CEMENT & QUICKLIME MANUFACTURE IN PNG

A new, strategic, high value vertically integrated industry for PNG
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Macroeconomics - Lime & Cement in PNG
New industry and Nation Building in PNG

EVOLUTION OF A RESOURCES BASED ECONOMY

A future trajectory for unlocking PNG’s natural resources wealth.....

FUTURE OPPORTUNITIES FOR PNG

1. Diversification of PNG’s mineral resource extraction base
2. Increase ‘value add’ to primary resource extraction

90% OF ALL EXPORTS FROM PNG ARE COMMODITY BASED

LEGEND:
- New mineral resources for PNG
- Key inputs for lime, clinker and cement products
- Value add / vertical integration for Domestic & Export Markets

Mayur’s portfolio

Copper
Nickel
Gold
Coal
Iron
Limestone
Construction Sands
Zircon
Ilmenite
Cement
DRI/Steel
Ag Lime
Quicklime
Power
Urea
Ag Lime
Quicklime
DRI/Steel
Cement

90% OF ALL EXPORTS FROM PNG ARE COMMODITY BASED

All within Mayur’s portfolio
Import Replacement & Vertical Integration Opportunities

Mayur’s mineral inventory in PNG (in Western, Gulf and Central provinces):

- Iron (Titanomagnetite)
- Construction Sands
- Mineral Sands (zircon + Ilmenite)
- Limestone
- Coal

Resources used for ‘in-country value add’:

- Power Generation
- Cement
- Quicklime
- Agricultural lime
- Construction materials
  - Petrochemicals
  - DRI / Steel

Mayur has access to key raw materials for an integrated Cement & Lime business in PNG
Whilst PNG’s consumption growth has been strong, it still has much growth potential

- **Cement consumption** – a key indicator of industrialisation

- As PNG’s GDP per capita increases demand for cement will grow as standards of living and national infrastructure spend increases

**Global cement consumption growth per capita, 1995-2014** *Cemnet, 2014*

- Between 1995 - 2014 the South Asia region experienced the fastest increase in cement consumption in the world driven by correlated GDP growth

- Reduction in power prices will drive cement consumption and PNG will be “poised for take off”

- As PNG’s economy develops there will be an increase in cement demand as a building block for sustained economic growth
PNG is catching up in a rapidly industrialising global region

- PNG’s cement consumption is very low – 60kg per capita, places PNG at the bottom of the global curve (point A)
- PNG will increase cement consumption by 500% to 1,000% as it moves towards its developing nation peer group (zone B)

**Strong Linkage between Cement Usage and GDP**

### PNG

**Cement consumption per capita:** ~60 kg

- No domestic production, all cement / clinker imported

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**Developed Nations / Mature Economies**

**Undeveloped nations**

**Developing nations**
PNG is catching up in a rapidly industrialising global region

Lime in PNG – import replacement

- PNG quicklime demand is currently dominated by use in mineral ore processing by the resources sector
- Domestic strategy to **displace PNGs current 100% import** of quicklime with a domestic sourcing option
- Future mining projects (e.g. Frieda River, Wafi Golpu etc.) could see current demand grow significantly
Cement & Quicklime manufacture in PNG

Cement / Lime in PNG – domestic import replacement

Future **domestic demand** for lime and cement in PNG to increase as a result of:

- Mining mega projects (future and current)
- Large scale road infrastructure investment (e.g. US$4.5bn Chinese ‘Belt & Road’ funded) to build much needed national road networks[^]
- Potential Gulf LNG / expansion of PNG LNG (7km from Mayur’s project)
- GDP per capita growth - driving housing demand for building materials including cement

Future export opportunities – a low cost supplier

- Export strategy to be one of Asia’s **lowest cost producers of clinker, cement and quicklime** and penetrate the Australian, NZ and other regional markets
- Production of clinker in Australia / NZ progressively being phased out for political and economic headwinds
- Mayur to position itself to offset this lost supply capacity

[^ http://www.thenational.com.pg/china-fund-k14-billion-projects/]

Mayur Resources
Port Moresby Lime Project - Overview
Strategically located on the coast 25km north of Port Moresby

- High grade limestone deposits 25km from Port Moresby, 7km from Exxon PNG LNG Refinery
- Huge 382 Mt Maiden JORC Resource
- 2 deposits (Kido / Lea Lea), including 205 Mt Measured
- MOU signed for gas supply from PNG LNG
- DFS underway for a vertically integrated quicklime and clinker/cement business in PNG
- Import replacement and export market penetration opportunities identified

1 Port Moresby Limestone Project JORC Resource as disclosed in the ASX Announcement dated 12 January 2018. The Company is not aware of any new information or data that materially affects the information contained in that announcement. 2 MOU with Kumul as disclosed in the ASX Announcement dated 10 January 2018.
Moresby Limestone Project – Giant size Resource with significant exploration upside

- Huge 382 Mt Maiden JORC Resource across 2 deposits (Kido and Lea Lea), including 205 Mt Measured sufficient to support long life multi generation low cost quick lime and cement businesses

<table>
<thead>
<tr>
<th>Area</th>
<th>Category</th>
<th>CaO cut off %**</th>
<th>Tonnes</th>
<th>CaO %</th>
<th>Al₂O₃ %</th>
<th>SiO₂ %</th>
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</thead>
<tbody>
<tr>
<td>Lea Lea</td>
<td>Measured</td>
<td>52%</td>
<td>61,000,000</td>
<td>53.4</td>
<td>0.6</td>
<td>1.65</td>
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<tr>
<td>Kido</td>
<td>Measured</td>
<td>52%</td>
<td>144,000,000</td>
<td>53.6</td>
<td>0.62</td>
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<tr>
<td>Total</td>
<td>Measured</td>
<td>52%</td>
<td>205,000,000</td>
<td>53.5</td>
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<tr>
<td>Lea Lea</td>
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<td>50%</td>
<td>117,000,000</td>
<td>51.8</td>
<td>0.9</td>
<td>2.7</td>
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<tr>
<td>Kido</td>
<td>Indicated</td>
<td>50%</td>
<td>11,000,000</td>
<td>51.5</td>
<td>0.6</td>
<td>1.1</td>
</tr>
<tr>
<td>Total</td>
<td>Indicated</td>
<td>50%</td>
<td>128,000,000</td>
<td>51.8</td>
<td>0.9</td>
<td>2.6</td>
</tr>
<tr>
<td>Lea Lea</td>
<td>Inferred</td>
<td>48%</td>
<td>7,000,000</td>
<td>48.1</td>
<td>1.1</td>
<td>2.5</td>
</tr>
<tr>
<td>Kido</td>
<td>Inferred</td>
<td>48%</td>
<td>42,000,000</td>
<td>48.4</td>
<td>1</td>
<td>1.8</td>
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<tr>
<td>Total</td>
<td>Inferred</td>
<td>48%</td>
<td>49,000,000</td>
<td>48.3</td>
<td>1</td>
<td>1.9</td>
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</table>

*Minor rounding errors apply pursuant to JORC 2012. **The cut-off grade for the Measured Mineral Resource is based on a commonly accepted CaO grade for the production of lime and quick lime.
Cement & Quicklime manufacture in PNG – study concepts

Moresby Limestone Project – Quicklime

- Commenced feasibility work for a 250,000 tpa quicklime plant (ramping to 750,000 tpa over 10 years) with associated power and port facilities (co-located with the cement/clinker facility outlined below)
- PNG has an import demand of approximately 150,000 tpa, sourced from locations as far away as NZ and Thailand
- Potential for demand to increase to over 500,000 tpa with future mining projects (e.g. Frieda River, Wafi Golpu etc)
- Signed a gas supply MOU with Kumul petroleum (for piped gas supply from PNG LNG, 7 km from proposed site)
- Seeking to leverage PNG’s proximity to Australian users of quicklime (> 1.5 Mtpa market) and access this market

Moresby Limestone Project – Clinker/Cement

- Study to develop a 1.5 million tpa cement and clinker facility (50/50 tonnage split), ramping to 3 million tpa within 10 years. It is proposed that this facility would share power and port facilities with the above lime facility
- PNG currently imports all of its cement and clinker (approximately 300,000 tpa) with 500% growth opportunity
- Australian cement consumption is approx. 10 Mtpa predominantly on the Eastern seaboard of Australia
- Australian industry moving towards a clinker/cement import model – thus providing new market opportunities for PNG as closest low cost developing nation neighbour
Two large scale, high grade, coastal lime deposits

Regional layout of Kido and Lea deposits

Kido deposit

Lea Lea deposit

3D section of Lea (left) and Kido (right) drilling

Mayur crushed limestone

X-sections of Kido limestone deposit
Cement & Quicklime – Kido Plant Development Layout

Access track to Lea Lea (~6 km); Port Moresby (~25 km)

Indicative Plant layout (for illustrative purpose only)
Cement & Quicklime – Lime Quarrying

Typical limestone quarry

Aerial view of Kido headland
Cement & Quicklime – Bathymetry & Jetty Plan

Proposed Jetty Location

PROPOSED JETTY LAYOUT
(Stage 1 to 5m depth)

PROPOSED TRANSHIPPING LOCATION (2 OPTIONS)

Typical vessel loading solutions
Quicklime – for PNG & Export Market
Quicklime Manufacture

Quicklime– Process Block Diagram

Simplified process diagram for the production of quicklime

FROM LIMESTONE CRUSHER

LIMESTONE SUPPLY 30 TO 120mm

CONVEYING SYSTEM

BUFFER SILO 200 TON

BUCKET ELEVATOR CONVEYING SYSTEM

WEIGH AND PRESSURE CHARGING SYSTEM

TWIN SHAFT VERTICAL KILN

KILN QUICKLIME DISCHARGE SYSTEM

MILLING

SCREENING

FUEL GAS

FD AIR

EXHAUST AIR

VACUUM BAGHOUSE

FINE QUICKLIME SILOS

CONTAINER FOR TRUCK LOADING
Quicklime Kilns and bagging plants

Moresby Limestone Project – Quicklime Production

Examples of vertical shaft quicklime kilns

Quicklime to be bagged and containerised for transport by truck or sea freight
Quicklime – geographic location provides excellent market opportunities

Domestic import replacement and proximity to major markets in Australia

Domestic market opportunities:

- Current import demand ~150,000 tpa from mining projects
- Quicklime users (e.g. mines) have commitments to use domestic supply where possible yet have no option but to import.
- PNG demand could increase to +500,000 tpa with potential future mining projects (e.g. Frieda River, Wafi Golpu)

Export market opportunities:

- Australian lime market currently > 1.5 Mtpa
- Predominantly alumina smelters and mining industry in QLD and WA
- Quicklime market in Australia is expected to expand at a CAGR of 2% in terms of value (2016–2024)^
- Australian lime customers are focusing not only on basic lime products but also importing quicklime from ASEAN countries^ 

Mayur’s project site is well placed to service both domestic demand and regional growth in the coming years

Cement & Clinker – Industrialising PNG & Export
Cement and Clinker – Process Block Diagram

Simplified process diagram for the production of cement and clinker

Indicative Raw Feed Mix (1.5Mtpa)

<table>
<thead>
<tr>
<th>Raw Material</th>
<th>Proportion (%)</th>
<th>Tonnes per year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limestone</td>
<td>86.63</td>
<td>2,319,122</td>
</tr>
<tr>
<td>Marl</td>
<td>5.66</td>
<td>175,766</td>
</tr>
<tr>
<td>Silica</td>
<td>7.71</td>
<td>239,505</td>
</tr>
</tbody>
</table>

DISRUPTIVE DIFFERENTIATOR:

All key raw material inputs (except gypsum) can be sourced from Mayur’s mineral portfolio in PNG.
Cement and Clinker plant

Examples of the main plant and equipment for the cement and clinker facility

- Pre heater & feed meal silo
- Rotary Kiln
- Clinker grinding vertical mill

Straight Line layout (as proposed for Mayur’s project)
Mayur has secured a site at Port Botany (Sydney, Australia) for a potential cement & construction sands discharge, storage and distribution facility. Refer to section 14.9 of the MRL Prospectus for further details of the arrangement with NSW Ports.
Cement and Clinker – markets

Domestic Import replacement and regional market penetration opportunities

Domestic market opportunities:

- PNG currently imports all of its cement and clinker (approximately 300,000 tpa)
- Potential for 5 to 10 times demand increase opportunity from power price reduction, infrastructure project development and GDP growth

Export market opportunities:

- Main opportunity is Australia (~10 Mtpa market) given market size and proximity to PNG
- In 2016, 40% of clinker used in Australia was imported; clinker imports are growing at 4% p.a.¹
- New Zealand has been ramping down clinker production capacity over the same period with imports increasing being used
- Unlikely that current clinker grinding capacity will expand – hence opportunity for increased imports of cement in future to both countries from PNG

¹ source- Australian Bureau of Statistics
Stable growth in Australia, with imports continuing to replace domestic production

- Australian cement usage increased 5% in 2014-16, despite clinker production declining 3% over the same period.
- The difference being an increase in imports and this trend is likely to continue.
- In the medium-longer term, cement imports should also increase as older cement plants are decommissioned.

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Opportunity for export of clinker / cement from PNG to Australia, given it’s increasing reliance on imports.

Data source: Australian Bureau of Statistics
Cement and Clinker

Cement / Clinker - Australian Import replacement opportunities

**Australian market opportunities:**

- Main opportunity to displace imports of clinker / cement from Japan, China, Vietnam and Indonesia
- Mayur aims to leverage its natural advantages of:
  - having a clinker /cement plant on the coast,
  - adjacent to a large high quality limestone deposit,
  - within a few kilometres of energy source (gas supply)
  - possessing all key raw materials within its mineral portfolio,
  - in a low cost country to become a low cost clinker / cement producer in the region
- Furthermore, the shipping distances from PNG to east coast Australia are far shorter than from current north Asian suppliers

**Mayur’s Port Moresby project is in the ‘sweet spot’ of mineral resource and shipping location thus enabling a low delivered cost to Australia**
Other Products – Aggregates, Agri lime
Moresby Lime Project – other potential products and applications

<table>
<thead>
<tr>
<th>PRODUCT</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agri lime</td>
<td>Soil improvement, Livestock feed e.g. chicken feed, pig feed</td>
</tr>
<tr>
<td>Aggregates</td>
<td>Road building, concrete manufacture</td>
</tr>
<tr>
<td>Finely ground high grade limestone</td>
<td>Paper manufacture, paints, plastics, toothpaste</td>
</tr>
<tr>
<td>Crushed limestone</td>
<td>Water treatment, waste water treatment, oil and gas, air filtration</td>
</tr>
<tr>
<td>Lime Hydrate</td>
<td>Various Industrial processes</td>
</tr>
<tr>
<td>Coarse quicklime</td>
<td>Iron and Steel manufacturers, environmental dust emissions</td>
</tr>
</tbody>
</table>

Example - Agricultural Lime

- PNG’s population of 8.4 million is rapidly increasing and due to almost double in the next 30 years
- Growing population and affluence will see increase in demand for foodstuffs and thus more intensive farming and agricultural production
- Much of the topsoil in PNG is acidic and will need lime to neutralise and optimise cropping with increased yields
PNG Government support

- Mayur’s strategy is aligned with the PNG government’s ‘Nation Building Agenda’

- Mayur’s business activities have **strong support** across all levels of Government including the Prime Minister Mr Peter O’Neill.

- Mayur has strong support from both the **Gulf Provincial Governor** (Hon Chris Havieta) and the **Central Province Governor** (Hon Robert Agarobe) where the lime and cement raw materials and facilities are to be located.
Moresby Limestone Project – targeting to be Asia’s lowest cost producer

- High grade, lime resource (~96% CaCO₃) at surface (zero strip ratio)
- Excellent decrepitation properties with very low fines generation (< 1%) when crushed (highly marketable)
- On coast (no requirement for land based transport, other than local Port Moresby market)
- Close to markets (PNG and export)
- Low cost labour country
- Supportive, pro development and pragmatic government
- Adjacent to PNG LNG as gas for fuel supply (7km from deposits)
- Direct control of other cement raw materials i.e. iron, silica, clay, coal all within Mayur’s portfolio in PNG
- Directly owned wharf jetty infrastructure

Mayur is strongly positioned to be a lowest cost lime, clinker and cement producer in Asia Pacific