for general and hazardous waste prior to the operation phase

Table 10: Environmental Monitoring Plan

Indicator (Survey item)	Location of Data Collection	Method and Frequency	Institution
Construction Phase			
Monitoring EMP implementation • Mitigation measures • Enhancement measures • Contingency • Compensation	Project area	Daily monitoring and documenting, and quarterly reporting	SOD Department
Air quality (NO_2, SO_2, CO, TSP, PM_{10})	3 locations (same as baseline data collection locations)	Quarterly (March, July, November)	Third Party

Table 10: Environmental Monitoring Plan (Continue)

Indicator (Survey item)	Location of Data Collection	Method and Frequency	Institution
Construction Phase			
Noise	4 locations (same as baseline data collection locations)	Quarterly (March, July, November)	Third Party
Surface Water Quality Analysis (Parameter are same as IFC standard)	Locations and number of samples are same as baseline data collection	Quarterly (March, July, November)	Third Party
Ground Water Quality Analysis (Parameter are same as IFC standard)	Locations and number of samples are (same as baseline data collection)	Quarterly (March, July, November)	Third Party
Soil Quality	Locations and number of samples are (same as baseline data collection)	Yearly (March)	Third Party
Operation Phase			
Air quality (NO_2, SO_2, CO, $PM_{2.5}$, PM_{10})	3 locations (same as baseline data collection locations)	Quarterly (March, July, November)	Third Party
(Temperature, Velocity, SO_2, SPM, NOx, HC, CO)	Stack/Chimney Monitoring	Quarterly (March, July, November)	SOD Department
Noise	4 locations (same as baseline data collection locations)	Quarterly (March, July, November)	Third Party
Surface Water Quality Analysis (Parameter are same as IFC standard)	Locations and number of samples are same as baseline data collection	Quarterly (March, July, November)	Third Party
Ground Water Quality Analysis (Parameter are same as IFC standard)	Locations and number of samples are (same as baseline data collection)	Quarterly (March, July, November)	Third Party
Implementation of Air quality management plan, Noise Management plan, Waste management plan	Within factory area (Stack)	Daily monitoring and quarterly reporting	SOD Department
Surface water pollution monitoring (DO, BOD, COD, Heavy metal, pH, salinity, Total hardness, Nitrate, TDS, TSS, Temperature, etc.)	1. Effluent discharge point	Quarterly (March, July, November)	Third Party
Implementation of Ecosystem Management plan	Within project area	Regular monitoring and quarterly reporting	SOD Department or Third Party

Table 10: Environmental Monitoring Plan (Continue)

Indicator (Survey item)	Location of Data Collection	Method and Frequency	Institution
Construction Phase			
Whether people and workers suffer from health risk	Project site and surrounding the area	Quarterly	SOD Department
Occupational Health and Safety	Cement Plant and Compound (Work site and offices)	Twice per year Record of accidents and infectious diseases	SOD Department
Community Health and Safety	5 villages nearby the project sites	Twice per year Record of accidents and infectious diseases related to the community	SOD Department
The implementation status for CSR activities such as community support program	5 villages nearby the project sites	Once per year	SOD Department
Usage of chemicals	Cement Plant and Compound (Work site and offices)	Biannually Record of the type and quantity of chemicals and implementation status of control measures through self-inspection	SOD Department

13) MCL's Social Impact Assessment and Monitoring Program

Regarded on the baseline survey, about 300 sample respondents selected from 7 Villages such as Pauktaw, Kaw Don, Kaw Pa Naw, Hni Don, Kwan Nyan, Ka Don Sit and Me Ko Ro villages within the project area were interviewed. All these are project affected people (PAPs), but they are not necessary to be relocated under any project activity. To understand their existing situations, attitudes and impacts from the project development, the interviews were undertaken with the help of the structured questionnaires which cover the contents of basic information of interviewees, their socio-economic conditions, education and current environmental problems, facilities and social problems, perceptions of the project, attitudes towards the project, and attitudes towards draft mitigation measures regarding the impact caused by the project development.

The survey will be focused on community study within 3 km circle surrounding the project site. The survey will cover 7 Village Tracts as shown in the following figure and table.

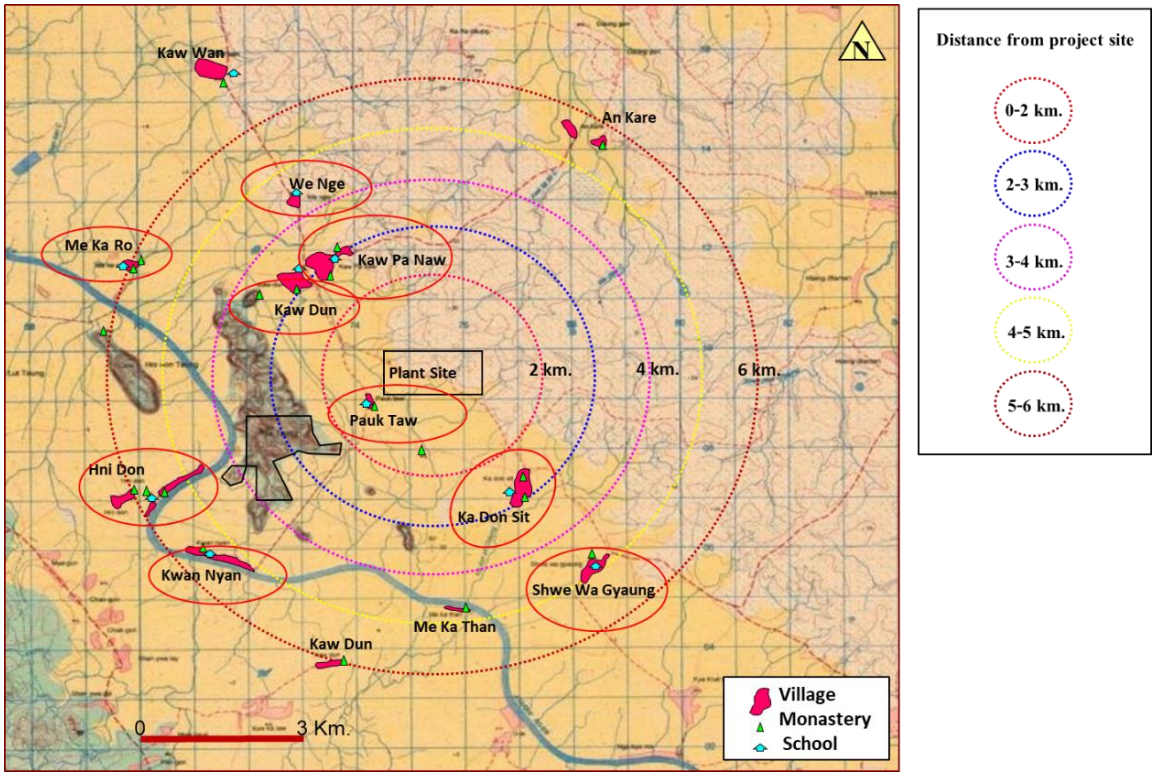


Figure 31: Village Community Area around Proposed MCL Project

Table 11: Location of Villages in the Project Area

No.	Name of Village	Latitude (North)	Longitude (East)
1	Pauktaw	16° 21' 43"	97° 49' 09"
2	Kaw Dun	16° 22' 60"	97° 48' 24"
3	Kaw Pa Naw	16° 23' 12"	97° 48' 40"
4	Hni Don	16° 20' 42"	97° 46' 44"
5	Kwan Nyan	16° 20' 1"	97° 47' 34"
6	Ka Don Sit	16° 20' 43"	97° 50' 44"
7	Me Ko Ro	16° 23' 9"	97° 46' 42"

Source: REM Field survey (February 2013)

13.1) Socioeconomic Impacts

The evaluation and assessment involve the assessment of both qualitative and quantities data with professional judgment and stakeholder consultation.

In assessing the characteristics of the individual impact, following factors are taken into consideration.

- Nature of impact (beneficial or adverse)
- Duration of impact (temporary and permanent)
- Likelihood
- Severity
- Significance of impact

14) Environmental and Social Management Plan Framework

In the Environmental and Social Management Plan (ESMP) framework a summary of the mitigation measures to be implemented both during construction and operation phase is reported.

Mitigation measures during construction phase of the Project (estimated in 24 months) are associated to good practices, and mitigation measures to be adopted during operation phase (such as those for air emissions and noise generation) are part of the design and will be inserted into the Project design specifications.

14.1) Stakeholder Engagement and Public Consultation Activities

Disclosure of information and stakeholder consultation during the development of the EIA is a substantial component of overall stakeholder engagement, which is outlined in the Stakeholder Engagement Plan.

Table 12: SEP Reporting Mechanisms and Responsibilities

SEP Reporting Mechanism	Timing	Responsibility
Consultation Form	For each consultation or stakeholder contacted	SOD Manager
Stakeholder Identification and Consultation Register	Continued	SOD Manager
Grievance Register	Continued	SOD Manager
Grievance Monitoring	Quarterly during construction Biannually during the operation	SOD Manager
SEP Progress Reports	Quarterly during construction Biannually during the operation	
SEP Annual Report	Biannually	

1) Stakeholder Engagement Approaches

The mixed approach outlined above will allow this Stakeholder Engagement Plan to reach affected people, vulnerable groups, interested persons, government agencies and NGOs, among others.

- Information and consultation meetings
- Focus Group Discussions (women, elders, youth… on thematic topics)
- Socioeconomic baseline survey
- Information Centre at Project site and public noticeboards
- Stakeholder Consultation Workshop on EIA report
- Official correspondence by phone/email/text messaging
- Individual interviews and Questionnaire Survey
- Formal meetings

2) Public Consultation

A series of meetings were conducted as shown in Table 9-2.

Table 13: Stakeholder Consultation Meetings

No.	Date	Name of Town/Village/Ward	Participation	Arranged by
Year 2013 (1st Stakeholder Consultation and Disclose of Project Relevant Information)				
1	23.2.2013	Head of Village Tract Office	-MCL Authorities -REM Consultants -Kaw Pa Naw Villagers -Pauktaw Village Villagers	MCL
2	24.2.2013	Village's Head Office Kwanngan Village	-MCL Authorities -REM Consultants -Me Ko Ro Villagers -Kwan Nyan Villagers -Hni Don Villagers	MCL
3	25.2.2013	Village's Head Office Ka Don Sit Village	-MCL Authorities -REM Consultants -Kadonsit Villagers -KawDon Villagers	MCL
4	25.2.2013	Administrator, General Administrative Department, Kyaikmaraw Township	-Heads of Village Tracts in Kyaikmaraw Township -REM Consultants -MCL Authorities	MCL
5	26.2.2013	GAD Office, Kyaikmaraw Township	-REM Consultants	
Year 2013 (2nd Stakeholder Meeting on Road Access)				
1	28.10.2013 10:00-11:00	Village's Head Office, Kadonsit Village	-REM Consultants -MCL Authorities	MCL
2	29.10.2013 11:00 AM – 12:00 PM	Village's Head Office, Kawdon Village	-REM Consultants -MCL Authorities -Villagers	MCL
3	29.10.2013 1:00 PM – 2:00 PM	Village's Head Office, Wenge Village	-REM Consultants -MCL Authorities -Villagers	MCL
4	30.10.2013 9:30 AM - 10:30 AM	Village's Head Office, KawWon Village	-REM Consultants -MCL Authorities -Villagers	MCL
5	30.10.2013 11:00 AM - 12:00 PM	Village's Head Office, Angazine Village	-REM Consultants -MCL Authorities -Villagers	MCL
6	30.10.2013	Village's Head Office, Taranar Village	-REM Consultants -MCL Authorities -Villagers	MCL

Table 13: Stakeholder Consultation Meetings (Continue)

No.	Date	Name of Town/Village/Ward	Participation	Arranged by
Year 2013 (2nd Stakeholder Meeting on Road Access)				
7	30.10.2013 2:30 PM – 3:30 PM	Village's Head Office, Kaw Thet	-REM Consultants -MCL Authorities -Villagers	MCL
Year 2016 (3rd Stakeholder Consultation)				
1	7.2.2016	KawPaNaw Monastery	-Villagers -REM Consultants -MCL Authorities -Kaw Pa Naw -Kaw Dun -We Nge	MCL
2	7.2.2016	Kaw Dun Monastery		
3	7.2.2016	We Nge Monastery		
4	7.2.2016	Kwan Nyan Monastery	-Villagers -REM Consultants -MCL Authorities	
5	8.2.2016	KaDonSit Monastery	-Villagers -REM Consultants -MCL Authorities -Shwewarchaung -Mekaro	MCL
6	8.2.2016	Shwe War Gyaung Monastery		
7	8.2.2016	MeKaRo Monastery		
8	10.2.2016	MCL Meeting Room	-REM Consultants -MCL Authorities	MCL

Table 14: Public Consultation and Disclosure Meetings

No.	Date	Name of Town/Village/Ward	Participation	Arranged by
Year 2013 (1st Public Consultation and Disclose Project Relevant Information)				
1	25.5.2013	Meeting Hall, Kyaikmaraw Administrative Office	-Government Stakeholders -MCL Authorities -Villagers -REM Consultants	MCL
Year 2013 (2nd Public Consultation and Disclose on Scoping Report)				
1	3.9.2013	Kyaikmaraw office	-Government Officers from Kyaikmaraw office -MCL Authorities -REM Consultants -Heads of Village tracts	MCL
2	4.9.2013	Kawpanaw	-MCL Authorities -REM Consultants -Wegne -Kawpanaw -Kaw Dun	MCL

Table 14: Public Consultation and Disclosure Meetings (Continue)

No.	Date	Name of Town/Village/Ward	Participation	Arranged by
Year 2013 (2nd Public Consultation and Disclose on Scoping Report)				
3	4.9.2013	Ka don sit	-MCL Authorities -REM Consultants -Ka Don Sit -Shwe war gyaung	MCL
4	5.9.2013	Kyan Nyan	-MCL Authorities -REM Consultants -Kyan Nyan -Pauk Taw	MCL
5	5.9.2013	Hni Don	-MCL Authorities -REM Consultants -Hni Don	MCL
6	6.9.2013	Mekaro	-MCL Authorities -REM Co. Ltd. -Mekaro	MCL
7	6.9.2013	Shin Zaw Pu Ward	-MCL Authorities -REM Consultants -Shin Zaw Pu Ward (Kyaikmara)	MCL
8	7.9.2013	Tarana	-MCL Authorities -REM Consultants -Tarana -Kyun Gon	MCL
9	7.9.2013	Kaw That	-MCL Authorities -REM Consultants -Kaw That Villagers	MCL
10	8.9.2013	Kaw Wan	-MCL Authorities -REM Consultants -Ang Ka Zaing & Kaw Wan	MCL
11	8.9.2013	Nyaung Bin Seik	-MCL Authorities -REM Consultants -Nyaung Bin Seik (village Tract)	MCL
Year 2017 (Public Disclosure on EIA Report Submission)				
1	17.8.2017 9:00 AM - 12:40 PM	Rheymonya Hotel, Mawlamyine	-Chief Minister of Mon State -State Governmental Officers -Kyaikmaraw Township GAD officer -Local people project surrounding villagers -Media -NGOs and interested persons -REM Consultants -MCL Authorities	MCL

Table 14: Public Consultation and Disclosure Meetings (Continue)

No.	Date	Name of Town/Village/Ward	Participation	Arranged by
Year 2017 (Public Disclosure on EIA Report Submission)				
2	18.8.2017, 9:00 AM – 12:00 PM	Kaw Pa Nor new Monastery	-Kaw Pa Naw Villagers -REM Consultants -MCL Authorities	MCL
3	18.8.2017, 2:00 PM – 5:00 PM	Kaw Dun New Monastery	-Kaw Dun Villagers -Mekaro Villagers -REM Consultants -MCL Authorities	MCL
4	19.8.2017 9:00 AM - 12:00 PM	Kaw-Krid Monastery	-Kwan Ngan Villagers -Pauk Taw Villagers -REM Consultants -MCL Authorities	MCL
5	19.8.2017 2:00 PM – 5:00 PM	Shwe War Chaung Monastary	-Kadonsit Villagers -Shwe War Chaung Villagers -REM Consultants	MCL
6	20.8.2017 9:00 AM– 12:00 PM	Hnidon Village Administrative office	-Hnidon Villagers -REM Consultants -MCL Authorities	MCL

During stakeholder consultations most of the respondents suggested the followings: -

1) to give a good salary to workers in the project for reducing to go and work in Thailand where the salary is higher,
2) to give information on how to apply for the job,
3) to consider about the fishing boats if Ataran River is used for water transportation,
4) to maintain water from Ataran River during the dry season,
5) to conserve the mountain,
6) to acquire the public opinion,
7) to promote roads and electricity,
8) to give compensate money in current price,
9) to supply schools and teachers,
10) to provide wells for drinking water,
11) to reduce dust from factory,
12) to encourage regional development, and
13) to construct clinics and medical centers

The villagers considered that the project is acceptable for the rural and regional development and the respondents hoped that the project will support the economy of the country.

There are some basic requirements of rural and regional development, suggested by the community as follows;

1) To prepare the roads
2) To be free of charge in the health services
3) To create job opportunities
4) To contract new school buildings

Public Consultation and Disclose on EIA Report at Rehomomya Hotel, Mawlamyine (17.8.2017)


Table 15: Estimated Environmental Management Plan and Monitoring Cost (Operation Phase)

Indicator (Survey item)	Location of Data Collection	Method and Frequency	Institution	Annual Cost (USD)
Construction Phase				
Monitoring EMP implementation • Mitigation measures • Enhancement measures • Contingency • Compensation	Project area	Daily monitoring and documenting, and quarterly reporting	SOD Department	14,400
Air quality (NO_2, SO_2, CO, TSP, PM_{10})	3 locations (same as baseline data collection locations)	Quarterly (March, July, November)	Third Party	19,500
Noise	4 locations (same as baseline data collection locations)	Quarterly (March, July, November)	Third Party	10,755
Surface Water Quality Analysis (Parameter are same as IFC standard)	Locations and number of samples are same as baseline data collection	Quarterly (March, July, November)	Third Party	8,715
Ground Water Quality Analysis (Parameter are same as IFC standard)	Locations and number of samples are (same as baseline data collection)	Quarterly (March, July, November)	Third Party	10,455
Soil Quality	Locations and number of samples are (same as baseline data collection)	Yearly (March)	Third Party	8,475
Operation Phase				
Air quality (NO_2, SO_2, CO, $PM_{2.5}$, PM_{10})	3 locations (same as baseline data collection locations)	Quarterly (March, July, November)	Third Party	19,500
(Temperature, Velocity, SO_2, SPM, NOx, HC, CO)	Stack/Chimney Monitoring	Quarterly (March, July, November)	SOD Department	6,450
Noise	4 locations (same as baseline data collection locations)	Quarterly (March, July, November)	Third Party	10,755
Surface Water Quality Analysis (Parameter are same as IFC standard)	Locations and number of samples are same as baseline data collection	Quarterly (March, July, November)	Third Party	8,715

Table 15: Estimated Environmental Management Plan and Monitoring Cost (Operation Phase) (Continue)

Indicator (Survey item)	Location of Data Collection	Method and Frequency	Institution	Annual Cost (USD)
Operation Phase				
Ground Water Quality Analysis (Parameter are same as IFC standard)	Locations and number of samples are(same as baseline data collection)	Quarterly (March, July, November)	Third Party	10,455
Implementation of Air quality management plan, Noise Management plan, Waste management plan	Within factory area (Stack)	Daily monitoring and quarterly reporting	SOD Department	14,440
Surface water pollution monitoring (DO, BOD, COD, Heavy metal, pH, salinity, Total hardness, Nitrate, TDS, TSS, Temperature, etc.)	1. Effluent discharge point	Quarterly (March, July, November)	Third Party	4,250
Implementation of Ecosystem Management plan	Within project area	Regular monitoring and quarterly reporting	SOD Department or Third Party	10,350
Occupational Health and Safety	Cement Plant and Compound (Work site and offices)	Twice per year Record of accidents and infectious diseases	SOD Department	1,250
Community Health and Safety	5 villages nearby the project sites	Twice per year Record of accidents and infectious diseases related to the community	SOD Department	14,250
The implementation status for CSR activities such as community support program	5 villages nearby the project sites	Once per year	SOD Department	2 percent of annual net profits
Usage of chemicals	Cement Plant and Compound (Work site and offices)	Biannually Record of the type and quantity of chemicals and implementation status of control measures through self-inspection	SOD Department	4,600

Table 16: Target Schedule for Monitoring Report

Task	Yearly EMP Reporting Schedule																														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Jan																															
Feb																															
Mar																															
Apr																															
May																															
Jun																															
Jul																															
Aug																															
Sep																															
Oct																															
Nov																															
Dec																															

Public Holiday
Target Reporting Period

14.2) Potential Impact to Population and Demographic Change

Potential impact of migration to the project affected area by the development of Mawlamyine Cement Project area likely to result mainly from the migration of personnel with the hope of getting job and receiving potential health, education and other social services that may result from the project.

However, it is expected that number of personnel moving into the project affected area is very low in comparison with the existing local population. It is also the reason that there are an enormous number of local people working in Thailand have the chance to return their natives so movement of labors from other region would be minor. As a result, there may be no alter in the number of residential population around the project areas or affect their demographic structure.

14.3) Potential Impact to Traffic Issues on Road and Waterway

There may be traffic volume increase during the construction phase. The traffic will use Mawlamyine – Kyaikmaraw Road and Mawlamyine – Hpa-An Road to assess to the proposed project site.

Construction related traffic will not utilize largely on Local Streets which are adjuring local communities. The traffic is expected not to interact with venerable local communities.

The project is located in the shrub and forest area and people not commonly visit into the project site. Besides, there is no project activities which defer the community assess and movement. No communities would be severed by the project in term of access and movement.

Construction will not affect the existing road network as the transportation vehicles will apply vessels along the Ataran River.

The impact to the public access and movement resulted from the project activities during construction and operation is forecasted minor.

14.4) Potential Impact to Employment, Skill and Business

Project will source it operative work forces mainly from the local area due to the reason of project's commitment of prioritizing the selection to local people and availability in adjacent areas for the basic level semi-skill and non-skilled works.

Owing to the information collected during the course of the survey in study area, the people are expecting with though that the cement project will bring improvements to the living standard and local economic status of local people by creating job opportunities.

Since construction phase is the period of high demand of job openings with temporary employment, the numbers of employees will be dramatically high.

The prospect of an increased income and greater autonomy is likely to cause an increase in the aspirations of local communities both those involved with the project and, to a lesser extent, those from other working individually. This is a direct positive effect with a moderate extent and long-term duration. As consequence, it is considered as a major beneficial impact resulted from the project.

Company is intending to conduct both awareness and critical training necessary to its employees, it is perceived that capacity building which is expected by both company and local community is the one of the beneficial effects as well. As this will be long term income stability to the hired employees assuring the economy security to its family members.

The project is located in Kyaikmaraw Township which is not far from the Thai border; there will be potential of having return of immigrant labors from Thailand. Most of the families in the project area have members who have been working as labors in Thailand. New job opportunities with reliable salary will encourage the households to re-organize in their native. Proposed project area is closed to the local residential areas.

Both during the construction and operational phase, it has the high opportunity to employ local people in all level of full- skilled, semi-skilled, unskilled and technicians. In this regard, company shall develop local hiring plan. Here local people refer to the people living in the affected areas or entire project area of influence.

This project is anticipated to source the operative force on local basis and has the potential to increase the educational and technical qualification of local work forces through onsite technical transferring and in-house training programs.

The project will definitely have significant beneficial impacts on the local communities.
One of the effective implementations of the Social Impact Management Plan of the project is the development of a capacity and local awareness building.

14.5) Recommended Mitigation and Enhancement Measures

In order to enhance the local capacity building, and avoid unnecessary social conflict and dispute related to the employment within local communities, following measures are suggested.

- Identify the range of skill required for the labor force and conduct a gap analysis against skills availability
- Notify local people of job openings through local advertising, information center, project notice boards to place in office or road junctions of each village
- Develop and implement a local employment policy for the people of affected communities
- Careful management to be practiced about the expectation of local people in regard to the employment to avoid any disputes
- Undertake regular review of labor requirement and skill demands ensuring that training strategies meet the needs of project
- Initiate training and job skill development programs
- Considering to establishing a contractual agreement with contractors to ensure that all contractors understand the company's expectation of favor local content in hiring employees

1) Potential Impact to Land Use and Property

Based on the information provided above there will be no impact on the land use related issues. And no additional mitigation measures are provided in this regard as there is no impact on the land use and effect on the private property.

2) Impact on Community Value and Life Style and Social Cohesion

Though a proportion of construction workforces are to be recruited from the local areas and live locally, some numbers of workforces are to be sourced outside of the community area.

It is anticipated the relationship between workforce and local community will be increased from time to time. As a result, potential crime and antisocial behavior within the local community from the Mawlamyine cement project are foreseeable to some extent. Those anticipated potential crimes include alcohol /drug use and other social misconducts.

The potential for increases in crime and anti-social behavior is likely and may challenge local authorities and create resentment amongst the local community. It may also result in some changes to the lifestyles or cohesion of communities in the surrounding suburbs. During the phase of survey by social team, there is no significant dispute or unrest caused in terms of the political belief, religious thoughts and social concepts within the community. There is no major development in study areas and it is unlikely that social cohesion issues will arise.

Anyway, with project exist, both within and outside the current project area, this finding might alter and there could be potentially impact the project by creating a preconceived perception of the project and its associated activities from local communities and other organization.

The impact on the lifestyle and social cohesion is predicted as moderate and additional control measures are required.

3) Local Economy

There is some probability that the workforce will patronize local retail services, such as food outlets during lunch or coffee time, which would be beneficial to the economy at the local scale.

On the project site, it is certain that some materials required for the project use could be locally available and due to the easy accessibility, there might be greater consumption for local market and increase business opportunity for local business.

In addition, the arrival of newcomers to project area could result in increased economic activity, greater exposure to markets and opportunities, larger customer bases for local businesses and positive diversity with the community.

Following measures to enhance this beneficial effect are recommended

- Investigate the possible procurement needs of the project that can be sourced locally
- Investigate the possible employment needs of the project that can be sourced locally

4) Occupational Health and Safety

The hazards can arise from the use of chemicals in the process used in cement production activities. All such hazards can be successfully controlled by the adoption of safe plant methods, training programs and OHS management systems. The introduction of health and safety measures by the Client into the plant management will be reflected in a strong enhancement of the OHS conditions of the Project workers compared to the current level.

There is various occupational health and safety risks are likely to happen during the construction and operation period.

In order to avoid the harms caused by project activities to employees and local people, occupation health and safety management system shall be developed for the proposed cement plant.

5) Impacts on Community Health

The main impact which may affect local communities residing close to the Project areas during the Project construction phase is related to the increase in the heavy vehicle traffic. As mentioned before, the risk of increased prevalence of diseases deriving from the foreign workforce is considered minor. During this phase the risk of incidents and process characteristics which might affect community health and safety remains unchanged with respect to the normal operation (pre - and post expansion) of the facilities.

A significant traffic volume increase, especially on the road, is expected to occur during the construction activities within the cement plant as well as during the construction of the conveyor belt, all along the path till the quarry, and for the realization of the worker camp. In any case, heavy traffic movement will negatively impact the road condition; will cause disturbances to road bordering residents due to noise, and dust, which might damage crops and structures close to dirt roads, as well as disturbances and temporary disruptions to local traffic. Furthermore, a significant increase in traffic levels combined with a number of factors including poor current road conditions, uneven surfaces and the limited understanding of road safety among local drivers and pedestrians is likely to increase the number of accidents. These might particularly involve the numerous motorbikes and pedestrians using local roads, especially vulnerable groups (i.e.: children walking to school).

6) Health Mitigation Measures

The aim of the Health Impact Assessment (HIA) aspect of the study is to determine the potential effect that construction and operation of the Project will have on the local communities' health and the capacity of local health services to cope with any increased demand for services in terms of equipment, trained personnel, medicines and the balance between the community and workforce needs.

The following measures in line with GIIP and PS2 will be adopted to avoid, minimize and mitigate the negative health and safety impacts of the Project construction and operation:

- adopting and training all personnel (including contractor workers) in the use of Personal Protective Equipment (PPE) and chemical handling;
- clear marking of work site hazards (especially close to high temperatures and open tanks) and training in recognition of hazard symbols;
- adoption of work site hazards signage both in Chinese and Myanmar language;
- training of all personnel in health and safety risk prevention and protection;
- regular noise surveys to ensure the on-site maximum levels are not exceeded;
- development of inspection, testing and maintenance programs for machinery and equipment;
- accident recording and investigation and prevention initiatives;
- development of and training in site emergency response plans both for the construction and operation phase; and
- Compliance to all international, national or local HS standards that may exist

14.6) Visual/Landscape Impact

This project is first and major project which will include various infrastructures for proposed region where there does not facilitate any project before. The project will introduce the vertical structures which can be overseen from various parts of the region.

In consideration of impacts due to the change of landscape of the region, the degree of significance of visual impact could be moderate to high. Anyway, there are control measures those can be adopted during the detailed design of the project.

Lighter color can be utilized to complement the surrounding areas. Where technically feasible, to decrease the visibility of facilities, plantation around the building should be planned.

14.7) Cultural Heritage

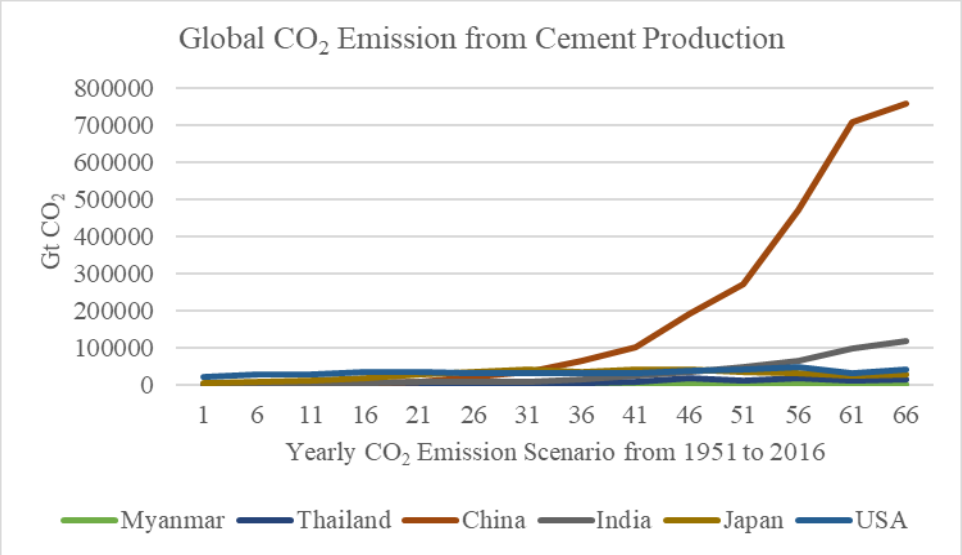
The limestone quarry for the cement plant will be realized within the boundaries of the forest area and agricultural land, thus no impact on any cultural heritage site is expected.

In this framework, the Client SOD Manager shall conduct routine inspections of site activities to assess the potential for chance finds at work sites. He/she will also supervise sites where chance finds were unearthed to ensure that the correct control procedures and engagement activities were performed. Induction training will be organized to Project staff and contractors to disseminate the Chance Find Procedure.

14.8) Considerations of Climate Change Impacts

Climate change should be recognized when the project activities are related with the Greenhouse gases emissions (GHGs) such as carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6), etc.

Cement production activities are mainly relevant with the CO_2 emissions and the generation of CO_2 from cement production in Myanmar is relatively very small when compared with the international CO_2 emission rate from cement production, seen in the following figure.



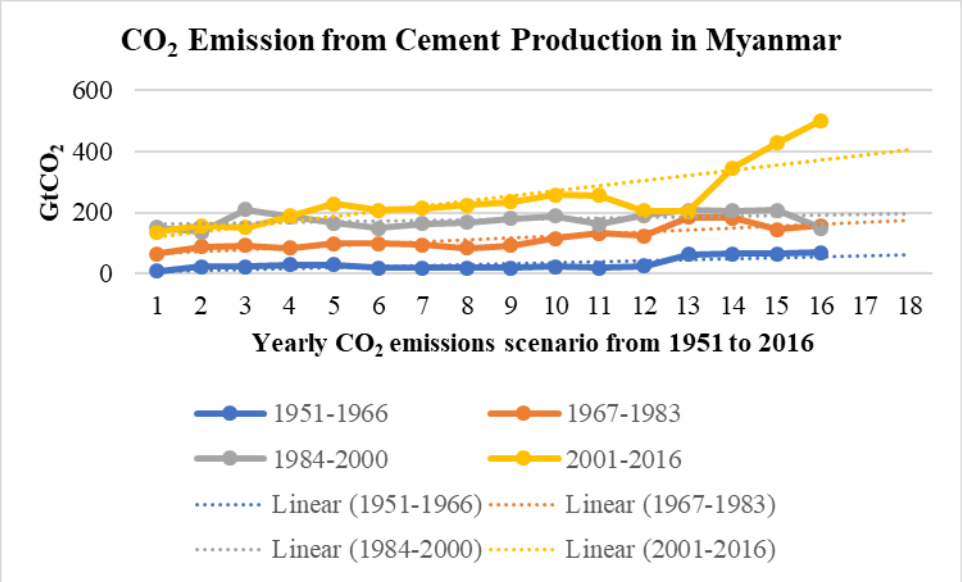
Source: Robbie M. Andrew[3]

Figure 32: Global CO_2 Emissions from Cement Production in Six Countries, During the Years of 1951-2016

[3] RobbieM.Andrew, CICERO Center for International Climate Research, Oslo 0349, Norway, 26th January 2018

However, the following scenario pointed out that cement production is being increased in Myanmar nowadays, as well as CO_2 generation trend from cement production are likely to increase in the future.

Myanmar CO_2 emission from cement production was also demonstrated in the following figure in the duration of 1951 to 2016 with the developing emission trend line of CO_2**.**



Source: Robbie M. Andrew

Figure 33: CO_2 Emissions from Cement Production in Myanmar During 1951-2016

Myanmar has also made commitments to the Kyoto Protocol to the Convention on Climate Change, Kyoto, 1997, on the date of Rectification: 13-8-2003(Accession) by cabinet approval date: 26/2003 (16-07-2003). Thus, MCL should strictly follow to take actions for GHGs emission related with cement production process according to the policy framework of Kyoto Protocol to the Convention on Climate Change, Kyoto, 1997. The Kyoto Protocol applies to the six greenhouse gases listed as: Carbon dioxide (CO_2), Methane (CH_4), Nitrous oxide (N_2O), Hydrofluorocarbons (HFCs) Perfluorocarbons (PFCs) and Sulphur hexafluoride (SF_6).

In accordance with relevant decisions of the Conference of the Parties to the Convention, Myanmar hereby presents its enhanced mitigation actions, policies, strategies and adaptive efforts on climate change. MCL performance on CO_2 mitigation was mentioned in this document, Section 6.3: Alternative Power Supply.

15) Analysis of Cumulative Impacts

Cumulative impacts must be taken into account for incremental direct and indirect impacts of the proposed project which resulted on Valued Ecosystem Components (VECs) such as fundamental elements of the physical, biological or socio-economic environment, including the air, water, soil, terrain, vegetation, wildlife, fish, birds and land use, as well as the added contributed effects to same VECs from other past, present and future projects or actions located in the same area.

The key VEC physical components include:

Atmosphere: climate conditions and trends, and extreme weather events and air-quality conditions.

Physiography and Geology: physiography such as landforms, elevations, relief and unique features; surficial geology including types and depths; and bedrock geology including types, location and depths.

Soils: soil types and characteristics, soil capabilities and limitations, and permafrost conditions.

Surface Water: watersheds and waterbodies characteristics, shoreline environment, and sources of potable water.

Groundwater: primarily local groundwater characteristics.

The selected criteria will be considered on the followings;

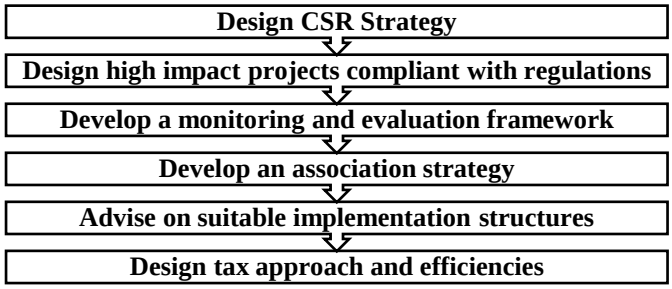
- Overall importance/value to people
- Regulatory requirements
- Potential for substantial Project effects
- Key for ecosystem function
- Umbrella indicator

16) Corporate Social Responsibility Program

MCL CSR Program and Monitoring Plan

Expecting part of the profit of the project to share the social benefit of the community, the project company "MCL" would manage to fulfill the following CSR program for the local residents, 2 percent of annual net profits will be formulated.

MCL encouraged to push the company CSR strategy for every benefited project in accordance with the followings;



MCL CSR monitoring implementations will be managed by SOD team with the following monitoring plan.

MCL CSR Activities

1) Public health & medical programs
2) Clinic and mobile medical care service especially near cement plant operating areas
3) Public benefit activities
4) Support and contribute appropriately to society and communities, especially near cement plant operating areas i.e. recondition public road, school, temple & pagoda, government office etc
5) Education/ religion
6) Encourage and promote activities/programs related to helping young people realize their potential and capability in education, science, technology, sport and art, and instill ethics and moral sense, thus creating smart and ethical people i.e. scholarships, playground, sport area, science camp, English language camp etc
7) Occupational development
8) Occupational development program according to sufficient economy i.e. Integrated Farming System, biogas, Bio-fertilizer, Non-toxic vegetables etc
9) Community activities
10) Provide opportunities to communities and relevant parties to collaborate in activities and many different programs i.e. open-house program, One Cell One Project (OCOP) etc
11) Join traditional activities i.e. Thingyan festival

17) List of Commitments

Commitment Source	Commitment
Chapter II	Mawlamyine Cement Limited (MCL) will follow National and international Laws, By Laws, Regulations and Guidelines Relevant to Canal and Jetty operation process. Also, the project will meet the emission and effluent standards with national.
Chapter II	Mawlamyine Cement Limited (MCL) will specifically commit itself to the prevention of pollution through the implementation of processes, practices, and techniques to avoid, reduce and control the creation, emission and discharge of any type of pollutant and waste.
Chapter II, Use of Natural Resources	Mawlamyine Cement Limited (MCL) will specifically commit itself to minimize the use of consumptive resources and promote the reduction and recycling of waste products where possible.
Chapter II, Air quality standard	Mawlamyine Cement Limited (MCL) will follow National Environmental Quality (Emission) Guideline and IFC General

Commitment Source	Commitment
	EHS Guidelines for the ambient air quality especially in operation phase as in Table 2.3-1 and 2.3-2 (NEQG).
Chapter II, Wastewater Effluent	Mawlamyine Cement Limited (MCL) will follow National Environmental Quality (Emission) Guideline and IFC General EHS Guidelines and for the waste water effluent as in Table 2.3-3 and 2.3-4.
Chapter II, Ambient Noise Standard	Mawlamyine Cement Limited (MCL) will follow NEQG for the ambient and industrial noise standard during construction and operation phase as In Table 2.3-5.
Chapter II Commitments	Mawlamyine Cement Limited (MCL) will prepare an IEE report with fully compliment with EIA procedure 2015 in timely and precisely mannar as in Table 2.2-1.
Chapter II Organization Guideline	Mawlamyine Cement Limited (MCL) will follow International Finance Corporation's EHS Standard for organization as in Table 2.4-1.
Chapter II, Ambient Noise Standard	Mawlamyine Cement Limited (MCL) will follow International Finance Corporation's EHS Standard for the ambient and industrial noise standard during construction and operation phase as in Table 2.4-2.
Chapter III Designs and Equipments	Mawlamyine Cement Limited (MCL) will utilize the facilities'designs and modernized equipment and machinery as described in Project description for cement plant construction and operation.
Chapter VII Impact Assessments and Mitigation Measures	Mawlamyine Cement Limited (MCL) will be adopted mitigation measures for avoiding or reducing such environmental and socio-economic impacts potentially generated by the Project during both the construction and operation phases.
Chapter VII Ambient Air Emission	Mawlamyine Cement Limited (MCL) will implement mitigation measures for ambient air emission in Section 7.3 with the regular monitoring plan.
Chapter VII Noise Emission	Mawlamyine Cement Limited (MCL) will implement mitigation measures for operation phase as mentioned in Section 7.6.
Chapter VII Wastewater Effluents	Mawlamyine Cement Limited (MCL) will implement mitigation measures in Sections 7.7.4.1 and 7.7.4.2 for both construction and operation period.
Chapter VII Solid Wastes	Mawlamyine Cement Limited (MCL) will implement mitigation measures for solid waste as mentioned in Section 7.9.3.
Chapter VII Soil	Mawlamyine Cement Limited (MCL) will implement mitigation measures in Section 7.8.4 and 7.8.6.
Chapter VII Biodiversity	Mawlamyine Cement Limited (MCL) will implement mitigation measures in Section 7.10.5.
Chapter VII Visual/Landscape	Mawlamyine Cement Limited (MCL) will implement mitigation measures in Sections 7.8.5 and 7.8.6 for construction and operation phases.
Chapater VII Cultural Heritage	Mawlamyine Cement Limited (MCL) will implement mitigation measures as shown in Section 7.14.2.

Commitment Source	Commitment
Chapter VII Cumulative Impacts	Mawlamyine Cement Limited (MCL) will implement mitigation measures as shown in 7.17.3.
Chapter VII Traffic Issue	Mawlamyine Cement Limited (MCL) will implement mitigation measures in 7.11.8.
Chapter VII Socioeconomic	Mawlamyine Cement Limited (MCL) will implement mitigation measures as in Section 7.11.10.
Chapter VII Community Health and Safety	Mawlamyine Cement Limited (MCL) will implement mitigation measures as in Section 7.12.4 and 7.12.5.
Possibility of employment opportunities	The labor recruitment policy must be formulated in such a way that local laborers can easily get chance of employment in the project.
Occupational health hazard	Arrangement of personal protective equipments sucha as gloves, helmet, sunglasses and other tools, dress (life jackets) and uniforms for each worker so that the workers can keep themselves safe from any kinds of accident and the occupational health training will also be provided.
Chapter VIII, Environmental component	Mawlamyine Cement Limited (MCL) will develop and implement environmental and social management plan in accordance with the impacts that described in Table 8.2-3, 8.2-5.
Chapter VIII, Social & OHS component	Mawlamyine Cement Limited (MCL) will develop and implement social and OHS components as described in table 8.2-4 and 8.2-6
Occupational Health and Safety Management Plan	Mawlamyine Cement Limited (MCL) will develop and implement social and OHS components as described in section 8.7.
Chapter VIII, Emergency Response Plan	Mawlamyine Cement Limited (MCL) will develop and implement social and OHS components as described in table 8.9-2.
Chapter VIII, Cultural Heritage	Mawlamyine Cement Limited (MCL) will develop and follow a chance find procedure for cultural heritage objects and sites as shown in Section 7.14.3.
Chapter VIII Decommissioning Phase	Mawlamyine Cement Limited (MCL) will implement mitigation measures as described in 8.11.3.
Chapter VIII, Ecological Management Plan	Mawlamyine Cement Limited (MCL) will develop and implement an ecological management plan as shown in 8.10.
Chapter VIII, Grievance Redress Procedure	Mawlamyine Cement Limited (MCL) will develop and implement a grievance redress mechanism as shown in Section 9.2.3 for social management with the monitoring and evaluation as mentioned.
Chapter VIII, Monitoring and Reporting	Mawlamyine Cement Limited (MCL) will develop and implement a monitoring and reporting plan as presented in Table 9.1-1 and 9.2-1.
CSR Program	Mawlamyine Cement Limited (MCL) plan and reserve for cooperate social responsibility (CSR) (during operation period),

Commitment Source	Commitment
	two percent (2%) of yearly net profit of the project and CSR will be implemented as shown in Section 9.4.
Chapter IX, Environmental Monitoring Plan	The compliance monitoring report along with the checklist will be indexed and annexed with the monthly and annual monitoring report. It may be required to submit the annual monitoring report to Department of Environmental Conservation for renewing of the Environmental Clearance Certificate each year.
CSR Program	Mawlamyine Cement Limited (MCL) plan and reserve for cooperate social responsibility (CSR) (during operation period), two percent (2%) of yearly net profit of the project.

18) Conclusions and Recommendations

There were no other project activities in proposed cement project area, however, cement project will be operated with the limestone quarry, coal power plant and jetty & canal, as its associated facilities.

The potential affected VEC components by cement plant and its associated facilities are to be land use, vegetation, air and socioeconomic environments. However, the advantage of minimizing impacts can be expected and all of these projects can be considered as the fully-integrated cement project because MCL is the same project proponent for all of these project activities and same EIA implementation team, Sustainable Organization and Development Department (SOD) will take accountability of controlling and monitoring for all potential impacts in order to minimize and mitigate in consideration of the overall project actions.

အစီရင်ခံစာ အကျဉ်းချုပ်

၁) နိဒါန်း

ဤအစီရင်ခံစာအား ဘိလပ်မြေစက်ရုံ (Mawlamyine Cement Limited) အတွက် Resource & Environment Myanmar (REM) Co., Ltd မှ ဘိလပ်မြေထုတ်လုပ်သည့် စက်ရုံနှင့် ၎င်းနှင့်ဆက်စပ်မှ လုပ်ငန်းများကို အကောင်အထည်ဖော်ဆောင်ရွက်ရာတွင်ဖြစ်ပေါ်လာနိုင်ဖွယ်ရှိသောပတ်ဝန်းကျင်နှင့် လူမှုရေးရာထိခိုက်သက် ရောက်မှုများကို ဆန်းစစ်အကဲဖြတ်ရန် ရည်ရွယ်၍ ပြုစုထားခဲ့ ပါသည်။

ဘိလပ်မြေထုတ်လုပ်ခြင်းတွင် ပါဝင်သော လုပ်ငန်းစဉ်များမှာ-

၁) ထုံးကျောက်သတ္တုမိုင်း

၂) rotary kiln ထဲတွင် ထုံးချော်ပြုလုပ်ခြင်း

၃) ရရှိလာသော ချော်များကို အအေးခံခြင်း

၄) ချော်များကို gypsum နှင့်ရောမွှေခြင်း

၅) အမှုန့်ကြိတ်ခြင်း

၆) ထုပ်ပိုးခြင်း

၇) သိုလှောင်ခြင်းနှင့် ဘိလပ်မြေများကို အိတ်သွင်းခြင်း

၈) သယ်ယူပို့ဆောင်ခြင်း

လုပ်ငန်းစဉ်များသည် ဖုန်မှုန့်ကဲ့သို့သောအမှုန် ဖြန့်ပစ္စည်းအမျိုးမျိုးကို ဖြစ်ပေါ်စေ၍ ၎တို့ကို လုပ်ငန်း စဉ်ဆောင်ရွက်နေစဉ်အတွင်း ပြန်လည် ဖမ်းယူ၍ အသုံးပြုနိုင်ပါသည်။ ဤလုပ်ငန်းစဉ်သည် စွမ်းအင်အများအပြား အသုံးပြုရန်လိုအပ်ပြီး စွမ်းအင်ထိန်းသိမ်းရန်အလို့ငှာလည်း မက်လောက်စရာ အကျိုးသက်ရောက်မှုများ ရှိပါသည်။

ထို့ကြောင့်ပတ်ဝန်းကျင်နှင့် လူမှုရေးရာ ထိခိုက်သက်ရောက်မှုများ ဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံး လုပ်နည်း များ (၂၀၁၅) အရ ဘိလပ်မြေထုတ်လုပ်ခြင်းသည် မည်မျှသေးငယ်သောပမာဏပင် ထုတ်လုပ်သည် ဖြစ်စေကာမူ အမျိုးမျိုးသော လုပ်ငန်းစဉ်များမှပတ်ဝန်းကျင်နှင့် လူမှုရေးရာအပေါ်တွင် ထိခိုက်သက်ရောက်မှုများ ရှိလာနိုင်ခြင်း၊ အမျိုးမျိုးသောဖြန့်ပစ္စည်းများ မြစ်ဖျားခံ ဖြစ်ပေါ်လာသောနေရာများတွင် သက်သာပြေလျော့စေသော နည်းလမ်း များ နှင့် ကြပ်မတ်စီမံခြင်းများကို အကောင်အထည်ဖော်ဆောင်ခြင်း ဖြင့် ထိခိုက်မှုမြင့်မားသောကိစ္စရပ်များ နှင့် ပတ်ဝန်းကျင် နှင့် လူမှုရေးရာကို ဆိုးကျိုးထိခိုက်မှုမရှိစေရန် ပတ်ဝန်းကျင်နှင့် လူမှုရေးရာ ထိခိုက်သက်ရောက်မှုများ ဆန်းစစ်ခြင်း အစီရင်ခံစာကို ပြုစုသင့်ပါသည်။

၂) အဆိုပြုထားသော **MCL ဘိလပ်မြေစက်ရုံ တည်နေရာ**

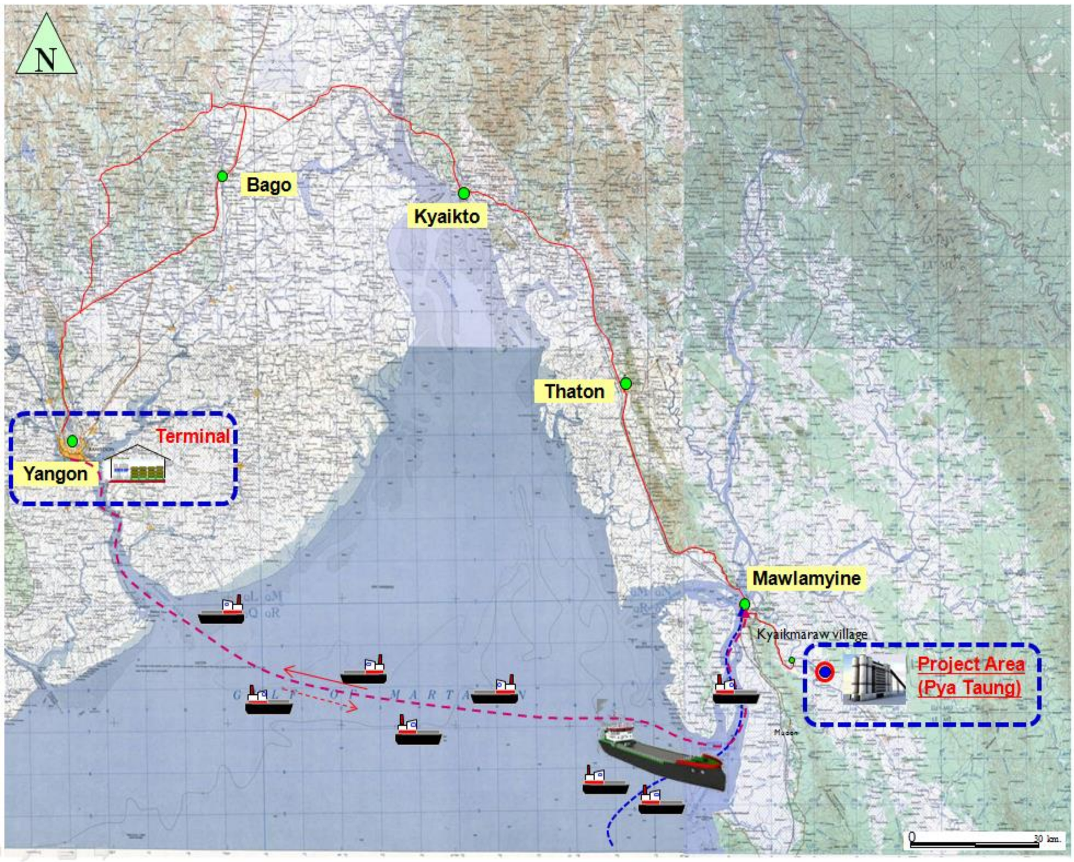
အဆိုပြုထားသော MCL ဘိလပ်မြေစက်ရုံကို SCG cement **နှင့်** Pacific Link Cement Industry (PLCI) **တို့ ပူးပေါင်းဆောင်ရွက်ကာ အကောင်အထည်ဖော်မည်ဖြစ်ပြီး ၎င်းသည် မြန်မာနိုင်ငံတောင်ပိုင်း မွန်ပြည်နယ်တွင် တည်ရှိပါသည်။**

ဘိလပ်မြေစက်ရုံတည်ရှိရာ နေရာမှာ မြန်မာနိုင်ငံ၊ မွန်ပြည်နယ်၊ မော်လမြိုင်ခရိုင်အတွင်းကျိုက်မရောမြို့နယ်ရှိ ပျားတောင်ဧရိယာအတွင်းတွင် ဖြစ်ပြီး အတ္တရံမြစ်၏ အရှေ့ဘက်မှ ခန့်မှန်းခြေအားဖြင့် ကြမုန်းရွာမှ ၀.၈၆ ကီလိုမီတာအကွာတွင် တည်ရှိပါသည်။ ဘိလပ်မြေ စက်ရုံ တည်ရှိရာနေရာ အတိအကျမှာ မြောက်လတ္တီတွဒ် ၁၆ ဒီဂရီ ၂၁ မိနစ်နှင့် ၄၄ စက္ကန့် နှင့် အရှေ့လောင်ဂျီတွဒ် ၉၇ ဒီဂရီ ၅၀ မိနစ်နှင့် ၁၇ စက္ကန့် တွင် တည်ရှိပါသည်။

ဇယား ၁: အဆိုပြုထားသော MCL ဘိလပ်မြေစီမံကိန်း၏ ကိုဩဒိနိတ်အမှတ်များ

No.	Project Proponent	Latitude	Longitude
1	Cement Plant	16°21'56.53"N	97°50'11.26"E
2	Coal Fired Power Plant	16°21'55.07"N	97°49'58.73"E
3	Limestone Quarry	16°21'25.25"N	97°48'14.24"E
4	Jetty	16°21'26.11"N	97°50'2.49"E
5	Worker Camp	16°22'9.57"N	97°49'33.64"E

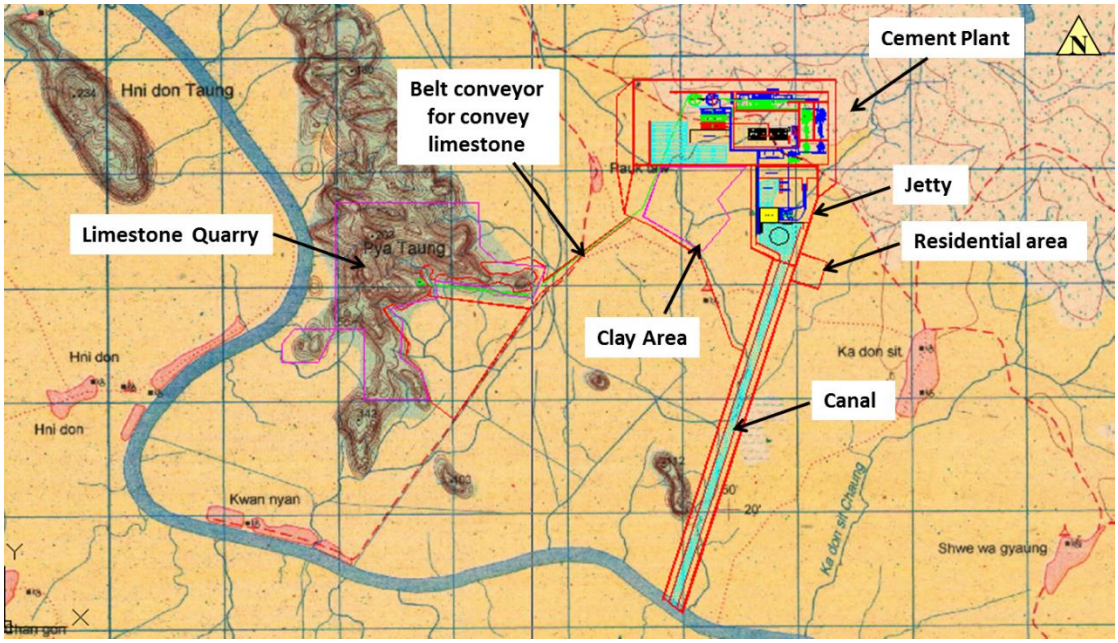
ဘိလပ်မြေစက်ရုံနေရာ၏ ဘူမိဗေဒ အနေအထားကို အောက်ဖော်ပြပါ ပုံ ၁ တွင် ဖော်ပြထားပါသည်။



ပုံ (၁): MCL ဘိလပ်မြေစက်ရုံနေ ဘူမိဗေဒ အနေအထား

ဘိလပ်မြေစက်ရုံနှင့် ဆိပ်ကမ်းနှင့် ကုန်ကြမ်းသိုလှောင်ထိန်းသိမ်းရန်နေရာ အပါအဝင် ဆက်စပ်ရာ လုပ်ငန်းများအတွက် လိုအပ်သော မြေဧရိယာမှာ ၁၄၀၀ ဧက ဖြစ်ပါသည်။ သက်ဆိုင်ရာနေရာချထားမှု အပြင်အဆင်ကို ပုံ (၂) တွင် တွေ့မြင်နိုင်ပါသည်။

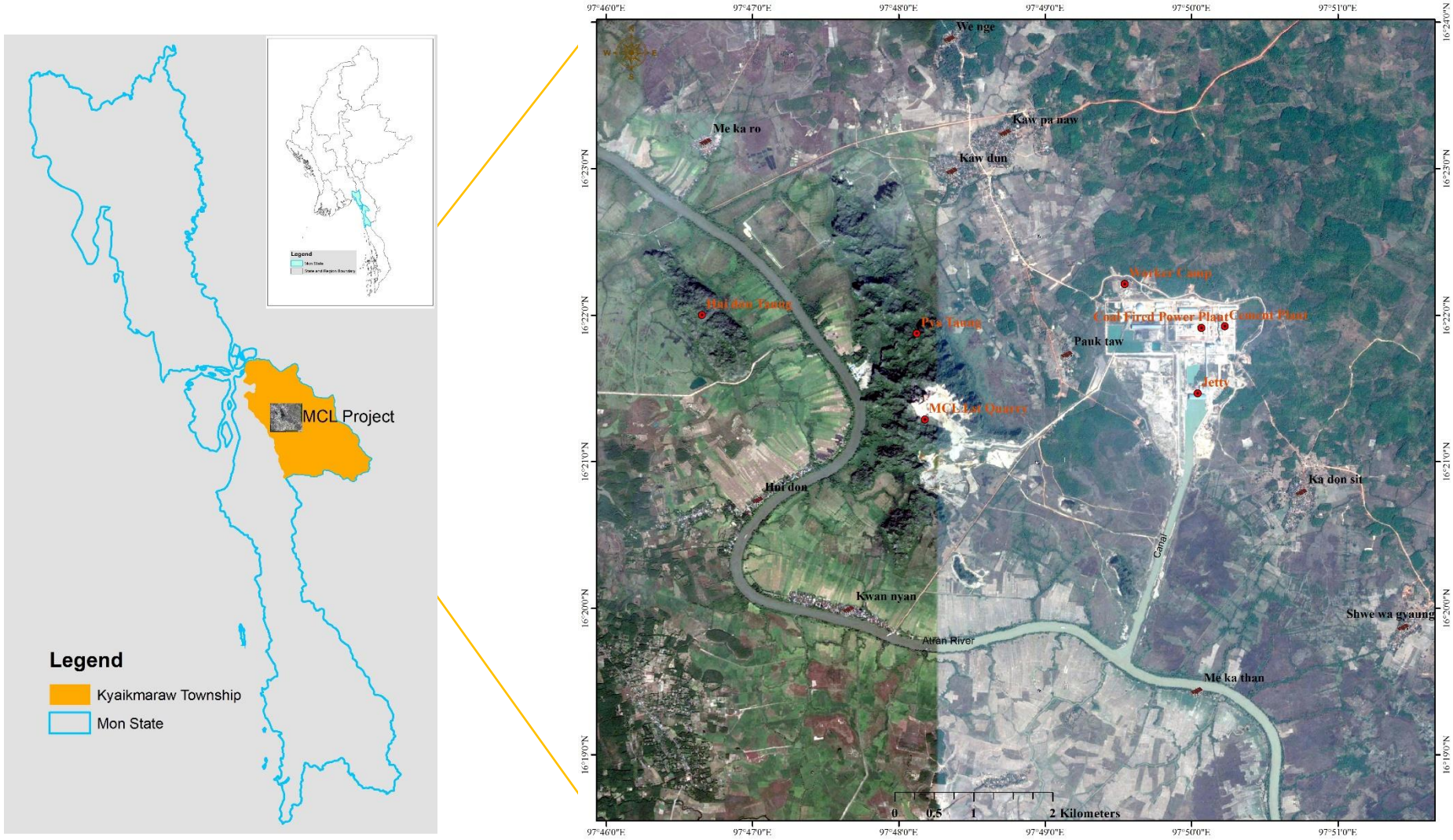
ပံု (၂):



ဘိလပ္ေျမစက္ရံုႏွင့္ ဆက္စပ္လုပ္ငန္းမ်ားအတြက္
ႀကိဳတင္ေနရာခ်ထားမႈ အျပင္အဆင္

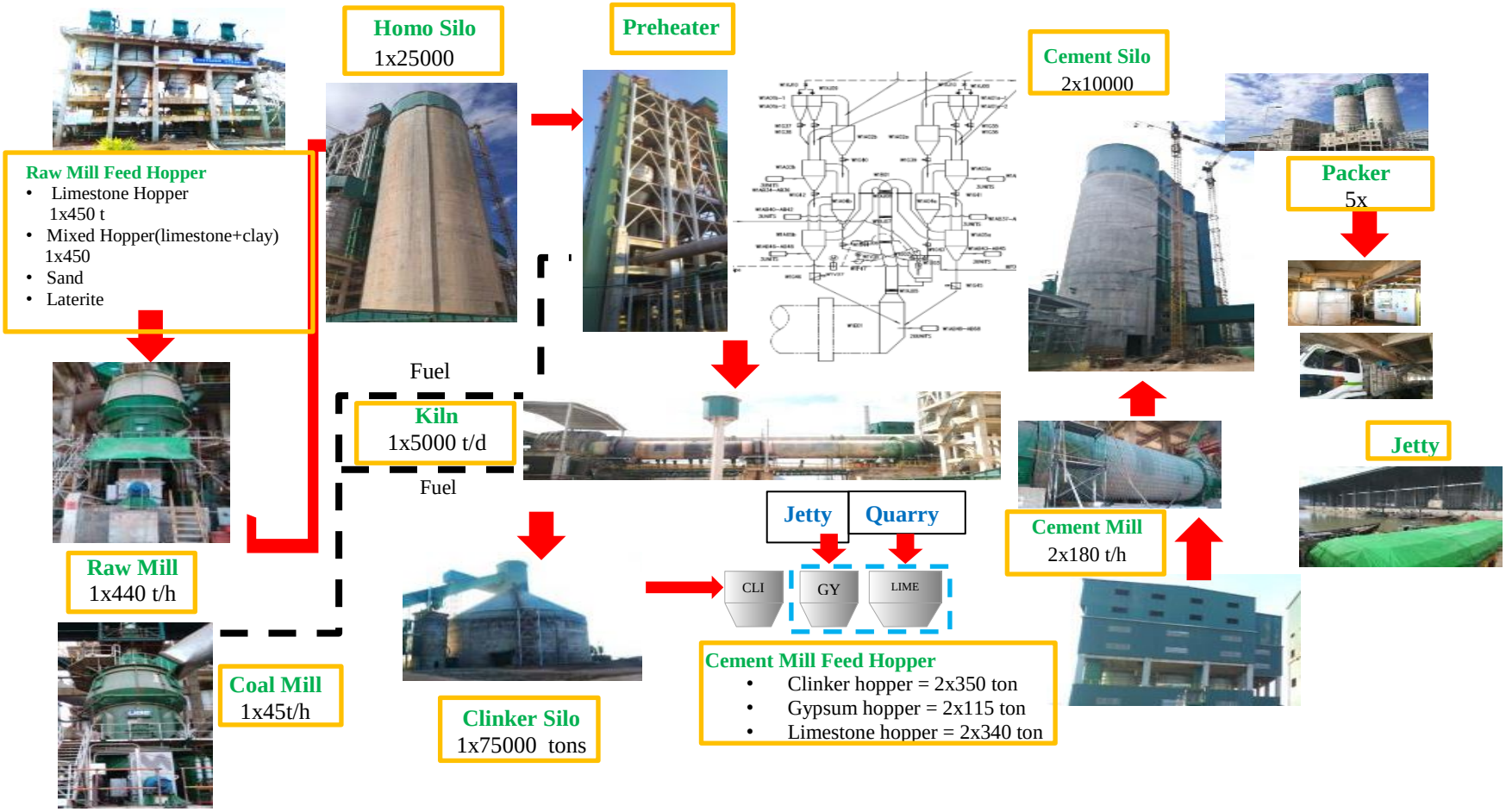
၃) MCL ဘိလပ္ေျမစီမံကိန္း၏ ေျမမ်က္ႏွာသြင္ျပင္အေနအထား

ဟ်းေတာင္၏ ေတာင္ကုန္းအဖ်ားတစ္ေနရာသည္ အတိုရံျမစ္အနီး လြင္ျပင္ႏွင့္ ထိစပ္တည္ရွိလွ်က္ရွိပါသည္။ ၎င္းသည္ ေျမာက္မွေတာင္သို႕သြယ္တန္းလွ်ဳက်ရွိၿပီး ျမင့္မားမက္ေစာက္ကာ ေဒါင္လြင္အေန အထားတြင္ တည္ရွိပါသည္။ ဟ်းေတာင္၏ အလယ္ပိုင္းသည္ က်ယ္ျပန္႕သေယာင္ရွိၿပီး ေတာင္စြန္းႏွင့္ ေျမာက္ဖ်ားပိုင္းတြင္ က်ဥ္းေျမာင္းသြားပါသည္။ ဟ်းေတာင္၏ အျမင့္ဆံုးအမွတ္မွာ ပင္လယ္ေရမ်က္ႏွာျပင္ အထက္ ၂၆၃ မီတာအထိ ရွိပါသည္။ ဟ်းေတာင္သည္ အတိုရံျမစ္ႏွင့္ ေတာင္တန္းမ်ားအၾကားရွိ လြင္ျပင္တြင္ ထင္ရွားစြာ မားမားမတ္မတ္ တည္ရွိေနပါသည္။ အတိုရံျမစ္သည္ ဟ်းေတာင္၏ အေနာက္ဘက္မွ ျဖတ္သန္းစီးဆင္းလ်က္ရွိၿပီး အေရွ႕ေတာင္မွ အေနာက္ေျမာက္သို႕ ဦးတည္စီးဆင္းေနပါသည္။ ေတာင္တန္းမ်ားမွာ ေယဘူယ်အားျဖင့္ အေနာက္ေျမာက္မွ အေရွ႕ေတာင္သို႕ သြယ္တန္းလွ်က္တည္ရွိပါသည္။



Source: Google Earth Satellite Images (2017)

ပံု (၃): MCL ဘိလပ္ေျမစီမံကိန္း၏ တည္ေနရာျပပံု

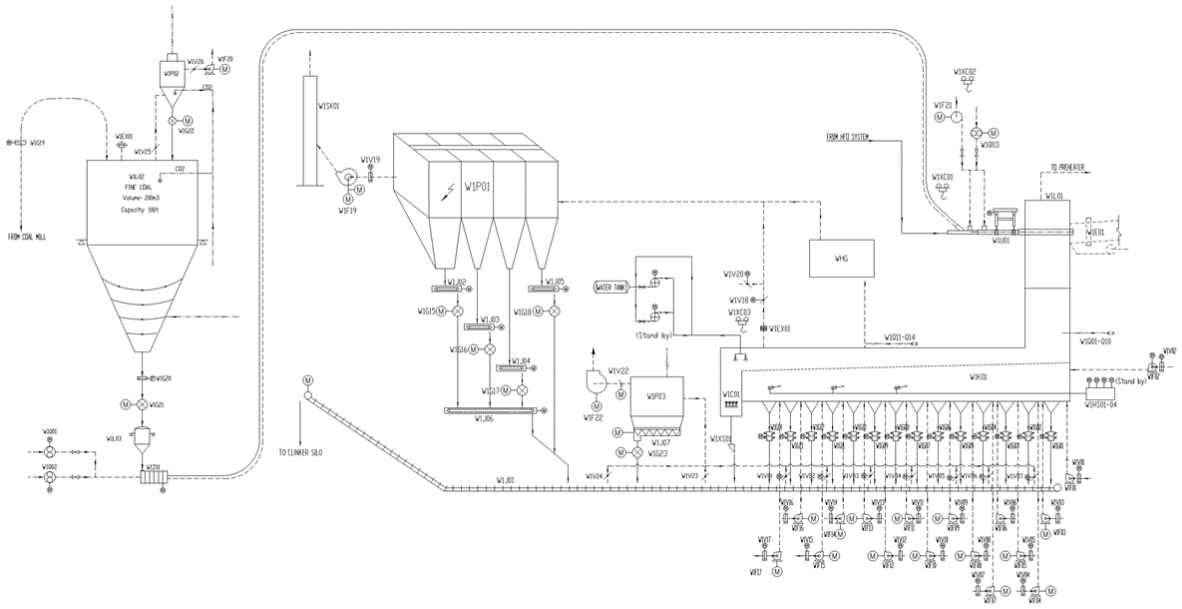


ပံု (၄) : ဘိလပ္ေျမထုတ္လုပ္ျခင္းလုပ္ငန္းမ်ားအတြက္ အဓိက လုပ္ငန္းစဥ္ျပပံု


Limestone Storage 50,000 t
Limestone Quarry
Kiln Process
Coal Storage 24,000 t x 2
Clay Storage 20,000 t x 2
Packer & Jetty
Self-Captive Power unit
Cement Mill
Clinker Silo 75,000 t
Laterite 6,000 t Sand 3,000 t
Mixed Mat Storage 22,000 t x 2
Homo Silo 25,000 t
Raw Mill


Residential Buildings and Offices
Limestone
Coal2
Coal1
Clay2
Clay1
Main access road

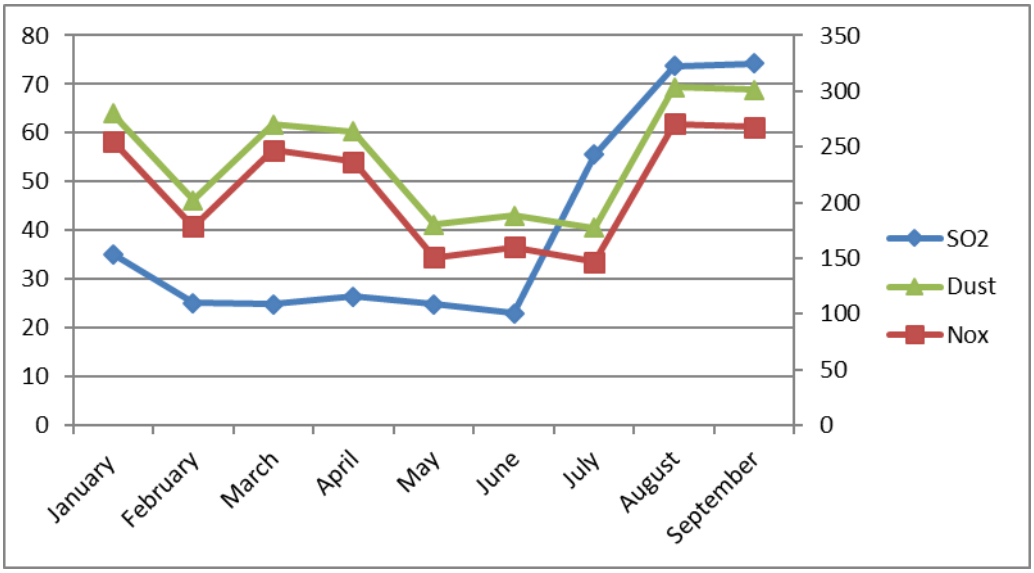
ပုံ (၇): ပစၥည္းမ်ား ထုတ္လုိးေသာ စက္ရံုႏွင့္ ကုန္စၥည္းမ်ား ျဖန္ေ၀ရာ ေနရာျပပံု



ပံု (၈): EP Cooler မီးခိုးေခါင္းတိုင္ တပ္ဆင္ထားပံု

ဇယား (၂): Air Emissions Monitoring Results from Main Cement Stacks (2018)

Parameters	Jan	Feb	Mar	April	May	Jun	July	Aug	Sep
SO_2	35.14516	25.15793	24.77419	26.41333	24.8619	23.048	55.512	73.672	74.21875
No_x	255.2806	178.4674	247.1935	236.42	150.8714	159.728	146.772	270.936	267.95625
Dust	24.86129	23.73214	22.93226	27.15433	29.01905	28.232	30.332	32.408	33.15



ပံု (၉): မီးခိုးေခါင္းတိုင္မွ ေလထုညစ္ညမ္းပစၥည္းမ်ား (NO_x, SO_2 and Dust) ထြက္ရွိမႈ

၄) အဆိုျပဳထားေသာ MCL စီမံကိန္းအတြက္ ကုန္ၾကမ္းလ်ာထားခ်က္

ေအာက္ေဖာ္ျပပါ ဇယားသည္ ဘိလပ္ေျမထုတ္လုပ္ျခင္းစီမံကိန္းအတြက္ တစ္ႏွစ္အတြင္း သံုးစြဲမည့္ ကုန္ ၾကမ္း လ်ာထားခ်က္မ်ားကို ေဖာ္ျပထားပါသည္။

ဇယား (၃) ား ႏွစ္စဥ္ ကုန္ၾကမ္းသံုးစြဲမႈ အေျခအေနျပ ဇယား

Items	% Dry Basis	% Moisture	Consumption per Year
Limestone	78.34	1	2.1 MTon (approx.)
Clay	12.51	20	0.5 MTon (approx.)
Sand*	5.54	15	0.15 MTon (approx.)
Laterite	3.6	10	0.15 MTon (approx.)
Gypsum	Hlaingbwe, Hpa-an		0.10 MTon (approx.)
Coal	IndonEIA and Local coal		0.35 MTon (approx.)

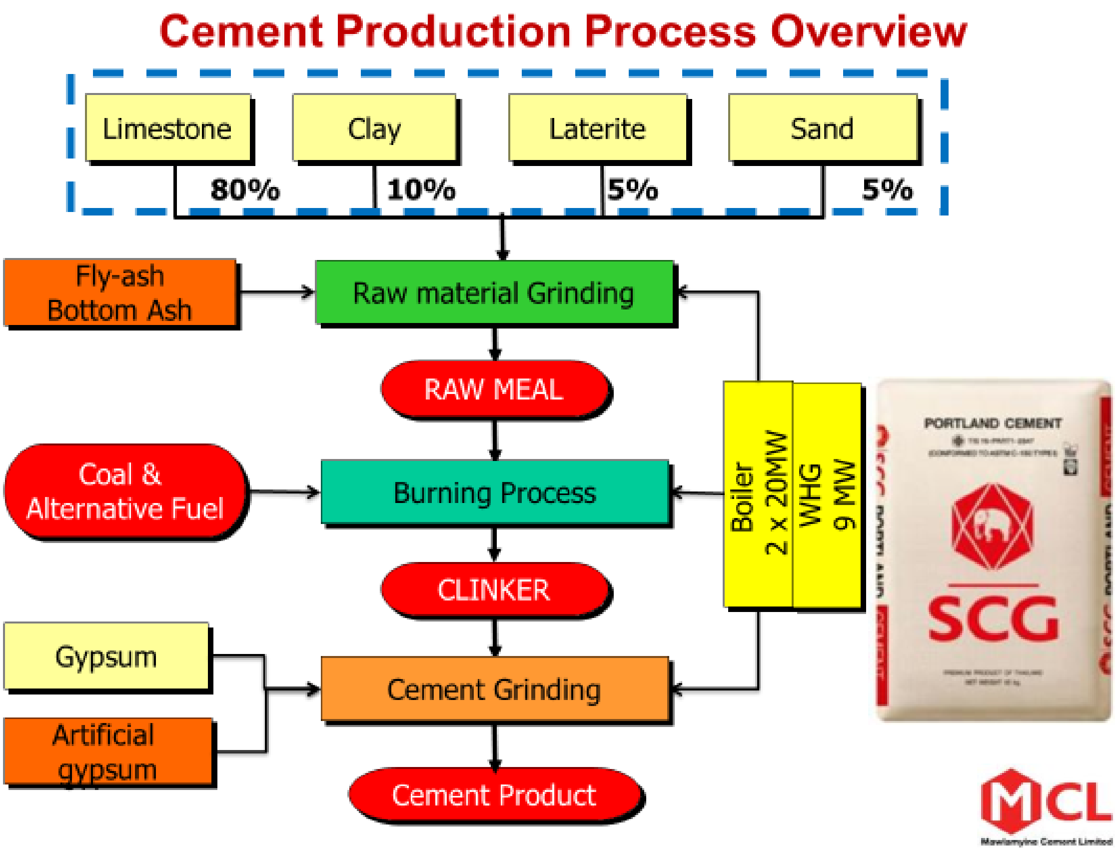
၄.၁) ေရသံုးစြဲမႈ

ေရသိုေလွာင္ႏိုင္စြမ္းအား # ကန္ (၁) : ၂၅၀၀၀၀ ကုဗမီတာ
ေရသိုေလွာင္ႏိုင္စြမ္းအား # ကန္ (၂) : ၁၅၀၀၀၀ ကုဗမီတာ
ေန႔စဥ္ေရအသံုးစြဲမႈ ခန္႕မွန္းခ်က္ : ၅၅၀၀ ကုဗမီတာ
ေန႕စဥ္ျပန္လြွတ္လာေသာေရ : ၂၀၀၀ ကုဗမီတာ (စက္ရံုမွ)
အမွန္တကယ္ ေန႕စဥ္သံုးစြဲမႈ : ၃၅၀၀ ကုဗမီတာ

- လစဥ္သံုးျပဳမႈ : ၃၅၀၀ x ၃၀ = ၁၀၅၀၀၀ ကုဗမီတာ
- ေရသိုေလွာင္ကန္ # ကန္ (၁) = ၂၅၀ ၀၀၀ ကုဗမီတာ (၇၁ ရက္သံုးနိုင္သည္)
- မိုးရာသီကာလ (ေဖြန္၊ ဇူလိုင္၊ ၾသဂုတ္၊ စက္တင္ဘာ) တြင္ ေရထပ္ျဖည့္ရန္မလိုပါ။
- ေအာက္တိုဘာ၊ ႏိုဝင္ဘာ၊ ဒီဇင္ဘာ၊ ဇန္နဝါရီ၊ ေဖေဖာ္ဝါရီ၊ မတ္၊ ဧၿပီ၊ ေမ (ကန္ (၁) မွ သိုေလွာင္ေရသည္ ေအာက္တိုဘာႏွင့္ ႏိုဝင္ဘာလအတြက္ ေကာင္းစြာလံုေလာက္ပါသည္။)
- ဒီဇင္ဘာ၊ ဇန္နဝါရီ၊ ေဖေဖာ္ဝါရီ၊ မတ္၊ ဧၿပီ၊ ေမ လမ်ားအတြက္ ကန္ (၂) မွ ေရကို ကန္ (၁) သို႕ ျဖည့္ေပးရန္ လိုအပ္ပါသည္။
- ေရသိုေလွာင္ႏိုင္စြမ္းအား # ကန္ (၂) : ၁၅၀၀၀၀ ကုဗမီတာ (ဒီဇင္ဘာလ ႏွင့္ ဇန္နဝါရီလ အတြက္ ၄၂ ရက္သံုး ႏိုင္သည္)
- အမွန္တကယ္ ျဖည့္စြက္ အသံုးျပဳရန္လိုအပ္ေသာ လမွာ ၄ လ (ေဖေဖာ္ဝါရီ၊ မတ္၊ ဧၿပီ၊ ေမ)
- အတံခါးျမစ္မွ စုစုေပါင္း ရယူသံုးစြဲရန္ လိုအပ္ေသာ ေရပမာဏ ၁၀၅၀၀၀ × ၄ လ = ၄၂၀၀၀၀ ကုဗမီ တာ (ႏွစ္စဥ္)

၅)　ဘိလပ္ေျမထုတ္လုပ္မႈ လုပ္ငန္းစဥ္

ဘိလပ္ေျမထုတ္လုပ္မႈ လုပ္ငန္းစဥ္သည္ အေျခာက္ခံထုတ္လုပ္မႈ လုပ္ငန္းစဥ္ျဖစ္၍ စြမ္းအင္သံုးစြဲမႈ ႏွင့္ ေရသံုးစြဲမႈမွာ ဘိလပ္ေျမ အစိုထုတ္လုပ္ျခင္း လုပ္ငန္းစဥ္ထက္ ေလ်ာ့နည္းပါသည္။ ဘိလပ္ေျမ ထုတ္လုပ္ျခင္းလုပ္ငန္းစဥ္တြင္ ေအာက္ပါအဆင့္မ်ား ပါဝင္ပါသည္။



ပံု (၁၀): ဘိလပ္ေျမထုတ္လုပ္ျခင္း လုပ္ငန္းစဥ္

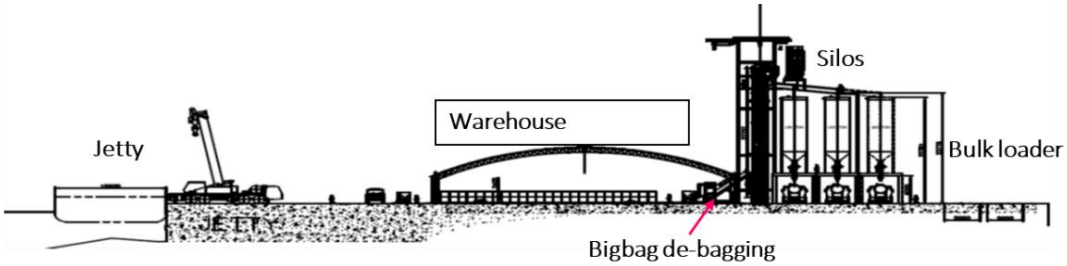
တစ္ေန႕လွ်င္ ဘိလပ္ေျမ တန္ ၅၀၀၀ က် (တစ္ႏွစ္လွ်င္ တန္ ၁.၈ သန္း) ထုတ္လုပ္ေသာ ဘိလပ္ေျမ စက္ရံုသည္ ထံုးေက်ာက္တြဲၿပီး ဘိလပ္ေျမ ထုတ္ပိုးၿပီးသည္အထိ လုပ္ငန္းစဥ္မ်ား ပါရွိၿပီး ေအာက္ပါ အတိုင္း ၂ ပိုင္း ခြဲျခားထားပါသည္။

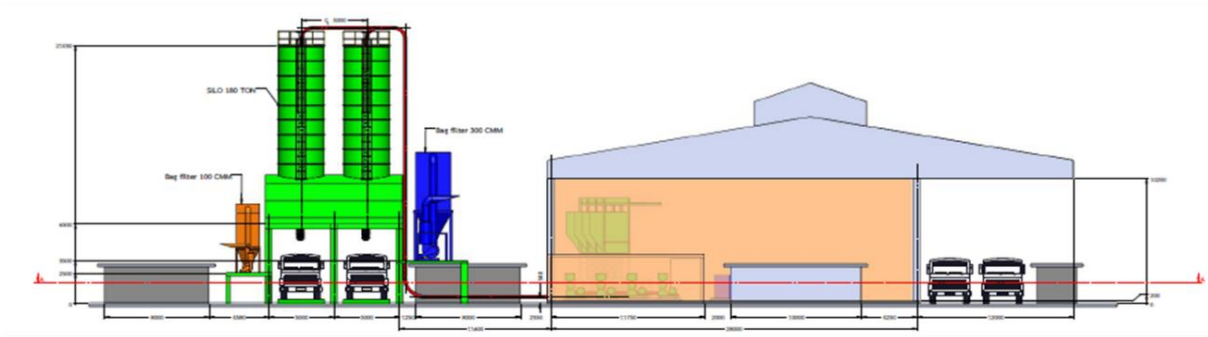
၁)　ဘိလပ္ေျမစက္ရံု

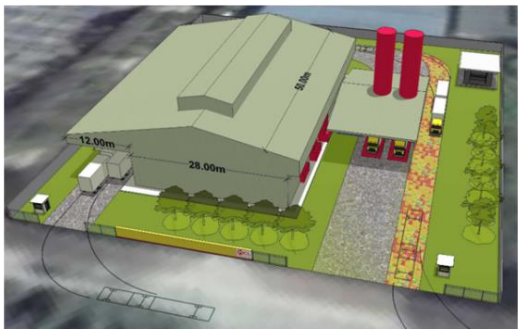
ဘိလပ္ေျမစက္ရံုႏွင့္ ဆက္စပ္လုပ္ငန္းစဥ္မ်ားသည္ ျမန္မာျပည္နယ္ က်ိဳက္မရာၿမိဳ႕နယ္အတြင္း အတံရံျမစ္အနီး ဟ်ားေတာင္ရွိယာတြင္ တည္ရွိပါသည္။ ဘိလပ္ေျမစက္ရံုႏွင့္ ဆိပ္ကမ္းႏွင့္ ကုန္ၾကမ္းသိုေလွာင္ ထိန္းသိမ္းရန္ေနရာ အပါအဝင္ ဆက္စပ္ လုပ္ငန္းမ်ားအတြက္ လိုအပ္ေသာ ေျမဧရိယာမွာ ၁၄၀၀ ဧက ျဖစ္ပါသည္။ ဘိလပ္ေျမအိတ္ ၾကီးမ်ား ႏွင့္ ပံုမွန္အိတ္မ်ားကို အကၡမန္ဒလယ္ႏွင့္ အတံရံျမစ္ကို ျဖတ္၍ စပ္တူသမၺာန္မ်ားႏွင့္ ဘိလပ္ေျမသို ေလွာင္ရံုသို႕ သယ္ယူပါသည္။

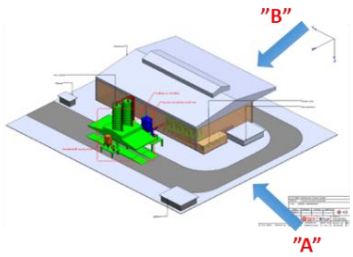
၂) ဘိလပ္ေျမ ဆိုပ္ကမ္း

ဘိလပ္ေျမဆိုပ္ကမ္းႏွင့္ ဆက္စပ္အေဆာက္အဦမ်ားမွာ ရန္ကုန္ဘက္ကမ္းတြင္ တည္ရွိၿပီး ကုန္သေဘၤာ ဆိပ္ကြင္း တည္ရွိပါသည္။ အေဆာက္အဦးအားလံုးအတြက္ ခန္႕မွန္းေျခလိုအပ္ေသာ ေျမကေမွာ ၄၀ ဧက ခန္႔ျဖစ္ပါသည္။







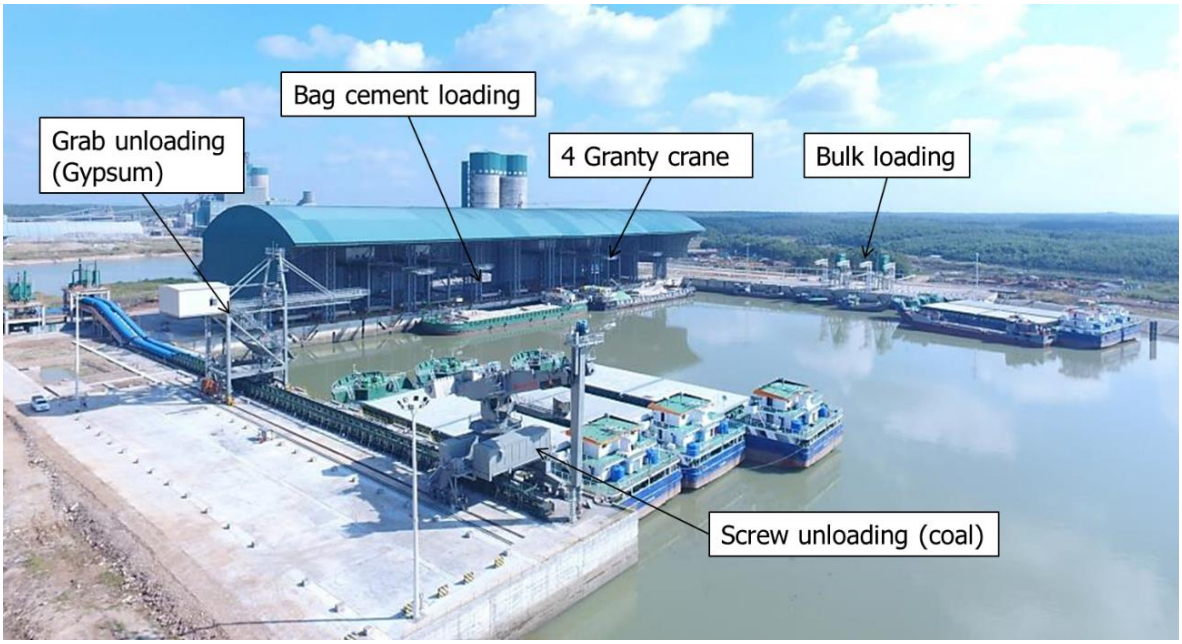


ပံု (၁၁) ား ရန္ကုန္ရွိ MCL ဘိလပ္ေျမ ဆိပ္ကမ္း

MCL မွ ထုတ္လုပ္သည့္ ဘိလပ္ေျမ အမ်ိဳးအစား ၃ မ်ိဳးမွာ ေအာက္ပါအတိုင္း ျဖစ္ပါသည္။

1) OPC Small 80-85%
2) Masonry 10-15% and
3) Mix cement 10-15 %.

ပံု (၁၂) ။ ဘိလပ္ေျမကုန္ေခ်ာ အမ်ိဳးမ်ိဳး



ပံု (၁၃) ။ MCL ဆိပ္ကမ္း၏ လက္ရွိအေျခအေန

၆) စီမံကိန္း၏ အျခားျဖစ္ႏိုင္ေျခ ရွိသည့္ နည္းလမ္းမ်ားကို ႏိႈင္းယွဥ္ေရြးခ်ယ္ျခင္း

၆.၁) ဘိလပ္ေျမထုတ္လုပ္သည့္ နည္းလမ္း

ဘိလပ္ေျမအစိုထုတ္လုပ္ျခင္းႏွင့္ ႏိႈင္းယွဥ္စဥ္းစားရာတြင္ MCL သည္ ေအာက္ပါအားသာခ်က္မ်ားကို ႏိႈင္း ယွဥ္သံုးသပ္ကာ ဘိလပ္ေျမအေျခာက္ထုတ္လုပ္ျခင္းနည္းစနစ္ကို ေရြးခ်ယ္ခဲ့ျခင္း ျဖစ္ပါသည္။

ဇယား (၄) : ဘိလပ်မြေ အစိုနှင့် အခြောက်ထုတ်လုပ်ခြင်း လုပ်ငန်းစဉ် နှစ်ခုအကြားရှိ ကွာခြားချက်များ[4]

Differences	Wet Process	Dry Process
1. Mixing of raw materials	Wash mill with 35-50 % of water	Dry stage in Blenders
2. Materials existing the mill	Slurry and have flow-ability characteristics	Kiln Feed
3. Size of Kiln	Big	Small
4. Fuel Consumption	High (350 kg of coal per ton of cement produced)	Low (100 kg of coal per ton of cement produced)
5. Production Cost	High	Less

ဘိလပ်မြေအခြောက်ထုတ်လုပ်ခြင်း လုပ်ငန်းစဉ်သည် ဘိလပ်မြေဖျော်စက်များကို အသုံးပြုရခြင်း နှင့် လုပ်ငန်းစဉ်မှာ ရှုပ်ထွေးလွန်းသောကြောင့် အစို ထုတ်လုပ်ခြင်းလုပ်ငန်းစဉ် ထက်ငွေကြေးစိုက်ထုတ် ကုန်ကျမှု များသော် လည်း အခြောက်ထုတ်လုပ်ခြင်းမှာ စွမ်းအင်သုံးစွဲမှု လျော့နည်းခြင်းနှင့် လုပ်ငန်းစဉ်ကာလမှာ အချိန်တိုခြင်း တို့ကြောင့် **MCL** က ရွေးချယ်ခဲ့ပါသည်။

၆.၂) ဘိလပ်မြေထုတ်လုပ်မည့် အဓိက စက်ပစ္စည်းများအပေါ်တွင် နှိုင်းယှဉ်ရွေးချယ်မှုများ

ဘိလပ်မြေထုတ်လုပ်မည့် အဓိက စက်ပစ္စည်းများအပေါ်တွင် နှိုင်းယှဉ်ရွေးချယ်မှုများကို ဘိလပ်မြေ ထုတ် လုပ်သည့် နည်းပညာအပေါ်တွင် အခြေခံကာ စဉ်းစားခဲ့ပြီး ထည့်သွင်းစဉ်းစားချက်များတွင် ယေဘူယျသဘော ဖော်ပြချက်၊ လည်ပတ်နှုန်း၊ တပ်ဆင်ခြင်း၊ လုပ်ငန်းလည်ပတ်ရန်လွယ်ကူသက်သာမှု၊ လည်ပတ်ရန် ကုန်ကျစ ရိတ်၊ ပြင်ဆင်ထိန်းသိမ်းရန် လွယ်ကူမှု နှင့် ကုန်ကျစရိတ်၊ စွမ်းအင်သုံးရာတွင် သက်သာမှု၊ အသုံးကျယ်ပြန့်မှု၊ အဆင့် ဂုမြင့်တင်သုံးစွဲနိုင်မှု စသည့် ဘိလပ်မြေထုတ်လုပ်သည့် စက်ရုံလည် ပတ်ရာတွင် ၎င်းတို့ကို တပ်ဆင်အသုံးပြုရခြင်း၏ အားသာချက်များ ပါဝင်ပါသည်။

MCL ဘိလပ်မြေထုတ်လုပ်မည့် နှိုင်းယှဉ်ရွေးချယ်ခဲ့သော အဓိက စက်ပစ္စည်းများမှာ အောက်ပါအတိုင်းဖြစ်ပါ သည်။

၁) Raw Mill (Vertical Roller Mill)

ကြိုရွေးချယ်မှုသည် ဘိလပ်မြေစက်ရုံ၏ကုန်ကြမ်းများကြိတ်ခွဲရာတွင် စွမ်းအင်အားသက်သာပြီး နောက် ဆုံးပေါ်နည်းပညာကို သုံးထားခြင်း စသော အချက်များပေါ်တွင် အခြေခံခဲ့ပါသည်။

[4] https://wecivilengineers.wordpress.com/2018/03/28/difference-between-wet-and-dry-process-of-cement/

၂) Cement Mill (Roller Press +Tube Mill)

ေလထုဖိအားသံုး က်ိတ္ခြဲစက္မ်ားသည္ ဂ်ပ္ဆြန္ဳစံ က်ိတ္ခြဲစက္မ်ားႏွင့္ စြမ္းအင္ျမင့္ အရာဝတၳဳမ်ားကို ေလဖိ အားသံုးခြဲျခားေပးႏိုင္ေသာစက္မ်ားႏွင့္ တြဲဖက္အသံုးျပဳႏိုင္ပါသည္။ ဤဘိလပ္ေျမစက္အမ်ိဳးအစား မ်ားသည္ စြမ္းအင္ စားအလြန္သက္သာမႈမွာ ႀကီမ်ိဳးက်ိတ္ခြဲစနစ္၏ သိသာေသာ ေကာင္းက်ိဳးတစ္ခု ျဖစ္ပါ သည္။ vertical cement mill မ်ားသည္ စြမ္းအင္စား ပိုမိုသက္သာေသာ္လည္း ဘိလပ္ေျမ ထုတ္ကုန္ အမ်ိဳးမ်ိဳးအတြက္ လည္ပတ္ရန္ ခက္ခဲၿပီး Cement Mill (Roller Press +Tube Mill) မွာ မည္သည့္ ဘိလပ္ေျမ ထုတ္ကုန္အတြက္ျဖစ္ေစ အသံုးျပဳႏိုင္မွဳမွာ အားလံုးထက္သာလြန္ေကာင္းမြန္ေသာ အခ်က္ ျဖစ္ပါသည္။ ဘိလပ္ေျမ ထုတ္ကုန္မ်ား ကြဲျပားသည့္အေလ်ာက္ ၎ တို့ကို အသံုးျပဳႏိုင္စြမ္း၊ ဂုဏ္သတၱိႏွင့္ ဝယ္ယူသံုး စြဲသူမ်ားလိုအပ္ခ်က္မွာလည္း ကြဲျပားပါသည္။ ေတာင့္တင္း ခိုင္မာ မႈႏွင့္ ျပဳျပင္ထိန္းသိမ္းရာတြင္ လည္း vertical cement mill မ်ားထက္ ေကာင္းမြန္လွ်က္ပါသည္။

၃) Clinker Cooler (Grate Cooler)

အေအးခံစက္မ်ား၏ အဓိကလုပ္ငန္းတာဝန္မွာ ေခ်ာ္ရည္ေဖ်ာ္စက္မ်ားကို စြမ္းအားျပည့္လည္ပတ္ ရန္ ကူညီေပးၿပီး ေခ်ာ္ခဲမ်ားကို cement mill အတြက္ကိုက္ေခ်ႏိုင္ေသာ သင့္ေတာ္ရာ အရြယ္အစားအထိေရာက္ ေအာင္ႀကိတ္ခြဲေပးပါသည္။ တတိယအဆင့္မ်ိဳးဆီက္ျဖစ္ေသာ stationary grate cooler မ်ားမွာ အပိုပစၥည္း လိုအပ္ခ်က္နည္းပါးျခင္း၊ အေအးဆံုးရံႈးမႈ နည္းျခင္း၊ ျပင္ဆင္ထိန္းသိမ္းမႈႏွင့္ စြမ္းအင္စာ သက္သာ ျခင္း၊ အင္ဂ်င္ သြားျခင္းမရွိပဲ အက်ိဳးမ်ားျခင္း စေသာ အားသာခ်က္မ်ားရွိပါသည္။ ၎တို့ကို Cross Bar Coolers မ်ားဟုပင္ တင္စား ထားရာတြင္ ၎တို့၏ အေဆာက္အဦသစ္မ်ားႏွင့္အံဝင္ခြင္က်ရွိျခင္း ႏွင့္ အဆင့္ဂ်မွင့္တင္ သံုးစြဲ၍ရျခင္း၊ clinker မ်ား ကို ေဘးတိုက္ေရး႕ကာသယ္ႏိုင္ျခင္း ႏွင့္ သယ္ယူရာတြင္ အဆင့္ေျမင့္ၿပီး အက်ိဳးမ်ား ျခင္း စေသာ အားသာ ခ်က္မ်ား ေၾကာင့္ ျဖစ္ပါသည္။

၄) Kiln (Pre-calciner)

Pre-calciner kiln ကို preheater cyclones ၅ ဆင့္ခံကာ တတိယမ်ိဳးဆီက္ Grate Cooler ႏွင့္အတူ တြဲကာ အသံုးျပဳထားပါသည္။ ဤတြဲစပ္မႈသည္ ဆီစားစြမ္းအင္စားသက္သာေစသည့္အျပင္ ထြက္လာေသာ စြန္႕ပစ္အပူ ဓာတ္ေငြ႕ကိုပါ စြန္႕ပစ္အပူကို အသံုးျပဳကာလည္ပတ္ေသာစနစ္ (WHG) တြင္ လွ်ပ္စစ္စြမ္းအင္ ထုတ္လုပ္မွဳအတြက္ ျပန္လည္အသံုးျပဳႏိုင္ပါသည္။ ထို႕အျပင္ ဆီစား ပါဝါစား သက္သာေလ်ာ့နည္းရံုသာမကပဲ အျခားေသာ kiln အမ်ိဳးအစားမ်ားႏွင့္ ႏိုင္းယွဥ္ပါက NO_x, CO_2, SO_x ထုတ္လႊတ္မွဳပမာဏမွာလည္း အၿမဲေလ်ာ့နည္းပါသည္။

၆.၃) ဓာတ္အားရယူမႈ ႏိုင္းယွဥ္ေရြးခ်ယ္ခ်က္

Waste Heat Power Generator (WHG): **ဤစနစ္သည္ ဘိလပ္ေျမ လုပ္ငန္းစဥ္ စြန္႕ပစ္အပူကို အသံုးျပဳကာ ၎ကိုယ္တိုင္အလိုအေလ်ာက္ ဓာတ္အားထုတ္လုပ္ေပးသည့္စနစ္ျဖစ္ပါသည္။ ၎သည္ စက္ရံု အတြက္ လိုအပ္ေသာ ဓာတ္အား၏ ၂၀ ရာခိုင္ႏွဳန္းအထိ ေထာက္ပံ့ေပးႏိုင္ပါသည္။**

ဤအျခားနည္းလမ္းတြင္ ၉ မဂၢါဝပ္ရွိေသာ Waste Heat Power Generator ကို အသံုးျပဳထားပါသည္။ Clinker Cooler ႏွင့္ the Suspension Preheater ရရွိေသာ အပူေဘတ္ေငြ႕ကို Air Quenching Cooler Boiler (AQC boiler) ႏွင့္ Suspension Preheater Boiler (SP boiler) မ်ားဆီသို႕ အသီးသီး ပို႕ ေဆာင္ေပးပါသည္။

Waste Heat Power Generator သည္ Rotary Kiln မွ စြမ္းအင္ကို ျပန္လည္ထုတ္ယူရန္ သာမ ဟုတ္ပဲ ဓာတ္အားထုတ္လုပ္မႈမွ ထြက္လာေသာ CO_2 ကဲ့သို့ေသာ Green House Gas (GHG) ထုတ္လႊတ္ မႈကိုပါ ေလ်ာ့ခ်ေစႏိုင္ပါသည္။ စြန္႕ပစ္အပူျပန္လည္အသံုးျပဳျခင္းျဖစ္သည့္ Rotary Kiln ၏ အပူႏွင့္ ေလာင္စာဆီ သံုးစြဲမႈကို မည္သည့္ထိခိုက္မႈမွ မရွိႏိုင္ပါ။

ေဆာက္လုပ္ေရးကာလတြင္ စီမံကိန္းအေနျဖင့္ ဒီဇယ္ဆီ ၄၅၀၀ KVA အထိ အသံုးျပဳရန္ ခန္႕မွန္းထားၿပီး တစ္ေန႕လွ်င္ လီတာေပါင္း ၉၀၀၀ အထိ အသံုးျပဳရပါမည္။

Waste Heat Recovery System (Maximum: 9MW, Normal Operation: 6.5 MW)

d. Boiler Specification*:* Natural Circulation Type

Suspension Preheater Boiler:

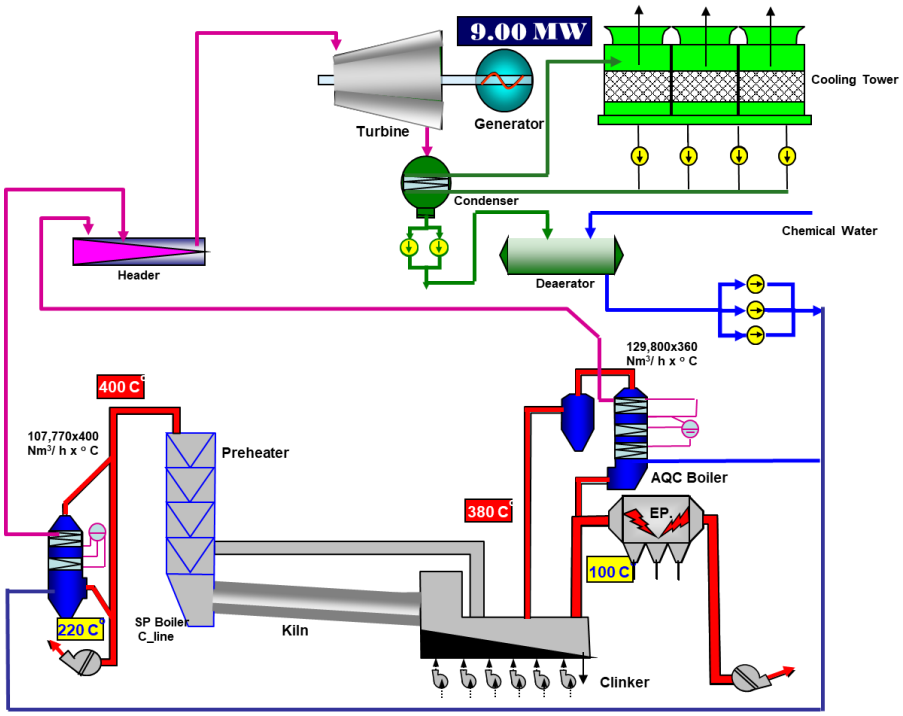
Rated Steam Generation: 26.4 tph
Rated Working Pressure: 1.6 MPa
Rated Steam Temperature: 313 °C
Inlet Flue Gas Volume: 350,000 Nm^3/h
Inlet Flue Gas Temperature: 330°C
Efficiency of Heat Recovery: 34.8%

e. Air Quenching Cooler Boiler *:*

Rated HP Steam Generation: 21.4 tph
Rated HP Steam Temperature: 1.6 MPa
Rated HP Steam Temperature: 365 °C
Rated LP Steam Generation: 3.7 tph
Rated LP Steam Temperature: 0.5 MPa
Rated LP Steam Temperature: 200 °C
Inlet Flue Gas Volume: 225,000 Nm^3/h
Inlet Flue Gas Temperature: 380°C
Efficiency of Heat Recovery: 74.5%

f. Turbo-generator Specification*:* Condensing Turbine Type

Rated Power Output: 9,000 kW
Rated Speed: 3,000 rpm
Rated Voltage: 10.5 kV
Inlet Steam Condition: 44.5 tph, 1.6 MPa, 320°C
Rotational Direction: Clockwise



ပုံ (၁၄): MCL စြန့်ပစ္စည်းသုံး ဓာတ်အားပေးစနစ် သဏ္ဌာန်ပေဖာ်ပြပုံ

၇) စီမံကိန်း ရေးဆွဲထားမှု အစီအစဉ်

ဆောက်လုပ်ချင်းအတွက် အခ်ိန် ၂ နှစ်နှင့် စက္ကစာည်းမ်ားတပ်ဆင် အစမ်းလည်ပတ်ချင်းကာလ စီမံ ကိန်း အစီအစဉ်နှင့် စက်ရုံဖြိ့စည်းထားမှု အျပင်အဆင်အား တြကာ တင်ျပထားပါသည်။

ဆောက်လုပ်ေရးကာလမာ ၂ နှစ်ျဖစ်ပီး အဆင့်ဂ်မှင့် ဆောက်လုပ်ေရးလုပ်နှ်းမ်ားအား ပုံ ၁၄ နှင့် ၁၅ တြင် ေဖာ်ျပထားပါသည်။

April 28, 2016
Limestone Crusher Test Run

May 08, 2016
Start Power Generation from Boiler

Jul 18, 2016
Coal Mill First Load Run

ပံု (၁၅): MCL ၏ ေဆာက္လုပ္ေရးႏွင့္ စက္ပစၥည္းမ်ား တပ္ဆင္မႈ အစီအစဥ္

Jul 26, 2016
Raw Mill First Load Run

Aug 12, 2016
Kiln Firing

Apr 1, 2017
Commercial run

ပံု (၁၆): စက္ရံုလည္ပတ္ခန္ တပ္ဆင္မႈ အစီအစဥ္

၈)　　ျပဌါန္းထားသည့္ ဥပေဒမူေဘာင္

၈.၁။　ျမန္မာ့ ဥပေဒမ်ားကို ျခံဳငံုသံုးသပ္ျခင္း

ျမန္မာႏိုင္ငံသည္ ၂၀၁၅ ခုႏွစ္ ဒီဇင္ဘာလ ၂၉ ရက္ေန႕တြင္ ပတ္ဝန္းက်င္ ထိခိုက္မႈဆန္းစစ္ျခင္း လုပ္ထံုးလုပ္ နည္းမ်ား (EIA) ကို ျပဌါန္းခဲ့ၿပီး ထိုအတြက္ လိုအပ္ခ်က္မ်ားကို သတ္မွတ္ေဖာ္ျပရာတြင္ *"ပတ္ဝန္းက်င္ ထိခိုက္မႈ ဆန္းစစ္ျခင္းအတြက္ စံုစမ္းစစ္ေဆးရာတြင္ ေလ့လာမႈ ဧရိယာ၏ သက္ရွိ ဇီဝဆိုင္ရာ၊ ရုပ္ဝတၳဳ ဆိုင္ရာ၊ လူမႈေရး၊ စီးပြားေရး၊ က်န္းမာေရး၊ ယဥ္ေက်းမႈႏွင့္ ပတ္ဝန္းက်င္ ရႈခင္းရႈကြက္ အစိတ္အပိုင္းမ်ားႏွင့္ အတူ အၾကိဳ တည္ေဆာက္ေရး လုပ္ငန္းေဆာင္ရြက္ျခင္း၊ တည္ေဆာက္ျခင္း၊ လုပ္ငန္းလည္ပတ္ျခင္း၊ လုပ္ငန္းရပ္စဲျခင္း၊ ပိတ္သိမ္းျခင္းႏွင့္ လုပ္ငန္းပိတ္သိမ္းျပီး ေနာက္ပိုင္း စသည့္ စီမံကိန္းလုပ္ငန္း အဆင့္အားလံုး ေဆာင္ရြက္စဥ္ အတြင္း စီမံကိန္းေၾကာင့္ ထိခိုက္ေသာ ေျမအသံုးခ်မႈ၊ အရင္းအျမစ္ အသံုးျပဳမႈ၊ ေျမပိုင္ဆိုင္မႈႏွင့္ ေျမႏွင့္ အျခား အရင္းအျမစ္ဆိုင္ရာ အခြင့္အေရးတို႔ အပါအဝင္ ပတ္ဝန္းက်င္၊ အမ်ားျပည္သူႏွင့္ လူမႈ အဖြဲ႔အစည္းႏွင့္ သက္ဆိုင္ေသာ ဥပေဒေရးရာ ကိစၥမ်ားကိုလည္း ထည့္သြင္း စဥ္းစားရမည္။ ထို႔အျပင္ စီမံကိန္းမွ ေပၚေပါက္လာႏိုင္ေသာ ဆိုးက်ိဳးသီက်ေရာက္မႈမ်ားႏွင့္ ေဘးအႏၱရာယ္ ရွိမႈ တို႔ကို ဆန္းစစ္သံုးသပ္ေပးရမည္။"*

၈.၂)　ပတ္ဝန္းက်င္ ထိခုိက္မႈ ဆန္းစစ္ျခင္း လုပ္ငန္းစဥ္ အတြက္ ကြဲျပားသည့္ အဆင့္ ၃ဆင့္ကို ေအာက္ပါ က႑မ်ားတြင္ ေဖာ္ျပထားပါသည္။

- စိစစ္ျခင္း အဆင့္
- နယ္ပယ္ဆြဲျခင္းတာ သတ္မွတ္ျခင္း အဆင့္
- ပတ္ဝန္းက်င္ ထိခိုက္မႈ ဆန္းစစ္ျခင္း အတြက္ စံုစမ္းစစ္ေဆးျခင္းႏွင့္ အစီရင္ခံစာ ျပင္ဆင္ျခင္း

၁)　စိစစ္ျခင္း အဆင့္

ပတ္ဝန္းက်င္ ထိခိုက္မႈ ဆန္းစစ္ျခင္း လုပ္ငန္းစဥ္မွာ စိစစ္ျခင္း လုပ္ငန္းစဥ္ျဖင့္ စတင္ပါသည္။ သဘာဝ ပတ္ဝန္းက်င္ ထိန္းသိမ္းေရးႏွင့္ သစ္ေတာေရးရာ ဝန္ၾကီးဌာန (ယခု သယံဇာတႏွင့္ သဘာဝပတ္ဝန္းက်င္ထိန္းသိမ္း ေရးဝန္ၾကီးဌာန) သည္ စီမံကိန္းကို ပဏာမ စိစစ္ျခင္းဆိုင္ရာစံမ်ား သတ္မွတ္ျခင္း လုပ္ပိုင္ခြင့္ ကို ေဆာင္ရြက္ႏုိင္ ပါသည္။ မည္သည့္ စီမံကိန္း သို႔မဟုတ္ လုပ္ငန္းမ်ားသည္ ကနဦးပတ္ဝန္းက်င္ ဆန္းစစ္ျခင္း သို႔မဟုတ္ ပတ္ဝန္းက်င္ ထိခိုက္မႈ ဆန္းစစ္ျခင္းကို ေဆာင္ရြက္သင့္သည္ စသျဖင့္ လမ္းၫြန္ခ်က္တြင္ စီစဥ္ေဖာ္ျပထားပါသည္။ ယင္းဆံုး ျဖတ္ခ်က္အရ ကနဦးပတ္ဝန္းက်င္ ဆန္းစစ္ျခင္း သို႔မဟုတ္ ပတ္ဝန္းက်င္ ထိခိုက္မႈဆန္းစစ္ျခင္းကို ေဆာင္ရြက္ရန္ လိုအပ္ပါက စီမံကိန္းအဆိုျပဳသူသည္ ယင္းအတြက္ ခြင့္ျပဳခ်က္ရယူ ျခင္းႏွင့္ အဆိုျပဳ စီမံကိန္းႏွင့္ သင့္ေလ်ာ္သည့္ ပတ္ဝန္းက်င္ စီမံခန္႔ခြဲမႈ အစီအစဥ္ကို အေကာင္အထည္ ေဖာ္ေဆာင္ျခင္းကို ၾကိဳတင္ျပင္ဆင္ရမည္ ျဖစ္ပါသည္။

ထို႕ေၾကာင့္ ထံုးေက်ာက္ထုတ္လုပ္သည့္ စီမံကိန္းတြင္ ေျမႏွင့္အရင္းအျမစ္မ်ား အသံုးခ်မႈ ေၾကာင့္ သက္ရွိ ဝန္းက်င္ႏွင့္ ပတ္ဝန္းက်င္ ရႈခင္းရႈကြက္မ်ားေပၚတြင္ ထိခိုက္မႈျဖစ္ေစႏိုင္ၿပီး မိုင္းခြဲျခင္း၊

စက္သံယာဥ္ သံမ်ား ဆူညံျခင္း အစရွိေသာ သတၱိတြင္းလုပ္ငန္းစဥ္မ်ားေၾကာင့္ ယဥ္ေက်းမႈ ႏွင့္ လူမႈေရးဆိုင္ရာ ထိခိုက္မႈ မ်ား၊ ထံုးေက်ာက္ထုတ္လုပ္ မႈမွ လြင့္လာေသာ အမႈန္မ်ားေၾကာင့္ေလအရည္အေသြးအေပၚ ထိခိုက္မႈ အစရွိ သည္မ်ား ဆက္စပ္ျဖစ္ေပၚလာႏိုင္ပါ သည္။ ထို႕ေၾကာင့္ ထံုးေက်ာက္ထုတ္လုပ္မႈ လုပ္ငန္းစဥ္အတြက္ ပတ္ဝန္းက်င္ထိခိုက္မႈဆန္းစစ္ျခင္းအတြက္ စံုစမ္းစစ္ေဆးဖို႕ရန္လိုအပ္ေၾကာင္း ခိုင္မာစြာ အဆိုျပဳအပ္ပါ သည္။

၂) နယ္ပယ္ဆိုင္းတာ သတ္မွတ္ျခင္း အဆင့္

ပတ္ဝန္းက်င္ ထိခိုက္မႈ ဆန္းစစ္ျခင္း ျပဳလုပ္ရန္ လုိအပ္သည့္ စီမံကိန္း အမ်ိဳးအစားအားလံုးသည္ ပတ္ဝန္းက်င္ ထိခိုက္မႈ ဆန္းစစ္ျခင္းဆိုင္ရာ နယ္ပယ္ တုိင္းတာ သတ္မွတ္ျခင္းကို ေဆာင္ရြက္ရန္ လိုအပ္ပါ သည္။ စီမံကိန္း အဆိုျပဳသူသည္ ပတ္ဝန္းက်င္ ထိခိုက္မႈ ဆန္းစစ္ျခင္းအတြက္ နယ္ပယ္ဆိုင္းတာ သတ္မွတ္ ျခင္းႏွင့္ ဆန္းစစ္ျခင္း ေဆာင္ရြက္ရမည့္ လုပ္ငန္းတာဝန္မ်ား သတ္မွတ္ျခင္းကို ကၽြမ္းက်င္မႈဆိုင္ရာနည္းလမ္းျဖင့္ ေဆာင္ရြက္ ရန္ႏွင့္ ဤလုပ္ထံုးလုပ္နည္းႏွင့္ သယံဇာတႏွင့္ သဘာဝပတ္ဝန္းက်င္ ထိန္းသိမ္းေရး ဝန္ၾကီးဌာနက ထုတ္ျပန္ထား ေသာ သို႔မဟုတ္ သတ္မွတ္ထားေသာ သက္ဆိုင္ရာ လမ္းညႊန္ခ်က္မ်ားႏွင့္ အညီ ေဆာင္ရြက္ရမည္။

စီမံကိန္း အဆိုျပဳသူသည္ နယ္ပယ္ဆိုင္းတာ သတ္မွတ္ျခင္း၏ အစိတ္အပိုင္း တစ္ရပ္အျဖစ္ အမ်ားျပည္ သူ ႏွင့္ တိုင္ပင္ေဆြးေႏြးျခင္းႏွင့္ အမ်ားျပည္သူ ပူးေပါင္းပါဝင္ျခင္းဆိုင္ရာ ေအာက္ပါ တိုင္ပင္ ေဆြးေႏြးမႈ လုပ္ငန္းစဥ္ကို ေဆာင္ရြက္ရမည္။

- *အဆိုျပဳထားသည့္ စီမံကိန္းဆိုင္ရာ သတင္း အခ်က္အလက္မ်ားကို အမ်ားျပည္သူႏွင့္ လူမႈအဖြဲ႕အစည္းမ်ား က သိရွိႏိုင္ရန္ စီမံကိန္း ေနရာမ်ားတြင္ အမ်ားျပည္သူ ျမင္ေတြ႕ႏုိင္သည့္ ဆိုင္းဘုတ္မ်ားႏွင့္ ေၾကာ္ျငာသင္ပုန္းမ်ား ထင္ရွားစြာ စိုက္ထူျခင္း အပါအဝင္ ျပည္သြင္း မီဒီယာမ်ားမွ ထုတ္ေဖာ္ျခင္း၊*
- *ေဒသခံလူ အဖြဲ႕အစည္းမ်ား၊ စီမံကိန္းေၾကာင့္ အဓိက ထိခိုက္ခံစားရမည့္သူမ်ား၊ ေဒသဆိုင္ရာ အုပ္ခ်ဳပ္ေရး အဖြဲ႕အစည္းမ်ား၊ ရပ္ရြာ အေျချပဳ အဖြဲ႕အစည္းမ်ား၊ လူမႈ အဖြဲ႔အစည္းမ်ားႏွင့္ လိုအပ္ သည့္ တိုင္ပင္ ေဆြးေႏြးပြဲမ်ားကို ဝန္ၾကီးဌာနက အၾကံျပဳသည့္ အတိုင္း စီစဥ္ျပဳလုပ္ျခင္း။*

စီမံကိန္း အဆိုျပဳသူသည္ နယ္ပယ္ဆိုင္းတာသတ္မွတ္ျခင္း အစီရင္ခံစာႏွင့္ ပတ္ဝန္းက်င္ဆိုင္ရာ ထိခိုက္မႈ ဆန္းစစ္ျခင္းဆုိင္ရာ စံုစမ္းစစ္ေဆးျခင္း အတြက္ ေဆာင္ရြက္မည့္လုပ္ငန္း တာဝန္မ်ားကိုျပဳစုရမည္။ ျပဳစုျပီး နယ္ပယ္ တိုင္းတာ သတ္မွတ္ျခင္း အစီရင္ခံစာႏွင့္ ေဆာင္ရြက္မည့္ လုပ္ငန္းတာဝန္မ်ားကို သံုးသပ္ခ်က္ျပဳ ေပးႏိုင္ရန္ သယံဇာတႏွင့္ သဘာဝ ပတ္ဝန္းက်င္ ထိန္းသိမ္းေရးဝန္ၾကီးဌာနသို႔ တင္ျပရမည္။

၃) ပတ္ဝန္းက်င္ ထိခုိက္မႈ ဆန္းစစ္ျခင္းအတြက္ စံုစမ္းစစ္ေဆးျခင္းႏွင့္ အစီရင္ခံစာ ျပင္ဆင္ျခင္း

စီမံကိန်း အဆိုပြုသူသည် ပတ်ဝန်းကျင် ထိခိုက်မှု ဆန်းစစ်ချင်းအတြက် ဆိုးက်ိုးသီက်ေရာကမှု အားလံုးကို သင့်တင့်ြစွာစံုစမ်းစစ်ေဆးမှုပြုရန် လုပ်ငန်းတာဝန်ခံနှင့်အညီ ေဆာက်ြရွက်ပါမည်။ ပတ်ဝန်းက်ငိုခိမှု ဆန်းစစ် ချင်းအတြက် စံုစမ်းစစ်ေဆးရာတြင် ေလ့လာမှုဧရိယာ၏ သက်ရှိ ဇီဝဆိုင်ရာ၊ ရုပ်ဝတ်ေ ဆိုင်ရာ၊ လူမှုေရး၊ စီးပြားေရး၊ က်နှ်းမာေရး၊ ယဉ်ေက်းမှုနှင့်ပတ်ဝန်းက်ငှ်းခင်းရှုကြက် အစိတ်အပိုင်းမ်ားနှင့်အတူ အဖွကိဳေဆာက်လုပ်ေရးလုပ်ငန်း ေဆာင်ရွက်ချင်း၊ တည်ေဆာက်ချင်း၊ လုပ်ငန်းလည်ပတ်ချင်း၊ လုပ်ငန်းရပ်စဲချင်း၊ ပိတ်သိမ်းချင်းနှင့် လုပ်ငန်းပိတ်သိမ်း ပြီး ေနာက်ပြင်း စသည့် စီမံကိန်း လုပ်ငန်းအဆင့်အားလံုး ေဆာင်ရွက်ခဲ့တြင်း စီမံကိန်းေဖွကာင့် ထိခိုက်ေသာ ေပြမ အသံုးခ်မှ၊ အရင်းအြမစ် အသံုးပြုမှ၊ ေပြမပိုင် ဆိုင်မှုနှင့် ေပြမှုနှင့် အျခားအရင်းအြမစ်ဆိုင်ရာ အခြင့်အေရးတို့ အပါအဝင် ပတ်ဝန်းက်ငှ်၊ အမ်းပြည်သူနှင့် လူမှုအဖြွ့ အစည်းနှင့် သက္ဆုိင်ေသာ ဥပေဒေရးရာ ကိစ်မ်းကိုလည်း ထည့်သြင်း စဉ်းစား ရမည်။ ထို့အျပင် စီမံကိန်း ေပၚေပါက်လာနုိင်ေသာဆိုးက်ိုသီက်ေရာကမှုမ်းအတြက် ပတ်ဝန်းက်ငှ် ထိခိုက်မှ ၊ လူမှုေရး ထိခုိက်မှုနှင့် လိုအပ်ပါက က်နှ်းမာေရး ထိခိုက်မှုတို့ကို ဆန်းစစ်သံုး သပ္ပမည်။

အိမ္ယာေျပာင်းေရြ့ရမှ သို့မဟုတ် တုိင်းရင်သား မ်ိုးနွယ်စုမ်ား အေပၚ သက်ေရာကမှု ရှိုးိုင်ေသာ စီမံ ကိန်းမ်ားဆိုင်ရာ သီးသန့် ကိစ်မ်းနှင့် စပ်လျဉ်း၍ ပတ်ဝန်းက်ငှ် ထိခိုက်မှ ဆန်းစစ်ချင်းဆိုင်ရာ လုပ်ထံုး လုပ်နည်းတြင် ထုတ်ျပန်ထားချင်း မရှိပါ။ အဆိုပါ စီမံကိန်းမ်ားသည် သက်ဆိုင်ရာ ဝန်ကီးဌာနမ်ားက သီးျခား ထုတ်ျပန်ထားသည့် လုပ်ထံုးလုပ်နည်းမ်ားကို လိုက်နာေဆာင်ရွက်ရမည်။ ယင်းသို့ သီးျခားလုပ်ထံုးလုပ်နည်းမ်ားမရှိလ်ငှ် ဆးၚမပါ ေသာ ေနရာေျပာင်းေရြ့ရမှုးနှင့် တိုင်းရင်းသား မ်ိုးနွယ်စုဆိုင်ရာ အျပည်ျပည်ဆိုင်ရာ အေလ့အက်င့်ေကာင်းမ်ားကို လိုက်နာ ေဆာင်ရွက်ရမည်။

စီမံကိန်း အဆိုပြုသူသည် ျပည်ေထာင်စု အစိုးရအဖြွ့ကျဖစ်ေစ သယံဇာတနှင့် သဘာဝ ပတ်ဝန်းက်ငှ် ထိန်းသိမ်းေရး ဝန်ကီးဌာနကျဖစ်ေစ အတည်ပြုထားေသာ သက်ဆိုင်ရာ အမ်ိုသီား စံခ်ိန်စံြညွှန်း သို့မ ဟုတ် အျပည်ျပည်ဆိုင်ရာ စံခ်ိန် စံြညွှန်းကို လည်းေကာင်း၊ ယင်းအမ်ိုသီား စံခ်ိန်စံြညွှန်း သို့မဟုတ် ခ်မှတ် ထားေသာ အျပည်ျပည်ဆိုင်ရာ စံခ်ိန်စံြညွှန်းမရှိပါက ဝန်ကီးဌာနက သေဘာတူထားေသာ စံခ်ိန်စံြညွှန်း မ်ားကို လည်း ေကာင်း အသံုးပြုခ်ငှ်း သို့မဟုတ် လိုက်နာခ်ငှ်းနှင့် ကိုးကားခ်ငှ်းပြုရမည်။

ပတ်ဝန်းက်ငှ် ထိခိုက်မှ ဆန်းစစ်ချင်းတြင် စီမံကိန်းေဖွကာင့် ထိခိုက်ခံစားရသူမ်ား၊ လူမှုအဖြွ့အစည်း မ်ားနှင့် ပုဂိလ် တစ်ဦးခ်ငှ်းစီ သို့မဟုတ် စီမံကိန်းတြင် အက်ိုသီက်ဆိုင်သူမ်ား၏ အျမင်၊ အေလးထား မှုနှင့် သေဘာထားမ်ားကို ထည့်သြင်း စဉ်းစားရမည်။ ပတ်ဝန်းက်ငှ် ထိခိုက်မှု ဆန်းဆစ်ချင်းတြင် အမ်းပြည် သူနှင့် တိုင်ငှ် ေဆြးေးြေးချင်း၏ ရလာဒ်မ်း၊ ထိခုိက်ခံစားရသည့် အမ်းပြည်သူနှင့် အျခားသက်ဆိုင်သူမ်း၏ ပတ်ဝန်းက်ငှ်းနှင့် လူမှုေရးဆိုင်ရာ ျပဿနာမ်း ပါဝင်ရမည်။ ပတ်ဝန်းက်ငှ် အေပၚ သက်ေရာကမှုမ်းကို ဆန်း စစ်ချင်း၊ ဆိုးက်ိုး သက်သာ ေလ့်နည်းေစသည့် အေရးယူ ေဆာင်ရွက်ခ်မ်းကို ဒီဇိုင်းေရးဆြဲချင်း ှနှင့် ေစာင့် ဖွကပ္ခ်ကည့်ရှုမည့် သတ်မှတ်ခ်မ်း ေရြးခ်ယ်ချင်းတို့တြင် တိုင်ငှ်ေဆြးေးြေးမှုမ်းမွ ထြက်ေပၚလာ သည့် စိုးရိမ် ေဖွကာင့်ဖွကမှုမ်းကို ထည့်သြင်း စဉ်းစားရမည်။

သယံဇာတနှင့် သဘာဝ ပတ်ဝန်းက်ငှ် ထိန်းသိမ်းေရး ဝန်းဖွကီးဌာနသည် အစီရင်ခံစာ တင်ြွင်းပြီး ၁၀ ရက် အတြင်း ပတ်ဝန်းက်ငှ် ထိခိုက်မှ ဆန်းစစ်ချင်း အစီရင်ခံစာကို လူမှု အဖြွ့အစည်း၊ စီမံကိန်း ေဖွကာင့် ထိခုိက်ခံ စားရသူမ်း၊ သက်ဆိုင်ရာ အစိုးရအဖြွ့အစည်းမ်ားနှင့် အျခား အက်ိုသီက်ဆိုင်သူမ်း သိရှိုိုင်ရန်

ထုတ္ေဖာ္ ေၾကညာ ရမည္။ သယံဇာတႏွင့္ သဘာဝ ပတ္ဝန္းက်င္ ထိန္းသိမ္းေရး ဝန္းၾကီးဌာန သည္ ပတ္ဝန္းက်င္ ထိခိုက္မႈ ဆန္းစစ္ျခင္း အစီရင္ခံစာကို သေဘာထား မွတ္ခ်က္ႏွင့္ ေထာက္ခံခ်က္ အတြက္ စိစစ္သံုးသပ္ႏိုင္ရန္ ပတ္ဝန္းက်င္ ထိခိုက္မႈ ဆန္းစစ္ျခင္း အစီရင္ခံစာ စိစစ္ သံုးသပ္ေရး အဖြဲ႕သို႔ ေပးပို႔ရ မည္။ အမ်ိဳးသား အဆင့္ႏွင့္ တုိင္းေဒသၾကီး/ ျပည္နယ္/ နယ္ေျမ အဆင့္တြင္ စီမံကိန္း အဆိုျပဳသူက အမ်ားျ ပည္သူႏွင့္ တိုင္ပင္ေဆြးေႏြးပြဲမ်ား က်င္းပရန္ႏွင့္ ယင္းေဆြး ေႏြးပြဲမ်ားတြင္ ပတ္ဝန္းက်င္ ထိခိုက္မႈ အစီရင္ခံစာကို တင္ျပရန္ စီမံ ကိန္း အဆိုျပဳသူအား ညြန္ၾကားရမည္။ ပတ္ဝန္းက်င္ ထိခိုက္မႈ ဆန္းစစ္ျခင္း အစီရင္ခံစာစိစစ္သံုးသပ္ေရးအဖြဲ႕၏ သေဘာထား မွတ္ခ်က္ႏွင့္ ေထာက္ခံခ်က္ မ်ား အပါအဝင္ လက္ခံရရွိေသာ သေဘာထား မွတ္ခ်က္ႏွင့္ အၾကံျပဳခ်က္အားလံုးကို သယံဇာတႏွင့္ သဘာဝ ပတ္ဝန္း က်င္ထိန္းသိမ္းေရးဝန္ၾကီးဌာနမွ စုစည္းသံုးသပ္၍ ပတ္ဝန္းက်င္ ထိခိုက္မႈ ဆန္းစစ္ျခင္း အစီရင္ခံစာ ခြင့္ျပဳခ်က္ကို အျပီးသတ္ ဆံုးျဖတ္ခ်က္မွတ္မည္ ျဖစ္ပါ သည္။

သယံဇာတႏွင့္ သဘာဝ ပတ္ဝန္းက်င္ ထိန္းသိမ္းေရးဝန္ၾကီးဌာနသည္ ပတ္ဝန္းက်င္ ထိခုိက္မႈဆန္းစစ္ျခင္း အစီရင္ခံစာကို လက္ခံရရွိျပီး ရက္ေပါင္း ၉၀ အတြင္း ယင္း၏ အျပီးသတ္ ဆံုးျဖတ္ခ်က္ကို ခ်ရမည္။ အမ်ားျပည္သူႏွင့္ တိုင္ပင္ေဆြးေႏြးျခင္း လုပ္ငန္းစဥ္အပါအဝင္ ပတ္ဝန္းက်င္ထိခုိက္မႈဆန္းစစ္ျခင္း အစီရင္ခံစာ ထုတ္ေဖာ္ေၾကညာျခင္း ႏွင့္ သံုးသပ္ျခင္းလုပ္ငန္းစဥ္ျပီးေျမာက္ေရးအတြက္ ကုန္က်ခဲသည့္ ကုန္က်စရိတ္အားလံုးကို စီမံကိန္း အဆိုျပဳသူက က်ခံရမည္။ ပတ္ဝန္းက်င္ ထိခုိက္မႈ အစီရင္ခံစာကို စိစစ္သံုးသပ္ျပီးပါက သယံဇာတႏွင့္ သဘာဝပတ္ဝန္းက်င္ထိန္း သိမ္းေရး ဝန္းၾကီးဌာနသည္ ပတ္ဝန္းက်င္ထိန္းသိမ္းေရးဆိုင္ရာ လိုက္နာေဆာင္ရြက္မႈ သက္ေသခံလက္မွတ္ ထုတ္ ေပးရမည္ သို႔မဟုတ္ ပတ္ဝန္းက်င္ ထိခိုက္မႈ အစီရင္ခံစာအား ျငင္းပယ္ေၾကာင္း ဆံုးျဖတ္ခ်က္ကို စီမံကိန္း အဆိုျပဳ သူထံ အေၾကာင္းၾကားရမည္။ ယင္း၏ ဆံုးျဖတ္ခ်က္ကို အမ်ားျပည္သူသိရွိရန္ ထုတ္ျပန္ ေၾကညာရမည္။

၈.၃။ နိဒါန္းတကာ စံခ်ိန္စံညႊန္းမ်ားႏွင့္ လက္ေတြ႕က်ေသာ လမ္းညႊန္မႈမ်ား

ပတ္ဝန္းက်င္ဆုိင္ရာႏွင့္ လူမႈဝန္းက်င္ဆိုင္ရာ ထိခိုက္မႈဆန္းစစ္ျခင္း အစီရင္ခံစာတြင္ လက္ေတြ႕ အသံုးျပဳ၍ ရေသာ အိမ္ရွင္ႏုိင္ငံဥပေဒမ်ားအျပင္ ေအာက္ေဖာ္ျပပါႏုိင္ငံတကာ စံခ်ိန္စံညႊန္းမ်ားႏွင့္ လမ္းညႊန္မႈမ်ားကို အတိအ လင္းကိုးကား၍ စီမံကိန္းေၾကာင့္ထိခိုက္မႈမ်ားႏွင့္ ေလ်ာ့နည္းသက္သာေစမည့္ နည္းလမ္းမ်ား ကို တင္ျပထားပါသည္။

- *ႏိုင္ငံတကာဘဏ္ေရး* ေကာ္ပိုေရးရွင္း၏ စံခ်ိန္စံညႊန္းမ်ား - Performance Standards (2012);
- *စီမံကိန္းတြင္ အသံုးခ်မည့္ ပတ္ဝန္းက်င္၊ က်န္းမာေရး ႏွင့္ေဘးကင္းမႈ အေထြေထြ လမ္းညႊန္ခ်က္မ်ား အပါ အဝင္ ကမၻာဘဏ္ အုပ္စု၏ ပတ္ဝန္းက်င္၊ က်န္းမာေရး ႏွင့္ ေဘးကင္းမႈ လမ္းညႊန္ခ်က္မ်ား*
- (World Business Council for Sustainable Development (WBCSD) *မွ ျပဳလုပ္ထားေသာ* Cement Sustainability Initiatives (CSI) ဘိလပ္ေျမစက္ရံုအတြက္ ပတ္ဝန္းက်င္ ႏွင့္ လူမႈဝန္းက်င္ဆိုင္ရာ ထိခိုက္မႈဆန္း စစ္ျခင္းအတြက္ လမ္းညႊန္ခ်က္မ်ား

၈.၄။ ႏိုင္ငံတြင္း ျပဌာန္းထားေသာ ဥပေဒႏွင့္ လိုက္နာရမည့္ လမ္း၊ွန္ခ်က္မ်ား

စီမံကိန္း ပိုင္ရွင္ျဖစ္သူ MCL သည္ စီမံကိန္းႏွင့္သက္ဆိုင္ေသာ ေဖာ္ျပပါ ႏိုင္ငံဥပေဒမ်ားအားလံုးကို ေလးစား လိုက္နာပါမည္။ လက္ရွိစီမံကိန္းႏွင့္သက္ဆိုင္သည့္ လိုက္နာေဆာင္ရြက္ရမည့္ ဥပေဒႏွင့္ လမ္း၊ွန္ခ်က္မ်ား ကို ေအာက္ပါအတိုင္း စာရင္းျပဳစုထားရွိပါသည္။

၁။ အမ်ိဳးသားပတ္ဝန္းက်င္ မူဝါဒ (၁၉၉၄)
၂။ ျပည္ေထာင္စုသမၼတ ျမန္မာႏိုင္ငံေတာ္ ဖြဲ႔စည္းပံု အေျခခံ ဥပေဒ (၂၀၀၈)
၃။ ပတ္ဝန္းက်င္ထိန္းသိမ္းေရး ဥပေဒ(၂၀၁၂)
၄။ ေရွးေဟာင္းအေဆာက္အအံုမ်ားကာကြယ္ ထိန္းသိမ္းေရး ဥပေဒ (၂၀၁၅)
၅။ ပတ္ဝန္းက်င္ထိန္းသိမ္းေရး နည္းဥပေဒ (၂၀၁၄)
၆။ ပတ္ဝန္းက်င္ထိခိုက္မႈဆန္းစစ္ျခင္းဆိုင္ရာလုပ္ထံုးလုပ္နည္း(၂၀၁၅)
၇။ ျမန္မာႏိုင္ငံ ရင္းႏွီးျမွဳပ္ႏွံမႈ ဥပေဒ (၂၀၁၆)
၈။ တိုင္းရင္းသား လူမ်ိဳမ်ား၏ အခြင့္အေရး ကာကြယ္ ေစာင့္ေရွာက္သည့္ ဥပေဒ (၂၀၁၅)
၉။ လွ်ပ္စစ္ဥပေဒ (၂၀၁၄)
၁၀။ ျပည္သူ႔က်န္းမာေရး ဥပေဒ (၁၉၇၂)
၁၁။ ျမန္မာႏိုင္ငံ မီးသတ္ဖြဲ႔ ဥပေဒ (၁၉၉၇)
၁၂။ ျမန္မာႏိုင္ငံ အင္ဂ်င္နီယာေကာင္စီ ဥပေဒ (၂၀၁၃)
၁၃။ ျမန္မာႏိုင္ငံ အာမခံ ဥပေဒ (၂၀၁၆)
၁၄။ စက္ရံုမ်ား အက္ဥပေဒ (၁၉၅၁)
၁၅။ ျမန္မာႏိုင္ငံ မီးသတ္ဖြဲ႔ ဥပေဒ (၂၀၁၅)
၁၆။ အလုပ္သမားေလ်ာ္ေၾကးဥပေဒ (၁၉၂၃)
၁၇။ ခြင့္ရက္ႏွင့္ အလုပ္ပိတ္ရက္ အက္ဥပေဒ (၁၉၅၁)
၁၈။ အနည္းဆံုး အခေၾကးေငြ ဥပေဒ (၂၀၁၃)
၁၉။ အလုပ္သမား အဖြဲ႔အစည္း ဥပေဒ (၂၀၁၁)
၂၀။ ေရနံ အက္ဥပေဒ (၁၉၃၄)
၂၁။ ေရနံ နည္းဥပေဒ (၁၉၃၇)
၂၂။ ဓာတုပစၥည္းႏွင့္ ဆက္စပ္စၥည္းမ်ား အႏၱရာယ္ တားဆီးကာကြယ္ေရး ဥပေဒ (၂၀၁၃)

၂၃။ ဘြိဳင်္လာ ဥပေဒ (၂၀၁၅)
၂၄။ ကူးစက်ေရာဂါမ်ား တားဆီးကာကြယ်ေရး ဥပေဒ (၁၉၉၅)
၂၅။ ေဆးလိပ်ႏွင့်ေဆးရြက္ဆကီးထြက္ပစၥည္းေသာက္သံုးမႈထိန္းခ်ဳပ္ေရး ဥပေဒ (၂၀၀၆)
၂၆။ ေမာ္ေတာ္ယာဉ္ ဥပေဒ (၂၀၁၅) ႏွင့္ နည္းဥပေဒ (၁၉၈၇)
၂၇။ ေရွးေဟာင္းဝတၳဳစာည္းမ်ား ကာကြယ္ထိန္းသိမ္းေရး ဥပေဒ (၂၀၁၅)
၂၈။ သဘာဝေဒသမ်ား ထိန္းသိမ္းေရးႏွင့္ ေတာရိုင္းတိရိစၧာန္မ်ား၊ အပင္မ်ားကာကြယ္ေရး ဥပေဒ (၁၉၉၄)
၂၉။ ယဥ္ေက်းမႈ အေမြအႏွစ္ဆိုင္ရာ ေဒသမ်ား ကာကြယ္ ထိန္းသိမ္းေရး ဥပေဒ (၁၉၉၈)
၃၀။ သစ္ေတာ ဥပေဒ (၁၉၉၂)
၃၁။ စံခ်ိန္စီညႇိနႈိင္းသတ္မွတ္ျခင္းဆိုင္ရာ ဥပေဒ(၂၀၁၄)
၃၂။ ပို႔ကုန္ ႏွင့္ သြင္းကုန္ ဥပေဒ (၂၀၁၂)
၃၃။ အလုပ္အကိုင္ ႏွင့္ ကြ်မ္းက်င္မႈ ဖြံ႔ၿဖိဳးတိုးတက္ေရး ဥပေဒ(၂၀၁၃)
၃၄။ အလုပ္သမားေရးရာ အျငင္းပြားမႈေျဖရွင္းေရး ဥပေဒ (၂၀၁၂)
၃၅။ စားသံုးသူအကာအကြယ္ေပးေရး ဥပေဒ (၂၀၁၄)
၃၆။ အျမန္လမ္းမႀကီးမ်ား ဥပေဒ (၂၀၁၅)
၃၇။ ငါးေမြးျမဴျခင္းဆိုင္ရာ ဥပေဒ (၁၉၈၉)
၃၈။ ေရခ်ိဳးဖမ္းလုပ္ငန္း ဥပေဒ (၁၉၉၁)
၃၉။ ေပါက္ကြဲေစတတ္ေသာ ပစၥည္းမ်ားဆိုင္ရာ ဥပေဒ (၁၉၀၈)
၄၀။ လူမႈဖူလံုေရး ဥပေဒ (၂၀၁၂)
၄၁။ ပတ္ဝန္းက်င္ထိန္းသိမ္းေရးႏွင့္လူမႈသက္ေရာက္မႈအကဲျဖတ္ျခင္းအတြက္လမ္းညႊန္ခ်က္မ်ား (၂၀၁၄)
၄၂။ ပတ္ဝန္းက်င္ထိန္းသိမ္းေရးႏွင့္လူမႈသက္ေရာက္မႈအကဲျဖတ္ျခင္းအတြက္လမ္းညႊန္ခ်က္မ်ား (၂၀၁၄)
၄၃။ ေရအရင္းအျမစ္ ႏွင့္ ျမစ္ေခ်ာင္းမ်ား ထိန္းသိမ္းေရး ဥပေဒ (၂၀၀၆)
၄၄။ ေျမလြတ္၊ ေျမလပ္ ႏွင့္ ေျမရိုင္းမ်ား စီမံခန္ခြဲေရး ဥပေဒ (၂၀၁၂)
၄၅။ တိုင္းရင္းသား လူမ်ိဳမ်ား၏ အခြင့္အေရး ကာကြယ္ ေစာင့္ေရွာက္သည့္ ဥပေဒ (၂၀၁၅)
၄၆။ အလုပ္သမားေလ်ာ္ေၾကးဥပေဒ (၁၉၂၃)
၄၇။ အခေၾကးေငြေပးေခ်ေရး ဥပေဒ (၂၀၁၆)
၄၈။ အမ်ိဳသီား သဘာဝပတ္ဝန္းက်င္ဆိုင္ အရည္အေသြး (ထုတ္လႊတ္မႈ) လမ္းညႊန္ခ်က္မ်ား (၂၀၁၅)
၄၉။ မြန္ျပည္နယ္ စည္ပင္သာယာေရး ဥပေဒ (၂၀၁၇)
၅၀။ The Explosive Act-1 [India Act Iv, 1884.] (1887)

၈.၅။ ပတ္ဝန္းက်င္ႏွင့္ လူမႈဝန္းက်င္ဆိုင္ရာ သက္ေရာက္မႈဆန္းစစ္ျခင္း နည္းလမ္း

လက္ရွိ အစီရင္ခံစာသည္ ပတ္ဝန္းက်င္ႏွင့္ လူမႈဝန္းက်င္ဆိုင္ ထိခိုက္မႈဆန္းစစ္ျခင္း လမ္းညႊန္ခ်က္မ်ား ကို လိုက္နာ၍ ေဆာင္ရြက္ထားၿပီး ေအာက္ပါတို႔ပါဝင္ပါသည္။

- *ရည္မွန္းခ်က္မ်ား၊ အျမင္သေဘာထားမ်ား ႏွင့္ ရည္မွန္းထားသည့္ သဘာဝအရင္းအျမစ္ အသံုးခ်မႈမ်ား အပါအဝင္ အဆိုျပဳထားသည့္ စီမံကိန္းအေၾကာင္းအရာကို ရွင္းရွင္းလင္းလင္း ပံုေဖာ္ျခင္း*
- *စီမံကိန္းအတြက္ အျခားနည္းလမ္းမ်ား ႏွင့္ သတ္မွတ္ထားေသာ ဆံုးျဖတ္ခ်က္မ်ားအား ထုတ္ေဖာ္ ျပသျခင္း*
- *စီမံကိန္းေနရာ အတြင္းတြင္ ရုပ္ပဝတၳဳဆိုင္ရာ ေနရာမ်ား၊ ပတ္ဝန္းက်င္အေျခအေန ျဖစ္တည္မႈ၊ လူမႈေရးရာ ႏွင့္ စီပြားေရးဆိုင္ရာ ျပသနာရပ္မ်ားပါဝင္ေသာ ပကတိအေျခအေနေဖာ္ျပခ်က္*
- *အဆိုျပဳထားေသာ စီမံကိန္း ၿပီးေျမာက္ေအာင္ ေဆာင္ရြက္ရာတြင္ ဥပေဒ၊ မူဝါဒ ႏွင့္ အဖြဲ႔အစည္း ဆိုင္ရာ မူေဘာင္မ်ား ထုတ္ေဖာ္ခ်က္*
- *စီမံကိန္းရွိေနသည့္ ေနရာမ်ား၏ ပတ္ဝန္းက်င္ဆိုင္ရာ၊ လူမႈဝန္းက်င္ဆိုင္ရာ ႏွင့္ စီးပြားေရးဆိုင္ရာ က႑ ရပ္မ်ား အေသးစိတ္ခြဲျခမ္းျခင္း*
- သင့္ေတာ္သည့္ ေလ်ွာ့ခ်ေရး (သို႕) ျပင္ဆင္ျခင္း နည္းလမ္းမ်ား အျပင္ ႏိုင္ငံတကာ ေငြေၾကးအဖြဲ႕ အစည္း၏ လမ္းညႊန္ခ်က္မ်ားႏွင့္ အညီေဆာင္ရြက္ထားသည့္ စီမံကိန္း လုပ္ငန္းရပ္မ်ား၊ ျဖစ္ေပၚ လာရန္ အလားအ လာရွိသည့္ သက္ေရာက္မႈမ်ားႏွင့္ ေလ်ွာ့ခ်ေရး လုပ္ငန္းမ်ားကို ကိုယ္စားျပဳေန ေသာ ပတ္ဝန္းက်င္ႏွင့္ လူမႈဝန္း က်င္ဆိုင္ စီမံခန္႔ခြဲမႈ အစီအစဥ္ကို ျပင္ဆင္ထားျခင္း

နည္းလမ္း၏ အဓိကရည္ရြယ္ခ်က္မွာ ဘိလပ္ေျမထုတ္လုပ္မႈႏွင့္ သက္ဆိုင္သည့္ တိက်ခိုင္မာစြာ ေဖာ္ထုတ္တင္ျပထားသည့္ ကိုးကားဖြယ္ စာရြက္စာတမ္းမ်ားမွရရွိေသာ သတင္းအခ်က္အလက္မ်ား၊ ကြင္းဆင္း ေလ့လာရာမွ ရရွိထားသည့္ ပကတိအေျခအေနမ်ားကို အေျခခံ၍ အဆိုျပဳထားေသာ စီမံကိန္းမွ ထြက္ေပၚလာသည့္ ထိခိုက္သက္ ေရာက္မႈမ်ားကို ခြဲျခားသတ္မွတ္ေပးရန္ ျဖစ္ပါသည္။

၁) အဆိုျပဳထားေသာ ဘိလပ္ေျမစီမံကိန္း အတြက္ MCL ၏ ပတ္ဝန္းက်င္သစ္ဆိုးမႈ မျဖစ္ေစရန္ ထိန္းသိမ္း ေဆာင္ရြက္ေရး ဖြဲ႕စည္းပံု မူေဘာင္မ်ား

လက္ရွိတရားဝင္က်င့္သံုးေနေသာ ဥပေဒ မူဝါဒ ႏွင့္ လမ္းၫြန္ခ်က္မ်ားကို လိုက္နာမည္ ျဖစ္သည့္ အျပင္ MCL ကိုယ္တိုင္ကပင္ ေရရွည္ဖြံ့ၿဖိဳးတိုးတက္ေရး မူဝါဒႏွင့္ ပတ္ဝန္းက်င္ထိန္းသိမ္းေရး လိုက္နာ ေဆာင္ရြက္ရမည့္ အစီအစဥ္မ်ား ထားရွိေဆာင္ရြက္ထားပါသည္။ အမွန္တကယ္တြင္ MCL သည္ SCG cement (Thailand) ႏွင့္ Pacific Link Cement Industry (PLCI) တို႕ ပူးေပါင္းေဆာင္ရြက္ထားသည့္ စီမံကိန္းတစ္ခုျဖစ္ပါသည္။ SCG အေနျဖင့္ စဥ္ဆက္မျပတ္ ဖြံ့ၿဖိဳးတိုးတက္ေစေရးမူဝါဒ (ISO 14001 series standards) အတိုင္း လိုက္နာေဆာင္ရြက္ခဲ့သည့္အတြက္ ေထာက္ခံခ်က္လက္မွတ္ ရရွိထားၿပီး ျဖစ္ၿပီး MCL စီမံကိန္းကို ေရရွည္ဖြံ့ၿဖိဳးတိုးတက္ေစေရးမူဝါဒ ႏွင့္ လမ္းၫြန္ခ်က္မ်ာအတိုင္း လိုက္နာကာ ထုတ္လုပ္ လည္ပတ္ေစမည္ ျဖစ္ပါသည္။

MCL ၏ေၾကျငာခ်က္ကိုလည္း ေအာက္ပါအတိုင္း ထုတ္ျပန္ထားပါသည္။

MCL
Mawlamyine Cement Limited

Announcement MCL 009/2016

SUSTAINABLE DEVELOPMENT POLICY (Safety, Environment, CSR)

Mawlamyine Cement Limited establish safety to our employees and contractors, preserve the environment and collaborate with local government and surrounding communities in order to be environmental friendly factory and be a good citizen in Mon state under corporate governance.

Mawlamyine Cement Limited has therefore implemented the Sustainable Development policy as the followings:

1. Align SCG Safety Principle to develop Safety Management Program
2. Promote safety caring culture with uncompromising on safety standard
3. Safety is everybody's accountability
4. Control air emission and noise to conform to the relevant standards by implementing Pollution Prevention and Clean Technology.
5. Reduce natural resource consumptions; increase the efficiency of energy by improving the operation to reduce the environmental impacts.
6. Improve waste management by applying 3R's (Reduce, Reuse, Recycle) management and comply with legal requirements.
7. Prevent pollution by improving operation effectiveness and efficiency and increase more green areas.
8. Coordinate with government, external organizations and communities to conserve environment and natural resources for sustainable development.
9. Increase more satisfaction from surrounding communities by implementing CSR program and stakeholder engagement program.

The Sustainable Development policy is communicated within Mawlamyine Cement Limited to make all employees understood and well implemented.

The policy, objective and target of the environmental management system are maintained, reviewed and revised at least once a year via regular Management Review meeting.

Managing Director
Mawlamyine Cement Limited
March 4, 2016

Mawlamyine Cement Limited
No.136/137, Pyay Road, Saw Bwar Gyi Gone, Insein Township, Yangon, Myanmar.

၂) MCL စီမံကိန်း၏ ပတ်ဝန်းကျင်ထိန်းသိမ်းစောင့်ရှောက်ရေး မူဝါဒ

မူဝါဒတွင် ဖော်ပြထားသည်မှာ “အလုပ်သမားထဲမှ မည်သူမဆို (SOx, NOx, Dust and Noise) အစရှိသည့် လေထုနှင့် အသံညစ်ညမ်းစေသော အရာများ၏ သတ်မှတ်ထားသော စံနှုန်းကို အလေးဂရုမပြုပဲ သတ်မှတ်စံနှုန်းထက် မြင့်တက်သွားအောင် ကျော်လွန်သွားအောင် ပြုလုပ်ပါက ကုမ္ပဏီမှ အပြစ်ပေးခြင်းကို ခံ ယူရပါ မည်။ အမြင့်ဆုံး ပြစ်ဒဏ်မှာ အလုပ်မှ ထုတ်ပယ်ခြင်း ဖြစ်ပါမည်” ဟူ၍ ဖြစ်ပါသည်။

အခြား အန္တရာယ်ကင်းရှင်းရေး အစီအမံများနှင့် အလုပ်သမားများ စီမံခန့်ခွဲမှု အစီအစဉ်များကို အခန်း (၂)၊ မူဝါဒဆိုင်ရာအခန်းတွင် ဖော်ပြထားပြီး နောက်ဆက်တွဲတွင်လည်း ထည့်သွင်းထားပါသည်။

ဇယား (၅)း ဘိလပ်ေျမထုတ္လုပ္ေရးစက္ရံုမ်ားအတြက္ ကမၻာတြင္ က်င့္သံုးေနၾကေသာ ေလထုညစ္ညမ္းမႈအဆင့္မ်ား

Pollutants	Units	Guideline Value
Particulate Matter (new kiln system)	mg/Nm^3	30[a]
Particulate Matter (Existing Kiln)	mg/Nm^3	100
Dust (Other point sources incl. clinker cooling, cement grinding)	mg/Nm^3	50
SO_x	mg/Nm^3	400
NO_x	mg/Nm^3	600
HCl	mg/Nm^3	10[b]
Hydrogen Fluoride	mg/Nm^3	1[b]
Total Organic Carbon	mg/Nm^3	10
Dioxin-furans	$mg\ TEQ/Nm^3$	0.1[b]
Cadmium & Thallium	mg/Nm^3	0.05[b]
Mercury (Hg)	mg/Nm^3	0.05[b]
Total Metals	mg/Nm^3	0.5

NOTES:

* Emissions from the kiln stack unless otherwise noted. Daily average values corrected to 273 K, 101.3 kPa, 10 percent O_2, and dry gas, unless otherwise noted.

d) 10 mg/Nm^3 if more than 40 percent of the resulting heat release comes from hazardous waste.
e) If more than 40 percent of the resulting heat release comes from hazardous waste, average values over the sample period of a minimum of 30 minutes and a maximum of 8 hours.
f) Total Metals = Arsenic (As), Lead (Pb), Cobalt (Co), Chromium (Cr), Copper (Cu), Manganese (Mn), Nickel (Ni), Vanadium (V), and Antimony (Sb)

ဇယား (၆): ထံုးႏွင့္ဘိလပ္ေျမထုတ္လုပ္ေရးစက္ရံုမ်ားအတြက္ ဖြန္႕ပစ္ေရ ညစ္ညမ္းမႈ သတ္မွတ္ခ်က္ အဆင့္မ်ား

Pollutants	Units	Guideline Value
Particulate Matter (new kiln system)	mg/Nm^3	30[a]
Particulate Matter (Existing Kiln)	mg/Nm^3	100
Dust (Other point sources incl. clinker cooling, cement grinding)	mg/Nm^3	50
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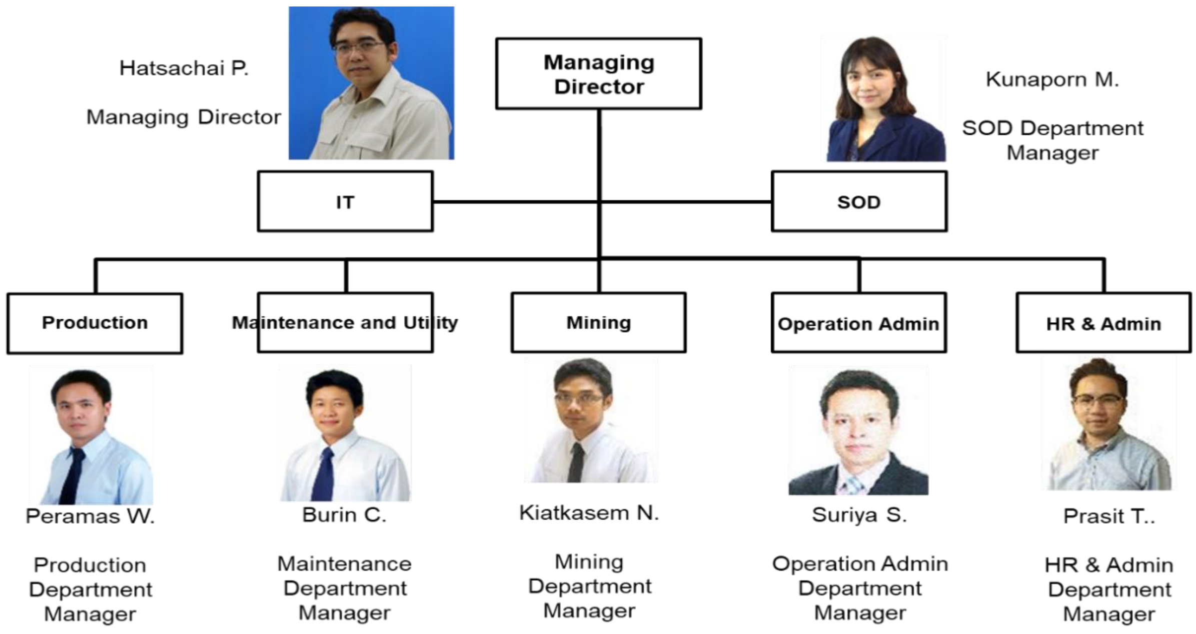
Cadmium & Thallium	mg/Nm3	0.05[b]
Mercury (Hg)	mg/Nm3	0.05[b]
Total Metals	mg/Nm3	0.5

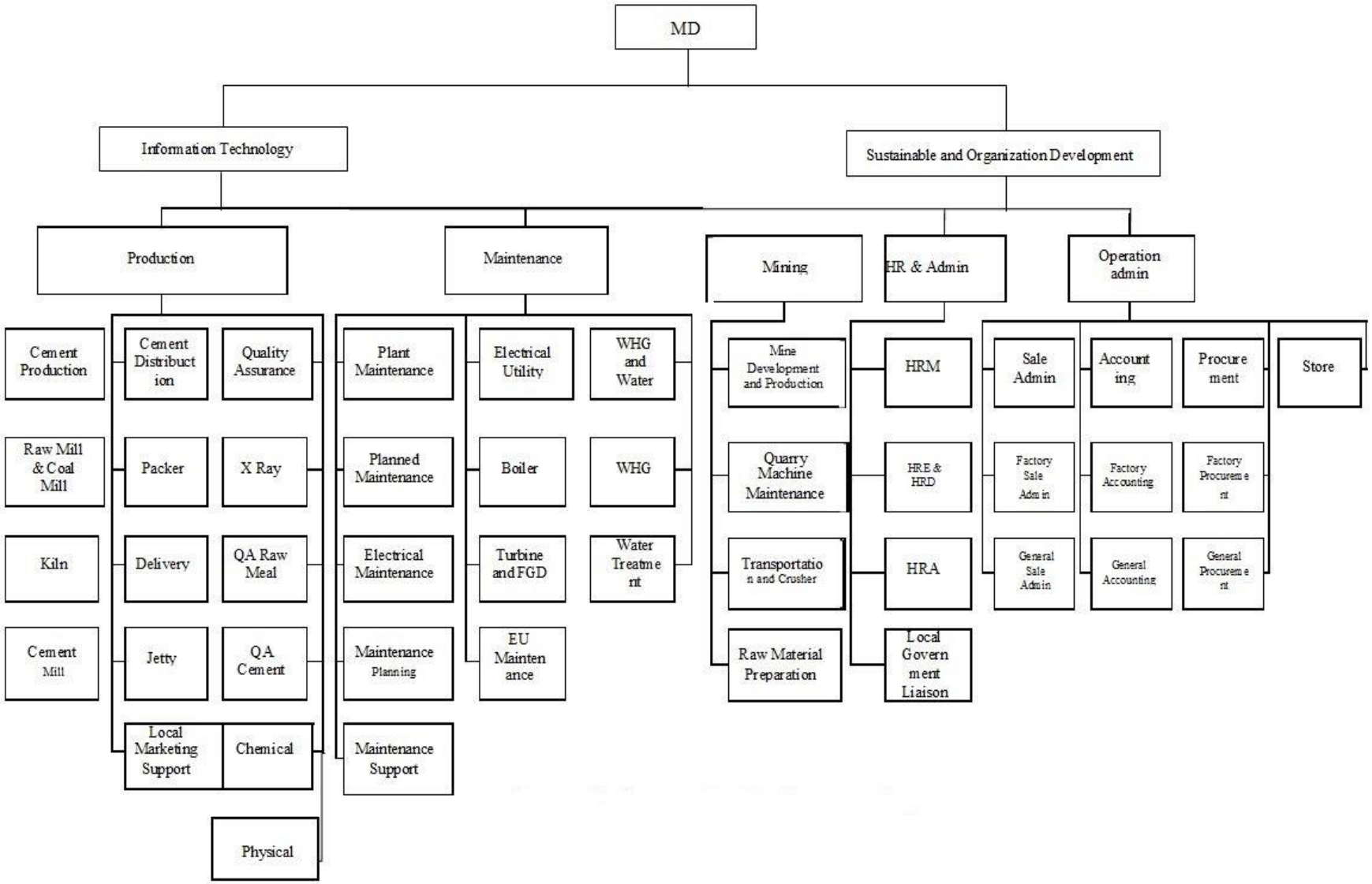
၃) EIA လုပ္ငန္းမ်ားကို အေကာင္အထည္ေဖာ္ ေဆာင္ရြက္မည့္ အဖြဲ႕ အစည္း

Mawlamyaine Cement Limited မွ ဘိလပ္ေျမစက္ရံုလည္ပတ္မႈအတြက္ အစစ တာဝန္ယူမည္ ျဖစ္ၿပီး ထိန္းသိမ္းျပင္ဆင္ျခင္း၊ သႀကီးၾကပ္ကြပ္ကဲျခင္း ႏွင့္ EIA လုပ္ငန္းမ်ားကို အေကာင္အထည္ ေဖာ္ ေဆာင္ရြက္ျခင္းမ်ားကို အခန္းက႑တစ္ခုခ်င္းစီအလိုက္ စီမံေဆာင္ရြက္သြားမည္ ျဖစ္ပါသည္။ စဥ္ဆက္မျပတ္ ေရရွည္ ဖြံ႕ၿဖိဳးတိုးတက္ေစေရး အဖြဲ႕အစည္း ဌာန (Sustainable and Organization Development Department) မွ EMP and HSE အစီအစဥ္မ်ားကို သင့္ေလ်ာ္ေသာ ထိန္းခ်ဳပ္ေဆာင္ရြက္မႈမ်ားျဖင့္ စီမံအုပ္ခ်ဳပ္ လုပ္ကိုင္သြားမည္ ျဖစ္ၿပီး စီမံကိန္းႏွင့္ သက္ဆိုင္သူမ်ားႏွင့္ ဂႏၲဝင္ႏိုင္ငံေဆြးေႏြးျခင္းႏွင့္ လူထု ဆက္ဆံေရး လုပ္ငန္းမ်ားကိုပါ အဓိကထား ေဆာင္ရြက္သြားပါ မည္။ MCL ဖြဲ႕စည္းပံုကို ေအာက္တြင္ ေဖာ္ျပထား ပါသည္။



ပုံ (၁၇): MCL ဦးဆောင် စီမံခန့်ခွဲမှုကဏ္ဍ ဖွဲ့စည်းမှု

ပုံ (၁၈): MCL ရေရှည်ဖွံ့ဖြိုးတိုးတက်ရေး စီမံခန့်ခွဲမှုကဏ္ဍ ဖွဲ့စည်းမှု



ပုံ (၁၉): MCL စက္ခုံ၏ ဖြဲ့စည်းပုံ

ဇယား (၇): MCL အေကာင္အထည္ေဖာ္ေဆာင္ေရးအဖြဲ႕၏ လုပ္ငန္းတာဝန္မ်ားႏွင့္ တာဝန္ယူမႈမ်ား

Role	Responsibility
Top management (Safety and Health Committees	Set the policy, rules and regulations for safety and environment programs
SOD manager	Management of CSR, Environmental Team, Safety Team
CSR team	Communities relation, Government Relation, Communities Development programs, Education, Religions and other correspondent activities
Environment Team	inbound and outbound monitoring process, plantation, waste management
Safety team	employees' and workplace safety such as fire safety, workplace safety, vehicles and road safety
Liaison Officer	-To liaise with the different stakeholders from government offices, communities and other associated organization like consultants, NGOs, etc. -To receive the grievances/complaints related with the project activities via suggestion box, on call, email or by person and address and close the complaints according with the adequate communication and management actions

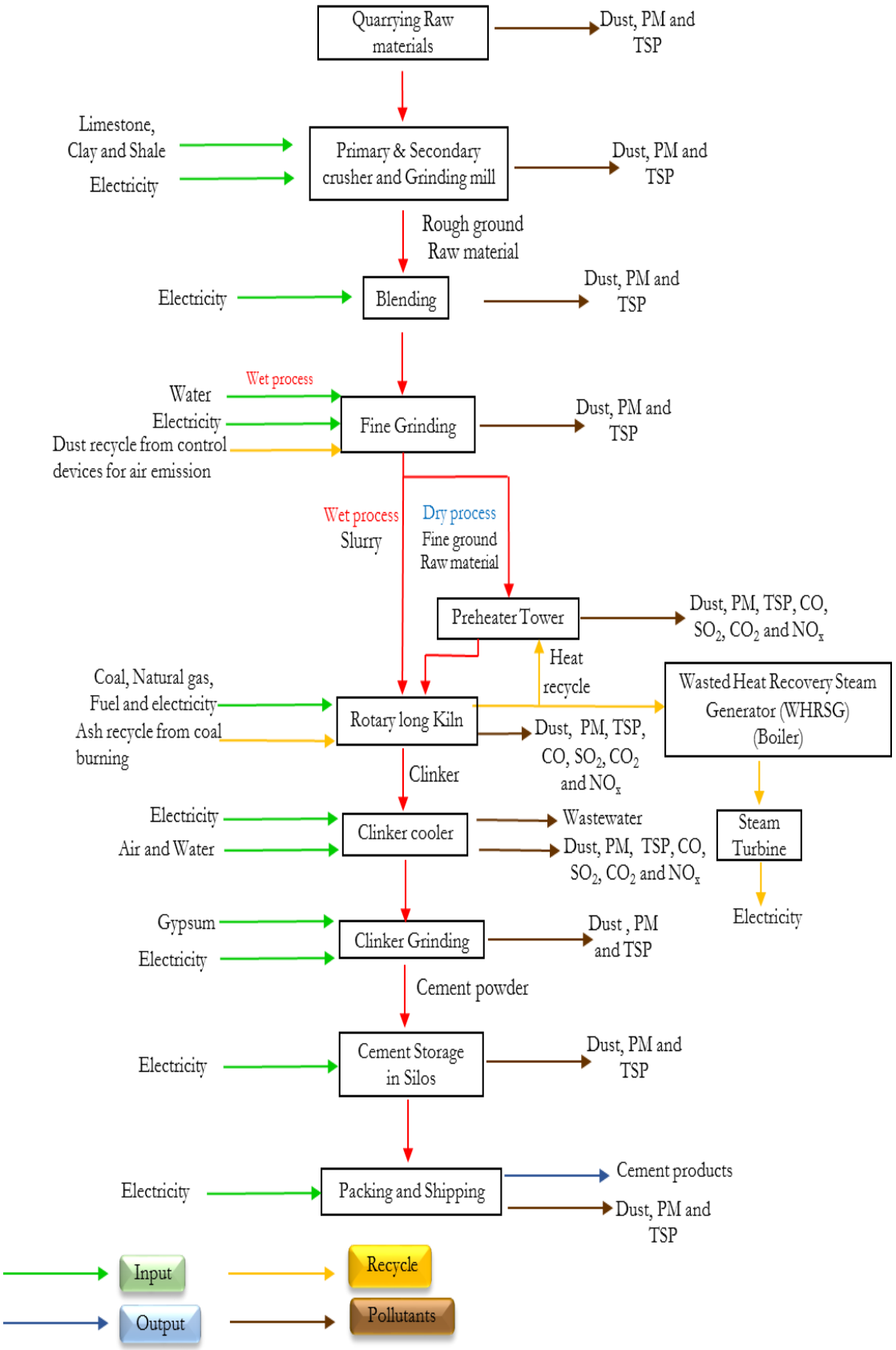
ပတ္ဝန္းက်င္ႏွင့္ လူမႈေရးရာ ဆန္းစစ္ျခင္းအစီရင္ခံစာ သေဘာတူ အတည္ျပဳခ်က္ ရရွိေရးအတြက္ Resource & Environment Myanmar Co. Ltd. သည္ စီမံကိန္းႏွင့္ သက္ဆိုင္ေသာ ျပဳပုိင္းဆိုင္ရာႏွင့္ သက္ရွိပတ္ဝန္းက်င္မ်ားကို ေလ့လာျခင္းႏွင့္ လူထုနားလည္လက္ခံမႈ၊ စိုးရိမ္ပူပန္မႈ၊ စီမံကိန္းအေပၚယူဆခ်က္ ႏွင့္ ေမွ်ာ္လင့္ခ်က္မ်ား အစရွိေသာ လူမႈေရးဆိုင္ရာ အခ်က္အလက္မ်ားကို စစ္တမ္းေကာက္ယူျပဳစုကာ စီမံ ကိန္းအေနျဖင့္ ပတ္ဝန္းက်င္ႏွင့္ လူမႈေရးရာမ်ားအေပၚတြင္ ထိခိုက္နစ္နာမႈ မရွိေစေရးႏွင့္ အမွားနည္း ႏုိင္သမွ်နည္းပါးေအာင္ သတိထား၍ အေကာင္အထည္ေဖာ္ ေဆာင္ရြက္ေစေရးအတြက္ ျဖစ္ပါ သည္။

ဖြံ့ၿဖိဳးတိုးတက္ေရးလုပ္ငန္းမ်ားကို တည္ေဆာက္လည္ပတ္ရာတြင္ မည္သည့္လုပ္ငန္းပင္ျဖစ္ေစ ပတ္ဝန္းက်င္အေပၚသို႕ ေကာင္းက်ိဳးရာ ဆိုးက်ိဳးပါ ျဖစ္ေပၚေစႏုိင္ပါသည္။ စီမံကိန္းပိုင္ရွင္အေနျဖင့္ နီးစပ္ရာ ပတ္ဝန္းက်င္ အေပၚ ထိခိုက္သက္ေရာက္မႈမ်ားကို ခြဲျခား ဆန္းစစ္ၿပီး ဆိုးက်ိဳးမ်ားကို ေလ်ာ့နည္း ေအာင္ ႏွင့္ ေကာင္းက်ိဳးမ်ားကို မ်ားသထက္မ်ားေစရန္ ေဆာင္ရြက္ရပါမည္။ အဆိုျပဳထား ေသာ ဘိလပ္ ေျမစီမံကိန္းသည္ နီးစပ္ရာ ဝန္းက်င္သာမက ျမန္မာႏုိင္ငံတဝန္းလံုးရွိ ေဆာက္လုပ္ေရးလုပ္ငန္း ႏွင့္ စက္ရံု မ်ားအတြက္ ဘိလပ္ေျမလိုအပ္ခ်က္ကို ျဖည့္ဆည္းေပး ရန္ ေမွ်ာ္လင့္ပါသည္။ ဘိလပ္ေျမစက္ရံုႏွင့္ ဆက္စပ္လုပ္ငန္းမ်ားအတြက္ ပတ္ဝန္း က်င္ထိန္းသိမ္းေရးစီမံကြပ္ကဲမႈ မ်ားကို အရည္အေသြးျပည့္ဝေသာ အင္ဂ်င္နီယာမ်ားႏွင့္ နည္းပညာရွင္မ်ားျဖင့္ အဖြဲ႕မ်ား ဖြဲ႕စည္းကာ ျပည့္ျပည့္ဝဝ ေဆာင္ရြက္ပါမည္။

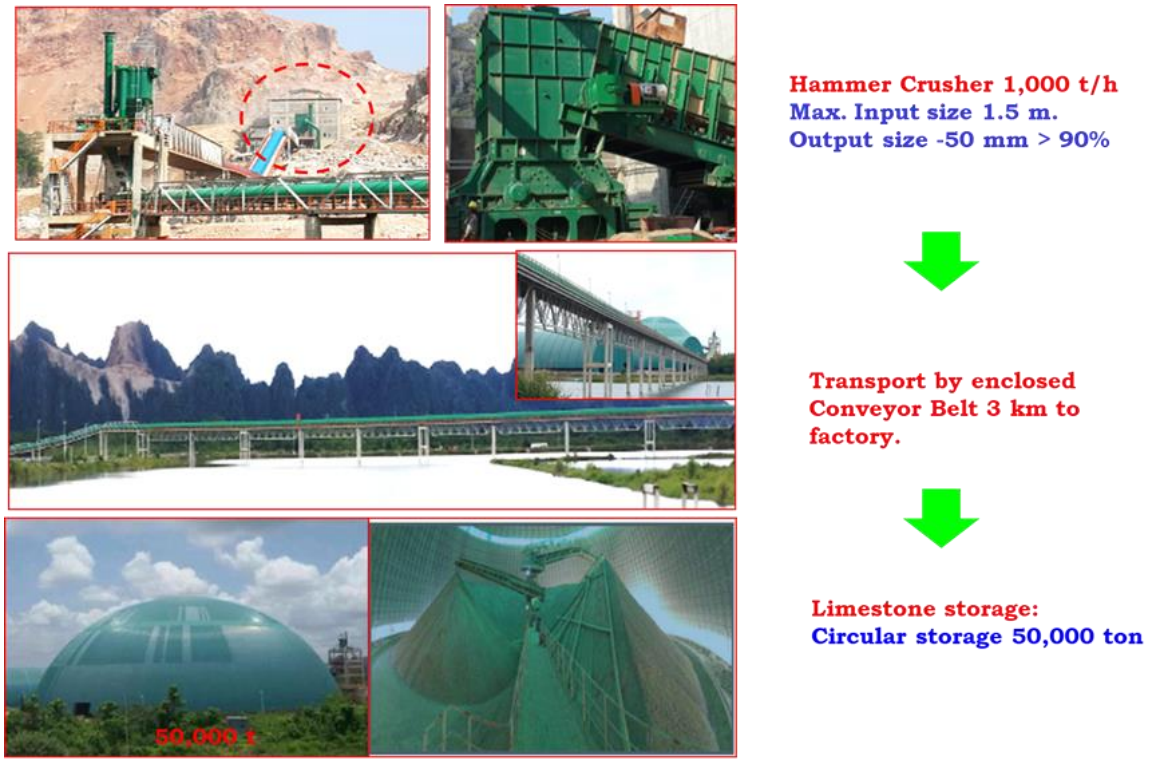
ပတ်ဝန်းကျင်၊ လူမှုရေးရာ နှင့် ကျန်းမာရေးဆိုင်ရာ ထိခိုက်သက်ရောက်မှုများကို နည်းစနစ်တကျ လေ့လာ ထားမှုများအရ မော်လမြိုင်ဘိလပ်မြေစက်ရုံစီမံကိန်းသည် အကောင်အထည်ဖော်ဆောင်ရွက်ရန် ကတိကဝတ်ပြုထား သော ပတ်ဝန်းကျင်ထိန်းသိမ်းရေး စီမံကြပ်ကဲမှုများ၊ လူမှုရေးရာ၊ ကျန်းမာရေးဆိုင်ရာ နှင့် ဘေးအန္တရာယ်ကင်းရှင်းရေး ဆိုင်ရာလိုက်နာဆောင်ရွက်ဖွယ်ရှိသည့်များကို အတိအကျလိုက်နာ အကောင်အထည်ဖော်ဆောင်ရွက်ပါက လူမှုပတ် ဝန်းကျင်အပေါ်တွင်ကောင်းကျိုး များသက်ရောက်စေမည် ဖြစ်ပါသည်။

၉) ထိခိုက်သက်ရောက်မှု ဆန်းစစ်ချက်၊ လျော့ပါးသက်သာစေရေးနှင့် စီမံခန့်ခွဲမှု အစီအစဉ်များ

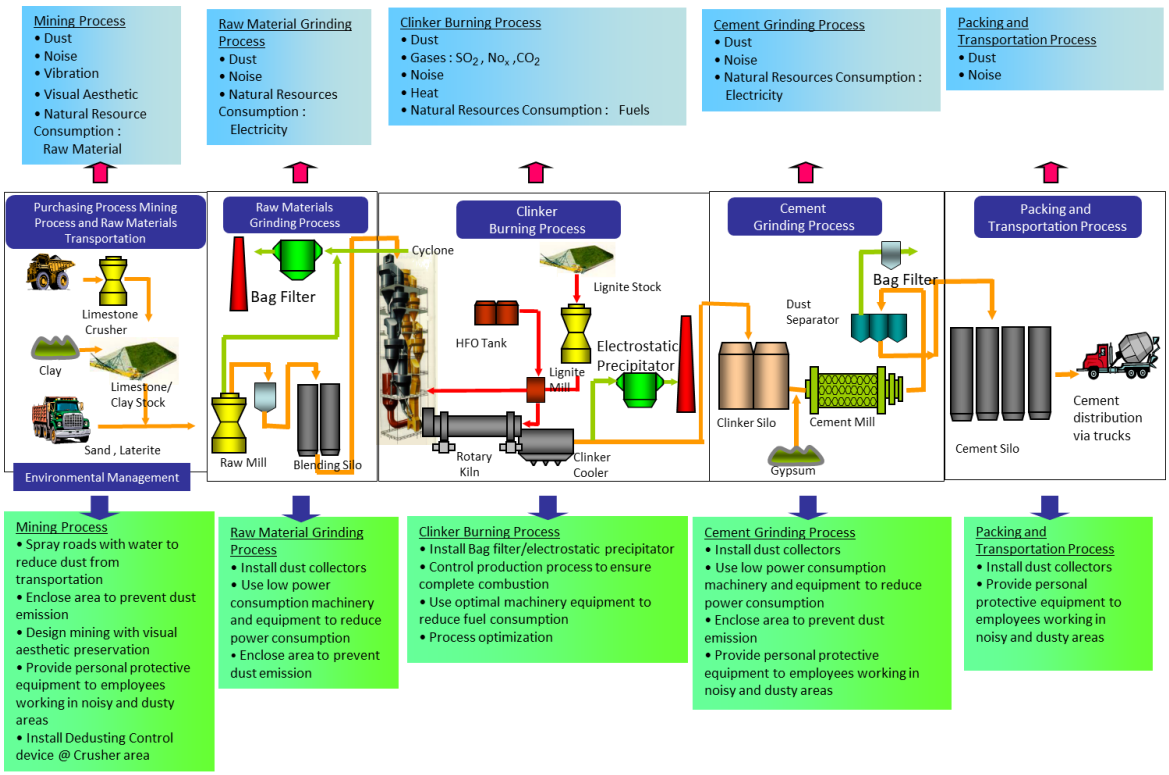
အဆိုပြုထားသော MCL စီမံကိန်းကိုယ်တိုင်သည် ပတ်ဝန်းကျင်ထိန်းသိမ်းရေး စီမံကြပ်ကဲမှု အစီအစဉ် နှင့် လူမှုအဖွဲ့အစည်းများနှင့် ပူးပေါင်းဆောင်ရွက်မှုဆိုင်ရာ တာဝန်ယူ စီမံကြပ်ကဲမှု အစီအစဉ်များရှိပါသည်။ တကယ်တမ်း တွင် MCL သည် ပတ်ဝန်းကျင်ထိန်းသိမ်းရေး စီမံကြပ်ကဲမှု ဆိုင်ရာ စနစ်များဖြင့် စီမံကိန်းကို အကောင်အထည်ဖော် လည်ပတ်လျက်ရှိပြီး ထုတ်လုပ်မှုလုပ်ငန်းစဉ် အဆင့်တစ်ခုချင်းစီ အတွက် ပတ်ဝန်းကျင်ထိန်းသိမ်းရေး ကြီးကြပ်ကွပ် ကဲမှု အစီအမံ များဖြင့် ပေါင်းစပ်အကောင်အထည်ဖော်လျက်ရှိပါသည်။



ပံု (၂၀): ဘိလပ္ေျမ အစိုးွင့္အေျခာက္ထုတ္လုပ္မွဳ လုပ္ငန္းစဥ္မ်ား၏ ျဖစ္ေပၚလာႏိုင္ေသာ ထိခိုက္သက္ေရာက္မွဳမ်ား ကို ျခံဳငံုသံုးသပ္ခ်က္



ပုံ (၂၁) ။ ထုံးေက်ာက်တြဲျခင္းႏွင့္သယ္ယူပို႔ေဆာင္ျခင္း



ပံု (၂၂): ဘိလပ္ေျမထုတ္လုပ္ျခင္းလုပ္ငန္းစဥ္၏ ပတ္ဝန္းက်င္အေပၚ ထိခိုက္သက္ေရာက္မႈမ်ားကို ဆန္းစစ္ကာ သက္သာေလ်ာ့ပါးေရးႏွင့္ ထိန္းသိမ္းေရး စီမံကြပ္ကဲမႈေဆာင္ရြက္ခ်က္မ်ားကို ျပခ်ိဳင့္တင္ျပျခင္း

၁၀) ေလထုညစ္ညမ္းမႈ ထိန္းခ်ဳပ္ေရးဆိုင္ရာ အဓိက စက္ပစၥည္းကိရိယာမ်ား

MCL **ဘိလပ္ေျမစက္ရံုတြင္** ေလထုညစ္ညမ္းမႈထိန္းခ်ဳပ္ေရးဆိုင္ရာ အဓိကစက္ပစၥည္းကိရိယာမ်ား ေအာက္ပါအတိုင္း ၃ မ်ိဳးရွိပါသည္။

၁) Main Bag Filter

၂) Main EP Clinker Cooler

၃) Grab and Screw Unloading

၁၀.၁) Main Bag Filter

Main Bag Filter **သည္ ဓာတ္ေငြ႕မ်ားမီးခိုးေခါင္းတိုင္ကို ျဖတ္သြားေသာအခ်ိန္တြင္ ၎မွထြက္လာေသာ ဓာတ္ေငြ႕မ်ားထဲမွ ဖုန္မႈန္႔မ်ားကို စုယူကာ ဖယ္ရွားရန္ ျဖစ္ပါသည္။ ၎ကို ေလထုညစ္ညမ္းမႈ ထိန္းခ်ဳပ္ေရးအ တြက္ အဓိက မီးခိုးေခါင္းတိုင္တြင္ တပ္ဆင္ထားပါသည္။**

Specification:

Type	- Bag Filter
Gas Volume	- 788,000 m^3/h
Dust Load	- Input 50 g/m^3, Output <10 g/m^3
Filtration area	- 13,680 m^2
Power requirement	- BF Fan – 1,400 kW

ပံု (၂၃): MCL ဘိလပ္ေျမစက္ရံုတြင္ တပ္ဆင္ထားေသာ Bag Filter

၁၀.၂) Main EP Clinker Cooler

Main Electrostatic Precipitator (EP) သည္ အမႈန္စာည္းမ်ားကို ထိန္းခ်ဳပ္ရန္ တပ္ဆင္ထားပါ သည္။ ဘိလပ္ေျမေဖာ္စပ္ (clinker) မွ စြန္႕ထုတ္ေသာ အိတ္ေဇာ ဓာတ္ေငြ႕မ်ားမွ ဖုန္မႈန္႕မ်ားကို ခြဲထုတ္ရန္ လွ်ပ္စစ္ဓာတ္ စြမ္းအား ကို အသံုးျပဳထားပါသည္။

Specification:

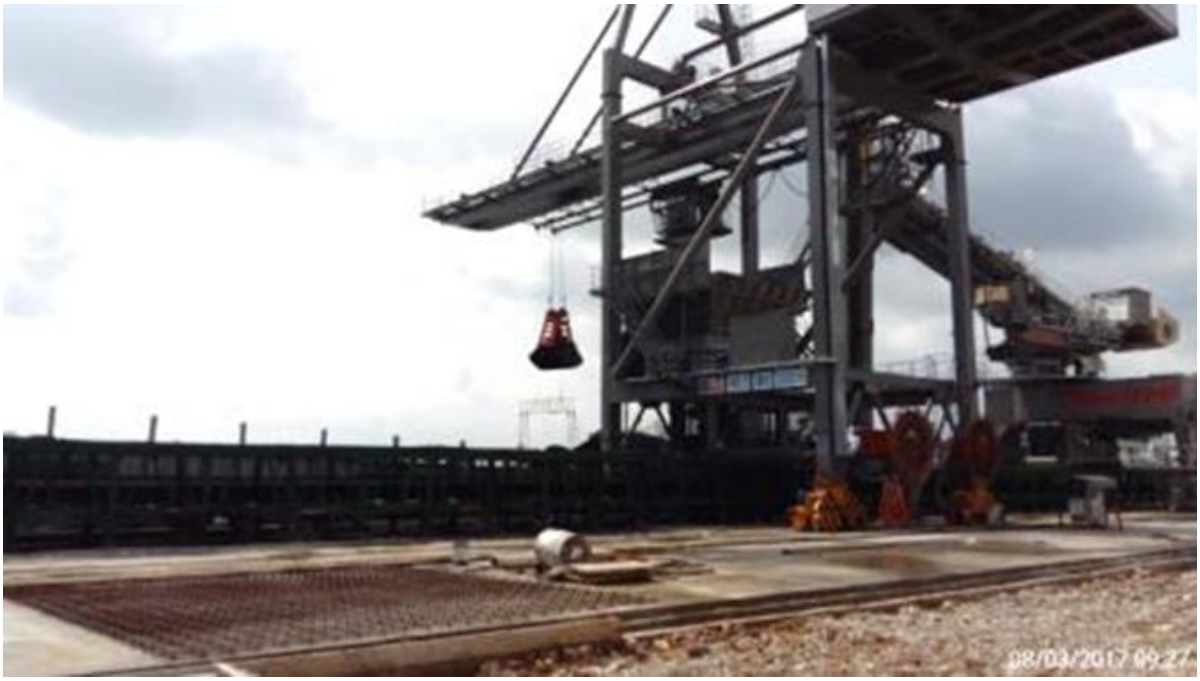
Type	- Electrostatic Precipitator (EP)
Capacity (max)	- 760, 000 m^3/h
Filtration area	- 20,687 m^2
Power requirement	- BF Fan – 800 kW (VSD)
Emission	- 30 mg/Nm^3, DB max

ပံု (၂၄): MCL ဘိလပ္ေျမစက္ရံုတြင္ တပ္ဆင္ထားေသာ Electrostatic Precipitator (EP)

၁၀.၃) Grab and Screw Unloading

Specification (Grab):

Type	- Grab unloading
Manufacturer	- CITIC
Capacity (DB)	- 300 t/h
Electrical load	- 0.5 MW



ပုံ (၂၅): MCL ဘိလပ်ေျမစက်ရုံတြင် တပ္ဆင္ထားေသာ ဝန္ခံစိက္

Specification (Screw Unload):

Type	- Screw unloading
Manufacturer	- Swirtel
Capacity (DB)	- 500 t/h
Electrical load	- 1.6 MW

ပုံ (၂၆): MCL ဘိလပ်ေျမစက်ရုံတြင် တပ္ဆင္ထားေသာ ဝန္ခံစိက္

၁၁) အဓိက ညစ္ညမ္းပစၥည္းထြက္ရွိရာရင္းျမစ္ေနရာႏွင့္ ၎တို႕၏ လကၡဏာရပ္မ်ား

ထုတ္လုပ္သည့္လုပ္ငန္းစဥ္မွာ ဘိလပ္ေျမအေျခာက္ထုတ္လုပ္ျခင္းနည္းလမ္းကို အသံုးျပဳထားပါသည္။ ထို႕ ေၾကာင့္ အဓိက ေလထုညစ္ညမ္းေစေသာပစၥည္းထုတ္လႊတ္မႈတြင္ clinker ႏွင့္ ဖန္ဆံုးအိမ္ မာတ္ ေငြ႕မ်ား (**CO_2, CO**) ထြက္ရွိမႈ၊ ကုန္ၾကမ္းပစၥည္းမ်ား၊ သဘာဝ ေက်ာက္ျဖစ္႐ုပ္ဆင္းမွရေသည္ စြမ္းအင္မ်ား ႏွင့္ စြန္႕ပစ္စြမ္းအင္မ်ားကို အသံုးျပဳျခင္းမွ ထြက္ရွိေသာ မာက်ီရိုက္ခဲသို႕ေသာ သတၱဳအေလးဆသိပ္သည္း မႈမ်ား ေသာ ပစၥည္းမ်ား ထြက္ရွိမႈမွလြဲ၍ က်န္ရွိေသာ **Total Suspended Particulate (TSP), Sulfur dioxide (SO_2) and Nitrogen Oxides (NO_x)** စသည္တို႕ပါဝင္ၿပီး ၎တို႕ကို bag filters ႏွင့္ Electro Static Precipitators (ESP) မ်ားကို အသံုးျပဳကာ ထိန္းခ်ဳပ္ႏိုင္ပါသည္။

၁) အဓိက ေလထုထဲသို႕ စြန္႔ထုတ္ေသာ ပစၥည္းမ်ားႏွင့္ ထိခိုက္သက္ေရာက္မႈမ်ားကို ဆန္းစစ္ျခင္း ႏွင့္ ထိန္းခ်ဳပ္စီမံျခင္း

ဘိလပ္ေျမထုတ္လုပ္ျခင္းတြင္ ၾကားခံပစၥည္းမ်ားႏွင့္ ေနာက္ဆံုးထြက္ကုန္ ပစၥည္းမ်ားကို ကိုင္တြယ္ ျခင္းႏွင့္ သိုေလွာင္ထားရွိျခင္း၊ မီးဖိုစနစ္မ်ားကို သံုးစြဲလည္ပတ္ျခင္း၊ ဘိလပ္ေျမေဖာ္စက္ ႏွင့္ က်ိတ္ေခ်စက္ မ်ားကို အသံုးျပဳလည္ပတ္ျခင္းတို႕မွ ေလထုထဲသို႕ ညစ္ညမ္းေစေသာ ပစၥည္းမ်ား ထုတ္လႊတ္ေစႏိုင္ပါသည္။

က) ဖုန္မႈန္႕မ်ားထုတ္လႊတ္မႈကို ထိန္းခ်ဳပ္ျခင္း

မီးခိုးေခါင္းတိုင္ဓာတ္ေငြ႕မ်ားမွ ဖုန္မႈန္႕မ်ားဖယ္ထုတ္ျခင္း၊ ေရြ႕လ်ားစက္ခါးပတ္ သံုးစြဲသည့္ေနရာမ်ား (belt transfer) ႏွင့္ က်ိတ္ခြဲစက္ရွိေသာ ေနရာမ်ားမွ ဖုန္မႈန္႕မ်ားကို Bag filter အသံုးျပဳျခင္းျဖင့္ ၉၉.၉၉ % အထိ ဖယ္ရွား ရွင္းလင္းႏိုင္ပါသည္။

ဧယား (၈): MCL ဖုန္မႈန္႕စုယူေသာ စက္မ်ား၏ အေသးစိတ္သတ္မွတ္ေဖာ္ျပခ်က္မ်ား

Items	Types	Flow
1. Main Bag Filter	Bag Filter	788,000 **m^3/h**
2. Main EP Clinker Cooler	Electrostatic Precipitator (EP)	760, 000 **m^3/h**
3. Screw Unloading for coal	Screw unloading	500 t/h
4. Grab unloading for gypsum	Grab unloading	500 t/h

ဇယား (၉): MCL စီမံကိန်းတြင် တပ်ဆင်ထားသော Bag Filters မ်ား

Section	No. of Bag Filters	Required Air (m3/h)	Bag Filter Capacity (m3/h)	Diff (%)	Remark
Limestone Transportation (Mining)	5	37,200	65,461	43	
Raw Material Transportation & Raw Mill	22	111,273	175,260	37	
Raw Coal Transportation & Coal Mill	14	76,106	118,560	36	
Kiln	9	42,962	94,680	55	
Clinker Transportation	13	45,708	122,880	63	
Gypsum Transportation	13	50,037	55,800	10	
Cement Mill	10	75,653	102,480	26	
Packer	16	124,714	195,300	36	
Summary	**102**	**563,653**	**930,421**	**39**	

ခ) အသံဆူညံျခင္း ထိန္းခ်ဳပ္မ်ဳိး

အသံဆူညံးႏွန္းနည္းေသာ စက္ပစၥည္းမ်ားကို ဦးစားေပးတပ္ဆင္ထားၿပီး ပတ္ဝန္းက်င္ေနေသာ စက္မ်ားႏွင့္ ကိရိယာမ်ားတြင္ အသံလံုေသာ အဖံုးအကာမ်ားတပ္ဆင္ျခင္း သို႕မဟုတ္ အသံကာပစၥည္းမ်ားကို တပ္ဆင္သံုးစြဲ သင့္ၿပီး FD ပန္ကာေရလက္ခံကားမ်ား၊ ဘြိဳင္လာစက္ႏွိမ္ေနးျခင္း ႏွင့္ ေရေႏြးေငြ႕စက္မ်ားတြင္ ဝန္းက်င္ဆူညံမႈကို ထိန္း ခ်ဳပ္ရန္ အသံတိတ္ပစၥည္းမ်ားကို တပ္ဆင္အသံုးျပဳထားပါသည္။

 က) အသံတိတ္စနစ္တပ္ဆင္ထားေသာေလပန္ကာ

ခ) အသံတိတ္စနစ္တပ္ဆင္ထားေသာ ေရေႏြးေငြ႕စက္

ပံု (၂၇): MCL စက္ရံုတြင္ အသံဆူညံထုတ္လႊတ္ျခင္းကို ထိန္းခ်ဳပ္ရန္ တပ္ဆင္ထားမႈမ်ား

ဂ) ေရဆိုးထုတ္လႊတ္မႈ ႏွင့္ထိန္းခ်ဳပ္ျခင္း

ေရဆိုးထုတ္လႊတ္မႈမွာ လည္ပတ္စဥ္ကာလ စက္ပစၥည္းမ်ားကို အေအးခံရန္အတြက္အသံုးျပဳျခင္း လုပ္ငန္း စဥ္မ်ားမွသာ (e.g. bearings, kiln rings) ထြက္ရွိျခင္းမွာ MCL စီမံကိန္းသည္ ဘိလပ္ေျမအေျခာက္ ထုတ္လုပ္ျခင္း နည္းလမ္း ကိုအသံုးျပဳေသာေၾကာင့္ျဖစ္ပါသည္။ လည္ပတ္စဥ္ခ်ိဳ့ေသာ အေအးခံ အဆင့္မ်ား မွထြက္ရွိေသာ ေရ ဆိုးမ်ားတြင္ pH ႏွင့္ suspended solids မ်ား ျမင့္မားေနပါသည္။ သို့ေသာ္ျငားလည္း ေရကို သင့္ေလ်ာ္ေသာ ထပ္ခါတလဲလဲ ျပန္လည္သုတ္သံုးျပဳျခင္း စနစ္ကို အသံုးျပဳထားေသာေၾကာင့္ ဘိလပ္ ေျမစက္ရံုမွ စြန္႕ထုတ္လို္ က္ေသာ ေရဆိုးမ်ားအားလံုးမွာ အေအးခံျခင္း လုပ္ငန္းစဥ္အတြက္ သင့္ေလ်ာ္စြာ ျပန္လည္ အသံုးျပဳထားေသာ ေၾကာင့္ ေျမေပၚေရႏွင့္ေျမ ေအာက္ေရအရင္းအျမစ္မ်ားထဲသို့ ေရဆိုးစြန္႕ထုတ္မႈ လံုးဝမရွိေတာ့ပါ။ ေရကိုထပ္ခါ တလဲ လဲ ျပန္လည္အသံုးျပဳျခင္း စနစ္ကို ေအာက္တြင္ ေဖာ္ျပထားပါသည္။

၁) ေရထဲမွ ဓာတ္သတၱဳဖယ္ရွားသန္႕စင္ေသာ စနစ္

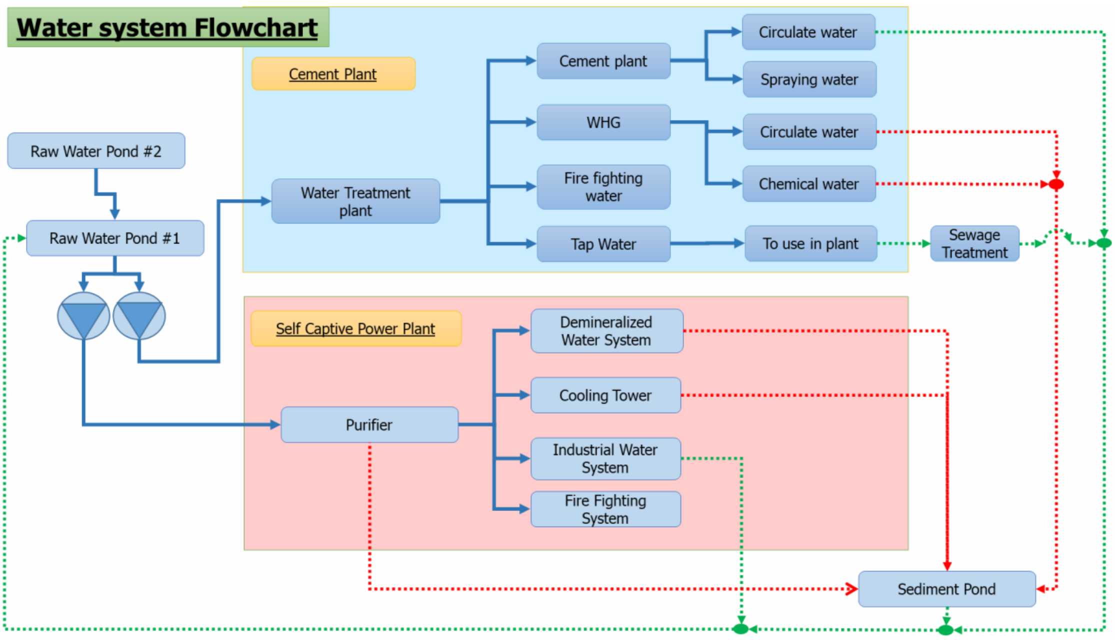
ဘြိဳင္လာတြင္ အသံုးျပဳမည့္ေရကို RO+EDI နည္းလမ္း ၂ ဆင့္ျဖင့္ သတၱဳဓာတ္မ်ား ဖယ္ရွားျခင္းစနစ္ကို အသံုးျပဳကာ စက္ကိရိယာတန္ဆာပလာမ်ားကို ထိန္းသိမ္းရန္ ႏွင့္ စနစ္တက် လုပ္ေဆာင္ႏိုင္စြမ္းအား တစ္နာ ရီ တန္ ၄၀ (2*20t/h) က်ရန္အတြက္ ေရအရည္အေသြး လကၡဏာရပ္မ်ားလိုအပ္ခ်က္ ျပည့္မီေစရန္ စနစ္တက် ကိုင္တြယ္ တြက္ခ်က္ကာ လုပ္ေဆာင္ပါသည္။

၂) ေရကိုထပ္ခါတလဲလဲအေအးခံအသံုးျပဳျခင္းစနစ္

စက္ပစၥည္းမ်ား ေလဝင္ေလထြက္ေကာင္းမြန္ေစရန္ (သံေခ်းမတက္ေစရန္) ေရကို အဖံုးဖြင့္ထပ္ခါတလဲလဲ လည္ပတ္ေစေသာစနစ္သည္ ေရကို ထပ္ခါတလဲလဲအေအးခံျခင္းစနစ္အတြက္ FRP (Glass Fiber Reinforced Plastics) စနစ္ကို အသံုးျပဳထားပါသည္။ ေလဝင္ေလထြက္ေကာင္းမြန္ေစရန္ အေအးခံစနစ္ ေမွ်ာ္ဘက္စင္မ်ားသည္ တစ္နာ ရီ ၃၀၀၀ ကုဗမီတာရွိ ေမွ်ာ္စင္ ၄ စင္တပ္ဆင္ထားၿပီး ေရကို စုစုေပါင္း

တစ်နာရီ ၁၂၀၀၀ ကုဗမီတာထိ အအေးခံ ထားနိုင်ပြီး အပူချိန်ခြားနားမှုမှာ ၁၀ ဒီဂရီစင်တီဂရိတ် ရှိပြီး ရေစုပ်စက် ၅ လုံးမှာ တစ်နာရီ ၃၁၇၀ ကုဗမီတာ၊ ၀.၂၂ MPa၊ ၂၅၀ ကီလိုဝပ်၊ ၁၀ ကီလိုဗို့ရှိပြီး ၄ လုံး မှာတစ်ပြိုင်နက်တည်း လည်ပတ်နေပြီး တစ်လုံးမှာ ပျက်လျှင်အစားထိုး ရန် အရန်သင့်ဆောင်ထားပါသည်။

ပုံ (၂၈): MCL စက်ရုံရှိ ရေသန့်စင်သည့်စနစ်များ



ပုံ (၂၉): MCL စက်ရုံ၏ ရေကိုထပ်ခါတလဲလဲအသုံးပြုခြင်းစနစ်

၁၂) MCL ၏ ပတ်ဝန်းကျင်ညစ်ညမ်းမှု သက်သာလျော့ပါးစေရေးနှင့် သကီးကြပ်ကြပ်ပံ့မှု အစီအစဉ်

စီမံကိန်းဧရိယာအတွင်းတွင် လေ့လာတွေ့ရှိချက်များအရ ဘိလပ်မြေစက်ရုံလုပ်ငန်းများနှင့် ဆက်စပ်လုပ်ငန်း များအတွက် တည်ရှိသောအပင်နှင့် သတ္တဝါများတွင် ရှားပါးအန္တရာယ်ကျရောက်မည့် မျိုးစိတ်များမရှိသဖြင့် မည်သည့် ဂေဟစနစ်ဆိုင်ရာသက်ရှိပစ္စည်းကိုမှ ထိန်းသိမ်းဆောင်ရွက်ရမည့် အစီအစဉ် မလိုအပ်ပါ။ ထို့ပြင် MCL **စီမံကိန်း ဧရိယာသည် ရှေးဟောင်းသမိုင်းဝင်ဘာသာရေးနယ်မြေများနှင့် ဝေးကွာပြီး**

အနီးဝန်းကျင်၌လည်း မည်သည့်ရှေးဟောင်းယဉ်ကျေးမှု အမွေအနှစ်စသည်းကိုမှ ရှာဖွေတွေ့ရှိမှုလည်း မရှိပါ။

MCL တွင် အဆိုပြုထားသော စီမံကိန်းဧရိယာအတွင်း ပတ်ဝန်းကျင်ကာကွယ်ရေးလုပ်ငန်းများကို ပတ်ဝန်းကျင်စီမံခန့်ခွဲခြင်း အစီအမံများအတိုင်း အပြည့်အဝအကောင်အထည်ဖော်ဆောင်ရွက်ကာ ဖွံ့ဖြိုးတိုးတက်စေရန် ခံဝန်ကတိပြုထားပြီး လုပ်ငန်းဆောင်ရွက်စဉ်နှင့် လည်ပတ်ဆဲကာလတွင် ပတ်ဝန်းကျင် အပေါ်ထိခိုက်သက်ရောက်မှုများကို လျော့နည်းစေ၍ ကောင်းကျိုးများကို ပိုမိုတိုးတက်များပြားစေရန် သင့်တော်သည့် နည်းလမ်းများကို အသုံးပြု ကာ ဆောင်ရွက်သွားမည် ဖြစ်ပါသည်။

ပတ်ဝန်းကျင်ကာကွယ်စောင့်ရှောက်ရေးမှာ MCL ဘိလပ်မြေစက်ရုံစီမံကိန်း ဧရိယာအတွက် အဓိကလို အပ်ချက်တစ်ခုဖြစ်ပါသည်။ ကုမ္ပဏီမှ ချမှတ်ထားသော ပတ်ဝန်းကျင်ကာကွယ်စောင့်ရှောက်ရေး မူဝါဒ နှင့် အကြံပြု တင်ပြထားသော နိုင်ငံတကာစံနှုန်းများနှင့်အညီ လုပ်ကိုင်ဆောင်ရွက်ချက်များနှင့် ကိုက်ညီမှုရှိစေရန် အတွက် စီမံကိန်း အကောင်အထည်ဖော်ဆောင်ရွက်ရသည့် အဆင့်တိုင်း အဆင့်တိုင်း၌ အစီအစဉ်ကို စနစ်တကျချမှတ်ကာ လျော့ပါး သက်သာစေရေးအတွက် ထိန်းချုပ်စီမံသွားရမည် ဖြစ်ပါသည်။

EMP ၏အဓိကရည်မှန်းချက်မှာ ကနဦးပတ်ဝန်းကျင်အပေါ်ထိခိုက်သက်ရောက်မှုများကို ဆန်းစစ်ခြင်း လုပ်ငန်း ဆောင်ရွက်စဉ်ကတည်းက အကျိုးရှိထိရောက်သော ထိန်းသိမ်းစီမံကြပ်မတ်မှုနှင့် ကြီး ကြပ်ကွပ်ကဲ မှု လုပ်ငန်း စဉ်များချမှတ်ကာ နည်းစနစ်ကျဖြင့် သက်သာလျော့ပါးစေရေးလုပ်ငန်းများကို ဆောင်ရွက်သွားစေရန်နှင့် ထိုသို့ လုပ်ဆောင်မှုသော ပတ်ဝန်းကျင်နှင့်လူမှုရေးထိခိုက်သက်ရောက်မှု ဆိုးကျိုးများကို အကျိုးရှိစွာလျော့ချထိန်းသိမ်း ပေး နိုင်စေရေးအတွက် ချမှတ်ထားသော အထောက်အကူပြုအစီအစဉ်တစ်ခု ဖြစ်လာပါမည်။ ထို EMP အစီအစဉ်သည် ဖြစ်လာနိုင်သောပျက်စီးဆုံးရှုံးမှုများကို ရှောင်ရှားနိုင်ခြင်း၊ ဖြစ်သင့်ဖြစ်ထိုက်သည်ကို ကျခံသုံးစွဲခြင်း နှင့် ပြည်သူ လူထု၏ အတွေးအမြင်နှင့် မဆန့်ကျင်ပဲ လိုက်လျောညီထွေဖြစ်အောင် ဆောင်ရွက်စေခြင်းဖြင့် MCL အား ၎င်းတို့ ရည်မှန်းထားသော ပတ်ဝန်းကျင် နှင့် လူမှုဆက်ဆံရေးတွင် အောင်မြင်မှုပန်းတိုင်ကို ရောက်ရှိစေရန် အထောက်အကူ ဖြစ်စေမည် ဖြစ်ပါသည်။ ထို့အပြင် ဤအစီအစဉ်အားဖြင့် စီမံကိန်း၏ ကောင်းကျိုးများ ပိုမိုတိုး တက်လာစေခြင်း၊ အမျိုးသားနိုင်ငံမှ ချမှတ်ထားသော မူဘောင်အတွင်း အံဝင်ခွင်ကျရှိခြင်း နှင့် စက်ရုံလုပ်ငန်းများနှင့် သက်ဆိုင်သော နိုင်ငံတ ကာမှ အကောင်းဆုံးနည်းလမ်းများကို စံပြုအတုယူကာ လိုက်နာဆောင်ရွက်စေခြင်း စသည်တို့ဖြစ်ပေါ်လာနိုင်စေ ရန်အထောက်အကူပြုပါလိမ့်မည်။

ဤပတ်ဝန်းကျင်ထိန်းသိမ်းရေးစီမံကြပ်မတ်မှု အစီအစဉ်သည် သင့်လျော်ပြီး အကျိုးဖြစ်ထွန်းစေမည့် စီမံ ဆောင်ရွက်ချက်များနှင့် လျော့ပါးသက်သာစေရေး နည်းလမ်းများပါဝင်ခြင်းကြောင့် ထိခိုက်သက်ရောက်မှုများ ဆန်း စစ်ခြင်းဆိုင်ရာ အခန်းကဏ္ဍတွင် သတ်မှတ်ဖော်ပြထားသော ပတ်ဝန်းကျင်နှင့် လူမှုရေးရာ ထိခိုက်သက်ရောက်မှုများ ကို လျော့ပါးသက်သာစေပါသည်။ ထို့အပြင် ဤအစီရင်ခံစာတွင် ပတ်ဝန်းကျင်ကာကွယ်ထိန်းသိမ်းရေး နည်းစနစ်လုပ် ငန်းစဉ်များကိုပါ စီမံကိန်းထဲသို့ တစ်ပါတည်းထည့်သွင်းထားပါသည်။

ဆောက်လုပ်ရေးနှင့် လည်ပတ်ဆဲကာလတွင် အဆိုပြု စီမံကိန်းမှ သက်ရှိဝန်းကျင်၊ ရုပ်ဝတ္ထုဝန်းကျင် နှင့် လူသားဝန်းကျင်များသို့ ထိပါးလာနိုင်ဖွယ်ရှိသော အရိပ်လက္ခဏာများ ကို အောက်ပါအတိုင်း ဖော်ပြအပ်ပါသည်။

- ေရေနကုန္းေန ဇီ၀မ်ိဳးႀကြဲစံုမ်ား
- ေလအရည္အေသြး
- ေရအရည္အေသြး
- အသံဆူညံမႈ ႏွင့္တုန္ခါမႈ
- အမိႈက္မ်ားကို စီမံေဆာင္ရြက္မႈ
- ရႈခင္းႏွင့္ ျမင္ကြင္းအလွအေပၚတြင္ ထိခိုက္မႈ
- က်န္းမာေရးႏွင့္ ေဘးအႏၲရာယ္ကင္းရွင္းမႈ
- လူမႈေရးရာ ေရာယွက္ရႈပ္ေထြးလာမႈ

ဤအစီရင္ခံစာကို အၿမဲျပင္ဆင္ျဖည့္စြက္ေဆာင္ရြက္ေပးပါမည္။ စီမံကိန္းလက္ေတြ႕ေဆာင္ရြက္ေနစဥ္ အတြင္း ဤအစီရင္ခံစာတြင္ ေဖာ္ျပထားေသာလုပ္ငန္းစဥ္မ်ား၌ အေျပာင္းအလဲတစ္စံုတစ္ရာရွိခဲ့ပါက ထိုေျပာင္းလဲ မႈႏွင့္ လိုက္ေလ်ာညီေထြျဖစ္ေစရန္ လိုအပ္ပါက သင့္ေလ်ာ္ေသာ ျပန္လည္စိစစ္သံုးသပ္ျခင္း၊ ျဖည့္စြက္ ျပင္ဆင္ ျခင္း ႏွင့္ ျပီျပင္မြမ္းမံျခင္း အစရွိသည္တို႕ကို စဥ္ဆက္မျပတ္ေဆာင္ရြက္သြားပါမည္။

၁၂.၁) အခန္းက႑အလိုက္တာ၀န္ယူမႈမ်ား

ဤအစီရင္ခံစာ၏ပိုင္ရွင္ျဖစ္သည္အားေလ်ာ္စြာ MCL သည္ ဤအစီရင္ခံစာအတိုင္း ဖြံ႕ၿဖိဳးတိုးတက္ေစရန္ ျပန္လည္စိစစ္သံုးသပ္ျခင္း၊ ျပင္ဆင္ျဖည့္စြက္ျခင္း၊ျပီျပင္မြမ္းမံျခင္းႏွင့္ အက်ိဳးရွိေစေသာ အေကာင္အထည္ေဖာ္ေဆာင္ ရြက္မ်ား အ၀၀ကို လံုး၀ဦးစီး တာ၀န္ယူပါမည္။ အကယ္၍ ေလ်ာ့ပါးသက္သာေစေရး နည္းလမ္းမ်ားသည္ ခ်မွတ္ထား ေသာ မူ၀ါဒ လမ္းစဥ္မ်ားႏွင့္ မကိုက္ညီပါက ျပည့္၀စြာေက်နပ္မႈ ရရွိေစသည္အထိ လိုအပ္သလို ျပန္လည္ျပင္ဆင္ ေဆာင္ရြက္ေပးပါမည္။

ပတ္၀န္းက်င္ႏွင့္ လူမႈေရးဆိုင္ရာ အေကာင္အထည္ေဖာ္ေဆာင္ရြက္ရန္အတြက္ တာ၀န္၀တၱရား မ်ားကို SCG ၏ စီမံေဆာင္ရြက္မႈႏွင့္အတူ ျဖစ္ေစရပါမည္။ ထိုစီမံေဆာင္ရြက္မႈမ်ားမွာလည္း ဤအစီရင္ခံစာ တြင္ ေဖာ္ျပထားေသာ ကတိက၀တ္မ်ားအတိုင္း တာ၀န္ယူေဆာင္ရြက္ေစပါမည္။

ပတ္၀န္းက်င္ထိန္းသိမ္းေရး စီမံေဆာင္ရြက္မႈ အစီအစဥ္မ်ားကို စဥ္ဆက္မျပတ္သာကီးၾကပ္မႈ ကဲျခင္း မွ စီမံကြပ္ကဲမႈ လိုအပ္သည္ဟု ယူဆႏိုင္ေၾကာင့္ ရွာေဖြေတြ႕ရွိခ်က္မ်ားအား အခ်ိန္ႏွင့္ တစ္ေျပးညီ စိစစ္သံုးသပ္ပါ မည္။ ေလ့လာခ်က္ရလာဒ္အေပၚအေျခခံ၍ မွားယြင္းလြဲေခ်ာ္မႈမ်ားကို အမွန္အကန္ျဖစ္ေစ ရန္ႏွင့္ ပတ္၀န္းက်င္ ထိန္းသိမ္းေရးစနစ္ကို စဥ္ဆက္မျပတ္တိုးတက္ေနေစရန္ မွန္ကန္သင့္ျမတ္ေသာ လုပ္ေဆာင္ခ်က္နည္းစနစ္မ်ားကို သတ္သတ္မွတ္မွတ္လုပ္ေဆာင္ေစေရးအတြက္ အတည္တက်ျဖစ္ေနေစ ရန္ စီမံကြပ္ကဲ သြားပါမည္။

၁၂.၂) ကုန္းေနသတၱ၀ါမ်ား

ေဆာက္လုပ္ေရးလုပ္ငန္းကာလတြင္ ေဆာက္လုပ္ေရး ဧရိယာအတြင္းရွိေသာ သဘာ၀ေပါက္ပင္ မ်ားႏွင့္ အေလ့က်အပင္မ်ားအား ေနရာရွင္းလင္းေရးအတြက္ ဖယ္ရွားရွင္းထုတ္ရမည္ ျဖစ္ပါသည္။ ေဒသရင္း

အပင္ႏွင့္ သတၱ၀ါမ်ိဳးစိတ္မ်ားကို မထိခိုက္ေစရန္ ေအာက္ပါေလ်ာ့ပါးသက္သာေစေရးနည္းလမ္းမ်ားကို လိုအပ္သလို လိုက္နာ ေဆာင္ရြက္သင့္ပါသည္။

၁၂.၃) *အႀကိဳေဆာက္လုပ္ေရးကာလ*

- ေဆာက္လုပ္ေရးလုပ္ငန္းကတိ၀န္ခံခ်က္မ်ားကို ခြင့္ျပဳမိန္႔မက်ခင္ကတည္းက ရယူထားျခင္း
- သဘာ၀ေပါက္ပင္ႏွင့္ အေလ့က်အပင္မ်ားကို ဆံုးရံႈးမႈေလ်ာ့နည္းေစရန္ ရွင္းလင္းမည့္ေနရာအား နယ္နိမိတ္သတ္မွတ္ကာ ေဘာင္ခတ္ထားျခင္း
- မလိုအပ္ပဲ သစ္ပင္မ်ားခုတ္ထြင္မႈကို ေရွာင္ၾကဥ္ရမည္။
- ေဒသရင္းဇီ၀မ်ိဳးစံုမ်ိဳးကြဲမ်ားအား ထိန္းသိမ္းရန္ ပတ္၀န္းက်င္ဆိုင္ရာအသိပညာေပးသင္တန္းမ်ား ကို အလုပ္သမားအားလံုးအား ေပးထားရမည္ျဖစ္ၿပီး စီမံကိန္းဧရိယာ၏ အထိမခံပ်က္စီးလြယ္ေသာ သေဘာသဘာ၀မ်ား ကို သိရွိေစရန္ လုပ္ငန္းခြင္၀င္သင္တန္းေပးျခင္း
- အပင္ႏွင့္ေတာ႐ိုင္းတိရစၧာန္မ်ားကို *ခြဲျခားသတ္မွတ္ရန္ႏွင့္ ေနရာေရႊ႕ေျပာင္း ေရးအတြက္ လိုအပ္ပါက လုပ္ငန္း ခြင္အတြင္းသတ္မွတ္ထားေသာ ၫႊန္ၾကားခ်က္မ်ား/က်င့္၀တ္စည္းကမ္းမ်ားအား ႐ုပ္ပံုၫႊန္ၾကားခ်က္မ်ားပါ၀င္ေသာ အသိပ ညာေပး သင္ေထာက္ကူျပဳစာစည္းမ်ားကို အသံုးျပဳကာ အလုပ္သမား အား လံုးကို သင္ၾကားေပးရပါမည္။*

၁၂.၄) *ေဆာက္လုပ္ေရးကာလ*

- ေဒသရင္းေတာ႐ိုင္းတိရစၧာန္မ်ားအား ေဆာက္လုပ္ေရးလုပ္ငန္းမ်ားေၾကာင့္ ရည္ရြယ္ခ်က္ရွိရွိ ထိခိုက္ေစျခင္း မ်ိဳးမရွိရပါ။
- ေန႔ဘက္တြင္ လုပ္ကိုင္ႏိုင္ေသာ လုပ္ငန္းတာ၀န္မ်ားအား ညဘက္တြင္ လုပ္ကိုင္ျခင္းကို ေရွာင္ရွားသင့္ပါ သည္။
- သတ္မွတ္ထားသည့္ စီမံကိန္းေနရာနယ္နိမိတ္အား မလိုလားအပ္ေသာ အေလ့က်အပင္ ႏွင့္သဘာ၀ ေပါက္ပင္ရွင္းလင္းခုတ္ထြင္မႈမ်ားမရွိရေအာင္ ပံုမွန္စစ္ေဆးသင့္ပါ သည္။
- ေဒသရင္းေတာ႐ိုင္းတိရစၧာန္မ်ားအား ၎တို႔ေနထိုင္ရာ သဘာ၀ႏွင့္ကိုက္ညီတူညီမႈရွိေသာ ေနရာမ်ားသို႔ ေျပာင္းေရႊ႕ေပးရမည္။
- ေတာ႐ိုင္းတိရစၧာန္မ်ား၏ ဝိေသသလကၡဏာရပ္မ်ားကို ေနရာရွင္းလင္းေရးမျပဳလုပ္ခင္ကတည္းက ေလ့ လာစိစစ္ထားၿပီး ၎တို႔ေနထိုင္ရာ သဘာ၀ႏွင့္ကိုက္ညီတူညီမႈရွိေသာ အနီးဆံုးေနရာသို႔ ေျပာင္းေရႊ႕ေပးႏိုင္ရန္ သတ္မွတ္ေဆာင္ရြက္ရမည္။
- အရည္အခ်င္းျပည့္မီေသာ *ပတ္၀န္းက်င္ပညာရွင္မွ ပတ္၀န္းက်င္ေစာင့္ၾကည့္စစ္ေဆးေရး လုပ္ငန္း ေဆာင္ရြက္ခ်က္မ်ားကို ပံုမွန္ႀကီးၾကပ္မႈ စစ္ေဆးေနရမည္။*
- ေဆာက္လုပ္ေရးယာဥ္မ်ားလႈပ္ရွားေဆာင္ရြက္မႈေၾကာင့္ ေတာ႐ိုင္းတိရစၧာန္မ်ား ေသေၾကပ်က္စီးမႈ မရွိေစရန္ ယာဥ္ေမာင္းသူမ်ားႏွင့္ အလုပ္သမားမ်ားအားလံုးကို သတိထား လုပ္ေဆာင္ၾကရန္ ၫႊန္ၾကား ခ်က္ေပးရမည္။
- ေဒသရင္း ေတာတိရစၧာန္မ်ားအား အမဲလိုက္ျခင္း၊ ဖမ္းယူျခင္းမ်ားကို တားျမစ္ရမည္။

- အနည္းငယ္ထိန္းခ်ဳပ္ေရးစနစ္ကို တည္ေဆာက္ရန္ မိုးတြင္းအခါသမယတြင္ ျခံစည္းရိုး ပင္စိုက္ျခင္း၊ ျခံခတ္ျခင္း အစရွိသည္တို႕ကို စီမံကိန္းမွ အသံုးမျပဳေသာ ဝန္းက်င္ေနရာေဒသမ်ားသို႕ အနည္မ်ားပ်ံ႕ ႏွံ႔ျခင္းမရွိေစရန္ ေရွာင္ၾကည္ျခင္း
- နည္းပညာအရ လက္ေတြ႔ျဖစ္ေျမာက္ႏိုင္စြမ္းရွိသာေနရာမ်ားတြင္ စီမံကိန္း၏ ေဆာက္လုပ္ေရးကာလအ တြင္း အပင္သစ္မ်ားကို ႀကိဳတင္စိုက္ပ်ိဳးထားရပါမည္။ စီမံကိန္းနယ္နိမိတ္တြင္ အပင္မ်ိဳးမ်ား ျပန္လည္ျပဳစုပ်ိဳးေထာင္ရာတြင္ ေဒသရင္းမ်ိဳးစိတ္မ်ားကိုသာ အသံုးျပဳရမည္ျဖစ္ၿပီး ႏိုင္ငံျခားတိုင္းတပါးမွလာေသာ မ်ိဳးစိတ္မ်ားကို လံုးဝစိုက္ပ်ိဳးခြင့္မျပဳရပါ။
- ယာယီသတ္မွတ္ထားေသာ *လုပ္ငန္းခြင္ေနရာတြင္ လုပ္ကိုင္ေဆာင္ရြက္ၿပီးစီးပါက သစ္ပင္မ်ား၊ ခ်ဳံပုပ္ မ်ား၊ ျမက္မ်ား အစရွိသည္တို႕ကို ျပန္လည္ ေနရာခ်ထားေပးခဲ့ရပါမည္။*

၁၂.၅) လည္ပတ္ဆဲအဆင့္

- ပတ္ဝန္းက်င္ထိန္းသိမ္းေရးစနစ္ ႀကီးၾကပ္ေဆာင္ရြက္မႈမ်ားကို အေကာင္အထည္ေဖာ္လုပ္ကိုင္ျခင္း ကို ဆက္လက္ျပဳေဆာင္ရန္ႏွင့္ ထိန္းသိမ္းထားရန္
- သတ္မွတ္ထားေသာ စိမ္းစိုေရိယာကို ဆက္လက္ဖြံ႕ၿဖိဳးတိုးတက္ေအာင္ ေဆာင္ရြက္ျခင္း
- စက္ရိယာမ်ားကို အသံုးမျပဳသည့္အခ်ိန္တြင္ ပိတ္ထားရမည္။
- မလိုလားအပ္ေသာ အသံဆူညံထုတ္လႊတ္ေနေသာ စက္ပစၥည္း ကိရိယာမ်ားကို သတ္မွတ္အခ်ိန္အား တိုင္းပံုမွန္စစ္ေဆးမႈမ်ား ျပဳလုပ္ေပးရမည္။
- အသံဆူညံမႈနည္းေသာ စက္အင္ဂ်င္မ်ားႏွင့္ အသံကာပစၥည္းမ်ား၊ အသံတိတ္စက္ပစၥည္းမ်ားကို အသံုးျပဳ ရမည္။
- အသံထုတ္လႊတ္မႈကို *လမ္းေၾကာင္းသတ္မွတ္ခ်က္မ်ား* (*ေယဘူယ် ထုတ္လႊတ္မႈ လမ္းေၾကာင္းခ်က္မ်ား* < *အေဆာက္အဦးမ်ားမွထုတ္လႊတ္မႈကို* 85 dB(A), Impulse < 115 db(A) from 1.5 m distance, 85 dB(A) ႏွင့္ စက္ရံုလည္ပတ္ဆဲ စက္ရံုနယ္နိမိတ္မ်ားမွ 70 db(A)) အတိုင္း *ထိန္းသိမ္းေဆာင္ရြက္ရမည္။*
- အလုပ္သမားမ်ားအား သင့္ေလ်ာ္ေသာ နားၾကပ္မ်ား၊ နားကာပစၥည္းမ်ားေထာက္ပံ့ေပးထားၿပီး အသံဆူညံေသာ ေနရာမ်ားတြင္ အလုပ္လုပ္ရပါက မျဖစ္မေန တပ္ဆင္ထားရန္ ၾကားထားရ မည္။
- အသံဆူညံမႈ ေလ်ာ့ပါးေရး နည္းလမ္းမ်ားကို သိရွိနားလည္ရန္ အလုပ္သမားမ်ားအား သင့္ေလ်ာ္ေသာ သင္တန္းမ်ားေပးရမည္။
- ကုန္ၾကမ္းပစၥည္းမ်ားႏွင့္ *ကုန္ေခ်ာပစၥည္းမ်ားကို တစ္ေနရာမွ တစ္ေနရာသို႕ သယ္ယူပို႕ေဆာင္ရာ တြင္ ေလထုညစ္ညမ္းမႈမရွိေစရန္ ေသခ်ာစြာ ဖံုးအုပ္ထားရမည္။*

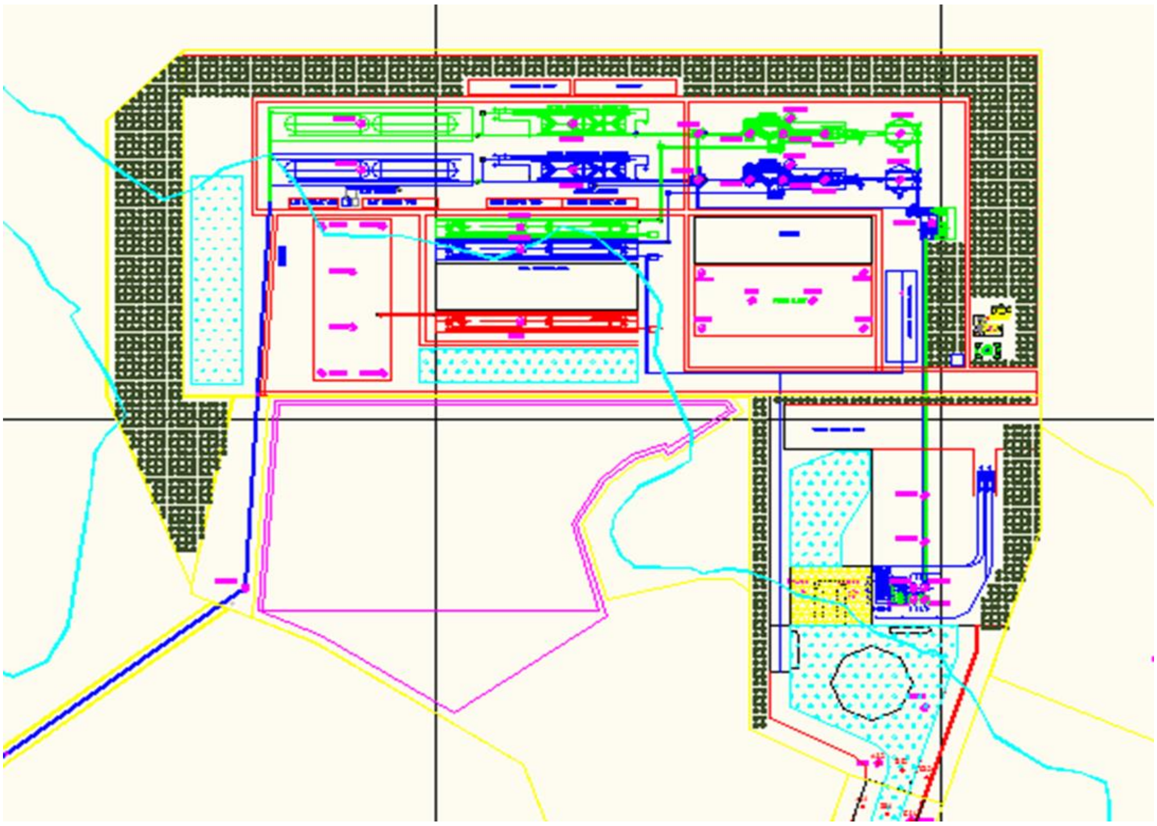
၁၂.၆) စိမ္းစိုနယ္ေျမ ဖြံ႕ၿဖိဳးတိုးတက္ေရး အစီအစဥ္

သက္သာေလ်ာ့ပါးေစေရး နည္းလမ္းမ်ားတြင္ ေလထုညစ္ညမ္းမႈေလ်ာ့ပါးေစေရးတြင္ အသံကာအရံ အတားအျဖစ္လည္း လုပ္ေဆာင္ႏိုင္ေသာ စိမ္းစိုနယ္ေျမ ဖြံ႕ၿဖိဳးတိုးတက္ေရး အစီအစဥ္ကို စီမံကိန္းဧရိယာအ တြင္းတြင္ တည္ေဆာက္ထားရမည္။

ဤအပင်များစိုက်ပျိုးရန် သတ်မှတ်ထားသောနေရာများမှာ စီမံကိန်းနယ်နိမိတ်တစ်လျှောက်၊ လမ်း ဘေးဝဲယာများ၊ မြေလွတ်များ နှင့် အခြားအဆောက်အဦများဆောက်လုပ်ရန် လျာထားချက် မရှိသော နေရာ များတွင် ဖြစ်ရမည်။

အပင်မျိုးစိတ်များကိုရွေးချယ်ရာတွင် ဖြစ်နိုင်ပါက အမြဲစိမ်းလန်းနေသော ဒေသရင်းအပင်မျိုးစိတ် များကိုသာ စိုက်ပျိုးရမည်။

ကြားခံနယ်မြေသာလျှင်မကပဲ အခြားဖြစ်နိုင်သော အမြဲတစေ လွတ်နေသော နေရာများတွင် မြက်ခင်း လွှ ပေစေသာ၊ အသီးသီးသော၊ ကျေးငှက်သာရကာများ နားခိုနိုင်သော အပင်မျိုးစိတ်များကို စိုက်ပျိုးရပါမည်။ သစ်ပင် စိုက်ပျိုးမှု အစီအစဉ်ကို အကောင်အထည်ဖော်ဆောင်ရွက်ခြင်းဖြင့် အသံဆူညံမှုနှင့် ဖုန်မှုန့်ထုတ်လွှတ်မှုကို လျော့နည်းစေပါသည်။ ထို့အပြင် စီမံကိန်းဧရိယာကိုအနီးအနားရှိရွာများ နှင့် အလုပ်သမားများအတွက် အပန်းဖြေနေ ရာ ပန်းခြံအဖြစ်ပင် ပြောင်းလဲသက်ရောက်စေပါသည်။



ပုံ (၃၂): စိမ်းစိုဧရိယာပြပုံ

၁၂.၇) ေရႏွင့္ေရဆိုး

Issues	Mitigation Measure	Monitoring Program
Water ▪ Stormwater runoff ▪ Surface water ▪ Groundwater	▪ Flood management : Drainage system ▪ Water reservoir (Internal use) ▪ Re-circulate cooling water	▪ Surface water monitoring ▪ Groundwater monitoring ▪ Baseline data gathering
Wastewater (W/W) ▪ W/W from coal stockpile ▪ W/W from Power plant (Backwash water)	▪ Pavement coal storage area ▪ Ensure zero discharge of water from any facility into the surrounding areas ▪ Install w/w treatment i.e. grease & oil trap, sedimentation pond	▪ Effluent water sampling (All point source discharges) ▪ Groundwater boreholes

၁၂.၈) စက္ရံုတြင္းရွိစြန္႕ပစ္စာည္းမ်ား

Issues	Mitigation Measure	Monitoring Program
Solid wastes ▪ Fly ash ▪ Bottom ash ▪ Gypsum	▪ Alternative Raw Material in cement process i.e. fly ash, gypsum ▪ Ash & Gypsum storage facility → Indoor storage to prevent leachate from rain	▪ Fly ash & Gypsum Sampling ▪ Quality Control
Liquid wastes ▪ Used oil ▪ Chemicals	▪ Alternative Fuel in cement process i.e. used oil, some chemicals	▪ Quality control

၁၂.၉) စြန္႔ပစ္စာည္းမ်ား စီမံကြပ္ကဲျခင္း

- ရင္းျမစ္စာည္းမ်ား သံုးစြဲမႈကို ေလွ်ာ့ခ်ရန္ (Reduce, Reuse, Recycle) စေသာ 3Rs အစီအစဥ္အတိုင္း အ တည္ျပဳသံုးစြဲရမည္။
- SCG ၏ ZERO waste to landfill မူဝါဒကို လိုက္နာက်င့္သံုးရမည္။
- အမိႈက္စြန္႕ပစ္ေရး စီမံကြပ္ကဲမႈတြင္ အမိႈက္ကို ခြဲျခားစြန္႕ပစ္ျခင္း၊ ထြက္ရွိသမွ် အမိႈက္အားလံုးကို စီမံကာ စြန္႔ပစ္ရမည္။
- ေဘးအႏၱရာယ္ျဖစ္ေစေသာပစၥည္းမ်ားကို အမွတ္အသားျပဳထားေသာ အမိႈက္ပံုးမ်ားတြင္သာ စြန္႔ရမည္။
- ေဘးအႏၱရာယ္ျဖစ္ေစေသာပစၥည္းမ်ားကို သိုေလွာင္စြန္႕ပစ္ရာတြင္ ၎တို႕၏ေဘးအႏၱရာယ္ျဖစ္ေစ
- ေသာဝိေသသလကၡဏာရပ္မ်ားအေပၚမူတည္ကာ ေဒသတြင္းႏွင့္ဝိုင္းတြင္း သတ္မွတ္ထားေသာ ၁ႏွစ္ ၾကာခ်က္မ်ား၊ စည္းမ်ဥ္းစည္းကမ္းမ်ားအတိုင္း လိုက္နာေဆာင္ရြက္ရမည္။
- စြန္႔ပစ္စာည္းမ်ားကိုသတ္မွတ္ထားေသာေနရာတြင္ ခြဲျခားထားၿပီး သိုေလွာင္ ေသာေနရာမွ အျခား တစ္ေန ရာသို႕ ဘက္ဆီးရီးယားပိုးမႊားမ်ား ပ်ံ႕ႏွံ႕မႈမရွိေစရန္ အဖိုးအကာမ်ားျဖင့္ ထားရမည္။

- ထရန္စေဖာ္မာတြင္အသံုးျပဳေသာ ဆီအပါအဝင္ အသံုးျပဳၿပီးေသာ ဆီမ်ားကို ျပန္လည္သံုးစြဲရမည္။
- မီးေဘးကာကြယ္ေရးစနစ္ႏွင့္ တဆင့္ခံထိန္းခ်ဳပ္စာည္းမ်ားကို မီးေဘးအႏၱရာယ္ကာကြယ္ရန္ႏွင့္ အႏၱ ရာယ္ရွိ ပစၥည္းမ်ား ယိုစိမ့္ေက်မႈ မရွိေစရန္ အသံုးျပဳထားရမည္။
- စြန္႕ပစ္စာည္းအားလံုးကို ေဒသတြင္းသတ္မွတ္ထားေသာ လိုအပ္ခ်က္မ်ားႏွင့္ကိုက္ညီမႈ ရွိေစရန္ႏွင့္ သင့္ ေလ်ာ္ေသာ လိုင္စင္ရွိထားၿပီးေသာ စြန္႕ပစ္စာည္း စြန္႕ထုတ္ရန္ အဂါၤရပ္မ်ားႏွင့္အညီ စြန္႕ပစ္ရ ပါမည္။
- စြန္႔ပစ္စာည္းစြန္႕ရာေနရာကို သတ္မွတ္ထားၿပီး လုပ္ငန္းမလည္ပတ္ခင္ကတည္းက ႐ိုး႐ိုးစြန္႕ပစ္ပစၥည္းႏွင့္ အႏၱရာယ္ရွိေသာစြန္႔ပစ္စာည္းမ်ားအတြက္ ေနရာကို သတ္သတ္ ခြဲထုတ္ကာ သတ္မွတ္ထား ရပါမည္။

ဇယား (၁၀): ပတ္ဝန္းက်င္ စီမံခန္႕ခြဲ ႀကီးၾကပ္မႈ အစီအစဥ္

Indicator (Survey item)	Location of Data Collection	Method and Frequency	Institution
Construction Phase			
Monitoring EMP implementation • Mitigation measures • Enhancement measures • Contingency • Compensation	Project area	Daily monitoring and documenting, and quarterly reporting	SOD Department
Air quality (NO_2, SO_2, CO, TSP, PM_{10})	3 locations (same as baseline data collection locations)	Quarterly (March, July, November)	Third Party
Noise	4 locations (same as baseline data collection locations)	Quarterly (March, July, November)	Third Party
Surface Water Quality Analysis (Parameter are same as IFC standard)	Locations and number of samples are same as baseline data collection	Quarterly (March, July, November)	Third Party
Ground Water Quality Analysis (Parameter are same as IFC standard)	Locations and number of samples are (same as baseline data collection)	Quarterly (March, July, November)	Third Party
Soil Quality	Locations and number of samples are (same as baseline data collection)	Yearly (March)	Third Party
Operation Phase			
Air quality (NO_2, SO_2, CO, $PM_{2.5}$, PM_{10})	3 locations (same as baseline data collection locations)	Quarterly (March, July, November)	Third Party
(Temperature, Velocity, SO_2, SPM, NOx, HC, CO)	Stack/Chimney Monitoring	Quarterly (March, July, November)	SOD Department
Noise	4 locations (same as baseline data collection locations)	Quarterly (March, July, November)	Third Party

ဇယား (၁၀): ပတ္ဝန္းက်င္ စီမံခန္႕ခြဲ ႀကီးၾကပ္မႈ အစီအစဥ္ (Continue)

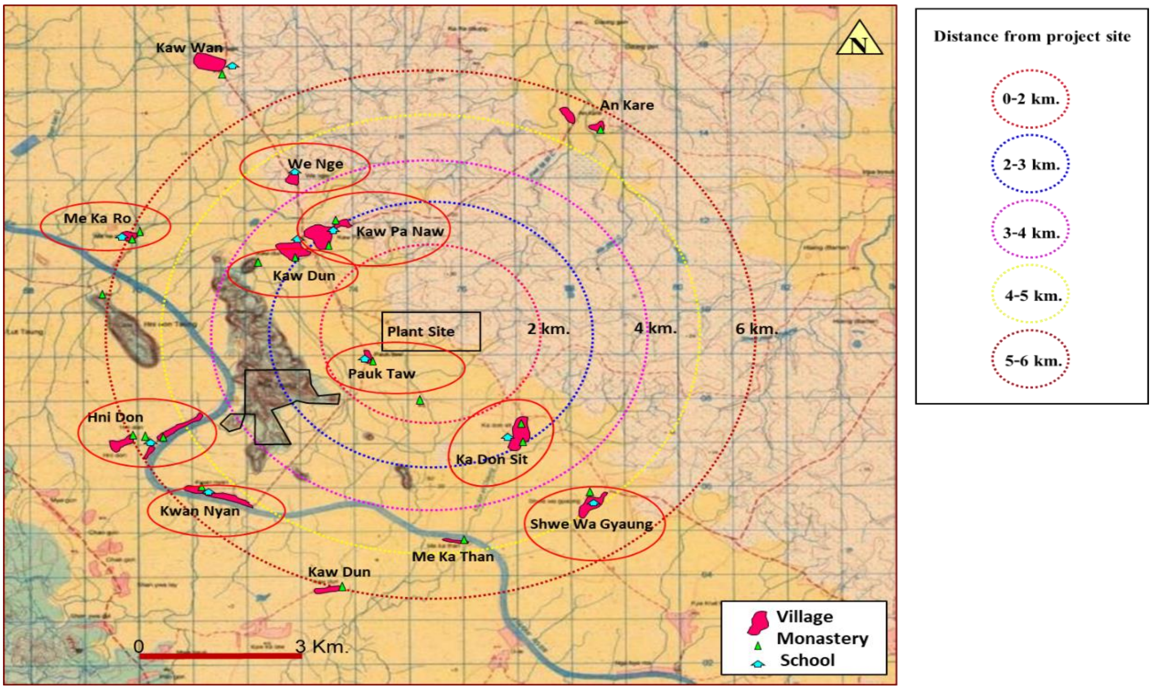
Indicator (Survey item)	Location of Data Collection	Method and Frequency	Institution

Operation Phase			
Surface Water Quality Analysis (Parameter are same as IFC standard)	Locations and number of samples are same as baseline data collection	Quarterly (March, July, November)	Third Party
Ground Water Quality Analysis (Parameter are same as IFC standard)	Locations and number of samples are (same as baseline data collection)	Quarterly (March, July, November)	Third Party
Implementation of Air quality management plan, Noise Management plan, Waste management plan	Within factory area (Stack)	Daily monitoring and quarterly reporting	SOD Department
Surface water pollution monitoring (DO, BOD, COD, Heavy metal, pH, salinity, Total hardness, Nitrate, TDS, TSS, Temperature, etc.)	1. Effluent discharge point	Quarterly (March, July, November)	Third Party
Implementation of Ecosystem Management plan	Within project area	Regular monitoring and quarterly reporting	SOD Department or Third Party
Whether people and workers suffer from health risk	Project site and surrounding the area	Quarterly	SOD Department
Occupational Health and Safety	Cement Plant and Compound (Work site and offices)	Twice per year Record of accidents and infectious diseases	SOD Department
Community Health and Safety	5 villages nearby the project sites	Twice per year Record of accidents and infectious diseases related to the community	SOD Department
The implementation status for CSR activities such as community support program	5 villages nearby the project sites	Once per year	SOD Department
Usage of chemicals	Cement Plant and Compound (Work site and offices)	Biannually Record of the type and quantity of chemicals and implementation status of control measures through self-inspection	SOD Department

၁၃) MCL ၏ လူမႈေရးရာ ထိခိုက္ဆန္းစစ္မႈ ႏွင့္ ႀကီးၾကပ္ကြပ္ကဲေရး အစီအစဥ္

အနီးဝန္းက်င္ရွိ ရရွိရင္းျမစ္အရာဝတၳဳမ်ားကို ဆန္းစစ္ေလ့လာရာတြင္ စီမံကိန္းဧရိယာအတြင္းရွိ ေပါက္ ေတာ၊ ေကာ့ဒြန္း၊ ေကာ့ပေနာ္၊ ႏွီးဒံု၊ ကြမ္ညန္း၊ ကဒံုစိ ႏွင့္ မဲကၠ႐ြာစေသာ ႐ြာေပါင္း ၇ ႐ြာမွ ေျဖၾကား သူ စုစုေပါင္း ၃၀၀ ကို လူေတြ႕ေမးျမန္းခဲ့ပါသည္။ ထိုသူမ်ားအားလံုးမွာ စီမံကိန္းထိခိုက္သက္ေရာက္ခံ ဧရိယာအတြင္းမွ ပုဂၢိဳလ္မ်ား ျဖစ္ေသာ္လည္း စီမံကိန္းေၾကာင့္ ေရႊ႕ေျပာင္းမႈ ျပဳလုပ္ရန္ မလိုအပ္ပါ။ ၎တို႔၏လက္ရွိတည္ရွိေနေသာ အေျခအေန အေနအထားမ်ား၊ စီမံကိန္းတည္ေဆာက္ျခင္းအေပၚ သေဘာထား အျမင္မ်ား ႏွင့္ ထိခိုက္သက္ေရာက္ ႏိုင္မႈမ်ားကို နားလည္သေဘာေပါက္ရန္ လူေတြ႕ေမးျမန္းသူမ်ားသည္ နည္းစနစ္တက် ျပင္ဆင္ထားေသာ စစ္တမ္းကို ျပဳစုကာ သတင္းအခ်က္အလက္မ်ား ေကာက္ယူခဲ့ပါသည္။ ထိုစစ္တမ္းတြင္ လူေတြ႕ေျဖၾကားမည့္သူမ်ား၏ အေျခခံအခ်က္အလက္မ်ား၊ လူမႈစီးပြားအေျခ အ ေနမ်ား၊ ပညာေရးႏွင့္ လက္ရွိ ပတ္ဝန္းက်င္ဆိုင္ရာျပႆနာမ်ား၊ အေဆာက္အဦးႏွင့္ လူမႈေရး ျပႆနာမ်ား၊ စီမံကိန္း အေပၚထားရွိသည့္ ခံယူခ်က္မ်ား၊ သေဘာထားမ်ား ႏွင့္ စီမံကိန္းေဆာင္ရြက္ရာ မွ ျဖစ္ေပၚလာေသာ ထိခိုက္ သက္ေရာက္မႈမ်ားႏွင့္ပတ္သက္၍ ေလ်ာ့ပါးသက္သာေစေရးမ်ား ေဆာင္ရြက္ထားရွိသည့္ အေပၚ သ ေဘာထားအျမင္မ်ား စေသာ အခ်က္ အလက္မ်ားစြာကို ထည့္သြင္းေမးျမန္းခဲ့ပါသည္။

စစ္တမ္းကို စီမံကိန္းဧရိယာမွ ၃ ကီလိုမီတာအကြာအေဝးအတြင္းရွိ သက္ဆိုင္ရာ ျပည္သူလူထု အ ေပၚတြင္ အဓိကထား၍ ေဆာင္ရြက္ခဲ့ပါသည္။ စစ္တမ္းေကာက္ယူမည့္ ဧရိယာတြင္ ႐ြာေပါင္း ၇ ႐ြာ ရွိၿပီး ေအာက္ေဖာ္ျပပါ ပံုႏွင့္ဇယားတို႔တြင္ ေဖာ္ျပထားပါသည္။



ပံု (၁၃): အဆိုျပဳထားေသာ MCL စီမံကိန္းအနီးဝန္းက်င္ရွိ လူေနထိုင္ရာ ေက်း႐ြာမ်ားျပေျမပံု

ဧယား (၁၁): စီမံကိန်းဧရိယာအတြင်းရှိ ေက်းရြာမ်ား၏ တည္ေနရာ

No.	Name of Village	Latitude (North)	Longitude (East)
1	Pauktaw	16° 21' 43"	97° 49' 09"
2	Kaw Dun	16° 22' 60"	97° 48' 24"
3	Kaw Pa Naw	16° 23' 12"	97° 48' 40"
4	Hni Don	16° 20' 42"	97° 46' 44"
5	Kwan Nyan	16° 20' 1"	97° 47' 34"
6	Ka Don Sit	16° 20' 43"	97° 50' 44"
7	Me Ko Ro	16° 23' 9"	97° 46' 42"

Source: REM Field survey (February 2013)

၁၃.၁) လူမႈစီးပြားဆိုင္ရာ ထိခိုက္လြယ္ေရာက္မႈမ်ား

ေကာက္ယူရရွိလာေသာ သတင္းအခ်က္အလက္မ်ားကို အေရအတြက္အားျဖင့္ေသာ္လည္းေကာင္း အရည္ အေသြးေပၚတြင္လည္းေကာင္း အေျခခံကာ ဆန္းစစ္အကဲျဖတ္ရာတြင္ နည္းပညာရွင္မ်ား၏ နည္းစနစ္က် ဆံုးျဖတ္ ခ်က္မ်ားႏွင့္ စီမံကိန္းႏွင့္ သက္ဆိုင္သူမ်ား၏ ေဆြးေႏြးအၾကံျပဳ ေဝဖန္ခ်က္မ်ားကို ထည့္ သြင္း စဥ္းစားခဲ့ပါသည္။

သက္ေရာက္မႈ တစ္ခုခ်င္းစီ၏ လကၡဏာရပ္မ်ားကို ဆန္းစစ္အကဲျဖတ္ရာတြင္ ေအာက္ပါအခ်က္အလက္မ်ား ကို ထည့္သြင္းစဥ္းစားခဲ့ပါသည္။

- ထိခိုက္လြယ္ေရာက္မႈ၏ သေဘာသဘာဝ (အေကာင္း သို့မဟုတ္ အဆိုး)
- ထိခိုက္လြယ္ေရာက္မႈ၏ ၾကာခ်ိန္ ကာလ အပိုင္းအျခား (ယာယီ သို့မဟုတ္ တစ္သက္တာ)
- အေရးပါမႈ
- ျပင္းထန္မႈ
- ထင္ထင္ရွားရွားသက္ေရာက္ထိခိုက္မႈ

၁၄) ပတ္ဝန္းက်င္ဆိုင္ရာႏွင့္ လူမႈဝန္းက်င္ဆိုင္ရာ စီမံခန္႔ခြဲမႈ အစီအစဥ္ တည္ေဆာက္ခံု

ပတ္ဝန္းက်င္ဆိုင္ရာႏွင့္ လူမႈဝန္းက်င္ဆိုင္ရာ စီမံခန္႔ခြဲမႈအစီအစဥ္ တည္ေဆာက္ခံု စီမံကိန္း ၏ ေဆာက္လုပ္ ေရး ကာလႏွင့္ လည္ပတ္စဥ္ကာလအတြင္း ေလ့ာ်ိးသက္သာေစေရး ေဆာင္ရြက္ခ်က္မ်ား အက်ဥ္းခ်ဳပ္ကို အစီရင္ ခံ တင္ျပပါမည္

ေဆာက္လုပ္ေရး ကာလ ခန္႕မွန္းေျခ၄၄ လအတြင္း ထိခိုက္မႈ ေလ့ာ့ခ်ေရး နည္းလမ္းမ်ားကို နည္းနာေကာင္း မ်ားႏွင့္ ဆက္စပ္ လုပ္ေဆာင္သြားမည္ ျဖစ္ၿပီး လုပ္ငန္းလည္ပတ္ျခင္း ကာလအတြင္း (ေလထု ထုတ္လႊတ္မႈႏွင့္ ဆူညံသံထြက္ရွိမႈ) ထိခိုက္မႈ ေလ့ာ့ခ်ေရးနည္းလမ္းမ်ားကိုလည္း စီမံကိန္းဒီဇိုင္း ေရးဆြဲသတ္မွတ္ရာတြင္ တစ္ပါတည္း ထည့္သြင္း ေရးဆြဲပါမည္။

၁၄.၁) စီမံကိန္းႏွင့္ အစိုးရ သက္ဆိုင္သူမ်ားႏွင့္ ေတြ႕ဆံုေဆြးေႏြးျခင္းႏွင့္ အမ်ားျပည္သူႏွင့္ တိုင္ပင္ေဆြးေႏြးမႈ လုပ္ငန္းစဥ္မ်ား

သတင္းအခ်က္အလက္မ်ားထုတ္ေဖာ္ျခင္းႏွင့္ ျပည္သူလူထုႏွင့္ေတြ႕ဆံုေဆြးေႏြးပြဲမ်ားအား EIA စီမံကိန္း လည္ပတ္ေနသမွ်ကာလပတ္လံုးတြင္ သက္ဆိုင္သူမ်ားႏွင့္ေဆြးေႏြးေဆြးေႏြးျခင္းမ်ားအား အစီအစဥ္တြင္ တင္ျပထား သည့္အတိုင္း ေဆာင္ရြက္သြားပါမည္။

ဇယား ၁၂: သက္ဆိုင္သူမ်ားႏွင့္ေဆြးေႏြးေဆြးေႏြးျခင္းလုပ္ငန္းစဥ္ႏွင့္တာဝန္ခံထားမႈမ်ား

SEP Reporting Mechanism	Timing	Responsibility
Consultation Form	For each consultation or stakeholder contacted	SOD Manager
Stakeholder Identification and Consultation Register	Continued	SOD Manager
Grievance Register	Continued	SOD Manager
Grievance Monitoring	Quarterly during construction Biannually during the operation	SOD Manager
SEP Progress Reports	Quarterly during construction Biannually during the operation	
SEP Annual Report	Biannually	

၁) သက္ဆိုင္သူမ်ားႏွင့္ေဆြးေႏြးေဆြးေႏြးနိုင္မည့္နည္းလမ္းမ်ား

စီမံကိန္းႏွင့္သက္ဆိုင္သူမ်ား ၊ မသန္စြမ္းမ်ား ၊ စိတ္ဝင္စားသူမ်ား ၊ အစိုးရေအဂ်င္စီမ်ား ႏွင့္ အစိုးရ မဟုတ္ေသာ အဖြဲ႕အစည္းမ်ား ႏွင့္ အျခားအဖြဲ႕အစည္းမ်ားအားလံုးဆီသို႕ ေရာက္ရွိေစရန္ သက္ဆိုင္သူမ်ားႏွင့္ ေဆြးေႏြး ေဆြးေႏြးေဆာင္ရြက္ရန္ အစီအစဥ္အတိုင္း ေဆာင္ရြက္မည္ျဖစ္ပါသည္။

- သတင္းအခ်က္အလက္ႏွင့္ေဆြးေႏြးပြဲမ်ား
- သီးသန္႕အုပ္စုမ်ားဖြဲ႕၍ ေဆြးေႏြးျခင္း (အမ်ိဳးသမီးမ်ား ၊ အသက္ႀကီးသူမ်ား ၊ ငယ္ရြယ္သူမ်ား အစရွိ သျဖင့္)
- လူမႈစီးပြားအေျခခံအခ်က္အလက္မ်ားအားကြင္းဆင္းေကာက္ယူျခင္း
- စီမံကိန္းေနရာႏွင့္ ျပည္သူလူထုေၾကာ္ျငာဘုတ္မ်ားတြင္ သတင္းဌာနမ်ား ထားရွိျခင္း
- အစီရင္ခံစာအား သက္ဆိုင္သူမ်ားသို႕ထုတ္ေဖာ္တင္ျပေဆြးေႏြးျခင္း
- ဖုန္း အီးေမးလ္မ်ားျဖင့္ ျပန္လည္ေျဖၾကားရန္ တရားဝင္ထုတ္ျပန္ေပးျခင္း

- တစ္ဦးခ်င္းအင္တာဗ်ဴးမ်ားႏွင့္ ေမးခြန္းစစ္တမ္းမ်ား
- ပံုမွန္ဆက္သြယ္ေသာ အစည္းအေဝးမ်ား

၂) အမ်ားျပည္သူႏွင့္တိုင္ပင္ေဆြးေႏြးျခင္း

ဇယား ၁၃: သက္ဆိုင္သူမ်ားႏွင့္ေဆြးေႏြးေဖာ္ေဝဆိုျခင္းအစည္းအေဝးမ်ား

No.	Date	Name of Town/Village/Ward	Participation	Arranged by
Year 2013 (1st Stakeholder Consultation and Disclose of Project Relevant Information)				
1	23.2.2013	Head of Village Tract Office	-MCL Authorities -REM Consultants -Kaw Pa Naw Villagers -Pauktaw Village Villagers	MCL
2	24.2.2013	Village's Head Office Kwanngan Village	-MCL Authorities -REM Consultants -Me Ko Ro Villagers -Kwan Nyan Villagers -Hni Don Villagers	MCL
3	25.2.2013	Village's Head Office Ka Don Sit Village	-MCL Authorities -REM Consultants -Kadonsit Villagers -KawDon Villagers	MCL
4	25.2.2013	Administrator, General Administrative Department, Kyaikmaraw Township	-Heads of Village Tracts in Kyaikmaraw Township -REM Consultants -MCL Authorities	MCL
5	26.2.2013	GAD Office, Kyaikmaraw Township	-REM Consultants	
Year 2013 (2nd Stakeholder Meeting on Road Access)				
1	28.10.2013 10:00-11:00	Village's Head Office, Kadonsit Village	-REM Consultants -MCL Authorities	MCL
2	29.10.2013 11:00 AM – 12:00 PM	Village's Head Office, Kawdon Village	-REM Consultants -MCL Authorities -Villagers	MCL
3	29.10.2013 1:00 PM – 2:00 PM	Village's Head Office, Wenge Village	-REM Consultants -MCL Authorities -Villagers	MCL
4	30.10.2013 9:30 AM - 10:30 AM	Village's Head Office, KawWon Village	-REM Consultants -MCL Authorities -Villagers	MCL
5	30.10.2013 11:00 AM - 12:00 PM	Village's Head Office, Angazine Village	-REM Consultants -MCL Authorities -Villagers	MCL
6	30.10.2013	Village's Head Office, Taranar Village	-REM Consultants -MCL Authorities -Villagers	MCL

ဇယား ၁၃: သက္ဆိုင္သူမ်ားႏွင့္ေဆြးေႏြးေရွ့ဆိုႏိွင္းျခင္းအစည္းအေဝးမ်ား (continue)

No.	Date	Name of Town/Village/Ward	Participation	Arranged by
Year 2013 (2nd Stakeholder Meeting on Road Access)				
7	30.10.2013 2:30 PM – 3:30 PM	Village's Head Office, Kaw Thet	-REM Consultants -MCL Authorities -Villagers	MCL
Year 2016 (3rd Stakeholder Consultation)				
1	7.2.2016	KawPaNaw Monastery	-Villagers -REM Consultants -MCL Authorities -Kaw Pa Naw -Kaw Dun -We Nge	MCL
2	7.2.2016	Kaw Dun Monastery		
3	7.2.2016	We Nge Monastery		
4	7.2.2016	Kwan Nyan Monastery	-Villagers -REM Consultants -MCL Authorities	
5	8.2.2016	KaDonSit Monastery	-Villagers -REM Consultants -MCL Authorities -Shwewarchaung -Mekaro	MCL
6	8.2.2016	Shwe War Gyaung Monastery		
7	8.2.2016	MeKaRo Monastery		
8	10.2.2016	MCL Meeting Room	-REM Consultants -MCL Authorities	MCL

ဧယား ၁၄: အမ်ားျပည္သူႏွင့္တိုင္ပင္ေဆြးေႏြးျခင္းႏွင့္သတင္းအခ်က္အလက္ထုတ္ေဖာ္မႈ အစည္းအေဝးမ်ား

No.	Date	Name of Town/Village/Ward	Participation	Arranged by
Year 2013 (1st Public Consultation and Disclose Project Relevant Information)				
1	25.5.2013	Meeting Hall, Kyaikmaraw Administrative Office	-Government Stakeholders -MCL Authorities -Villagers -REM Consultants	MCL
Year 2013 (2nd Public Consultation and Disclose on Scoping Report)				
1	3.9.2013	Kyaikmaraw office	-Government Officers from Kyaikmaraw office -MCL Authorities -REM Consultants -Heads of Village tracts	MCL
2	4.9.2013	Kawpanaw	-MCL Authorities -REM Consultants -Wegne -Kawpanaw -Kaw Dun	MCL
Year 2013 (2nd Public Consultation and Disclose on Scoping Report)				
3	4.9.2013	Ka don sit	-MCL Authorities -REM Consultants -Ka Don Sit -Shwe war gyaung	MCL
4	5.9.2013	Kyan Nyan	-MCL Authorities -REM Consultants -Kyan Nyan -Pauk Taw	MCL
5	5.9.2013	Hni Don	-MCL Authorities -REM Consultants -Hni Don	MCL
6	6.9.2013	Mekaro	-MCL Authorities -REM Co. Ltd. -Mekaro	MCL
7	6.9.2013	Shin Zaw Pu Ward	-MCL Authorities -REM Consultants -Shin Zaw Pu Ward (Kyaikmara)	MCL
8	7.9.2013	Tarana	-MCL Authorities -REM Consultants -Tarana -Kyun Gon	MCL
9	7.9.2013	Kaw That	-MCL Authorities -REM Consultants -Kaw That Villagers	MCL
10	8.9.2013	Kaw Wan	-MCL Authorities -REM Consultants -Ang Ka Zaing & Kaw Wan	MCL

ဇယား ၁၄: အမ်ားျပည္သူႏွင့္တိုင္ပင္ေဆြးေႏြးျခင္းႏွင့္သတင္းအခ်က္အလက္ထုတ္ေဖာ္မႈ အစည္းအေဝးမ်ား (continue)

11	8.9.2013	Nyaung Bin Seik	-MCL Authorities -REM Consultants -Nyaung Bin Seik (village Tract)	MCL
Year 2017 (Public Disclosure on EIA Report Submission)				
1	17.8.2017 9:00 AM - 12:40 PM	Rheymonya Hotel, Mawlamyine	-Chief Minister of Mon State -State Governmental Officers -Kyaikmaraw Township GAD officer -Local people project surrounding villagers -Media -NGOs and interested persons -REM Consultants -MCL Authorities	MCL
Year 2017 (Public Disclosure on EIA Report Submission)				
2	18.8.2017, 9:00 AM – 12:00 PM	Kaw Pa Nor new Monastery	-Kaw Pa Naw Villagers -REM Consultants -MCL Authorities	MCL
3	18.8.2017, 2:00 PM – 5:00 PM	Kaw Dun New Monastery	-Kaw Dun Villagers -Mekaro Villagers -REM Consultants -MCL Authorities	MCL
4	19.8.2017 9:00 AM - 12:00 PM	Kaw-Krid Monastery	-Kwan Ngan Villagers -Pauk Taw Villagers -REM Consultants -MCL Authorities	MCL
5	19.8.2017 2:00 PM – 5:00 PM	Shwe War Chaung Monastary	-Kadonsit Villagers -Shwe War Chaung Villagers -REM Consultants	MCL
6	20.8.2017 9:00 AM– 12:00 PM	Hnidon Village Administrative office	-Hnidon Villagers -REM Consultants -MCL Authorities	MCL

စီမံကိန်းႏွင့္ သက္ဆိုင္သူမ်ားႏွင့္ ဂ်ဝိဳးႏိုင္းေဆြးေႏြးစဥ္တြင္ ပါဝင္ေဆြးေႏြးသူမ်ားမွ ေအာက္ပါအတိုင္း အၾကံျပဳ ေဆြးေႏြးတင္ျပထားပါသည္။

၁. စီမံကိန္းတြင္ဝင္ေရာက္အလုပ္လုပ္ေနေသာ အလုပ္သမားမ်ားအားလစာျမင့္ေသာ ထိုင္းႏိုင္ငံသို႕ သြားေရာက္အလုပ္လုပ္ကိုင္ျခင္းမွ ေလွ်ာ့ခ်ႏိုင္ရန္ လစာေကာင္းေကာင္းေပးထားရန္။
၂. အလုပ္ကို မည္သို႕ေလွ်ာက္ရမည္ ဟူေသာ သတင္းအခ်က္အလက္မ်ားကို ေပးရန္။
၃. အတၱံရံုျမစ္ကို ေရလမ္းသယ္ယူပို႕ေဆာင္ေရးအတြက္ အသံုးျပဳမည္ဆိုပါက ငါးဖမ္းေလွမ်ားအား ထည့္သြင္း စဥ္းစားေပးရန္။
၄. ေျခာက္ေသြ႕ရာသီတြင္ အတၱံရံုျမစ္ေရသံုးစြဲမႈကို ထိန္းသိမ္းရန္။
၅. ေတာင္မ်ားကို ထိန္းသိမ္းရန္။
၆. ျပည္သူလူထု၏ ယူဆခ်က္ အေတြးအျမင္ကို ရယူရန္။
၇. လမ္းျပင္ျခင္းႏွင့္ လွ်ပ္စစ္စာတန္းရရွိမႈကို တိုးၾမွင့္ေဆာင္ရြက္ေပးရန္။
၈. ေလ်ာ့ေၾကးေငြမ်ားေပးရာတြင္ လက္ရွိေပါက္ေစ်းအတိုင္း ေငြေပးေခ်ရန္။
၉. စာသင္ေက်ာင္းမ်ားႏွင့္ ဆရာအင္အားကို ျဖည့္တင္းေပးရန္။
၁၀. ေသာက္ေရအတြက္ ေရတြင္းမ်ား တူးေဖာ္ေပးရန္။
၁၁. စီမံကိန္းမွ ဖုန္မႈန္႕ထြက္ရွိမႈကို ေလွ်ာ့ခ်ေပးရန္။
၁၂. ေဒသတြင္း ဖြံ႕ၿဖိဳးတိုးတက္ေရးကို အရွိန္အဟုန္ ၾမွင့္တင္ရန္။
၁၃. ေဆးခန္းမ်ားႏွင့္ ေဆးေပးခန္းမ်ားကို တည္ေဆာက္ေပးရန္။

ေက်းရြာရွိလူမ်ားသည္ စီမံကိန္းသည္ ေက်းလက္ေဒသႏွင့္ ေဒသတြင္း ဖြံ႕ၿဖိဳးတိုးတက္မႈအတြက္ လက္ခံသင့္သည္ဟု ယူဆၾကၿပီး ေျဖဆိုသူမ်ားကလည္း စီမံကိန္းသည္ တိုင္းျပည္ဖြံးၿိးေရးအတြက္ အေထာက္အကူ ျဖစ္ေစလိမ့္မည္ ဟု ေမွ်ာ္လင့္ထားၾကပါသည္။

ေက်းလက္ေဒသႏွင့္ ေဒသတြင္း ဖြံ႕ၿဖိဳးတိုးတက္မႈအတြက္ လူထုမွေတာင္းဆိုေသာ အေျခခံလိုအပ္ ခ်က္မ်ားမွာ ေအာက္ပါအတိုင္း ျဖစ္ပါသည္။

၁. လမ္းျပင္ေပးရန္
၂. က်န္းမာေရးေစာင့္ေရွာက္မႈအား အခေၾကးေငြ မယူပဲ ဝန္ေဆာင္မႈ ေပးရန္
၃. အလုပ္အကိုင္အခြင့္အလမ္းမ်ားဖန္တီးေပးရန္
၄. စာသင္ေက်ာင္းေဆာင္သစ္မ်ား ေဆာက္လုပ္ေပးရန္

Public Consultation and Disclose on EIA Report at Rehomomya Hotel, Mawlamyine (17.8.2017)

ဇယား (၁၅): ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးအစီအစဉ်နှင့် ကြီးကြပ်ကွပ်ကဲရေးလုပ်ငန်းများအတွက် ခန့်မှန်းကုန်ကျစရိတ်များ (လည်ပတ်စဉ်ကာလ)

Indicator (Survey item)	**Location of Data Collection**	**Method and Frequency**	**Institution**	**Annual Cost (USD)**
Construction Phase				
Monitoring EMP implementation • Mitigation measures • Enhancement measures • Contingency • Compensation	Project area	Daily monitoring and documenting, and quarterly reporting	SOD Department	14,400
Air quality (NO_2, SO_2, CO, TSP, PM_{10})	3 locations (same as baseline data collection locations)	Quarterly (March, July, November)	Third Party	19,500
Noise	4 locations (same as baseline data collection locations)	Quarterly (March, July, November)	Third Party	10,755
Surface Water Quality Analysis (Parameter are same as IFC standard)	Locations and number of samples are same as baseline data collection	Quarterly (March, July, November)	Third Party	8,715
Ground Water Quality Analysis (Parameter are same as IFC standard)	Locations and number of samples are (same as baseline data collection)	Quarterly (March, July, November)	Third Party	10,455
Soil Quality	Locations and number of samples are (same as baseline data collection)	Yearly (March)	Third Party	8,475
Operation Phase				
Air quality (NO_2, SO_2, CO, $PM_{2.5}$, PM_{10})	3 locations (same as baseline data collection locations)	Quarterly (March, July, November)	Third Party	19,500
(Temperature, Velocity, SO_2, SPM, NOx, HC, CO)	Stack/Chimney Monitoring	Quarterly (March, July, November)	SOD Department	6,450
Noise	4 locations (same as baseline data collection locations)	Quarterly (March, July, November)	Third Party	10,755

ဇယား (၁၅): ပတ်ဝန်းကျင်ဆိုင်ရာသိမ်းဆည်းရေးအစီအစဉ်နှင့် ဆက်သွယ်ပြောကြားရေးလုပ်ငန်းများအတွက် ခန့်မှန်းကုန်ကျစရိတ်များ (လည်ပတ်ဆဲကာလ) (continue)

Indicator (Survey item)	Location of Data Collection	Method and Frequency	Institution	Annual Cost (USD)
Operation Phase				
Surface Water Quality Analysis (Parameter are same as IFC standard)	Locations and number of samples are same as baseline data collection	Quarterly (March, July, November)	Third Party	8,715
Ground Water Quality Analysis (Parameter are same as IFC standard)	Locations and number of samples are(same as baseline data collection)	Quarterly (March, July, November)	Third Party	10,455
Implementation of Air quality management plan, Noise Management plan, Waste management plan	Within factory area (Stack)	Daily monitoring and quarterly reporting	SOD Department	14,440
Surface water pollution monitoring (DO, BOD, COD, Heavy metal, pH, salinity, Total hardness, Nitrate, TDS, TSS, Temperature, etc.)	1. Effluent discharge point	Quarterly (March, July, November)	Third Party	4,250
Implementation of Ecosystem Management plan	Within project area	Regular monitoring and quarterly reporting	SOD Department or Third Party	10,350
Occupational Health and Safety	Cement Plant and Compound (Work site and offices)	Twice per year Record of accidents and infectious diseases	SOD Department	1,250
Community Health and Safety	5 villages nearby the project sites	Twice per year Record of accidents and infectious diseases related to the community	SOD Department	14,250
The implementation status for CSR activities such as community support program	5 villages nearby the project sites	Once per year	SOD Department	2 percent of annual net profits
Usage of chemicals	Cement Plant and Compound (Work site and offices)	Biannually Record of the type and quantity of chemicals and implementation status of control measures through self-inspection	SOD Department	4,600

ဧယား (၁၆): ဆကီးၾကပ္ကြပ္ကဲမႈ အစီရင္ခံစာတင္ရန္ ရည္ရြယ္ထားရွိမႈ အခ်ိန္ဇယား

Task	Yearly EMP Reporting Schedule																														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Jan																															
Feb																															
Mar																															
Apr																															
May																															
Jun																															
Jul																															
Aug																															
Sep																															
Oct																															
Nov																															
Dec																															

Public Holiday

Target Reporting Period

၁၄.၂) လူဦးေရႏွင့္ လူဦးေရစာရင္း အေျခအေန ေျပာင္းလဲမႈ ျဖစ္ႏိုင္ေျခရွိသည့္ သက္ေရာက္မႈ

ေမာ္လျမိဳင္ ဘိလပ္ေျမ စီမံကိန္း တည္ေဆာက္ျခင္း အားျဖင့္ သက္ေရာက္ခံရသည့္ ဧရိယာသို႔ ေျပာင္းေရြ႕ အေျခခ်မႈေၾကာင့္ ျဖစ္ႏိုင္ေျခရွိသည့္ အက်ိဳးသက္ေရာက္မႈမ်ားမွာ အဓိကအားျဖင့္ အလုပ္ရွိလိုသည့္ ရည္ရြယ္ခ်က္ ျဖင့္ ေျပာင္းေရြ႔လာသည့္ ဝန္ထမ္းမ်ားႏွင့္ စီမံကိန္းမွ ရရွိႏိုင္သည့္ က်န္းမာေရး၊ ပညာေရး ႏွင့္ အျခား လူမႈေရး ဝန္ဆာင္မႈမ်ားေၾကာင့္ ျဖစ္ႏိုင္ပါသည္။

သို႔ေသာ္လည္း စီမံကိန္း ဧရိယာသို႔ ေျပာင္းေရြ႕လာသည့္ ဝန္ထမ္းဦးေရမွာ ယခင္တည္းကရွိခဲ့ေသာ ေဒသခံ လူဦးေရ အေရအတြက္ ႏွင့္ႏိုင္းယွဥ္ပါက အလြန္းနည္းပါးသည္ဟု ယူဆလွ်င္ ရပါသည္။ ၄င္း အခ်က္မွာ ထိုင္းႏိုင္ငံတြင္ အလုပ္လုပ္ကိုင္ေနသည့္ မ်ားစြာေသာ ေဒသခံမ်ားေနရပ္ျပန္ႏိုင္သည့္ အခြင့္ အေရး ရွိမည္ျဖစ္ျပီး တစ္ျခား ေဒသမွ အလုပ္သမားမ်ား ေျပာင္းေရြ႕မႈမွာ အေသးအဖြဲ မေျပာပေလာက္ပါ။ ရလာဒ္အရ စီမံကိန္း ပတ္ဝန္း က်င္အနီး ေနထိုင္သည့္ လူဦးေရ ေျပာင္းလဲမႈ ရွိႏိုင္မည္ မဟုတ္ပါ သို႔မဟုတ္ လူဦးေရ ဖြဲ႔စည္းပံု အေျခ အေနကို သက္ေရာက္မႈ မရွိႏိုင္ပါ။

၁၄.၃) လမ္းႏွင့္ သြားလာလႈပ္ရွားမႈ အေပၚ ထိခိုက္သက္ေရာက္မႈ

ေဆာက္လုပ္ေရး ကာလအတြင္း ယာဉ္သြားလာမႈ ပမာဏ မ်ားျပားႏိုင္ပါသည္။ အဆိုျပဳ စီမံကိန္းသို႔ သြားရန္ ယာဉ္သြားလာမႈမွာ ေမာ္လျမိဳင္ - က်ိဳက္မေရာလမ္းႏွင့္ ေမာ္လျမိဳင္ - ဘားအံလမ္းကို အသံုးျပဳမည္ ျဖစ္ပါသည္။

ေဆာက္လုပ္ေရးႏွင့္ ဆက္စပ္သည့္ ယာယီသြားလာမႈမွာ ေဒသခံ လူထု ညြန္ၾကားခ်က္အရ ေဒသတြင္းလမ္း မ်ားကို မ်ားစြာအသံုးျပဳမည္ မဟုတ္ပါ။ ယာယီသြားလာမႈမွာ ထိခိုက္လြယ္သည့္ ေဒသခံလူထုႏွင့္ တံု႔ျပန္မႈ မရွိႏိုင္ဟု မွန္း ဆရပါသည္။

စီမံကိန္းမွာ ခ်ိဳးႏွင့္ သစ္ေတာ ဧရိယာတြင္ တည္ရွိျပီး စီမံကိန္း ေနရာသို႔ အမ်ားအားျဖင့္ လူမ်ား မလာ ေရာက္ႏိုင္ပါ။ ထို႔အျပင္ လူထု သြားလာမႈလမ္းကို ေရြ႕ဆိုင္းမည့္ စီမံကိန္း လုပ္ငန္းမ်ားလည္း မရွိပါ။ စီမံကိန္း သြား လာ လႈပ္ရွားမႈေၾကာင့္ ကန္႔ကြက္မည့္ လူထုလည္း မရွိပါ။ ေဆာက္လုပ္ေရး ကာလတြင္ အတၱရံ ျမစ္တစ္ေလွ်ာက္ ေရယာဥ္မ်ားကို သယ္ယူပို႔ေဆာင္ေရးယာဥ္မ်ားအျဖစ္ အသံုးျပဳမည္ ျဖစ္ ေသာေၾကာင့္ လက္ရွိ လမ္းပန္း ဆက္သြယ္မႈ ကို သက္ေရာက္ႏိုင္မည္ မဟုတ္ပါ။

ေဆာက္လုပ္ေရးကာလႏွင့္ လုပ္ငန္းလည္ပတ္သည့္ ကာလအတြင္းစီမံကိန္း လုပ္ငန္းမ်ားမွ အမ်ား ျပည္သူ အသံုးျပဳလမ္းႏွင့္ သြားလာမႈ အေပၚ သက္ေရာက္မႈမွာ ေသးငယ္သည္ဟု ခန္႔မွန္းရပါသည္။

၁၄.၄) အလုပ္အကိုင္အခြင့္အလမ္း၊ ကၽြမ္းက်င္မႈ ႏွင့္ စီးပြားေရးေပၚ ျဖစ္ေပၚလာႏိုင္ေသာ သက္ေရာက္မႈ

စီမံကိန္း သေဘာတူညီခ်က္အရ စီမံကိန္းတြင္ ေဒသခံမ်ားအားဦးစားေပးခန္႔ထားမည္ျဖစ္ၿပီး အေျခခံ လုပ္သားအဆင့္ႏွင့္ ကၽြမ္းက်င္မႈ မလိုအပ္ေသာ လုပ္ငန္းေနရာမ်ားအတြက္ ခန္႔ထားမည္ျဖစ္သည္။

ေဆာက္လုပ္ေရးကာလသည္ ယာယီအလုပ္အကိုင္မ်ားအားျမင့္မားစြာ ဖန္တီးေပးႏိုင္သည့္အတြက္ လုပ္သား အေရအတြက္မွာ ျမင့္တက္လာမည္ျဖစ္သည္။

ဝင္ေငြျမင့္မားလာျခင္းႏွင့္ အလုပ္အကိုင္ အခြင့္အလမ္းရရွိလာျခင္းေၾကာင့္ ေဒသခံျပည္သူလူထု၏ စီမံကိန္း တြင္ ပါဝင္လုပ္ကိုင္လိုျခင္းႏွင့္ တစ္ဦးခ်င္း ကိုယ္ပိုင္လုပ္ငန္းထူေထာင္လုပ္ကိုင္လိုျခင္း စေသာ စိတ္ဆႏၵမ်ား ေရတိုကာ လအတြင္း ျပင္းျပလာေစပါသည္။ တိုက္႐ိုက္အက်ိဳးခံစားျဖင့္ ထိေရတိုစိတ္ ဆႏၵျပင္းျပမႈ သည္ ေရရွည္ကာလ တြင္ ဖြံ႕ၿဖိဳးတိုးတက္မႈအတြက္ တိုက္႐ိုက္အက်ိဳး၏ သက္ေရာက္ေစပါသည္။ ၎မွာ စီမံကိန္းမွ ရရွိေသာ အဓိက ေကာင္းက်ိဳးတစ္ခုဟု မွတ္ယူႏိုင္ပါသည္။

ကုမၸဏီသည္ ဝန္ထမ္းမ်ားအား လိုအပ္သည့္ အသိပညာ ဗဟုသုတ ျမွင့္တင္ေပးျခင္းႏွင့္ အေတြးအ ေခၚ တိုးတက္ျမင့္မားလာေစေရးအတြက္ လိုအပ္ေသာ သင္တန္းမ်ားအား စီစဥ္ေပးရန္ရွိၿပီး ထိုကဲ့သို႕ လုပ္ေဆာင္ျခင္း အား ျဖင့္ အေျခခံစြမ္းရည္ႏွင့္ အသိစိတ္ဓာတ္ တိုးတက္ေကာင္းမြန္လာၿပီး ကုမၸဏီႏွင့္ေဒသခံ ျပည္သူ ႏွစ္ဦးႏွစ္ဘက္အတြက္ ေကာင္းက်ိဳးမ်ား ရရွိခံစားရမည္ ျဖစ္ပါသည္။ ထို႔အတူ အလုပ္သမားအတြက္ လည္း တည္ၿငိမ္ေသာ ဝင္ေငြ အၿမဲရရွိေနေသာေၾကာင့္ သက္ဆိုင္ရာ မိသားစုကို စီးပြားေရြ႕ၾကားပိုင္း ဆိုင္ရာ ဖူလံုမႈ ေပးစြမ္းႏိုင္မည္ ျဖစ္ပါသည္။

စီမံကိန္းမွာ က်ိဳက္မေရာၿမိဳ့နယ္တြင္ တည္ရွိေသာေၾကာင့္ ထိုင္းနယ္စပ္ႏွင့္ နီးကပ္လ်က္ရွိသည့္ အတြက္ ထိုင္းႏိုင္ငံမွ လုပ္သားမ်ား ကိုယ့္ေနရပ္သို႕ ျပန္လာလုပ္ကိုင္ရန္အတြက္ အခြင့္အလမ္းမ်ား ျဖစ္ေပၚေစႏိုင္ပါသည္။ စီမံ ကိန္းဧရိယာမွ မိသားစုအမ်ားစုသည္ ထိုင္းႏိုင္ငံတြင္ အလုပ္လုပ္ေနၾကေသာ

မိသားစုဝင်များ ရိွၾကသည္။ သင့္ေတာ့ ေသာ လုပ္ခလစားႏွင့္အလုပ္အကိုင္သစ္မ်ားသည္ ထိုသူမ်ားအတြက္ ေနရပ္သို့ျပန္လာ မိသားစုႏွင့္ ျပန္လည္ ေပါင္းစည္းေနထိုင္ေရးအတြက္ တြန္းအားတစ္ခု ျဖစ္လာႏိုင္ပါသည္။

ေဆာက္လုပ္ေရးကာလႏွင့္ လုပ္ငန္းခြင္ကာလတြင္ ကၽြမ္းက်င္လုပ္သား၊ အေျခခံ ကၽြမ္းက်င္လုပ္ သား၊ အလုပ္ၾကမ္းသမား ႏွင့္ နည္းပညာရွင္ေနရာမ်ား စေသာလုပ္သားလိုအပ္ခ်က္မ်ားသည္ ေဒသခံျပည္ သူလူထု အတြက္ အလုပ္အကိုင္အခြင့္အလမ္းမ်ား တိုးတက္ျမင့္မားေစလိမ့္မည္ျဖစ္ပါသည္။ ကုမၸဏီမွလည္း ေဒသခံျပည္သူမ်ားအား ငွားရမ္း ခန္႕အပ္ရန္ ဆႏၵရွိပါသည္။ ဤေနရာတြင္ ေဒသခံျပည္ သူလူထု ဆိုသည္မွာ စီမံကိန္းမွ ထိခိုက္ သက္ေရာက္မႈကို ခံရေသာ ဧရိယာအတြင္း ေနထိုင္သူမ်ား သို့မဟုတ္ စီမံကိန္း၏ လႊမ္းမိုးသက္ေရာက္မႈခံရေသာ နယ္ေျမဧရိယာမ်ားဟု မွတ္ယူရပါမည္။

စီမံကိန္းသည္ ေဒသခံအေပၚအေျခခံျပီး လည္ပတ္ရွိကာ နည္းပညာလႊဲေျပာင္းမႈ ႏွင့္ေနအိမ္ လုပ္ ငန္းခြင္အတြင္း သင္တန္းမ်ားေပးျခင္းျဖင့္ ေဒသတြင္း ပညာေရးႏွင့္ နည္းပညာအရည္အေသြးမ်ား ဖြံ႕ၿဖိဳး တိုး တက္လာ ရန္ အလားအလာရွိပါသည္။

စီမံကိန္းသည္ေဒသခံလူထုေပၚသို့ သိသာထင္ရွားေသာ ေကာင္းက်ိဳးမ်ား ရရိွေစပါသည္။ ေဒသ ေန ျပည္သူတို့၏ အသိပညာ ဗဟုသုတ ျမင့္မားေရးႏွင့္ စြမ္းရည္ဖြံ့ၿဖိဳးတိုးတက္ေစေရးတို့သည္ စီမံကိန္း ၏ လူမႈေရး သက္ေရာက္မႈ စီမံခန္႔ခြဲျခင္း အစီအစဥ္လုပ္ေဆာင္ျခင္းမွ ရရိွလာေသာ ေကာင္းက်ိဳးဓာတ္ရပ္ ျဖစ္ သည္။

၁၄.၅) ထိခိုက္မႈသက္သာေလ်ာ့ပါးေစေရး ႏွင့္ ဖြံ့ၿဖိဳးတိုးတက္ေစေရး အတြက္ ေဆာင္ရြက္ရမည့္ အစီအမံမ်ား

ေဒသေနလူထု၏ စြမ္းရည္ဖြံ့ၿဖိဳးတိုးတက္လာေစရန္ႏွင့္ မလိုလားအပ္ေသာ လူမႈေရး ပဋိပကၡမ်ား မျဖစ္ပြားေစ ရန္ႏွင့္ ေဒသခံလူထု အလုပ္အကိုင္ႏွင့္ ဆက္စပ္၍ အျငင္းပြားမႈမ်ား မျဖစ္ေစရန္ ေအာက္ပါ နည္း လမ္းမ်ားကို လိုက္နာက်င့္သံုးရပါမည္။

- လုပ္သားထုအတြက္ လိုအပ္ေသာကၽြမ္းက်င္မႈ ႏွင့္ ကၽြမ္းက်င္မႈမရွိရျခင္း၏ အေၾကာင္းရင္း လိုအပ္ ခ်က္ကို စိစစ္သံုးသပ္၍ စီမံေဆာင္ရြက္ေရး
- ေဒသတြင္း ေၾကာ္ျငာစာေစာင္မ်ား၊သတင္းဌာနမ်ား၊ စီမံကိန္းသတင္းေၾကာ္ျငာဘုတ္မ်ား (ရံုးေနရာ ႏွင့္ တစ္ရြာခ်င္းစီ၏ လမ္းဆံုလမ္းခြမ်ား) မ်ားမွတဆင့္ ေဒသခံမ်ားအား အလုပ္ေခၚယူေနၾကာင္း အ ခ်က္ျပ သတင္းေပး ျခင္း
- ထိခိုက္သက္ေရာက္ခံ ျပည္သူလူထုအတြက္ေဒသတြင္း အလုပ္အကိုင္ေပးေရးမူဝါဒကို ခ်မွတ္၍ ေဆာင္ရြက္ ေရး
- ေဒသခံျပည္သူမ်ား၏ ေမွ်ာ္လင့္ခ်က္မ်ားျပည့္ေစရန္ ေဆာင္ရြက္ရာတြင္အလုပ္ခန္႕အပ္ျခင္း ႏွင့္ စပ္ လ်ဥ္း၍ အျငင္းပြားမႈမ်ားကို မျဖစ္ေစရန္ ေသခ်ာစြာ စီမံ၍ အေကာင္အထည္ေဖာ္ေဆာင္ေရး
- စီမံကိန္းလိုအပ္ခ်က္ႏွင့္အညီ လုပ္သားလိုအပ္မႈ ႏွင့္ သင္တန္းနည္းဗ်ဴဟာမ်ား စနစ္တက်ရိွေစေရး အတြက္ ကၽြမ္းက်င္မႈ လိုအပ္ခ်က္မ်ားကို ပံုမွန္သံုးသပ္ေလ့လာရန္ တာဝန္ယူေဆာင္ရြက္ေရး

- သင္တန္းေပးေရးႏွင့္ လုပ္ငန္းကၽြမ္းက်င္မႈ ဖြံ႕ၿဖိဳးတိုးတက္ေစေရး အစီအစဥ္မ်ားကို စတင္ရန္
- ကန္ထ႐ိုက္တာမ်ားႏွင့္ သေဘာတူစာခ်ဳပ္ ခ်ဳပ္ဆိုရာတြင္ ကန္ထ႐ိုက္တာမ်ားအား လုပ္သား ငွားရမ္းျခင္း ကိစၥရပ္မ်ားတြင္ေဒသခံမ်ားကိုသာ ဦးစားေပးေခၚယူေရးသည္ကုမၸဏီ၏ ေမွ်ာ္လင့္ခ်က္ ျဖစ္ေၾကာင္း သိရွိနားလည္ၿပီး ထည့္သြင္းစဥ္းစားေစေရး

၁) ေျမအသံုးခ်မႈႏွင့္ ေျမယာပိုင္ဆိုင္မႈ

ထံုးေက်ာက္ကၽြင္း ဧရိယာသည္ သတၱဳတြင္း ဝန္ႀကီးဌာန (ယခု သယံဇာတႏွင့္ ပတ္ဝန္းက်င္ထိန္းသိမ္းေရးဝန္ ႀကီးဌာန)မွ သတၱဳတြင္းဦးစီးဌာန၏ ခြင့္ျပဳခ်က္ရရွိၿပီးျဖစ္သည္။ လက္ရွိထံုးေက်ာက္ကၽြင္း ေနရာတြင္ ေနထိုင္သည့္ ေဒသေနလူထု၊ စီးပြားေရးလုပ္ငန္းႏွင့္ စက္မႈလုပ္ငန္းမ်ားလည္းမရွိေသးေပ။ အက်ိဳးဆက္ အေနျဖင့္ စီမံကိန္းႏွင့္ မည္သူတစ္ဦးတစ္ေယာက္မွ် တိုက္႐ိုက္ပတ္သက္မႈ မရွိေပ။ အထက္ပါအခ်က္အလက္မ်ား ေပၚမူတည္၍ ေျမယာအသံုးခ်မႈႏွင့္ ဆက္စပ္သည့္ ကိစၥရပ္မ်ားအတြက္ မည္သူ တစ္ဦးတစ္ ေယာက္ကိုမွ် ထိခိုက္သက္ေရာက္မႈ မရွိႏိုင္ေပ။ ေျမယာအသံုးခ်မႈႏွင့္ ပုဂၢလိကပိုင္ဆိုင္မႈ တို႔အေပၚ သက္ ေရာက္မႈမရွိသည့္ အတြက္ ထိန္းညွိေလ်ာ့ခ်ေရး နည္းလမ္းမ်ားလည္း လိုအပ္မည္မဟုတ္ေပ။

၂) ျပည္သူလူထု၏ အေလးထားမႈမ်ား၊ လူေနမႈစရိုက္ ႏွင့္ လူမႈေရး ဆက္ႏႊယ္မႈအေပၚသက္ေရာက္မႈ

အထက္တြင္ ေဖာ္ျပခဲ့သည့္အတိုင္း စီမံကိန္းဧရိယာမွာ လူေနထိုင္သည့္ေဒသခံဧရိယာႏွင့္ နီးကပ္ စြာတည္ရွိေနသည့္အတြက္ လူေနထိုင္သည့္ ေဒသႏွင့္ အနီးဆံုး ကီလိုမီတာဝက္ခန္႔အကြာတြင္ လုပ္သားမ်ား အတြက္ ယာယီေဆာက္လုပ္ေရးလုပ္ငန္းခြင္သံုး လူေနအိမ္ တည္ေဆာက္ရန္ ရည္ရြယ္ထားသည္။

ေဆာက္လုပ္ေရး လုပ္ငန္းခြင္တြင္ ေဒသခံ ဧရိယာမွ လုပ္သားမ်ား ခန္႔ထားရန္ႏွင့္ အခ်ိဳ႕လုပ္ငန္း ခြင္တြင္ ျပင္ပမွ လုပ္သားမ်ား ခန္႔ထားမည္ျဖစ္သည္။

လုပ္ငန္းခြင္ႏွင့္ ေဒသလူထုၾကား ဆက္စပ္မႈသည္ အခ်ိန္ၾကာလာသည္ႏွင့္အမွ် ရင္းႏွီးမႈတိုးတက္ လာမည္ဟု ေမွ်ာ္မွန္းရသည္။ အက်ိဳးဆက္အျဖစ္ ဘိလပ္ေျမစီမံကိန္းအေနျဖင့္ ေဒသခံျပည္သူလူထု အတြင္း ျဖစ္လာႏိုင္ဖြယ္ အလားအလာရွိေသာ ရာဇဝတ္မႈ ႏွင့္ လူမႈေရး မွားယြင္းေဖာက္ဖ်က္မႈ အစရွိေသာ ကိစၥရပ္မ်ား အေျခအေနမ်ား ကို ျဖစ္လာႏိုင္သည္ဟု ခန္႔မွန္းမိပါသည္။ ထိုျဖစ္ေပၚလာႏိုင္ေသာ ရာဇဝတ္ မႈမ်ားတြင္ အရက္ေသစာ ေသာက္စားျခင္း၊ မူးယစ္ေဆးဝါးသံုးစြဲျခင္း ႏွင့္ အျခားလူမႈေရးကိစၥမ်ားတြင္ မွားယြင္း စြာ ဆံုးျဖတ္ လုပ္ကိုင္မႈ အစရွိသည္တို႔ ပါဝင္ႏိုင္ပါ သည္။

ထိုရာဇဝတ္မႈမ်ားႏွင့္ လူမႈေရးမွားယြင္းေဖာက္ဖ်က္မႈမ်ားမွာ ျဖစ္လာႏိုင္ဖြယ္ရွိၿပီး ေဒသခံ အာဏာ ပိုင္မ်ားအတြက္ စိန္ေခၚမႈ တစ္ရပ္ကဲ့သို႔ ျဖစ္လာႏိုင္ကာ လူထုအတြင္း၌လည္း အခ်င္းခ်င္း ခါးသီး မႈႏွင့္ အမုန္း တရားမ်ား ျဖစ္ပြားေစႏိုင္ပါသည္။ ထိုအေၾကာင္းတရားမ်ားေၾကာင့္ ထိုအနီးတစ္ဝိုက္ ဆင္ေျခဖံုး တြင္ ေနထိုင္ ၾကေသာ ျပည္သူလူထုအတြင္း ခ်စ္ခင္စည္းလံုးမႈ ပ်က္ျပားျခင္းႏွင့္ လူေနမႈစ႐ိုက္မ်ား ေျပာင္းလဲ သြားျခင္း အစ ရွိသည္တို႔ ျဖစ္ေပၚလာႏိုင္ပါသည္။

လူမှုစစ္တမ်း ေကာက္ယူျခင္း အဖြဲ၏ စစ္တမ္းအရ သိသာထင္ရွားေသာ ႏိုင္ငံေရး၊ ဘာသာေရးႏွင့္ လူမႈေရးေရးဆိုင္ရာ ဆူပူမႈမ်ား၊ အျငင္းပြားမႈမ်ား မရွိေၾကာင္းေတြ႕ရွိရသည္။ ထိုဧရိယာအတြင္းတြင္ သိသာ ထင္ရွားေသာ တိုးတက္မႈကို မေတြ႕ရွိခဲ့ရသလို ခ်စ္ခင္ရင္းလံုးၫီၫြတ္မႈပ်က္ျပားျခင္းမ်ားလည္း ျဖစ္လာမည့္ လကၡဏာ မေတြ႕ရွိခဲ့ဟု ယူဆရပါသည္။

မည္သို႕ပင္ဆိုေစကာမူ စီမံကိန္းတည္ရွိေနသည့္အတြက္ စီမံကိန္း၏ နယ္ေျမအတြင္း ႏွင့္ အျပင္ ႏွစ္ခု လံုးကို ထည့္သြင္းစဥ္းစားပါက ဤထင္ျမင္ယူဆခ်က္မွာ ေျပာင္းလဲေကာင္း ေျပာင္းလဲသြားႏိုင္ပါသည္။ ထို့ ေၾကာင့္ စီမံကိန္း ေၾကာင့္ ျဖစ္ပြားလာႏိုင္ၾကြယ္ဝေသာ အလားအလာရွိေသာ ထိခိုက္သက္ေရာက္မႈအျဖစ္ စီမံကိန္းႏွင့္ စီမံကိန္းႏွင့္ သက္ဆိုင္သူ ေဒသခံျပည္သူလူထု၊ အျခားအဖြဲ႕အစည္းမ်ားအေနျဖင့္ ႀကိဳတင္ တြက္ဆ ကာထားရပါမည္။

ထို႕ေၾကာင့္ လူေနမႈစ႐ိုက္ႏွင့္ ျပည္သူအခ်င္းခ်င္း ခ်စ္ခင္ရင္းလံုးမႈ ပ်က္ျပားႏိုင္ေစရန္ ထိခိုက္သက္ ေရာက္မႈကို အလယ္အလတ္တန္းစားအဆင့္ ထိခိုက္မႈဟု သတ္မွတ္ကာ သင့္ေတာ္ေသာ ေျဖေလ်ွာ့မႈမ်ားကို ေဆာင္ရြက္ရန္ လိုအပ္လာပါသည္။

၃) ေဒသတြင္း စီးပြားေရး

လုပ္ငန္းခြင္ဝင္းေန႔လည္စာႏွင့္ နားေနရန္ စားေသာက္ဆိုင္မ်ားကို ဖြင့္လွစ္ေစျခင္းျဖင့္ ေဒသတြင္း စီးပြား ေရးလုပ္ငန္းမ်ား ဖြံ႕ၿဖိဳးတိုးတက္လာေစရန္ ေကာင္းမြန္ေသာအေထာက္အပံ့ေကာင္းတစ္ခု ျဖစ္ပါသည္။

စီမံကိန္းတြင္ လိုအပ္ေသာ ပစၥည္းမ်ားအား ေဒသတြင္း လြယ္ကူစြာရယူအသံုးျပဳႏိုင္ပါက စီမံကိန္းမွ ရယူအ သံုးျပဳျခင္းေၾကာင့္ ေဒသေစ်းကြက္၌ သံုးစြဲမႈ ျမင့္တက္ေစျပီး ေဒသတြင္း စီးပြားေရးအခြင့္အလမ္းေကာင္းမ်ား တိုးပြား ေစသည္။

ထို႕အျပင္ စီမံကိန္း ဧရိယာသို႔ အသစ္ဝင္ေရာက္လာသူမ်ားေၾကာင့္ စီးပြားေရးဆုိင္ရာ၊ ေစ်းကြက္ႏွင့္ အခြင့္ အလမ္းမ်ားအား ပိုမိုထိေတြ႕နားလည္လာျခင္း၊ ေဒသတြင္းစီးပြားေရးလုပ္ငန္းမ်ားတြင္ ဝယ္ယူသံုးစြဲသူ စားသံုးသူအေရ အတြက္ တိုးတက္လာၿပီး ျပည္သူလူထုအတြင္း လူမ်ိဳေပါင္းစံုလင္စြာျဖင့္ စီးပြားေရးလုပ္ငန္းမ်ား တြင္က်ယ္လာမည္ ျဖစ္ပါသည္။

ေကာင္းက်ိဳးမ်ားပိုမိုတိုးတက္လာေစေရးအတြက္ ေအာက္ပါအတိုင္း ေဆာင္ရြက္ရမည္ ျဖစ္ပါသည္။

- စီမံကိန္းတြင္ လိုအပ္သည့္ လိုအပ္ခ်က္မ်ားအား ျဖစ္ႏိုင္ပါက ေဒသတြင္းမွာသာ ရင္းႏွီးၾကြယ္ဝပ္ေစရန္။
- စီမံကိန္းတြင္ လိုအပ္သည့္ အလုပ္အကိုင္အခြင့္လမ္းမ်ားအား ေဒသတြင္းမွ ျဖည့္ဆည္းရန္။

၄) လုပ္ငန္းခြင္ က်န္းမာေရးႏွင့္ ေဘးကင္း လံုၿခံဳမႈ

ဘိလပ္ေျမထုတ္လုပ္ေရး စီမံကိန္း လုပ္ငန္းမ်ားတြင္ဓာတုပစၥည္းမ်ား အသံုးျပဳမႈမ်ားေၾကာင့္ အႏၱရာယ္က ေရာက္လာႏိုင္ပါသည္။ ထိုအႏၱရာယ္မ်ားကို ေဘးကင္းေစေရး အစီအစဥ္မ်ားခ်မွတ္အေကာင္အထည္ေဖာ္ေဆာင္ ရြက္ျခင္း၊ သင္တန္းမ်ား ေပးျခင္း ႏွင့္ေဘးကင္းလံုျခံဳေစေရး နည္းလမ္းမ်ား (OHS) စနစ္မ်ားကို အသံုးျပဳျခင္း စသျဖင့္ စီမံထားရွိရပါမည္။ က်န္းမာေရး ႏွင့္ ေဘးအႏၱရာယ္ကင္းရွင္းေရး အစီအမံမ်ားကို လုပ္ငန္းပိုင္ဆိုင္မွစီမံထားရွိၿပီး လုပ္သားမ်ား၏ ေဘးကင္းလံုျခံဳေစေရးကို တိုးၾကြင့္ ေဆာင္ရြက္ ထားရွိရပါမည္။

ေဆာက္လုပ္ေရးႏွင့္ လုပ္ငန္းခြင္ကာလတြင္ လုပ္ငန္းခြင္ က်န္းမာေရးႏွင့္ လံုၿခံဳမႈအတြက္ အမ်ိဳးမ်ိဳး အေထြ ေထြေသာ အႏၱရာယ္မ်ား ျဖစ္ပြားႏိုင္ေပသည္။

လုပ္သားမ်ားႏွင့္ ေဒသခံျပည္သူအား စီမံကိန္း လုပ္ငန္းစဥ္မ်ားမွ ထိခိုက္ျခင္းမ်ား ကင္းေဝးေစရန္ လုပ္ငန္းခြင္ က်န္းမာေရးႏွင့္ လံုၿခံဳမႈစီမံခန္ခြဲျခင္း အစီအစဥ္မ်ား အဆိုျပဳ ထံုးေက်ာက္မိုင္းတြင္းအတြက္ လုပ္ ေဆာင္ရန္ လိုအပ္သ ည္။

၅) လူထု က်န္းမာေရးအေပၚ သက္ေရာက္မွဳမ်ား

ေဆာက္လုပ္ေရးကာလတြင္း စီမံကိန္းႏွင့္နီးေသာ ေဒသခံ ျပည္သူလူထုထံ အဓိကသက္ေရာက္မွဳမွာ ယာဥ္ေၾကာပိတ္ဆို႔မႈပင္ျဖစ္သည္။

အထက္တြင္ ေဖာ္ျပခဲ့သည့္အတိုင္း ျပင္ပမွဝင္ေရာက္လုပ္ကိုင္ေသာ အလုပ္သမားမ်ားမွ ေရာဂါမ်ား ပ်ံ႕ႏွ႔ံမႈမွာ လည္း မေျပာပေလာက္ေသာ သက္ေရာက္မွဳတစ္ခုျပင္ျဖစ္သည္။ထိုကာလအတြင္း ဝင္ေရာက္မွဳမ်ား ႏွင့္ ျဖစ္ရပ္လကၡဏာမ်ားေၾကာင့္ ျပည္သူလူထုအတြက္ က်န္းမာေရးႏွင့္ လံုၿခံဳမႈသည္ ပံုမွန္အေျခအေနတစ္ခုတြင္ ေျပာင္းလဲ မႈ မရွိႏိုင္ပါ။

သိသာထင္ရွားေသာ ယာဥ္ေၾကာပိတ္ဆို႕မႈကို ဘိလပ္ေျမစက္ရံု ေဆာက္လုပ္ေနစဥ္အတြင္း ႏွင့္ထံုး ေက်ာက္သယ္ယူပို႕ေဆာင္ရာလမ္းတစ္ေလွ်ာက္ သယ္ယူပို႕ေဆာင္ေရး လမ္းေၾကာင္းစနစ္တစ္ခု တည္ေဆာက္ေနစဥ္အတြင္းႏွင့္ ေဆာက္လုပ္ေရးအလုပ္သမားမ်ားေျပာင္းေရႊ႕လာမႈမ်ားေၾကာင့္ ေတြ႕ရႏိုင္ပါသည္။

မည္သည့္ကိစၥရပ္တြင္ ျဖစ္ေစ ေလးလံေသာ ယာဥ္မ်ား ေမာင္းႏွင္မႈသည္လမ္းအေျခအေနကို ဆိုးရြားစြာ ထိခိုက္ေစၿပီးလမ္းေဘးလူေနအိမ္ေျခမ်ားအား အသံဆူညံမႈ၊ ဖုန္မႈန္႕လြင့္ပ်ံ႕ေစမႈတို႕ ျဖစ္ေစကာ နီးစပ္ရာတြင္ရွိ ေကာက္ပဲသီးႏွံမ်ားကို ပ်က္ဆီးေစျခင္းႏွင့္ နီးစပ္ရာပစၥည္းမ်ား လမ္းမ်ားကို ညစ္ပတ္ေစျခင္းအျပင္ေဒသတြင္း ယာဥ္ ေၾကာပိတ္ဆို႕မႈကိုလည္း ယာယီအားျဖင့္ ထိခိုက္သက္ေရာက္ေစႏိုင္ပါသည္။ ထို႔အျပင္ ယာဥ္သြားလာမႈမ်ား သိသာစြာ တိုးလာျခင္းသည္ လက္ရွိလမ္းအေျခအေနအား ဆိုးရြားေစျခင္း၊ ခ်ိဳ့ယြင္းမ်ား ျဖစ္ေပၚေစျခင္း ႏွင့္ ေဒသတြင္းရွိ ယာဥ္ ေမာင္းသူမ်ားႏွင့္ ေျခက်င္ သြားလာသူမ်ား၏ လမ္းအႏၱရာယ္ကင္းရွင္းမႈအား အဟန္႕အတားျဖစ္ေစကာ ယာဥ္မေတာ္ တဆမႈမ်ား မ်ားျပားလာႏိုင္ပါသည္။ ထိုေဒသတြင္း လမ္းကိုအသံုး ျပဳ၍သြားလာသူမ်ားတြင္ ေမာ္ေတာ္ဆိုက္ကား ယာဥ္မ်ား ေျခက်င္ လမ္းေလွ်ာက္သူ မ်ား

အပါအဝင္အဓိကခုခံႏိုင္စြမ္းအားနည္းသူမ်ားျဖစ္ေသာ ေက်ာင္းသို႕လမ္းေလွ်ာက္သြား ေသာ ေက်ာင္းသူ ေက်ာင္းသား ကေလးသူငယ္မ်ား ပါဝင္မည္ျဖစ္ပါသည္။

၆) က်န္းမာေရး အႏၱရာယ္ ေလ့ာ့ပါး သက္သာေစေရး အစီအမံမ်ား

က်န္းမာေရးကို ထိခိုက္သက္ေရာက္ႏိုင္မွဳမ်ားကို ဆန္းစစ္ရာတြင္ စီမံကိန္း၏ေဆာက္လုပ္ဥ ကာလ ႏွင့္ လည္ပတ္ဆဲကာလမ်ား၌ ေဒသတြင္း ျပည္သူလူထုအတြက္ က်န္းမာေရး ေစာင့္ေရွာက္မွဳ ႏွင့္ က်န္း မာေရး အတြက္ လိုအပ္ေသာ အေဆာက္အဦး၊ ကိရိယာ တန္ဆာပလာ၊ က်န္းမာေရးသင္တန္း ၿပီးေျမာက္ ေအာင္ျမင္ ထားသူမ်ား၊ ေဆးဝါးမ်ားႏွင့္ ျပည္သူလူထု ႏွင့္ ေဆးလုပ္သား အေရအတြက္ အင္အား မွ်တမွဳ အစရွိသည္တို႕ကို ဆန္းစစ္ေလ့လာ ၿပီးမွ ေဆာင္ရြက္ရန္ ျဖစ္ပါသည္။

ထိုအစီအစဥ္မ်ားသည္ GIIP and IFC PS-2 တို႕ႏွင့္ ကိုက္ညီမွဳ ရွိေအာင္ ထားရွိရမည္ ျဖစ္ၿပီး အလုပ္ သမားမ်ားအား ဆိုးရြားစြာထိခိုက္ေစျခင္းမွ ေလ်ာ့နည္းသြားေစပါမည္။

- ကန္ထ္ရိုက္ အလုပ္သမားမ်ားအပါအဝင္ အလုပ္သမားမ်ားကို Personal Protective Equipment (PPE) ႏွင့္ မာတုပစၥည္းမ်ားကိုင္တြယ္ရာတြင္ သင္တန္းေပးၿပီးမွ ေဆာင္ရြက္လုပ္ကိုင္ေစရန္။
- လုပ္ငန္းခြင္ အႏၱရာယ္ရွိေသာေနရာမ်ား (အပူခ်ိန္ျမင့္ေသာနရာမ်ား ႏွင့္ အဖံုး ဖြင့္ထားေသာ ေရတိုင္ကီ မ်ား) တြင္ေသခ်ာစြာ ျမင္သာေအာင္ အမွတ္အသား ျပဳလုပ္ထား ေပးရန္ ႏွင့္ အႏၱရာယ္ျပ အမွတ္ အသားမ်ားကို မွတ္မိေအာင္ သင္တန္းေပးထားရန္။
- လုပ္ငန္းခြင္ အႏၱရာယ္ျပ အမွတ္အသားမ်ားကို တ႐ုပ္ ႏွင့္ ျမန္မာ ဘာသာစကားမ်ားျဖင့္ ေဖာ္ျပရန္။
- က်န္းမာေရးႏွင့္ ေဘးအႏၱရာယ္ကင္းရွင္းေရးအတြက္ ကာကြယ္ေရး ႏွင့္ တားဆီးေရး သင္တန္း မ်ားကို ေပးထားရန္။
- အသံဆူညံမွဳကို လုပ္ငန္းခြင္အတြင္း သတ္မွတ္ထားေသာအျမင့္ဆံုး ႏွဳန္းထက္ မေက်ာ္ေစရန္ ပံုမွန္ စစ္ေဆးေပးရန္။
- စက္ပစၥည္း ကိရိယာတန္ဆာပလာမ်ားကိုစမ္းသပ္စစ္ေဆးျခင္း၊ ထိန္းသိမ္း ျပဳျပင္ေရးအစီအစဥ္မ်ား ထားရွိ ထားၿပီး ဖြဲ႕စဖြဲ့တိုးတက္ေစရန္။
- မေတာ္တဆမွဳ မွတ္တမ္းထားရွိျခင္း၊ စံုစမ္းစစ္ေဆးျခင္း ႏွင့္ ကာကြယ္ထားဆီးေရး အစီအစဥ္မ်ား ထားရွိရန္။
- လုပ္ငန္းတည္ေဆာက္ဥႏွင့္ လည္ပတ္ဆဲကာလအတြင္း လုပ္ငန္းခြင္ အေရးေပၚ တုန္႔ျပန္မွဳ အစီအစဥ္မ်ား ကို သင္တန္းေပးထားရန္ ႏွင့္ ဖြဲ႕စဖြဲ့ေအာင္ ေဆာင္ရြက္ရန္။
- ႏိုင္ငံတကာ ႏွင့္ ျပည္တြင္း သို႕မဟုတ္ ေဒသတြင္ ျပဌါန္းထားေသာ က်န္းမာေရး ႏွင့္ ေဘးအႏၱ ရာယ္ ကင္း ရွင္းေရး စံခ်ိန္စံၫႊန္းမ်ားအတိုင္း ကိုက္ညီေအာင္ ေဆာင္ရြက္ရန္။

၁၄.၆) ေျမယာ ရႈခင္းအေပၚ ထိခိုက္သက္ေရာက္မႈ

ဤစီမံကိန္းသည္ ေဒသအတြင္း မည္သည့္ စီမံကိန္းမွ ယခင္ကမလုပ္ခဲ့ဖူးေသာ အေျခခံအေဆာက္အဦမ်ား အားလံုးထည့္တြက္ ေဆာင္ရြက္ထားေသာ ပထမဦးဆံုး စီမံကိန္း ျဖစ္ပါသည္။ စီမံကိန္းသည္ အျခားေနရာေဒသ မ်ားမွ လွမ္းၾကည့္လွ်င္ ျမင္ႏိုင္ေသာ ေဒါင္လိုက္ အေဆာက္အဦး အားလံုးကိုပါ ေဖာ္ျပထားသည္။

ေဒသတြင္း ျမင္ကြင္းဆိုင္ရာ ေျပာင္းလဲမႈေၾကာင့္ ထိခိုက္သက္ေရာက္မႈကို စဥ္းစားရာတြင္ ထိခိုက္သက္ေရာက္မႈ၏ပ မာဏမွာအလယ္အလတ္မွ အျမင့္အဆင့္တြင္ ရွိႏိုင္ပါသည္။ မည္သို့ျပင့္ျဖစ္ေစ စီမံကိန္း ၏ အေသးစိတ္ဒီဇိုင္း ေရး ဆြဲခ်ိန္ကိတည္းကအပင္မ်ား ျပန္လည္စိုက္ပ်ိဳးမည့္ အစီအစဥ္မ်ားကဲ့သို့ေသာ ထိခိုက္မႈေလွ်ာ့ခ်သက္သာ ေစေရး နည္းလမ္းမ်ားကို အတည္ျပဳထည့္သြင္း ထားႏိုင္ပါသည္။

ပတ္ဝန္းက်င္ဆိုင္ရာတစ္ဝိုက္တြင္ အျမင္အာရံုအားမထိခိုက္ေစေသာ အေရာင္ေဖ်ာ့ႏွင့္ သင့္ေတာ္ေသာ အေ ရာင္မ်ားကို သံုးစြဲရပါမည္။ နည္းပညာအရ ျဖစ္ႏိုင္မည္ဆိုပါက အေဆာက္အဦးမ်ား၏ ထင္သာျမင္သာျဖစ္မႈကို ေလွ်ာ့ခ်ရန္ အေဆာက္အဦးတစ္ဝိုက္တြင္ အပင္မ်ား စိုက္ပ်ိဳးထီားသင့္ပါသည္။

၁၄.၇) ယဥ္ေက်းမႈဆိုင္ရာ အေမြအႏွစ္မ်ား

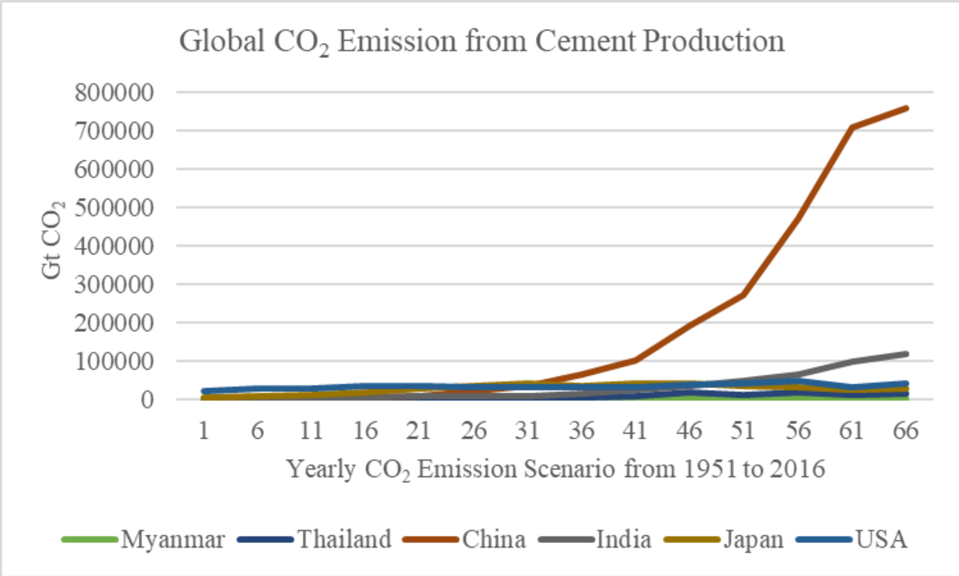
ဘိလပ္ေျမစက္ရံုအတြက္ ထံုပံုးေက်ာက္ထုတ္လုပ္သည့္ မိုင္းတြင္း ျဖစ္ပါေသာေၾကာင့္ သစ္ေတာ ဧရိယာ ႏွင့္ စိုက္ပ်ိဳေျမ ဧရိယာေဘာင္အတြင္း၌သာ ျဖစ္ေသာေၾကာင့္ ယဥ္ေက်းမႈအေမြအႏွစ္မ်ားေပၚတြင္ သက္ေရာက္ ထိခိုက္မႈ ရွိႏိုင္လိမ့္မည္ဟု မယူဆပါ။

ဤမူေဘာင္မ်ားအတြင္းေဆာင္ရြက္ရာတြင္ စီမံကိန္းလုပ္ငန္းမွ SOD Manager မွ လုပ္ငန္းခြင္ အတြင္း တြင္ ထိုကဲ့သို့ရွာေဖြေတြ့ရွိမႈမ်ား ရွိမရွိ စစ္ေဆးရန္အတြက္ လုပ္ငန္းခြင္အတြင္း ေန့စဥ္စစ္ေဆး ေမးျမန္းရပါမည္။ ၎ သည္ ထိုကဲ့သို့အဆန္းတၾကယ္ပစၥည္းမ်ားေတြ့ရွိႏိုင္ေျခရွိေသာ လုပ္ငန္းခြင္မ်ားအား ႀကီးၾကပ္ကြပ္ကဲၿပီး မွန္ကန္ ေသာ ထိခိုက္မႈ ေလ်ာ့ပါးေစေရး အစီအမံမ်ား ႏွင့္ ဆက္သြယ္ေဆာင္ ရြက္မႈမ်ားကို လုပ္ေဆာင္ရပါမည္။ ထိုသို့ရွာ ေဖြေတြ့ရွိမႈမ်ားကိုသတင္းေပးျဖန့္ျဖဴးရန္ စီမံကိန္း အလုပ္သမားမ်ားႏွင့္ ကန္ ထ႐ိုက္တာမ်ားအား သင္တန္းမ်ားေပး ထားရပါမည္။

၁၄.၈) ရာသီဥတုေျပာင္းလဲမႈဆိုင္ရာ ထိခိုက္သက္ေရာက္မႈမ်ားအေပၚ ထည့္သြင္းစဥ္းစားခ်က္

စီမံကိန္းလုပ္ငန္းမ်ားသည္ carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6) စေသာ ဖန္လံုအိမ္ေခါတ္ေငြ့ထြက္ရွိမႈမ်ားႏွင့္ ဆက္ႏြယ္ခဲ့မည္ဆိုပါက ရာသီဥတုေျပာင္းလဲျခင္းဆိုင္ရာ ထိခိုက္မႈမ်ား ကို ထည့္သြင္းစဥ္းစားသင့္ပါသည္။

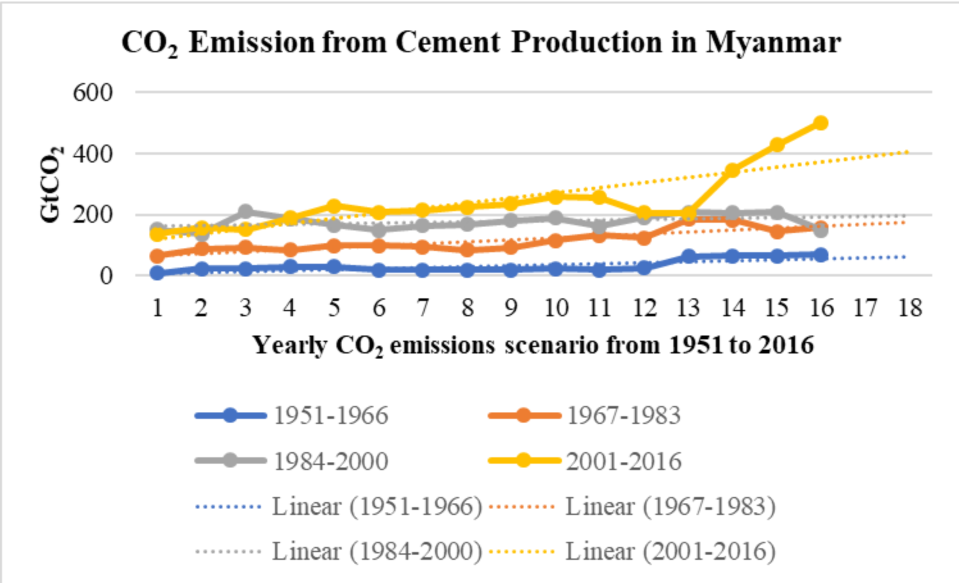
ဘိလပ္ေျမထုတ္လုပ္ျခင္း လုပ္ငန္းသည္ အဓိကအားျဖင့္ CO_2 ထုတ္လႊတ္မႈႏွင့္ ဆက္စပ္ေနၿပီး ႏိုင္ငံတကာတြင္ ဘိလပ္ေျမထုတ္လုပ္မႈမွ ထြက္ရွိေသာ CO_2 ပမာဏႏွင့္ ႏိုင္းယွဥ္ပါက ျမန္မာႏိုင္ငံ၏ ဘိလပ္ ေျမထုတ္လုပ္မႈမွ ထြက္ရွိေသာ CO_2 ပမာဏသည္ အဆမတန္နည္းပါးသည္ကို ေအာက္ပါပံုမ်ားတြင္ေတြ့ရွိ ႏိုင္ပါသည္။



Source: Robbie M. Andrew[5]

ပုံ (၃၄): ၁၉၅၁ မှ ၂၀၁၆ ခုနှစ်အတွင်း နိုင်ငံ ၆ နိုင်ငံမှ ဘိလပ်မြေထုတ်လုပ်မှုမှ တစ်ကမ္ဘာလုံး ဆိုင်ရာ CO_2 ထုတ်လွှတ်မှု ပြပုံ

သို့သော်ငြားလည်း အောက်ပါခန့်မှန်းတွက်ချက်မှုသည် ယနေ့ခေတ် မြန်မာနိုင်ငံတွင် တိုးတက်လျှက်ရှိသော ဘိလပ်မြေထုတ်လုပ်မှုများကို ဝန်းနှုပြလျှက်ရှိပြီး အနာဂတ်တွင်လည်း ဘိလပ်မြေထုတ်လုပ်မှုမှ CO_2 ထွက်ရှိမှုမှာလည်း တိုးတက်ဖွယ်ရာသာ ရှိပေသည်။ မြန်မာနိုင်ငံရှိ ဘိလပ်မြေထုတ်လုပ်မှုမှ CO_2 ထွက်ရှိမှု ကို ၁၉၅၁ ခုနှစ်မှ ၂၀၁၆ အထိ ဦးတည်ချက်များနှင့်အတူ ဖော်ပြထားပါသည်။



Source: Robbie M. Andrew

ပုံ (၃၅): ၁၉၅၁ မှ ၂၀၁၆ ခုနှစ်အတွင်း မြန်မာနိုင်ငံမှ ဘိလပ်မြေထုတ်လုပ်မှုမှ CO_2 ထုတ်လွှတ်မှု ပြပုံ

[5] RobbieM.Andrew, CICERO Center for International Climate Research, Oslo 0349, Norway, 26th January 2018

မြန်မာနိုင်ငံသည် ရာသီဥတုပြောင်းလဲမှုဆိုင်ရာ ကွန်ဗန်းရှင်း ကျိုတိုလမ်းညွှန်ချက်များ (၁၉၉၇) သို့ ၂၀၀၃ ခုနှစ် ဂျူလိုင်လ ၁၆ ရက် (၂၆/၂၀၀၃)အရ အစိုးရအဖွဲ့၏ ခွင့်ပြုချက်ဖြင့် ၂၀၀၃ ခုနှစ် ဩဂုတ်လ ၁၃ ရက်နေ့တွင် အတည်ပြုဝင်ရောက်ခဲ့ပါသည်။ ထို့ကြောင့် MCL သည် ဘိလပ်မြေ ထုတ်လုပ်မှုမှ ဖန်လုံအိမ်အာနိသင်ဓာတ် ငွေ့ထုတ်လွှတ်မှုလျော့ချရေးဆောင်ရွက်ချက်များကို၁၉၉၇ခုနှစ် ကျိုတိုမြို့တွင် ကျင်းပခဲ့သော **ရာသီဥတုပြောင်း လဲမှုဆိုင်ရာ ကွန်ဗန်းရှင်း ကျိုတိုလမ်းညွှန်ချက်များ (၁၉၉၇)၏ မူဝါဒအတိုင်း လိုက်နာဆောင်ရွက်ရမည် ဖြစ်ပါသည်။ ကျိုတိုလမ်းညွှန်ချက်များတွင်** Carbon dioxide (CO_2), Methane (CH_4), Nitrous oxide (N_2O), Hydrofluorocarbons (HFCs) Perfluorocarbons (PFCs) and Sulphur hexafluoride (SF_6) အစရှိသော ဓာတ်ငွေ့များပါဝင်ပါသည်။

ကွန်ဗန်းရှင်းအဖွဲ့ဝင်များ ကွန်ဗရင့်၏ ဆုံးဖြတ်ချက်များအရမြန်မာသည် ရာသီဥတုပြောင်းလဲမှု ဆိုင်ရာ လော့ပါးသက်သာမှု ဆောင်ရွက်ချက်များ၊ မူဝါဒများ၊ မဟာဗျူဟာများ နှင့် လိုက်လျောညီထွေဖြစ်စေ့ အား စိုက်ထုတ်မှုများနှင့် တိုးတက်ဆောင်ရွက်မှုများကို တင်ပြထားပါသည်။ MCL ၏ CO_2 ထုတ်လွှတ်မှု လျော့ချရေးလုပ်ငန်းစဉ်များကို အခန်း ၆.၃ ဓာတ်အားရရှိရေး အခြားနည်းလမ်းတွင် ဖော်ပြထားပါသည်။

၁၅) စုပ်ထပ်ထိခိုက်သက်ရောက်မှုများကို လေ့လာဆန်းစစ်ခြင်း

စုပ်ထပ်ထိခိုက်သက်ရောက်မှုများကို လေ့လာဆန်းစစ်ရာတွင် အခြေခံလိုအပ်ချက်များဖြစ်သော လေ၊ ရေ၊မြေ၊မြေအနေအထား၊ သဘာဝပေါက်ပင်၊ တောရိုင်းတိရစ္ဆာန်များ၊ ငါးများ၊ ငှက်များနှင့် မြေအသုံးပြုမှုများအစရှိ သော ရုပ်ပိုင်းဆိုင်ရာ၊သက်ရှိများဆိုင်ရာ နှင့် လူမှုစီးပွားဆိုင်ရာဝန်းကျင်လက္ခဏာများ စသော တန်ဖိုးထားဖွယ်ဂေဟဗေဒ ဆိုင်ရာ အစိတ်အပိုင်းများအပေါ် စီမံကိန်းလုပ်ငန်းများ ဆောင်ရွက်မှုမှ တိုက်ရိုက် နှင့်သွယ်ဝိုက်ထိခိုက် ရောက်မှုများနှင့်အတူ စီမံကိန်းဧရိယာအတွင်း၌ လွန်ခဲ့သောအတိတ်ကာလ၊လက်ရှိကာလနှင့် အနာဂတ် လစီမံကိန်းလုပ်ငန်းများနှင့် ဆောင်ရွက်ချက်များမှ ထိုတန်ဖိုးထားဖွယ်ဂေဟ ဗေဒဆိုင်ရာအစိတ်အပိုင်းများ အပေါ်သို့ ထိခိုက်သက်ရောက်နိုင်ခြေရှိမှု တိုးတက်လာနိုင်ခြင်း များကိုပါ ထည့်သွင်း စဉ်းစားရပါမည်။

တန်ဖိုးထားဖွယ်ဂေဟဗေဒဆိုင်ရာ အစိတ်အပိုင်းများတွင် -

လေထု: ရာသီဥတုအခြေအနေနှင့်ဦးတည်ချက်များ နှင့် ရာသီဥတုအခြေအနေလွန်ကဲမှုများ နှင့် လေအရည် အသွေးအခြေအနေများ

မြေမျက်နှာသွင်ပြင်နှင့် ဘူမိဗေဒ: မြေအနေအထား၊ ရေမျက်နှာပြင်ထက်မြင့်ပိုင်း၊ အနိမ့်ပိုင်းနှင့် ထူးခြားသော လက္ခဏာရပ်များ။ မြေမျက်နှာသွင်ပြင်အမျိုးအစားနှင့် နက်ရှိုင်းမှုများ၊ အောက်ခြေရှိ ကျောက်များ၏ ဘူမိဗေဒ အမျိုးအစားများ၊ တည်နေရာများနှင့် နက်ရှိုင်းမှုများ။

မြေ:မြေအမျိုးအစားနှင့်လက္ခဏာရပ်များ၊ မြေအရည်အသွေးနှင့်ကန့်သတ်ချက်များ နှင့် ဝင်ရိုးစွန်းဒေသများ ရှိ အစဉ်အေးနေသော မြေဆီလွှာ အခြေအနေများ။

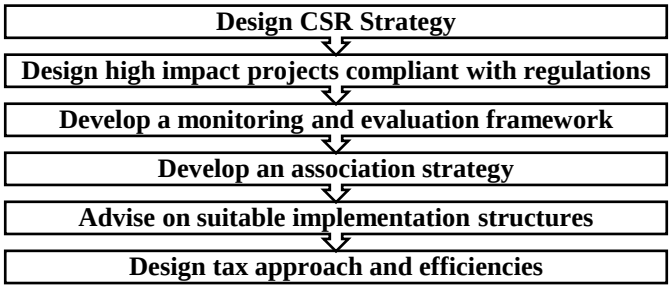
မျက်နှာပြင်ရေ: ရေအလင်းပြန်မှုနှင့်ရေထုလက္ခဏာရပ်များ၊
ကမ်းခြေဝန်းကျင်နှင့်ရေဝင်ရောက်နိုင်သော နေရာများ
မြေအောက်ရေ : မူလရှိနှင့်စပ်သော ဒေသရင်း မြေအောက်ရေလက္ခဏာများ

ေရြးခ်ယ္ခရာ လကၡဏာရပ္မ်ားကို ေအာက္ပါအတိုင္းထည့္သြင္းစဥ္းစားခဲ့ပါသည္ -

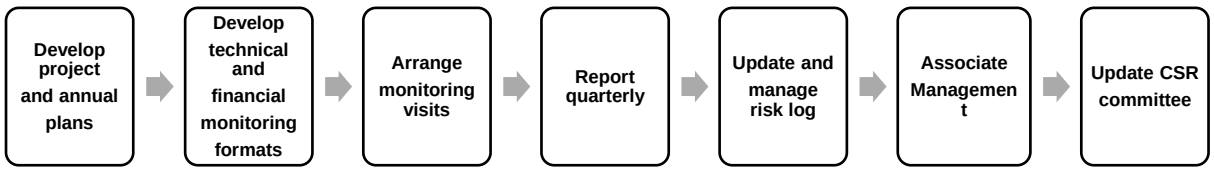
- လူသားမ်ားအတြက္ လံုၿခံဳမွဳ အေရးႀကီးမႈ သို႕မဟုတ္ တန္ဖိုးထားမႈ
- ထိန္းသိမ္းေစာင့္ေရွာက္ရန္ လိုအပ္မႈမ်ား
- စီမံကိန္းမွထိခိုက္သက္ေရာက္မွဳမ်ားစြာကို ခံရႏိုင္ျခင္းရွိမႈ
- ေဂဟစနစ္တြင္ အေရးပါထိေရာက္မွဳ
- ေဂဟစနစ္ကို ထိန္းသိမ္းႏိုင္ေသာမ်ိဳးစိတ္မ်ား တည္ရွိမႈ

၁၆) လူမႈဆိုင္ရာတာဝန္သိလုပ္ငန္းမ်ားအစီအစဥ္

MCL ၏ လူမႈဆိုင္ရာတာဝန္သိလုပ္ငန္းမ်ားအစီအစဥ္ ႏွင့္ ေစာင့္ၾကပ္ကြပ္ကဲရးေရးအစီအစဥ္မ်ား MCL မွ ေဆာင္ရြက္လ်က္ရွိေသာ စီမံကိန္း၏ အက်ိဳးအျမတ္ထဲမွ ၂ ရာခုိင္ႏွဳန္းေသာ ပမာဏကို ေဒသခံ ျပည္သူအစုအဖြဲ႕မ်ား အက်ိဳးျဖစ္ထြန္းေစရန္အလို႕ငွာ ေအာက္ပါလုပ္ငန္းဆိုင္ရာမ်ားႏွင့္လုပ္ေဆာင္ရန္ စီစဥ္သြားပါသည္။



MCL ၏ တာဝန္သိ လူမႈဆိုင္ရာ လုပ္ေဆာင္ခ်က္မ်ား အား SOD အဖြဲ႕ မွ ေအာက္ေဖာ္ျပပါ အစီအစဥ္မ်ားျဖင့္ အေကာင္အည္ေဖာ္ေဆာင္ရြက္မည္ျဖစ္ပါသည္။



MCL မွ လုပ္ေဆာင္ရန္ရွိေသာ CSR အစီအစဥ္မ်ား

၁. ျပည္သူ႕က်န္းမာေရးႏွင့္ေဆးကုသေရးအစီအစဥ္မ်ား

၂. ဘီလပ္ေျမစကၠဴ ဧရိယာပတ္လည္တြင္ ေဆးကုသခန္းမ်ား ၊ ေဂ်း၂လ်ားေဆးေပးခန္းမ်ားစီစ ဥ္ ထားရွိျခင္း

၃. လူထုအက်ိဳးျပဳလုပ္ငန္းမ်ား

၄. ဘီလပ္ေျမစကၠဴ ဧရိယာပတ္လည္တြင္ရွိေသာ ျပည္သူမ်ားအတြက္ လမ္းျပင္ေပးျခင္း ၊ စာသင္ေက်ာင္း ေဆာက္လုပ္ျပင္ဆင္ျခင္း ၊ ဘုရားရွိခိုးေက်ာင္းႏွင့္ဘုရားမ်ား ျပင္ဆင္ြမွမ္းမံျခင္း ႏွင့္ အစိုးရဆိုင္ရာရံုးမ်ားအား ျပင္**ဆင္** ေပးျခင္း

၅. ပညာေရး/ဘာသာေရးက႑

၆. လူငယ္လူရြယ္မ်ားအား ပညာေရး ၊ သိပၸံပညာ ၊နည္းပညာ ၊ အားကစားႏွင့္ အႏုပညာ ႏွင့္ က်င့္ဝတ္ ႏွင့္ ကိုယ္က်င့္တရားေကာင္းမြန္လာေစျခင္းအားျဖင့္ (ဆိုလိုသည္မွာ ပညာသင္ဆုမ်ားခ်ီးျမင့္ေပးျခင္း၊ ကစားကြင္းမ်ား ၊အားကစားဧရိယာမ်ား၊ သိပၸံပညာသင္တန္းေက်ာင္းမ်ား၊ အဂၤလိပ္ဘာသာစကားသင္တန္း) ကိုယ္က်င့္တရား ေကာင္းမြန္ေသာ လူမႈအဖြဲ႕အစည္းတစ္ရပ္အား ျပဳစုပ်ိဳေထာင္ႏိုင္မည္ ျဖစ္ပါ သည္။

၇. အလုပ္အကိုင္အခြင့္အလမ္းမ်ား တိုးတက္လာေရး

၈. ျပည့္စံုလံုေလာက္ေသာစီးပြားေရးဆိုင္ရာ လုပ္ငန္းခြင္ ဆုိင္ရာ ဖြံ႕ၿဖိဳးတိုးတက္မႈ (စုေပါင္း လယ္ ယာစနစ္ ၊ ဇီဝဓာတ္ေငြ႕ ၊ ဇီေျမၾသဇာ ၊ အဆိပ္အေတာက္ကင္းေသာ ဟင္းသီးဟင္း ရြက္မ်ား ထုတ္လုပ္မႈဆိုင္ရာ သင္တန္း မ်ား စသျဖင့္)

၉. လူထုပါဝင္ေသာ ပူးေပါင္းေဆာင္ရြက္မႈမ်ား

၁၀. ျပည္သူလူထုႏွင့္သက္ဆိုင္သူမ်ား ပူးေပါင္းပါဝင္ႏိုင္ေသာ ျပဳမူေဆာင္ရြက္ခ်က္မ်ားႏွင့္ အျခား အစီအစဥ္မ်ား (**ဥပမာ** open-house program, One Cell One Project (OCOP) **စသျဖင့္**)

၁၁. သၾကၤန္ကဲ့သို့ေသာ လူအမ်ားႏွင့္သက္ဆုိင္သည့္ **ဂိုးရာပြဲလမ္းသဘင္မ်ားတြင္ပူးေပါင္းပါဝင္ျခင္း**

၁၇) ဝန္ခံကတိျပဳခ်က္မ်ား

Commitment Source	Commitment
Chapter II	Mawlamyine Cement Limited **(**MCL**)** will follow National and international Laws, By Laws, Regulations and Guidelines Relevant to Canal and Jetty operation process**.** Also, the project will meet the emission and effluent standards with national.
Chapter II	Mawlamyine Cement Limited **(**MCL**)** will specifically commit itself to the prevention of pollution through the implementation of processes, practices, and techniques to avoid, reduce and control the creation, emission and discharge of any type of pollutant and waste.
Chapter II, Use of Natural Resources	Mawlamyine Cement Limited **(**MCL**)** will specifically commit itself to minimize the use of consumptive resources and promote the reduction and recycling of waste products where possible.

Commitment Source	Commitment
Chapter II, Air quality standard	Mawlamyine Cement Limited (MCL) will follow National Environmental Quality (Emission) Guideline and IFC General EHS Guidelines for the ambient air quality especially in operation phase as in Table 2.3-1 and 2.3-2 (NEQG).
Chapter II, Wastewater Effluent	Mawlamyine Cement Limited (MCL) will follow National Environmental Quality (Emission) Guideline and IFC General EHS Guidelines and for the waste water effluent as in Table 2.3-3 and 2.3-4.
Chapter II, Ambient Noise Standard	Mawlamyine Cement Limited (MCL) will follow NEQG for the ambient and industrial noise standard during construction and operation phase as In Table 2.3-5.
Chapter II Commitments	Mawlamyine Cement Limited (MCL) will prepare an IEE report with fully compliment with EIA procedure 2015 in timely and precisely mannar as in Table 2.2-1.
Chapter II Organization Guideline	Mawlamyine Cement Limited (MCL) will follow International Finance Corporation's EHS Standard for organization as in Table 2.4-1.
Chapter II, Ambient Noise Standard	Mawlamyine Cement Limited (MCL) will follow International Finance Corporation's EHS Standard for the ambient and industrial noise standard during construction and operation phase as in Table 2.4-2.
Chapter III Designs and Equipments	Mawlamyine Cement Limited (MCL) will utilize the facilities'designs and modernized equipment and machinery as described in Project description for cement plant construction and operation.
Chapter VII Impact Assessments and Mitigation Measures	Mawlamyine Cement Limited (MCL) will be adopted mitigation measures for avoiding or reducing such environmental and socio-economic impacts potentially generated by the Project during both the construction and operation phases.
Chapter VII Ambient Air Emission	Mawlamyine Cement Limited (MCL) will implement mitigation measures for ambient air emission in Section 7.3 with the regular monitoring plan.
Chapter VII Noise Emission	Mawlamyine Cement Limited (MCL) will implement mitigation measures for operation phase as mentioned in Section 7.6.
Chapter VII Wastewater Effluents	Mawlamyine Cement Limited (MCL) will implement mitigation measures in Sections 7.7.4.1 and 7.7.4.2 for both construction and operation period.
Chapter VII Solid Wastes	Mawlamyine Cement Limited (MCL) will implement mitigation measures for solid waste as mentioned in Section 7.9.3.
Chapter VII Soil	Mawlamyine Cement Limited (MCL) will implement mitigation measures in Section 7.8.4 and 7.8.6.
Chapter VII Biodiversity	Mawlamyine Cement Limited (MCL) will implement mitigation measures in Section 7.10.5.
Chapter VII Visual/Landscape	Mawlamyine Cement Limited (MCL) will implement mitigation measures in Sections 7.8.5 and 7.8.6 for construction and operation phases.

Commitment Source	Commitment
Chapater VII Cultural Heritage	Mawlamyine Cement Limited (MCL) will implement mitigation measures as shown in Section 7.14.2.
Chapter VII Cumulative Impacts	Mawlamyine Cement Limited (MCL) will implement mitigation measures as shown in 7.17.3.
Chapter VII Traffic Issue	Mawlamyine Cement Limited (MCL) will implement mitigation measures in 7.11.8.
Chapter VII Socioeconomic	Mawlamyine Cement Limited (MCL) will implement mitigation measures as in Section 7.11.10.
Chapter VII Community Health and Safety	Mawlamyine Cement Limited (MCL) will implement mitigation measures as in Section 7.12.4 and 7.12.5.
Possibility of employment opportunities	The labor recruitment policy must be formulated in such a way that local laborers can easily get chance of employment in the project.
Occupational health hazard	Arrangement of personal protective equipments sucha as gloves, helmet, sunglasses and other tools, dress (life jackets) and uniforms for each worker so that the workers can keep themselves safe from any kinds of accident and the occupational health training will also be provided.
Chapter VIII, Environmental component	Mawlamyine Cement Limited (MCL) will develop and implement environmental and social management plan in accordance with the impacts that described in Table 8.2-3, 8.2-5.
Chapter VIII, Social & OHS component	Mawlamyine Cement Limited (MCL) will develop and implement social and OHS components as described in table 8.2-4 and 8.2-6
Occupational Health and Safety Management Plan	Mawlamyine Cement Limited (MCL) will develop and implement social and OHS components as described in section 8.7.
Chapter VIII, Emergency Response Plan	Mawlamyine Cement Limited (MCL) will develop and implement social and OHS components as described in table 8.9-2.
Chapter VIII, Cultural Heritage	Mawlamyine Cement Limited (MCL) will develop and follow a chance find procedure for cultural heritage objects and sites as shown in Section 7.14.3.
Chapter VIII Decommissioning Phase	Mawlamyine Cement Limited (MCL) will implement mitigation measures as described in 8.11.3.
Chapter VIII, Ecological Management Plan	Mawlamyine Cement Limited (MCL) will develop and implement an ecological management plan as shown in 8.10.
Chapter VIII, Grievance Redress Procedure	Mawlamyine Cement Limited (MCL) will develop and implement a grievance redress mechanism as shown in Section 9.2.3 for social management with the monitoring and evaluation as mentioned.
Chapter VIII, Monitoring and Reporting	Mawlamyine Cement Limited (MCL) will develop and implement a monitoring and reporting plan as presented in Table 9.1-1 and 9.2-1.

Commitment Source	Commitment
CSR Program	Mawlamyine Cement Limited (MCL) plan and reserve for cooperate social responsibility (CSR) (during operation period), two percent (2%) of yearly net profit of the project and CSR will be implemented as shown in Section 9.4.
Chapter IX, Environmental Monitoring Plan	The compliance monitoring report along with the checklist will be indexed and annexed with the monthly and annual monitoring report. It may be required to submit the annual monitoring report to Department of Environmental Conservation for renewing of the Environmental Clearance Certificate each year.
CSR Program	Mawlamyine Cement Limited (MCL) plan and reserve for cooperate social responsibility (CSR) (during operation period), two percent (2%) of yearly net profit of the project.

၁၈) နိဂုံးခ်ဳပ္အၾကံျပဳခ်က္

လက္ရွိ ဘိလပ္ေျမစီမံကိန္းဧရိယာတြင္ အျခားသား စီမံကိန္းလုပ္ငန္းမ်ားမရွိေသာ္လည္း ဘိလပ္ေျမ ထုတ္လုပ္ျခင္းစီမံကိန္းသည္ ထံုးေက်ာက္မိုင္း၊ ေက်ာက္မီးေသြးလွ်ပ္စစ္စက္ရံု၊ ဆိပ္ကမ္းႏွင့္ တူးေျမာင္း အစရွိေသာ ဆက္စပ္ လုပ္ငန္းမ်ားႏွင့္ ဆက္ႏြယ္ေနပါသည္။

ဘိလပ္ေျမစက္ရံုႏွင့္ ဆက္စပ္လုပ္ငန္းမ်ားေၾကာင့္ ထိခိုက္သက္ေရာက္ႏိုင္ဖြယ္ရွိေသာ တန္ဖိုးထားဖြယ္ေဂ ဟေဗဒဆိုင္ရာအစိတ္အပိုင္းမ်ားမွာေျမအသံုးခ်မႈ၊ သဘာဝေပါက္ပင္၊ ေလထုႏွင့္ လူမႈစီးပြားဆိုင္ရာဝန္းက်င္တို႕ ျဖစ္ပါသည္။ သို႕ေသာ္ျငားလည္း ထိုထိခိုက္သက္ေရာက္မႈမ်ားမွာ ေလွ်ာ့ခ်ႏိုင္ဖြယ္ရွာရွိသည္ ဟုယူဆရၿပီး ဤစီမံ ကိန္း မ်ားအားလံုးကိုလည္း ျပည့္စံုစြာေပါင္းစပ္ဖြဲ့စည္းထားသည့္ ဘိလပ္ေျမစီမံ ကိန္းတစ္ခုဟုသာ ယူဆႏိုင္ပါသည္။ အဘယ္ေၾကာင့္ဆိုေသာ္ ဤစီမံကိန္းမ်ားအားလံုး၏ ပိုင္ရွင္မွာ MCL တစ္ဦးတည္းျဖစ္ကာ EIA လုပ္ငန္းမ်ားကို အေကာင္အထည္ေဖာ္ေဆာင္ရြက္ရာတြင္လည္း တစ္ခုတည္းေသာ SOD အသင္းမွသာစဥ္ဆက္မျပတ္ဖြဲ့စၿဖိဳးတိုး တက္ေစေရးအတြက္ စီမံကိန္း ေဆာင္ရြက္ခ်က္မ်ားအားလံုးကို ျခံဳငံုသံုးသပ္ကာျဖစ္ေပၚလာႏိုင္ဖြယ္ရွိေသာ ထိခိုက္ သက္ေရာက္မႈမ်ား အားလံုးကို စဥ္းစား၍ ေလွ်ာ့ခ် သက္သာေစေရးနည္းလမ္းမ်ား ေဆာင္ရြက္ေရးကို ထိန္း ခ်ဳပ္ခ်ီကီး ၾကပ္ကြပ္ကာ တာဝန္ယူေဆာင္ရြက္မည္ ျဖစ္ေသာေၾကာင့္ ျဖစ္ပါသည္။

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Chapter 1
Introduction

1.1 Introduction

With the blooming of the civilization and GDP growth of almost all countries in the world, the demand for infrastructure such as houses, schools, roads, dams, sewers, hospitals and a myriad other structure keeps on growing, so will cement production be increasing, because it is the key ingredient of concrete used in construction. Modern life without cement is impossible to conceive.

This Environmental Impact Assessment **(**EIA**)** report was prepared for Mawlamyine Cement Limited **(**MCL**)** by a consultant firm "Resource & Environment Myanmar Ltd." **(**REM**)** engaged to undertake the project titled "Development of the Cement Plant and Associated Facilities" as a collaborative work of SCG cement and Pacific Link Cement Industry **(**PLCI**)** in Mon state of the southeastern part of Myanmar. The purpose of the present project is to produce SCG brand cement and reduce national cement demand imported from foreign countries.

The three main types of cements are proposed to produce by MCL as the followings;

1) OPC Small 80**-**85%
2) Masonry cement 10**-**15% and
3) Mix cement 10**-**15%

These percentage is likely to change regarding on the cement market situation.

The products are mostly dispatched by barge from MCL**'**s own jetty**.** The main distribution area is expected to be in Yangon, Mon state and Kayin State**.** Some are distributed to the nearby factories by trucks.

Cement production processes are deeply concerned with the greenhouse gases emission, mostly carbon dioxide (CO_2) emission and some processed pollutants, mainly on NO_x, SO_x, Dust and particulate matter (PM), however, almost all dust and PM generation in cement processing can be collected through the filters and used as the raw materials in the process. There are two types of cement processes, Dry and Wet. If the cement process run on Wet process, wastewater effluent will be one of the main issues, wastewater generation should be treated to meet with the standard guideline values, however, for Dry process, the wastewater effluent rate is able to be negligible.

1.2 Background of MCL Project

In support and approval of EIA, the REM Consultant will develop environmental and social impact assessments in terms of collecting and analyzing physical environment, biological and social data like people's perceptions, concern, opinion, and expectation on the project to update for the approval of clean environment and guiltless society during and after the development of the project as contracted with MCL and the project is being implemented by MCL.

The EIA report was submitted to Myanmar Investment Commission (MIC) in 2013 and MCL received permission letter from MIC on 7 May 2013. At present, the cement plant and captive power plant (9MW Waste Heat Generator and 20 MW x 2 coal based thermal power plant) have been constructed.

Regarding on the approval from the meeting of the developer, MCL and the governmental officers from Environmental Conservation Department (ECD), Ministry of Natural Resources and Environmental Conservation (MONREC), the EIA report shall be updated based on EIA procedures (2015) by REM Consultant team.

The fully integrated MCL cement plant project was proposed to include the following main components:

- Construction and operation of cement plant in 5000 ton per day
- Operation of the quarry site within the existing concession area
- Construction and operation of captive power plant (9MW Waste Heat Generator and 20 MW x 2 coal based thermal power plant, and
- Construction and operation of MCL own jetty

Moreover, the individual EIA reports for cement plant, quarry production site and captive power plant shall be submitted to ECD according to EIA procedure 2015.

This EIA report was prepared to present for construction and operation of 5000 ton per day Cement Plant Project and to meet in line with national and international compliances, such as Performance Standards of International Finance Corporation (IFC PS).

1.3 Purpose and Scope

The main purpose of this proposed project is to fulfill the local demand of cements for any construction related activities and to create a local cement market for national economic development.

The main objectives are:

1) To produce high quality cement in local
2) To reduce the importation of cement and related material of Myanmar.
3) To fulfill the cement required for the local consumer and developer in Myanmar
4) To create job opportunities for people in Myanmar especially who lives near the factory location.
5) To provide directly and/or indirectly for the improvement of national economic development
6) To raise the industrial production development sectors
7) To increase technology advancement in the country and interact both national and international levels

Resource & Environment Myanmar Co., Ltd. (REM) was appointed by MCL as an Environmental and Social Consultant to establish the updated EIA report for the present Cement Plant Project under the scope to assess the environmental and social effects of the Project and other existing and planned activities in the area related to the Project, including any associated facilities and prepared in compliance with national and international requirements,

namely the IFC PS and World Bank (WB) Group's Environmental Health and Safety (EHS) Guidelines with the general objectives as the following:

- Identify the social and environmental components likely to be affected by the proposed Project activities;
- Describe the baseline environmental and social conditions of the Project site and its surroundings within the Area of Influence (AoI) potentially affected by the Project through direct and indirect affected impacts;
- Determine the significance of impacts;
- Provide an analysis of the environmental, social, and health and safety aspects of the Project according to the international applicable standards; and
- Highlight the positive impacts of the Project and address the negative ones, developing mitigation measures as to minimize pollution, environmental disturbance, and nuisance during construction and operation.

1.4 Report Organization

This document is outlined as follows:

Chapter 1: provides a general introduction to the Project, the Scope of Work (SoW), and a brief description of the adopted methodology;

Chapter 2: provides the most relevant regulatory information. The pertinent and applicable regulations and standards on environmental & social aspects are described in agreement with local guidelines and regulations and the international IFC PSs and WB EHS Guidelines;

Chapter 3: presents a description of the Project, including the characteristics of the proposed works and related activities. The consideration of the alternatives which are taken into account during the design phase of the Project are also presented;

Chapter 4: discusses the physical, biological, and socio-economic baseline conditions at the project site and surrounding areas, prior to the Project execution. Assembling and analysing the baseline data/information allowed to identify the critical environmental variables, which may be affected by Project-related actions and to avoid considerable impacts unrelated to the areas and sites of interest;

Chapter 5: presents the plans for Stakeholder Engagement and Public Consultation Activities as part of the EIA for the present project

Chapter 6: identifies, evaluates and quantifies any potential environmental and social impact relevant to both construction and operation phases of the present Project and indicates the mitigation measures to be adopted in order to avoid or, when avoidance is not feasible, reduce the identified impacts.

Chapter 7: presents the framework Environmental Social Management Plan (ESMP) prepared for the Project and based on the main findings of the EIA process;

Chapter 8: describes the Environmental Monitoring Plan and

Chapter 9: describes the conclusion.

1.5 EIA Methodology

The present Report was developed following the EIA guidelines and included:

- Review the Secondary data wherever possible from the strongly recommended sources for same project activities of cement production process
- Formation of the geographical and topographical maps to describe the main project location and its surroundings by mapping techniques
- A clear and detail description of the proposed Project including its objectives, design concepts, workloads and proposed natural resources uses;
- Feasibility of the Project alternatives and selection criteria;
- Description of the legal, policy and institutional framework within which the proposed project will be implemented;
- Description of the baseline conditions in the Project area to cover the physical location, environmental settings, social and economic issues;
- Highlight of the anticipated impacts to the environment, social and economic aspects of the area covered by the project;
- Recommendation of appropriate mitigation and/or corrective measures; and
- Development of a framework ESMP presenting the Project activities, potential impacts, and mitigation actions to be taken to bring the Project in line with the national and international standards.

The main objective of this methodology was to identify impacts resulting from the proposed cement project roject to be determined based on the baseline conditions established during the field works and information obtained from the documents reviewed.

1.6 Documentary Review

A certain number of Project-related documents were reviewed for a clear understanding of the terms of reference, environmental status of the Project area, demographic trends, land use practices in the affected areas, development strategies and plans as well as the applicable policy and legal framework. Some of the reviewed documents include:

- design Reports and associated documents provided by MCL
- relevant Legal, Policy and Regulatory documents;
- EIA Cement Industry Guidelines developed by World Business Council Sustainable Development (WBCSD) within Cement Sustainability Initiative (CSI); and
- IFC PSs and WB EHS Guidelines.

1.7 Field Survey

Field surveys were conducted by the project teams to assess the physical and biological environment of the Project area as well as the Project Affected Parties (PAPs). The fieldwork was aimed at determining the anticipated positive and negative impacts in terms of physical and biological environment (hydrology, climatic patterns and water resources related aspects), social and economic trends, (population trends, settlement trends, economic patterns, cultural setting and linkages, land ownership issues, etc.).

Specific objectives of the field survey included:

- obtaining any available information and data from the local public offices on the AoI environment, water, lands and agriculture;
- evaluating the environmental setting in the AoI. General observations were focused on the topography, land use trends, surface water sources, public amenities, land cover, climate, settlements, forests, soils, etc.;
- evaluating social, economic and cultural settings in the Project areas; and
- undertaking consultative public participation exercises to reach a large section of the PAPs as well as other stakeholders, with the purpose to inform them about the Project and collect their feedback and concerns.

1.7.1 Detailed EIA Study Activities

A clear picture of the environmental and social baseline status was achieved also through interviews and physical inspection of the entire Project area. The baseline conditions provided the starting point for the impacts predictions and benchmark for the mitigation measures. Details and outputs of the activities are outlined in the sections below and include:

- Introduce the EIA Consultant Team and Project Proponents
- Review of the proposed project details for understanding the project magnitude;
- Update of the legislative and regulatory requirements as a basis for drawing a compliance monitoring protocol for the construction and commissioning phases;
- Establishment of the current baseline conditions to provide a documented foundation for the impact assessment and a benchmark for the development of mitigation measures;
- Consultation of nearby community about the project impacts through the socioeconomic surveys and consultation meetings
- Environmental and social impacts assessments for the identification of significant impacts to the environment and the nearby communities; and
- Environmental management plan on mitigation measures, responsibilities, timeframes, environmental costs and a comprehensive environmental management plan.

1.7.2 Stakeholder and Public Consultations

As part of the EIA preparation process a certain number of public consultations and meetings have been organized to present to the stakeholders the Project, the preliminary outcomes of the EIA and collect feedback. These stakeholder meetings have been organized also as part of the public consultation requirements foreseen the national EIA approval process. A presentation of the public consultations carried out is given in Chapter 6.

Stakeholders are persons or groups who are directly or indirectly affected by a project, as well as those who may have interests in a project and/or the ability to influence its outcome, either positively or negatively. Stakeholders may include locally affected communities or individuals and their formal and informal representatives, national or local government authorities,

politicians, religious leaders, civil society organisations and groups with special interests, the academic community, or other businesses.[6]

As part of the EIA preparation process a certain number of public consultations and meetings have been organized to present to the stakeholders of the Project, as the preliminary outcomes of the EIA and collect feedback. These stakeholder meetings have been organized also as part of the public consultation requirements foreseen the national EIA approval process. A presentation of the public consultations carried out is given in Chapter 6 with engagement plan as well.

The objectives of stakeholder engagement is to explore options to avoid, minimize and/or mitigate Project impacts with Project stakeholders in particular affected communities, which are categorized stakeholders by their thematic relevance, priority, when/where/how they will be impacted by the Project and how they would influence the Project, their inter-relationships and dynamics, and the size or level of operation.

1.7.3 Reporting

The reports (draft and final) were done within pre-agreed time frames to meet with the requirements of ECD. The report schedule included a draft final EIA study report and final EIA study report.

The present document is the Draft Environmental & Social Impact Assessment study submitted to ECD for comments.

1.8 Organizations for Establishment and Implementation of EIA Report

In developing the project, the processes and methods which were specified by REM consultant team to be compliance with national and international standards and implemented by the project owner, MCL project E&S implementation team.

1.8.1 MCL Organization for EIA Implementation

The project proponent (MCL) consists of 5 departments/divisions which are Production dept., Maintenance dept., Quarry dept., Human Resources dept. and Operation Administrative Dept. Sustainable and Organization Development Section is responsible for environmental, health and safety management as well as Community relation. This department, which is directly under supervision of managing director, is responsible for grievance adjustment, support of the community, CSR activities etc.

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[6] International Finance Corporation Stakeholder Engagement: A Good Practice Handbook for Companies Doing Business in Emerging Markets

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1.8.2 Consultant Organization of Environmental Impact Assessment

Resource & Environment Myanmar Ltd (REM) is in Yangon, Myanmar, and it is a leading resources and environment consulting firm in the country. The company members are composed of environment, society and earth resources management and other related subjects. Its predecessor was a research team founded in 1998 in University of Yangon, the team members were ecologists, social economists, geologists, doctors, economists, and data management staff. In 2003, an environmental impact assessment team was established; the team members are retired and current professors and scientists who have strong interest in environmental and resource management.

After five years of cooperation in several projects with the scientists from various subjects of University of Yangon (such as environmental data collection, oilfield development evaluation, construction of offshore oil & gas production base, beach resorts and onshore gas pipelines, etc.), the Resource & Environment Myanmar is registered under the current laws and regulations in Myanmar, the company can provide systematic services for a variety of major infrastructure projects under the request.

The company can provide environmental impact assessment, social and health impact evaluation for private or government authorities` projects. In addition, the Company can also deliver geotechnical engineering, geological and hydrogeological survey, and soil investigation, geological hazard assessment (potential landslide risk figure, seismic hazard assessment, and flood risk map). The company currently has nine research groups, including ecology, plants, soil and water, social investigation, cultural heritage, public health, risk, information management and atmospheric research, a total of 33 experts and has passed ISO9001:2008 No. 686750 certified laboratory's assistance. In recent years, the company has delivered environmental impact assessment services for such projects as Shweli River two-stage hydropower station project, Yangon municipal development planning and Thilawa class A of special economic zones and three 500MW gas turbine projects.

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EIA Team Members
The EIA study team comprises members who have been involved in numerous environmental related studies. The personnel are well trained and qualified in their respective field. Please refer to **Table 1.8-1** for detail information about the members in the study team. Curriculum Vitae of each member were attached in Annex-1.

Table 1.8-1: EIA Team Members

Sr.No.	Name	Field of Study	Responsibility
1	Dr. Win Maung	Principal Consultant (Project Director)	Ecology (Fauna)
2	Dr. Saw Pyone Naing	Principal Consultant	Traffic, Land use, Social Impact
3	Daw Khin Ohnmar Htwe	Principal Consultant	Socio-Economic
4	U Zaw Naing Oo	Principal Consultant	Environmental Management Plan
5	U Kyaw Zin Win	Principal Consultant	GIS and Physical Environment
6	Dr. Myint Aung	Principal Consultant	Ecology (Flora)
7	Dr. Thiha Soe	Principal Consultant	Mining Geology
8	U Soe Yu Htun	Senior Consultant	Physical Baseline Data Collection
9	U Kyaw Naing Oo	Senior Consultant (Ecology)	Wildlife
10	U Ngwe Moe	Principal Consultant	Environment, health and safety
11	Dr. Tin Tin Khaing	Principal Consultant	Ecology
12	Dr. Sandar Win	Principal Consultant	Ecology
13	U Chit Myo Lwin	Senior Consultant	Physical Environment
14	U Nyan Lin Maung	Senior Consultant	Ecology
15	U Thura Aung	Principal Consultant	Environmental Geology
16	Dr. Nyomie Razak	Principal Consultant	Cultural Heritage
17	Dr. Lai Lai Win	Principal Consultant	Impact Assessment and Reporting

Chapter 2
Legal Framework

Legislation of Myanmar and international standards for the issues of interest are presented in the following sections in order to figure out a set of regulatory or reference limits and to address the best management practices for each considered environmental and social aspects relevant for the Project.

Legislation will be required or chosen for the implementation of a policy if:

- existing rights and obligations are to be modified
- the policy is to have long term operation
- the policy is of a very high level of importance.

2.1 Myanmar Law and Regulation (Background)

Myanmar already had some legislations and regulations which are, the more or the less, relating to natural environmental aspects since before its independence. The Forest Act and the Burma Wildlife Protection Act, for example, have been enacted respectively in 1902 and 1936 for the sustainability of the forest products. Amended versions of such earlier act and newly promulgated one are briefly outlined to give a perspective on the existing legal and administrative framework concerning the environmental affairs in Myanmar.

National Commission on Environmental Affairs (NCEA) was formed in 1990 with the purposes of setting environmental standards and creating environmental policies for utilizing natural resources and controlling environmental pollutions.

NCEA has adopted a National Environmental Policy in 1994 to ensure the incorporation of environmental concerns in planning for economic development. The NEP emphasizes "the responsibility of the State and every citizen to preserve its natural resources in the interest of present and future generations". In accordance with Notification No. 26/94 made in 1994, National Environmental Policy was stated as follows.

*"*To establish sound environment policies, utilization of water, land, forests, mineral, marine resources and other natural resources in order to conserve the environment and prevent its degradation, the Government of the Union of Myanmar hereby adopts the following policy*:* The wealth of the nation is its people, its cultural heritage, its environment and its natural resources. The objective of Myanmar*'*s environmental policy is aimed at achieving harmony and balance between these through the integration of environmental considerations into the development process to enhance the quality of the life of all its citizens. Every nation has the sovereign right to utilize its natural resources in accordance with its environmental policies; but great care must be taken not to exceed its jurisdiction or infringe upon the interests of other nations.

It is the responsibility of the State and every citizen to preserve its natural resources in the interests of present and future generations. Environmental protection should always be the primary objective in seeking development*"*.

The commission also formulated a blue print, the Myanmar Agenda 21, in 1997 in response to the call of the Earth Summit to develop national strategies to implement the Global Agenda 21. This document may serve as a framework for integrating environmental considerations in future national development plans as well as sectorial and regional development plans in Myanmar with the purpose of securing the aims of sustainable development.

The *Myanmar Agenda 21* is divided into 4 Parts and 19 Chapters and encompasses a broad range of sectors and issues. Building on the National Environment Policy, the agenda takes into consideration the programme guidelines found in the *Global Agenda 21* and is aimed at strengthening and promoting systematic environmental management in the country.

Most importantly, the *Myanmar Agenda 21* makes recommendations for the drafting and promulgation of a framework law which can further promote the integration of environmental and developmental concerns in the decision-making processes of the country.

Environmental management in Myanmar is founded on the National Environmental Policy (1994), the Constitution of the Union of Myanmar (2008), and the Environmental Conservation Law (2012).

Table 2.1-1: Associated International Convention, Protocol and Agreements

No	Name of Convention/Protocol/Agreement	Date of Rectification
1	Plant Protection Agreement for the South-East Asia and the Pacific Region, Rome, 1956	4-11-1959 (Adherence)
8	United Nations Framework Convention on Climate Change, New York, 1992 (UNFCCC)	25-11-1994 (Ratification)
	The Kyoto Protocol (international agreement linked to the UNFCCC), Kyoto, 1997	13-08-2003 (Ratification)
9	Convention on Biological Diversity, Rio de Janeiro, 1992	25-11-1994 (Ratification)
	The Paris Agreement, Paris, 2015	19-09-2017 (Ratification)
12	International Tropical Timber Agreement (ITTA), Geneva, 1994	31-1-1996 (Rectification)
13	Vienna Convention for the Protection of the Ozone Layer, Vienna, 1985	24-11-1993 (Rectification)
14	Montreal Protocol on Substances that Deplete the Ozone Layer, Montreal, 1987	24-11-1993 (Rectification)
15	London Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer, London, 1990	24-11-1993 (Rectification)
16	The Convention for the Protection of the World Culture and Natural Heritage, Paris, 1972	29-4-1994 (Acceptance)

Table 2.1-1: Associated International Convention, Protocol and Agreements (Continue)

No	Name of Convention/Protocol/Agreement	Date of Rectification
20	Agreement on the Networks of Aquaculture Centres in Asia and the Pacific, Bangkok, 1988	22-5-1990 (Accession)
21	South East Asia Nuclear Weapon Free Zone Treaty, Bangkok, 1995	16-7-1996 (Rectification)
22	United Nations Convention to Combat Desertification in Those Countries Experiencing Serious Drought and / or Desertification, Particularly in Africa, Paris, 1994 (UNCCD)	02-01-1997 (Accession)
23	Convention on International Trade in Endangered Species of Wild Fauna and Flora, Washington, D.C., 1973; and this convention as amended in Bonn, Germany,1979 (CITES)	13-6-1997 (Accession)
28	ASEAN Agreement on Transboundary Haze Pollution	13-3-2003 (Rectification)
30	Kyoto Protocol to the Convention on Climate Change, Kyoto, 1997	13-8-2003 (Accession)
31	Stockholm Convention on Persistent Organic Pollutants (POPs), 2001	18-4-2004 (Accession)

2.2 National Applicable Laws by Mawlamyine Cement Limited

MCL will strictly follow the following national applicable laws along with the attached articles, rules and regulations in details.

Table 2.2-1: Existing National Applicable Laws/Regulations

Legislation Section	Laws/Rules/ Guidelines	MCL Commitments	Project Relevant Sections
Administrative			
1	The Constitution of Union of Myanmar (2012)	The project will act to be a good citizen in compliance with the duties.	Sect. 24, 37 (a, b,c), 42 (a, b), 390 (a, b, c, d)
2	The Territorial Sea and Maritime Zones Law, 1977	No ballast, rubbish or other wastes will be discharged at Myanmar ports.	Sect. 3-5
3	The Explosive Substances Act, 1908	The project shall not unlawfully and maliciously cause by any explosive substance an explosion of a nature likely to endanger life or to cause serious injury to property.	Sec. 3, 4 (a, b, d, e), 5
4	The Explosives Act, 1887	The project shall obtain relevant government permissions.	Sect. 1, 2, 3, 4, 5, 6, 30 (a, b)
5	Myanmar Investment Law (2016)	The project owner will obtain permit or endorsement accordance with the law.	Sec. 50 (a, d), 51 (a, b, c, d), 65 (g, I, j, k, l, m, n, o, p, q), 78
Agriculture Land			
1	The Farmland Law, 2012	The project shall obtain relevant government permissions and registration for paddy land for other use.	Sect. 7, 30. (a, b)
2	The Land Acquisition (Mines) Act. 1885	The project shall obtain relevant government permissions.	Taking Possession, section 16, 17, Acquisition of Land for Companies, sect. 38A and 44B, Determination of Compensation Rate, Sect. 23-25
3	The Vacant, Fallow, and Virgin Lands Management Law, 2012	The project shall obtain relevant government permissions for land use and purpose.	Right to Cultivate or Utilize Vacant, Fallow and Virgin Lands, Sect. 4 (d), 5 (a-e),6 (a-d) 7, 8, 9, 10 (d), 12, 16 (a)-(g), 23, (a-c), 24, 25 (a)-(c), 26, 27, 28, 29

Table 2.2-1: Existing National Applicable Laws/Regulations (Continue)

Legislation Section	Laws/Rules/ Guidelines	MCL Commitments	Project Relevant Sections
Agriculture Land			
4	National Land Use Policy (2016)	The project shall obtain relevant government permissions.	Objectives
Cultural			
1	The Protection and Preservation of Cultural Heritage Regions Law (1998)	The project shall abide by the provisions of other existing laws and also apply to the Department in accordance with stipulations to obtain prior permission within ancient monumental zone.	Sect. 13 (a), (b), (c), 16, 18, 22
2	The Protection and Conservation of Antique Objects Law, 2015	The antique object is valuable for national heritage. So, anybody has to inform if he or she has found any antique object.	Purpose, Sect. 3 (a)-(e), Sect. 12, 16, 19, 20, 25
3	The Protection and Preservation of Ancient Monuments Law (2015)	The proponent will inform to the nearest village and township administration department if found out an ancient building of 100 years or more of age without owner on the ground, underground, above the water or under water, if the building is recognized as or believed to be an ancient monument.	Sec. 12, 15 (b), 17,18, 19, 20 (b), 21, 23, 24, 25, 26, 30
City Development			
1	Mon State Municipal Law (2017)	Mon State Parliament enacted this law in June 2017. The sections 48 (d)-(f), 49 (a), 50 (a)-(c) and 52 (g) are related to this project. The section 48 and 49 illustrate the duties and responsibilities of the committee to encourage the factories to proper effluent discharge and solid waste disposal. The section 50 provides the laws transport vehicles while 52 sub-section (g) mentions construction of road.	Sect. 48 (d)-(f), 49 (a), 50 (a)-(c), 52 (g)

Table 2.2-1: Existing National Applicable Laws/Regulations (Continue)

Legislation Section	Laws/Rules/ Guidelines	MCL Commitments	Project Relevant Sections
Finance & Revenue			
1	The Myanmar Citizen Investment Law (2016)	The project shall obtain relevant government permissions.	50 (d), 51, 69 (c)-(n), 73
2	Myanmar Investment Rules (2017)		202, 203, 206
Forestry			
1	The Forest Law, 2018	The project proponent will obtain the approval of Ministry if the project area is included in the forest land or the land administrated by the government which covers the forest.	Sect. 12 (a) (b)
Health			
1	The Public Health Law (1972)	The project proponent make ensure the public health include not only employees but also resident people and cooperation with the authorized person or organization of health department.	Purpose, Sect. 3 (1), 4, 5
2	Prevention and Control of Communicable Disease Law (1995)	The proponent make ensure the healthy work environment and prevention the communicable diseases by the cooperation with the relevant health department.	Objectives Prevention, Sect. 3 (a-c), 4, 9, Measures taken in respect of an outbreak of Principal Epidemic Disease, Sect. 11
3	The Control of Smoking and Consumption of Tobacco Product Law (2006)	The project owner will arrange the specific place for smoking in the operation area and keep the caption and mark in accordance with the stipulations.	Sec: 7, 9 (Sub sect: a, b,c,d)

Table 2.2-1: Existing National Applicable Laws/Regulations (Continue)

Legislation Section	Laws/Rules/ Guidelines	MCL Commitments	Project Relevant Sections
Mining Sector			
1	Myanmar Mine Law (2017)	MCL will take care for license or permit validity and will update the license before expired when needed. MCL will also pay the income tax to the respective ministry officer and will straightly follow in accordance of any provision of the existing laws.	Section 29
Industry Sector			
1	The Private Industrial Enterprise Law, 1990	The project shall understand to obey the prohibitions, offences and penalty for industrial operation process.	Basic Principles, Sect. 3 (a), (b), (d)-(g), 4, 13 (b, e, f, g), 15 (a, b) Prohibitions Sect. 26 Offence and Penalty Sect. 28 (a), (h), (c), 29 (a), (h), (c)
2	The Factories Act (2016)	The project proponent will strictly follow the guidelines to keep clean and free from effluvia arising from any drain, privy or other nuisance and provide the canteen for foods and sheds for rest time and the particular room while the workers are sick.	Sec. 13 (a-e), 15 **(**1**)**, 16 **(**1**)**, 18 **(**1**)**, **-**19 **(**1**)**, 20, 21, 23 (1), 36, 40 (4,5), 48, 49, 50
3	Petroleum Act (1934)	The project shall import, transport, store or distribute any petroleum save in accordance with the rules.	Sec. 3 (Sec: 1, 2) Sec. 4
4	Petroleum and Petroleum Products Law (2017)	The project shall have the licenses for exportation, importation, transportation, transit, storage, refinery, distribution, testing of petroleum and any petroleum products must be obtained from the relevant ministries.	9 (a)-(d), 10 (a), (b), (d), (e)

Table 2.2-1: Existing National Applicable Laws/Regulations (Continue)

Legislation Section	Laws/Rules/ Guidelines	MCL Commitments	Project Relevant Sections
Industry Sector			
5	The Petroleum Rules (1937)	The project proponent shall take all due precautions at all time to prevent accident by leakage, or fire or explosion or discharge when using and stored the petroleum and its related materials including all the empty tanks or other receptacles which contained petroleum for vehicle uses and other purposes during the project construction and operation in accordance with the rules.	Prohibition: 7 and 8
6	The Export and Import Law (2012)	No the project shall export or import restricted, prohibited and banned goods.	Sec. 5,6,7
7	Industrial Use Explosive Substances (2018)	The project proponent shall get the relevant Departmental permissions for import, usage, storage and transportation of mining explosive substances for industrial production purpose.	Chapter I: Definitions Chapter II: Objectives Chapter III: Requesting and getting the permissions for the land for store area, import, usage and storage of explosive substances for industrial purpose. Section: (4-9) Chapter IV: Registration of license after inspector's checklists complement and renew the license once a year before 30 day to expired. Section: (10-14) Chapter V: The responsibilities of license holders Section: (15-16)

Table 2.2-1: Existing National Applicable Laws/Regulations (Continue)

Legislation Section	Laws/Rules/ Guidelines	MCL Commitments	Project Relevant Sections
Industry Sector			
			Chapter VI: The responsibilities of Inspector Section: 17 Chapter VII: Prohibitions Section: (18-21) -Not to refuse the inspector's investigation -Not to import, store and transport any explosive substances that are not consistence with this law -Not to destroy any explosive substances without the permission from ministry of defense -Not fail to implement the rules, regulations and guidelines by this law -Not to store the explosive substances in area without holding license. -Not to store the additional amount more than the permitted one -To inform the nearby police station if any explosion occurred -Not to store without renewing license when expired. Chapter VIII: Offenses and Penalties Chap. IX: Miscellaneous

Table 2.2-1: Existing National Applicable Laws/Regulations (Continue)

Legislation Section	Laws/Rules/ Guidelines	MCL Commitments	Project Relevant Sections
Labour			
1	Labour Organization Law (2011)	The project owner will give the right to the labour organization to carry out freely in drawing up their constitution and rules, in electing their representatives, in organizing their administration and activities or in formulating their programmes.	Rights and Responsibilities of the Labour Organization, Sec. 17, 18, 19, 20, 21, 22, 23
2	Settlement of Labour Dispute Law, 2012	The project owner shall not fail to negotiate and coordinate in respect of the complaint within the prescribed period without sufficient cause and no alter the conditions of service relating to workers concerned in such dispute at the consecutive period.	Sec. 38, 39, 40, 51
3	Employment and Skill Development Law (2013)	The project proponent will provide the suitable trainings and activities to improve the skill of employees in relevant practical field.	Sec. 5 (a)-(h), 14, 30 (a, b)
4	The Minimum Wages Law (2013)	The project proponent shall not pay wage to the worker less than the minimum wage stipulated under the law.	Sec. 12 (a-e), 13 (a-g)
5	The Leaves and Holiday Act (1951)	The project proponent will follow the prescriptions for the rights of the workers in a private enterprise which are granted the following leaves and holidays' 6 days casual leave, 30 days medical leave, 10 days earned leave, and 21 public holidays in a year with wages. In addition, women workers in private enterprises covered by the Social Security Act 1954 are granted maternity leave with paid wages.	
6	The Law Amending the Workmen' Compensation Act, 1923 (Amended in 2005)	This act is to provide for the payment by certain classes of employers to their workmen of compensation for injury by accident.	

Table 2.2-1: Existing National Applicable Laws/Regulations (Continue)

Legislation Section	Laws/Rules/ Guidelines	MCL Commitments	Project Relevant Sections
Labour			
7	The Payment of Wages Law (2016)	The project proponent shall pay wages to the workers employing as stipulations of Central Bank of Myanmar with the necessary to pay particular benefit, profits and opportunities for workers working in commerce, production and service businesses and overtime wages.	Sec. 3, 4, 7, 8, 9, 10, 11, 12, 13, 14, 18
8	Labour Welfare Law, 2012	The project will manage according to the said law for labour welfare issue.	11 (a), 15, 18, 48 (b), 49, 75
9	Myanmar Insurance Law	The project will compensate for all the general damages to the environment and injuries to public to ensure the needed insurances such as making insurance for the project owned vehicles and injured person.	Sec: 15 and 16
10	Workmen Compensation Law (1923)	This act is to provide for the payment by certain classes of employers to their workmen of compensation for injury by accident.	
Livestock and Fisheries Sector			
1	The Freshwater Fisheries Law, 1992	The project will not violate any prohibitions related to aqua species.	22 (c), 34 (a), 35, 36, 39, 40, 41, 43, 45, 46, 47, 48
2	The Myanma Marine Fisheries Law, 1990 (The Law Amending the Myanma Marine Fisheries Law, 1993)	The project will follow any requirement and take actions to conserve and protect the marine organisms.	Prohibitions, Sec. 34, 36, 40, 41 Penalties, Sec. 43,45-47
3	The Law Relating to Aquaculture, 1989	No the Project shall do the following: -obstructing navigation and -flowing of water or polluting the water within the fisheries water or -abetting such acts;"	Sect. 29, 31

Table 2.2-1: Existing National Applicable Laws/Regulations (Continue)

Legislation Section	Laws/Rules/ Guidelines	MCL Commitments	Project Relevant Sections
Livestock and Fisheries Sector			
4	The Conservation of Water Resources and Rivers Law 2017	The project shall not carry out any act or channel shifting with the aim to ruin the water resources and rivers and creeks and cause the wastage of water resources willfully without disposing any harms to water resources.	Sec. 8, 9, 11, 12, 13, 14, 19, 21, 22, 23, 24, 26, 27, 28, 29, 30
Environment			
1	National Environmental Policy (1994)	The project proponent will follow any stipulations of the law to achieve harmony and balance between socio-economic, natural resources and environment through the integration of environmental considerations into the development process enhancing the quality of the life of all its citizens.	
2	The Environmental Conservation Law (2012)	The project will comply the duties and powers relating to the environmental conservation of relevant Ministry and follow any stipulation to conserve the environments.	Sec.7 (d), (o), Environmental Conservation Sec. 10, 12, 14,15, Prior Permission, Sec. 24, Prohibitions, Sec. 29
3	Environmental Conservation Rules (2014)	carry out any activity which can damage the ecosystem and the natural environment	69 (a, b)
4	The EIA Procedure (2015)	The project proponent will prepare an IEE report with the relevant sections and fully commitments, correctly and timely action to build a suitable EMP framework for the project impacts and monitoring and management plan that will meet to approve from relevant department.	32, 33, 24, 35, 77, 78, 79, 82, 83, 84, 86, 87, 88, 91, 92, 93, 94, 95, 96, 100, 102-110, 113, 115, 117, 123, 128
5	Environmental and Social Impact Assessment Guidelines (2014)	The project proponent will submit a standalone document with the required identification and management of impacts from the	Chap. 1 and 2

Table 2.2-1: Existing National Applicable Laws/Regulations (Continue)

Legislation Section	Laws/Rules/ Guidelines	MCL Commitments	Project Relevant Sections
Environment			
		project on affected communities and stakeholders and the preparation of an international standard ESIA.	
6	National Environmental Quality (Emission) Guidelines (2015)	The project proponent will follow and comply the following target level of each component. Each quantitative target value to be applied is described below. 1. Air Quality 2. Water Quality 3. Noise 4. Vibration	For air emission and effluents of general condition (Ambient), Cement and manufacturing section, MARPOL 83/87 I, II, IV and VI for waterway transportation will be complied. Noise and vibration will be complied with industrial production section.
7	The Protection of Wildlife, Wild Plants and Conservation of Natural Area Law **(**2018**)**	The project shall not cause unacceptable impacts to Protected Area protected habitats and species. The project shall ensure the protection of natural areas and wildlife and wild plants which are in the natural areas.	35, 36, 39 (a) (d) (e), 40 (a)-(c), 41 (a, b)
8	The Prevention of Hazard from Chemical and Related Substances Law (2013)	The project proponent will strictly follow when chemicals and related substances is to be transferred, stored, used, or disposed, operating approval certificate in accordance with the regulations based on the international treaties.	15 (a, b), 16, 17, 22, 23 (a), 27

Table 2.2-1: Existing National Applicable Laws/Regulations (Continue)

Legislation Section	Laws/Rules/ Guidelines	MCL Commitments	Project Relevant Sections
Transportation Sector			
1	The Highways Law, 2015	The proponent shall comply an interactive general guides and regulations that citizens shall follow when using the Highway for various purposes.	Article 8, 9, 17
2	The Motor Vehicle Law (2015) and Rules (1987)	The project proponent promises to abide by the nearly all provisions of said law and rules, especially, the provisions related to air pollution, noise pollution and life safety.	
Socioeconomic Sector			
1	Protection the Rights of Ethnic Nationalities Law (2015)	The project proponent will make ensure to disclose to the resident ethnic nationalities about the project fully, moreover, to ensure cooperate with them.	Formation of the Ministry and Appointment of the Union Minister, Sect. 5, 14, 22, 23, 24
2	Social Security Law	The Project owner will create the social security for the employees and ensure the social security for employees of the project and register to the social security offices and to pay the prescribed funds.	Sect. 11 (a), 15 (a), 18 (b), 48 (a, b, c), 49 (a, b), 75 (a,b,c)
3	The Fire Force Law (2015)	The project proponent will follow the rules and precautions to prevent fire hazard.	Fire Precaution and Prevention Works, Sect. 18 (c), (d), (f), Prohibitions, Sect. 25, Penalties, Sect. 35
4	The Fire Service Law (2015)	The project proponent will get the granting permission from the relevant department.	Sec. 18 (c, d, f), 25, 35
5	The Consumer Protection Law (2014)	The project will cause fulfillment of goods or services that enable to ensure the high quality for safety, health, satisfaction of the consumer and not carry out the production, trade of illegal and prohibited goods.	Sec. 8 (a,b,c,d,e,f,g,h,i,j) Sec. 9 (a,b,c,d,e,f,g,h) Sec. 11, 12, 15

Table 2.2-1: Existing National Applicable Laws/Regulations (Continue)

Legislation Section	Laws/Rules/ Guidelines	MCL Commitments	Project Relevant Sections
Myanmar Engineering Council Law			
1	Myanmar Engineering Council Law **(**2013**)**	The project will hire the registered engineers and technician for the industrial processing related with engineering work.	The Duties and Rights of Registered Engineers, Graduate Technologists and Technicians **31, 34, 37** Prohibitions and Penalties **37**

2.3 National Environmental Quality (Emission) Guidelines (2015)

MONREC formulated the National Environmental Quality (Emission) Guidelines (NEQG) in coordination with ADB in December 2015. The NEQG determines the guideline values for general emission such as air emissions, wastewater, noise levels, odor, and those for sector-specific emission such as emission from forestry, agribusiness/food production, chemicals, oil and gas, infrastructure, general manufacturing, mining and power generation.

Emission guideline and target values of ambient air quality, air emission, wastewater, and noise levels were set in NEQG, while other standards have not been set yet by MONREC.

MCL will follow and comply the following target level of each component. Each quantitative target value to be applied is described below.

1) Air Quality
2) Water Quality
3) Noise
4) Vibration

2.3.1 Air Quality

i) Target Value of Ambient Air Quality

On the basis of the above standards, the target value for air quality in the Project, as shown in **Table 2-1** has been set with the following considerations:

Target parameters of ambient air quality in Myanmar's standards are applied if it has set (SO_2, NO_2, $PM_{2.5}$, and PM_{10}).

The averaging period adopted is 24 hours, which could be measured using the available equipment in Myanmar whereas currently it is impossible to implement continuous measurement for one month or one year at the project site due to battery/electrical capacities.
The power transmission and distribution sector does not typically give rise to significant effluents or air emissions. The major emission during construction period is only dust and

exhaust gas from vehicles. Therefore, MCL will comply with General Guidelines for air quality.

Table 2.3-1: Air Emission Level Set in NEQG

Parameter	Averaging Period	Guideline Value µg/m^3
Nitrogen Dioxide	1-year 1-hour	40 200
Ozone	8-hour daily maximum	100
Particulate Matter PM10[a]	1-year 24-hour	20 50
Particulate Matter PM2.5[b]	1-year 24-hour	10 25
Sulfur Dioxide	24-hour 10-minute	20 500

[a] Particulate matter 10 micrometers or less in diameter
[b] Particulate matter 2.5 micrometers or less in diameter

Table 2.3-2: Air Emission Levels (for Cement Manufacturing)

Parameter	Unit	Guideline Value
Cadmium + Thallium	mg/Nm^{3a}	0.05
Dioxins / Furans	mg TEQ^b/Nm^3	0.1
Dust (other point sources including clinker cooling, cement grinding)	mg/Nm^3	50
Hydrogen chloride	mg/Nm^3	10
Hydrogen fluoride	mg/Nm^3	1
Mercury	mg/Nm^3	0.05
Nitrogen oxides	mg/Nm^3	600
Particulate matter PM_{10}[c] (existing kilns)	mg/Nm^3	100
Particulate matter PM_{10} (new kiln system)	mg/Nm^3	30
Sulfur dioxide	mg/Nm^3	400
Total metals [d]	mg/Nm^3	0.5
Total organic carbon	mg/Nm^3	10

[a] Milligrams per normal cubic meter at specified temperature and pressure
[b] Toxicity equivalence factor
[c] Particulate matter 10 micrometers or less in diameter
[d] Total metals are Arsenic, Lead, Cobalt, Chromium, Copper, Manganese, Nickel, Vanadium, and Antimony

2.3.2 Industrial Specific Guidelines for Wastewater Discharges

Industry-specific guidelines apply during the operations phase of projects and cover direct or indirect discharge of wastewater to the environment**.** They are also applicable to industrial discharges to sanitary **(**domestic**)** sewers that discharge to the environment without any treatment. Wastewater generated from project operations includes process wastewater, wastewater from utility operations, runoff from process and storage areas, and miscellaneous

activities including wastewater from laboratories, and equipment maintenance shops**.** Projects with the potential to generate process wastewater, sanitary sewage, or storm water should incorporate the necessary precautions to avoid, minimize, and control adverse impacts to human health, safety or the environment**.** Industry-specific guidelines summarized hereinafter shall be applied by all projects, where applicable, to ensure that effluent emissions conform to good industry practice.

For project types where industry-specific guidelines are not set out in these Guidelines, the following general guideline values, or as stipulated on a case-by-case basis, apply during project operations.

Table 2.3-3: Wastewater, Storm Water Runoff, Effluent and Sanitary Discharges (general application)

Parameter	Unit	Guideline Value
5-day Biochemical oxygen demand	mg/l	50
Ammonia	mg/l	10
Arsenic	mg/l	0.1
Cadmium	mg/l	0.1
Chemical oxygen demand	mg/l	250
Chlorine (Total residual)	mg/l	0.2
Chromium (hexavalent)	mg/ls	0.1
Chromium (total)	mg/l	0.5
Copper	mg/l	0.5
Cyanide (free)	mg/l	0.1
Cyanide (total)	mg/l	1
Fluoride	mg/l	20
Heavy metal (total)	mg/l	10
Iron	mg/l	3.5
Lead	mg/l	0.1
Mercury	mg/l	0.01
Nickel	mg/l	0.5
Oil and grease	mg/l	10
pH	S.U.[a]	6-9
Phenols	mg/l	0.5
Selenium	mg/l	0.1
Silver	mg/l	0.5
Sulphide	mg/l	1
Temperature increase	°C	<3b
Total coliform bacteria	100 ml	400
Total phosphorus	mg/l	2
Total suspended solids	mg/l	50
Zinc	mg/l	2

[3] Pollution prevention and abatement handbook. 1998. Toward cleaner production. World Bank Group in collaboration with United Nations Environment Programme and the United Nations Industrial Development Organization.

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

2.3.2.1 Cement and Lime Manufacturing [7]

This guideline applies to cement and lime manufacturing projects. Extraction of raw materials, which is a common activity associated with cement manufacturing projects, is covered in the guideline for Construction Materials Extraction.

Table 2.3-4: Effluent Levels

Parameter	Unit	Guideline Value
pH	S.U. [a]	6-9
Temperature increase	°C	<3[b]
Total suspended solids	mg/l	50

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

2.3.3 Noise

Noise Level Set in NEQG

In NEQG, the noise level is set as shown in Table 2-3 and noise prevention and mitigation measures should be taken by all projects where the predicted or measured noise impacts from a project facility or operation exceed the applicable noise level guideline at the most sensitive point of reception. Noise impact should not exceed the levels shown below or result in a maximum increase in background levels of three decibels at the nearest offsite receptor location.

Table 2.3-5: Target Noise Level Set in NEQG

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

Source: NEQG (December 2015)

[7] Environmental, health, and safety guidelines for cement and lime manufacturing. 2007. International Finance Corporation, World Bank Group.

2.3.4 Vibration

With regard on vibration management, MCL will have the proper mining schedule, with the adequate warning to the surrounding community and will act exactly with a tight plan. Blasting frequency is maximum 6 days/week**.** For cultural concern MCL avoid blasting on Sabbath day**.** Vibration monitoring report in details will be provided in annex section.

2.4 International Standards

In addition to the applicable host Country Laws, this ESIA Report presents the Project impacts and mitigation measures with explicit reference to the following international standards and guidelines:

1) World Health Organization (WHO)
2) Environmental Protection Agency (EPA)
3) IFC Performance Standards - PS (2012);
4) WB Group's EHS Guidelines, as applicable to the Project, including EHS General Guidelines;

1. IFC Performance Standards on Environmental and Social Sustainability (2012)

The IFC's Performance Standards define a proponent' responsibilities for managing their environmental and social risks. The IFC has eight Performance Standards that are relevant to environmental and social safeguards including:

a. Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts. This Performance Standard highlights the importance of identifying environmental and social risks and impacts and managing environmental and social performance throughout the life of a project;

b. Performance Standard 2: Labour and Working Conditions. This Performance Standard recognizes that the pursuit of economic growth through employment creation and income generation should be balanced with protection of basic rights for workers;

c. Performance Standard 3: Resource Efficiency and Pollution Prevention. This Performance Standard recognizes that increased industrial activity and urbanization often generate higher levels of air, water and land pollution and that there are efficiency opportunities;

d. Performance Standard 4: Community Health, Safety and Security. This Performance Standard recognizes that projects can bring benefits to communities, but can also increase potential exposure to risks and impacts from incidents, structural failures and hazardous materials;

e. Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources. This Performance Standard promotes the protection of biodiversity and the sustainable management and use of natural resources;

2. International Finance Corporation Environmental, Health, and Safety Guidelines

The IFC EHS Guidelines are technical reference documents with general and industry-specific examples of good international industry practice.

The General EHS Guidelines are designed to be used together with the relevant industry sector EHS guidelines that provide guidance to users on EHS issues in specific industry sectors. The EHS Guidelines contain the performance levels and measures that are generally considered to be achievable in new facilities by existing technology at reasonable costs. When host country regulations differ from the levels and measures presented in the EHS Guidelines, projects are expected to achieve whichever is more stringent.

The EHS Guidelines for cement and lime manufacturing include information relevant to cement and lime manufacturing projects. Extraction of raw materials, which is a common activity associated with cement manufacturing projects, is covered in the EHS Guidelines for Construction Materials Extraction. The contents of both sector EHS Guidelines will be described in the following sections, after a brief presentation of the general EHS Guidelines. The General EHS Guidelines are organized as reported in the following Table.

Table 2.4-1: Summary of Recommended Personal Protective Equipment According to Hazards

Objective	Workplace Hazards	Hazards Suggested PPE
Eye and face protection	Flying particles, molten metal, liquid chemicals, gases or vapors, light radiation.	Safety glasses with side- shields, protective shades, etc.
Head protection	Falling objects, inadequate height clearance, and overhead power cords.	Plastic helmets with top and side impact protection.
Hearing protection	Noise, ultra-sound.	Hearing protectors (ear plugs or ear muffs).
Foot protection	Falling or rolling objects, pointed objects. Corrosive or hot liquids.	Safety shoes or boots for protection against moving & falling objects, liquids and chemicals.
Hand protection	Hazardous materials, cuts or lacerations, vibrations, extreme temperatures.	Gloves made of rubber or synthetic materials (Neoprene), leather, steel, insulating materials, etc.
Respiratory protection	Dust, fogs, fumes, mists, gases, smokes, vapors.	Facemasks with appropriate filters for dust removal and air purification (chemicals, mists, vapors and gases). Single or multi-gas personal monitors, if available.
	Oxygen deficiency	Portable or supplied air (fixed lines). On-site rescue equipment.
Body/leg protection	Extreme temperatures, hazardous materials, biological agents, cutting and laceration.	Insulating clothing, body suits, aprons etc. of appropriate materials.

Occupational Health and Safety

The most significant occupational health and safety impacts occur during the operational phase of cement and lime manufacturing projects and primarily include the following:

- Dust
- Heat
- Noise and vibrations
- Physical hazards
- Radiation
- Chemical hazards and other industrial hygiene issues

Solid Wastes

Sources of solid waste in cement and lime manufacturing include clinker production waste, mainly composed of spoil rocks, which are removed from the raw materials during the raw meal preparation. Another potential waste stream involves the kiln dust removed from the bypass flow and the stack, if it is not recycled in the process.

Limited waste is generated from plant maintenance (e.g. used oil and scrap metal). Other waste materials may include alkali or chloride / fluoride containing dust buildup from the kiln.19 In lime production, dust, off-specification quicklime, and hydrated lime are reused / recycled in selected commercial products (e.g. lime for construction uses, lime for soil stabilization, hydrated lime, and palletized products).

Guidance on the management of hazardous and non-hazardous wastes is provided in the General EHS Guidelines.

Noise

Noise pollution is related to several cement and lime manufacturing phases, including raw material extraction (discussed in the EHS Guidelines for Construction Materials Extraction); grinding and storage; raw material, intermediate and final product handling and transportation; and operation of exhaust fans. The General EHS Guidelines provides levels for recommended noise abatement measures and ambient noise levels.

Table 2.4-2: Noise Limits for Different Working Environments – IFC EHS General Guidelines

Noise Limits for Various Working Environments		
Location / Activity	**Equivalent Level LA_{eq},8h**	**Maximum LA_{max},fast**
Heavy Industry (no demand for oral communication)	85 dB(A)	110 dB(A)
Light industry (decreasing demand for oral communication)	50-65 dB(A)	110 dB(A)
Open offices, control rooms, service counters or similar	45-50 dB(A)	-
Individual officers (no disturbing noise)	40-45 dB(A)	-
Classrooms lecture halls	35-40 dB(A)	-
Hospitals	35-40 dB(A)	B(A)

2.5 MCL's Sustainable Policy

In addition to compliance with the existing legal policies, regulation and guidelines, MCL had its own Sustainability Development Policy and environmental management plan. Indeed, MCL had been established by collaborative work of SCG cement **(**Thailand**)** and Pacific Link Cement Industry **(**PLCI**)**. SCG already got certification of ISO 14001 series for Sustainable Development Policy and MCL also handled to develop the proposed project by operating the manufacturing processes in sustainable policy and guidelines **(**see in MCL announcement described as follow**)**.

MCL
Mawlamyine Cement Limited

Announcement MCL 009/2016

SUSTAINABLE DEVELOPMENT POLICY (Safety, Environment, CSR)

Mawlamyine Cement Limited establish safety to our employees and contractors, preserve the environment and collaborate with local government and surrounding communities in order to be environmental friendly factory and be a good citizen in Mon state under corporate governance.

Mawlamyine Cement Limited has therefore implemented the Sustainable Development policy as the followings:

1. Align SCG Safety Principle to develop Safety Management Program
2. Promote safety caring culture with uncompromising on safety standard
3. Safety is everybody's accountability
4. Control air emission and noise to conform to the relevant standards by implementing Pollution Prevention and Clean Technology.
5. Reduce natural resource consumptions; increase the efficiency of energy by improving the operation to reduce the environmental impacts.
6. Improve waste management by applying 3R's (Reduce, Reuse, Recycle) management and comply with legal requirements.
7. Prevent pollution by improving operation effectiveness and efficiency and increase more green areas.
8. Coordinate with government, external organizations and communities to conserve environment and natural resources for sustainable development.
9. Increase more satisfaction from surrounding communities by implementing CSR program and stakeholder engagement program.

The Sustainable Development policy is communicated within Mawlamyine Cement Limited to make all employees understood and well implemented.

The policy, objective and target of the environmental management system are maintained, reviewed and revised at least once a year via regular Management Review meeting.

Managing Director
Mawlamyine Cement Limited
March 4, 2016

Mawlamyine Cement Limited
No.136/137, Pyay Road, Saw Bwar Gyi Gone, Insein Township, Yangon, Myanmar.

2.5.1 MCL Environmental Policy

Mawlamyine Cement Limited **(**MCL**)** is committed to responsible environmental management in all its operations during construction, operation, decommissioning, closure and post-closure monitoring of the Project because the SCG was satisfied **ISO 14001 Sustainable Development Policy** for sustainable cement production. To this effect the company adopted the Safety Design Guideline, and Occupational Health and Safety Manual. The Safety Design Guidelines and Occupational Health and Safety Manual are shown in **Annex- 2-1 and 2-2** and MCL announcement in **Sustainable Development Policy**. MCL also have the logistic models for transportation.

2.5.2 Environmental Caring Policy of Proposed MCL Project

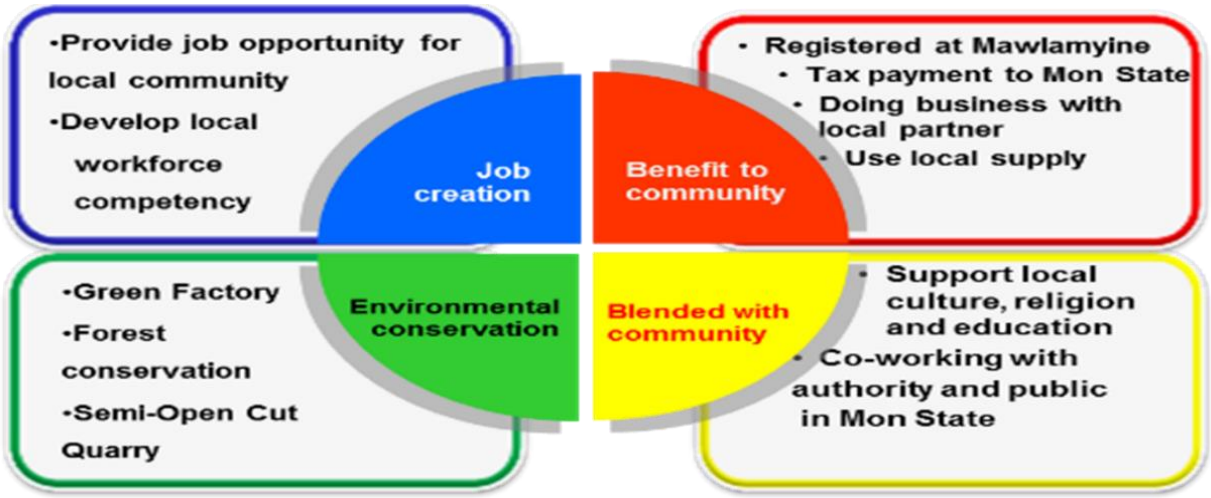
In 2nd February 2018, MCL released announcement letter for monitoring the emission standards control and environmental caring policy for every working area as the following:

"Any employee who is careless and makes the standard value of pollution (SO_x, NO_x and Dust) exceed standardization shall be punished by the company. The highest penalty would be termination".

2.5.3 MCL Commitments

The Project Proponent **(**The Company**)** shall follow any new ones other than the existing laws, rules, regulations and guidelines from respective Government Departments and any national and international requirements and regulations which are relevant with the project. And MCL will prepare IEE/EIA and EMP in accordance with the requirements and regulations of the Ministry of Natural Resources and Environmental Conservation **(**MONREC**)** in accordance with the relevant necessary sections.

MCL shall act to be a good citizen with the following four principles.



The General Safety Guideline as the Annex 2-1, SCG Safety Design Guidelines in Annex 2-2 and Occupational Health and Safety Manual in Annex 2-3 were attached in this report.

MCL also strictly prohibit the staffs and workers:

- Not to drink alcohol and any drugs in the area of MCL. If anyone breaks the rule, MCL will take action as regulation immediately. If it is a serious case, MCL will send the case to the government department immediately.
- Not to quarrel and fight in the area of MCL. If found, MCL will inform to the government department to handle.
- Not to catch any aquatic and animal creatures in the area of MCL.

Chapter 3
Project Description

3.1 Geographical Location of the Cement Plant Site

The cement plant site is located at Pya Taung area, approximately 0.86 km north of the Kwan Ngan village, east bank of Ataran River, in Kyaikmaraw Township, Mawlamyine District, Mon state of the Union of Myanmar. The cement plant is located between 16º21'44" and 16º22'05" N latitude and between 97º49'25" and 97º50'17" E longitude.

Mawlamyine is the third largest city of Myanmar, and also the capital of Mon State, which is the main trading center and seaport in south-eastern Myanmar.

Mawlamyine is situated about 300 km south east of Yangon and 70 km south of Thaton at the mouth of Thanlwin (Salween) river. There are several ways to get to Mawlamyine, by air, railway or road transportation. It takes around 4.5 hours from Yangon to Mawlamyine by road transportation in a car.

There are 2 routes to get the cement plant site from Mawlamyine;

Route 1, West of Pya Taung, traveling to the town of Kyaikmaraw by car and then going to Kwan Ngan village by boat, and after that going to plant site by car or walk. Boat can be directly accessed to plant site only rainy season. It will take about two hours in total.

Routes 2, East of Pya Taung, the plant site can be reachable by car directly through the Ataran Bridge and then go along the road through the villages of Pha Yon Gu, Tharana and Kaw Pa Naw lead to the plant site. This way can be available to use in any season to reach the plant site but the road condition is not fairly smooth. It will take around 2-2.5 hours.

The geographical location of the cement plant site can be seen in Figure 3.3-1.

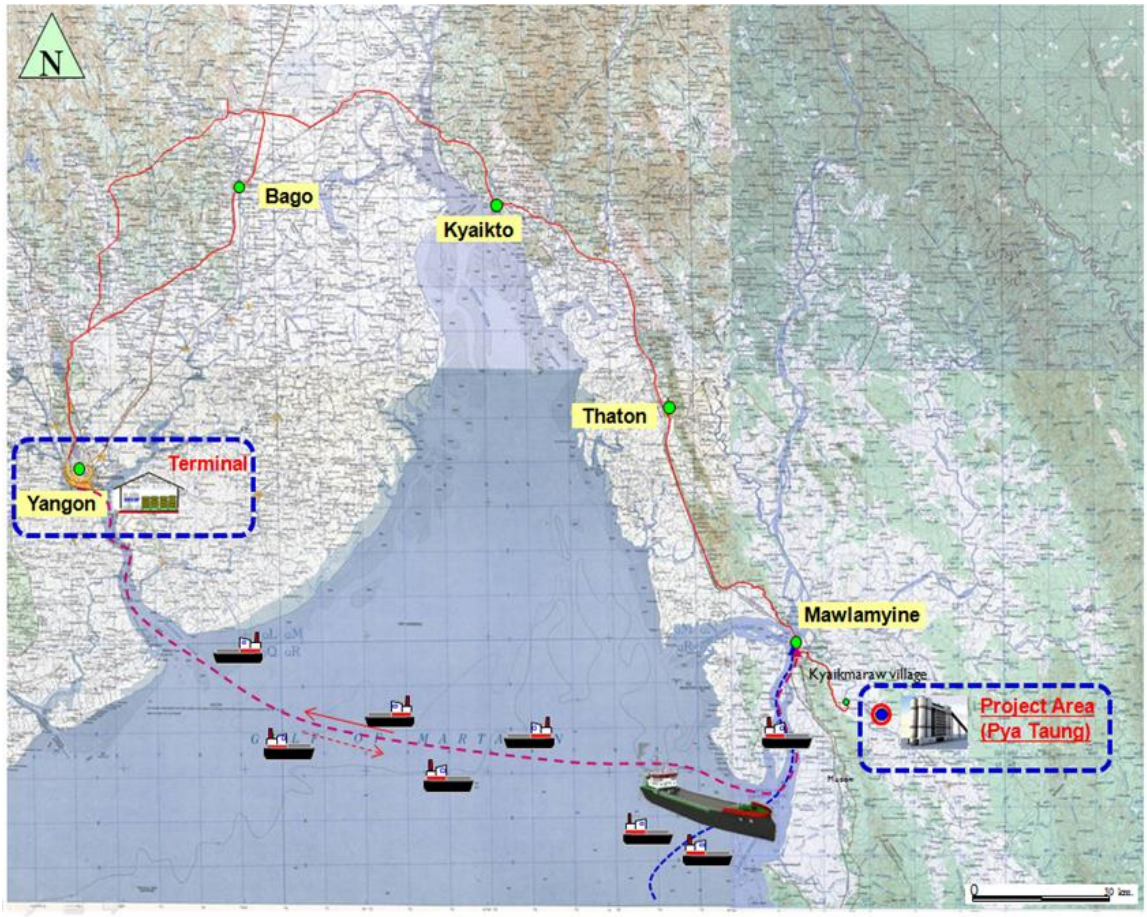


Figure 3.1-1: Location of Cement Plant and Cement Terminal

The estimated area required for the cement plant and its related facilities including reserves of raw material and Jetty is approximately 1,400 acres. The preliminary layout of cement plant can be seen in Figure 3.1-2.

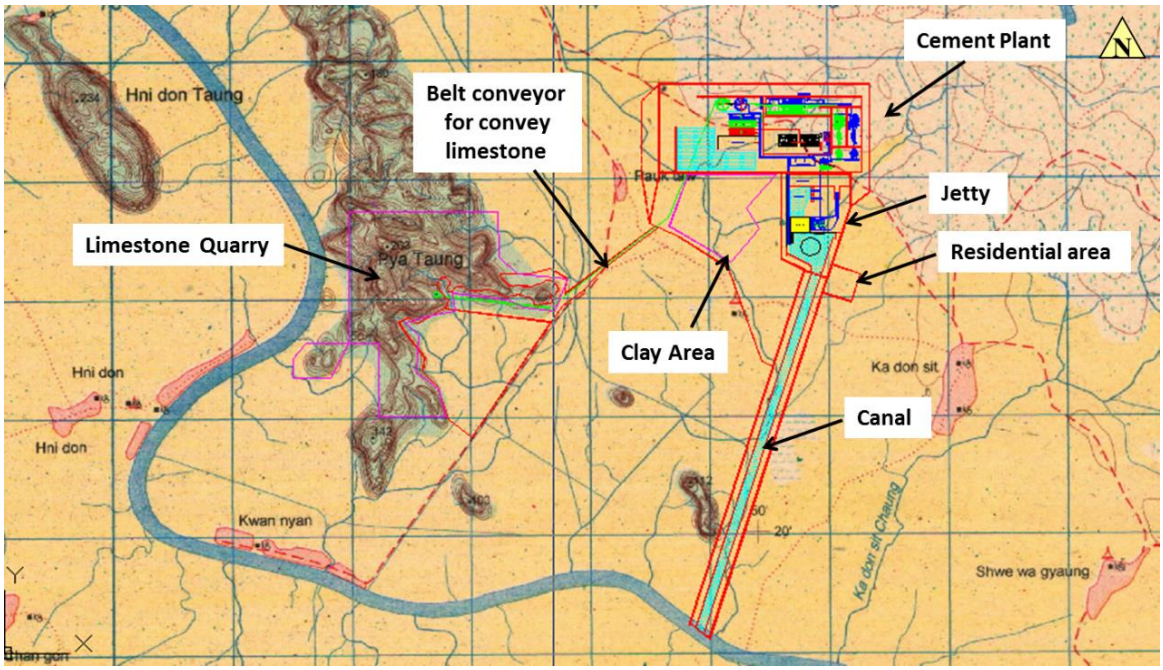


Figure 3.1-2: Preliminary Layout of Cement Plant & its Facilities

3.2 Topography of the Cement Plant Site

The isolated hill of Pya Taung is exposing in the plain near the Ataran River. It is generally N-S trending and lofty vertical sided. It can be seen the middle portion of Pya Taung is widen and the extremity of the southern and northern portion is narrowed. Its maximum point is at 263 m above sea level. It is situated distinctly in the plain which is between Ataran river and the area of hill-ridges. The Ataran River is bounded in the west of Pya Taung and flows uniquely from SE to NW in general. The hill-ridges are generally also NW-SE trending. It can be seen that the drainage pattern is dendritic and the streams are flowing to NE and SW in general from watershed of the hill-ranges.

Myanmar climate is controlled by the monsoon circulating system of South Asia. Mountain ranges run generally N to S or NW-SE presenting a barrier for the SW monsoon in the summer and the NE monsoon in the winter.

Pya Taung area is classed as a tropical monsoon area. In the rainy season (from June to October) rainfall exceeds 250 cm. In the so-called summer from March to May maximum daytime temperature exceeds 32°C. During the cold season from November to February the maximum day time temperature averages 24°C.

The main vegetation is typical evergreen tropical forest often containing tropical hardwoods such as Kanyin, Thingan, Taungthayet, Da Nyin, Thitkya and Malwa. Some deciduous forest can be seen in some places. Bamboos, ferns and grasses are also found in the area. Agriculture is largely limited to rubbers, palm trees and vegetables. The paddy fields can be seen in the surrounding areas of Pya Taung and local villages.

Summary of the Cement Plant Topography

Heights above mean sea level (+MSL)	10 m
Temperature	
Yearly average	28 ℃
Average of the hottest month: Max	36 ℃
Average of the coldest month: Min	18 ℃
Relative humidity	
Yearly average	76.71 %
Average of the hottest month	65.50 %
Average of the coldest month	63.70 %
Rainfall	
Max. Rainfall per day	481 mm (16.6.2004) 236 mm (1.5.2008)
Yearly average	4727.20 mm
Rainy season monthly average	866.56 %
Average of the coldest month	65.73 %
Recommended wind velocity	100 km/hr
Earthquake factor at site:	There is no earthquake in this area according to the seismic fault in Myanmar map. (i.e. It is beyond the limit of seismic faults).

Table 3.2-1: Coordinated Location of Proposed MCL Cement Plant

No.	Project Proponent	Latitude	Longitude
1	Cement Plant	16°21'56.53"N	97°50'11.26"E
2	Coal Fired Power Plant	16°21'55.07"N	97°49'58.73"E
3	Limestone Quarry	16°21'25.25"N	97°48'14.24"E
4	Jetty	16°21'26.11"N	97°50'2.49"E
5	Worker Camp	16°22'9.57"N	97°49'33.64"E

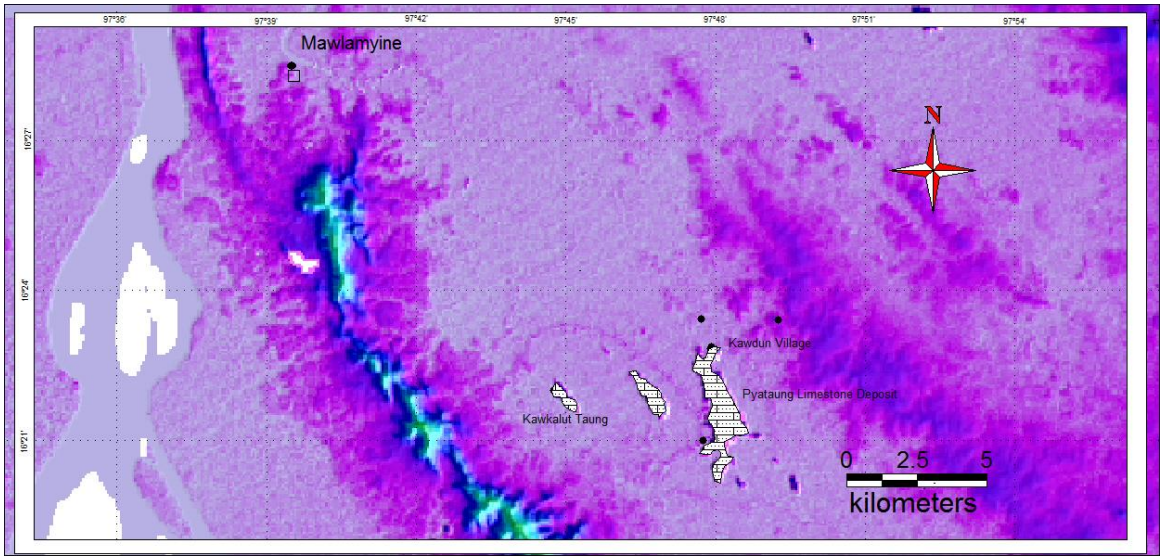
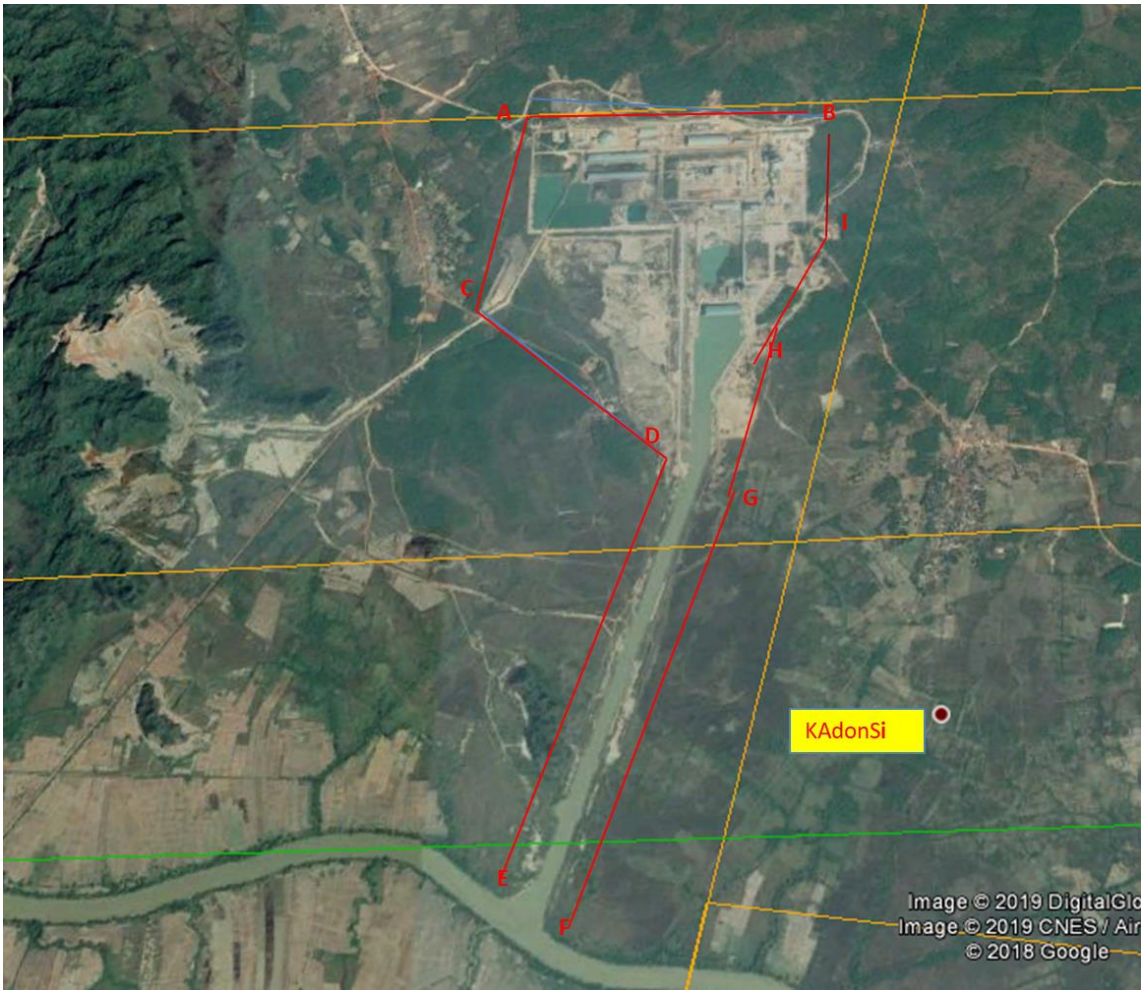
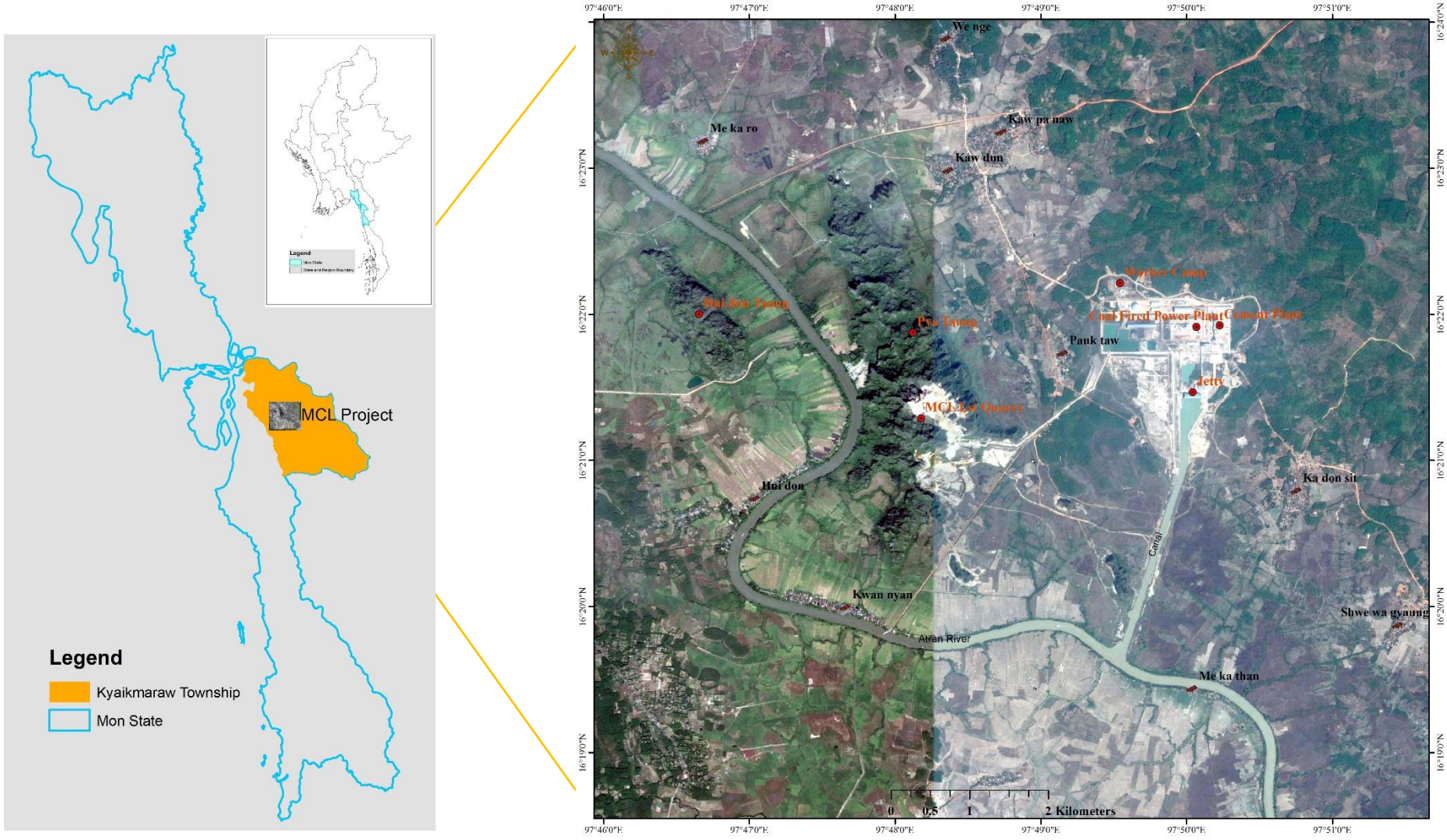


Figure 3.2-1: Location Map of the Pya Taung Limestone Deposit & Proposed Cement Plant



Latitude	Longitude
A - 16° 22' 01.49"N	97° 49' 30.41" E
B - 16° 22' 02.69"N	97° 50' 20.34" E
C - 16° 21' 28.19"N	97° 49' 16.49"E
D - 16° 20' 58.99"N	97° 49' 50.92"E
E - 16° 19' 46.69"N	97° 49' 31.21"E
F - 16° 19' 39.36"N	97° 49' 36.40"E
G - 16° 20' 55.82"N	97° 50' 07.37"E
H - 16° 21' 28.15"N	97° 50' 18.67"E
I - 16° 21' 43.27"N	97° 50' 19.47"E
Total area	1353 acres

Figure 3.2-2: Boundary Area of the Overall Project Site (About 1353 Acres)



Source: Google Earth Satellite Images (2017)

Figure 3.2-3: Location Map of MCL Cement Project

3.3 Background Profile of the Proposed Cement Project

The proposed cement project which is established by Mawlamyaine Cement Limited **(**MCL**)** which will be collaboratively operated by SCG cement and Pacific Link Cement Industry **(**PLCI**)**, was located in Mon state at the southeastern part of Myanmar.

Cement Plant with a capacity of 5,000 metric tons of clinker per 24 hours a day (1.8 million tons of cement per year) covers the process from limestone crushing to cement packing as well as loading facilities and consists of two parts as follows.

1) Cement Plant

Cement Plant and its facilities are located near Ataran River in Mon state, Kyailkmaraw Township, Pya Taung. The estimated area required for the cement plant and its facilities including reserves of raw material and Jetty is approximately 1400 acres. Cement, in-bulk and in-bags is transported by barges through Ataran River and through Andaman Sea to the Cement Terminal.

2) Cement Terminal

Cement Terminal and its facilities are located in the cargo port located on the riverbank in Yangon. The estimated area required for all terminal facilities is approximately 40 acres.

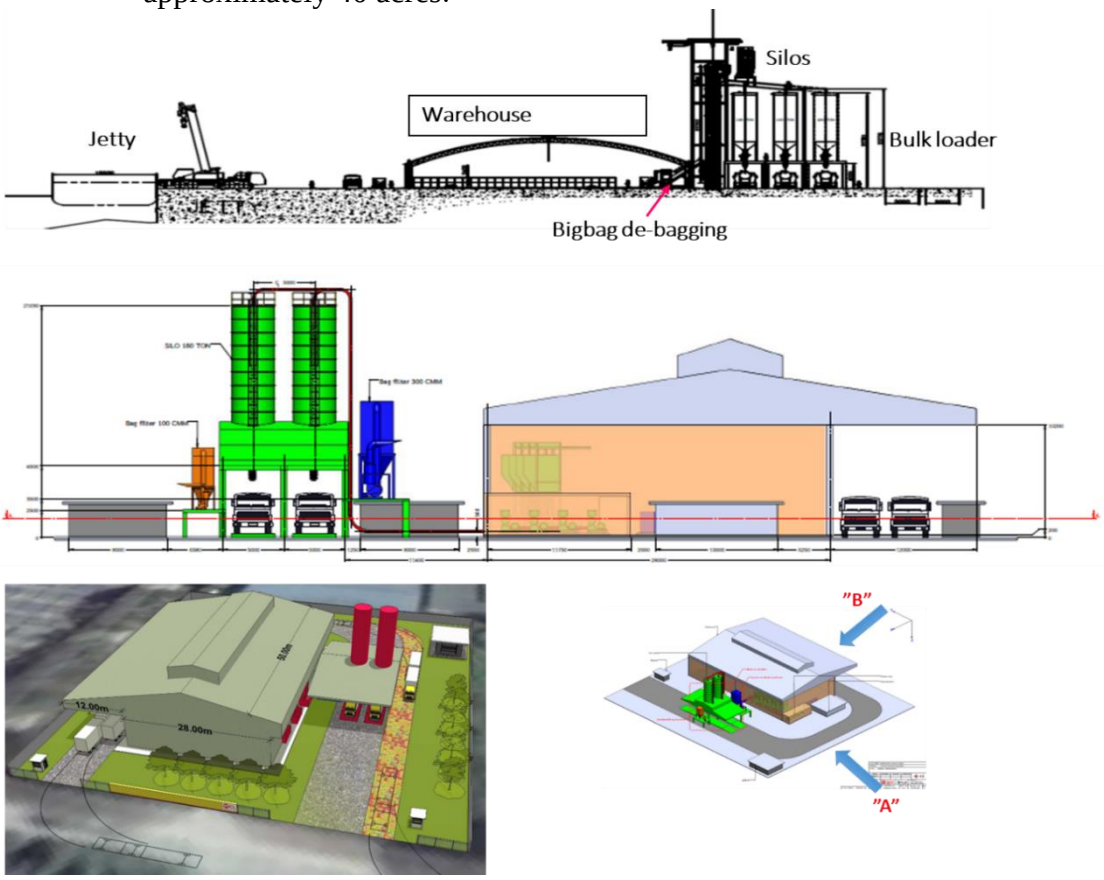


Figure 3.3-1: MCL Cement Terminal in Yangon

The three main types of cements are proposed to produce by MCL as the followings;

1) OPC Small 80-85%
2) Masonry 10-15% and
3) Mix cement 10-15%.

The fully integrated MCL cement plant project was proposed to include the following main components:

- construction and operation of cement plant in 5000 ton per day operation of the quarry site within the existing concession area
- construction and operation of captive power plant (9MW Waste Heat and 20 MW x 2 coal based thermal power plant, and
- construction and operation of MCL own jetty

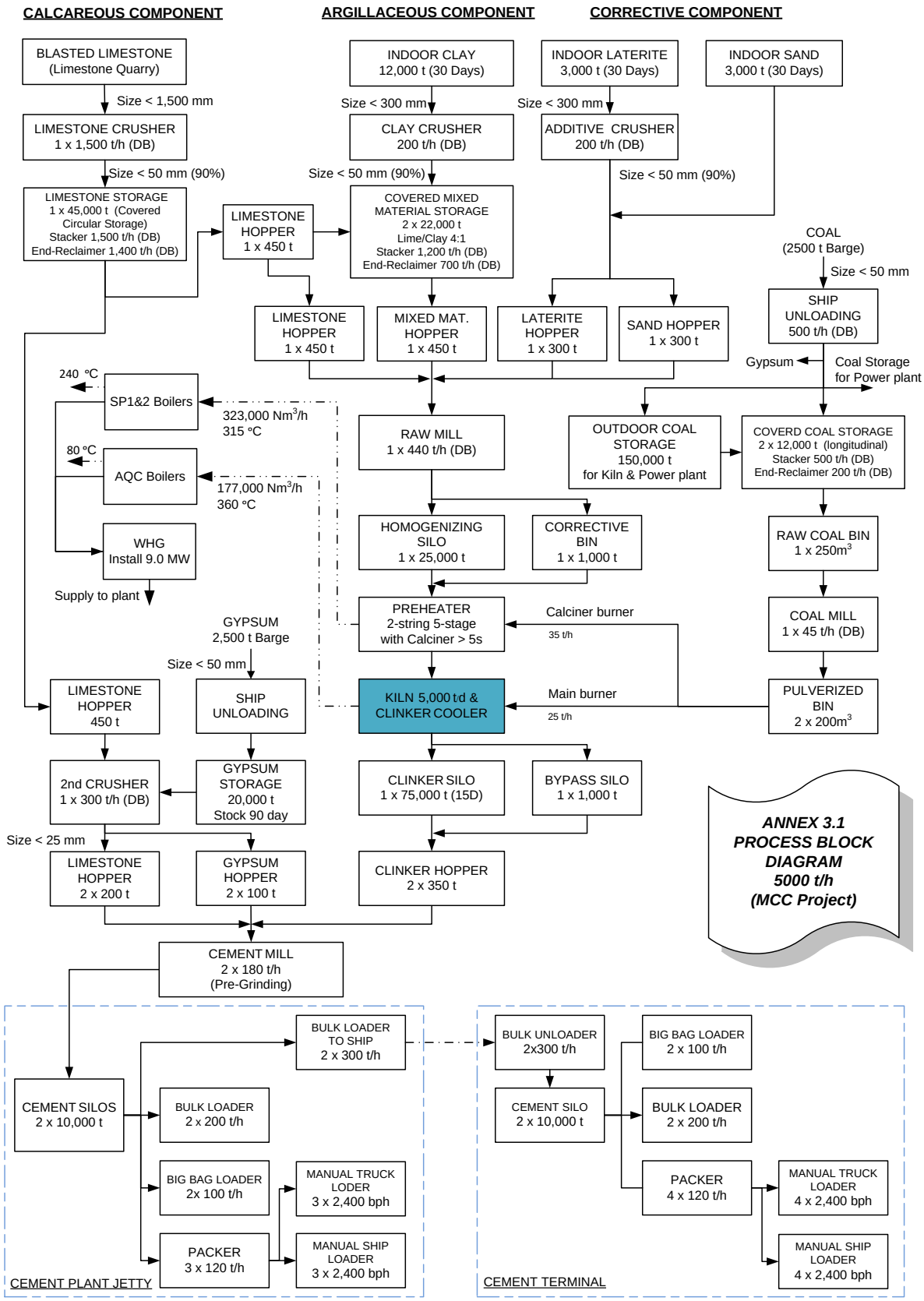


Figure 3.3-2: Workflows of Cement Plant and Cement Terminal

3.4 Cement Manufacturing Process

The cement manufacturing process is dry process that uses fuel less than other process and rarely use water in cement manufacturing process.

Cement production process involves the following steps.

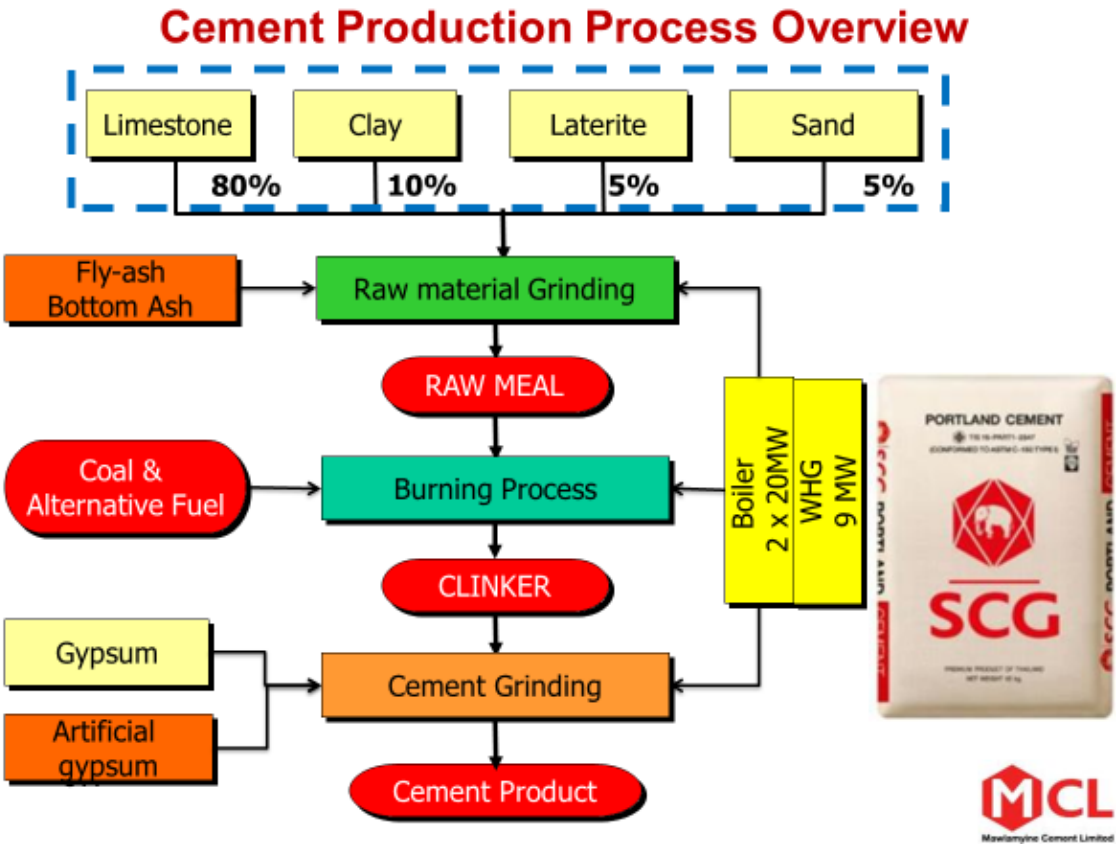


Figure 3.4-1: Cement Production Process

3.4.1 Quarrying and Raw Material Preparation

Raw materials for cement production consist of limestone, clay, sand and laterite.

- Limestone: Blasted limestone of the Pya Taung, which maximum lump size is less than 1,500 mm, is transported to a hopper by truck, and fed into an Impact Crusher (1,000t/h). The output size of crushed limestone is ≤50mm (90%) and it is transported to the Pre-blending Storage (50,000 t) by belt conveyors (1,500 t/h).

  From the stockpile, the crushed limestone shall be reclaimed by a bridge reclaimer (1,400 t/h) and conveyed to the crushed limestone hoppers at the raw mill, cement mill and mixed material stockpile on a time-sharing basis that is multitasking at the same time.

  The annual consumption of limestone is approximately 1.5-2.0 million metric tons based on the type of coals.

- Clay: Clay, from clay mine, is transported to a hopper by truck, and fed into a Clay Crusher (200 t/h). The crushed clay that mixed with crushed limestone is transported to the Pre-Blending Storage (22,000 t) by belt conveyors (1,200 t/h).

  From the stockpile, the mixed material shall be reclaimed by a bridge reclaimer (700 t/h (WB)) and conveyed to the raw mill feed hopper.

  The annual consumption of clay is approximately 0.25 to 3 million metric tons.

- Laterite: Laterite is transported to a hopper by truck and fed into an Additive Crusher (200t/h). The crushed Laterite is directly transported to Raw Mill by belt conveyors. The annual consumption of Laterite is approximately 0.15 million metric tons.
- Sand or Silt: Sand is transported to a hopper by barges (small barges 100-200 ton or up to 2000-ton barges) or 10-12 wheels truck from Thanlwin river delta and fed to Raw Mill by belt conveyors. Currently, silt was also used in stead of sand in MCL cement plant. The annual consumption of Sand/Silt is approximately 0.15 million metric tons.

3.4.1.1 Raw Material Usage for MCL Cement Plant

The following table shows the consumption of raw material per year for the present cement manufacturing project.

The mixing ratio of the main raw materials for MCL cement production is Limestone: Clay: Latrite: Sand, **80:10:5:5** for 5000 t/d cement plant.

Table 3.4-1: Consumption of Raw Materials

Items	% Dry Basis	% Moisture	Consumption per Year
Limestone	78.34	1	1.5-2.0 MTon (approx.)
Clay	12.51	20	0.25 to 3.0 MTon (approx.)
Sand/Silt*	5.54	15	0.15 MTon (approx.)
Laterite	3.6	10	0.15 MTon (approx.)
Gypsum	Hlaingbwe, Hpa-an		0.10 MTon (approx.)
Coal	Indonesia and Local coal		0.3-0.4 MTon (approx.)

3.4.1.2 Raw Material Properties

The properties of raw materials are presented below:

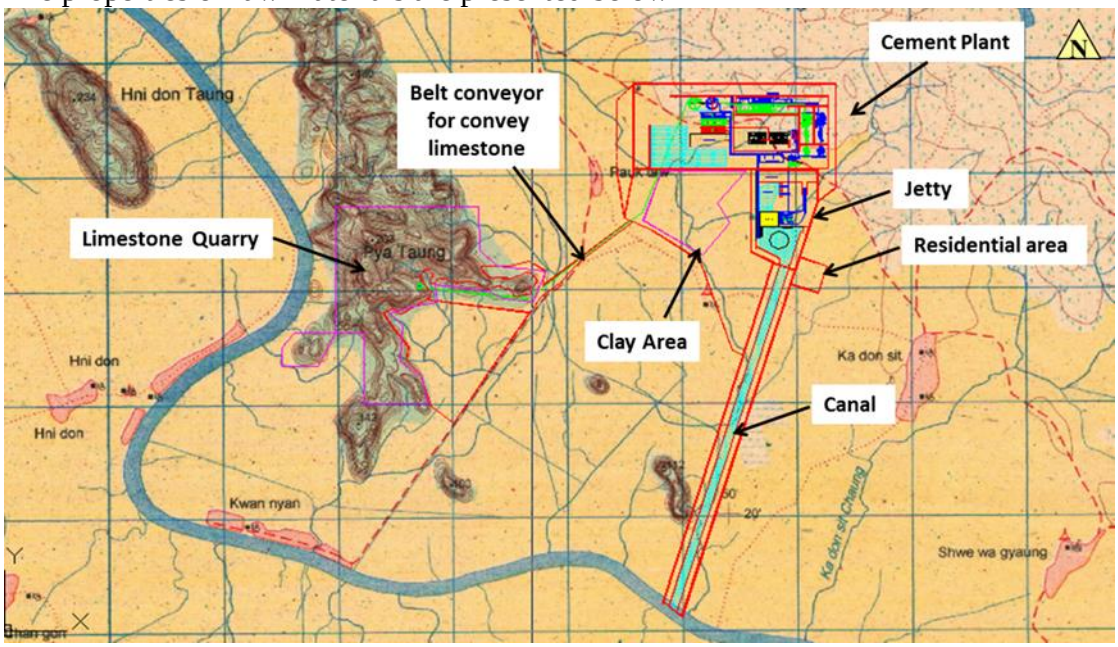


Figure 3.4-2: Preliminary Layout of Cement Plant & its Facilities

Limestone

The result is 96 million ton-Limestone mining reserve.

Based on cement production line with a capacity of 5,000 tons per day, mining plan is categorized into 4 phases as follows.

Phase 1: Year 1 to 5, Level the eastern area down to 90 meters above mean sea level with estimated production as the first 11 million ton.
Phase 2: Year 6 to 20, Level the western area down to 90 meters above mean sea level with estimated production of 31 million tons.
Phase 3: Year 21 to 35, Lower bench level to 40 meters above mean sea level with estimated production of 31 million tons.
Phase 4: Year 36 to 46, Lower bench level to 5 meters above mean sea level with estimated production 23 million tons.

1) Limestone

		Minimum	Average	Maximum
CaO	**%**	**49.30**	**54.88**	**55.70**
SiO_2	%	0.07	0.21	5.30
Al_2O_3	%	0.00	0.11	2.16
Fe_2O_3	%	0.01	0.09	2.26
MgO	%	0.35	0.35	0.35
Na_2O	%	0.00	0.00	0.01
K_2O	%	0	0.00	0.03
Loss on Ignition	%	40.28	43.87	44.19
Maximum Moisture Content		:	1.00 % (Dry season)	
			2.00 % (Wet season)	
Maximum Lump Size (edge to edge)		:	1, 500 mm	

2) Clay

		Minimum	Average	Maximum
CaO	%	0.23	0.30	0.43
SiO_2	%	53.40	59.60	77.50
Al_2O_3	**%**	**11.30**	**19.65**	**24.30**
Fe_2O_3	%	2.29	4.50	7.94
MgO	%	0.30	0.43	1.18
Na_2O	%	0.23	0.28	0.28
K_2O	%	1.31	2.08	2.10
Loss on ignition	%	5.59	7.84	12.57
Maximum moisture content		:	10.00 % (Dry season)	
			29.00% (Wet season)	
Maximum lump size (edge to edge)		:	300 mm	

The figure 3.4-3 showed the existing clay production area **(**Area 1**)** and the planned clay production area **(**Area 2**)**. MCL has requested to the concerned department to do EIA for clay production area.

Clay Area 1

	Lat	Lon
A	16° 21′ 40.62″ N	97° 49′ 28.57″ E
B	16° 21′ 40.92″ N	97° 49′ 51.26″ E
C	16° 21′ 00.59″ N	97° 49′ 52.44″ E
D	16° 21′ 34.25″ N	97° 49′ 26.28″ E

45.51 Hectare

Clay Area 2

	Lat	Lon
A	16° 21′ 29.20″ N	97° 48′ 39.98″ E
B	16° 21′ 10.07″ N	97° 48′ 52.06″ E
C	16° 20′ 55.90″ N	97° 48′ 29.02″ E
D	16° 20′ 42.38″ N	97° 49′ 33.84″ E

95.48 Hectare

Figure 3.4-3: Locations of Existing and Planned Clay Produciton Areas

3) Sand

		Minimum	**Average**	**Maximum**
CaO	%	0.28	0.96	4.90
SiO_2	**%**	**69.30**	**83.22**	**88.40**
Al_2O_3	%	5.30	7.14	8.70
Fe_2O_3	%	1.51	2.12	5.30
MgO	%	0.38	0.38	1.81
Na_2O	%	0.39	0.60	0.88
K_2O	%	2.06	2.15	2.76
Loss on ignition	%	1.03	2.11	5.42
Maximum moisture content		:	10.00 % (Dry season)	
			15.00 % (Wet season)	
Maximum lump size (edge to edge)		:	: sand size	

4) Laterite

		Minimum	Average	Maximum
CaO	%	0.07	0.08	0.08
SiO_2	%	33.70	45.83	57.40
Al_2O_3	%	13.82	13.90	15.70
Fe_2O_3	**%**	**20.00**	**29.35**	**38.00**
MgO	%	0.24	0.37	0.50
Na_2O	%	0.00	0.09	0.09
K_2O	%	0.68	0.98	1.61
Loss on ignition	%	6.79	7.88	8.97
Moisture content		:	8.00% (Dry season)	
			10.00 % (Wet season)	
Maximum lump size (edge to edge)		:	300 mm	

5) Gypsum

Gypsum is typically use for add to cement product which typical quality as table

Typical analysis		
Free Water	%	0.06
Combine water (H_2O)	%	19.28
CaO	%	32.8
SO_3	%	44.8
Calculated $CaSO_4.2H_2O$	%	92.00
Moisture Content	%	15
Maximum lump size (edge to edge)	mm	50

6) Water Usage

Basically, MCL Cement plant use water for cooling system, WHG and consumption of water supply**.** Raw water is come from raw water pond which located inside MCL.2 main water ponds is considered to support both cement and power plant **(**see pond layout design in Annex 3-1**)**.

- Raw Water Pond no.1, Capacity 250,000 m^3
- Raw Water Pond no.2, Capacity 150,000 m^3

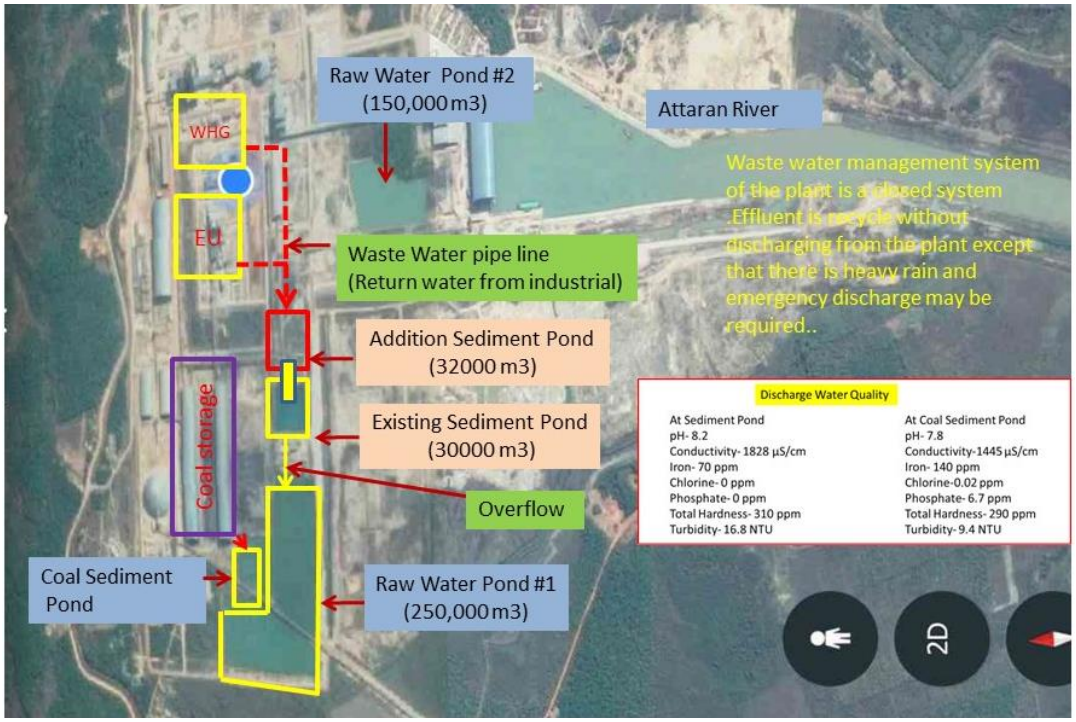


Figure 3.4-4: Layout Plan of Raw Water Pond, Sediment Pond and Coal Sediment Pond

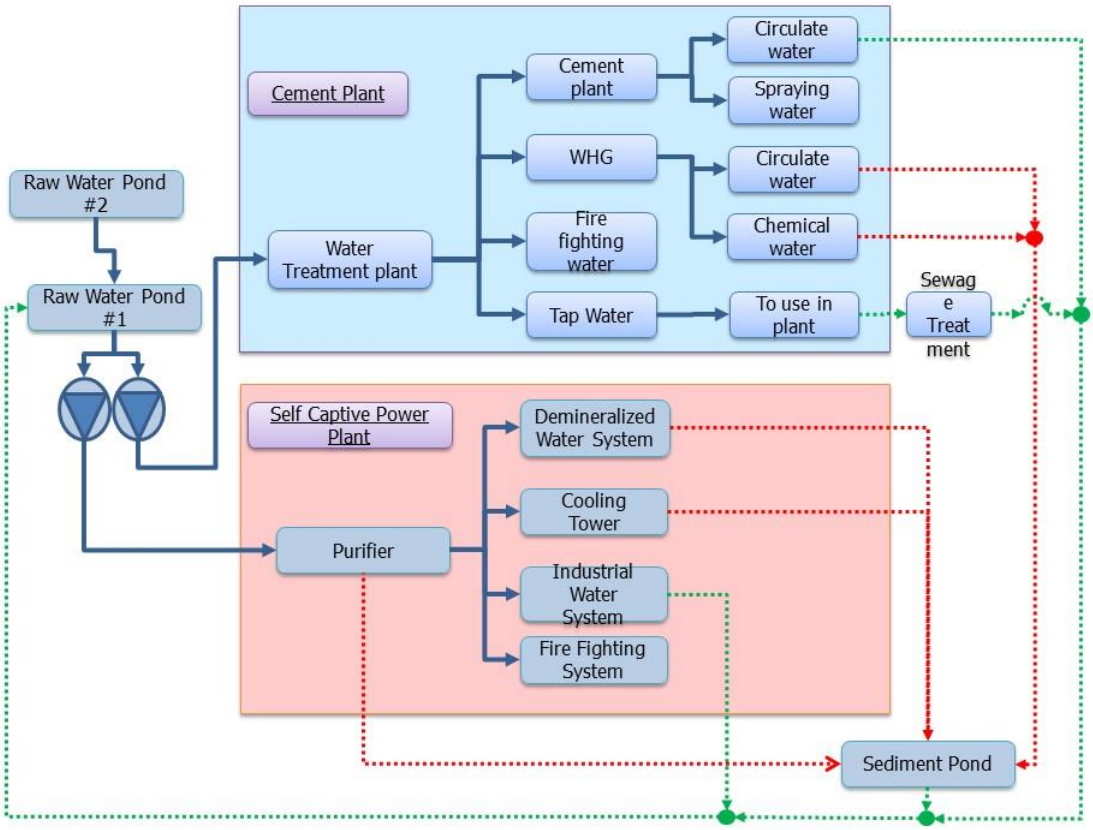


Figure 3.4-5: Water System Flow Chart

Water Treatment System for MCL Cement Plant

Basically, water supply to Cement plant for 3 main system as diagram below:

1) Recycling Cooling System
2) WHG System
3) Water Supply System

Water System for Cement Plant	Water Consumption (m^3/day)
1. Make up cooling water	312 Cement + 1440 WHG Total 1,752 m^3/day
2. Boiler Feed water (WHG)	140 m^3/day
3. Water Supply System (domestic use)	600 m^3/day

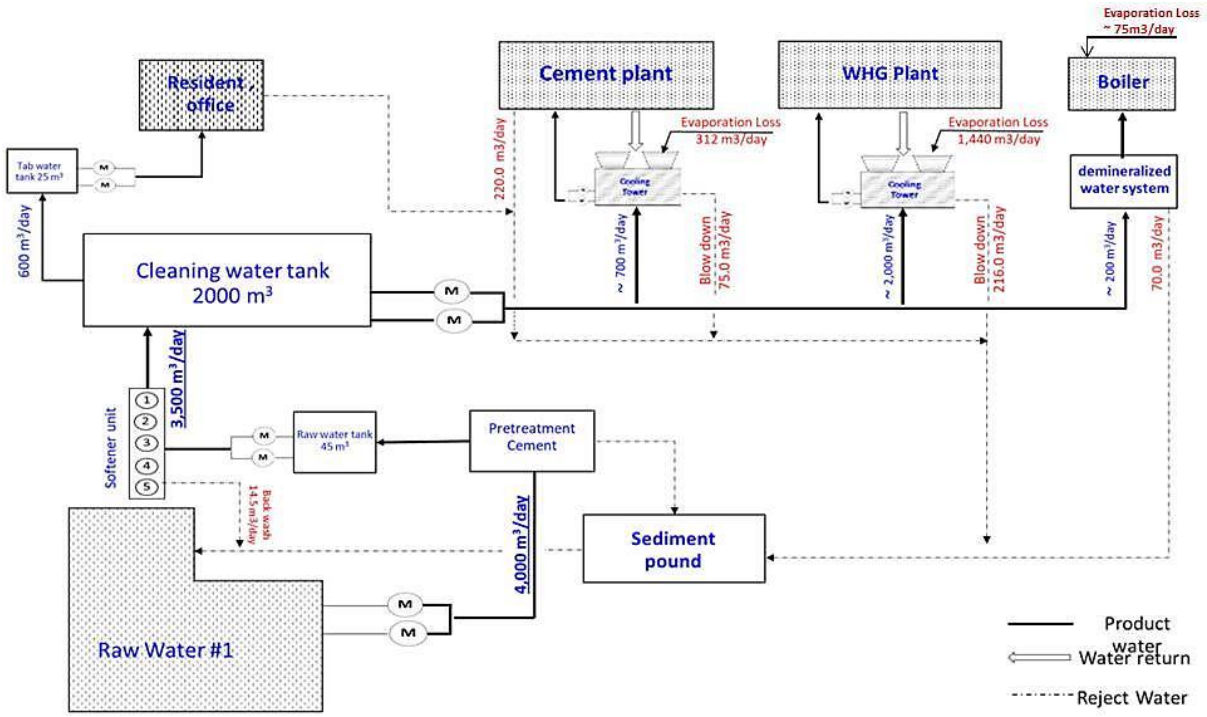


Figure 3.4-6: Flow Diagram of Product Water: Cement & WHG Plant

3.4.1.3 Energy and Fuel Sources Utilized in the Proposed MCL Project

The main energy usage in cement process consists of thermal energy (85%) and electric power (15%).

3.4.1.3.1 Heavy Fuel Oil (HFO) and Diesel

The usage is around 1,500 tons per year and is only used for starting boiler and machine.

1) HFO

General Specification

-	Specific gravity	@ 15.6ºC	max.	0.990
-	Sulphur content	%vol	max.	2.0
-	Ash	% Wt	max.	0.2
-	Gross calorific value	kcal/kgmin.		9,900

For the storage of HFO, HFO storage tank (seen in Figure 3.4-4) with the capacity of 259.4 ton is provided in MCL. However, HFO is still unused in MCL.

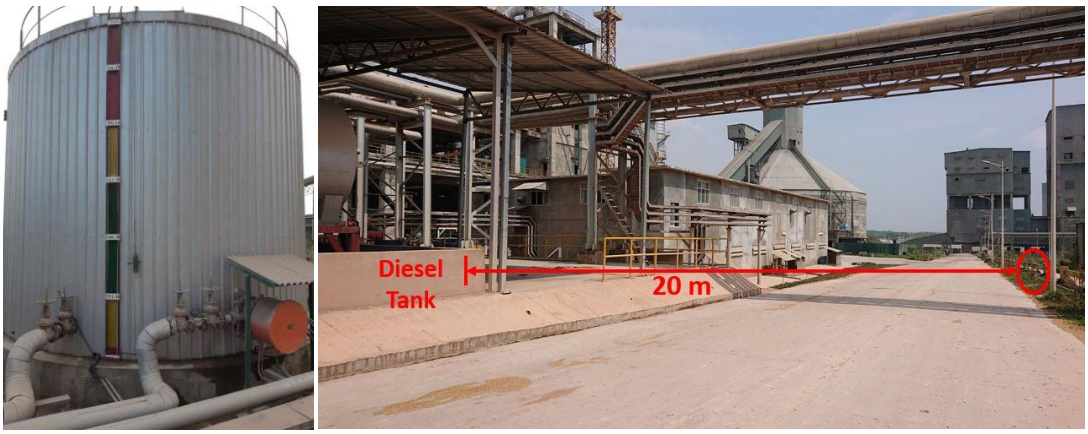
2) Diesel

For diesel storage, the diesel storage tanks with the capacity of 20000 liters for two units were provided for total capacity of 400000 liters.

The installed concrete retaining pond is constructed to protect spillage of fuel tanks which can seep the fuel oils into the environment especially the soil.

In MCL, fixed fire-fighting system was installed together with fire main pump and boosting pump. In this system, the fire hydrants are installed at every 100 m distance all around the plant and fire truck (Isuzu) which include foam extinguishing system.

For diesel storage tank, the nearest fire hydrant was installed about 20 m from the fuel tank as shown in Figure 3.4-7.



a) HFO Tank b) Diesel Tank and the nearest Fire Hydrant

Figure 3.4-7: HFO Storage Tank and Diesel Storage Tank

3.4.1.3.2 Thermal Energy Sources

Main fuels

- **Coal**: The main coal source is Indonesia and Myanmar (beginning stage for plant operation will use coal from Indonesia). The usage is around 300,000-400,000 tons per year which depending on the source of coal.

Proximate Analysis (Air-Dried Basis)

- Total Moisture (as received) : 36 % max
- Inherent Moisture : 15-20 %
- Ash Content : 4-10 %
- Lump Size : 0 – 50 mm
- Gross Heating Value : 5,000-5,500 kcal/kg

The MCL is now using local coal by mixing with Indonesia low sulfur coal and collected information on local coal analysis results are presented in Table. **3.4-2**. According to the results, it was found that the calorific values of local coal are comparable to Indonesian coal (> 9000 Btu/lb or ≈ 5000 kcal/kg) and the values range from 7195 to 12000 Btu/lb (≈ 4000 – 6670 kcal/kg) except Wankyan mine has the calorific value of 5890 Btu/lb (≈3270 kcal/kg). Relating to the moisture and ash content in coal from local mines, the highest moisture content is observed in coal from Wankyan mine at 40% whereas the amount of moisture in other mines are around 20 % which is a good match for medium sulfur Indo coal at 18.34%. Ash content from local coal ranges from 1 % to 40.70 % whilst the current use Indo coal, from 5.06 % to 21.40 %. Regarding with the sulfur content, the coal from Darthwekyauk (*Sagaing Region*), Karathuri, Kami (*Taninthayi Region),* Manpan-Monma, Harput, Sanya, Narkon, Mahkaw, Wankyan, Narparkaw (Shan State) and Kywesin (*Kayin State*) are less than 1 % sulfur content which are comparable to low sulfur Indonesian coal. The highest sulfur content is found in Narlan and Sanlaung mines in Shan state at 6.97% and 5.82% while the other coals found around 2-4 %. Thus, the thermal efficiency and emission status will not be significantly differed from current situation in case of using the local coals in combustion process.

Table 3.4-2: Comparison of Coal Analysis Results between Indo and Local Coals

DESCRIPTIONS			Kalawa			Pinlon			Indo (Low sulfur)			Indo (Normal Sulfur)		
			As Received	Air Dried	Dry	As Received	Air Dried	Dry	As Received	Air Dried	Dry	As Received	Air Dried	Dry
Moisture														
	Total	%	13.49			35.38			10.45			12.61		
	Inherent	%		7.59			13.69			3.04			9.73	
Ash		%	15.94	17.02	18.35	11.11	14.84	17.17	21.40	23.17	23.90	4.38	4.53	5.02
Volatile Matter		%	35.96	38.45	41.66	29.91	39.98	46.35	37.85	40.98	42.26	42.81	44.21	48.97
Fixed Carbon		%	34.62	36.94	39.99	23.61	31.50	36.49	30.30	32.81	33.84	40.20	41.53	46.01
Calorific Value														
	Gross	cal/g	5094	5436	5884	3454	4608	5339	5257	5692	5870	5913	6107	6765
Sulfur														
	Bomb Sulfur	%	1.33	1.42	1.53	0.66	0.89	1.02	0.35	0.37	0.39	1.90	1.96	2.17
Size														
	0-50 mm													

Source: MCL Laboratory

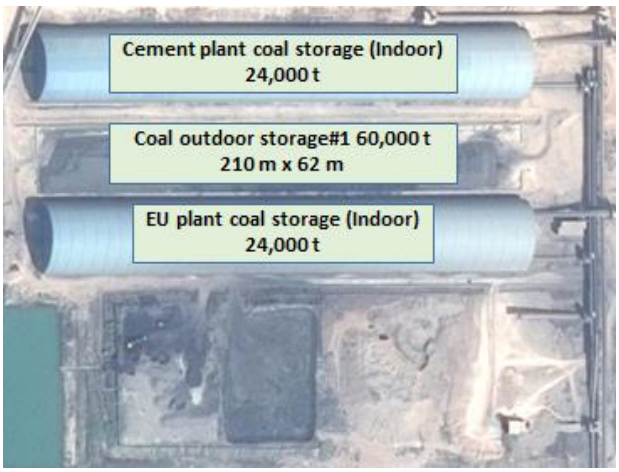
Table 3.4-3: Results of Heavy Metal Emissions from Coal Combustion

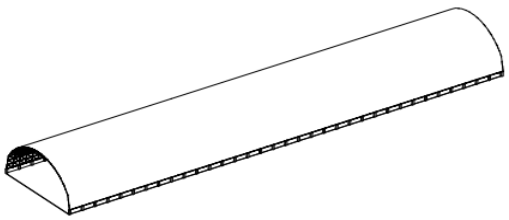
Type of Sample:		Fuel, Fly Ash								
Lab Sample No	Sample Name	As	Cd	Cr	Cu	Mn	Ni	Pb	Se	Zn
		(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
61AT211001	Local low heat	23	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
61AT211002	Local high heat	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
61AT211003	Indonesia Low sulfur	21	< 1	< 1	< 1	25	< 1	< 1	< 1	< 1
61AT211004	Indonesia normal sulfur	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
61AT211005	Fly ash	< 1	< 1	22	2	108	21	32	< 1	41

According to the heavy metal test report, mercury is not present in coal.

1) Coal storage

Coal storage is outdoor which made of concrete floor and has the drainage system to prevent coal leaching.





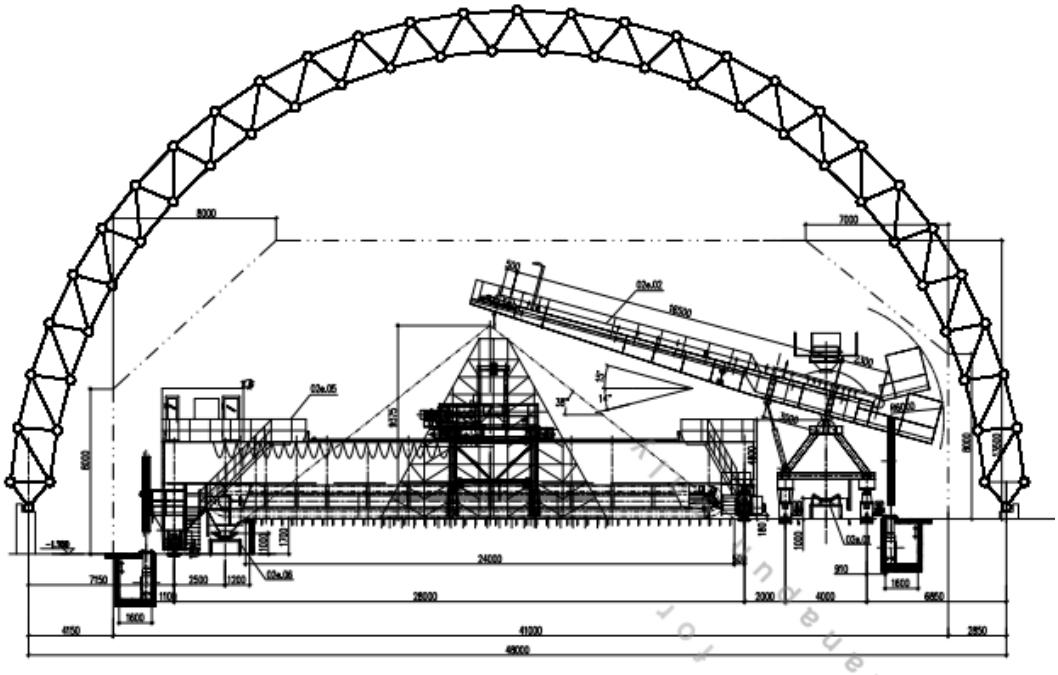


Figure 3.4-8: Inside of Coal Storage Building

2) Ways and Conditions of Coal Transportation from Port to Plant

To unload coal from vessel by Screw unloader and transport to storage by belt conveyor.

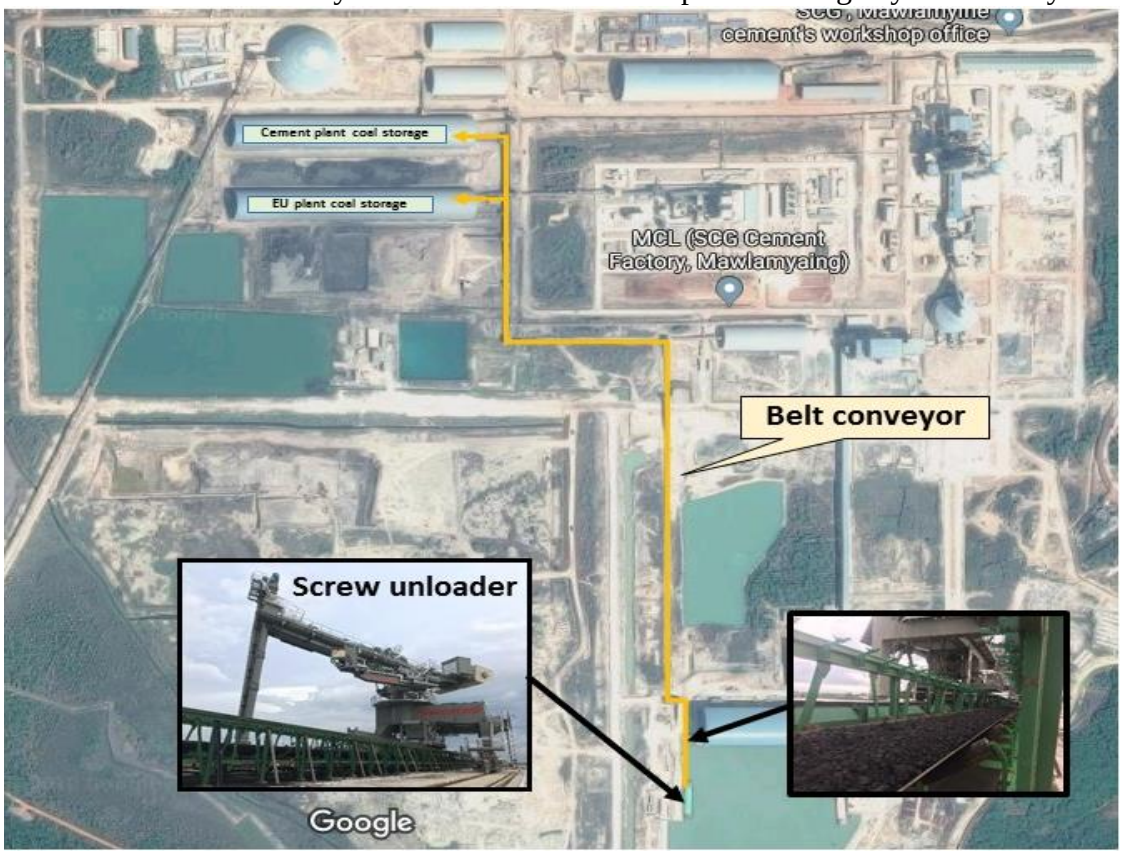


Figure 3.4-9: Transportation Route of Coal from Port to Cement Plant

3) Coal Conveying System

Fuel coal is supplied by the Indoor coal storage, and then put into transfer coal silo of 400m³ by using Re-claimer and covered belt conveyors.

After that through electromagnetic vibration coal feeder to coal belt conveyor. It shall be sent to main building raw coal bunker by coal belt conveyor after secondary crushing.

Dual-loop belt conveyor of belt width of 650mm shall be used according to planned capacity, with systematic output of a single belt conveyor being 100t/h.

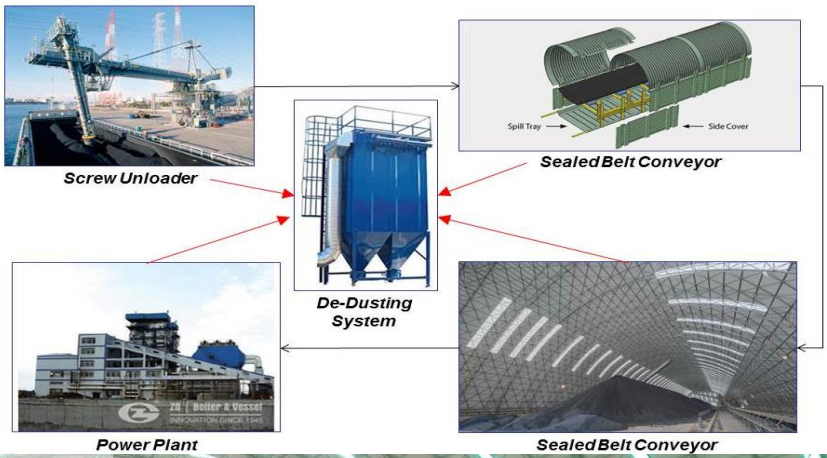
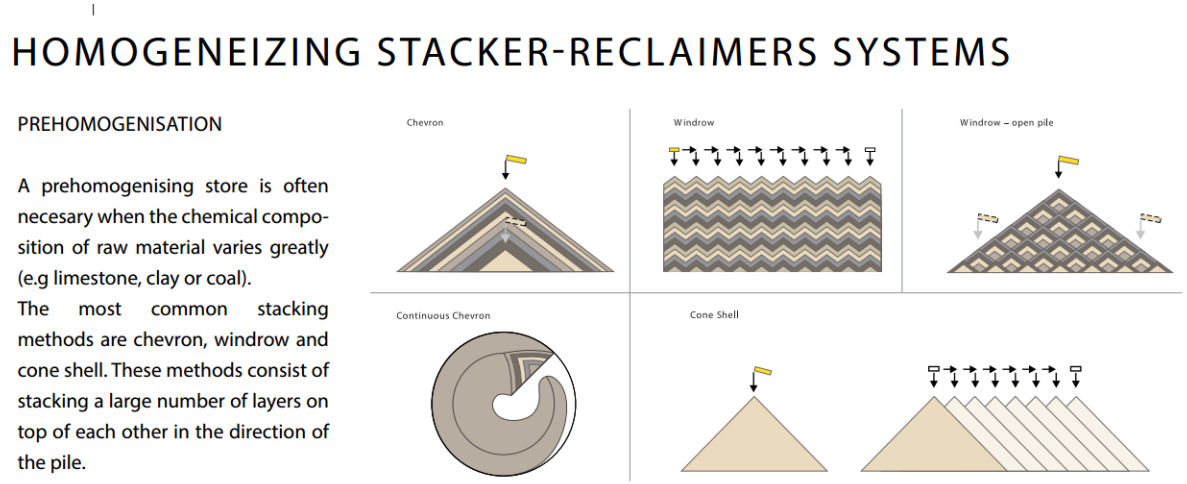


Figure 3.4-10: Coal Conveying System Used in MCL

MCL using coal mixing technique by using machines called Stacker and Reclaimer**.** Those machines are using for homogenizing the quality of coal by the method coal "Chevron Homogenizing".

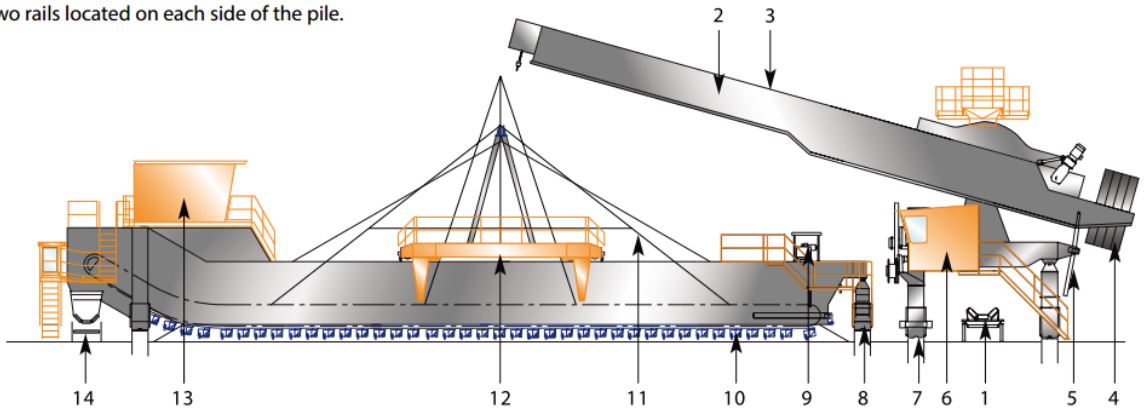


1. LONGITUDINAL HOMOGENIZING STACKER-RECLAIMER SYSTEM

The longitudinal stacker-reclaimer system operates with two piles. One pile is stacked while the other is being reclaimed.

The input material comes on a rubber-belt conveyor and is discharged through the stacker traveling on rails alongside the store at a constant speed. Its height above the top of the pile is kept at a minimum distance to reduce dust emission.
The reclaimer bridge moves alongside the pile onto two rails located on each side of the pile.

Reclaiming takes place from the face of the pile to be reclaimed by a harrow travelling on the bridge reclaimer. The sweeping movements of the harrow cause the material to slide on the pile base.
A scraper conveyor equipped with chains and blades drags the material to a belt conveyor located along the pile, and the material goes to the next process step.
Electrical feed for power and controls is accomplished by use of multi-composition cable and motor cable reel.
The machine may be operated locally using controls located on operating console inside the cabin or from a remote location.



1 Incoming belt conveyor
2 Station boom
3 Conveyor belt
4 Counterweight
5 Luffing unit
6 Operator cabin
7 Stacker bogie
8 Reclaimer bogie
9 Hydraulic tensioning unit
10 Scraper chain
11 Raking harrow
12 Raking car
13 Operator cabin
14 Outgoing belt conveyor

Source: https://www.ameco.eu.com/PDF/AMECO_reelwork.pdf

Figure 3.4-11: Coal Mixing Process in MCL

4) MCL Coal Quality Analysis

In order to assure quality of coal, MCL has their own lab to analyze coal which used in MCL Cement plant.

The chemicals used in coal quality analysis were described in Table xxx and the quality analysis procedures were described as the followings.

Table 3.4-4: List of Chemicals used for Coal Qualitative Analysis

No.	Type of Chemical	Name	Chemical Formula	Consumption	Objective of Usage	Use/Feed in System	Storage Method	Stock Preparation		
				g/month				Duration	Min. Stock: (kg)	Max. Stock: (kg)
13	Liquid	Phenolphthalein Indicator 100G	$C2H6O_2$	once/5month	Sulfur	Coal testing	Cabinet	2g/ Year	5 g	100 g
14	Solid	Sodium carbonate 1kg	$Na2\text{-}C\text{-}O_3$	15g/ 2month	Sulfur	Coal testing	Cabinet	15g/ 2Month	500 g	1 Kg
15	Solid	Methyl orange, 100G	C14H14N3NaO3S	once/5month	Sulfur	Coal testing	Cabinet	1g/ Year	5 g	100 g
16	Liquid	Barium Hydroxide	Ba(OH)2	35g/1month	Sulfur	Coal testing	Cabinet	35g/1month	300 g	1 Kg

Coal Analysis (QA)

Proximate Analysis (Air-Dried Basis)	
Total Moisture (as received):	36 % max
Inherent Moisture:	15-20 %
Ash Content:	4-10 %
Lump Size:	0 – 50 mm
Gross Heating Value:	5,000-5,500 kcal/kg

Equipment for Coal Analysis

Figure 3.4-12: Equipment and Procedure for Coal Analysis in MCL

Weight the sample (600g)

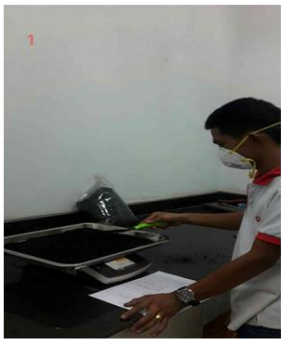
Put in Air dry oven (36 C) for >20 hr → Surface moisture

Constant weight

Combine samples at Tray

Divide samples into 4 portion and reject 2 portion

Combine samples for 2 portion



Contd:

Combine samples for 2 portion

Put Samples in Oven (107 C) for 1.5 hr

Grinding with Swing Mill

Put 1g Sample in furnace at 750 C for 4 hr

Constant weight

Inherent Moisture

%Ash

Put 1g Sample in Oven (107 C) for 1 hr

Put 1g Sample in furnace at 950 C for 7 min

%Moisture in Analysis

Take 1g Sample

Testing with AC500

Volatile Matter

Calorific Value (CV)

Residual water from CV testing machine

Titration (Phenolphthalein Indicator, Ba(OH)2, Na2CO3, HCL)

%Sulfur

Figure 3.4-13: Demonstration of Analysis Process of Air-Dry Basis in MCL

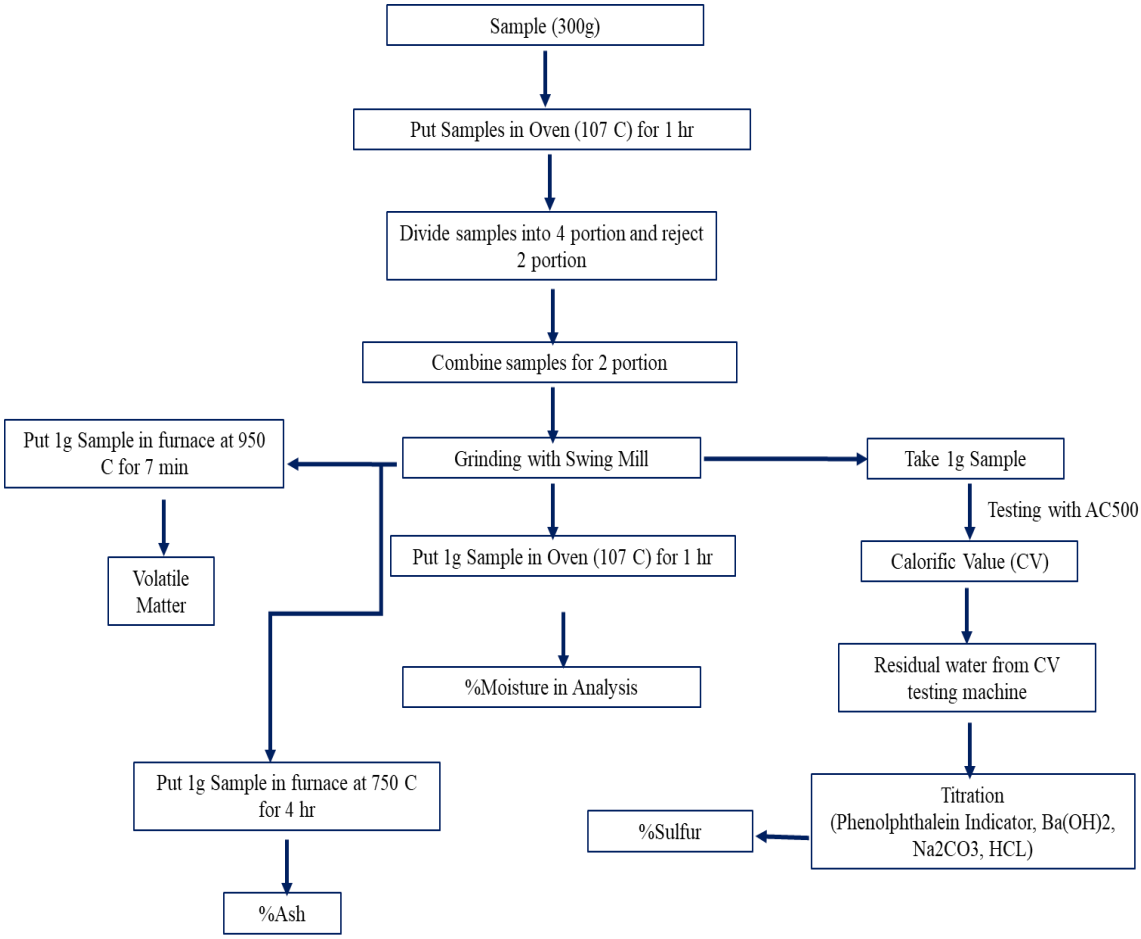


Figure 3.4-14: Demonstration of Analysis Process of Dry Basis in MCL

3.4.1.3.3 Other Alternative Fuels

Currently, rice husk is using as alternative fuel. The % percent replacement is approx. 0-2% depending on the volume of supply. Rice husk is collected from surrounding native villages around MCL cement plant and it was provided.

The amount of rice husk is depending upon the suppliers. However, the use of rice husk is available in MCL cement plant system without any processing and technical change.

Now, non-hazardous waste from cement plant operation is burned at calciner for example the contaminated cleaning cloths, used oil, etc.

In the future MCL plan to use another alternative fuel which amount of used is vary based on heat consumption and portion of fuel use in the process. An alternative fuel is a selected waste and by-products with recoverable calorific value which can be used as fuels in a cement kiln, replacing a portion of conventional fuels, like coal, if it meet internal criteria and not harm to environment such as RDF, domestic waste, and industrial waste in the form of oil, grease, rubber, varnish, leather, plastic, wooden, and other materials.

3.4.2 Overall production Process for MCL Cement Plant

3.4.2.1 Limestone Crushing and Blending

After Limestone is blasted out from the quarry, the size of Limestone is approx. 1.5m or lower. It will be dumped into primary crushers which reduce them to the size less than 2 inches.

After crushed, Limestone will be transported to the Circular Storage and stack into piles by Stacker with capacity 1,000 t/h. The quality of limestone will be mixed and control its variation by laboratory. The capacity of the circular storage is 50,000 ton. After blending and storage, the limestone will be reclaimed and send to Limestone Hopper by Reclaimer with capacity 800 t/h.

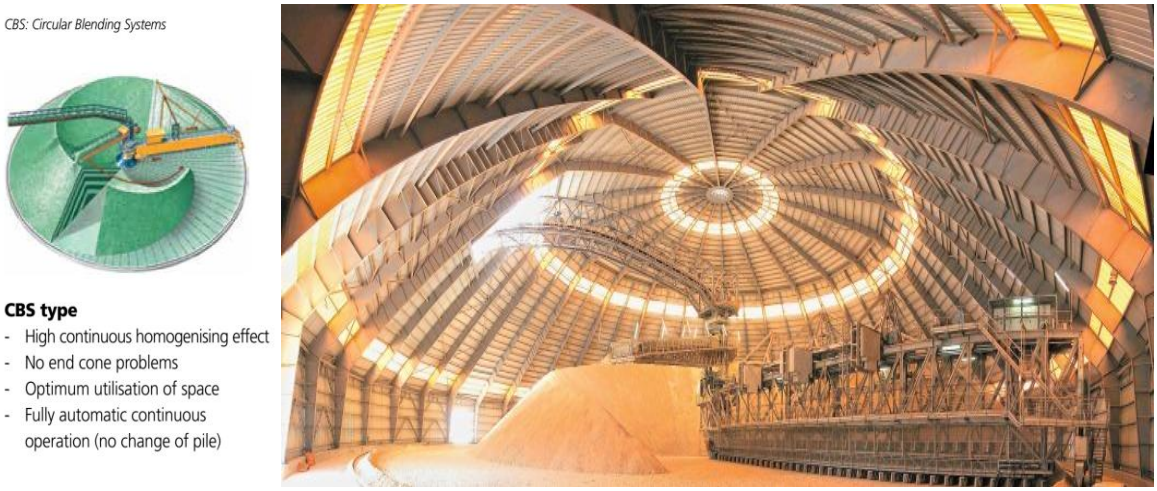


Figure 3.4-15: Limestone Circular Storage

3.4.2.2 Mix Material Blending

As clay is the sticky material and has high moisture up to 35%, so it needs to be crushed with clay crusher with capacity 200 t/h (dry basis) and mixed with limestone with ratio 3.5:1 to 4.0:1 for the convenient of its transportation and control its quality variation.

Figure 3.4-16: Mixed Material Stacker and Reclaimer

3.4.2.3 Raw Material Grinding (Raw Mill)

After prepared and stored in the storages, all raw materials, including Limestone, Clay, Laterite and Sand, will be transport to each raw material hopper and later will be weighed by Weigh Feeder and fed to a Raw Mill. The ratio of each materials is controlled by laboratory.

Vertical Raw Mill 440 t/h capacity and equipped with high efficiency separator is installed and will produce Raw Meal (grinded raw material) with fineness of 10% residue on 88-micron sieve. For grinding of raw material, hot gas from the preheater with temperature 220 °C (if WHG is in operation) will be used to dry the raw material. The total moisture of raw material feeding to Raw Mill will be 2-3% by weight will be reduce to less than 0.5%byweight after grinding.

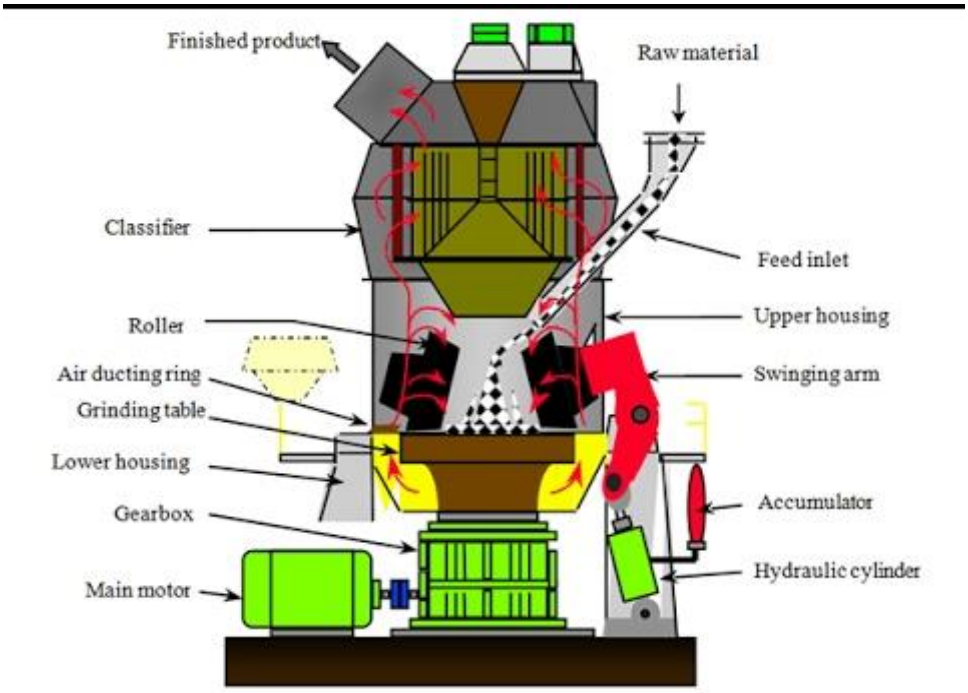


Figure 3.4-17: Diagram of Vertical Roller Mill

Finished product from the Rawmill, which called Rawmeal, will be classified by high efficiency classifier or separator, then exit the mill with mill exit gas. After that it will be collected by Multicyclone and transported to a Homogenizing Silo (25,000 t) for blended and storage. Gas exiting from Raw Mill flows to Bag Filter for dedusting. However, in case of stoppage of the Raw Mill, hot gas from preheater will be passed to Gas conditioning Tower for reducing gas temperature to 150 °C before flowing to Bag Filter.

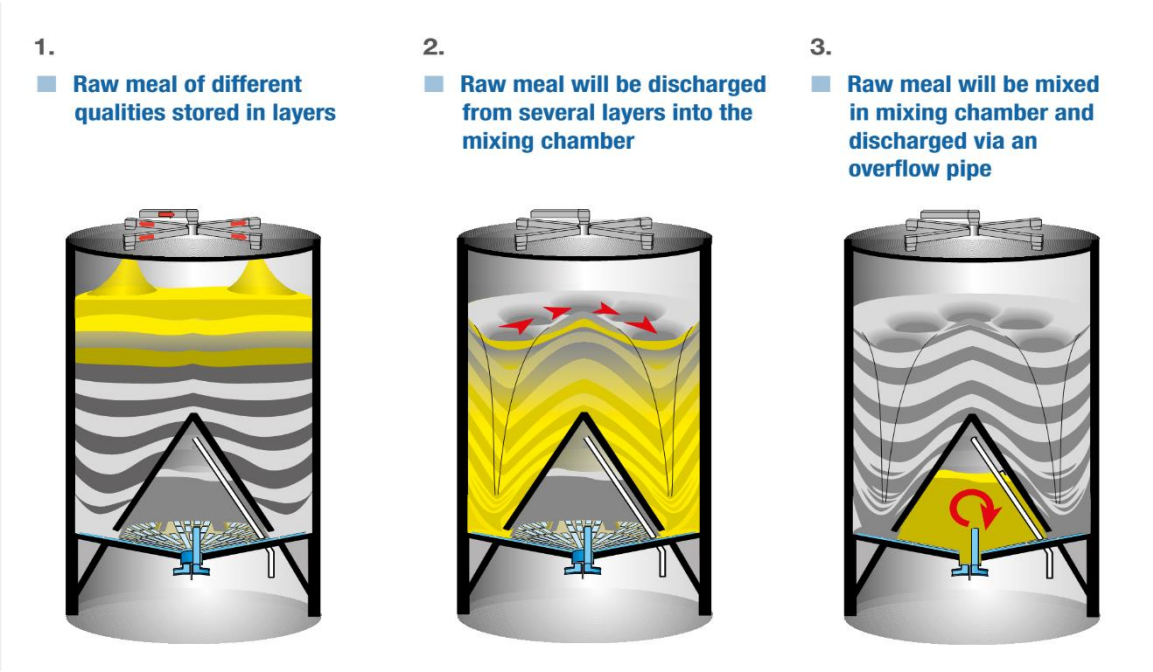


Figure 3.4-18: Diagram of Homogenizing Silo

Vertical raw mill has higher efficient than other type of mill such as ball mill, etc. because it has lower power consumption as well as the high volume of hot gas is allowed to use, so the speed of drying rate is far faster than the drying rate in ball mill which need to control the speed of gas in mill. Moreover, the vertical raw mill can internally equipped with high efficiency separator, so its construction is more simple than ball mill. As the grinded material from the vertical raw mill has lower moisture, the heat consumption in burning process of the kiln is also lower which result in lower fuel consumption and CO^2 emission.

3.4.2.4 Burning in Rotary Kiln

The heart of the cement manufacturing process is the pyro-processing system in the rotary kiln which is a process in which materials are subjected to high temperatures (1,240 °C) in order to bring about a chemical or physical change. This system transforms the raw meal into clinkers, which are gray, glass-hard, spherically shaped nodules that range from 0.32 to 5.1 centimeters (cm) in diameter.

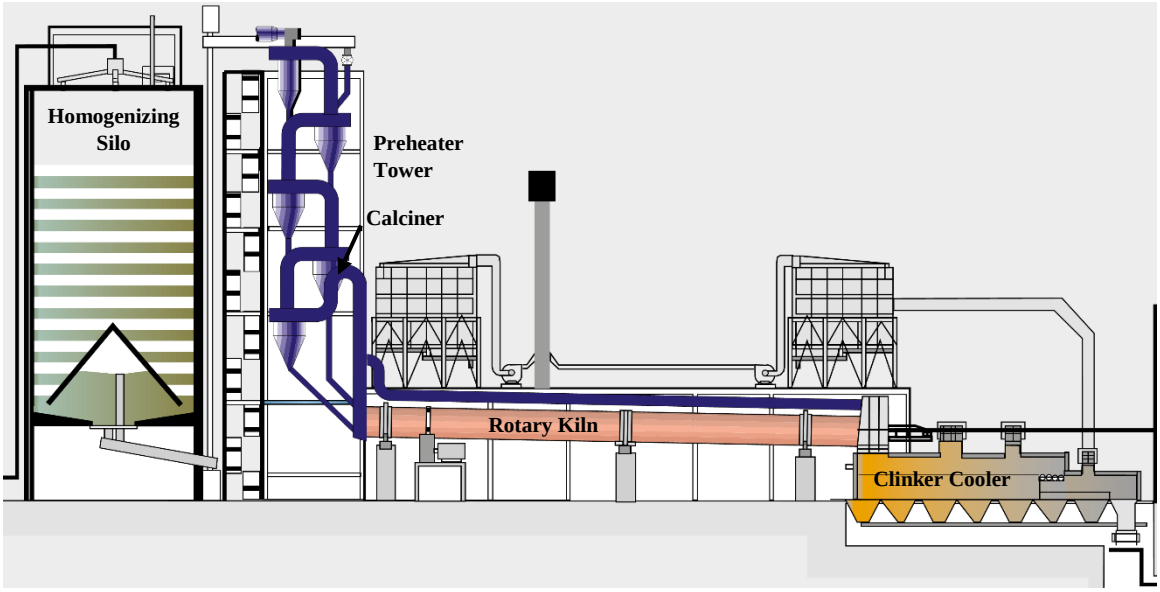


Figure 3.4-19: Diagram of Rotary Kiln

Rotary kilns are long, cylindrical, slightly inclined furnaces that are lined with refractory to protect the steel shell and retain heat within the kiln. The Raw meal is fed into the kiln and continuously and slowly moved to the kiln outlet by rotation of the kiln.

As they move down the kiln, the raw materials are changed to cementitious or hydraulic minerals because of the increasing temperature within the kiln. The most commonly used kiln fuels are coal, natural gas, and occasionally oil. The use of supplemental fuels such as waste solvents, scrap rubber, and petroleum coke has expanded in recent years.

Dry process rotary kiln (defined by the moisture in raw material shall less than 2%) have been improved in thermal efficiency and productive capacity through the addition of one or more cyclone-type preheater vessels in the gas stream exiting the rotary kiln. This preheating system is called the preheater cyclones. The cyclones are arranged vertically, in series, and are supported by a structure known as the preheater tower. Hot exhaust gases from the rotary kiln pass counter currently through the downward-moving raw materials in the preheater cyclones. This sequence of events in the rotary kiln may be conveniently divided into five stages, as a function of location and temperature of the materials in the rotary kiln.

(1) Evaporation of uncombined water from raw materials, as material temperature increases to 100°C (212°F). This stage is happened at the top of preheater cyclone (or called cyclone No.1)
(2) Dehydration, as the material temperature increases from 100°C to approximately 430°C (800°F) to form oxides of silicon, aluminum, and iron. This stage is happened at the preheater cyclone No.2 to No.5
(3) Calcination, during which carbon dioxide (CO_2) is evolved, between 900°C (1650°F) and 982°C (1800°F), to form CaO. This stage is mainly happen in the Calciner, which is the combustion chamber which will heat up the temperature of Rawmeal to 900 °C. The fuel consumption in the Calciner is approx. 60% of total fuel consumption in the process.

Reaction of the oxides along the rotary kiln and in the burning zone near the outlet of the rotary kiln, to form clinker at temperatures of approximately 1450 ^{o}C (2642^{o}F)

(4) The clinker which is produced from the rotary kiln will feed into a clinker cooler which use the air to reduce clinker temperature from 1450 ^{o}C at Kiln outlet down to 120-150 ^{o}C at the end of clinker cooler for convenient of storage and control the quality of clinker.

Modern Rotary Kiln now is possible to equipped with the Low-NOx burner. This type of burner can provide high momentum flame with low amount of air which lead to the significant reduction of thermal NOx producing from the burner. The new Low-NOx burner now reduce amount of air from 20%Ao to 6-8%Ao (Ao is stoichiometric air or theoretical air that require for complete combustion of fuel).

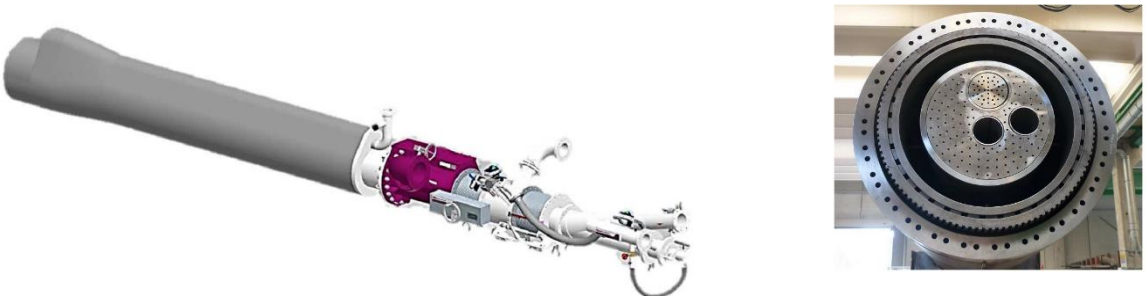


Figure 3.4-20: Pillard Novaflam® low NOx Burner

3.4.2.5 Clinker Grinding

The cooled clinker is mixed with a small amount of gypsum, which will help regulate the setting time when the cement is mixed with other materials and becomes concrete. The clinker grinding system combine with three main parts which are Roller Press which are

(1) The high efficiency pre-grinder which will press the clinker and create the crack in the structure of clinker which later turn into the significant reduction of power consumption in clinker grinding system,
(2) Ball mill which possible to grind clinker and gypsum down to fine particle called cement and,
(3) High efficiency separator which can separate the coarse particle from the finished product.

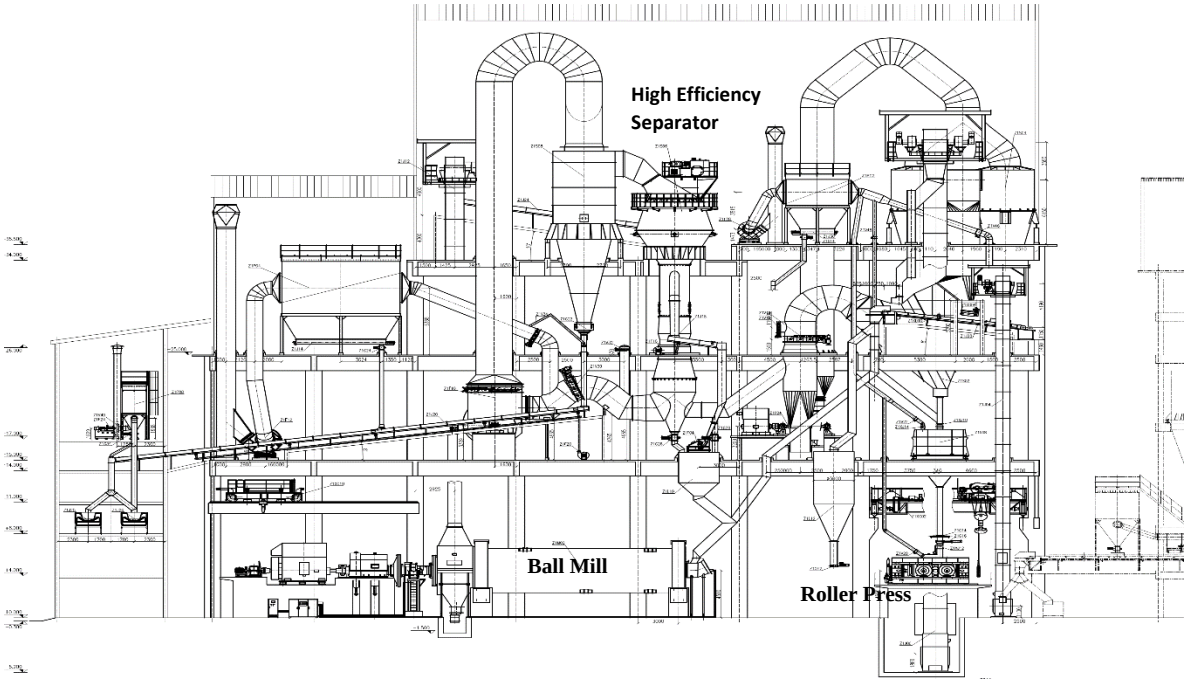


Figure 3.4-21: Ball Mill for Cement Grinding with Roller Press as Pre-Grinder

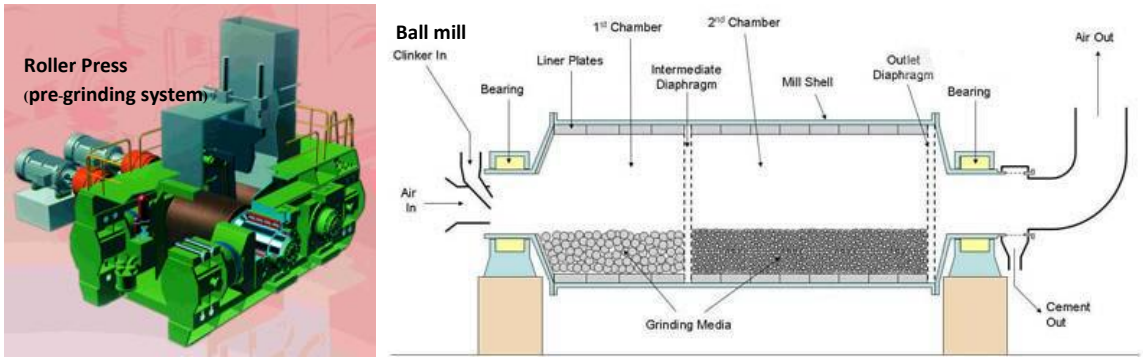


Figure 3.4-22: Roller Press and Ball Mill Diagram

3.4.2.6 Installation of Stacks

The stacker is mounted on the center column, which allows rotation in both directions simultaneously with the vertical movement of the jib. Its height above the crest of the pile is kept at a minimum to reduce dust emission. Main stack for MCL Cement plant as following.

Stack	Height	Controlling system
Preheater Main Stack	114.5 m	Bag Filter
Cooler Stack	40 m	EP
Coal Mill Stack	35 m	Bag Filter

Calculation of Stack High (Preheater)

H = 14Q^0.3
H = High of Chimney
Q = (Quantity of fuel (kg/h) x Sulphur content (%) x 2)/100

Heat con	830	kcal/kg-clk
LHV	4,700	kcal/kg-coal
Kiln Prod.	5,000	tpd
Coal con.	36,791	kg/h
Sulphur content	1.5	%

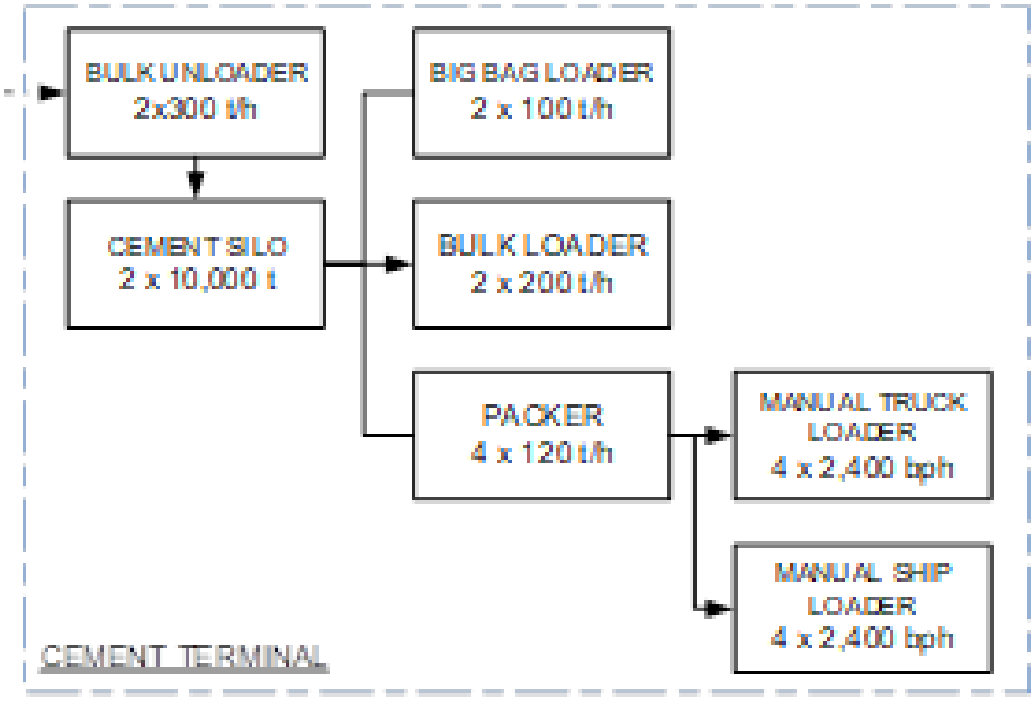
Q =	1103.7	-
H =	**114.5**	m

Figure 3.4-23: Preheater Stack (114.5 m) and EP Cooler Stack (40 m)

3.4.3 Cement Dispatching

Cement is discharged from Cement Silos and transported by conveyors to the following machines.

1) Five (5) set of Rotary Bag Packing Machine (called Packers) with capacity of 120 tons per hour each to pack 50-kg cement in PP-woven bags or glued paper. The cement bag will go to truck through 5 truck loaders.
2) Two (2) units of Bulk Truck Loaders, each of which has a capacity of 200 tons per hour
3) Four (4) units of Big Bag Loader, each of which has a capacity of 50 tons per hour
4) Two (2) units of Bulk Ship Loaders, each of which has a capacity of 300 tons per hour


BULK UNLOADER
2x300 t/h
CEMENT SILO
2 x 10,000 t
BIG BAG LOADER
2 x 100 t/h
BULK LOADER
2 x 200 t/h
PACKER
4 x 120 t/h
MANUAL TRUCK LOADER
4 x 2,400 bph
MANUAL SHIP LOADER
4 x 2,400 bph
CEMENT TERMINAL

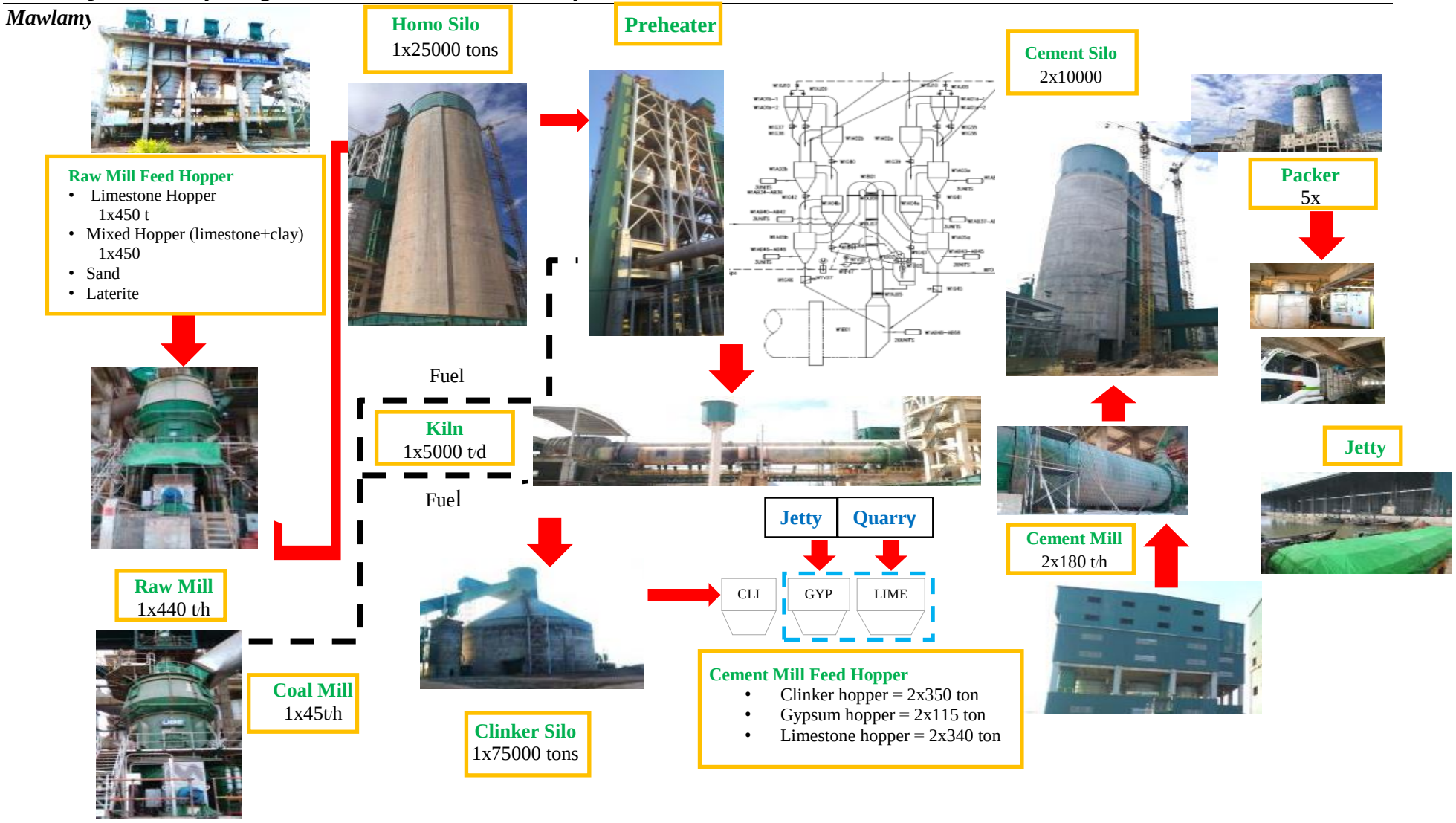


Figure 3.4-24: Main Process Flow for Cement Production and Associated Facilities

Figure 3.4-25: Plant Layout Overview of Cement Factory Compound

Figure 3.4-26: Plant Layout Overview of Packing Plant and Delivery Area

Figure 3.4-27: Overview of Raw Material Storage, Resident Buildings, Main Office and Main Access Road

3.4.4 Cement Products

The following cements will be produced in the plant.

(1) Ordinary Portland cement (OPC)
Ordinary Portland cement will be manufactured in compliance with ASTM C-150 Type I or EN197:2000 CEM I Class 52.5N)

(2) Mixed Cement
The Mixed Cement is produced by grinding Portland cement clinker with crushed limestone and gypsum.

(3) Portland Composite Cement (PCC)
The Portland Composite Cement is produced by grinding Portland cement clinker with crushed limestone and gypsum. Compliance with EN197:2000 CEM I Class 42.5N.

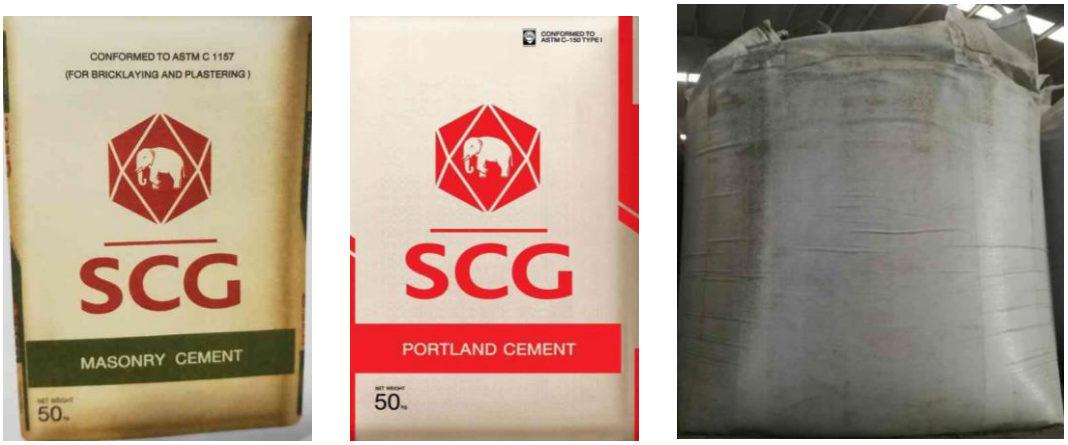


Figure 3.4-28:Various Type of Final Cement Products

3.5 Electrical Power Supply

This cement plant expects to use electrical power (2 x 20MW) from coal firing power plant and its EIA report will be submitted separately.

Cement production is a continuous process; therefore, the unreliability of power supply can lead to production loss. Consequently, the alternatives of power-supply source are prioritized as follows;

- *Captive Power Plant (Coal-Firing):* This alternative is preferable because of its reliability.

- *National Grid Line:* The government's energy development plan and the construction plan of the National Power Supply & Grid Line in adjacent areas to the plant have to be considered for this alternative.

It is possible to use both sources. National Grid Line source can be used to supply power to non-critical departments e.g. crusher, cement grinding and packer. Captive Coal Power Plant source have to be used to supply power to critical departments e.g. kiln and coal mill.

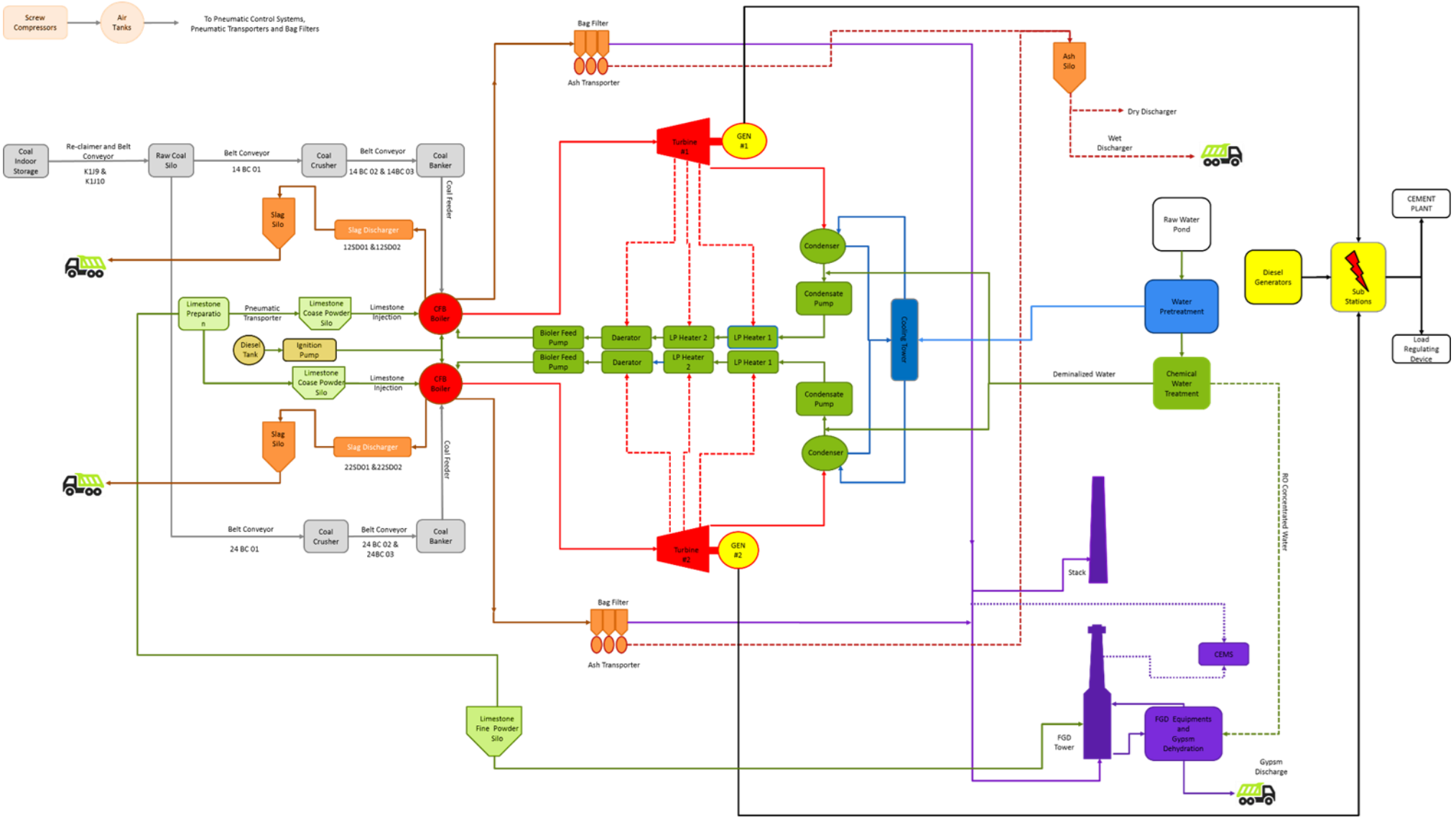


Figure 3.5-1: Schematic Diagram of Electricity and Utility Plants

Table 3.5-1: Plant Electrical Load Requirements

No.	Item	Load (MW)
1	Limestone crushing & conveying	2.1
2	Limestone pre-blending	
	- Limestone -> RM hopper	0.35
	- Limestone -> mix mat storage	0.09
	- Mixed mat belt conv -> Stacker	0.53
3	Clay crushing & conveying	0.30
4	Mixed mat pre-blending & RM hopper	1.05
5	Additive (Laterite) crushing & storage	0.28
6	Additive (Sand) crushing & storage	0.20
7	Raw mill	7.22
8	Homo silo & Kiln feed	0.31
9	Kiln system with clinker cooler	5.10
10	Clinker transport & storage	0.50
11	Coal grinding	1.23
12	2nd crusher (Limestone & Gypsum)	
	- Limestone -> CM hopper	0.30
	- Gypsum -> CM hopper	0.23
13	Cement mill 1	6.39
	Cement mill 2	6.39
14	Water treatment plant	0.17
15	Air Compressor plant	0.42
16	Packing 1	0.10
	Packing 2	0.10
	Packing 3	0.10
	Packing 4	0.10
**	Residence & Office	1.00
17	Coal ship	1.57
18	Gypsum ship	0.53

Estimated Total requirement: 34.2 MW.

Table 3.5-2: Capacity Parameters of Coal Mill, Kiln, Clinker

Coal Mill		**5000 tpd**		**5500 tpd**	
LHV (as fired)	Kcal/kg		5,500		5,500
Calciner burner Firing ratio - Coal	%		60		60
Main burner Firing ratio - Coal	%		40		40
Main burner Firing ratio - Natural gas	%		0		0
Clinker production	t/d		5,000		5,500
Kiln heat consumption	kcal/kg cl		730		730
Pulverized moisture	%		7		7
Actual Calciner consumption	t/h DB		**16.0**		**17.6**
	t/d DB		384		423
Actual main burner consumption	t/h DB		**10.7**		**11.7**
	t/d DB		256		282
Run factor	%	RF vs. Kiln	90		90
Recal. RF	%		59.30		65.23
	hr/d		14.23		15.65
Calculated capacity - Calciner	t/h DB		**18**		**20**
Calculated capacity - main burner	t/h DB		**11.9**		**13.0**
Total calculated capacity	t/h DB		29.65		32.61
Selected Capacity	t/h DB		45		
		1	Unit	45	t/ hr/ unit
	t/h DB			**26.7**	**29.4**

3.6 Other Facilities

Other facilities of MCL cement plant such as Limestone quarry and Canal and Jetty were described short portion in this report. The detail measurements and information will be submitted in each separate report.

3.6.1 Quarry (Semi-Open Cut)

Pya Taung Limestone Quarry is located in the southeast of Mawlamyine City, Kyaikmaraw Township, Mon State. The reserve lies in north-south direction with 5 km long, 1.5 km wide and adjoins the Ataran River to the west.

Limestone concession is applicable to the southern part of Pya Taung, covering 320 acres. The quarry area is 145 acres, 45% of the licensed area. With semi-open cut mining, the ridgeline is

preserved at 90 MSL and final pit at the level 5 meters MSL. The result is 96 million ton-Limestone mining reserve.

Based on one (1) cement production line with a capacity of 5,000 tons per day, mining plan is categorized into 4 phases as follows.

Phase 1: Year 1 to 5, Level the eastern area down to 90 meters above mean sea level with estimated production 11 million tons.

Phase 2: Year 6 to 20, Level the western area down to 90 meters above mean sea level with estimated production 31 million tons.

Phase 3: Year 21 to 35, Lower bench level to 40 meters above mean sea level with estimated production 31 million tons.

Phase 4: Year 36 to 46, Lower bench level to 5 meters above mean sea level with estimated production 23 million tons.

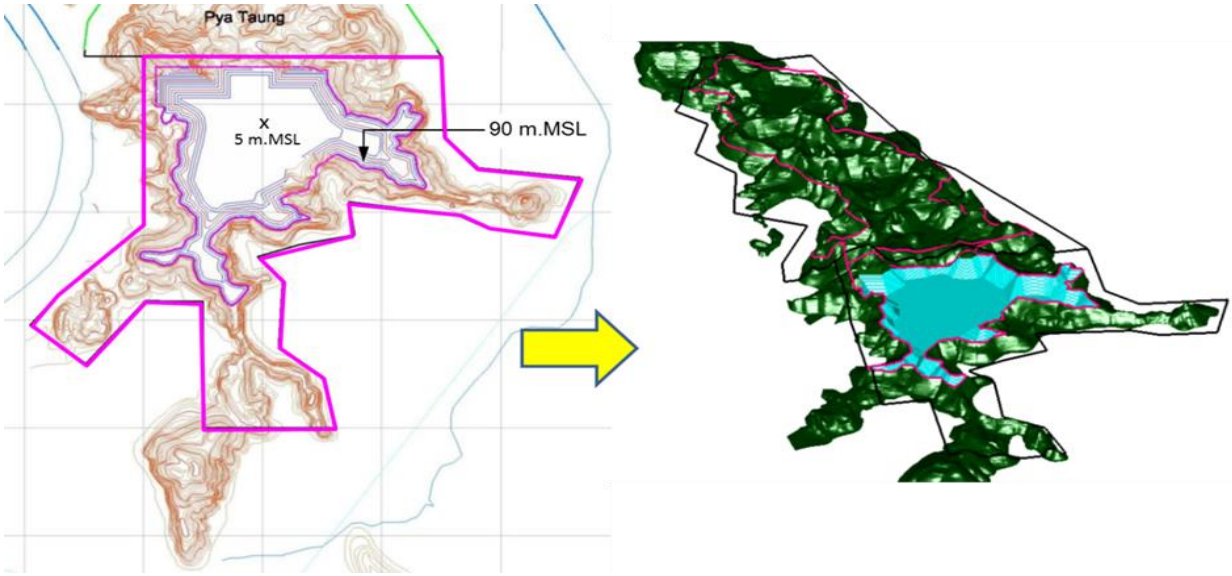


Figure 3.6-1: Quarry Plan (Semi Open Cut)

3.6.2 Logistic Arrangement of Raw Materials and Cement Products Transportation

3.6.2.1 Canal

In transporting process, A canal will be dug for carrying product and material by shipping from south gate of plant to Ataran River.

The canal has 3,190 m in length, 74-96 m in width and 11 m in depth. Both sides of canal have ridge 3 m height and 18 m width and the road is next to the ridge. So, the overall width cover from left to right road is about 200 m.

There are two villages in the surrounding area of the canal. One is in the left side and 3.0 km. far from the canal while the right side is about 1.2 km. The geological information from auger drilling shows that there are three layers in 11 m depth. First of all is the Topsoil, 0.5 m in depth, next is the Stiff clay with 3.8 m depth and the bottom of the canal is Soft clay that has the depth 6.7 m.

In canal design process, MCL use simulate program (FLAC) to calculate slope of the canal with some parameters such as Cohesion force of Top soil, Stiff clay and Soft clay are 11,11 and 0 kN/sq.m and the Friction angle are 16.6,16.6 and 26.2 degree respectively (Reference from "Bangkok Clay", The thesis report by Mr. Balasubramaniam, student of AIT, 1978). When using Safety Factor more than 1.5 and in case that the level of the water in the canal is about 7 m, the optimal slope is 1:2 to 1:3, this diagram will be confirmed after completion of Soil Test.

For digging process, MCC use backhoe and loading to the truck carrying material to the three dumping areas, as follows.

1. **Top soil**: use as the ridge along two sides of the canal that has 3 m height and 18 m width.
2. **Stiff clay or Upper clay:** carry to dumping area A, 98,870 sq.m, is in the south of the plant. The A pile is 5 m height.
3. **Soft clay or Lower clay**: carry to dumping area B, 745,390 sq.m, is in the left side of the canal. The B pile is 3 m height.

The canal digging process will start from plant area to the river. Overall volume of digging soil about 3,664,423 cu.m.

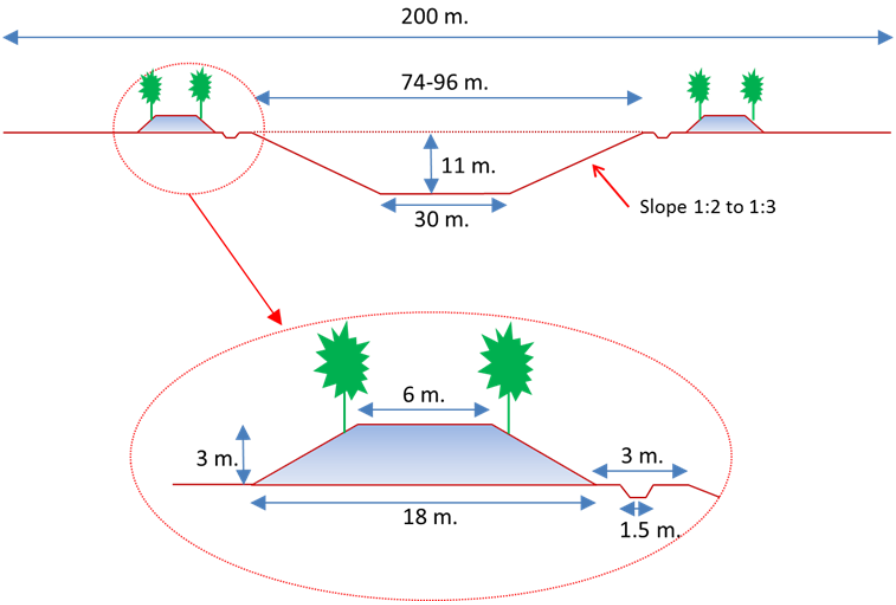


Figure 3.6-2: Canal Model

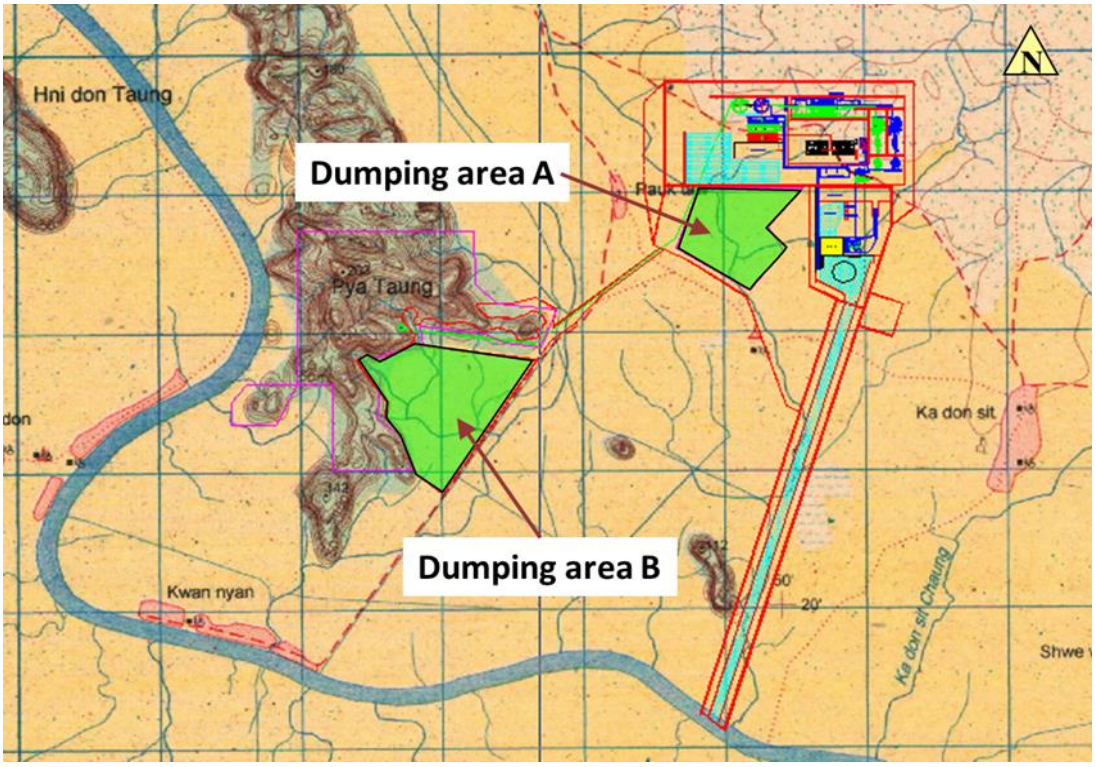


Figure 3.6-3: Dumping Area for Canal Digging

Figure 3.6-4: MCL Canal

3.6.2.2 Jetty

The jetty is located at the South of the Cement Plant, on Ataran riverbank (canal approx. 3 km from Ataran). It is used to deliver cement products (bulk & bag cement) to customers as well as Cement Terminal at Yangon, and unload raw material (coal & gypsum) to the Cement Plant. The detailed explanation of jetty is presented in separated IEE report.

Figure 3.6-5: Screw Unload in MCL Project

Figure 3.6-6: Grab Unload in MCL Project

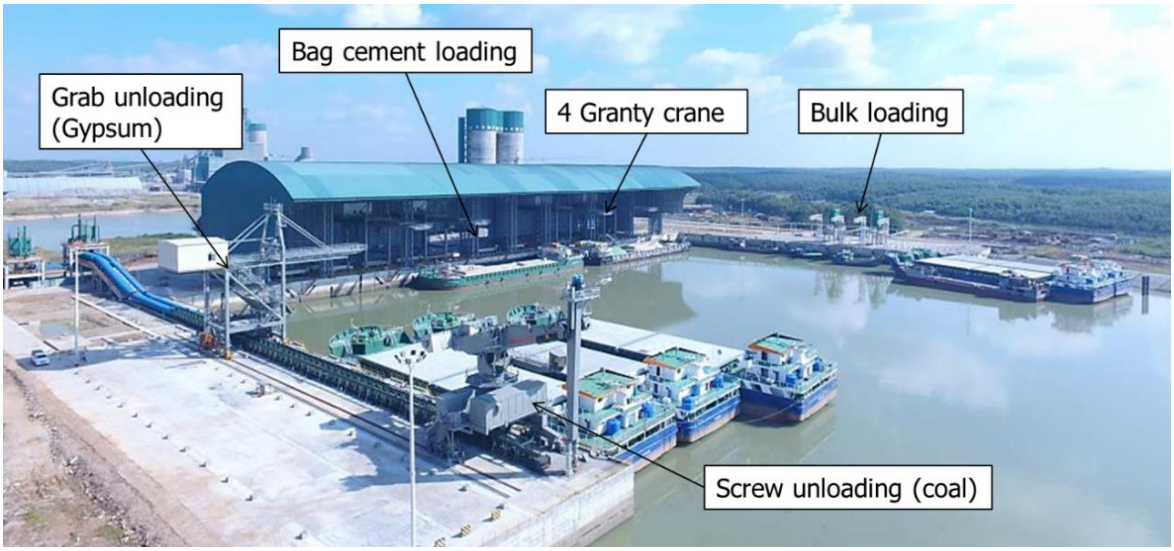


Figure 3.6-7: Current Status of MCL Canal and Jetty

3.6.2.3 Transportation of Raw Materials

Transportation of raw materials that are used in the production process will be by trucks for some materials, some by waterway (canal) and some by direct conveyor belt transport from MCL mining site.

- Blasted limestone will be transported by 85-tons hauler truck from the quarry to limestone crusher that is located same area (around 130 dumps per day).
- Clay will be transported by 10-12 wheels truck from clay area at the South of the cement plant (around 150 trucks per day)
- Laterite will be transported by 10-12 wheels trucks from Laterite area at the East of cement plant (around 50 trucks per day)
- Sand will be transported by barges (small barges 100-200 ton or up to 2000-ton barges) or 10-12 wheels truck from Thanlwin river delta (around 5 barge per day or 40 trucks per day)
- Coal will be transported by 10,000 – 30,000 tons ocean barge from Indonesia and loaded to 2,500-tons motor barge (around 20 barges per month)
- Gypsum will be transported by 10,000 tons ocean barge motor barge from Thailand (around 4 barges per month) as well as domestic supply.

3.6.2.4 Transportation of Cement Products

Most cement product will be transported from cement plant to cement market by barge.

- Bag Cement Transportation: Cement is packed in 50-kg and 1.5 tons cement in glued paper or PP-woven bags at the jetty. Then, cement bags are carried by open barge (2,500t) and delivered to distributors' ports in Yangon (1-2 barges per day).
- Bulk Cement Transportation: Cement is transported in close system. Cement is loaded into closed barges (2,500t) by bulk loader, transported to cement terminal by closed barge and unloaded by suction pump (1-2 barges per day). Then, cement is packed in 50-kg cement in glued paper or PP-woven bags and distributed from the cement terminal.

Some cement product will be distributed near the cement plant by truck (10-20 trucks per day).

3.7 Project Schedule

2 years for construction and installation Details of machine test run period as attached file "project schedule and plant layout".

The construction period is about 2 years and the progress of construction activities are presented in Figure 3.7-1 and 3.7-2.

Table 3.7-1: MCL Project Schedule

	During 2015	During 2016												During 2016										
Process	**Construction**	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Remark
Phase I		**Limestone Crusher Test Run**																								**100 %**
Phase II						**Start Power Generation from Boiler**																				**100 %**
Phase III								**Coal Mill First Load Run**																		**100 %**
Phase IV									**Raw Mill First Load Run**																	**100 %**
Phase V										**Kiln Firing**																**100 %**
Phase VI																						**Commercial Run**				**100 %**

April 28, 2016
Limestone Crusher Test Run

May 08, 2016
Start Power Generation from Boiler

Jul 18, 2016
Coal Mill First Load Run

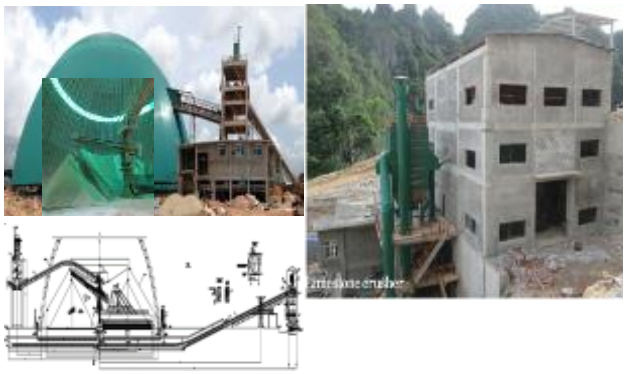


Figure 3.7-1: Schedule of MCL's Construction and Machines Uploads

Figure 3.7-2: Schedule of Operating Machines Uploads

3.8 Chemicals and Main Machines Utilized in Proposed MCL Project

Chemicals are used for mainly three purposes; cement plant, wastewater treatment plant and qualitative assessment. The following tables were described for the type of chemicals with its purposes of uses, how to storage and how to prepare the stock in MCL operation.

3.8.1 List of Chemicals

Table 3.8-1: List of Chemicals in Cement Plant

No.	Type of Chemical	Name	Chemical Formula	Consumption kg/month	Objective of Usage	Use/Feed in System	Storage Method	Stock Preparation		
								Duration	Min. Stock: (kg)	Max. Stock: (kg)
1	SAA	Grinding Aid	$CH_3OC_2H_4OH$	40500	to smooth cement grinding system	Feeder and mill inlet	With drum	1 month	46000	178400
2	S1002	Grinding Aid		1600	to smooth cement grinding system	Mill inlet	With drum	1 month	6000	10000
3	GS0658	Grinding Aid (Future Use)		0	to smooth cement grinding system	Feeder and mill inlet	With drum	1 month	45000	70000

Table 3.8-2: List of Chemicals in Wastewater Treatment

No.	Type of Chemical	Name	Consumption g/month	Objective of Usage	Use/Feed in System	Storage Method	Stock Preparation		
							Duration	Min. Stock: (kg)	Max. Stock: (kg)
1	liquid	VRB ACH (Coagulants)	10000 kg	To Coagulant Suspended Solid	Purify Plant	Chemical Storage	2 Months	15000	20000
2	powder	VRB Anionic Polymer (Flocculant)	125 kg	To flocculated suspended solid	Purify Plant	Chemical Storage	2 Months	300	400
3	liquid	SDI Reducer	125 kg	To reduce Silt Density Index	RO	Chemical Storage	2 Months	300	400
4	liquid	Antiscalant 410	125 kg	To prevent Scaling	RO	Chemical Storage	2 Months	300	400
5	liquid	Dechlorine 30	125 kg	To reduce FRC (Chlorine)	RO	Chemical Storage	2 Months	300	400
6	liquid	pH Booster (OH)	120 kg	To increase pH	RO	Chemical Storage	2 Months	300	400
7	liquid	CoolPerse (Antiscale)	15000 kg	To reduce scaling	Cooling Tower	Chemical Storage	2 Months	30000	35000
8	liquid	Sodium Hypochlorite - NaOCL (Oxidizing)	20000 kg	Anti-bacteria	Cooling Tower	Chemical Storage	2 Months	40000	45000
9	liquid	BacTrol (Biocide)	1000 kg	Anti-bacteria	Cooling Tower	Chemical Storage	2 Months	2000	3000
10	liquid	CorrGuard (Anti-Corrosion)	20000 kg	To prevent Corrosion	Cooling Tower	Chemical Storage	2 Months	40000	45000
11	liquid	KLEEN H (L637000026)	10000 kg	To adjust pH	Cooling Tower	Chemical Storage	2 Months	20000	25000
12	liquid	VRB Amine	120 kg	To increase pH in steam	Boiler Water	Chemical Storage	2 Months	200	300
13	liquid	VRB TriPhos (Phosphate)	1000 kg	To increase pH in Boiler Drum	Boiler Water	Chemical Storage	2 Months	2000	25000

Table 3.8-2: List of Chemicals in Wastewater Treatment (Continue)

No.	Type of Chemical	Name	Consumption	Objective of Usage	Use/Feed in System	Storage Method	Stock Preparation		
							Duration	Min. Stock: (kg)	Max. Stock: (kg)
14	liquid	VRB DHA (Oxygen Scavenger)	300 kg	To adjust oxygen in Boiler Feed Water	Boiler Water	Chemical Storage	2 Months	600	700
15	liquid	RO Cleaner 511	125 kg	To clean RO membrane	For CIP RO Membrane	Chemical Storage	2 Months	200	300
16	liquid	RO Cleaner 822	100kg	To clean RO membrane	For CIP RO Membrane	Chemical Storage	2 Months	200	300
17	liquid	pH Reducer (H)	50 kg	To clean RO membrane	For CIP RO Membrane	Chemical Storage	2 Months	150	250
18	powder	Softener Regenerant Agent (Salt)	30000 kg	To regenerate Softener Resin	Purify Plant for cement water treatent	Chemical Storage	2 Months	60000	65000

Table 3.8-3: List of Chemicals in Qualitative Assessment

No.	Type of Chemical	Name	Chemical Formula	Consumption	Objective of Usage	Use/Feed in System	Storage Method	Stock Preparation		
				g/month				Duration	Min. Stock: (kg)	Max. Stock: (kg)
1	Liquid	Hydrochloric Acid	HCL	100ml/month	Test for Sulfur, Insoluble & SO_3	Cement testing	Cabinet	100 ml/month	7500 ml	
2	Solid	Barium chloride, 500G "Loba"	$BaCl_2.2H_2O$	Sometime (Keep Stock)	SO_3	Cement testing	Cabinet	25g/ time	200 g	500 g
3	Liquid	Ethyl alcohol (Ethanol),2.5L	CH_3CH_2OH	Monthly	For Indicator (%S Coal, Insoluble, SO_3 gyp)	Cement testing	Cabinet	150ml/ Month	1000 ml	5 Lit
4	Solid	Benzonic Acid	C7H06	4unit /month (Normally)	AC-500	Coal testing	Desiccator	4pc/Month		4 bottle
5	Solid	Siliga gel, 1KG	$SiO_2.xH_2O$	Keep (Stock)	Desiccator	-	Cabinet	1500g/time		3 kg

Table 3.8-3: List of Chemicals in Qualitative Assessment (Continue)

No.	Type of Chemical	Name	Chemical Formula	Consumption	Objective of Usage	Use/Feed in System	Storage Method	Stock Preparation		
				g/month				Duration	Min. Stock: (kg)	Max. Stock: (kg)
6	Liquid	Manometer Fluid	-	Calibration, Sample testing error	Air Permeability Apparatus	Cement testing	Cabinet	1bottle/ 2 Month		3 bottle
7	Solid	X-Ray Flux Type (66:34) Granular (2kg),Batch : 100715A	-	1.5 bottle/ month	XRF	Fuse Testing	Cabinet	1.5 bottle/ month		24 kg
8	Gas	Methane in Argon (10%)	CH_4Ar	2yr/time	XRF	Raw Mat, RM, Clk , Fuse testing	Room	1Unit/2yr		2
9	Liquid	Hydrofluoric acid 500ml	HF	Sometime	Clean the crucible after testing insoluble	Cement testing	Cabinet	100ml/ Year	200 ml	500 ml
10	Liquid	Hydrochloric acid, Commercial, 20KG	HCL	Sometime	Clean the crucible after testing insoluble	Cement testing	Cabinet	1lit/ Year	5 kg	20 Kg
11	Solid	Bromocresol green pH3.6-5.2, 5G	C21H14Br4O5S	once/5month	Free.CaO by Wet analysis	Clk and Cement testing	Cabinet	2g/ Year	3 g	2 bottle
12	Liquid	Ethylene Glycol	$HOCH_2CH_2OH$	1bottle /2month (Normally)	Free.CaO by Wet analysis	Clk and Cement testing	Cabinet	5lit/month	7.5 Lit	
13	Liquid	Phenolphthalein Indicator 100G	C2H6O2	once/5month	Sulfur	Coal testing	Cabinet	2g/ Year	5 g	100 g
14	Solid	Sodium carbonate 1kg	$Na2\text{-}C\text{-}O_3$	15g/ 2month	Sulfur	Coal testing	Cabinet	15g/ 2Month	500 g	1 Kg
15	Solid	Methyl orange , 100G	C14H14N NaO3S	once/5month	Sulfur	Coal testing	Cabinet	1g/ Year	5 g	100 g

Table 3.8-3: List of Chemicals in Qualitative Assessment (Continue)

No.	Type of Chemical	Name	Chemical Formula	Consumption	Objective of Usage	Use/Feed in System	Storage Method	Stock Preparation		
				g/month				Duration	Min. Stock: (kg)	Max. Stock: (kg)
16	Liquid	Barium Hydroxide	$Ba(OH)_2$	35g/1month	Sulfur	Coal testing	Cabinet	35g/1month	300 g	1 Kg
17	Solid	Sodium hydroxide, AR,500G "Assay:98.5%"	NaOH	Keep Stock	Insoluble	Cement testing	Cabinet	50g/Month		stock
18	Solid	Methyl Red,25G	$C15-H15-N3-O_2$	Keep Stock	Insoluble	Cement testing	Cabinet	2g/ Year	6 g	stock
19	Solid	Ammonium thiocyanate (500g/bottle)Brand: EMSURE	NH4SCN	Keep Stock	BS Lab	Cement testing	Cabinet	-	-	1 Kg
20	Liquid	Ammonium ion (III) sulfate ,Brand: EMSURE	-	Keep Stock	BS Lab	Cement testing	Cabinet	-	-	-
21	Solid	AgNO3 (Silver Nitrate for analysis)(100g/bottle),Brand: EMSURE	$AgNO_3$	Keep Stock	BS Lab	Cement testing	Cabinet	-	-	500 g
22	Liquid	HNO3 acid (Nitric acid) (2.5L/ bottle, Brand: EMSURE	HNO_3	Keep Stock	BS Lab	Cement testing	Cabinet	-	-	7.5 Lit

3.8.2 Main Machinery Used in Proposed MCL Project

There are total of 5 main process machines in MCL's cement factory.

i)	Raw mill	1 unit
ii)	Coal mill	1 unit
iii)	Kiln and cooler	1 unit
iv)	Cement mill	2 units
v)	Rotary packer	5 units

i) Raw Mill

Specification:

Type	- Vertical mill
Manufacture	- UBE
Model	- UM56.4
Capacity	- 440 t/h (DB) for raw material grinding
Power requirement	- Main drive - 4,300 kW, Mill fan - 5000 kW, Separator – 220 kW
Electrical Load	- 9 MW

Figure 3.8-1: Vertical Raw Mill and Raw Material Hopper in MCL's Cement Plant

ii) Coal Mill

Specification:

Type	- Vertical mill
Manufacture	- UBE
Model	- UM30.3
Capacity (DB)	- 45 t/h for coal grinding
Power requirement	- Main drive – 1,000 kW, Mill fan – 1,600 kW, Separator – 132kW
Electrical Load	- 1.5 MW

Figure 3.8-2: Coal Mill Used in MCL's Cement Plant

iii) Kiln and Cooler

Specification:

Type	- Rotary kiln with In-line Calciner and 2 strings of 5 stages cyclone Preheater - Third generation grate cooler with roller crusher for clinker
Manufacture	- CITIC
Model	- Dia 4.8m x 74m x Speed 40 rpm (max)
Capacity (DB)	- 5,000 t/d for clinker burning
Power requirement	- Main drive – 900 kW, IDF – 2,800 kW, Cooler fan – 800 kW
Electrical Load	- 5.5 MW

Figure 3.8-3: Kiln and Cyclone Preheater used in MCL's Cement Plant

iv) Cement Mill

Specification:

Type	- Ball mill with Roller Press
Manufacture	- CITIC
Capacity (DB)	- 180 t/h for Cement grinding (OPC type I)
Power requirement	- Main drive – 4,000 kW, kW, V-sep fan – 900 kW,
Separator fan	- 1,000 kW, Mill fan – 90 kW
Electrical Load	- 6.5 MW

Figure 3.8-4: Cement Mill Used in MCL's Cement Plant

v) Rotary Packer

Specification:

Type	- Rotary packer
Manufacture	- Ventomatic
Capacity (DB)	- 2,400 bag/h for cement bag packing each bag 50 kg (net)
Electrical Load	- 1.0 MW

Figure 3.8-5: Rotary Packer and Cement Silo used in MCL's Cement Plant

3.8.3 Main Emission Control Machines

MCL's cement factory also includes three main emission control machines as below.

1) Main Bag Filter
2) Main EP Clinker Cooler
3) Screw Unloading for coal
4) Grab unloading for gypsum

Table 3.8-4: Main Emission Control Machines

Items	Types	Flow
1. Main Bag Filter	Bag Filter	788,000 m^3/h
2. Main EP Clinker Cooler	Electrostatic Precipitator (EP)	760, 000 m^3/h
3. Screw Unloading for coal	Screw unloading	500 t/h
4. Grab unloading for gypsum	Grab unloading	500 t/h

1) Main Bag Filter

It works to remove the dust from flue gases when the gas passes through, dust particulates are trapped. It is installed at main stack for emission control.

Specification:

Type	- Bag Filter
Gas Volume	- 788,000 m^3/h
Dust Load	- Input 50 g/m^3, Output <10 g/m^3
Filtration area	- 13,680 m^2
Filtration Speed	- 1 m/s
Power requirement	- BF Fan – 1,400 kW

Figure 3.8-6: Main Bag Filter Used in MCL's Cement Plant

2) Main EP Clinker Cooler

Main Electrostatic Precipitator **(**EP**)** is installed at Clinker cooler to control the particulate matters**.** It is used electrostatic forces to separate the dust from the exhaust gas by means of discharge from clinker.

Specification:

Type	- Electrostatic Precipitator (EP)
Capacity (max)	- 760, 000 m^3/h
Filtration area	- 16, 239 m^2
Filtration speed	- 0.78 m/s
Power requirement	- BF Fan – 800 kW (VSD)
Emission	- 30 mg/Nm^3, DB max

Figure 3.8-7: EP Clinker Cooler Used in MCL's Cement Plant

3) Screw Unloading

Specification (Screw Unload):

Type	- Screw unloading
Manufacturer	- Swirtel
Capacity (DB)	- 500 t/h
Electrical load	- 1.6 MW

Figure 3.8-8: Screw Unload in MCL's Cement Plant

4) Grab Unloading

Specification (Grab):

Type	- Grab unloading
Manufacturer	- CITIC
Capacity (DB)	- 300 t/h
Electrical load	- 0.5 MW

Figure 3.8-9: Grab Used in MCL's Cement Plant

3.8.4 Main Machinery and Operation Units with their Capacity Specifications

Based on the project requirement, the capacities of main machinery and equipment have been estimated. The capacities of intermediate storage and conveying equipment to match the capacities of main machinery have been also estimated. Table 3.8-4 shows the estimated main machinery used in this project.

Table 3.8-5: Capacity Specification of Main Machinery and Operation Units

Location	**Cement Plant @ Mawlamyine**	**Cement Terminal @ Yangon**
Plant Capacity	1,800,000 t/y Cement	
Main Machine		
Limestone Crusher	1 x 1,000 t/h (Hammer Crusher)	
Limestone storage	1 x 50,000 t (Circular Storage)	
Mixed Mat. Storage	2 x 22,000 t (Longitudinal Storage)	
Raw mill	1 x 440 t/h (Vertical Roller Mill)	
Homogenizing Silo	1 x 25,000 t (with Corrective Bin 1,000 t)	
Kiln	1 x 5000 t/d (Suspension Preheater with Pre-calciner)	
Clinker Storage	1 x 75000 t (with bypass silo 1,000 t)	
Cement mill	2 x 180 t/h (Combi-Grinding)	
Cement Storage	4 x 10,000 t	2 x 10,000 t
Bulk Loading Facility	2 x 300 t/h for ship 2 x 200 t/h for bulk truck	2 x 200 t/h for bulk truck
Big Bag Loader	4 x 50 t/h	4 x 50 t/h
Packer	5 x120 t/h (Rotary Packer)	4 x 120 t/h (Rotary Packer)
Manual Truck Loader	5 x 2400 bags/h	4 x 2400 bags/h
Bulk Unloading Facility	-	2 x 300 t/h (vacuum type unloader)
Raw Material Unloader	500 t/h Screw Loader 500 t/h Grab Loader	
Coal Storage	2x12,000 t (Longitudinal Storage)	
Coal mill	1 x 45 t/h (Vertical Roller Mill)	
WHG	9MW	
Power Plant	Total 2 x 20 MW Diesel Generator 2 x 4 MW	

3.8.5 Maintenance System

During operation, there are three types of maintenance systems to be adopted for operating machines:

1) Time Based Maintenance (TBM) when discovery of abnormalities.
2) Condition Based Maintenance (CBM) through continuous monitoring.
3) Shutdown Maintenance for annual plan when finding the issues such as part replacement, poor machine condition, etc.

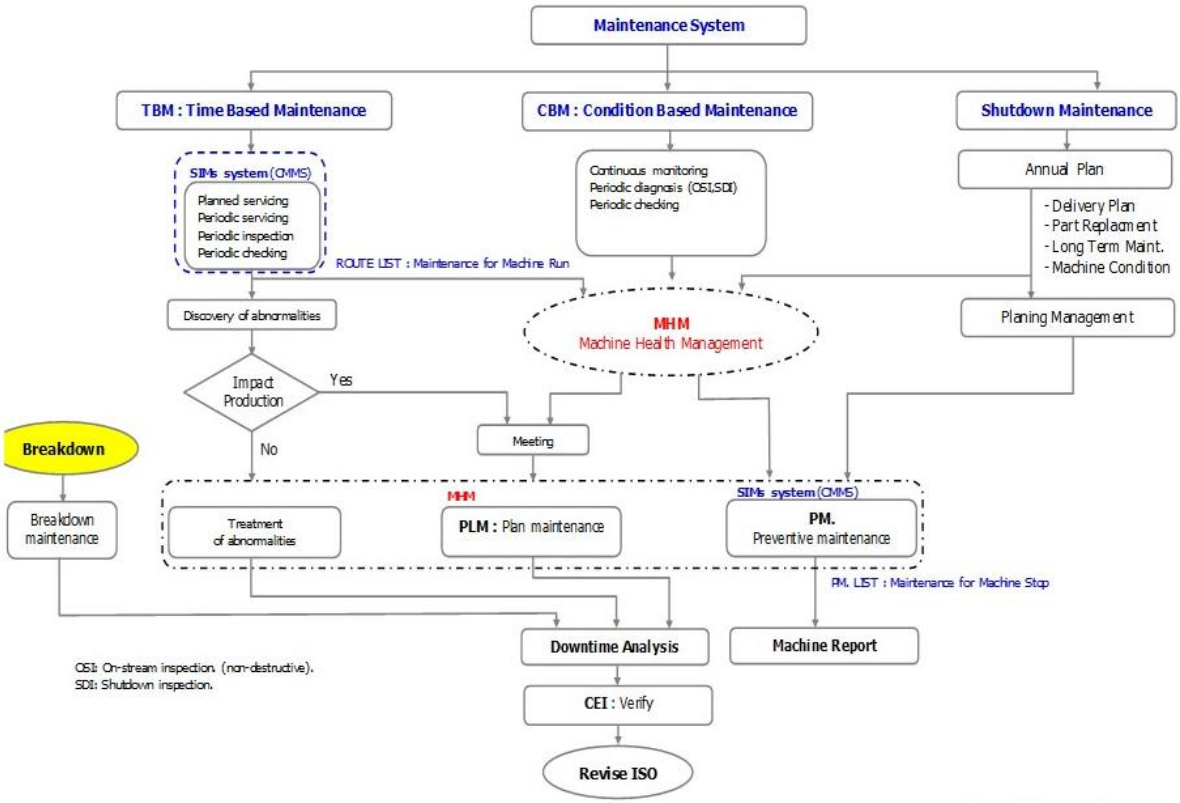


Figure 3.8-10: Demonstration of Maintenance System

3.9 Project Alternatives

3.9.1 Cement Production Process

Compared to Wet Cement process, MCL's choice was dry cement processing due to the following positive favors:

Table 3.9-1: Differences between Wet and Dry Cement Processes[8]

Differences	Wet Process	Dry Process
1. Mixing of raw materials	Wash mill with 35-50 % of water	Dry stage in Blenders
2. Materials existing the mill	Slurry and have flow-ability characteristics	Kiln Feed
3. Size of Kiln	Big	Small
4. Fuel Consumption	High (350 kg of coal per ton of cement produced)	Low (100 kg of coal per ton of cement produced)
5. Production Cost	High	Less

Although the capital cost of dry process is higher because of using blenders, and the production process is more complicated than the wet process, MCL Co., Ltd, established a **dry cement process** due to lower fuel consumption and shorter time of process than the wet.

3.9.2 Alternative Power Supply

Waste Heat Power Generator (WHG): This alternative is a self-power generation using waste heat from cement process to generate electricity. It can supply approximately 20% of total power consumption in the plant.

In this alternative, 9-Megawatt Waste Heat Power Generator is provided. The hot gas from the Clinker Cooler and the Suspension Preheater is carried to the Air Quenching Cooler Boiler (AQC boiler) and Suspension Preheater Boiler (SP boiler), respectively.

Waste Heat Power Generator not only recovers energy from Rotary Kiln, but also indirectly reduces the Green House Gas (GHG) emission from power generated. The waste heat recovery process does not affect the heat consumption or fuel consumption of the Rotary Kiln.

For construction period, this project expects to use totally 4,500 KVA diesel generation where 9,000 liters per day of diesel is consumed.

Waste Heat Recovery System (Maximum: 9MW, Normal Operation: 6.5 MW)

a. Boiler Specification*:* Natural Circulation Type
Suspension Preheater Boiler:
Rated Steam Generation: 26.4 tph
Rated Working Pressure: 1.6 MPa
Rated Steam Temperature: 313 °C
Inlet Flue Gas Volume: 350,000 Nm^3/h
Inlet Flue Gas Temperature: 330°C
Efficiency of Heat Recovery: 34.8%

[8] https://wecivilengineers.wordpress.com/2018/03/28/difference-between-wet-and-dry-process-of-cement/

b. Air Quenching Cooler Boiler *:*

Rated HP Steam Generation: 21.4 tph
Rated HP Steam Temperature: 1.6 MPa
Rated HP Steam Temperature: 365 °C
Rated LP Steam Generation: 3.7 tph
Rated LP Steam Temperature: 0.5 MPa
Rated LP Steam Temperature: 200 °C
Inlet Flue Gas Volume: 225,000 Nm^3/h
Inlet Flue Gas Temperature: 380°C
Efficiency of Heat Recovery: 74.5%

c. Turbo-generator Specification*:* Condensing Turbine Type

Rated Power Output: 9,000 kW
Rated Speed: 3,000 rpm
Rated Voltage: 10.5 kV
Inlet Steam Condition: 44.5 tph, 1.6 MPa, 320°C
Rotational Direction: Clockwise

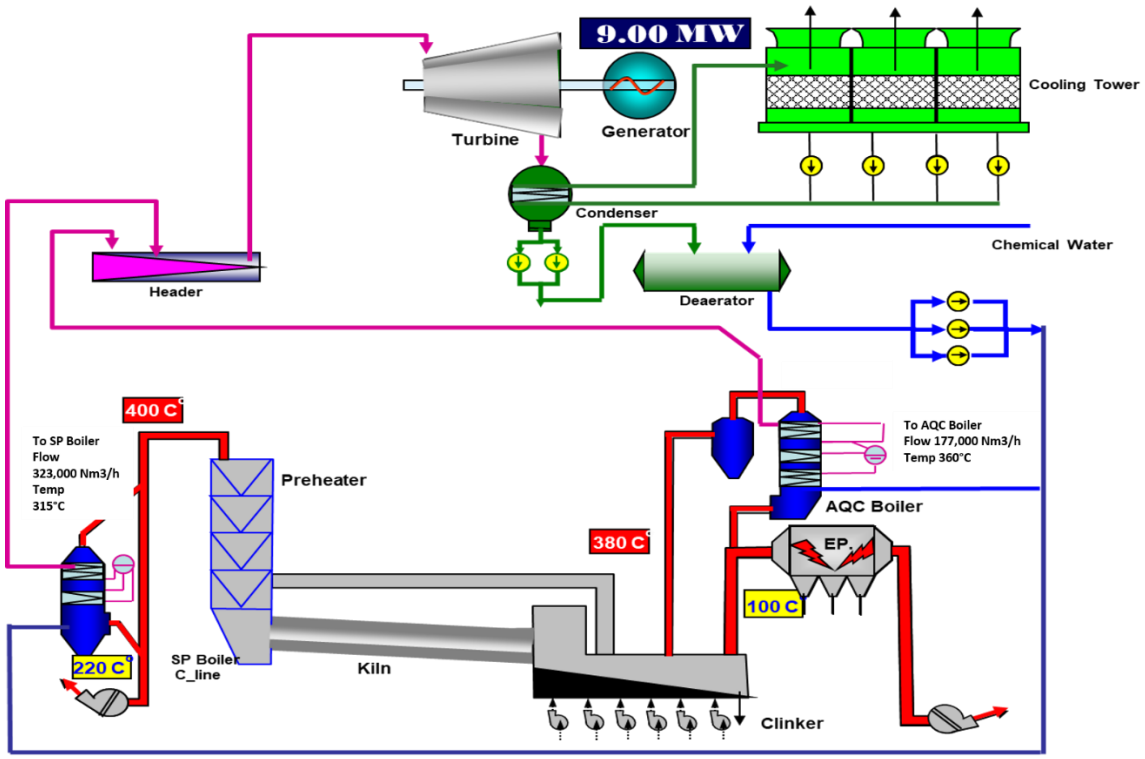


Figure 3.9-1: Schematic Diagram of MCL Waste Heat Generation Process

Actual Inlet Gas Volume for SP Boiler and AQC boiler

3.9.3 Alternative Sections for MCL Main Cement Machines

The alternative selection for main cement machines were proceeded by examining cement manufacturing technologies and alternative criteria with respect to system features such as general description, operation, installation, ease of operation, operation cost, ease of maintenance, maintenance cost, less energy use, versatility and upgrading and the benefits of installing those machines in cement manufacturing plant operations.

The selective alternative systems of the machines used in MCL cement plant were as follows.

1) Raw Mill (Vertical Roller Mill)

This selection was mainly based on the lowest power consumption and it was also the mature technology for raw material grinding of cement plant.

2) Cement Mill (Roller Press +Tube Mill)

The pre-grinding roll crusher (or another called as "the roller press") with tube mill and high efficiency separator. This type of cement mill is optimum solution in term of Low power consumption (as benefit of pre-grinding system).

Flexibility for producing different kind of product which is superior than the vertical cement mill which has lower power but has difficulty in operation with different type of cement products. (cement product is vary depending of required strength and properties as well as the customer requirement).

Robust and easy to maintenance than the vertical cement mill.

3) Clinker Cooler (Grate Cooler)

The main function of cooler helps to recuperate heat from clinker and also to crush the clinker to the acceptable feed size for cement mill. These 3rd generation stationary grate cooler with low wear parts, low cooler loss, low maintenance and power, no fall through and high efficiency. These coolers could also be referred to as Cross Bar Coolers because they are highly flexible for new construction and upgrades, horizontal clinker transport and improved transportation efficiency.

4) Kiln (Pre-calciner)

Pre-calciner kiln with 5 stages-preheater cyclones and 3rd generation Grate Cooler. This combination provides the benefit as low fuel consumption and low power consumption as well as the waste gas can be use as the heat source for produce the electricity in Waste heat power generation system (WHG). Moreover, this type of kiln used low fuel and power consumption thus in turn always lead lower emission of NO_x, CO_2, SO_x than other types of kiln.

The systematic features of each machine with their efficiencies were demonstrated in the following tables.

Table 3.9-2: Comparative System Features of Raw Mills

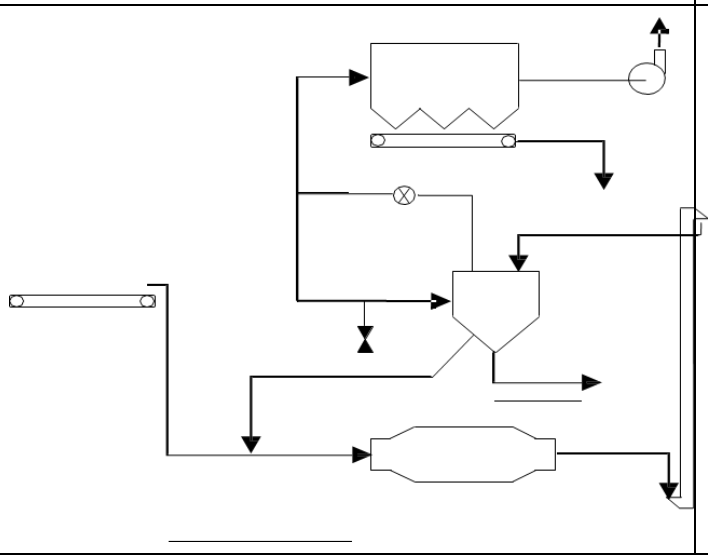
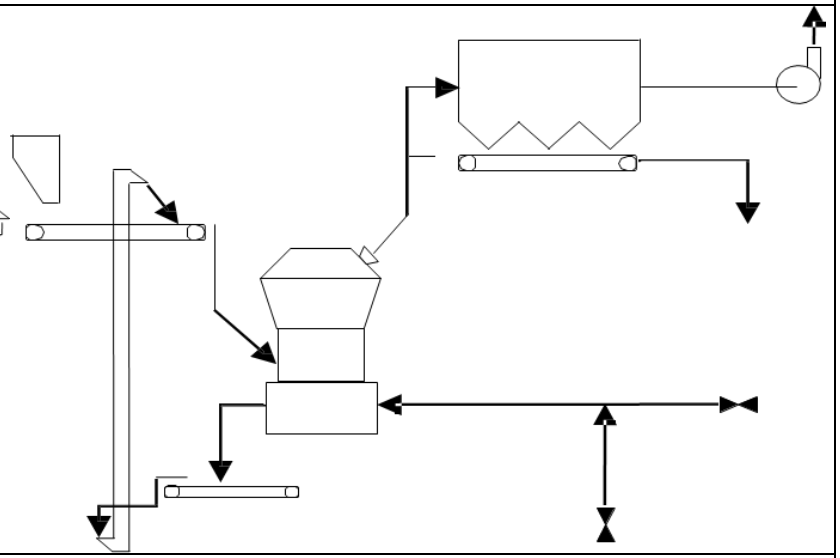
System Feature	Tube Mill	*Vertical Roller Mill
Mill System		
General Description	A two-compartment ball mill operating in a closed circuit with a high efficiency separator	Vertical roller mill for grinding clinker; three processes (drying, grinding and classifying) in a single unit
Operation	Highest specific energy consumption compared with other systems. Not sensitive with variation of mill feed quality (fineness) and mill fill rate; hence tube mill is easier to operate than vertical roller mill.	Specific energy consumption is 25 – 40% lower than tube mill system. Sensitive with variation of mill feed quality & mill feed rate. Quality management of cement product is easy because of superior system operational control response.
Ease of Maintenance	Wear parts of a tube mill (e.g. grinding barbells, liberates) are either easy to maintain or they have a long-life time.	Maintenance of wear parts are more complicated than a ball mill; however, the system has few auxiliary devices. Maintenance cost is similar to a tube mill.
Versatility and Upgrading	Not versatile in compared with vertical roller mill. Can be upgraded by installation of pre- grinders (roller press, roller mill).	A very versatile mill suitable for a wide range of products: pure slag, OPC, blended cements. The system cannot be upgraded.
Installation	Size of tube mill is higher for the same production capacity. High noise levels emitted from equipment (100 dBA); required to be enclosed in a building.	More compact and requires half installation area of tube mill system. Lower noise level (80-85 dBA); not typically enclosed by a building. Higher total installation cost than tube mill.

Table 3.9-3: Comparative System Features of Cement Mills

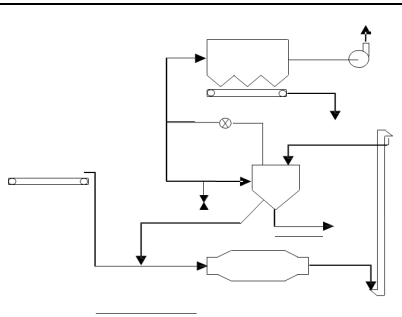
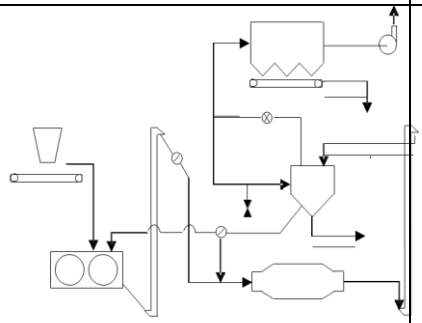
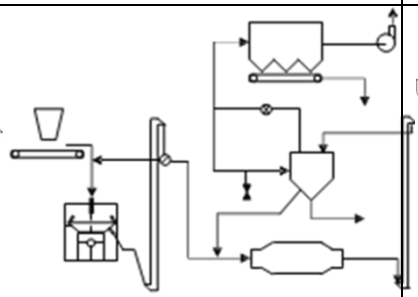
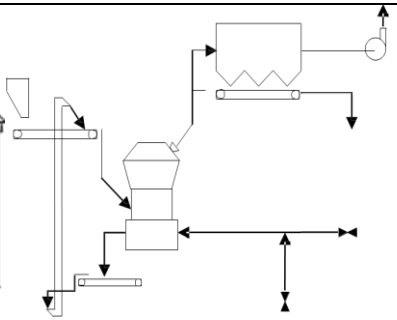
System Feature	Tube Mill	*Roller Press + Tube Mill	Roller Mill + Tube Mill	Vertical Roller Mill
Mill System				
General Description	A two-compartment ball mill operating in a closed circuit with a high efficiency separator	A pre-grinding roll crusher installed in the upstream of tube mill	A vertical roller mill (no classifier and air sweep) installed in the upstream of tube mill for pre-grinding of clinker.	Vertical roller mill for grinding clinker; three processes (drying, grinding and classifying) in a single unit.
Operation	Highest specific energy consumption compared with other systems. Not sensitive with variation of mill feed quality (fineness) and mill fill rate; hence tube mill is easier to operate than vertical roller mill.	Specific energy consumption is reduced 10% in comparison with tube mill. The operation of the system is more complicated than a tube mill, because the system has a lot of equipment and accessories.	Specific energy consumption is reduced 10- 20% in comparison with tube mill. The operation of the system is more complicated than a tube mill, because the system has a lot of equipment and accessories.	Specific energy consumption is 25 – 40% lower than tube mill system. Sensitive with variation of mill feed quality & mill feed rate. Quality management of cement product is easy because of superior system operational control response.
Ease of Maintenance	Wear parts of a tube mill (e.g. grinding barbells, liberates) are either easy to maintain or they have a long-life time.	Maintenance is more complicated than a tube mills due to many equipment and accessories. Maintenance cost is slightly increased due to many facilities.	Maintenance is more complicated than a tube mills due to many equipment and accessories. Maintenance cost is slightly increased due to many facilities.	Maintenance of wear parts are more complicated than a ball mill; however, the system has few auxiliary devices. Maintenance cost is similar to a tube mill.
Versatility and Upgrading	Not versatile in compared with vertical roller mill. Can be upgraded by installation of pre- grinders (roller press, roller mill).	-	-	A very versatile mill suitable for a wide range of products: pure slag, OPC, blended cements. The system cannot be upgraded.
Installation	Size of tube mill is higher for the same production capacity. High noise levels emitted from equipment (100 dBA); required to be enclosed in a building.	The system is more complicated, and its size is higher than a tube mill.	The system is more complicated, and its size is higher than a tube mill.	More compact and requires half installation area of tube mill system. Lower noise level (80-85 dBA); not typically enclosed by a building. Higher total installation cost than tube mill.

Table 3.9-4: Comparative System Features of Clinker Cooler

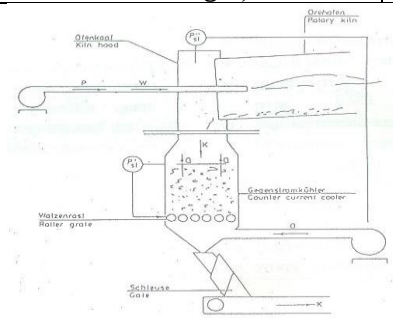
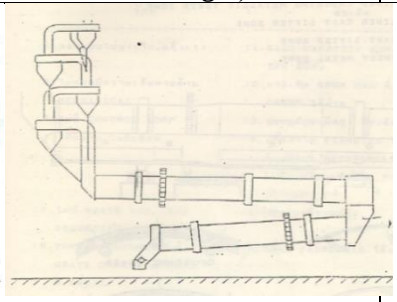
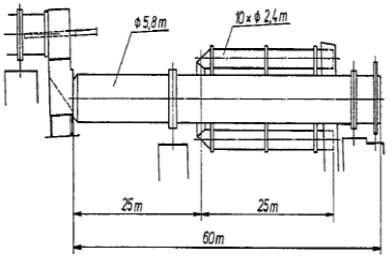
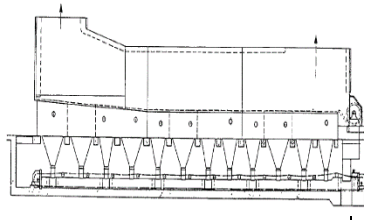
System Feature	Shaft Cooler (Counter current heat exchanger)	Rotary Cooler (Counter current heat exchanger)	Planetary Cooler (Counter current heat exchanger)	*Grate Cooler (Cross current heat exchanger)
Clinker Cooler System				
General Description	It is a vertical cooler to transfer heat by counter-current cooling process controlled by roller grate with fluidized bed.	Rotary Cooler consists of revolving cylinder following kiln. Rotary cooler is mounted on two riding rings, the girth gear and pinion drive like the kiln drive.	The kiln shell is extended beyond the cooling tube outlets and it is supported by additional roller station. The cooling tubes are fixed at inlet and loose at outlet support.	Cross flow heat exchange through clinker bed with cold air from below. Achieve low temp: clinker due to exceeding cooling air but air dedusting equipment is required. Can operate as large as 10000tpd.
peration	The fluid bed does not always materialize without some reservations. The quality of the clinker cooling is as equal as grate cooler to concern C_3S & C_2S ratio. The specific power consumption is 45% higher than grate cooler.	Cooling air passes through the rotary cooler in the counter-current flow of clinker. The negative pressure in the rotary kiln induces suction of coal air through the open end of the rotary cooler. Rotation speed is as same as rotary kiln, and approx.: 70% of the cooler drum length is refractory lining. The L/ID ratio of cooler drum is 10:1 to 12:1.	Cooling air enters into the cooler outlet and pass through each cooler tube by the counter current flow of clinker. L/D ratio is about 10:1. Retention time inside cooler is about 45 mins. Secondary Air Temp: is about 840-850C entering to Kiln and clinker temp: at cooler outlet is about 120-200C. Heat loss by radiation in this type of cooler is about 25%.	By using numbers of cooling fans, ambient air is blown to the underneath of the grate plates which is loaded with hot clinker. Enough pressure of air can penetrate clinker bed to cool down the clinker. Under idle condition, the cooling air required depends directly on the desire clinker temperature. The clinker is pushed by the

Table 3.9-4: Comparative System Features of Clinker Cooler (Continue)

System Feature	Shaft Cooler (Counter current heat exchanger)	Rotary Cooler (Counter current heat exchanger)	Planetary Cooler (Counter current heat exchanger)	*Grate Cooler (Cross current heat exchanger)
		Scoops are installed inside the cooler to lift the material constantly and to get better material distribution. 5 kWh/t less consume than grate cooler.	Power requirement for Kiln main drive and ID fan is higher about 1.3kWh/t than grate cooler.	vertical front surface of the grate plate to the clinker crusher. Lower heat consumption due to higher heat recuperation and higher efficiency.
Ease of Maintenance	No dust collection system is required. No hydraulic system is required.	No special mechanical problems comparable to rotary kiln. No control loops. No dedusting equipment required.	No dedusting equipment. Static and mechanical overstress of the kiln shell especially clinker discharge opening area. Short term durability of the refractory lining, metal linings and lifters inside cooler tubes.	More complicated mechanical installation and more maintenance cost. Wear of nose ring and burner refractory. Dedusting system capital cost and maintenance cost.
Versatility and Upgrading	No versatility for this system. To reduce power consumption, VSD Drive can install for Fluidized Bed Fan and Roller Crusher Grate.	-	-	
Installation	Capacity up to 3000 tpd. Depend on the clinker size and constant quantity of clinker over fluidized bed, difficult to control uniform air distribution.	Suitable up to max. 2000tpd production. Refractory need to install and water injection is also required. Girth Gear and Drive Unit need to install like rotary kiln.	Joints and elbow of cooling tube to kiln is installed to prevent the clinker is falling back to kiln at the top position. For a better heat transfer, the interior of the cooler tubes is equipped with refractory lifters and lifter bars, and internal construction consisting of heat resistant steel and steel casting. In case of the kiln upset condition, high temp. clinker is leaving and water cooling system is used to prevent.	Reciprocating Grate with drive system. Aeration system with fans, under grate compartments and direct air ducts. Clinker extraction system with hoppers, grates and transport. Clinker crusher. Casing with Kiln hood and connection for tertiary air duct.

Table 3.9-5: Comparative System Features of Kiln

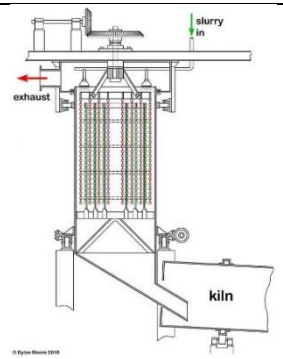
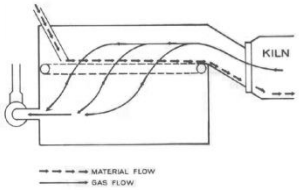
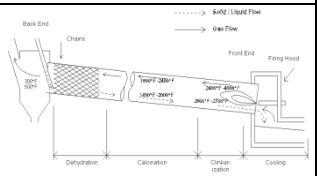
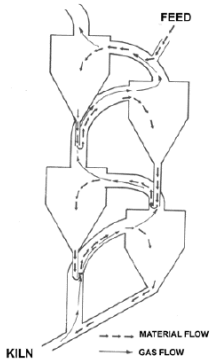
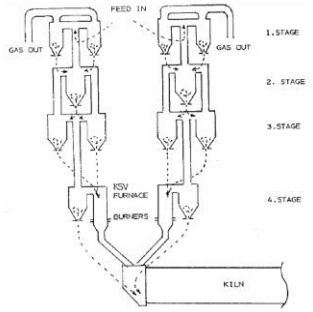
System Feature	Wet Kiln	Semidry Kiln	Dry Kiln	Preheater Kiln	*Pre-calciner Kiln
Kiln System					
General Description	Raw material with water content of 32-42% grinded in slurry mill is pumped into the kiln. Large amount of fuel need to use to evaporate water and a longer kiln is required for this purpose (dehydration zone).	A limited amount of water (10-15%) is added to pelletize raw meal to form a cake so that it can be nodulized, and the damp nodules are fed to the granular feed bed. Kiln exit gas pass through the granular feed bed and dry raw meal, and then feed to kiln inlet.	In this process the kiln feed enters the kiln in dry powder form. Dry-process kiln dimensions are similar to wet kilns, L/D ratio is 30:1 to 35:1.	The dry feed is preheated and partly calcined by the hot kiln exit gases in a tower of heat exchange cyclones.	Pre calciners are essentially suspension preheater kilns that are equipped with a secondary firing system attached to the lower stage of the preheater tower. A pre-calciner kiln produces 50-70% more clinker than a conventional preheater kiln of equal diameter.
Operation	Because of the high-water content in kiln feed, heat consumption is as twice as the dry process kiln. Heat consumption is about 1200-1500kcal/kg Clinker. Kiln exit gas temperature is 150-250C. Dust emission is as high as clinker production. Feed is blended more uniformly than in the dry process.	Granulator plant is required to make damp nodules of raw meal. Over the granular feed bed, kiln feed is partially calcined. But production of nodules and control of the thickness of the feed bed over the travelling grate is very closely need to monitor.	Water spray is required at the feed end because of the kiln exit gas temperature is vey high. At the kiln inlet, chain section is installed to transfer from exit gas to kiln feed more efficiently. Kiln exit gas temperature is about 450C.	In the preheating process, heat exchange between the gas and the material takes place in the cyclones while both are in suspension. The most common design is the parallel four-stage preheater. Exit gas temperature is about 340C, specific heat consumption is 750kcal/kg.	Fuel consumption is as same as Preheater Kiln and not reduce but heat load at burning zone is reduce as a result long service life of refractory lining. Possibility of using low grate fuel and alternative fuels.

Table 3.9-5: Comparative System Features of Kiln (Continue)

System Feature	Wet Kiln	Semidry Kiln	Dry Kiln	Preheater Kiln	*Pre-calciner Kiln
Versatility and Upgrading					-
Installation	To achieve higher extended surface, relative velocity, increase in turbulence, chain system is installed at first zone.	Granulator plant is required to install. Travelling granulator feed grate is also needed to install and required special attention for smooth process.	Kiln length is as long as wet process and chenin section is required to install at kiln inlet zone. Due to high temperature exit gas, prefer to generate power coz of more economical.	For preheating purpose, cyclones and ID fan are installed.	Pre-calciner Burner and tertiary air duct need to install.

Chapter 4
Existing Enviroinmental and Social Conditions

4.1 Overview

An overview of the existing environmental and social settings shall be provided in order to place the proposal in its local and regional context. It will also incorporate the appropriate control measures required to be adopted or implemented in order to minimize the adverse effects thereof.

In order to carry out baseline study, it is first necessary to delineate and define the existing environmental factors in and around the proposed project on the existing environmental scenario which will include various environs according to the list below.

- Land characteristics and use,
- Landscape Character and Existing View,
- Habitats, Flora and Fauna,
- Water including Hydrogeology, groundwater and water quality,
- Noise levels,
- Antiquities and other sites of historic and cultural significance,
- The social and economic context,
- Traffic flows and transport infrastructure,
- Utility service.

This section incorporates the description of the existing environmental settings within the area of proposed project site and its surrounding.

This description will specifically include;

- Past, existing and planned urban and or other developments on or near the proposed site;
- Past environmental performance, including the impacts of existing developments on the environment and the effectiveness of any impact mitigation measures applied on the site; and
- The relationship of the proposed development to any existing developments in nearby neighborhoods or areas.

4.2 Existing Environmental Condition

The environmental existing data such as water, air and noise quality, soil, and sediment survey and ecological survey were conducted selected sample sites within the project site and its surrounding. The ecological survey was conducted to assess the type of flora and fauna prevailing within the site. Geological mapping was done with clients before conducted the EIA Survey.

Topography, climate and meteorological information were collected through literature review and available data from Universities and some relevant NGO reports.

4.2.1 Geographical Location of the MCL Cement Project

The cement plant site is located in the Pya Taung area, approximately 0.86 km north of the Kwan Ngan village, east bank of the Ataran River, in the Kyaikmaraw Township, Mawlamyine District, Mon state of the Union of Myanmar. The cement plant is located between 16º21'44" and 16º22'05" N latitude and between 97º49'25" and 97º50'17" E longitude.

The Pya Taung Limestone deposit is situated near the Kawdun and Kawpanaw villages in Kyaikmaraw Township, Mon State. It lies between latitude 16° 20' N to 16° 23' N and longitude 97° 47' E to 97° 49' E, in one-inch topographic map No.94 H/15 of Myanmar Survey Department. It is also located at Mon State, about 19 km southeast of Mawlamyine City, State City of Mon Fig.**1.** It also lies between UTM Grid no 1806000N and 1809000N and 371000E and 374000E, WGS 84, UTM zone 47 Q.

Pya Taung Mountain (from East View)

Pya Taung Moutain (from West View)

Cement Plant Site Area

Cement Plant and Raw Storage Area

Access Road to Project Area | *Proposed Canal Area*

Ataran River | *Paddy Field near Project Area*

Source: REM Survey (Feb, 2013)

Figure 4.2-1: Existing Environmental Conditions Near the Project Site

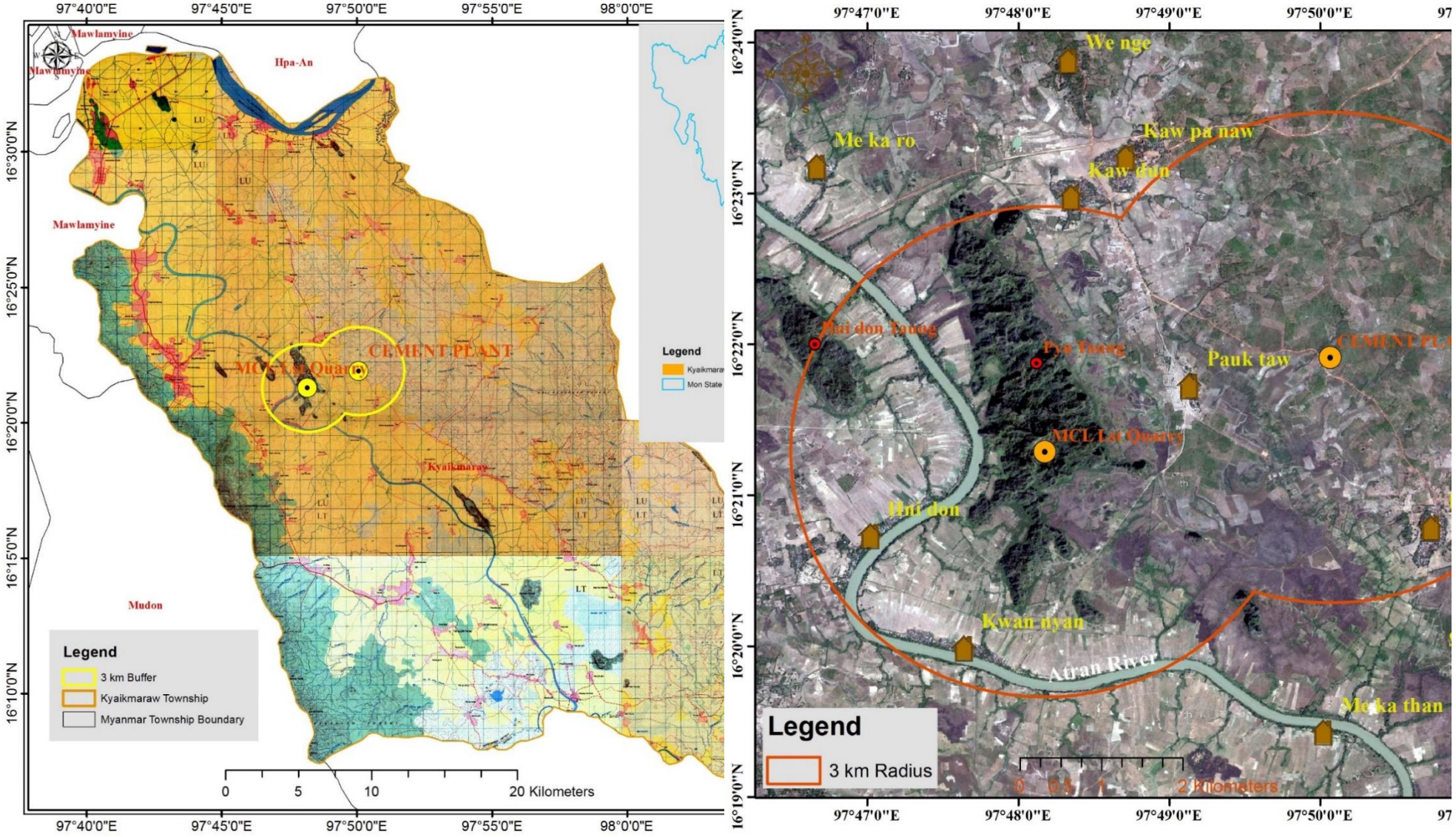


Figure 4.2-2: Location Map of MCL Cement Project

4.3 Existing Surface Characteristics

The existing surface characteristics such as topography, soil characteristics, terrain stability and susceptibility to erosion or landslip, the existing land uses occupying the site, the existing surface characteristics of the surrounding area, the existing land uses occupying the surrounding area and particularly those land uses which would be sensitive to industrial development.

4.3.1 Land Cover

According to the General Administrative Department of Kyaikmaraw Township, forest cover is about 22.04 % of total area of Kyaikmaraw Township.

According to the Kyaikmaraw General Administrative Department (GAD), the land use pattern is shown in Table 4.3-1.

Table 4.3-1: Land Types of Kyaikmaraw Township

No.	Land types	Area (Acrea)
1	Total area of net agriculture land	144589
	(1) Farm Land area	52853
	(2) Garden Land	91736
2	Total area of exposed land	51708
	(1) Farm Land area	51708
3	Pastureland	8005
4	Industrialization land	1492
5	Urban land	2912
6	Rural land	9079
7	Other land	3071
8	Reserved Forest	72602
9	Virgin land	6569
10	Fallow land	11544
11	Non-arable land	40482
	Total	**327494**

Source: General Administrative Department (2017)

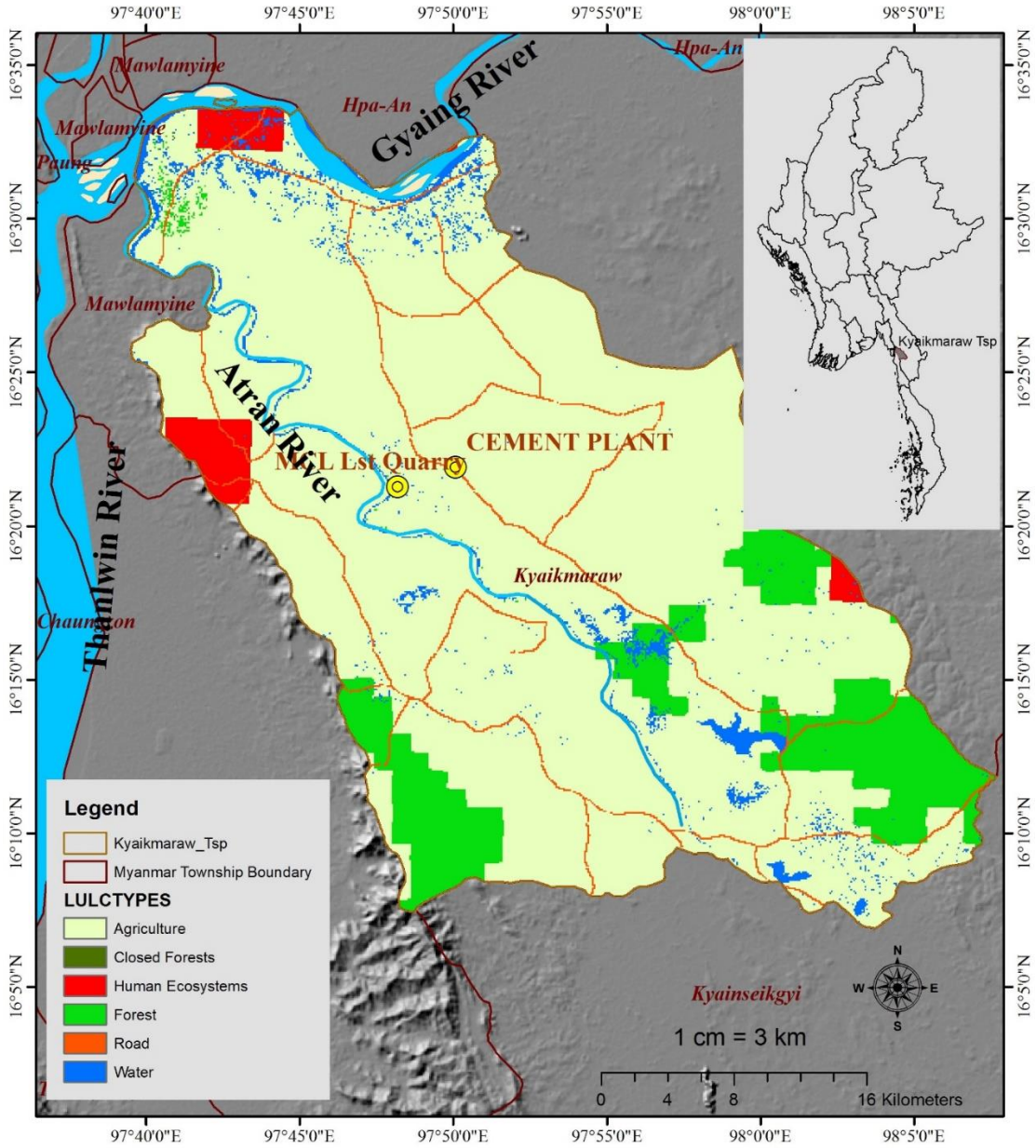


Figure 4.3-1: Land use/ Land cover of Kyaikmaraw Township (Landsat 8 Satellite Image_2015 Dec)

4.3.2 Topography

The area is isolated hill that exposed in the flat region. The Pya Taung area is mainly occupied by the lowland in the lower course of the Gyaing and low hills with plains on the right bank of Ataran River. These lowlands are built up of fertile alluvial soils carried by the tributaries of Gyaing and Ataran Rivers. These plains are useful for agriculture and are about 15 m above mean sea level. At the junction of the Gyaing and Ataran rivers, the plain is below 15 m. The lowland can be regarded as the economic backbone of the Kyaikmaraw Township.

The highest points of the Pya Taung mountain area are about 190 meter and 290 meter above sea level. The surrounding area of the Pya Taung is mainly covered by cultivated low land area with general elevation about 5 to 6 meters above sea level.

It forms rugged mountains characterized by karstic phenomena and rises as steep crags from the alluvial plains. West of the mountain is occupied by the Ataran River, which flows south to north and enters into the Thanlwin River near north of Mawlamyine City.

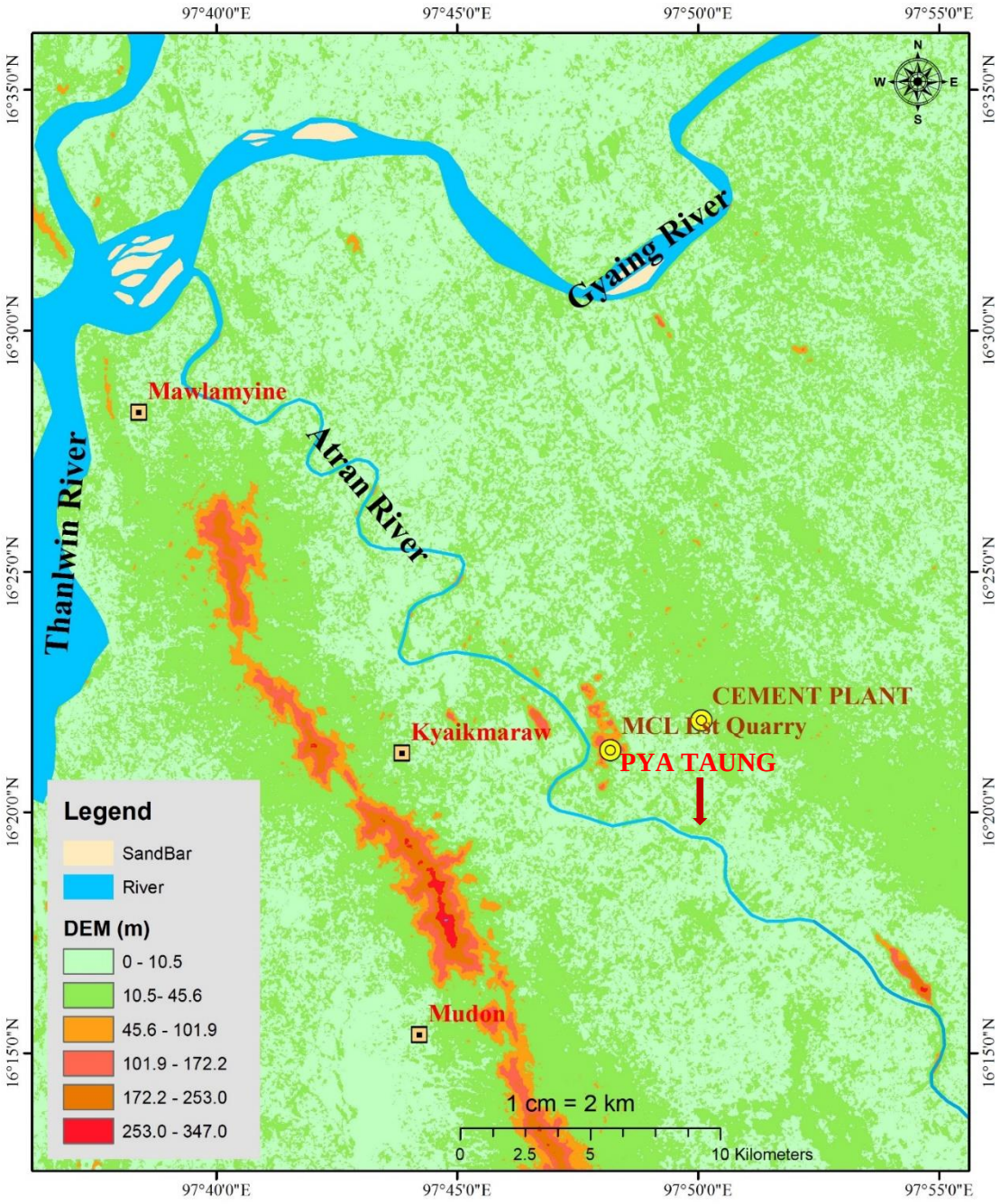


Figure 4.3-2: Topographic Map of Project Area (Digital Elevation Model_30m Resolution)

4.3.3 Regional Geologic Setting

The area is part of the Shan Plateau or Sino-Burman Ranges, extends from the gulf of Mottama into the south to the Mogok Ranges into the North. There are several limestone outcrops trending NNW-SSE along the western foothill of The Tanintharyi range especially between Pa-An to south of Mawlamyine through Dawei into the South. The Pya Taung hill is completely made up of limestone, minor dolomitic limestone and dolomite of the Moulmein Limestone

Group (Permian). Martaban beds and Mesozoic granitoid rocks are exposed at the northwestern part of the area.

The lower boundary of Moulmein Limestone cannot be seen in the area, but previous workers considered Taungnyo Series is overlain by Permian Moulmein Limestone with an unconformity (Bender, 1983). Generally, Pya Taung is trending in NW-SE position and standing on alluvial land. The general strike trend of the rock unit is NW-SE trending and dipping west with average dip amount is between 20° to 40°. In the western and southern parts of the area, the Taungnyo range also occupies with nearly N-S trending position. Martaban beds and Mesozoic granitoid rocks exposed at the northwestern part of the area. These limestones can be correlated with plateau limestone on the basis of stratigraphic position, lithologic similarities and faunlet assemblages (I.G.C.P, 1977).

4.3.4 Climate

Of all the physical factors, climate is one of the most important factors which determine general land utilization and natural vegetation of the area. Kyaikmaraw Township lies in the monsoon region to southern Asia and, therefore, the predominant wind systems are northeast monsoon and Southeast monsoon winds. "Monsoon" refers to the directional shifting of winds from one season to the next usually. The monsoon shifting is from a humid wind blowing from the ocean towards the land in the summer to a day, cooler wind blowing seaward off the land in the winter. A large amount of annual rainfall high temperature and humidity and a small amount of annual range temperature are the main climatic features of this area on the basic of rainfall. The climate can be differentiated into the rainy season and the dry season.

4.3.5 Temperature

Its location within the tropic makes the area suffer high temperature throughout the year. But because of the nearness to the sea, the heat is modified to some extent. The mean temperature for the month of January which is the coldest month of the year is 25.05°C (77.45 °F) and the mean monthly temperature for the hottest month in April is 30.49°C (90.41°F). The heat is intense during the dry period from March to May with above 28°C (82.4°F). The annual mean is 27.39°C (81.30°F). The diurnal range of temperature recorded for the month of December is 14.61°C (58.29°F), and on the other hand, the highest maximum temperature recorded for the month of April is 38.32°C (100.97°F). Monthly maximum, minimum, and mean temperatures of Kyaikmaraw Township (2002-2011) are shown in Table 4.3-2 and Figure 4.3-4). Moreover, temperature in both maximum and minimum temperatures of Mawlamyine Station are provided as below tables.

Table 4.3-2: Daily Maximum Temperature (˚C) of Mawlamyine Station (2007)

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	31.4	32.5	35.8	37.1	38	30.5	26.3	28.8	30.2	30.5	33.8	30.5
2	30.1	31	35.7	36.7	36.2	30.8	26.3	27.5	30	33	34.5	31.5
3	29.7	30.5	35.7	37.1	36	30.1	26.6	29	30	32	33	32
4	30.8	32.2	37.5	38	31.1	30.8	26.3	28.5	29.5	28	32.5	33
5	31.8	31.7	35.8	38.2	25.5	28.5	26.1	27	28.8	27.1	31.7	33.3
6	29.8	33	34.5	36.8	26.9	31	27.2	28.5	30.8	26.6	32.7	33.2
7	33.5	33.2	34	37.5	29.5	28.3	27.5	27.3	29.5	29.4	33.1	34.5
8	32.8	34.1	33.5	37.2	32.6	31.2	28.3	27.2	31	31	32.8	34.7
9	34.2	34	34.3	37	30.5	32.2	27	27	30.4	29.6	32.4	33
10	34	34.8	35.5	36.3	31.5	32.5	29.5	28	29.2	30	33.5	32.8
11	33.2	36	37	37.1	33	31.5	30.5	26.7	26.8	29.9	33.8	34
12	34.3	33.2	36.2	36.4	34	31.2	30	29	27.5	32.2	33.7	33.3
13	34.8	35.5	36.2	34.5	33.7	32.1	29.6	30.2	30	31	35	34.2
14	35.7	35	35	30.1	32.4	30.5	26.9	30.7	31	29.2	35	33.8
15	34.5	34.1	36.3	32.2	30.7	31	27.8	30.3	32	30.8	35	36
16	35	34	34.8	35.1	31	31.2	29	29	31.8	32.3	34.3	34.5
17	35	33.7	34	35.5	31.5	31.5	28	28.2	31.8	33.5	34.5	34.6
18	34.6	35	35	36.4	29.5	31.5	28.5	28.2	30.5	33.5	35	36
19	33.6	35	34.2	37	27.5	33.2	27.8	28.2	27	34.5	33.7	35.5
20	34.3	35.7	34.5	37.6	30.1	33.8	27.2	28.5	28.5	34	35	36.3
21	34.5	36.5	36.2	38.3	28.1	33.5	27	30	26.3	33	34.5	34.8
22	35	36.5	35.1	37.5	28.2	33	28.7	27.8	30	32.8	32.7	33.3
23	35	36.6	36.5	37.6	30.8	34	31.7	30.1	31.2	33.4	32	31.6
24	34.4	35.6	37	37.5	32	31.7	28.2	30	31.2	33.2	31.4	31
25	35.3	35.3	34.3	37.8	32.3	30.5	31.8	27.3	31.5	33	32	31
26	35	35.5	34.3	39.8	31.5	31.4	32.3	30.5	32.6	32.5	32	31.1
27	35	35	36	36	31.8	31.5	33	30.8	29.5	33.5	31.8	32.4
28	33.6	35	35.6	36	32.5	26	33.2	32.2	30.5	34.5	32.5	31
29	31.7		36	36	29.4	30.2	32.6	30.7	29.8	34.5	30.6	31.2
30	32.7		36.5	38.3	30.5	28.2	32.2	30	30	34.2	30.6	33.3
31	32.6		36.7		29.5		29.4	29.8		30.5		34

Source: Department of Meteorology and Hydrology

Table 4.3-3: Daily Maximum Temperature (˚C) of Mawlamyine Station (2008)

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	31.5	28.2	36.2	3.18	29.3	30	26.7	29	31.4	28	27.5	30
2	30	30.7	35.7	34.4	30	29	28	28	30.5	31.8	28	31.2
3	31.2	32.8	36.3	34.8	26.8	30	30	28.8	32.3	31.7	33.3	32.5
4	31.5	33.1	36.2	36.3	27.5	27.6	**29.8**	28.8	31.8	31.8	33.2	32.5
5	32.8	34	35.3	36.8	32	29	**27.5**	26.8	30.3	31	33.5	31.5
6	33.8	34.5	35	37.3	32	27.6	**28**	25.8	29.3	32.6	31	32
7	33.7	35	36.3	33	32.1	29.8	**27**	27.2	28.8	29.6	31	32.7
8	31.7	35.8	37	35.2	32	28.8	**28.5**	26.3	31.8	32	33.6	31.8
9	33.8	34.8	36.2	35.5	30.7	32.2	29.8	27.8	29.5	33.5	32.5	31.5
10	33.5	34.7	35.8	36	30.4	32.4	29.5	26.5	33	35.3	31.8	31
11	33	34.1	35.3	35.5	30.2	32.2	29.5	26.2	31.2	33.5	30.5	31
12	32.8	34.3	36.5	36	31	31.3	29.3	25.5	27.5	32.3	30	31.2
13	33	34	36.8	35.8	28.8	32	28.2	27.5	26.8	34	30	31.8
14	33.7	33	36.3	37	26.5	27	29.5	27.8	29	33.5	29.8	32
15	34	33.2	35.8	36.8	30.3	26.7	28.5	29	28.3	34	31	31.5
16	35	32.5	35.6	36.8	30.7	28.5	30	27.8	29.4	30	33.7	31.5
17	34	32.5	36	36.3	29.8	28	30	28	27.7	33.8	34.5	31
18	35	34	36	36	27.3	30	30.4	27.7	30.6	33.5	34	30.7
19	35	35	35.8	36	26	28	30.5	27.8	28.5	34	32	30.2
20	34.2	34.7	35.3	36.8	29.3	29.2	30	30	27.3	35	33	30.2
21	34	33.3	35.4	37	31.2	30	31.2	29	25.8	32.5	33	31.2
22	34.2	34.3	36.4	36.8	29.1	30.3	26.8	29	26.7	34	34.5	32.2
23	36	35	36	37	31	29.3	26.2	30.5	29	33.8	33.8	32.2
24	35	35.5	35.5	36.8	30.5	31.3	27.3	31.8	30	32.4	34.8	32.8
25	34.7	36	36	34.5	30	30.8	26.6	32	26.8	30.7	35	32.7
26	35.3	36.2	35.7	35	31	28.3	27.5	31	26.8	31.3	33.2	29.8
27	35	37	35.2	32.4	30.7	31	27.1	31.8	28.5	29.8	32.2	31.8
28	28.1	35	36	30.5	30	27.8	26.5	32	30	32.3	31	32
29	32.7	35	36	28	30.5	30.2	28.5	31.5	29.9	32	29.8	32.5
30	32.1		36.3	26	28.9	28	27.5	32.1	31.3	31.3	30	32.8
31	32.5		30.8		29.9		25.7	32.3		29.5		34.1

Source: Department of Meteorology and Hydrology

Table 4.3-4: Daily Maximum Temperature (˚C) of Mawlamyine Station (2009)

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	33	33	37	38.7	34.5	28	27	27	32.2	29.5	34.5	32.3
2	31.8	33	36.5	37.8	35	28.8	27.7	28	31	29.5	33	33.2
3	32	33	35.6	37.5	35	27.8	29.5	29.9	33.5	30.2	31.8	33
4	32.2	33.5	34.6	38.5	33.5	30	29.5	28.9	29.8	31.5	28	33
5	32.5	33	34.5	38	32.8	27.3	27.3	29.9	30	31.8	32.3	32.5
6	32.8	33.5	35	38.5	34	28.7	26.2	27.5	28.7	32	33.4	32.2
7	32.8	34	35	37.8	34.5	29.3	28.8	27.7	31	32.1	35	32.2
8	312.7	34	34.7	37.5	34.5	28.5	27.8	27.7	30.6	32.2	35.3	31.8
9	31.8	35	37.5	28.2	34.7	25.5	29.2	29.8	32	31.8	35	33.5
10	28.8	35.4	37	35	35.1	27	30.2	31	31	32	35	33.3
11	29.3	35.2	37	32	33.5	29.5	31.3	27.6	32.2	31.8	35	33
12	30	33.5	36	31.3	33.5	29.5	30	31.5	32.5	32	36.8	33
13	29.3	32.7	35	35	33.5	30.5	27.5	31.5	31	33	36.2	34
14	29.2	33.5	36.5	31.5	32	31	27.5	35.5	28.5	32	35.2	32.5
15	27.5	32.5	35.8	35.7	31.3	31.5	28.5	35	31.5	31.8	34	33.3
16	29.2	32.8	35.4	36	35	30.3	28.6	36.5	29.5	31.8	35	33.5
17	30.1	34.5	35	31	36.3	31.5	27.5	35.8	30.5	32.3	35.8	33.8
18	31	34.5	32	32.5	35	30.3	26.5	35.3	30.6	30.3	32.7	35
19	31.8	35	36	33.8	32	31	29.2	35.2	31.8	30.2	32.5	35
20	31.5	36.2	36	34	30	28.6	27.8	36	32.5	31.8	32.7	33.8
21	31.2	35.7	36.5	34.3	33	26.5	29.7	36.7	32.5	33.8	31.8	33.5
22	31.3	35.5	35.2	34.3	30	29	29.3	33	31.8	32.2	30.7	33
23	32.7	35.5	36.3	33.8	31.8	28.8	27.8	35	31.2	30.2	30.8	33.5
24	33.2	36.5	35.6	33.3	31.5	31.1	27.9	32.5	31	31.8	34	33.2
25	34.5	37.3	35.7	34.4	30.8	32.2	26.8	33.5	32	33.2	33	38.2
26	33.5	36.5	35.3	32.6	31.5	31.2	27.9	33	29.3	32.5	31.9	33
27	33.3	37.5	35.7	31.8	31.5	28.3	30	33.4	30.8	35.2	33.8	32.2
28	33.2	36	36	31	30	28.3	29.2	34.2	29.5	35	34	32.5
29	33.8		36	31.5	30	29.8	26.8	34	30.2	34.5	34	31.8
30	34		38.6	32.6	30.2	30.5	26.6	33.8	31.5	35.1	33.5	32.8
31	33		38		30.5		26.6	33.8		34.5		33.2

Source: Department of Meteorology and Hydrology

Table 4.3-5: Daily Maximum Temperature (˚C) of Mawlamyine Station (2010)

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	33.5	35.7	35.2	36.8	37	32.8	33.5	31.3	29.9	34.2	30.7	34
2	33.3	35	34.8	37.2	37.8	32.8	31	30.8	32	34.6	31.5	33.8
3	34	35.7	35	38.3	37.3	32.6	32.1	28.8	31	34.2	31.3	33
4	33.8	36	34.5	37.7	37.9	33	31	27.8	30.5	33.6	31.6	33.5
5	34.3	34.8	32.5	38	37.8	33	33	27.3	28.7	33.7	31.6	34.7
6	32.2	35.2	34	37.5	37	33	33.2	28.2	29.3	33.7	31.6	36
7	31	35.7	33.8	38.2	38.5	32.2	32	27.5	30.8	32	32.1	35.2
8	34.5	36.2	35.8	38.3	37.8	31.7	32	27.5	31.8	32.8	32.6	34.5
9	34.4	35.7	36.6	36.6	37.7	29	29.2	30.7	32.5	32.8	33.5	34.2
10	35	36	35.2	36	37.4	33.5	29.8	28.6	32	30.3	34.8	35
11	35	36.5	32.7	36.3	38	31.8	31	30.5	28	31	33.8	26.3
12	35	36.5	35.2	35.2	37.8	30.9	29.7	29.3	29.5	31.2	32.5	27
13	34.4	36.5	34.5	35.2	38.4	32.8	32.1	29.1	30.3	31.3	33.5	31.3
14	35.1	36	34.5	37	38	33	33.5	28.7	29.7	29.3	34.2	29.8
15	33	36.2	36	37.8	38.8	31.1	31.3	31.5	30	30.2	34	27
16	34.1	37.5	32.8	36.8	38.2	31.1	32.3	31.8	28	29.8	34.8	32.3
17	33	35.8	37.8	36.5	39	31.9	30	30.3	30.8	31.7	35.2	26.4
18	32.7	36.5	37.2	36.5	36.8	31.2	30	31.8	32.5	32	35	30.6
19	32.3	36	36.8	35.2	36.3	32.1	30	33	29.5	31.5	35.9	31.8
20	35.2	34.5	35.3	36.5	36.7	33.3	31.2	33.8	30.7	32	35	33.4
21	32.5	34.8	35.8	36.4	33	32.7	31.8	31	30.5	29.3	34.5	33.2
22	35	35.3	36	37.5	34.5	32.8	31.8	28.7	30.1	30.5	34.2	33.3
23	35.2	35	36	37.7	28	30.7	30.2	31.6	31.2	30.7	34.1	33
24	35	34	37.2	37.7	32.8	29	26.3	30.5	31.4	32.5	34.2	32.7
25	35	35	38	37.6	30.3	30.7	30.7	29.6	30.3	32.5	35	32.3
26	34.3	35.6	39	38	30.2	29.8	31.1	29.7	33.2	33.2	34.3	32
27	34.8	35.2	36.2	38.2	32.6	31.5	29.9	30.5	33.7	33.3	34.3	31.5
28	35.3	35.3	36	34.9	33.3	31.8	31.5	28.5	32	34.3	34.2	30.7
29	35		35	35.5	33.8	28.5	29.6	28.5	33	34.7	33.5	30.6
30	36.3		36.3	37.5	31.5	32	31	29.5	34.4	33.8	34.6	31.5
31	35.3		36		32.5		30.5	29.9		30.3		31.7

Source: Department of Meteorology and Hydrology

Table 4.3-6: Daily Maximum Temperature (˚C) of Mawlamyine Station (2011)

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG
1	32.3	37.8	36.2	34.1	31.5	32.8	26.6	26.8
2	32.6	33.5	36	35.2	33	33.1	25.2	30.9
3	33.6	33.3	35.5	35.1	34.9	32.5	27.8	30
4	32.7	33.5	35.8	36	35.2	33.9	31.2	28.5
5	33.7	34.2	37.1	35	33.7	34.2	32	30.3
6	34.9	33.3	36.5	35.8	33.8	31.7	32.6	30
7	32.9	33.5	37	34.9	33.4	31.8	31.6	28
8	31	31.9	35.5	35.2	35.6	31.6	33	28
9	33.3	31.8	35.9	37	27.9	30.8	31	27.5
10	33	33.3	36	34.8	29.1	29.3	27.8	27.8
11	31.1	33.8	37.1	35.7	31	28.9	30.4	26.5
12	31	33.9	36.4	34.4	33.4	30.1	32.1	27.8
13	30.5	32.7	37.1	34.4	32.8	29.6	31.5	30.7
14	30.5	33.7	32.8	34.5	32.1	32.3	29.5	31.3
15	31.7	34.2	30.8	34.4	31	29.9	29	29.9
16	30.8	34	21.4	35.8	32.8	28.1	29.6	30
17	31.3	34.7	20.8	35.2	33.4	30.6	28.3	28.3
18	31.6	34.2	29.5	34.4	31.9	27.2	28.5	27.8
19	31.2	35.5	33.4	34.3	29.2	27.5	28.4	25.2
20	31.5	35.3	34.1	35.4	29.2	27.8	26.8	30
21	31	36.5	33.3	35.6	30.6	27.2	26.5	26.8
22	32.9	36	35	37	30.7	31.2	27	30.5
23	32.8	35.4	31.6	35.8	32.9	30.2	28.5	30.4
24	32.6	35.8	35.4	36.8	30.7	29.1	30.5	31.1
25	32.6	35.8	32.5	27.5	31.8	27.3	31.4	30
26	33.8	36.2	32.8	33.1	32.5	33.1	29.2	31.3
27	33.8	35.5	30.1	33.4	31.2	27.6	30.8	30.1
28	34.2	35.1	26.1	34.9	29.6	27	31	31.8
29	34.7		27	37.2	32	30.8	31.1	29.6
30	33.3		30.9	38	32.5	29.7	30.2	27.3
31	33.3		33.2		32.8		25.8	30.2

Source: Department of Meteorology and Hydrology

Table 4.3-7: Daily Minimum Temperature (˚C) of Mawlamyine Station (2007)

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	16.5	15.5	21.6	25.7	25.2	23.5	23.4	23.8	23.9	24	23	14
2	16.5	16.7	21.2	26	26	23.8	23	21.7	24.3	24.8	23.5	16
3	15.2	15.5	19.8	23.8	25.4	25.1	23.4	23	23	24.8	24.5	16.5
4	15.1	15	20.2	23.6	25.7	24.5	23.5	22.9	23.8	25	23	19.5
5	16.2	15.5	20.3	24	24.2	24.7	23.5	23.5	23.5	23.3	23.8	18.5
6	20.8	16.5	21.8	24.2	24	23.8	23.5	24	23.7	23.5	23.5	19
7	21.5	16.4	19.5	25.7	22.5	24.3	22.5	23.8	22.9	23	22.8	20
8	20	16.2	20.7	26.1	24.8	24.2	23	23.7	24	23.3	20.5	19.6
9	19.8	19	17.5	24	24	25	24.8	24	25.2	23.7	20.5	19.5
10	19	19	16.7	24	26	25.5	23.8	24	24.5	24.3	20.2	20.3
11	18	21.8	16.6	25.8	25.7	26.5	24.6	23.2	23.8	23.6	21	20
12	17	22.2	21	25.5	25.5	24.5	24.2	23.8	23.7	23.8	21	20.5
13	18	22.2	20.8	25.4	25.5	26	24.2	24.5	23.5	23	22.8	20
14	18.5	22	21.7	25.3	26.4	25.1	23.5	24.5	23.7	23.2	23.5	19.8
15	17.5	21.8	21.6	24.8	24.5	25.4	24.2	25	24.1	23.6	23.5	20.5
16	17.2	20.4	24.5	23.9	23.5	25.2	24.5	23	24.9	24.5	23	21.5
17	16.8	20.4	24.5	25.3	23.3	23	24.5	23	25	23.8	22.2	22.5
18	16.6	19.5	24.2	25.4	24.2	23.5	24	23	24.5	24.8	21.5	23
19	16.7	19.5	20.5	25.6	23	25.9	24.5	23.5	24.2	25	21.7	22.7
20	16.5	18.5	23	26.5	23.4	24	23.8	24.5	23.5	23.8	24.2	23
21	14.8	18.2	20	26	23.6	25.3	23.5	24.5	22.5	22.2	21.5	22
22	14.5	20.5	23	27	23.3	24.8	23	23.8	22.5	22.5	23.4	21
23	15.1	20.5	23	27	23.2	24.3	24.6	23.9	22.8	22.8	22.6	20
24	17.5	23.5	21	27	24.1	24	23.5	24	22.9	23.6	23.6	14
25	20.2	23.2	21	27	24	25.1	24.1	25	24	23.5	19.5	16
26	22.7	23.2	23	26.8	25.5	25.3	24	23.8	24.8	21.8	19	17.3
27	22.3	21.9	22.9	27.5	25.1	24.8	25.3	23.8	27.2	22.5	19.6	17.5
28	22.2	21.8	23	24.5	23.4	22	24.9	23.9	24.6	23.4	16.5	17.5
29	21		24	24.7	24.2	24.6	26	25.1	23.5	23.8	16.5	18.5
30	17.5		24	26.6	25	23.8	24.7	24.2	23.5	24.5	15	18.5
31	16		24.5		24.8		23.2	24.1		23.5		19.1

Source: Department of Meteorology and Hydrology

Table 4.3-8: Daily Minimum Temperature (˚C) of Mawlamyine Station (2008)

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	18	22.7	22	21	23	24.5	23	22	24	22	22.3	17.5
2	18.8	22	21	23	23.5	23.2	22	22.5	23.8	22.5	20.5	16.7
3	18.9	21	21.3	23.5	20	23.5	22.7	22.7	23.5	22.5	21.6	16.5
4	16.5	19.6	20.7	24.3	21.7	23	22.5	22.5	23.2	23	21.8	16.6
5	16.5	20	20.5	23	21.5	22.7	22.5	21	22.8	21	22.8	17.3
6	17	17.8	21.5	25	24	23.2	22	22	22.1	22	22	17.5
7	17.3	18	20.5	25	22.8	22.8	21.5	21.3	23.4	22.5	21.8	17.5
8	19	18.3	18.5	24.8	22.7	24	22	22.2	21.8	21.7	22	19
9	19	19.5	21	24.8	23	23	23	21.3	22	21.8	22	17.2
10	17	21.8	22.8	26.5	23.5	25	22	22.2	22.5	22.8	19.5	17
11	17	20.5	21.5	24.7	22.5	25	23	21.7	22.5	23	19	16.5
12	15	20.7	19.4	25	24	24.5	23.8	21.4	22.6	21.2	18.1	15.9
13	16	21	21.5	25	24.8	23.8	22.9	21	21.8	22.6	18	17
14	16	21.7	21.8	25.2	22.7	24.5	22.7	21.6	20.7	22.5	19	16.8
15	16	21.5	23	24.5	23.8	25	23.7	22	22.7	22.5	18	16.5
16	18	19.5	22.2	26	24	23.4	22	22.5	21.8	23	19.5	16.8
17	19.8	18.5	23	26	23.2	23	22.5	22	21	23.5	20	16.8
18	19	16	23.8	26.5	23.2	23.9	22.8	21.9	21.8	23	21.4	15.3
19	20	18	23.8	26.8	21	23.5	23.2	21.9	21.5	23	23	15.3
20	20.1	21	22.6	26	21	22.8	23.5	22.2	22.1	23.5	22.5	14.5
21	19.5	20.5	22.6	26.7	23.7	22.7	24	22.9	21.5	21	21	14
22	17.3	17.5	23	26.8	23.1	22.3	23	22.3	20.5	22	22	16.7
23	17.4	17	22.8	25	23.2	23.3	22	23	20.5	22.4	20.8	17
24	19	19.2	23.4	22.6	24.7	24	21.8	23	21.6	22.5	21.5	17
25	18.8	19.1	22.8	22.2	24.5	25	22	23.6	22	22.8	22.2	18
26	21	18.8	22.8	24.4	24.8	22.5	21.8	23.8	21.6	23	21.5	21
27	22	19	23.4	23.5	23.2	22.7	21.5	23.8	21	22.2	19.8	19.5
28	21.8	22.8	23	24	24.5	22.8	21.5	22.5	22.2	22.8	18.5	18.5
29	22	22.8	23	23.5	24.7	24	21.7	22.7	22.2	22.5	18	18
30	21.3		24	21	24.5	23.7	22.1	22.7	22.3	22	17	16.4
31	21.5		23		23.3		22.2	23		22.2		16.7

Source: Department of Meteorology and Hydrology

Table 4.3-9: Daily Minimum Temperature (˚C) of Mawlamyine Station (2009)

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	19.3	17.2	22.9	23.6	25.2	24	22.3	23	23	24	23.5	18.8
2	20	18.2	23	23.3	25.4	22.5	22.5	23.5	22.8	24	21.5	18.5
3	18.6	19	24	24.5	23.5	23	23.7	23.8	22.5	23.9	22.5	18
4	18	19	23.5	24	23.8	23.8	23.3	24	23	24	22	18.5
5	18	18.8	22.5	24	24.5	23.3	23.8	24	23.5	24.5	21	17.5
6	17	18	22.3	24	24	23.5	22.3	24	23.5	24.5	21.2	17.5
7	17.5	20.5	23	24.4	25.5	22.8	22	24.5	24.5	24.6	22.8	17.3
8	16.8	21	20	24.8	26.5	24.5	23	23	24.3	25.2	23.3	17
9	15.8	20.5	20.8	25	27	23.5	23.2	22.8	24.5	24.7	23.8	16.5
10	16.2	20.5	20.5	24	26.8	22.5	22.3	23.7	24.6	24	23.7	17.5
11	13.6	19.5	20.8	24.8	24.5	23	24.2	23.7	24.6	24	24.3	20
12	13	19.5	21.7	25	24.3	23.8	23	23.7	25	24.3	24.2	19.5
13	13	21	22	25	22.7	23.5	22.5	23.7	25.7	25	24.2	20
14	16.5	18.5	22	24.5	23.8	24.2	22.5	24.5	24.5	25	24.5	19.6
15	16.5	18.5	23	24.5	24.5	23.2	22.7	25.3	24.3	24.8	24.6	19.5
16	16.5	20.5	23.4	25	25.3	23.8	23	25.5	24.5	25	23.5	19.8
17	11.5	21	24	24.2	25	23.5	22.8	25.9	24.3	24	24.5	19.8
18	11.4	21.5	22.5	23.8	24.6	24.2	22.9	25.3	24.3	23.5	23.5	21
19	13	22.8	22	24	25.5	24.6	22.3	25.2	24.6	24.3	22.8	22.3
20	13	23	22.9	25.5	24.3	24.3	23.5	24.3	24.2	24.5	20.5	21.5
21	14.5	22	23.5	25.8	24	23.2	23	24.7	24	24.5	20.5	21.3
22	17	22	23.5	23.5	25	23	23.8	25.5	24.8	24.5	20.5	19
23	15.5	21.7	23.6	24	22.3	24	22	24.8	23.5	25	19	19
24	16	20.5	23.6	25.2	25	22.2	22.2	25	24.5	24.5	18	19.3
25	18.5	20.7	24.4	26.8	24.3	23.5	20	24.8	24.3	24.5	18.6	18.5
26	18.3	20.8	24.5	26.8	23.8	24.2	22.8	23.7	22.8	25	19.6	19
27	18.1	22.7	22.8	23.8	22.8	23.2	22.8	24	22.8	25	18	19
28	17	22.7	22.8	24	23	23.5	24.4	24.5	23.5	24.5	19	19.5
29	16.8		23	24.5	23.5	23.5	23.5	24.9	23.8	23.7	19.5	19.5
30	18.3		24	24.5	23.4	24	24	24.8	24.2	23.5	20.5	18.3
31	18.2		24		24		23.5	24.2		23.5		18

Source: Department of Meteorology and Hydrology

Table 4.3-10: Daily Minimum Temperature (˚C) of Mawlamyine Station (2010)

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	18	19.5	20.2	24	26.5	24.3	24.5	23.7	24	24	20.6	21.5
2	17.5	19.5	20	25	25.7	23.7	25.5	25	24.8	25.2	19.7	20.6
3	18.5	19	19.7	25.5	26.5	24.3	25.9	23.8	24.5	25.2	19.2	22.5
4	18.5	21.3	20.5	25.5	26.6	26.3	25.5	23	24.5	25.5	19	22.6
5	20	21.3	22.5	25.7	27.5	24	25	23.3	24.5	25.9	21.5	22.6
6	20	18	22.5	26.7	27	27	25.5	23.8	24.8	25.7	21.8	22
7	22.6	18.7	22.5	25.7	28.2	25.2	24.8	23.5	23.9	24.1	21.4	22.5
8	23	18.5	21.5	25	26.6	25.2	25	24	23.9	24.3	21	23
9	22.2	19	25.1	25	28.1	25.7	24.5	25.1	25	24.9	21.5	21.8
10	20.5	20.2	24.5	26.5	27.5	25	24.5	24.7	23.8	23.5	20.5	21.8
11	20.5	20.3	24.5	24.8	27.5	25.5	24	25.2	23.4	23.5	21.5	22.5
12	21	19.7	24.2	26	28.5	24.5	24.5	25	23.5	23.8	23	23
13	21	19.1	22.8	25.8	26.5	24	24.3	24.1	24	24.5	23	21
14	21	18.7	22.7	25.4	27.5	25	24.3	24	23.3	24.2	24	19.6
15	21	18.6	23.8	24.8	27.5	24.8	25	23.3	23	22.5	22.8	19.5
16	20.8	18	24	22.5	28	24.6	25.5	23.3	23	23	22.8	19.8
17	20	21.5	25	25	25.5	23.8	25.3	25	23.5	23.5	22.2	23.2
18	18.3	22.2	23.2	25	25.8	25.3	24.8	24.5	24	25	22.5	20.8
19	18	22.3	25.5	25	26	24.9	24.9	24.5	24.3	24	22.7	20
20	17	23.5	22.5	25.8	23.8	25.3	25	25	24.7	23.7	23.5	21.5
21	17	19.5	24	26.8	27.5	24.8	24.5	24.2	24.5	23.2	22.5	20.5
22	22.5	19	23.5	27	24.5	25	24.5	23.8	24.9	23.3	22.8	19.8
23	21.3	17.6	22.5	27	24.5	25	24.3	24.1	24	23.8	22	19.2
24	23.3	17.7	23	27.2	24.3	25	23.8	23.6	24.8	22.8	22.3	20.8
25	22.5	19.6	22.7	25.2	24.2	24.5	23.5	22	23.9	23.3	21.5	18.2
26	22.2	20.7	22	27.5	22.2	24.5	23	23.7	24.3	24.5	21.5	17
27	22.8	20.5	22.2	27	24	25	23.3	24	24.8	23.5	21.5	17
28	21.5	19.7	24.5	23.2	25.8	26	24.7	23.4	24.5	22.7	21	16.8
29	20.8		22.5	25.3	24.8	24.8	24.8	23	24.3	22.3	23.5	17.3
30	20.8		22.5	25	24.5	24.5	24.7	22.8	23.7	22.3	21.5	16.7
31	21		23		25		23.7	24.5		20		17.8

Source: Department of Meteorology and Hydrology

Table 4.3-11: Daily Minimum Temperature (˚C) of Mawlamyine Station (2011)

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG
1	18	22.3	23	20.5	23.6	25.5	25.2	24.8
2	17.2	19.3	24.5	22	24.3	23	23.5	24.5
3	17.2	19.5	24.5	21.9	24.7	26.1	22.8	24.3
4	19	19.2	24	22	24.6	25.8	23.3	23.5
5	19.8	18.1	22.8	22.2	25.3	25.1	24.2	24
6	19.3	17.5	24	24.5	24.5	26.3	24.4	24
7	19.3	17	22.5	25	24.4	26	25	23.3
8	20.5	17.3	23	24.4	24.5	23.9	24.5	23.5
9	21.5	15.8	23.3	24.2	24.3	23.8	23.8	23.5
10	22.3	16.5	22.5	22.1	24.2	24.5	23.2	22
11	21.8	17.4	21.7	22.8	22.7	24	23.7	23.2
12	20	17.5	22	25	23.2	23.6	24.8	24.3
13	17.7	18.5	24.5	23.7	24.7	23	24.5	23
14	16.8	17.2	23.5	23.3	23.6	24	23.8	23.8
15	17.5	19	23.7	25	24.3	24	23.2	24.3
16	17.6	19.5	19.8	24.8	24.3	23	24	24.2
17	19.5	19.5	16.2	24.9	25	24.5	23.9	23.5
18	18.9	21	16	24.5	25.2	23	24	23.5
19	18.2	21.3	20.7	25.2	22.7	24.2	24	23
20	16.5	21.3	20	25	22.1	23.8	23.8	23.2
21	15.8	21.7	20.8	25.2	24	23.8	23.2	23.5
22	17	23.2	19.9	25	24	23.3	23	23
23	17	22.1	21.8	26.2	23.8	23.5	22.5	23.5
24	18.5	21.5	21.6	24.3	24.4	25.3	23.5	23.8
25	19.2	21	23	24.3	24.9	23.5	24.3	23.9
26	19.8	24	23.8	24.5	24.2	24.3	24.5	24.7
27	19.5	23	23.9	23.5	24.3	24	23	23.5
28	21.7	23	22.5	25	24.3	23.8	24.5	23.3
29	22.5		19.1	24.5	23.7	24.5	24.2	24.2
30	23.9		20	24.6	24	25.8	25.2	24
31	23.3		21.2		24.2		24.5	23.5

Source: Department of Meteorology and Hydrology

4.3.5.1 Regional Climate Classification of the Project Site

According to these informative data of temperature range throughout the year, the climate is tropical in Mawlamyine region. There is significant rainfall in most months of the year. The short dry season has little effect on the overall climate. This climate is considered to be **Am** according to the Köppen-Geiger climate classification. The average temperature in Mawlamyine is 26.8 °C.

Am means Tropical monsoon climate; driest month (which nearly always occurs at or soon after the "winter" solstice for that side of the equator) with precipitation less than 60 mm (2.4 in), but more than 4% the total annual precipitation.[9]

With an average of 29.8 °C, April is the warmest month. January has the driest and lowest average temperature of the year. It is 24.3 °C. During the year, the average temperatures vary by 5.5 °C.[10]

4.3.6 Rainfall

Rainfall is not evenly distributed throughout the year but therefore is distinct in dry season for about four months where monthly rainfall amounts are less than 1" (25.4mm). The rain comes in with the beginning of southwest monsoon wind when the southwest monsoon wind carries moisture while crossing the Andaman Sea. There is only a maximum in the month of July during the year. The annual rainfall received is over 500mm. January, February and March are the driest months and July has the highest monthly rainfall with 1245.53 mm. A large amount of rain occurs from May to October, Table (4.3-12) and Figure (4.3-4). There were 139 rainy days in 2011. Good rainfall in the late of monsoon season, especially December and January usually destroy the staple good crops for people. However, it happens rarely with coming of northeast monsoon wind in November. Dryness begins and lasts till May of next year. Stronger northeast winds indicate the drier nature of the weather. Total annual rainfall of Kyaikmaraw Township (2002-2011) is shown in Table 4.3-22. So, it enjoys Tropical Monsoon (Am) climate.

[9] *Chen, Hans; Chen, Deliang. "Köppen climate classification". hanschen.org.* Retrieved 2017-08-04.

[10] https://en.climate-data.org/location/1003326/

Table 4.3-12: Daily Rainfall (mm) of Mawlamyine Station (2007)

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	0	0	0	0	22	24	83	6	20	5	Trace	0
2	0	0	0	0	Trace	0	59	84	6	Trace	0	0
3	0	0	0	0	Trace	0	134	44	22	1	0	0
4	0	0	0	0	1	5	111	22	47	4	8	0
5	0	0	0	0	52	22	195	67	65	107	Trace	0
6	0	0	0	0	251	44	82	30	30	177	0	0
7	0	0	0	0	38	81	42	22	35	45	0	0
8	0	0	0	0	5	Trace	12	84	0	8	0	0
9	0	0	0	0	0	8	3	81	22	0	0	0
10	0	0	0	0	0	0	50	76	4	Trace	0	0
11	0	0	0	0	3	3	8	163	44	3	0	0
12	0	0	0	0	11	9	11	48	61	2	0	0
13	0	0	0	Trace	Trace	14	10	11	7	87	0	0
14	0	0	0	1	16	23	161	2	0	0	0	0
15	0	0	0	5	25	7	68	2	3	5	0	0
16	0	0	0	0	5	0	40	19	0	0	0	0
17	0	0	0	0	20	34	24	65	3	Trace	0	0
18	0	0	0	0	23	12	18	34	10	Trace	0	0
19	0	0	0	0	19	Trace	22	13	5	0	0	0
20	0	0	0	0	63	30	17	0	87	0	0	0
21	0	0	0	0	37	13	42	2	45	0	0	0
22	0	0	0	Trace	51	4	4	75	13	0	0	0
23	0	0	0	0	34	25	Trace	2	Trace	0	0	0
24	0	0	0	0	21	11	2	19	Trace	0	Trace	0
25	0	0	0	0	1	5	3	7	6	0	0	0
26	0	0	0	0	8	1	0	23	0	0	0	0
27	0	0	0	0	4	68	2	1	2	0	0	0
28	0	0	0	Trace	7	170	0	2	0	0	0	0
29	0		0	Trace	11	13	0	3	8	0	0	0
30	0		0	0	5	20	1	14	1	0	0	0
31	0		0		6		23	20		0		0

"Trace" The amount of rainfall which cannot be measured.
Source: Department of Meteorology and Hydrology

Table 4.3-13: Daily Rainfall (mm) of Mawlamyine Station (2008)

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	0	Trace	0	10	236	8	38	15	0	50	12	0
2	0	7	0	1	Trace	25	49	27	Trace	0	8	0
3	0	0	0	Trace	227	22	3	6	36	0	0	0
4	0	0	0	0	38	18	22	16	2	2	0	0
5	0	0	0	0	2	17	43	43	20	27	0	0
6	0	0	0	0	0	64	77	135	14	0	23	0
7	0	0	0	0	15	50	38	123	8	5	5	0
8	0	0	0	0	4	7	90	59	54	3	0	0
9	0	0	0	Trace	18	14	20	67	2	0	0	0
10	0	0	0	0	27	1	44	44	35	Trace	0	0
11	0	0	0	0	14	0	19	82	3	0	0	0
12	0	0	0	0	6	2	7	54	19	26	0	0
13	0	0	0	0	4	8	62	138	87	0	0	0
14	0	0	0	0	28	124	56	5	58	0	0	0
15	0	0	0	0	10	37	5	24	22	0	0	0
16	0	0	0	0	21	26	29	17	33	0	0	0
17	0	0	0	0	26	76	27	24	8	Trace	0	0
18	0	0	0	0	60	21	3	63	0	0	0	0
19	0	0	0	0	238	23	48	6	31	0	0	0
20	0	0	0	0	8	54	15	3	10	0	0	0
21	0	0	0	0	Trace	14	2	16	65	52	0	0
22	0	0	0	0	9	28	63	40	31	0	0	0
23	0	0	0	5	1	16	58	3	13	6	0	0
24	0	0	0	45	4	7	102	0	22	Trace	0	0
25	0	0	0	22	9	3	72	0	89	0	0	0
26	0	0	0	0	Trace	36	67	1	63	10	0	Trace
27	0	0	0	0	25	40	124	4	46	18	0	Trace
28	19	0	0	12	18	60	55	4	21	3	0	0
29	10	Trace	0	13	10	7	206	0	0	39	0	0
30	0		0	152	10	39	53	9	Trace	41	0	0
31	0		Trace		55		85	0		15		0

"Trace" The amount of rainfall which cannot be measured.
Source: Department of Meteorology and Hydrology

Table 4.3-14: Daily Rainfall (mm) of Mawlamyine Station (2009)

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	0	0	0	0	0	77	110	81	46	42	0	0
2	0	0	0	0	0	25	32	9	54	6	0	0
3	0	0	0	0	0	78	11	7	39	62	0	0
4	0	0	0	0	3	20	42	11	42	3	Trace	0
5	0	0	0	0	1	27	30	136	18	2	0	0
6	0	0	0	0	0	80	86	14	84	38	0	0
7	0	0	0	0	0	71	12	135	34	0	0	0
8	0	0	0	0	0	34	1	59	19	4	0	0
9	0	0	0	0	Trace	83	17	112	11	2	0	0
10	0	0	0	6	0	187	39	51	2	27	0	0
11	0	0	0	0	Trace	28	30	14	6	0	0	0
12	0	0	0	3	Trace	23	84	11	0	40	0	0
13	0	0	0	1	34	27	169	9	5	0	0	0
14	0	0	0	4	0	4	206	3	46	Trace	0	0
15	0	0	0	14	0	13	43	7	9	Trace	0	0
16	0	0	0	0	Trace	21	16	0	9	0	0	0
17	0	0	0	21	0	15	71	0	6	13	0	0
18	0	0	2	23	1	9	70	2	5	7	12	0
19	0	0	1	5	0	19	95	0	0	Trace	Trace	0
20	0	0	0	2	36	64	50	3	6	0	0	0
21	0	0	0	0	0	63	34	0	1	5	0	0
22	0	0	0	2	7	18	5	5	0	0	0	0
23	0	0	0	8	47	30	7	25	22	Trace	0	0
24	0	0	0	6	2	60	96	Trace	6	0	0	0
25	0	0	0	0	15	0	25	49	17	0	0	0
26	0	0	0	0	22	1	56	0	41	0	0	0
27	0	0	0	0	48	57	12	0	42	0	0	0
28	0	0	0	3	70	41	10	0	31	0	0	0
29	0		0	4	5	21	72	Trace	Trace	0	0	0
30	0		0	Trace	8	2	83	24	2	0	0	0
31	0		0		38		96	15		0		0

"Trace" The amount of rainfall which cannot be measured.
Source: Department of Meteorology and Hydrology

Table 4.3-15: Daily Rainfall (mm) of Mawlamyine Station (2010)

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	0	0	0	0	0	15	0	5	9	2	0	
2	0	0	0	0	0	81	14	0	6	0	0	0
3	0	0	0	0	0	15	1	61	5	0	0	0
4	0	0	0	0	0	8	11	108	19	Trace	0	0
5	0	0	0	0	0	23	3	39	48	0	0	0
6	0	0	0	0	0	5	0	8	13	Trace	0	0
7	Trace	0	0	0	0	4	Trace	98	2	18	0	0
8	Trace	0	0	0	4	11	24	174	Trace	0	0	0
9	0	0	0	0	0	7	22	32	11	18	0	0
10	0	0	0	0	0	Trace	63	30	30	1	0	0
11	0	0	0	0	0	4	41	10	3	7	0	104
12	0	0	0	0	0	26	12	1	21	3	0	48
13	0	0	0	0	0	26	57	60	5	1	0	2
14	0	0	0	0	0	10	Trace	8	21	11	0	0
15	0	0	0	0	0	1	4	27	6	1	0	0
16	0	0	0	0	0	19	10	12	3	0	0	0
17	0	0	0	0	Trace	48	4	19	0	8	0	3
18	0	0	0	0	Trace	9	30	13	11	Trace	0	0
19	0	0	0	0	0	1	11	7	2	24	0	0
20	0	0	Trace	0	Trace	0	8		Trace	0	0	0
21	0	0	0	0	Trace	11	5	35	19	5	0	0
22	0	0	0	0	18	3	56	41	6	5	0	0
23	0	0	0	0	37	4	26	3	22	8	0	0
24	0	0	0	0	11	32	98	21	3	9	0	0
25	0	0	0	0	30	11	43	40	0	Trace	0	0
26	Trace	0	0	0	73	46	20	31	0	0	0	0
27	0	0	0	0	7	8	Trace	20	0	0	0	0
28	0	0	Trace	20	Trace	Trace	2	43	0	0	0	0
29	0		3	0	3	7	20	118	0	0	0	0
30	0		Trace	Trace	34	26	64	50	13	Trace	0	0
31	0		0		10		21	26		Trace		0

"Trace" The amount of rainfall which cannot be measured.
Source: Department of Meteorology and Hydrology

Table 4.3-16: Daily Rainfall (mm) of Mawlamyine Station (2011)

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG
1	0	Trace	0	0	10	1	13	123
2	0	0	0	0	6	1	79	56
3	0	0	0	0	3	0	66	40
4	0	0	0	0	0	Trace	7	67
5	0	0	0	0	1	1	5	49
6	0	0	0	0	1	2	1	13
7	0	0	0	0	2	Trace	22	61
8	0	0	0	0	Trace	16	0	69
9	0	0	0	0	32	20	63	95
10	0	0	0	17	40	29	85	38
11	0	0	0	0	97	86	45	33
12	0	0	0	0	1	78	0	61
13	0	0	0	0	1	28	1	19
14	0	0	0	0	1	11	13	Trace
15	0	0	Trace	0	1	40	45	Trace
16	0	0	0	0	14	64	25	23
17	0	0	0	0	1	31	35	26
18	0	0	0	0	8	148	107	46
19	0	0	0	0	96	88	59	130
20	0	0	0	0	77	35	145	77
21	0	0	0	0	28	7	146	74
22	0	0	0	0	91	43	39	7
23	0	0	0	0	10	59	58	7
24	0	0	0	0	7	26	33	3
25	0	0	Trace	Trace	21	67	4	78
26	0	0	0	10	29	46	0	15
27	0	0	0	0	4	35	Trace	114
28	0	0	Trace	0	20	16	3	0
29	0		Trace	0	23	24	Trace	6
30	Trace		0	0	0	Trace	Trace	36
31	Trace		0		0		55	44

"Trace" The amount of rainfall which cannot be measured.
Source: Department of Meteorology and Hydrology

The rainfall in Mawlamyine region is 4 mm of precipitation in the driest month, January. With an average of 1253 mm, the most precipitation falls in August. The precipitation varies 1249 mm between the driest month and the wettest month.[11]

[11] https://en.climate-data.org/location/1003326/

4.3.7 Relative Humidity

The relative humiliation of Mawlamyine Station is provided in following tables.

Table 4.3-17: Relative Humidity (%) at (09:00) hrs: M.S.T of Mawlamyine Station (2007)

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	73	40	65	61	61	84	100	92	84	84	59	67
2	74	32	77	61	54	84	100	91	84	71	65	58
3	65	35	63	59	65	79	100	92	92	84	70	59
4	66	39	100	61	84	84	100	83	84	92	83	54
5	82	65	64	65	100	100	100	100	92	100	77	60
6	59	58	65	53	92	85	100	92	84	100	57	67
7	54	65	63	66	100	100	92	92	92	92	59	61
8	50	65	63	54	92	85	100	100	79	84	63	68
9	42	54	62	61	79	85	92	100	92	84	63	62
10	48	54	47	55	71	79	92	93	84	79	54	69
11	66	48	50	59	71	93	84	100	100	84	59	69
12	60	84	63	49	79	93	92	93	100	84	59	68
13	67	70	57	65	84	85	92	93	84	92	70	67
14	67	92	56	84	65	100	100	85	92	84	59	61
15	54	77	65	65	92	92	100	93	93	84	65	62
16	59	77	65	71	79	79	100	93	84	77	59	57
17	59	63	70	65	85	92	93	100	84	71	63	70
18	60	70	65	72	84	92	92	92	92	70	70	64
19	60	69	76	54	84	78	100	92	92	79	59	70
20	54	77	77	66	92	85	93	92	92	70	59	70
21	52	62	51	61	92	78	100	100	100	64	64	70
22	52	76	64	54	100	71	92	92	83	70	63	77
23	58	70	46	54	93	79	84	84	84	70	50	91
24	67	77	65	61	84	85	92	92	84	77	48	82
25	69	77	65	66	93	92	84	92	92	64	56	66
26	76	65	70	79	93	79	79	92	84	70	61	74
27	70	70	65	52	85	100	71	84	92	70	61	68
28	50	65	70	76	84	100	79	84	79	70	60	83
29	45		71	72	100	85	71	84	92	71	47	66
30	34		65	55	84	92	79	92	84	79	53	74
31	29		61		92		92	84		77		68

Source: Department of Meteorology and Hydrology

Table 4.3-18: Relative Humidity (%) at (09:00) hrs: M.S.T of Mawlamyine Station (2008)

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	42	76	70	83	92	84	100	100	85	100	100	47
2	59	83	64	77	65	100	92	100	79	84	92	47
3	40	83	70	77	100	92	84	92	71	93	84	60
4	40	76	53	59	100	100	92	100	85	85	70	66
5	66	76	45	65	84	92	100	100	92	84	79	70
6	47	61	63	64	70	100	100	100	100	93	92	61
7	61	61	62	77	79	84	100	100	84	84	92	54
8	68	54	56	65	84	92	100	100	79	85	85	68
9	68	64	59	65	79	79	100	92	84	71	84	61
10	66	77	59	71	84	71	100	92	85	79	50	76
11	74	70	59	61	77	79	92	100	79	71	54	60
12	74	70	62	71	84	84	84	100	100	92	54	60
13	82	63	63	65	77	85	92	100	100	71	54	66
14	82	65	59	66	92	100	92	100	92	79	54	67
15	61	70	79	66	84	92	92	84	100	71	54	61
16	67	70	65	65	84	100	93	92	100	85	63	60
17	54	83	59	66	92	100	92	92	92	71	70	60
18	68	74	65	66	100	92	84	100	92	65	71	73
19	68	54	65	66	100	100	93	92	100	65	59	59
20	61	63	84	61	92	92	92	84	92	71	53	58
21	54	69	70	66	77	92	84	92	100	84	59	65
22	66	50	71	66	100	100	100	100	92	71	64	59
23	61	54	71	84	79	100	100	84	92	84	64	54
24	54	60	79	71	71	84	92	79	92	84	65	54
25	67	48	65	77	92	85	100	84	100	79	59	67
26	56	54	65	70	79	100	100	85	100	84	46	76
27	69	56	71	71	92	92	100	92	93	92	46	67
28	100	57	65	70	92	100	100	84	85	79	54	68
29	83	77	71	92	93	92	100	79	84	79	76	76
30	83		59	100	92	100	100	79	77	92	76	66
31	77		64		100		100	71		92		67

Source: Department of Meteorology and Hydrology

Table 4.3-19: Relative Humidity (%) at (09:00) hrs: M.S.T of Mawlamyine Station (2009)

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	54	83	92	49	71	100	100	100	84	100	71	68
2	62	60	55	54	71	100	92	92	84	93	46	54
3	54	83	79	54	61	93	92	93	84	92	46	54
4	54	83	71	56	79	92	92	93	84	79	61	54
5	74	67	77	50	71	92	100	93	93	78	57	50
6	61	54	65	51	66	92	100	100	100	79	59	60
7	61	68	71	55	71	93	92	100	100	84	65	74
8	54	68	70	61	72	100	92	100	92	100	71	83
9	54	76	83	55	79	100	85	100	92	85	71	67
10	45	63	92	92	71	100	92	92	84	85	71	74
11	50	76	65	61	84	92	93	100	70	85	71	76
12	50	77	70	71	79	84	100	93	79	84	85	68
13	36	69	70	79	84	92	100	100	84	79	72	67
14	36	76	79	92	84	84	100	92	100	79	100	69
15	42	77	46	71	71	84	92	85	85	79	72	76
16	42	77	70	71	71	92	92	85	100	79	71	68
17	44	77	84	100	85	79	100	80	84	79	92	76
18	65	84	92	100	79	85	100	73	84	84	100	69
19	51	84	64	85	71	84	100	73	85	79	64	64
20	65	84	71	71	92	100	100	79	71	79	56	57
21	60	71	70	71	71	100	92	72	71	71	57	56
22	54	65	65	79	92	84	92	92	79	79	54	62
23	66	71	71	71	83	100	92	85	92	84	60	61
24	60	83	70	79	84	84	92	85	84	79	62	76
25	67	92	71	79	92	71	92	92	93	79	68	76
26	63	83	71	79	92	92	92	79	92	85	76	70
27	68	84	61	71	100	100	92	71	92	79	68	68
28	67	70	61	100	100	92	92	79	100	71	68	76
29	91		61	92	92	92	100	85	84	71	56	69
30	76		71	84	84	79	100	93	79	71	62	76
31	67		61		92		100	85		71		67

Source: Department of Meteorology and Hydrology

Table 4.3-20: Relative Humidity (%) at (09:00) hrs: M.S.T of Mawlamyine Station (2010)

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	61	56	59	54	62	84	78	84	85	85	54	63
2	60	63	53	66	56	100	93	84	92	85	50	56
3	54	56	64	66	62	79	79	100	85	79	44	51
4	54	64	53	62	61	93	78	100	85	61	50	50
5	68	77	77	62	56	84	79	92	100	64	50	63
6	70	76	59	62	61	100	72	84	79	79	56	56
7	83	76	71	61	61	85	79	92	79	84	63	64
8	84	68	65	62	72	100	85	100	79	79	70	53
9	70	69	65	56	56	93	92	85	100	100	59	56
10	64	57	79	62	56	71	85	92	100	85	51	64
11	70	56	61	55	52	84	79	84	84	92	57	100
12	65	56	72	61	56	85	85	79	93	85	56	92
13	70	59	71	61	62	85	84	84	92	84	59	76
14	69	45	65	61	62	71	79	84	83	100	65	67
15	70	59	65	61	62	71	100	77	92	70	59	83
16	69	68	84	66	62	92	85	84	77	83	70	83
17	56	69	79	66	56	84	84	84	84	79	65	92
18	54	71	54	56	61	79	79	84	100	79	59	61
19	69	71	72	55	56	84	93	79	84	92	65	68
20	66	71	61	61	85	79	85	71	85	71	59	70
21	61	69	66	61	71	100	79	84	100	79	70	76
22	70	83	71	55	85	78	100	100	79	100	84	68
23	77	83	61	56	100	93	84	71	84	92	92	68
24	65	70	59	56	79	93	92	100	79	85	70	92
25	70	76	54	61	100	84	84	84	84	79	70	76
26	83	70	54	44	92	100	79	92	71	85	70	74
27	70	65	49	67	65	78	85	84	77	71	64	60
28	92	92	83	65	72	78	79	92	71	71	57	59
29	62		82	67	71	84	100	84	71	59	63	65
30	54		61	62	100	79	92	92	79	50	63	65
31	56		61		92		92	92		56		59

Source: Department of Meteorology and Hydrology

Table 4.3-21: Relative Humidity (%) at (09:00) hrs: M.S.T of Mawlamyine Station (2011)

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG
1	66	53	71	70	92	71	92	100
2	74	67	71	70	85	79	100	93
3	66	76	71	79	72	72	84	100
4	76	60	71	71	78	78	84	92
5	67	66	71	79	93	79	79	93
6	67	67	84	92	79	93	79	93
7	56	66	70	71	72	79	92	100
8	63	60	71	71	71	85	85	92
9	56	82	71	71	100	93	85	100
10	62	74	83	84	100	84	92	100
11	83	76	70	71	100	100	85	100
12	83	76	70	83	79	92	79	100
13	91	70	65	71	79	84	92	84
14	100	68	77	71	79	85	84	79
15	91	76	83	79	79	84	100	92
16	59	56	100	71	66	100	84	84
17	52	84	100	79	79	92	93	84
18	61	70	69	72	79	92	92	92
19	82	69	67	72	100	100	92	100
20	82	77	77	71	92	100	100	92
21	73	83	70	79	84	92	100	100
22	74	70	77	66	92	92	100	92
23	67	77	77	72	85	93	92	92
24	74	70	79	71	85	93	84	84
25	67	77	84	92	85	100	85	100
26	67	84	64	79	84	100	84	92
27	74	71	77	71	79	100	79	93
28	57	70	82	79	84	100	84	85
29	64		73	71	84	84	93	92
30	67		59	61	78	93	96	100
31	54		56		72		100	92

Source: Department of Meteorology and Hydrology

4.3.8 Regional Hydrology

The Ataran River is the main river of the township. The Ataran River is formed by the Zami and Winyaw streams near Chaunghnakhwa Village. It flows from south to north and enters the Thanlwin River.

Its numerous tributaries are Damathat, Ulay, Khanaung, Phanon, Kyaikparan, MagyiChaung, Mekaro, Kadonsi, Pharthein and Daungdin creeks. Most of the tributaries join the Ataran River. They flow the Taungnyo Range watershed in the west and Dawna Range watershed in the east.

The drainage patterns provide the natural irrigation for winter crops. Small creeks are used to supplement the natural rainfall in post monsoon. The land around the creeks can be used for double cropping.

Ataran River information survey

The Depth: Average 12-14 m.
The Width: Average 100 m.
Water flow – 0.3 to 0.4 m/s

Table 4.3-22: The Monthly Climate Data in Mawlamyine Township (2002-2011)

Month	Rainfall (mm)	Rain days	Temperature		
			Maximum ˚C	Minimum ˚C	Mean ˚C
January	5.02	1	34.7	15.4	25.05
February	0.74	1	36.58	17.39	26.98
March	10.92	1	37.29	18.82	28.05
April	56.24	4	38.32	22.66	30.49
May	659.84	19	35.77	22.46	29.11
June	1014.4	26	32.34	22.57	27.45
July	1245.53	26	31.49	22.28	26.88
August	1207.74	27	32.11	22.34	27.22
September	657.04	23	32.9	22.44	27.67
October	199.93	9	34.71	22.93	28.82
November	6.96	1	34.07	18.57	26.32
December	15.77	1	34.9	14.61	24.75
Total Average	5080.13	139	33.8	20.21	27.39

Source: Meteorology and Hydrology Department

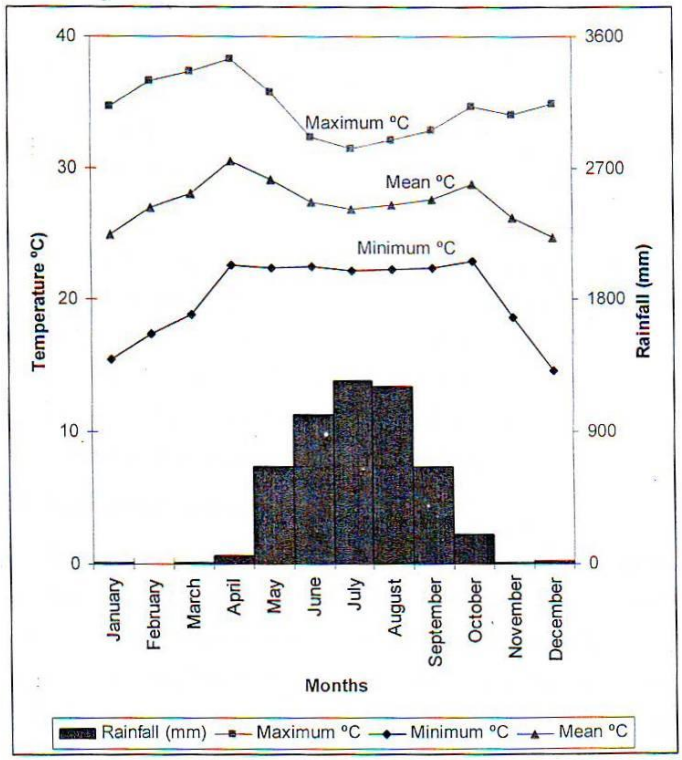


Figure 4.3-3: Climograph of Mawlamyine Township (2002-2011)

4.4 Overview of Existing Biological Environment

With the total land extent of 676,552 square kilometers (261,218 sq miles), Myanmar is located between Latitude 9▫28" and 28▫29" North and Longitude 92▫ 10" and 101▫ 10" East, and a largest country in mainland South East Asia sharing its international boundary with People Republic of China in the North and North East, Lao in the East, Thailand in the South East, Bangladesh and India in the West. Approximately, the estimated length from North to South is 2100 km while it is widened 925 km from East to West. Physical geography of Myanmar is structurally complex and diverse having the topography of steeper mountain ranges, upland plateau and hill valleys in the eastern, northern and north western regions while undulated central dry zone is surrounded by western coastal range and lowland deltaic region at the lower part of the country and narrower coastal strip is formed at further south adjoining with the peninsular Thailand.

Industrial projects in any given planning region must learn to respect the ecological integrity and biodiversity values of that region as these are going to be the determinants of environmental quality 'as well as the sustainability of development interventions. While some tradeoffs with these values may be inevitable, it is now widely recognized that the measure of resulting environmental degradation will be an inverse indicator of sustainability. Sustainable development is one that meets the needs of present, without compromising the ability of the future generations to meet their needs (Brundtland 1992). In practice, industrial development is often accompanied by significant adverse impacts on all or different components of the environment. For all potentially impacting development projects like multipurpose hydroelectric projects, thermal power plants, fertilizer plants, nuclear plants, transport and telecommunication projects, prior assessment and appraisal of impacts on the different

components of environment (abiotic and biotic, including forests, wildlife and people) is imperative for several reasons. It is needed to ensure sustainability that can result from conservation of ecological processes and thereby of life support systems and gene pool resources (or biodiversity). World Conservation Strategy (IUCN 1980) has laid down three criteria for identifying impacts on the environment. The first concerns the length of time and geographic area over which the effects will be felt. The second is urgency or the quickness with which a natural system might deteriorate. Finally, it is important to assess the degree of irreversible damage to communities of plants and animals. It also needs to ensure developmental pace and economic prosperity without actually altering the state of the environment.

4.4.1 Sensitive Habitats and Protected Areas

The following figure shows the protected areas and sensitive habitat of Myanmar and there is no sensitive habitat in and around the Project site. Consequently, **no impact on sensitive habitats and protected areas is expected to be generated by the Project during both construction and operation phase**.

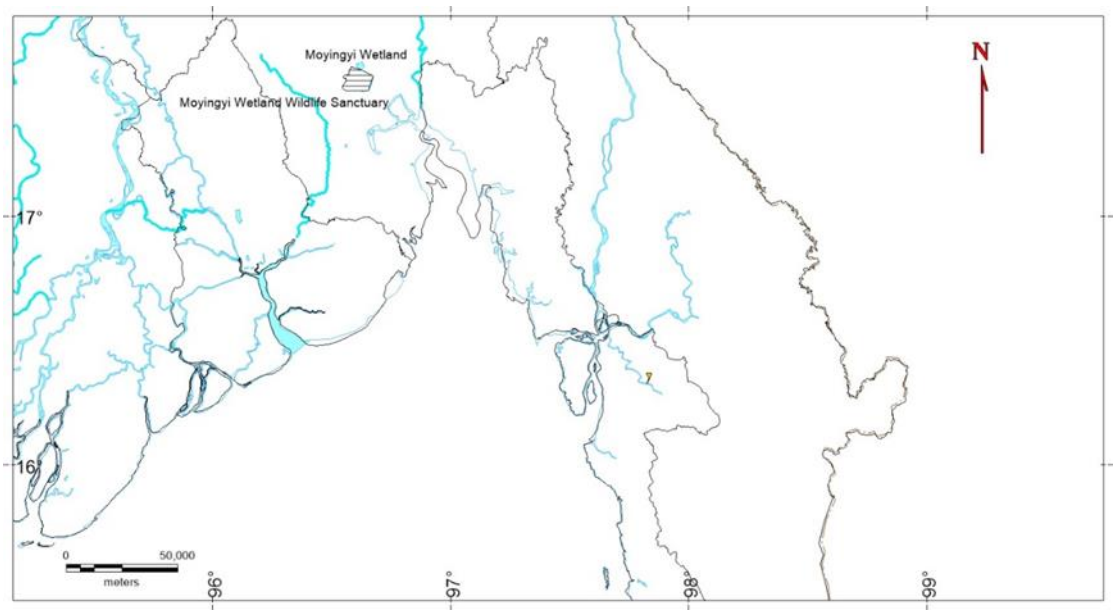


Figure 4.4-1: Sensitive Habitats and Protected Areas around the Mawlamyine Cement Plant

In Myanmar, KBAs have no legal standing as an official form of land tenure except where they overlap with formally established Protected Areas.[12] In addition, the project will not have any affect on Mawlamyine key biodiversity area which is located far from 12.72 km away from the MCL limestone quarry project.

[12] Supplement to MCRB's Briefing Paper on Biodiversity, Human Rights and Business, "Biodiversity in Myanmar, including Protected Areas and Key Biodiversity Areas", November 2018

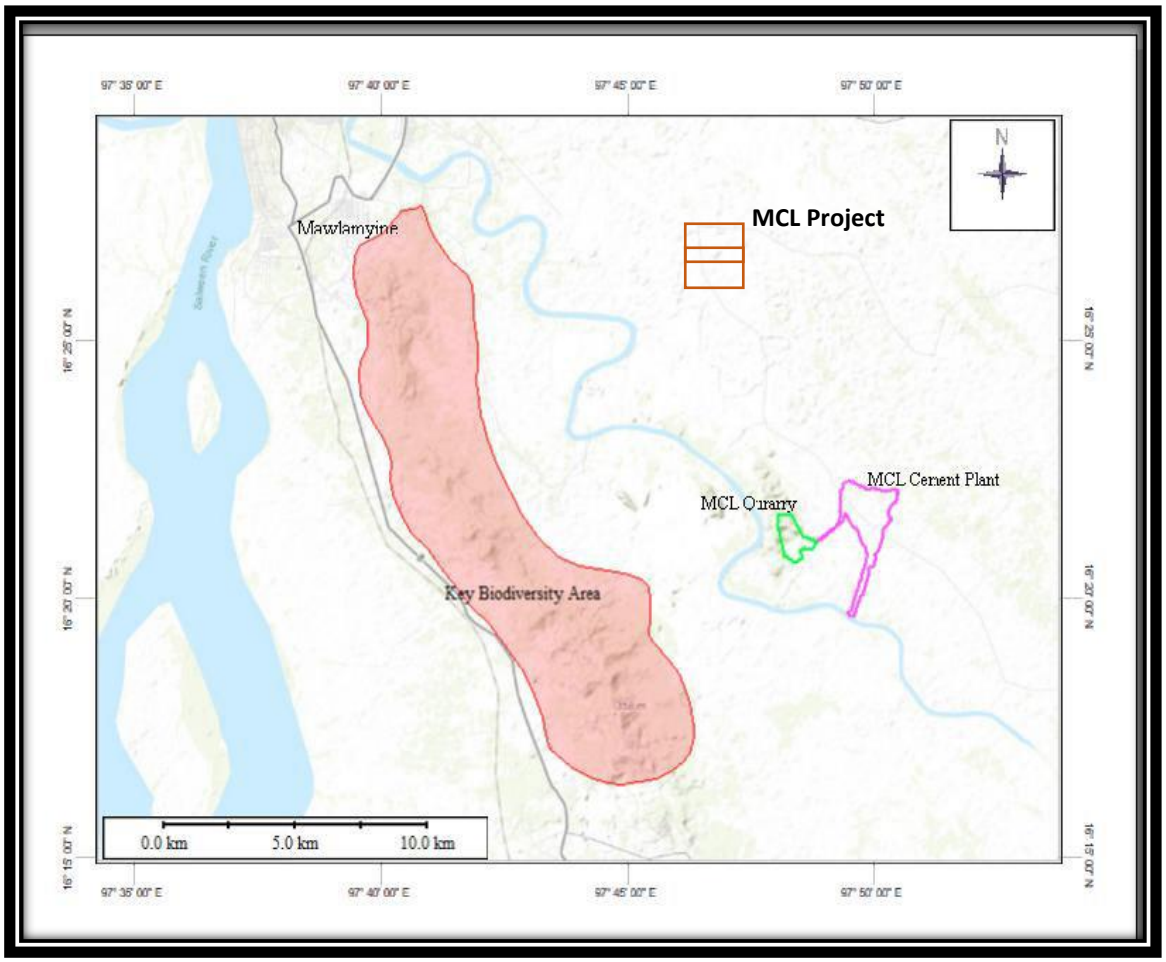


Figure 4.4-2: Location of Key Biodiversity Area (KBA) from the Project Site[13]

4.4.2 Habitat

Wildlife habitat is important for the survival of the wildlife animals in terrestrial ecosystem. The wild animals are now threatened by habitat degradation and habitat loss caused by misconduct of human being. A habitat is a part of an ecosystem and diverse ecosystems support for high species diversity. A change in an ecosystem necessarily affects the plant and animal species in the system, and changes in species affect ecosystem processes. The distribution of species on earth is becoming more homogenous.

In the proposed project area, three major habitat types were observed namely **(**1**)** Forest, **(**2**)** Mixed plantation and cultivated land and **(**3**)** aquatic habitat **(**Ataran River**).** There is one threatened plant species in the proposed project area and the overall habitat value is assumed to be moderate **(**Table 4**.**4**.**1**)**.

[13] WCS, Key Biodiversity Areas, 2013

Table 4.4-1: Key Terrestrial Habitat Features of the Proposed Project Site

Sr. No.	Criterion	Features	Remark
1	Fauna and Flora	Threatened species	Plant species *Hopea odorata*
2	Threatened Communities	Mixed vegetation and River water body	Potential human disturbance
3	Migratory Birds	No record	Nil
4	Wildlife Corridor	Moderate	Limestone cast forest
5	Representativeness	Moderate	Mixed vegetation and River Water body
6	Natural Diversity	Moderate	Some parts disturbed
7	Rarity and Distinctiveness	Moderate	Inhabitants of Limestone cast forest
8	Naturalness	Moderate	Limestone cast forest
9	Pest Species	Insect pests and field rat	Seasonal
10	Long –term viability	Moderate	Potential human pressure
11	Adjacent habitat values	Moderate	Plantation area and Limestone cast
12	Degree of existing modification	Low	Human activities
13	Sensitivity to disturbance	Moderate	Limestone cast forest and River
14	Overall habitat value	Moderate	Naturalness of the Limestone cast forest and Ataran River

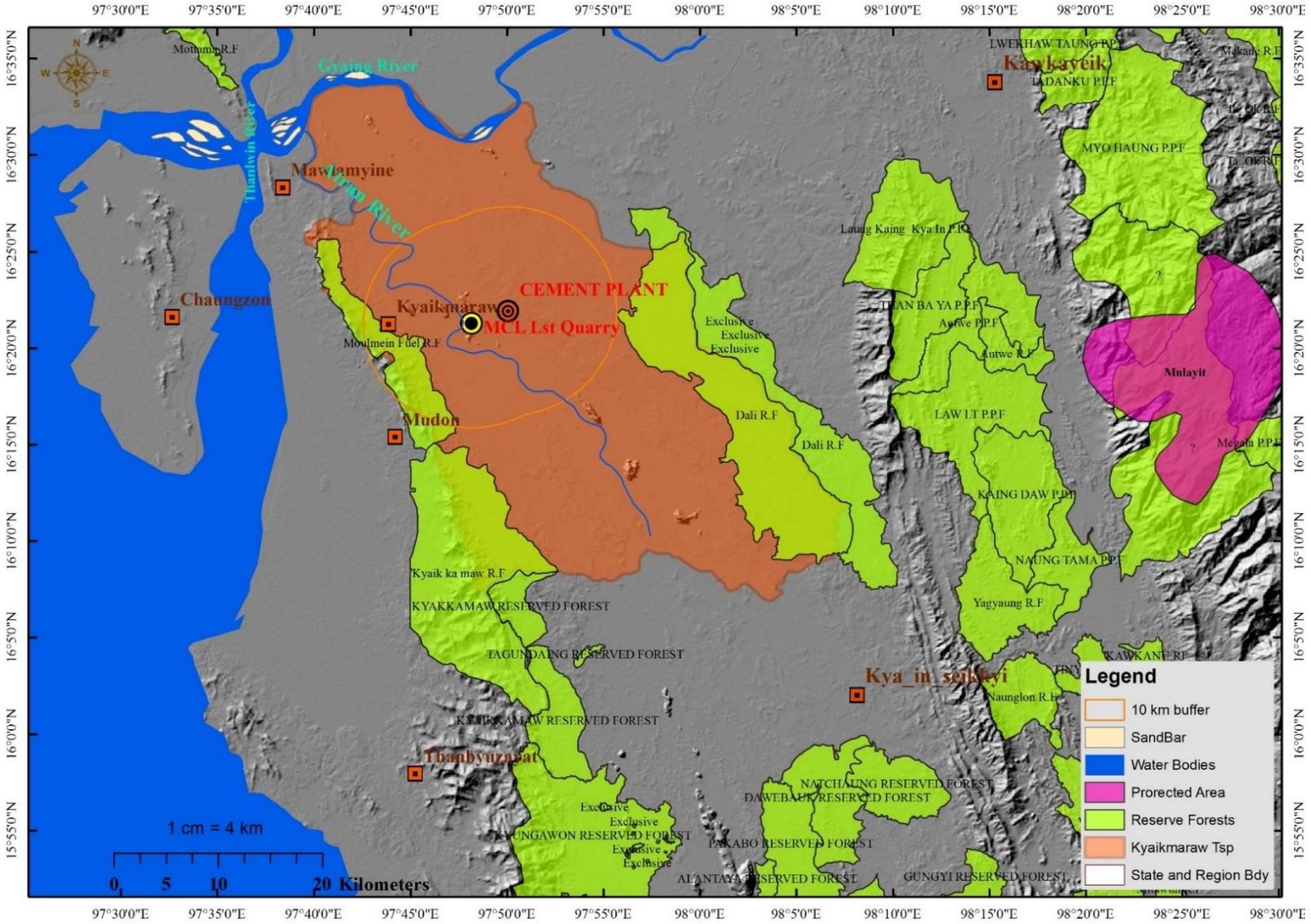


Figure 4.4-3: Protected Area and Reserve Forest Area near and outside of Kyaikmaraw Township

4.5 Aquatic Ecology

Inland fishery in Myanmar is mostly associated with riverine and estuarine systems. Inland water bodies, such as natural lakes, reservoirs, river systems and ponds, cover about 8.1 million hectares, of which 1.3 million hectares are permanent; the remainder being seasonally inundated floodplains. Ayeyarwaddy, Chindwin, Sittatung and Thanlwin are the main rivers, and extend from the eastern part of the Bay of Bengal to the Gulf of Moattama and along the eastern edge of the Andaman Sea. A total of 449 freshwater fish species were recorded in Myanmar.

"The Fisheries Law" 1905 was the only legislation regulating fishery management and the fishing industry of Myanmar until amended in 1954 and was finally repealed by "Law relating to the fishing rights of foreign fishing vessels" in 1989. After that, the government promulgated three other fisheries laws, namely "Aquaculture fisheries law" in 1989, "Myanmar marine fisheries law" in 1990, and "Freshwater fisheries law in 1991. This law protects the spawners, breeders and fingerlings of freshwater fishes, specifying those species that it is forbidden to catch, export, kill or keep in captivity in the months of May, June, July and August without permission of the Director General of Department of Fishery (DoF). These prohibit trade in spawners, breeders and fingerlings of the freshwater prawns *Macrobrachium rosenbergii*, and *M. malcolnsonii*, which cannot be caught, exported, sold, killed or kept in captivity in the months of May, June and July, unless permitted by the Director General of DoF. The regulation lists all the species of fish and mammals that are protected, including the dugong, whale, whale shark, dolphin, giant clam and turtle, and included in the list of endangered species in the Convention on International Trade of Endangered Species (CITES).

4.6 Overview of Existing Regional Socioeconomic and Cultural Settings

An overview of the existing social and cultural conditions will be provided in order to place the proposal in its local and regional context.

Kyaikmaraw Township is situated in Mon State within North latitudes 16º 7' and16º 34', and within 97º 9' and 97º 50'. Total area of township is about 511.70 square miles which extends about 40 miles from north to south and about 18 miles from west to east. The Kyaikmaraw Township is bounded on east by Kyainseikgyi and Kawkareik Townships, on south by Kyainseikgyi Township, on west by Mudon Township and on north by Mawlamyine and Hpa-An Townships respectively as shown in Figure 4.6-2.

4.6.1 Demography of Kyaikmaraw Township

As human beings are solely responsible for the socio economy of all regions, the characteristics of human population become the basis for understanding the socio-economic conditions of a particular region. Population number, population growth, population distribution and density, ethnic composition and believes are the major factors for the socioeconomic development of all regions.

The total population of Kyaikmaraw Township has about 222,091 persons which are 12,855 persons in urban area and 209,236 persons in rural area. The largest population are occurred in Kyaikmaraw Urban area and Tarana, Yae Twin Kone, Pein Hne Kone and Ka Dar Village Tracts according to the GAD data (2017).

Population density of Kyaikmaraw Township is about 434 persons per square mile including reserve forest area in 2017 (GAD). However, the population density varies with the population number and areas of village tracts in Kyaikmaraw Township. The highest population density is found in Kyaikmaraw Township with 12855 persons.

Table 4.6-1: Total Population of Kyaikmaraw Township (2000-2013 & 2017)

Year	Total Population
2004	200,248
2005	201,458
2006	202,578
2007	211,767
2008	211,953
2009	212,277
2010	209,524
2011	213,446
2012	212,706
2013	213,215
2017	222,091

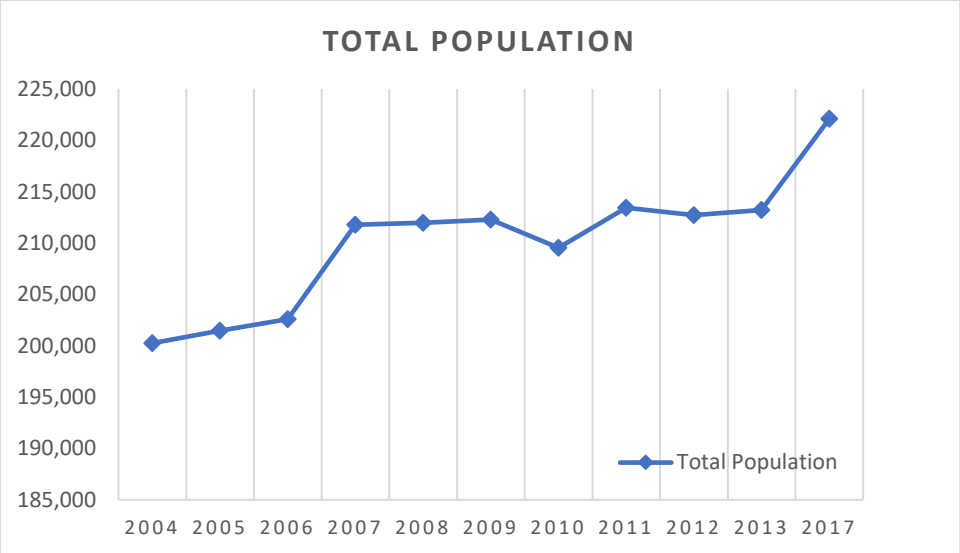


Figure 4.6-1: Total Population of Kyaikmaraw Township

Table 4.6-2: Population, Houses and Households of Kyaikmaraw Township

No.	Ward/Village Tract	Village	Houses	Household	Total		
					Male	Female	Total
1	Shinsawpu Ward		1005	1020	2,584	2,849	5433
2	Yanmyoaung Ward		1,097	1,100	3,691	3,731	7422
Total			**2102**	**2120**	**6,275**	**6,580**	**12855**
1	Antkaye Village Tract	Antkaye	89	91	344	331	675
		Katkataung	16	16	52	96	121
		Daungkone	41	45	163	180	343
	Total		146	152	559	607	1139
2	Ataran Village Tract	Ataran	80	85	260	247	507
		Pawlawkone	55	60	219	230	449
		Metwekone	91	99	303	272	575
		Pawlawkyne	282	296	1035	990	2025
		Kawtar	22	18	29	40	69
		Kyaukkwe	102	111	247	266	513
	Total		632	669	2093	2045	4138
3	Barbukone Village Tract	Barbukone	859	892	2638	2859	5497
4	Banebawe Village Tract	Banebawe	53	53	211	196	407
		BanebawesatKone	87	87	360	350	710
		Banebaweywathit	42	42	130	136	266
		Natsan	95	109	339	323	662
		Phayarkone	71	76	267	264	531
		Mayanchan	31	31	148	164	312
		Sannitkya	87	92	308	330	638
		AyeyeikThar	117	121	499	508	1007
		Ataran	196	196	553	566	1119
	Total		779	807	2815	2837	5652
5	Dammata Village Tract	Dammata	820	829	2495	2577	5072
6	Hlakazine Village Tract	Hlakazine	245	245	615	664	1279
		Taungkalay	834	834	1812	1933	3745
		Mekaro	265	265	674	769	1443
		Fattaykone	86	86	196	197	393
		Htawpalaw	125	125	248	289	537
	Total		1555	1555	3545	3852	7397
7	Kadar Village Tract	Kadar	73	73	191	171	362
		Thayetkone	217	218	556	742	1298
		Kyantaw	431	431	1106	1125	2231
		Hlaingkamine	170	175	488	577	1065
		Kanainglo	320	331	765	1229	1994

Table 4.6-2: Population, Houses and Households of Kyaikmaraw Township (Continue)

No.	Ward/Village Tract	Village	Houses	Household	Total		
					Male	Female	Total
		Kawkalaintaung	89	89	327	358	685
		Lonpimyuak	165	172	435	581	1016
		Kadarshanyar	111	121	319	492	811
		Pawtawmu	115	115	306	463	769
		Nyutle	154	159	399	489	888
		Yemon	69	69	143	240	383
	Total		1914	1953	5035	6467	11502
8	Kalinekanaine Village Tract	Kalinekanaine	379	387	1335	1197	2532
		Apawyar	203	214	461	437	898
		Thone ein su	28	30	68	67	135
		Autywar	65	70	208	185	393
		Kazunekone	158	160	549	472	1021
	Total		833	861	2621	2358	4979
9	Kanaung Village Tract	Kanaung	180	186	462	490	952
10	Kawbee Village Tract	Kawbee	449	492	1613	1676	3289
		Kawwan	477	509	1697	1694	3391
		Alatkone	266	281	798	806	1604
		Ankazine	72	80	231	247	478
	Total		1264	1362	4339	4423	8762
11	Kawkalain Village Tract	Kawkalain	271	302	1013	993	2006
		Kawkyik	52	73	240	274	514
		Kyarinnchaung	265	295	810	841	1651
	Total		588	670	2063	2108	4171
12	Kawpaline Village Tract	Kawpaline	248	248	783	735	1518
13	Kawpalaw Village Tract	Kawpalaw	302	305	868	869	1737
		Kadonkaye	20	21	54	49	103
		Pankone	120	122	296	156	552
		Thinkanchaung	72	73	192	222	414
		Mekathan	28	29	93	87	180
		Utochaung	156	157	463	517	980
		Kawdun	78	60	169	149	318
		Shanyargyi	76	78	132	152	284
		Mwehouse	119	120	317	311	628
	Total		971	965	2584	2512	5196
14	Kawpanaw Village Tract	Kawpanaw	547	575	1558	1668	3226
		Kawdun	396	429	1264	1277	2541
		Walngee	73	80	202	195	397
	Total		1016	1084	3024	3140	6164

Table 4.6-2: Population, Houses and Households of Kyaikmaraw Township (Continue)

No.	Ward/Village Tract	Village	Houses	Household	Total		
					Male	Female	Total
15	Kawthat Village Tract	Kawthat	758	769	2244	2382	4626
16	Kayon Village Tract	Kayon	500	503	1777	1905	3682
17	Kwan Nyan Village Tract	Kwan Nyan	434	440	880	904	1784
		Pauktaw	37	40	98	106	204
	Total		471	480	978	1010	1988
18	Kyukepayan Village Tract	Kyukepayan	566	630	1872	2039	3911
		Kawpyat	146	169	459	502	961
	Total		712	799	2331	2541	4872
19	Kyieeoat Village Tract	Kyieeoat	175	183	697	603	1298
		Kayinhlaing	173	118	681	515	1196
		Shankyun	58	68	214	193	407
	Total		406	369	1592	1311	2901
20	Kyonekyal Village Tract	Kyonekyal	192	226	586	626	1212
		Tadaoo	60	67	195	247	442
		Ohantapin	80	95	268	273	541
		Kawpyangmalar	90	104	282	300	582
		Payarngatto	108	110	345	362	707
		Myaingtaryar	48	54	163	176	339
		Tharyarkone	42	54	153	171	324
		Minkalarkone	16	17	52	56	108
		Yarnaing	44	63	171	174	345
		Kawkyaike	42	47	135	146	281
		Taungnar	117	140	418	440	858
		Nuteout	162	180	660	680	1340
		Ngaphalchaung	149	176	465	534	999
		Htiwakali	21	21	48	54	102
	Total		1171	1354	3941	4239	8180
21	Kyonsein Village Tract	Kyonsein	259	286	861	850	1711
		Kawlin	35	35	112	118	230
		Kawmin	45	48	171	167	338
	Total		339	369	1144	1135	2279
22	Kyonwan Village Tract	Kyonwan	485	508	1529	1621	3150
		Kyonmanin	270	290	917	838	1755
	Total		755	798	2446	2459	4905
23	Kyunyar Village Tract	Kyunywar	1114	1114	3100	3172	6272

Table 4.6-2: Population, Houses and Households of Kyaikmaraw Township (Continue)

No.	Ward/Village Tract	Village	Houses	Household	Total		
					Male	Female	Total
24	Lamuko Village Tract	Lamuko	56	67	171	140	311
		Mayinkone	278	288	760	712	1472
		Nyaungkone	65	77	221	199	420
		Warpyankone	205	226	624	561	1185
		Aungbalakone	36	48	131	106	237
		Kyukehtaw	95	108	344	288	632
		Oukawkone	21	25	61	69	130
	Total		756	839	2312	2075	4387
25	Latpan Village Tract	Latpan	347	350	948	1031	1979
		Yarthit	127	130	456	514	970
		Alankyun	18	18	102	90	192
	Total		492	498	1506	1635	3141
26	Me Ko Ro Village Tract	Me Ko Ro	492	498	1506	1635	3141
27	Mikathit Village Tract	Mikathit	292	292	860	895	1755
		Mikhar	119	119	410	384	794
		Layeinsu	134	134	427	430	857
		Nayattaung	125	125	287	307	594
		Minut	127	127	409	448	857
	Total		797	797	2393	2464	4857
28	Musoekyun Village Tract	Musoekyun	380	396	1159	1263	2422
		Tagukalote	98	109	304	300	604
		Kawkanee	12	12	49	42	91
	Total		490	517	1512	1605	3117
29	Ngapuinn Village Tract	Ngapuinn	71	70	326	260	586
		NaungNaungkone	35	35	120	114	234
		Yarthit	99	102	408	394	802
		Phayephahtaw	46	48	203	217	420
		Hlawsinkone	42	45	165	154	319
	Total		293	300	1222	1139	2361
30	Ngapinma Village Tract	Ngapyinma	210	235	665	660	1325
		Kyatkhakone	270	290	799	896	1695
31	Hnidon Village Tract	Hnidon	417	433	1330	1360	2690
		Myakone	102	104	325	334	659
		Shanyarkalay	139	154	429	461	890
		Chankone	153	163	516	519	1035
	Total		811	854	2600	2674	5274

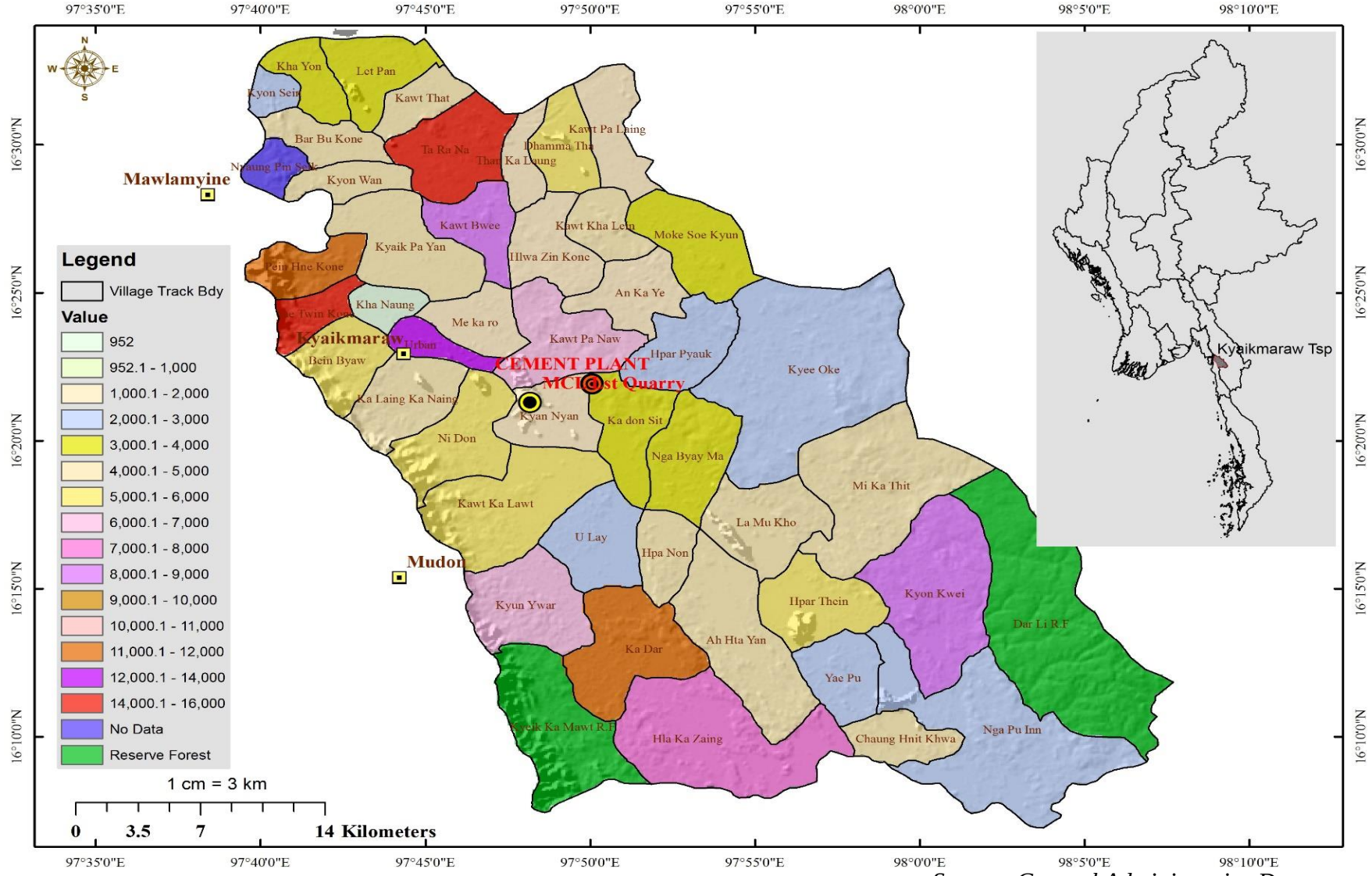
Table 4.6-2: Population, Houses and Households of Kyaikmaraw Township (Continue)

No.	Ward/Village Tract	Village	Houses	Household	Total		
					Male	Female	Total
32	Naungpinseik Village Tract	Naungpinseik	No data	No data	No data	No data	No data
		Phayarkone	No data	No data	No data	No data	No data
		Kyarinnkone	No data	No data	No data	No data	No data
	Total						
33	Pharpyauk Village Tract	Pharpyauk	281	292	723	778	1501
		Myanmarhlaing	140	153	349	358	707
	Total		421	445	1072	1136	2208
34	Painnalkone Village Tract	Painnalkone	460	470	1500	1596	3096
		Kyattonkone	206	210	785	922	1707
		Rawbarneekone	97	100	322	333	655
		Thukhamyaing	140	145	478	478	970
		Kinsu	114	116	418	418	888
		Theinphukone	486	490	1602	1602	3145
		Hledan	230	232	596	596	1193
	Total		1733	1763	5701	5945	11654
35	Phanote Village Tract	Phanote	377	382	1351	1336	2687
		Kywechankone	90	92	327	314	641
		Kawkwne	40	41	137	150	287
		Kawkalauk	87	89	182	270	452
		Kawwat	36	37	129	137	266
		Kawpankyaw	84	86	270	287	558
	Total		714	727	2396	2494	4891
36	Pharthein Village Tract	Phathein	625	625	1253	1417	2670
		Taungkalay	165	165	401	521	922
		Taungthukone	100	100	355	309	664
		Kannarsu	90	90	194	227	421
		Yarthitkone	61	61	208	197	405
	Total		1041	1041	2411	2671	5082
37	Tarana Village Tract	Tarana	1733	2383	4972	4951	9923
		Kyunkone	303	329	742	737	1479
		Kawnut	226	243	629	656	1285
		Kawsawe	607	607	1633	1641	3274
	Total		2869	3562	7976	7985	15961
38	Thankalaung Village Tract	Thankalaung	387	496	868	997	1865
39	Ulay Village Tract	Ulay	390	394	1186	1221	2407

Table 4.6-2: Population, Houses and Households of Kyaikmaraw Township (Continue)

No.	Ward/Village Tract	Village	Houses	Household	Total		
					Male	Female	Total
40	Yaytwinkone Village Tract	Yaytwinkone	279	303	1195	1189	2384
		Naunglon	472	494	1936	1883	3819
		Maharmyaing	354	369	1397	1496	2893
		Thukhamyaing	41	42	122	151	273
		Shankone	31	31	88	78	166
		Minkalarkone	380	395	1663	1663	3172
		Malaykone	170	174	696	686	1350
	Total		1727	1808	7097	7146	14057
41	Lwasinkone Village Tract	Lwasinkone	81	70	229	240	469
		Monsu	37	37	125	105	230
		Ywartanshae	43	41	164	165	329
	Total		161	148	518	510	1028
42	Chaungnakwa Village Tract	Chaungnakwa	392	504	981	1218	2199
		Mayankone	250	269	668	818	1486
		Payarkone	137	154	383	460	843
	Total		779	927	2032	2496	4528
43	KaDonsit Village Tract	KaDonsit	404	439	1131	1124	2255
		Shwewarchang	155	192	664	699	1363
	Total		559	631	1795	1823	3618
44	Yaepukawsut Village Tract	Kawsut	230	252	740	831	1571
		Tayatkone	105	128	372	363	735
	Total		335	380	1112	1194	2306
Total of Villages			***33515***	***35717***	***102395***	***106841***	***209236***
Total of Township			***35617***	***37837***	***108670***	***113421***	***222091***

Source: General Administrative Department (2017)



Source: General Administrative Department (2017)

Figure 4.6-2: Population Density Map of Kyaikmaraw Township

4.6.2 Socioeconomic Condition of Kyaikmaraw Township

Kyaikmaraw Township is situated at middle of Mawlamyine District with slower economic development. The main economy is agriculture and plantation. The main local product is rubber and mostly exported to Mawlamyine and Mudon Towns.

4.6.2.1 Land Use

General land use of Kyaikmaraw Township includes cultivated land, virgin land and non-cultivated land.

Table 4.6-3: Land Use of Kyaikmaraw Township

No	Land Types	Area (Acrea)
1	Total area of net agriculture land	144589
	(1) Farm Land area	52853
	(2) Garden Land	91736
2	Total area of exposed land	51708
	(1) Farm Land area	51708
3	Pastureland	8005
4	Industrialization land	1492
5	Urban land	2912
6	Rural land	9079
7	Other land	3071
8	Reserved Forest	72602
9	Virgin land	6569
10	Fallow land	11544
11	Non arable land	40482
	Total	**327494**

Source: General Administrative Department (2017)

4.6.2.2 Fishermen

There are fishing boats in every Village Tracts of Kyaikmaraw for fishery in Ataran River. Highest numbers of fishing boats are found in TaYaNar (20 boats), KyonSein (31 boats) and NyaungPinSeik (39 boats) village tracts. However, there are only 1 boat each in Kayil Pa Lan and Far Pyauk villages. The villagers worried about to lose their fishery business after the implementation of the project. Table 4.6-4 showed the list of fishing boats owned by each village.

Table 4.6-4: List of Fishing Boats in Ataran River (2012)

Sr.	Village Tract	Number of Boats
1	Me Ka Ro	13
2	Kaw Pa Naw	8
3	U Lay	10
4	Ka Don Sit	3
5	Kwan Nyan	5
6	NgaPyay Ma	14
7	Kaw Vee	12
8	Hni Don	3
9	Ta Ya Nar	20
10	Kayik Pa Lan	1
11	Far Pyauk	1
12	Far Thein	6
13	ChaungNitKwa	12
14	Khayon	10
15	KyonSein	31
16	Nyaung Pin Seik	39

Source: General Administrative Department, Kyaikmaraw Township

4.6.3 Modes of Transportation in Kyaikmaraw Township

There are 18 buses running along the 5 routes of land transportation in the project area. Among them, Ataran Myay Bus line operates daily trip between Kawwan and Mawlamyine.

Two boats alternately run at HniDon- KwaDon Jetty. About 11 boats are running daily at Sabegu Jetty. There is a daily boat from KwaDon to Sabegu. There are 29 boats running along the 3 trips in the ferry services of the project area. HniDon- KwanNyan ferry service is operating in all season. However, some boats run from Kyaikmaraw Jetty during the rainy season only. (Table 4.6-5 and Table 4.6-6).

Table 4.6-5: Road Transportation in the Project Area

Sr.	Trip (up and down)	Number of Bus
1	KawWan to Mawlamyine	4
2	FarPyauk- Mawlamyine	4
3	KawPaNaw- Mawlamyine	5
4	KaDonSit- Mawlamyine	2
5	Ngapyayma- Kyakatkone- Mawlamyine	3
	Total	**18**

Source: General Administrative Department, Kyaikmaraw Township

Table 4.6-6: Waterways in the Project Area

Sr.	Ferry (up and down)	Number of Boats
1	Hni Don- Kwan Nyan	9
2	MeKoRo-Sabai-Gu- Kaw Don	11
3	KawDon- Sabai-Gu	9
	Total	**29**

Source: General Administrative Department, Kyaikmaraw Township

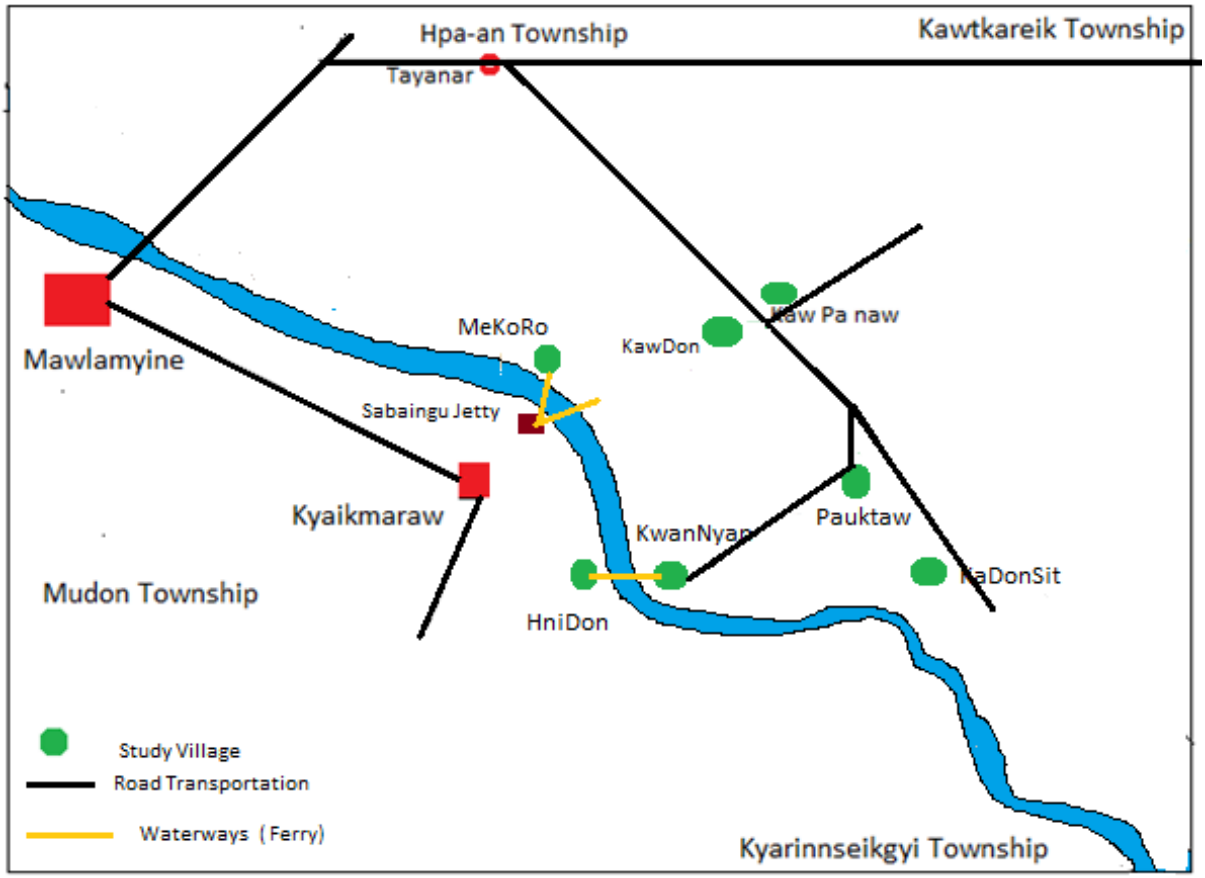


Figure 4.6-3: Transportation Network in the Study Area, Kyaikmaraw Township

4.7 Education Status in Kyaikmaraw Township

The development of a region can be evaluated, by the standard of education. There are schools in all village-tracts with convenient communication and transportation Graduates are also found in Kyaikmaraw Township.

According to 2208 data, Kyaikmaraw Township had (3) basic Education High Schools, (5) Basic Education Middle Schools (Affiliated), (4) Basic Education Middle Schools, (9) Basic Education Middle Schools (Affiliated), and (110) Basic Education Primary Schools in Kyaikmaraw Township. The teachers and the students' ratios were 1:22 for High School level, 1:32 for Middle School level, and 1:42 for Primary School. Therefore, the ratios of teachers

and students are sufficient, especially for High School level. The number of education buildings and staffs can be seen in Table 4.7-1.

Table 4.7-1: Number of Schools, Teachers and Students in Kyaikmaraw Township

No.	Categories	High School	High School (affiliated)	Middle School	Middle School (affiliated)	Primary School
1	Number of Schools	3	5	4	9	110
2	Number of Teachers	30	27	298	165	577
3	Number of Students	482	801	4197	5246	24175

Source: General Administrative Department, Kyaikmaraw Township

4.8 Community Health Status in Kyaikmaraw Township

Kyaikmaraw Township has one township-hospital, one station-hospital and four rural healthcare centres. The 25-bedded hospital is in Kyaikmaraw Township. There are 4 doctors, 9 nurses and 25 midwives in this township hospital. One station-hospital was opened in Chaungngekhwa Village Tract which was operated by one doctor and 3 nurses as shown in Table 4.8-1.

Rural health-care centers are opened in Pein Hne Kone, Taranar, Thapyauk, and Pharthein Village Tracts. Each rural health-care center consists of four branches of health-care centers under their central management.

The maternal and childcare department was opened in Kyaikmaraw Township. This department takes care of pregnant mothers' health, disease prevention for child and providing nutritious food for the children. Moreover, they made monthly field trips to villages to provide educational talks for feeding habit to get high nutritional value.

The most common diseases found in Kyaikmaraw Township are Malaria, Jaundice and Cholera. Most of the residents in the township suffer from these diseases owning to water contamination after flash flood in the rainy season.

Table 4.8-1: Health Facilities Status in Kyaikmaraw Township

No.	Categories	Building	Doctor	Nurse	Midwives	Total Staffs
1	Township Hospital	1	5	9	27	41
2	Station-township Hospital	1	1	5	10	16
3	Rural Health-care Centre	4	0	4	4	8
4	Maternal and Childcare Department	1	0	1	2	3

Source: General Administrative Department, Kyaikmaraw Township

4.9 Cultural Status of the Kyaikmayaw Township

The vocabulary of *Kyaikmaraw* is a derivative of Mon word (*Kyaik*). The meaning of (Kyaik) stands for pagoda. The historic Kyaikmaraw pagoda existed 1300 years ago built by Queen Banyar Htaw (Shin Saw Bu), a well-known Queen who devoted and donated gold to the Shwedagon Pagoda, in Myanmar Era, 817 (A.D 1455) according to the inscription which was found in pagoda compound. The extraordinary point of the image is sitting in the position of the legs hanging down as if sitting on a chair. It is widely believed that the wishes surely will come true while praying to Kyaikmayaw Pagoda and making a wish. Thus, this pagoda is well-known in the region.

Table 4.9-1: Famous Historical Mountains in Kyaikmaraw

Sr. No.	Township	Location	Name	Kinds	Building Dates
1	Kyaikmayaw	Shin Saw Bu word	Su Taung Pyae pagoda	Image	817(1455)
2	Kyaikmayaw	Letpan Ywa	Kharon Gu	Gu (cave)	-
3	Kyaikmayaw	Dhammasa Ywa	Dhammasa Hair Relic	Ceti (pagoda)	117(755)
4	Kyaikmayaw	Niton Ywa	Sanpae Gu	Gu (cave)	-
5	Kyaikmayaw	Lumokho Ywa	Paaung Gu Pagoda	Gu (cave)	1200(1838)

Stalactite and Stalagmite Caves

Krone village, *Dhammathat, Kawbane, Makaro* and other areas situated in *Kyaikmaraw* have famous stalactite and stalagmite caves. *Krone* is a kind of cave. It is situated within the Krone village and it is a limestone cave. It is on the east of the *Ataran* Rriver, a branch of *Thanlwin R*iver. And it is about 10 m above sea level. Notable culture characteristic of *Krone* cave is votive tablets sticked to the cave ceiling and walls. The length of the votive tablet is 3 inches and its width is 6 inches. The thickness of the tablet is 0.6 inch. All *are bhumiphassa mudras*. According to the stylistic analysis of the votive tablets, it was made in *Nyaung Yan* era (AD 17 century). There are 65 Buddha images in the cave donated by later donors. Among them, 5 are reclining Buddha. *Karone* cave has been protected since 1975 by Department of national Museum and Library, Archaeological Research, Ministry of Culture. *Krone* cave is few miles away from cement project area.

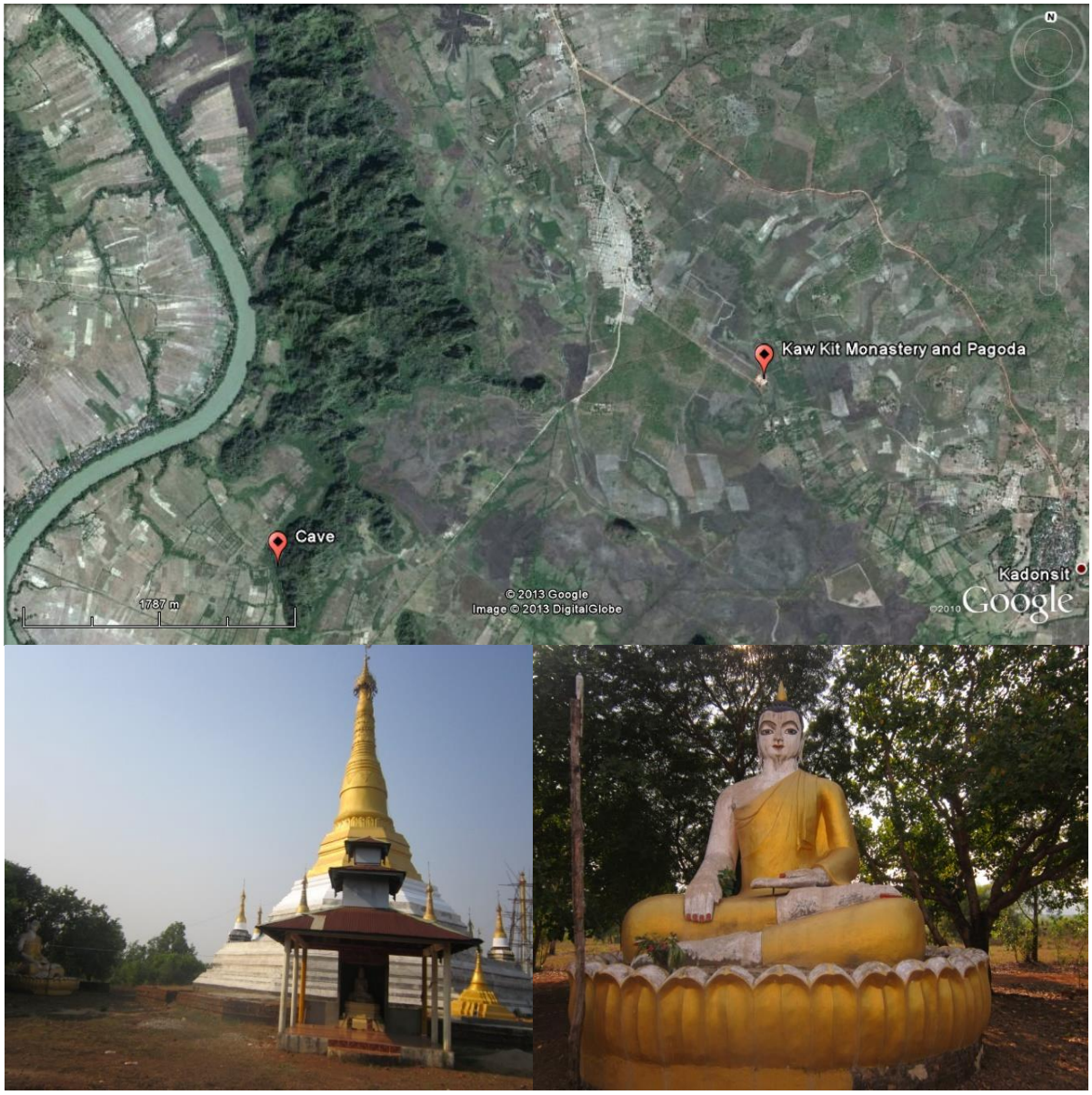


Figure 4.9-1: Kawkit Pagoda Near the MCL Project Site

Pya Taung

Pagodas can also be found at the northwest of *Pya Taung*. A cave situated in the south of *Pya Taung* has a lot of ancient ceti-es (pagodas) as shown in Figure 4.8-3. The authorities informed the Archaeological Department where the places have to be investigated. The cave is included in the project area so that a special care is a must not to damage them and to maintain the cultural heritages.

Sabai Cave

There are many pagodas in *Sabai* cave situated on *the Sabai Taung*. A lot of small Buddha images, besides the statues in sitting position, is found. Furthermore, there was also a shrine for Myanmar Nats (Spirit)[14].

[14] https://en.wikipedia.org/wiki/Nat_(spirit)

Figure 4.9-2: Photos of Sabai Cave

4.9.1 Reviewing the Project from Cultural Point of View

Kyaikmayaw regions in which the cement Project is set to be built, is flourishing with ancient Mon cultural, religious buildings such *as* abundant *of Pagodas (Ceti), Cave (gu), Sima* (Pali word meaning ordination halls in temples and monasteries in Myanmar which are called "Thein" in Myanmar*)*, monasteries, ancient bricks, lateritic artifacts, Coins and votive tablets. Due to the facts that Mon respects their religions and they are proud of their culture heritages, deep care should be taken in implementing the cement manufacturing plants.

On the other hand, Mon people are willing to develop their region, therefore, there were many educated persons in the region and most of them migrated to Thailand for their greener pastures. They believed that building a cement plant will open floodgate of job opportunities and the cement factory will foreside better transportation in their region. They thought that they don't need to go to Thailand for work if this happened. Thus, it is presumed that building of the cement factory is pleasant for regional Mon people. These are good points of view for the implementation of MCL cement project, so called "positive impacts".

There are also community's worries about the impacts in relation with mines processing which will be used for the cement project. Due to mine explorations, vibrations might affect the religious *(Buddhist)* buildings. Worrying is a must that *Kawkit ceti (pagoda) of Pauktaw* village situated within the project area might be potentially damaged due to vibration of mine activities. A canal will be dug to transport the products from the cement factory to the stock area. That canal set to dig is very close to *Pauktaw* Village so that taking great care is also necessary to avoid not to disturb the fishermen livelihoods and the accidental cases. Similarly, not to damaging the ancient *pagodas (ceti-es)*, the cave (*gu*) situated on the south of *Pya Taung* included in the project area is essential to prevent.

If artifacts are found during the excavation for the cement plant, it's an important suggest that all must be sent to the Archaeology Department.

Meanwhile, the evidence of '0' impact from project mining activity to Archaeological Zone which had been defined by Achaeology Department was provided in Annex 5-1: Archaeological Evidence: which was released from Archaeological Department to Ministry of

Mine on February 2011 and the 'No Objection' letter for mining activity in the MCL proposed mining area has also been reported to Minister from Nay Pyi Taw main office on March 2011.

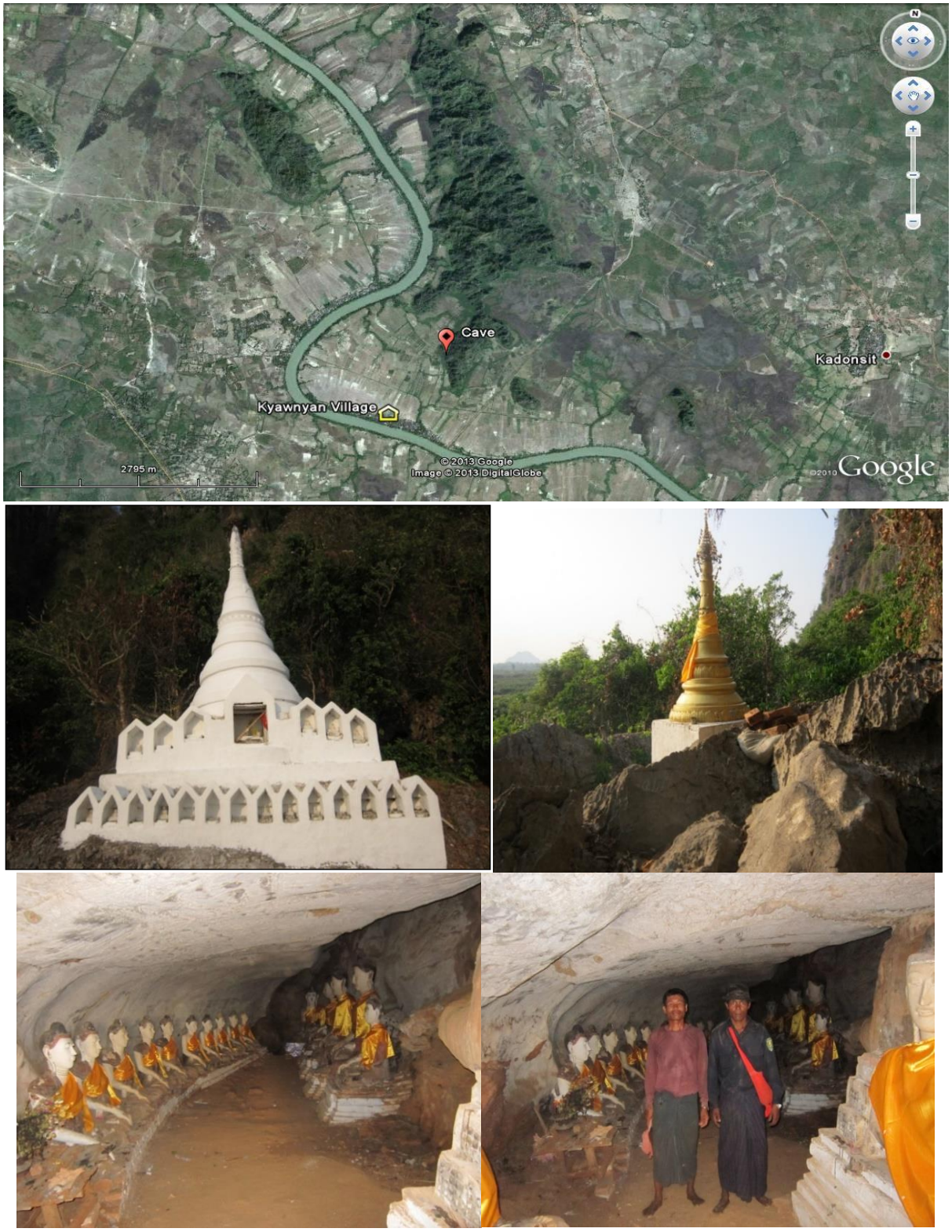


Figure 4.9-3: The Cave Pagodas, Images and Pagodas Located in Southern Part of Pya Taung

4.10 Recent Natural Disaster Hazards

Flood in 2017 (AGD Survey)

According to the AGD survey (2017) in Mon State, there was no disasters such as Cyclone, Tsunamis, Earthquakes, Flooding in Kyaikmaraw Township till the record of September 2017. However, the seasonal flooding was occurred almost every year which was caused by heavy rain. The maximum water level of Ataran River during flooding was used to raise at 510 cm. Fire case was occurred about 7 times in Kyaikmaraw Township with 4 houses lost and 2 injuries and the estimated loss was about 6.167 million Kyats.

Figure 4.10-1: Flood Caused by Heavy Rain (Aug 2013) at Kwan Ngan Village

Flood in 2018

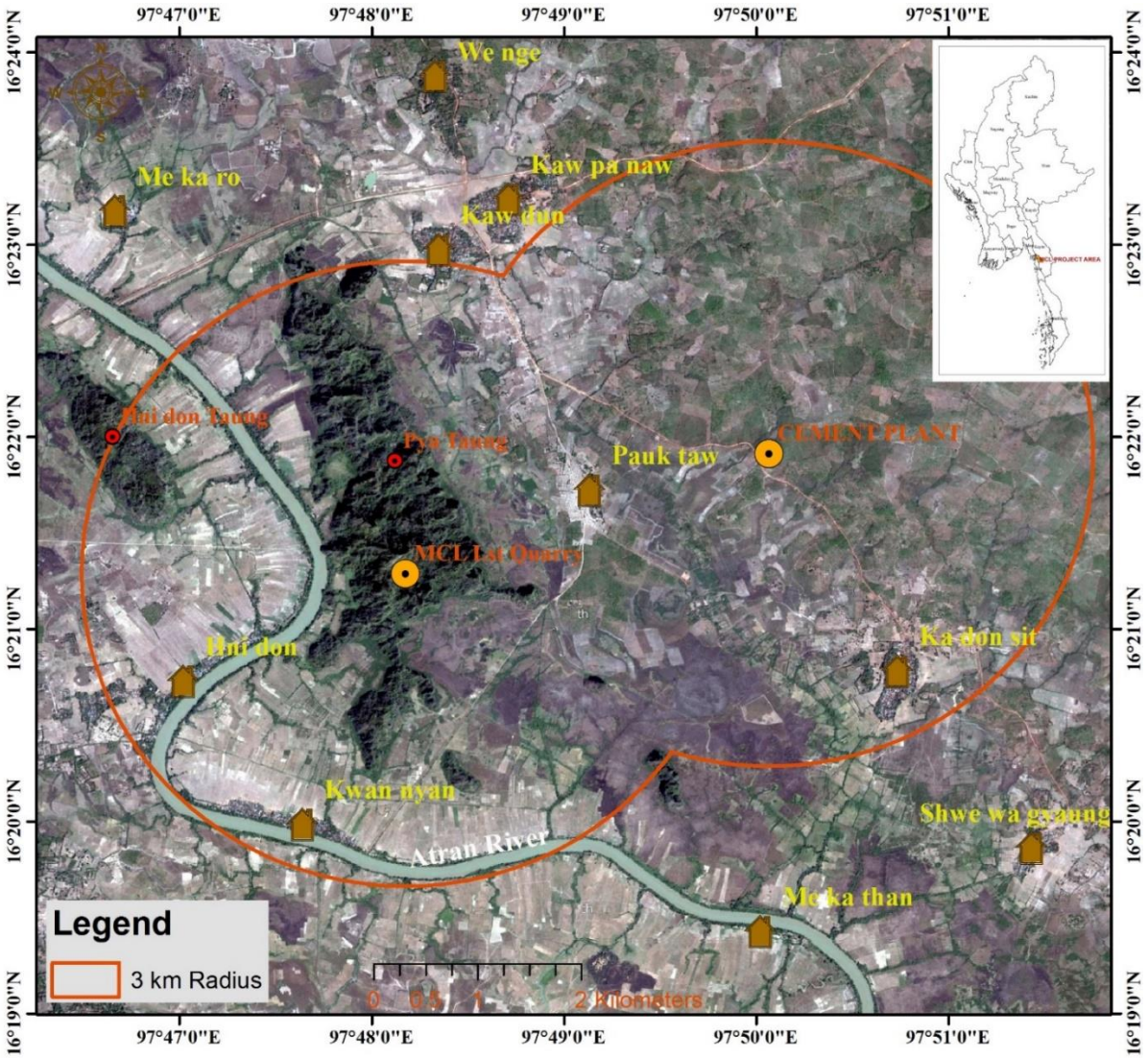
In 2018 June, Mon state experienced the worst flood in over 40 years after hours of heavy rain and rise of the tide in Thanlwin river. Myanmar Times stated that 'Hundreds of people were forced to flee their homes after floods swept Mawlamyine and other townships in Mon state after hours of heavy rain, government officials and rescuers said." The wall in front of Kyaikkalan pagoda was suddenly broken due to heavy rain and most of the roads and landslide were destroyed by this flood. The rain fall rates were 13.7 inches in Mawlamyine and 11.69, 6.22 and 11.89 for Mudon, Thanphyusayat and Chaung Zone townships, respectively. At least 16 people have been killed or are missing in the strong monsoon and affected over 35,000 households in Mon state.

Figure 4.10-2: Flood (June 2018) at Kwan Ngan Village

Chapter 5
Environmental and Socioeconomic Baselines

5.1 Introduction

Desk studies as well as site specific baseline investigations were carried out to provide a full picture of the status of the existing natural and human environment and to understand potential impacts and any sensitive risk receptors for the Project, in terms of the purpose of environmental management plans and social management plans by minimizing the negative impacts and maximizing the positive impacts of the project activities.



Source of Map: Google Earth (2012)

Figure 5.1-1: Area Potentially Affected by the Project

The baseline surveys were focused on circle of 3 km radius respectively centered at the Cement Plant, representing the area potentially affected by the Project as shown in Figure 5.1-1.

The baseline study was conducted during Pre Monsoon season during February 2013. The resulting environmental and socioeconomic baseline studies and conducted site surveys are presented in the following.

The environmental baseline data such as water, air and noise quality, river sediment bed, soil & water and ecological survey were conducted at the selected sampling sites within the project site. The ecological survey was conducted to assess the type of flora and fauna prevailing within the site. In addition, the socio-economic baseline surveys have also been done at the surrounding area.

5.2 Physical Baseline Studies

5.2.1 Outline

Resource and Environment Myanmar Co. Ltd. **(**REM**)** conducted the actual environmental survey for environmental impact assessment at the 5000 T/D Cement Plant and its facilities near Town, Mawlamyine District in Mon State. Three sampling sites for air quality and noise monitoring, eight sampling sites of water quality survey, four for surface water and four for underground water, three sampling sites for river bed and sixteen sampling points for soil were conducted in project site baseline investigation.

The summary of physical environmental survey is shown in Table 5.2-1 and sampling points for environmental survey are shown in Figure 5.2-1.

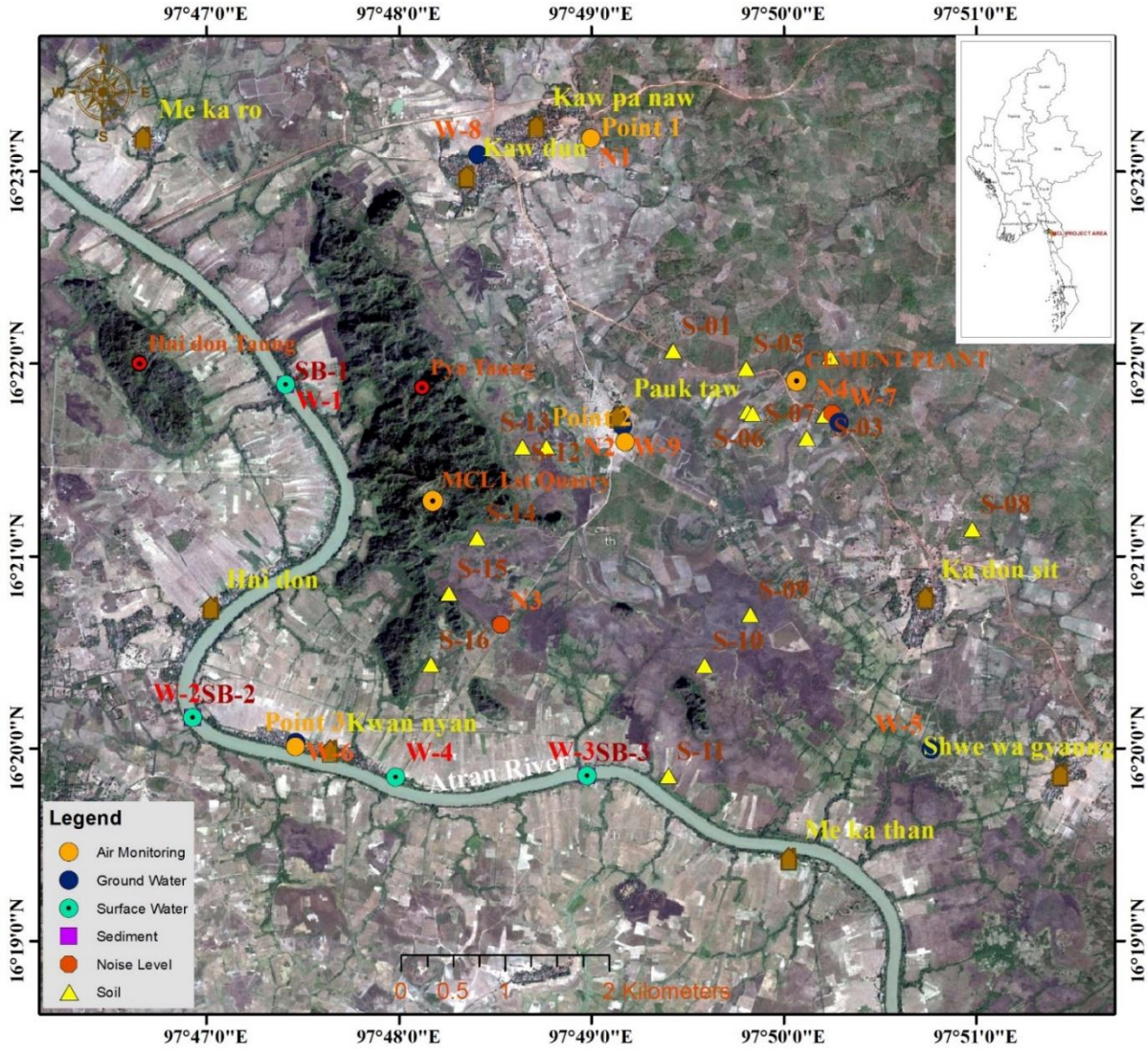
Table 5.2-1: Summary of Baseline Survey for Physical Environment

Air Quality & Meteorology	Parameter	1) Nitrogen dioxide, 2) CO, 3) particulate Matter PM_{10}, 4) Total Suspended Particulate, 5) Sulphur Dioxide, 6) VOC, 7) Relative Humidity, 8) Temperature, 9) Wind Speed, and 10) Wind Direction
	Period	3 points for one time within 24 hours
	Location	Residential area
Noise Level	Parameter	LAeq (A-weighted loudness equivalent)
	Period	One time at 4 locations within 24 hours
	Location	Residential and rural areas
Surface Water Quality	Parameter	In-situ Test : 1) pH, 2) EC, 3)TDS, 4) Temperature, 5) Turbidity, & 6) ORP
	Period	One time at 4 locations
	Location	River
Under ground Water Quality	Parameter	In-situ Test: 1) pH, 2) EC, 3) TDS, 4) Temperature, 5) Turbidity, & 6) ORP
	Period	One time at 4 locations
	Location	Wells and tube well

Table 5.2-1: Summary of Baseline Survey for Physical Environment (Continue)

River Bed Sediment	Parameter	Field Observation Survey and Sampling
	Period	One time at 3 locations
	Location	River bed sediment along the river
Soil Quality	Parameter	Field Observation Survey and Sampling
	Period	One time at 16 locations
	Location	Residential and rural areas

Source: REM Field Survey (February 2012)



Source of Map: Google Earth (2012)

Figure 5.2-1: Location Map of Baseline Sampling Points for Physical Environment Studies

5.2.2 Air Quality

Survey Item

Myanmar National Environmental Quality (Emission) Guidelines were released on 29th December, 2015 and guideline values for air pollution level are shown in Table 5.2-2.

Table 5.2-2: Myanmar National Environmental Quality Guideline Values for Air Quality Survey Parameters

No	Parameter	Averaging Period	Guideline Value	Units
1.	Nitrogen dioxide	1-hour	20	$\mu g/m^3$
2.	Carbon monoxide	-	-	-
3.	Particulate matter PM_{10} a	24-hours	50	$\mu g/m^3$
4.	Particulate matter $PM_{2.5}$ b	24-hours	25	$\mu g/m^3$
5.	Sulphur dioxide	24-hour	20	$\mu g/m^3$
6.	Temperature	-	-	°C
7.	Relative Humidity	-	-	%

Remark: PM_{10} a = Particulate matter 10 micrometers or less in diameter

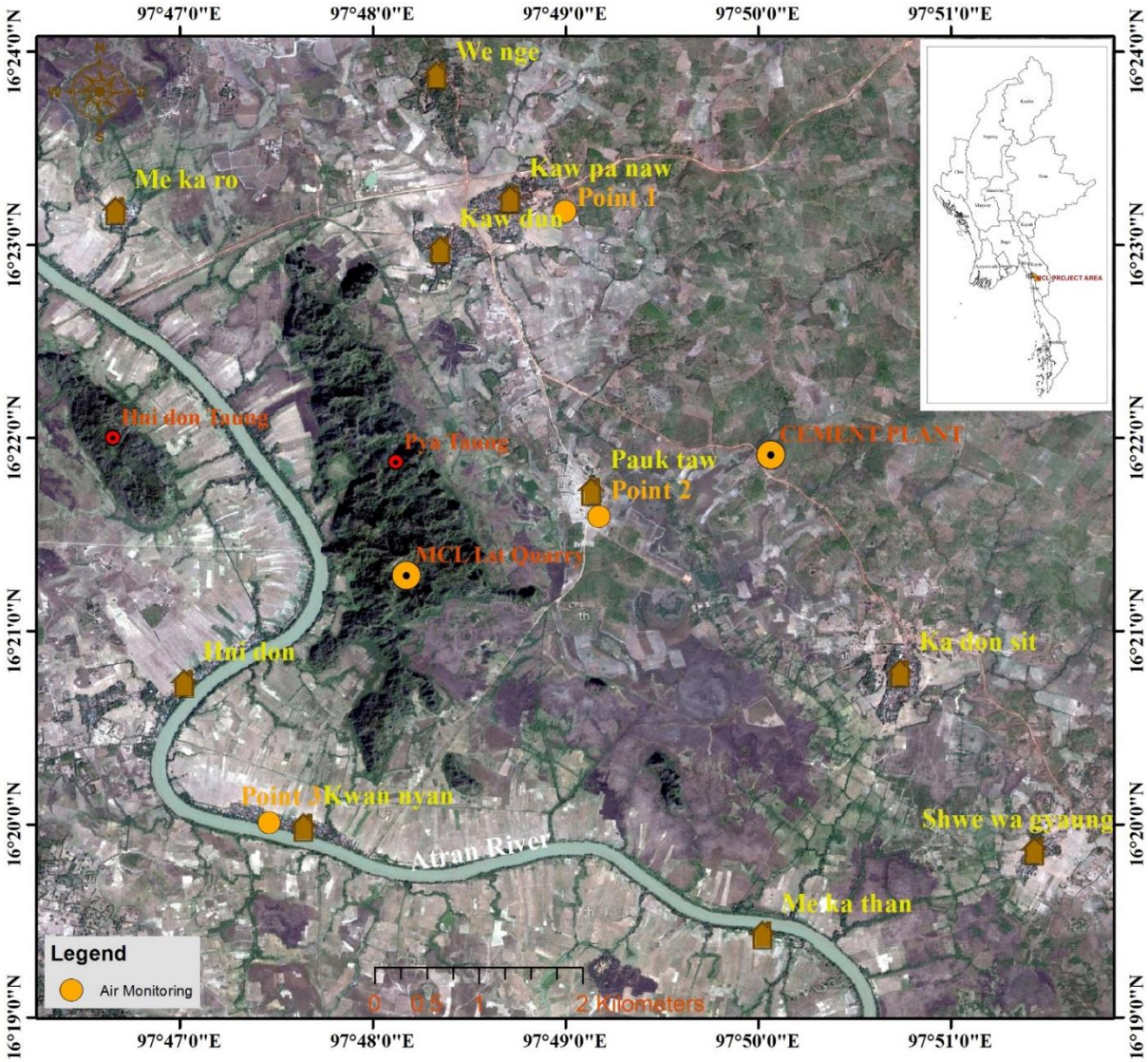
$PM_{2.5}$ b = Particulate matter 2.5 micrometers or less in diameter

Survey Location

The locations of air quality monitoring survey in detail are shown in Figure 5.2-2. The detailed sampling points are described as Table 5.2-3.

Table 5.2-3: Sampling Locations of Air Quality Survey

No	Monitoring Point	Coordination	Level above the ground (m)	Description
1.	Point 1	16° 23’ 10.5’’ N 97°48’ 59.9’’ E	1.5	At the monastery compound of Kawpanaw village and north of project site
2.	Point 2	16° 21’ 35.7’’ N 97° 49’ 10.5’’ E	1.5	At the monastery compound of Pauktaw village and west of project site
3.	Point 3	16° 20’ 0.6’’ N 97° 47’ 27.8’’E)	1.5	At the monastery compound of Kwan Ngan Village



Source of Map: Google Earth (2012)

Figure 5.2-2: Location Map of Air Quality Monitoring Survey

Point 1

The sampling site was conducted in the compound of Kawpanaw Village, Township, Mon State. It was fared about 2.7 km at northwest of project site. The location is surrounded by residential houses and rubber plantation. The possible emissions might become from human activities, such as cooking gases from normal biomass burning and dust from transportation on low level road infrastructures and the flocks through the roads for the purpose of agricultural business. The location of Point 1 is shown in Figure 5.2-3.

Figure 5.2-3: Air Quality Monitoring Survey at Point 1

Point 2

Point 2 was surveyed in the monastery compound of Pauk taw Village, Kyan Nyan Village Track, Township, Mon State and it was fared about 1.2 km at southwest of project site. The location of point 2 is generally flat terrain and covered with some houses and paddy fields as shown in Figure 5.2-4. The possible emissions might source from the human activities of residents as in above point 1.

Figure 5.2-4: Air Quality Monitoring Survey at Point 2

Point 3

The point 3 sampling site was set at the monastery compound of Kyan nyan village and fared about 5.6 km at southwest of project site. The location was at the bank of Ataran River and generally flat terrain and covered with many residential houses. The possible emission sources might become as above. The location of Point 3 is shown in Figure 5.2-5.

Figure 5.2-5: Air Quality Monitoring Survey at Point 3

Survey Methodology

Sampling and analysis of ambient air pollutants were conducted by referring to the recommendation of United States Environmental Protection Agency (U.S. EPA) as shown in Table 5.2-4. The Haz-Scanner EPAS Wireless Environmental Perimeter Air Station was used to collect Ambient Air Monitoring data.

Table 5.2-4: Sampling and Analysis Method for Air Quality

No.	Parameter	Analysis Method
1	Nitrogen dioxide (NO_2)	In Situ
2	Carbon monoxide (CO)	In Situ
3	Particulate matter 10 (PM_{10})	In Situ
4	Particulate matter 2.5 ($PM_{2.5}$)	In Situ
5	Sulphur dioxide (SO_2)	In Situ
6	VOC	In Situ
7	Temperature	In Situ
8	Relative Humidity	In Situ
9	Wind Speed	In Situ
10	Wind Direction	In Situ

Survey Result

Point 1

Average value of ambient gaseous levels at Point 1 for 24 hours are presented in following Table 5.2-5. CO, NO_2 and TSP values are not controlled by the applied standard. Generally, covering the all parameter of pollution, all parameters are commonly lower than the guideline standard except PM_{10}. So, it indicated the area had particulate sources and it was certainly to say the measured data were baseline level in the area.

Table 5.2-5: Ambient Air Quality Results at Point 1 (24-hr Average)

Date	Time	CO	NO_2	TSP	PM_{10}	VOC	RH	SO_2	Temp
D.M.Y	**hours**	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	**%**	µg/m^3	**˚C**
25th – 26th Feb, 2013	24	1	0	256	130	0	68	0	30
Myanmar Emission Guideline Value (24 hours)		-	20	-	50	-	-	20	-

Point 2

Average value of ambient gaseous levels at Point 2 for 24 hours are presented in following Table 5.2-6. CO, NO_2 and TSP values are not controlled by the applied standard. SO_2 is lower than the standard value while PM_{10} and NO_2 values are higher than the national emission guideline value. Therefore, it indicated the area had few emission sources during baseline studies.

Table 5.2-6: Ambient Air Quality Results at Point 2

Date	Time	CO	NO_2	TSP	PM_{10}	VOC	RH	SO_2	Temp
D.M.Y	**hours**	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	**%**	µg/m^3	**˚C**
25th – 26th Feb, 2013	24	1	50	145	114	0	68	2	30
Myanmar emission guideline value (24 hours)		-	20	-	50	-	-	20	-

Point 3

Average value of ambient gaseous levels at Point 3 for 24 hours are presented in following Table 5.2-7. CO, NO_2 and TSP values are not controlled by the applied standard. Even though SO2 values is lower than the standard, NO_2 and PM_{10} values are higher than the guideline value.

Table 5.2-7: Ambient Air Quality Results at Point 3

Date	Time	CO	NO_2	TSP	PM_{10}	VOC	RH	SO_2	Temp
D.M.Y	**hours**	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	**%**	$\mu g/m^3$	**˚C**
25^{th} – 26^{th} Feb, 2013	24	0	50	236	126	0	78	4	31
Myanmar Emission Guideline Value (24 hours)		-	20	-	50	-	-	20	-

5.2.3 Noise Level

Survey Item

Myanmar National Environmental Quality (Emission) Guidelines were announced on 29th December, 2015 and guideline value for noise level is as shown in Table 5.2-8.

Table 5.2-8: Guideline Value of Noise Level

No.	Parameter	Unit	National Environmental Quality Guidelines		
			Category	Day time 7:00-22:00	Night time 22:00-7:00
1	A-weighted loudness equivalent (LAeq)	dB	Residential, educational, institutional	55	45
			Industrial, commercial	70	70

Source: National Environmental Quality (Emission) Guidelines (2015)
Remark: a LAeq = Equivalent continuous sound level in decibels

Survey Location

The locations of Noise quality monitoring survey in detail are shown in Figure 5.2-6. The detail of sampling points are described as Table 5.2-9.

Table 5.2-9: Locations of Noise Quality Monitoring Station

Sampling Points	Coordinates	Description of Monitoring Point
N1	16°23'8.51"N 97°48'57.87"E	Same as Point 1 of Air Quality Survey
N2	16°21'35.83" 97°49'9.63"E	Same as the Point 2 of Air Quality Survey
N3	16°20'38.34"N 97°50'17.91"E	Near the proposed Quarry site
N4	16°21'41.83"N 97°50'17.91"E	Near Proposed Cement Plant Site

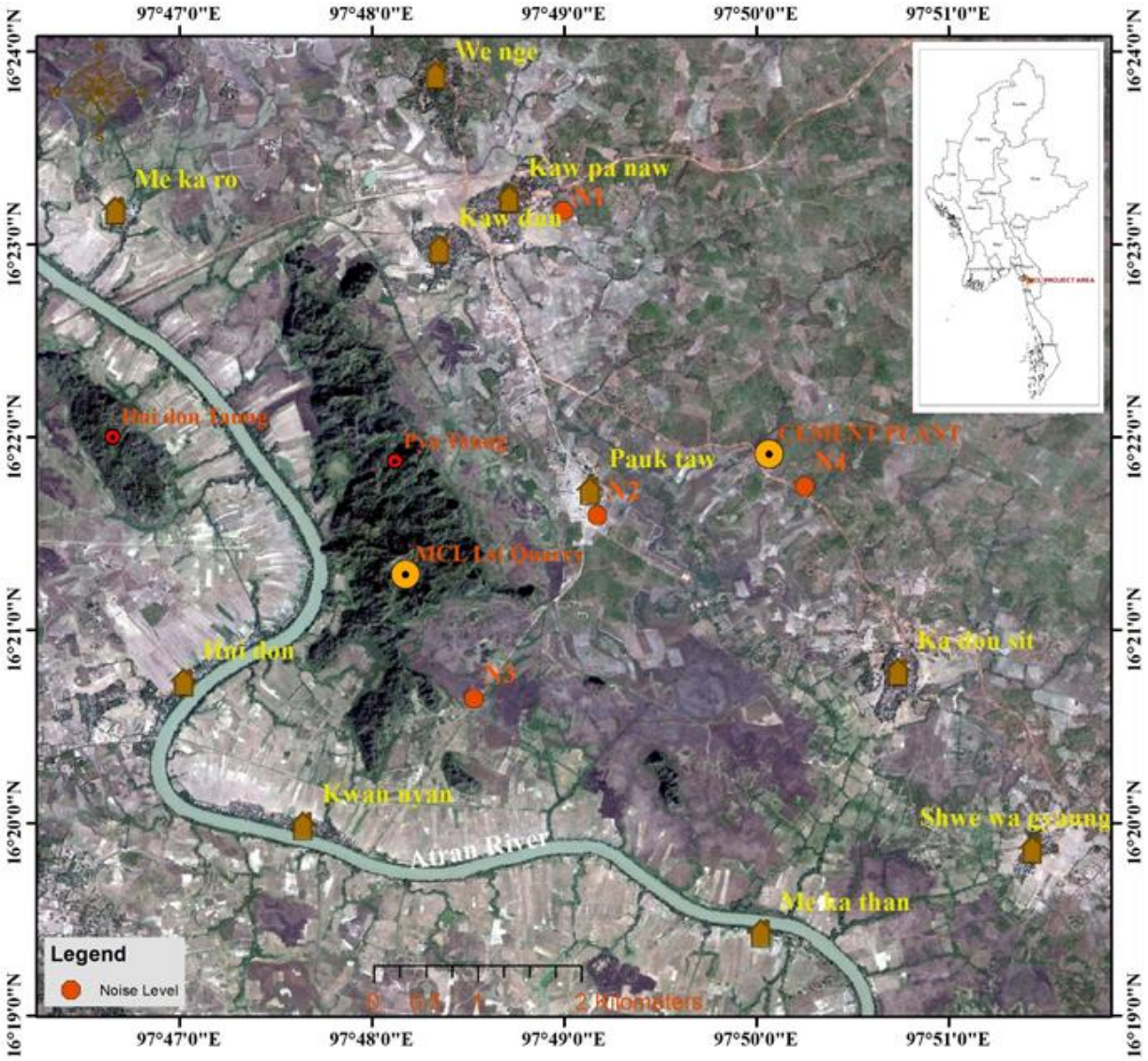


Figure 5.2-6: Location Map of Noise Quality Survey

N1

N2

N3

N4

Figure 5.2-7: Noise Monitoring Survey Activities

Survey Period

Noise level survey was conducted on 24 hours consecutively. The measurement duration is shown in Table 5.2-10.

Table 5.2-10: Sampling Duration for Noise Level Survey

Point	Period
N1	Feb 25th – 26th, 2013 (24 hours)
N2	Feb 26th – 27th, 2013 (24 hours)
N3	Feb 27th – 28th, 2013 (24 hours)
N4	Feb 278h – Mar 1st, 2013 (24 hours)

Survey Method

Measurement of environmental sound level was conducted by referring to the recommendation of International Organization for Standardization (ISO), i.e. ISO 1996-1:2003 and ISO 1996-2:2007. The instrumentation used for noise quality survey is shown in the following Table 5.2-11.

Noise meter was set up to record the log as ten minutes intervals during an hour for one consecutive day.

Table 5.2-11: Instrumentation for Noise Survey

Instrumentation	Description
Sound level meter	Sound level meter with SD Card, Model SL-4023SD

Source: Resource and Environment Myanmar Co., Ltd.

Figure 5.2-8: Lutron Sound Level Meter

Survey Result

The noise level within the 24 hours at most of all survey locations found lower than the noise quality of Myanmar National Environmental Quality (Emission) guideline except the daytime of N1 which is slightly higher than the guideline values as shown in Table 5.2-12.

One day LAeq was calculated by using the following array formula in the excel sheet. This formula is firstly used for hourly LAeq and then for the 24 hours;

L_{Aeq}. 10*LOG10 (AVERGAE (10^ ((RANGE)/10)))

As the monitoring is conducted for the industrial areas, the results are compared with "Residential, educational, institutional" environment.

By means of the calculated results, daytime and night time Leq at most of all monitoring points are lower than the national emission guideline standards for each categorized environment, however, N1 point at day time is slightly higher than the guideline standard because of unusual noise (strong wind, school activities at day time and heavy rain) during the survey period.

Table 5.2-12: A-weighted Loudness Equivalent (LAeq) Level Result (24 hours)

Day/Point	N1 Feb 25th – 26th, 2013		N2 Feb 26th – 27th, 2013		N3 Feb 27th – 28th, 2013		N4 Mar 28th–1st, 2013	
	Day Time	Night Time	Day Time	Night Time	Day Time	Night Time	Day Time	Night Time
Result (dBA)	56.37	40.44	53.03	36.65	45.36	44.68	46.74	41.61
EQEG* (dBA)	55	45	55	45	55	45	55	45

EQEG*** -** Myanmar National Environmental Quality **(**Emission**)** Guidelines for Residential, educational, and institutional.
Remark: N1, Shaded area *is higher than the standard.*

5.2.4 Surface Water Quality Standard

There is no standard for ambient surface water quality in Myanmar. However, in 2015 December 29th, Myanmar National Environmental Quality (Emission) Guidelines was released for effluent quality of Wastewater, Storm water runoff, Effluent and sanitary discharges for operation period of industries as showed in Table 5.2-13.

Table 5.2-13: Survey Parameters for Water Quality Survey

No.	Parameter	Unit	Myanmar Environmental Guideline Value (General Application)
1	pH	-	6 – 9
2	Electrical Conductivity (EC)	µS/cm	-
3	Total Dissolved Solid (TDS)	ppm	-
4	Temperature	°C	-
5	Turbidity	FNU	-
6	ORP	-	-
7	Total Suspended Solids (TSS)	mg/l	50
8	Total Hardness	mg/l	-
9	BOD (5 days)	mg/l	50
10	Salinity	ppt	50
11	Iron (Fe)	mg/l	-
12	SO_4	mg/l	-
13	Manganese	mg/l	-

Table 5.2-13: Survey Parameters for Water Quality Survey (Continue)

No.	Parameter	Unit	Myanmar Environmental Guideline Value (General Application)
14	Total Coliforms	cfu/100ml	-
15	Fecal Coliforms	cfu/100ml	-
16	*E.Coli*	cfu/100ml	-
17	Oil & Grease	mg/l	10
18	Dissolved Oxygen (mg/l)	mg/l	-
19	Total Alkalinity (mg/l)	mg/l	-
20	Fluoride (mg/l)	mg/l	-
21	Calcium (mg/l)	mg/l	0.1

Source: General Application; Wastewater, Storm water runoff, Effluent and sanitary discharges (Myanmar National Environmental Guidelines (2015, Dec 29th))

5.2.4.1 Surface Water Quality Survey Parameters

Parameters for water quality survey are determined so as to cover the parameters of existing environmental standards. The following parameters to be measured and analyzed in situ as well as laboratory.

1) Colour
2) pH
3) Alkalinity
4) Temperature
5) Turbidity
6) Dissolved Oxygen
7) Hardness
8) Electrical Conductivity
9) BOD_5
10) COD
11) Total Suspended Solids
12) Total Nitrogen
13) Total Phosphorous
14) Total Coliform Bacteria
15) Oil and Grease

Survey Locations

The locations of water sampling sites are described in Table 5.2-14 and Figure 5.2-9.

Table 5.2-14: Sampling and Survey Points of Surface Water Quality Survey

Category	Sampling Point	Coordinates	Description of Sampling Point
Surface Water	W-1	16°21'53.65" N 97°47'24.78" E	Upstream of Ataran River, Township
Surface Water	W-2	16°20'9.63" N 97°46'55.74" E	Middle Stream of Ataran River, Township
Surface Water	W-3	16°19'51.51" N 97°48'58.71" E	Downstream of Ataran River, Township
Surface Water	W-4	16°19'51.16" N 97°47'59.14" E	In the Creek, near Entrance of Kwangan Village, Township

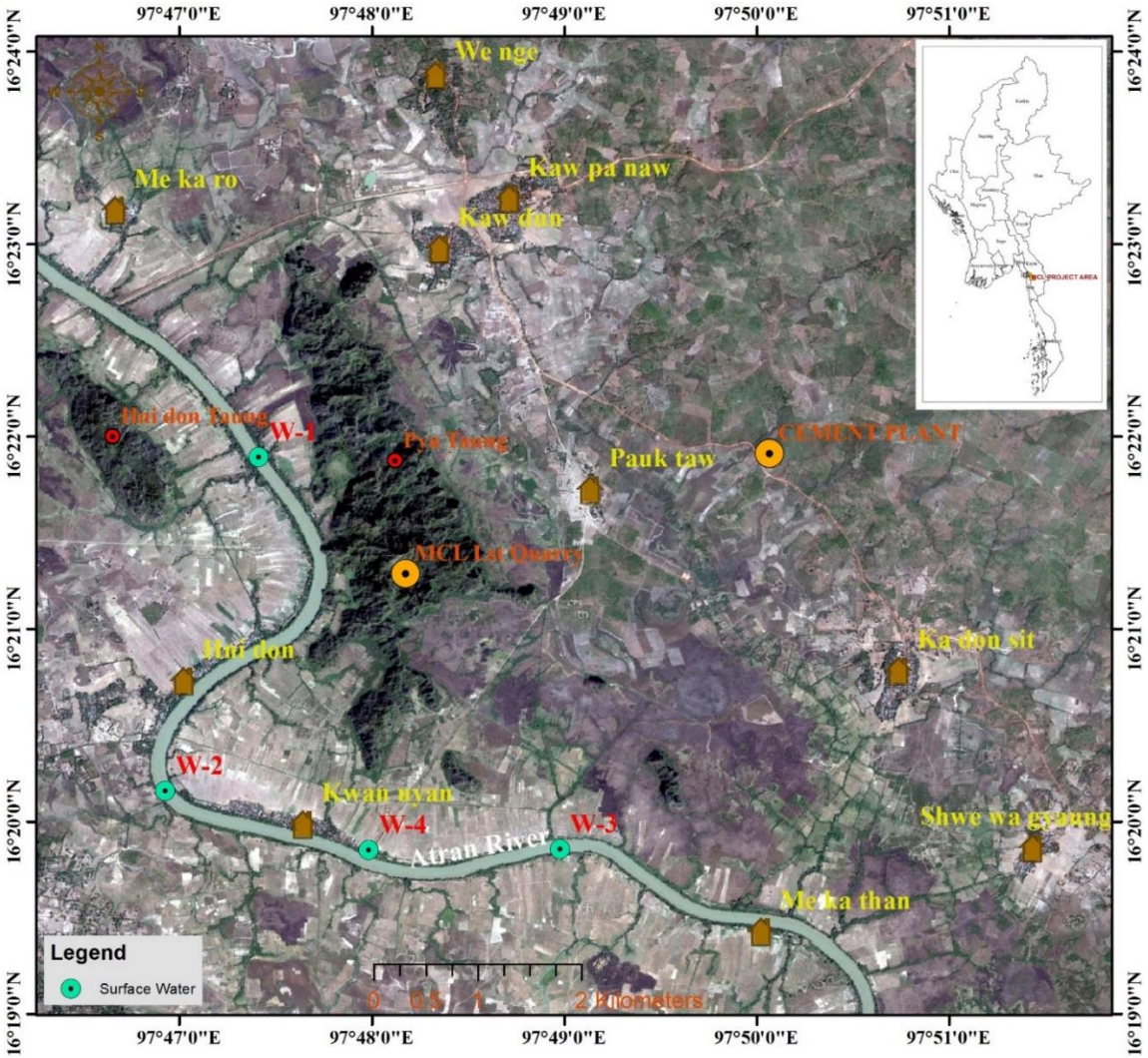


Figure 5.2-9: Locatin Map of Surface Water Quality Survey Area

5.2.4.2 Surface Water Sampling and Surveying

Four surface water quality survey and sampling were carried out along the Ataran River, which is generally flowing to Than Lwin River from southeast to northwest, Kyaukmaraw Township, Mawlamyine District, Mon State. SW1 sampling point was collected in the Ataran River at west of Pya Taung (Limestone Quarry) and also downstream sampling point of project area. SW2 surface water quality points was surveyed in Ataran River at south of Pya Taung and also closer to the Kyan Nyan Village to cover the downstream condition of canal in future. SW-4 point was collected in small canal which is flowing to Ataran River at just east of Kyan Nyan Village. The last water sampling, SW-3, was surveyed in upstream of canal entrance. The activities of surface water sampling and survey are shown in Figure 5.2-10.

Figure 5.2-10: Collection of Surface Water Samples

The sampling and measuring of the surface water were conducted on 26th -27th May, 2013.

5.2.4.3 Survey Method

Water samples were taken by Alpha horizontal water sampler and collected in plastic and sterilized glass sample containers. All sampling was in strict accordance with recognized standard procedures. The parameters as pH, temperature, dissolved oxygen (DO), electrical conductivity (EC), and total dissolved solid including the odor and color in visual analyzing were measured at each site concurrently with sample collection and. All samples were kept in iced boxes and were transported to the laboratory within 24 hours and kept at 4˚C in the refrigerator.

Moreover, the river survey; the flow rate, width and depth of river, was also measured using Vale port Flow Meter equipment and depth sounder.

Table 5.2-15: Field Equipment for Surface Water Quality Survey

No.	Equipment	Manufacturer	Originate Country	Model
1	Multiparameter (water quality)	HANNA	USA	HI7609829 (with 3 sensors) 
2	SmarTROLL multi-parameter	In-situ Inc.	USA	
3	pH meter	HANNA	USA	HI 98129
4	Alpha Bottle (Water Sampler)	Wildlife Supply Company®	Indonesia	-
5	DO meter	HANNA	USA	

Table 5.2-16(a): Container and Preservation Method for Water Samples

No.	Parameter	Container	Volume (ml)	Preservation	Holding Time
1	BOD	PE	1,000	Cool 4±2 °C	48 Hours
2	COD	PE	500	Add H_2SO_4 to pH <2	28 Days
3	TSS	PE	1,000	Cool 4±2 °C	7 Days
4	TDS	PE	1,000	Cool 4±2 °C	7 Days
5	TCB	Glass	250	Cool 4±2 °C	24 Hours
6	Heavy Metals (Pb, As, Fe)	PE	1,000	Add HNO_3 to pH <2	6 Months
7	Cyanide	PE	134	Add NaOH to pH >12	24 Hours

The following Table 5.2-16 provides the test method for water quality.

Table 5.2-16(b): Container and Preservation Method for Water Samples

No	Parameter	Container	Preservation
1	Oil and Grease	1000 ml glass bottle	Sulphuric acid, Refrigerate
2	BOD_5, COD	1000 ml glass bottle	Refrigerate
3	Heavy metals	1000 ml glass bottle	HNO_3, Refrigerate
4	Bacteria	1000 ml glass bottle (Sterilize)	Refrigerate
5	Others	2,800 ml plastic bottle	Refrigerate

Survey Result

Results of In-situ measurement and laboratory for surface water quality are provided in below Table 5.2-17 and Table 5.2-18.

Table 5.2-17: Result of in-situ Test of Surface Water Quality

Site ID	pH	EC (µS/cm)	TDS (ppm)	Temp (°C)	Turbidity (FNU)	ORP
W-1	7.88	252.92	126.58	29.94	136.38	113.73
W-2	7.73	287.25	143.58	30.45	70.73	105.10
W-3	7.59	268.75	132.17	30.13	144.08	80.02
W-4	7.89	278.75	139.42	30.39	157.25	54.10

Table 5.2-18: Laboratory Result of Surface Water Quality

Sample Code	W 1 T	W 1 B	W 2 T	W 2 B	W 3 T	W 3 B	W 4
Suspended Solid (mg/l)	185	177	171	170	166	165	171
Total Hardness (mg/l)	180	216	120	144	120	140	160
BOD (mg/l)	1	1.5	0.5	0.5	1.75	3	2.5
Salinity (ppt)	nil	nil	nil	nil	nil	nil	nil
Iron (mg/l)	nil	nil	nil	nil	0.01	3.1	1.02
Nitrate - N (mg/l)	nil	nil	nil	0.009	nil	nil	nil
SO_4 (mg/l)	0.4	4.16	4.48	0.68	0.36	0.28	4.24
Manganese (mg/l)	129.5	182.35	88.05	102	85.56	106.4	106.23
Total Coliforms (cfu/100ml)	$1.4x10^3$	$4x10^2$	$1x10^2$	$2x10^2$	$2x10^2$	$2x10^2$	$7.4x10^4$
Fecal Coliforms (cfu/100ml)	$1.4x10^3$	$4x10^2$	$1x10^2$	$2x10^2$	$2x10^2$	$2x10^2$	$7.4x10^4$
E.Coli (cfu/100ml)	0	0	0	0	0	0	0
Oil & Grease (mg/l)	<1	<1	<1	<1	<1	<1	<1
Dissolved Oxygen (mg/l)	5.5	5.0	5.0	4.5	5.0	5.0	5.5
Total Alkalinity (mg/l)	100	102	108	108	84	96	108
Fluoride (mg/l)	nil	nil	0.01	nil	0.01	nil	nil
Calcium (mg/l)	50.41	33.64	31.95	42	34.44	33.6	53.77

(a) Underground Water Quality

Survey Item

There is no standard for ambient underground water quality in Myanmar. However, in 2015 December 29th, Myanmar National Environmental Quality (Emission) Guidelines was released for effluent quality of Wastewater, Storm water runoff, Effluent and sanitary discharges for operation period of industries as showed in Table 5.2-13. Measured and analyzed parameter are as same as surface water quality.

Survey Location

The locations of water samples and surveys are shown in Table 5.2-19 and Figure 5.2-11. The detail of each sampling points are described as below.

Table 5.2-19: Sampling and Survey Points of Ground Water Quality Survey

Category	Sampling Point	Coordinates	Description of Sampling Point
Ground Water	W-5	16°19'59.74" N 97°50'46.01" E	Handed well at west of Kadonsit village, Kyaikmaraw Township.
Ground Water	W-6	16°20'1.94" N 97°47'27.98" E	Tube Well at the west of Kwangan village, in the compound of primary school, Kyaikmaraw Township.
Ground Water	W-7	16°21'41.75" N 97°50'17.27" E	Handed well at rubber plantation near proposed project site, Kyaikmaraw Township.
Ground Water	W-8	16°23'5.42" N 97°48'24.78" E	Well at Kaw dun village, Kyaikmaraw Township.
Ground Water	W-4	16°21'40.85" N 97°49'9.84" E	Handed Well at the middle part of Pauktaw village, Kyaikmaraw Township.

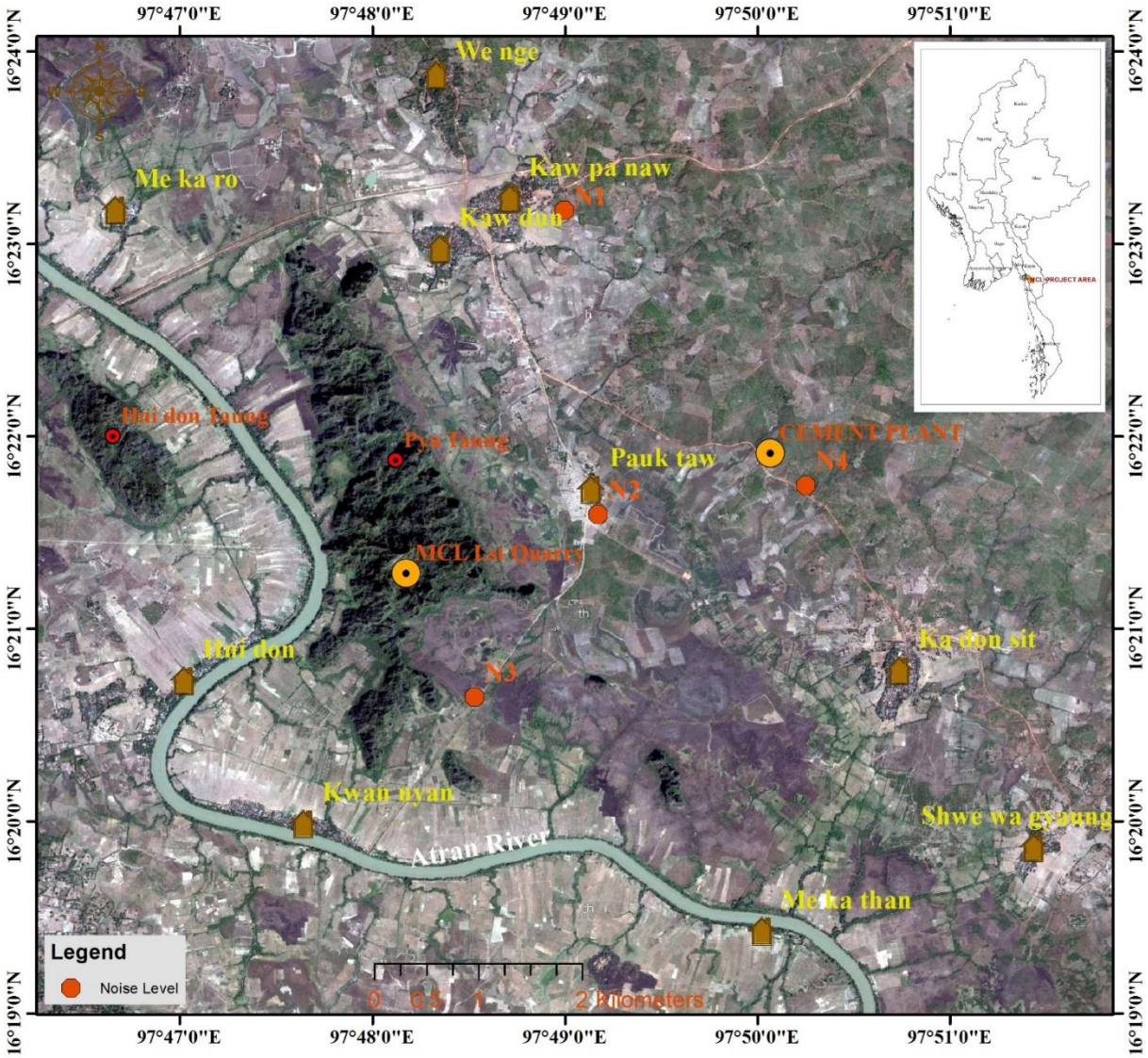


Figure 5.2-11: Location Map of Underground Water Survey

Underground Water Sampling and Survey

Underground water quality sampling and survey were conducted at or near project area of cement plant, canal, and limestone quarry from tube well, handed well, and well for physical in-situ and laboratory tests. Some of field activities are shown in below Figure 5.2-12.

Figure 5.2-12: Undergroud Water Quality Survey

Survey Period

The sampling and measuring of the surface water were conducted on 26th -27th May, 2013.

Survey Method

Survey method of surface water and ground water quality survey are the same.

Survey Result

Results of In-situ measurement and laboratory for surface water quality are provided in below Table 5.2-20.

Table 5.2-20: Laboratory Result of Underground Water

Sample Code	W-5	W-6	W-7	W-8	W-9	Guideline Value (WHO, 2008)
Suspended Solid (mg/l)	102	160	35	80	43	-
Total Hardness (mg/l)	88	120	80	36	56	-
BOD (mg/l)	2.25	3.25	4.5	4.0	3.0	-
Salinity (ppt)	Nil	Nil	Nil	Nil	Nil	-
Iron (mg/l)	5.0	1.12	1.5	1.1	0.015	-
Nitrate - N (mg/l)	Nil	Nil	Nil	0.01	0.007	-
SO_4 (mg/l)	0.28	0.48	0.36	0.52	0.36	300
Manganese (mg/l)	59.44	86.4	76.64	27.6	47.6	0.4
Total Coliforms (cfu/100ml)	$6x10^3$	$4 x10^2$	$4 x10^2$	$1.2 x10^3$	$1.1 x10^3$	-
Fecal Coliforms (cfu/100ml)	$6 x10^2$	$4 x10^2$	$4 x10^2$	$1.2 x10^3$	$1.1 x10^3$	-
E.Coli (cfu/100ml)	0	0	0	0	0	-
Dissolved Oxygen (mg/l)	5.5	6.0	6.5	6.0	6.0	-
Total Alkalinity (mg/l)	64	96	32	20	20	-
Fluoride (mg/l)	Nil	Nil	Nil	Nil	0.01	1.5
Calcium (mg/l)	28.56	33.6	3.36	8.4	8.4	75

5.2.5 Soil

Survey Item

Parameters for soil quality survey are determined so as to cover the parameters of existing available environmental standards as below.

No.	Parameter	Unit
1	Moisture	%
2	SO_4	mg/kg
3	Na	mg/kg
4	K	mg/kg
5	Ca	mg/kg
6	NO_3^-N	%
7	Total Nitrogen	%
8	O.M	%
9	P	mg/kg

Survey Locations

Total of 16 soil samples were collected in and around the cement plant site and quarry and also canal alignment as shown in Table 5.2-21 and Figure 5.2.13.

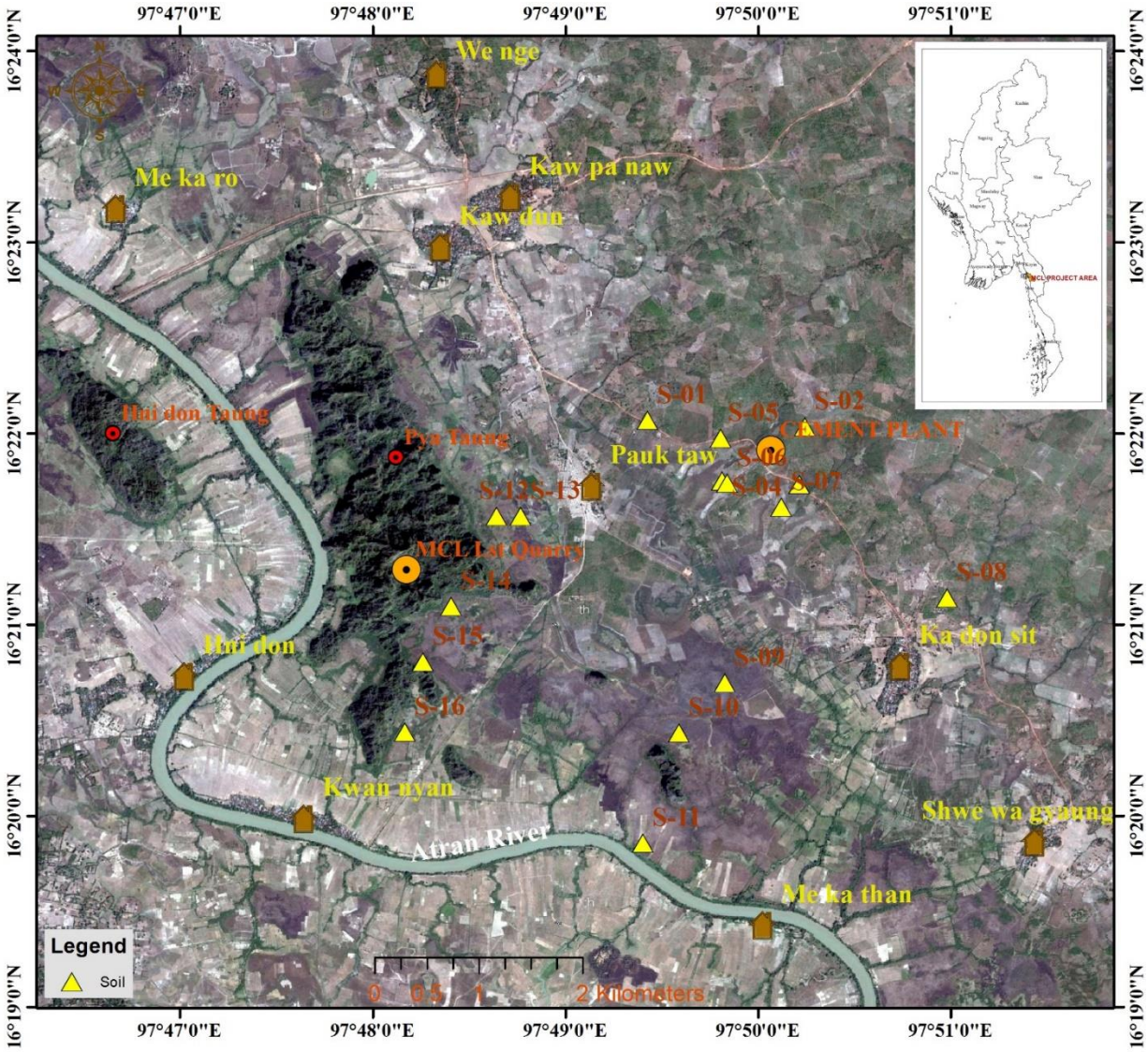


Figure 5.2-13: Location Map of Soil Sampling Points

Table 5.2-21: Sampling and Survey Points of Soil Quality Survey

Category	Sampling Point	Coordinates	Description of Sampling Point
Soil	S 01	N16° 22’ 04.2’’ E97° 49’ 25.6’’	At the rubber plantation area and just near to the proposed cement plant at west
Soil	S 02	N16° 22’ 02.2’’ E97° 50’ 14.6’’	At the rubber plantation area at east of proposed cement plant
Soil	S 03	N16° 21’ 44.1’’ E97° 50’ 12.8’’	At rubber plantation area of proposed cement plant
Soil	S 04	N16° 21’ 45.2’’ E97° 49’ 48.8’’	At paddy field near to prosed cement plant
Soil	S 05	N16° 21’ 58.6’’ E97° 49’ 48.3’’	At rubber plantation area near to proposed cement plant
Soil	S 06	N16° 21’ 44.5’’ E97° 49’ 50.4’’	At paddy field near to proposed cement plant
Soil	S 07	N16° 21’ 36.9’’ E97° 50’ 07.2’’	At paddy field near to prosed jetty
Soil	S 08	N16° 21’ 08.5’’ E97° 49’ 58.8’’	At rubber plantation at northeast of Kadonsit Village
Soil	S 09	N16° 20’ 41.8’’ E97° 49’ 49.6’’	At Paddy field along the prosed canal alignment
Soil	S-010	N16° 20’ 26.0’’ E97° 49’ 35.4’’	At Paddy field along the prosed canal alignment
Soil	S-011	N16° 19’ 51.5’’ E97° 49’ 24.1’’	At Paddy field along the prosed canal alignment
Soil	S-012	N16° 21’ 34.1’’ E97° 48’ 38.6’’	At Paddy field along the prosed canal alignment near to Ataran River
Soil	S-013	N16°21’ 04.4’’ E97° 48’ 46.1’’	At Paddy field at east of Pya Taung
Soil	S-014	N16° 21’ 05.8’’ E97° 48’ 24.5’’	At the land near to limestone quarry area of Pya Taung
Soil	S-015	N16° 20’ 48.4’’ E97° 48’ 15.7’’	At the land near to limestone quarry area of Pya Taung
Soil	S-016	N16° 20’ 26.3’’ E97° 48’ 10.0’’	At paddy filed at south of Pya Taung

Figure 5.2-14: Field Survey on Soil Quality Test

Survey Period

The sampling and measuring of the surface water were conducted on 20th – 22th Feb 2013.

Table 5.2-22: Soil Quality Analytical Data (REM Ecology Survey)

Sample code	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16
Moisture (%)	1.595	1.307	5.922	1.123	0.969	0.934	3.807	3.912	5.525	3.944	5.896	9.805	9.805	7.233	6.417	6.073
SO_4 (mg/kg)	112.8	118.8	106.7	1200	112.8	106.7	106.7	118.8	106.7	112.8	118.8	112.8	234.7	115.3	115.6	112.8
Na (mg/kg)	9.89	7.36	10.81	6.44	5.29	3.91	8.28	5.29	15.87	12.88	14.59	20.47	42.78	22.08	34.5	37.49
K (mg/kg)	35.58	25.02	53.17	14.17	19.94	9.775	30.88	10.16	36.75	30.88	37.14	38.70	4.418	37.53	58.65	63.73
Ca (mg/kg)	226.5	533.0	533.0	533.0	799.5	533.0	799.5	533.0	1068	1322	2136	1869	2136	3472	2404	3472
NO_3-N (%)	0.071	0.057	0.105	0.045	0.092	0.091	0.029	0.115	0.011	0.135	0.011	0.081	0.202	0.123	0.101	ND
Mg (mg/kg)	ND	ND	80.25	323.4	161.7	161.7	161.7	ND	161.7	ND	161.7	161.7	323.4	161.7	323.4	323.4
Total N (%)	0.178	0.248	0.186	0.142	0.177	0.124	0.236	0.146	0.129	0.164	0.167	0.194	0.252	0.208	0.168	0.149
O.M (%)	1.031	0.395	0.415	0.473	0.866	0.669	0.811	0.446	0.289	0.933	0.911	0.735	1.729	1.304	0.833	0.54
P (mg/kg)	5.91	22.65	31.27	23.87	8.28	20.6	10.83	9.58	8.51	7.29	2.12	3.55	1.77	1.3	3.22	1.07

Survey Method

The soil contamination caused by the project activities during both construction and operation could be a potential significant issue. Potential contamination of soil from the project activities may affect the agriculture. So, total of 16 soil samples were collected in and around the cement plant site and quarry and also canal alignment to establish baseline conditions. Detailed of the sampling locations and its geographical coordinates are provided in Table 5.2-21 and Figure 5.2-13.

Soil Survey Group will examine the soil profile of the proposed plant site and jetty site. An auger drill will be applied to collect subsoil information to an appropriate depth (2 meters or till the top of ground water table) from total 16 auger holes in the project area and general soil interpretation, especially susceptibility to the erosion and dust propagation will be reported. To determine the baseline condition before starting the project, a contamination study will perform by testing two samples from each drill.

The common soil types found in the project area are red brown forest soil, laterite soil and meadow soil. These are used for orchard garden and rubber plantations. The Meadow Soil (Gleysol), they are also known as paddy soils. They are occurred at the flat areas and very gently sloping areas, along the Gyaing and Ataran Rivers. The soil texture is mostly made up of clay alluvium and does not have definite stratification down to 1.5 m from the surface. Generally, the colour of the surface soils is yellow brown. This soil can be utilized for rice cultivation.

The total of soil samples collected during the file survey period from project site and within the study area sent to accredited laboratories in Myanmar for physical and chemical analyzing and the result of all soil sample is shown in below Table 5.2-23.

5.2.6 Riverbed Sediment

Survey Item
Parameters for river bed sediment quality survey are determined so as to cover the parameters of existing available environmental standards as below Table 5.2-24.

Table 5.2-23: Physical and Chemical Data for River Bed Sediment Parameters Units

Physical Parameters	
Particle Size	Unit
Gravel	%
Sand	%
Silt & Clay	%
Chemical Characters	
Mercury	ppm
Arsenic as As	ppm
Cadmium as Cd	ppm
Copper as Cu	ppm
Lead as Pb	ppm
Zinc as Zn	ppm
Chromium as Cr	ppm
Nickel as Ni	ppm

Survey Locations

Three sediment samplings were carried out during this survey as below Table 5.2-24.

Table 5.2-24: Sampling and Surveyed Points of Sediment Bed Survey

Category	Sampling Point	Coordinates	Description of Sampling Point
Sediment	SB-1	16°21'53.65" N 97°47'24.78" E	Same as W1 of surface water sampling
Sediment	SB-2	16°20'9.63" N 97°46'55.74" E	Same as W2 of surface water sampling
Sediment	SB-3	16°19'51.51" N 97°48'58.71" E	Same as W3 of surface water sampling

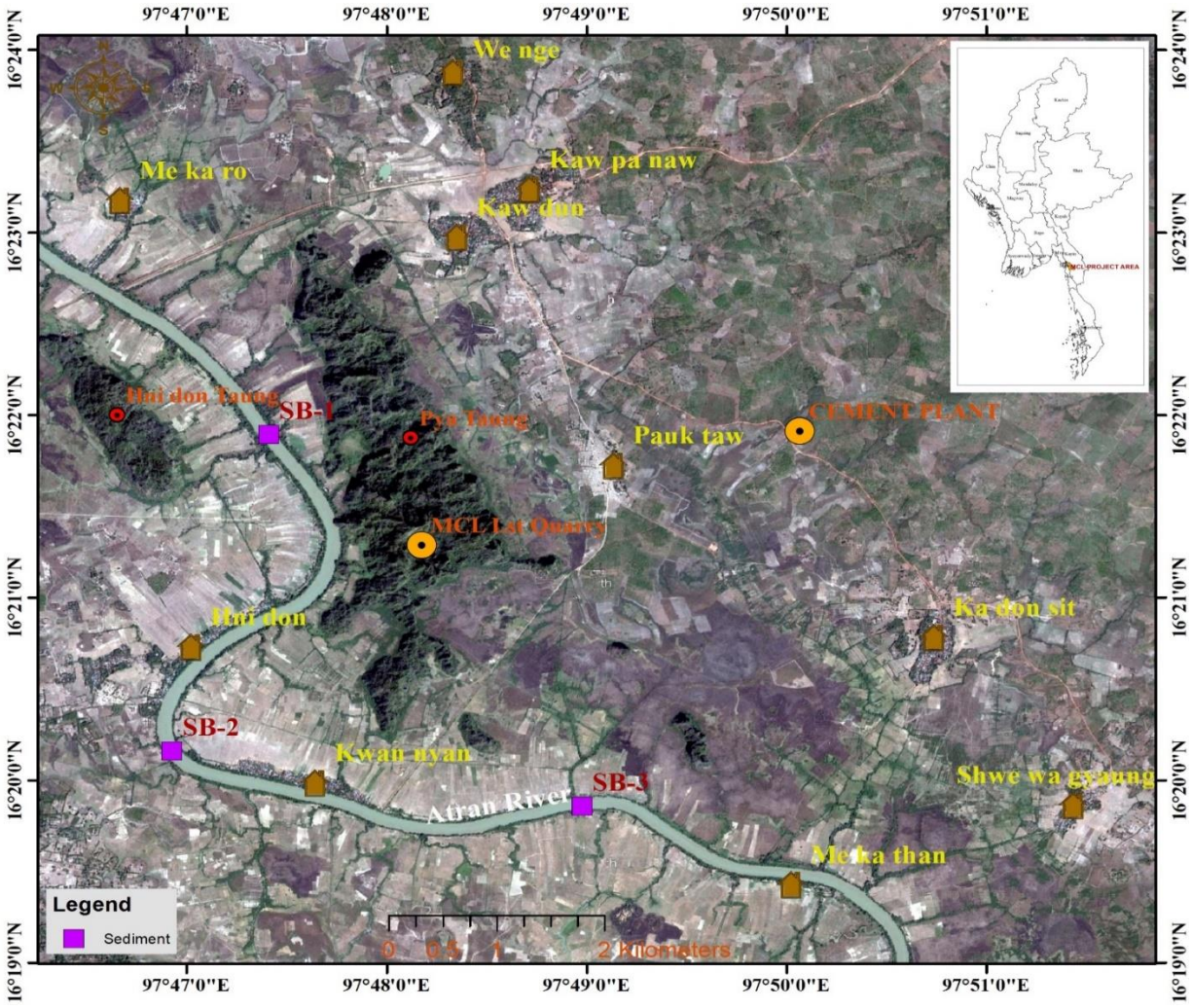


Figure 5.2-15: Location Map of River Bed Sediment Sampling Points

Figure 5.2-16: River Bed Sediment Sampling

Survey Period

The sampling and measuring of the surface water were conducted on 26th May, 2013.

Survey Method

River seabed sediments were collected by dive-based sampling method. Three stations were collected in this survey. At each station, sediment was collected in an amber glass bottle. Sample were labeled and refrigerated (<4º C) before being dispatched for laboratory analyses. Two (2) replicates of benthic samples were collected in a plastic basin. Each benthic sample was then slowly washed through a sieve with a mesh size of 500. The specimens and coarse sediment that were retained in the sieve were collected in a plastic container and preserved in 10% formalin solution.

Survey Result

The below Table 5.2-25 is the survey result of sediment bed.

Table 5.2-25: Physical and Chemical Data for River Bed Sediment Parameters Units

		SB1	***SB2***	***SB3***
Physical Parameters				
Particle Size				
Gravel	%	0	0	0
Sand	%	5	10	5
Silt & Clay	%	95	90	95

Parameters	***Units***	***SB1***	***SB2***	***SB3***
Chemical Characters				
Mercury	ppm	ND	ND	ND
Arsenic as As	ppm	ND	ND	ND
Cadmium as Cd	ppm	0.007	0.004	0.004
Copper as Cu	ppm	120	130	125

Lead as Pb	ppm	75	85	80
Zinc as Zn	ppm	115	120	105
Chromium as Cr	ppm	15	20	10
Nickel as Ni	ppm	7	12	8

5.3 Biodiversity Baseline Studies

5.3.1 Introduction

Physical geography of Myanmar is structurally complex and diverse having the topography of steeper mountain ranges, upland plateau and hill valleys in the eastern, northern and north western regions while undulated central dry zone is surrounded by western coastal range and lowland deltaic region at the lower part of the country and narrower coastal strip is formed at further south adjoining with the peninsular Thailand.

Industrial projects in any given planning region must learn to respect the ecological integrity and biodiversity values of that region as these are going to be the determinants of environmental quality 'as well as the sustainability of development interventions. While some tradeoffs with these values may be inevitable, it is now widely recognised that the measure of resulting environmental degradation will be an inverse indicator of sustainability. Sustainable development is one that meets the needs of present, without compromising the ability of the future generations to meet their needs (Brundtland 1992). In practice, industrial development is often accompanied by significant adverse impacts on all or different components of the environment. For all potentially impacting development projects like multipurpose hydroelectric projects, thermal power plants, fertilizer plants, nuclear plants, transport and telecommunication projects, prior assessment and appraisal of impacts on the different components of environment (abiotic and biotic, including forests, wildlife and people) is imperative for several reasons. It is needed to ensure sustainability that can result from conservation of ecological processes and thereby of life support systems and gene pool resources (or biodiversity). World Conservation Strategy (IUCN 1980) has laid down three criteria for identifying impacts on the environment. The first concerns the length of time and geographic area over which the effects will be felt. The second is urgency or the quickness with which a natural system might deteriorate. Finally, it is important to assess the degree of irreversible damage to communities of plants and animals. It also needs to ensure developmental pace and economic prosperity without actually altering the state of the environment.

5.3.2 Objective of the Survey

The following is the objectives of why conducting ecology baseline study:

1) Provision of comprehensive and accurate information on the ecological baseline;
2) Identification and prediction of potential ecological impacts;
3) Evaluation of the significance of the impacts identified;
4) Recommendations of effective and practicable alternatives and mitigation measures; and
5) Recommendations of the need for and the scope of an appropriate monitoring and audit programme.

5.3.3 Methodology

5.3.3.1 Desktop Survey

Publicly available sources of information were analyzed to build an outline of known and likely ecological values for the Study Area. Aerial imagery was used to build a more complete spatial understanding of the pattern of vegetation communities and human uses on the site, and to map access routes and internal tracks. In addition, ecologists with experience of the Study Area were consulted where possible to obtain information about species known to be present or previously recorded from the site, and other ecological values considered by them to be relevant.

5.3.3.2 Field Observation

(i) Flora

In order to obtain essential ecological data for predicting flora of trees, shrubs and herbs, 10 sample plots in the proposed cement factory, canal and Pya-Taung construction areas (each sample plot was 20m x 20m) were subjectively laid down and observed. All shrubs and herbs were listed and counted in each plot. In each sample plot every living tree of girth at breast height (GBH) ≤ 10cm was measured, listed and counted. Care has been taken to cover different elevation, slope, aspects, drainage and density gradients to study overall spectrum of species diversity. In addition, all trees, shrubs, herbs and cultivated crops around the project area were recorded and listed. Identification of plants and animal species was conducted with assistances of skilled local people. The identified species and families were translated to scientific name with assistance of a checklist of trees, shrubs, herbs and climbers of Myanmar.

(ii) Fauna

Birds were observed with binoculars and identified aided with field guide. The birds were watched from 6:00 am to 10:00 am in the morning and from 4:00 pm to 6:00 pm in the evening. Nocturnal birds were observed when it becomes dusk. Point count and opportunistic methods were used to census the species richness and point counting and transect count were used to get the relative measure of bird abundance. Birds were identified according to Smythies (1953, 2001), King et.al (1975) Lekagul and Round (1991), Harrison and Greensmith (1993), Eve and Guigue (1996) and Webster (1997). Protection status of the bird species was recorded citing the works of Collar (2000) and Hilton-Taylor (2000).

Distribution and presence of mammals were examined by conducting track and sign surveys. Sighting of prey species, tracks, scats, droppings were undertaken as data gathering in the field. Voucher specimens of tracks were taken in the forms of plaster casts, photographs or tracings. Questionnaire survey was carried out. The results of questioning each individual informant were treated as a distinct sample.

The tracks and signs of small mammals were observed along the proposed project area. Small mammal traps were set up in systematic randomization design and left to cover night and day hours and checked the trapped animals. The small mammal species were identified following after Tun Yin (1966), Lekagul and McNeely

(1988) and Francis (2001). Stratified random sampling method was applied for field survey.

In the present study, methodology of the study on reptilian and amphibian species was based on active search and trapping methods. Stratification of the habitat was relatively similar to that of mammal study. Reptilian and amphibian species were actively searched during the survey period. The collected specimens were preserved in 10% formalin for further identification in the laboratory. Turtles and tortoises were identified according to Win Maung and Win Ko Ko (2002).

Butterfly species were collected using insect net and kept in paper boxes in dry condition and brought to the laboratory for further identification. Population of each species within a catch period was recorded to analyze their diversity and distribution pattern. Identification of the butterflies was made according to Bingham (1907) and Talbot (1939).

(iii) Aquatic Fauna

Interviewed with local fisherman from the study area were conducted during the collection of the specimen. Fishermen were interviewed with regard to fishery process including kinds of gear used, number of fishing time per day, target species. The fishing gears are trap, hook and line and gill nets. The water body of the irrigation canal was studied for aquatic fauna. The fishes were collected with the help of the fishermen during the survey period. Traps were also used to get various types of fish like surface dwellers and bottom dwellers. The fishes were photographed soon after the collection and measurements were also taken for key characteristics. Indirect observation at a market and interview with fishermen about kind and quality of fishery product.

5.3.3.3 Interview Survey

In addition to the field observation, secondary data was also surveyed by interviewing from local residents and literature reviewing. In the interview survey, the surveyor visited the residents in and around the survey area and interviewed the name of plants and animals existing in and around the area. Also, the past situation of flora and fauna, and the change on biodiversity and ecosystem in the area was interviewed for examination.

5.3.4 Survey Area

The field survey was carried out at the proposed cement factory, canal and Pya-Taung areas. The survey area is shown in Figure 5.3-1 and the sceneries of the survey area is shown in the following 5.3-1.

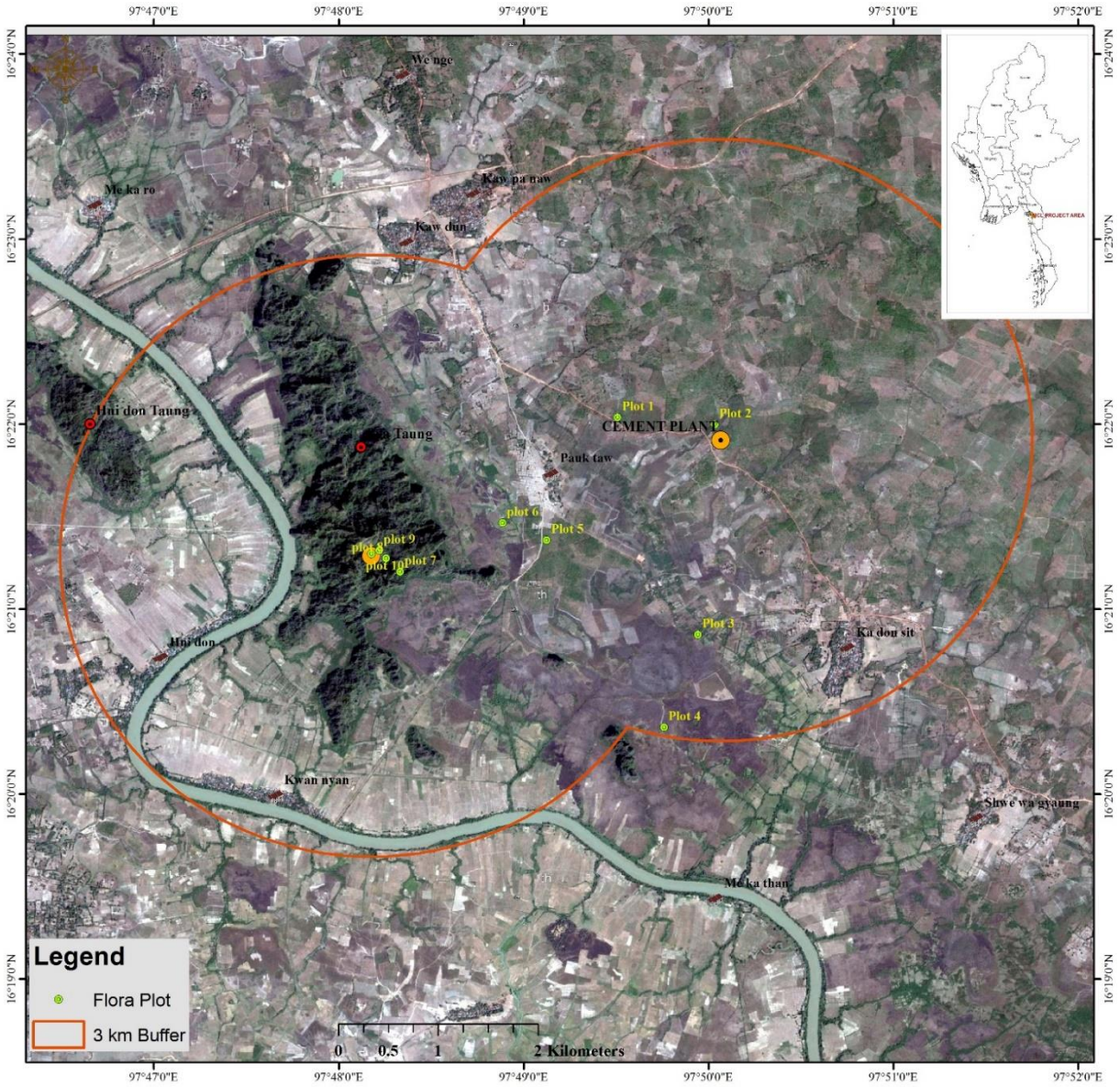


Figure 5.3-1: Survey Area of Biological Environment

Figure 5.3-2: Sceneries of the Survey Area

Figure 5.3-3: Field Survey Activities of Ecology Team

5.3.5 Survey Result

5.3.5.1 Flora

A total of 116 plant species representing 103 genera and 50 families were listed in the proposed cement factory site. It indicates that the study area is floristically heterogeneous. The value of diversity and evenness for plant species was moderate in study area. A total of 14 plant species representing 14 genera and 13 families were listed as cultivated plant species. A total of 17 plant species representing 17 genera and 11 families were recorded along the proposed canal area and in the proposed quarry area.

Among the recorded plant species, a threatened plant species, *Hopea odorata Roxb*. was noted in the area, which was listed as vulnerable species under IUCN Red List.

Table 5.3-1: Plant Species Recorded in the Proposed Cement Factory Area

No.	Botanical Name	Family Name	Myanmar Name	Habit	IUCN Status
1	*Acacia auriculiformis* A. Cunn.	Mimosaceae	Malaysia padauk	ST	NE
2	*Acacia mangium* A. Cunn.	Mimosaceae	Malaysia padauk	ST	NE
3	*Acacia pennata* (L.) Willd.	Mimosaceae	Suyit	S/Cl	NE
4	*Acmella calva* (DC.) R.K. Jansen	Asteraceae	Shadon-po, Sein-nagat	H	NE
5	*Albizia chinensis* (Osbeck) Merr.	Mimosaceae	Bonmeza	T	NE
6	*Albizia odoratissima* (L. f.) Benth.	Mimosaceae	Thit-magyi	T	NE
7	*Alysicarpus vaginalis* (L.) DC.	Fabaceae	Than-ma-naing-kyauk-ma-naing	S	NE
8	*Ascocentrum curvifolium* (Lindl.) Schltr.	Orchidaceae	Thanda-lay	Epiphyte	NE
9	*Ageratum conyzoides* L.	Asteraceae	Khwe-thay-pan	H	NE
10	*Amaranthus spinosus* L.	Amaranthaceae	Hin-nu-nwe-subauk	H	NE
11	*Antidesma acidum* Retz.	Euphorbiaceae	-	ST	NE
12	*Aporusa villosa* (Lindl.) Baill.	Euphorbiaceae	Ye-main	T	NE
13	*Aporusa villosula* Kurz	Euphorbiaceae	Thit-khauk	ST	NE
14	*Argyreia roxburghii* Arn. ex Choisy	Convolvulaceae	Taung kazun new	Cl/Cr	NE
15	*Aristolochia roxburghiana* Klotzsch	Aristolochiaceae	-	Cl/Cr	NE
16	*Axonopus* sp.	Poaceae	-	G	-
17	*Barleria strigosa* Willd.	Acanthaceae	Na-ga	S	NE
18	*Barringtonia acutangula* (L.) Gaertn.	Lecythidaceae	Ye-kyi	T	NE
19	*Bauhinia* sp.	Caesalpiniaceae	-	ST	-
20	*Blumea* sp.	Asteraceae	Kadu	S	-
21	*Breynia angustifolia* Hook. f.	Euphorbiaceae	Ngetmana khinsa	S	NE
22	*Bridelia* sp.	Euphorbiaceae	-	ST	-
23	*Butea parviflora* Roxb.	Fabaceae	Pauk-nwe	Cl	LC
24	*Caesalpinia* sp.	Caesalpiniaceae	-	S	-
25	*Calamus viminalis* Willd.	Arecaceae	Kyein-kha	S	NE
26	*Carallia brachiata* (Lour.) Merr.	Rhizophoraceae	Mani-awga	T	NE
27	*Careya arborea* Roxb.	Lecythidaceae	Ban-bwe	T	NE
28	*Cassampelos pareira* L.	Menispermaceae	Tilin kathar	Cl	NE

Table 5.3-1: Plant Species Recorded in the Proposed Cement Factory Area (Continue)

No.	Botanical Name	Family Name	Myanmar Name	Habit	IUCN Status
29	*Cephalandra indica* Naud.	Cucurbitaceae	Kinmon	Cl/Cr	NE
30	*Chromolaena odorata* (L.) R. M. King & H. Robinson	Asteraceae	Bizat	S	NE
31	*Clitoria macrophylla* Wall.	Fabaceae	Taw-pe	Cl/Cr	NE
32	*Combretum latifolium* Blume	Combretaceae	Maung-ma-khaw-nwe	Cl	NE
33	*Congea tomentosa* Roxb.	Verbenaceae	Thamaga-hmwezoke	Cl	NE
34	*Crassocephalum crepidioides* (Benth.) S. Moore	Asteraceae	-	H	NE
35	*Cratoxylum* sp.	Hypericaceae	-	T	-
36	*Crotalaria retusa* L.	Fabaceae	Taw-peiksan	H	NE
37	*Crotalaria* sp.	Fabaceae	-	S	-
38	*Croton joufra* Roxb	Euphorbiaceae	Thetyin-kado	ST	NE
39	*Crypteronia paniculata* Blume	Crypteroniaceae	Anan-bo	T	NE
40	*Cyperus* sp.	Cyperaceae	-	G	-
41	*Dalbergia stipulacea* Roxb.	Fabaceae	-	S/Cl	NE
42	*Desmodium triflorum* (L.) DC.	Fabaceae	Pe yaing	H	LC
43	*Dipterocarpus tuberculatus* Roxb.	Dipterocarpaceae	In	T	NT
44	*Eleusine indica* L.	Poaceae	Sin ngo myet	G	LC
45	*Emblica officinalis* Gaertn.	Euphorbiaceae	Zee-phyu	T	NE
46	*Euphorbia hirta* L.	Euphorbiaceae	Kywekyaung hmin say	H	NE
47	*Euphorbia hypericifolia* L.	Euphorbiaceae	-	H	NE
48	*Ficus hispida* L. f.	Moraceae	Kha-aung	ST	NE
49	*Ficus rumphii* Blume	Moraceae	Nyaung	T	NE
50	*Flacourtia* sp.	Flacourtiaceae	Naywe	T	-
51	*Flueggea leucopyrus* Willd.	Euphorbiaceae	Chinya-pyu, Kon-chinya	S	NE
52	*Gardenia coronaria* Buch.-Ham.	Rubiaceae	Yin-gat-kyi	T	NE
53	*Getonia floribunda* Roxb.	Combretaceae	Kywet nwe	Cl	NE
54	*Glochidion fagifolium* Miq.	Euphorbiaceae	Htamasok	ST	NE
55	*Glycine* sp.	Fabaceae	-	Cl	-
56	*Helicteres* sp.	Sterculiaceae	-	S	-
57	*Holarrhena pubescens* Wall. ex. G. Don	Apocynaceae	Let htoke gyi	ST	LC

Table 5.3-1: Plant Species Recorded in the Proposed Cement Factory Area (Continue)

No.	Botanical Name	Family Name	Myanmar Name	Habit	IUCN Status
58	*Hyptis suaveolens* (L.) Poit.	Lamiaceae	Kala pin sein	H	NE
59	*Indigofera* sp.	Fabaceae	Me-yaing	S	-
60	*Ipomoea sagittata* Poir	Convolvulaceae	Kone kazun	Cl	NE
61	*Ipomoea* sp.	Convolvulaceae	-	Cl	-
62	*Jasminum* sp.	Oleaceae	Taw-sabe	S	-
63	*Leea indica* Merr.	Leeaceae	Naga-mauk	S	NE
64	*Lepidagathis hyalina* Nees	Acanthaceae	-	H	NE
65	*Leptadenia reticulata* Wight & Arn.	Asclepiadaceae	Gon-kha	Cl/Cr	NE
66	*Litsea glutinosa* (Lour.) C.B. Rob.	Lauraceae	Ondon, Tagu	T	NE
67	*Lygodium* sp.	Schizaeaceae	Kauk kwe	F	-
68	*Markhamia stipulata* (Wall.) Seem. ex K. Schum.	Bignoniaceae	Ma-hlwa, Mayu-de	T	NE
69	*Mecopus nidulans* Benn.	Fabaceae	-	H	LC
70	*Melastoma malabathricum* L.	Melastomataceae	Se-oboke	S	NE
71	*Melochia corchorifolia* L.	Sterculiaceae	Pilaw-akyi	S	NE
72	*Memecylon* sp.	Melastomataceae	-	S	-
73	*Microcos paniculata* L.	Tiliaceae	Mya-ya	T	NE
74	*Millettia extensa* Benth.	Fabaceae	Dama-nge	S/Cl	NE
75	*Mimosa pudica* L.	Mimosaceae	Hti-ka-yone	H	LC
76	*Mitragyna parvifolia* (Roxb.) Korth.	Rubiaceae	Hetin	T	NE
77	*Moghania macrophylla* (Willd.) Kuntze	Fabaceae	Kyemi gyi	S	NE
78	*Moghania strobilifera* (L.) Aiton f.	Fabaceae	Gaung-ohnsa	S	NE
79	*Morinda angustifolia* Roxb.	Rubiaceae	-	ST	NE
80	*Ochna fruticulosa* Kurz.	Ochnaceae	Indaing se ni	S, ST	NE
81	*Oroxylum indicum* (L.) Kurz	Bignoniaceae	Kyaung-sha	T	NE
82	*Osbeckia chinensis* L.	Melastomataceae	Oboke lay	H	NE
83	*Passiflora foetida* L.	Passifloraceae	Taw suka	Cl	NE
84	*Pavetta* sp.	Rubiaceae	-	S	-
85	*Pennisetum pedicellatum* Trin.	Poaceae	Bottle-brush	G	NE
86	*Phyllanthus* sp.	Euphorbiaceae	-	S	-
87	*Phyllanthus urinaria* L.	Euphorbiaceae	Mye-zi-phyu	H	NE
88	*Physalis minima* L.	Solanaceae	Bauk pin	H	LC
89	*Piper* sp.	Piperaceae	-	Cl/Cr	-

Table 5.3-1: Plant Species Recorded in the Proposed Cement Factory Area (Continue)

No.	Botanical Name	Family Name	Myanmar Name	Habit	IUCN Status
90	*Pterospermum semisagittatum* Buch-Hum	Sterculiaceae	Na-gye	T	NE
91	*Quercus* sp.	Fagaceae	Sagat	T	-
92	*Randia uliginosa* DC.	Rubiaceae	Hman phyu	ST	NE
93	*Randia* sp.	Rubiaceae	Ma-gyi-bauk	S	-
94	*Rauwolfia serpentina* Benth.	Apocynaceae	Bonmayaza	S	NE
95	*Rungia pectinata* (L.) Nees	Acanthaceae	-	H	NE
96	*Schleichera oleosa* (Lour.) Oken	Sapindaceae	Gyo	T	NE
97	*Scoparia dulcis* L.	Scorphulariaceae	Darna-thu-kha	H	NE
98	*Sida acuta* Burm. f.	Malvaceae	Wet-chay-pane	S	NE
99	*Sida rhombifolia* L., s.l.	Malvaceae	Katsi-ne	H	NE
100	*Smilax macrophylla* Roxb.	Smilacaceae	Sein nabaw	Cl	NE
101	*Solanum indicum* L.	Solanaceae	Khayan-kazaw	S	NE
102	*Spermacoce latifolia* Rubl.	Rubiaceae	-	H	NE
103	*Spermacoce* sp.	Rubiaceae	-	H	-
104	*Streptocaulon tomentosum* Wight & Arn.	Asclepiadaceae	Myinsa-gonni	Cl/Cr	NE
105	*Strychnos nux-blanda* A. W. Hill	Loganiaceae	Kha baung	T	NE
106	*Symplocos racemosa* Roxb.	Symplocaceae	Dauk-yut	ST	NE
107	*Syzygium kurzii* (Duthie) N.P.Balakr.	Myrtaceae	Thabye-nyo	ST	NE
108	*Tadehagi triquetrum* (L.) H. Ohashi	Fabaceae	Lauk-thay	S	LC
109	*Terminalia bellerica* Roxb.	Combretaceae	Thit seint	T	NE
110	*Thespesia lampas* (Cav.) Dalzell E.A Gibson.	Malvaceae	Taw-wah	S	NE
111	*Tridax procumbens* L.	Asteraceae	Hmwezok-negya	H	NE
112	*Urena lobata* L.	Malvaceae	Katsene	S	NE
113	*Vernonia cinerea* Less.	Asteraceae	Kadu-pyan	H	NE
114	*Walsura* sp.	Meliaceae	-	T	-
115	*Xylia xylocarpa* (Roxb.) Taub.	Mimosaceae	Pyinka do	T	NE
116	*Ziziphus jujuba* Lam.	Rhamnaceae	Zee pin	ST	LC

NE = Not Evaluated
LC = Least Concerned
NT = Near Threatened
T- Tree Cl- Climber
ST- Small tree Cr- Creeper
S- Shrub G - Grass
H- Herb

Table 5.3-2: Cultivated Plant Species in the Proposed Project Area

No.	Botanical Name	Family Name	Myanmar Name	Habit	IUCN Status
1	*Anacardium occidentale* L.	Anacardiaceae	Thiho	T	NE
2	*Hevea brasiliensis* (Willd. ex A. Juss.) Muell.	Euphorbiaceae	Rubber	T	NE
3	*Nephelium lappaceum* L.	Sapindaceae	Kyetmauk	T	LC
4	*Artocarpus heterophyllus* Lam.	Moraceae	Pein -hne	T	NE
5	*Capsicum annuum* L.	Solanaceae	Ngayoke	S	LC
6	*Citrus* sp.	Rutaceae	Shauk	ST	-
7	*Cymbopogon citratus* (DC.) Stapf	Poaceae	Sabalin	G	NE
8	*Eryngium foetidum* L.	Apiaceae	Shan-nan-nan	H	NE
9	*Ismelia* spp.	Asteraceae	Gandama	H	-
10	*Lagenaria siceraria* (Molina) Standl.	Cucurbitaceae	Bu	Cr	NE
11	*Mangifera indica* L.	Anacardiaceae	Tha-yet	T	DD
12	*Musa* sp.	Musaceae	Nget-pyaw	T	-
13	*Piper nigrum* L.	Piperaceae	Ngayoke-kaung	Cl/Cr	NE
14	*Psidium guajava* L.	Myrtaceae	Malaka	ST	NE

NE = Not Evaluated
LC = Least Concerned
DD = Data Deficit
T- Tree **Cl- Climber**
ST- Small tree **Cr- Creeper**
S- Shrub **G - Grass**
H- Herb

5.3.5.2 Fauna

Wildlife habitat is important for the survival of the wildlife animals in terrestrial ecosystem. The wild animals are now threatened by habitat degradation and habitat loss caused by misconduct of human being. A habitat is a part of an ecosystem and diverse ecosystems support for high species diversity. A change in an ecosystem necessarily affects the plant and animal species in the system, and changes in species affect ecosystem processes. The distribution of species on earth is becoming more homogenous.

In the proposed project area, three major habitat types were observed namely (1) Forest, (2) Mixed plantation and cultivated land and (3) aquatic habitat (Ataran River). There is one threatened plant species in the proposed project area and the overall habitat value is assumed to be moderate.

Survey Result

During the survey period, 4 species of Mammals, 9 species of Reptiles and 7 species of Amphibian, 21 species of Birds, total of 41 species of Butterflies and 26 species of Fish were recorded in and around the Project are. During the field survey period, one threatended species of bird namely Red-breasted parakeet (*Psittacula alexandri)* was recorded from the survey area according to the IUCN Red List of Threatened Species (2017). According to the field survey,

no endemic species of Bird found. Butterflies species was found abundantly within the survey area. Other fauna species were recorded by interviewing local villager who live within the project area. There was no globally threatened species of mammals according to the IUCN Red list threatened species (2017). Fish Species were recorded by direct observation during the field survey period.

(i) Birds

Birds are included in the wildlife animals with considerable number of the species listed under the categories of threatened and near threatened species. Some natural habitats of the birds including wetlands and forests were destructed or degraded. Lowland and highland forests inhabited by various bird species were cleared with different purposes such as timber extraction, cultivation, human settlement and development projects etc. Hunting is still a major threat to wildlife even in national parks and wildlife sanctuaries, as local people living around protected area margins are poor and supplemented their income by collecting and selling various forest products collected within.

A total of 21 bird species, which belong to 16 families, were recorded at the proposed project area. The bird Red-vented Bulbul *Pycnonotus cafer*, Common myna *Acridotheres tristis tristis* and spotted dove *Spilopelia chinensis* were dominant species in the proposed project area.

During the study period some bird species were seen in all kinds of habitat showing their capability of wide distribution. Such commonly distributed species comprise insect eaters, some omnivores that have alternative food choice on insects, flowers, seeds and fruits. The common species of the study area include *Acridotheres tristis tristis* and *Streptopelia chinensis*.
Some bird species are adapted to different habitats and they can be found in shrubland, human habitation area and forest; e.g. Common myna *Acridotheres tristis tristis*. Some bird species like Common myna *Acridotheres tristis tristis* and spotted dove *Spilopelia chinensis* recorded in the present study were normally common in the human habitation area.

Table 5.3-3: List of Bird Species Recorded form the Survey Area

Sr. No.	Order/Family	Common name	Species	IUCN Status
1	Accipitridae	Shikra	*Accipiter badius*	LC
2	Columbidae	Spotted Dove	*Streptopelia chinensis*	NE
3	Strigidae	Collared Owlet	*Glaucidium brodiei*	LC
4	Strigidae	Asian Barred Owlet	*Glaucidium cuculoides*	LC
5	Hirundinidae	Barn Swallow	*Hirundo rustica*	LC
6	Hirundinidae	Asian palm-swift	*Cypsiurus batasiensis*	NE
7	Campephagidae	Scarlet Minivet	*Pericrocotus flammeus*	LC
8	Pycnonotidae	Black-crested Bulbul	*Pycnonotus melanicterus*	LC
9	Pycnonotidae	Red-whiskered Bulbul	*Pycnonotus jocosus*	LC
10	Pycnonotidae	Red-vented Bulbul	*Pycnonotus cafer*	LC
11	Dicruridae	Black Drongo	*Dicrurus macrocercus*	LC
12	Corvidae	Large-billed Crow	*Corvus macrorhynchos*	LC
13	Corvidae	Large-billed Crow	*Corvus macrorhynchos*	LC
14	Psittacidae	Red-breasted parakeet	*Psittacula alexandri*	NT
15	Megalaimidae	Lineated barbet	*Megalaima asiatica*	NE
16	Sylviidae	Common tailorbird	*Orthotomus sutorius*	LC
17	Meropidae	Green Bee-eater	*Merops orientalis*	LC
18	Irenidae	Common Iora	*Aegithina tiphia*	LC
19	Saxiculidae	Oriental Magpie Robin	*Copsychus saularis*	LC
20	Passeridae	Eurasian Tree Sparrow	*Passer montanus*	LC
21	Emberizidae	Greater Coucal	*Centropus sinensis*	LC

LC = Least Concerned
NT = Near Threatened
NE = Not Evaluated

Figure 5.3-4: Bird Speices Recorded in the Survey Area

(ii) Mammals

A total of four mammal species were recorded during the survey periods. Long-tailed Macaque (*Macaca fascicularis*) was commonly found in limestone cast forest. Some species like White bellied rat (*Niviventer fulvscens*), and Greater bandicoot rat (*Bandicota indica*) were found mainly in the mixed plantation and cultivated area whereas grey squirrel (*Callosciurus pygerythrus*) was found in both scattered trees and plantation areas.

Table 5.3-4: List of Mammal Species Recorded in the Survey Area

Sr. No.	Scientific name	Common Name	Family	IUCN Status	Observation Status
1	*Callosciurus pygerythrus*	Irrawaddy Squirrel	Sciuridae	LC	Observed
2	*Macaca fascicularis*	Long-tailed Macaque	Cercopithecidae	LC	Track
3	*Niviventer fulvscens*	Indomalayan Niviventer	Muridae	NE	Observed
4	*Bandicota indica*	Greater bandicoot rat	Muridae	LC	Interviewed

NE = Not Evaluated
LC = Least Concerned

Figure 5.3-5: Mammal Species Recorded in the Survey Area

(iii) Reptile and Amphibian

Nine reptilian species and seven amphibian species were recorded at the proposed project site during the survey period. The reptile species *Calotes versicolor* was observed in the mixed vegetation with scattered trees area. Among the recorded species, the paddy frog (*Fejervarya limnocharis*) was found as a very common species. The frog species (*Holobatrachus tigerinus*) was also common in the area distributing in many parts of the area in wet season.

Table 5.3-5: List of Reptile and Amphibian Species Recorded in the Survey Area

Sr. No.	Scientific Name	Common Name	Family	IUCN Status	Type of evidence
1	*Naja kaouthia*	Monocled cobra	Elapidae	LC	Interviewed
2	*Bungarus fasciatus*	Banded krait	Elapidae	LC	Interviewed
3	*Daboia russelii*	Russell's Viper	Viperidae	NE	Interviewed
4	*Ptyas korros*	Indo-chinese rat snake	Colubridae	NE	Interviewed
5	*Ahaetulla nasuta*	Indian vine snake	Colubridae	NE	Observed
6	*Rhabdophis subminiatus*	Red-necked keelback	Colubridae	LC	Observed
7	*Xenochrophis piscator*	Chequered keelback Water Snake	Colubridae	NE	Observed
8	*Holobatrachus tigerinus*	Indian bull frog	Dicroglossidae	NE	Interviewed
9	*Fejervarya limnocharis*	Asian Grass Frog	Dicroglossidae	LC	Interviewed
10	*Polypedates leucomystax*	White-lipped Tree Frog	Rhacophoridae	LC	Interviewed
11	*Bufo bufo*	Common toad	Bufonidae	LC	Interviewed
12	*Microhyla ornata*	Ornate sand frog	Microhylidae	LC	Observed
13	*Kaloula pulchra*	Painted bull frog	Microhylidae	LC	Interviewed
14	*Eutropis multifasciata*	Common sun skink	Scincidae	NE	Interviewed
15	*Calotes versicolor*	Garden fence lizard	Agamidae	NE	Interviewed

NE = Not Evaluated
LC = Least Concerned

Figure 5.3-6: Reptile and Amphibian Species Recorded in the Survey Area

(iv) Butterfly

A total of 10, 15 and 16 butterfly species were recorded in the proposed Pya-Taung ore extraction site, cement factory site and along the canal area respectively. All the recorded butterfly species were common species. Estimated butterfly density of the proposed project area is moderate, and the distribution of the butterflies is random.

Table 5.3-6: Butterfly Species Recorded in the Proposed Cement Factory Area

Sr. No.	Species	Common name	Family	Abundance Status	IUCN /Status
1	*Danaus. chrysippus*	Plain Tiger	Danaidae	Very Common	NE
2	*Danaus genutia*	Common Tiger or Striped Tiger	Danaidae	Common	NE
3	*Euploea core godartii*	Crow	Danaidae	Common	NE
4	*Papilio polytes zomulus*	Common Mormon	Papilionidae	Common	NE
5	*Junonia atlites Linnaeus*	Grey Pansy	Nymphalidae	Common	NE
6	*Symbrenthia javanus Moore*	Jester	Nymphalidae	Very Common	NE
7	*Paduca fasciata fasciata*	The Little Banded Yemon	Nymphalidae	Very Common	NE
8	*Euploea modesta modesta*	Plain Blue Crow	Nymphalidae	Very Common	NE
9	*Euploea midamus*	Blue Spotted Crow	Nymphalidae	Common	NE
10	*Neptis hylas*	Common sailer	Nymphalidae	Common	NE
11	*Euploea crameri crameri*	Spotted Black Crow	Nymphalidae	Common	NE
12	*Eurema hecabe*	Common Grass Yellow	Pieridae	Very Common	NE
13	*Catopsilia Pomona*	Lemon Emigrant	Pieridae	Very Common	NE
14	*Catopsilia pyranthe Linnaeus*	The Mottled Emigrant	Pieridae	Very Common	NE

NE = Not Evaluated

Catopsilia pomona

Figure 5.3-7: Butterfly Species Recorded in the Survey Area

5.3.5.3 Aquatic Fauna

The Ataran River was studied for aquatic fauna. The fishes were collected with the help of the fishermen during the survey period. Traps were also used to get various types of fish like surface dwellers and bottom dwellers. The fishes were photographed soon after the collection and measurements were also taken for key characteristics. The fishes were then preserved in 10% formalin solution for further identification in the laboratory. The fishes were then identified according to Jayaram (1981) and Talwar and Jhingram (1991).

(i) Fish

A total of 26 fish species were recorded during the survey period. The fishes are important for the ecosystem of the Ataran river ecosystem. The fish species *Mystus cavasius* and *puntius chola* were found as very common species in the proposed project area. The fish species *Mystus bleekeri* and *Labeo calbasu* were also abundant in the aquatic habitat. Some brackish water fish species were also recorded along the river.

Table 5.3-7: List of Fish Species Recorded in the Survey Area

Sr. No.	Scientific Name	Common Name	Family	Remark	IUCN/ Status
1	*Notopterus notopterus*	Grey featherback	Notopteridae	Observed	LC
2	*Puntius chola*	Chola Barb	Cyprinidae	Observed	LC
3	*Amblypharyngo don mola*	Mola carplet	Cyprinidae	Observed	LC
4	*Labeo calbasu*	Karnataka labeo	Cyprinidae	Observed	LC
5	*Cirrhinus mrigala*	Mrigal Carp	Cyprinidae	Observed	LC
6	*Clarias batrachus*	Walking catfish	Claridae	Observed	LC
7	*Heteropneustes fossilis*	Stinging catfish	Heteropneustidae	Observed	LC
8	*Anabas testudineus*	Climbing perch	Anabantidae	Observed	LC
9	*Late calcarifer*	Giant sea perch	Centropomidae	Observed	NE
10	*Mystus bleekeri*	Catfish	Bagridae	Observed	LC
11	*Mystus leucophasis*	Catfish	Bagridae	Observed	LC
12	*Neotropius acutriostris*	Dwarf cat-fish	Schilbeidae	Observed	NE
13	*Channa striatus*	Striped snake head	Channidae	Observed	NE
14	*Channa orientalis*	Brown snakehead	Channidae	Observed	NE
15	*Channa panaw*	Green snakehead	Channidae	Observed	LC
16	*Macrognathus aral*	Lesser spiny eel	Mastacembelidae	Observed	LC

Table 5.3-7: List of Fish Species Recorded in the Survey Area (Continue)

Sr. No.	Scientific Name	Common Name	Family	Remark	IUCN/ Status
17	*Macrognathus zebrinus*	Burmese spiny eel	Mastacembelidae	Observed	LC
18	*Monopterus albus*	Asian swamp eel	Synbranchidae	Observed	LC
19	*Monopterus cuchia*	Cuchia	Synbranchidae	Observed	LC
20	*Oreochromic spp*	Mozambic cichlid	Cichlidae	Observed	NE
21	*Boleophthalmus boddarti*	Boddart's goddle eye goby	Gobiidae	Observed	LC
22	*Tenualosa ilisha*	River shad	Clupeidae	Observed	LC
23	*Glossogobius giuris*	Gobifish	Gobiidae	Observed	LC
24	*Polynemus paradiseus*	Mangoes fish	Polynemidae	Observed	NE
25	*Sillago sihama*	Silver whiting	Sillaginidae	Observed	LC
26	*Cynoglossus lingua*	Long tonguesole	Cynoglossidae	Observed	NE

NE = Not Evaluated
LC = Least Concern

Puntius chola

Labeo calbasu

Figure 5.3-8: Fish Species Recorded around the Survey Area

(ii) Benthos Species

Three immature dragonfly nymphs were found as benthic species in the surface layer of the sediment of the irrigation canal. The recorded nymph species were *Brachydiplax sobrina, Brachythemis contaminate,* and *Neurothemis tullia tullia.* The tadpoles of the paddy frog species Fejervarya *limnocharis* was also found as benthic species living in the sediment**.**

(iii) Plankton Species

A total of 11 plankton species were found in the Ataran River**.** Among the recorded species, five species were zooplankton species and six species were found as phytoplankton species**.** The species *Cyclops scutifer* as zooplankton and and *Staurastrum bibrachiatum* as phytoplankton species were commonly found in the aquatic area. The plankton species are primary products of the natural water body supporting the aquatic ecological web. The planktons are essential prey of the small vertebrates and fishes in aquatic habitat.

Table 5.3-8: Plankton Species Recorded in the Ataran River

Sr. No.	Scientific Name	Family	Phylum/Division	IUCN Status
1	*Notholca acuminate*	Brachiondae	Rotifer	NE
2	*Lecane sp*	Lecanidae	Rotifer	-
3	*Cyclops scutifer*	Cyclopoida	Arthropoda	NE
4	*Diaptomus sp.*	Diaptomidae	Arthropoda	-
5	*Bosminopsis sp.*	Bosminidae	Arthropoda	-
6	*Synedra affinis*	Fragilariaceae	Chrysophyta	NE
7	*Oscillatoria limnetica*	Oscillatoriaceae	Cyanophyta	NE
8	*Gyrosigma attenuatum*	Naviculaceae	Chrysophyta	NE
9	*Staurastrum bibrachiatum*	Desmidiaceae	Chlorophyta	NE
10	*Staurastrum ophiura*	Desmidiaceae	Chlorophyta	NE
11	*Staurastrum tohopekaligense*	Desmidiaceae	Chlorophyta	NE

NE = Not Evaluated

5.4 Socio-Economic Baseline Studies

5.4.1 Findings in Project Affected Village Area of Kyaikmaraw Township

Although there are 46 villages in *Kyaikmaraw* Townships, only ***Maekaro, Kadonsit, Pauktaw*** **and** ***Kwan Ngan*** villages are located within 3 km radius from the cement project (see in Figure 4.4-1). Major ethnic group in all study villages is Mon. Most of the people were Buddhist.

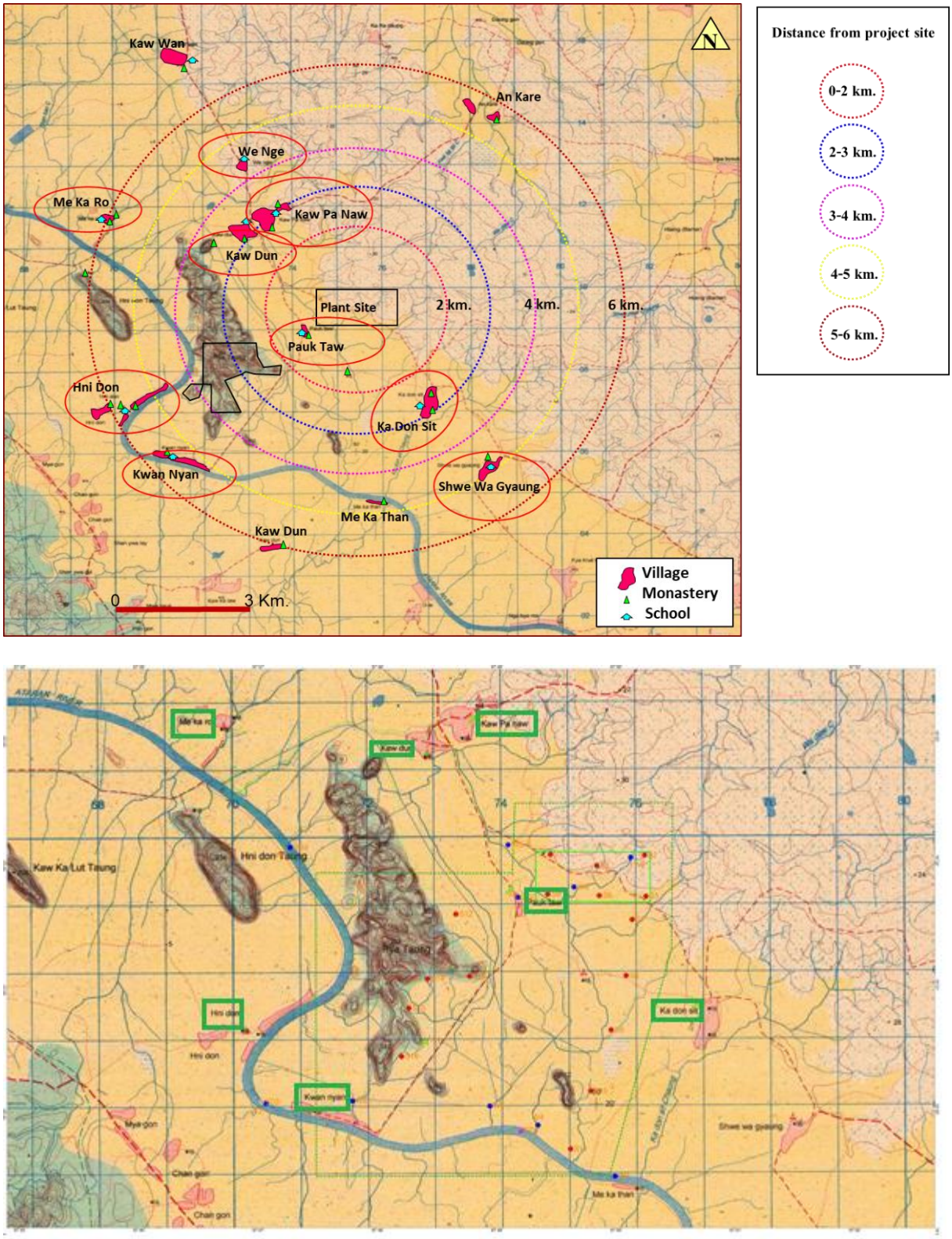


Figure 5.4-1: Village Community Area Around Proposed MCL Cement Plant

5.4.2 Demography

Among the seven villages, Kaw Pa Naw Village is the biggest village with 556 houses and 580 households followed by Kaw Dun Village with 395 houses and 425 households. Hni Don is the third biggest village with 387 houses and 402 households. However, Pauktaw Village is very near to the project site. In fact, potential social impact of this project to Kaw Pa Naw and Kaw Dun villages is relatively higher due to their wide social network.

There are 3,327 persons in Kaw Pa Naw Village, 2,451 persons in Hni don Village, 2,235 persons in Kaw Dun Village, 2,022 persons in Ka Don Sit Village, 1,704 persons in Kwan Ngan Village,1,579 persons in Me Ko Ro Village and 248 persons in Pauktaw Village. Among them, 300 respondents are selected as sample population for the study. (Table 5.4-2 and Figure 5.4-3).

Table 5.4-1: Total Population of the Study Villages (2012)

Sr.	Villages	Houses	Household	Male	Female	Total	No. of Sample
1	Pauktaw	35	48	123	125	248	20
2	Kaw Dun	395	425	1107	1128	2235	50
3	Kaw Pa Naw	556	580	1629	1698	3327	50
4	Hni Don	387	402	1209	1242	2451	50
5	Kwan Ngan	351	350	859	845	1704	50
6	Ka Don Sit	333	341	968	1054	2022	50
7	Me Ko Ro	280	296	770	809	1579	30
		2337	**2442**	**6665**	**6901**	**13566**	**300**

Source: Field Survey (February 2013)

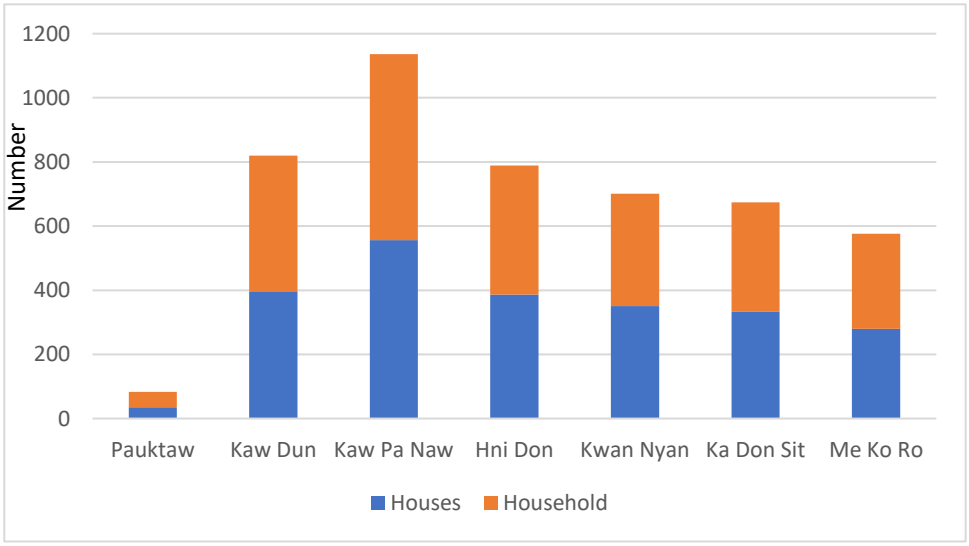


Figure 5.4-2: Houses and Households of the Study Villages

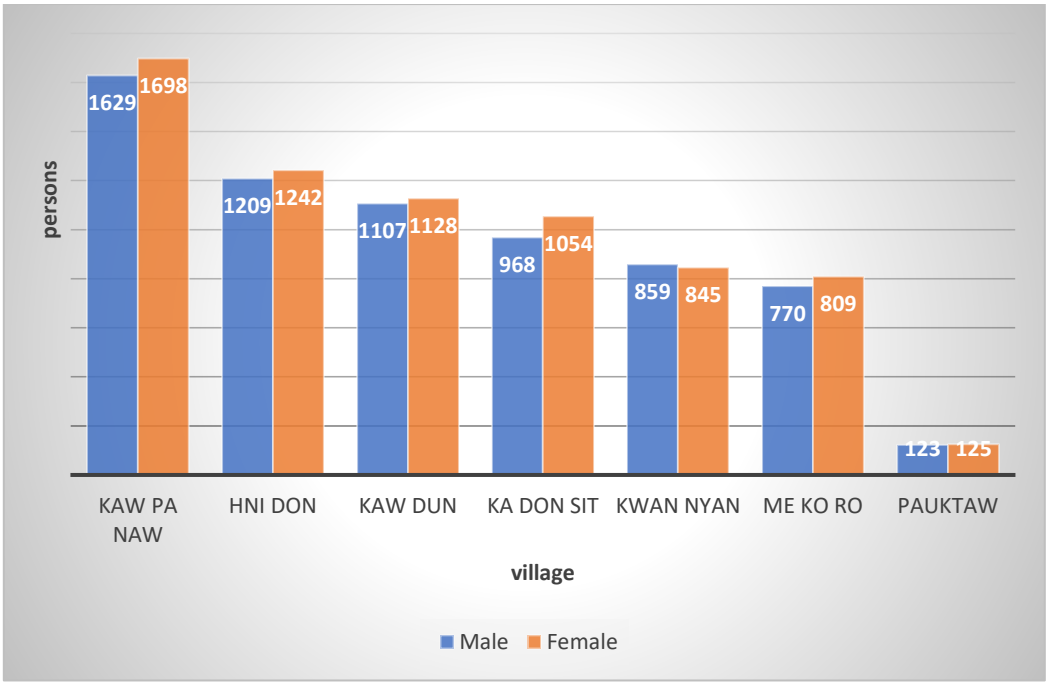


Figure 5.4-3: Total Population by Gender in the Study Wards

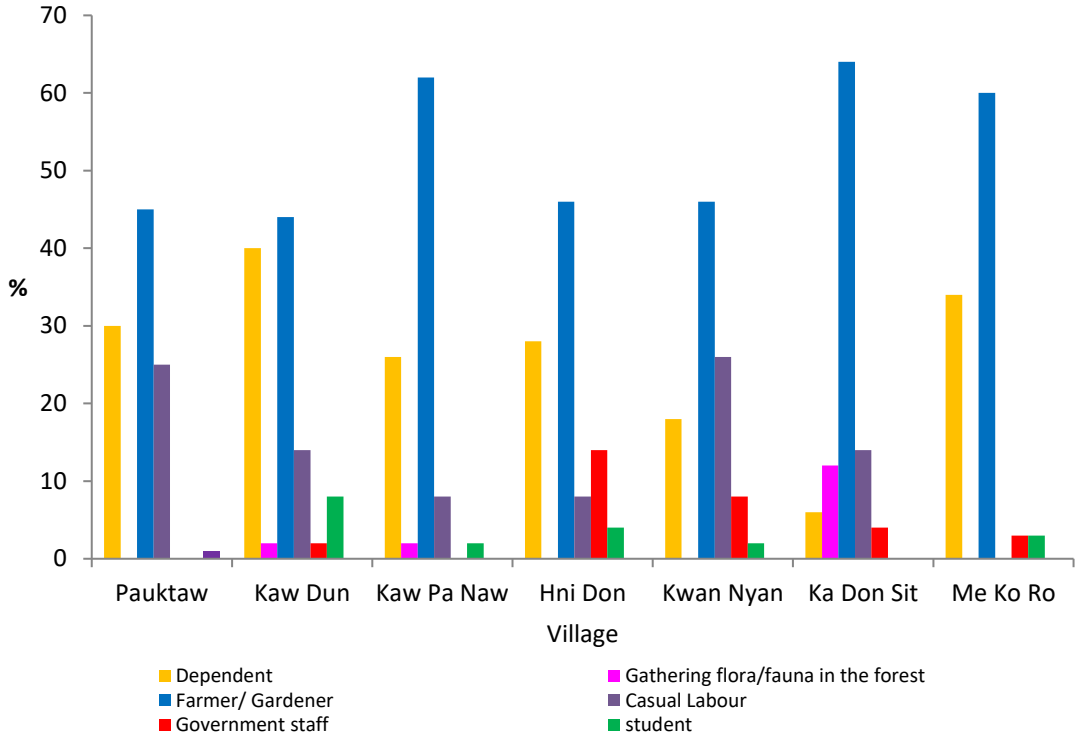
5.4.2.1 Occupational Structure

According to the field survey data, type of occupation includes dependent, flora/fauna gathering in the forest, farmer/Gardener, Casual Labour, government staff and student. All villages are farmers/ gardener. Larger percentages of farmers/ gardeners were found in Kaw Pa Naw. Kaw Don, and Me Ko Ro villages with more than 60 percent. In Kaw Don, Kaw Pa Naw and Ka Don Sit villages, some respondents are flora and fauna gatherers. Government staffs are mainly found in Hnidon and Kwan Ngan villages. Certain amounts of respondents are dependent persons in the study area (Table 5.4-2 and Figure 5.4-4).

Table 5.4-2: Profile of Occupational Structure in the Study Wards (%)

Village	Dependent	Flora/Fauna Collectors in the Forest	Farmer/ Gardener	Casual Labour	Government staff	Student
Pauktaw	30	0	45	25	0	0
Kaw Dun	40	2	44	14	2	8
Kaw Pa Naw	26	2	62	8	0	2
Hni Don	28	0	46	8	14	4
Kwan Ngan	18	0	46	26	8	2
Ka Don Sit	6	12	64	14	4	0
Me Ko Ro	34	0	60	0	3	3

Source: Field Survey (February 2013)



Source: Field Survey (February 2013)

Figure 5.4-4: Profile of Occupational Structure in the Study Villages (%)

5.4.2.2 Income Level

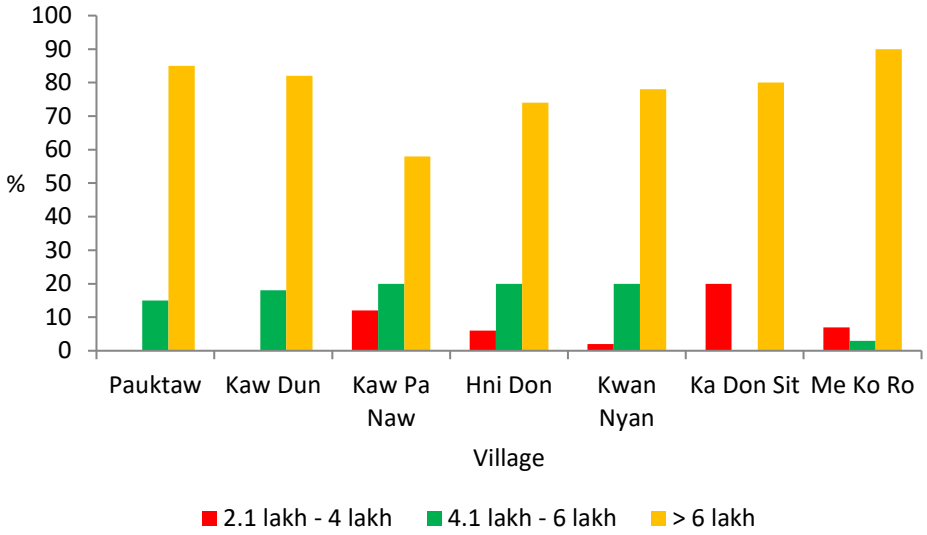
Income level of people was measured by using primary data received from field survey in February 2013. (Table 5.4-3 and Figure 5.4-5).

Most of the respondents in all study villages are in high income level of more than 6 lakh kyats per household. Low income group with less than 2 lakh kyats is observed in no villages. High income group is mainly found in Pauktaw, Kaw Don, Ka Don Sit and Me Ko Ro villages. Among them, respondents from Pauktaw Village and Kaw Don Village have regular income level more than 4 lakh kyats per year.

Table 5.4-3: Household Income Level of the Study Villages (%)

	< 2lakh	2.1 lakh - 4 lakh	4.1 lakh - 6 lakh	> 6 lakh
Pauktaw	0	0	15	85
Kaw Dun	0	0	18	82
Kaw Pa Naw	0	12	30	58
Hni Don	0	6	20	74
Kwan Ngan	0	2	20	78
Ka Don Sit	0	20	0	80
Me Ko Ro	0	7	3	90

Source: Field Survey (February 2013)
Note: 1 lakh Kyats = 120 USD average in 2013 March



Source: Field Survey (February 2013)
Note: 1 lakh Kyats = 120 USD average in 2013 March.

Figure 5.4-5: Income Level of the Study Villages (%)

5.4.2.3 Public Health and Health Status

To collect the baseline information on health conditions of the houses around the project area, present survey was conducted based on the questionnaires distribution to 70 representative households. Public health and health status are determined based on the source of food, source of drinking water, management of wastewater, solid waste management, medical history and current status of public health services. Main sources of daily food for respondents are market, forest and river and home gardens. The main source is the market and some respondents also rely their daily food on home gardens where vegetables and edible plants are grown. Forest and river are major source of food for a few respondents from PaukTaw Village and Hnidon Village. For them the loss of forest and river is a major problem for daily food supply. Most of the respondents utilize water from well and some villages use from the Ataran River (Table 5.4-4 and Figure 5.4-6).

Table 5.4-4: Source of Foods

Village	Owned- orchards	Natural resources (forest, river)	From market
Pauktaw	5	10	85
Kaw Dun	6	0	94
Kaw Pa Naw	14	0	86
Hni Don	8	6	86
Kwan Ngan	14	0	86
Ka Don Sit	2	0	98
Me Ko Ro	13	0	87

Source: Field Survey (February 2013)

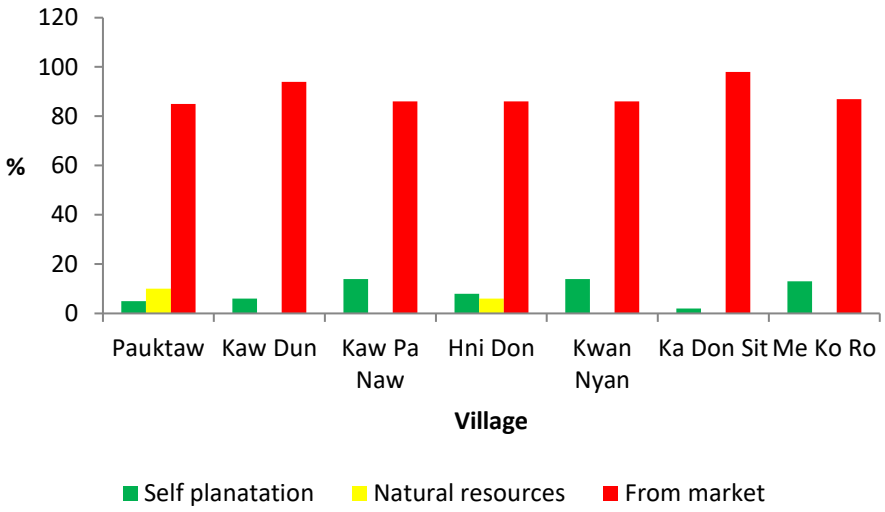


Figure 5.4-6: Food Source Analysis of Respondents

Health status is also related to waste water, disposal in the study area. Bad disposal of waste water can create several health problems. In the survey area, most of the respondents disposed waste water directly to the open ground in their surrounding area. Only a few respondents disposed waste water into the public river channel and gardens. (Table 5.4-5 and Figure 5.4-7).

Table 5.4-5: Management of Wastewater from Household (%)

Vilage	Discharge to ground	to drainage system	to public river	to the garden
Pauktaw	100	0	0	0
Kaw Dun	98	0	2	0
Kaw Pa Naw	90	4	6	0
Hni Don	98	0	0	4
Kwan Ngan	88	0	10	2
Ka Don Sit	96	2	2	0
Me Ko Ro	90	4	4	0

Source: Field Survey (February 2013)

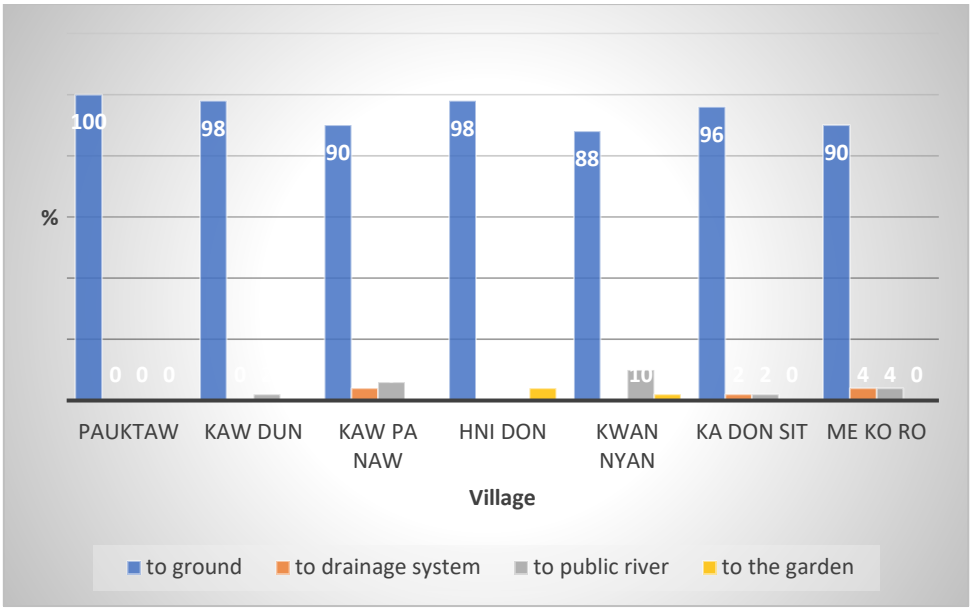


Figure 5.4-7: Management of Waste Water from Household (%)

Most of the respondents burned garbage and solid wastes disposed from their houses. Some respondents used landfill system for waste disposal and certain number of respondents piled up their household wastes outside their houses. These systems of solid waste disposal are also related to health problems of the survey area. (Table 5.4-6 and Figure 5.4-8).

Table 5.4-6: Management of Solid Waste from Household (%)

Village	Pile up Outside the House	Landfill	Burning
Pauktaw	0	0	100
Kaw Dun	2	10	88
Kaw Pa Naw	6	4	90
Hni Don	14	8	78
Kwan Ngan	6	10	84
Ka Don Sit	18	4	78
Me Ko Ro	10	14	76

Source: Field Survey (February 2013)

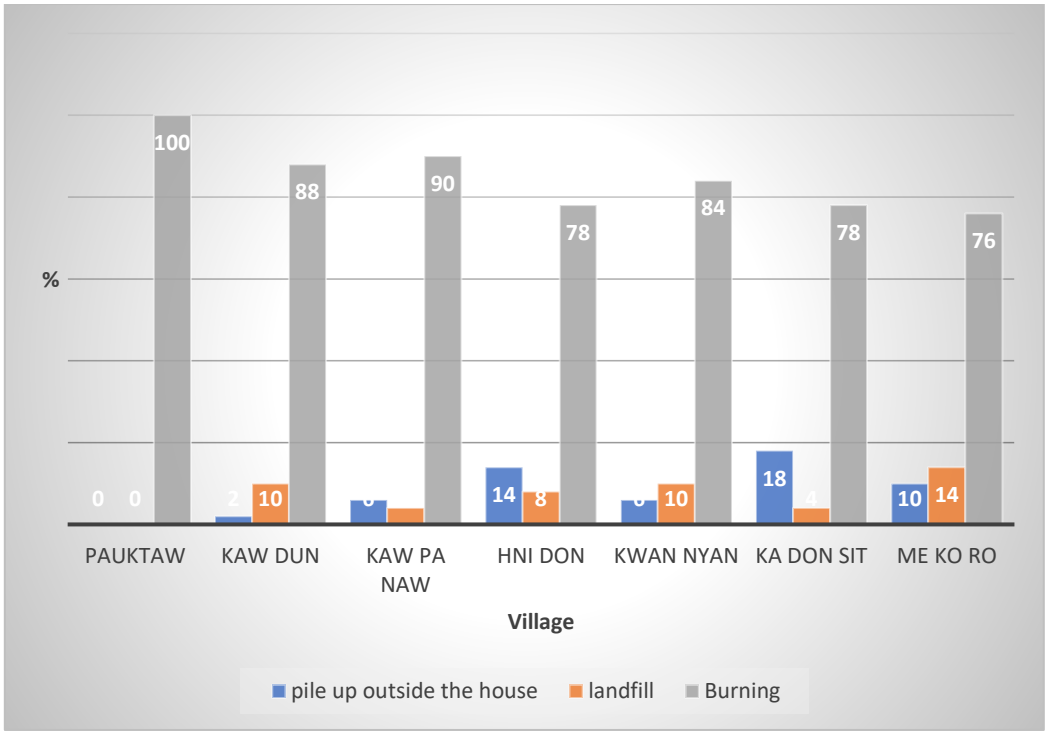


Figure 5.4-8: Management of Solid Waste from Household (%)

About 57 percent of respondent suffered from kind of diseases such as common cold and flu, hypertension and heart so on. However, common cold and flu are more common. The second highest amount of health problem is related to hypertension and heart diseases. There are some medical problems for digestive systems, eyes and ears among the respondents.

When they suffered from disease, most of the respondents take herbal medicines. Some respondents went to the clinics and checked by the doctors and some bought medicines from nearby drug stores. There are no systematic treatments for most respondents in the survey area. Problems related to health conditions of the survey area are;

1) Insufficiency of physicians and nurses (58%),
2) High medical care expenses (93%),
3) Insufficiency of specialist (100%), and
4) Far and inconvenient location of public healthcare centers (82%).

Higher expenses and less accessibility of medical centers are more important problems for respondents in the survey area.

Local people usually want the project to support them in solving these problems related to health status. Adequate support of the project in education and health sectors of affected area could create high participation of local people to implementation and planning processes of the project.

5.4.3 Results of Interview and Questionnaire Survey

In the survey, about 300 sample respondents selected from 7 Villages such as Pauktaw, Kaw Don, Kaw Pa Naw, Hni Don, Kwan Ngan, Ka Don Sit and Me Ko Ro villages within the project

area were interviewed. All these are project affected people (PAPs), but they are not necessary to be relocated under the project. To understand their existing situations, attitudes and impacts from the project development, the interviews were undertaken with the help of the structured questionnaires which cover the contents of basic information of interviewees, their socio-economic conditions, education and current environmental problems, facilities and social problems, perceptions of the project, attitudes towards the project, and attitudes towards draft mitigation measures regarding the impact caused by the project development.

5.4.3.1 Basic Information

Field surveys and semi- structured interviews were done in four sample groups within the project area. Most of the respondents are males (54 percent of total respondents) and remaining are females (46 percent of the respondents). Most of the respondents belong to Mon ethnic group and they are Buddhists (Figure 5.4-9).

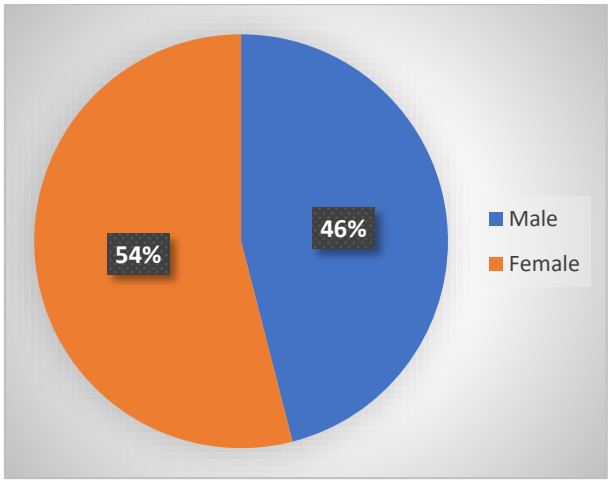


Figure 5.4-9: Gender of Respondents

Respondents on semi- structured interviews mainly represented age group between 20 years old and over 60 years old. Respondents generally covered the working group of population in the project area although some respondents from Hni Don and Me Ko Ro are under 20 years of age. Opinions and suggestions represented adult group of population within the project are because most of the respondents are in the age group between 20 years old and 60 years old. Most of the respondents are found in the age group of 41 to 60 years who have significant knowledge about their region. (Table 5.4-7 and Figure 5.4-10).

Table 5.4-7: Age Composition of Respondents (%)

Age Group	Pyinmapin	Resettlement	Tawtait	Pyitawthar
under 20	2	1	0	0
20 to 34	11	15	25	25
35 to 49	37	44	35	60
50 to 64	35	37	25	15
above 60	15	3	25	0

Source: Field Survey (February 2013)

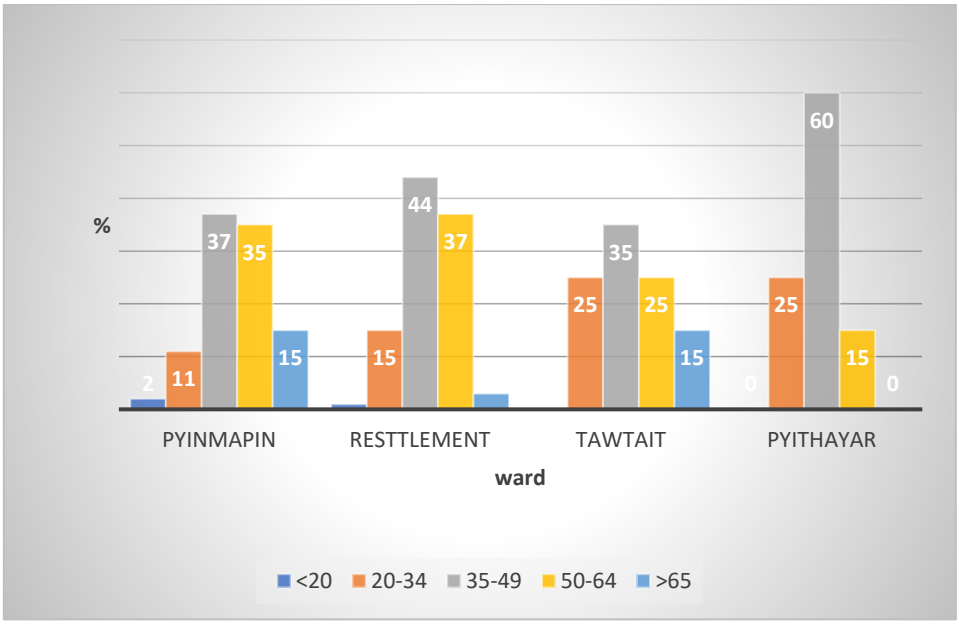


Figure 5.4-10: Age Composition of Respondents (%)

5.4.3.2 Family Size

Family size of respondents can be grouped into three classes as;

1) Family with 1 to 3 persons,
2) Family with 4 to 6 persons,
3) more than 6 persons.

Among the respondents, family size with more than 6 persons is observed in all study villages. Most of the families have members of 4 persons and above. Only a few families have 1 to 3 persons of family members. Therefore, the results of this survey represented families with high members. Size of family determined the relocation of houses from one place to another (Table 5.4-8 and Figure 5.4-11).

Table 5.4-8: Family Size of Respondents (%)

Family Size	Pauktaw	KawDon	KawPaNaw	HniDon	Kwan Nyan	KaDonSit	MeKoRo
1 to 3 persons	15	12	16	16	36	18	13
4 to 6 persons	45	48	58	44	44	50	60
More than 6 persons	40	40	26	40	20	32	27

Source: Field Survey (February 2013)

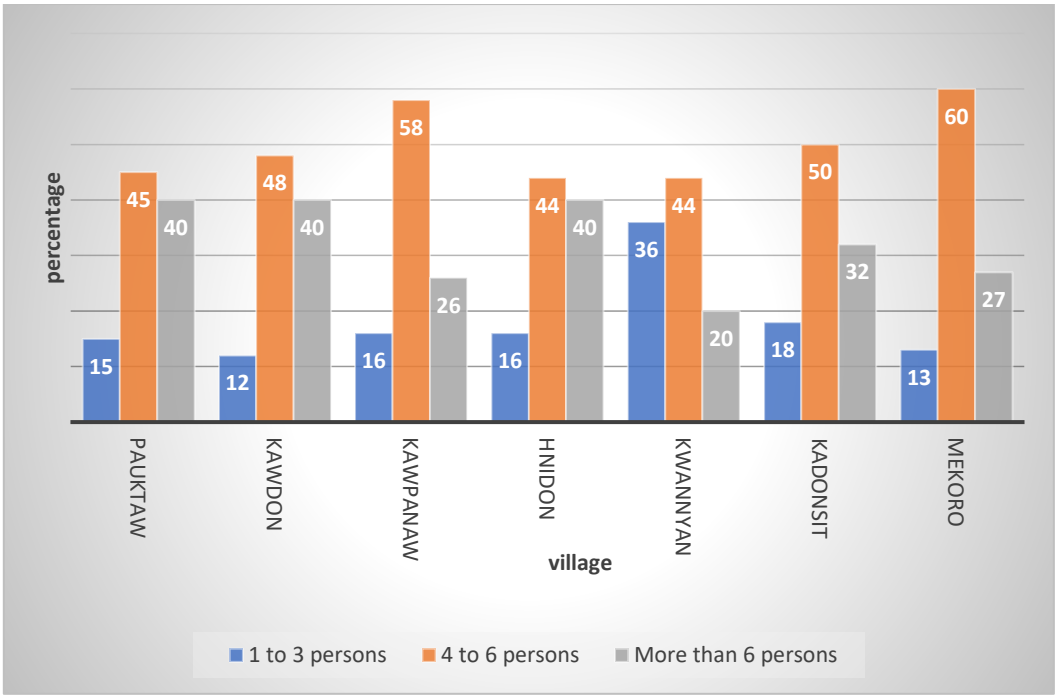


Figure 5.4-11: Family Sizes of Respondents (%)

5.4.3.3 Education Level

Many respondents are in primary education level and some have no education level. A very few persons entered high school levels. However, some graduates are also found in respondents of study villages. Generally, respondents in the survey represented an education of primary school level although non-educated persons are found in all villages of the study area (Table 5.4-9 and Figure 5.4-12).

Table 5.4-9: Education Level in the Study Villages (%)

Education	Pauktaw	KawDon	KawPa Naw	HniDon	Kwan Ngan	KaDonSit	MeKoRo
None	55	24	18	42	24	14	14
Primary	45	42	48	38	40	76	46
Middle	0	16	24	18	18	8	30
High	0	6	8	2	10	2	7
Graduate	0	10	2	2	8	0	3
Post Graduate	0	2	0	0	0	0	0

Source: Field Survey (February 2013)

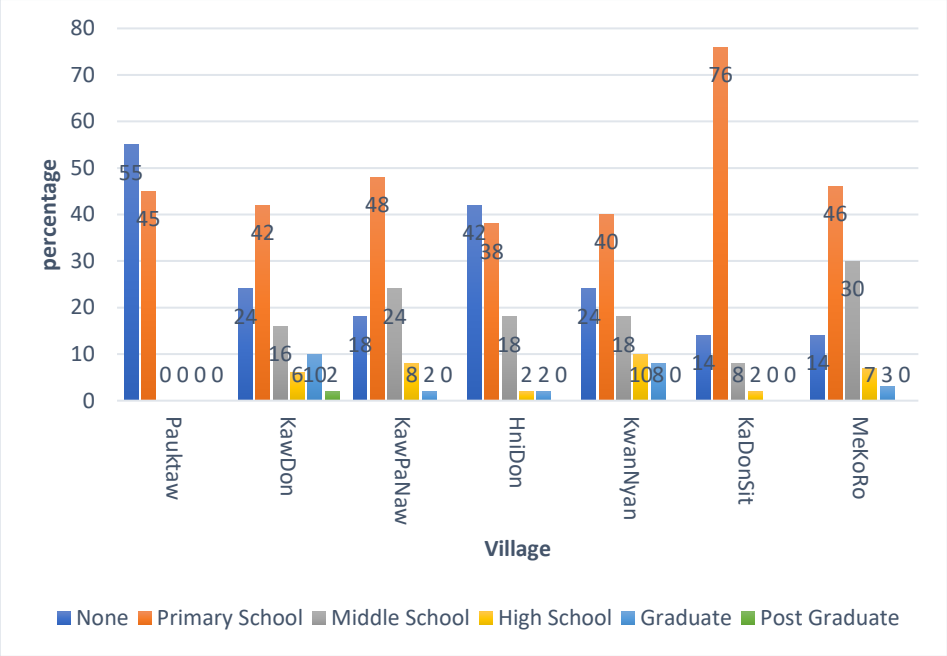


Figure 5.4-12: Education Level in the Study Villages (%)

5.4.3.4 Current Environmental Problems, Facilities and Social Problems

Current environmental problems being considered by respondents include solid waste disposal, wastewater disposal and dust, noise and odor from construction.

Most of the respondents considered that current waste disposal is not a problem for their environment. Very few respondents are interested is some impacts of solid waste disposal. For wastewater disposal, most of the respondents did not reveal the impacts of wastewater on their environment. However, some respondents considered the low impacts of wastewater and solid waste disposal to their surrounding areas. (Table 5.4-10 and Figure 5.4-13 and 5.4-14).

Table 5.4-10: Current Solid Waste and Wastewater Problem (%)

Village	Solid Waste				Wasterwater			
	None	Low	Moderate	High	None	Low	Moderate	High
Pauktaw	100	0	0	0	100	0	0	0
Kaw Dun	94	2	2	2	82	14	4	0
Kaw Pa Naw	78	12	8	2	64	12	10	6
Hni Don	96	4	0	0	96	4	0	0
Kwan Ngan	88	6	4	2	90	6	2	2
Ka Don Sit	96	2	2	0	96	2	2	0
Me Ko Ro	90	10	0	0	90	10	0	0

Source: Field Survey (February 2013)

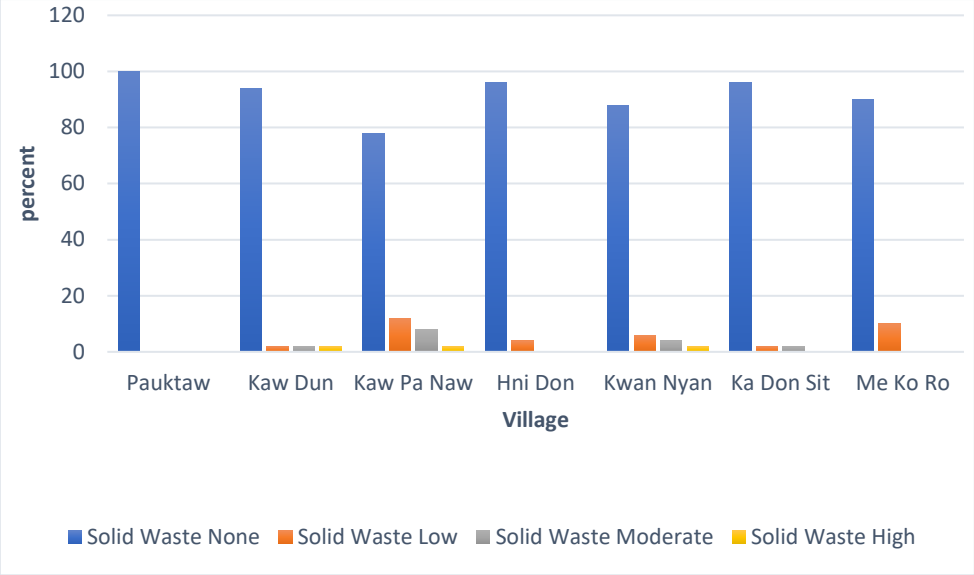


Figure 5.4-13: Current Solid Waste Problems

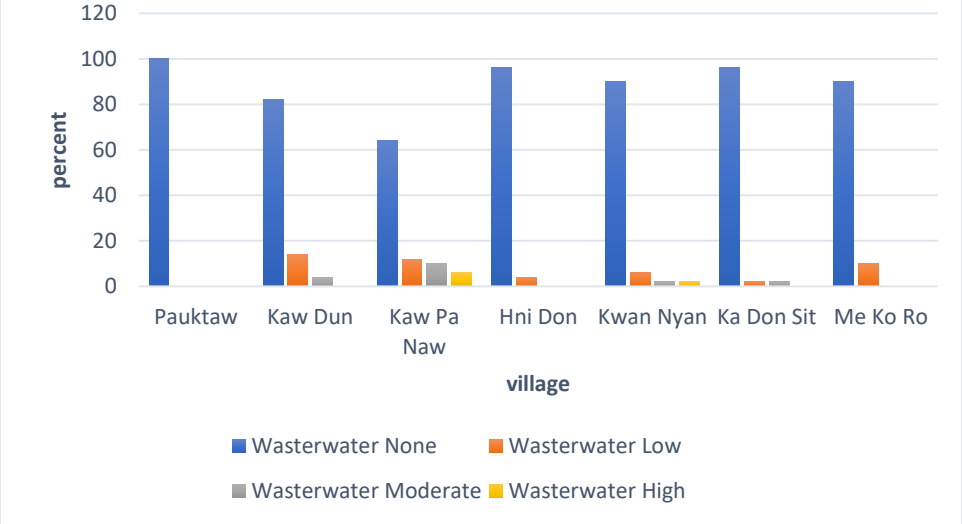


Figure 5.4-14: Current Waste Water Problem

Most of the respondents mentioned that their region has no significant impacts by dust, noise and odor from construction under the project. However, some respondents from Kaw Dun Village, Kwan Ngan Village and Kaw Pa Naw Village considered the moderate and high impacts of dust, noise and odor on their villages and surrounding environment. Therefore, it is necessary to reduce these impacts on villagers during construction and implementation phases of the project (Table 5.4-11 and Figure 5.4-15, 5.4-16, and 5.4-15).

Some respondents from Kaw Dun Village always considered low, moderate and high impacts of dust, noise and odor of waste from the project as well as for solid waste and wastewater disposals. All respondents from Pauktaw Village revealed that there are no impacts of dust, noise and odor from waste on their environment.

Table 5.4-11: Current Dust, Noise and Odor Problem (%)

Dust from Construction				Noise from Construction				Bad Odor from Waste			
None	Low	Moderate	High	None	Low	Moderate	High	None	Low	Moderate	High
100	0	0	0	100	0	0	0	100	0	0	0
52	14	12	22	94	2	2	2	96	2	2	0
74	12	10	4	78	10	10	2	68	2	20	0
80	20	0	0	94	6	0	0	94	6	0	0
86	8	4	2	92	4	2	2	92	4	2	2
98	2	0	0	98	2	0	0	98	2	0	0
87	10	3	0	93	7	0	0	98	2	0	0

Source: Field Survey (February 2013)

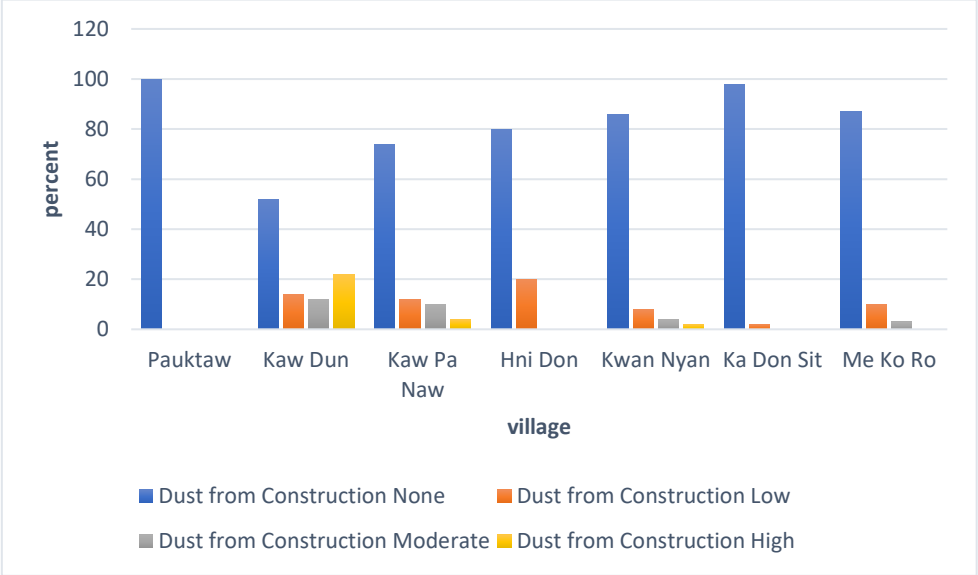


Figure 5.4-15: Dust Expected from Construction

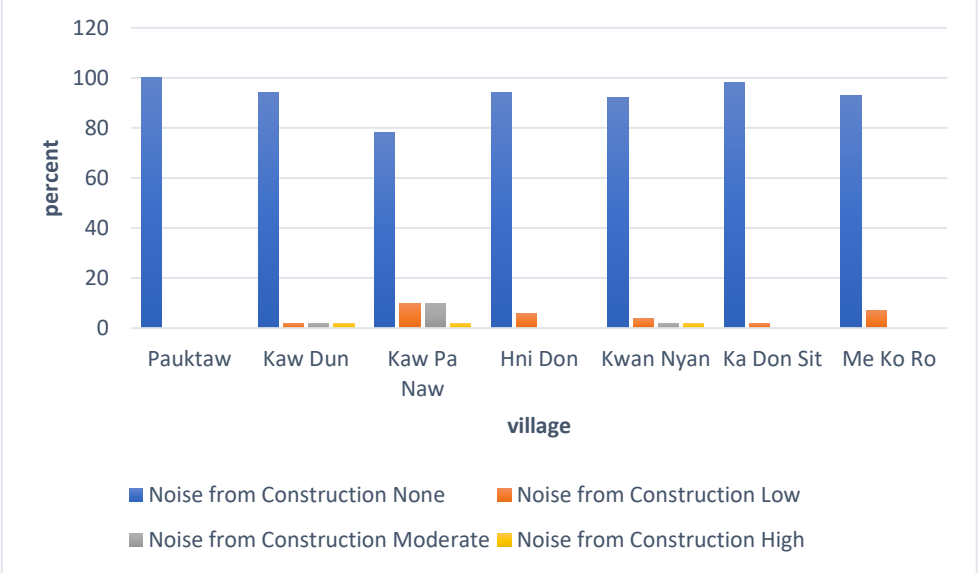


Figure 5.4-16: Noise Expected from Construction

Figure 5.4-17: Bad Odor from Waste in Peoples' Perception

Although dust, noise and odor are not big problems for their villages, all respondents want to inform to the government authorities about the potential impacts of dust, noise and odor on their environment.

5.4.3.5 Source of Project Information

It is also important to survey whether the people in the project area know about the project or not. If they know about the project they can prepare for the impacts of the project. The survey results showed that most of the respondents have already known about the project. But some families did not know about the project (Table 5.4-12 and Figure 5.4-18).

Table 5.4-12: Receiving Information about the Project (%)

Village	No	%	Yes	%
Pauktaw	6	30	14	70
Kaw Dun	9	18	41	82
Kaw Pa Naw	7	14	43	86
Hni Don	12	24	38	76
Kwan Ngan	14	28	36	72
Ka Don Sit	11	22	39	78
Me Ko Ro	7	23	23	77

Source: Field Survey (February 2013)

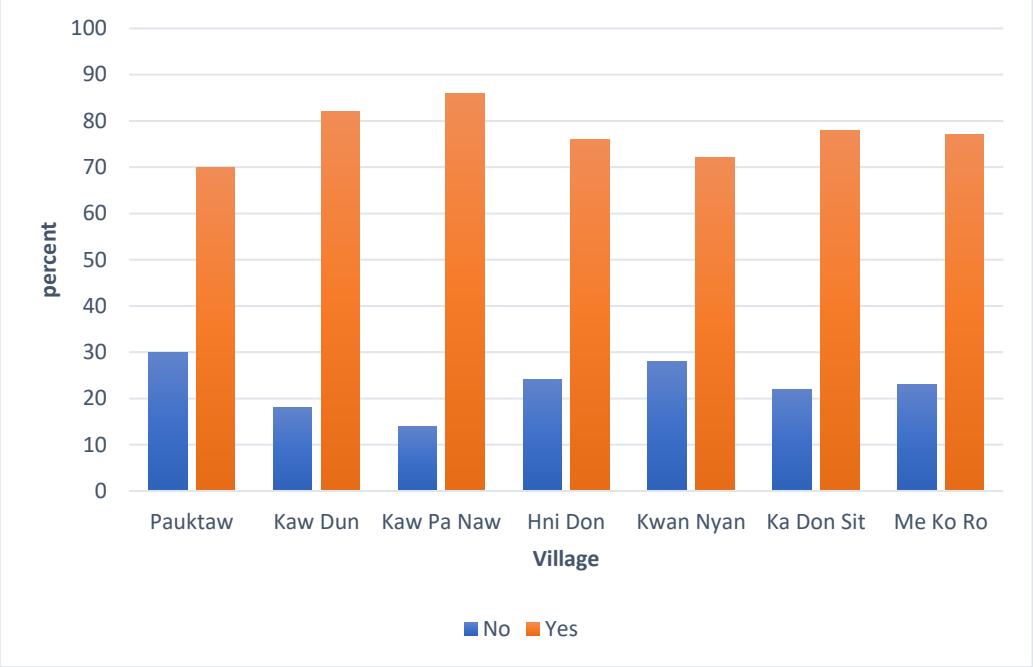


Figure 5.4-18: Receiving Information about the Project (%)

During the survey, 14 percent to 30 percent of respondents from 7 villages did not receive information about the project and 70 percent to 86 percent of the respondents got information on the project.

High percentages of respondents from PaukTaw (30%) and KwanNyan (2.8%) did not know about the project in prior to construction phase. The project developer should inform about their project to the local villagers to avoid misunderstanding.

The survey also stressed on the sources of information about the project from which the respondents received. There are 3 main sources of information about the project received by the respondents. These are;

1) Information from authority,
2) Information from neighbours, and
3) Information from public media.

The result of the survey showed that information about the project is rarely came from authority and public media.

Transparency between project developer and local people is one of the important factors for planning and implementation of the project. If the local people received the information from their neighbors, it will be very subjective. Therefore, it is necessary to give information about the project to the people who are living around the project area for full cooperation.

5.4.3.6 Attitude towards the Project

According to the survey results, most of the respondents believed that the project will not generate environmental, Social, Health and Agricultural impacts on their villages and surrounding region. However, some respondents, especially from KawPaNaw and KawDon

villages considered that the project will also create all impacts on their village (Table 5.4-13 and Figure 5.4-19).

Dust from construction and traffic is main impact of the project on air quality deterioration. Most of the respondents from 7 villages generally agreed that dust from the construction has no impact on air quality of their environment. But, some respondents from Kaw Dun Village and Kaw Pa Naw Village mentioned that the project created negative impact on air quality by producing dust from construction site and roads.

Table 5.4-13: Concern on Air Quality Impacts of the Project

Village	Dust dispersion from construction and transportation			
	Negative Impact			No Impact
	L	M	H	
Pauktaw	10	0	20	70
Kaw Dun	20	16	14	50
Kaw Pa Naw	18	16	20	46
Hni Don	12	0	14	74
Kwan Ngan	14	4	10	72
Ka Don Sit	24	2	6	68
Me Ko Ro	10	3	10	77

Source: Field Survey (February 2013)

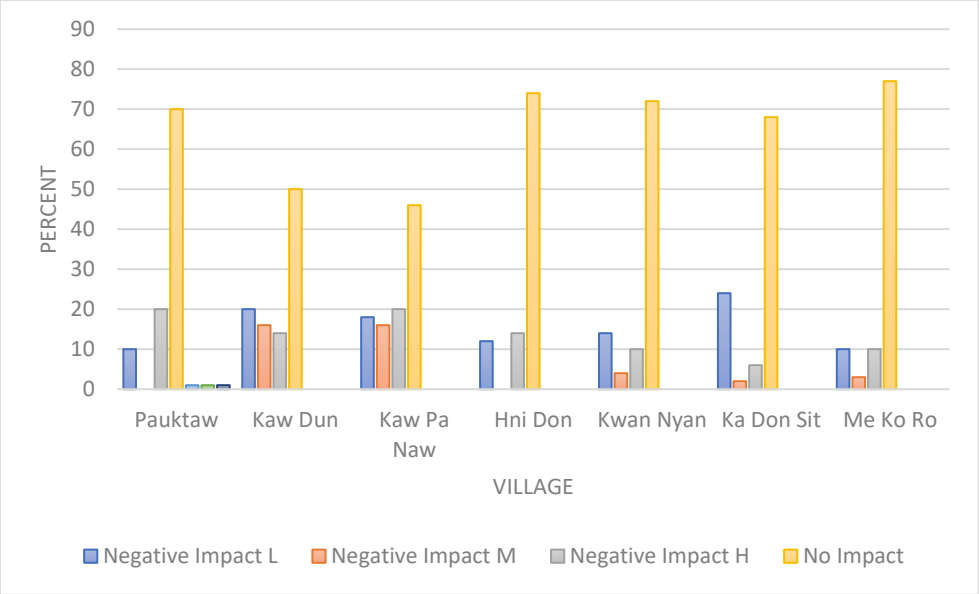


Figure 5.4-19: Concern on Air Quality Impacts of the Project

Most of the respondents from all surveyed villagers considered that gas emission from the project will not impact on air quality of surrounding environment. However, some villagers, especially from Kaw Dun Village and Kaw Pa Naw Village, mentioned that gas emission from project area will not create air pollution in some extent (Table 5.4-14 and Figure 5.4-20).

Table 5.4-14: Concern on Air Pollution of the Project

Village	Air pollution emission			
	Negative Impact			No Impact
	L	M	H	
Pauktaw	10	0	20	70
Kaw Dun	20	18	12	50
Kaw Pa Naw	24	16	10	50
Hni Don	12	0	14	74
Kwan Ngan	14	4	10	72
Ka Don Sit	22	2	8	68
Me Ko Ro	17	3	10	70

Source: Field Survey (February 2013)

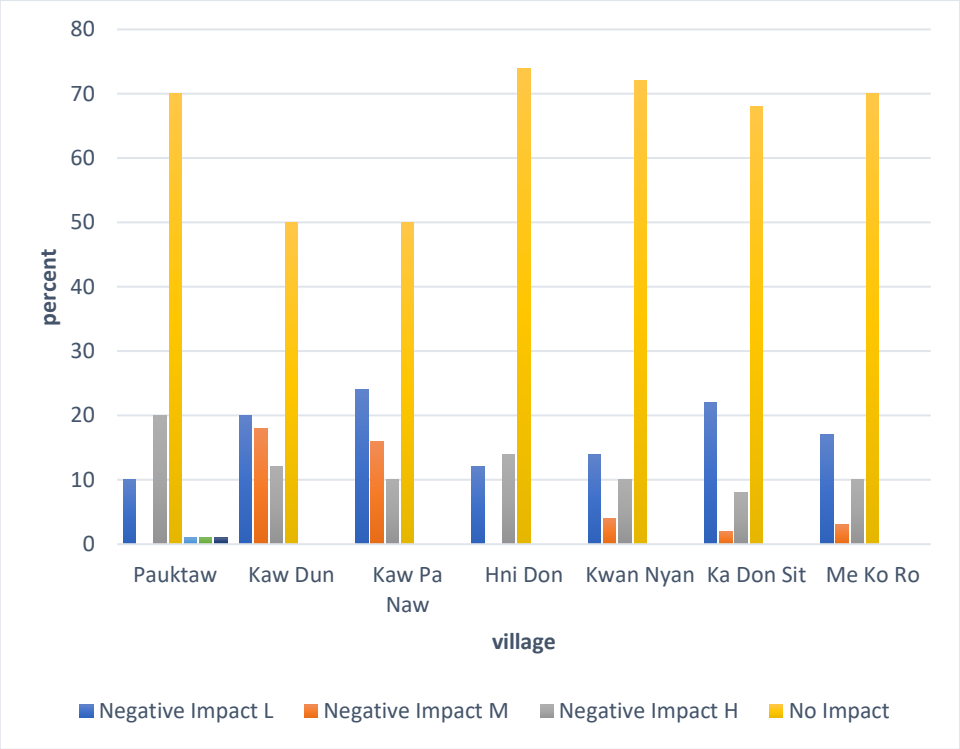


Figure 5.4-20: Concern on Air Pollution of the Project

Bad odor from factory is another environmental impact on surrounding villages. Most of the respondents considered that there is no impact of odor from factory. But, some respondents (44 percent) from KawPaNaw Village mentioned that there will be low to high potential negative impacts of bad odor on their villages and surrounding areas.

Table 5.4-15: Concerns on the Project for Bad Odor

Village	Bad Odor from factory			
	Negative Impact			No Impact
	L	M	H	
Pauktaw	5	0	20	75
Kaw Dun	6	12	12	70
Kaw Pa Naw	24	14	6	56
Hni Don	12	0	14	74
Kwan Ngan	10	4	6	80
Ka Don Sit	6	2	8	84
Me Ko Ro	7	3	10	80

Source: Field Survey (February 2013)

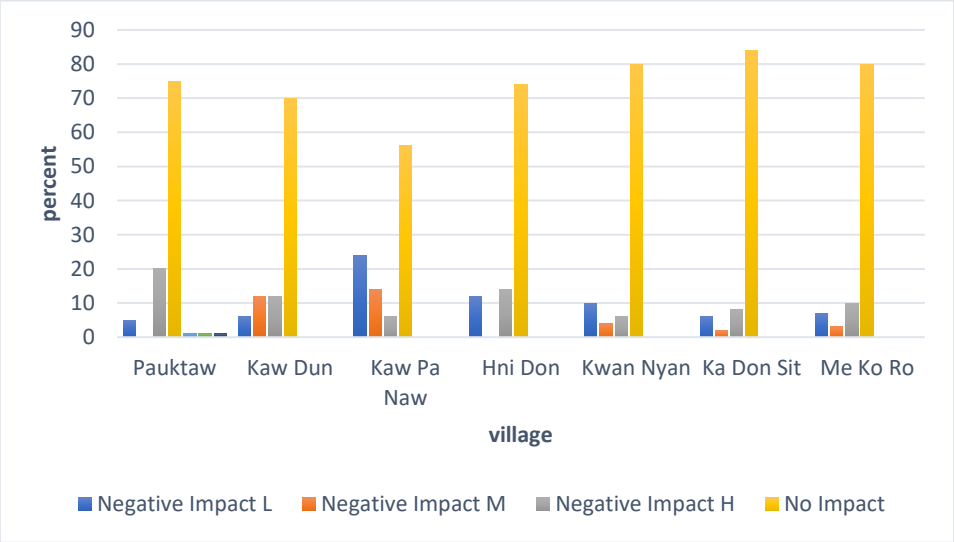


Figure 5.4-21: Concern on Impacts of the Project for Bad Odor

Most of the respondents from 7 villages considered noise and vibration from construction may not generate impacts on surrounding environment of their villages. However, 32 percent of respondents from Kaw Dun Village and 38 percent of respondents from Kaw Pa Naw Village anxious that noise and vibration from construction will have impact on pleasant environment of their villages.

Table 5.4-16: Noise and Vibration Expected for the Construction Period

Village	Noise and vibration from construction			
	Negative Impact			No Impact
	L	M	H	
Pauktaw	5	0	20	75
Kaw Dun	8	12	12	68
Kaw Pa Naw	20	14	4	62
Hni Don	12	0	14	74
Kwan Ngan	10	4	10	76
Ka Don Sit	6	2	8	84
Me Ko Ro	7	3	7	83

Source: Field Survey (February 2013)

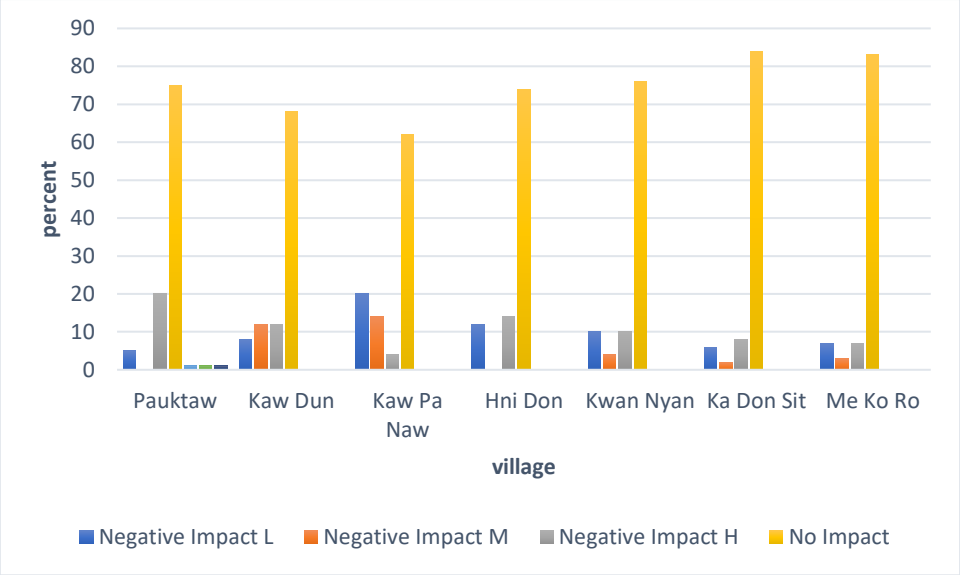


Figure 5.4-22: Noise and Vibration Expected for the Construction Period

About 2 percent to 25 percent of respondents from surveyed villages recognized that there will be low to high negative impacts of water contamination from project site to surrounding areas. However, most of the villagers, from 66 percent to 86 percent of the respondents believed that there will not be significant impact of project on water pollution of surrounding areas.

Table 5.4-17: Concern on Water Contamination from Construction and Workers

Village	Water Contamination from Construction and Workers			
	Negative Impact			No Impact
	L	M	H	
Pauktaw	5	0	25	70
Kaw Dun	10	14	0	76
Kaw Pa Naw	16	12	6	66
Hni Don	10	0	12	78
Kwan Ngan	6	4	14	76
Ka Don Sit	4	2	8	86
Me Ko Ro	7	3	13	77

Source: Field Survey (February 2013)

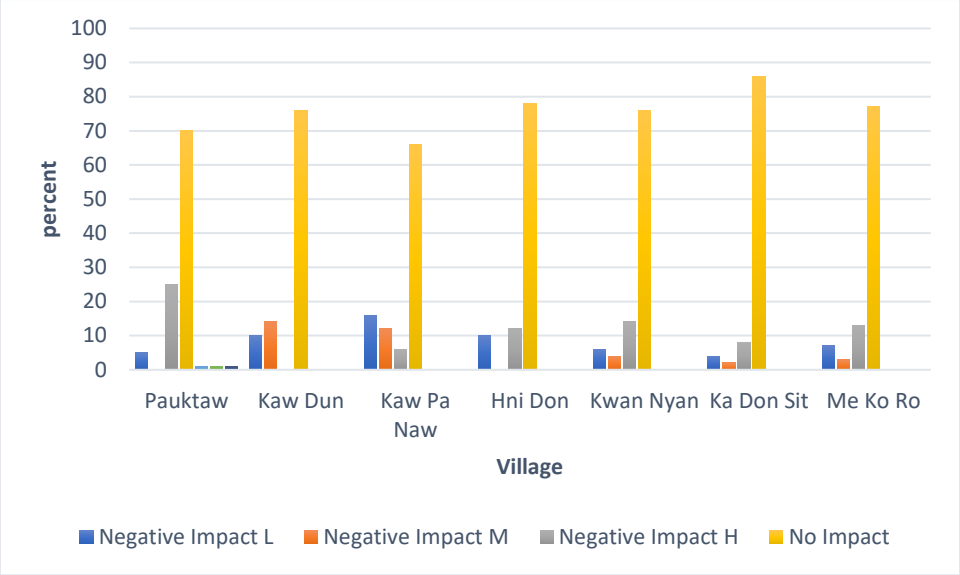


Figure 5.4-23: Concern on Water Contamination from Construction and Workers

About 38 percent of respondents from Kaw Dun Village and 32 percent of respondents from Ka Pa Naw Village believed that there will be low to high negative impacts of wastewater from the project which drained into public sewer and river. Most of the villagers considered that there will not be significant impact of wastewater from the project to surrounding areas of surveyed villages.

Table 5.4-18: Concern on Wastewater Discharge to Public Water

Village	Wastewater discharge to public river/canal/sea			
	Negative Impact			No Impact
	L	M	H	
Pauktaw	5	0	25	70
Kaw Dun	10	16	12	62
Kaw Pa Naw	14	12	6	68
Hni Don	8	2	12	78
Kwan Ngan	6	4	10	80
Ka Don Sit	4	2	8	86
Me Ko Ro	7	3	13	77

Source: Field Survey (February 2013)

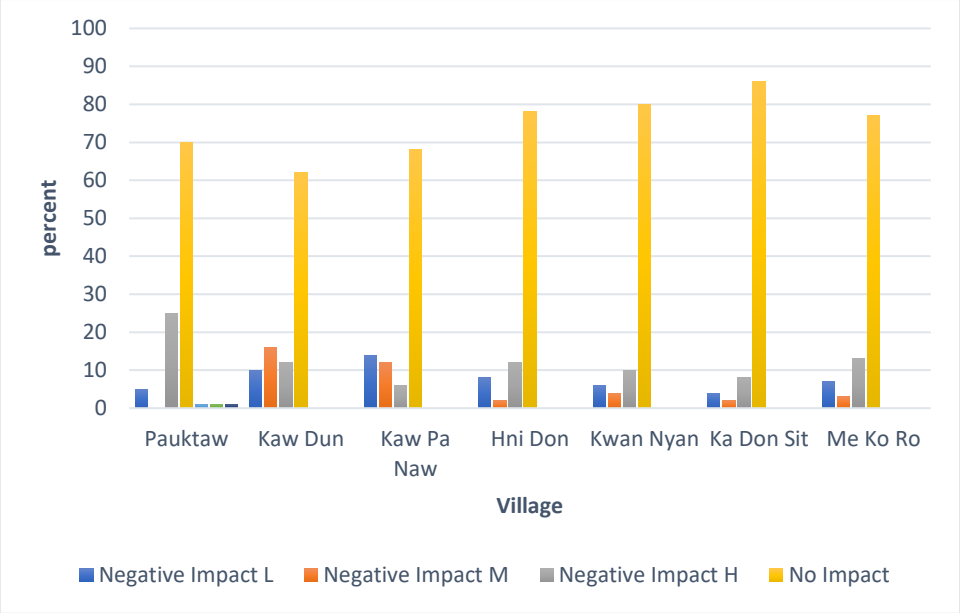


Figure 5.4-24: Concern on Wastewater Discharge to Public Water

Utilization of water resources by community and the project is one of the issues in the surveyed area. Most of the respondents considered that opportunity of water between community and the project has no apparent impact on environmental and social concerns. However, about 30 percent of respondents from Pauktaw, Kaw Dun, and Kaw Pa Naw villages believed that opportunity of water will create low to high negative impacts on social and environmental status of the villages (Table 5.4-19 and Figure 5.4-25).

Table 5.4-19: Potential Water Opportunity between Community and the Project

Village	Snatching of water between community and the project			
	Negative Impact			No Impact
	L	M	H	
Pauktaw	5	5	20	70
Kaw Dun	2	16	12	70
Kaw Pa Naw	14	10	4	72
Hni Don	6	0	12	82
Kwan Ngan	6	6	8	80
Ka Don Sit	4	0	8	88
Me Ko Ro	3	7	10	80

Source: Field Survey (February 2013)

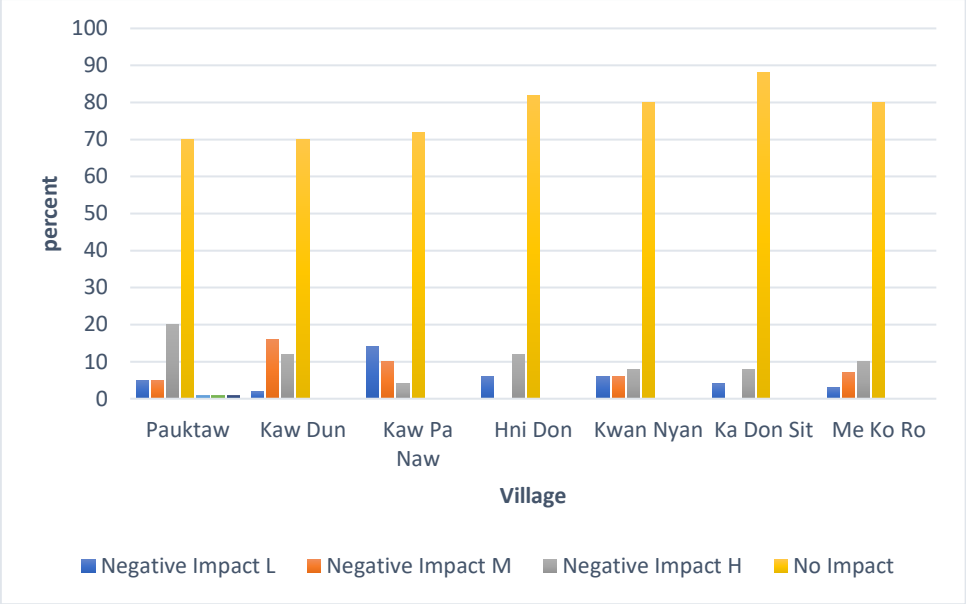


Figure 5.4-25: Potential Water Oppourtunity between Community and the Project

According to the surveyed data, construction of water drains or embankment may not generate flood in the town area. About 62 percent to 90 percent considered there is no impact of water drain or embankment. However, 38 percent of respondents from Kaw Dun Village and 30 percent of respondents from Kaw Pa Naw Village worried about the negative impacts of water drains and embankment which may generate floods in the city area. (Table 5.4-20 and Figure 5.4-26).

Table 5.4-20: Concern on Water Drain or Embankment from the Project to Generate Flood in the City

Village	Water drain or embankment from the project may generate flood in the city			
	Negative Impact			No Impact
	L	M	H	
Pauktaw	5	0	10	85
Kaw Dun	8	18	12	62
Kaw Pa Naw	10	10	10	70
Hni Don	4	2	12	82
Kwan Ngan	4	12	10	74
Ka Don Sit	0	0	10	90
Me Ko Ro	10	3	10	77

Source: Field Survey (February 2013)

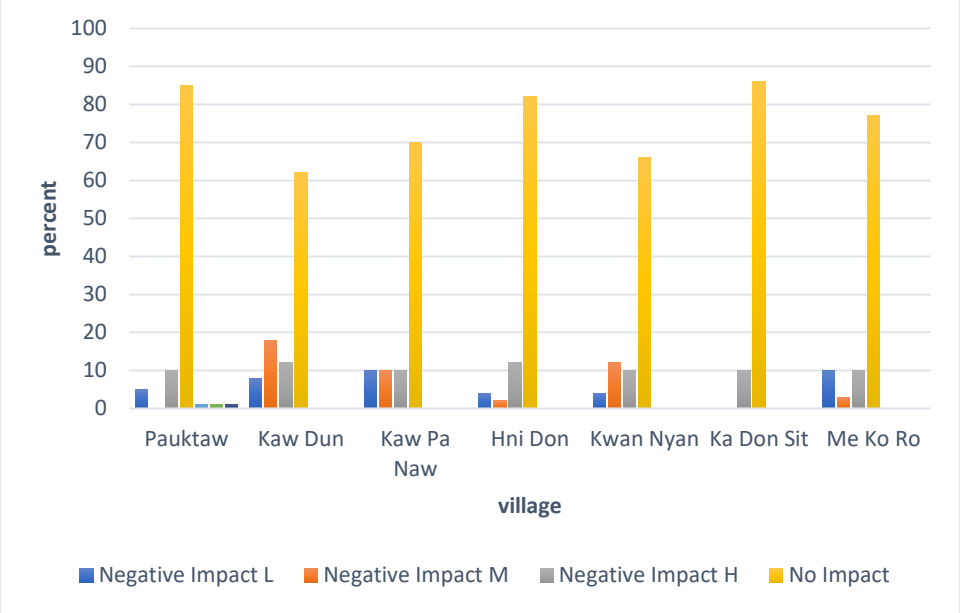


Figure 5.4-26: Concern on Water Drain or Embankment from the Project to Generate Flood in the City

Change in land use is one of the important social and environmental impact of the project on surrounding areas. About 14 percent to 42 percent of respondents worried about low to high negative impacts of land use changes on their villages. About 34 percent from Kaw Pa Naw and 42 percent from Kaw Dun Villages considered the negative impacts of land use changes. Most of the respondents from 7 villages believed that there will be no significant impact of change of land use on their villages. (Table 5.4-21 and Figure 5.4-27).

Table 5.4-21: Concern on Change in Land Use

Village	Change of land use			
	Negative Impact			No Impact
	L	M	H	
Pauktaw	10	0	10	80
Kaw Dun	14	16	12	46
Kaw Pa Naw	22	10	2	66
Hni Don	8	10	8	66
Kwan Ngan	4	4	10	72
Ka Don Sit	0	0	4	80
Me Ko Ro	13	7	13	64

Source: Field Survey (February 2013)

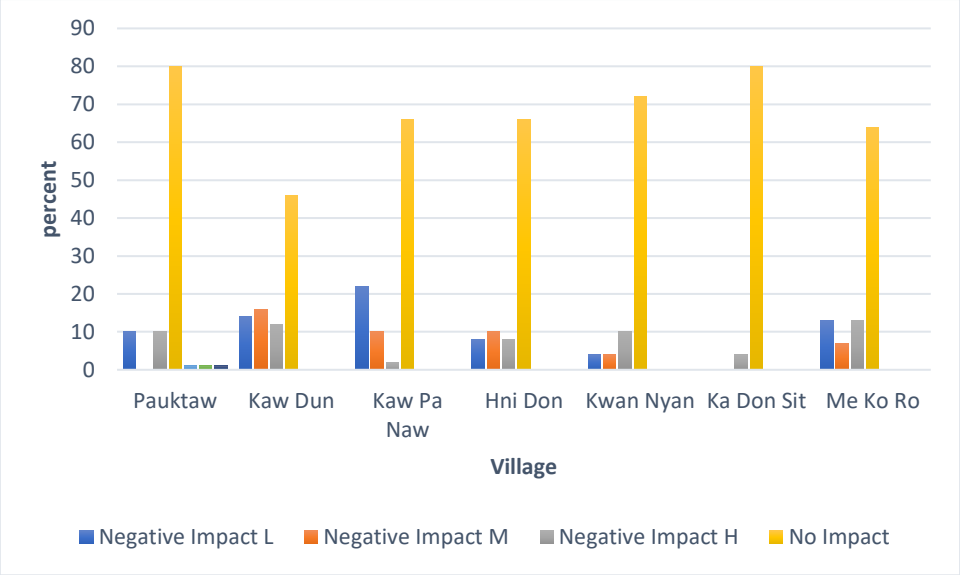


Figure 5.4-27: Concern on Change in Land Use

About 86 percent to 94 percent of respondents from all surveyed villages believed that there will be no impact of the development of new roads on social and physical environments of their villages. Very few respondents considered that the development of new road has low to high impact on their environment. All respondents considered that the development of new road could support the economic growth of their region by supporting good transportation (Table 5.4-22 and Figure 5.4-28).

Table 5.4-22: Perception on Development of New Road

Village	Development of new road			
	Negative Impact			No Impact
	L	M	H	
Pauktaw	0	0	10	90
Kaw Dun	0	2	2	86
Kaw Pa Naw	4	0	0	86
Hni Don	2	0	6	92
Kwan Ngan	0	2	4	94
Ka Don Sit	4	0	4	92
Me Ko Ro	3	3	3	91

Source: Field Survey (February 2013)

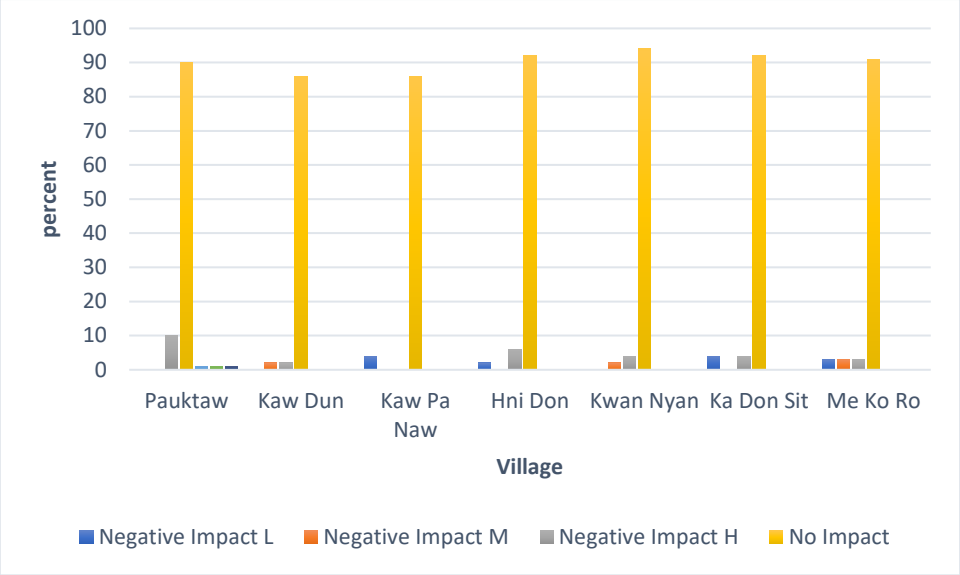


Figure 5.4-28: Perception on Development of New Road

According to the survey data, there will be no expectation on significant impact of road and bridge destroys due to heavy truck under the project. About 23 to 24 percent of respondents from Kaw Pa Naw and Me Ko Ro villages worried about road and bridge destroy due to heavy truck. Generally, the developer repaired roads and bridges after their intensive use of heavy trucks during the construction phase. Some villagers worried about the responsibility of developer to repair roads and bridges after the construction period of the project (Table 5.4-23 and Figure 5.4-29).

Table 5.4-23: Concern on Road and Bridge Degradation due to Heavy Truck

Village	Road and bridge degradation due to heavy truck			
	Negative Impact			No Impact
	L	M	H	
Pauktaw	0	0	10	90
Kaw Dun	0	10	10	80
Kaw Pa Naw	8	14	2	76
Hni Don	2	2	4	92
Kwan Ngan	4	2	8	86
Ka Don Sit	6	0	4	90
Me Ko Ro	3	10	10	77

Source: Field Survey (February 2013)

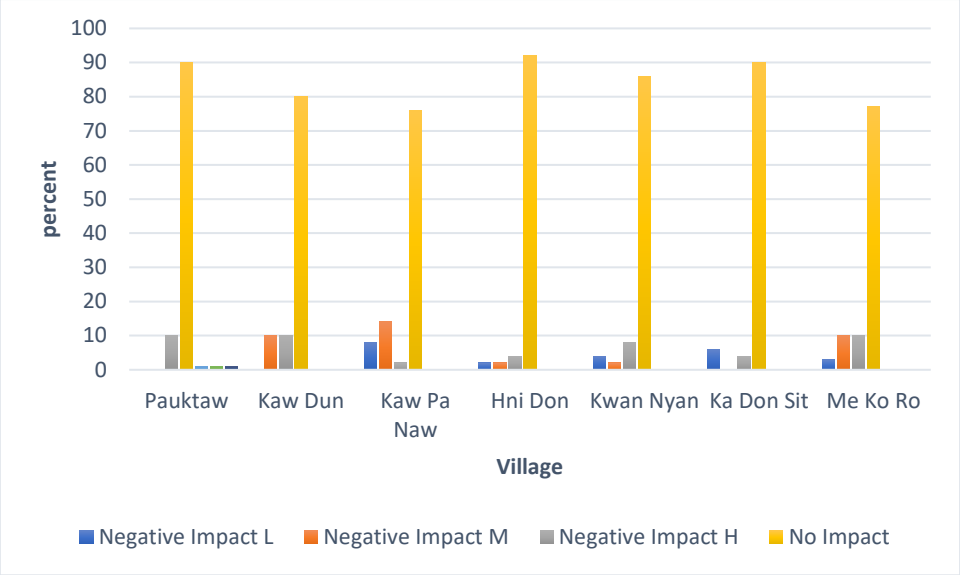


Figure 5.4-29: Road and Bridge Degradation due to Heavy Truck, Expected by Local People

All respondents from survey area believed that the project has positive impact on their villages by sufficient coverage of electricity supply. They considered that the project may fulfill the electricity requirements of their villages and surrounding areas.

Wastes and industrial disposal smuggling in the public area, contamination by industrial wastes, accidents and fire outbreak possibility from the project area are the most important issues for local people. All respondents considered that these issues will be strong negative impacts on social and environmental conditions of their villages.

More than 70 percent of respondents from survey area considered that there will be no significant impact on surrounding scenery, aesthetic and green area by construction and implementation of the project. However, 22 per cent of respondents from Hni Don, Kwan Nyun and Kaw Dun Villages worried about the negative impacts of project on scenery, aesthetic and green area of their villages. (Table 5.4-24 and Figure 5.4-30).

Table 5.4-24: Anxiety on Impact to Scenery/ Aesthetic/ and Green Area

Village	Impact to scenery/aesthetic/and green area			
	Negative Impact			No Impact
	L	M	H	
Pauktaw	0	0	10	90
Kaw Dun	6	28	10	56
Kaw Pa Naw	4	0	0	96
Hni Don	0	6	20	74
Kwan Ngan	4	8	12	76
Ka Don Sit	0	2	4	94
Me Ko Ro	3	7	10	76

Source: Field Survey (February 2013)

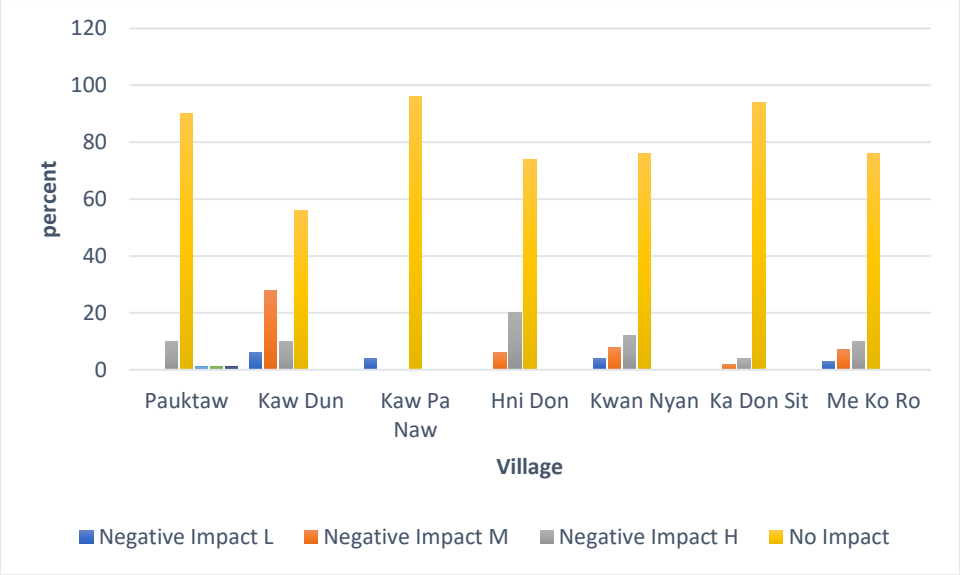


Figure 5.4-30: Anxiety on Impact to Scenery/ Aesthetic/ and Green Area

According to the survey results, there will be only positive impacts of the project on creating health centers and public health services, generating source of food, promoting local income and economy, creating local job opportunities, allowing migration of labor and finally encouraging changes in lifestyle of local people in the whole survey area.

5.4.3.7 Grievance Mechanism Approaches Towards Draft Mitigation Measures of the Project's Impact

Most of the respondents mainly emphasized on the most convenient way for complain about the project. Most of them mentioned that complain through community leaders is the best way and some respondents considered that face-to-face discussion with project staffs is more convenient tor complaining about the project. In many cases, discussion through the community leaders is the most convenient way. (Table 5.4-25 and Figure 5.4-31).

Table 5.4-25: Grievance Acceptances about the Project

Village	1	2	Telephone	Post	Internet	Other
Pauktaw	0	75	0	0	25	0
Kaw Dun	26	72	2	0	0	0
Kaw Pa Naw	20	60	0	0	0	20
Hni Don	12	84	2	0	0	2
Kwan Ngan	12	86	0	0	0	2
Ka Don Sit	0	100	0	0	0	0
Me Ko Ro	23	77	0	0	0	0

Source: Field Survey (February 2013)
1= Face-to-face with project staffs
2 = Via community leaders

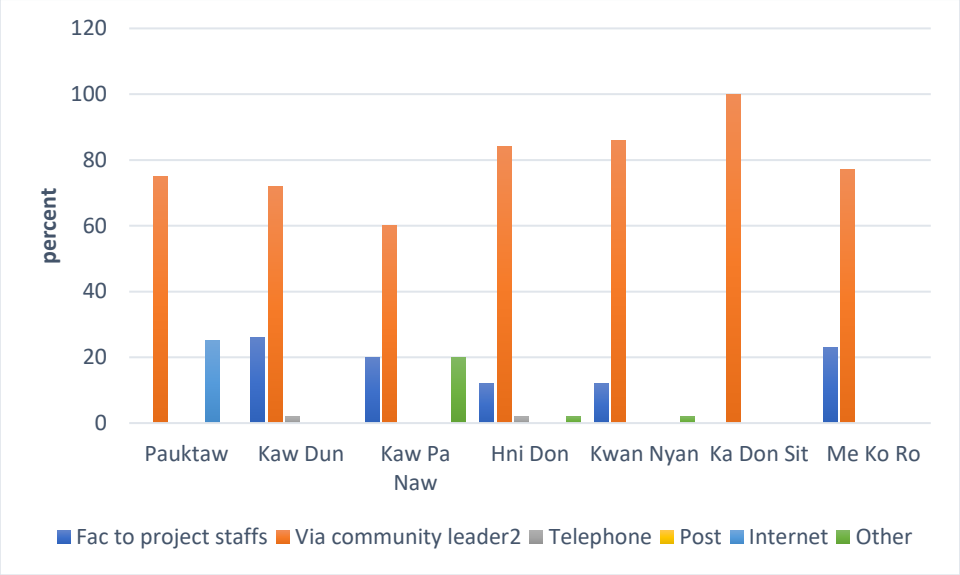


Figure 5.4-31: Grievance Acceptances about the Project

5.4.3.8 Priority Requirements of Community on the Project

There are specific priorities from each village to be fulfilled by the project.

For Pauktaw Village, public health is the topmost priority and followed by occupational training/ skill practice, education, environmental quality and religion and cultural promotion.

For Kaw Don Village, to keep the environment is the top priority and followed by occupational training/ skill practice, education, environmental quality and religion and cultural promotion.

For Kaw Pa Naw Village, to keep the environment is the top priority and followed by occupational training/ skill practice, education, environment and religion and cultural promotion.

For Kwan Ngan Village, the education is the top priority and followed by religion and culture promotion, public health, environment and occupational training / skill practice.

For Ka Don Sit Village, the occupation is the top priority and followed by public health, religion and culture promotion, education and environment.

For Me Ko Ro Village, public health is the topmost priority and followed by education, religion and cultural promotion, occupation and environment.

5.4.3.9 Community's Opinions about the Project

All respondents agreed to operate the project within their region expect some villagers from Hni Don Village. About 10 per cent of the respondents from Hni Don Village did not agree the project to be implemented. However, their reasons for not allowing the project in their village are much generalized and weak and also notable to have on the basis of their experience on a poorly managed project few years ago.

Table 5.4-26: Community Agreement on the Project (%)

Village	No	Yes	No comment
Pauktaw	0	90	10
Kaw Dun	0	50	50
Kaw Pa Naw	0	52	48
Hni Don	10	60	30
Kwan Ngan	0	90	10
Ka Don Sit	0	100	0
Me Ko Ro	0	67	33

Source: Field Survey (February 2013)

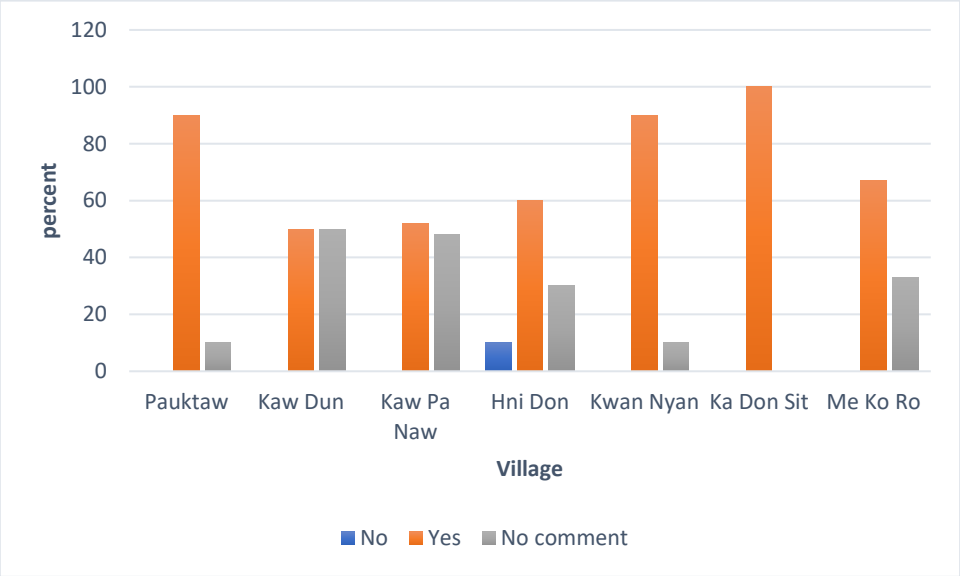


Figure 5.4-32: Community Agreement on the Project (%)

Most of the respondents suggested: -

1) to provide a good salary for workers in the project for reducing to go and work in Thailand where the salary is higher,
2) to support full of information on how to apply for the job in the plant,
3) to consider about the fishing boats if Ataran River is used for water transportation,
4) to maintain Ataran River water during dry season,
5) to conserve the mountain,
6) to acquire the public opinion,
7) to promote availability of access roads and electricity,
8) to compensate with the current price,
9) to support school facilities and requirement of teachers,
10) to provide wells for drinking water,
11) to reduce dusts generated from factory,
12) to encourage regional development, and
13) to construct clinic and medical centers.

The villagers considered that the project is acceptable for the rural and regional development and the respondents hoped that the project will support the economy of the country.

There are some basic requirements of rural and regional development, suggested by the community as follows;

1) To repair the access roads
2) To support the free of charge health services
3) To create employment opportunities
4) To construct new school buildings

Chapter 6
Stakeholder Engagement and Public Consultation

This Section summarizes the stakeholder consultation process initiated as part of the ESIA for the proposed MCL project. It is presented in the context of the ongoing process that is being taken forward by Mawlamyine Cement Ltd. (MCL) to engage with stakeholders, both those who are directly affected by the Project (primary stakeholders), and those who, although not directly affected, have an interest in or influence on the Project (secondary stakeholders).

"Stakeholder engagement" is emerging as a means of describing a broader, more inclusive, and continuous process between a company and those potentially impacted that encompasses a range of activities and approaches and spans the entire life of a project.[15]

Stakeholder engagement refers to a process of sharing information and knowledge, seeking to understand the concerns of others and building relationships based on collaboration and partnership. It is a long-term process that requires the building of trust through open dialogue and the delivery of commitments.

Disclosure of information and stakeholder consultation during the development of the ESIA is a substantial component of overall stakeholder engagement, which is outlined in the Stakeholder Engagement Plan. It is fundamental to the development of the ESIA itself in the following ways:

- information is shared in a meaningful and timely manner to enable the public to provide considered feedback in the proactive approach at a much earlier stage of a project than in the past;
- it enables the Project to develop effective mitigation measures and management plans that are sensitive to the local context; and
- Opportunities can be identified for affected communities to participate in mitigation, monitoring and enhancement measures.

The stakeholder engagement outlines and timeframe were described in detail information in the following sections.

6.1 Project Stakeholders

Project stakeholders are identified according to IFC stakeholder engagement guideline in order to understand the individuals or organizations that will be affected by or may influence the Project or related activities either positively or negatively. Broadly categorized into affected parties and influential/interested groups, the preliminary key stakeholders are identified below in Table 6.1-1. The updated list of stakeholders will be maintained in the SOD.

[15] International Finance Corporation Stakeholder Engagement: A Good Practice Handbook for Companies Doing Business in Emerging Markets

Table 6.1-1: Overview of Key Project Stakeholders

Sub-Categories	Description	Potential Impact/ Involvement
AFFECTED PARTIES		
Land Owners and Land Users	Land owners and land users of the parcels affected by the construction of cement plant and associated facilities, including owners and users with formal or informal right and claim on the land they occupy	Economic displacement due to land acquisition and compensation for the loss of assets.
Project Affected Communities	Inhabitants of the villages close to the cement plant, the quarry, along the access road to the affected facilities, in the surrounding areas.	Receptors of direct/ indir- ect and positive/ negative social and environmental impacts; in particular, affected by project traffic, dust and noise during the construction phase
Vulnerable Groups	Any person/group who can be disproportionally affected by the Project construction (i.e., children, low income people, elderly people, etc.).	Limited access to information on Project activities, impacts and mitigation measures, especially if affected by the land acquisition process or by Project traffic, noise and dust during the construction phase.
Local Government and Authorities of the Counties affected by the Project	Local authorities of Kyaikmaraw township and District affected/ involved by project activities (i.e., local health centers and service providers for education, trainings, emergency services).	Use of resources, services and infrastructures and providing some local permits and instructions.
Local Formal and Informal Leaders, Community Representatives and Opinion Makers	Influential persons within the community as opinion makers (e.g., local politicians, local religious leaders and wealthy persons from the community, NGOs); local delegations of political parties.	Influence on the community regarding the Project perceptions; informal collectors/ bearer of comm- unity opinions and complaints.
Local Interest Groups	Formal and informal associations and groups composed by and representing the affected parties (e.g. women's and farmers groups); Federation of Trade Unions – Myanmar	Influence on the community regarding the Project perceptions; informal collectors/ bearer of community opinions and complaints.
INFLUENTIAL/INTERESTED GROUPS		
National and Regional Government Bodies, Regulatory Agencies and Certification Authorities	Institutions, agencies, authorities involved in the permitting procedures and Project approvals, including MONREC, Ministry of Industry, Ministry of Labor	Responsible for the delivery of operation and construction permits, authorizations, certifications and involved in the land acquisition process.
Main National and Local NGOs and Associations	NGOs and associations mainly operating in Kyaikmaraw region, especially in the fields of human rights and social development.	Watch the Company and can provide early warning signals about emerging issues and community concerns.
Local and National Media	Television, Radio, Press (also via internet), social media	Disseminate information on ongoing and planned activities, shape public image of the Project and affect reputation positively or negatively

6.1.1 Stakeholder Identification and Stakeholders' Capacity Analysis

An integral component of assessing a project's potential impacts is to identify and prioritize the project's stakeholders.

Stakeholders are persons or groups who are directly or indirectly affected by a project, as well as those who may have interests in a project and/or the ability to influence its outcome, either positively or negatively. Stakeholders may include locally affected communities or individuals and their formal and informal representatives, national or local government authorities, politicians, religious leaders, civil society organizations and groups with special interests, the academic community, or other businesses.[16]

For some projects, the most vocal opposition may come from stakeholders outside the affected area – in other parts of the country or the world. It is therefore important to also include those groups or organizations that are not adversely affected, but whose interests determine them as stakeholders in the stakeholder analysis.

Following the initial identification of stakeholders, a more in-depth look at stakeholder group interests has been undertaken to consider how they will be affected and to what degree, and what influence they could have on the project.

A preliminary stakeholder identification survey has been undertaken. The survey involved the following steps:

a. Interviews with project stakeholders of General Administrative Officer and Head of 34 villages from Kyaikmaraw Township, staffs from Pacific Link Company Limited and staffs from SCG Cement Company Ltd.
b. Following the identification of project stakeholders, each stakeholder group was assessed on the basis of their likely interest in, and influence over the project.
c. Focus Group Meetings are conducted after consultation in villages. The stakeholder map provides a visual representation of project stakeholders.

During the present study, high interest and low influenced group, especially of local people are analyzed as principal component for the management of the developer.

According to IFC stakeholder engagement guidelines, the developer will take the strategic keys to make stakeholder consultation which involves mainly to be transparency, strategy and prioritization, referring to the past stakeholder consultation and information, development of socio-economic fact sheets with a focus on vulnerable groups. Verification of stakeholder representatives is also very important and need to engage in their own communities and be ensure that the government is the key stakeholder.

[16] International Finance Corporation Stakeholder Engagement: A Good Practice Handbook for Companies Doing Business in Emerging Markets

6.1.2 Location of Public Consultation Meetings

The social impact assessment team visited project area for one time on 23rd February to 26th February 2013. A series of meetings were conducted as shown in Table 6.1-2. The detailed information about each meeting was described in Annex 6-1 and 6-2.

Table 6.1-2: Stakeholder Consultation and Public Consultation Meetings

No.	Date	Name of Town/ Village	Participation	Arranged by
Year 2013				
1	23.2.2013	• Kaw Pa Naw village • Pauktaw Village	• Villagers • REM Co. Ltd.	Head of Village Tract
2	24.2.2013	• Me Ko Ro Village • Kwan Nyan Village • Hni Don Village	• Villagers • REM Co. Ltd.	Head of Village
3	25.2.2013	• Ka Don Sit Village • Kaw Don Village	• Villagers • REM Co. Ltd.	Head of Village
4	25.2.2013	• Kyaikmaraw Town	• Head of Village Tracts in Kyaikmaraw Township, • REM Co. Ltd., • Mawlamyine Cement Limited	Administrator, General Administrative Department, Kyaikmaraw Township
5	26.2.2013	• Kyaikmaraw Town	• REM Co. Ltd. • Township GAD Officers	GAD Office, Kyaikmaraw Township
Year 2016				
1	7.2.2016	• Kaw Pa Naw	• Villagers • REM Co. Ltd.	Kaw Pa Naw Monastery
2	7.2.2016	• Kaw Dun		
3	7.2.2016	• We Nge		
4	7.2.2016	• Kwan Nyan	• Villagers • REM Co. Ltd.	Kwan Nyan Monastery
5	8.2.2016	• KaDonSit	• Villagers • REM Co. Ltd.	KaDonSit Monastery
6	8.2.2016	• Shwe War Gyaung		Shwe War Gyaung Monastery
7	8.2.2016	• MeKuRo		MeKuRo Monastery
8	10.2.2016	• MCL	• REM Co. Ltd. • MCL (Kyaikmayaw)	MCL Meeting Room

No.	Date	Name of Town/Village/Ward	Participation	Arranged by
Year 2013 (1st Public Consultation and Disclose Project Relevant Information)				
1	25.5.2013	Meeting Hall, Kyaikmaraw Administrative Office	• Government Stakeholders • MCL Authorities • Villagers • REM Consultants	MCL
Year 2013 (2nd Public Consultation and Disclose on Scoping Report)				
1	3.9.2013	Kyaikmaraw office	• Government Officers • from Kyaikmaraw office • MCL Authorities • REM Consultants • Heads of Village tracts	MCL
2	4.9.2013	Kawpanaw	• MCL Authorities • REM Consultants • Wegne • Kawpanaw • Kaw Dun	MCL

Table 6.1-2: Stakeholder Consultation and Public Consultation Meetings (Continue)

No.	Date	Name of Town/ Village	Participation	Arranged by
Year 2013 (2nd Public Consultation and Disclose on Scoping Report)				
3	4.9.2013	Ka don sit	• MCL Authorities • REM Consultants • Ka Don Sit • Shwe war gyaung	MCL
4	5.9.2013	Kyan Nyan	• MCL Authorities • REM Consultants • Kyan Nyan • Pauk Taw	MCL
5	5.9.2013	Hni Don	• MCL Authorities • REM Consultants • Hni Don	MCL
6	6.9.2013	Mekaro	• MCL Authorities • REM Co. Ltd. • Mekaro	MCL
7	6.9.2013	Shin Zaw Pu Ward	• MCL Authorities • REM Consultants • Shin Zaw Pu Ward (Kyaikmara)	MCL
8	7.9.2013	Tarana	• MCL Authorities • REM Consultants • Tarana • Kyun Gon	MCL
9	7.9.2013	Kaw That	• MCL Authorities • REM Consultants • Kaw That Villagers	MCL
10	8.9.2013	Kaw Wan	• MCL Authorities • REM Consultants • Ang Ka Zaing & Kaw Wan	MCL
11	8.9.2013	Nyaung Bin Seik	• MCL Authorities • REM Consultants • Nyaung Bin Seik (village Tract)	MCL
Year 2017 (Public Disclosure on EIA Report Submission)				
1	17.8.2017 9:00 AM - 12:40 PM	Rheymonya Hotel, Mawlamyine	• Chief Minister of Mon State • State Governmental Officers • Kyaikmaraw Township GAD officer • Local people project surrounding villagers • Media • NGOs and interested persons • REM Consultants • MCL Authorities	MCL
2	18.8.2017, 9:00 AM – 12:00 PM	Kaw Pa Nor new Monastery	• Kaw Pa Naw • Villagers • REM Consultants • MCL Authorities	MCL

Table 6.1-2: Stakeholder Consultation and Public Consultation Meetings (Continue)

No.	Date	Name of Town/ Village	Participation	Arranged by
Year 2017 (Public Disclosure on EIA Report Submission)				
3	18.8.2017, 2:00 PM – 5:00 PM	Kaw Dun New Monastery	• Kaw Dun Villagers • Mekaro Villagers • REM Consultants • MCL Authorities	MCL
4	19.8.2017 9:00 AM - 12:00 PM	Kaw-Krid Monastery	• Kwan Ngan Villagers • Pauk Taw Villagers • REM Consultants • MCL Authorities	MCL
5	19.8.2017 2:00 PM – 5:00 PM	Shwe War Chaung Monastary	• Kadonsit Villagers • Shwe War Chaung Villagers • REM Consultants	MCL
6	20.8.2017 9:00 AM – 12:00 PM	Hnidon Village Administrative office	• Hnidon Villagers • REM Consultants • MCL Authorities	MCL

6.1.3 Stakeholder Engagement Approaches

The SOD will utilize a multi-stakeholder approach, using workshops, focus group discussions (thematic) at the local level and interviews with key informants/stakeholders (socio-economic baseline survey.

The mixed approach outlined above will allow this Stakeholder Engagement Plan to reach affected people, vulnerable groups, interested persons, government agencies and NGOs, among others.

- Information and consultation meetings
- Focus Group Discussions (women, elders, youth… on thematic topics)
- Socioeconomic baseline survey
- Information Centre at Project site and public noticeboards
- Stakeholder Workshop on EIA report
- Official correspondence by phone/email/text messaging
- Individual interviews
- Formal meetings

6.1.3.1 Interview and Questionnaire Survey

In the survey, about 300 sample respondents selected from 7 Villages such as Pauktaw, Kaw Don, Kaw Pa Naw, Hni Don, Kwan Nyan, Ka Don Sit and Me Ko Ro villages within the project area were interviewed. All these are project affected people (PAPs), but they are not necessary to be relocated under the project. To understand their existing situations, attitudes and impacts from the project development, the interviews were undertaken with the help of the structured questionnaires which cover the contents of basic information of interviewees, their socio-economic conditions, education and current environmental problems, facilities and social problems, perceptions of the project, attitudes towards the project, and attitudes towards draft mitigation measures regarding the impact caused by the project development.

The survey will be focused on community study within 3 km circle surrounding the project site. The survey will cover 7 Villages Tracts as shown in Table 5.2-3.

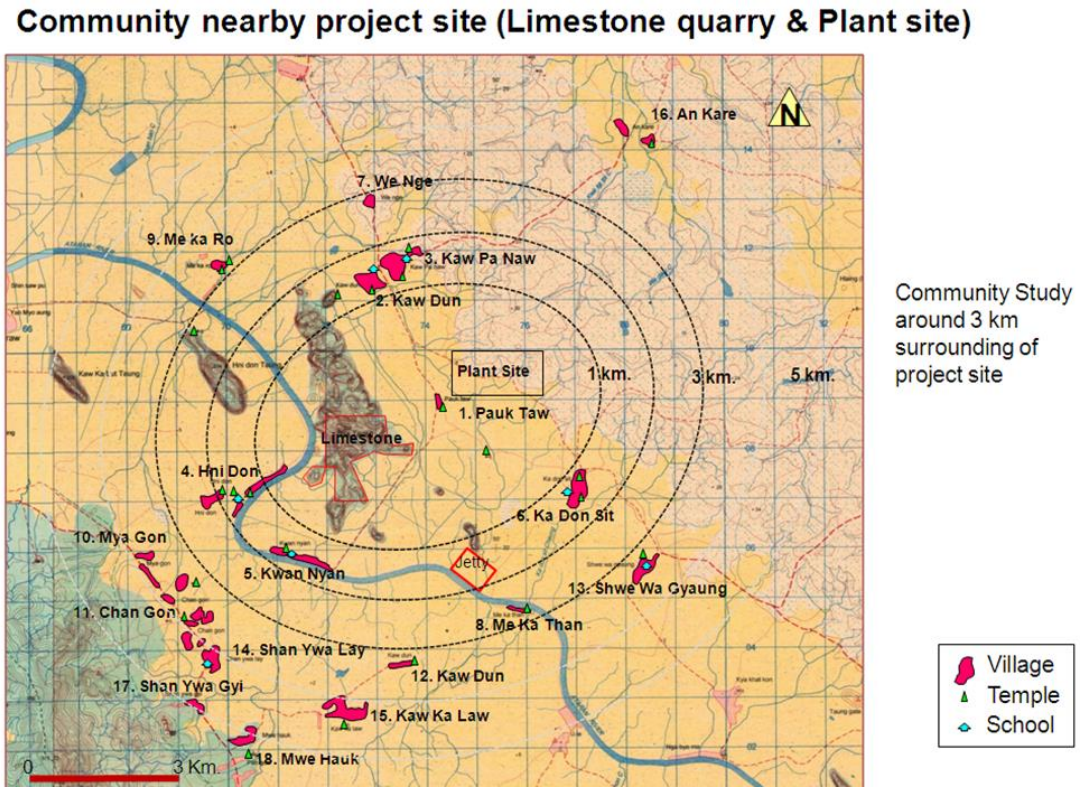


Figure 6.1-1: Project Community of Limestone Quarry

Table 6.1-3: Location of Villages in the Project Area

No.	Villages	Latitude (North)	Longitude (East)	Elevation (Meter)
1	Pauktaw	16° 21' 43"	97° 49' 9"	28
2	Kaw Dun	16° 22' 60"	97° 48' 24"	7
3	Kaw Pa Naw	16° 23' 12"	97° 48' 40"	25
4	Hni Don	16° 20' 42"	97° 46' 44"	20
5	Kwan Nyan	16° 20' 1"	97° 47' 34"	20
6	Ka Don Sit	16° 20' 43"	97° 50' 44"	20
7	Me Ko Ro	16° 23' 9"	97° 46' 42"	20

Source: REM Field survey (February 2013)

6.1.3.2 Implementation Schedule

There will be two phases for MCL limestone quarry project for public consultations, at the pre-construciton and operation stage.

There have been land acquisition and compensation before the project construction started. MCL have already compensated for the lands which will be used for the whole area, including the cement plant, limestone quarry, jetty and coal captive power plant before the project started.

MCL consulted with all the land owners for land acquisition and compensation and have already bought those lands which will be permanently abandoned under the project activities and have already paid the compensation in cash.

For the limestone quarry site, MCL have already got the liscense acceptance from the Ministry of Mining and the official documents will be attached in Annex-5.2 for confirmed evidence.
For the operation of Limestone quarry, MCL will manage in three options:

Option 1: The blasting and mine explosure schedule will be informed to the village community and the operation will be surely made within the determined time period. Also MCL agreed to have the grievance complaint box in the villages near the quarry site and received the grievances and took measurable actions to prevent them.

Option 2: MCL will continuously monitored the possible affected peoples (APs) from the surrounding community and their livelihoods and will take mitigation action for those impacts. Even though the impacts will not be mentioned in MCL EIA report, MCL could take measures to prevent it in taking close consultation with APs if there have any feedback or complaint from the community people.

Option 3: When mining activities have done completely, MCL will strictly follow the mine closure plan and rehabilitate the quarry environments by planting local indiginous plant species and make the environs in beautiful sight scenery.

These options, including pros and cons of what may result in the best outcomes for APs as well as budget considerations, should be analyzed carefully by the Project and discussed in close consultations with APs.

6.1.4 Stakeholder Consultation and Public Disclosure

The SOD will utilize a multi-stakeholder approach, using workshops at national and local levels, focus group discussions (thematic) at the local level and interviews with key informants/stakeholders (socio-economic baseline survey).

The mixed approach outlined above will allow this Stakeholder Engagement Plan to reach affected people, vulnerable groups, interested persons, government agencies and NGOs, among others.

Interview and Questionnaire survey methods were used in the survey for about 300 sample respondents selected from 7 Villages such as Pauktaw, Kaw Don, Kaw Pa Naw, Hni Don, Kwan Ngan, Ka Don Sit and Me Ko Ro within the project area.

Regarding on the socioeconomic survey and stakeholder consultation results, it has found out that all these villages are said to be project affected people (PAPs) within the project area, but they are not necessary to relocate by any project activities. The main purpose of these consultation meetings is to understand their existing situations, attitudes and concerns on the affected impacts from the project development and the interviews were undertaken with the help of the structured questionnaires which cover the contents of basic information of interviewees, their socio-economic conditions, education status and current environmental problems, existing provided facilities and social problems, perceptions of the project, attitudes towards the project, and attitudes towards the possible mitigation measures regarding the

impacts on them caused by the project development and the impacts analysis by each gender and focus group.

The SOD describes the Project strategy and procedures for interactions with stakeholders at local, regional and national level, with particular focus on Project Affected Persons (PAPs). The SOD also outlines a grievance mechanism to allow stakeholders to bring concerns to the Project attention.

The SOD is designed to promote the Project objectives in the field of stakeholder engagement: by providing good public information, communicating well with all stakeholders, and developing positive relationships with local and regional communities, markets and clients, the Project enhances its reputation, brand, and ultimately, value but it also reduces the risks deriving from social instability improperly managed and impacting Project activities. By adopting this document, MCL shows its will to engage in fostering good stakeholder relations and communication with local and national groups.

The SOD is also a 'living document' which, once endorsed, will be updated periodically by MCL to summarize results achieved i.e. to record consultations undertaken, issues raised, actions taken; to describe lessons learned and any changes to the consultation process; and to update the stakeholder group list and outline the schedule for on-going and future interactions. This document applies to all the phases and components of the Fully-Integrated Cement Production Facility Project (cement plant, coal fired power plant, quarry site and Jetty).

This survey work will be focused on community study within 3 km circle surrounding the project site. The survey will cover 7 Villages Tracts which were located within 3 km circle around the project site as shown in Table 6.1-3.

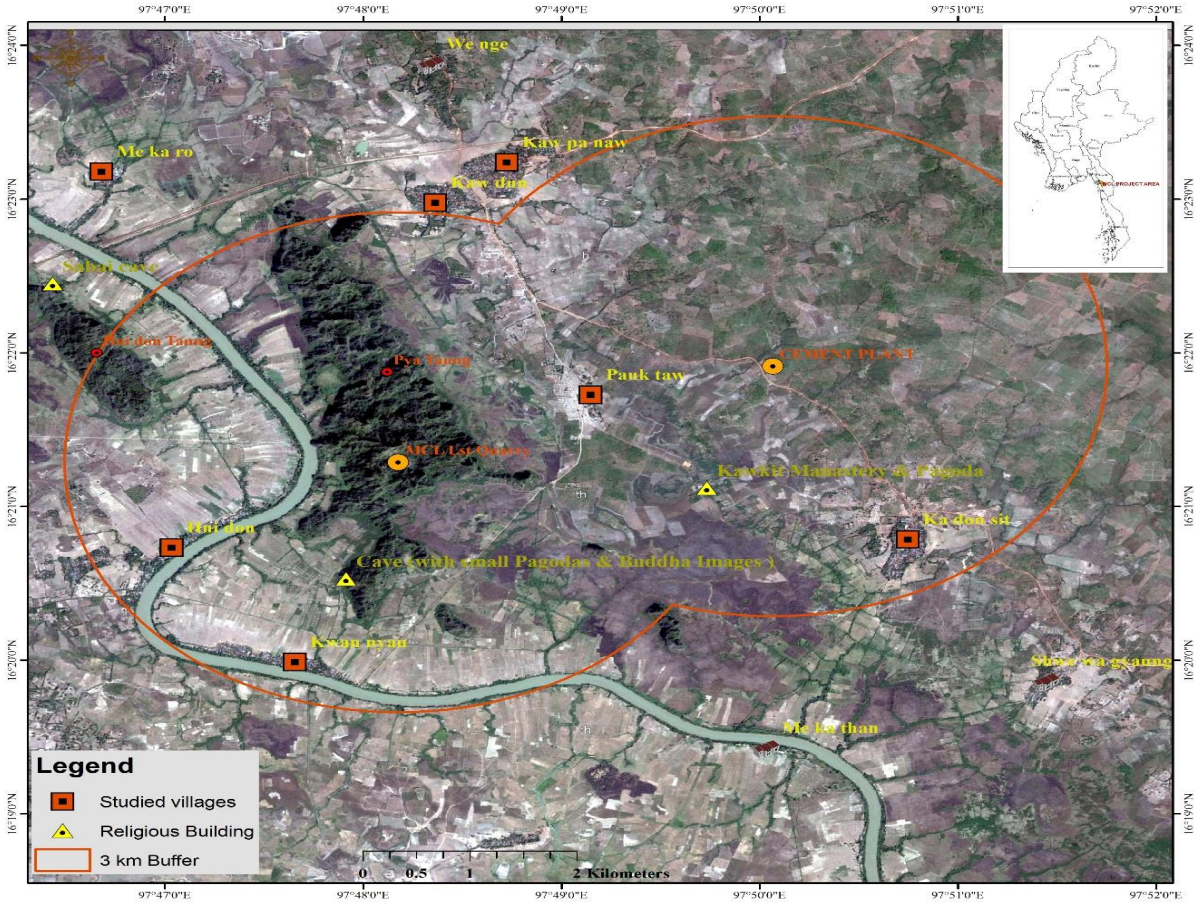


Figure 6.1-2: Survey Villages near Project Area

6.1.5 Stakeholder Participation

An integral component of assessing a project's potential impacts is to identify and prioritize the project's stakeholders.

Following the initial identification stakeholders, a more in-depth look at stakeholder group interests has been undertaken to consider how they will be affected and to what degree, and what influence they could have on the project.

A preliminary stakeholder identification exercise has been undertaken. The exercise involved the following steps:

a. Interviews with project stakeholders of General Administrative Officer and Head of 34 villages from Kyaikmaraw Township, staffs from Mawlamyine Cement Litmited.
b. Following the identification of project stakeholders, each stakeholder group was assessed on the basis of their likely interest in, and influence over the project.
c. Focus Group Meetings are conducted after villages. The stakeholder map provides a visual representation of project stakeholders.

During the present study, high interest and low influenced group, especially of local people are analyzed as principal component for the management of the developer.

Figure 6.1-3: Meeting with GAD Officer in Kyaikmayaw Township

*GAD - General Administrative Department

	
Consultation Meeting at Kyaikmaraw	**Consultation Meeting at Kyaikmaraw**
	
Consultation Meeting at Kyaikmaraw	**Consultation Meeting at Hni Don Village**

	
Kaw Pa Naw Village	**Me Ke Ro Village**
	
Nyaung Bin Seik (for transportation)	**Kaw That Village Tract**
	
Hnidon Village	**Ka Don Sit Village**

Kaw Dun Village

Kwan Ngan Village

Pauktaw Village

Kyaikmaraw (Feb 2013)

Figure 6.1-4: Public Consultation Images at the Affected Township and Villages

MCL will create a website with the main Projects' information and events of interest for the various stakeholders for public disclosure. The documents and information that will be disclosed in the website include, but are not limited to, the following:

- SOD will be disclosed in English and Burmese language;
- ESIA executive summary;
- information on the construction schedule and services disruption;
- stakeholder's consultations timeframe, venues and MoM;
- grievance procedure;
- community development activities; and
- SOD Manager contact

Considering the low percentages of internet users in the affected area, the Project disclosure through MCL website will be mainly targeted, but not limited to, specific stakeholders (NGOs, national or regional stakeholders, authorities, Lenders, etc.).

In addition, given the particular setting of Project operational areas, possible methods to reach the target audience include, but are not limited, to:

- open meetings with residents of the affected communities (e.g., at schools, public/ religious or associations premises);
- SOD aerate meetings with landowners/land users, vulnerable groups, farmers associations and local NGOs, as needed and appropriate;
- brochures, posters, informative leaflets at key communities' centres, and radio announcements, in particular to inform about the construction schedule, grievance mechanism and forthcoming community meetings. Written information material should take in duly consideration the fact that there is a relevant number of illiterate people in the area; and
- social media: this method can be useful to keep ongoing communication with NGOs and other interested stakeholders.

MCL will provide and publicise well in advance a schedule of the dates and locations of any planned consultation activities, including follow up and disclosure activities. A stakeholder engagement and disclosure plan detailing methods and content of engagement and disclosure for each type of stakeholder is presented in Table 6.2-3.

All meetings will be carefully documented and logged, minutes taken, and follow up activities recorded. A Public Grievance Sample Form and the Consultation Information Template are presented respectively in Table 6.2-2 and 6.2-3. The flow chart of processing grievances is shown in Figure 6.2-1.

6.2 Stakeholder Engagement Plan (SEP)

6.2.2 Stakeholder and Public Disclosure Plan

6.2.1 Purpose of SEP

This Stakeholder Engagement Plan (SOD) has been prepared as part of the ESIA undertaken for the proposed Project by Resource & Environment Myanmar Co., Ltd.

This SOD, whose beneficiary will be MCL, presents the Project commitments and plans for stakeholder engagement.

The objectives of this stakeholder engagement plan are to:

- Identify and map all different stakeholders (groups and individuals) either directly or indirectly impacted by the MCL Project or in any other way have a stake in the Project.
- Categorize stakeholders by their thematic relevance, priority, when/where/how they will be impacted by the Project and how they would influence the Project, their inter-relationships and dynamics, and the size or level of operation.
- Conduct stakeholder consultation meetings with all identified stakeholders to discuss the MCL Project plans and intentions and to receive the stakeholder opinions on the proposed Project. Criteria for the meetings are as follows:

    (i) Stakeholders and households for focus group discussions and household surveys are statistically representative/significant;

(ii) Inclusive of all stakeholder sub-groups e.g. women, elderly, youth, vulnerable persons;
(iii) One-on-one household interviews and focus groups are arranged directly and not through village chiefs or influential community persons, and are conducted in a locally/culturally sensitive manner and without external interference or pressure so that interviewees can speak freely;
(iv) Notices of meetings and surveys should be sufficiently notified in advance at prominent locations;
(v) The comments and suggestions received from the participants shall be collected and incorporated into the ESIA and ESMP. When the ESIA and ESMP are completed these reports need to be disclosed in an appropriate way to the different stakeholders.

- Explore options to avoid, minimize and/or mitigate Project impacts with Project stakeholders in particular affected communities. Incorporate these findings into the ESIA, ESMP.

The purpose of this MCL SOD plan is to establish and maintain a constructive relationship with affected people and other interested parties over the life of the Project in order to obtain and maintain the "social license to operate" and broad public support. The objectives of stakeholder engagement are:

- to ensure the timely provision of relevant and understandable information;
- to create a process that provides opportunities for stakeholders to express their views, concerns and complaints, and allow MCL to consider and respond to them;
- to maintain awareness of safety and environmental issues among communities in the vicinity of Project facilities;
- to monitor community attitude to the Project;
- to manage and monitor the effectiveness of any corrective actions implemented as a result of stakeholder concerns or complaints during Project activities;
- to manage and report on the closing out of stakeholder concerns or complaints; and
- to comply with IFC Performance Standards.

Stakeholder engagement will include an on-going communication process based on:

- public disclosure of appropriate information so as to enable meaningful, accessible and continued communication to consultation with stakeholders;
- meaningful consultation with potentially affected and interested parties; and
- a procedure by which people can make comments or complaints.

Table 6.2-1: Public Grievance Sample Form

Reference No:	
Full Name	
Contact Information **Please mark how you wish to be contacted (mail, telephone, e-mail).**	☐ **By Post: Please provide mailing address:** **_____** **_____** **_____** ☐ **By Telephone: _____** ☐ **By E-mail _____**
Preferred Language for communication	☐ **Burmese** ☐ **English** ☐ **Other**
Description of Incident or Grievance:	**What happened? Where did it happen? To whom did it happen? What is the result of the problem?**
Date of Incident/Grievance	
	☐ **One time incident/grievance (date _____)** ☐ **Happened more than once (how many times? _____)** ☐ **On-going (currently experiencing problem)**
What would you like to see happen to resolve the problem?	

Signature: _____

Date: _____

Please return this form to:

Name of Contact Person, Position and Title:_____

Address:_____

Tel.:_____

E-mail: _____

Table 6.2-2: Consultation Information Template

Reference No: **(to be determined by the project)**	
Site name	
Contact details of appointed staff	**Name** _____ **Telephone:** _____ **E-mail** _____
Language of the Communication Activity	☐ **Burmese** ☐ **English** ☐ **Other**_____
Description of Consultation Activity:	**Meeting, Location, office address, etc.**
Type and number of stakeholders met (specify gender):	
Materials Provided:	
Date of Consultation Activity	**Location where information is available**
	☐ **Website** _____ ☐ **Hard copy** _____ ☐ **Other** _____

Issues raised	Response provided	Actions to be taken	Deadline

Flowchart for Processing Grievances

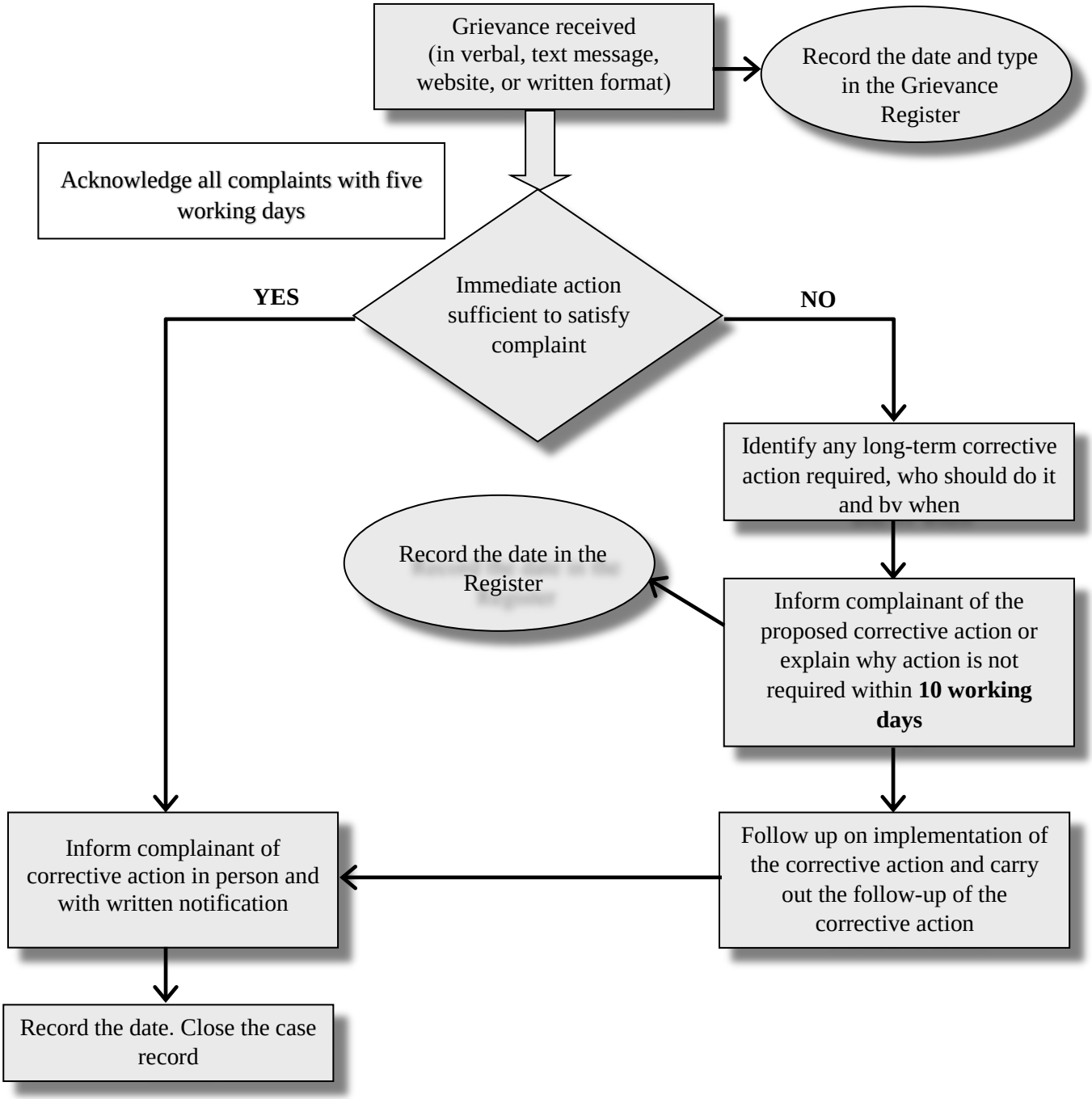


Figure 6.2-1: The Flow Chart of Processing Grievances

MCL will keep ongoing consultations with all identified stakeholders. Consultation activities will not be limited to a single meeting with the interested parties but will entail a series of meetings, discussions, and opportunities for affected parties to learn about the Project details, be informed of the potential impacts, and of planned mitigation measures. They will be followed up with written records and agreements. These activities are valuable for MCL to understand stakeholder concerns, gain feedback, identify potential risks and act pre-emptively to ensure positive outcomes. At the same time, the MCL awareness of the local context will allow to better define and tailor community development activities.

MCL will prepare information to be disclosed in advance and in a format adapted and suitable to the different public and groups. It will identify multiple and preferred communication channels to convey information on the Project activities and mitigation of identified impacts, or occurrence of new impacts, effectively so as to be fully transparent and informative. In addition, the venue and timing of meetings will be adapted to stakeholders' preference and needs.

The disclosure plan, as preliminarily presented in Table 6-5, is mainly addressed to the construction and operation phases and only in very generic terms to the decommissioning phase, which at the moment appears unlikely to occur: in case any decommissioning will take place, this SOD will be updated accordingly, and decommissioning will be treated in more detailed terms.

During the Project construction and operation phases MCL will disclose information regarding ongoing Project activities or relevant changes in the Project through the following main methods:

- detailed publications in local newspapers or other media and radio spots, which allow to easily reach also illiterate people: this method is aimed at informing all Project stakeholders on the ongoing activities and future development plans, including the impacts and mitigation measures foreseen;
- notice boards in the main public spaces of the affected areas: this method addresses in particular all Project affected communities (residents) and land owners and users on the ongoing activities, including the impacts and mitigation measures foreseen, methods to present complains and comments;
- meetings and events (with open or restricted participation), which allow to reach local and national authorities, residents of affected communities, NGOs and civil society associations to present Project activities, including the impacts and mitigation measures foreseen, grievance mechanism, and discussion on relevant topics such as labour issues, environmental impacts, community's health and safety, etc.;
- MCL webpage and SOD Manager contact, which will allow the distribution of information on Project impacts and mitigation measures, schedule of activities and plans, as well as the collection of grievances. Furthermore, it will represent a good channel to collect stakeholders' suggestions and concerns.

An internal and external grievance mechanism will be in place during all the Project phases. Table 6.2-3 presents a tentative plan for stakeholder engagement according to the information available at the time on its preparation. Future updates will be done every time relevant modification to the Project context are foreseen.

Table 6.2-3: Preliminary Stakeholder Disclosure Plan during Construction and Operation Phases

Project Information Dissemination Methods	Stakeholders Addressed	Information Disclosed	Timeline	Resources - Responsibilities
Face-to-face meetings with PAPs	Residents and representatives of the Project affected communities, vulnerable groups, local businesses	Information on planned activities, assessed positive and negative impacts and mitigation measures, presentation of the external grievance mechanism	Along the EIA approval process, before and the beginning of and during construction activity	Project staff with SOD Manager
Meetings with local level authorities and administrations, National Government Bodies involved in the authorization phases	Regulators (national, governorate, and local)	Project development, identified ES impacts, schedule of activities, definition of the emergency response plan	According to the procedural and administrative needs	MCL Factory Managers with SOD Manager
Induction and staff trainings	Temporary and permanent workers	Working conditions, OHS induction, and code of conduct/ awareness raising on local customs, internal grievance mechanism	Immediately after hiring and later only when contractual changes occur	MCL Human Resources
Publications/announcements in national and local media, social media, MCL website	All identified stakeholders	Information on planned activities in each specific area, assessed positive and negative ES impacts and mitigation measures, presentation of grievance mechanism and MCL points of contacts	Before the beginning of the construction phase; at the end of the of the construction phase	Project staff with SOD Manager
Notice boards in the main public spaces of the affected areas	People in the Project affected area (mainly residents), landowners and users	Information on the schedule of the forthcoming construction activities in each specific area, Impacts and mitigation measures, grievance mechanism, SOD Manager contacts	Before the beginning of the construction phase	SOD Manager

6.2.3 Demography

Among the seven villages, Kaw Pa Naw Village is the biggest village with 556 houses and 580 households followed by Kaw Dun Village with 395 houses and 425 households. Hni Don is the third biggest village with 387 houses and 402 households. However, Pauktaw Village is very near to the project site. In fact, potential social impact of this project to Kaw Pa Naw and Kaw Dun villages is relatively higher due to their wide social network.

There are 3,327 persons in Kaw Pa Naw Village, 2,451 persons in Hni don Village, 2,235 persons in Kaw Dun Village, 2,022 persons in Ka Don Sit Village, 1,704 persons in Kwan Nyan Village,1,579 persons in Me Ko Ro Village and 248 persons in Pauktaw Village. Among them, 300 respondents are selected as sample population for the study as shown in Table 6.2-4 and Figure 6.2-2.

The main issue for this socioeconomic survey is the small sampling size because of the village people, those who were traveling to Thailand for their work opportunities and livelihoods. However, the survey team tried much efforts to get the adequate sampling size of the households for the potentially affected villages while the transitional period of some political changes.

Table 6.2-4: Total Population of the Survey Villages (2012)

No.	Villages	House	Household	Male	Female	Total	Number of Household Sample
1	Pauktaw	35	48	123	125	248	20 (42 %)
2	Kaw Dun	395	425	1107	1128	2235	50 (12 %)
3	Kaw Pa Naw	556	580	1629	1698	3327	50 (9 %)
4	Hni Don	387	402	1209	1242	2451	50 (12 %)
5	Kwan Nyan	351	350	859	845	1704	50 (14.5 %)
6	Ka Don Sit	333	341	968	1054	2022	50 (15 %)
7	Me Ko Ro	280	296	770	809	1579	30 (17 %)
		2337	**2442**	**6665**	**6901**	**13566**	**300 (12.3 %)**

Source: REM Field Survey (February 2013)

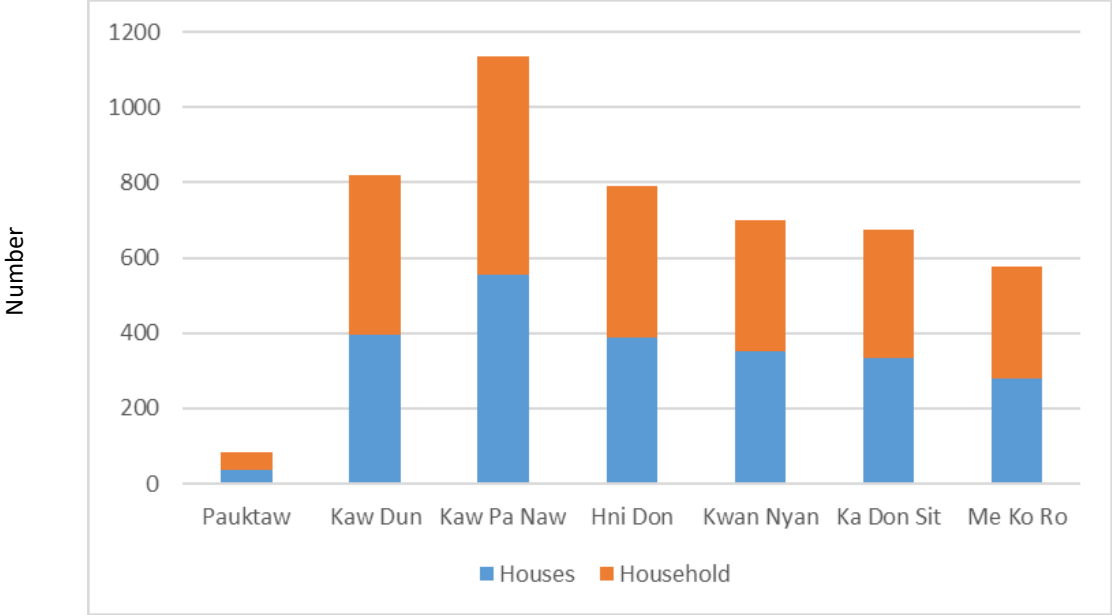


Figure 6.2-2: Houses and Households of the Survey Villages

Figure 6.2-3: Houses in Pauk Taw Village

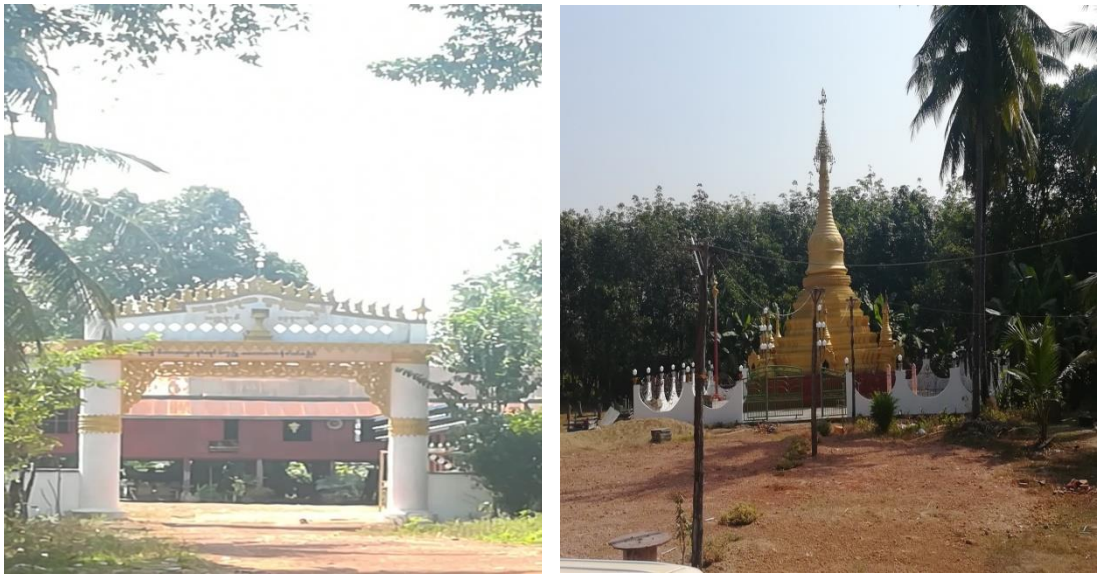


Figure 6.2-4: Monastery in Pauk Taw Village

6.2.4 Gender Distribution Status

Even though the project didn't concern about any resettlement by project activities, the project will make efforts to address the special needs of vulnerable groups. Vulnerable groups include households headed by females, elderly, youth or a person with a disability, landless households, poor households and any other household identified as vulnerable by community members.

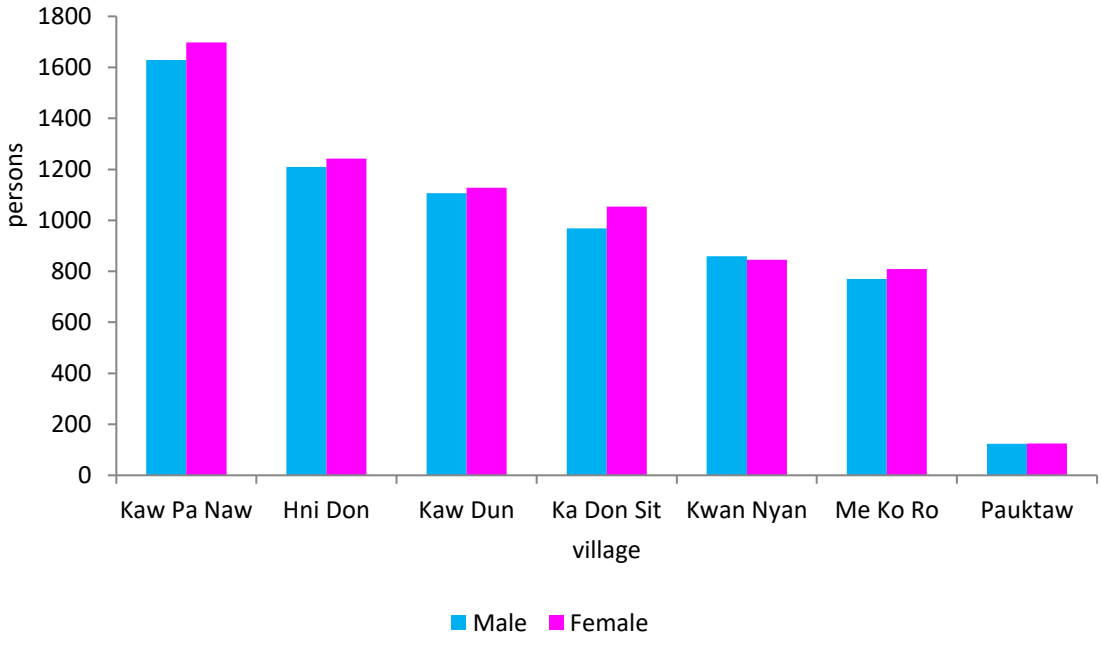


Figure 6.2-5: Gender Distribution in the Study Villages

Figure 6.2-6: Focus Group Meetings in Pauk Taw Village

Figure 6.2-7: Key Informant Interview in Me Ko Ro Village

6.2.5 Livelihood Status of Survey Villages

According to the field survey data, type of occupation includes dependent, flora/fauna gathering in the forest, farmer/Gardener, Casual Labour, government staff and student. All villages are farmers/ gardener. Larger percentages of farmers/ gardeners were found in Kaw Pa Naw. Kaw Don, and Me Ko Ro villages with more than 60 percent. In Kaw Don, Kaw Pa Naw and Ka Don Sit villages, some respondents are flora and fauna gatherers. Government staffs rare mainly found in Hnidon and Kwan Nyan villages. Certain amounts of respondents are dependent persons in the study area as in Table 6.2-5 and Figure 6.2-8.

Table 6.2-5: Occupational Structure in the Survey Villages (%)

Village	Dependent	Flora/Fauna Collector in the Forest	Farmer/ Gardener	Casual Labour	Government Staff	Student
Pauktaw	30	0	45	25	0	0
Kaw Dun	40	2	44	14	2	8
Kaw Pa Naw	26	2	62	8	0	2
Hni Don	28	0	46	8	14	4
Kwan Nyan	18	0	46	26	8	2
Ka Don Sit	6	12	64	14	4	0
Me Ko Ro	34	0	60	0	3	3

Source: REM Field Survey (February 2013)

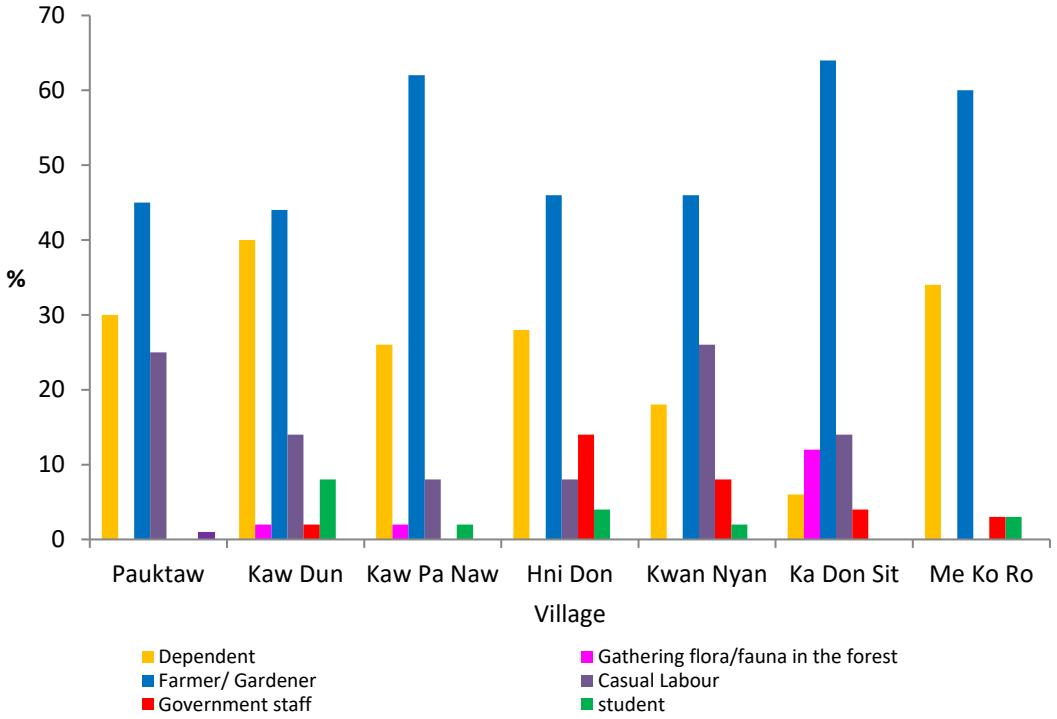


Figure 6.2-8: Profile of Occupational Structures in the Study Villages (%)

6.2.6 Income Level

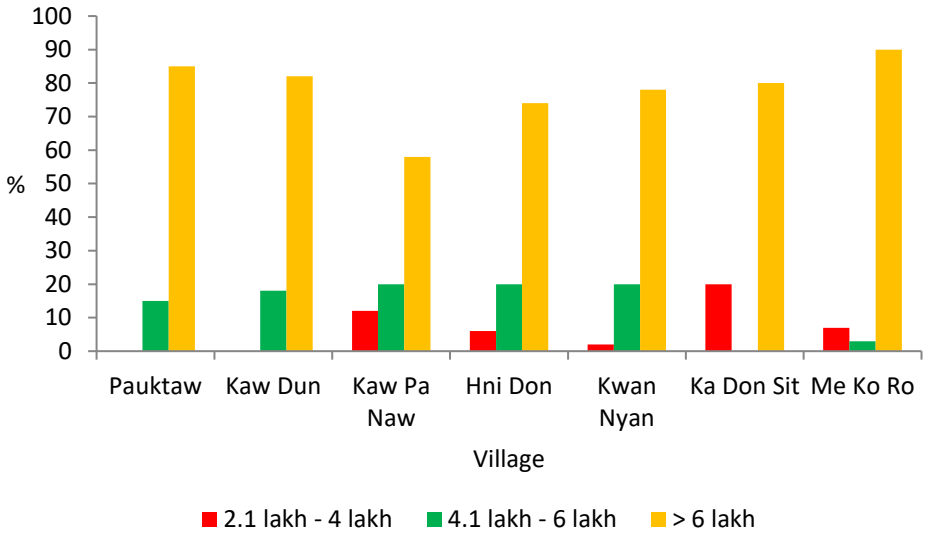
Income level of people in four wards was measured by using primary data received from field survey in February 2013, as shown in Table 6.2-6 and Figure 6.2-9.

Most of the respondents in all study villages are in high income level of more than 6 lakh kyats. Low income group with less than 2 lakh kyats is observed in no villages. High income group is mainly found in Pauktaw, Kaw Don, Ka Don Sit and Me Ko Ro villages. Among them, respondents from Pauktaw Village and Kaw Don Village have regular income level more than 4 lakh kyats per year.

Table 6.2-6: Income Level of the Study Wards (%)

Village	> 2lakh	2.1 lakh - 4 lakh	4.1 lakh - 6 lakh	> 6 lakh
Pauktaw	0	0	15	85
Kaw Dun	0	0	18	82
Kaw Pa Naw	0	12	30	58
Hni Don	0	6	20	74
Kwan Nyan	0	2	20	78
Ka Don Sit	0	20	0	80
Me Ko Ro	0	7	3	90

Note: 1 lakh Kyats = 120 USD average in 2013 March
Source: REM Field Survey (February 2013)



*Note: 1 lakh Kyats = 120 USD average in 2013 March

Source: REM Field Survey (February 2013)

Figure 6.2-9: Income Level of the Study Villages (%)

6.2.7 Public Health and Health Status

To collect the baseline information about the health conditions of the houses around the project area, present survey was conducted based on the questionnaire's distribution to 70 representative households. Public health and health status are determined based on the source of food, source of drinking water, management of wastewater, solid waste management, medical history and current status of public health services. Main sources of daily food for respondents are market, forest and river and home gardens.

The main source is the market and some respondents also rely their daily food on home gardens where vegetables and edible plants are grown. Forest and river are major source of food for a few respondents from PaukTaw Village and Hnidon Village. For them the loss of forest and river is a major problem for daily food supply. Most of the respondents utilize water from well and some villages use from the Ataran River according to Table 6.2-7 and Figure 6.2-10.

Table 6.2-7: Food Sources of Respondents

Village	Owned- Orchards	Natural Resources (Forest, River)	From Market
Pauktaw	5	10	85
Kaw Dun	6	0	94
Kaw Pa Naw	14	0	86
Hni Don	8	6	86
Kwan Nyan	14	0	86
Ka Don Sit	2	0	98
Me Ko Ro	13	0	87

Source: REM Field Survey (February 2013)

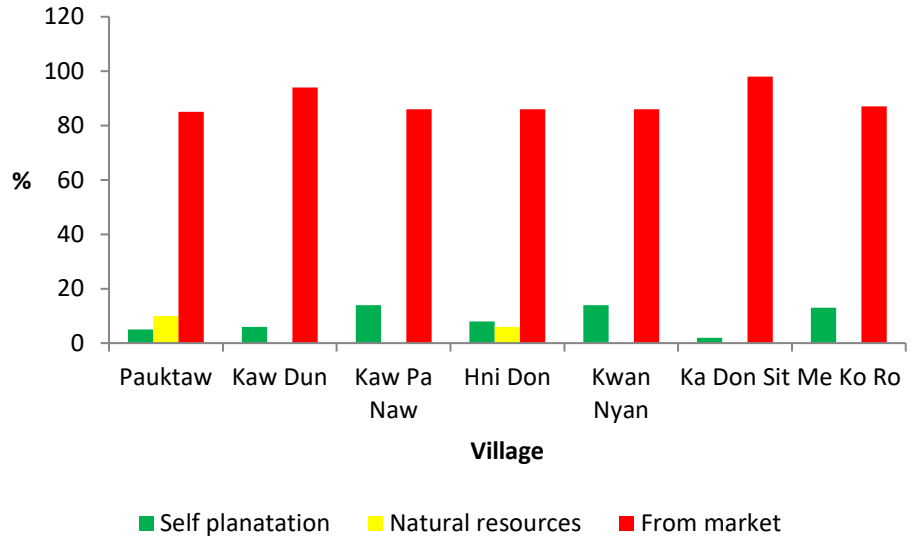


Figure 6.2-10: Food Sources of Respondents

Health status is also related to wastewater disposal in the study area. Inadequate disposal of wastewater without any treatment can create several health problems. In the survey villages, almost nearly 100 % of the respondents disposed wastewater directly into the open ground in their surrounding area and very few respondents disposed wastewater into the river channel and their own gardens as well as shown in Table 6.2-8 and Figure 6.2-11.

The most obvious fact is that Pauktaw village disposed their wastewater directly into the ground in overall 100 %.

Table 6.2-8: Discharge Patterns of Wastewater from Household (%)

Survey Village	Disposal Sites of Wastewater			
	Ground	Drainage System	River	Garden
Pauktaw	100	0	0	0
Kaw Dun	98	0	2	0
Kaw Pa Naw	90	4	6	0
Hni Don	98	0	0	4
Kwan Nyan	88	0	10	2
Ka Don Sit	96	2	2	0
Me Ko Ro	90	4	4	0

Source: REM Field Survey (February 2013)

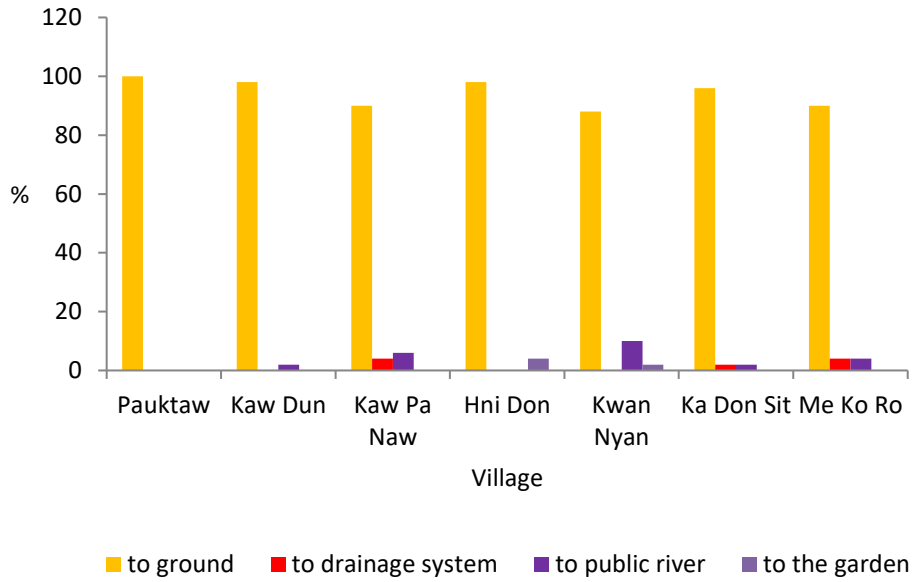


Figure 6.2-11: Disposal of Wastewater from Household (%)

Most of the respondents burned garbage and solid wastes generated from their houses. Some respondents used village landfill site for waste disposal and certain number of respondents dumped the solid wastes in their own backyard. Those improper disposals of solid wastes are spoiling in developing countries and seriously related to health problems of the survey area. The solid wastes disposal pattern of the survey villages were shown in Table 6.2-9 and Figure 6.2-12.

The most important issue is that almost over 75 % of the generated solid wastes were burned.

Table 6.2-9: Management of Solid Waste from Household (%)

Village	Dumping at the Backyards	Village Landfill	Burning
Pauktaw	0	0	100
Kaw Dun	2	10	88
Kaw Pa Naw	6	4	90
Hni Don	14	8	78
Kwan Nyan	6	10	84
Ka Don Sit	18	4	78
Me Ko Ro	10	14	76

(Source: REM Field Survey, February 2013)

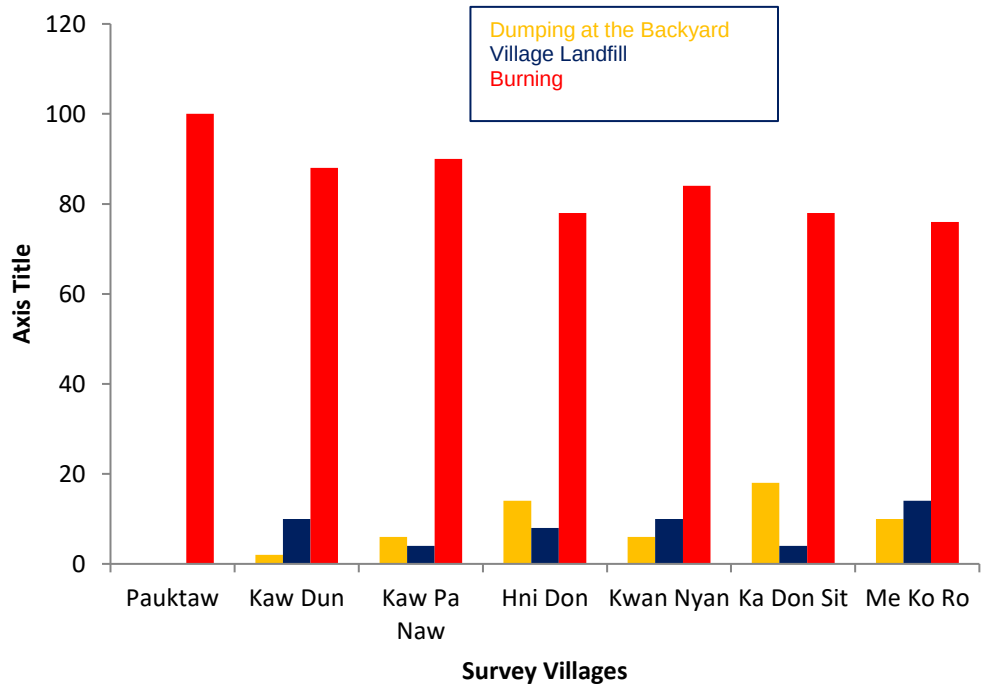


Figure 6.2-12: Management of Solid Waste from Household (%)

About 57 percent of respondent suffered from kind of diseases such as common cold and flu, hypertension and heart failure and so on. However, common cold and flu are the most common. The second highest amount of health problem is related to hypertension and heart diseases. Some respondents suffered from medical problems of digestive systems, eyes and ears.

When they suffered from disease, most of the respondents take herbal medicines. Some respondents went to the clinics and checked by the doctors and some bought medicines from nearby the stores who selling some home-use drugs. There are no adequate medical treatment centers for respondents at the rural area as usual as in developing countries like Myanmar. Problems related to health conditions of the survey area are;

1) Insufficiency of health assistants and nurses (58%),
2) High expenses for healthcare (93%),
3) Insufficiency of specialists (100%), and
4) Less access to public healthcare centers because of distant location and inadequate transportation (82%).

Higher expenses and less accessibility of medical centers are more important problems for respondents in the survey area.

Local people are usually willing to get for the supports in solving these health-related issues. Adequate support of the project in education and health sectors of affected area could create high participation of local people to implementation and planning processes of the project.

Figure 6.2-13: Key Informant Interview with Health Assistant of Kyaikmayaw Township

Note: Myanmar is one of the low-income countries. The Health Assistant is a medical provider who is trained to serve the primary care for needs of the rural healthcare centers. As close to 70% of the population live in rural areas, this workforce has been proven as a vital part of the health workforce; increasing access to care with a focus on Primary Care at the community level. They are not allowed to practice in private clinics.

6.3 The Outcomes from Interview and Questionnaire Survey

In the survey, about 300 sample respondents selected from 7 Villages such as Pauktaw, Kaw Don, Kaw Pa Naw, Hni Don, Kwan Nyan, Ka Don Sit and Me Ko Ro villages within the project area were interviewed. All these are project affected people (PAPs), but they are not necessary to be relocated under the project. To understand their existing situations, attitudes and impacts from the project development, the interviews were undertaken with the help of the structured questionnaires which cover the contents of basic information of interviewees, their socio-economic conditions, education and current environmental problems, facilities and social problems, perceptions of the project, attitudes towards the project, and attitudes towards draft mitigation measures regarding the impact caused by the project development.

6.3.1 Basic Information

Field surveys and semi- structured interviews were done in four sample groups within the project area. Most of the respondents are males (54 percent of total respondents) and remaining are females (46 percent of the respondents). Most of the respondents belong to Mon ethnic group and they are Buddhists. Figure 6.4-1 is shown for the gender distribution within the survey area.

According to the outcomes, the surveyors made the equal distribution of gender when collecting the socioeconomic information from the respondents during the survey period.

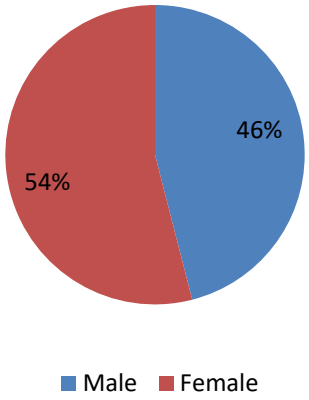


Figure 6.3-1: Gender of Respondents

Respondents on semi- structured interviews mainly represented age group between 20 years old and over 60 years old. Respondents generally covered the working group of population in the project area although some respondents from Hni Don and Me Ko Ro are under 20 years of age.

Opinions and suggestions represented adult group of population within the project are because most of the respondents are in the age group between 20 years old and 60 years old. Most of the respondents are found in the age group of 41 to 60 years who have significant knowledge about their region.

6.3.2 Family Size

Family size of respondents can be grouped into three classes as;

1) Family with 1 to 3 persons,
2) Family with 4 to 6 persons,
3) more than 6 persons.

Among the respondents, family size with more than 6 persons is observed in all study villages. Most of the families have 4 persons and above. Only a few families have 1 to 3 persons of family members. Therefore, this outcome was to determine big family size are obvious within the survey area if there will have the needs for relocation or resettlement because of the project activities. Table 6.3-1 and Figure 6.3-2 represented the family size among the survey villages.

Fortunately, there will be no need to relocate or resettlement by any project activity of MCL limestone quarry.

Table 6.3-1: Family Size of Respondents (%)

Family Size	Pauktaw	KawDon	KawPaNaw	HniDon	KwanNyan	KaDonSit	MeKoRo
1 to 3 persons	15	12	16	16	36	18	13
4 to 6 persons	45	48	58	44	44	50	60
More than 6 persons	40	40	26	40	20	32	27

Source: REM Field Survey (February 2013)

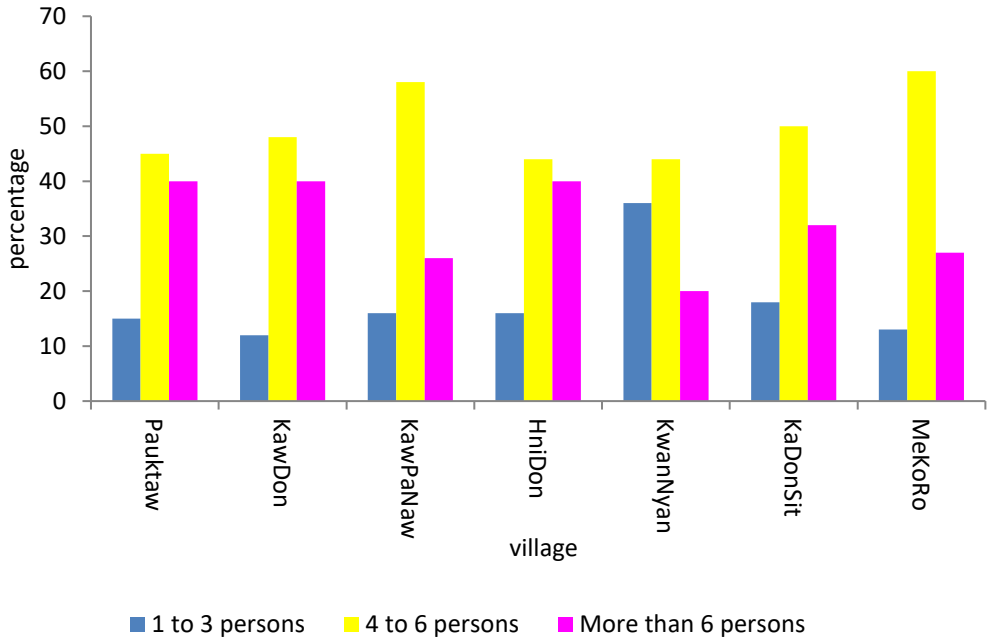


Figure 6.3-2: Family Sizes of Respondents (%)

6.3.3 Education Level

The educational status is also observed in the survey area. Many respondents are in primary level and some have no education level. A very few persons entered high school levels and graduated. Generally, the most common educational experience among the respondents is in primary and illiteracy levels according to collected data as shown in Table 6.3-2 and Figure 6.3-3.

Table 6.3-2: Education Level in the Study Villages (%)

Education	Pauktaw	KawDon	KawPaNaw	HniDon	KwanNyan	KaDonSit	MeKoRo
Illiterate	55	24	18	42	24	14	14
Primary	45	42	48	38	40	76	46
Middle	0	16	24	18	18	8	30
High	0	6	8	2	10	2	7
Graduate	0	10	2	2	8	0	3
Post Graduate	0	2	0	0	0	0	0

Source: Field Survey (February 2013)

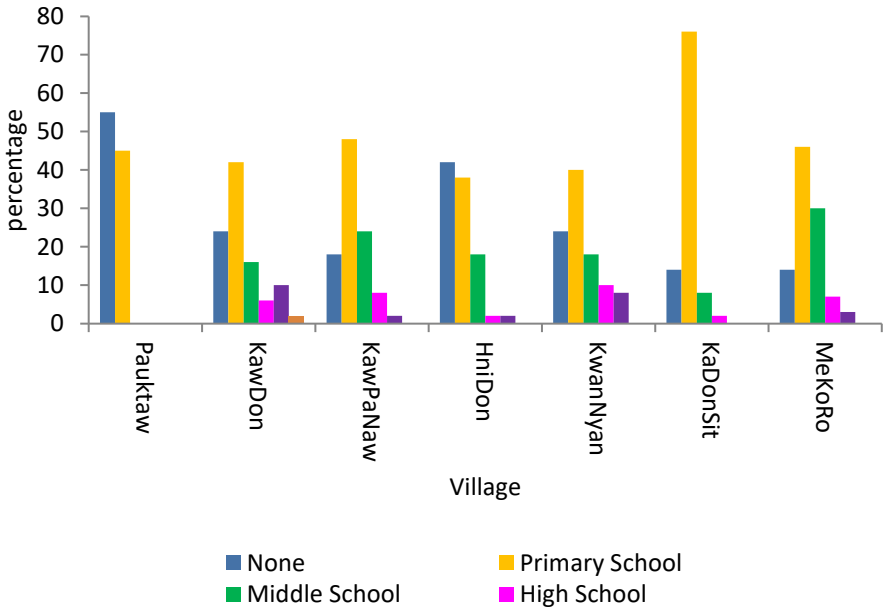


Figure 6.3-3: Education Level in the Study Villages (%)

6.3.4 Peoples' Perception for Environmental Concerns about Facilitie and Social Problems

Current environmental problems being considered by respondents include solid waste disposal, wastewater disposal and dust, noise and odor from the construction activities.

Most of the respondents considered that currently waste disposal is not a problem for their environment. Very few respondents are interested is some impacts of solid waste disposal. For wastewater disposal, most of the respondents did not reveal the impacts of wastewater on their environment. However, some respondents considered impacts of wastewater and solid waste disposal to their surrounding areas although the impact is low. Table 6.3-3 and Figure 6.3-4

and 6.3-5 represented the impact levels of solid waste and wastewater determined by the village community themselves.

Table 6.3-3: Peoples' Perception for Solid Waste and Waste Water Impacts (%)

Village	Solid Waste				Waste water			
	None	Low	Moderate	High	None	Low	Moderate	High
Pauktaw	100	0	0	0	100	0	0	0
Kaw Dun	94	2	2	2	82	14	4	0
Kaw Pa Naw	78	12	8	2	64	12	10	6
Hni Don	96	4	0	0	96	4	0	0
Kwan Nyan	88	6	4	2	90	6	2	2
Ka Don Sit	96	2	2	0	96	2	2	0
Me Ko Ro	90	10	0	0	90	10	0	0

Source: Field Survey (February 2013)

Figure 6.3-4: Solid Waste Impact Levels

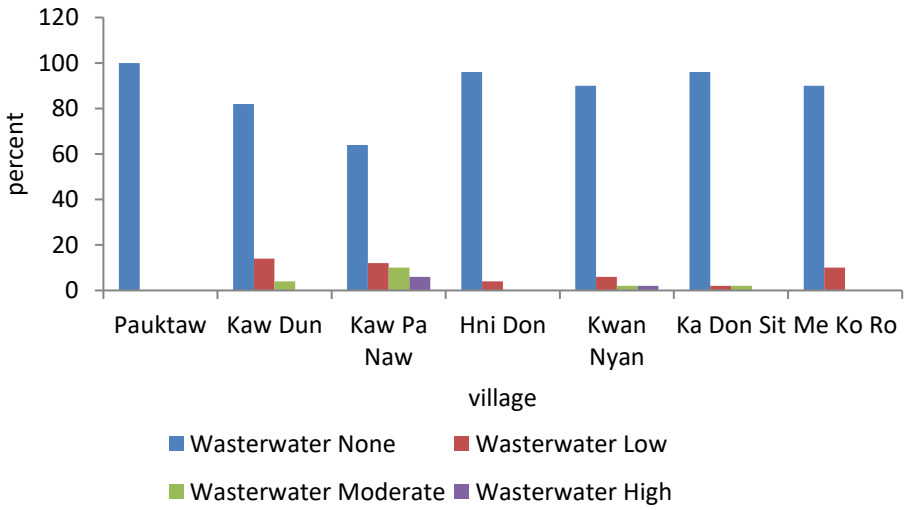


Figure 6.3-5: Wastewater Impact Levels

Most of the respondents mentioned that their region has no significant impacts by dust, noise and odor from construction under the project. However, some respondents from Kaw Dun Village, Kwan Nyan Village and Kaw Pa Naw Village considered the moderate and high impacts of dust, noise and odor from their villages and surrounding environment.

Therefore, it is necessary to reduce these impacts for those villagers who are living around during construction and implementation phases of the project. Table 6.3-4 and Figure 6.3-6, 6.3-7, and 6.3-8 showed the concerning impact level by village communities on the project activities of MCL limestone quarry.

The obvious point in this survey was that some respondents from Kaw Dun Village always complaint about the impacts in low, moderate and high and all the respondents from Pauktaw village revealed that there had no impacts on them. Therefore, these impacts level considerations of the respondents may come from their emotional evaluation about the projects because Pauktaw village is nearer to the project than Kaw Dun village. In addition, the respondents from Kaw Dun village also complain as presence of impacts about self-disposal systems of solid waste and wastewater impacts, so it can be said that they might be more sensitive to project impacts than the other villages.

On the other hand, it can be considered that Pauktaw village might used to those impacts as usual and other villages feels strange of those impacts because they would never get those sufferings. Nevertheless, MCL shall take into consider for monitoring of the impacts of dust, noise and odour at Kaw Dun village whether those impacts were over the standard limits or not. If exceed than the standards, MCL shall take measures to prevent it.

Table 6.3-4: Peoples' Perception for Dust, Noise and Odour Impact Level (%)

Survey Village	Dust from Construction				Noise from Construction				Bad Odor from Waste			
	None	Low	Moderate	High	None	Low	Moderate	High	None	Low	Moderate	High
Pauktaw	100	0	0	0	100	0	0	0	100	0	0	0
Kaw Dun	52	14	12	22	94	2	2	2	96	2	2	0
Kaw Pa Naw	74	12	10	4	78	10	10	2	68	2	20	0
Hni Don	80	20	0	0	94	6	0	0	94	6	0	0
Kwan Nyan	86	8	4	2	92	4	2	2	92	4	2	2
Ka Don Sit	98	2	0	0	98	2	0	0	98	2	0	0
Me Ke Ro	87	10	3	0	93	7	0	0	98	2	0	0

Source: REM Field Survey (February 2013)

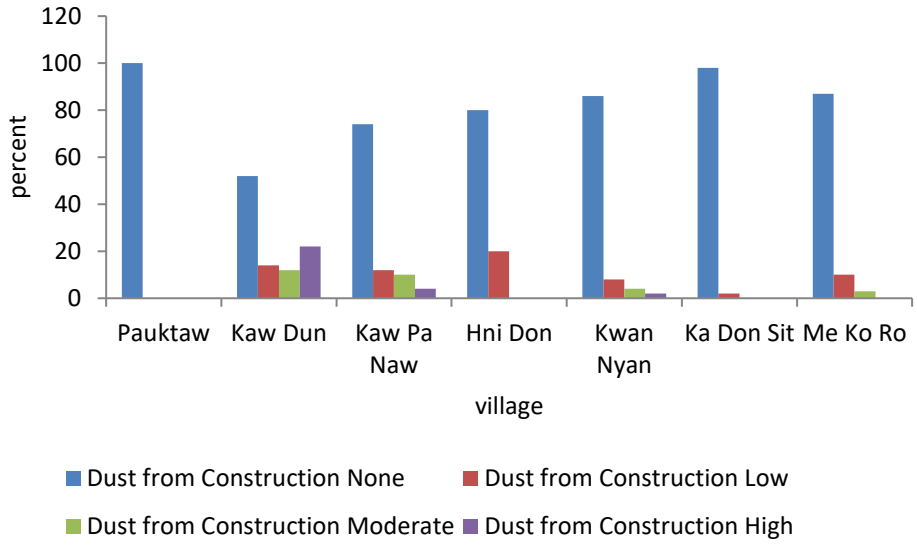


Figure 6.3-6: Peoples' Perception for Dust from Construction

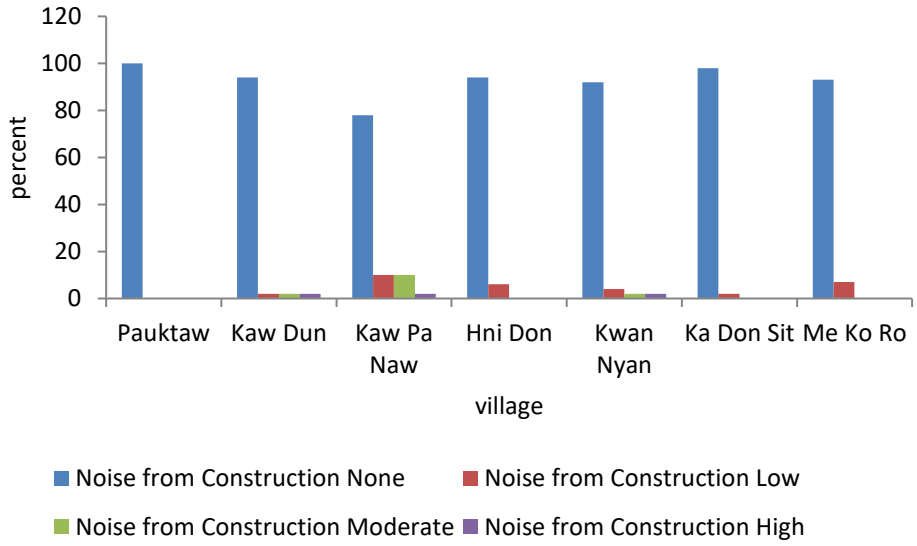


Figure 6.3-7: Peoples' Perception for Noise Expected from Construction

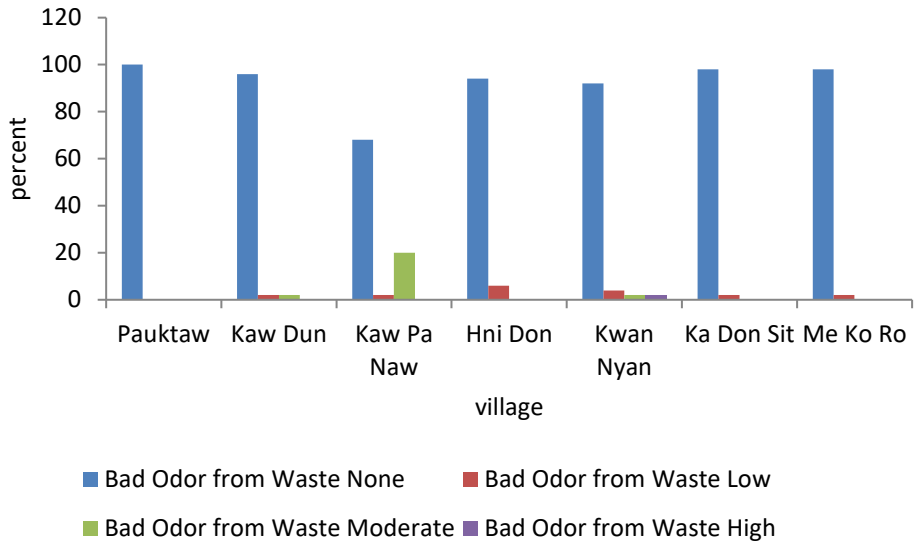


Figure 6.3-8: Peoples' Perception for Bad Odor from Solid Waste

Although dust, noise and odor are not big problems for their villages, all respondents want to inform to the government authorities about the potential impacts of dust, noise and odor on their environment.

6.3.5 Access of Project Information

It is also important to survey whether the people in the project area know about the project or not. If they know about the project they can prepare for the impacts of the project. The survey results showed that most of the respondents have already known about the project. But some families did not know about the project. Table 6.3-5 and Figure 6.3-9 were presented for accessing the project information by the surrounding communities.

Table 6.3-5: Access of Project Information by the Communities (%)

Village	Sample Size	No Access	%	Access	%
Pauktaw	20	6	30	14	70
Kaw Dun	50	9	18	41	82
Kaw Pa Naw	50	7	14	43	86
Hni Don	50	12	24	38	76
Kwan Nyan	50	14	28	36	72
Ka Don Sit	50	11	22	39	78
Me Ko Ro	30	7	23	23	77

Source: REM Field Survey (February 2013)

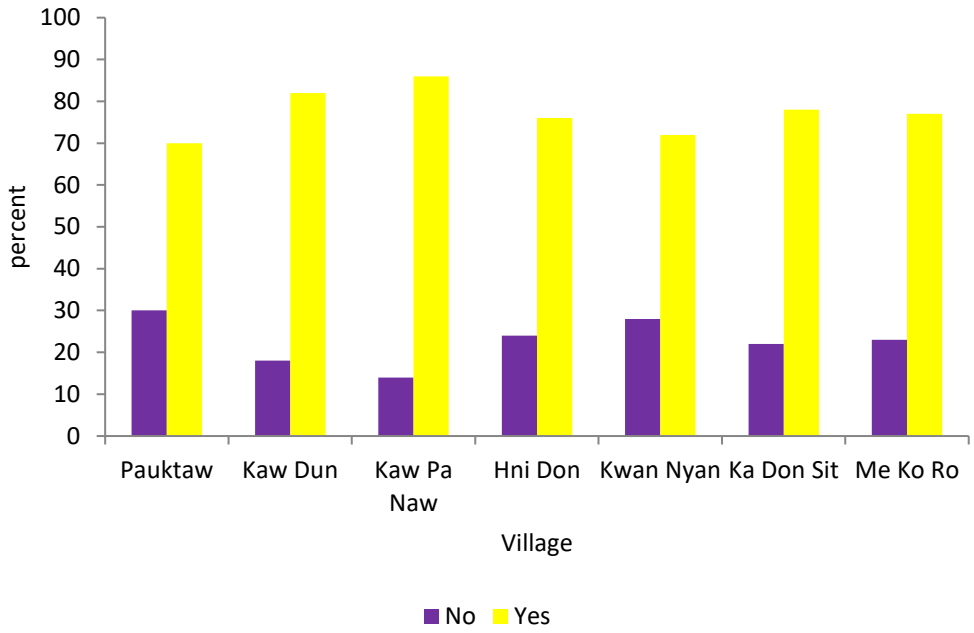


Figure 6.3-9: Receiving Information about the Project (%)

According to this survey outcome, 14-30 % of respondents from 7 villages did not receive information about the project and 70-86 % of the respondents got adequate information of the project.

High percentages of respondents from Pauk Taw (30%) and Kwan Nyan (28%) did not know about the project in prior to construction phase. Therefore, the project developer shall manage to inform about the project and project activities to the local villagers to avoid misunderstanding and to consider the mitigation control measures on their concerns.

The survey also stressed on the sources of information about the project from which the respondents would like to receive. There are 3 main sources of information about the project received by the respondents. These are;

1) Information from authority,
2) Information from neighbours, and
3) Information from public media.

The result of the survey showed that information about the project is rarely came from authority and public media.

Transparency between project developer and local people is one of the important factors for planning and implementation of the project. If the local people received the information from their neighbors, it will be very subjective. Therefore, it is necessary to give information about the project to the people who are living around the project area for fully cooperation and participation to mitigate the project impacts.

6.3.6 Community's Suggestions from Stakeholder Engagement Meetings

Most of the audience suggested: -

1) to provide a good salary for workers in the project for reducing to go and work in Thailand where the salary is higher,
2) to support full of information on how to apply for the job in the plant,
3) to consider about the fishing boats if Ataran River is used for water transportation,
4) to maintain Ataran River water during dry season,
5) to conserve the mountain,
6) to acquire the public opinion,
7) to promote availability of access roads and electricity,
8) to compensate with the current price,
9) to support school facilities and requirement of teachers,
10) to provide wells for drinking water,
11) to reduce dusts generated from factory,
12) to encourage regional development, and
13) to construct clinic and medical centers.

The villagers considered that the project is acceptable for the rural and regional development and the respondents hoped that the project will support the economy of the country.

There are some basic requirements of rural and regional development, suggested by the community as follows;

1) To repair the access roads
2) To support the free of charge health services
3) To create employment opportunities
4) To construct new school buildings

Chapter 7
Environmental and Social Impacts Assessments and Mitigation Measures

7.1 Introduction

The scientific and technical reliability of an Environmental Impact Assessment study depends on the skills of the EIA practitioners/reviewers, who estimate and review the nature and magnitude of the environmental change that the proposed project may entail. Impact prediction and evaluation is a vital exercise for assessing impacts, deciding alternatives, setting down mitigation measures and developing an environmental management plan. Predicting the magnitude of impacts and evaluating their significance is the core exercise of impact assessment. This process is also known as impact analysis and can be broadly broken down into three overlapping phases;

- Identification: To specify the impacts associated with each phase of the project and the activities undertaken
- Prediction: To forecast the nature, magnitude, extent and duration of the main impacts; and
- Evaluation: To determine the significance of residual impacts after taking into account how mitigation will reduce a predicted impact.

In assessing environmental impacts and their significance, some key concerns have to be kept in mind:

- Identity who or what is affected
- Description of how they are affected
- Evaluation against a set of consistent assessment criteria

7.1.1 Impact Identification

There are various tools that can be used for impact identification, such as questionnaires, checklists, network method, comparison with other similar projects, matrix and ad-hoc methods and field surveys and analysis.

In this ESIA report, we used the impact identification methods of questionnaires and comparison with other similar projects to complete the actions for social concern on the project activities and impact assessments.

The summary of potential impacts on environmental, socio- economic, demographic and cultural context will be present in this section. While identifying the above key features, the section also discusses the type and range of impacts likely to result from the different project activities, measuring its extent and severity.

The specific purpose of this section is to;

- Identify and assess the range of potential impacts and extent of their severity;
- Explain the ways in which the project might affect environment, ecology, socio-economic resources, demographics, livelihoods, cultural patterns, as well as access and infrastructure issues;
- Suggest viable mitigation measures for the identified impacts;
- Develop a management plan based on the proposed mitigation measures.

These impacts have been identified through field surveys, onsite measuring, and enquire with the village community.

- Discussions with project proponents, district officials, and village representatives were undertaken along the study area.
- A mix of quantitative and qualitative methods i.e. sampling, questionnaires, interviews, oral histories, have been used to derive these impacts.
- Potential impacts have also been predicted based on experience of working in past similar assignments.

The assessment process is based on available information, including the project description (as provided by Client), and social and environmental baseline data. The assessment considers all relevant social and environmental impact/risks, including issues identified in IFC Performance Standards 2 through 8, and those who will be affected by such risks and impacts.

The main cement activities are operate in the area of 1400 Acres, with fully operated dry cement production factory (5000 t/d), limestone quarry at Pya Taung, a captive coal power plant for energy support and the canal and jetty for transportation of raw materials and cement products.

In summary, the project activities include:

(i) Feasibility Study

- consultation with Myanmar government officials
- assessing the environmental and social feasibility through conduction of field investigations and stakeholder engagement

(ii) Pre-Construction Phase

- Review of all available existing information
- Gap analysis
- Assessment of project alternatives
- Technical and Consultant Team Site Visit and Survey
- Stakeholder consultation and dissemination for the scoping stage
- Identification of Impact Zones
- Describing the project phases
- Baseline survey design refinement and detailed planning

(iii) Construction Phase/Decommissioning Phase

- Clearance of plants
- Earthworks for the installation of the main buildings for machines and equipment and production processes
- Construction of towers, belt conveyer, cement plant facilities, coal power plants and raw storage facilities, and canal & jetty
- Construction of worker camp

(iv) Operation Phase

- Mitigation and management stage planning task allocation and detailed planning for all generation of solid wastes, water discharges and air emissions throughout the whole production process
- Installation of specific machines and equipment to mitigate all waste generation
- Consultation of community and stakeholders for appropriate impact mitigation measures
- To implement CSR activities for affected community and surrounding area

Based on the project descriptions and consultation result, REM have been listed the possible impacts by the project activities presented as follows.

In the following sections, the potential environmental and socio-economic impacts associated to the Project activities are assess and the relevant mitigation measures are describe.

The environmental impacts were assess with respect to the following main biophysical components:

- air
- noise
- water
- land
- waste
- biodiversity

7.1.2 Impact Prediction

In general, significant level of impacts is predict in connection with impact duration, magnitude, extent, possibility, and sensibility of the receptors. Significant categories are classify as negligible, minor, major and critical. Wherever possible, the degree of significance is determined by comparing the predicted outcome with performance standard or industrial guideline. In many instances, professional judgment has prevailed in assessing the potential of individual impact.

This section presents a summary of the environmental impacts from the activities related to construction and operation of the cement plant and its associated facilities. The impacts are based on the project description provided by the client, existing available data and similar past projects and consultant field surveys.

7.1.3 Impact Evaluation

Impacts assessed as negligible and minor, usually does not require any additional mitigation measure. This means those identified impacts are within acceptable level because they are very unlikely to happen and/or their sensitivity of receiving environment is very low and /or project designs have installed enough control mechanisms. In any case, implementing additional control measures will help remain the impacts as acceptable in the failure of inherent control measures.

Impacts evaluated as moderate or major, deemed as significant impacts, require additional mitigation measures to reduce the impacts at acceptable levels. These impacts can be minimized in order to reach negligible or minor levels that are also deemed as acceptable level of impacts (using effective control measures).

Impact assessed as critical cannot be reduced by implementing mitigation measures. In this case, further option has to be considered in order to avoid any critical significance driven by project. That is known as analysis of alternative strategy.

Based on the above, a preliminary identification of the potential impacts and the related affected components, associated to the planned Project activities, during both the construction and operation phases.

The severity, spatial scope and duration of the environmental impact together comprise the consequence of the environmental impact and when summed can obtain a maximum value of 15, as shown in Table 7.1-1 below. The frequency of the activity and the frequency of the environmental impact together comprise the likelihood of the environmental impact occurring and can obtain a maximum value of 10, as shown in Tables.

Table 7.1-1: Consequence and Likelihoods of Environmental Impacts

Severity of Environmental Impacts	Rating	
Insignificant / Non-harmful	1	CONSEQUENCE
Small / Potentially Harmful	2	
Significant/ Slightly Harmful	3	
Great / Harmful	4	
Disastrous/Extremely Harmful	5	
Spatial scope of Environmental Impact	**Rating**	
Activity Site	1	
Plant Boundary	2	
Local area (within 5 km of the plant boundary)	3	
Regional	4	
National	5	
Duration of Environmental Impact	**Rating**	
Construction (up to 2 years)	1	
Construction (2- 5 years)	2	
Construction (6- 10 years)	3	
Life of Plant Operation	4	
Permanent (exists after closure)	5	
Frequency of activity/Duration of Aspect	**Rating**	LIKELIHOOD
Annually or less (but > 6 months) / Low	1	
Biannual / Temporary	2	
Monthly / Infrequent	3	
Weekly / Life of Plant / Regularly / Likely	4	
Daily / Permanent / High	5	
Frequency of Environmental Impact	**Rating**	
Almost never / Almost Impossible	1	
Very seldom / Highly Unlikely	2	
Infrequent / Unlikely	3	
Often / Regularly / Likely	4	
Daily / Permanent / Highly Likely	5	

The significance of the environmental impact arithmetic product of the ratings for likelihood and consequence of the environmental impact shown in Table 7.1-2 and Table 7.1-3 are used for determine the significance of the environmental impact.

Measures such as demolishing infrastructure, and re-instatement and rehabilitation of land, are consider post-mitigation. The model outcome of the environmental impacts is then assess in terms of impact certainty and consideration of available information.

Table 7.1-2(a): Consequence and Likelihood Ratings

	CONSEQUENCE														
LIKELIHOOD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30
	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45
	4	8	12	16	20	24	28	32	36	40	44	48	42	56	60
	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75
	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90
	7	14	21	28	35	42	49	56	63	70	77	84	91	98	105
	8	16	24	32	40	48	56	64	72	80	88	96	104	112	120
	9	18	27	36	45	54	63	72	81	90	99	108	117	126	135
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150

Table 7.1-2(b): Consequence and Likelihood Ratings

Significance Rating	Value
Very High	126 - 150
High	101 - 125
Medium – High	76 - 100
Low – Medium	51 - 75
Low	26 – 50
Very Low	1- 25

7.2 Prediction of Potential Impact and Mitigation measure during Construction

During the construction phase, emissions of air pollutants, especially Particulate Matters (as the form of Dust), NOx and SO_2, at the cement plant site are mainly associated to transportation (i.e. vehicle movement), earth works, foundation works, dismantling, construction and site clearance activities. These activities are expect to occur over a period of about 24 months.

7.2.1 Air Emission Dust, Sox, NOx, GHG emission

7.2.1.1 Impact sources/Activities

The construction activities at the cement plant include the following main steps:

- preparation works and excavation;
- concrete works;
- structure installation and assembling; and
- commissioning.

Construction phase activities will generate the following main types of air emissions:

- combustion and exhaust emissions generated from the construction equipment, generators and vehicles; and
- fugitive dust generated by earthworks including excavation, backfilling, grading, equipment movement, material piling, loading and unloading, and demolition of decommissioned buildings.

The following Table summarizes types and number of equipment involved in the key construction activities along with the relevant typical power consumptions in kW. It is assume that the equipment should operate simultaneously during each main step.

The pollutant emissions from yard equipment (land vehicles, machinery, etc.) generated during the construction steps identified above were quantified using specific emission factors taken from literature.

Table 7.2-1: Type, Power and Number of Equipment Used at the Cement Plant during Construction Phase

Typology	Power (kW)	Excavation	Concrete Works	Structure Installation & Assembling	Commissioning	Steel Structure Fabrication
Forklift (3t)	37	1	1	1		
Forklift (5t)	83		1	1	1	
Forklift (10t)	110		1	1		
Forklift (8t)	83		1	1	1	
Truck crane (25t) QY25	206		2	2		
Truck crane (50t) NK50	247		1	1	1	
Truck crane STC5	230		1	1		
Crane (50t)	230		1	1		
Crane (25t)	206		2	2		
Crawler crane (150t)	242		1	1		
Crane (25t)	206		1	1		
Travelling crane MH10T	198					2
Travelling crane MH5T	96					1
Steel plant shearer	8					1
Concrete mixer truck	202		6			
Concrete mixing station	320		2			
Plate rolling machine	30					1
Gantry crane (10t)	19.2					1
Gantry crane (20t)	23.5					1
Shot blasting machine	300					1
Tower crane	56		1	1		
Tower crane QTZ63	95		5	3		
Backhoe excavator	95.5	3				
Mini-excavator	40.9	1				
Wheeled loader	154	4	4		1	

Table 7.2-1: Type, Power and Number of Equipment Used at the Cement Plant during Construction Phase (Continue)

Typology	Power (kW)	Excavation	Concrete Works	Structure Installation & Assembling	Commissioning	Steel Structure Fabrication
Dump truck	220	9	5			
Concrete pump truck	300		2			
Concrete dragging pump	55		2			
60t crane SCC600E	-			1		
Flat truck	-			1		
Flat truck	-			1		
Earthmover	-		2			
Rotary drilling machine	-		2			

The emissions into air caused by construction-site equipment were assessed starting out from standard emission factors reported in literature. These factors recommend the specific emissions of the single pollutants (NO_x, SO_x, and Particulate Matter) for each item of equipment on the basis of its typology. The estimate of the emissions produced by the whole equipment was calculated by multiplying the emission factor by the number of items of that type of equipment and by repeating this calculation for each type of equipment used on site during the construction phase.

The vehicles expected to be used during the construction phase and the emission factors, derived from the Air Quality Dispersion Modelling (AQDM) study for diesel engines, are showed in the following Tables, for preparation works and excavation, concrete works, structure installation and assembling and commissioning respectively. For each type of vehicle, a typical output power in kW was indicated, to which reference was made for assessing the emission factor.

Table 7.2-2: Cement Plant Construction Equipment, Emission Factors AQDM Preparation Works and Excavation

Typology	Power (kW)	No. of equipment	NO_x [kg/h]	SO_x [kg/h]	Particulate Matter [kg/h]
Backhoe excavator	95.5	3	1.0068	0.0017	0.0514
mini-excavator	40.9	1	0.1022	0.0001	0.0076
Wheeled loader	154	4	1.6394	0.0035	0.0532
Dump truck	220	9	5.7749	0.0109	0.2059

Table 7.2-3: Cement Plant Construction Equipment, Emission Factors AQDM Concrete Works

Typology	Power (kW)	No. of equipment	NO_x [kg/h]	SO_x [kg/h]	Particulate Matter [kg/h]
Forklift	37	1	0.0600	0.0001	0.0042
Forklift (5t)	83	1	0.1054	0.0002	0.0079
Forklift	110	1	0.1559	0.0003	0.0085
Forklift	83	1	0.1054	0.0002	0.0079
Truck crane (25t)	206	2	0.7505	0.0011	0.0259
Truck crane (50t)	247	1	0.5351	0.0008	0.0193
Truck crane	230	1	0.5351	0.0008	0.0193
Crane	230	1	0.5351	0.0008	0.0193
Crane	206	2	1.0702	0.0016	0.0386
Crawler crane	242	1	0.5351	0.0008	0.0193
Crane	206	1	0.5351	0.0008	0.0193
Concrete mixer truck	202	6	3.8499	0.0073	0.1372
Wheeled loader	154	4	1.6394	0.0035	0.0532
Dump truck	220	9	5.7749	0.0109	0.2059
Concrete pump truck	300	2	1.2833	0.0024	0.0457
Earthmover	160	2	0.8095	0.0016	0.0269
Rotary drilling machine	300	2	0.6969	0.0028	0.0213

Table 7.2-4: Cement Plant Construction Equipment, Emission Factors AQMD Structure Installation and Assembling

Typology	Power (kW)	No. of equipment	NO_x [kg/h]	SO_x [kg/h]	Particulate Matter [kg/h]
Forklift	37	1	0.0600	0.0001	0.0042
Forklift (5t)	83	1	0.1054	0.0002	0.0079
Forklift	110	1	0.1559	0.0003	0.0085
Forklift	83	1	0.1054	0.0002	0.0079
Truck crane (25t)	206	2	0.7505	0.0011	0.0259
Truck crane (50t)	247	1	0.5351	0.0008	0.0193
Truck crane	230	1	0.5351	0.0008	0.0193
Crane	230	1	0.5351	0.0008	0.0193
Crane	206	2	1.0702	0.0016	0.0386
Crawler crane	242	1	0.5351	0.0008	0.0193
Crane	206	1	0.5351	0.0008	0,0193
60t crane	132	1	0.3028	0.0004	0.0171
Flat truck	300	1	0.6417	0.0012	0.0229
Flat truck	120	1	0.3894	0.0006	0.0216

The maximum level of air pollutants emission during the construction phase is expected during a medium advancement stage of the works when the aboveground concrete works at the areas will overlap to the earthworks. This period of construction, which will entail different concurrent activities on site and involve a higher number of different heavy equipment for construction and earth moving, was therefore considered to estimate the maximum expected emission of air pollutants rate from the construction site and related air concentrations at increasing distances from the site.

7.2.1.2 Estimate and evaluate impact

Overall construction activities for the conveyor belt, including levelling works, foundation works, bearing steel and concrete structures and finishing works, are expect to occur over a period of 12 months. As already discussed for the construction phase of the cement plant, this phase will generate mainly two types of air pollutants:

- combustion emissions generated from the construction equipment and vehicles; and
- fugitive dust generated by earthworks including excavation, backfilling, grading and equipment movement.

The air pollutants such as NO_2, SO_2, CO, and dust will emit from construction machineries and vehicles used. The air pollutants discharged by construction machineries and vehicles shall be controlled and minimized by construction prevention and control measures. Impact of air pollution is expected to be limited and low because the dust and the emission gases generated during the construction work for conveyor belt will affect only the surrounding area around the conveyor belt, the impacts are reversible with limited duration (estimated in 12 months).

Therefore, it is judged the air pollution in construction work of conveyor belt will be well controlled and managed and will not cause any significant environmental impact in the surrounding area. The main air pollutants will include:

- Dust (TSP) generation form high Traffic volumes
- contribution to pollutant concentrations arising from the construction and operation activities such as SOx, NOx and PM (Dust).

As shown, the most critical phases occur while earth moving, and concrete works are carried out and in particular while preparing the areas and during construction of foundations.

In any case, it should be noted that these emissions are concentrated in a limited period of time and occur inside the boundaries of the cement plant. The repercussions are entirely acceptable and will only affect the plant area. The associated impacts are therefore expected to be low and, in any case, reversible.

Overall, during construction phase there will be impacts on air quality due to construction site equipment. However, the adoption of the proposed mitigation measures will allow reducing the impacts to an acceptable level, especially as they are limited to the construction phase.

(i) Dust and Particulate Matter Emissions from Raw Materials Preparation and Construction Activities

Dust lifting can be generated because of soil disturbance during earthworks excavation, filling and grading of the site area. Total dust emissions due to earth moving result from several distinct source activities:

- loading of aggregate onto storage piles (batch or continuous drop operations);
- wind erosion of pile surfaces and ground areas around piles; and
- load - out of aggregate for shipment or for return to the process stream (batch or continuous drop operations).

Estimation of the quantity of dust generated is closely related to the type of equipment used, and the duration and nature of the civil works. USEPA reports the typical emissions factors for various construction activities which are presented in the following table. These are illustrated for indicative purposes.

Table 7.2-5: Uncontrolled Particulate Emission Factors for Open Dust Sources (USEPA, AP-42)

Sources	TSP Emission Factors	Unit
Topsoil removal by scraper	0.029	kg/mg
Truck loading by power shovel	0.018	kg/mg
Bottom dump truck unloading	0.001	kg/mg
Scrapper unloading	0.02	kg/mg
Wind erosion of exposed areas	0.38	ton/acre/year

During the construction activities, atmospheric dust levels are anticipated by the movement of trucks and vehicles transporting construction material and equipment. The amount of dust generated by the activity is difficult to estimate at this stage because no information on the overall amount of materials to be excavated has been provided; however, the occurrence and significance of the dust generation depend upon meteorological and ground conditions at the

time and location of the civil works activities. In any case, under normal meteorological conditions, dust impacts should be limited to within several hundred meters around the existing cement plant boundary.

The main environmental concern associated with dust generation is then likely to be limited to occupational health risk and irritation to humans (i.e. construction workers and nearby local community). Therefore, it must be noted that the dust production during construction is concentrated within a limited period. The repercussions, which may be assumed to be minor and affecting only the existing cement plant boundary and low density of local community area, will not affect sensitive areas or receptors. The associated impact, of a temporary nature, is therefore considered to be low and, in any case, reversible.

Dusts emissions are among the most significant impacts of cement and lime manufacturing. The main sources of TSP emissions are:

- the intermediate and final materials handling and storage (including crushing and grinding of raw materials);
- handling and storage of solid fuels; and
- transportation of materials (e.g. by trucks or conveyor belts).

Based on the monitoring result, the ground level concentrations (the daily averages) are lower than applicable limits, except some days of some monitoring points and related air impact can be consider as low.

Dust emissions during operation of all units are expect to be < 30mg/Nm^3.
Dust emission limit for cement manufacturing in Myanmar National Environmental Quality (Emission) Guideline is 50mg/Nm^3.

(ii) Emission of Atmospheric Pollutants During Raw Materials Preparation and Construction

As concern traffic, in general, an overall increase in traffic and heavy machinery movement is foreseen during the construction phase with an increase in dust emission levels. Such emissions together with exhaust emissions coming from the equipment used during the construction phase are likely to result in marginal increases in levels of SO_x and NO_x. However, the overall impact on air quality due to these emissions can be considered as low, due to the limited duration of the construction period (around 24 months). Furthermore, some emissions sources and activities, such as earth moving, land clearing and demolition works, are estimated to be short term duration, therefore the related impacts are expected to be low and, in any case, reversible. In the following Table, a summary of the total emission for NO_x, SO_x, Particulate Matter (PM) during each of the identified construction phases is summarized.

Table 7.2-6: Pollutants Discharged into the Air by the Equipment Used during the Construction and Decommission Activities

Construction Phase	Total Number of Equipment	NO_x (kg/h)	SO_x (kg/h)	Particulate Matter (kg/h)
Excavation	16	8.5232	0.0163	0.3181
Concrete Works	32	18.9766	0.0359	0.6800
Structure Installation & Assembling	7	6.2566	0.0097	0.2512
Commissioning	6	2.3852	0.0046	0.0883

7.2.1.3 Mitigation Measures

Withstanding the potential of atmospheric emissions from construction and related activities the environmental impact of the project is high; the following mitigation measures will further reduce the impact of emissions, leading to insignificant impacts:

- Sprinkling of water on dust generating areas;
- Restricting the speed limits of vehicles during movement on unpaved roads;
- Covering of vehicles carrying loose soil/construction material.
- Applying preventive maintenance system
- Checking vehicle and equipment inspection daily
- Stopping dust generating activities in high wind
- Applying good site practice and house keeping
- Turning off the engine while not in use
- Optimizing construction schedule to minimize time that vehicles are in operation
- Covering load-carrying platform properly when carrying earth/sand

With the purpose to reduce the emissions of gaseous pollutants during the construction phase from the equipment used both for the cement plant and for the conveyor belt, the following mitigation measures and good practice have to be taken into account:

- vehicle engines and other machinery will be kept turned on only if necessary, avoiding any unnecessary emission;
- machines and equipment will be periodically checked and maintained to ensure their good working condition;
- all equipment and machines must be maintained and tested for compliance with standards and technical regulations for the protection of the environment and have appropriate certifications;
- activities will be conducted trying to use the minimum required number of means at the same time;
- electric small-scale mechanization and technical tools will be used when available and feasible; and
- repair and maintenance of construction equipment and vehicles will be performed outside of the construction site by at specialized enterprises.

Concerning dust control methods and measures, the following actions are recommended to reduce the generation of dust:

- watering or increase of the moisture level of the open materials storage piles to reduce dust levels (especially during dry season);
- enclosure or covering of inactive piles to reduce wind erosion;
- loads in all trucks transporting dust-generating materials will be sprayed with water to suppress dust, as well as wheels of means moving inside and outside of the construction site;
- speed reduction for the means travelling inside the construction site; and
- stabilization and re-vegetation of cleared areas that are no longer needed as soon as practicable during construction.

Environmental monitoring activities will have to be performed to monitor the air pollution during construction activities in the surroundings of the site and at the residential buildings located close to the site boundaries. The monitoring program to be conducted at the project site will be developed according to the following considerations:

- dust concentration (TSP) would be monitored considering that it represents the main pollutant discharged into the air during construction phase and its relatively high concentrations in rural areas as resulting from the baseline assessment (air emission in the area are mostly generated by mobile sources – vehicles traffic on unpaved road);
- monitoring points would be in the residential areas surrounding the project site; and
- air monitoring activities would be conducted on a quarterly basis. With reference to the conveyor belt, environmental monitoring activities would have to be performed to monitor the air pollution during construction activities at the residential areas located close to the corridor of conveyor belt.

The overall construction activities of the project have been completed and no serious environmental problem especially on the ambient air quality around the factory was found.

Table 7.2-7: Impact Significance due to Air Emissions during Construction/Decommission Phase

Component	**Significance of Impacts**						
	Potential Impacts	**Residual Impacts**					
	Consequence & Likelihood	**Consequence of Impact**			**Likelihood of Impact**		
	Negative	Severity	Spatial Scope	Duration	Frequency of Activity	Frequency of Impact	Significance of Impact
Emission of Air Pollutants	Low-Medium	Small	Plant Boundary	Construction	Daily	Very seldom	Negative
	54	1	2	2	5	2	Low
		5			7		35

7.2.2 Noise Emission

7.2.2.1 Impact sources/Activities

Potential impacts on noise environment generated by the construction phase of the cement plant and conveyor belt are discuss in the following.

(i) Cement plant

The construction schedule of the cement plant can be divide into four construction stages. Each stage is characterize by different noise emissions:

- Earthwork: the main noise sources are related to the use of equipment and earthwork machinery such as: bulldozers, excavators, loaders, various transport vehicles.
- groundwork: the main noise sources are pile hammers, and excavators. It has been noted that the pile hammers noise is characterized by an impulse noise
- structure installation: the main noise sources during the structure installation stage are concrete mixer, vibrating machine, electric saw, etc., and collision noise impact during the load and unload of materials and;
- equipment installation: the main noise source during the equipment stage is crane elevator.

The planned construction program of the cement plant will only take place during daytime period (i.e. 6:00 am till 6:00 pm). Noise levels from different activities can vary between 50 - 100 dB(A) based on the typical noise levels of machinery specified in the British Standards for Noise and Vibration Control on Construction and Operation sites (BS5228:1997).

(ii) Conveyor Belt

The primary sources of noise generation during construction of the conveyor belt include:

- land clearance, compaction and excavation work;
- construction of above ground reinforced concrete structures including slabs and pile foundations;
- general movement of heavy vehicles such as delivery trucks, dozers, concrete delivery vehicles, cranes, front end loader, excavators, and mechanical dumpers; and
- handheld and table tools such as saws, grinders, etc.

Construction equipment likely to be used is listed in the table below. Selected noise levels at 15 m for the noisiest of these types of equipment are shown below the values quoted are from the RCNM (Roadway Construction Noise Model) database.

An enclosed conveyor belt, approximately 3310-meter length, has been built for transporting crushed limestone from the limestone quarry to the cement plant. No detailed information was made available at the time of the preparation of this ESIA.However, it will be reportedly designed to pass through from the resident houses and will operate in daytime only. Also, the

conveyor belt operation, comparing with road transport, is expected to produce lower noise and vibration emissions.

7.2.2.2 Impact Estimation and Evaluation

Noise impact was evaluated considering the equipment that could operate simultaneously during the construction site. In the following table the equipment and the related sound power levels Lw (dBA) are reported.

Table 7.2-8: Cement Plant Construction – Noise Emission Sources

Machinery	L_w (dBA)	NEQG (Industrial)	NEQG (Residential)	
			Day Time	Night Time
Backhoe Excavator	106	70	55	45
Truck crane	91	70	55	45
Truck	91	70	55	45
Wheeled Loader	91	70	55	45
Forklift	91	70	55	45
Steel Plant Shearer	106	70	55	45
Plate Rolling machine	101	70	55	45
Concrete mixing truck	97	70	55	45
Short Blasting Machine	111	70	55	45
Concrete Truck Pump	91	70	55	45
Concrete dragging pump	106	70	55	45
Rotary Drilling Machine	101	70	55	45
Earthmover	91	70	55	45

Table 7.2-9: Selected Construction Equipment Noise Levels (RCNM Database)

No.	Construction Equipment	L_{max} Db(A)	NEQG (Industrial)	NEQG (Residential)	
				Day Time	Night Time
1	Compactor (ground)	83.2	70	55	45
2	Compressor (air)	77.7	70	55	45
3	Concrete Mixer Truck	78.8	70	55	45
4	Concrete Pump Truck	81.4	70	55	45
5	Bulldozer	81.7	70	55	45
6	Dump Truck	76.5	70	55	45
7	Excavator	80.7	70	55	45
8	Front End Loader	79.1	70	55	45
9	Generator	80.6	70	55	45
10	Crane	80.6	70	55	45

RCNM = Roadway Construction Noise Model

The use of heavy equipment during site clearance and construction works will inevitably generate noise, which may create a temporary nuisance for people in the vicinity. Such negative impact can be considered as negligible, due to its duration that will be short-term and intermittent and there are only scattered houses near the conveyor belt.

7.2.2.3 Impact Mitigation Measures

The mitigation measures foreseen to minimize and reduce the impacts related to the noise emissions during the construction phase of the cement plant are:

- to select adequate equipment (fit with noise mufflers);
- to minimize machinery and equipment unused conditions with engines in action;
- to maintain machinery and equipment in good conditions;
- to maintain an active community consultation and positive relations with residents that will assist in alleviating concerns that might arise and resolve any potential noise complaints;
- to post warning signs within the vicinity of the impact and all personnel shall be provided with personal protective equipment. For example, workers operating equipment that generates noise should be equipped with the appropriate noise protection gear; and
- to restrict the construction activities that will generate disturbing sounds to normal working hours.

The above-mentioned mitigation measures should be considered typical for site activities as the ones under examination. It should also be noted that in EU countries temporary activities are normally regulated under derogation normative, setting noise limits on a case-by-case (normally around 70 dBA for day-time and 60 dBA for night-time and excluding the application of a maximum increase in background levels). It is pointed out that the monitoring

campaign noise contribution of the site can be considered as peak condition which can occur in limited period within the site construction period.

In conclusion, for the afore mentioned reasons the noise impact generated by the construction activities to the surrounding environment at the identified receptors is to be considered low, reversible and on a local scale.

In any case, the construction phase is characterized by intermittent noise emissions and they generally not expected to be continuously operational during the entire construction period. Overall, the nature of construction noise impacts is characterized by temporary short- term reversible impacts as they cease to exist once the construction activities will be completed.

Table 7.2-10: Impact Significance due to Noise Emissions during Construction/Decommission Phase

Component	Significance of Impacts							
	Potential Impacts	Residual Impacts						
	Consequence & Likelihood	Consequence of Impact			Likelihood of Impact			
	Negative	Severity	Spatial Scope	Duration	Frequency of Activity	Frequency of Impact	Significance of Impact	
Noise Impacts	Low-Medium	Insignificant	Activity Site	Construction	Temporary	Very seldom	Negative	
	54	1	1	2	2	2	Very Low	
		4			4		16	

7.2.3 Vibration

7.2.3.1 Impact sources/Activities

The vibration effects caused by the construction activities will be mainly from the piling activities and operation of heavy machineries.

7.2.3.2 Impact Estimation and Evaluation

The vibration determination was conducted in 28-30th January 2017 at the monastery of Pauktaw village, Kawpanaw village, Kwan Nyan village and Kadonsit village and MCL mining office. According to US Bureau of Mines (USBM), 1971 described in the following table, the maximum permitted peak particle velocity is described on the respective distances form mining activities.

Table 7.2-11: Maximum Permitted Peak Particle Velocities

Distance from Blasting Site (ft.)	Maximum allowed Peak Particle Velocity (inch/sec)	Maximum allowed Peak Particle Velocity (mm/sec)
0 to 300	1.25	31.75
301 to 5000	1.00	25.4
5001 and beyond	0.75	19.05

Source: USBM (1971)

In addition, the Germany DIN 4150-3 of 5.0 mm./sec (0.2 inches/sec) which is used as vibration standards in Dwellings and buildings of similar design and/or occupancy.

However, the MCL vibration results showed the same result 0.0025 mm/sec for all detected positions, which are still under the international guideline value (5.0 mm/sec). Detail results of vibration measurements will be annexed in this report.

7.2.3.3 Impact Mitigation Measures

Since, according to the determination in the vicinity of the project area during the construction period, the vibration effects is significantly lower than permitted limit (mentioned in above table) and construction activities are operating with limited period, it is assumed that no special mitigation measures are needed to carry out.

Table 7.2-12: Impact Significance due to Vibration during Construction/Decommission Phase

Component	Significance of Impacts						
	Potential Impacts	Residual Impacts					
	Consequence & Likelihood	Consequence of Impact			Likelihood of Impact		
	Negative	Severity	Spatial Scope	Duration	Frequency of Activity	Frequency of Impact	Significance of Impact
Vibration Impacts	Low	Insignificant	Activity Site	Construction	Temporary	Very seldom	Negative
	36	1	1	2	2	2	Very Low
		4			4		16

7.2.4 Water Resources and Wastewater Management

7.2.4.1 Impact Sources and Activities

During the Project construction phase, impacts on the local water resources may occur, mainly related to;

- exploitation of local water resources for both human and Project needs; and
- contamination of water resources from construction activities.
- hydrogeological study was conducted to evaluate the groundwater resources of the area, and according to the study Result, the main groundwater aquifer in the project area are:
- an alluvium aquifer; and
- aquifer of Carboniferous age Taungnyo Group.

The groundwater level is characterized by considerable variation due to seasonal excursions. In rainy season (from June to September), the groundwater level reaches 1 m to 1.5 m bgl; instead during the dry season (from September to April) the groundwater level can reach 15 m bgl.

Potential sources of contamination into surface and groundwater quality are likely to include:

- construction and site clearance activities;
- wastewater discharge from residential area, limestone mining and related activities of cement production processes;
- piling operations for foundation; and
- accidental chemical or oil spill from the project operations (e.g: refueling operations).

During the construction period, raw water is supplied from canal that connected to the Ataran River and pumped into raw water pond inside area plant. The maximum water usage during construction will be 2,500 m^3/d. The volume of water usage depends on stage of construction. There will be no direct effluent discharge from either the construction site, and therefore no possibility of waste from either location being transported to the river environment. Control features are needed at the plant site during construction to ensure that in major rainfall events, sediments are not transported to the river environment.

Wastewater from process and utilities will not directly discharge into the environment.

Wastewater coming from cement plant shall be controlled by installation of treatment system such as use of closed system, grease and oil trap, aeration pond, sediment pond, septic tank.

During the construction phase, the water consumption is mainly related to:

- domestic use due to the presence of the staff and construction workers .It is planned that in average a total of 300 workers will be employed for the construction phase. The total consumption will be around 30 m3/day;
- water for concrete batching;

- soil watering for dust mitigation and management during excavation works and construction vehicles transits and washing down and cleaning equipment at localized work sites .The total consumption foreseen are evaluated in average in 300 m^3/day and will vary from 200 m3/day to 400 m3/day; and
- fire-fighting system.

Overall, during the construction phase at the cement plant, the average water demand can vary from 230 m^3/day and 430 m^3/day per normal practice. It is estimated that the main water consumption will be used for construction purposes (75%) and associated operations; whereas the remaining 25 % would serve for domestic purposes for office use, worker camp and canteen.

Considering that the water will be withdrawn by Ataran River (that has an average discharge amount 575 m^3/s) the impacts related to water consumption can be considered negligible because the quantities of water involved are relatively small towards the overall discharge of the river, and they will be required over a relatively short period of time.

Additionally, impacts from water consumption can be further reduced to as low as reasonably practicable by adopting water control and saving measures (discussed in the mitigation and monitoring subsection).

In conclusion, the overall impact related to the levels of consumption reported above must be considered as temporary and completely reversible.

7.2.4.2 Impact Estimation and Evaluation

Potential water pollution would occur within construction phase on Ataran River and it could cause by the discharged wastewater from mining activities and during the construction work of the cement plant and the conveyor belt.

During construction, wastewater would be discharged from the construction area as the result of rainfall on the construction unpaved areas.

In conclusion wastewater discharge will have negligible impact on the quality of surface and groundwater in consideration of both the effluents characteristics, and the disposal systems; furthermore, the wastewater discharge is characterized by limited amounts (related to the river flow rate) and a temporary short – term condition.

(i) Site Preparation Works

Site preparation works will comprise the levelling of the site, earthworks and the excavations for foundations, trenching and installation of underground services.

Both surface water and groundwater resources may be subjected to potential impacts related to accidental spillage or leakage as described in the following.

(ii) Accidental Events

Pollution of surface and/or groundwater may arise from accidental spills during construction (fuel, oils, grease, etc.). Both surficial water and groundwater resources will be at risk during

these construction activities from potential pollution caused by accidental spillage of fuels, lubricants cement and wet concrete.

(iii) Organic Pollutants from Residential Area and Canteen

The discharged wastewater generated from residential area and food making area, MCL canteen in this case was the main sources for nutrients rich wastewater, such as rich of Nitrogen, N and Phosphorous, P and BOD, oil and grease etc.

7.2.4.3 Impact Mitigation Measures

As discussed above, during the construction phase, the potential impacts on water resources are expected to be limited, because wastewater discharges from the construction site will be considered as a temporary event.

The potential contamination and/or erosion risks during construction phase related activities shall be mitigated by adopting good construction management practices.

- Wastewater generated from offices, canteens, and worker accommodation is treated by septic-sewage system .Wastewater treatment unit will be provided for treating wastewater from canteens.
- Temporary drainage system will be provided for collecting drain water from construction activity and rain to sediment pond and reuse inside construction area.
- Create a special storage for fuel and lubricants/oil .The storage is a closed building and it is protected from rainwater.
- Provide grease and oil trap for workshop and maintenance area.
- direct runoff away from disturbed areas by means of temporary drainage ways, utilizing for example cut-off drains;
- provide containment measures for hazardous material and storage areas to prevent spills or leakage of fluid materials which may soak into the ground and reach the groundwater table;
- design of store hazardous material providing suitable reception facility with impervious flooring, roofing and suitable drainage control;
- regular maintenance and checking of all plant and machinery to minimize the risk of fuel or lubricant leakages;
- no discharge of untreated wastewater to soil and groundwater and onto surficial water bodies;
- as construction activities typically generate disturbed soil, concrete fines, oils and other waste, on-site collection and settling of storm water, prohibition of equipment washdowns, and prevention of soil loss and toxic releases from the construction site are necessary to minimize water pollution; and
- training and equipping relevant staff in protected storage and handling practices, and rapid spill response and clean up techniques.

Table 7.2-13: Significance of Residual Impacts for Water Resources during Construction Phase

Component	Significance of Impacts						
	Potential Impacts	**Residual Impacts**					
	Consequence & Likelihood	**Consequence of Impact**			**Likelihood of Impact**		
	Negative	Severity	Spatial Scope	Duration	Frequency of Activity	Frequency of Impact	Significance of Impact
Water Resource Impacts	Low	Small	Plant Boundary	Construction	T Regularly	Infrequent	Negative
	48	2	2	1	4	3	Low
		5			7		35

7.2.5 Land/Soil Impact

7.2.5.1 Impact Source and Activity

The Project activities will entail:

- temporary occupation of land to set up the construction site and the temporary worker camp; and
- permanent land occupation for the conveyor belt installation.

7.2.5.2 Impact Estimation and Evaluation

In this section, the potential impacts on land component during construction phase is assessed, together with the related protection and mitigation measures to be adopted to avoid or minimize the related potential impacts.

(i) Land Use

During both construction phases, land occupation will be limited to areas categorized as agricultural land that will be acquired for the needed of the Project.

The occupied area is private land that already purchased, therefore, impacts connected with land occupation in terms of restrictions on the land use are considered negligible during the construction phase considering that the first will be temporary and the second one long term.

(ii) Landscape

The activities related to the construction of the Project would be phased, temporary and restricted to the construction period, and therefore the resulting landscape and visual impacts will also be temporary. The possible impacts on landscape resulting from the construction phase include those resulting from:

- impacts arising from the installation of all site compound, including temporary living and production areas;
- temporary works and installations, and temporary storage;

- the installation and movement of heavy and light construction machinery (including tall cranes);
- construction lighting, including high mast lighting for activities; and
- special load movement and storage.

Construction phases will be carried out in about 24 months as scheduled. Completion will be accompanied with waste collection. Therefore, construction phases only affect landscape in a limited period.

As described in the baseline, the general landscape within the development area is characterized by a flatting, alluvial area and a hilly area in the West (in correspondence of the presence of the limestone quarry).

Constructions activities may change the visual landscape of the Project area. Site clearance activities, gathering of equipment and construction materials, machinery and camp establishment on the existing cement plant boundary and along the conveyer belt may reduce the scenic beauty. Nevertheless, the impact is for a short duration, and reversible as the project plan includes landscape planning, green belt development etc.

In conclusion, taking into consideration the low sensitivity of the receiving landscape, the absence of any landscape designations and the temporariness of the activities duration, it is considered that the construction impacts are most likely to be of low negative significance regarding both landscape and visual impacts.

(iii) Soil

The increasing of soil erosion could be caused by the removal of vegetation and excavation activities for the construction of the conveyor belt and the cement plant, all the construction activities will be performed within the present project boundary. The path of the designed conveyor belt will involve agricultural land (basically paddy fields) and the removal of existing vegetation would be minimal. In any case, if necessary, effective construction site drainage measures, utilizing cut-off drains (to divert surface runoff from exposed soils or construction areas) will be implemented, to reduce the top soil erosion. Regarding the excavation activities, top-soil and sub-soil will be removed especially at the foundations area. The excavated soil will be temporary stored using the best available procedure and techniques to avoid loss and/or degradation. After the construction works will be completed, soil cover shall be placed back on for reinstatement activities;

(iv) Modification of the Geomorphologic Condition

The construction activities at the site of interest will not cause detrimental changes in geomorphologic landforms and site setting, considering that the site is quite flat. An "open excavation" method will be adopted, and it will determine only temporary changes in the micro-topography of the area. The original conditions will be then restored at the end of excavation works and construction phase;

(v) Changes in Geological and Lithological Conditions

After excavation activities and following backfilling, compaction of soil as well as mixing of construction material with natural soil, should lead to changes in the physical, mechanical and

other soil properties. These modifications are in any case evaluated as negligible because of small entity. Furthermore, the changes will not affect soil with archaeological or natural landscape values, therefore the possible related impacts could be considered negligible also on historical and archaeological point of view.

(vi) Pollution of Soil

Pollution could affect soil in case of accidental spillage of oil from vehicles used for transportation of construction material and accidental spillage from the building material used for construction purposes. These accidental events could be considered remote if specific maintenance activities and safety procedures will be correctly implemented. More details are provided in the following section presenting the main applicable protection and mitigation measures.

In conclusion, considering the mitigation measures implemented, the medium term and the reversibility of the activities, the soil impacts during construction phase can be considered as negligible.

7.2.5.3 Impact Mitigation Measures

(i) Land

With reference to landscape impacts, the following mitigation measures shall be considered during the construction activities:

- machinery and materials will be stored tidily during the works. Tall machinery including cranes will not be left in place for longer than required for construction purposes, to minimize its visual intrusion;
- temporary roads providing access to site compounds and work areas will be maintained free of dust; and
- security and work lighting shall be shielded and directed downwards, and the use of tall mast lights shall be carefully assessed.

(ii) Soil

With reference to the construction phase, the following environmental protection and mitigation measures will be implemented to reduce or prevent potential impacts on soil:

- to prevent soil contamination by oil or grease spills, leakages or releases, all manipulations of oil derivate in the process of construction and provision of fuel to the machines should be performed with maximum attention;
- leak proof containers should be used for storage and transportation of oil/grease and wash off from the oil/grease handling area shall be drained through drains and treated properly before disposal;
- construction waste and debris shall be collected on a regular basis, covered by roof and disposed of at designated landfills;
- only authorized quarries shall be used for purchasing soil to be used for embankment, padding, bedding, backfilling during construction;

- it must be prohibited to operate with equipment and vehicles outside the designated work areas and roads; and
- training and equipment will be in place to minimize the potential environmental impact in the case of accidents (for example using spill kit).

Table 7.2-14: Significance of Residual Impacts for Soil Impacts during Construction Phase

Component	Significance of Impacts						
	Potential Impacts	Residual Impacts					
	Consequence & Likelihood	Consequence of Impact			Likelihood of Impact		
	Negative	Severity	Spatial Scope	Duration	Frequency of Activity	Frequency of Impact	Significance of Impact
Soil Impacts	Low	Insignificant	Activity Site	Construction	Temporary	Very seldom	Negative
	30	1	1	1	2	2	Very Low
		3			4		12

7.2.6 Solid Waste

Solid waste related issues are discussed under PS3, IFC EHS General Guidelines (Section 1.6) and IFC EHS Guidelines for Cement and Lime Manufacturing (Section 1.1). In general, the Project is requested to avoid the generation of hazardous and non-hazardous waste materials.

In case waste generation cannot be avoided, the project through the protection and mitigation measures to be taken into account would reduce the generation of waste and recover or reuse the waste in a safe way for human health and the environment; instead, in case waste cannot be recovered or reused, it is foreseen to treat, destroy, or dispose of it in an environmentally sound manner that includes the appropriate control of emissions and residues resulting from the handling and processing of the waste material.

The different types of waste that will arise during construction and operation phases were identified through an understanding of the processes associated with the different parts of the proposed development. Considering that there is no specific information available regarding the quantities of waste that are likely to be produced during Project phases, the impact assessment was performed qualitatively.

7.2.6.1 Impact Sources and Activities

The construction phase will be carried out through different activities as civil, mechanical, electrical installation operations and liquid effluents which in turn will generate volumes of waste with typology characteristic of the nature of each activity.

In general, waste streams, generated during construction phase of the project, shall be related to:

- excavation spoil;
- construction waste;
- domestic waste;

The generation and handling of these waste streams are discussed in the following sections.

Waste generated during excavation activities will be mainly related with the excavation works for foundations of the major items of plant and equipment, underground piping and ponds development and ground levelling.

Wherever possible, the spoil which is excavated will be re-profiled around the site or re-used for landscaping. The surplus amount (if any) is planned to be disposed of offsite in authorized plants.

7.2.6.2 Impact Estimation and Evaluation

The potential adverse impacts resulting from the generation of waste during the construction phase may be summarized as follows:

- increasing of traffic while disposing waste at licensed landfills;
- possible contamination of groundwater or soil caused by an improper waste management; and
- potential negative impact on community health.

7.2.6.3 Impact Mitigation Measures

The overall impacts during construction should be considered as negligible if the following mitigation measures are exercised;

- a waste management plan shall be developed including requirements for separation, handling and disposal of all waste generated;
- all hazardous materials shall be stored in clearly labeled containers;
- storage and handling of hazardous materials should be in accordance with national and local regulations appropriate to their hazard characteristics;
- waste shall be separated on site and waste storage areas shall be roofed and bounded to prevent potential cross-contamination;
- spent oils (including transformer oil) shall be recycled;
- fire prevention systems and secondary containment shall be provided for storage facilities, where necessary, to prevent fires or releases of hazardous materials;
- all waste shall be disposed of in line with local requirements at a suitable and licensed waste disposal facility; and
- suitable disposal sites shall be identified with capacities for disposal for general and hazardous waste prior to the operation phase.

Table 7.2-15: Significance of Residual Impacts for Solid Waste during Construction Phase

Component	Significance of Impacts						
	Potential Impacts	Residual Impacts					
	Consequence & Likelihood	Consequence of Impact			Likelihood of Impact		
	Negative	Severity	Spatial Scope	Duration	Frequency of Activity	Frequency of Impact	Significance of Impact
Solid Waste Impacts	Low	Insignificant	Activity Site	Construction	Temporary	Very seldom	Negative
	30	1	1	1	2	2	Very Low
		3			4		12

7.2.7 Biodiversity

7.2.7.1 Impact Sources and Activities

The major activities that likely have impacts on the biodiversity during the construction phase include followings;

- clearance of vegetation cover
- excavation of land
- construction noise by operation of heavy machineries
- construction waste
- spill of oil, lubricant and other hazardous materials

7.2.7.2 Impact Estimation and Evaluation

With reference to the field observations that describe the general conditions of the terrestrial investigated area, the main ecosystems expected in the area are:

It is necessary to know the configuration of vegetation, plantation, animals, birds, aquatic life, wild life features, bird sanctuaries, national parks, reserved forests etc., in the study area to assess the probable effect likely to be reflected on the existence of these features after the commissioning of the proposed project.

In the study area, most of the land is agricultural and residential oriented. As a result, there is no major suitable habitat for either natural flora or fauna other than domestic animals, birds and reptiles.

Wildlife habitat is important for the survival of the wildlife animals in terrestrial ecosystem. The wild animals are now threatened by habitat degradation and habitat loss caused by misconduct of human being. A habitat is a part of an ecosystem and diverse ecosystems support for high species diversity. A change in an ecosystem necessarily affects the plant and animal species in the system, and changes in species affect ecosystem processes. The distribution of species on earth is becoming more homogenous**.**

In the proposed project area, three major habitat types were observed namely (1) Forest, (2) Mixed plantation and cultivated land and (3) aquatic habitat (Ataran River). There is one threatened plant species in the proposed project area and the overall habitat value is assumed to be medium to high.

(i) Fauna

In the cement plant and the conveyor belt areas typically, the elevated background noise levels emitted by the civil works and vehicular movement may compel the native fauna to vacate in the immediate vicinity. Additional sources of noise include the high number of generators which will be used to supply the facility with its power demand during the entire construction period. It is noted that the faunal species in the surrounding area is generally mobile hence no territorial needs will be affected by the works.

However, noise may disturb animal breeding, feeding and migration patterns. The light (night-time guard watch) and noise impacts is expected to be of long-term duration given the expected 24 months construction phase followed by the on-going operation procedures required for cement manufacturing and power generation (i.e. transportation of manpower and raw material in and out of the facilities).

According to the findings of the baseline conducted, in the cement plant area and along the conveyor belt corridor, a total of 15 butterfly species, 4 mammal species, 9 reptile and 7 amphibian species and 21 bird species were observed.

Endangered (EN) species, vulnerable (VU) species by IUCN Red List 2015 ver. 3.1 and prohibited species, which need to conserve and no hunting, trading and no disturb to them by Myanmar Law, were not identified in the cement plant area as well as along the conveyor belt. The cement plant is in active agriculture and plantation area where high ecological values of species are unexpected. On the other hands, some species of mammals, reptiles/amphibians would be affected by the construction work, although important species would not be included these affected species. However, it is confirmed by literature and local experts that most of these species live widely in the surrounding area.

Based on the above, the construction activities at the cement plant and the conveyor belt will not cause any significant impact on species and its habitats.

(ii) Flora

As already reported in the baseline section, the habitats found out in the survey area are made up of degraded mixed forest, grassland, agricultural land, and developed area and orchard villages.

The direct ecological impact in terms of flora, resulting from the construction phase, is the loss of vegetation and habitat associated with site clearance in particular for the cement plant and associated facilities and path of the conveyor belt. According to the baseline data survey result, total of 116 plant species in the cement plant area were recorded.

The cement plant construction activities are the major source of potential impacts on the study area for floral biodiversity and vegetation cover. Site clearance activities, grading and transport of heavy machinery and vehicles would most likely result in physical damage of the land cover.

There are some potential disturbances to the flora resulting in invasion of some alien species when the construction work is terminated. The flora may also be impacted by solid waste littering by the construction crew members, and accidental leaks or spills. It is anticipated that the vegetative cover along the proposed footprint, access routes (as well as newly upgraded roads and new conveyer line) and the workers camp will be completely damaged and lost following the civil works during the construction phase of the project.

As concern the conveyor belt, during the construction phase, a loss of some vegetation cover is foreseen. There are some potential disturbances resulting in invasion of new alien species when the construction works will finish. Clearing of topsoil and land cover to construct the conveyor belt may cause the loss of habitat and habitat fragmentation along the conveyor belt. Overall, due to the limited period of time of the construction works, the **relevant impact on flora can be considered as medium to high for the cement plant area and low for the conveyor belt path, also taking into account the mitigation measures** provided in the following section.

To be concluded, with reference to the field observations, it is necessary to know the configuration of vegetation, plantation, animals, birds, aquatic life, wild life features, bird sanctuaries, national parks, reserved forests etc., in the study area to assess the probable effect likely to be reflected on the existence of these features after the commissioning of the proposed project.

In the study area, most of the land is agricultural and residential oriented. As a result, there is no major suitable habitat for either natural flora or fauna other than domestic animals, birds and reptiles.

Wildlife habitat is important for the survival of the wildlife animals in terrestrial ecosystem. The wild animals are now threatened by habitat degradation and habitat loss caused by misconduct of human being. A habitat is a part of an ecosystem and diverse ecosystems support for high species diversity. A change in an ecosystem necessarily affects the plant and animal species in the system, and changes in species affect ecosystem processes. The distribution of species on earth is becoming more homogenous.

In the proposed project area, three major habitat types were observed namely (1) Forest, (2) Mixed plantation and cultivated land and (3) aquatic habitat (Ataran River). However, there is one threatened plant species in the proposed project area. Therefore, the overall evaluation for biodiversity is assumed to be medium to high.

(iii) Sensitive Habitats and Protected Areas

The field observation revels that there is no sensitive habitat in and around the Project site. Consequently, no impact on sensitive habitats and protected areas is expected to be generated by the Project during both construction and phase.

7.2.7.3 Impact Mitigation Measures

Mitigation measures to minimize further potential impacts on the Project area fauna and flora include:

- routine checking of trenches (if any) and escape routes to minimize, if not prevent, entrapment of fauna;
- washing down of vehicles in place and prior to commencing work;
- preservation of excavated topsoil for future site restoration procedures particularly in highly disturbed areas;
- limiting vehicular transport to defined roads as to prevent unnecessary injury, habitat destruction and complying with safe driving procedures;
- reporting of any violation relating to hunting and trading activities;
- implementing good housekeeping practices on the field and implementing good Solid Waste Management Plan in order to eliminate any source of hazard to the native fauna;
- minimize vegetation clearance and habitat disturbance by demarcating the clearing boundaries in the quarry site;
- unnecessary cleaning the trees is to avoid;
- environmental awareness training to be given to all workers for the preservation of local biodiversity species and induct the nature of the sensitivity of project area;
- site specific instruction/protocol for identifying and relocation of plant and wildlife species if necessary, shall be provided to all workers with education materials including photographs; and
- works areas in temporarily affected areas shall be reinstated with tree/shrub / grass upon completion of the works;

Table 7.2-16: Significance of Residual Impacts on Flora and Fauna during Construction Phase

Component	Significance of Impacts						
	Potential Impacts	Residual Impacts					
	Consequence & Likelihood	Consequence of Impact			Likelihood of Impact		
	Negative	Severity	Spatial Scope	Duration	Frequency of Activity	Frequency of Impact	Significance of Impact
Impacts on Flora and Fauna	Medium-High	Insignificant	Plant Boundary	Life of Plant	Regularly	Very seldom	Negative
	90	2	2	4	4	2	Low
		8			6		48

7.2.8 Socioeconomic condition

7.2.8.1 Impact Sources and Activities

Socioeconomic impact by the construction of the project can be both positive and negative. The positive impacts can be creation of employment opportunities, receiving potential health, education and other social services etc., while highly likelihood of road accidents by project vehicles, and massive migration of construction workers from other regions can impose social cohesion leading to negative impacts. The estimation of potential impacts by the particular activity of the project are presented in the following section.

7.2.8.2 Impact Estimation and Evaluation

(i) Impact Assessment Criteria

According to IAIA (International Association for Impact Assessment), SIA is generally defined as a process of analyzing, analyzing and monitoring the consequence of the project.

More precisely, Social Impact Assessment includes the processes of analyzing, monitoring and managing the intended and unintended social consequences, both positive and negative of planned interventions (policies, programs, plans, projects) and any social change invoked by those interventions. Its primary purpose is to bring about a more sustainable and equitable biophysical and human environment.

The evaluation and assessment involve the assessment of both qualitative and quantities data with professional judgment and stakeholder consultation.

In assessing the characteristics of the individual impact, following factors are taken into consideration.

- Nature of impact)beneficial or adverse(
- Duration of impact)temporary and permanent(
- Likelihood
- Severity
- Significance of impact

(ii) Potential Impact to Population and Demographic Change

Potential impact of migration to the project affected area by the development of Mawlamyine Cement Project area likely to result mainly from the migration of personnel with the hope of getting job and receiving potential health, education and other social services that may result from the project.

However, it is expected that number of personnel moving into the project affected area is very low in comparison with the existing local population. It is also the reason that there are an enormous number of local people working in Thailand have the chance to return their natives so movement of labors from another region would be minor. As a result, there may be no alter in the number of residential populations around the project areas or affect their demographic structure.

As a result, **an alteration in the number of residential populations around the project area or impacts to the local demographic structure is not expected**. Thus, it is considered the potential impact related to population demographic structure of local communities is negligible to minor.

(iii) Potential Impact to Assess and Movement

There may be traffic volume increase during the construction phase. The traffic will use Mawlamyine – Kyaikmaraw Road and Mawlamyine – Hpa-An Road to assess to the proposed project site.

Construction related traffic will not utilize largely on Local Streets which are adjuring local communities. The traffic is expected not to interact with venerable local communities.

The project is in the shrub and forest area and people not commonly visit into the project site. Besides, there is no project activities which defer the community assess and movement. No communities would be severed by the project in term of access and movement. Construction will not affect the existing road network as the transportation vehicles will apply vessels along the Ataran River.

The impact to the public access and movement resulted from the project activities during construction and operation is forecasted minor.

(iv) Potential Impact to Employment, Skill and Business

Project will source it operative work forces mainly from the local area due to the reason of project's commitment of prioritizing the selection to local people and availability in adjacent areas for the basic level semi-skill and non-skilled works.

Owing to the information collected during the survey in study area, the people are expecting with though that the cement project will bring improvements to the living standard and local economic status of local people by creating job opportunities.

Since construction phase is the period of high demand of job openings with temporary employment, the numbers of employees will be dramatically high.

The prospect of an increased income and greater autonomy is likely to cause an increase in the aspirations of local communities both those involved with the project and, to a lesser extent, those from other working individually. This is a direct positive effect with a moderate extent and long-term duration. As consequence, it is considered as a major beneficial impact resulted from the project.

Company is intending to conduct both awareness and critical training necessary to its employees, it is perceived that capacity building which is expected by both company and local community is the one of the beneficial effects as well. As this will be long term income stability to the hired employees assuring the economy security to its family members.

The project is in Kyaikmaraw Township which is not far from the Thai border; there will be potential of having return of immigrant labors from Thailand. Most of the families in the project area have members who have been working as labors in Thailand. New job opportunities with reliable salary will encourage the households to re-organize in their native.

Proposed project area is closed to the local residential areas.

Both during the construction and operational phase, it has the high opportunity to employ local people in all level of full- skilled, semi-skilled, unskilled and technicians. In this regard, company shall develop local hiring plan. Here local people refer to the people living in the affected areas or entire project area of influence.

This project is anticipated to source the operative force on local basis and has the potential to increase the educational and technical qualification of local work forces through onsite technical transferring and in-house training programs.

The project will have significant beneficial impacts on the local communities.

(v) Potential impact to Land Use and Property

Project is constructed and operated in the plantation area which is purchased by the company with current price.

It is informed that there will be no resident, business or industry properties acquired for the proposed cement project. Consequently, no population would be directly related to the project. Based on the information provided above there will be no impact on the land use related issues. And no additional mitigation measures are provided in this regard as there is no impact on the land use and effect on the private property.

(vi) Impacts on Community Value and Lifestyle and Social Cohesion

As mentioned previously, the project area is located closed to the residential area, the temporary construction camps for workers is expected to be built in the project area which is about half kilometer to the nearest residential area.

Though a proportion of construction workforces are to be recruited from the local areas and live locally, some numbers of workforces are to be sourced outside of the community area.

It is anticipated the relationship between workforce and local community will be increased from time to time. As a result, potential crime and antisocial behavior within the local community from the Mawlamyine cement project are foreseeable to some extent. Those anticipated potential crimes include alcohol /drug use and other social misconducts.

The potential for increases in crime and anti-social behavior is likely and may challenge local authorities and create resentment amongst the local community. It may also result in some changes to the lifestyles or cohesion of communities in the surrounding suburbs.

During the phase of survey by social team, there is no significant dispute or unrest caused in terms of the political belief, religious thoughts and social concepts within the community. There is no major development in study areas and it is unlikely that social cohesion issues will arise.

Anyway, with project exist, both within and outside the current project area, this finding might alter and there could be potentially impact the project by creating a preconceived perception of the project and its associated activities from local communities and other organization.

The impact on the lifestyle and social cohesion is predicted as moderate and additional control measures are required.

(vii) Local Economy

There is some probability that the workforce will patronize local retail services, such as food outlets during lunch or coffee time, which would be beneficial to the economy at the local scale. On the project side, it is certain that some materials required for the project use could be locally available and due to the easy accessibility, there might be greater consumption for local market and increase business opportunity for local business.

In addition, the arrival of newcomers to project area could result in increased economic activity, greater exposure to markets and opportunities, larger customer bases for local businesses and positive diversity with the community.

Following measures to enhance this beneficial effect are recommended:

- Investigate the possible procurement needs of the project that can be sourced locally
- Investigate the possible employment needs of the project that can be sourced locally

(viii) Traffic Issue (Transportation)

During the construction and operation phase, there will have potential traffic increase on the road where local people are using for their transportation. The volume of vehicles carrying raw materials will be high during the operation period. Proper traffic management plan is to be adopted and local road improvement scheme is to be developed without interfering the existing transportation system of local people.

The other minor impact is wave from cruising upstream affects accommodations and fish boat/ passenger boat along the river.

(ix) Occupational Health and Safety

There is various occupational health and safety risks are likely to happen during the construction and operation period.

In order to avoid the harms caused by project activities to employees and local people, occupation health and safety management system shall be developed for the proposed cement plant.

7.2.8.3 Impact Mitigation Measures

In conclusion, the adoption of the following measures will allow mitigating the negative impacts resulting from the Project traffic during the operation phase:

- to install appropriate road signage on the roads used by Project traffic in particular at bends, junctions, schools and populated areas;
- to define speed limits and make sure that they are respected by Project drivers (including contractors);
- to maintain the Project roads in order to reduce the possibility of accidents, including clearing of vegetation on to improve sight distance and visibility; and
- to adopt a Traffic Management Plan to ensure traffic safety, which should foresee safe drive trainings and regular alcohol and drug tests for drivers.

One of the effective implementations of the Social Impact Management Plan of the project is the development of a capacity and local awareness building.

To enhance the local capacity building, and avoid unnecessary social conflict and dispute related to the employment within local communities, following measures are suggested.

- Identify the range of skill required for the labor force and conduct a gap analysis against skills availability
- Notify local people of job openings through local advertising, information center, project notice boards to place in office or road junctions of each village
- Develop and implement a local employment policy for the people of affected communities
- Careful management to be practiced about the expectation of local people in regard to the employment to avoid any disputes
- Undertake regular review of labor requirement and skill demands ensuring that training strategies meet the needs of project
- Initiate training and job skill development programs
- Considering establishing a contractual agreement with contractors to ensure that all contractors understand the company’s expectation of favor local content in hiring employees

This impact would be positive impact due to encouragement of regional socioeconomic condition due to the development of project.

Table 7.2-17: Significance of Residual Impacts on Socioeconomic Activities during Construction Phase

Component	Significance of Impacts						
	Potential Impacts	Residual Impacts					
	Consequence & Likelihood	Consequence of Impact			Likelihood of Impact		
	Positive	Severity	Spatial Scope	Duration	Frequency of Activity	Frequency of Impact	Significance of Impact
Socioeconomic condition	Low	Significant	Local area	Construction	Temporary	Regularly	Positive
	50	3	3	1	2	4	Low
		7			6		42

7.3 Prediction of Potential Impact and Mitigation Measure during Operation Phase

7.3.1 Air Emission

7.3.1.1 Impact Sources and Activities

During plant operation, the air emissions are mainly characterized by particulate matter, SO_2 and NO_x. In general, the impacts generated by dust emissions on surrounding environment derive from the process of production itself, such as cement production, material broken, transportation, grinding, calcination and packing that generates particles and discharge.

Almost every process of production such as cement production, material broken, transportation, grinding, calcination and packing are accompanied with particle generation and discharge. Its characteristic is much emission point, emissions loads have direct relations with filter model and maintenance management, and the majority of the emissions are organized dust source. The main source of the particulate matter in the cement production process:

Material particulate matter: come from the process of the material load and unload, crush, transport, storage.

The particulate matter of the kiln inlet: come from the process of raw meal grinding, preheater, disintegrating, clinker calcining. Clinker particulate matter: come from the process of the clinker cooling, crushing, transport, and storage.

Cement particulate matter: come from the process of the cement grinding, storage, package and transshipment.

The main environmental concerns associated with dust emissions are occupational health concern for factory workers and community health for surrounding areas which close to the factory boundary especially west of the cement factory boundary and north of the factory boundary.

7.3.1.2 Impact Evaluation

(i) Impact from Sulphur Dioxide (SO_2) Emissions

The MCL cement plant used dry kiln process. The present domestic dry kiln production line which already put into production fully proved low SO_2 emissions.

According to the literature review, SO_X emissions are generally formed from the combustion of sulphur (S) in the fuel (coal in this case) and from the oxidation of sulphur present in the raw materials and are predominantly (99%) released as Sulphur Dioxide (SO_2).

The main sources of SO_2 emissions during the operation of dry processed cement plant would be from:

- Raw material kiln feed; and
- The combustion of sulphur present in coal fed to the cement kiln and the power generation plant

Sulphur dioxide (SO_2) is known to contribute to acid deposition (dry and wet) resulting in subsequent damages to ecosystem while in reference to human health impacts from exposure to sulphur dioxide concentrations, the main impact relates to repercussions induced on the respiratory system through inhalation since it does not accumulate in the body. The main source for SO_2 emission is clinker burning process.

The cement kiln is known to be an excellent scrubber for acid gases, due to the presence of alkalis & free lime generated by the raw materials. This is especially the case for modern kiln technologies and for situations with no pyretic sulphur in raw materials. In keeping with MCL's standards, all quarries have to be screened for pyretic sulphur content. In addition, a low sulphur coal for the power plant (0.9 %) has been adopted. Under these conditions a SO_2 retention of 99,8 % for modern kilns, as the result of SCG's cement plant in Thailand, is suggested.

SO_2 is known to contribute to acid deposition (dry and wet) resulting in subsequent damages to ecosystem while about human health impacts from exposure to sulphur dioxide concentrations, the main impact relates to repercussions induced on the respiratory system through inhalation since it does not accumulate in the body. Sulphur dioxide in ambient air mostly affects the elderly, children, and people with bronchial and asthmatic disorders (i.e. the most sensitive and vulnerable groups in the community).

According to the WHO Air Quality Guidelines (AQG) for Europe (2000), it is noted that the lowest observed adverse-effect levels of SO_2 for which effects on the most sensitive population groups (people suffering from asthma) were:

- 1,000 $\mu g/m^3$ (10 minutes) for changes in lung function in asthmatics; and
- 250 $\mu g/m^3$ (24-hr) and 100 $\mu g/m^3$ (annual) for exacerbation of respiratory symptoms.

No estimated SO_2 emissions from combustion sources were provided by MCL at this stage of the study. It should be mentioned that Exhaust emissions are inevitable during normal operation of combustion sources.

It should also be reminded that the proposed MCL plant intends to reuse solid by-products from power generation (i.e. fly ash and slag) for cement manufacturing. This common practice is expected to reduce on reliance on coal hence leading to a decrease in SO_2 emissions.

Calculation of SO_2 Emissions based on Stack Emission Monitoring Results

Based on the stack monitoring result, the emission of SO_2 from raw mill stack is 3.4 mg/Nm^3[17] with the flow rate of 141.13 m^3/s.

SO_2 Emission rate (g/s) = concentration (g/m^3) x gas flow (m^3/s)
= 5×10^{-7} g/m^3 x 508068 m^3/h
= 0.3 g/h
= 7.2 g/day

Calculation of SO_2 emissions based on Amount of Coal Used (Without Control Unit)

In cement plant, the amount of coal used is approximately 300,000 – 400,000 tons per year.

Table 7.3-1: Indo (Normal Sulfur)

Parameters			**As Received**	**Air Dried**	**Dry**
Moisture					
	Total	%	18.34		
	Inherent	%		10.48	
Ash		%	5.06	5.54	6.19
Volatile Matter		%	40.55	44.44	49.65
Fixed Carbon		%	36.06	39.53	44.16
Calorific Value					
	Gross	cal/g	5550	6083	6796
	net	cal/g	5560		6588
Sulfur					
	Bomb Sulfur	%	1.59	1.74	1.94
Size					
	15-50 mm				

The basic equation used in fuel analysis emission calculations is the following[18]:

$$E_{kpy,i} = Q_f \times C_i \times (MWp / EW_f) \times 1E\text{-}06 \times OpHrs$$

where:

$E_{kpy,i}$	=	emissions of pollutant i, kg/yr
Q_{coal}	=	fuel use (kg/hr)
C_i	=	pollutant concentration in fuel – ppm or mg/kg
MW_p	=	molecular weight of pollutant emitted (kg/kg-mole)
EW_f	=	elemental weight of pollutant in fuel (kg/kg-mole)
OpHrs	=	annual operating hours in hr/yr

[17] "Nm^3" means normal cubic meter, being that amount of gas which when dry, occupies a cubic meter at a temperature of 25 degree Centigrade and at an absolute pressure of 760 millimeters of mercury (1 atm).

[18] National Pollutant Inventory Emission estimation technique manual for Fossil Fuel Electric Power Generation Version 3.0 January 2012.

Note: For instance, sulfur dioxide emissions from oil combustion can be calculated based on the concentration of sulfur in the oil. This approach assumes complete conversion of sulfur to sulfur dioxide. Therefore, for every kilogram of sulfur (EW = 32) burned, two kilograms of SO_2 (MW = 64) are emitted.

Q_f	=	400000 ton/yr =	45662 kg/hr
C_{SO2}	=	1.94 % (Dry) =	19400 ppm
OpHrs	=	4320 hr/yr (~ approximately fully 6 months)	
$(MW_p / EW_f) \times 1E\text{-}06$	=	(64/32) 10^{-6} kg/hr	
$E_{kpy,SO2}$	=	45662 x 19400 x (64 / 32) x 10^{-6} x 4320	
	=	7653681.792 kg / yr or	≈ 7654 ton/yr

(ii) Impact from Nitrogen Dioxides (NO_2) Emissions

Nitrogen dioxides (NO_2) emissions are mostly generated during the high temperature combustion process of the cement kiln.

According to the Result for the NO_2 ground concentrations during monitoring campaign are well below the limit of **200 µg/m^3 (0.2 mg/m^3).**

The hourly maximum concentrations are in correspondence of the plant and nearly reach the relevant regulation. It must be highlighted that the assessment was developed following a conservative approach; in fact, the modelled pollutant is NO_x (mixture of all the nitrogen oxides), while the concentration limit refers only to the Nitrogen dioxide (NO_2) which is a fraction of NO_x. Therefore, it is reasonable to consider ground concentration compliant with the relevant limit.

(iii) Impact from Particulate Matter (PM) Emissions

The main sources of particulate matter in the cement production process can be subdivided as follow:

- raw material particulate matter :comes from the process for the row material load and unload, crushing, transport, and storage;
- particulate matter of the kiln inlet :comes from the process of raw meal grinding, preheater, disintegrating, clinker calcining;
- clinker particulate matter :comes from the process of the clinker cooling, crushing, transport, and storage; and
- cement particulate matter :comes from the process of the cement grinding, storage, package and transshipment.

The main environmental concerns associated with dust emissions are occupational health concern for factory workers and community health that lives in the closest surroundings of the factory, especially on the Western and Northern side of the plant boundary.

The fugitive particulate matter (PM) emissions in cement plants come from raw material handling, grinding, blending and delivery, clinker storage, grinding, cement storage, bulk

loading and packaging of final products.[19] PM also comes from stationary sources such as the stacks attached to the raw mill, rotary kiln, coal mill, grate cooler, cement mill etc.

According to literature, majority of particulates emitted from cement industry may range from 0.05 to 5.0 μm in diameter.[20]

In cement plants without any dust control technology, 7% of the emitted particles were found to be lesser than 10 and 2.5 μm, in a dry process kiln, 42% and 18% of particulate emissions were less than 10 and 2.5 μm.

In dry process plants with dust control technology, about 85% of escaping particles were less than 10 μm in diameter, while in dry plants having bag houses, about 45% of escaping particles was of b2.5 μm diameter.[21]

(iv) Stack Emissions of Cement Plant

Air quality deterioration is a major issue in typical cement industries due to the existence of numerous sources of air pollutants. Primary emission point of source of cement facilities including mobile and stationary, that generate dust and air pollutants are raw material transportation and grinding, clinker burning, cement grinding, packing and transportation, power plant, generators, vehicle and equipment movement operation.

Regarding the dust and air emissions, dust can cause a nuisance to residents and cause a health risk to workers. Therefore, main risk to face is represented by the exposure of workers and residents with degradation of ambient air quality. The analytical results for stack emissions were attached in Annex-7-2.

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[19] E. Kalafatoglu, N. Ors, S.S. Ozdemir, I. Munlafalioglu, Trace element emissions from some cement plants in Turkey, Water, Air, and Soil Pollution 129 (2001), 91–100, (PDF) Particulate matter and elemental.... Available from: https://www.researchgate.net/publication/257210587_Particulate_matter_and_elemental_emissions_from_a_cement_kiln [accessed Jul 25 2018].

[20] I. Kalacic, Chronic nonspecific lung disease in cement workers, Archives of Environmental Health 26)1973 (78–83.

[21] H.G. van Oss, A.C. Padovani, Cement Manufacture and the Environment Part II: Environmental Challenges and Opportunities, Journal of Industrial Ecology 7)2003 (93–126.

Table 7.3-2: Stack Monitoring Result of Main Bag Filter Raw Mill

No.	Parameter	Temp (°C)	Flow Rate (m^3/s)	Result	Unit	Standard Value	Method
1.	PM	91.67	141.13	20	mg/Nm^3	≤ 50	U.S. EPA Method 5
2.	SO_2			<3.4	mg/Nm^3	≤ 400	U.S. EPA Method 6
3.	NOx (as NO_2)			563	mg/Nm^3	≤ 600	U.S. EPA Method 7
4.	CO			191	mg/Nm^3	-	Electrochemical Method

Table 7.3-3: Stack Monitoring Result of Cement Mill I, Mill II and EP Cooler

Monitoring Sites	Parameter	Temp (°C)	Flow Rate (m^3/s)	Result	Unit	Standard Value	Method
Cement Mill I	PM	75.70	5.26	9	mg/Nm^3	≤ 50	U.S. EPA Method 5
Cement Mill II	PM	76.05	5.63	18	mg/Nm^3	≤ 50	U.S. EPA Method 5
EP Cooler	PM	82.60	108.75	25	mg/Nm^3	≤ 50	U.S. EPA Method 5
Coal Mill	PM	51.92	52.75	6	mg/Nm^3	≤ 50	U.S. EPA Method 5

(v) GHGs (CO_2) Emissions

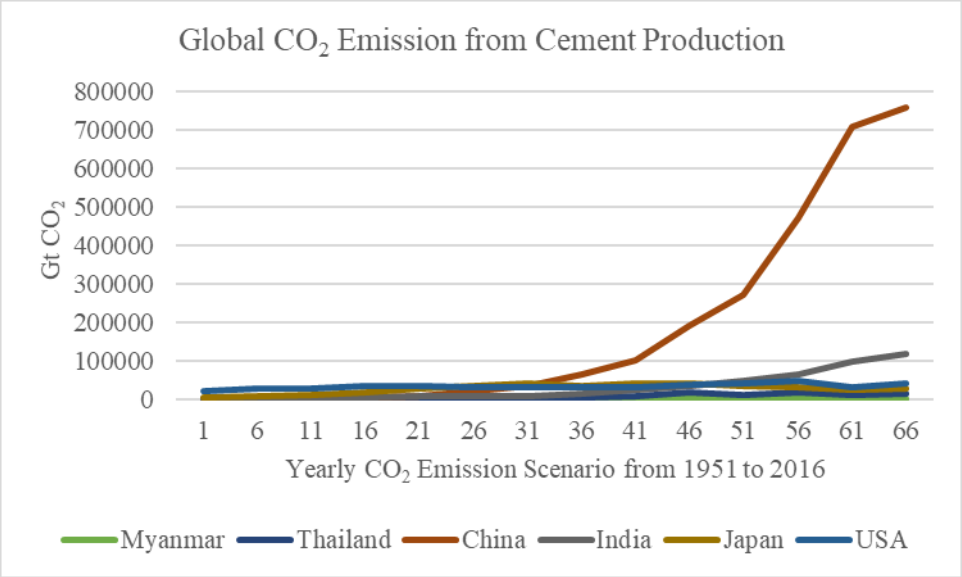
Climate change should be recognized when the project activities are related with the Greenhouse gases emissions (GHGs) such as carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6), etc.

SCG Cement is a core member of WBCSD CSI. SCG follow and report according to Cement CO_2 Protocol. In 2013, SCG Cement emitted 15.08 million-ton CO_2 which related to cement volume production and report in term of intensity 625 kgCO_2 per ton cement.

Cement manufacturing contributes the greenhouse gases, CO_2 emission mainly from fossil fuel burning, coal burning in this case and fuel combustion wherever through the use of energy and the other aspect is the chemical reaction involved in the production of cement components like the conversion of limestone, $CaCO_3$ to lime, CaO, and the production of clinker, etc. The greenhouse gas contribution mainly concerned with the climate change impact.

The figure below pointed out the global CO_2 emission from cement production which were represented for five countries, 4 Asian Countries, Myanmar, Thailand, China, India and 1 European country, USA. The comparative time series was from 1951 to 2016 for CO_2 production scenario.

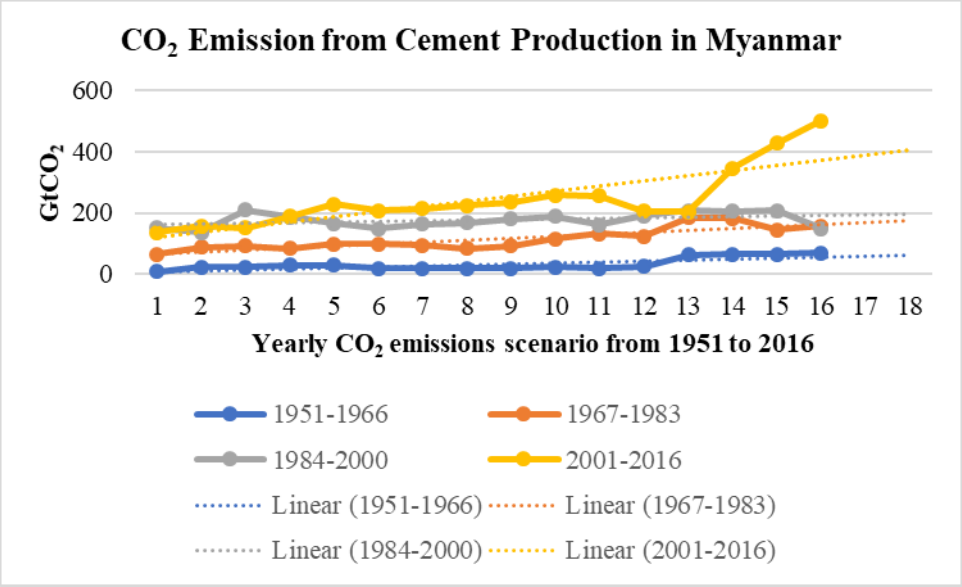
From this scenario, the emission of CO_2 from cement production peaked in 2016, at 756364 Gt CO_2 for China, which was the highest cement produced country in the world, 117444 for India, which stood at second position, 26504 for Japan, 14662 for Thailand and 502 for Myanmar, one of the lowest cement produced country in Asia and 40665 for USA, the European country which was included mainly for the purpose of comparison in CO_2 emission from cement production with the Asian countries.



Source: Robbie M. Andrew[22]

Figure 7.3-1: Global CO_2 Emissions from Cement Production in Six Countries, during the Years of 1951-2016

However, the following scenario pointed out that cement production is being increased in Myanmar nowadays, as well as CO_2 generation trend from cement production are likely to increase in the future. Myanmar CO_2 emission from cement production was also demonstrated in the following figure in the duration of 1951 to 2016 with the developing emission trend line of CO_2.



Source: Robbie M. Andrew

Figure 7.3-2: CO_2 Emissions from Cement Production in Myanmar During 1951-2016

[22] RobbieM.Andrew, CICERO Center for International Climate Research, Oslo 0349, Norway, 26th January 2018

(vi) Heavy Metals Emission

Heavy metals especially mercury emissions (with the boiling point of 360˚C) can be found in cement manufacturing which used the natural fuel materials such as coal materials in their energy generation processing but in trace amount which is under USEPA guideline value (see Table 7.7-2).

Emission Estimation

The amount of heavy metals emission by the stack may vary depending on the efficiency of control devices (bag filters) because toxic elements especially heavy metals are presented in the fly ash and emitted as fine particles. Currently, the two units of bag filters have 99.97% removal efficiency and only 0.03% of fly ash which might contain heavy metals can be emitted to the atmosphere. Despite heavy metals concentration in the flue gas would be in very low and the emission is calculated with the following methods.

$$Em_i = A_i \times EF_i\,(100 - ER_i/100)$$

where,
Em_i = *emission of pollutant i (*g/yr)
A_i = *activity rate of pollutant i (mass of fuel consumption* in GJ*)*
EF_i = *emission factor of pollutant i* (g/GJ).
ER_i = Overall control efficiency of pollutant i (%)
Coal consumption rate - 6,418,364 *GJ, based on 219000 ton/year*
Flue gas flow rate[a] – 69.44 m^3/s

Emission factors (g/t) used for calculation of Pb and Cd emission, according to different methodologies, Estimation of heavy metal emissions from coal-fired power plants and Emission factors for coal combustion, power plants and district heating plants, wet bottom boilers, Improved Inventory for Heavy Metal Emission from Stationary Combustion Plants (1990-2009).

Table 7.3-4: Estimated Emission of Heavy Metals [23,24]

Parameter	Emission Factor (mg/GJ)	g/s	mg/Nm^3	Guideline limit*[25], mg/Nm^3
Arsenic (As)	8.0	4.88E-07	8.78E-06	-
Cadmium (Cd)	1.1	6.72E-08	1.21E-06	0.0153
Copper (Cu)	4.8	2.93E-07	5.27E-06	-
Mercury (g)	1.7	1.04E-07	1.87E-06	0.061
Nickel (Ni)	5.7	3.48E-07	6.26E-06	-
Lead (Pb)	8.6	5.25E-07	9.45E-06	0.153

*U.S. EPA Promulgated 12/95 for New Large Units

[23] S. Gromov & V. Ginzburg: Estimation of heavy metal emissions from coal fired power plants in Russia, Wfzfwfg q/GVoW C/zmare aW&Wogy, 20-5 G/g6ovj&aya &., Moscow, 107258, Russia.

[24] Malene Nielsen, Ole-Kenneth Nielsen and Leif Hoff Mann: Improved Inventory for Heavy Metal Emissions from stationary combustion plants (1990-2009), Scientific Report from DCE – Danish Centre for Environment and Energy, Aarhus University, N0. 68:2013. https://dce2.au.dk/pub/SR68.pdf.

[25] U.S .EPA Promulgated 12/95 for New Large Units

7.3.1.3 Impacts Mitigation Measures

(i) Mitigation Measures for SO_2 Emissions

The protection measures adopted in the project design in order to reduce and control SO_2 discharge are described the following:

Coal and raw material feeding into the rotary kiln and the decomposing furnace, may be also leading some sulphur, main source of SO_2. From the design input, it is assumed that both the sulphur contained into the coal and into the raw meal will enter the flue gas as SO_2 after burning. The flue gas will enter in contact to the materials in the rotary kiln and decomposing furnace firstly, where $CaCO_3$ contained in the meal will be decomposed as CaO; then CaO and SO_2 will react forming sulfate and sulphite and then enter the cement clinker.

The waste gas will be discharged into the cyclone preheater, and the SO_2 which has not been absorbed before will react with the materials and will be absorbed by the meal. The gas measurement result shows that kind of preheater could produce sulphate and sulphite that will enter the clinker, the SO_2 emission concentration in the preheater waste gas is 25.8 mg/Nm^3 and could satisfy the requirement of "cement industry atmospheric pollutant discharge standard" (equal to 400 mg/Nm^3). The producing process will control the SO_2 in a feasible and reliable manner;

(ii) Mitigation Measures for NOx Emissions

The protection measures adopted in the project design in order to minimize and control NO_x discharges are illustrated in the following.

Most NO_x in the proposed project, which is produced by the combustion of the N_2 in the air and nitrogen in the materials supported by the combustion of the fuel inside the kiln, comes from the rotary kiln, and the density of the NO_x is closely related to the kiln temperature and ventilation quantity, which means that more NO_x will come into being with higher temperature, larger ventilation quantity and longer reaction time.

NO_x emission reduction measures that will be adopted in this Project are as follows:

- low-NOx combustor will be installed next to grate cooler :most of the thermal NOx in the rotary kiln is produced by AQC combustor, so the installation of a low NOx AQC combustor will severely reduce the production of NOx in the rotary kiln, to be more exact 15-%20 %NOx will be reduced, by improving the first wind jet velocity speed, eruption quantity and reducing the dosage of first wind to improve the ability of the high temperature second wind;
- air grading combustion principles and technology solutions:
- air grading combustion means to put the air needed by combustion into the furnace in different stages to make the fuel get burned in a hierarchical way making the nitrogen removal efficiency reach 15-30.%,
- chlorine density in the burning section has a big influence on the production of various NOx .With the excess air coefficient $\alpha<1$, reduction reaction will take place between carbon monoxide and nitrogen oxide produced in the combustion process; furthermore, ammonia in the material will be

decomposed into interacting intermediate products or nitrogen oxide will perform reductive decomposition with the effect of restricting the production of fuel nitrogen oxide .The air, adopting this method, is sent into the burning section in two stages, with one being the main secondary air, accounting for 70-%85 %of the secondary wind, delivered by the main pipe of the tertiary air duct, the other one accounting the rest 15-%30 %of the secondary air delivered by another wind pipe,

- NOx emission density of the proposed project will be ≥600 mg/Nm^3 which means controlling NOx in the producing process is feasible by adopting the above measures.

(iii) Mitigation Measures for Particulate Matter Emissions

All dust emissions together with particulate matters (PM) reduction measures were designed for efficient collection of particulate matters emission in nearly 100 % because of the developer cannot lose any PM emissions as far as possible and PM can be reused as the raw materials in the cement production process. The effectiveness of bag filters, EP, cyclones and dust collectors is 99.99 % and the final discharge standard meets with the national and international cement guideline values.

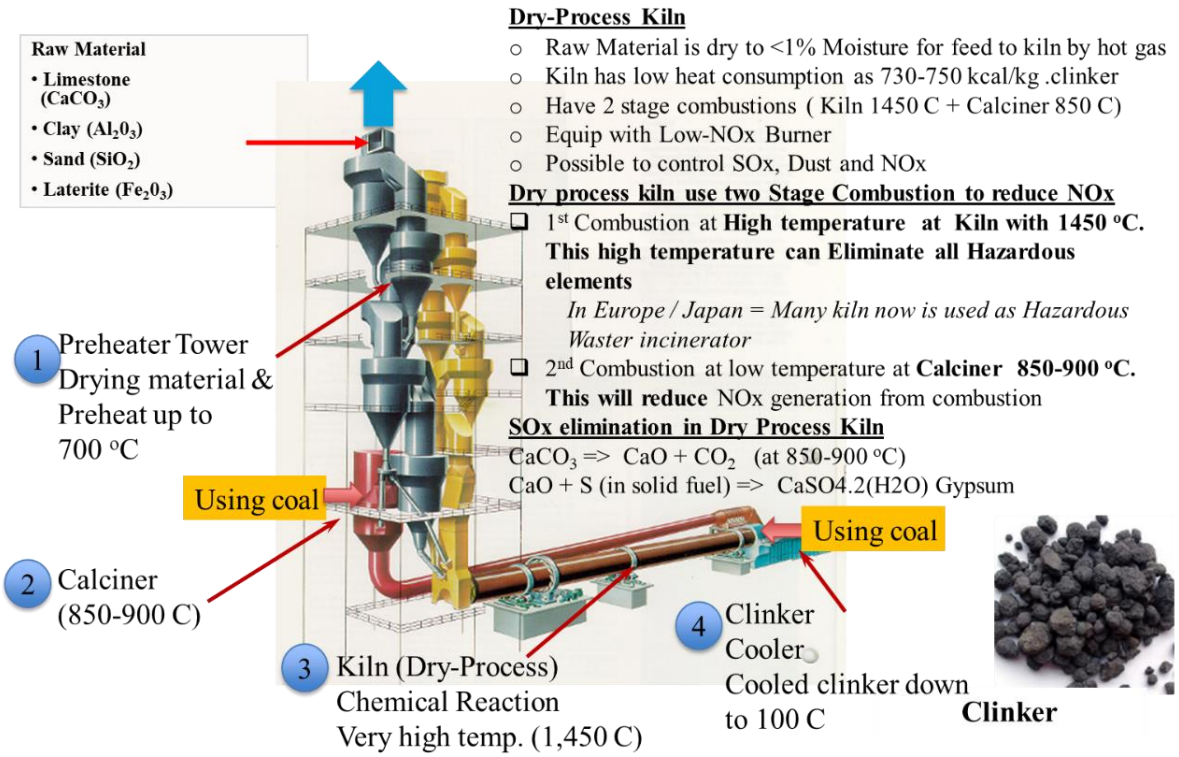


Figure 7.3-3: Cement Production Process, Dry Cement Kiln

(iv) Installation of Control Machines (Dust Collector, Bag Filters, Cyclone and Coolers)

To reduce the emissions of gaseous pollutants during the operation phase from the equipment used in the cement plant, the following mitigation measures and good practices are preliminarily recommended:

- advance machines, equipment and methods are utilized to minimize air pollutions, such as covering machines, watering accessible road and installing dust collecting system (i.e .Electrostatic Precipitator (EP), Bag Filter (BF) etc);
- chimneys and stacks are designed and constructed to have sufficient heights to effectively vent dust, smoke and odors to the atmosphere;
- all dust collectors or de-dusting equipment are designed, installed and guaranteed to regulate particulate matter emissions not exceeding 60 mg/Nm3 at all ranges of kiln operation;
- operational conditions of de-dusting equipment are maintained such as temperature of flue gas entering electrostatic precipitator not to exceed operational range, etc;
- regular inspection and maintenance of gas analyzer at an inlet of electrostatic precipitator are carried out to maintain a good operational condition;
- tree plantations are provided along the boundary of the cement plant .This green belt can minimize dust dispersion generated from on-site transportation;
- sprinkle the road used for material transportation; and
- the concentration of dust in areas where plant personnel are working such as the areas along the conveying system, at which material is transferred including the areas around receiving hoppers, is limited to be less than 15 mg/m^3 .

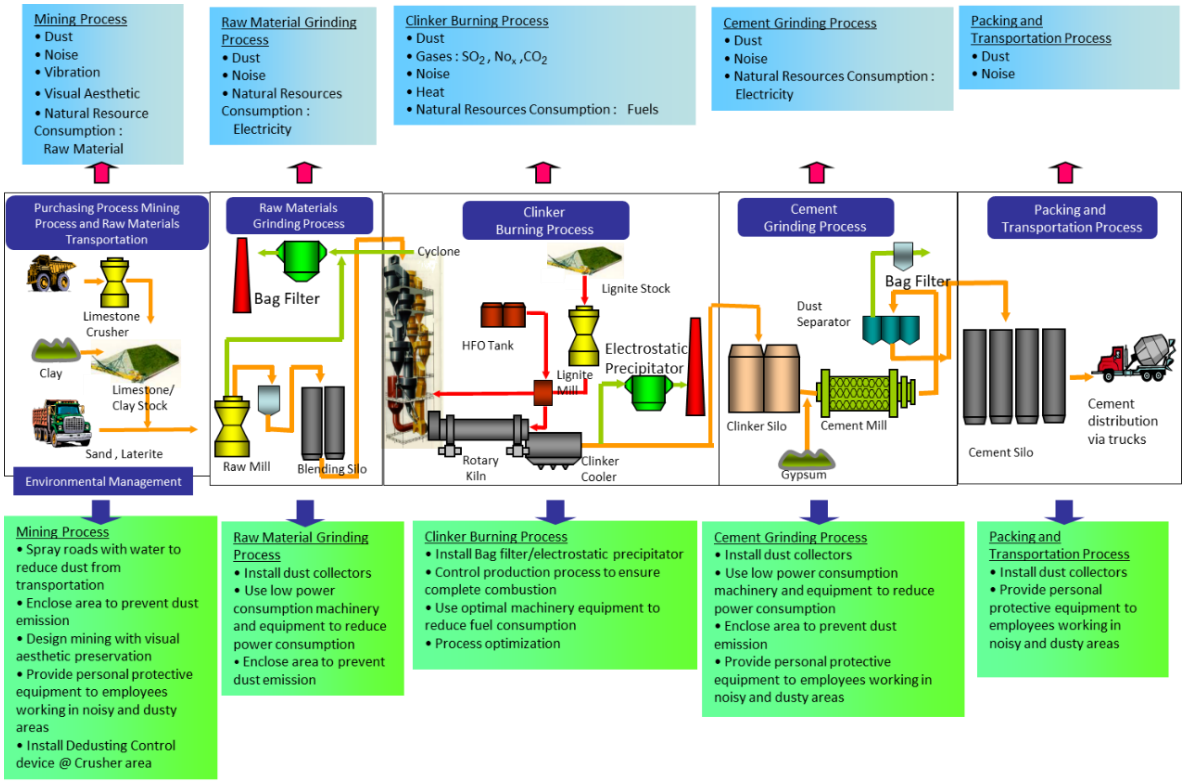


Figure 7.3-4: List of Emission from Cement Process and Environmental Management

In detail, the protection measures adopted in the project design in order to avoid, minimize, and abate the particulate matter ($PM_{2.5}$ and PM_{10}) are the following:

- to effectively control dust emissions and to reduce the impact on the surrounding environment, the engineering design has minimized the parts in the production line which usually cause dust pollution, using equipment with less dust; using enclosed conveying equipment such as chutes, screw conveyors for the transportation of raw cement, pulverized coal and other materials. For the transportation using conveyor belt, it is strengthened closing and minimized the inclination to reduce the dust generating; and

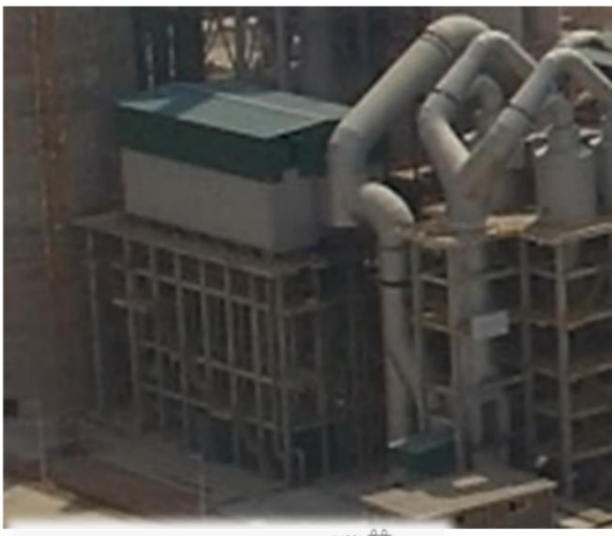
- All emission points of the operation are equipped with technology reliable and high efficiency dust catchers. The kiln end is the main source of dust emissions with high dust concentrations and exhaust gas volumes. The system is equipped with an efficient filter bag, and the concentration of exhaust gases is below 50 mg/Nm^3 (ICF guideline value for emissions of PM_{10} from new kilns). For the clinker cooler and coal mills with large amount of exhaust gas emissions, it is used a special filter bags with emissions less than 50 mg/Nm^3. Every transshipment point of the materials using filter bags. Based on the above, after the treatment, waste gas dust concentrations of each emission outlet can comply with the relevant emission standard.

Figure 7.3-5: Installation of Dust Collectors and Bag Filters for Reduced Air Emissions

Specification of Main Bag Filters in MCL

Specification

- Type Bag filter
  - Control emission at main stack
- Gas volume 788,000 m3/h
- Dust load
  - input 50 g/m3
  - Output < 10 g/m3
- Filtration area 13,680 m2
  - PTFE (Heat resistance 260 °c)
- Power requirement
  - BF fan 1,400 kW



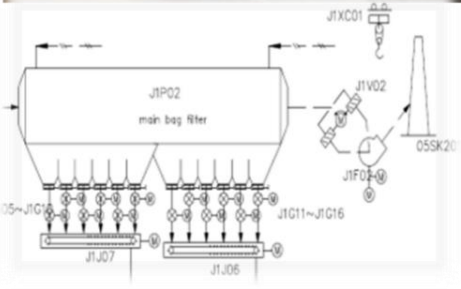


Table 7.3-5: Installation Units of Bag Filters in Proposed MCL Project

Section	No. of Bag Filters	Required Air (m3/h)	Bag Filter Capacity (m3/h)	Diff (%)	Remark
Limestone Transportation (Mining)	5	37,200	65,461	43	
Raw Material Transportation & Raw Mill	22	111,273	175,260	37	
Raw Coal Transportation & Coal Mill	14	76,106	118,560	36	
Kiln	9	42,962	94,680	55	
Clinker Transportation	13	45,708	122,880	63	
Gypsum Transportation	13	50,037	55,800	10	
Cement Mill	10	75,653	102,480	26	
Packer	16	124,714	195,300	36	
Summary	**102**	**563,653**	**930,421**	**39**	

(v) Mitigation measure for Conveyor Belt and Storage System

As above described, the conveyor belt will pass through the area between the limestone quarry and the cement plant.

Emissions of air pollutants during the construction phase of the conveyor belt are mainly associated to transportation (i.e. vehicle movement), earth works, foundation works and site clearance activities.

During operation, small pieces of limestone are transported by enclosed conveyor belt system between crushing site located in the limestone quarry and cement plant site, therefore no significant impacts on air quality caused by operation of conveyor belt are foreseen.

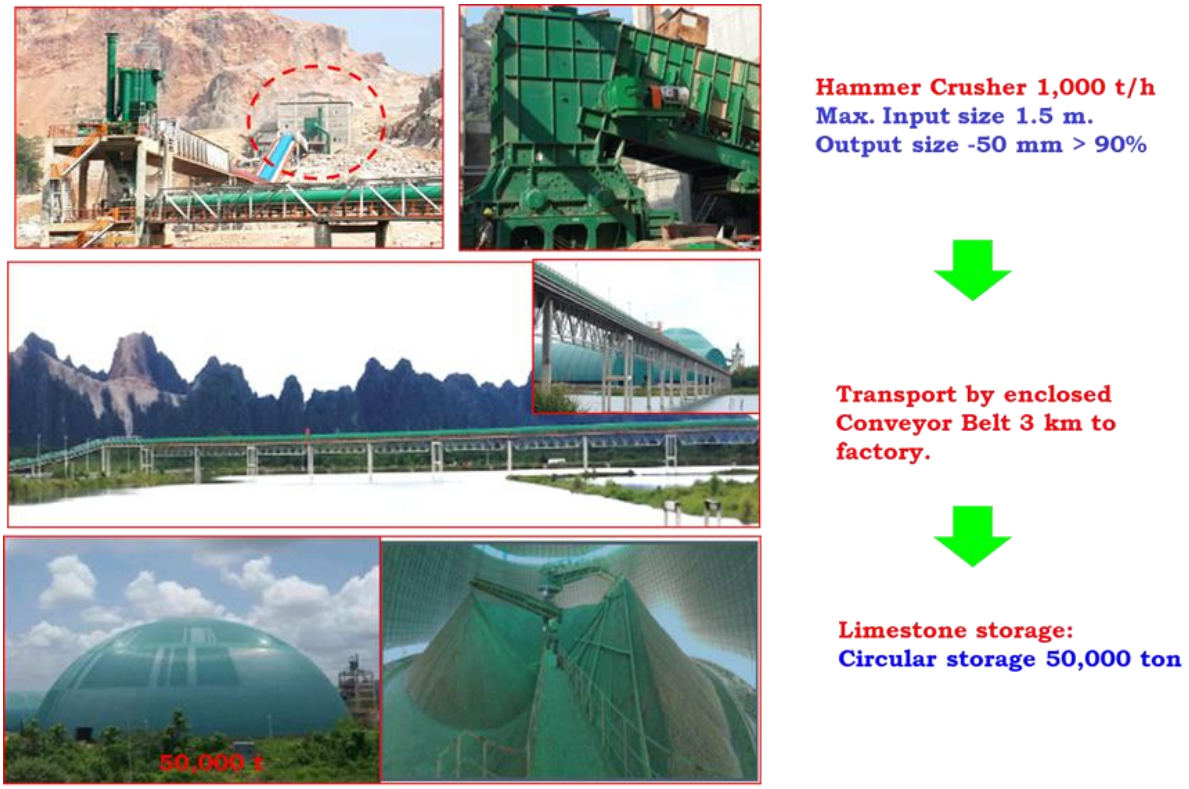


Figure 7.3-6: Limestone Crushing, Transporation and Storage Systems in MCL

Figure 7.3-7: Raw Materials Storage System Installations in MCL

(vi) Mitigation Measure at Jetty and Canal in MCL for Transportation of Raw Materials and Cement Products

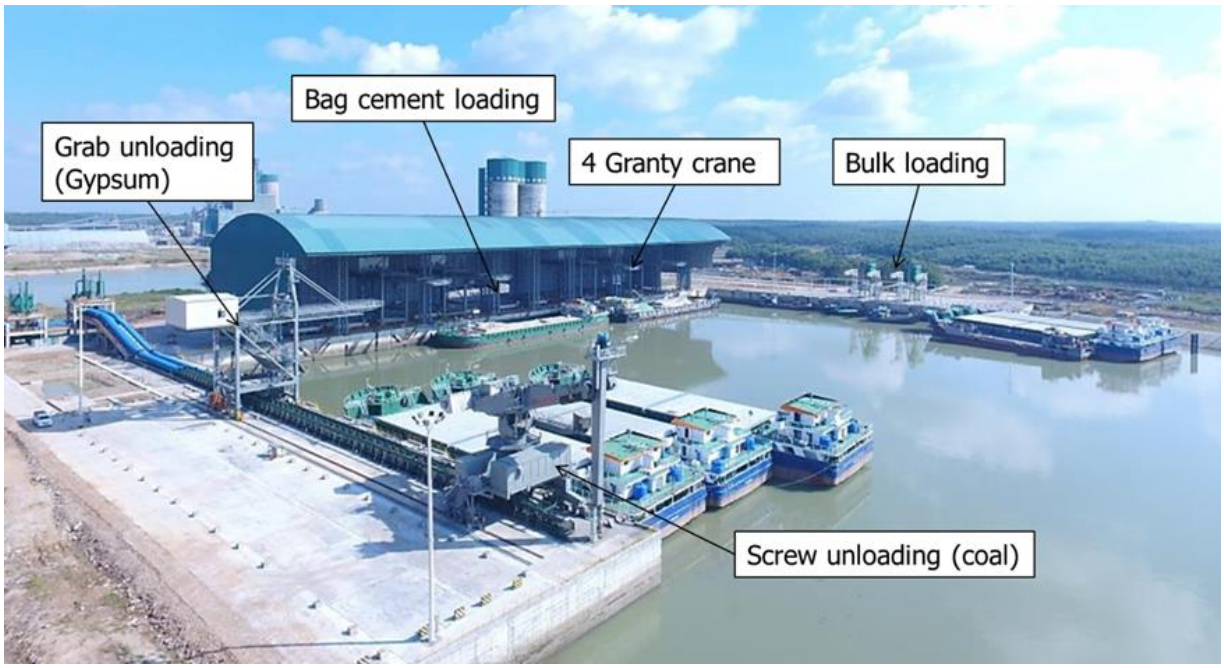


Figure 7.3.8: MCL Jetty and Canal

(vii) Mitigation Measures for Greenhouse Gases, CO_2 Emissions

As described in above, carbon dioxide emissions will be reduced by using waste heat generator units and Alternative fuel eg. Biomass and agricultural waste.

The Cement Plant Waste Heat Power Generation (WHG) Plant is a facility to generate power by recovering heat from waste gas discharged from a cement plant. This is an energy saving system to cover approximately 20 % of the total electric consumption of a cement plant. The Cement Plant Waste Heat Power Generation Plant generates electric power by a steam turbine utilizing steam produced from the heat of two sources– suspension pre-heater waste gas (SP waste gas) and air quenching cooler waste gas (AQC waste gas).

(viii) Future Alternative Energy Resource Plan

MCL is supposed a plan to use the alternative fuel resources such as Rice Husk, wood chip and biomass. Rice husk and wood chip are now trying to introduce in the MCL energy generation system, but they are still in the testing stage for fully operation in terms of reducing coal that in turns to minimize the greenhouse gas emissions and other atmospheric emissions.

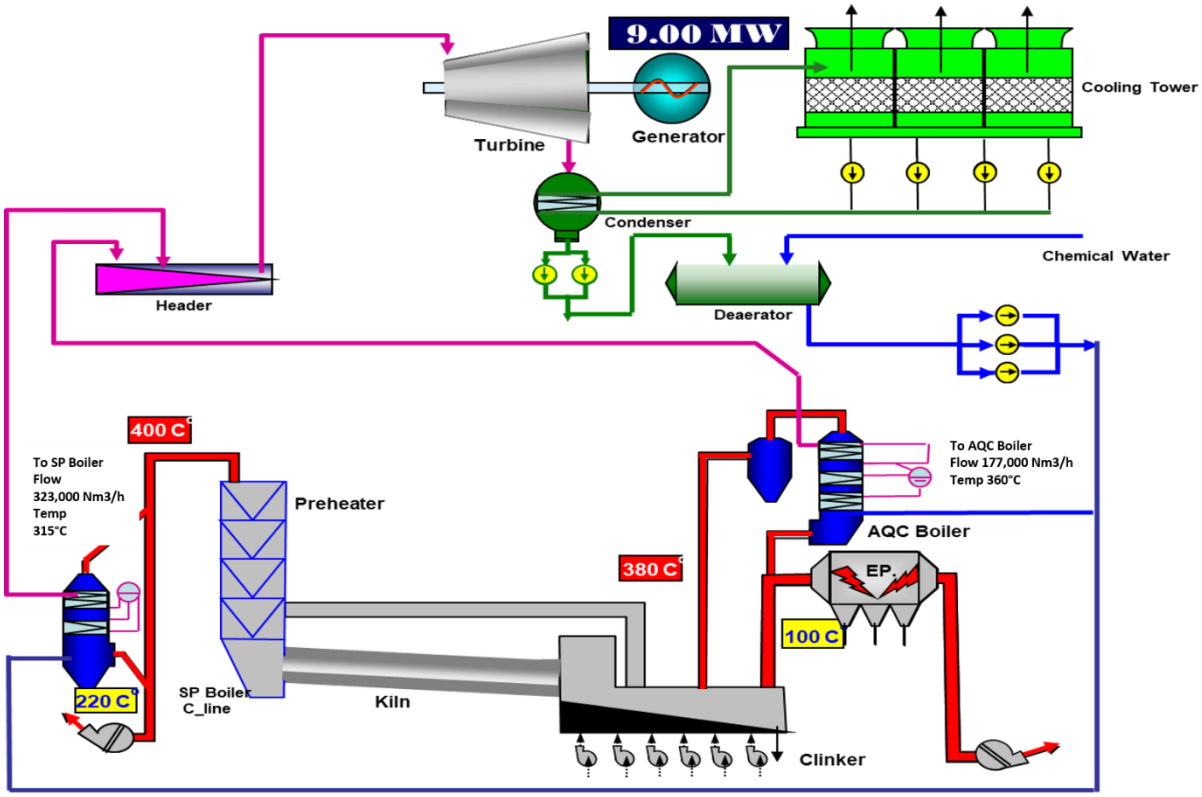


Figure 7.3-9: Installation of Waste Heat Generator in MCL

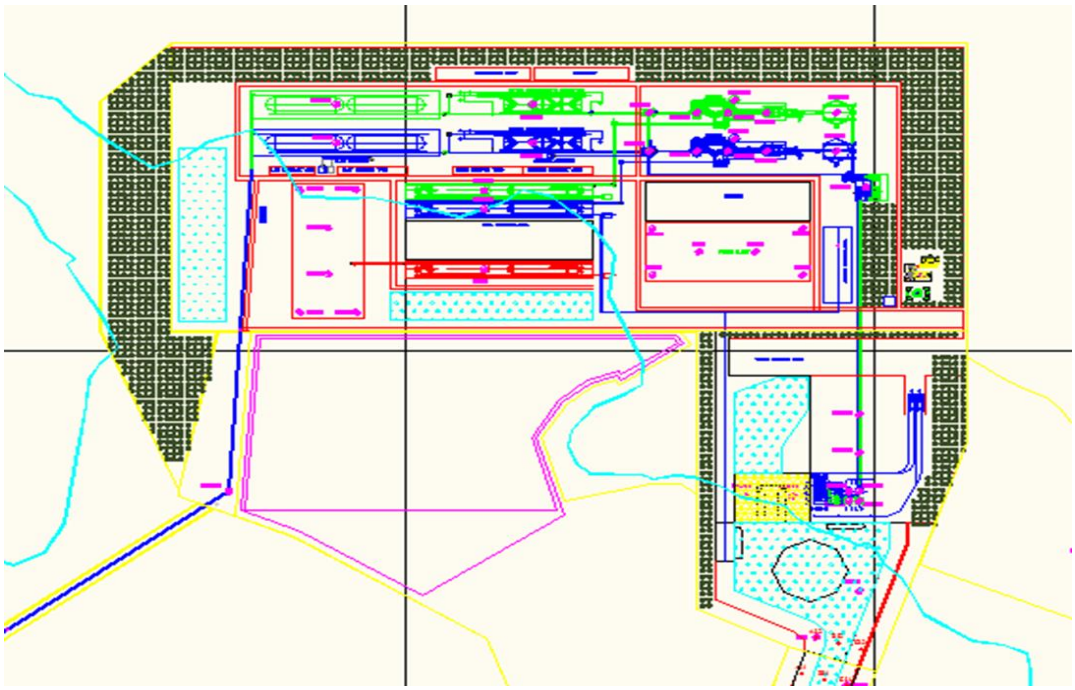


Figure 7.3-10: Green Belt Area (Buffer Zone)

Table 7.3-6: Impact Significance due to Air Emissions during Operation Phase

Component	Significance of Impacts						
	Potential Impacts	Residual Impacts					
	Consequence & Likelihood	Consequence of Impact			Likelihood of Impact		
	Negative	Severity	Spatial Scope	Duration	Frequency of Activity	Frequency of Impact	Significance of Impact
Emission of Air Pollutants	Medium-High	Insignificant	Local Area	Life of Plant Operation	Life of Plant	Very Seldom	Negative
	100	1	3	4	4	2	Low
		8			6		48

7.3.2 Noise Emission

7.3.2.1 Impact Sources and Activities

Field assessment of the study area, undertaken on 25th February 2013 to establish a baseline noise level and record the type and location of sensitive receptors. Basically, the noise emissions are generated by several activities, including:

- overall cement plant operation (machineries and auxiliary equipment)
- operation of machineries and equipment at the cement plant site;
- operation activities of conveyor belt
- mining activities at the limestone quarry sites;
- traffic flow for transportation of raw material and final product

Cement manufacturing includes raw material grinding, mixing and storage; intermediate and final product handling and transportation; and operation of exhaust fans. The noise of the cement production line mainly come from crusher, mill, blower, air compressor, packer, pump and the transport vehicle, analogy similar engineering, the noise intensity when the equipment operate is usually among 85～110dB(A). The noise intensity, preventive measures and noise reduction effect of the project main equipment is shown in Table below.

Table 7.3-7: The Main Equipment Noise Intensity, Prevention Measures and Effects Unit: dB (A)

No.	Noise Source	Noise Intensity	Preventive Measure	Noise Reduction
1	Raw mill	95～105	Foundation vibration reduction	10～15
2	Coal mill	90～100	Foundation vibration reduction	10～15
3	Cement grinding mill	95～105	Foundation vibration reduction	10～15
4	Roots blower	105～115	Foundation vibration reduction and install silencer, workshop closed	15～25
5	Main fan of Kiln inlet	90～110	Foundation vibration reduction and install silencer	15～25
6	Grate cooler	85～100	Workshop closed	10～15
7	Air Compressor room	90～95	Foundation vibration reduction install silencer and Workshop closed	15～25
8	Water pump	85～90	Flexible joints and Workshop closed	15～20
9	Packer	85～95	Foundation vibration eduction	5～15
10	Condensing steam turbine	～105	Foundation vibration reduction install silencer and Workshop closed	5～15

- During the test run period, the monitoring of noise level produced from the operation of the MCL cement plant at 4 receptors were done.
- Exposure levels measured at the four receptor points are all well within the IFC EHS guideline and National Environmental Quality)Emission (Guideline)See Table 6.2-4 .(Based on the monitoring camping conducted and the consideration reported above, the noise impact related to the operation phase of the cement plant can be considered as low.

7.3.2.2 Impact Evaluation

The inventory of potential sensitive receptors and land use recorded based on field visits and satellite images. The identified receptors were geo-referenced using handheld GPS equipment during the site visit. Distance and direction from planned project activity sites were determined; and an inventory of the primary noise sources identified together with the determination of the noise levels for each phase of the project, i.e. especially in operation phase, and for each location, i.e. (1) limestone quarry site; and (2) cement plant.

7.3.2.3 Impacts Mitigation Measures

The protection, mitigation and monitoring measures foreseen to minimize and reduce the impacts related to the noise emissions during the operation phase of the cement plant and the power plant are:

- to minimize machinery and equipment unused conditions with engines in action;
- to maintain machinery and equipment in good conditions;
- to maintain an active community consultation and positive relations with residents that will assist in alleviating concerns that might arise and resolve any potential noise complaints;
- to post warning signs within the vicinity of the impact and all personnel shall be provided with personal protective equipment .For example, workers operating equipment that generates noise should be equipped with the appropriate noise protection gear; and
- to restrict the construction activities that will generate disturbing sounds to normal working hours.

Table 7.3-8: Impact Significance due to Noise Emissions during Operation Phase

Component	Significance of Impacts						
	Potential Impacts	Residual Impacts					
	Consequence & Likelihood	Consequence of Impact			Likelihood of Impact		
	Negative	Severity	Spatial Scope	Duration	Frequency of Activity	Frequency of Impact	Significance of Impact
Noise Impacts	Low-Medium	Small	Activity Site	Life of Plant Operation	Temporary	Very seldom	Negative
	72	2	1	4	2	2	Low
		7			4		28

7.3.3 Vibration

7.3.3.1 Impact Sources and Activities

During the operation phase, the vibration effects arise from the operation of the cement plant and movement of heavy vehicles.

7.3.3.2 Impact Estimation and Evaluation

The evaluation of vibration effects has been done based on the vibration determination in receptor areas, at the monastery of Pauktaw village, Kawpanaw village, Kwan Nyan village and Kadonsit village and MCL mining office.

7.3.3.3 Impact Mitigation Measures

As it was discussed in construction phase, no specific mitigation measures are necessary to carried out for vibration effects.

Table 7.3-9: Impact Significance due to Vibration during Operation Phase

Component	Significance of Impacts						
	Potential Impacts	Residual Impacts					
	Consequence & Likelihood	Consequence of Impact			Likelihood of Impact		
	Negative	Severity	Spatial Scope	Duration	Frequency of Activity	Frequency of Impact	Significance of Impact
Vibration Impacts	Low – Medium	Insignificant	Very Low	Life of Plant Operation	Temporary	Very seldom	Negative
	64	1	1	4	2	2	Very Low
		6			4		24

7.3.4 Water Resources and Wastewater Management

7.3.4.1 Impact Sources and Activities

The water usage during operation of cement plant will be around 4,000 m^3/d and basically, water supply to Cement plant for 3 main system as diagram below:

1) Recycling Cooling System
2) WHG System
3) Water Supply System

Table 7.3-10: Water Consumptions – Operation Phase

Water System for Cement Plant	Water Consumption)m^3/day(
1. Make up cooling water	312 Cement +1440 WHG Total 1,752 m^3/day
2. Boiler Feed water (WHG)	140 m^3/day
3. Water Supply Systemdomestic use(	600 m^3/day

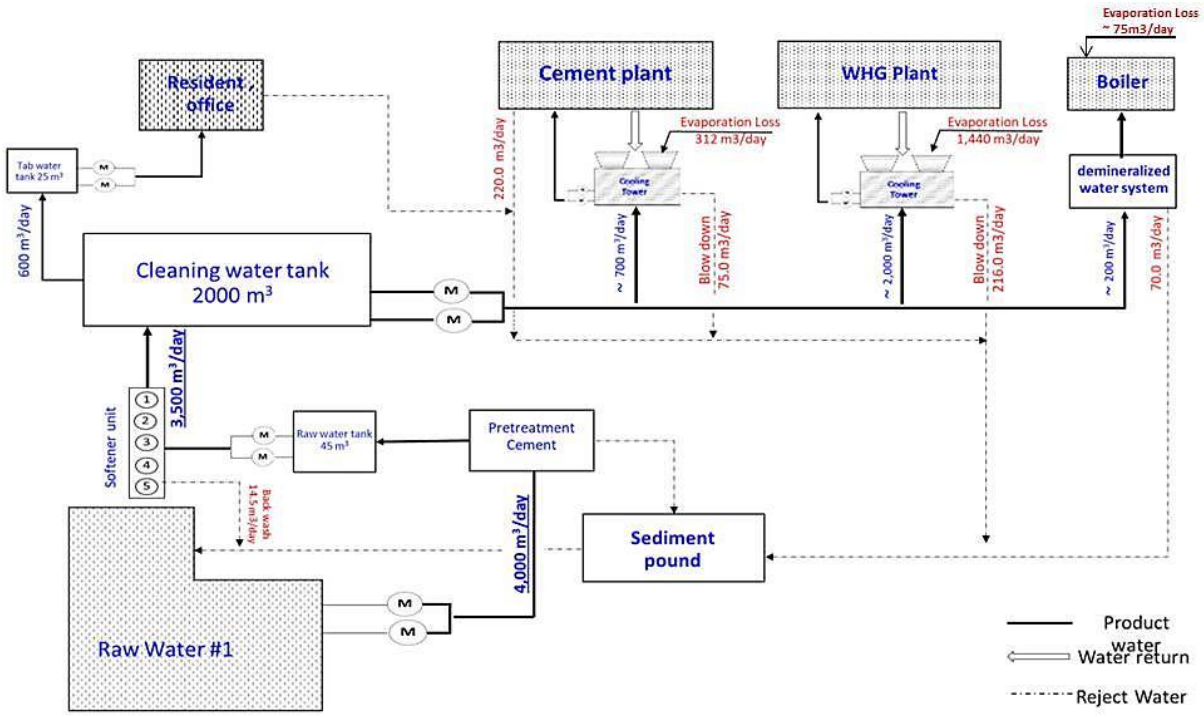


Figure 7.3-11: MCL Water Flow

Likewise the construction phase, there will be no direct effluent discharge from either the plant or the quarry, and therefore no possibility of waste from either location being transported to the river environment. Control features are needed at the quarry during operations and at the plant site during construction to ensure that in major rainfall events, sediments are not transported to the river environment. Wastewater from process and utilities will not directly discharge into the environment.

Wastewater coming from cement plant shall be controlled by installation of treatment system such as use of closed system, grease and oil trap, aeration pond, sediment pond, septic tank.

In conclusion, the overall impact related to the levels of consumption reported above must be considered as temporary and completely reversible.

7.3.4.2 Impact Estimation and Evaluation

(i) Inorganic pollutants from Wastewater Discharge at the Operation, Raw Materials Storage and Workshop Area

The run-off wastewater from operation area might also be contaminated with the raw materials sediments and oil and grease for use of machines to operate well conditions, which are also from workshop and raw materials storage area as well.

(ii) Impact on Groundwater Quality

Regarding water discharges, the operation phase should cause impact on the water environment due to:

- Contamination of surface water bodies from wastewater discharges (stormwater drainage, sanitary sewage and wastewater drainage systems); and
- Contamination from accidental releases.

Wastewater effluents from the cement plant and associated thermal power plant are generated by cooling operations in different phases of the process (e.g. bearings, kiln rings, cooling tower blowdown). Domestic wastewater will be generated from the manpower camps and office facilities.

7.3.4.3 Impact Mitigation Measures

The water demand for the operation phase will be entirely provided by the Ataran River and rainwater collected by the small reservoir (250,000 m^3 water pond) that can collect rainwater to use for power plant and cement plant in the cement plant compound. Based on the hydrogeological features of the site, the Project area is settled in an alluvial plain rich in water and groundwater sources even in the dry season. Based on the above, it can be concluded that the overall impact on the water availability for the existing purposes (surrounding villages, agriculture purposes, etc.) can be considered of minor significance.

Figure 7.3-12: MCL Water Storage Reservoir for Plant Use

Wastewater from process and utilities will not directly discharge into the environment. Wastewater coming from the cement plant shall be controlled by installation of a wastewater treatment system such as use of closed system, grease and oil trap, sediment pond.

Mitigation Measures during Operation Phase are:

- Cement production is operated in dry condition and Water used for cooling system is reused or circulated in cooling water system. Therefore, the dry cement production does not cause water pollution.
- Wastewater management system of the plant is a closed system . Effluent is recirculated without discharging from the plant except that there is heavy rain and emergency discharge may be required.

- Wastewater generated from production process is sent to oil separator and sedimentation pond, respectively. The water from sedimentation pond is reused in some equipment and other activities in cement plant, such as Conditioning Tower, Raw Mill, and Cement Mill.
- Wastewater generated from offices, canteens, and staff accommodation is treated by septic-seepage system .Wastewater treatment unit will be provided for treating wastewater from canteens.
- Reusing the discharge water for watering the roads and plants in the green belt area
- Create a special storage for fuel and lubricant /oi .The storage is a closed building and it is protected from rainwater drainage.
- Provide grease and oil trap for workshop and maintenance area.
- Provide separated water drainage and treatment system for outdoor coal storage.
- Compact the storage ground with clay to prevent seepage into the ground

Based on the data provided, if effective water management and treatment system are fully implemented, the ground and surface water quality and water consumption is predicted to be insignificance.

In any case, the use of a proper Wastewater Treatment Plant (WWTP), and appropriate protection measures, together with the potential volume of involved materials, can be considered as a low impact.

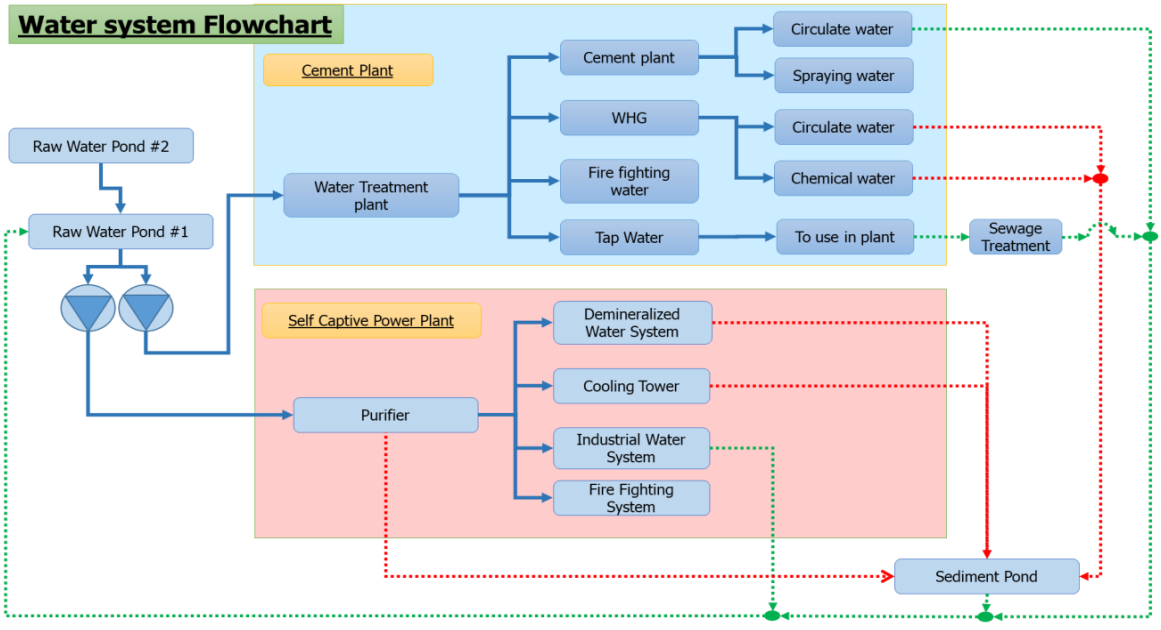


Figure 7.3-13: Water Circulation System of MCL

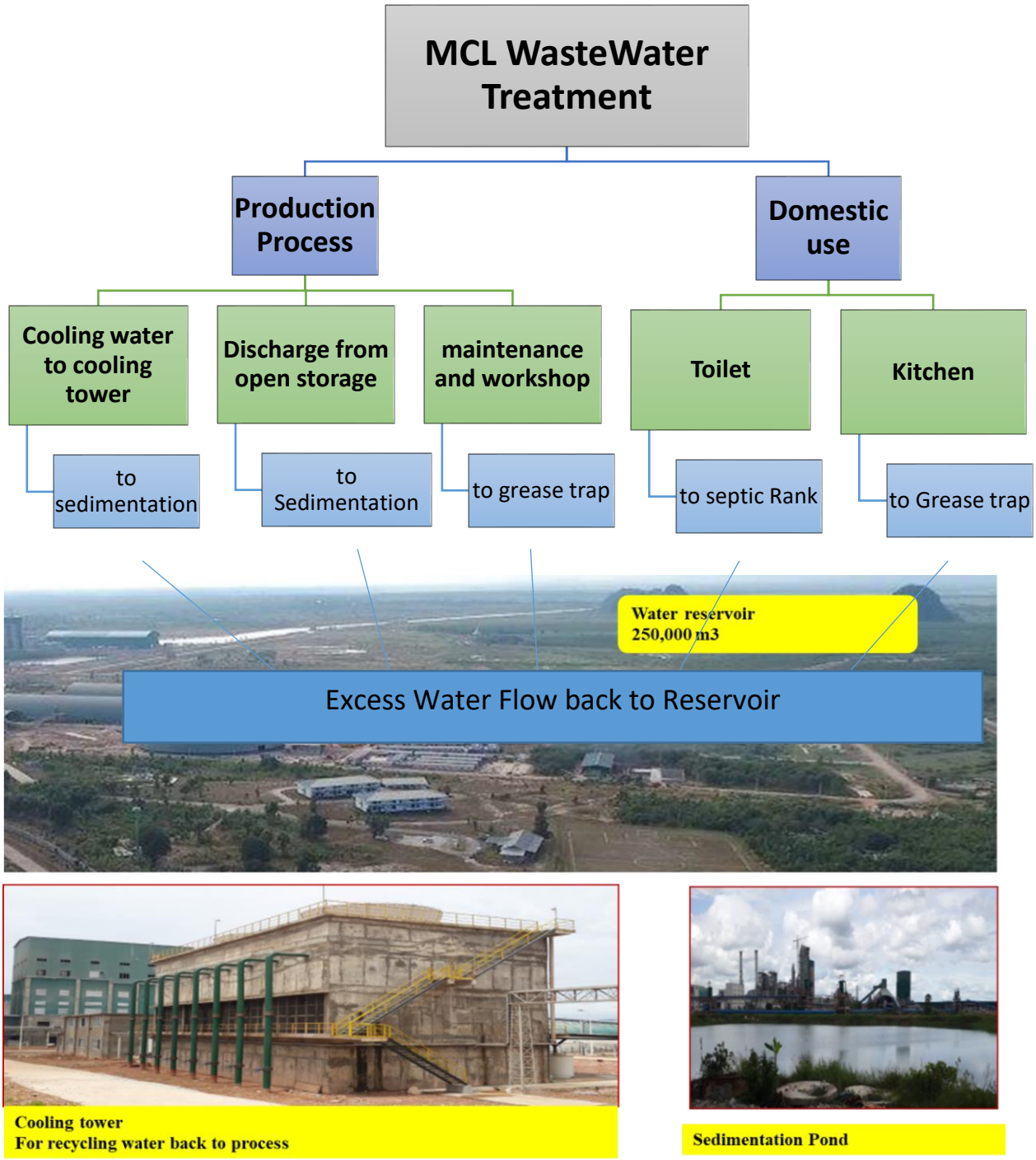


Figure 7.3-14: Water Management System in MCL

Table 7.3-11: Significance of Residual Impacts for Water Resources during Operation Phase

Component	Significance of Impacts							
	Potential Impacts	Residual Impacts						
	Consequence & Likelihood	Consequence of Impact			Likelihood of Impact			
	Negative	Severity	Spatial Scope	Duration	Frequency of Activity	Frequency of Impact	Significance of Impact	
Water Resource Impacts	Medium – High	Small	Activity Site	Life of Plant Operation	Temporary	Very seldom	Negative	
	72	2	1	4	2	2	Low	
		7			4		28	

7.3.5 Land/Soil Impact

7.3.5.1 Impact Source and Activity

There is no significant impact on land and soil during the operation phase. However, the following major activities can cause the impacts:

- Lack of drainage channel lead to soil erosion
- improper design structures that are not matched with the existing visual environment

This project is first and major project which will include various infrastructures for proposed region where there does not facilitate any project before. The project will introduce the vertical structures which can be overseen from various parts of the region.

It is anticipated that the scale of construction and operation of cement plant and quarry will certainly have visual impact on the landscape due to the introduction of different features. In this regard, MCC will use semi open cut method in developing and digging quarry. By the mean, most of the outer parts of mountain range will remain untouched and the mine pit can be hidden from outside view.

In consideration of impacts due to the change of landscape of the region, the degree of significance of visual impact could be moderate to high. Anyway, there are control measures those can be adopted during the detailed design of the project such as plant design, mining plan and growing vegetation.

Color for the cement facilities should be carefully selected. Lighter color can be utilized to complement the surrounding areas. Where technically feasible, to decrease the visibility of facilities, plantation around the building should be planned.

7.3.5.2 Impact Estimation and Evaluation

During the operation phase, the contamination of soil and subsoil is expected as a result of leaks or spills as:

- equipment containing lubricating oil and/or chemical additives used in the plant process will be placed in enclosed premises; and
- fuel-oil (heavy and light fuel oil) used as main power source for the cement plant will be stored in dedicated storage tanks, in such a manner that any possible small leakages of polluting oil can be contained.

Considering the adopted design and the mitigation measures described in the following Section, the risk of soil and subsoil contamination related to spills of oil and/or pollutants can be considered low.

7.3.5.3 Impact Mitigation Measures

The following mitigation measures will be considered to limit the impacts on land:

- the use of lighter colour and grey hues for coloring the cement plant structures and the conveyor belt to blend into the environment; and
- consultation with villages/ward to address their specific impacts.

The implementation of the above-mentioned mitigation measures is likely to reduce the negative visual impact. Where technically feasible, to decrease the visibility of facilities, plantation around the building should be planned.

Table 7.3-12: Significance of Residual Impacts for Soil Impacts during Operation Phase

Component	**Significance of Impacts**						
	Potential Impacts	**Residual Impacts**					
	Consequence & Likelihood	**Consequence of Impact**			**Likelihood of Impact**		
	Negative	Severity	Spatial Scope	Duration	Frequency of Activity	Frequency of Impact	Significance of Impact
Soil Impacts	Low – Medium	Insignificant	Activity Site	Construction	Temporary	Very seldom	Negative
	64	1	1	1	2	2	Very Low
		3			4		24

7.3.6 Solid Waste

7.3.6.1 Impact Sources and Activities

MCL has two types of wastes; 1) process waste and 2) non-process wastes.

1. Process waste Mostly are waste generate from operation process i.g. Used oil, Chemical container, Battery, 200L Tang and etc.

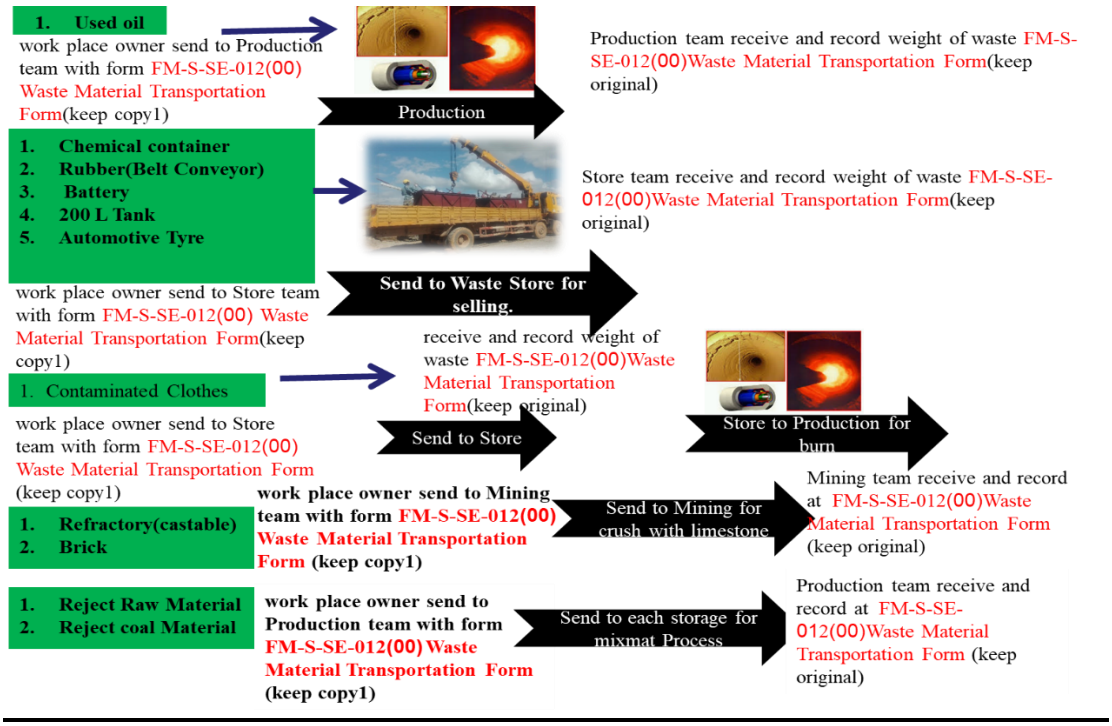


Figure 7.3-15: Flow Process of Waste in MCL

2. Non-process wastes It includes wastes from out of the cement production line. Such as sewage, food waste, paper and other associated wastes from the office and residential buildings.

7.3.6.2 Impact Estimation and Evaluation

During the operation phase, there will be several wastes generated from the Project processes (process waste) that will need to be managed in accordance with the international standards, as discussed in the following.

If not controlled properly, there could be impacts from the waste generated during the operation phase of the Project. In more detail, a not proper disposal of this waste, particularly, hazardous waste such as used oils filters, could result in potential contamination for surface water, groundwater resources and soils, which could have negative impacts on ecosystem functioning and on human health for those living close to the dump sites.

Concerning the management of general waste (like food, plastic, etc), the disposal at existing dumpsites will increase associated environmental issues such as windblown litter, vermin and other disease vectors. There are also health impacts related to the direct contact of waste scavengers with the disposed waste.

7.3.6.3 Impact Mitigation Measures

(i) Waste Management

A commercial carter will continue to pick up the municipal solid waste generated during the construction activities from the working site where it will be taken to transfer stations for eventual transport to landfills.

In any case, taking into account the proposed measures to ensure proper handling and disposal of generated solid waste (see the following section), and if all the potentially hazardous waste is disposed of correctly and the additional waste deposited at the local dumpsites can be reduced to the absolute minimum, the residual impact associated with waste generated during the construction phase should be of low significance and of a short-term duration.

(ii) Waste Minimization

The minimization of the amount of waste produced during the construction should be reached by carefully selecting materials and avoiding over-ordering and will be performed carefully selecting materials and avoiding over-ordering. Regardless of whether the solid waste is recycled or sent to a transfer company for disposal, the chosen facility will be contacted prior to initiation of construction activities so that scheduling and other details can be arranged.

(iii) Source Separation at Collection Origins

The solid waste generated during construction phase of the Project will either be recycled or sent to a transfer facility for subsequent disposal. Solid waste, addressed to be recycled and reused, needs to be source separated during the construction activities. The most efficient way to accomplish this separation is to make recycling containers available to all construction personnel (i.e. place such containers at all parts of the jobsite where work with recyclable materials is likely to occur) and make separation of materials mandatory for all workers.

(iv) Reuse and Recycling

If possible, MCL will try to sell (or donate) a range of materials for reuse and recycling in the local community and/or regionally. Furthermore, in case of hazardous one (such as lead acid batteries) the recycling process will be undertaken in an appropriate way to avoid H&S and environmental issues.

Concerning re-use, some of the more inert waste, such as mortar, concrete, etc. can be reused for example in the construction of access roads, hard standings or car parks. Furthermore, it may be possible to sell or hand out some excess materials (wood or metals) to be reused or recycled in the local communities.

(v) Treatment

Treatment will be undertaken for some type of waste that cannot be recycled (such as used oil filters). If the needed treatment facilities are not present locally, such waste should be exported to other countries that have the facilities to ensure their treatment and disposal in compliance with the needed environmental, health and safety requirements; and will be the only possible solution for waste that cannot be reused or recycled. In any case, the main mitigation to reduce the impact due to disposal of waste at the dumpsite will be to minimize the amount of waste that is sent there through the waste minimization and reuse/recycling measures outlined above.

In any case, it is important to note that if all the potentially hazardous waste is disposed of correctly and the additional waste deposited at the local dumpsites can be reduced to the absolute minimum, the residual impact associated with waste generated during the operation phase should be of low significance.

(vi) MCL Waste Management System

MCL solid wastes can be classified as the followings;

Waste Lists for Burn at Kiln	Waste List for Sell	Waste List for Reuse	Waste List for Landfill	Other Wastes
1. Used oil 2. Contaminated Clothes 3. Gloves 4. Plastic packaging (Wrap, Bigbag) 5. Paper packaging 6. Grease 7. Mask	1. Stainless steel, Liner 2. Normal steel 3. Wooden packaging 4. Pallet 5. Brick 6. Can 7. Plastic bottle 8. Chemical container 9. Rubber (Belt Conveyor) 10. Battery 11. Wire 12. Cable 13. 200 L Tank 14. Glass, mirror 15. Used Cement bags	1. Refractory (castable) 2. Reject Raw Material 3. Reject coal Material	1. Compostable waste	1. Light Bulb 2. Fuse 3. Package Contaminated (Used Paint Can) 4. Insulation 5. Fluorescent tube 6. Dry cell battery 7. Lab equipment 8. Foam 9. Spray

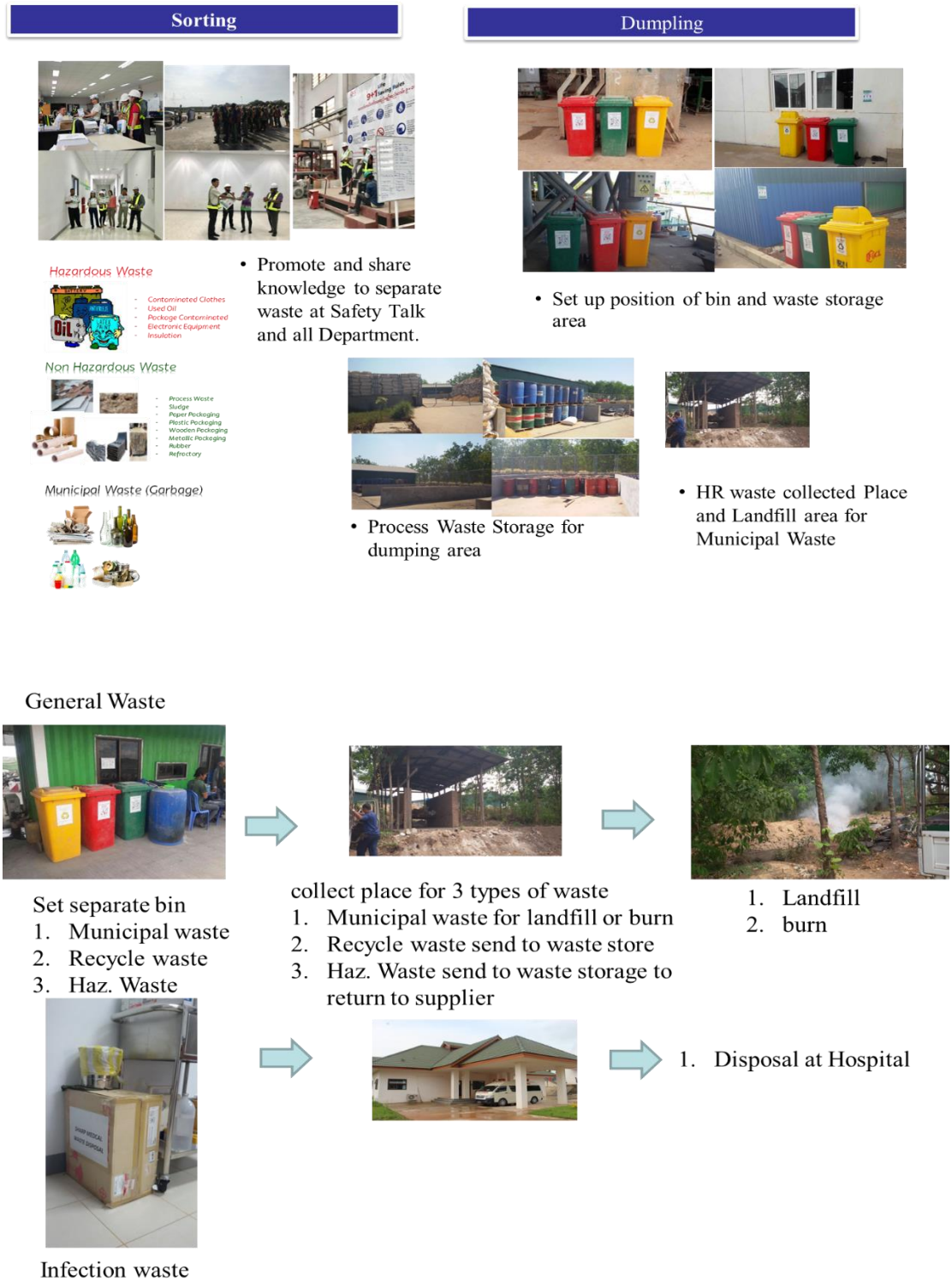


Figure 7.3-16: Example of Waste Management Activities in MCL

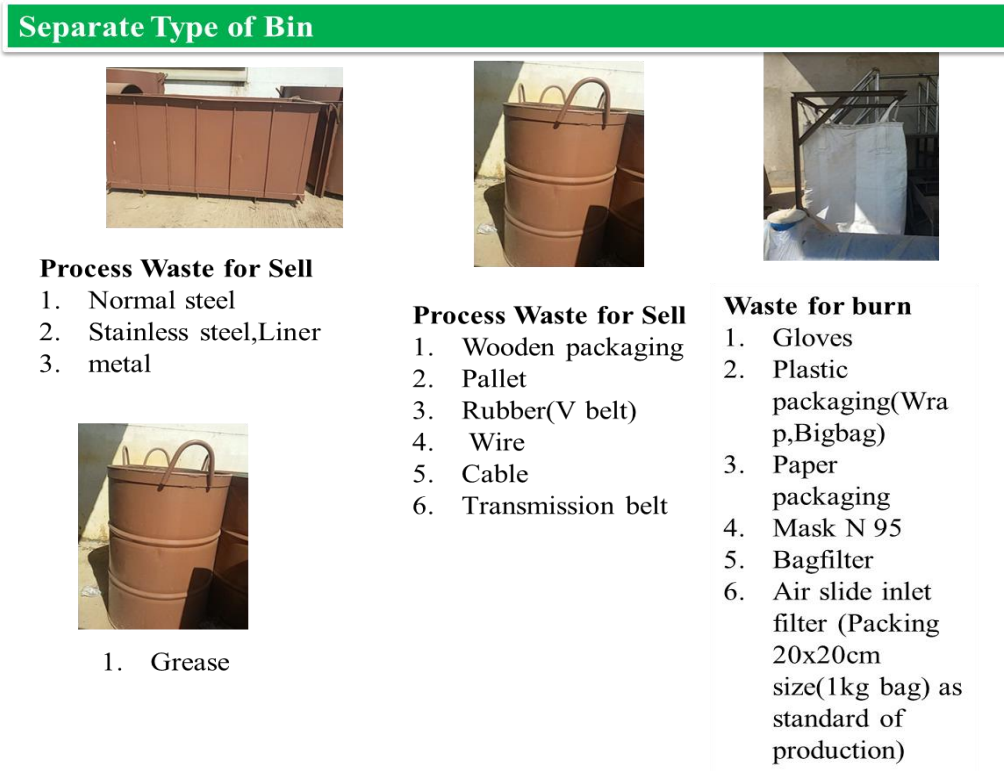


Figure 7.3-17: Type of Bin in MCL

Figure 7.3-18: Location of Process Waste Bin in MCL

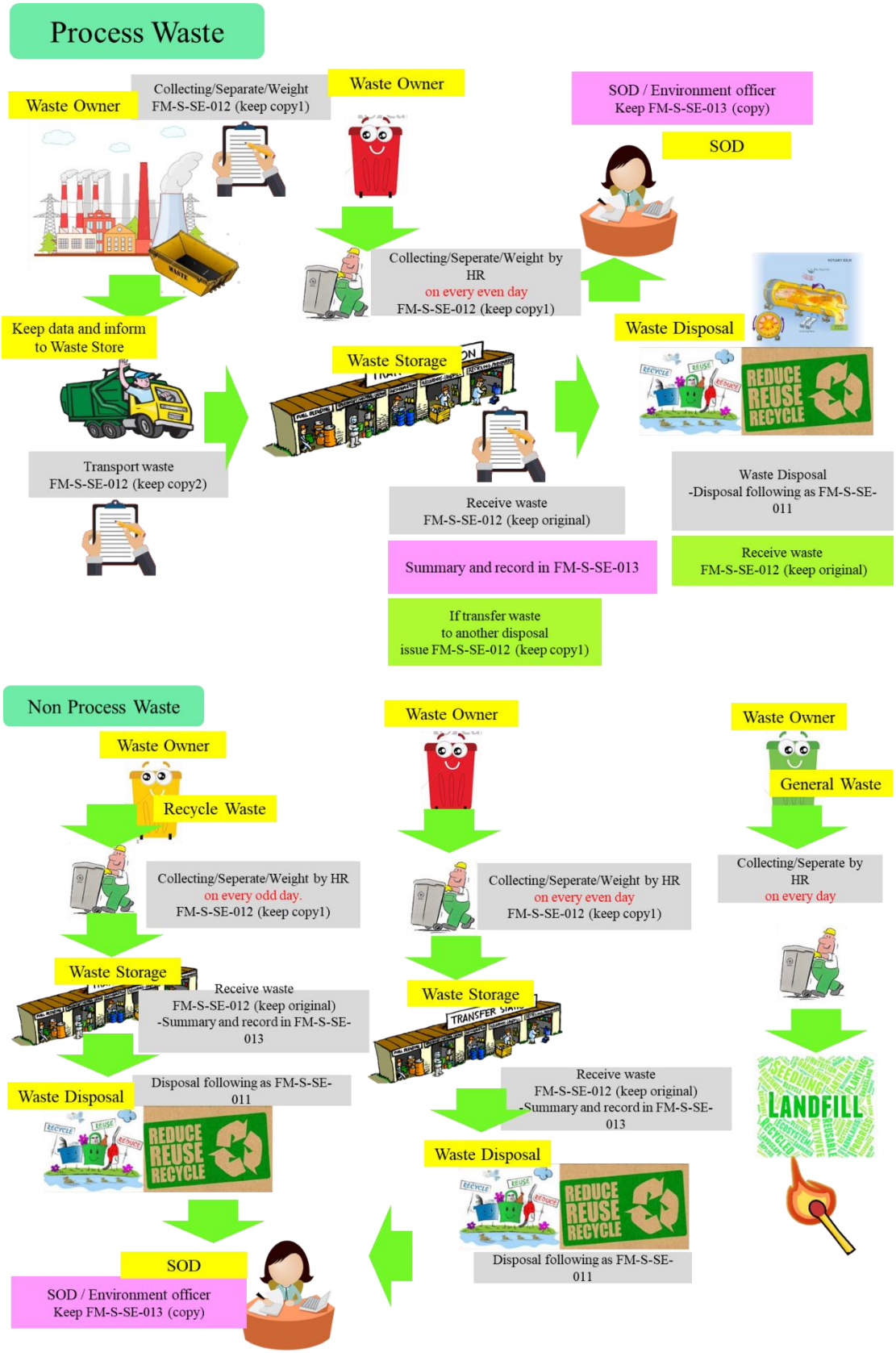


Figure 7.3-19: Process of Waste Management in MCL

Table 7.3-13: Significance of Residual Impacts for Solid Waste during Operation Phase

Component	Significance of Impacts							
	Potential Impacts	Residual Impacts						
	Consequence & Likelihood	Consequence of Impact			Likelihood of Impact			
	Negative	Severity	Spatial Scope	Duration	Frequency of Activity	Frequency of Impact	Significance of Impact	
Solid Waste Impacts	Low	Insignificant	Activity Site	Construction	Temporary	Very seldom	Negative	
	30	1	1	1	2	2	Very Low	
		3			4		12	

7.3.7 Biodiversity

7.3.7.1 Impact Sources and Activities

The existing flora can be mainly impacted from the site clearance activities during pre-construction phase and construction phase. The related fauna dependent on those floral existence might be also suffered in site specific and short-term but permanently. Also, the construction period has been completed in this case. During operation and decommissioning phases, the production of cement process might not be occurred to impact the biodiversity components.

7.3.7.2 Impact Estimation and Evaluation

(i) Fauna

Impacts on fauna during the Cement Plant operation phase are mainly linked air and noise emissions and effluent discharges.

Considering the outcomes of the previous sections (absence of critical endangered, endangered and vulnerable species and habitats) and the overall low entity of the impacts on air quality, noise and water resources described above, the impacts related to the cement plant operation phase can be considered as negligible.

Quarrying/blasting operations and vehicular movement may compel the native fauna to vacate the immediate vicinity. Among the listed species, there are no endangered species in the cement plant area. It is noted that the faunal species of the surrounding area is generally mobile, hence no territorial needs will be affected by the works. In any case, noise may disturb animal breeding, feeding and migration patterns.

Considering the outcomes of the previous sections (absence of critical endangered, endangered and vulnerable species and habitats) and the overall low entity of the impacts on air quality, noise and water resources described above, **the impacts related to the limestone operation phase can be considered as negligible.**

Finally, there are no anticipated impacts on fauna caused by the operation of cement plant and conveyor belt.

(ii) Flora

With reference to the cement plant area, air pollution causes some damages to vegetation cover at cement plant through movement of vehicles and maintenance activities in operation phase. Air pollution causes damages on the on-site vegetation, through the decrease of the absorption of light intensity for the plant growth and pollination. Most of the effects of dust particles on plants include the potential to block and damage the stomata such that photosynthesis and respiration are affected. Pollutants such as dust, gaseous emissions and air- borne particulates will be produced and get deposited on the plants. This will no doubt affect the physiological activities of the plants most especially those around the cement plant area such as in photosynthesis and respiration. The implication of these is that some of the plants may have retarded growth while others may be eliminated.

The floral species identified in the study area as well as the floral community listed in the existing literature are regarded as common species suggesting a low environmental value. However, the degree of land disturbance is high and permanent loss of the vegetative cover is highly likely to occur in the designed working areas (quarry sites) and regarded of significant effect in terms of visual contrast and aesthetics of the receiving area.

As concern the conveyor belt there is no significative adverse impact on flora is foreseen during operation phase.

7.3.7.3 Impact Mitigation Measures

- routine checking of trenches (if any) and escape routes to minimize, if not prevent, entrapment of fauna;
- washing down of vehicles in place and prior to commencing work;
- preservation of excavated topsoil for future site restoration procedures particularly in highly disturbed areas;
- limiting vehicular transport to defined roads as to prevent unnecessary injury, habitat destruction and complying with safe driving procedures;
- reporting of any violation relating to hunting and trading activities;
- implementing good housekeeping practices on the field and implementing good Solid Waste Management Plan in order to eliminate any source of hazard to the native fauna;
- minimize vegetation clearance and habitat disturbance by demarcating the clearing boundaries in the quarry site;
- unnecessary cleaning the trees is to avoid;
- environmental awareness training to be given to all workers for the preservation of local biodiversity species and induct the nature of the sensitivity of project area;
- site specific instruction/protocol for identifying and relocation of plant and wildlife species if necessary, shall be provided to all workers with education materials including photographs; and
- works areas in temporarily affected areas shall be reinstated with tree/shrub /grass upon completion of the works;

Table 7.3-14: Significance of Residual Impacts on Flora and Fauna during Operation Phase

Component	Significance of Impacts							
	Potential Impacts	Residual Impacts						
	Consequence & Likelihood	Consequence of Impact			Likelihood of Impact			
	Negative	Severity	Spatial Scope	Duration	Frequency of Activity	Frequency of Impact	Significance of Impact	
Impacts on Flora and Fauna	Low	Insignificant	Activity Site	Life of Plant	Annual	Very seldom	Negative	
	48	1	1	4	1	2	Very Low	
		6			3		18	

7.3.8 Socioeconomic Condition

7.3.8.1 Impact Sources and Activities

It is sure that the operation phase of the project can bring more positive impacts than negative impacts such as increase in employment rate, experience with better health care services and other CSR programs by the project.

7.3.8.2 Impact Estimation and Evaluation

Social impact assessment (SIA) was undertaken and it is a proactive tool used to understand the potential impact, adverse or beneficial, that proposed project could have on the affected communities and to recommend effective mitigation measures to reduce those identified impacts to less significance.

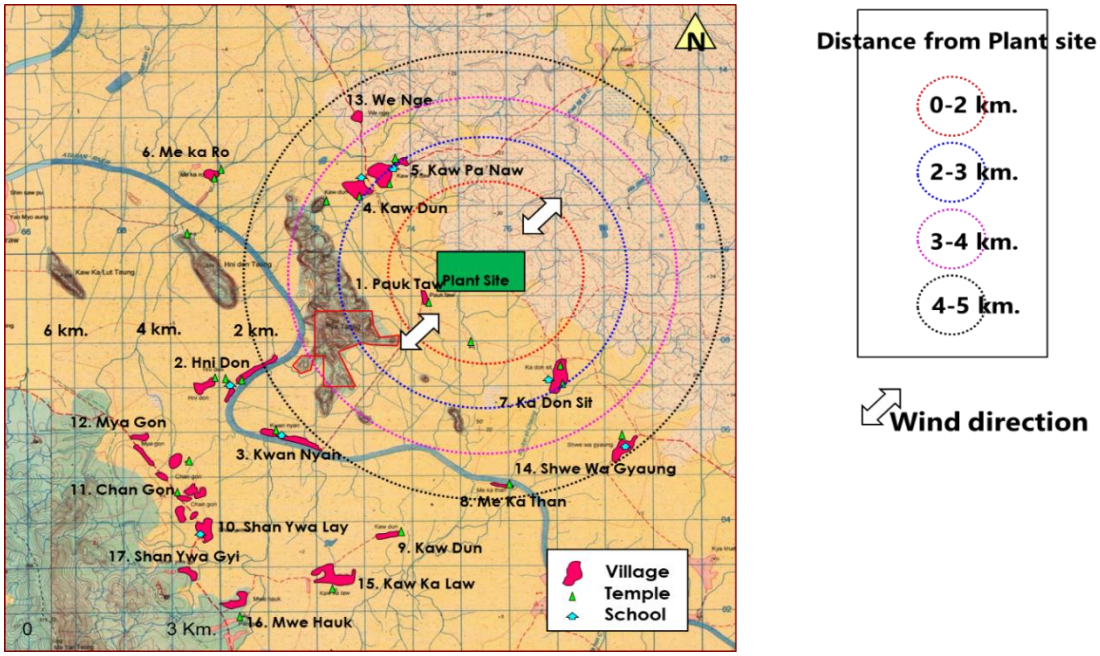


Figure 7.3-20: Socioeconomic Survey Area Within 3-5 km from Plant Site

(i) Road accident

During the operation phase, there will not have potential traffic increase on the road where local people are using for their transportation. The volume of vehicles carrying raw materials will be very low during the operation period as coal transportation will be relied on water way. Besides, proper traffic management plan is to be adopted and local road improvement scheme is to be developed without interfering the existing transportation system of local people.

Ataran River is the most important for the communication and transportation for Kyaikmaraw Township. Local residents use this water for transportation of goods and navigational purpose by private boats. There are total of 29 boats running as ferry services along the Ataran River around the project site.

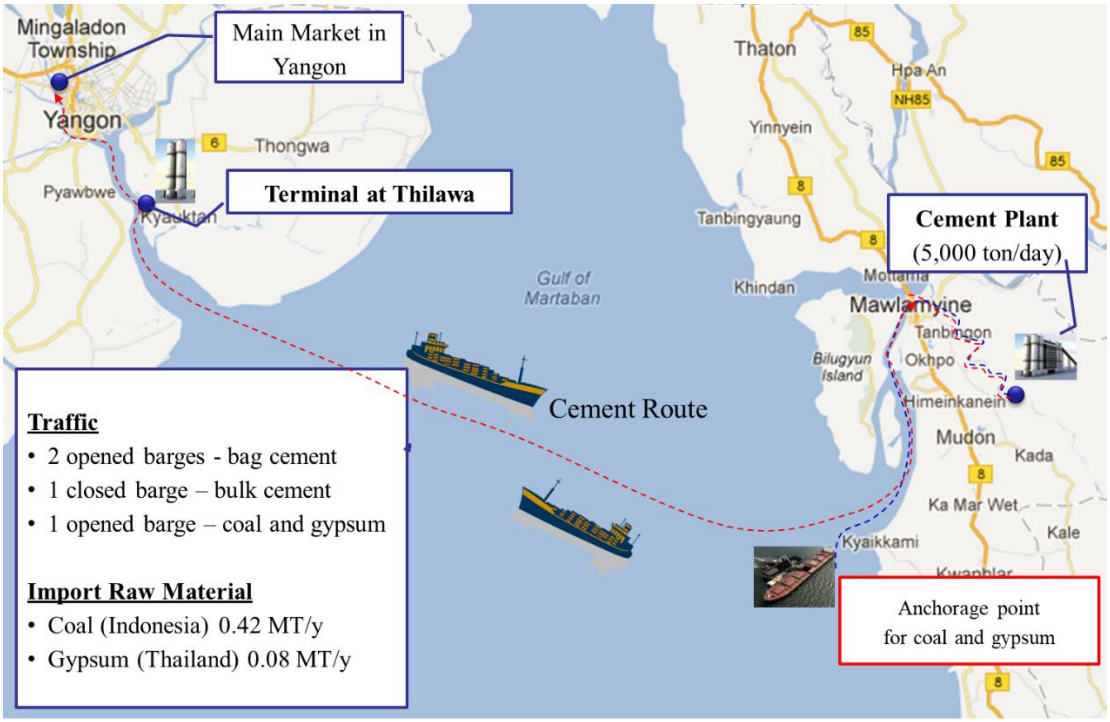


Figure 7.3-21: Overall Logistic Model of the Project

Ataran River will be used for the main water way for transportation of raw materials for the power plant. The volume of barges will be used for transportation of coal and other materials (including bag cement and bulk cement) will be 3 to 4 barge per day. It is anticipated that traffic issues generated by the transportation in operation phase will not have a significant impact. The width of barges is 15 to 15.5 meter and the width of the river is 100 meter so the traffic congestion should not be considered as high.

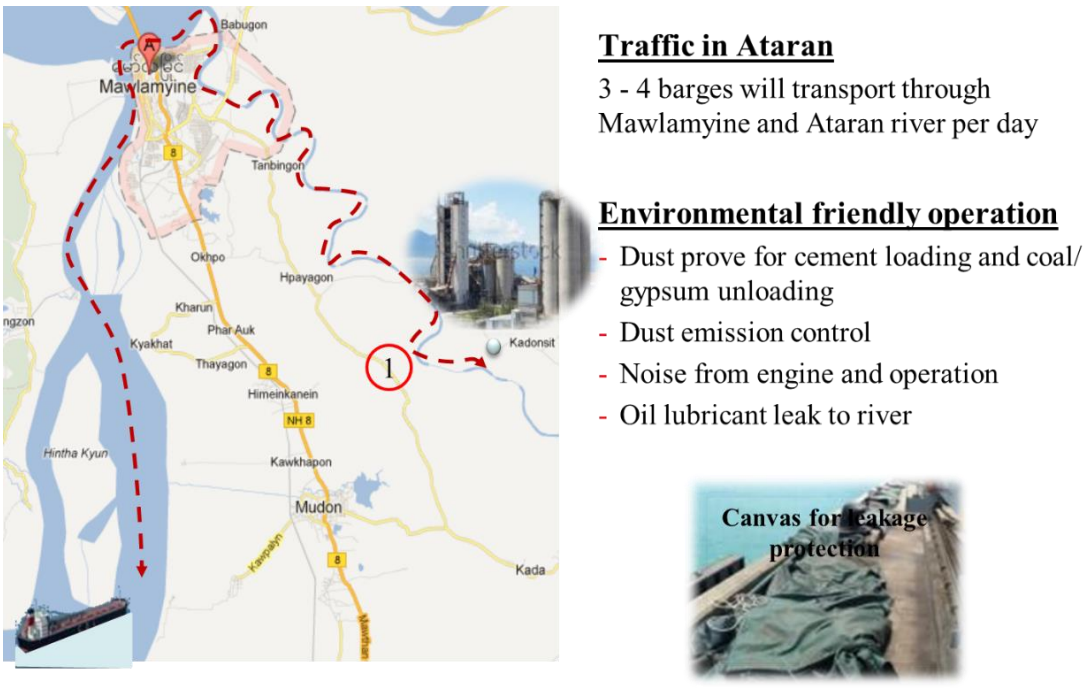


Figure 7.3-22: Waterway Transportation of the Project in Ataran River

The sizes of vessels are:

Lighter		**Motor barge**	
Length:	62 m	Length:	75m
Beam:	15m	Beam:	15m
Depth:	5.5m	Depth:	5.5m
Draft:	4.0m	Draft:	4.0m
Cement loading:	5,000ton	Cement loading:	2,500ton

The other minor impact is wave from cruising upstream affects accomondations and fish boat/ passenger boat along the river.

During the first period of operation of the coal power plant, an increase of vehicular traffic is expected to be very low as transportation of coal will mainly be rely on water way. Thus, the dust and noise impacts resulting from traffic transit transportation will be low.

(ii) Health Impact Assessment

The aim of the Health Impact Assessment (HIA) aspect of the study is to determine the potential effect that construction and operation of the Mawlamyine Cement Project will have on the local communities' health and the capacity of local health services to cope with any increased demand for services in terms of equipment, trained personnel, medicines and the balance between the community and workforce needs.

The objectives of the HIA are:

- To identify and evaluate all short, medium -and long-term impacts of the project on the health of all stakeholders in all project phases within an agreed geographical boundary so that any potential negative impacts can be reduced or avoided, and positive impacts enhanced.
- To recommend and justify specific, practical measures for mitigating negative and enhancing positive health impacts.

The focus of the health impacts will be the communities near the cement plant site, jetty site and quarry site; affected communities were determined by the social studies and the same groups will be considered for health impacts. However, health impacts in surrounding villages also were addressed, reflecting the potential for communicable, including sexually transmitted, infections to impact this town.

Due to the need to consider capacity of hospitals, clinics etc., to deal with the potential extra demands that the existence of the Project may place upon them (especially during construction), the health of residents in these villages also need to be considered, as be the status of the clinics in these locations.

(iii) Impacts on Community Health

The main impact which may affect local communities residing close to the Project areas during the Project construction phase is related to the increase in the heavy vehicle traffic.As mentioned before, the risk of increased prevalence of diseases deriving from the foreign

workforce is considered minor. During this phase the risk of incidents and process characteristics which might affect community health and safety remains unchanged with respect to the normal operation (pre - and post expansion) of the facilities.

A significant traffic volume increase, especially on the road, is expected to occur during the construction activities within the cement plant as well as during the construction of the conveyor belt, all along the path till the quarry, and for the realization of the worker camp. In any case, heavy traffic movement will negatively impact the road condition; will cause disturbances to road bordering residents due to noise, and dust, which might damage crops and structures close to dirt roads, as well as disturbances and temporary disruptions to local traffic. Furthermore, a significant increase in traffic levels combined with a number of factors including poor current road conditions, uneven surfaces and the limited understanding of road safety among local drivers and pedestrians is likely to increase the number of accidents. These might particularly involve the numerous motorbikes and pedestrians using local roads, especially vulnerable groups (i.e.: children walking to school).

No information is currently available regarding the possible Project need to enlarge the existing roads to facilitate trucks traffic or the possibility to create new access roads.

(iv) Labour and Working Conditions

The current workforce of the plant totals 394 employees approx. (Myanmar, 95 % of which are from mainly from Mon State and nearby area such as Kayin State, Bago division, Yangon etc. and Thai, 5 % of which are from Thailand), which will work during the operation phase. In terms of employment opportunities for local communities, it is therefore expected that only few new workplaces will be created both during the construction (mainly unskilled workers) and operation phases.

To meet IFC requirements, the Client will develop appropriate HR policies, procedures and employment contracts compliant with the Myanmar labor legislation and IFC PS2 to be applied to temporary and permanent workers, construction workers, operation workers, third- party and supply chain workers. The procedures should include:

- a human resources policy;
- working conditions and terms of employment, to be clearly communicated to workers on the commencement of their employment and to be applied also to migrant workers (including anticipated duration of the contract for temporary workers);
- measures to guarantee fair treatment both for local and migrant workers, non-discrimination & equal opportunity and avoidance of child and forced labor, especially within the supply chain;
- a grievance mechanism to be disseminated among and accessible by all workers (including third party workers); and
- measure to protect the workforce from health and safety risks.

Overall, taking into account the mitigation measures implemented, the impacts related to Labour and Working Conditions both during the construction and operation phase are considered having a medium significance.

(v) Occupational Health and Safety

The health and safety risks in a cement plant during operations include potential for respiratory diseases, burns, allergies and industrial accidents. Additional hazards can arise from the use of chemicals in the process and explosive materials used in quarrying activities. All such hazards can be successfully controlled by the adoption of safe plant methods, training programs and OHS management systems. The introduction of health and safety measures by the Client into the plant management will be reflected in a strong enhancement of the OHS conditions of the Project workers compared to the current level.

7.3.8.3 Impact Mitigation Measures

(i) Overall Mitigation Measures

The following measures in line with GIIP and PS2 will be adopted to avoid, minimize and mitigate the negative health and safety impacts of the Project construction and operation:

- adopting and training all personnel (including contractor workers) in the use of Personal Protective Equipment (PPE) and chemical handling;
- clear marking of work site hazards (especially close to high temperatures and open tanks) and training in recognition of hazard symbols;
- adoption of work site hazards signage both in Chinese and Myanmar language;
- training of all personnel in health and safety risk prevention and protection;
- regular noise surveys to ensure the on-site maximum levels are not exceeded;
- development of inspection, testing and maintenance programs for machinery and equipment;
- accident recording and investigation and prevention initiatives;
- development of and training in site emergency response plans both for the construction and operation phase; and
- Compliance to all international, national or local HS standards that may exist.

Figure 7.3-23: MCL Management for Public Health and Safety

(ii) Mitigation Measures for Community Health and Safety

Overall, the potential impacts on existing community health and safety can be considered as low due to the temporary features of the construction phase and considering the mitigation measures:

- to establish of a grievance mechanism with the aim of receiving and facilitating resolution of affected communities 'concerns and grievances, including thus related to Project traffic;
- to develop an annual medical surveillance program for project employees to monitor the trend and pattern of communicable disease and foresee health awareness raising campaigns as part of them heal and safety induction.
- a series of traffic measures should be also considered :dust suppression measures, as vehicle speed restrictions, wheel washing area installed at all site access points, containment for dusty materials, and frequent watering or covering of exposed areas of ground, and prompt site restoration;
- installation of appropriate temporary road sign points on the roads used by Project traffic at bends, junctions, schools and populated areas;
- definition of speed limits and make sure that they are respected by Project drivers) including contractors;)
- guarantee proper vehicle maintenance to reduce noise and accidents;
- maintain the Project roads to reduce the possibility of accidents, including clearing of vegetation on to improve sight distance and visibility;
- adopt a Traffic Management Plan to ensure traffic safety, which should foresee safe drive trainings, regular alcohol and drug tests for drivers and driving restrictions during rush hours (especially close to schools);
- if road enlargements are required close to settlements, foresee a pedestrian path and/or provide pedestrian alternative walkways to reach the main points of interest (i.e., schools, markets, etc); and

- engage with local communities through traffic safety awareness campaigns.

During the first period of operation of the cement plant, an increase of vehicular traffic is expected, because of the higher number of trucks necessary to transport the produced cement bags. This should be a transition solution until the planned increase in the number of boats for the transportation via river. During this temporary phase, trucks will travel only on paved roads therefore, the dust and noise impacts resulting from traffic transit transportation will be medium.

In any case, till the transportation of the finished product will be mainly transported via Ataran river, a potential impact on local population due to noise and risk of vehicular accidents is not expected. Taking into consideration the provisional nature of such situation, the related potential impact can be considered as low.

No variations are expected in the number of vehicles supplying process materials to the plant while raw material will be continued to be supplied off-road from the quarry (shifting to conveyor belt).

It has to be underline that a positive impact is associated to the use of the conveyor belt connected to the transportation of the raw material through a sealed belt. It will considerably reduce the quantity of dust which was formerly released during the transportation via open buckets of the existing road.

In conclusion, the adoption of the following measures will allow mitigating the negative impacts resulting from the Project traffic during the operation phase:

- to install appropriate road signage on the roads used by Project traffic at bends, junctions, schools and populated areas;
- to define speed limits and make sure that they are respected by Project drivers (including contractors);
- to maintain the Project roads in order to reduce the possibility of accidents, including clearing of vegetation on to improve sight distance and visibility; and
- to adopt a Traffic Management Plan to ensure traffic safety, which should foresee safe drive trainings and regular alcohol and drug tests for drivers.

Table 7.3-15: Significance of Residual Impacts on Socioeconomic Activities during Operation Phase

Component	Significance of Impacts						
	Potential Impacts	Residual Impacts					
	Consequence & Likelihood	Consequence of Impact			Likelihood of Impact		
	Positive	Severity	Spatial Scope	Duration	Frequency of Activity	Frequency of Impact	Significance of Impact
Socioeconomic condition	Medium – High	Great	Local area	Life of Plant	Regularly	Highly likely	Positive
	90	4	3	4	4	2	Low – Medium
		11			6		66

7.3.9 Cultural Heritage

7.3.9.1 Impact Sources and Activities

The area, which will be used for this purpose, does not have historical and archeological importance and thus the risk of encountering historical finds is negligible.
The conveyor belt path will follow areas with no archeological importance: it is an area characterized by the presence of grass and shrub lands and agricultural land, therefore the risk of encountering historical finds is very low.

In conclusion, considering the surveys performed and the literature documentation examined, there are no potential ancient above ground resources in the Project area which may be impacted during the construction works. In any case, a Chance Find Procedure shall be developed for the Project to be applied in case unknown cultural heritage sites/remains will be found during construction and operation phases. The objective is to protect previously unrecorded cultural heritage sites, objects, or features from Project-related damage and unexpectedly discovered during excavation works. The procedure, in accordance with national and international requirements in this field, must outline roles, responsibilities and the response times for project staff in case unknown heritage resources are encountered, clear instructions to deal with the findings (including the possible involvement of an expert) and potential work stoppages that could be required.

7.3.9.2 Impacts on Cultural Heritage

The surveys performed on the document examination and hearings from the regional cultural visiting sites whether to consider the potential impacts by the project activities. There are no potential cultural heritage list above ground resources in the Project area.

Table 7.3-16: Place of Site Visit

No.	Place	Coordinates	Distance from the Project (km)
1	Kyaikmaraw Pagoda	16°22′40" N 97°44′8" E	10.47
2	Sabei Cave	16°22′23" N 97°46′22" E	6.42
3	Pauk Taw Village	16°21′42" N 97°49′9" E	1.34
4	Kawtkit Pagoda	16°21′7" N 97°49′41" E	1.02
5	Kyauk KaLauk Cave	16°20′46" N 97°49′7" E	2.06
6	Kayone Cave	16°32′0" N 97°42′54" E	23.07

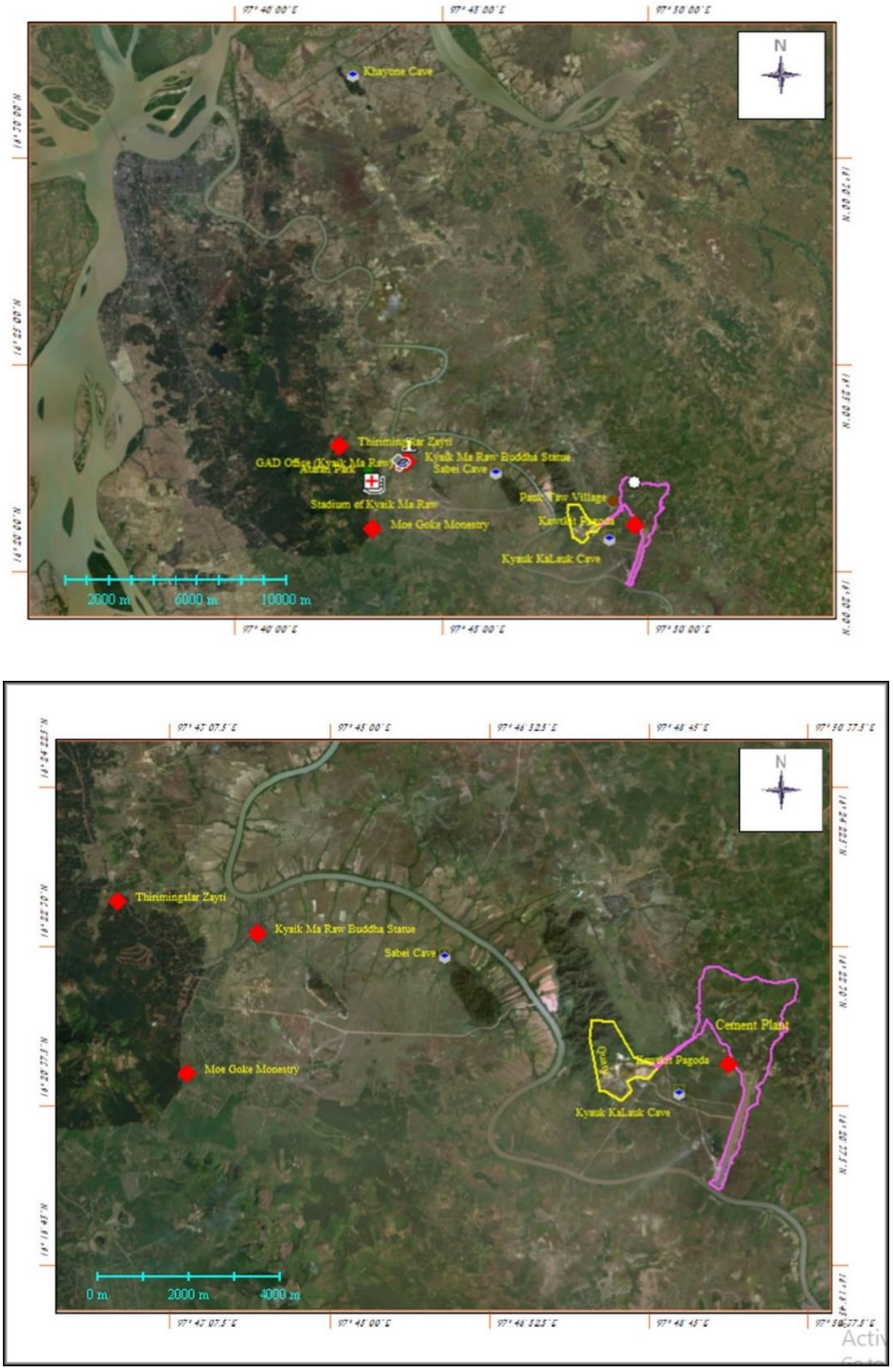


Figure 7.3-24: Existing Famous Cultural Sites within Kyikmaraw Township

The planned construction **for cement plant** will be realized within the boundaries of the grass land and showing the present condition of negative land use and no cultivation. In addition, the vibration results were 0.0025 mm/sec which is under thus **no impact on any cultural heritage site is expected**.

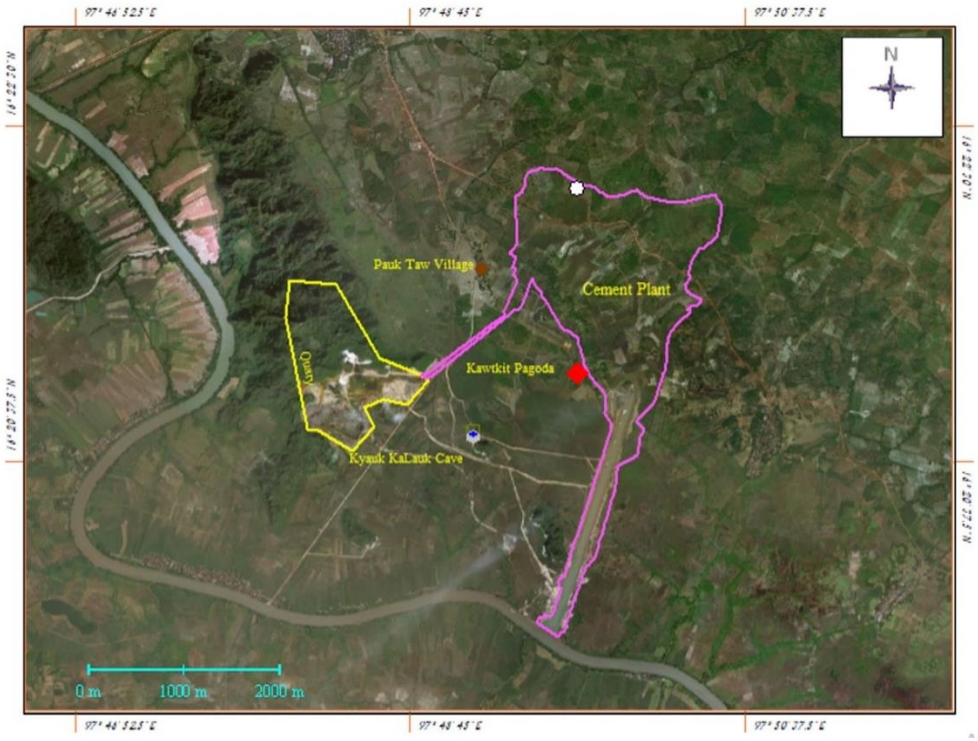


Figure 7.3-25: Existing Culture Sites within the Project Boundary

There is a pagoda, Kawtkit Pagoda and a cave, Kyauk Ka Lauk Cave within 3 km circle, with 1.02 km, 2.06 km, respectively. However, they were not in the cultural heritage list and the project doesn't have any effect on them.

The construction work will only foresee surface interventions and vegetation removal with very limited ground excavations. The area which will be used for this purpose does not have historical and archeological importance and thus **the risk of encountering historical finds is negligible**.

The **canal alignment** will follow areas with no archeological importance: it is an area characterized by the presence of grass and shrub lands, therefore the risk of **encountering historical finds is very low**.

7.3.9.3 Mitigation Measures

(i) Mitigation measures for Cultural Heritage

In any case, a Chance Find Procedure shall be developed for the Project to be applied in case unknown cultural heritage sites/remains will be found during construction activities.

The objective is to protect previously unrecorded cultural heritage sites, objects, or features from Project-related damage and unexpectedly discovered during excavation works.

The procedure, in accordance with national and international requirements in this field, has to outline roles, responsibilities and the response times for project staff in case unknown heritage resources are encountered, clear instructions to deal with the findings (including the possible involvement of an expert) and potential work stoppages that could be required.

(ii) Standard Provisions for New Cultural Heritage Finding

Standard provisions in construction contracts in Myanmar foresee the following steps in case of chance finds:

- to interrupt the construction activities in the chance, find;
- to delineate the discovered site or area;
- to secure the site to prevent any damage or loss of removable objects;
- to notify the supervisory Engineer who in turn will notify the responsible local authorities;
- responsible local authorities and the relevant Ministry would be in charge of protecting and preserving the site before deciding on subsequent appropriate procedures;
- decisions on how to handle the finding shall be taken by the responsible authorities and the relevant Ministry (this could include changes in the layout, conservation, restoration and salvage);
- implementation for the authority decision concerning the management of the finding shall be communicated in writing by the relevant Ministry;
- Construction work could resume only after permission is given from the responsible local authorities and the relevant Ministry concerning safeguard of the heritage.

In this framework, the Client HSE Manager shall conduct routine inspections of site activities to assess the potential for chance finds at work sites. He/she will also supervise sites where chance finds were unearthed to ensure that the correct control procedures and engagement activities were performed. Induction training will be organized to Project staff and contractors to disseminate the Chance Find Procedure.

7.3.10 Natural Disasters: Flood

The proposed project region is usually the flood area while in the wet season and the seasonal flood is used to occur every year as mentioned in Chapter 4. The following pictures represent the condition of project area during survey period.

Figure 7.3-26: Surveys at Proposed Project Area

(i) Road Map for Flood Protection Management

Geographical and site survey were done for flood way at the project site with the continuous monitoring system.

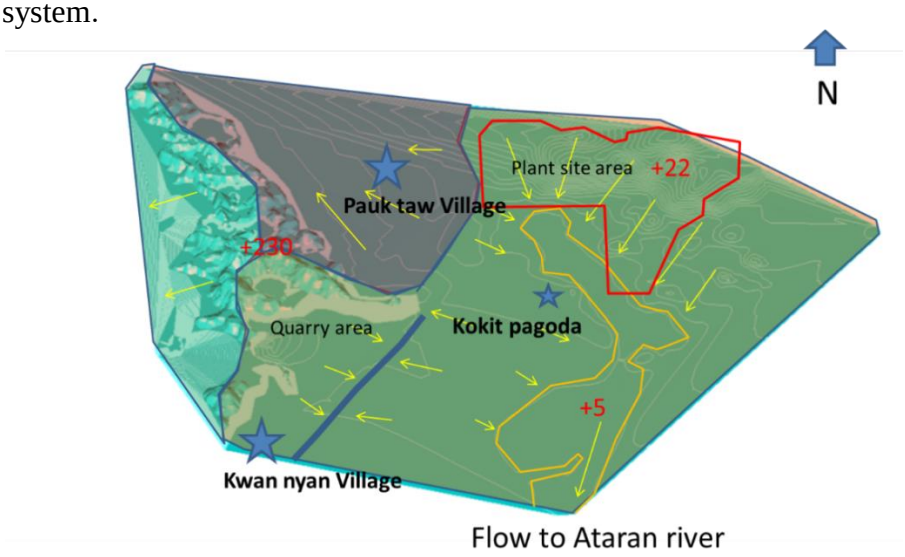


Figure 7.3-27: Watershed Model (Normal Condition without Project)

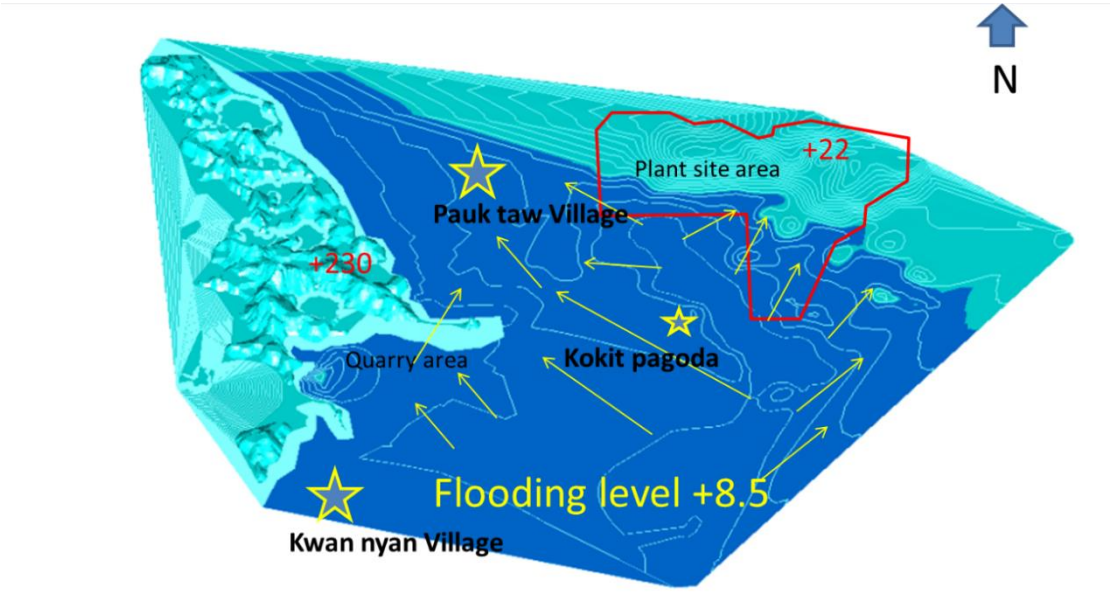


Figure 7.3-28: Watershed Model (Flood Condition without Project)

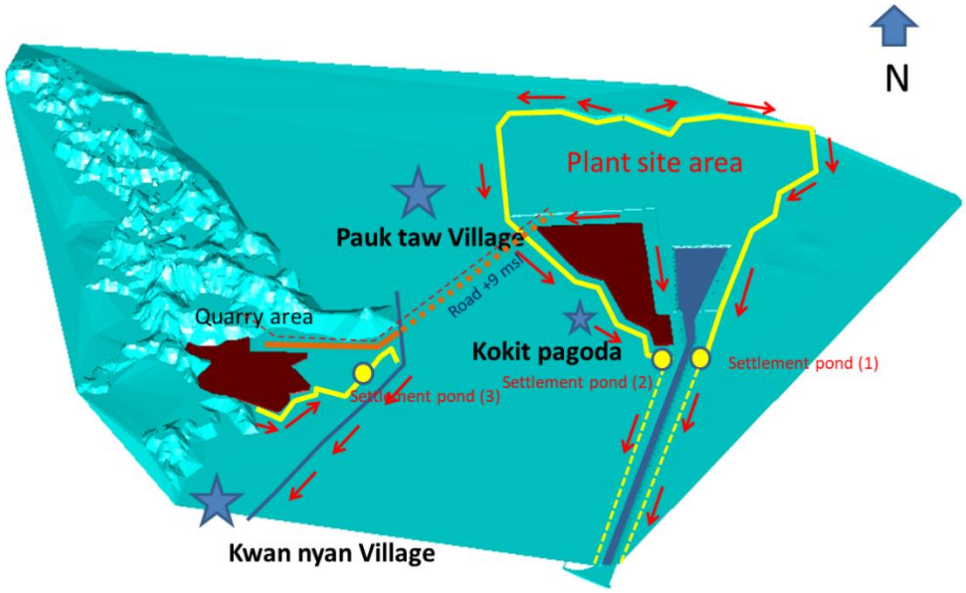


Figure 7.3-29:Drainage Model (Normal Condition with Project)

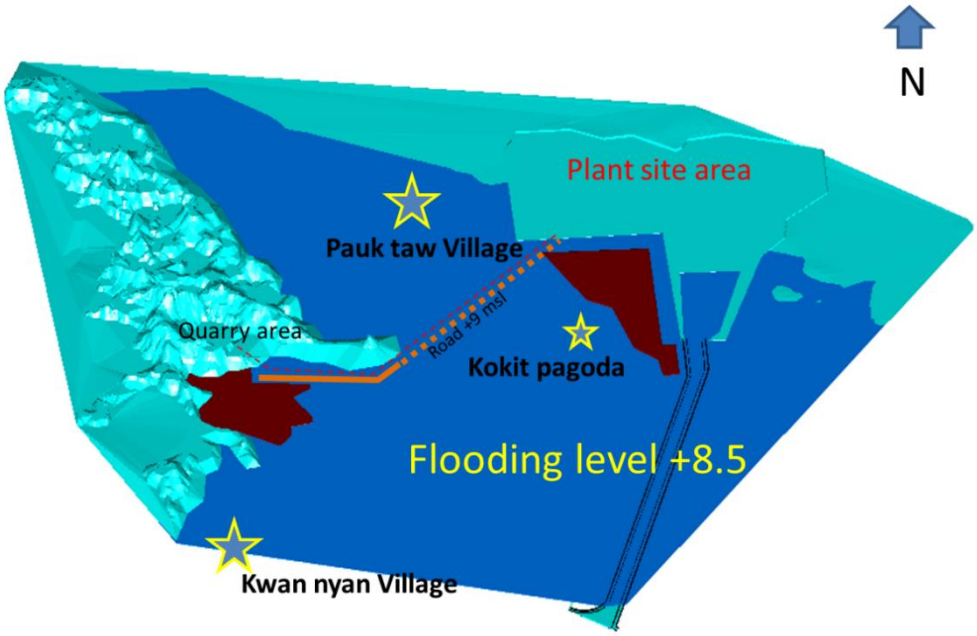


Figure 7.3-30: Drainage Model (Flood Condition without Project)

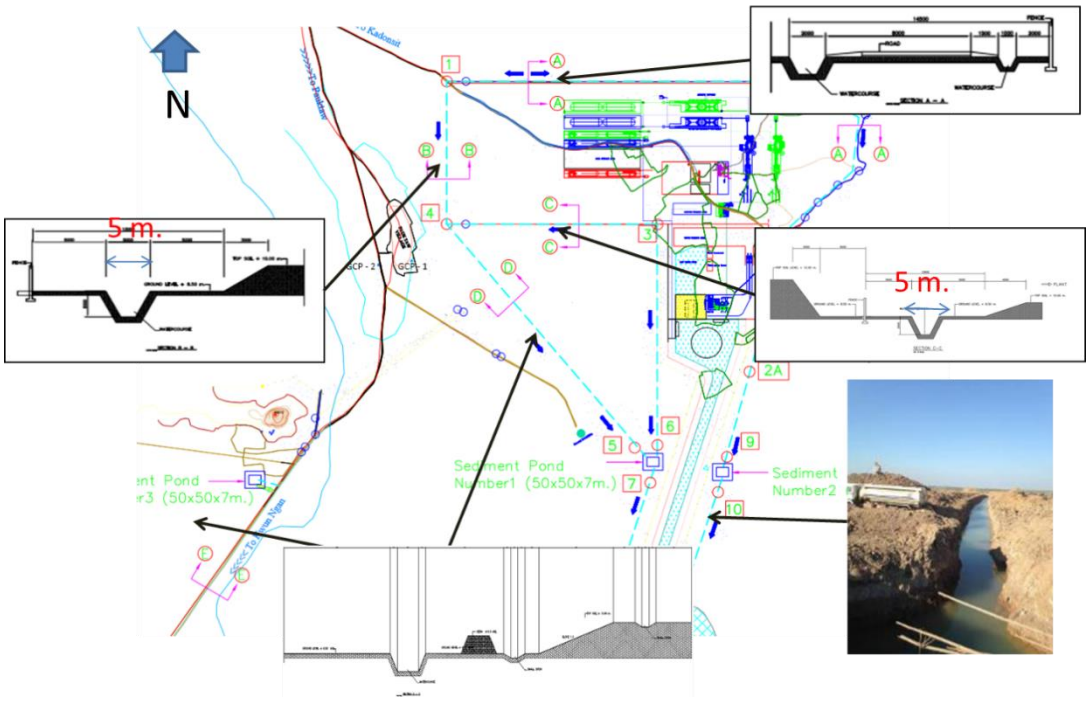
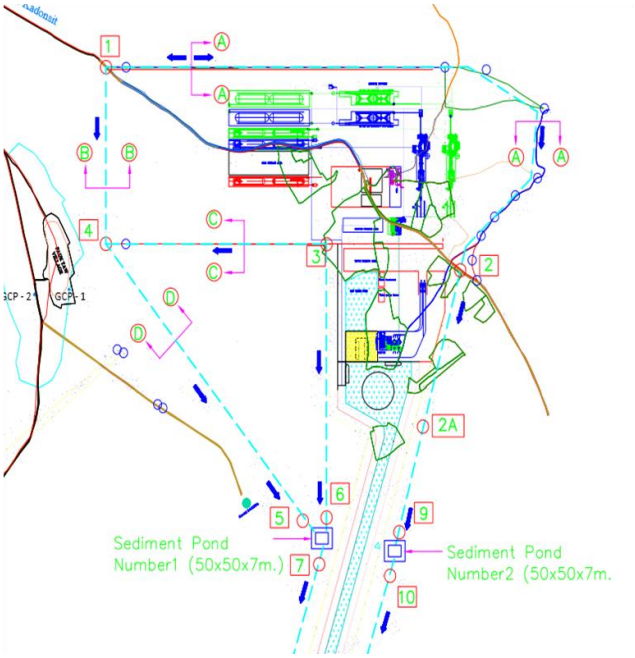
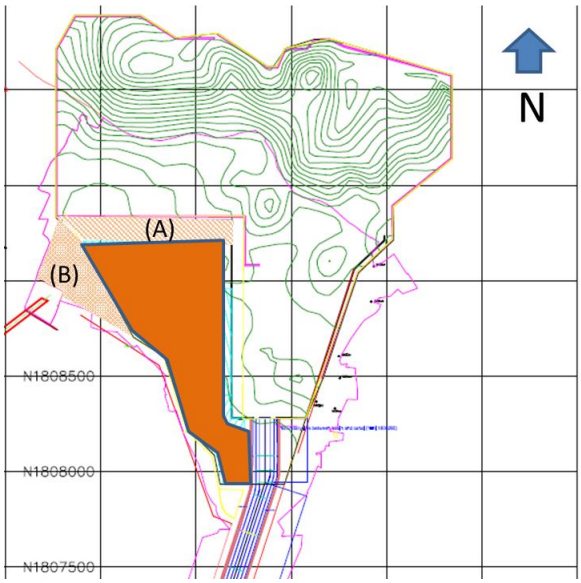


Figure 7.3-31: Overview Plant Site Area (Water Course Model)



- Related Drainage System 2 Lines
  - Eastern line
  - Western line
- Sediment Pond System 2 Ponds (50X50X7 m)



- Left Space between the plant and clay storage 100 m (A)
- Left Space of floodway to prevent the flow to the community (B)

Figure 7.3-32: Water Drainage (Plant Area) and Reduced Clay Storage Area

(ii) Monitoring of Flood Protection

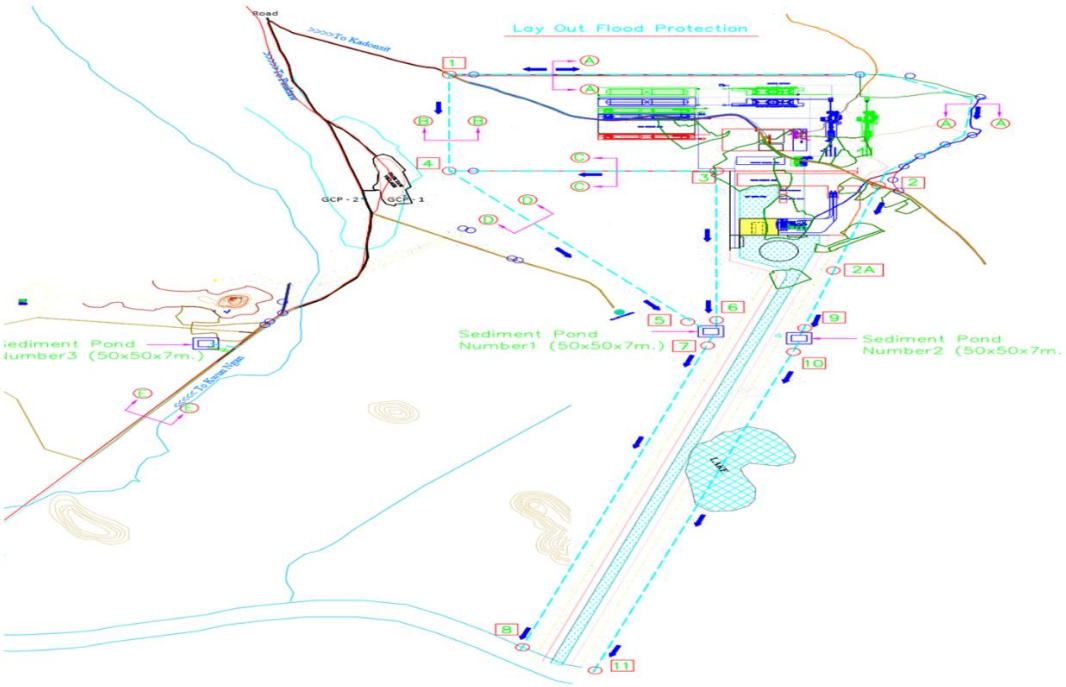


Figure 7.3-33: Layout Plan of Flood Protection

7.4 Analysis of Cumulative Impacts

Cumulative impacts must be taken into account for incremental direct and indirect impacts of the proposed project which resulted on Valued Ecosystem Components **(**VECs**)** such as fundamental elements of the physical, biological or socio-economic environment, including the air, water, soil, terrain, vegetation, wildlife, fish, birds and land use, as well as the added contributed effects to same VECs from other past, present and future projects or actions located in the same area**.**

The key VEC physical components include**:**

Atmosphere: climate conditions and trends, and extreme weather events and air-quality conditions.

Physiography and Geology: physiography such as landforms, elevations, relief and unique features; surficial geology including types and depths; and bedrock geology including types, location and depths.

Soils: soil types and characteristics, soil capabilities and limitations, and permafrost conditions.

Surface Water: watersheds and waterbodies characteristics, shoreline environment, and sources of potable water.

Groundwater: primarily local groundwater characteristics.

The selected criteria considered on the followings;

- Overall importance/value to people
- Regulatory requirements
- Potential for substantial Project effects
- Key for ecosystem function
- Umbrella indicator

The following table illustrated other project activities in proposed cement project area, however, related industrial activities with the cement production, limestone quarry, power plant and jetty & canal processes**.**

Table 7.4-1: Development of Related Industrial Project Activities in the Region

No.	Activity	Location	Distance from Project Area	Project Operator	Photographs
1	Myaing Ka Lay Cement Plant	Next to the Thaton-Mawlamyine Highway Road	~ 61.94 km, N	The factory is producing approximately 4,000 tons of cement per day. The factory is operated by **Myanmar Economic Corporation.**	
2	Mawlamyine Gas-fired Power Plant (230MW)	Eastern part of Mawlamyine Train Station	~ 19.89 km, NW	Developed by **Myanmar Lighting** under the government's independent power producer (PP) system. The plant has a generation capacity of 230MW from four gas-fired turbines and two steam turbines.	

Table 7.4-1: Development of Related Industrial Project Activities in the Region (Continue)

No.	Activity	Location	Distance from Project Area	Project Operator	Photographs
3	June Cement Industry Ltd	Pya Taung Area, Kyaikmaraw Township	~ 0.85 km, NW	June Cement Company Limited is planned to produce 5000 tons cement per day .It is also expected to produce limestone quarry process in the project .The project is currently in the ESIA processing stage.	
4	Location 1	A mountain near Pya Taung	~ 2.19 km, S	Illegal small-scale local mine (currently cease the operation by the Local Authorities)	

Table 7.4-1: Development of Related Industrial Project Activities in the Region (Continue)

No.	Activity	Location	Distance from Project Area	Project Operator	Photographs
5	Location 2	A mountain near Pya Taung	~ 2.22 km, S	Illegal small-scale local mine (currently cease the operation by the Local Authorities)	
6	Mawlamyine Cement Limited (5000 ton per day)	Located in Pya Taung Area	~ 3 km	Mawlamyine Cement Limited, cooperation with the Pacific Link Cement Limited, operated the jointly cement production process with the associated facilities such as limestone quarry, coal power plant and canal and jetty.	

7.4.1 Prediction and Leverage Assessment of Cumulative Impacts

The potential affected VEC components by cement plant and its associated facilities are to be land use, biodiversity, air, noise and socioeconomic environments.

For the calculation of cumulative impacts, Mawlamyine Cement Plant is associated with some of the fully operation facilities within the factory boundary such as limestone mining, coal power plant and canal and jetty projects though without considering other project activities within the region. However, those projects will be implemented through the same monitoring team from MCL to reduce the negative impacts and promote the positive impacts along with the project's implementation period.

While considering the cumulative impacts of the fully integrated cement plant can be estimated as the following table.

Table 7.4-2: Significance Level of Cumulative Impact Assessment

Impact Parameter (VECs)	Cumulative Impact Evaluation					Descriptions /Mitigation Measures
	Level of Significance			Temporal Frame (operation period before decommissioning)	Spatial Frame)Some rural area in Kyaikmaraw township in Mon State)	
	1	2	3			
Air Emission	√			during operation period	Nearby villages in Kyaikmaraw Township	Stakeholder consultation and strictly follow to EMP
Water Quality		√				Stakeholder consultation and take mitigation actions
Noise and Vibration		√				Stakeholder consultation and avoid repeat action with other noise generation activities and working at nighttime.
Biodiversity (Forest, Flora, Fauna)			√			Stakeholder consultation and establish a tree-compensation plan
Geology and Soil			√			Need to be reflected in detail design if the periods of the two projects overlap through coordination with MPA. Monitoring action as ESMP plans

Table 7.4-2: Significance Level of Cumulative Impact Assessment (Continue)

Impact Parameter (VECs)	Cumulative Impact Evaluation					Descriptions /Mitigation Measures
	Level of Significance			Temporal Frame (operation period before decommissioning)	Spatial Frame (Some rural area in Kyaikmaraw township in Mon State)	
Socio-economic Component		√		Operation period	Nearby Villages in Kyaikmaraw Township	Combined with a series of listed projects that would occur simultaneously or in near future with the proposed project would accelerate urbanization and population growth as well as the infrastructure and socio-economic development in the region. Livelihood of the community in the four affected Township and the broader community of the Mon state shall be affected positively. [Mitigation measures] ►MCL to coordinate the overall management of the cumulative socio-economic impacts of the multiple projects that are to be implemented in the region in coordination with the relevant stakeholders and the related local government agencies.
Hydrology			√	Operation period	Beyond the affected township (to the entire Region)	Need to further review whether flood protection is suitable for seasonal flood Monitoring action as EMP plans
Wildlife			√	Operation period	Area at Pya Taung area	Strictly forbid to haunt the animals and took a stringent action when would be happened.
Cultural Resource	√			Impact not triggered	Impact not triggered	Regular stakeholder consultation and Chance find procedure to be implemented
Visual Resource		√		Operation period	Area along nearby villages	Consultation Monitoring actions

7.4.2 Impact Mitigation Measures

(i) Land

MCL had been already got the license approval for governmental land area for the overall fully operated cement plant **(**about 1400 Acres**)** and limestone quarry **(**320 Acres**)** and had also been compensated for private ownership land area. The Leese area for land use will be attached in Annex-5-2.

(ii) Air Pollution and Noise

- All MCL employees shall be provided with hardhats, safety boots, overalls, ear and eye protection, dust masks and gloves as appropriate as shown in Table 8.7-1.
- The company shall ensure that The Mining Explosives Regulations governing the safe storage, handling and transport of explosives to, in and around the mine is strictly enforced.
- Only qualified and certified personnel shall be allowed to carry out blasting operations.
- Hazard and warning signs shall be erected or posted around the plant site to warn employees and contractors of potential dangers.
- Monitoring sites will be checked up periodically and the new sites will be added wherever needed or when received from community**'**s complains.

(iii) Vegetation

MCL will strictly follow the replantation according to mine closure plan and the greenbelt area will also be developed to maintain the landscape and for other mitigation purposes according to the descriptions in EMP plan.

(iv) Socioeconomic

MCL will also take control actions for socioeconomic issues such as providing the educational and healthcare facilities to the community, opening the job opportunities to the local communities, especially the affected communities as mentioned in the above sections.

However, the advantage of minimizing impacts can be expected and all of these projects can be considered as the fully-integrated cement project because MCL is the same project proponent for all of these project activities and same EIA implementation team, Sustainable Organization and Development Department **(**SOD**)** will take accountability of controlling and monitoring for all potential impacts in order to minimize and mitigate in consideration of the overall project actions.

7.5 Grievance Mechanism for Mitigation Measures of Social Entitlements

MCL will create a website with the main Projects' information and events of interest for the various stakeholders for public disclosure. The documents and information that will be disclosed in the website include, but are not limited to, the following:

- SEP will be disclosed in English and Burmese language;
- ESIA executive summary;
- information on the construction schedule and services disruption;
- stakeholder's consultations timeframe, venues and MoM;
- grievance procedure;
- community development activities; and
- SEP Manager contact

Considering the low percentages of internet users in the affected area, the Project disclosure through MCL website will be mainly targeted, but not limited to, specific stakeholders (NGOs, national or regional stakeholders, authorities, Lenders, etc.).

In addition, given the particular setting of Project operational areas, possible methods to reach the target audience include, but are not limited, to:

- open meetings with residents of the affected communities)e.g., at schools, public / religious or associations premises(;
- separate meetings with landowners/land users, vulnerable groups, farmers associations and local NGOs, as needed and appropriate;
- brochures, posters, informative leaflets at key communities 'centres, and radio announcements, in particular to inform about the construction schedule, grievance mechanism and forthcoming community meetings .Written information material should take in duly consideration the fact that there is a relevant number of illiterate people in the area; and
- social media :this method can be useful to keep ongoing communication with NGOs and other interested stakeholders.

MCL will provide and publicise well in advance a schedule of the dates and locations of any planned consultation activities, including follow up and disclosure activities. A series of stakeholder engagement and disclosure plan detailing methods and content of engagement and disclosure for each type of stakeholder as presented in Chapter 6. All meetings will be carefully documented and logged, minutes taken, and follow up activities recorded. By using a Public Grievance Sample Form and the Consultation Information Template are presented respectively in Chapter 8.

Chapter 8
Environmental and Social Management Plan Framework

8.1 Introduction

The ESMP framework 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 and social risks arising from the proposed Project and take appropriate actions to properly manage that risk.

The ESMP also ensures the Project implementation is carried out in accordance with the design by taking appropriate mitigation actions to reduce adverse environmental and social impacts during its life cycle. The plan outlines existing and potential problems that may adversely impact the environment and recommends corrective measures where required.

The components of the ESMP, potential impacts arising out of the Project and remediation measures are summarized in the following Table.

This document shall be treated as a dynamic and live document. Reviewing, revising and updating are subject to do as deemed necessary in line with the variation of proposed activities described in this document ensuring its remains appropriate to ongoing aspects of project.

8.2 Institutional Framework of MCL for EIA Implementation Activities

8.2.1 Project Proponent

The project proponent (MCL) consists of 5 departments/divisions which are Production dept., Maintenance dept., Quarry dept., Human Resources dept. and Operation Administrative Dept. As shown in Figure 8.2-1. Sustainable and Organization Development Section is responsible for environmental, health and safety management as well as Community relation. This department, which is directly under supervision of managing director, is responsible for grievance adjustment, support of the community, CSR activities etc.

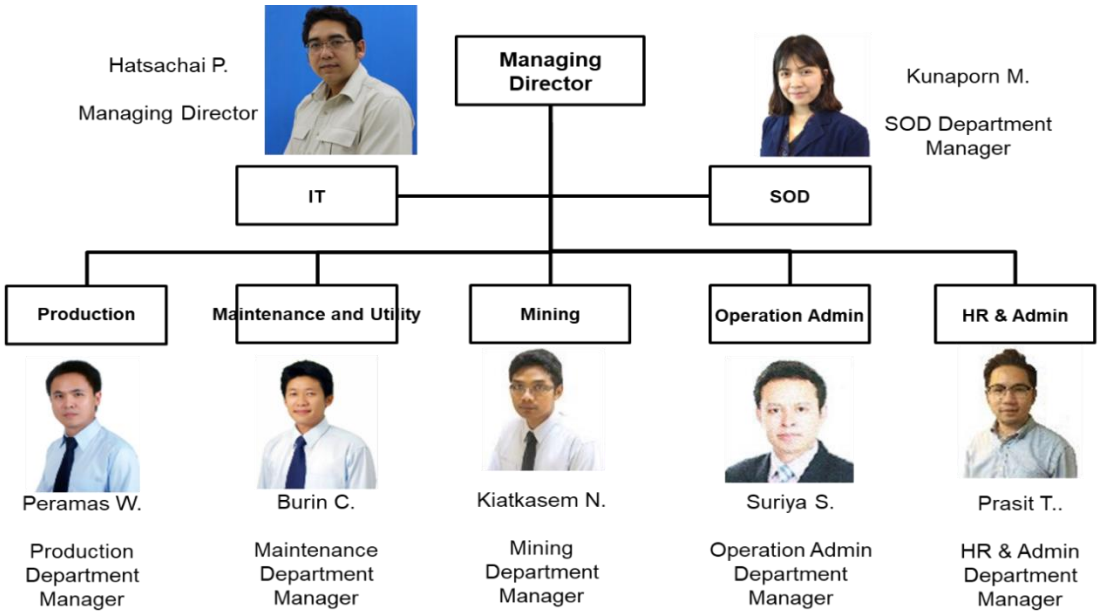


Figure 8.2-1: MCL Organization Structure for Top Management Role

Figure 8.2-2: MCL Organization Structure for Sustainable Development Department

Table 8.2-1: Main Tasks for Environmental and Social Consideration in MCL

Division/ Section	Main Tasks
Environment, safety and health section	1) Monitoring the factory operations according to EMP and EMoP, and; 2) Submitting environmental monitoring reports to ECD.
Community relation division	1) Grievance Adjustment - Handling complains/ claims/ requests from community and its response as necessary - Coordinating between tenant and community for grievance adjustment 2) Planning and implementation of CSR activities 3) Consultation with community relation 4) Job matching and assistance

The present project has finished the construction period and MIC issued permission letter to MCL. So, the institutional arrangement for operation period will be proposed as follows.

8.2.2 Role and Responsibilities

Being owner of this project, MCL will hold ultimate responsibility and shall fully exercise in developing, reviewing, updating and effective implementing of this document. If the measures set up in it does not meet or follow accordingly, company will redefine as necessary until full satisfaction is achieved.

Responsibilities for the implementation of environmental social considerations lie with MCL management. Management shall be accountable for delivering commitments made in this report.

Finding from the continuous monitoring of environmental management plan is subject to be reviewed periodically and as deemed necessary by management. Based on the result, management shall be able to take necessary remedial actions and to enforce to adopt adequate performance strategy toward the continual improvement of the environmental management system.

Table 8.2-2: Organizational Tasks and Responsibility of MCL's Implementation Team

Role	Responsibility
Top management (Safety and Health Committees)	set the policy, rules and regulations for safety and environment programs
SOD manager	Management of CSR, Environmental Team, Safety Team
CSR team	Communities relation, Government Relation, Communities Development programs, Education, Religions and other correspondent activities
Environment Team	inbound and outbound monitoring process, plantation, waste management
Safety team	employees' and workplace safety such as fire safety, workplace safety, vehicles and road safety
Liaison Officer	- To liaise with the different stakeholders from government offices, communities and other associated organization like consultants, NGOs, etc. - To receive the grievances/complaints related with the project activities via suggestion box, on call, email or by person and address and close the complaints according with the adequate communication and management actions

Table 8.2-3: Environmental Components – Construction Phase

Item	Component	Issues	Potential Impacts from Project Activities	Impact Evaluation and Extent	Mitigation/Monitoring Measures
1	Air (Section 6.1.)	Ambient air quality deterioration due to dust and gaseous pollutant emissions	*Cement Plant, Conveyor Belt:* emission of pollutants from construction site equipment (e.g. NO_x, SO_x, Particulate Matter)	Duration: Medium term Extent: Local Significance: Low and completely reversible	• engines of vehicles and other machinery will be kept turned on only if necessary, avoiding any unnecessary emission machines and equipment will be periodically checked and maintained • all equipment and machinery must be maintained and tested for compliance with standards and technical regulations for the protection of the environment and have appropriate certifications; • repair and maintenance of construction equipment and vehicles outside of the construction site; • monitoring points will be located in the residential areas surrounding the project site; and • air monitoring activities will be conducted 3 times a year. In particular, with reference to the conveyor belt, environmental monitoring activities would have to be performed in order to monitor the air pollution during construction activities at the residential areas located close to the corridor of conveyor belt
			Cement Plant, Conveyor Belt: emission of pollutants due to earth moving and vehicles traffic	Duration: Medium term Extent: Local Significance: Low and completely reversible	• watering or increase of the moisture level of the open materials storage piles to reduce dust levels (especially during dry season); • enclosure or covering of inactive piles to reduce wind erosion; • loads in all trucks transporting dust-generating materials will be sprayed with water to suppress dust, as well as wheels of means moving inside and outside of the construction site; • speed reduction for the means travelling inside the construction site; and • stabilization and re-vegetation of cleared areas that are no longer needed as soon as practicable during construction. • Prepare the land for construction but still leave several trees on the green area for absorbing noise and air pollution without disrupting construction activities.

Table 8.2-3: Environmental Components – Construction Phase (Continue)

Item	Component	Issues	Potential Impacts from Project Activities	Impact Evaluation and Extent	Mitigation/Monitoring Measures
					• Transportation of raw materials and products to and from the site should be well covered to prevent dust and falling of materials.
2	Noise (Section 6.2)	Increase of noise levels	*Cement Plant:* Increase of Noise Emissions	Duration: Medium term Extent: Local Significance: Low and completely reversible	• minimization of machinery and equipment unused conditions with engines in action; • maintenance of machinery and equipment in good conditions; • location of noise sources in concealed areas with respect to acoustic receptors, consistent with the needs of the construction site (if possible); • maintenance an active community consultation and positive relations with local residents that will assist in alleviating concerns that might arise and resolve any potential noise complaints; • posting of warning signs within the vicinity of the impact and all personnel shall be provided with personal protective equipment. For example, workers operating equipment that generates noise should be equipped with the appropriate noise protection gear;
			Conveyor Belt: Increase of Noise Emissions	Duration: Short term Extent: Local Significance: Negligible	
3	Water Resources (Section 6.3)	Water consumption; and modification of water quality	*Cement Plant and Conveyor Belt:* Exploitation of local water resources for both human and Project needs.	Duration: Medium term Extent: Local Significance: Negligible	• direct runoff away from disturbed areas by means of temporary drainage ways, utilizing for example cut-off drains; • provide containment measures for hazardous material and storage areas to prevent spills or leakage of fluid materials which may soak into the ground and reach the groundwater table;

Table 8.2-3: Environmental Components – Construction Phase (Continue)

Item	Component	Issues	Potential Impacts from Project Activities	Impact Evaluation and Extent	Mitigation/Monitoring Measures
			1. wastewater discharge 2. site preparation works 3. accidental events		• design of store hazardous material providing suitable reception facility with impervious flooring, roofing and suitable drainage control; • regular maintenance and checking of all plant and machinery in order to minimize the risk of fuel or lubricant leakages; • as construction activities typically generate disturbed soil, concrete fines, oils and other waste, on-site collection and settling of stormwater, prohibition of equipment wash downs, and prevention of soil loss and toxic releases from the construction site are necessary to minimize water pollution; • training and equipping relevant staff in protected storage and handling practices, and rapid spill response and cleanup techniques
4	Land Environment (Section 6.4)	Land Use Landscape modification Soil/Subsoil Modifications and Contamination	*Cement Plant and Conveyor Belt:* ○ *Land Use:* temporary occupation of land to set up the construction site and the temporary worker camp ○ *Landscape:* 1. impacts arising from the installation of all site compounds; 2. temporary works, installations, and storage; 3. the installation and movement of heavy and light construction machinery (including tall cranes);	**Land Use** Duration: Medium Term Extent: Local Significance: Negligible **Landscape** Duration: Medium Term Extent: Local Significance: Low **Soil/Subsoil Modifications** Duration: Medium Term	• prevention of soil contamination by oil or grease spills, leakages or releases, all manipulations of oil derivate in the process of construction and provision of fuel to the machines should be performed with maximum attention; • leak proof containers should be used for storage and transportation of oil/grease and wash off from the oil/grease handling area shall be drained through drains and treated properly before disposal; • construction waste and debris shall be collected on a regular basis, and disposed of at designated landfills; • it must be prohibited to operate with equipment and vehicles outside the designated work areas and roads; • training and equipment will be in place to minimize the potential environmental impact in the case of accidents (for example through the use of spill kits); • machinery and materials will be stored tidily during the works. • temporary roads providing access to site compounds and work areas will be maintained free of dust; •

Table 8.2-3: Environmental Components – Construction Phase (Continue)

Item	Component	Issues	Potential Impacts from Project Activities	Impact Evaluation and Extent	Mitigation/Monitoring Measures
			4. construction lighting, including high mast lighting for activities; and 5. special load movement and storage o *Soil/Subsoil Modifications and Contamination* 1. soil erosion; 2. modification of the geomorphologic condition; 3. changes in geological and lithological conditions; pollution of soil	Extent: Local Significance: Negligible	• security and work lighting shall be shielded and directed downwards and the use of tall mast lights shall be carefully assessed.
5	Solid Waste (Section 6.5)	Waste management and disposal	*Cement Plant and Conveyor Belt:* Production of construction waste, including excavation spoil, construction waste, domestic waste and sewage / wastewater.	Duration: Medium Term Extent: Local Significance: Low	• inventory and schedule of all types of waste • identification and evaluation of local waste management facilities • waste sorted into a number of waste streams • waste storage facilities fenced on the perimeter, properly lighted and with access constraints for unauthorized people • no uncontrolled disposal of during the construction phase and all waste streams directed to proper treatment • disposal of waste and hazardous materials by authorized contractors according with local legislation • maximization of reuse and recycle (when possible) • identification of specific disposal procedures for all waste streams (transporting, auditing, recording, monitoring, etc); • transporting vehicles properly marked and provided with documents describing nature of the transported waste and its hazardous degree

Table 8.2-3: Environmental Components – Construction Phase (Continue)

Item	Component	Issues	Potential Impacts from Project Activities	Impact Evaluation and Extent	Mitigation/Monitoring Measures
					• compilation of a register of the quantities and characteristics of the waste sent to landfill, (origin, type, quantities and landfill locations) • construction site periodically cleaned.
6	Biological Environment (Section 6.6)	Depletion of natural habitat/protected species	*Cement Plant, and Conveyor Belt:* • project area can be considered to have a low biodiversity and low significance area for ecosystem • the construction phase will be characterized by temporary activities • no endangered habitats are expected • endemic habitats can be affected by the proposed project • no rare species fauna / flora and no endangered species of fauna / flora are encountered in surveyed area	Duration: Long Term Extent: Local Significance: Negligible for all phases and project facilities (low for new conveyor belt)	• refer to applicable mitigation measures related to air, waste, water, etc; • washing down of vehicles in place and prior to commencing work; • preservation of excavated top-soil for future site restoration procedures particularly in highly disturbed areas; • limiting vehicular transport to defined roads as to prevent unnecessary injury, habitat destruction and complying with safe driving procedures; • implementing good housekeeping practices on the field and implementing good Solid Waste Management Plan in order to eliminate any source of hazard to the native fauna; • minimize vegetation clearance and habitat disturbance by demarcating the clearing boundaries in the quarry site; • unnecessary cleaning the trees is to avoid; • environmental awareness training to be given to all workers for the preservation of local biodiversity species and induct the nature of the sensitivity of project area; • site specific instruction/protocol for identifying and relocation of plant and wildlife species if necessary, shall be provided to all workers with education materials including photographs; and

Table 8.2-4: Social and OHS Components – Construction Phase

Item	Component	Issues	Potential Impacts from Project Activities	Impact Evaluation and Extent	Mitigation/Monitoring Measures
7	Socio Economic environment (Section 6.7)	Impacts on Demography and Social Structure	*Cement Plant, Conveyor belt*, the interactions between foreign migrant workers (Chinese) and the local community could result in social conflicts and cultural misunderstanding	Duration: Medium Term Extent: Local Significance: Negligible	• organization of awareness raising campaign to inform foreign workers on the local social customs and traditions
		Impacts on the socio-economic context	*Cement Plant, Conveyor belt*, positive impacts on the local socio-economic context (new, even if moderate, job opportunities and general benefits to the local welfare). Appropriate enhancement measures should be implemented to boost the beneficial effects on the local socio-economic context	Duration: Medium Term Extent: Local Significance: Low	• further investigations on the possibility to increase the local supply of goods and services (i.e. food supply, material supply, restoration services); and • further increase of the efforts to employ local sources both for skilled and unskilled workforce and provide them with appropriate training for the development of their capacity.
8	Community Health and Safety (Section 6.8)	Increase of Project Traffic	*Cement Plant, Conveyor belt*: Increase in the heavy vehicle traffic which will: negatively impact the road condition; will cause disturbances to road bordering residents due to noise, and dust, which might damage crops and structures close to dirt roads, as well as disturbances and temporary disruptions to local traffic	Duration: Medium Term Extent: Local Significance: Medium	• adoption of a Traffic Management Plan to ensure traffic safety, which should foresee safe drive trainings, regular alcohol and drug tests for drivers and driving restrictions during rush hours (especially close to schools); • adoption of a series of traffic measures: dust suppression measures, as vehicle speed restrictions, wheel washing area installed at all site access points, containment for dusty materials, and frequent watering or covering of exposed areas of ground, and prompt site restoration; • installation of appropriate temporary road sign points on the roads used by Project traffic in particular at bends, junctions, schools and populated areas; • definition of speed limits and make sure that they are respected by Project drivers (including contractors);

Table 8.2-4: Social and OHS Components – Construction Phase (Continue)

Item	Component	Issues	Potential Impacts from Project Activities	Impact Evaluation and Extent	Mitigation/Monitoring Measures
					• guarantee proper vehicle maintenance to reduce noise and accidents; • maintenance of the Project roads to reduce the possibility of accidents, including clearing of vegetation on to improve sight distance and visibility; • if road enlargements are required close to settlements, foresee a pedestrian path and/or provide pedestrian alternative walkways to reach the main points of interest (i.e., schools, markets, etc.); and • engage with local communities through traffic safety awareness campaigns.
9		Impacts on Community Health (foreign workers)	*Cement Plant, Conveyor belt*: impacts on community health due to the arrival of foreign workers	Duration: Medium Term Extent: Local Significance: Negligible	• development of an medical surveillance program for project employees to monitor the trend and pattern of communicable disease and foresee health awareness raising campaigns as part of their heal and safety induction
10	Stakeholder Engagement (Chapter 5)	Engaging with local and institutional stakeholders	*Cement Plant, Conveyor belt*: Community engagement for the management of risks, impacts and mitigation measures on local communities.	Duration: Long Term Extent: Local Significance: Medium	• Regular implementation and update of the SEP • ESIA and all related materials to be made available to stakeholders • Public consultations to be carried out and duly recorded • Company to implement an adequate grievance mechanism addressed to communities and affected land owners

Table 8.2-4: Social and OHS Components – Construction Phase (Continue)

Item	Component	Issues	Potential Impacts from Project Activities	Impact Evaluation and Extent	Mitigation/Monitoring Measures
11	Occupational Health and Safety (OHS) (Section 6.8.2)	Occupational Health and Safety	*Cement Plant, Conveyor belt*: The health and safety risks in a cement plant during operations include potential for respiratory diseases, burns, allergies and industrial accidents as well as from the use of chemicals in the process and explosive materials used in quarrying activities. However, the introduction of health and safety measures by MCL into the plant management will be reflected in a strong enhancement of the OHS conditions of the Project workers compared to the current level	Duration: Long Term Extent: Local Significance: Medium	• development and adoption of an appropriate OHS Plan covering all Project components and phases; • adoption and training all personnel (including contractor workers) in the use of PPE and chemical handling; • clear marking of work site hazards (especially close to high temperatures and open tanks) and training in recognition of hazard symbols; • adoption of work site hazards signage both in Burmese language and others; • training of all personnel in health and safety risk prevention and protection; • regular noise surveys to ensure the on-site maximum levels are not exceeded; • development of inspection, testing and maintenance programs for machinery and equipment; • accident recording and investigation and prevention initiatives; • development of and training in site emergency response plans both for the construction and operation phase
12	Labor and Working Condition (Section 6.8.3)	Labor and Working Condition	*Cement Plant, Conveyor belt*: labor conditions during the construction and operation phase have to comply with IFC requirements and Myanmar labor legislation; they have to apply to temporary and permanent workers, construction workers, operation workers, third-party and supply chain workers	Duration: Long term Extent: Local Significance: Medium	• development of appropriate HR policies, procedures and employment contracts to include: - a human resources policy; - working conditions and terms of employment, to be clearly communicated to workers on the commencement of their employment and to be applied also to migrant workers (including anticipated duration of the contract for temporary workers);

Table 8.2-4: Social and OHS Components – Construction Phase (Continue)

Item	Component	Issues	Potential Impacts from Project Activities	Impact Evaluation and Extent	Mitigation/Monitoring Measures
					- measures to guarantee fair treatment both for local and migrant workers, non-discrimination & equal opportunity and avoidance of child and forced labor, especially within the supply chain; - a grievance mechanism to be disseminated among and accessible by all workers (including third party workers); and - measures to protect the workforce from health and safety risks
13	Cultural Heritage (Section 6.10)	Potential uncovering of cultural artifacts during excavation and possible relocation of a cultural heritage site	*Cement plant, Conveyor belt*: Potential uncovering of cultural artifacts during excavation works	Duration: Medium Term Extent: Local Significance: Low	• A Chance Find Procedure should be developed for the Project to be applied in case unknown cultural heritage sites/ remains will be found during construction activities

Table 8.2-5: Environmental Components – Operation Phase

Item	Component	Issues	Potential Impacts from Project Activities	Impact Evaluation and Extent	Mitigation/Monitoring Measures
1	Air (Section 6.1.)	Ambient air quality deterioration due to dust and gaseous pollutant emissions	*Cement Plant:* Air Pollutant Emissions	Duration: Long term Extent: Local Significance: Medium	• advance machines, equipment and methods are utilized to minimize air pollutions, such as covering machines, watering accessible road and installing dust collecting system; • chimneys and stacks are designed and constructed to have sufficient heights to effectively vent dust, smoke and odors to the atmosphere; • all dust collectors or de-dusting equipment are designed, installed and guaranteed to regulate particulate matter emissions not exceeding the relevant reference emission limit; • operational conditions of de-dusting equipment are maintained such as temperature of flue gas entering electrostatic precipitator not to exceed operational range; • regular inspection and maintenance of gas analyzer at an inlet of electrostatic precipitator are carried out to maintain a good operational condition; • tree plantations are provided along the boundary of the cement plant. This green belt can minimize dust dispersion generated from on-site transportation; • sprinkle the road used for material transportation; • the concentration of dust in areas where plant personnel are working such as the areas along the conveying system, at which material is transferred including the areas around receiving hoppers, is limited to be less than 15 mg/m^3; (Dust in working area) • to effectively control dust emissions and to reduce the impact on the surrounding environment, the engineering design has minimized the parts in the production line which usually cause dust pollution, using equipment with less dust;

Table 8.2-5: Environmental Components – Operation Phase (Continue)

Item	Component	Issues	Potential Impacts from Project Activities	Impact Evaluation and Extent	Mitigation/Monitoring Measures
					• all emission points of the operation are equipped with technology reliable and high efficiency dust catchers; • the producing process will control the SO_2 in a feasible and reliable manner; • a set of monitoring campaigns will be performed in order to control the SOx emissions at MAQN-1 monitoring point (located at the boundary of the cement plant) in order to evaluate the eventual need of a system for the abatement of the relevant emissions (i.e.: wet scrubber). • chlorine density in the burning section has a big influence on the production of various NOx. • NOx emission density of the proposed project will be ≤ 600 mg/Nm^3 and the emission load of the products per ton will be ≤ 0.94 kg/t (preheater exhaust quantity amount calculated at 1.56 Nm^3/kgcl), which means controlling NOx in the producing process is feasible by adopting the above measures.
2	Noise (Section 6.2)	Increase of noise levels	*Cement Plant*: Increased Noise Emissions	Duration: Long term Extent: Local Significance: Low	• Provide the silencer and acoustic insulations for high noise level machine and equipment. • ear muffs and other PPE will be provided to the workers and it will be enforced to be used by the workers; • ensuring good maintenance and repair of the heavy equipment; • period equipment maintenance schedule is to be practiced; • ambient noise level monitoring will be conducted at suitable location at periodic intervals during the operation phase in order to meet the relevant standards.

Table 8.2-5: Environmental Components – Operation Phase (Continue)

Item	Component	Issues	Potential Impacts from Project Activities	Impact Evaluation and Extent	Mitigation/Monitoring Measures
3	Water Resources (Section 6.3)	Water consumption; and modification of water quality	*Cement Plant:* water consumptions	Duration: Long term Extent: Local Significance: Negligible	• cement production is operated in dry condition and water used for cooling system is reused or circulated in cooling water system. Therefore, the production does not cause water pollution; • wastewater generated from production process is sent to oil separator and sedimentation pond, respectively. The water from sedimentation pond is reused in some equipment and other activities in cement plant, such as conditioning tower, raw mill, and cement mill; • wastewater generated from offices, canteens, and staff accommodation is treated by a treatment system or septic tank ; • provision of grease and oil trap for workshop and maintenance area; and • provision of separated water drainage and treatment system for outdoor coal storage. Compact the storage ground with clay to prevent seepage into the ground
			Cement Plant contamination of water resources from operation activities due to wastewater discharge (installation of a wastewater treatment system) and accidental events	Duration: Long term Extent: Local Significance: Low (negligible for accidental events)	
4	Land Environment (Section 6.4)	Land Use Landscape modification Soil/Subsoil Modifications and Contamination	*Conveyor Belt:* ○ *Land Use:* permanent occupation of land *Cement Plant, and Conveyor Belt:* ○ *Soil/Subsoil Modifications and Contamination* *Landscape*	**Land Use** Duration: Long Term Extent: Local Significance: Low	• consultation with villages/ward to address their particular impacts

Table 8.2-5: Environmental Components – Operation Phase (Continue)

Item	Component	Issues	Potential Impacts from Project Activities	Impact Evaluation and Extent	Mitigation/Monitoring Measures
				Landscape Duration: Long Term Extent: Local Significance: Low **Soil/Subsoil Modifications** Duration: Long Term Extent: Local Significance: Low	
5	Solid Waste (Section 6.5)	Waste Management and Disposal	*Cement Plant, and Conveyor Belt*: generation process waste (filters, used lubricating oils, sludge, used oil, etc) and waste associated to the maintenance of the facilities	Duration: Long Term Extent: Local Significance: Low	• a waste management plan shall be developed including requirements for separation, handling and disposal of all waste generated; • all hazardous materials shall be stored in clearly labeled containers; • storage and handling of hazardous materials should be in accordance with national and local regulations appropriate to their hazard characteristics; • Hazardous waste shall be separated on site and waste storage areas shall be roofed and bounded to prevent potential cross-contamination; • spent oils (including transformer oil) shall be recycled; • fire prevention systems and secondary containment

Table 8.2-5: Environmental Components – Operation Phase (Continue)

Item	Component	Issues	Potential Impacts from Project Activities	Impact Evaluation and Extent	Mitigation/Monitoring Measures
					• all waste shall be disposed of in line with local requirements at a suitable and licensed waste disposal facility; and • suitable disposal sites shall be identified with capacities for disposal for general and hazardous waste prior to the operation phase
6	Biological Environment (Section 6.6)	Depletion of natural habitat/protected species	*Cement Plant and Conveyor Belt:* • project area can be considered to have a limited extension • the construction phase will be characterized by temporary activities • no endangered habitats are expected • endemic habitats can be affected by the proposed project • no rare species fauna / flora and no endangered species of fauna / flora are encountered in surveyed area	Duration: Long Term Extent: Local Significance: Negligible for all phases and project facilities (Low for one Cement Plant for operation phase)	• refer to applicable mitigation measures related to air, waste, water, etc; • washing down of vehicles in place and prior to commencing work; • preservation of excavated top-soil for future site restoration procedures particularly in highly disturbed areas; • limiting vehicular transport to defined roads as to prevent unnecessary injury, habitat destruction and complying with safe driving procedures; • implementing good housekeeping practices on the field and implementing good Solid Waste Management Plan in order to eliminate any source of hazard to the native fauna; • unnecessary cleaning the trees is to avoid; • environmental awareness training to be given to all workers for the preservation of local biodiversity species and induct the nature of the sensitivity of project area; • site specific instruction/protocol for identifying and relocation of plant and wildlife species if necessary, shall be provided to all workers with education materials including photographs;

Table 8.2-6: Social and OHS Components – Operation Phase

Item	Component	Issues	Potential Impacts from Project Activities	Impact Evaluation and Extent	Mitigation/Monitoring Measures
7	Socio Economic environment (Section 6.7)	Impacts on the socio-economic context	*Cement Plant, Conveyor belt:* Positive impacts on the local socio-economic context (new business opportunities for upstream and downstream satellite activities in the region). Appropriate enhancement measures should be implemented to boost the beneficial effects on the local socio-economic context	Duration: Long Term Extent: Local Significance: Low	• further investigations on the possibility to increase the local supply of goods and services (i.e. food supply, material supply, restoration services); • further increase of the efforts to employ local sources both for skilled and unskilled workforce and provide them with appropriate training for the development of their capacity
8	Logistics Activities	Impacts on river water quality	Oil leakage from barge operation	Duration: Long Term Extent: Local Significance: Low	• Label indicating details of each lubricant tank • The movement of tank is operated under work instruction • Provide oil spill dispersant in case of leakage
			Dust leaking and material dropping in ocean and river from coal and gypsum stevedoring process and cement jetty	Duration: Long Term Extent: Local Significance: Low	• Install dust collector • Schedule port cleaning time (entrance and road cleaning) • Regular dust measurement
		Traffic	Moorage affects water traffic	Duration: Long Term Extent: Local Significance: Low	• Moorage is in canal near cement jetty
		Aquatic animals and fish	Effect of anchorage operations on important aquatic animals and fish	Duration: Long Term Extent: Local Significance: Low	• Avoid anchorage point that near fishery and endangered aquatic animals

Table 8.2-6: Social and OHS Components – Operation Phase (Continue)

Item	Component	Issues	Potential Impacts from Project Activities	Impact Evaluation and Extent	Mitigation/Monitoring Measures
9	Community Health and Safety (Section 6.8)	Increase of Project Traffic	*Cement Plant:* Increase of Project traffic to transport the produced cement bags is expected (transition period until the planned increase in the number of boats for the transportation via river)	Duration: Medium Term Extent: Local Significance: Medium	• adopt a Traffic Management Plan to ensure traffic safety, which should foresee safe drive trainings and regular alcohol and drug tests for drivers; • install appropriate road signage on the roads used by Project traffic in particular at bends, junctions, schools and populated areas; • define speed limits and make sure that they are respected by Project drivers (including contractors); • maintain the Project roads in order to reduce the possibility of accidents, including clearing of vegetation on to improve sight distance and visibility
10	Stakeholder Engagement	Engaging with local and institutional stakeholders	*Cement Plant, Conveyor belt*: Community engagement for the management of risks, impacts and mitigation measures on local communities	Duration: Long Term Extent: Local Significance: Medium	• Regular implementation and update of the SEP (Stakeholder Engagement Plan) • ESIA and all related materials to be made available to stakeholders • Public consultations to be carried out and duly recorded • Company to implement an adequate grievance mechanism addressed to communities and affected land owners
11	Occupational Health and Safety (OHS) (Section 7.4)	Occupational Health and Safety	*Cement Plant, Conveyor belt*: The health and safety risks in a cement plant during operations include potential for respiratory diseases, burns, allergies and industrial accidents as well as from the use of chemicals in the process and explosive materials used in quarrying activities. However, the introduction of health and safety measures by Client into the plant	Duration: Long Term Extent: Local Significance: Medium	• development and adoption of an appropriate OHS Plan covering all Project components and phases; • adoption and training all personnel (including contractor workers) in the use of PPE and chemical handling; • clear marking of work site hazards (especially close to high temperatures and open tanks) and training in recognition of hazard symbols; • adoption of work site hazards signage both in Burmese language and others;

Table 8.2-6: Social and OHS Components – Operation Phase (Continue)

Item	Component	Issues	Potential Impacts from Project Activities	Impact Evaluation and Extent	Mitigation/Monitoring Measures
			management will be reflected in a strong enhancement of the OHS conditions of the Project workers compared to the current level		• training of all personnel in health and safety risk prevention and protection; • regular noise surveys to ensure the on-site maximum levels are not exceeded; • development of inspection, testing and maintenance programs for machinery and equipment; • accident recording and investigation and prevention initiatives; • development of and training in site emergency response plans both for the construction and operation phase; and • compliance to, national or local HS standards that may exist
12	Labor and Working Condition (Section 7.5)	Labor and Working Condition	*Cement Plant, Conveyor belt*: labor conditions during the construction and operation phase have to comply with IFC requirements and Myanmar labor legislation; they have to apply to temporary and permanent workers, construction workers, operation workers, third- party and supply chain workers	Duration: Long Term Extent: Local Significance: Medium	• development of appropriate HR policies, procedures and employment contracts to include: • a human resources policy; • working conditions and terms of employment, to be clearly communicated to workers on the commencement of their employment and to be applied also to migrant workers (including anticipated duration of the contract for temporary workers); • measures to guarantee fair treatment both for local and migrant workers, non-discrimination & equal opportunity and avoidance of child and forced labor, especially within the supply chain; • a grievance mechanism to be disseminated among and accessible by all workers (including third party workers); and • measures to protect the workforce from health and safety risks

Table 8.2-6: Social and OHS Components – Operation Phase (Continue)

Item	Component	Issues	Potential Impacts from Project Activities	Impact Evaluation and Extent	Mitigation/Monitoring Measures
13	Emergency	Usage of Chemicals	*Risk of chemicals hazards and industrial hygiene*	Duration: Long Term Extent: Local Significance: Low	• Formulation of chemical management plan as necessary • Training of safety usage and preparation of the emergency • response plans • Implementation of the proper storage and record of usage. • Applying for the acquisition of the license with management plan in accordance with the relevant law, and compliance with the law. • Provision of protective equipment and clothes to workers as necessary.
14	Emergency	Risk of Fire	Impact on the community around the project site by increasing of risk of fire	Duration: Long Term Extent: Local Significance: Low	• Installation of the fire hydrants in and aroud the cement plant and offices in sufficiently. • Implementation of emergency drill • Preparartion of Emergency Response Plan

8.3 MCL's Pollution Control

8.3.1 Main Pollution Sources and its Characteristics

8.3.1.1 Air Emission

Air emissions in cement manufacturing are generated by the handling and storage of intermediate and final materials, and by the operation of kiln systems, clinker coolers, and mills.

- Particulate matter (PM) emissions associated with intermediate and final materials handling and storage (including crushing and grinding of raw materials) or handling and storage of solid fuels and transport.
- Dust is associated with work in most of the dust-generating stages of cement and lime manufacturing, but most notably from quarry operation, raw material handling, and clinker / cement grinding. Exposure to active (crystalline) silica dust (SiO_2), when present in the raw materials, is a relevant potential hazard in the cement manufacturing sector.
- Nitrogen oxide (NOx) emissions are generated in the high temperature combustion process of the cement kiln.
- Sulfur dioxide (SO_2) emissions in cement manufacturing are primarily associated with the content of volatile or reactive sulfur in the raw materials (high content of organic sulfur or pyrite (FeS)), and although less important, with the quality of fuels for power generation.
- Greenhouse gas emissions, especially carbon dioxide (CO_2), are mainly associated with fuel combustion and with the decarbonation of limestone, which in its pure form is 44 % CO_2 by weight.
- Carbon monoxide (CO) represents an indicator of the conditions of the process. High CO readings are usually a warning sign that the manufacturing process is not performing properly (potentially involving higher fuel consumption).
- Heavy metals (e.g. lead, cadmium, and mercury) can be significant emissions from cement manufacturing, and are generated from the use of raw materials, fossil fuels, and waste fuel. Nonvolatile metals are mostly bound to the particulate matter. Volatile metal emissions, such as mercury, are usually generated from both the raw materials and the waste fuels.

Table 8.3-1: Air Emissions Levels for Global Cement Manufacturing Industries

Pollutants	Units	Guideline Value	NEQG Value
Particulate Matter (new kiln system)	mg/Nm^3	30[a]	30
Particulate Matter (Existing Kiln)	mg/Nm^3	100	100
Dust (Other point sources incl. clinker cooling, cement grinding)	mg/Nm^3	50	50
SO_x	mg/Nm^3	400	400 (as SO_2)
NO_x	mg/Nm^3	600	600
HCl	mg/Nm^3	10[b]	10
Hydrogen Fluoride	mg/Nm^3	1[b]	1
Total Organic Carbon	mg/Nm^3	10	10
Dioxin-furans	mg TEQ/Nm^3	0.1[b]	0.1
Cadmium & Thallium	mg/Nm^3	0.05[b]	0.05
Mercury (Hg)	mg/Nm^3	0.05[b]	0.05
Total Metals	mg/Nm^3	0.5	0.5

NOTES:
* Emissions from the kiln stack unless otherwise noted. Daily average values corrected to 273 K, 101.3 kPa, 10 percent O_2, and dry gas, unless otherwise noted.

a. 10 mg/Nm 3 if more than 40 percent of the resulting heat release comes from hazardous waste.
b. If more than 40 percent of the resulting heat release comes from hazardous waste, average values over the sample period of a minimum of 30 minutes and a maximum of 8 hours.
c. Total Metals = Arsenic (As), Lead (Pb), Cobalt (Co), Chromium (Cr), Copper (Cu), Manganese (Mn), Nickel (Ni), Vanadium (V), and Antimony (Sb)

The production process uses dry process. Thus, major air emissions include Total Suspended Particulate (TSP), Sulfur dioxide (SO_2) and Nitrogen Oxides (NO_x) can be controlled by bag filters and Electro Static Precipitators (ESP), except for the only the emissions generated from clinker.

Table 8.3-2: Parameters and Method Measurement of Emission Standard

Parameters	Method Measurement
Particulate	Determination of Particulate Emissions from Stationary Sources (U.S.EPA)
Sulfur Dioxide (SO_2)	Determination of Sulfur Dioxide Emissions from Stationary Sources or Determination of Sulfuric Acid Mist and Sulfur Dioxide Emissions from Stationary Sources (U.S.EPA)
Nitrogen Oxide (NO_x)	Determination of Nitrogen Oxide Emissions from Stationary Sources (U.S.EPA)

Table 8.3-3: Sampling and Monitoring Air Pollution at Workplace

Location	Parameters	Frequency
Personal sampling	TSP PM-$_{10}$ PM-$_{2.5}$	Continuous (8 hr)
Area sampling	TSP	Continuous (8 hr)

8.3.1.1.1 Monitoring for Atmospheric Mitigation Measures

The impacts will be localized in nature and the areas outside the project boundary are not likely to have any major adverse impact with respect to ambient air quality.

Hence, there will not be any concentration of emissions at any single point**.** It shall be ensured that both gasoline and diesel-powered construction vehicles are properly maintained to minimize smoke in the exhaust emissions.

Dust generation during construction phase can be reduced by:

1) Sprinkling of water shall be done at frequent intervals by preferably using truck-mounted sprinklers;
2) Sprinkling of water will be done along the roads and work zone areas to reduce the fugitive dust;
3) Construction equipment shall be maintained and serviced regularly such that the gaseous emissions from this equipment are maintained within the design specifications; and
4) Since electrical power is available within plant site, attempts shall be made to utilize the electrically powered machinery to the extent possible to minimize the emissions of SO_2 and NOx during construction**.**
5) implementing speed limits on heavy traffic,
6) Limiting the traffic of peoples and machines to the construction area**.**

Table 8.3-4: Air Emissions Monitoring Results from Main Cement Stacks (2018)

Parameters	Jan	Feb	Mar	April	May	Jun	July	Aug	Sep
SO_2	35.14516	25.15793	24.77419	26.41333	24.8619	23.048	55.512	73.672	74.21875
No_x	255.2806	178.4674	247.1935	236.42	150.8714	159.728	146.772	270.936	267.95625
Dust	24.86129	23.73214	22.93226	27.15433	29.01905	28.232	30.332	32.408	33.15

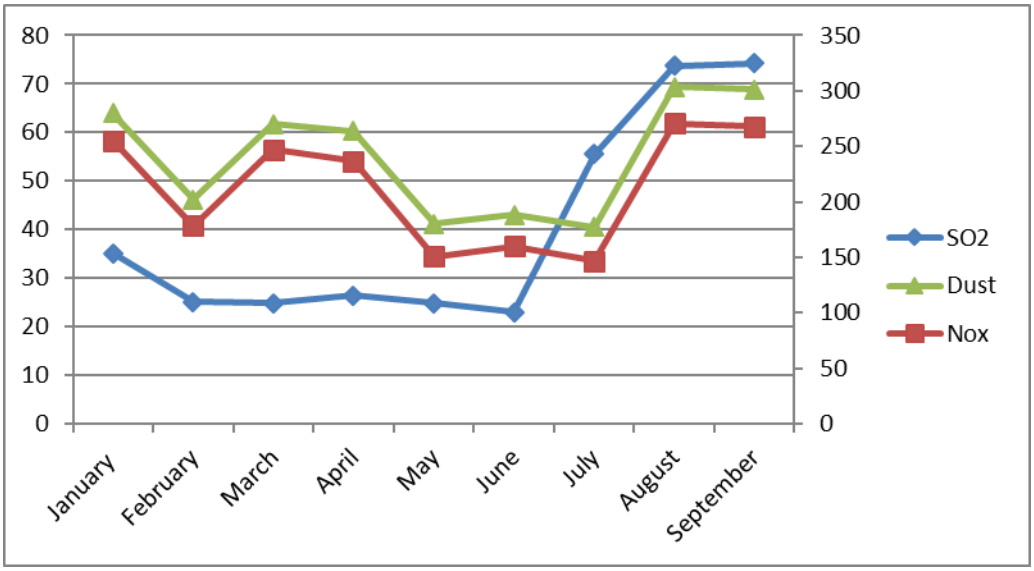


Figure 8.3-1: Air Emissions (NO_x, SO_2 and Dust) from Cement Main Stacks

Table 8.3-5: Air Quality Monitoring Result in March, July and November 2016

REM Survey (Ambient Air Quality in March 2016)

No.	Location	Items	Unit/ 24 hours	17-18 Day Results, in March 2016	18-19 Day Results, in March 2016	19-20 Day Results, in March 2016	Target Value to be applied	Country's Standard (Reference to WHO)	Method
				Measured Value (Mean)	Measured Value (Mean)	Measured Value (Mean)			
1.	AQN-1 (at Pauk Taw Village)	**CO**	ug/m^3	110	160	0.17	-	MNEQG	EPAS
		NO_2	ug/m^3	70	70	70	200 ug/m^3 (1 hour)	MNEQG	EPAS
		NO	ug/m^3	40	40	30	-	MNEQG	EPAS
		SO_2	ug/m^3	<10	<10	<10	500 ug/m^3 (10 mins), 20 ug/m^3 (24 hours)	MNEQG	EPAS
		TSP	ug/m^3	60	60	60	-	MNEQG	EPAS
		PM_{10}	ug/m^3	50	50	60	20 ug/m^3 (1 year), 50 ug/m^3 (24 hours)	MNEQG	EPAS
2.	AQN-2 (at Kawpanaw Village)	**CO**	ug/m^3	140	190	140	-	MNEQG	EPAS
		NO_2	ug/m^3	60	60	60	200 ug/m^3 (1 hour)	MNEQG	EPAS
		NO	ug/m^3	40	<10	20	-	MNEQG	EPAS
		SO_2	ug/m^3	<10	<10	<10	500 ug/m^3 (10 mins), 20 ug/m^3 (4 hours)	MNEQG	EPAS
		TSP	ug/m^3	70	50	50	-	MNEQG	EPAS
		PM_{10}	ug/m^3	60	50	40	20 ug/m^3 (1 year), 50 ug/m^3 (24 hours)	MNEQG	EPAS
3.	AQN-3 (at Kwangan Village)	**CO**	ug/m^3	120	160	120	-	MNEQG	EPAS
		NO_2	ug/m^3	90	80	80	200 ug/m^3 (1 hour)	MNEQG	EPAS
		NO	ug/m^3	170	130	160	-	MNEQG	EPAS
		SO_2	ug/m^3	20	20	20	500 ug/m^3 (10 mins), 20 ug/m^3 (24 hours)	MNEQG	EPAS
		TSP	ug/m^3	80	60	60	-	MNEQG	EPAS
		PM_{10}	ug/m^3	60	40	50	20 ug/m^3 (1 year), 50 ug/m^3 (24 hours)	MNEQG	EPAS

Note: MNEQ: Myanmar National Environmental Quality (emission) Guideline, December 2015.

Table 8.3-5: Air Quality Monitoring Result in March, July and November 2016 (Continue)

REM Survey (Ambient Air Quality in July 2016)

No.	Location	Items	Unit	26-27 Day Results, in July 2016	27-28 Day Results, in July 2016	28-29 Day Results, in July 2016	Target Value to be Applied	Country's Standard	Method
				Measured Value (Mean)	Measured Value (Mean)	Measured Value (Mean)			
1.	AQN-1 (at Pauk Taw Village)	**CO**	ug/m^3	60	60	60	-	MNEQG	EPAS
		NO_2	ug/m^3	50	60	60	200 ug/m^3 (1 hour)	MNEQG	EPAS
		NO	ug/m^3	10	30	<10	-	MNEQG	EPAS
		SO_2	ug/m^3	10	10	<10	500 ug/m^3 (10 mins), 20 ug/m^3 (24 hours)	MNEQG	EPAS
		TSP	ug/m^3	30	30	30	-	MNEQG	EPAS
		PM_{10}	ug/m^3	20	20	20	20 ug/m^3 (1 year), 50 ug/m^3 (24 hours)	MNEQG	EPAS
2.	AQN-2 (at Kawpanaw Village)	**CO**	ug/m^3	90	50	50	-	MNEQG	EPAS
		NO_2	ug/m^3	60	70	60	200 ug/m^3 (1 hour)	MNEQG	EPAS
		NO	ug/m^3	70	50	80	-	MNEQG	EPAS
		SO_2	ug/m^3	10	10	10	500 ug/m^3 (10 mins), 20 ug/m^3 (24 hours)	MNEQG	EPAS
		TSP	ug/m^3	30	30	30	-	MNEQG	EPAS
		PM_{10}	ug/m^3	20	20	20	20 ug/m^3 (1 year), 50 ug/m^3(24 hours)	MNEQG	EPAS
3.	AQN-3 (at Kwangan Village)	**CO**	ug/m^3	90	80	80	-	MNEQG	EPAS
		NO_2	ug/m^3	90	60	60	200 ug/m^3 (1 hour)	MNEQG	EPAS
		NO	ug/m^3	270	130	110	-	MNEQG	EPAS
		SO_2	ug/m^3	10	30	30	500 ug/m^3 (10 mins), 20 ug/m^3 (24 hours)	MNEQG	EPAS
		TSP	ug/m^3	30	50	30	-	MNEQG	EPAS
		PM_{10}	ug/m^3	20	30	20	20 ug/m^3 (1 year), 50 ug/m^3 (24 hours)	MNEQG	EPAS

Table 8.3-5: Air Quality Monitoring Result in March, July and November 2016 (Continue)

REM Survey (Ambient Air Quality in November 2016)

No.	Location	Items	Unit	14-15 Day Results, in Nov 2016	15-16 Day Results, in Nov 2016	16-17 Day Results, in Nov 2016	Target Value to be Applied	Country's Standard	Method
				Measured Value (Mean)	Measured Value (Mean)	Measured Value (Mean)			
1.	AQN-1 (at Pauk Taw Village)	**CO**	ug/m^3	160	210	150	-	MNEQG	EPAS
		NO_2	ug/m^3	50	80	70	200 ug/m^3 (1 hour)	MNEQG	EPAS
		NO	ug/m^3	10	10	10	-	MNEQG	EPAS
		SO_2	ug/m^3	30	30	20	500 ug/m^3 (10 mins), 20 ug/m^3 (24 hours)	MNEQG	EPAS
		TSP	ug/m^3	70	90	60	-	MNEQG	EPAS
		PM_{10}	ug/m^3	40	50	40	20 ug/m^3 (1 year), 50 ug/m^3 (24 hours)	MNEQG	EPAS
2.	AQN-2 (at Kawpanaw Village)	**CO**	ug/m^3	320	280	380	-	MNEQG	EPAS
		NO_2	ug/m^3	70	70	80	200 ug/m^3 (1 hour)	MNEQG	EPAS
		NO	ug/m^3	10	10	10	-	MNEQG	EPAS
		SO_2	ug/m^3	40	40	40	500 ug/m^3 (10 mins), 20 ug/m^3 (24 hours)	MNEQG	EPAS
		TSP	ug/m^3	110	80	10	-	MNEQG	EPAS
		PM_{10}	ug/m^3	60	40	60	20 ug/m^3 (1 year), 50 ug/m^3 (24 hours)	MNEQG	EPAS
3.	AQN-3 (at Kwangan Village)	**CO**	ug/m^3	140	150	120	-	MNEQG	EPAS
		NO_2	ug/m^3	60	60	60	200 ug/m^3 (1 hour)	MNEQG	EPAS
		NO	ug/m^3	220	10	70	-	MNEQG	EPAS
		SO_2	ug/m^3	50	50	50	500 ug/m^3(10 mins), 20 ug/m^3 (24 hours)	MNEQG	EPAS
		TSP	ug/m^3	50	50	50	-	MNEQG	EPAS
		PM_{10}	ug/m^3	40	40	40	20 ug/m^3 (1 year), 50 ug/m^3 (24 hours)	MNEQG	EPAS

Note: MNEQ: Myanmar National Environmental Quality (Emission) Guidelines. (December 2015).

8.3.2 Appraisal on Air Quality Monitoring Results

The air quality sampling sites are nearby the villages and beside the road, which was repairing and upgrading during monitoring period and many road construction vehicles and machines were operating there. Some kinds of smoke from road repairing works and dust generation from using existing clay roads were also integrated during monitoring period. Therefore, concentration of SO_2 might be increased especially from vehicles and machine operations and not related with cement plant emission because MCL emission level within the cement plant boundary met with National Emission Guideline Standards.

8.4 Wastewater Treatment

Generation of wastewater is mainly only from utility operations for cooling purposes in different phases of the process (e.g. bearings, kiln rings) because MCL project used the dry cement process. Process wastewater with high pH and suspended solids may be generated in some operations (cooling). However, MCL use proper circulation system for water and all of the discharge water from cement plant will be circulated for cooling purpose and there will be no discharge of process water into the surface water and ground water as shown **Water Recirculation System in Figure 7.7-1**. However, if MCL need to discharge treated water into the surface water, MCL shall be followed the standard discharge guidelines for wastewater effluent from cement plant as follows.

Table 8.4-1: Effluent Levels*:* Cement and Lime Manufacturing

Pollutants	Units	Guideline Value
pH	S.U	6-9
Total Suspended Solids	mg/L	50
Temperature Increase	˚C	<3[a]

a: At the edge of a scientifically established mixing zone which considers ambient water quality, receiving water use, potential receptors and assimilative capacity.

Table 8.4-2: Wastewater Characteristic of Cement Industry

Parameters	Unit	Value	Discharge Standard for Industry
pH	-	9.9	6-9
TDS	mg/l	2453.9	3000 mg/l
TSS	mg/l	845.2	50 mg/l

8.5 Solid Waste

Sources of solid waste in cement manufacturing include clinker production waste, mainly composed of spoil rocks, which are removed from the raw materials during the raw meal preparation. Another potential waste stream involves the kiln dust removed from the bypass flow and the stack, if it is not recycled in the process. Limited waste is generated from plant maintenance (e.g. used oil and scrap metal). Other waste materials may include alkali or chloride/fluoride containing dust buildup from the kiln.

A Waste Management Plan (WMP) will be prepared for managing the waste during the construction phase, to minimize the potential negative impact on the environment and community health. The following main environmental standards for waste management will be adopted:

- all types of waste generated during the construction phase should be inventoried and scheduled;
- local waste management facilities will be identified and evaluated;
- waste will be sorted into several waste streams (groups of waste requiring common handling methods, i.e. re-use, decontamination/processing, authorized disposal, etc.);
- waste storage facilities must be fenced on the perimeter, properly lighted and with access constraints for unauthorized people;
- no uncontrolled disposal of waste will be carried out during the construction phase, as all waste streams will be directed to proper treatment;
- disposal of waste and hazardous materials will be performed by authorized in-country contractors according with local legislation;
- maximization of reuse and recycle, for example by returning the materials to the original vendor for commercial regeneration. When no market or capability exists for a given waste, the waste will be temporarily stored on site and sent to an appropriate off-site treatment/disposal facility;
- specific disposal procedures for all waste streams will be identified (transporting, auditing, recording, monitoring, etc);
- transporting vehicles will be properly marked and drivers will carry the appropriate documents describing nature of the transported waste and its hazardous degree. A register of the quantities and characteristics of the waste sent to landfill, indicating origin, type, quantities and landfill locations will be maintained;
- all vehicles and containers will be designed to prevent leakage of transported liquid and solid waste; drivers will have specialized training license related to handling and disposal of cargo;
- incineration of combustible waste and construction debris is prohibited; and
- construction site will be periodically cleaned.

8.6 Noise Control Measures

Noise pollution is related to several cement manufacturing phases, including raw material extraction; grinding and storage; raw material, intermediate and final product handling and transportation; and operation of exhaust fans.

Table 8.6-1: Monitoring Noise at Workplaces

Location	Parameters	Standard (dBA)	Frequency
Workplace nearly machinery	Maximum level (L_{max})	≤140	Continuous
	Average level ($L_{Aeq, 8}$)	≤90	Continuous (8 hr)

Table 8.6-2: Summarized/Comparison Data Sheet for Noise Monitoring Annual Result, 2016

No.	Location	Items	Unit	17-18 day Result, in March 2016	18-19 day Result, in March 2016	19-20 day Result, in March 2016	Target Value to be Applied	NEQG (Residential)	
				Measured Value (Mean) L_{Aeq}	Measured Value (Mean) L_{Aeq}	Measured Value (Mean) L_{Aeq}		Day Time	Night Time
1	N-1 (Pauk Taw village)	Noise	dB	48 (Day Time)	49 (Day Time)	46 (Day Time)	70	55	45
				41 (Night Time)	42 (Night Time)	39 (Night Time)	70	55	45
2	N-2 (Kawpanaw Village)	Noise	dB	51 (Day Time)	50 (Day Time)	52 (Day Time)	70	55	45
				41 (Night Time)	48 (Night Time)	49 (Night Time)	70	55	45
3	N-3 (Kwangan Village)	Noise	dB	58 (Day Time)	57 (Day Time)	51 (Day Time)	70	55	45
				55 (Night Time)	45 (Night Time)	43 (Night Time)	70	55	45
4	N-4 (Kadonsit Village)	Noise	dB	53 (Day Time)	55 (Day Time)	58 (Day Time)	70	55	45
				52 (Night Time)	49 (Night Time)	51 (Night Time)	70	55	45

Table 8.6-2: Summarized/Comparison Data Sheet for Noise Monitoring Annual Result, 2016 (Continue)

No.	Location	Items	Unit	26-27 day Result, in July 2016	27-28 day Result, in July 2016	28-29 day Result, in July 2016	Target Value to be applied	NEQG (Residential)	
				Measured Value (Mean) L_{Aeq}	Measured Value (Mean) L_{Aeq}	Measured Value (Mean) L_{Aeq}		Day Time	Night Time
1	N-1 (Pauk Taw village)	Noise	dB	50 (Day Time)	55 (Day Time)	49 (Day Time)	70	55	45
				66 (Night Time)	52 (Night Time)	49 (Night Time)	70	55	45
2	N-2 (Kawpanaw Village)	Noise	dB	48 (Day Time)	60 (Day Time)	60 (Day Time)	70	55	45
				41 (Night Time)	55 (Night Time)	53 (Night Time)	70	55	45
3	N-3 (Kwangan Village)	Noise	dB	57 (Day Time)	62 (Day Time)	66 (Day Time)	70	55	45
				61 (Night Time)	54 (Night Time)	54 (Night Time)	70	55	45
4	N-4 (Kadonsit Village)	Noise	dB	67 (Day Time)	63 (Day Time)	60 (Day Time)	70	55	45
				75 (Night Time)	60 (Night Time)	51 (Night Time)	70	55	45

Table 8.6-2: Summarized/Comparison Data Sheet for Noise Monitoring Annual Result, 2016 (Continue)

No.	Location	Items	Unit	14-15 day Result, in Nov 2016	15-16 day Result, in Nov 2016	16-17 day Result, in Nov 2016	Target Value to be applied	Note (Reason of excess of the Standard)
				Measured Value (Mean) L_{Aeq}	**Measured Value (Mean) L_{Aeq}**	**Measured Value (Mean) L_{Aeq}**		
1	N-1 (Pauk Taw village)	Noise	dB	48 (Day Time)	47 (Day Time)	50 (Day Time)	70	
				54 (Night Time)	51 (Night Time)	50 (Night Time)	70	
2	N-2 (Kawpanaw Village)	Noise	dB	56 (Day Time)	56 (Day Time)	48 (Day Time)	70	
				54 (Night Time)	49 (Night Time)	49 (Night Time)	70	
				Measured Value (Mean) L_{Aeq}	**Measured Value (Mean) L_{Aeq}**	**Measured Value (Mean) L_{Aeq}**		
3	N-3 (Kwangan Village)	Noise	dB	62 (Day Time)	65 (Day Time)	69 (Day Time)	70	
				50 (Night Time)	52 (Night Time)	49 (Night Time)	70	
				Measured Value (Mean) L_{Aeq}	**Measured Value (Mean) L_{Aeq}**	**Measured Value (Mean) L_{Aeq}**		
4	N-4 (Kadonsit Village)	Noise	dB	63 (Day Time)	60 (Day Time)	59 (Day Time)	70	
				52 (Night Time)	53 (Night Time)	54 (Night Time)	70	

Note: Target Noise Level 70 dB is Industrial & Commercial" zone standard which announced on 29th DEC 2015 Myanmar National Environmental Quality (emission) Guideline.

Note: The noise level in some villages are higher than the residential guideline value as shown in the study villages, however, it cannot be considered as these noise level mainly come from the project. The reason is that some noise level in most rural area, especially in the villages nearby are originally higher than the residential values due to loud-speakers and some cultural ceremonies etc.

8.7 Occupational Health and Safety Management Plan

Mawlamyine Cement Limited **(**MCL**)** has a Health and Safety policy of which all personnel are briefed on and are consulted in its development through their representatives.

Mawlamyine Cement Limited **(**MCL**)** Works Health and Safety policy (See in Annex-3 and 4) highlights the importance of individual and collective behavior and of action undertaken by all the employees to prevent industrial accidents and work-related illnesses.

Implementation of a Health and Safety Management System has significantly improved Mawlamyine Cement Limited **(**MCL**)** Works Safety performance in all operations. This has been facilitated consequently by Management's strong involvement and commitments intensify Safety concerns and awareness at all levels on matters of health and safety.

Consequently, Mawlamyine Cement Limited Works has demonstrated its resolve to create a safe and healthy work environment for its employees, contractors and visitors through:

- The application of proven occupational Health and Safety technologies, standards and operating procedures to minimize exposure to risk
- The reporting and investigation of potential accident situations within the workplace and the implementation of mitigation plans to prevent reoccurrence
- The provision of adequate financial and human resources, employee training and awareness raising to facilitate the continual improvement in Safety performance.

An OHS Management Plan will cover all the Project components and phases to provide a clearly written statement of intent and plan of action for the prevention of accidents and occupational illness and injury. Based on the risks and hazard assessment (e.g. HAZOP), it will include:

- strategies to control, respond rapidly to and prevent accidents, illness and injury resulting from each of the identified hazards and risks (e.g. introduction of a Permit to Enter system, effective housekeeping, safety walkthrough, wearing of PPE, etc);
- prevention and response strategies and clear and documented rules and safety procedures for health and safety in the workplace (both in Myanmar and Chinese language);
- staff safety education and training (including toolbox talks and inductions);
- measures to promote workers' safety culture via periodic HSE training, induction, toolbox talks to focus workers' attention on particular and specific safety issues;
- emergency response plan; and
- Documentation, monitoring and reporting requirements, including daily monitoring and monthly review of near-misses, incidents, occupational diseases, dangerous occurrences, accidents at project activity areas.

In conclusion, taking into account the mitigation measures listed above, the impacts related to OHS both during the construction and operation phase are considered having a medium significance.

8.7.1 Occupational Health

Myanmar Conch Cement Company Works has implemented an HIV/AIDS awareness and prevention program in consultation with local HIV/AIDS organizations and government initiatives to inform and counsel employees regarding the dangers of HIV/AIDS and how to reduce the spread of the disease.

- Pre-employment and regular medical examinations shall be carried out on all plant employees.
- Mawlamyine Cement Limited Works shall provide well-equipped sanitary facilities for its employees.
- Workers in areas of high temperature and other high-risk areas shall be allowed to take shorter shifts.

8.7.1.1 Occupational Safety

The general safety of employees while at work is the responsibility Mawlamyine Cement Limited, except in cases where the employee was acting in a negligent and dangerous manner. To that effect the following measures are in place.

- Conveyors and similar machinery shall be provided with a means of stopping them at any point.
- Guards shall be fitted to all drive belts, pulley, gears and other moving parts to protect workers.
- Raised platforms, walkways, gantries, scaffolds, stairways and ramps shall be equipped with handrails and non-slip surfaces.
- All electrical equipment shall be grounded, well insulated and conform to applicable codes.
- Plant site piping shall be colour-coded for acid, water, compressed air and process solution.
- Cement plant employees shall be provided with hardhats, safety boots, overalls, ear and eye protection, dust masks and gloves as appropriate, Table 8.7-1.
- Hazard and warning signs shall be erected or posted around the plant site to warn employees and contractors of potential dangers.

Table 8.7-1: Summary of Recommended Personal Protective Equipment According to Hazard

Objective	Workplace Hazards	Suggested PPE
Eye and face protection	Flying particles, molten metal, liquid chemicals, gases or vapors, light radiation.	Safety Glasses with side-shield, protective shades, etc.
Head protection	Falling objects, inadequate height clearance and overhead power cords.	Plastic Helmets with top and side impact protection
Hearing protection	Noise, ultrasound	Hearing protectors (ear plugs or earmuffs)

Table 8.7-1: Summary of Recommended Personal Protective Equipment According to Hazard (Continue)

Objective	Workplace Hazards	Suggested PPE
Foot protection	Falling or rolling objects, pointed objects, corrosive or hot liquid	Safety shoes and boots for protection against moving & falling objects, liquids and chemicals
Hand protection	Hazardous materials, cuts or lacerations, vibrations, extreme temperatures	Gloves made of rubber or synthetic materials (Neoprene) leather, steal, insulating materials, etc.
Body/leg protection	Extreme temperatures, hazardous materials, biological agents, cutting and laceration.	Insulating clothing, body suits, aprons etc. of appropriate materials.

The following measures in line with GIIP and PS2 will be adopted to avoid, minimize and mitigate the negative health and safety impacts of the Project construction and operation:

- adopting and training all personnel (including contractor workers) in the use of Personal Protective Equipment (PPE) and chemical handling;
- clear marking of work site hazards (especially close to high temperatures and open tanks) and training in recognition of hazard symbols;
- adoption of work site hazards signage both in Chinese and Myanmar language;
- training of all personnel in health and safety risk prevention and protection;
- regular noise surveys to ensure the on-site maximum levels are not exceeded;
- development of inspection, testing and maintenance programs for machinery and equipment;
- accident recording and investigation and prevention initiatives;
- development of and training in site emergency response plans both for the construction and operation phase; and
- compliance to all international, national or local HS standards that may exist.

Figure 8.7-1: MCL Management for Public Health and Safety

8.8 Occupational Safety Training

8.8.1 Occupation Health and Safety Training

Mawlamyine Cement Limited shall provide Occupation Health and Safety orientation training to all new employees to ensure they are appraised of the basic site rules of work at/on site and of personal protection and preventing injury to fellow employees.

Training shall consist of basic hazard awareness, site specific hazards, safe work practices, and emergency procedures for fire, evacuation, and natural disaster, as appropriate. Any site-specific hazard or color coding in use shall be thoroughly reviewed as part of orientation training.

8.8.2 Visitor Orientation

Where visitors to the site can gain access to areas where hazardous conditions or substances may be present, a visitor orientation and control program shall be established to ensure visitors do not enter hazard areas unescorted.

8.8.3 Basic Occupational Health and Safety (OHS) Training

Mawlamyine Cement Limited will institute a basic OHS training as follows;

- A basic occupational training program and specialty courses shall be provided, as needed, to ensure that workers are oriented to the specific hazards of individual work assignments.
- Training shall generally be provided to management, supervisors, workers, and occasional visitors to areas of risks and hazards.

- Workers with rescue and first-aid duties shall receive dedicated training so as not to inadvertently aggravate exposures and health hazards to themselves or their coworkers.
- Training would include the risks of becoming infected with blood–borne pathogens through contact with bodily fluids and tissue.
- Through appropriate contract specifications and monitoring, Mawlamyine Cement Limited management shall ensure that service providers, as well as contracted and subcontracted labor, are trained adequately before assignments begin.

8.9 Emergency Response and Rescue Plan

8.9.1 Objective

The following constitute the main objectives of the Emergency Response and Rescue Plan.

- Ensure employees are aware of their responsibilities in an emergency situation.
- Outline basic procedures to follow during safety related emergencies.

8.9.2 Activities

8.9.2.1 Maintenance of Emergency Contacts

1) The Central Control Room operator should prepare and maintain an updated list of the following:

   a) Key Plant Management Team Members
   b) External emergency service contacts such as the Fire Services Department of Kyaikmaraw, Township Police Department, company-subscribed clinics and township hospitals, including contact numbers of the doctors in charge.

Table 8.9-1: Contact Numbers for Emergency Response

Internal Contact (Mawlamyine Cement Limited) Contacts		
NAME & DESIGNATION	**TELEPHONE (WORK)**	**MOBILE**
CSR Department Manager	-09796093056	
HR Department Manager	-09769832204	
MCL Clinic Doctor	-09788903438	-
External Emergency Contacts		
KyaikMaRaw Police Station	057-860-04	
KyaikMaRaw Fire Service Department	057-860-15	
Doctor, KyaikMaRaw Township Hospital	057-860-08	
Department of Relief and R, Mon State	057-248-25	

2) Update and post all Safety Notice Boards in various sections of the Plant with:
   a) Emergency Plans which will clearly indicate exit routes, location of first aid boxes, fire extinguishers and Assembly Points.
   b) Emergency Toolboxes/rescue equipment.
   c) Company Ambulance contact numbers.

8.9.2.2 Emergency Assembly Points

There shall be clearly marked and designated Emergency Assembly Points in the Plant areas.

8.9.2.3 Fire Fighting Equipment

Mawlamyine Cement Limited will institute the following measures in order to enhance fire safety preparedness:

1) All offices shall be fitted with smoke detectors to offer early warning to employees in case of fire. The workplaces will be provided with fire alarms which will be activated in case of fire.
2) Electrical substations and other critical installations such as the cement packing plant, poly-bag warehouses, etc. shall be equipped with specialized automatic fire protection and control systems to detect and trigger the fire extinguishing agent.
3) All working areas will be provided with suitable fire extinguishers which shall be mounted in easily accessible locations.
4) At least a square meter of the area where a fire extinguisher has been mounted shall be kept clear.
5) Fire Extinguisher locations shall be posted with ‘’Fire Extinguisher’’ signs and will be mounted at eye level.
6) In addition to fire extinguishers, there shall be designated points for connecting fire hoses around the plant. These points shall be regularly serviced as per fire regulatory requirements.

8.9.2.4 Incident Management

The following shall constitute key management interventions in response to each respective emergent situation.

8.9.2.4.1 Fire

In the event of fire, the person discovering the fire should:

a) Raise the alarm.
b) Call the Central Control Room and or the Fire Brigade on.
c) If safe to do so tackle the fire, if in doubt get out.
d) Evacuate the premises and report to your designated assembly point.

8.9.2.4.2 Accidents

In case of an accident in the workplace:

a) The involved, if they are able to do so, should immediately report to their supervisor. Alternatively, the person discovering the accident should report it immediately to the Central Control Room Operator, who should in turn inform the Shift Manager.
b) The Shift Manager shall immediately go to the accident scene to assess its nature.
c) If the accident is a major one, that is, resulting in serious personal injury, and or property damage, the Shift Manager shall mobilize the required emergency services, including first aiders and inform the Safety Manager, Plant Manager, and others, accordingly.
d) If the accident occurs after-hours, the Shift Manager shall inform all the required personnel as per Plant Call Out procedure.
e) Information pertaining to the accident shall be released to the public through the Corporate Affairs Department or the Plant Manager.
f) During any emergency all communication on phones will be restricted to personnel handling the emergency.

8.9.2.4.3 Road Traffic Accidents

In case of a Road Traffic Accident:

a) Render assistance to any person injured, if practical.
b) Report the accident to the nearby Kyaikmaraw Police Station.
c) Do not accept responsibility for the accident but cooperate with the Police who will investigate the accident.
d) Obtain the particulars of the other involved parties, i.e. vehicle registration number, driver's name, witnesses etc.
e) Inform immediate supervisor and Safety Manager.

8.9.2.4.4 Hazardous Material Spills

In case of major hazardous material spills the following procedure will apply in order to minimize the impact on the environment:

a) Contain

The spilled oil shall be contained by constructing a bund around the affected area.

The trapped oil shall be pumped/collected into suitable containers, such as sealed drums and kept in a bounded area while awaiting removal from site.

b) Notify

The spill incident shall be reported to the supervisor who shall assess the situation and notify the relevant senior officials as per Incident Reporting Procedure.

In all cases where the oil spill is on ore, that is, in the pit or at the Run of Mine (ROM) pad, the senior officials will be consulted to recommend the best remedial action.

c) Dispose

Contaminated soil and absorbent material shall be disposed off in accordance with the waste management procedure.

d) Maintain

The affected area shall, as soon as is reasonably practicable, be cleaned up and replaced with fresh soil.

8.9.2.5 Responsibility

All supervisors are responsible for ensuring effective implementation of the Emergency Response Plan and will act as key respondents.

Designated assistants will act in the absence of substantive supervisors and will act as key respondents in that case.

Table 8.9-2 is a summarized Emergency Response Plan aimed at guiding response to emergency situations which may arise as stipulated above. The plan identifies likely emergency situations together with their causative factors followed by an elaboration of the proposed response. The plan finally identifies the respondents in order of priority. It is anticipated that implementation of the plan would safeguard the health and safety of workers and prevent excessive loss of property.

Table 8.9-2: Emergency Response Plan

	Emergent Situation	Cause	Proposed Response	Respondents
1	Staff Injury	• Unskilled labour • Neglect of safety procedures • Faulty equipment and tools	• Apply appropriate First Aid • Document incidence • Take to hospital if necessary • Investigate causative factor and institute appropriate measures to prevent similar occurrences	**Key Respondents:** Immediate supervisor or person first arriving at accident scene and Safety and Health Manager **Other Respondents:** First Aid Attendant on Duty Immediate Supervisor, Factory Manager.
2	Chemical Poisoning	• Unskilled labour • Neglect of safety procedures • Faulty equipment and tools	• Apply appropriate First Aid • Document incidence • Take to hospital if necessary	**Key Respondents:** Immediate supervisor or person first arriving at accident scene and Safety and Health Manager **Other Respondents:** First Aid Attendant on Duty Immediate Supervisor, Factory Manager.
3	Fire Outbreak	• Neglect of safety procedures	• Sound alarm and instruct all to assemble at Fire Assembly point • Conduct roll Call • Fight the fire using appropriate tools (fire extinguisher, sand, water) • Inform Kyaikmaraw Fire Brigade and Police • Document incidence	**Key Respondent:** Fire Discoverer , immediate supervisor and Safety and Health Manager **Other Respondents:** Emergency Response Team.
4	Chemicals and other material Spillage	• Neglect of safety procedures • Poor containment/storage facilities	• Contain material by bunding around with sand or any other suitable material to stop material flow and spread • Clean up affected areas • Document incidence	**Key Respondent:** Immediate supervisor and Environmental Manager **Other Respondents:** Emergency Response Team.

8.10 Ecological Management System

MCL monitoring plan will be completed with all of the following measures:

- routine checking of trenches (if any) and escape routes to minimize, if not prevent, entrapment of fauna;
- washing down of vehicles in place and prior to commencing work;
- preservation of excavated top-soil for future site restoration procedures particularly in highly disturbed areas;
- limiting vehicular transport to defined roads as to prevent unnecessary injury, habitat destruction and complying with safe driving procedures;
- reporting of any violation relating to hunting and trading activities;
- implementing good housekeeping practices on the field and implementing good Solid Waste Management Plan in order to eliminate any source of hazard to the native fauna;
- minimize vegetation clearance and habitat disturbance by demarcating the clearing boundaries in the quarry site;
- unnecessary cleaning the trees is to avoid;
- environmental awareness training to be given to all workers for the preservation of local biodiversity species and induct the nature of the sensitivity of project area;
- site specific instruction/protocol for identifying and relocation of plant and wildlife species if necessary, shall be provided to all workers with education materials including photographs; and works areas in temporarily affected areas shall be reinstated with tree/shrub/ grass upon completion of the works;

As referenced on MCL's commitments shown as below, MCL also took care about the water resources in terms of the ecological management control actions such as;

1) Tree Plantation
2) Releasing indigenous fish species into the Ataran river
3) Prohibition of Hunting and Catching Natural Animals

1) Tree Plantations

MCL have planted the trees about 69980 in number at different surrounding area around the project site.

Plantation of Trees from 2015 to 2018

Plantation event within MCL	
Actual planted amount of tree 2015	**24,566**
Actual planted amount of tree 2016	**20,414**
Actual planted amount of tree 2017	**10,000**
Plan for planting 2018	**15,000**
Actual planted amount of tree 2018	**600**
Total planted amount of tree	**55,280**

Nursery 1

Nursery 2

Figure 8.10-1: MCL Plantation Events at Jetty and Canal Area

2) Releasing Indigenous Fish Species into the Canal

After the complete set up of canal and jetty, MCL made "fish releasing event" into the canal on 12th August 2017, in terms of caring about the indigenous fish species as in ecological study in existing environmental condition (Chapter 4). It was about 50,000 fishes into the canal and the event was coordinately organized with the relevant stakeholders from Government office and students from nearby village schools together with the villages from the villages surrounding the MCL cement plant as shown in the following figures.

Figure 8.10-2: MCL Fish Releasing Event on 12th August 2017

3) Prohibition of Hunting and Catching Natural Animals

Hunting and catching natural animals are also strictly prohibited to the MCL staffs and the invaders from surroundings at around the canal and plant area as shown in figures below.

Table 8.10-1: MCL Control Measures for Ecological Management Plan

Sr. No.	Criterion	Possible impacts	Remark	Mitigation measure
Vegetation				
1	Limestone cast forest, and Mixed plantation area	Disturbance from the project construction activities and workers and visitors during operation phase	Loss of vegetation and wildlife species; mainly threatened plant species *Hopea odorata*	Systematic design and management should be performed. Re-vegetation should be carried out.
Cultivated and Shrub land				
2	Cultivated, shrub and herb species	Disturbance from the project construction activities and workers and visitors during operation phase	The impact on distribution of plant species may not be distinct however management system is important.	Revegetation should be done.
Pollution of air and water				
3	Water pollution	Wastewater and any waste disposal, depending on design during operation phase	Process dependent	Recycling and Reuse of waste water and waste disposal would be practiced.
4	Pollutants of air	Dust	Air pollution	Reduce the impacts by using possible means.

8.11 Public Relation Activities

MCL Open House Activities and Public Relation Program were conducted in 25th June 2019 in 8 villages around MCL project area including the key persons such as villages' heads, heads of schools and village health care officer together with MCL authorities and staffs. These open house activities included the open discussion among the MCL authorities and the villages and planting trees along the village boundary and school area.

Table 8.11-1: List of Villages Involved in Open House Activities

Sr. No.	Village	Participants from Villages	Participants from MCL
1	Kaw Pa Naw	5	MD and Staffs
2	Me Ka Ro	4	
3	Kwan Ngan	9	
4	Pauk Taw	5	
5	Village Healthcare Centre	3	
6	Ka Don Sit	3	
7	We Nge	1	
8	Kaw Wan	7	
9	Kaw Dun	1	
Total		**38**	

There were 38 participants in the public relation activities (seen in above Table) and 9 concerned questions in total about the MCL supports in villages' facilities in development and improvement activities.

Table 8.11-2: Villages' Concerns on Project in Public Relation Meeting

Villages	Village Representatives	Questions	Solutions by MCL	Representatives from MCL
Kaw Dun	U Ye Win	MCL should concern about the Cement Transportation vehicles speed and if accident happened, MCL should involve to solve the problems. (accident with Me Ka Ro villager and cement transport car hadn't get agreement for compensation yet. Like that case MCL should involve deeply).	In the future, like that accident cases, MCL, villagers and owner of car should cooperate and solve the problem.	Mr. Hatsacchai (MD, MCL)
Kaw Wan	U Sein Aung	Villagers would like to request MCL to support their village cemetery repairing process.	Villagers' should request with detail calculation and design in order to consider by MCL with the fully or partially supports.	Mr. Hatsacchai (MD, MCL)

Table 8.11-2: Villages' Concerns on Project in Public Relation Meeting (Continue)

Villages	Village Representatives	Questions	Solutions by MCL	Representatives from MCL
Pauk Taw	U Thein Tun	Villagers would like to request MCL to provide water drainage along the village.	MCL will consider supporting based on the detail calculation and design.	Mr. Hatsacchai (MD, MCL)
		Would like to request MCL to support school's window repairing from glass to other materials.	MCL will think about it.	Mr. Hatsacchai (MD, MCL)
		Would like to request MCL to support school signboard repairing process.	MCL will think about it.	Mr. Hatsacchai (MD, MCL)
Me Ka Ro	U Soe Myint	Villagers would like to request MCL to support village road which has 4000 feet length repairing and concreting process. Estimated 2000 cement bags have to be used.	Villager should request with the detail calculation of amount of stone, amount of cement bags, length/ width/ height of road so that MCL will consider about fully or partially support.	Mr. Hatsacchai (MD, MCL)
Ka Don Sit	Daw Nyo Nyo	Would like to request MCl to support school entrance road concreting process.	MCL request head of villagers to calculate detail expenses.	Mr. Hatsacchai (MD, MCL)
Kwan Ngan	U San Thein	Would like to request MCl to support school fence repairing process.	MCL request head of villagers to calculate detail expenses with design.	Mr. Hatsacchai (MD, MCL)

8.11.1 Future Social Management Plan

MCL will make this kind of open house activities in the future along with the project implementation as necessary and the concerned authorized persons from Government sector and Regional sector will be invited to the work site visiting tour in Thailand so that the concerned stakeholders can understand the project activities and the control management actions of Siam Cement Plant (SCG) operation processes with the sustainable measures on coal fired power plant.

8.12 Decommissioning and Closure Plan

This Decommissioning and Closure Plan has been developed as part of the overall Environmental Management Plan for MCL in line with the company's Environmental, Health and Safety (EHS) Policy. The Plan covers a description of all activities that need to be carried out to effect decommissioning and closure in an environmentally friendly and socially

acceptable manner. To this effect work standards have been stipulated to achieve the decommissioning and closure objectives in line with the overall EHS policy.

Key considerations in the development of the Plan have been the envisioned state of environmental setting within the mining license area particularly the plant area, the limestone quarry area at the time of closure. It is this vision that characterize the rehabilitation works and standards to which the said works will have been done together with monitoring requirements. It should however be noted that preparation of this plan is based on the information available as of now. The current quarry mine and manufacturing plant has an estimated lifespan of more than 30 years.

Over this period operational and environmental conditions may differ requiring adjustment to the proposed plan in view of the above this plan is hereby presented to serve the purpose of initial planning subject to perfection at the time of actual decommissioning and closure.

8.12.1 Rationale for Development of A Decommissioning and Closure Plan

Every project has a start and end time. Cement manufacturing works at MCL Cement plant are not an exception. The mine and plant which have been operating since 2014 will have exhausted its useful lifespan and thus will be decommissioned and finally closed.

The plant will undergo decommissioning where mining operations and cement production will cease followed by removal of all infrastructure on site, clean up and rehabilitation after which a period of rehabilitation and restoration to acceptable standards of alternative use will follow and finally monitoring will take place to ensure stability of the site before final closure.

8.12.2 Industrial Use

The project site under discussion is an industrial/mining operation and the zoning for the area is compatible with this type of land use. The site does not present any limitations to use of the site as an industrial facility apart from the safety aspects associated with the quarry and pollution concerns for some types of industries in view of proximity to a water body. However, adequate mitigation measures can easily be put in place to render the safety risks insignificant for safe use of the site. The only limitation is that it is difficult to guarantee investor availability to take up the site and operate a viable industry.

8.12.3 Decommissioning and Closure Activities

8.12.3.1 Removal and Disposal of Movable Equipment

Movable equipment both motorized such as motor vehicles, tippers, loaders, drill rig, etc. and non -motorized such as furniture, computers and other office equipment, etc. would be moved to a central location and auctioned on site. Thereafter they will be moved from site within one month of purchase by the buyers. Disposal will however take consideration of works that will need to be carried out in site rehabilitation and any equipment and tools found to be valuable for carrying out rehabilitation works will be retained and only be disposed of after completion of rehabilitation works associated with the said equipment. This equipment includes tippers, front end loaders, drilling machines, folk lifters, etc.

8.12.3.2 Dismantling, Removal and Disposal of Immovable Equipment and Infrastructure

The first activity to be carried out in this regard will be to carry out an inventory of all available equipment and infrastructure with a view to identifying usable ones in line with the chosen land use option for the site. The result of this activity will be a listing of equipment and infrastructure that will be reserved for post closure use and those which require dismantling/demolition and removal from site. To this effect the principle of universal usage will be applied. Some type of facilities is such that regardless of the type of land use to be put in place they will serve a purpose. These include buildings such as offices, canteen, shower rooms, storerooms/warehouses, sheds, water treatment and supply facilities, sewer facilities, electricity, roads, workshop (excluding fittings and equipment), electricity substation, etc. These facilities will be reserved for post-closure use. In this regard usage may vary in specific terms but will generally have the same purpose of housing. For example, the canteen may not necessarily be used as a canteen but may be converted into a lecture room. Similarly, the engineering workshop may not be used as a workshop but can be partitioned into offices. A more detailed inventory would be worked out at the time of decommissioning.

Other facilities, installations and equipment with specialized usage may not have universal use and as such may not be required for use post closure and as such would require removal from site. These include crushing units, grinding/milling/blending units, cement loading/bagging units, conveyer units, kilns, rail line, overhead cranes, weigh bridge, mobile workshop, explosives storage facilities, etc. The following procedures and methods will be used in removing these facilities and equipment from site.

- Adherence to Best Practices in Waste Management by ensuring maximum use of equipment and facilities to be removed from site thereby reducing on waste designated for disposal.
- Auctioning the equipment, installations and facilities as whole units followed by removal from site by buyers under the company supervision.
- Encouraging removal of equipment and facilities capable of being removed from site as whole units to be removed as such without dismantling/disassembling them.
- Engagement of specialized services for dismantling of units which could not be removed as whole units in such a manner as to maintain their usability and easy assembling (piece by piece dismantling). This approach would enhance both personal and environmental health and safety. The dismantled material should then be stored in isolated units (in respect of each unit).
- Enforcement of MCL safety standards on all agents carrying out the required dismantling/removal works to maintain a healthy and safe working environment.
- Negotiation with buyers for removal of equipment from site within a specified period, e.g. 3 months.

Once all usable equipment and facilities have been removed from site the next step would be the dismantling of the remaining equipment and segregation of components into various material types for sale as scrap. This work shall be done with due consideration to environmental concerns e.g. by ensuring that equipment with oil is drained appropriately and the oil stored safely pending disposal as per standard procedures governed by law.

Once the dismantling exercise has been completed the materials will be sold as scrap to the various scrap users.

8.12.3.3 Demolition of Non Usable Structures, Building Foundations and Removal of Debris

Apart from usable equipment and facilities as noted above a lot of other infrastructure on site could not be recovered and these will require demolition for easy clean up and removal from site for disposal. These include slurry, clinker and cement storage silos (where these cannot be used as grain storage facilities), concrete (standard and reinforced) basements and columns for crushers, grinders, milling plants and other removed units. Demolitions will be done using various equipment including drilling machines, cranes, bulldozers, excavators, manual and hydraulic hammers, etc. Once demolition is completed the debris can then once more be assessed and sorted as appropriate for disposal after recovery of usable materials. Disposal would then be carried out in consultation with the relevant authorities.

Chapter 9
Environmental Monitoring Plan

9.1 Implementation of Environmental and Social Monitoring Plan

Successful implementation of Environmental Monitoring Plan (EMP) depends on regular monitoring, documenting and reporting. Mawlamyine Cement Limited (MCL) should have provision of Health, Safety and Environmental Department for monitoring the EMP implementation during construction and operation phase of the project.

The environmental monitoring officer should monitor the EMP implementation and submit a quarterly report to the concerned department. Additionally, another yearly monitoring report with quarterly monitoring data should be submitted to the Environmental Conservation Department for renewing the Environmental Clearance Certificate. The institutional arrangement for implementation of EMP and Monitoring Plan is described in Section 2.9 (Chapter-2). The detail environmental monitoring plan has been presented in Table 9-1.

Table 9.1-1: Environmental Monitoring Plan

Indicator (Survey item)	Location of Data Collection	Method and Frequency	Institution
Construction Phase			
Monitoring EMP implementation • Mitigation measures • Enhancement measures • Contingency • Compensation	Project area	Daily monitoring and documenting, and quarterly reporting	SOD Department
Air quality (NO_2, SO_2, CO, TSP, PM_{10})	3 locations (same as baseline data collection locations)	Quarterly (March, July, November)	Third Party
Noise	4 locations (same as baseline data collection locations)	Quarterly (March, July, November)	Third Party
Surface Water Quality Analysis (Parameter are same as IFC standard)	Locations and number of samples are same as baseline data collection	Quarterly (March, July, November)	Third Party
Ground Water Quality Analysis (Parameter are same as IFC standard)	Locations and number of samples are (same as baseline data collection)	Quarterly (March, July, November)	Third Party
Soil Quality	Locations and number of samples are (same as baseline data collection)	Yearly (March)	Third Party

Table 9.1-1: Environmental Monitoring Plan (Continue)

Indicator (Survey item)	Location of Data Collection	Method and Frequency	Institution
Operation Phase			
Air quality (NO_2, SO_2, CO, $PM_{2.5}$, PM_{10})	4 locations (same as baseline data collection locations + Kadonsi village)	Quarterly (March, July, November)	Third Party
(Temperature, Velocity, SO_2, SPM, NOx, HC, CO)	Stack/Chimney Monitoring	Quarterly (March, July, November)	SOD Department
Noise	4 locations (same as baseline data collection locations)	Quarterly (March, July, November)	Third Party
Surface Water Quality Analysis (Parameter are same as IFC standard)	Locations and number of samples are same as baseline data collection	Quarterly (March, July, November)	Third Party
Ground Water Quality Analysis (Parameter are same as IFC standard)	Locations and number of samples are (same as baseline data collection)	Quarterly (March, July, November)	Third Party
Implementation of Air quality management plan, Noise Management plan, Waste management plan	Within factory area (Stack)	Daily monitoring and quarterly reporting	SOD Department
Surface water pollution monitoring (DO, BOD, COD, Heavy metal, pH, salinity, Total hardness, Nitrate, TDS, TSS, Temperature, etc.)	1. Effluent discharge point	Quarterly (March, July, November)	Third Party
Implementation of Ecosystem Management plan	Within project area	Regular monitoring and quarterly reporting	SOD Department or Third Party
Whether people and workers suffer from health risk	Project site and surrounding the area	Quarterly	SOD Department
Occupational Health and Safety	Cement Plant and Compound (Work site and offices)	Twice per year Record of accidents and infectious diseases	SOD Department
Community Health and Safety	5 villages nearby the project sites	Twice per year Record of accidents and infectious diseases related to the community	SOD Department

Table 9.1-1: Environmental Monitoring Plan (Continue)

Indicator (Survey item)	Location of Data Collection	Method and Frequency	Institution
Operation Phase			
The implementation status for CSR activities such as community support program	5 villages nearby the project sites	Once per year	SOD Department
Usage of chemicals	Cement Plant and Compound (Work site and offices)	Biannually Record of the type and quantity of chemicals and implementation status of control measures through self-inspection	SOD Department

9.2 Monitoring and Reporting

Compliance monitoring is the prudent element of Environmental Monitoring Plan that ensure effective implementation of the Environmental Management Plan, compliance of all project related activities with relevant environmental rules and regulations and safety procedure.

Monitoring of the compliance will be carried out by the SOD Department but should be audited yearly by the external auditor. The monitoring activities and results should be well documented and followed by the standard monitoring checklist.

9.2.1 Internal Monitoring

MCL SOD team will take over for internal monitoring activities. The principle approach of the step by step monitoring involves:

- Walkthrough inspection: quick survey of the activities, operations, equipment, and facilities
- Through inspection: visual observation activities, operation, equipment and facilities and review of related documents, previous records, reports, etc.
- Interview of relevant personnel: interviewing of related employees, key personnel, etc.
- Consultation with local people: consultation with local people to understand community perception on the project related activities and to identify social issues related with the project

The specific objectives of the internal monitoring are to:

- Verify that the baseline information of all the affected area that have been stated in EIA report and that the valuation of impacts or damaged by the project activities that was carried out in accordance with the approved EMP plan;
- Oversee that the environmental monitoring plan is implemented as designated and approved; and
- Verify that funds/cost for implementation of the EMP are provided by the Project management in a timely manner and in amounts sufficient for their purposes, and such funds are used in accordance with the provisions of the EMP.

The main indicators to be monitored regularly are:

- The measurements of ambient air quality are in accordance with the list of parameters and monitoring locations mentioned in and that the analysis period is carried out in line with agreed procedures;
- The measurements of surface water and ground water quality are in accordance with the list of parameters and monitoring locations mentioned in and that the analysis period is carried out in line with agreed procedures;
- The measurements of noise quality are in accordance with the monitoring locations mentioned in and that the analysis period is carried out in line with agreed procedures;
- The measurements of soil quality are in accordance with the list of parameters and monitoring locations mentioned in and that the analysis period is carried out in line with agreed procedures;
- Implementation of ecological preservations such as plantation and backfilling of soil into the pits etc. which will be degraded by the mining activities such as forest clearance and soil digging and removal of top soil during construction period;
- Compliance monitoring in storage of fuels and equipment and handling of machines to be alliance with the safety guidelines;
- Continuous monitoring of occupational health safety of workers and community health and safety at the surrounding villages mentioned in EMP report;
- Receiving the community grievance or complaints over any damage or impact by the related mining activities and verify and evaluate the proposed impacts and give the adequate explanation and control measures to reduce or avoid it;
- Managing the CSR activities are carried out in line with agreed procedures in EMP;

9.2.2 External Monitoring

Potentially this monitoring has to be made by government officers or independent group and/or altogether that the implementation works are in accordance with the agreed procedures.

External monitoring should be periodically carried out by an independent monitoring agency to provide an independent view on the achievement of the EMP. The external monitoring will focus on the outcomes and results of control measures and mitigation activities such as the changes in environmental setting and socioeconomic of the project area, the effectiveness, impact and sustainability of control measures, the need for further mitigation measures if any, and to learn strategic lessons for future policy formulation and planning.

The external monitoring can adopt some of the following indicators:

- Full payment to be made to all affected persons sufficiently before land acquisition.
- Completion of land acquisition before the construction starts.
- Public consultation and awareness of environmental emission policy: (a) all the villages nearby project, especially the affected villages should be fully informed and consulted about the project activities, b) Ongoing of public consultation meeting in accordance with the agreed period mentioned in EMP on the regarding problem, issue or grievance related to the project activities and impacts.
- The operation of the mechanisms for grievance redress, and the speed of grievance redress will be monitored.
- The level of satisfaction of the affected villages/persons with various aspects of the livelihood support program or providence of community health and educational facilities will be monitored and recorded.
- Throughout the implementation process, the trends of the new possible impacts and current impacts mitigation level will be observed and surveyed around the project area and community area. Any potential problems in the study area will be reported, and recommendation for further adjustment of the plan and approach should be made if necessary.

The following activities are the standard functions of the external monitors:

- Verification of internal monitoring reports, by field check of the following:
- Oversee the complement of implementation works
- Evaluate the results and outputs of control measures
- satisfaction of affected community towards the project EMP implementation
- Check the type of grievance issues and the functioning of grievance redress mechanisms by reviewing processing of appeals at all levels and interviewing aggrieved persons.
- Survey the completed implementation works how they have been improved or maintained.
- Advise Project management regarding possible improvements in the implementation of the EMP.
- Regular external monitoring should begin along with implementation activities and carry on until the end of the EMP and Project phasing out.

The inspection, observation, consultation and reporting should be followed by an organized checklist. The checklist of the monitoring should be developed during operation phase of the project.

The target areas of monitoring are:

- Compliance of project related activities with national and international (if required) environmental rules and regulation as described in chapter 2 during preconstruction, construction and operation phases
- Compliance of the project related activities with the Suggested EMP during construction and operation phases
- Compliance of the Plant operation (noise, emission, waste disposal, waste water discharge, etc.) with relevant national and international (if required) standards

- Compliance of the Environmental Monitoring Activities with suggested Environmental Monitoring Plan
- Record each of incidents

9.2.3 Grievance Mechanism

The purpose of the grievance mechanism is to ensure that all requests and complaints from individuals, groups and local communities throughout the Project life, from planning and design through construction, operations and decommissioning, are dealt with systematically in a timely manner with appropriate corrective actions being implemented and the complainant being informed of the outcomes.

As aforementioned, MCL will establish several channels for grievance and information to enable the public to register any concern about the Project. Grievance mechanism will be in place throughout all Project stages and presented and discussed with the public during consultations. Channels to raise grievances will include:

- postal, electronic mail, and local telephone line reaching the administrative office of MCL in Project Compound (to be specifically created);
- written or orally to the conveyor belt construction site manager; and
- written or orally during public events and meetings.

The grievance mechanism is responsibility of the staff appointed for the SOD implementation. All complaints will be logged and processed and addressed within a fixed time, communicated to the complainant, as shown in Annex - B by the processing grievances flowchart. The procedure is summarized below:

- grievances will be logged in a Grievance Register and an acknowledgement of receipt of complaint will be issued to the complainant within five working days;
- in case an immediate corrective action is not possible or sufficient, MCL will inform complainant of the proposed long-term corrective action, specifying a deadline, or explain the reason why the action is not feasible within 10 working days;
- MCL will identify responsibilities and internal deadline for corrective action(s);
- MCL will follow up the implementation of the corrective measures;
- MCL will inform the complainant in writing and in person of the corrective action and record the closure of the grievance; and
- if the corrective action implemented is not accepted, it may be reviewed to identify alternative corrective actions. A revised resolution may be proposed. in case the resolution is then accepted by the stakeholder, the relevant grievance will be closed. On the contrary, if it will be not accepted, and no further improvements can be made, then external remedies may be pursued.

Complaints will be resolved within a period that will not exceed 30 days from their receipt and registration date.

As part of the grievance process, MCL when receiving the complaint will log each grievance and document the action taken. It will regularly review the database of received grievances to identify and analyse any recurrent issues and trends.

9.2.4 Monitoring and Evaluation

The SOD will be endorsed by the MCL, who will have the responsibility for its implementation. The Company SOD will be regularly updated, presenting changes in Project activities, stakeholders, as well as advice and inputs received, lessons learned and any change to the consultation process. As a minimum, the SOD will be updated before the start of the operation phase.

The Company will develop a programme to monitor the Project stakeholder engagement activities and public perception of the Project. The monitoring programme will detail key elements of the monitoring, such as monitoring parameters, modality and frequency. The Company will also describe how and when the results will be reported.

Stakeholder, consultation and grievance registers, recording relevant information in a tabular form, shall be updated on an on-going basis. Progress reports will be prepared on a quarterly basis during the construction period and on a biannual basis during the operation phase to include updates on the grievance process, with the number of grievances received and addressed/closed, most frequent types of grievances, and any recommendation or action taken to decrease the number of grievances.

As long as there will be open grievances, the SOD Manager will make a selection of a random sample of grievances biannually and follow up with the complainants to ensure that appropriate corrective actions have been taken and that the outcomes are satisfactory.

The reporting mechanism and responsibilities for stakeholder engagement are outlined in Table 6.3-6.

Table 9.2-1: SOD Reporting Mechanisms and Responsibilities

SOD Reporting Mechanism	Timing	Responsibility
Consultation Form	For each consultation or stakeholder contacted	SOD Manager
Stakeholder Identification and Consultation Register	Continuous	SOD Manager
Grievance Register	Continuous	SOD Manager
Grievance Monitoring	Quarterly during construction Biannual during the operation	SOD Manager
SOD Progress Reports	Quarterly during construction Biannual during the operation	
SOD Annual Report	Annually	

9.2.5 Resources and Responsibilities

The implementation of this SOD is responsibility of MCL during all over Project phases. MCL will appoint one SOD Manager in charge of all SOD activities (from the available staff or an external figure, for example from a local NGO or university, in both cases with appropriate professional background on stakeholder engagement in the local context).

MCL staff involved in the Project will be briefed in order to be aware of the commitments taken by the Project and the Project approach in dealing with stakeholders. The SOD Manager will coordinate the implementation of the SOD activities and keeping ongoing contacts with the construction manager.

The SOD Manager will be based in Project Office and will take part to all the stakeholder engagement activities in the area. He/she has a general control function of the grievance mechanism process and collects, records and deals with grievances.

9.2.6 Budget

The budget for the SOD implementation will consider the following items throughout the Project construction and operation phase:

- cost of human resources: the remuneration of the SOD Manager, if not identified within the internal MCL staff, and of a short-term expert to carry out specific tasks, if necessary;
- training of the SOD Manager;
- specific consultation activities as outlined in the SOD;
- consultation materials and tools; and
- monitoring of the effectiveness of the SOD

9.2.7 Annual Reporting Schedule for EMP

Monitoring and evaluation (M&E), including reporting, will be regularly carried out as a major element of the management of the EMP implementation throughout the period of EMP implementation.

The compliance monitoring report along with the checklist should be indexed and annexed with the monthly and annual monitoring report. It may be required to submit the annual monitoring report to Department of Environmental Conservation (ECD) for renewing of the Environmental Clearance Certificate each year.

Table 9.2-2: Target Schedule for Monitoring Report

Task	Yearly EMP Reporting Schedule																														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Jan																															
Feb																															
Mar																															
Apr																															
May																															
Jun																															
Jul																															
Aug																															
Sep																															
Oct																															
Nov																															
Dec																															

Public Holiday
Target Reporting Period

9.3 Estimated Cost for Implementation of EMP and Environmental Monitoring

The Project cost is inclusive of cost for implementing Environmental Management Plan and installation of pollution abatement and mitigation measures described in the this ESIA report. The costs for Environmental Management Plan and responsible institute has been estimated in Table 8-2.

The main cost for Environmental Monitoring during construction and operation phases are cost for field measurements such as air quality, water, and noise quality. MCL cement plant and associated facilities have been constructed and the present condition is test run phase so the annual costs for field measurements in the construction and operation phase are estimated, as shown in Table 9.2-1.

Table 9.3-1: Estimated Environmental Management Plan and Monitoring Cost (Operation Phase)

Indicator (Survey item)	Location of Data Collection	Method and Frequency	Institution	Annual Cost (USD)
Construction Phase				
Monitoring EMP implementation • Mitigation measures • Enhancement measures • Contingency • Compensation	Project area	Daily monitoring and documenting, and quarterly reporting	SOD Department	14,400
Air quality (NO_2, SO_2, CO,TSP, PM_{10})	3 locations (same as baseline data collection locations)	Quarterly (March, July, November)	Third Party	19,500
Noise	4 locations (same as baseline data collection locations)	Quarterly (March, July, November)	Third Party	10,755
Surface Water Quality Analysis (Parameter are same as IFC standard)	Locations and number of samples are same as baseline data collection	Quarterly (March, July, November)	Third Party	8,715
Ground Water Quality Analysis (Parameter are same as IFC standard)	Locations and number of samples are (same as baseline data collection)	Quarterly (March, July, November)	Third Party	10,455
Soil Quality	Locations and number of samples are (same as baseline data collection)	Yearly (March)	Third Party	8,475
Operation Phase				
Air quality (NO_2, SO_2, CO, $PM_{2.5}$, PM_{10})	3 locations (same as baseline data collection locations)	Quarterly (March, July, November)	Third Party	19,500
(Temperature, Velocity, SO_2, SPM, NOx, HC, CO)	Stack/Chimney Monitoring	Quarterly (March, July, November)	SOD Department	6,450
Noise	4 locations (same as baseline data collection locations)	Quarterly (March, July, November)	Third Party	10,755

Table 9.3-1: Estimated Environmental Management Plan and Monitoring Cost (Operation Phase) (Continue)

Indicator (Survey item)	Location of Data Collection	Method and Frequency	Institution	Annual Cost (USD)
Operation Phase				
Surface Water Quality Analysis (Parameter are same as IFC standard)	Locations and number of samples are same as baseline data collection	Quarterly (March, July, November)	Third Party	8,715
Ground Water Quality Analysis (Parameter are same as IFC standard)	Locations and number of samples are (same as baseline data collection)	Quarterly (March, July, November)	Third Party	10,455
Implementation of Air quality management plan, Noise Management plan, Waste management plan	Within factory area (Stack)	Daily monitoring and quarterly reporting	SOD Department	14,440
Surface water pollution monitoring (DO, BOD, COD, Heavy metal, pH, salinity, Total hardness, Nitrate, TDS, TSS, Temperature, etc.)	1. Effluent discharge point	Quarterly (March, July, November)	Third Party	4,250
Implementation of Ecosystem Management plan	Within project area	Regular monitoring and quarterly reporting	SOD Department or Third Party	10,350
Occupational Health and Safety	Cement Plant and Compound (Work site and offices)	Twice per year Record of accidents and infectious diseases	SOD Department	1,250
Community Health and Safety	5 villages nearby the project sites	Twice per year Record of accidents and infectious diseases related to the community	SOD Department	14,250

Table 9.3-1: Estimated Environmental Management Plan and Monitoring Cost (Operation Phase) (Continue)

Indicator (Survey item)	Location of Data Collection	Method and Frequency	Institution	Annual Cost (USD)
Operation Phase				
The implementation status for CSR activities such as community support program	5 villages nearby the project sites	Once per year	SOD Department	2 percent of annual net profits
Usage of chemicals	Cement Plant and Compound (Work site and offices)	Biannually Record of the type and quantity of chemicals and implementation status of control measures through self-inspection	SOD Department	4,600

9.4 Corporate Social Responsibility

The annual report must contain a section on CSR activities detailing activities, spent amounts, impact and a sustainability assessment.

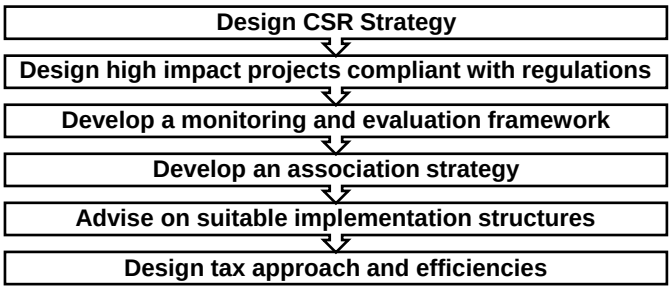
Executive management should set out a strategy or an annual plan, through which it will deliver the company's CSR philosophy, policies, and community-based principles. The strategy must outline:

- Allocated budget
- Available support and ways to participate
- The values and principles the company wants to establish and spread
- The community segments and social fields to be targeted

9.4.1 MCL CSR Program and Monitoring Plan

Expecting part of the profit of the project to share the social benefit of the community, the project company "MCL" would manage to fulfill the following CSR program for the local residents, 2 percent of annual net profits will be formulated.

MCL encouraged to push the company CSR strategy for every benefited project in accordance with the followings;



MCL CSR monitoring implementations will be managed by SOD team with the following monitoring plan.

Annual CSR reporting will be prepared as the followings;

- Prepare and file annual CSR reports according to regulatory guidelines
- Tax inputs for accurate representation
- CARE tool services.

9.4.2 MCL CSR Activities

1) Public health & medical programs
2) Clinic and mobile medical care service especially near cement plant operating areas
3) Public benefit activities
4) Support and contribute appropriately to society and communities, especially near cement plant operating areas i.e. recondition public road, school, temple & pagoda, government office etc
5) Education/ religion
6) Encourage and promote activities/programs related to helping young people realize their potential and capability in education, science, technology, sport and art, and instill ethics and moral sense, thus creating smart and ethical people i.e. scholarships, playground, sport area, science camp, English language camp etc
7) Occupational development
8) Occupational development program according to sufficient economy i.e. Integrated Farming System, biogas, Bio-fertilizer, Non-toxic vegetables etc
9) Community activities
10) Provide opportunities to communities and relevant parties to collaborate in activities and many different programs i.e. open-house program, One Cell One Project (OCOP) etc
11) Join traditional activities i.e. Thingyan festival

The past CSR program that have been already conducted by MCL are attached in Annex-6.

The amount of budget spent on past CSR activities are provided in the following figure and the photos of CSR program conducted by MCL are attached in Annex-9-1.

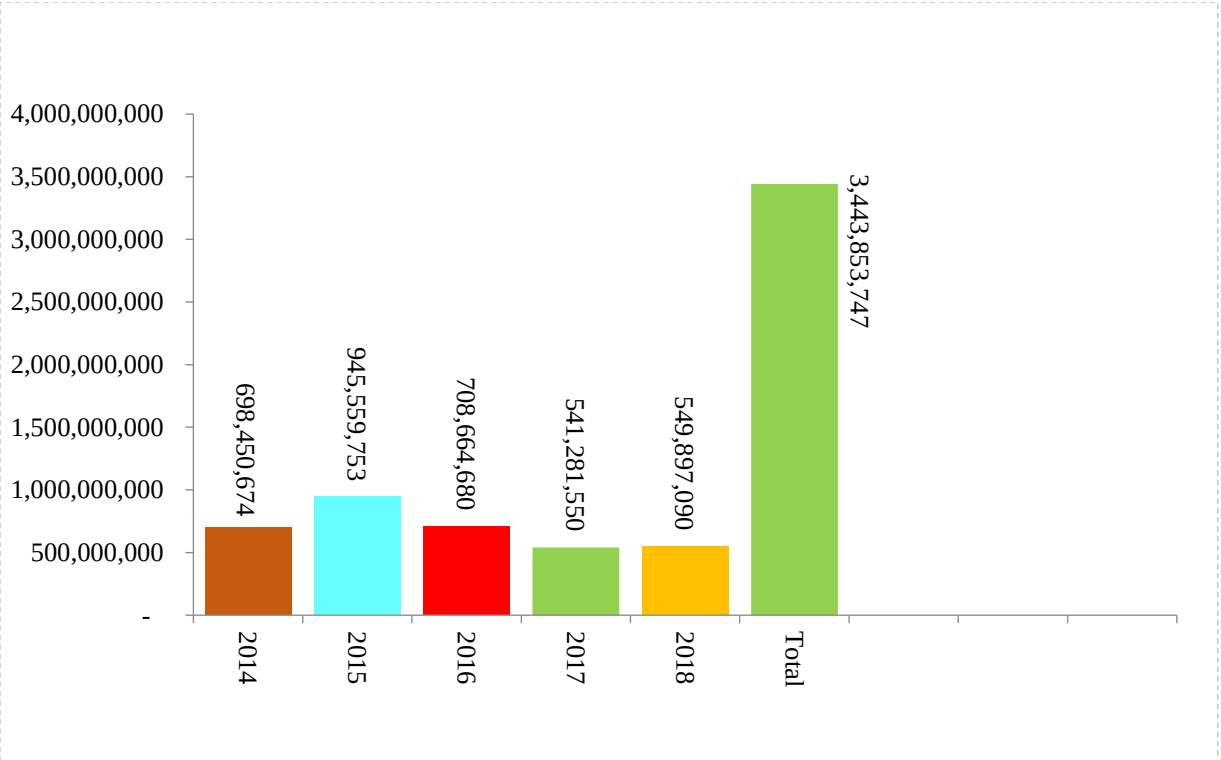


Figure 9.4-1: Budget Allocation on CSR Program from 2014 to 2018

9.5 Monitoring of Decommissioning and Closure Plan

9.5.1 Rehabilitation of the Plant Surface Area

The beginning point in rehabilitation works will be the carrying out of safety, environmental and health risk assessment in relation to the preferred land use option – social amenities/farming in this case. This will include pollution assessment of the area to establish nature and degree of remedial works needed.

After assessment has been done and pollution status established the next step would be the application of appropriate pollution remedial measures to detoxify the area. This may include general cleanup of the area to remove any debris, vacuum sweeping of all cement dust deposition, soil excavation for areas assumed to be heavily contaminated, liming or bioremediation e.g. in cases of moderate pollution by hydrocarbons. Once pollution remediation has been done follow up would include levelling, re-grassing, reforesting, etc. landscaping of disturbed open sites.

9.5.2 Rehabilitation of Solid Waste Dump

The cement plant area has solid waste dumps. Rehabilitation works will be done in line with the rehabilitation objectives as far much as can be achieved under the obtaining circumstances together with compliance to commitment that described in Contract with national or regional and international rules and guidelines.

- Physical Stabilization
- Chemical Stabilization
- Erosion and Dust Control
- Re-vegetation

9.5.3 Budgetary Provisions

The budget for plant decommissioning and closure will be committed to relevant ministry after discussion with Ministry of Mine and Ministry of Industry. Specific cost lines are as follows:

- Disposal of Equipment and Installations both movable and immovable as well as salvaged scrap –
- Demolition works and disposal of demolition waste –
- Plant Surface Area Rehabilitation –
- Solid Waste Dump Site –

The following considerations were taken into account on working the budget:

- First consideration for disposal of equipment and materials with use value would be sale by auctioning
- First line option for disposal of equipment/machinery/instillations, furniture and scrap would be sale by auctioning
- Plant surface area needing rehabilitation will depend on area contaminated.

The proposed Environmental Management Plan and Monitoring Plan are scheduled for implementation effective after approval from MIC. The ongoing activities have now been consolidated in this Management Plan to provide a holistic approach to the management of environmental aspects of the project.

It shall be the responsibility of each supervising Head of Department to ensure that the EMP provisions are effectively implemented starting with he/herself down the line of command. Day to day monitoring and evaluation of EMP implementation will however be the responsibility of the Environmental Manager of Mawlamyine Cement Limited. Mawlamyine Cement Limited will ensure that annual audits are internally conducted to assess implementation of the EMP and its effectiveness. Feedback from the audit will be used to review the EMP with a view to strengthening aspects not yielding the intended results. The EMP will be subjected to External Auditing every after three years with the same objectives.

Results of the External Audits will be shared with the Ministry of Natural Resources and Environmental Conservation and safety agencies. Suffice to say so the authorizing agencies have the mandate to demand for an audit where it is grossly noted that the environmental aspects of the plant and or quarries are not being managed according to the commitments made in this EMP.

Chapter 10
Conclusion

10.1 List of Commitments

A consolidated summary list of environmental and social impacts and mitigation measures commitments that Mawlamyine Cement Limited (MCL) will be expected to adopt in order to manage and mitigate potential impacts associated with the project development is provided below in Table.

Table 10.1-1: Project Key Commitments

Commitment Source	Commitment
Chapter II	Mawlamyine Cement Limited (MCL) will follow National and international Laws, By Laws, Regulations and Guidelines Relevant to Canal and Jetty operation process. Also, the project will meet the emission and effluent standards with national
Chapter II	Mawlamyine Cement Limited (MCL) will specifically commit itself to the prevention of pollution through the implementation of processes, practices, and techniques to avoid, reduce and control the creation, emission and discharge of any type of pollutant and waste.
Chapter II, Use of Natural Resources	Mawlamyine Cement Limited (MCL) will specifically commit itself to minimize the use of consumptive resources and promote the reduction and recycling of waste products where possible.
Chapter II, Air quality standard	Mawlamyine Cement Limited (MCL) will follow National Environmental Quality (Emission) Guideline and IFC General EHS Guidelines for the ambient air quality especially in operation phase as in Table 2.3-1 and 2.3-2 (NEQG).
Chapter II, Wastewater Effluent	Mawlamyine Cement Limited (MCL) will follow National Environmental Quality (Emission) Guideline and IFC General EHS Guidelines and for the waste water effluent as in Table 2.3-3 and 2.3-4.
Chapter II, Ambient Noise Standard	Mawlamyine Cement Limited (MCL) will follow NEQG for the ambient and industrial noise standard during construction and operation phase as In Table 2.3-5.
Chapter II Commitments	Mawlamyine Cement Limited (MCL) will prepare an IEE report with fully compliment with EIA procedure 2015 in timely and precisely mannar as in Table 2.2-1.
Chapter II Organization Guideline	Mawlamyine Cement Limited (MCL) will follow International Finance Corporation's EHS Standard for organization as in Table 2.4-1.
Chapter II, Ambient Noise Standard	Mawlamyine Cement Limited (MCL) will follow International Finance Corporation's EHS Standard for the ambient and industrial noise standard during construction and operation phase as in Table 2.4-2.

Table 10.1-1: Project Key Commitments (Continue)

Commitment Source	Commitment
Chapter III Designs and Equipments	Mawlamyine Cement Limited (MCL) will utilize the facilities'designs and modernized equipment and machinery as described in Project description for cement plant construction and operation.
Chapter VII Impact Assessments and Mitigation Measures	Mawlamyine Cement Limited (MCL) will be adopted mitigation measures for avoiding or reducing such environmental and socio-economic impacts potentially generated by the Project during both the construction and operation phases.
Chapter VII Ambient Air Emission	Mawlamyine Cement Limited (MCL) will implement mitigation measures for ambient air emission in Section 7.3 with the regular monitoring plan.
Chapter VII Noise Emission	Mawlamyine Cement Limited (MCL) will implement mitigation measures for operation phase as mentioned in Section 7.6.
Chapter VII Wastewater Effluents	Mawlamyine Cement Limited (MCL) will implement mitigation measures in Sections 7.7.4.1 and 7.7.4.2 for both construction and operation period.
Chapter VII Solid Wastes	Mawlamyine Cement Limited (MCL) will implement mitigation measures for solid waste as mentioned in Section 7.9.3.
Chapter VII Soil	Mawlamyine Cement Limited (MCL) will implement mitigation measures in Section 7.8.4 and 7.8.6.
Chapter VII Biodiversity	Mawlamyine Cement Limited (MCL) will implement mitigation measures in Section 7.10.5.
Chapter VII Visual/Landscape	Mawlamyine Cement Limited (MCL) will implement mitigation measures in Sections 7.8.5 and 7.8.6 for construction and operation phases.
Chapater VII Cultural Heritage	Mawlamyine Cement Limited (MCL) will implement mitigation measures as shown in Section 7.14.2.
Chapter VII Cumulative Impacts	Mawlamyine Cement Limited (MCL) will implement mitigation measures as shown in 7.17.3.
Chapter VII Traffic Issue	Mawlamyine Cement Limited (MCL) will implement mitigation measures in 7.11.8.
Chapter VII Socioeconomic	Mawlamyine Cement Limited (MCL) will implement mitigation measures as in Section 7.11.10.
Chapter VII Community Health and Safety	Mawlamyine Cement Limited (MCL) will implement mitigation measures as in Section 7.12.4 and 7.12.5.
Possibility of employment opportunities	The labor recruitment policy must be formulated in such a way that local laborers can easily get chance of employment in the project.

Table 10.1-1: Project Key Commitments (Continue)

Commitment Source	Commitment
Occupational health hazard	Arrangement of personal protective equipments sucha as gloves, helmet, sunglasses and other tools, dress (life jackets) and uniforms for each worker so that the workers can keep themselves safe from any kinds of accident and the occupational health training will also be provided.
Chapter VIII, Environmental component	Mawlamyine Cement Limited (MCL) will develop and implement environmental and social management plan in accordance with the impacts that described in Table 8.2-3, 8.2-5.
Chapter VIII, Social & OHS component	Mawlamyine Cement Limited (MCL) will develop and implement social and OHS components as described in table 8.2-4 and 8.2-6
Occupational Health and Safety Management Plan	Mawlamyine Cement Limited (MCL) will develop and implement social and OHS components as described in section 8.7.
Chapter VIII, Emergency Response Plan	Mawlamyine Cement Limited (MCL) will develop and implement social and OHS components as described in table 8.9-2.
Chapter VIII, Cultural Heritage	Mawlamyine Cement Limited (MCL) will develop and follow a chance find procedure for cultural heritage objects and sites as shown in Section 7.14.3.
Chapter VIII Decommissioning Phase	Mawlamyine Cement Limited (MCL) will implement mitigation measures as described in 8.11.3.
Chapter VIII, Ecological Management Plan	Mawlamyine Cement Limited (MCL) will develop and implement an ecological management plan as shown in 8.10.
Chapter VIII, Grievance Redress Procedure	Mawlamyine Cement Limited (MCL) will develop and implement a grievance redress mechanism as shown in Section 9.2.3 for social management with the monitoring and evaluation as mentioned.
Chapter VIII, Monitoring and Reporting	Mawlamyine Cement Limited (MCL) will develop and implement a monitoring and reporting plan as presented in Table 9.1-1 and 9.2-1.
CSR Program	Mawlamyine Cement Limited (MCL) plan and reserve for cooperate social responsibility (CSR) (during operation period), two percent (2%) of yearly net profit of the project and CSR will be implemented as shown in Section 9.4.
Chapter IX, Environmental Monitoring Plan	The compliance monitoring report along with the checklist will be indexed and annexed with the monthly and annual monitoring report. It may be required to submit the annual monitoring report to Department of Environmental Conservation for renewing of the Environmental Clearance Certificate each year.
CSR Program	Mawlamyine Cement Limited (MCL) plan and reserve for cooperate social responsibility (CSR) (during operation period), two percent (2%) of yearly net profit of the project.

10.2 Conclusions

Mawlamyine Cement Ltd. (MCL) has been incorporated as a joint venture between SCG Cement (SCG) and Pacific Link Cement Industry (PLCI) to produce cement, distribute and sell cement and cement-related products, and operate limestone quarry and power plant (for self-purpose used).

The Resource & Environment Myanmar Ltd. has been invited by, SCG and PLCI to study Environmental, Social and Health Impact Assessment for the proposed cement plant at Pya Taung area, Mon State of the southeastern part of Myanmar.

In support and approval of ESHIA, the Resource & Environment Myanmar Ltd. had collected and analyzed physical, biological and social data such as people's perceptions, concern, opinion, and expectation on the project for the approval of clean environment and guiltless society during and after the development of the project.

Any type of development activity has both beneficial and adverse impacts on the environment in which it operates. The impacts are identified and evaluated by the project proponents to reduce their negative impacts and maximize the positive effects on the surrounding environment. The proposed project is being expected to meet the cement requirement for the construction and industries in the surrounding areas and also in different parts of Myanmar. The proposed project will generate an optimum employment generation for the local population. Full pledged Environmental Management Plan for the proposed cement project shall be constituted with qualified Engineers and Technicians.

According to the technical study and the environmental, social and health impacts assessment, the MCL Cement project will have positive impact on the Environment if the recommended Environmental Monitoring, Health, Safety & Environmental Management Plan (EMP) are fully implemented in high spirit by the project proponents.