PROJECT DESCRIPTION FOR SCOPING

Proposed Cement Manufacturing Plant, Power Plant and Building Materials Manufacturing Plant

Barangay Casabangan, Pio V. Corpus, Masbate

Submitted to:

ENVIRONMENTAL MANAGEMENT BUREAU
Department of Environment and Natural Resources
DENR Compound, Visayas Avenue, Quezon City, Metro Manila

Submitted by:

Matibay Cement Ltd. Co.

1906 The Orient Square Don Francisco Ortigas, Jr. Road, Ortigas Center, Pasig City

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1 Project and Proponent Basic Information

Name of Project	Cement Manufacturing Plant, Power Plant, and Building Materials Manufacturing Plant
Nature of the Project	• 2 x 2,500,000 metric tons per annum (mtpa) Cement Plant • 4 x 50 MW Power Plant • Building Materials Manufacturing • Jetty and Barge Pier
Name of Proponent	Matibay Cement Ltd. Co.
Project Location	Brgy. Casabangan, Pio V. Corpus, Masbate
Authority Over Land	Land Title and Leases by Masbate Materials Ltd. Co. with Municipal Industrial Land Classification
Address & Contact No. of Proponent	Sitio Puro, Brgy. Casabangan, Pio V. Corpus, Masbate Head Office: 1906 The Orient Square Don Francisco Ortigas Jr. Road, Ortigas Center, Pasig City, 1605 Philippines Tel. No.: (+632) 532-0819
Authorized Signatory and Representative	Engr. Oliver B. Chavez

2 Project Description

Matibay Cement Ltd. Co. ("MCLC" or "Proponent") proposes to develop and construct a vertically integrated building materials industrial site consisting of a 2 x 2,500,000 mtpa cement manufacturing plant with 4 x 180 metric tons per hour cement grinding mills (the "Cement Plant"), a 4 x 50 MW Circulating Fluidized Bed coal-fired captive power plant (the "Power Plant") a building materials manufacturing plant for fiber cement board, concrete hollow blocks, pre-cast concrete systems, paving stones, ready-mix concrete, tile adhesive, grouting and aggregates (the "Building Materials Plant"), and a 330m barge pier and 530m jetty (all together, the "Project").

The Project will undertake a phased construction as described below:

Phase 1A	2 x 180 metric tons per hour Cement Grinding Mill 7m draft Barge Pier
Phase 1B	1 x 2,500,000 metric tons per annum (mtpa) Cement Plant 2 x 50 MW Power Plant 12m draft deep-water Jetty
Phase 2	1 x 2,500,000 metric tons per annum (mtpa) Cement Plant 2 x 50 MW Power Plant Other building materials (fiber cement board, concrete hollow blocks, pre-cast concrete systems, paving stones, ready-mix concrete, tile adhesive, grouting, aggregates)

2.1 Project Location and Area

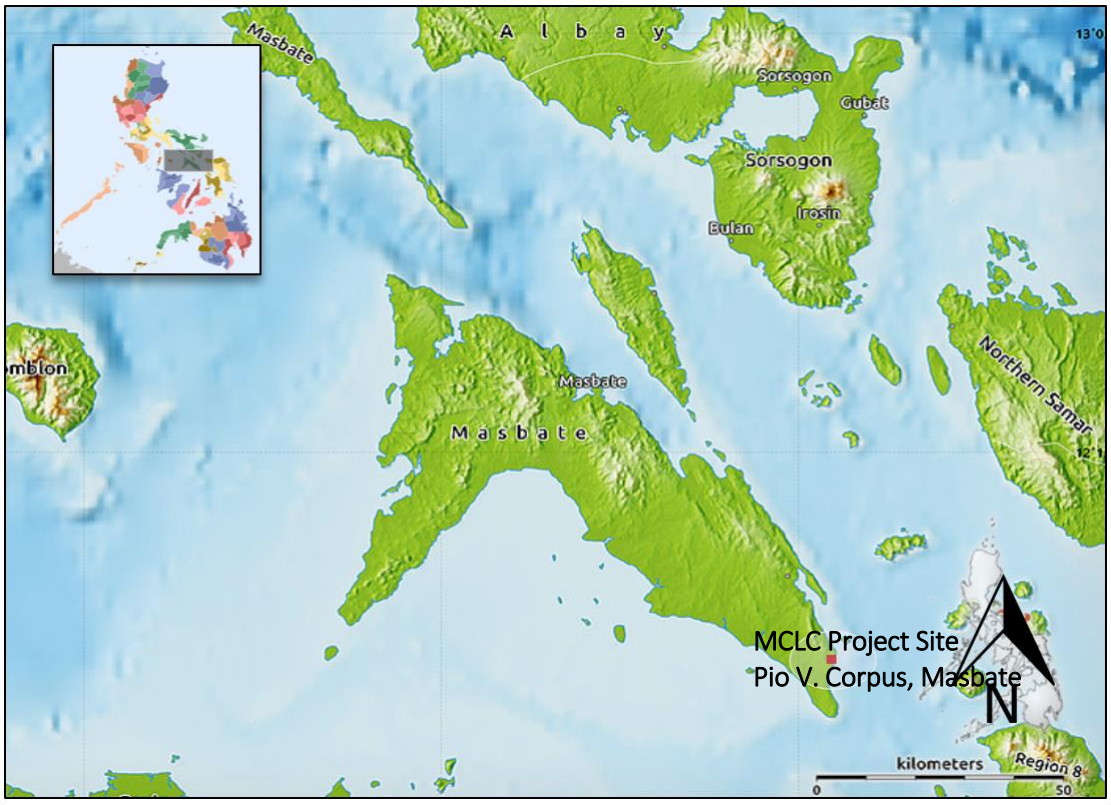
The proposed Project will be located in Barangay Casabangan, Municipality of Pio V. Corpus in Masbate Province (the "Project Site"). The Project Site will occupy approximately 160

hectares of land, with 120 hectares (**ha**) intended for the main components of the integrated plant. Access to the Project will be via a national road where future access roads to the Site will be connected. The Project will also have access to the Visayas Sea for the fuel supply delivery and exports of cement and associated building materials.

The approximate geographic coordinates of the Project Site are summarized in **Table 2.1-1** while the geographical location map, site vicinity map and the initial plant layout are presented in **Figures 2.1-1**, **2.1-2** and **2.1-3**, respectively.

The Project area is accessible by land from Masbate City Hall with a travel distance of approximately 100 kilometers (**km**) passing through the Central Nautical Highway. Estimated travel time to reach the Project area is 2 hours.

The Project Site is bounded in the north by open land, in the east by Visayas Sea, and in the west by Masbaranon River.



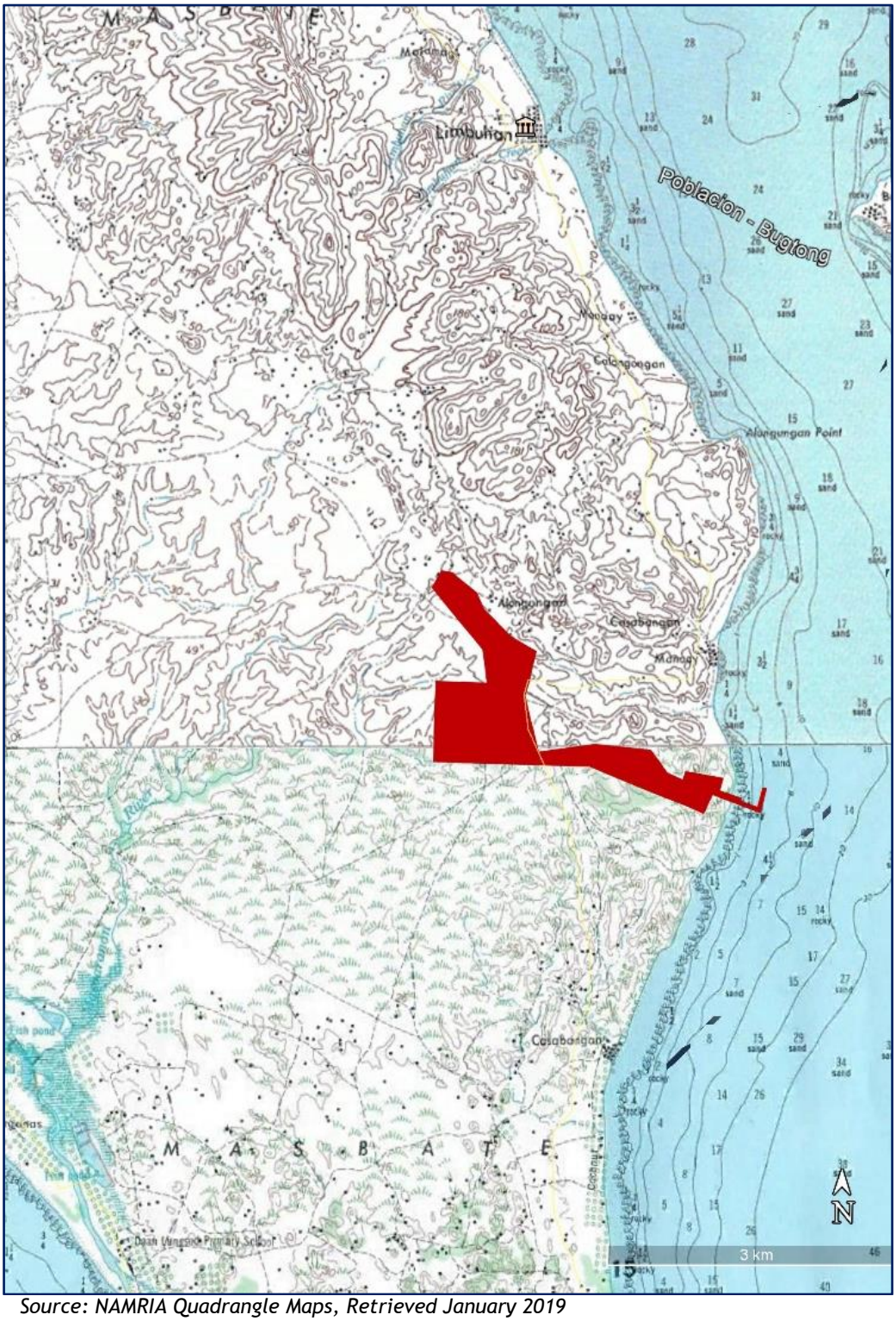
Source: Google Images, Retrieved and Processed January 2019

Figure 2.1-1 Geographical Location Map of the Proposed MCLC Project in Southern Masbate

Table 2.1-1 Geographic Coordinates of the Project Site

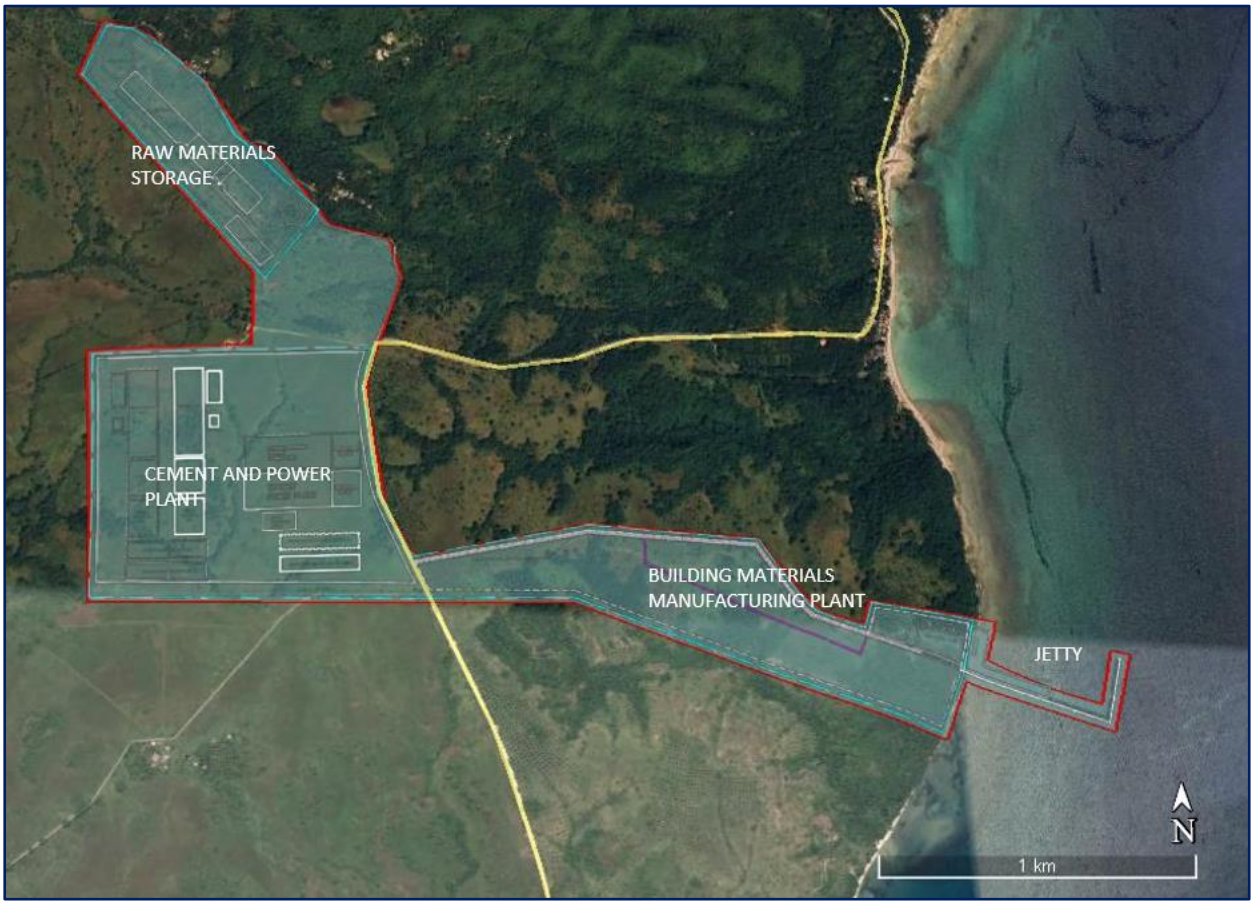
Cement Plant, Power Plant, Building Materials Plant		
Corner	**North Latitude**	**East Longitude**
1	11°49'42.78"N	124° 2'31.17"E
2	11°49'42.68"N	124° 2'33.73"E
3	11°49'42.54"N	124° 2'40.60"E
4	11°49'42.29"N	124° 2'53.97"E
5	11°49'41.98"N	124° 3'04.33"E
6	11°49'41.71"N	124° 3'20.32"E
7	11°49'38.53"N	124° 3'28.92"E
8	11°49'35.31"N	124° 3'37.54"E
9	11°49'31.43"N	124° 3'47.74"E
10	11°49'29.78"N	124° 3'47.73"E
11	11°49'27.60"N	124° 3'58.06"E
12	11°49'32.23"N	124° 4'00.22"E
13	11°49'37.64"N	124° 4'01.83"E
14	11°49'39.46"N	124° 3'51.36"E
15	11°49'36.99"N	124° 3'50.27"E
16	11°49'38.92"N	124° 3'44.74"E
17	11°49'41.11"N	124° 3'42.80"E
18	11°49'46.06"N	124° 3'39.43"E
19	11°49'46.61"N	124° 3'33.88"E
20	11°49'47.23"N	124° 3'27.74"E
21	11°49'47.74"N	124° 3'21.79"E
22	11°49'46.20"N	124° 3'11.70"E
23	11°49'44.93"N	124° 3'02.95"E
24	11°49'45.89"N	124° 3'02.44"E
25	11°49'50.11"N	124° 3'00.43"E
26	11°49'51.66"N	124° 2'59.80"E
27	11°49'52.46"N	124° 2'59.56"E
28	11°49'55.14"N	124° 2'58.88"E
29	11°49'58.36"N	124° 2'58.55"E
30	11°50'01.51"N	124° 2'58.24"E
31	11°50'02.55"N	124° 2'58.20"E
32	11°50'03.31"N	124° 2'58.25"E
33	11°50'04.14"N	124° 2'58.32"E
34	11°50'04.93"N	124° 2'58.52"E
35	11°50'06.45"N	124° 2'59.04"E
36	11°50'06.80"N	124° 2'59.23"E
37	11°50'07.62"N	124° 2'59.91"E
38	11°50'08.43"N	124° 3'00.26"E
39	11°50'09.34"N	124° 3'00.70"E
40	11°50'10.04"N	124° 3'00.99"E
41	11°50'11.33"N	124° 3'01.48"E

42	11°50'12.55"N	124° 3'01.99"E
43	11°50'13.19"N	124° 3'02.25"E
44	11°50'14.00"N	124° 3'02.53"E
45	11°50'14.35"N	124° 3'02.56"E
46	11°50'14.67"N	124° 3'02.44"E
47	11°50'15.36"N	124° 3'02.06"E
48	11°50'15.59"N	124° 3'01.96"E
49	11°50'15.99"N	124° 3'01.92"E
50	11°50'16.73"N	124° 3'01.94"E
51	11°50'17.60"N	124° 3'01.90"E
52	11°50'17.92"N	124° 3'01.88"E
53	11°50'18.27"N	124° 3'01.73"E
54	11°50'18.41"N	124° 3'01.01"E
55	11°50'19.02"N	124° 2'56.45"E
56	11°50'25.56"N	124° 2'48.69"E
57	11°50'29.46"N	124° 2'44.89"E
58	11°50'35.13"N	124° 2'41.81"E
59	11°50'38.67"N	124° 2'37.50"E
60	11°50'40.97"N	124° 2'33.87"E
61	11°50'41.45"N	124° 2'32.02"E
62	11°50'36.69"N	124° 2'29.78"E
63	11°50'15.14"N	124° 2'48.55"E
64	11°50'06.35"N	124° 2'48.55"E
65	11°50'06.42"N	124° 2'30.91"E



Source: NAMRIA Quadrangle Maps, Retrieved January 2019

Figure 2.1-2 Project Site Vicinity Map



Source: Google Earth, Retrieved January 2019

Figure 2.1-3 Initial Plant Layout

2.2 Project Rationale

The cement demand in the Philippines is expected to grow by 6% to 8% per annum over the next 5 years. This is mainly driven by the government's initiatives as launched in its Philippine Development Plan (**PDP**) 2017-2022 and its PHP 9-trillion 'Build, Build, Build' infrastructure program. Such projects prioritize spending and accelerate public infrastructure development as well as industrial construction. Continued developments in commercial and private construction investments are also expected to contribute to the sustained growth of the country's economy.

In anticipation of the robust growth in the construction sector and, therefore, cement consumption, the Project aims to boost the domestic cement production capacity by supplying market-competitive cement, fiber cement board, and other building materials. Key advantages of the Project are the abundance and proximity to raw materials, its self-generation of reliable and competitively priced power, and its access to the sea for product dispatch to other islands. Supply of the Project's cement is targeted to the South Luzon area and the North East Visayas region, including its home market, Masbate, which is currently a net importer of construction materials.

The development, construction and operation of the proposed Project will considerably benefit the Province of Masbate, specially its host municipality, Pio V. Corpus. Substantial

increase in the annual average revenue, income taxes and other local government taxes, among others, are envisaged to boost the development of the local economy. **Table 2.2-1** presents the estimated annual tax payments to the local government unit. Livelihood projects, education programs, health and sanitation services will also be prioritized as part of the Social Development and Management plan. The Project will also generate large number of direct and indirect employment which will prioritize hiring of local qualified residents. Manpower requirements are expected to reach 1,500 during the construction phase and around 300 during the full operations of the integrated facility. Overall, the Project will uplift the socio-economic activity in the area as it creates jobs, improves infrastructure, and opens opportunities for other investments in Masbate.

Table 2.2-1 Estimated Annual Tax Payments to the LGU

Type of Payment (Operations Phase)	Minimum Annual Estimated Amount (PHP)
Real Property Tax	
Special Education Fund	100,000,000
Basic Property Tax	100,000,000
Province (35%)	35,000,000
Municipality (40%)	40,000,000
Barangay (25%)	25,000,000
Tax on Quarry Resources	15,000,000
Province (30%)	4,500,000
Municipality (30%)	4,500,000
Barangay (40%)	6,000,000
Social Development and Management Programs (SDMP)	5,000,000
TOTAL	**PhP 220,000,000**

2.3 Project Alternatives

There is an alternative location in South Masbate being considered for the siting of the facility. The proposed Project Sites are studied to be technically, economically and socially advantageous primarily due to the following reasons:

- Availability of large quantities of high-quality limestone
- Geographical advantages in terms of inbound and outbound shipping of materials and products
- Economic benefits to Masbate island – a third-tier province in need of investments

2.4 Project Development Plan, Process and Components

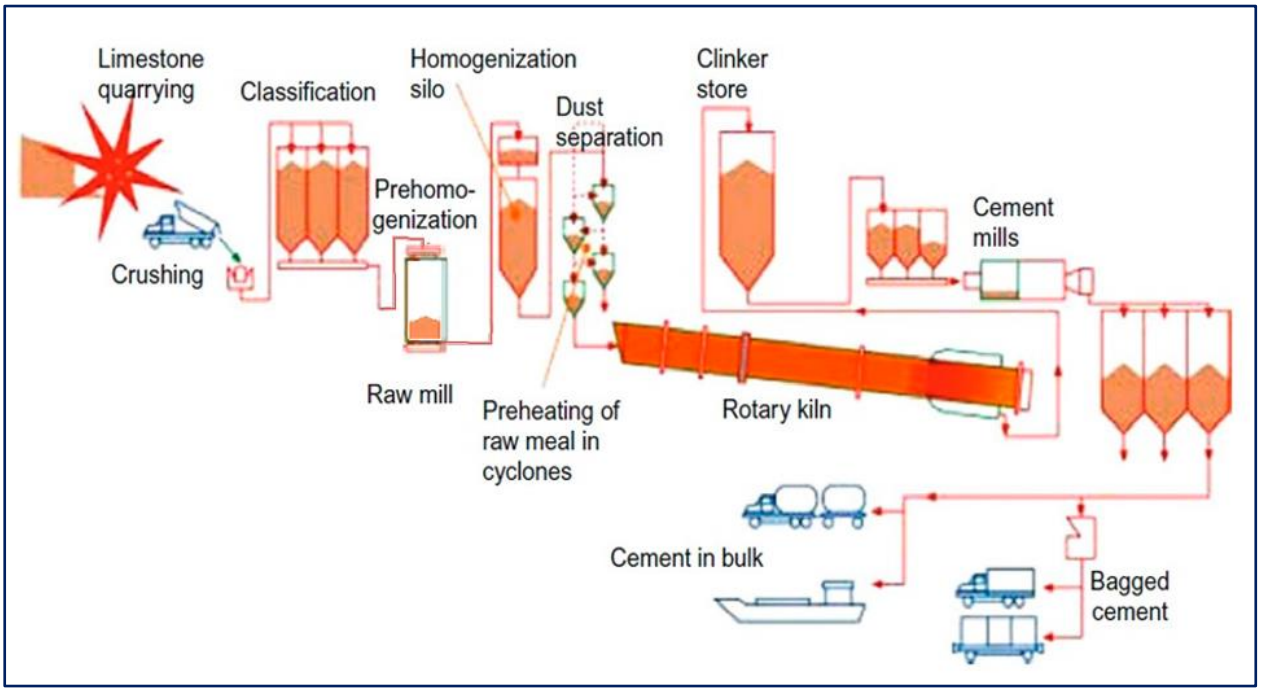
2.4.1 Cement Manufacturing Plant

The construction of 2 x 6,000 tons per day clinker will employ dry process using the latest technology to maximize fuel, energy and power efficiency. Expected output of clinker, cement and cement-related products are listed below:

- Two (2) lines of limestone crushers, raw mill systems, hammer mill, coal mill, and kilns to produce 2 x 6,000 tons per day of clinker
- Annual output of clinker will be 3,648,000 tons (2 x 1,824,000 tons if 320 days @ 95% operations)
- Up to Four (4) cement mills with cement silos and warehouse to facilitate loading of bagged and bulk cement in jumbo bags offshore
- Annual output of cement will be 4,864,000 tons (2 x 2,432,000 tons based on clinker : gypsum : additives proportion of 75% : 5% : 20%
- Bagged cement: bulk cement = 85% :15%

The following are the key steps involved in cement manufacturing. This is further illustrated in Figure 2.4.1-1.

- Quarrying and preliminary crushing of raw materials (limestone, shale, silica)
- Handling and storage of raw materials and fuel
- Raw milling/fine grinding and mixing of raw materials producing raw meal
- Heating of raw meal into a rotary kiln producing clinker
- Clinker cooling
- Clinker handling and storage
- Mixing of clinker and additives producing cement
- Final milling
- Cooling and storage of cement
- Cement packing
- Loading and unloading operations for bagged and bulk cement



Source: MCLC Modified 2019

Figure 2.4.1-1 Cement Manufacturing Process Flow

The following Cement Plant facilities and systems will be designed, engineered, procured, constructed, commissioned and become operational.

1. Limestone Storage 2. Shale / Clay crushing system 3. Raw Material and Cement Additive Storage (e.g. Slag, Gypsum, Iron, etc.) 4. Raw Material Storage (Shale, Silica, Iron, Bottom Ash) 5. Raw Material Proportional Hopper and Feeding System 6. Raw Meal Silos 7. Raw Meal Grinding Systems 8. Kiln Feed Bag Filter System 9. Coal Mill System 10. Petcoke Milling System 11. RDF Shredding, Storage, and Feeding System 12. Preheater System 13. Kiln System 14. Clinker Cooling System 15. Clinker Cooler Bag Filter System 16. Clinker Silos / Storage System	17. Unburnt Clinker Silos / Storage System 18. Pozzolan Crushing System and Storage 19. Pozzolan Silo 20. Cement Additive Storage (Gypsum, Limestone, Fly Ash, Slag, etc.) 21. Cement Grinding / Milling System 22. Cement Storage / Silos 23. Operations Building & Control Center Room 24. Conveyor System 25. Cement Packing, Palletizing and Jumbo Bagging System 26. Cement Storage in Pallets, Sling Bags, and Jumbo Bags near Jetty 27. Cement Loading for Land Transport in Masbate 28. Cement Loading of Barges and Vessels at MCLC Jetty 29. Coal Storage

2.4.1.1 Design Criteria

- Self-sufficient power for the Project with additional capacity for sales to electric cooperative
- Locally sourced key raw materials
- High equipment efficiency
- High equipment reliability
- Economical investment cost
- Optimized procurement, construction, and erection schedule
- Low operations and maintenance cost
- High safety standards
- Healthy environment for employees, contractors and local communities
- Low air emissions, low noise

2.4.1.2 Air Pollution Control Facilities

Table 2.4.1.2-1 Cement Plant Air Pollution Source and Control Equipment

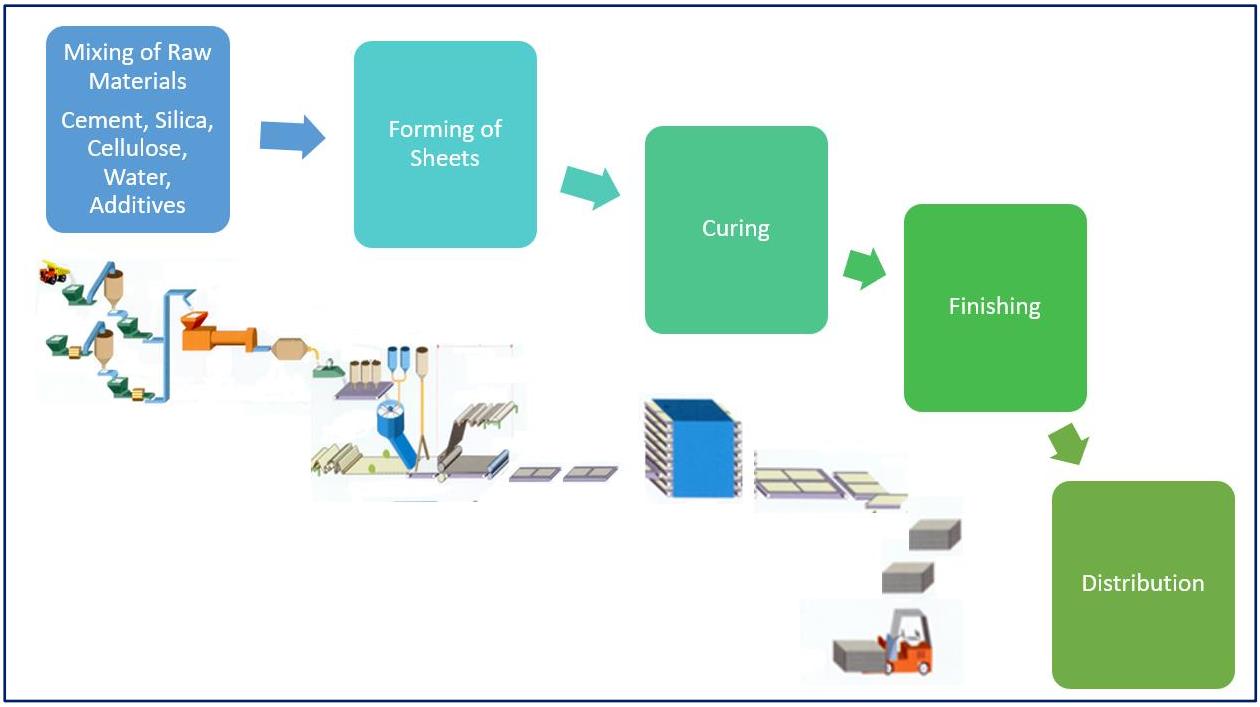
Area	Air Pollution Source Equipment	Location	Air Pollution Control Equipment
1	Double Rotor Crusher	Crusher	Bag Filter Dust Collector
2	Belt Conveyor for Crusher to Storage	Crusher	Bag Filter Dust Collector
3	Vertical Roller Mill	Raw Mill	Dust Collector / Bag House
4	Bucket Elevator for Raw Meal	Raw Mill	Bag Filter Dust Collector
5	Rotary Kiln	Clinkering	Electrostatic Precipitator (ESP)
6	Kiln Feed Bin	Preheater	Bag Filter Dust Collector
7	Air Quenching Cooler	Clinker Cooler	Electrostatic Precipitator (ESP)
8	Conveyor System Discharge zone	Clinker Transport	Bag Filter Dust Collector
9	Bucket Elevator Drop – Clinker	Clinker Silos	Bag Filter Dust Collector
10	Coal Mill	Coal Milling	Bag Filter Dust Collector
11	Fly Ash System	Fly Ash Silos	Bag Filter Dust Collector
12	Cement Mills	Cement Mills	Bag Filter Dust Collector
13	Bucket Elevator Drop – Cement	Cement Silos	Bag Filter Dust Collector
14	Cement packing/loading area	Packhouse	Bag Filter Dust Collector
15	Bucket Elevator for Packing Operations	Packhouse	Bag Filter Dust Collector

2.4.2 Building Materials Manufacturing Plant (fiber cement board as example)

The manufacturing of fiber cement board will involve the following steps:

1. Raw materials such as cement, silica, cellulose fibers and other additives are fed and blended in the mixer with water.
2. The mixture is poured into rollers and adjusted to a nominal size.
3. Fiber cement sheets are subjected to drying process using steam from the Power Plant boilers to remove excess water.
4. The sheets are sanded and trimmed to the exact dimensions.

5. Fiber cement board finished products are stored in a warehouse. For distribution, sheets are placed on pallets and/or containers and delivered for installation.



Source: MCLC Modified 2018

Figure 2.4.2-1 Fiber Cement Board Manufacturing Process Flow

2.4.2.1 Raw Materials

- Cement – The cement will be sourced from the Cement Plant via a conveying system and then transferred to the silos inside the fiber cement board plant. Silos are equipped with dust collection system to capture cement dust during the transfer.
- Silica – Silica will be sourced locally from the quarry site near the Plant and conveyed to the storage silos.
- Cellulose – The cellulose fiber or pulp will be imported. Containers will be received via the plant jetty and brought to the plant via trucks
- Water – Water will come from the groundwater treatment facility.

2.4.3 Power Plant

The Power Plant will utilize Circulating Fluidized Bed (**CFB**) boiler technology. The Power Plant process flow is shown in **Figure 2.4.3-1** and the components are specified in **Table 2.4.3-1**.

Coal is fed to the CFB boiler where it burns and sustains a very large column of fire. Along the walls of the boiler are water tubes, where the water turns to high-pressure high-temperature steam. A sample CFB technology is shown in **Figure 2.4.3-2**. A network of pipes transports the steam to a steam turbine, causing the propeller-like blades of the steam turbine to turn. A generator coupled to the steam turbine turns as well, generating

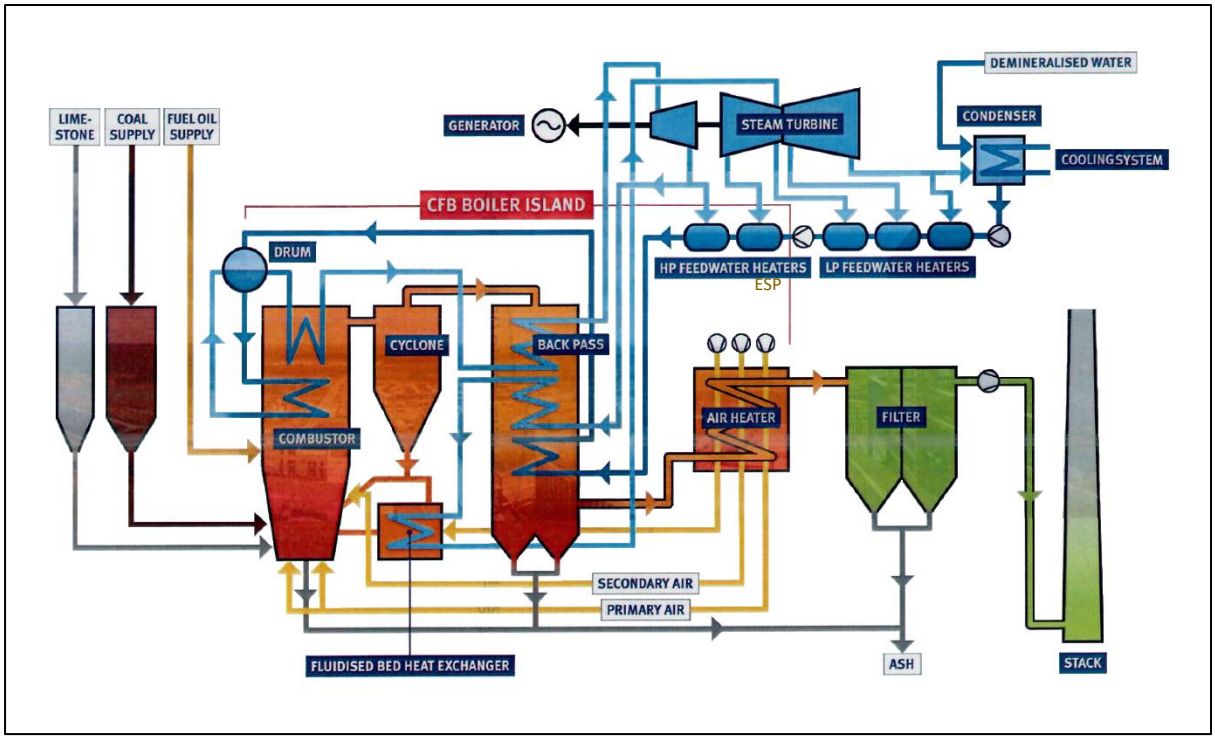
electricity which is stepped-up to an appropriate voltage by transformers for transmission to the grid.

Steam is condensed to water using seawater cooling or air-cooled condensing and the water is then recirculated to the boiler to be heated again. This increases the efficiency of the Power Plant.

Specific to this Power Plant, the boilers will be designed to produce sufficient quantity of steam required by the turbine generators as well as for the manufacturing requirements of the Building Materials Manufacturing Plant.

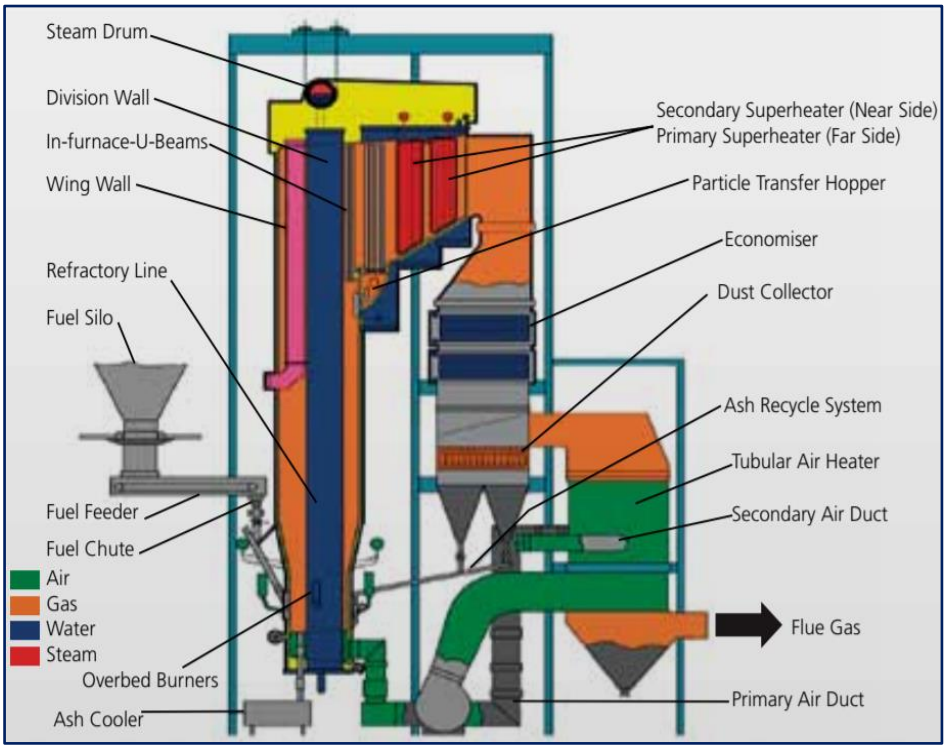
The combustion of coal produces solid by-products. The lighter particulate by-products called fly ash are propelled upwards together with the hot gases where they are removed by filters in a baghouse. The heavier combustion by-products called bottom ash fall to the bottom of the boiler where they are removed and transported to storage bins. Ash produced by the Power Plant will be used as raw material for the Cement Plant.

After the filtration of fly ash, the exhaust gases are passed through a wet scrubber that utilizes limestone slurry to remove the gaseous sulfur oxides, in compliance with Philippine and World Bank standards on air emissions. The limestone reacts with the sulfates, producing calcium sulfite and water. Calcium sulfite will be further reacted with oxygen to produce gypsum, to be used in the Cement Plant.



Source: Doosan 207. Modified January 2019

Figure 2.4.3-1 Power Plant Process Flow



Source: Thermax 2018

Figure 2.4.3-2 Circulating Fluidized Bed

Table 2.4.3-1 Power Plant Components List

Components	Description
Boiler	Four (4) 40 MW units CFB boilers
Steam Turbine and Generators	Four (4) units of steam turbine Four (4) units generators
Coal Handling System	Covered coal conveyors
Partially-covered Coal Yard (shared with Cement Plant)	1 ha, suitable for 120,000 tons of coal storage
Coal Unloading Jetty	Phase 1B Jetty to accommodate Handymax ships of 50,000 tons
Ash Storage	With transfer system to Cement Plant ash storage
Air Pollution Control Facilities	Electrostatic Precipitators
Exhaust Chimney	80m exhaust chimney with two (2) flues
Continuous Emission Monitoring Systems (CEMS)	One (1) CEMS for each CFB boiler flue
Ash Silos	Four (4) dry ash silos
Condenser/Cooling System	Air-cooled condensers or sea water cooling system

Demineralized Water Supply System	One (1) Sea Water Treatment System with the following: Sea water pre-treatment facility, ultra-filtration units, two-stage reverse osmosis units and mix bed de-ionization system
Desalination Plant	For general and domestic use
Industrial Wastewater Treatment System (IWWTS)	The IWWTS shall be designed to treat the following streams as a minimum: 1. Oily water drains from equipment and floor drains. 2. Effluent from the coal pile sedimentation basin (if required). 3. Miscellaneous equipment and floor drains. 4. Acid and caustic wastewater from boiler make-up water system and condensate polishing system. 5. Boiler acid cleaning wastewater. 6. Air pre-heater and boiler fire side washing wastewaters
Sewage Treatment lant (STP)	The STP shall process all Facility sanitary sewage waste and then discharge to the sea water cooling water outfall
Diesel Oil Storage Tank	To be used to store diesel to be used for commissioning and start-up
Electrical System	13.8kV voltage delivery 69kV substation step up to 115kV or 138kV for Phase 2
Building (Administration, Maintenance, Central Control)	Insulated, pre-engineered metal or concrete building
Laboratory	To be used for self-monitoring; Will apply for accreditation from DENR
Warehouse	Single-story concrete building

2.4.3.1 Fuel

The primary fuel for the Power Plant on normal operations will be sub-bituminous coal with relatively low calorific value from Indonesia. Phase 1B Power Plant will consume approximately 420,000 tons of coal per year.

The plant will be designed to burn environmentally-friendly coal with the following as received criteria:

- Low sulfur content (0.10 - 0.57 %)
- Low ash content (1.4 - 6.4 %)
- Moisture content (23 - 42 %)

Diesel oil or bunker fuel oil will be used for Phase 1A diesel generator sets and plant commissioning and plant start-up.

2.4.3.2 Power Plant Pollution Control Facilities

Category	Waste	Pollution Control System/Management Method
Air	Fugitive dust emission	Dust suppression using water, enclosure of the source area
	Source specific dust emission (PM_{10}, SO_2, NO_x, CO and VOC)	Electrostatic precipitators, limestone FGD, low NO_x burners, exhaust stack

Liquid	Operational wastewater	Industrial wastewater treatment system
	Contaminated stormwater	Oily water treatment system, Runoff water treatment system
	Irregular wastewater (for commissioning and maintenance only)	Industrial wastewater treatment system
	Domestic wastewater (100 m^3)	Sewage treatment plant- sequence batch reactor
Solid	Industrial solid wastes: Fly ash and bottom ash	Cement Plant as offtaker Ash storage facility
	Domestic solid waste	Temporary collection and store in waste bins, sorted out and disposal by the Local Government

2.4.4 Jetty and Barge Pier

The jetty and barge pier will be constructed in different phases of the Project. For Phase 1A, imported clinker will be transferred offshore from Handysize vessels to the smaller barges of 1,000 – 5,000-ton capacity that will be accommodated by the pier along with other barges for cement additives and outbound cement products. For Phase 1B, the extended jetty will accommodate mooring of Handysize vessels delivering coal for the Cement and Power Plants. This will be unloaded using self-unloading grabbers, transferred into coal hoppers and conveyed to the coal yard.

2.5 Resource Requirement

2.5.1 Water Supply

Based on the daily per capita water requirement of 166 liters per day or 0.166 m^3 per day provided by the Corporate Planning Group of the Metropolitan Waterworks and Sewerage System (MWSS) and, assuming 50% or 0.083 m3/day is the water usage for transient residents/workers, the water requirement for the construction phase is estimated at 125 m^3 per day. The Project process water requirement for Phase 1B operations is estimated at 30 m^3 per hour with additional 30 m^3 per hour intermittent requirement for plant service and domestic water.

2.5.2 Power Supply

The Project will supply its power from diesel or bunker fuel oil generator sets for the temporary facility, floodlights at the construction site, staging area, and other uses during the construction phase.

During its operation, the Power Plant's generator will produce 13.8 kV which will be supplied to the adjacent Cement and Building Materials Plants.

2.5.3 Manpower

The manpower requirements of the Project will be composed mostly of local skilled workers with priority given to the qualified residents of Brgy. Casabangan and the Municipality of Pio V. Corpus. The Project will employ a total of 1,500 employees during the peak

construction phase, around 500 of which will be local workers. Around 300 local workers will be hired during the operations and maintenance of the facility.

2.6 Description of Project Phases

2.6.1 Pre-construction Phase

An environmental impact assessment will be conducted during the pre-construction phase in order to determine the necessary environmental management measures.

Preliminary design and planning will be done to optimize and generate information on the physical layout of the facilities, site development including estimation of land cut and fill volumes, and engineering soil investigations. Preparation works will be made including construction of access road and sediment control structures such as sedimentation ponds and silt traps.

Other development permits, licenses and relevant clearances shall be obtained such as BOI incentives, PEZA designation, BOC for importation of machines and equipment.

2.6.2 Construction Phase

The construction phase of the project involves the following activities:

- Site preparation including all earthworks for ground leveling, plant access roads, excavation for foundations
- Basic & detailed engineering
- Purchase order and delivery of imported equipment to the Project Site
- Civil works, installation and erection of equipment
- Hiring of operations and maintenance personnel, pre-commercial training for operations
- Commissioning of plants leading to stable operations

2.6.3 Operation Phase

Following the construction phase, MCLC will proceed with the full operations of the integrated facility. The normal operation is expected to be 24 hours a day, seven (7) days per week for 320 days per year.

2.6.4 Abandonment and Rehabilitation Phase

The Project's expected life is approximately 25 years. However, if the facility is still needed due continued demand for cement production, it may have to be refurbished and/or upgraded for further operations.

In the event of abandonment, MCLC will ensure that the manufacturing facility will not pose environmental or safety hazards to the public. The Cement Plant equipment will be dismantled and all hazardous materials (e.g. used oil, laboratory chemical reagents, used batteries, light bulbs, etc.) are properly disposed as approved by the government. If soil contamination is present, the subject area will be decontaminated through the appropriate measures.

2.7 Project Cost, Duration and Schedule

A bar chart of the project development schedule is presented in **Table 2.7-1**. Upon financial closing and issuance of notice to proceed to the EPC contractor, the construction of the facility will commence. It is estimated that the completion and commissioning work of the building materials complex will be 18 to 24 months from notice to proceed. The Project cost is still to be determined.

Table 2.7-1 Project Development Schedule

Critical Path Activities	Start Date	Target Completion	2019				2020			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Market Feasibility	Jan-18	Jul-18								
Land Acquisition	Jan-18	Sep-18								
Environmental Impact Assessment (EIA)	Dec-18	Nov-19								
Engineering, Procurement and Construction (EPC) Bidding	Aug-19	Feb-20								
Permits	Sep-18	Mar-20								
Project Financing	Oct-19	Apr-20								

2.8 Environmental Management Plan

Environmental Aspect	Environmental Component Likely to be Affected	Potential Impact	Prevention/Mitigation/Enhancement Measures
CONSTRUCTION PHASE			
	LAND		
Cut and fill activities Construction of the proposed Project	Land use and Classification	• Change/Inconsistency in Land Use	• The Project site is an agricultural l land and the host municipality has identified the project area for industrial use. The municipality intends to pass a resolution on the industrial zoning of the project area
		• Encroachment to Environmentally Critical Area	• The Project site has not encroached in an ECA.
	Geology/ Geomorphology	• Change in surface landform/terrain/slope	• Designation of a competent person to prepare a proper grading plan including a cut and fill strategy.
		• Change in sub-surface underground geomorphology	• The excavations done at the site and its peripheral roads shall cause permanent but low level of disturbance. • Strict conformance to the recommendations of the geotechnical study
		• Inducement of subsidence, liquefaction, landslides, mud/debris flow	• Since the Project site is flat/level , the possibility of experiencing landslides and/or mud/debris flow is nil. • If ever some unstable slopes in the limestone area at the northern side of the project area will be noted in the future, appropriate measures such as installation of wire mesh, shotcreting, riprapping or benching may be applied.
Site Preparation, and Earthwork	Pedology	• Soil erosion	• Construction of soil erosion control measures either by engineering structure or planting of grasses/trees. • Placement of excavated soil materials in appropriate stockpile areas with avoidance of stockpiling along drainage ways/creeks. • Covering of soil stockpiles with plastic sheets/geotextile, or planted with grasses/ small shrubs for erosion control.

Environmental Aspect	Environmental Component Likely to be Affected	Potential Impact	Prevention/Mitigation/Enhancement Measures
			• Scheduling of excavation work/earth movement during dry months.
	Terrestrial Ecology	• Vegetation removal and loss of habitat	• Since the site is agricultural, most vegetation are coconut and the required Permit-To-Cut will be secured from the Philippine Coconut Authority (PCA). For the removal of trees, the Permit-To-Cut will be secured from the DENR..
		• Threat to existence and/or loss of important local species	• Not applicable since there will be no significant flora and fauna that will be affected in the project site
		• Threat to abundance, frequency and distribution of important species	
		• Hindrance to wildlife access	• There are no ecologically sensitive habitats such as forests and mangroves, etc. in the Project area and its vicinity that will be affected by the proposed MCLC Project.
	WATER		
Construction of impoundment/ reservoir Water consumption during construction	Hydrology/ Hydrogeology	• Change in drainage morphology/inducement of flooding/reduction in stream volumetric flow	• No surface water will be diverted for the MCLC Project. • Any amount of water to be extracted from a groundwater source shall be applied for water permit for compliance and assurance of right implementation of necessary measures to conserve water and reduce water usage.
		• Change in stream, lake water depth	
		• Depletion water resources/ competition in water use	
Mobilization of construction	Water Quality	• Degradation of groundwater quality	• Provision of containment structures and canals in the storage areas for oil and the motor pool area

Environmental Aspect	Environmental Component Likely to be Affected	Potential Impact	Prevention/Mitigation/Enhancement Measures
equipment and materials Generation of domestic waste			• Return of contaminated cans/containers of hazardous materials such as paints, thinners, wood preservatives and others to the supplier/producer for treatment and safe disposal • Regular monitoring of groundwater quality
Construction of the proposed jetty and discharge outfall		• Degradation of marine water quality	• Developing an erosion protection program • Putting in place erosion control measures along drainage ways prior to construction such as silt traps and sedimentation basins • Stockpiling and temporary re-vegetation of op soil for later use in rehabilitation • Scheduling of construction activities during the dry season • Immediate stabilization of exposed soil/s/barren areas with indigenous drought resistant plants • Work to minimize destruction to seabed through the use of geotextile curtains to control the spread of sediment • Prohibition of the discharge of bilge water from attending vessels and other delivery vessels • Compliance with the MARPOL, PCG-MC 01-94, DAO No. 35 S. 1990 be stipulated in the Contract • Regular monitoring of marine water quality
	Freshwater Ecology	• Threat to existence and/or loss of important local species and habitat • Threat to abundance, frequency and distribution • Loss of important species	• Soil erosion protection measures and good Stormwater Management Plan shall be implemented with the needed diversion canals, grit chambers, and others to contain siltation and minimize other pollutants from leaching to the river. • Provision of portable toilets for all workers on site and sanitary facilities on the workers camp site. • Implementation of Solid Waste Management Program

Environmental Aspect	Environmental Component Likely to be Affected	Potential Impact	Prevention/Mitigation/Enhancement Measures
		• Loss of habitat	• Regular monitoring of TSS, plankton and freshwater benthic invertebrates should be conducted to evaluate effects of siltation on the composition and abundances of these biota
	Marine Ecology	• Threat to existence and/or loss of important local species and habitat	• Construction of siltation ponds to prevent sediment from being washed into the area. • Installation of appropriate drainage to prevent erosion of silt to the bay. • Adequate and proper drainage system • Regular monitoring of plankton and marine benthic invertebrates shall be conducted to evaluate effects of siltation on the composition and abundances of these biota. • Avoidance of coral reefs in the construction of the barge pier
		• Threat to abundance, frequency and distribution	• Construction of siltation ponds to prevent sediment from being washed into the area. • Provide appropriate drainage for the stockpiles to prevent erosion of silt to the bay. • Regular monitoring of planktons and marine benthic invertebrates shall be conducted to evaluate effects of siltation on the composition and abundances of these biota.
	AIR		
Mobilization of Construction Equipment and Materials	Meteorology/ climatology	• Change in local climate and local temperature	• Establishment of a buffer zone using native species, as these would be expected to have good survival rate.
	Air Quality and Noise	• Degradation of Air Quality	• Paving every main haul road with concrete, bituminous materials, hardcores or metal plates keeping the road clear of dusty materials; spraying the road with water or a dust suppression chemical so as to maintain the entire road surface wet; and immediately before

Environmental Aspect	Environmental Component Likely to be Affected	Potential Impact	Prevention/Mitigation/Enhancement Measures
			leaving a construction site, washing every vehicle to remove any dusty materials from its body and wheels • Where a vehicle leaving the construction site is carrying a load of dusty materials, covering the load entirely by clean impervious sheeting to ensure that the dusty materials do not leak from the vehicle • Spraying the working area of any excavation or earth moving operation with water or applying a dusty suppression chemical immediately before, during and immediately after the operation so as to maintain the entire surface wet • Treatment of exposed earth by compaction, turfing, hydroseeding, vegetation planting or sealing with latex, vinyl, bitumen, shotcrete or other suitable surface stabilizer within six (6) months after the last construction activity on the construction site or part of the construction site where the exposed earth lies • Covering entirely of any stockpile of dusty material by impervious sheeting; placing an area sheltered on the top and the three (3) sides; or spraying with water or a dust suppression chemical so as to maintain the entire surface wet • Periodic watering of aggregates storage piles or covering or enclosure if material is especially dusty. • Provision of water sprays and chemical dust suppressants or oil on roadways • Ambient air (TSP) monitoring
		• Increase in ambient noise level	• Scheduling certain high noise emitting works to more acceptable times of day • Use of the most environmentally acceptable equipment which is properly maintained and silenced • Use of the least intrusive method of work • Proper instruction and supervision of staff

Environmental Aspect	Environmental Component Likely to be Affected	Potential Impact	Prevention/Mitigation/Enhancement Measures
			• Acoustic screening • Preference of electrically powered plant, where practicable, to mechanically powered alternatives. If mechanical powered plant will be used, it shall be fitted with suitable silencers and mufflers • Repair or replacement of defective equipment/parts with abnormal noise and/or vibration • Scheduling of equipment/machines emitting high noise like pile driver during day time operation while, minimizing use during night time operation • Provision of required proper ear protectors to all employees working on site • Conduct of noise level monitoring
	PEOPLE		
Implementation of livelihood projects	Local residents	• Increase income for residents	• Positive Impact
Hiring of workers	Local residents	• Increase in local employment	• Priority employment for qualified local residents without discrimination to women
Increase in taxes and revenues	Local community	• Improvement in infrastructures and social services	• Diligent payment of taxes/revenues
Accidents	Local residents	• Construction-related hazards	• Environment, health and safety training prior to construction
OPERATION PHASE			
	LAND		

Environmental Aspect	Environmental Component Likely to be Affected	Potential Impact	Prevention/Mitigation/Enhancement Measures
Foundation Stability		• Subsidence and Liquefaction	• Structural monitoring of buildings/facilities especially after each earthquake • Formulation of detailed Emergency Preparedness and Response Plan
Generation of ash wastes	Pedology	• Soil contamination with heavy metals	• Proper handling, storage and disposal of hazardous materials • Regular monitoring of heavy metals in soil (Pb, Hg, Cd, Cr^{+6}, etc.) through sampling and analysis to serve as basis for mitigating/remedial measures
Open area upstream of the power plant facilities and sedimentation in the power plant vicinity		• Soil erosion	• Planting of trees within the vicinity of the Project site to serve as buffer for soil erosion • Establishment of sedimentation control structures (sedimentation ponds/dams) within the power plant vicinity.
Utilization of coal for fuel	Terrestrial Ecology	• Possible off-site impacts • Generation of power plant emissions	• Establishment of a buffer zone using native species, as these would be expected to have good survival rate.
	WATER		
Presence of water-based structures	Oceanography	• Change in coastal processes	• Implementation of shoreline protection measures such as beach nourishment operation, sand bypass/relocation operation and engineering and vegetation measures, in the event of shoreline erosion and accretion
Plant generation of process wastewater	Water Quality	• Degradation of water quality	• Installation of Wastewater Treatment System (**WWTS**) that will efficiently treat operation wastewater • Installation of Sewage Treatment Plant (**STP**) to treat the domestic wastewater generated

Environmental Aspect	Environmental Component Likely to be Affected	Potential Impact	Prevention/Mitigation/Enhancement Measures
and thermal effluent			• MCLC shall install thermistors to monitor the seawater temperature on a monthly basis
Water consumption	Freshwater Ecology	• Threat to abundance, frequency and distribution of species • Loss of important species • Loss of habitat	• Implementation of Solid Waste Management Program • Regular monitoring of TSS, plankton and freshwater benthic invertebrates should be conducted to evaluate effects of siltation on the composition and abundances of these biota
Use of Seawater for Cooling	Marine Ecology	• Entrainment and impingement of marine organism at the intake structure	• Installation of screens at the intake structure • Frequent cleaning and maintenance
Use of Hypochlorite in bio-fouling activity		• Threat to abundance, frequency and distribution of species • Loss of important species • Loss of habitat	• Using the lowest possible hypochlorite concentration and proper and regular maintenance of the underwater structures • Installation of sensor mechanism to control dosage of the sodium hypochlorite level at the outlet to 2 ppm
Use of fuel and other chemicals	Groundwater Quantity	• Groundwater contamination	• Daily supervision of possible leaks or spillages in the fuel storage tanks • Regular maintenance to minimize pipe tank leaks or ruptures • Use of coal ash by cement plants
	AIR		
Operation of the cement plant and other facilities	Air Quality	• Degradation of Air Quality	• Installation of cyclones, dust collectors and filter baghouse • Construction of a high smoke stack at 80 m • Provision of an Electrostatic Precipitator (EP)

Environmental Aspect	Environmental Component Likely to be Affected	Potential Impact	Prevention/Mitigation/Enhancement Measures
			• Installation of Continuous Emission Monitoring System (CEMS) to have real time monitoring of emissions at the stack and to be link-up with EMB Monitoring System • Provision of appropriate of PPEs such as dusts masks and goggles
Utilization of coal for fuel	Air Quality	• Degradation of Air Quality	• Use of the CFB Technology which allows the fuel to be burned at a relatively lower temperature, and reduces the NOx formation by approximately 60% due to a low combustion temperature of 800-900°C • Use of limestone injection to capture up to 98% of sulfur impurities from the fuel by reacting with it to form calcium sulfate, an inert material that is removed with the combustion and, thereby reducing SO_x formation • Installation of EP to remove 99.5% of particulates, particularly fly ash from the flue gas prior to its release through the stacks • Installation of CEMS to have real time monitoring of emissions at the stack • Construction of stack at 80m to have proper air dispersion • Conduct of ambient air quality monitoring and stack emissions testing
Use of air compressor and emergency generators Operation of steam turbine and boiler equipment	Noise Quality	• Increase in ambient noise level	• Provision of noise attenuation measures in air compressors and emergency diesel generators • Enclosure of steam turbine and boiler equipment and installation of silencers at the exhaust • Provision of absorptive silencer in the steam drum, super heater and re-heater safety valves Conduct of noise level monitoring

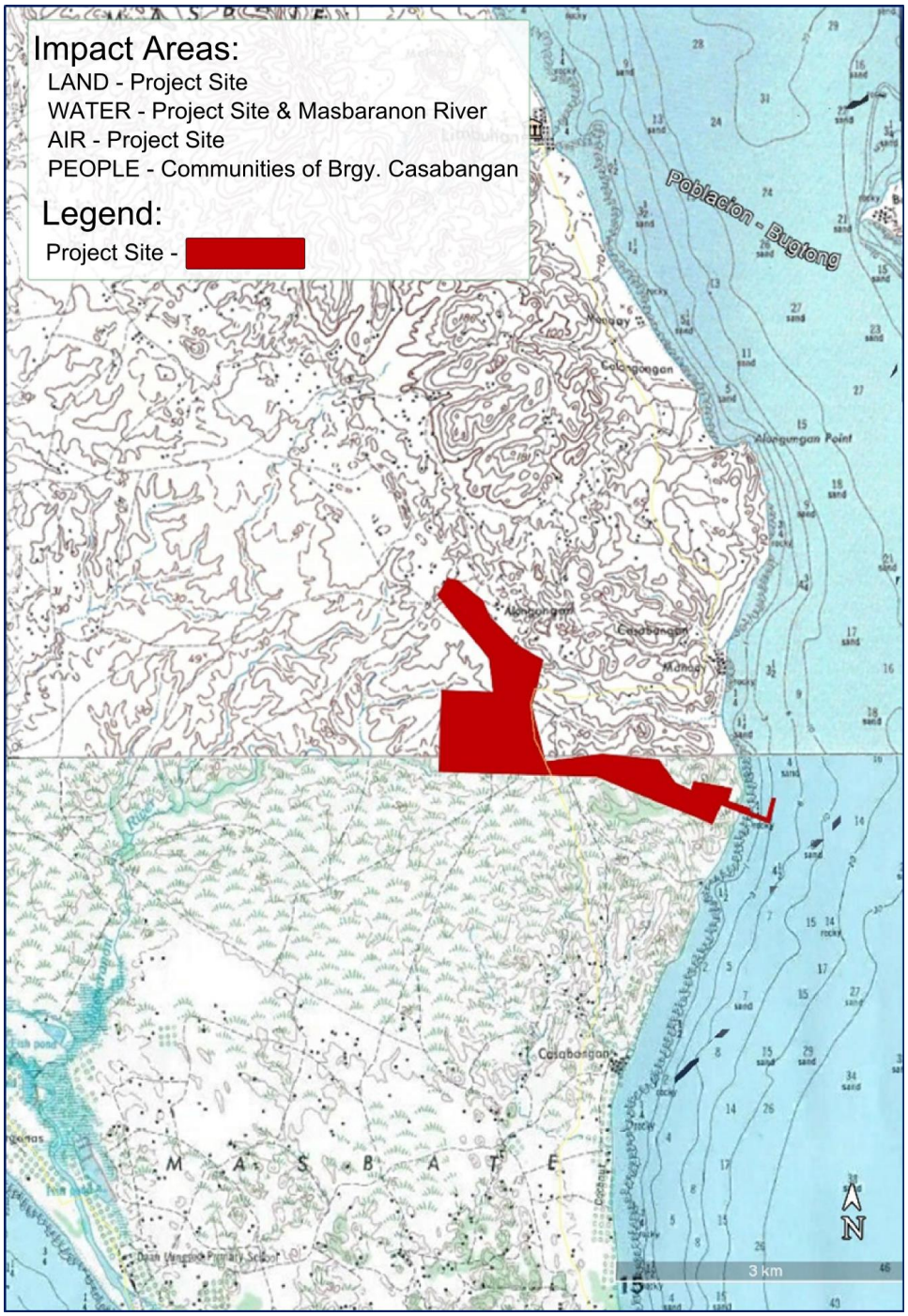
Environmental Aspect	Environmental Component Likely to be Affected	Potential Impact	Prevention/Mitigation/Enhancement Measures
	PEOPLE		
	Waste Management	• Generation of sewage/solid waste	• Provision of STP, portalets and latrines, no litter signs, waste can • Applying the hierarchy of measures: Reduce, Segregate, Re-use, Recycle and Dispose • Proper disposal of non-recyclable wastes through an accredited contractor
Hiring of workers	Population	• Change in population (size, distribution) • In-migration	• Priority hiring of qualified local residents in coordination with the Municipal Gov't and host barangay • Training program and skill transfer for local residents
	Social services	• Overburdening of public social services	• Priority hiring of qualified local residents • On-site medical clinic staffed by at least a doctor and a nurse • Provision of an ambulance
	Health	• Introduction of disease between migrant and local workers	• Clean bill-of-health as a condition for employment Conduct of regular medical check-up as part of the CSR program of MCLC to monitor the occurrence of unusual health problems that can be associated with the proposed Project • Provision of potable water, sanitary facilities and garbage bins for workers • Provision of medical clinic and a safety officer to monitor safe working conditions • Provision of medical/first aid kits in all work places • Provision of an ambulance
Operation of the power plant	Local residents	• Increased social and economic financial activity	• Positive impact, no mitigation required

Environmental Aspect	Environmental Component Likely to be Affected	Potential Impact	Prevention/Mitigation/Enhancement Measures
Spontaneous combustion of coal	Local properties	• Fire hazard	• Regular compaction and watering of coal pile once the temperature exceeds 90°C • Installation of temperature monitoring system, water sprinkler system and fire hydrants in the coal yard • Provision of fire suppression systems, fire detections systems, fire host stations and portable fire extinguishers • Full enclosure of the coal yard • A "first-in-first out policy of handling of coal • Transferring, cooling and immediate use of affected portions of the stock • Provision of a fire truck
ABANDONMENT PHASE			
	LAND		
Decommissioning	Pedology	• Soil contamination with heavy metals	• The Abandonment Rehabilitation Plan shall be followed strictly with emphasis on the strategy of sustaining erosion/ sedimentation control within and adjacent vicinity of the power plant and rendering the Project area free of soil contamination for heavy metals (Pb, Hg, Cd and Cr^{+6})
	Terrestrial Ecology	• Increase biodiversity due to retention of buffer zone	• Positive impact, no mitigation needed
	WATER	•	
Disposal of waste	Water Quality	Disposal of wastes may lead to possible impacts from spills and discharges of contaminants affecting	• Collection of spills • Removal and/or neutralization of chemicals • Continuous water quality monitoring

Environmental Aspect	Environmental Component Likely to be Affected	Potential Impact	Prevention/Mitigation/Enhancement Measures
		water quality and aquatic ecology	
	AIR		
	Air Quality and Noise	• Generation of noise, which drives away some wildlife • Generation of dusts which affects workers, vegetation and wildlife at risk	• Watering during dismantling to minimize dusts • Proper maintenance of vehicles • Use of noise suppressors/mufflers • Limiting noisy activities during daytime • Conduct of noise level monitoring
	PEOPLE		
Hiring of workers for demolition and abandonment activities	Local residents	• Increase in local employment during abandonment • New skills developed for decommissioning may be marketable elsewhere	• Priority employment for qualified local residents
Loss of jobs/ employment		• Reduction in employment opportunities to include the staff of local contractors with long-standing service contracts with the project, for example, maintenance services, site transport services and franchised catering companies. • Job displacement •	• Six (6)-month notice prior to termination of contract to give ample time to look for next employment • Effective management via consultation, planning and communications with affected workers • Financial support within a human resources plan

Environmental Aspect	Environmental Component Likely to be Affected	Potential Impact	Prevention/Mitigation/Enhancement Measures
	Demographic	• Out-migration of affected project personnel to seek work elsewhere	
Decommissioning activities	Local Community	• Nuisance • Decommissioning activities may cause local disturbance or damage through increased road traffic, noise, etc.	• Formulation and implementation of decommissioning impact management plan

Annex 1- Impact Areas of the proposed Cement Manufacturing Plant, Power Plant And Building Materials Manufacturing Plant



Source: NAMRIA Maps, modified by GEOSPHERE 2019