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Technical Valuation

Soalara Limestone Project

Cassius Mining Limited

Job No. **2930-01**

Report Date: **10 August 2024**

Prepared for:

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Technical Director

Cassius Mining Limited

Prepared by:

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Reviewed by:

Sue Border

BSc Hons (Mining Geology), Grad Dip (Indust Min Sc), FAusIMM

Principal Adviser

Executive Summary

The Soalara Project is located in the southwest of Madagascar near the town of Toliara and consists of two contiguous Mining Permits (latitude 23.60° S / longitude 43.72° E) of area ~18.8 km^2 and with a granted term until 2055. The Project comprises Eocene Epoch fossiliferous limestones that form a cliff ~ 100m high and dip shallowly at 3-5° to the west. The upper limestone is conformably underlain by a different fossiliferous limestone.

In 2023 a Mineral Resource, compliant with the JORC Code 2012, of 340Mt high purity limestone (97% $CaCO_3$) at a cut-off grade 95.7% $CaCO_3$, comprising 100-Mt Indicated and 240Mt Inferred Resources, was estimated by H&S Consultants.

CSA Global Pty Ltd (2016) valued the Soalara Project and assigned a market value range US$1.25M-US$2.0M, with a Preferred Value of US$1.6M. The value was based on an Exploration Target of 491Mt to 818Mt of limestone.

Geos Mining has utilised two methods on which to base a Technical Value for the Soalara Project: Comparable Transactions (CT) and Modified Replacement Value (MRV). The range of Technical Values using the CT method is US$10.9M to US$19.4M with a Preferred Value of US$11.0M. The MRV range is US$3.7M to US$8.5M with a Preferred Value of US$6.1M (Table 12). The weighted Technical Values from the two methods were discounted by 40% to determine the Market Values.

The Soalara Project has a range of values of between US$3.5 million and US$7.1 million with a Preferred Value of US$4.6 million.

In Geos Mining's opinion, the project value range could be increased by completing a Scoping Study to determine a likely range of cost parameters as well as an assessment of the risk factors outlined in this report.

Signature: 

Name:	Sue Border	Position:	Principal Advisor
Qualifications:	BSc Hons (Mining Geology), Grad Dip (Indust Min Sc), FAusIMM	Date:	10th August 2024

Disclaimer

Geos Mining has undertaken suitable checks, enquiries, analyses and verification procedures, considered as meeting the Reasonable Grounds Requirement for the soundness of the inputs that lead to the conclusions drawn in a Public Report (in accordance with the VALMIN Code 2015), and can accept no liability if, despite our checks, materially inaccurate, incomplete or misleading data has affected the conclusions of this report.

Geos Mining and the authors are independent of Cassius Mining Limited and have no financial interests in Cassius Mining Limited or any associated companies. Geos Mining is being remunerated for this report on a standard fee for time basis, with no success incentives.

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1. Introduction

1.1 Commissioning Entity

This valuation was commissioned by Cassius Mining Limited.

1.2 Indemnities

In commissioning this work, Cassius Mining Limited signed a written undertaking to:

- provide all material information in its possession to Geos Mining, including any previous project assessment reports and valuations
- ensure that necessary access will be assured for Geos Mining staff to the company's personnel and records
- inform Geos Mining if any information is to be regarded as confidential and not to be included in the final report
- respect the independence of Geos Mining Staff.

In accordance with Clause 11.4 of the VALMIN Code 2015, Cassius Mining Limited also undertook to indemnify Geos Mining for any liability:

- resulting from their reliance on information provided by Cassius Mining Limited that is Materially inaccurate or incomplete; and
- relating to any consequential extension of workload through queries, questions or public hearings arising from the Public Report.

1.3 Background

Cassius Mining Limited ('Cassius') is an ASX listed (ASX:CMD) resource exploration and mining company with projects based in Africa. The Madagascar Soalara Limestone Project ('Soalara Project') (Figure 1) is 100% owned by Cassius, via its Malagasy-registered company Soalara Calcaire SARL. Soalara Calcaire SARL is a wholly owned subsidiary of Austral Malagasy Mining SARL which in turn is a 100% subsidiary of Cassius. Cassius changed its name from Gulf Industrials Limited on 1 December 2017.

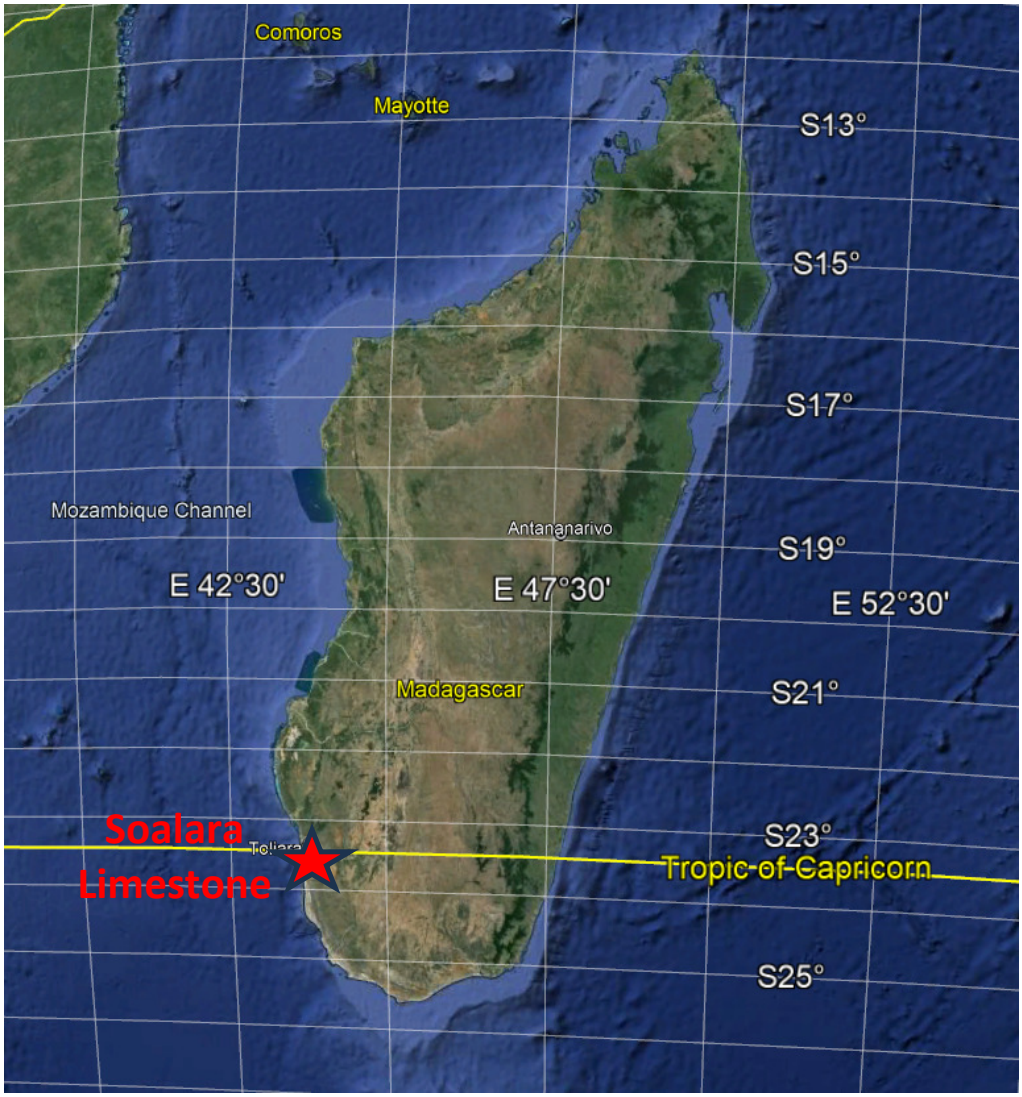

Figure 1: Location of Soalara Limestone Project

1.4 Date of Valuation

The date of this valuation is 10 August 2024.

1.5 Purpose of Valuation

This valuation has been prepared for the purpose of public release to meet ASX disclosure obligations.

1.6 Basis of Valuation

The valuation was primarily based on a Technical Value method. The Australasian Code for the Public Reporting of the Technical Assessments and Valuations of Mineral Assets 2015 Edition (the "VALMIN Code

2015") defines Technical Value as *"an assessment of a Mineral Asset's future net economic benefit at the Valuation Date under a set of assumptions deemed most appropriate by a Practitioner, excluding any premium or discount to account for market considerations."*

Assessment of Modifying Factors were applied to the Technical Value to arrive at a Market Value, which is defined by the VALMIN Code 2015 as *"the estimated amount of money (or the cash equivalent of some other consideration) for which the Mineral Asset should exchange on the date of Valuation between a willing buyer and a willing seller in an arm's length transaction after appropriate marketing wherein the parties each acted knowledgeably, prudently and without compulsion".*

The valuation of the Subject relied on Comparable Transactions and Modified Replacement Value methods.

1.7 Standards and Codes

This report and valuation have been prepared in accordance with:

- The VALMIN Code 2015, prepared by the VALMIN Committee, a joint committee of The Australasian Institute of Mining and Metallurgy and the Australian Institute of Geoscientists, with the participation of the Minerals Council of Australia and other key stakeholder representatives,
- ASX Listing Rules (Australian Securities Exchange, 2024)
- ASIC (Australian Securities & Investments Commission, 2024)
- The JORC Code 2012 (Joint Ore Reserves Committee of the Australasian Institue of Mining and Metallurgy, Australian Institute of Geoscientists and Minerals Council of Australia, 2012)

Currency used in this report is US dollars (US$).

1.8 Statement of Competence

This report has been prepared by Geos Mining and has been compiled and edited by Senior Consultant Jeff Randell. Principal Adviser Sue Border has reviewed this document.

Jeff Randell has more than 40 years mineral exploration and mining experience in Australia and is the author of numerous mineral asset valuations reports. Jeff is a Specialist (in accordance with the VALMIN Code 2015) in the valuation of mineral assets.

Sue Border has more than 40 years industrial mineral exploration and mining experience in Australia and overseas and is a recognised industry expert in industrial minerals. Sue is the founding Director of Geos Mining and is a Specialist (in accordance with the VALMIN Code 2015) in industrial minerals marketing, exploration and valuations.

1.9 Statement of Independence

Geos Mining is independent of all parties involved with the project activities described in this report. Geos Mining will receive a professional fee based on standard rates plus reimbursement of out-of-pocket expenses for the preparation of this report. The payment of these fees is not contingent upon the success or otherwise of any associated fundraising or transactions. There are no pecuniary or other interests that could be reasonably regarded as being capable of affecting the independence of Geos Mining or the authors of this report.

Geos Mining is not aware of any appointments over the past two years by any stakeholders or other relevant parties involved in the Subject project that may be perceived as able to affect the independence of Geos Mining. Geos Mining, the authors and members of the authors' families, have no interest in, or entitlement to, any of the project areas the subject of this report.

1.10 Reliance on Other Specialists

Geos Mining has sub-contracted the Market Study to associate independent minerals consultant, Murray Lines of Stratum Resources. Murray Lines is the founder and principal of Aust-Asia Stratum Resources Consulting, an independent minerals consultancy providing information, supply demand analysis and advice on policy developments for the mining industry. He has a detailed knowledge of limestone deposits located throughout Asia, from the Middle East to Japan/China (for paper, plastic, steel, etc) and has visited many site operations.

Murray Lines requested some commentary from Chris Spencer. Chris is a highly experienced industrial minerals specialist who has extensive experience in Africa and Saudi Arabia.

Contributions from Mr Lines and Mr Spencer are acknowledged in this report while the full Market Study report is included as Section 14.

1.11 Reasonableness Statement

In undertaking this valuation, Geos Mining has assessed the Technical and Financial inputs in an impartial, rational, realistic and logical manner. We believe that the overall Technical Assessment, Valuation Approach and Valuation Methods are in line with industry standards and meet the Reasonable Grounds Requirement of the VALMIN Code 2015.

1.12 Cost

Geos Mining is to be remunerated on a fixed fee basis for undertaking this valuation, with no bonus payment to be made based on the derived valuation of the Subject or the success of the Transaction.

The fee agreed between Geos Mining and Cassius Mining Limited (the commissioning agent) is 23,100 Australian Dollars.

1.13 Limitations and Consent

With respect to this report and its use by Cassius Mining Limited and its advisers, Cassius Mining Limited agrees to indemnify and hold harmless Geos Mining, its shareholders, directors, officers and associates against any and all losses, claims, damages, liabilities or actions to which they or any of them may become subject under any securities act, statute or common law, except in respect to fraudulent conduct, negligence or wilful misconduct, and will reimburse them on a current basis for any legal or other expenses incurred by them in connection with investigating any claims or defending any actions, except where they or any of them are found liable for, or guilty of fraudulent conduct, negligence or wilful misconduct.

This report is provided to Cassius Mining Limited solely for the purpose of assisting Cassius Mining Limited directors and other interested parties in assessing the geological and technical issues associated with the Subject. This report does not constitute a full technical audit, but rather it seeks to provide an independent overview and technical appreciation of the Subject. This report may be reproduced only in its entirety and then only with Geos Mining's prior written consent.

2. Sources of Information

2.1 Data Provided by Client

Cassius provided the following data:

- Diamond drilling collars, surveys, lithologies, densities and assays for drillholes CMD001-009, with accompanying diagrams
- Mining Permits 14542 and 14960 of total area 18.8km^2
- Project Overview (Gulf Industrials Limited, 2011)
- Technical Review Report (SRK Exploration, 2016)
- Valuation and Marketing Study (CSA Global Pty Ltd, 2016)
- Soalara Mineral Resource Estimate (H&S Consultants Pty Ltd, 2023)

Geos Mining has not inspected the core from the 2022 diamond drilling, sighted the original laboratory certificates or verified the Mineral Resource Estimate. For the purposes of this valuation, we have accepted as factual the data contained in the CSA Global Valuation and Marketing Study report (CSA Global Pty Ltd, 2016), the SRK Independent Technical Review (SRK Exploration, 2016) and the Soalara MRE (H&S Consultants Pty Ltd, 2023).

2.2 Site Inspection

A site inspection was not carried out by any of the Valuers as the valuation was not based on an Income method of valuing the asset, and there is no significant infrastructure on site. A site visit was considered unlikely to materially change our assessment.

3. Project Description

3.1 Geographic Location

Madagascar is located southeast of the African continent, due east of Mozambique and separated from it by the Mozambique Channel (Figure 2). The island has an area of ~587,000 km^2 and comprises largely highlands interspersed with plateaus and lowland coastal plains. The current population is 29.6 million (at 2022) with ~1.3 million living in the capital city Antananarivo. The majority of roads are unpaved although sealed roads connect the six largest regional towns.

The Soalara Project is located in the southwest of Madagascar near the town of Toliara at latitude 23.60° S and longitude 43.72° E. It is located ~650kms southwest of the capital city and ~30kms south of the town of Toliara.

Figure 2: Geographic Elements of Madagascar

3.2 CLIMATE

In Madagascar, two seasons are recognized: a hot, rainy season from November to April and a cooler, dry season from May to October. The east coast has a sub-equatorial climate driven by easterly trade winds, along with the heaviest and most consistent rainfall, with a maximum of 3,700 mm annually. The west coast of the country is generally drier and is subject to significant coastal erosion. The southwest and the extreme south are semi-desert environments, receiving less than 800 mm of rainfall annually. The average annual temperatures vary between 23°C and 27°C along the coast and between 16°C and 19°C in the central mountains (World Bank Group, 2024).

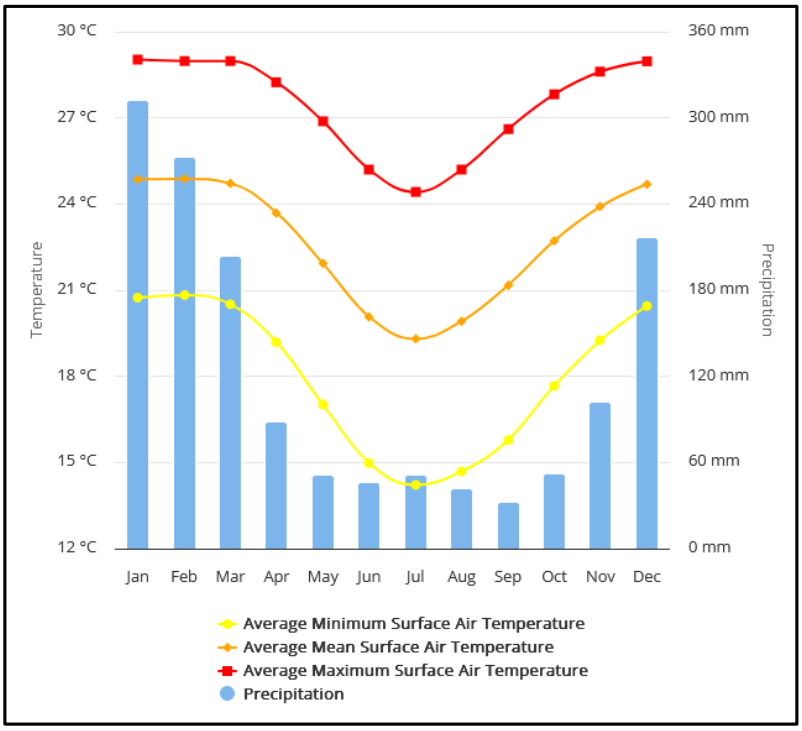

Figure 3: Average Monthly Temperatures and Rainfall for Madagascar

(Source: (World Bank Group, 2024)

3.3 Mining Tenements

The project consists of two contiguous Mining Permits[1] (Permits d' Exploitation) numbered 14542 and 14960, covering areas of 32 squares and 16 squares, respectively[2] in the Toliara II District, Atsimo-Andrefana Region of the Toliara Province in southwest of Madagascar.

For the purposes of this valuation, we have assumed that the tenements are in good standing with no legal disputes and all government administrative fees up to date. We have not independently verified the status of the tenements.

Tenement	Holder	Area (km^2)	Granted	Expiry	Status
MP14542	Soalara Calcaire SARLU[3]	12.5	04/11/2015	03/11/2055	Current
MP14960	Soalara Calcaire SARLU	6.3	04/11/2015	03/11/2055	Current

Table 1: Soalara Mining Tenements

[1] A Mining Permit grants the exclusive right to exploit commodities and carry on prospecting and research of the specified commodities. Both permits are valid for 40 years and can be renewed multiple times, each for a period of 20 years

[2] A 'square' in Madagascar is equivalent to an area of 625m x 625m (0.39km^2)

[3] S.A.R.L.U. is an acronym for Société à Responsabilité Limitée Unipersonnelle

3.3.1 Mining Legislation Madagascar

A summary of the New Mining Code has been extracted below from Dentons (2024).

Mining permits are managed by the Bureau du Cadastre Minier Madagascar (BCMM). Any natural person of Malagasy nationality and any legal entity under Malagasy law, may acquire and hold mining permits, approvals and authorizations. Legal entities must have at least one representative resident in Madagascar. The New Mining Code, read together with the Investment Law (Law 2007-036), does allow foreign companies to hold mining rights.

To include local communities, the New Mining Code establishes the Mining Fund for Social and Community Investment and requires permit holders to formulate a Corporate Social Responsibility Plan.

Article 253 of the New Mining Code echoes provisions contained in the Malagasy Environment Charter (MEC) which stipulates that investment projects must undergo an Environmental Impact Assessment.

The royalty rate has been revised upwards from 2% to 5% with a reduction of 30% applicable to the 5% royalty rate if the products are locally “transformed”. The composition of the 5% royalty rate comprises a 2% mining rebate for the benefit of local communities and a 3% mining royalty rate for the benefit of the State. The term “transformed” is not defined and its application is not explicitly outlined, however, it can be inferred that the 30% reduction of the 5% royalty rate will be applicable to mining entities that advance the local beneficiation of the commodities prior to their export.

The Malagasy government has moved to allay investor fears of any reneging of agreements by guaranteeing returns on their investments through guaranteed maintenance of the legal and regulatory regimes in force at the time of request. A “Stability Guarantee” is granted to any holder of a permit and is valid for a renewable period of up to 5 years. Permit holders can request more favourable measures that would have come about after the date of exercising the stability option.

3.4 Geology and Mineralisation

Tertiary and Mesozoic limestones occur along the western coast of Madagascar, as shown in Figure 4.

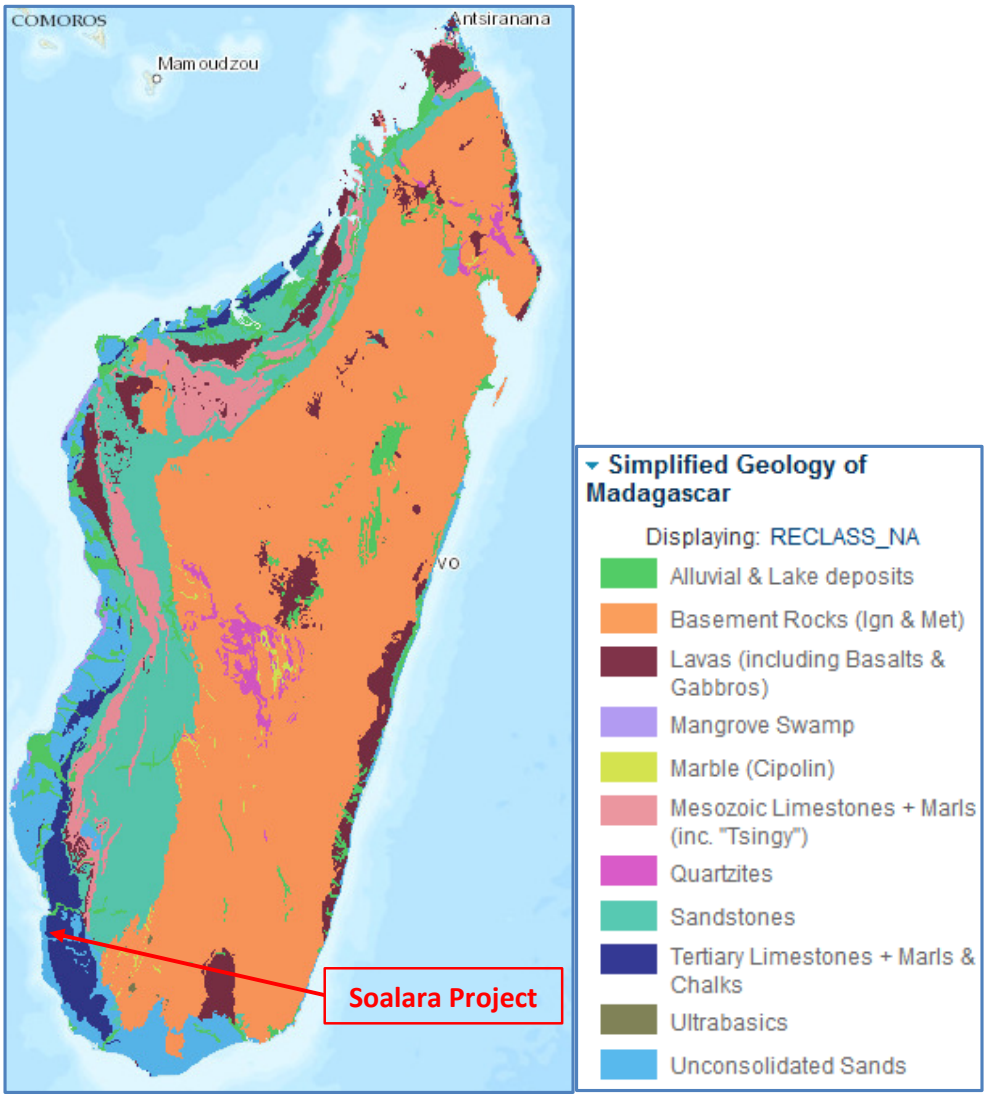

Figure 4: Simplified Geology of Madagascar

(Source: Data Basin (2010)

The Soalara Project comprises Eocene Epoch (~34-56Ga) fossiliferous limestones that form a cliff ~ 100m high and dip shallowly at 3-5° to the west (Figure 5). The upper limestone is conformably underlain by a different fossiliferous limestone (SRK Exploration, 2016). Cassius reported that the limestone can be subdivided into:

- Lower Sequence – compositionally variable limestone ~40m thick
- Upper Sequence – massive and compositionally uniform limestone ~40m thick.

Cliff face samples collected by SRK in 2016 indicated an average CaO content of 54.7% in the lower limestone and 56.01% in the upper limestone (97.6% and 99.9% $CaCO_3$ respectively). Deleterious features such as clay-filled cavities, chert nodules, silicification, dolomitization and metalliferous mineralisation were not apparent (Gulf Industrials, 2016).

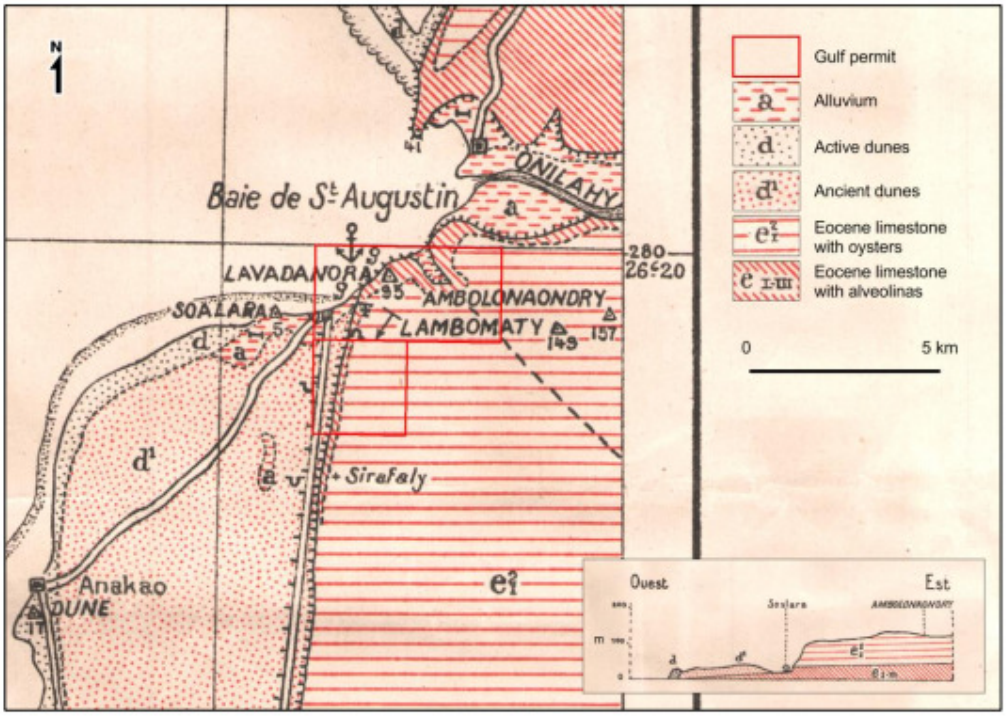

Figure 5: Historical Geological Mapping, Soalara Project

(Source: SRK Exploration (2016)

3.5 Exploration History

SRK Exploration (2016) summarised historical exploration up to 2015:

- 1928, 1943-1948 – geological mapping by Madagascar Mines Department
- 1966 – description of the Soalara deposit with some limestone assay results
- 2005 – Soalara Calcaire SARL granted exploration rights for permits 14542 and 14960
- 2008 – Madagascar Mineral Resources SARL assayed four limestone samples
- 2009 – Soalara Calcaire permitted to complete six drillholes (not completed)
- 2010 – Gulf Industrials acquired 100% Soalara Calcaire through subsidiary Austral Malagasy Mining SARL
- 2010 – Gulf Industrials assayed some limestone samples
- 2013 – Independent valuation completed by Al Maynard & Associates
- 2013 – Independent expert report by BDO Corporate Finance completed
- 2015 – Permits 14542 and 14960 granted as Mining Permits

Since 2016, the following exploration has been completed:

- 2016 – SRK completed an Independent Technical Review, 27 rock samples analysed. SRK estimated an Exploration Target of 491-818Mt limestone with high to very high purity (assuming 5km^2 area, 60m thickness, bulk density 2.4t/m^3) (Gulf Industrials, 2016)
- 2017 – Environmental Impact Study completed for proposed drilling program (Gulf Industrials Limited, 2017)
- 2022 – Diamond drilling completed (9 drillholes [CMD001-009] for 900.8m). High to very high purity limestone was intersected.
- 2023 – Maiden MRE reported:
  - 340Mt high purity limestone (97% $CaCO_3$) at a cut-off grade 95.7% $CaCO_3$, comprising 100Mt Indicated and 240Mt Inferred Resources, or
  - 440Mt high purity limestone (97% $CaCO_3$) at a cut-off grade 95.3% $CaCO_3$, comprising 130Mt Indicated and 310Mt Inferred Resources.

3.6 Mining History

There has been no mining commenced within the project area apart from small artisanal gougings.

The mining industry in Madagascar suffered until recently due to government disinterest and 'distrustful companies' (Wikipedia, 2024). The more important mines include:

- Ambalafotaka mine (Graphite)
- Ambatovy mine (Nickel & Cobalt)
- Ankaizina mine (Bauxite)
- Artsirakambo mine (Graphite)
- Bekisopa mine (Iron)
- Betioky mine (Iron)
- Farafangana mine (Bauxite)
- Fenoarivo mine (Iron)
- Green Giant mine (Vanadium)
- Holcim (Limestone for Cement)
- Kraoma (Chromite)
- Madagascar Long Cimenterie (Limestone for Cement)
- Manantenina mine (Bauxite)
- Mandena (Ilmenite)
- Marovinsty mine (Graphite
- Ranobe mine (Titanium)
- Sahamamy (Graphite)

3.7 Mineral Resources / Ore Reserves

The inaugural Mineral Resource Estimation (MRE) was prepared by H&S Consultants Pty Ltd (H&SC) in 2023 in accordance with the requirements of the JORC Code (2012). The MRE was based on data from 9 diamond drill holes completed in 2022 to 100m vertical depth and included 889 samples with an average grade of 52.9% CaO, equivalent to 94.4% purity $CaCO_3$ (H&S Consultants Pty Ltd, 2023). It is noted that:

- Sample lengths varied from 0.53m to 3.23m and averaged 0.92m
- Relative density measurements indicate some discrepancies in values using two methods of calculation. H&SC reported some anomalously low and high values but used an average value of 2.37t/m^3

- H&SC classified material within the drilled area as Indicated while limestone extrapolated up to 500m beyond the drillholes was classified as Inferred
- Limestone purity is based on the scheme of (Cox, et al., 1977) and (Mitchell, 2011)
  - Very high purity >98.5 $CaCO_3$ wt% / >55.2 CaO wt%
  - High purity 97.0-98.5 $CaCO_3$ wt% / 54.3-55.2 CaO wt%
  - Medium purity 93.5-97.0 $CaCO_3$ wt% / 52.4-54.3 CaO wt%
  - Low purity 85.0-93.5 $CaCO_3$ wt% / 47.6-52.4 CaO wt%

3.8 Metallurgical Testwork and Ore Processing

No testwork regarding metallurgical amenability has been carried out.

3.9 Mining Plan

Geos Mining is not aware of any recent mining plan that has been formulated. In 2011, Gulf Industrials presented a project overview that included a conceptual mining/ processing/ transport plan with preliminary project cost estimates (Gulf Industrials Limited, 2011).

3.10 Environmental Aspects

CSA Global Pty Ltd (2016) reported that "Soalara Calcaire SARLU was issued an environmental permit by the Office National de l'Environement (ONE) in 2009. The accompanying specifications give permission to complete six drill holes in permit 14542. However, the specifications accompanying the issued environmental permit state that "*Since the mining Squares are composed of some sensitive sites (xerophytes thickets, gallery forest, mangroves, zones prone to erosion, zones prone to desertification, river and ground water) …., this project of limestone exploratory drilling is subject to Environmental Impact Study (EIE)*."

SRK Exploration (2016) noted that "Due to the presence of drainage and a gorge in the eastern third of the property, and a large number of grave sites along the western edge of the plateau, this leaves an area of approximately 5 square kilometres that is considered to be most prospective and amenable to exploitation." The locations of the grave sites are shown in Figure 6. We note the special significance of graves and tombs in Madagascar:

- In particular the Ancestral world has a prominent meaning in the life of most inhabitants on Madagascar, which extends to all areas of life. Due to this constant presence in everyday life, the contact with the ancestors is therefore an indispensable part of life, which is expressed in various sacrificial rites, oracles and especially in the burial culture of Madagascar.

- Graves and tombs are not only places of worship or special rites in Madagascar (like the Famadihana) - as Resting place of the ancestors they have a much higher value than the houses of the living (Urlaub Auf Madagscar, 2020).

Geos Mining is not qualified to comment on either the possible restrictions that could be applied to development of the Soalara Project due to environmental and religious/ cultural constraints. However, we do note these issues as a matter for consideration in this valuation.

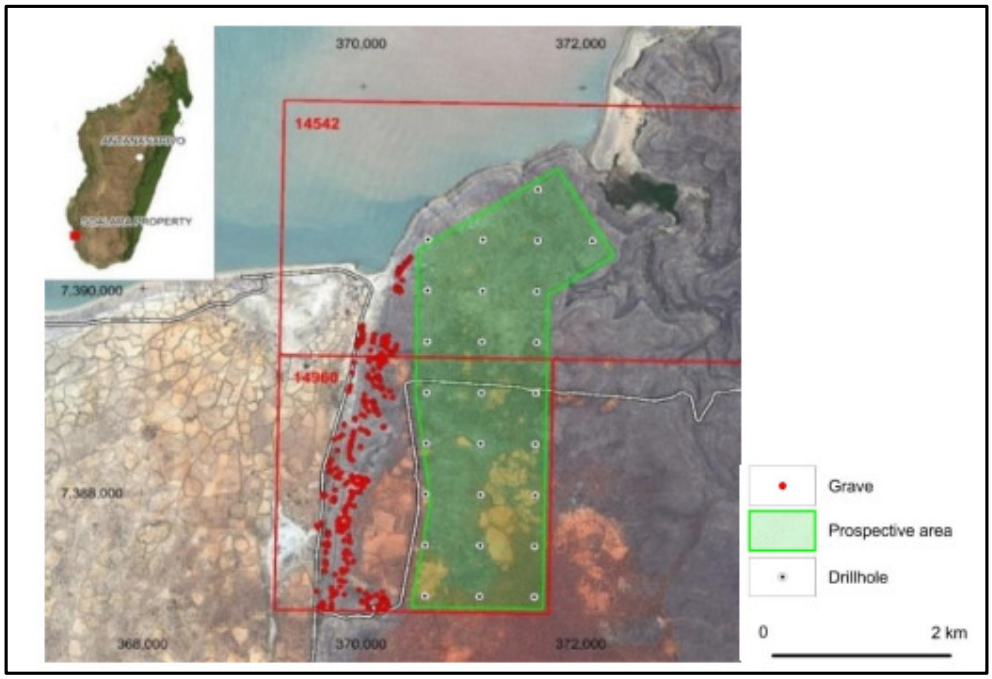

Figure 6: Location of grave sites and planned drilling area, Soalara Project

(Source: Cassius Mining Limited (2020))

3.11 Infrastructure

The Soalara Project is situated 30km south of the port town of Toliara which is the major business hub for the South Western region of Madagascar. The limestone deposit abuts the old Port of Soalara where the Soalara township was connected by a reasonably large vehicular ferry to St Augustin until very recently. The deposit is approachable by land from the Toliara – Antananarivo national highway along a sealed road (~250kms).

4. Limestone Uses

Limestone is a rock type with an enormous diversity of uses (Figure 7). In many chemical applications, such as the manufacture of cement and lime, limestone is defined as comprising at least 90% $CaCO_3$ while in applications such as fillers or whiteners where limestone is used for its physical characteristics, limestone or

dolomitic limestone can be used. Limestone is also used as hard-rock aggregate for road construction and concrete manufacture. The large quantities of limestone consumed and the nature and number of industrial applications in which it is used make limestone one of the most important of all industrial minerals. Low-quality can be utilised as a construction material in the form of aggregates and dimension stone. Purer limestone may be calcined for use in cement production or to produce lime, which has a large number of chemical uses. Powdered limestone is used as a filler in paper, paint, rubber, and plastics. Crushed limestone is used as a filter stone in on-site sewage disposal systems. Powdered limestone is also used as a sorbent (a substance that absorbs pollutants) at many coal-burning facilities (CSA Global Pty Ltd, 2016).

As well as being used to make lime, limestone may also substitute for lime in many applications, such as agriculture, fluxing, and sulphur removal. Limestone, which contains less reactive material, is slower to react and may have other disadvantages compared with lime, depending on the application; however, limestone is considerably less expensive than lime (USGS Publications Warehouse, 2022).

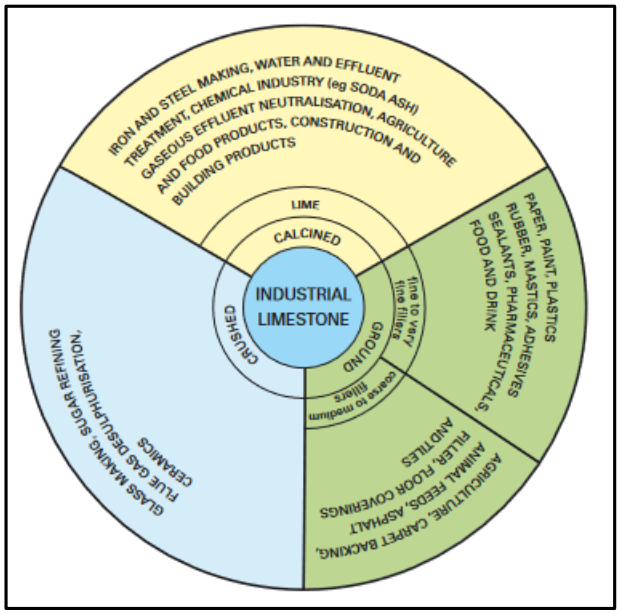

Figure 7: Uses of Limestone

(Source: (British Geological Survey, 2006)

4.1 Limestone Qualities

Limestone purity classification (Figure 8) is traditionally taken from Cox, et al.(1977), Harrison, et al. (1998) and Mitchell (2011). Brightness values should be greater than 80% for high purity uses according to (British Geological Survey, 2006).

Purity classification	$CaCO_3$ (wt %)	CaO (wt %)	MgO (wt %)	SiO_2 (wt %)	Fe_2O_3 (wt %)
Very high Purity	> 98.5	> 55.2	< 0.8	< 0.2	< 0.05
High Purity	97.0 - 98.5	54.3 - 55.2	0.8 - 1.0	0.2-0.6	0.05 – 0.1
Medium Purity	93.5 - 97.0	52.4 - 54.3	1.0 - 3.0	0.6 – 1.0	0.1 – 1.0
Low Purity	85.0 - 93.5	47.6 - 52.4	> 3.0	< 2.0	> 1.0
Impure	< 85.0	< 47.6		> 2.0	

Figure 8: Purity Classification of Limestone

Ibrahim & Abdelmonem (2020) have conveniently compiled specifications for limestone in a variety of uses from a large number of sources; this has been summarised below in Table 2.

Industrial uses	$CaCO_3$ (min.)	CaO (min.)	SiO_2 (max.)	Al_2O_3 (max.)	Fe_2O_3 (max.)	MgO (max.)	Brightness, (min.)
Steel industry [2,9,11]	91.00	51.00	6.00	1.30	1.00	2.00	-
Paper [1,6]	96.00	53.76	0.40	0.50	0.10	0.45	93.30
Filler [3,7,10]	96.00	53.76	1.20	0.30	0.08	0.72	75.00
Pottery & Porcelain ware [6,12]	96.00	53.76	2.00	-	0.30	0.50	-
Bleaching powder [2,5]	96.60	54.00	0.75	-	0.15	2.00	-
Soda ash & caustic soda [2,5]	94.60	53.00	3.00			1.00	-
Calcium carbide [2,5,6,7]	97.00	54.00	1.20	0.50		0.80	-
Sugar [3,5]	89.29	50.00	2.00	1.50		1.00	-
Glassware [3,4,8,9]	98.00	54.85	0.30	0.40	0.10	0.83	-
Ceramic [1,2]	97.00	54.32	0.12	-	0.30	3.00	95.50
Textile production [2,7]	94.00	52.64	2.50	2.00		3.00	-
Food & pharmaceutical [1]	97.00	54.35	0.12	-	0.10	0.42	90.00
Adhesive & sealants [1]	92.00	51.55	4.50	-	0.10	1.20	75.00
Agriculture & animal feed [1,2]	92.00	51.55	4.50	-	0.10	0.96	81.00

Table 2: Specifications of limestone for industrial uses

Lime is a manufactured chemical product resulting from the calcination of limestone in its various forms. Lime is made from high calcium, or magnesium (or dolomitic) limestone and dolomite that has a minimum of 97% total carbonate composition. Lime is used in a range of industries including steel production, sugar production, metallurgy (including nickel/cobalt), environmental (flue gas desulphurisation (FGD)), pulp and paper, glass, agriculture and construction materials.

4.2 Cement Production

World cement production in 2022 (Figure 9) was 4.1BTonnes (CEMBUREAU, 2024) and is less than that reported in 2015 (4.6BTonnes).

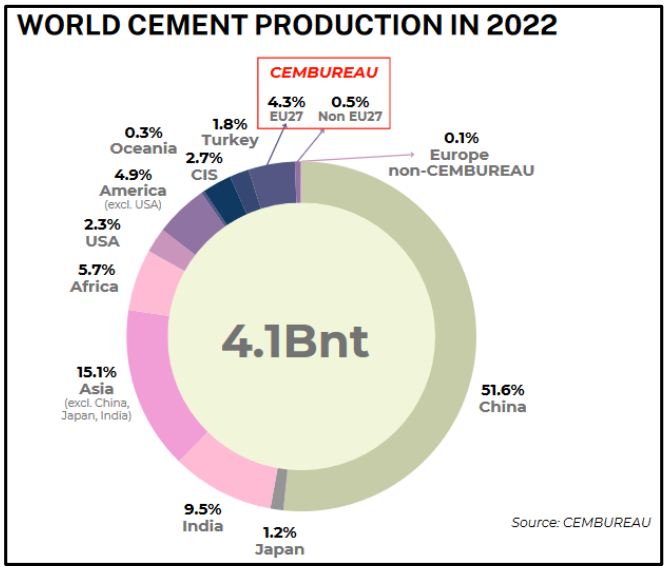

Figure 9: World Cement Production in 2022

(Source: (CEMBUREAU, 2024))

CSA Global Pty Ltd, 2016) note that in the cement industry that many limestone deposits are unusable for Portland cement clinker because of $MgCO_3$ content. The ideal "cement rock" comprises 77-78% $CaCO_3$, 14% SiO_2, 2.5% Al_2O_3, and 1.5% Fe_2O_3, coupled with <3% $MgCO_3$, <0.4% Na_2O, and 0.3% K_2O. Limestone with lower levels of $CaCO_3$ and higher levels of alkalis and magnesia requires blending with high-grade limestone. Limestone normally has to be blended with argillaceous material to adjust the chemistry of silica, alumina, and iron oxide. This presents cost and operating challenges to the cement producer because it requires large quantities of argillaceous minerals such as clay, which are usually more difficult to convey, store, and feed.

According to Harben (2002) clinker feed for Portland cement is typically 44.4% CaO, 14.3% SiO_2, 3% Al_2O_3 and 1.1% Fe_2O_3. Low magnesia, alkalis, sulphate, chlorides, sulphides and mercury are essential as these either reduce cement strength or form pollutants during kiln production. Specific ratios of calcium, silicon, aluminium and iron oxides are used to determine the best chemistry for the kiln feed, and blending is critical in reducing costs and maintaining an efficient operation. The quality of cement is usually measured by recording the development of its compressive strength, which in turn is dependent on several factors including the free lime component of the limestone, the composition of the other raw materials, grainsize of the feed and clinker, and degree and timing of heating.

Note that most cement kilns are sited adjacent to very large limestone deposits, so there is only a minor market for shipped bulk limestone to be used in cement manufacture.

4.3 Steel Manufacture

Limestone is a critical component in steel production where it is used as a flux to remove impurities. The approximate amount of limestone needed to make a tonne of steel can vary depending on the specific process and quality of the raw materials used. However, (Lines, 2024) considers that a general estimate for the basic oxygen furnace (BOF) method, which is one of the most common steel-making processes, is that

approximately 50 to 100 kilograms (0.05 to 0.1 tonnes) of limestone is needed per tonne of steel produced. The Electric Arc Furnace (EAF) Method generally requires less limestone compared to the BOF method[4]. The approximate amount can range from 20 to 50 kilograms (0.02 to 0.05 tonnes) per tonne of steel.

4.4 Lime

Lime production, which uses limestone as a primary raw material, is a significant industry in Asia. The lime market in Asia is valued at over US$5 billion, with a large portion attributed to the construction and environmental sectors. Lime kilns have traditionally been sited adjacent to large limestone deposits so do not import limestone.

4.5 Soalara Limestone Qualities

H&S Consultants Pty Ltd (2023) completed a Mineral Resource Estimate (MRE) for the Soalara Project in accordance with the requirements of the Joint Ore Reserves Committee of the Australasian Institue of Mining and Metallurgy, Australian Institute of Geoscientists and Minerals Council of Australia (2012) and estimated a tonnage of 340Mt with total oxide values, as shown in Table 3, indicating that the limestone can be classified as High Purity.

CLASS	Mt	CaO	$CaCO_3$	Al2O3	Fe2O3	MgO	SiO2
Indicated	**100**	54.3	**97.0**	0.42	0.24	0.32	1.44
Inferred	**240**	54.3	**97.0**	0.44	0.26	0.35	1.43
Total	**340**	54.3	**97.0**	0.43	0.26	0.34	1.43

Table 3: MRE Soalara Limestone

Based on this MRE and comparing with specifications shown in Table 2 indicates that the Soalara limestone would be suitable for use in steel production, pottery/ porcelain ware, caustic soda production, sugar and textiles, and blended for cement production. We note that sizing specifications and other physical parameters have not been considered in this statement. Brightness tests are not available so properties of the limestone for high quality uses are unknown.

[4] These values can vary depending on factors such as the type of steel being produced, the composition of the raw materials, and the specific practices of the steel plant (Lines, 2024).

5. Supply and Demand Considerations

5.1 Market Size

Madagascar minerals production was reported at 614,108 Metric Tonnes in Dec 2022 (Figure 10) and represents an all-time high since 2009 (CEIC Data, 2021).

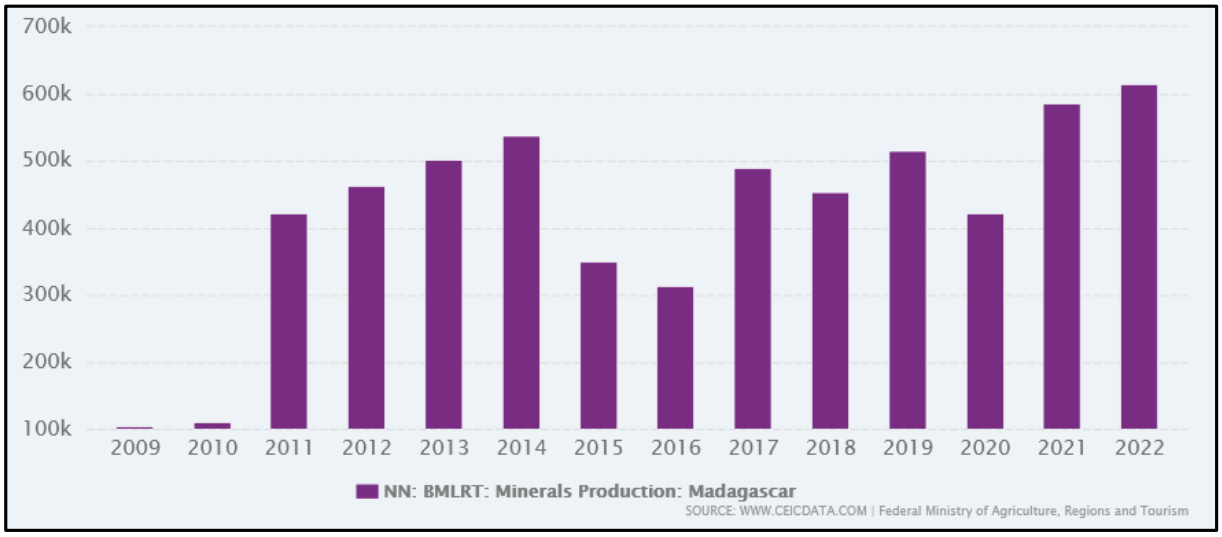

Figure 10: Minerals Production in Madagascar 2009-2022

The market for bulk limestone, particularly in Asia, is substantial due to its extensive use in industries such as steel manufacturing, construction, and lime production. Estimated tonnage and value of bulk limestone sold around the region has been commented on by Lines (2024). These estimates provide a broad overview of the bulk limestone market in the region, highlighting its economic significance and the substantial volume of limestone traded and consumed:

The Global Limestone Market Size was valued at around US$73 billion in 2021, and it is projected to reach US$92 billion by 2027, growing at a CAGR of around 3.5% during the forecast period. The Asia-Pacific region is the largest market for limestone, driven by the rapid industrialization and infrastructure development in countries like China, India, Japan, and South Korea. The overall estimated value of bulk limestone sold around the Asia-Pacific region can be approximated at US$40-50 billion annually, considering both domestic consumption and exports. China alone consumes a significant portion of the global limestone production due to its massive steel and construction industries. The country produces over 1 billion tonnes of limestone annually, with a substantial amount consumed domestically. The value of limestone sales in China is estimated to be around US$30 billion annually, and China is also a significant exporter of limestone. India has a large steel industry and a growing demand for raw materials like limestone. India produces around 340 million tonnes of limestone annually. The value of limestone sold in India is estimated to be around US$5 billion. The proximity of Madagascar to India could make it a cost-effective supplier although it is noted that Oman and other Middle East countries have very large limestone deposits (Spencer, 2024). Japan and South Korea combined produce and consume over 100 million tonnes of limestone annually, with an estimated value of US$2-3 billion. Vietnam exports around 20 million tonnes of limestone annually,

valued at approximately US$1 billion while Malaysia and Thailand combined export around 10-15 million tonnes annually, valued at US$500-750 million.

The Local Limestone Market includes Madagascar where ongoing and planned infrastructure development projects could drive demand for limestone in cement and construction aggregates. Approximately 40% of the population in Madagascar is currently under the age of 15 years and is predicted to grow by 15% over the next 5 years; demand for housing will be high (Statista, 2024a). South Africa has a robust steel industry which could be a significant market for high-quality limestone used in steel production. Additionally, South Africa's cement industry could also be a potential market although the country is currently self-sufficient (Spencer, 2024). Mozambique is developing its industrial sector, including cement production, which might need quality limestone. Both Kenya and Tanzania are experiencing significant infrastructure growth and have established cement industries. These markets could benefit from imported limestone for cement production (Lines, 2024b).

In 2019, LaFargeHolcim (Madagascar) S.A. produced an estimated 230,000 tonnes of cement compared with 210,000 tonnes in 2018. In late December, China Building Material Product announced plans to reopen its plant at Ambohimanambola, which had been closed for several years (USGS, 2019)

5.2 Opportunities and Challenges

Lines (2024) considered that entering the market as a new supplier of bulk limestone from a mine in SW Madagascar, especially if the limestone is of very high purity and can be conveniently loaded onto ships close to the mine, presents several opportunities and considerations:

Opportunities:

1. **High Purity Advantage:**
   - High purity limestone is in demand for various industrial applications, including steel manufacturing, lime production, and environmental applications like flue gas desulfurization.
   - This purity can command a premium price in the market, giving the supplier a competitive edge.
2. **Strategic Location:**
   - Madagascar’s proximity to key markets in Asia, the Middle East, and Africa could reduce shipping costs and delivery times.
   - The ability to load limestone directly onto ships near the mine significantly cuts down on transportation costs and logistics complexities.
3. **Growing Demand:**
   - The construction boom and industrial growth in Asia-Pacific and the Middle East are driving increased demand for limestone.

- The steel industry, which heavily relies on high-quality limestone, is expanding in countries like India and China.

4. **Trade Agreements:**
   - Madagascar may have trade agreements or preferential trade terms with nearby countries or economic zones, facilitating easier market entry and reduced tariffs.
5. **Underserved Markets:**
   - There may be underserved markets in Africa and the Indian Ocean region that could benefit from a closer and reliable supply of high-purity limestone.

Considerations and Challenges:

1. **Market Competition:**
   - Established suppliers from countries like Vietnam, Malaysia, and Thailand have a strong presence in the market.
   - Competitive pricing, consistent quality, and reliable supply chains are essential to compete effectively.

The three leading lime producing countries in the world in 2023 were China, the United States, and India, with production volumes of 310 million metric tons, 17 million metric tons, and 16 million metric tons, respectively. In 2023, the world's total production of lime was estimated at 430 million metric tons (Statista, 2024).

2. **Infrastructure and Logistics:**
   - While proximity to shipping facilities is an advantage, the overall infrastructure in Madagascar must support efficient mining operations, transportation, and loading processes.
   - Investments in infrastructure may be necessary to ensure smooth operations.
3. **Regulatory Environment:**
   - Understanding and complying with local mining regulations, environmental laws, and export requirements is crucial.
   - Engaging with local communities and ensuring sustainable practices can mitigate risks and enhance corporate reputation.
4. **Market Penetration:**
   - Building relationships with key buyers, distributors, and end-users in target markets is essential.
   - Marketing the high purity and strategic advantages of your product will be necessary to differentiate from competitors.
5. **Cost Management:**
   - Keeping production and logistics costs competitive while maintaining high-quality standards is vital.

- Efficient operations, economies of scale, and leveraging local resources can help manage costs.

Over and above these challenges, Transparency International Accountable Mining (2024) considers that Madagascar is facing a critical period in its mineral and strategic resources sector, following 12 years of regulatory uncertainty. Persistent community grievances highlight continuing challenges due to the lack of local consultation that has proved a recurring problem in Madagascar. These communities bear impacts caused by mining activities on their land to their income, their livelihoods, and their health. The mines' disruption of local ecosystems and impacts on water quality have been particularly contentious in the context of the local community's reliance on local rivers and lakes. Given these costs to the environment, local communities do not feel that they are benefiting from fair compensation from the mining companies. Several communities are beginning to reject mining projects, given the impacts recorded in some mining localities and the fear of losses in other parts of the country.

In addition, the identity of companies operating in Madagascar has been the subject of significant public debate (EITI, 2020). EITI (Extractive Industries Transparency Initiative) reporting has documented the absence of criteria in the country's licensing framework to assess companies' technical and financial capacities. This has intensified popular scepticism over how extractive companies are granted licences and whether they are sufficiently qualified. Many companies operating in Madagascar are subsidiaries of privately held companies, making it difficult to hold their owners accountable for their companies' operations.

5.3 Marketing Strategies

Lines (2024) noted that, by leveraging the high purity of the limestone and the strategic location of the mine, a new entrant can position itself as a competitive supplier in the regional bulk limestone market. Effective planning, strategic investments, and strong market relationships will be key to capturing market share and achieving long-term success. The following steps are recommended:

1. **Market Research:**
   - Conduct thorough market research to identify potential buyers, market demand, pricing trends, and competitor strategies.
   - Assess the feasibility of penetrating different regional markets and identify the most lucrative opportunities.
   - Consider the potential to construct a cement or lime kiln on site.
   - Consider the potential for sale of the project to one of the major cement or limestone producers.
2. **Infrastructure Development:**
   - Invest in necessary infrastructure to ensure efficient mining, processing, and transportation of limestone to shipping points.
   - Explore partnerships with logistics providers to optimize shipping routes and costs.

3. **Regulatory Compliance:**
   - Ensure compliance with all local and international regulations related to mining, environmental impact, and exports.
   - Engage with local authorities and communities to build a supportive operational environment.
4. **Quality Assurance:**
   - Implement rigorous quality control measures to maintain the high purity of the limestone.
   - Obtain relevant certifications and standards to enhance market credibility and trust.
5. **Marketing and Sales Strategy:**
   - Develop a robust marketing strategy highlighting the purity, strategic location, and logistical advantages of your limestone.
   - Establish direct relationships with key industry players in target markets through trade shows, industry conferences, and direct outreach.
6. **Financial Planning:**
   - Secure adequate financing to support initial infrastructure investments, operational costs, and market entry strategies.
   - Develop a comprehensive business plan outlining projected costs, revenues, and profitability.

6. Current Limestone Producers and Potential Customers

Companies mining limestone within the Asia region, potential steel mills likely to purchase limestone in bulk and ports that would receive the limestone are listed in Table 4 from information provided by Lines (2024). These companies, steel mills, and ports play crucial roles in the limestone supply chain across Asia. The listed ports are key logistics hubs for receiving bulk shipments, ensuring smooth transportation and distribution of limestone to various industries.

Country	Region	Producers	Steel Manufacturers	Ports
India	Rajasthan – Jaisalmer (known for high-quality limestone, used extensively in cement and steel industries) & Nagaur (significant deposits used for cement manufacturing)	Rajasthan State Mines & Minerals Ltd (RSMML): Major producer of limestone in Rajasthan. UltraTech Cement Ltd: Operates limestone mines in Jaisalmer and Nagaur.	Tata Steel May purchase limestone for its steel production. JSW Steel Potential buyer for its cement and steel operations	Kandla Port: Major port for bulk shipments in Gujarat. Mundra Port: Another key port in Gujarat for limestone exports.
	Gujarat - Amreli (major producer of limestone for cement and lime production) & Porbandar (rich in limestone used in cement and industrial applications)	Gujarat Mineral Development Corporation (GMDC): Active in limestone mining. Nirma Ltd: Operates limestone mines in Gujarat.	Essar Steel: Likely buyer for limestone. ArcelorMittal Nippon Steel India: May purchase limestone in bulk.	Kandla Port: Handles bulk shipments. Mundra Port: Another significant port in the region.
	Andhra Pradesh - Kadapa (limestone here is used for cement production, with numerous cement plants in the region) & Krishna (also has large limestone deposits catering to cement industries	Andhra Pradesh Mineral Development Corporation (APMDC): Major player in limestone mining. Dalmia Bharat Ltd: Operates mines in the region.	Vizag Steel: Potential buyer for limestone. Tata Steel: May purchase limestone for its operations.	Krishnapatnam Port: Key port for limestone shipments. Chennai Port: Another port handling bulk commodities
	Madhya Pradesh - Katni (known for high-purity limestone used in steel and cement industries	Birla Corporation Ltd: Active in limestone mining. Prism Cement Ltd: Operates limestone mines.	Jindal Steel & Power: Likely buyer. SAIL (Steel Authority of India Limited): Potential buyer.	Jawaharlal Nehru Port (Nhava Sheva): Major port in Maharashtra for bulk shipments. Kolkata Port: Handles bulk commodities
Vietnam	Quảng Ninh (major limestone deposits used in cement and construction industries), Thanh Hóa (home to large limestone reserves, primarily for cement production) & Hà Nam (limestone here is used in cement production and construction materials) Provinces	Vicem Cement: Major producer with limestone mines. The Vissai Group: Operates limestone quarries	Hoa Phat Group: Major steel producer in Vietnam. Formosa Ha Tinh Steel Corporation: Potential buyer.	Hai Phong Port: Key port for bulk commodities. Cai Lan Port: Another significant port for limestone
Indonesia	East Java (significant limestone deposits used for cement and lime production) & West Java (limestone mining for industrial applications and cement production) and North Sumatra (rich in limestone, supporting local cement and construction industries).	Indocement: Major player in limestone mining. Semen Indonesia: Operates limestone mines	Krakatau Steel: Likely buyer for its steel production. Gunung Steel Group: Potential buyer.	Tanjung Priok Port (Jakarta): Major port handling bulk shipments. Belawan Port (Medan): Key port in Sumatra for bulk commodities

Country	Region	Producers	Steel Manufacturers	Ports
Malaysia	Perak (known for high-quality limestone used in cement, steel, and lime production) & Sarawak (significant limestone resources for cement production and construction materials)	Lafarge Malaysia: Active in limestone mining. YTL Cement: Operates limestone mines.	Malaysia Steel Works (Masteel): Likely buyer. Ann Joo Steel: Potential buyer.	Port Klang: Major port for bulk shipments. Bintulu Port: Key port in Sarawak for limestone
Thailand	Saraburi (major limestone production area, supporting the cement industry) & Lampang (limestone used in both the cement industry and as a raw material for construction) Provinces	Siam City Cement: Major producer with limestone mines. TPI Polene: Operates limestone quarries	Sahaviriya Steel Industries (SSI): Likely buyer. Millcon Steel: Potential buyer	Laem Chabang Port: Key port for bulk commodities. Bangkok Port: Handles bulk shipments
Philippines	Luzon – Bulacan (large limestone deposits for cement and industrial uses) & Rizal (limestone mining for construction and cement industries)	Republic Cement: Major player in limestone mining. Eagle Cement: Operates limestone mines.	SteelAsia Manufacturing: Likely buyer. Global Steel Philippines: Potential buyer.	Port of Manila: Major port handling bulk shipments. Batangas Port: Key port for bulk commodities
China	Guangxi (major limestone production area for cement and construction industries), Sichuan (significant limestone deposits for cement and lime production), & Shandong (large-scale limestone mining for industrial applications, including steel production)	China National Building Material Company (CNBM): Major producer with limestone mines. Anhui Conch Cement: Operates limestone quarries	Baowu Steel Group: Likely buyer. HBIS Group: Potential buyer	Port of Shanghai: Major port handling bulk commodities. Port of Tianjin: Another significant port for limestone
Oman	Salalah (home to Carmeuse Majan, which produces high-purity limestone for various industries including steel and lime production)	Carmeuse Majan: Major producer of high-purity limestone. Oman Cement Company: Operates limestone mines.	Jindal Shadeed Iron & Steel: Likely buyer. Oman Steel Factory: Potential buyer.	Port of Salalah: Major port handling bulk shipments.

Table 4: Limestone Producers in Asia Region

Potential steel producing customers for the Soalara Limestone by country include (Table 5):

Country	Steel Manufacturer	Approximate Steel Production (Mtpa)[5]	Approximate Limestone Requirements (Mtpa)
India	Tata Steel	30	10
	JSW Steel	22	8
	Essar Steel (now part of ArcelorMittal Nippon Steel India)	10	
	ArcelorMittal Nippon Steel India	9	
	Vizag Steel (Rashtriya Ispat Nigam Limited)	7	
	Jindal Steel & Power	8	3
	Rashtriya Ispat Nigam Limited (RINL)		
Vietnam	Hoa Phat Group	8	
	Formosa Ha Tinh Steel Corporation	7	
Indonesia	Krakatau Steel	3	
	Gunung Steel Group	2	
Malaysia	Malaysia Steel Works (Masteel)	0.7	
	Ann Joo Steel	1.5	
Thailand	Sahaviriya Steel Industries (SSI)	4	
	Millcon Steel	1	
Philippines	SteelAsia Manufacturing	2.5	
	Global Steel Philippines	1.5	
China	Baowu Steel Group	120	>20
	HBIS Group	44	
	Ansteel Group Corporation		10
Oman	Jindal Shadeed Iron & Steel	2	
	Oman Steel Factory	1	
Other Middle East	Emirates Steel		2

Table 5: Steel Producers Asia (and Middle East)

USGS (2019) reported limestone capacity in Madagascar increased from 165,000 metric tonnes in 2015 to 190,000 tonnes in 2019. Lines (2024b) has noted some companies involved in the markets where limestone from southwestern Madagascar could be targeted:

- South Africa - ArcelorMittal South Africa is the largest steel producer on the African continent and requires ~1.2Mtpa limestone for steel production. PPC (Pretoria Portland Cement) is a leading supplier of cement in Southern Africa and requires 2-3 Mtpa limestone for cement production.
- Mozambique - Cimentos de Moçambique is a major cement producer in Mozambique, part of the InterCement Group, and requires ~1Mtpa limestone. Vale Mozambique is primarily a coal mining company but the company's industrial activities could align with potential limestone supply for steel production

[5] These production capacities are approximate and can vary from year to year based on market conditions, expansions, and other factors. More accurate estimates are available if required from world steel databases.

- Kenya - Bamburi Cement Limited is part of the LafargeHolcim group and a major cement producer in Kenya, requiring ~2Mtpa limestone. ARM Cement is another key player in the East African cement market requiring an estimated 1.5Mtpa limestone.
- Tanzania - Tanga Cement Company Limited is a significant cement producer requiring ~1Mtpa limestone.

7. Limestone Pricing

The CIF (Cost, Insurance, and Freight) price for bulk limestone varies significantly based on location, quality, and market conditions. Some of these companies may potentially be future buyers or partners in the limestone trade from Madagascar (Lines, 2024). Indicative CIF prices (per tonne in USD) of bulk limestone at various selected locations in Asia (Table 6) can vary based on the specific terms of the contract, the volume of purchase, the quality of limestone, and fluctuations in the global market. For the most accurate and up-to-date prices, direct contact with suppliers or market research reports is recommended.

Country	Region/ Port	Indicative CIF Limestone Price (US$/t)
India	Rajasthan - Jaisalmer	$30 - $45
	Rajasthan - Nagaur	$30 - $45
	Gujarat - Amreli	$25 - $40
	Gujarat - Porbandar	$25 - $40
	Andhra Pradesh - Kadapa	$28 - $42
	Andhra Pradesh - Krishna	$28 - $42
	Madhya Pradesh - Katni	$30 - $45
Vietnam	Quảng Ninh Province	$25 - $35
	Thanh Hóa Province	$25 - $35
	Hà Nam Province	$25 - $35
Indonesia	East Java	$20 - $35
	West Java	$20 - $35
	North Sumatra	$20 - $35
Malaysia	Perak	$25 - $40
	Sarawak	$25 - $40
Thailand	Saraburi Province	$22 - $37
	Lampang Province	$22 - $37
Philippines	Luzon - Bulacan	$23 - $38
	Luzon - Rizal	$23 - $38
China	Guangxi	$20 - $35
	Sichuan	$20 - $35
	Shandong	$20 - $35
Oman	Salalah	$25 - $40
	Average Range	**$24 - $38**

Table 6: Indicative Limestone Prices in Asia Region

8. Valuation Principles and Methodology

8.1 Valuation Approaches

There is no single method of valuation that is appropriate for all situations. Rather, there are a variety of valuation methods, all of which have some merit and are more or less applicable depending on the circumstances.

- Market Approach
- Income Approach
- Cost Approach

The VALMIN Code 2015 presents a general guide to the applicability of each valuation approach to projects at different stages of development (Table 7).

Valuation Approach	Exploration Projects	Pre-development Projects	Development Projects	Production Projects
Market	Yes	Yes	Yes	Yes
Income	No	In some cases	Yes	Yes
Cost	Yes	In some cases	No	No

Table 7: Applicability of Valuation Approaches to Projects at different stages of development

Each of these approaches has its own strengths and weaknesses and the selection of the most appropriate method depends upon the stage of development of the project and the information available to the Valuer. Geos Mining considers that the Soalara Project is an 'Exploration Project' in the sense of Table 7.

8.1.1 Market Approach

The Market Approach includes the Comparable Transactions method and the Market Capitalisation method.

The Comparable Transactions method utilises information on market transactions between unrelated parties involving projects of similar size, commodity and geopolitical jurisdiction during times of similar market conditions (especially with regards to commodity prices).

The Market Capitalisation method involves comparisons between similar sized companies holding similar size projects.

8.1.2 INCOME APPROACH

The Income Approach analyses the anticipated benefits of the potential income or cash flow of a Mineral Asset. The Income Capitalisation method, also known as the Discounted Cash Flow ("DCF") method, is applicable if the project is in operation, under development, or at an advanced feasibility study stage (which includes detailed pre-feasibility studies). If ore reserves, mining and processing recoveries, and capital and operating costs are well defined, it is generally accepted that the DCF method is generally the most relevant and appropriate valuation method.

If a project is at the scoping study or pre-feasibility study stage, or if ore reserves have yet to be defined, additional weight has to be given to the risks, due to uncertainties in capital and operating costs, operational performance and a lower degree of confidence in the resources / reserves.

8.1.3 COST APPROACH

This approach, also known as the Modified Replacement Value (MRV) method, examines the cost that would be incurred by an explorer in acquiring and exploring a similarly prospective tenement up to the same stage of development as the subject tenement. This method is usually restricted to projects at the early stages of exploration that have not had costs of production identified.

The MRV formula is:

MRV = (AC + EE) x MF x PF

Where:

AC = Acquisition Cost

EE = attributable Exploration Expenditure that has usefully advanced the project

MF = Market Factor, usually between 1 and 2, depending upon the availability of similar ground

PF = Prospect Factor, between 0.5 (where exploration results have been disappointing) and 3. To eliminate some of the subjectivity with respect to this method, Geos Mining commonly utilises the PF ranges as detailed in Table 8, although values outside this range may be justified in particular situations.

Band	PF	Applicability
1	0.5 – 0.9	Previous exploration indicates the area has limited potential and its prospectivity may have been downgraded by the prior exploration.
2	1.0 – 1.4	The existing (historical and/or current) data consists of pre-drilling exploration and the results are sufficiently encouraging to warrant further exploration.
3	1.5 – 1.9	The prospect contains one or more defined significant targets warranting additional exploration.
4	2.0 – 2.4	The prospect has one or more targets with significant drillhole intersections; similarly prospective ground is not commonly available for application in this area.
5	2.5 – 2.9	Exploration is well advanced and infill drilling is required to define or up-grade a resource such that a reserve can be estimated.
6	3.0	Resource has been defined but a pre-feasibility study has not been recently completed.

Table 8: Prospect Factor multipliers

8.2 Risks and Special Circumstances

Special circumstances of relevance to mining projects or properties can have a significant impact (both positive and negative) on value and need to be taken into account to modify valuations that might otherwise apply. Examples could include:

- environmental risks that can result in a project being subject to extensive opposition, delays and possibly refusal of development approvals;
- indigenous peoples / land rights issues - projects in areas subject to claims from indigenous peoples can experience prolonged delays, extended negotiations or veto;
- country issues - the location of a project can significantly impact on the cost of development and operating costs and has a major impact on perceived risk and sovereign risk;
- technical issues peculiar to an area or deposit, such as geotechnical or hydrological conditions, or metallurgical difficulties could affect a project's economics.

8.3 Selection of Methodology

This Valuation Report has been compiled in compliance with the VALMIN Code 2015. The fundamental objective of the VALMIN Code 2015 is the protection of investors. With this objective in mind we have conducted the valuation in the following way:

- where there has been a choice of a simple and a complex method of estimating a financial factor and there is no material difference between the methods in the resulting accuracy of, or confidence about, the factor amount, the simple method has been used; and
- where there is a material uncertainty regarding the quantum of an amount or parameter, we have been as conservative as possible to be consistent with our intent to provide a reasonable estimate of the value of the Subject.

We have assumed the Subject to have an economic transaction value, for an "arms-length" transaction that is not under duress (i.e. negotiated over a suitable timeframe, not a fire sale requiring rapid closure).

The VALMIN Code 2015 recommends using at least two Valuation Approaches and to present a range of values, and a preferred value, for the Subject. The Subject can be described as an Exploration Project, for which mineral resources have been estimated. From Table 7, the most applicable methods for valuing the Subject are the Market and Cost Approach.

9. Assumptions

9.1 Tenure

Mining Permits 14542 and 14960 are current until 2055 and environmental permits for diamond drilling have been approved. We have assumed that further exploration drilling will also be permitted and that a comprehensive EIS that is required prior to any development would also be approved by the Malagasy Government.

As mentioned in Section 3.10 Environmental Aspects, Geos Mining notes the environmental and religious/ cultural aspects that may affect the permitting of a mining operation.

9.2 Resources & Reserves

Geos Mining has reviewed the drilling data and the inaugural Mineral Resource Estimate (H&S Consultants Pty Ltd, 2023) and make the following comments:

- The drillhole data appears to be clean, comprehensive, well organised and a reliable dataset for any modelling or grade estimation work based on it.
- The location of the drill hole collars has not been independently verified through a site visit by Geos Mining. However, we note that (Futurmap, 2022) measured the drillhole collars using a differential GPS system.
- Appropriate checks have been carried out on assayed samples.
- Geos Mining agrees with the recommendations made by H&SC, specifically:
  - Verify exact traces of drillholes
  - Further relative density measurements of limestone should be carried out. We further recommend that a bulk density be obtained from trial mining samples
  - Continuity of mineralisation should be verified by infill drilling
  - Testwork and marketing studies will be vital to determine the viability of mining.

9.3 Mining and Processing

9.3.1 Mining

Gulf Industrials report previous mining by locals (Gulf Industrials Limited, 2011) but this appears to be of a minor nature. This same 2011 document considers open pit mining to be appropriate, suggesting mining to a depth of only 20m at a rate of 2Mtpa.

Geos Mining has not sighted any mining plans developed by Cassius Mining Limited.

9.3.2 Processing

Gulf Industrials Limited (2011) presented one option for on-site crushing/ screening with the establishment of port facilities and process flow sheets.

Geos Mining has not sighted any processing plans developed by Cassius Mining Limited.

9.4 Capital and Operating Costs

Gulf Industrials Limited (2011) presented CAPEX/ OPEX estimates at that time but Geos Mining has not sighted any financial updates since that report was released.

10. Valuation of the Subject

10.1 Previous Valuations

CSA Global Pty Ltd (2016) valued the Soalara Project using the Market Appraisal Method and assigned a market value range US$1.25M-US$2.0M, with a Preferred Value of US$1.6M. The value was based on an Exploration Target of 491Mt to 818Mt and four transactions involving the Gulf Industrials acquisition of Soalara Calcaire in 2010, Premier African Minerals acquisition of a 52% beneficial interest in the Sofala Project in Mozambique in 2016, Spitfire Resources acquisition of the White Lion Project in Zambia in 2015 and Metallica Minerals sale of three limestone projects in Queensland in 2016.

10.2 Technical Value

Clause 8.1 of the VALMIN Code 2015 states: "**Technical Value** is an assessment of a Mineral Asset's future net economic benefit at the Valuation Date under a set of assumptions deemed most appropriate by a Practitioner, excluding any premium or discount to account for market considerations."

We have chosen two methods on which to base a Technical Value for the Soalara Project: Comparable Transactions and Modified Replacement Value.

10.3 Comparable Transactions

10.3.1 African Limestone Deposits

Brittanica (2024) has reported that limestone in Africa is important because of its use in the cement industry and due to deposits being fairly widespread. North Africa is a particularly important source. In western Africa a belt of limestone runs from the Central African Republic to the Atlantic coasts, with major outcrops in northern Nigeria, Niger, Burkina Faso, and Mali. Elsewhere there are deposits in Nigeria, Benin, Togo, and Ghana. East African deposits include those in Kenya, Tanzania, Uganda, and Zambia; there are also deposits in South Africa.

Lines (2024a) noted that several countries have significant limestone deposits and large mining operations. Some of the key countries with notable limestone resources and operations are shown in Table 9.

Country	Deposits	Major Companies	Notable Transactions
Nigeria	Extensive limestone deposits in several states including Ogun, Kogi, and Cross River	Dangote Cement, Lafarge Africa, BUA Cement	Lafarge Africa's acquisition and merger activities, such as the consolidation of Lafarge WAPCO and Ashaka Cement
South Africa	Major limestone deposits are found in the Northern Cape and Limpopo provinces	PPC Ltd (Pretoria Portland Cement Company), AfriSam	Mergers and acquisitions within the cement industry, such as PPC's acquisitions to expand their footprint.
Kenya	Significant limestone deposits in the Athi River region	Bamburi Cement, East African Portland Cement	LafargeHolcim's acquisition of a controlling stake in Bamburi Cement and other East African subsidiaries.
Tanzania	Limestone deposits are found in the Tanga region and other parts of the country	Tanzania Portland Cement Company (Twiga Cement), Dangote Cement	Investments and acquisitions by Dangote Cement to expand their operations in Tanzania.
Ethiopia	Large limestone deposits are found in the Oromia and Amhara regions	Dangote Cement, National Cement Share Company	Dangote Cement's establishment and expansion in the country, with potential investment changes.
Egypt	Limestone deposits are extensive in the Sinai Peninsula and the Eastern Desert	Suez Cement, Lafarge Cement Egypt	Acquisitions and mergers involving LafargeHolcim in Egypt
Morocco	Significant limestone resources in various regions	LafargeHolcim Maroc, Ciments du Maroc	Ongoing investments and acquisitions to consolidate market presence
Ghana	Notable limestone deposits in the Buipe and Nauli areas	Ghacem (HeidelbergCement), Diamond Cement	HeidelbergCement's stake in Ghacem and their continued investments

Table 9: Notable African Limestone Deposits

These countries and companies illustrate the widespread availability and commercial interest in limestone resources across Africa. Transactions within these industries often involve mergers, acquisitions, and strategic investments, which can provide insights into the approximate value of these deposits.

10.3.2 Comparable Transactions Discussion

Published data relating to pre-development stage limestone projects in Africa has been very difficult to obtain although corporate transactions comprising company acquisitions have been researched as shown in Table 10. We have listed those transaction since 2016 where the maximum transaction value (100% equity) is US$231.6M as a background to inform of the lower end of the value spectrum.

To enable a simplistic project value range to be estimated we have utilised price ranges for minerals resources from (CSA Global Pty Ltd, 2016), pending reliable and current unit cost values:

- The price range for limestone in Australia, US, Canada, South America in 2016 varied from US$0.01-0.02/t for Inferred Resources, US$0.03-0.05/t for Indicated Resources and US$0.15-0.20/t for Measured Resources (CSA Global Pty Ltd, 2016). If we inflate this by 4% pa then the price range increases to US$0.013-0.026/t for Inferred Resources, US$0.04-0.07/t for Indicated Resources and US$0.20-0.27/t for Measured Resources.
- The current Mineral Resource Estimate (MRE) of 240Mt Indicated and 100Mt Inferred would then equate to an in-situ value of US$10.9M - US$19.4M.

We have not created a DCF analysis due to the great uncertainty in local economic cost factors. However, it is apparent that further research by way of a scoping study is necessary to determine project viability with any degree of confidence.

TARGET	DATE	% ACQUIRED	DEAL VALUE (US$M)	100% VALUE (US$M)	BUYER	SELLERS	COMMENTS
Natal Portland Cement Company (Pty) Ltd.	28/06/2023	100	231.60	231.60	Huaxin (Hong Kong) International Holdings Limited	InterCement Trading Inversiones, S.A.U.	Natal Portland Cement Company (Pty) Ltd. develops, manufactures, and distributes cement, concrete, and aggregate products to the hardware retail, ready-mix, concrete product, and construction industries. It produces Portland cement, ready mix mortars, and non-metallic mineral by-products.
Hima Cement Ltd.	14/11/2023	100	123.00	123.00	Sarrai Group Limited	Bamburi Cement Plc (NASE:BAMB); Cementia Holding AG Zurich (:CEM)	Hima Cement Ltd. is headquartered in Kampala, Uganda. Bamburi Cement Plc operates as a subsidiary of Bamburi Cement Plc. As of March 5, 2024, Hima Cement Ltd. operates as a subsidiary of Sarrai Group Limited.
Cimerwa Ltd.	17/11/2023	51	42.50	83.33	National Cement Company Limited	PPC Ltd (JSE:PPC)	Cimerwa Ltd. engages in the production and distribution of cement. Cimerwa Ltd. was founded in 1982 and is based in Cyangugu, Rwanda. Cimerwa Ltd. operates as a subsidiary of PPC Limited.
Tanga Cement Public Limited Company	26/10/2021	68.33	52.97	77.52	Scancem International DA	AfriSam (South Africa) (Pty) Ltd	Scancem International DA, through its subsidiaries, manufactures cement, operates, and manages cement factories, grinding plants, and terminals. It also markets and distributes cement. The company was incorporated in 1986 and is based in Oslo, Norway. Scancem International DA operates as a subsidiary of HeidelbergCement AG.
Kenyan assets of ARM Cement PLC	21/05/2019	100	50.00	50.00	National Cement Company Limited	ARM Cement PLC (:ARM)	ARM Cement PLC manufactures and sells cement in Kenya, Tanzania, South Africa, and Rwanda. It operates through Cement and Lime, and Other Products segments. The company is also involved in the mining and processing of industrial minerals and chemicals; trading of other building products; extraction and processing of limestone; and manufacture and sale of fertilizers and silicate liquid.

TARGET	DATE	% ACQUIRED	DEAL VALUE (US$M)	100% VALUE (US$M)	BUYER	SELLERS	COMMENTS
Continental Blue Investment Ghana Limited	26/03/2021	35	8.20	23.43	F. Scott AG	Lafarge Africa Plc (NGSE:WAPCO)	Continental Blue Investment Ghana Limited manufactures and sells cement under Supacem brand. The company is based in Accra, Ghana.
Pre-Mixed Concrete Limited	18/10/2021	51	6.51	12.76	The United Basalt Products Limited (MUSE:UBP.N0000)	Cementia Holding AG Zurich (:CEM); Associated International Cement Limited	Pre-Mixed Concrete Limited manufactures ready mix concrete for both commercial and domestic projects. The company was incorporated in 1966 and is based in Bambous, Mauritius.
Austral Cimentos Sofala, SA	21/04/2016	100	9.75	9.75	Heidelberg Materials AG (XTRA:HEI)	Austral Cimentos Sofala, SA	Private company construction materials
AMITECH Maroc SPA	24/11/2020	50	3.21	6.42	Unknown	The Saudi Arabian Amiantit Company (SASE:2160)	AMITECH Maroc SPA manufactures pipes and accessories in polyester reinforced fiberglass (PRV). The company was founded in 2007 and is based in Casablanca, Morocco.
Maweni Limestone Limited	26/09/2019	100	5.14	5.14	Huaxin Cement Co., Ltd. (SHSE:600801)	ARM Cement PLC (:ARM)	Maweni Limestone Limited manufactures cement. The company was founded in 2009 and is based in Dar es salaam, Tanzania.
PPC Aggregate Quarries Botswana (Pty) Ltd	9/06/2021	100	4.49	4.49	Unknown	PPC Botswana (Pty) Ltd.	PPC Aggregate Quarries Botswana (Pty) Ltd manufactures and supplies stone, sand, road layer material, and special aggregate related products in Gaborone and Francistown. The company is based in Francistown, Botswana.

Table 10: Corporate Transactions in Africa since 2016

(Source: S&P Capital IQ (2024))

10.3.3 Comparable Transactions Summary

Published data relating to pre-development stage limestone projects in Africa has been very difficult to obtain and indeed, we have been unsuccessful in locating anything more than corporate transactions. These are not helpful in valuing a single undeveloped deposit, as all these transactions involved material assets in addition to mining tenure, and involved companies that are already operating and have gained market share in their local markets.

A simplistic estimate of possible value based on the current MRE indicates a value of US$10.9 - US$19.4M.

10.4 Modified Replacement Value

10.4.1 Acquisition Cost

Gulf Industrials purchased the rights to the Soalara Limestone Project in 2010 (Gulf Industrials Limited, 2010). Gulf paid US$795,000 with a further cash payment of US$420,000 due "on the sales receipt of the first commercial shipment". A royalty of US$0.40 per tonne is to be paid on 70% of the production. We note that SRK Exploration (2016) records the transaction as "Gulf acquired 100% of share capital of Soalara Calcaire through its Malagasy subsidiary Austral Malagasy Mining SARL".

Geos Mining does not have sufficient information to compare the market capitalisation of Soalara Calcaire Pty Ltd with the value of the Soalara Project in 2010 but we have assumed the actual acquisition cost as the price paid at the time of the transaction i.e. US$795,000. We have not increased this price paid to reflect inflation from 2010 to 2024, as mining transactions are subject to a variety of factors, and do not often follow general consumer inflation. In addition, there has been considerable uncertainty for mining tenure in Madagascar which may have influenced the Acquisition Cost.

10.4.2 Exploration Expenditure

There has been limited exploration carried out historically apart from rock chip sampling/ assaying and various studies. We have arbitrarily assigned an expenditure of US$250,000 to this work.

In 2022, diamond drilling was completed (9 drillholes for 900.8m) on a grid basis over the eastern portion of the deposit. High to very high purity limestone was intersected. We have estimated an expenditure of $540,000 for this drilling based on an all-up cost of $600/m.

In 2023, the Maiden MRE was reported and we have assigned an expenditure of US$100,000 to this work.

10.4.3 Assessment of Effectiveness of Exploration

We have assigned values of the effectiveness of exploration based on the type of program and how this has advanced the knowledge of the deposit. Values have been applied as follows:

- Historical exploration – 0.7 due to the acquisition of rock chip sampling data and the initial acquisition of tenure
- 2022 diamond drilling – 0.8 due to the direct sub surface core data obtained
- 2023 exploration – 0.6 due to the MRE interpretation

10.4.4 Summary of Modified Replacement Value

With reference to Section 8.1.3, we have used the formula below:

MRV = (AC + EE) x MF (1-2) x PF (2.5-2.9)

Low value: US$1.462M x 1.0 x 2.5 = US$3.66M

Preferred Value: US$1.462M x 1.5 x 2.8 = US$6.14M

High Value: US$1.462M x 2 x 2.9 = US$8.48M

10.5 Risks and Opportunities

Geos Mining has limited the scope of this risk assessment to major factors relevant to this valuation. There has been no consideration of political stability (apart from a general estimate of country risk), or of the financial risk arising from any lack of liquidity. While we have based our assessment on foreseeable and quantifiable risks, we make no guarantee that all material risks have been included in this assessment.

Risk is based on the product of two factors: probability and consequence. For the purposes of this risk assessment Geos Mining has adopted the matrix below as a measure of project risk (Table 11).

CONSEQUENCE	PROBABILITY						RISK	Probability		Consequence	
		A	B	C	D	E		A	Common	1	Catastrophic loss, over 40% of project value
	1	1	2	4	7	11	HIGH 1-6	B	Has happened	2	Major disruption/ impediment, 10% - 40% of project value
	2	3	5	8	12	16	MEDIUM 7-15	C	Could happen	3	Moderate disruption/ impediment, over $5m value
	3	6	9	13	17	20	LOW 16-25	D	Not likely	4	Minor disruption/ impediment, less than $5m
	4	10	14	18	21	23		E	Practically impossible	5	No lasting effect
	5	15	19	22	24	25					

Table 11: Risk rating table

10.5.1 Risks

- Production of marketable commodities - limestone quality and price are not sufficiently understood in the local environment. There are currently only 9 drillholes at a spacing of 500m; local variations in quality have not been determined and local pricing scenarios are not well known. ***Risk Rating: C1 HIGH***
- Local social grievances - persistent community grievances due to the lack of local consultation has proved a recurring problem in Madagascar. Notwithstanding the reported excellent relations with the

inhabitants of the Soalara village, it has been reported (EITI, 2020) that communities bear impacts caused by mining activities on their land to their income, their livelihoods, and their health. ***Risk Rating: B1 HIGH***

- Country risk – there may be social, political, environmental, cultural and security factors which cannot be controlled by Cassius ***Risk Rating: B1 HIGH***
- Regulatory Environment – the impact of the recent changes to mining legislation have not been fully considered by industry. The understanding and complying with local mining regulations, environmental laws, and export requirements is crucial. ***Risk Rating: B1 HIGH***
- Water resources – rainfall in the Toliara region is extremely low [average 59mm annually (Weather and Climate, 2024)], so local opposition seems likely unless Cassius can locate an aquifer water supply suitable for production requirements. Cassius have located a good supply of fresh water for the Soalara village and have considered the installation of a desalination plant. However, until sufficient groundwater drilling and economic analysis has been completed, we consider this a high risk. ***Risk Rating: C1 HIGH***
- Environmental concerns – the reported disruption of local ecosystems by Madagascan mines and impacts on water quality have been particularly contentious in the context of the local community's reliance on local rivers and lakes. ***Risk Rating: C2 MEDIUM***
- Early stage of development – additional exploration may not confirm the uniformity of the limestone, requiring additional costs to separate the lower grade material ***Risk Rating: C3 MEDIUM***
- Resources / reserves – the current classification of Indicated and Inferred may not be upgraded to Indicated and Measured with subsequent infill drilling ***Risk Rating: C3 MEDIUM***
- Mining risks – there is currently no geotechnical data available from which to gauge the competency of the limestone and the level of blasting required ***Risk Rating: C3 MEDIUM***
- Adequacy of infrastructure – while proximity to shipping facilities is an advantage, the overall infrastructure in Madagascar must support efficient mining operations, transportation, and loading processes. There is insufficient information available to gauge the availability of suitable contractors and construction materials. ***Risk Rating: C2 MEDIUM***
- Financial risk – funding for start-up capital items, working capital and operational expansions may not be made available ***Risk Rating: C2 MEDIUM***

10.5.2 Opportunities

- Potential for additional resources – the northern and eastern portions of MP14542 and southern portion of MP14960 have not been explored and may contain additional resources
- Market demand – the projected population growth will flow through to demand for housing and cement manufacture
- Expansion of capacity – the untapped potential for addition limestone may enable economies of scale through increased production

- High purity advantage - high purity limestone is in demand for various industrial applications, including steel manufacturing, lime production, and environmental applications like flue gas desulfurization.

10.5.3 Summary of Risks and Opportunities

The early stage of development of the Soalara Project coupled with the lack of hard data to offset numerous possible risks suggest that a significant Market Discount will need to be applied, pending further research to reduce the nominated risks.

Overall, the risk profile is rated as Medium (Major disruption/ impediment, 10% - 40% of project value).

10.6 Market Value

10.6.1 Assessment of Modifying Factors

Clause 12 of the JORC Code 2012 defines Modifying Factors as "considerations used to convert Mineral Resources to Ore Reserves. These include, but are not restricted to, mining, processing, metallurgical, infrastructure, economic, marketing, legal, environmental, social and governmental factors."

We consider that the risks far outweigh the opportunities and we have applied a 40% discount to the Technical Value of the Soalara Project.

10.6.2 Comparable Transactions

Published data relating to pre-development stage limestone projects in Africa has been very difficult to obtain although corporate transactions comprising company acquisitions have been researched. A simplistic valuation approach based on the value of the MRE has equated to a value of US$10.9M - US$19.4M for the Soalara Project with a Preferred Value at the lower end of that range i.e. US$11M.

10.6.3 Modified Replacement Value

There have been two exploration campaigns that have provided useful data from which project value may be assessed using this method. We have assigned a range of values from US$3.7M to US$8.5M with a Preferred Value of US$6.1M.

11. Opinion of Value

In keeping with the requirements of the VALMIN Code 2015, a range of values, and a preferred value, have been estimated for the Soalara Project.

We have used both the Comparable Transactions (CT) method and Modified Replacement Value (MRV) method in the assessment of the Project value but, in our opinion, the MRV method is the more applicable in this case as it reflects quantifiable (albeit estimated) exploration costs, whereas the CT method should be assigned a lower weighting due to the lack of comparable transactions and the simplicity of the method used. We have elected to weight the two methods by the ratio 70% MRV: 30% CT in recognition of the assumptions required to be made.

The range of Technical Values using the CT method is US$10.9M to US$19.4M with a Preferred Value of US$11.0M. The MRV range is US$3.7M to US$8.5M with a Preferred Value of US$6.1M (Table 12). The weighted Technical Values from the two methods were discounted by 40% to determine the Market Values.

The discount of 40% from the Technical Value to arrive at a Market value has been determined by a consideration of the risks as stated in Section 10.5, and allowing for the early stage of project development, and lack of any technical economic studies.

Valuation Method	Low Value	High Value	Preferred Value	Weighting
CT	10.9	19.4	11.0	30%
MRV	3.7	8.5	6.1	70%
Weighted Summary	**5.9**	**11.8**	**7.6**	
Discounted Values	**3.5**	**7.1**	**4.6**	**40%**

Table 12: Summary of Valuation Ranges in US$M

The Soalara Project has a range of values of between US$3.5 million and US$7.1 million with a Preferred Value of US$4.6 million.

In Geos Mining's opinion, the project value could be increased by completing a Scoping Study to determine a likely range of cost parameters as well as an assessment of the risk factors outlined in this report. We also recommend that brightness tests are carried out on selected core to aid the assessment of limestone usage, as a high brightness product may have a higher market price.

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13. Terms and Definitions

Term	Definition
$CaCO_3$	Calcium carbonate - either a white powder or a colourless crystal. When heated, it produces carbon dioxide and calcium oxide
CAGR	Compound Annual Growth Rate - the mean annual growth rate of an investment over a period longer than one year
CaO	Calcium Oxide - commonly known as quicklime, is a widely used material. It is a white, caustic, alkaline solid at room temperature. As a commercial product, lime often also contains MgO, silicon oxide (sand) and smaller amounts of aluminium oxide and iron oxide
DCF	Discounted Cash Flow - valuation method that estimates the value of an investment based on its expected future cash flows.

Term	Definition
Diamond drilling	A rotary drilling technique that uses diamond-impregnated drill bits to cut through rock and produce a solid core sample.
Dolomite	A type of limestone rich in magnesium carbonate (~40%), calcium carbonate (~60%) and other minerals.
Eocene	The Eocene is the second of five epochs in the Tertiary Period from about 55.8 to 33.9 million years ago.
Exploration Target	An estimate of the exploration potential of a mineral deposit in a defined geological setting where the statement or estimate, quoted as a range of tonnes and grade (or quality), relates to mineralisation for which there is insufficient exploration to estimate a Mineral Resource
Indicated Resource	That part of a Mineral Resource for which quantity and grade (or quality), densities, shape and physical characteristics are estimated with sufficient confidence to allow the application of Modifying Factors in sufficient detail to support mine planning and evaluation of the economic viability of the deposit.
Inferred Resource	That part of a Mineral Resource for which quantity and grade (or quality) are estimated on the basis of limited geological evidence and sampling. It has a lower level of confidence than that applying to an Indicated Mineral Resource and must not be converted to an Ore Reserve
JORC Code	A professional code of practice that sets minimum standards for Public Reporting of minerals Exploration Results, Mineral Resources and Ore Reserves.
Mesozoic	This Era began 252.2 million years ago, following the conclusion of the Paleozoic Era, and ended 66 million years ago, at the dawn of the Cenozoic Era. The major divisions of the Mesozoic Era are, from oldest to youngest, the Triassic Period, the Jurassic Period, and the Cretaceous Period.
Mineral Resource Estimate	An occurrence of solid material of economic interest in or on the Earth's crust in such form, grade (or quality) and quantity that there are reasonable prospects for eventual economic extraction.
Pre-Feasibility Study	A comprehensive study of a range of options for the technical and economic viability of a mineral project that has advanced to a stage where a preferred mining method or pit configuration is established and an effective method of mineral processing is determined.
Royalty	A payment made by one party to another that owns a particular asset, for the right to ongoing use of that asset. A royalty interest is the right to collect a stream of future royalty payments.
Scoping Study	An order of magnitude technical and economic study of the potential viability of Mineral Resources.
Tertiary	The Tertiary Period began about 66 million years ago with a mass extinction and ended when the ice ages of the Quaternary Period began, about 2.6 million years ago.
VALMIN Code	Sets out requirements for the technical assessment and valuation of mineral assets and securities for independent expert reports.

14. Appendix: Stratum Resources Market Trends

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Marketing Summary

Soalara Limestone Project

Client: Cassius Mining Limited

Report Date: **10 August 2024**

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Figures

1. Property Location and Description

The Soalara Limestone Project is located on the south-western coast of Madagascar, just south of St Augustin, where the Onilahy River flows into the Mozambique Channel. The deposit consists of about 80 metres of flat, layered Eocene limestones with no overlying material. With straightforward extraction followed by simple processing to suitable sizing, the product seems highly suitable for the markets of steel manufacturers of both steel and lime production around the region.

2. Global Demand

Pure limestone is a highly sought-after raw material due to its versatility and essential role in various industrial processes. Its purity and chemical properties make it a critical component in the production of lime, which is indispensable for several industries, including steel manufacturing. The global demand for pure limestone is driven by the rapid industrialization and infrastructure development in emerging economies, particularly in Asia.

2.1. Limestone Market in 2023

Global production reached approximately 6.18 billion tonnes with a significant portion from Asia, with China and India being major contributors. The global limestone market was valued at around US$77 billion in 2023, with Asia Pacific playing a dominant role with an estimated US$41 billion. This value is expected to grow at a compound annual growth rate (CAGR) of ~7.3% from 2023 to 2030 (Grand View Research).

The construction sector is the largest end-user of limestone, accounting for over 82% of its use. Limestone is crucial in the production of cement, which is essential for construction activities (Figure 1). The steel industry also heavily relies on limestone, which is used in both basic oxygen furnaces and electric arc furnaces for crude steel production (Grand View Research).

	Production[6]	
	2022	2023[e]
United States	17,000	17,000
Australia	1,990	2,000
Belgium[8]	1,710	1,200
Brazil	8,300	8,300
Bulgaria	1,420	1,400
Canada (shipments)	1,680	1,700
China	310,000	310,000
France	2,500	3,000
Germany	5,900	5,900
India	16,000	16,000
Iran	4,000	4,000
Italy[8]	3,500	3,500
Japan (quicklime only)	6,240	6,200
Korea, Republic of	5,100	5,100
Malaysia	1,500	1,500
Poland (hydrated and quicklime)	1,800	1,800
Romania	1,100	1,100
Russia (industrial and construction)	11,400	11,000
Slovenia	1,100	1,100
South Africa	1,070	1,200
Spain	1,700	1,700
Turkey	4,600	4,600
Ukraine	2,600	2,000
United Kingdom	1,400	1,400
Other countries	15,400	15,000
World total (rounded)	430,000	430,000

Figure 1: World Lime Production for 2022 and 2023 (source: USGS)

2.2. Market Trends in the Limestone Industry

The global limestone market size is estimated at 1,000 million tonnes in 2024, and it is expected to reach 1,200 million tonnes by 2029, growing at a CAGR of 3.7% during the forecast period from 2024-2029. The Asia Pacific Regional Estimate for 2024 is 600 million tonnes and 720 million tonnes by around 2029 (Mordor Intelligence).

Industry drivers are the:

- Construction sector which is expanding, driving demand for limestone. Growth in this sector was slightly better in 2023 compared to 2022.
- Steel Industry which is booming and increasing limestone demand. Global crude steel production (Figure 2 and Figure 3) reached 1,849.70 million metric tons in 2023, up from 1,831.50 million metric tons in 2022 according to the World Steel Association (https://worldsteel.org/data/steel-data-viewer).

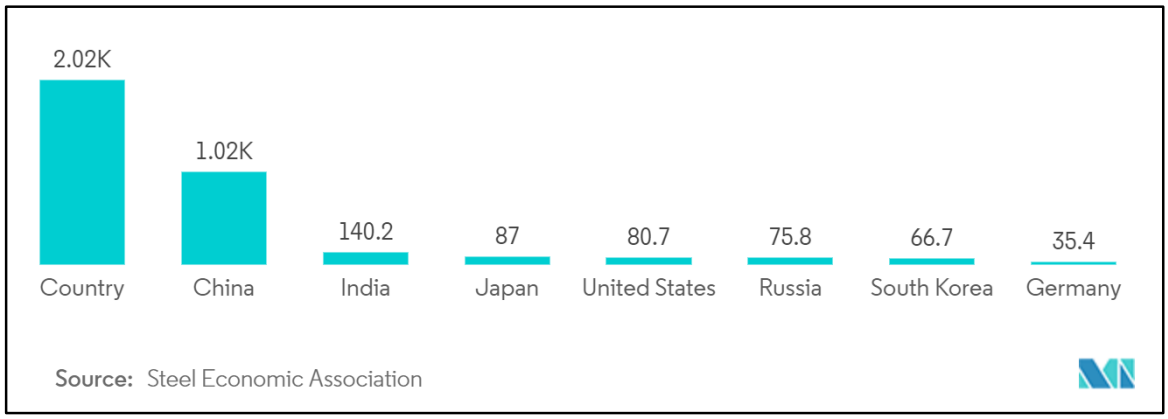

Figure 2: Crude Steel Production (MTonne) 2023

Source: Mordor intelligence

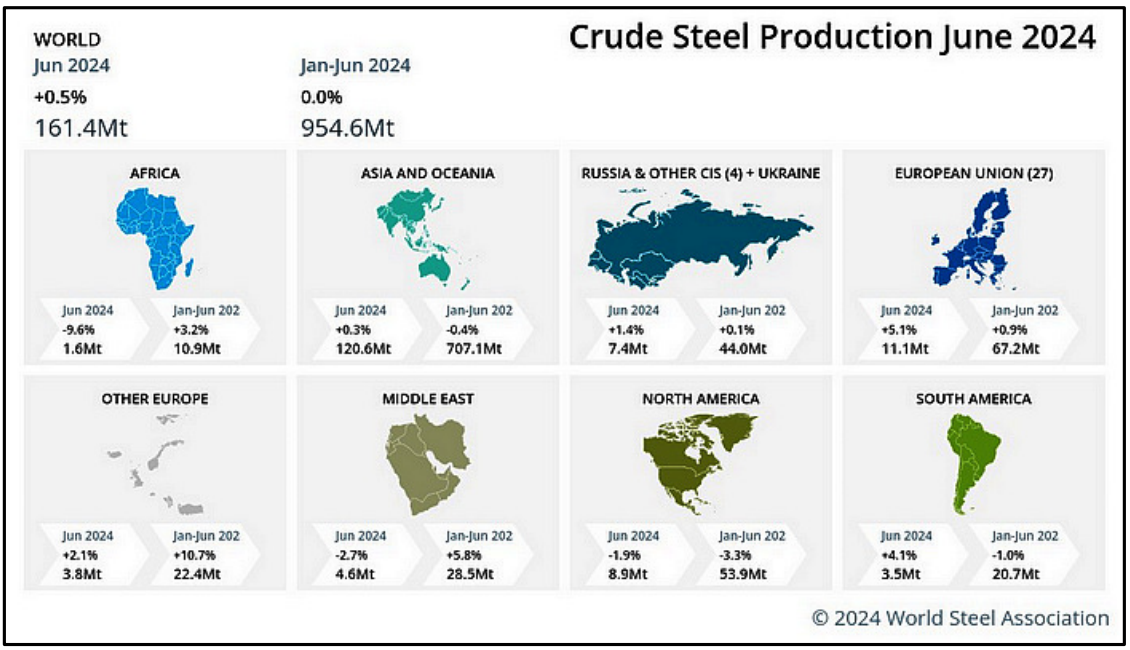

Figure 3: Crude Steel Production, June 2024

The limestone market's growth is closely tied to the health of the steel industry and infrastructure development. Limestone's use extends beyond steel production to cement and concrete manufacturing, highlighting its importance in modern construction and industrial processes. Policies and urbanization trends in major economies like China and India significantly impact limestone demand.

The limestone industry is poised for continued growth, driven by its critical role in steel manufacturing and the expanding construction sectors in Asia-Pacific. The ongoing urbanization and infrastructure investments in China and India will further augment demand, solidifying the region's dominance in the global limestone market.

According to the American Iron and Steel Institute (AISI), the United States steel mills shipped 7,082,921 net tons in December 2023, a 2.6% increase from December 2022 while the Steel Economic Association of Germany reported crude steel production reached 32.81 million tons in 2023, down from 36.85 million tons

in 2022. The Brazilian iron and steel foundry industry-maintained revenue around US$793.23 million in 2023, similar to 2022.

The market is likely to be driven by the growing use of limestone in steel and iron industries over the next few years. Note that most steelworks use a combination of raw limestone and burnt lime. Many steelmakers operate their own on-site lime kilns, whereas others prefer to buy in burnt lime from an outside supplier. The cost of limestone, which is the primary raw material for producing quicklime, can vary based on several factors, including quality, location, and transportation. The approximate total cost of producing limestone from limestone in Oman would be between US$24 per tonne and US$41 per tonne FOB The price for the final lime product for shipment is estimated at between US$90 and US$110 per tonne. These estimates can vary based on the specific operational efficiencies and economic conditions. For more precise costs, detailed financial reports or direct communication with the production facility would be required.

2.3. Regional Asia Pacific Market Dynamics

The Asia Pacific region is witnessing rapid industrialization and urbanization, leading to a burgeoning demand for construction materials, including pure limestone. The region's steel and construction industries are major consumers of limestone, driving its market growth. Countries such as India, China, Japan, and South Korea are significant players in these industries, creating a robust market for pure limestone. The continuous infrastructure projects and industrial developments ensure sustained demand for high-quality limestone.

The Asia Pacific limestone market is estimated at ~600 million tonnes in 2024 and is expected to reach 710 million tonnes by 2029. The main drivers are an increasing demand from the construction industry and rising usage in the steel industry (Cognitive Market Research).

Growth in residential construction has been driven by increasing disposable incomes and urbanization; the Asia-Pacific region accounts for 52% of the global building sector value and saw a 6% growth in construction output in 2023. China recorded the largest portion of finished residential buildings in 2023 but despite being the largest construction market globally, housing construction has slowed due to excessive growth and credit concerns for major companies. China has sufficient limestone reserves, reducing the need for imports. China and India are leading the limestone market due to abundant raw materials and significant chemical industries. India's paper industry and steel production are also significant consumers, with the construction industry projected to grow substantially, increasing limestone demand. India's growing construction industry, with a projected value of US$1.4 trillion by 2025, and the need for urban infrastructure, will drive limestone demand. The National Investment Plan (NIP) allocates significant funds to infrastructure projects, further increasing limestone usage.

Other countries such as Vietnam, Malaysia and Indonesia have large limestone reserves and are major exporters, especially of very white marble varieties used in paper, plastic, and rubber industries.

Limestone is crucial in cement production, fuelling demand as the building and construction industry expands. According to the IMF, the building sector growth in 2023 was better compared to the global economy in 2022. Mapei SpA reported a 3.4% growth in the global construction market in 2023, an improvement from 2022.

Limestone is essential in steel and iron manufacturing and the booming steel industry increases limestone demand. Asia and Oceania produced 707.1 million tonnes of crude steel from Jan-Jun 2024, a slight decrease of 0.4% while the Middle East produced 28.5 million tonnes of crude steel from Jan-Jun 2024.

It is concluded that the limestone market in Asia, driven by the construction and steel industries, shows robust growth and significant production volumes (Figure 4). Environmental management and sustainable practices remain crucial due to mining impacts. The versatility of limestone in various applications underscores its importance in the building and construction sectors. The increasing use of limestone in various applications beyond steel production, such as cement and concrete usage, underscores its importance in modern construction and industrial processes.

The ongoing urbanization and infrastructure investments in China and India will further augment demand, solidifying the region's dominance in the global limestone market. It is noted however that environmental policies and urbanization trends in major economies like China and India significantly impact limestone demand.

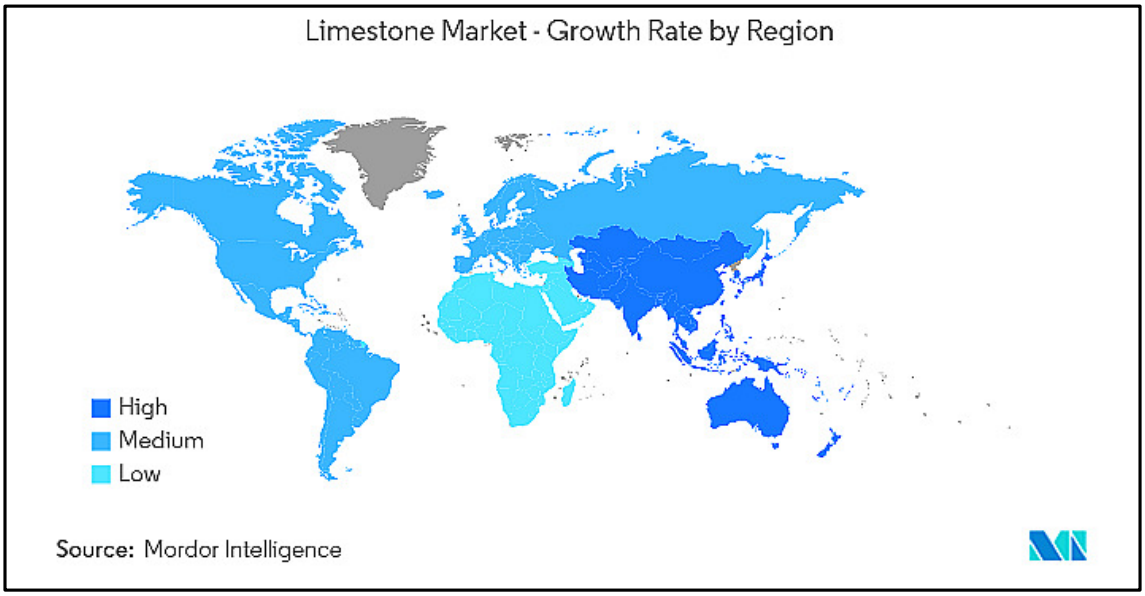

Figure 4: Limestone Market - Growth rate by Region

2.3.1. China Market Dynamics

Asia-Pacific is expected to dominate the market over the coming years. In the regional market, China is the largest economy by GDP, while China and India are among the fastest-emerging economies worldwide. Historically, China's calcium carbonate industry grew rapidly, dominated by small businesses with low-end manufacturing capacity. Recent policies and standards have improved, eliminating scattered, chaotic, and polluted enterprises and increasing market concentration. Most provinces, except Guangxi, have moved towards high-quality development. Under its 14th Five-Year Plan (2021-2025), China has set the target for coal-power capacity to about 1,100 GW. The network operator State Grid and the China Electricity Council have been targeting plans to develop hundreds of new coal-fired power stations in the country. In 2023, 47.4GW of coal power capacity came online in 2023. This increase accounted for two-thirds of the global rise in operating coal power capacity, which climbed 2% to 2,130 GW.

China now dominates the limestone market in terms of consumption and production due to the local availability of raw materials and its huge chemical industry. The iron and steel industry consumes the most limestone globally and in China. China is a top limestone exporter, with exports slightly decreasing from 125.70 kilotons in 2022 to 125.08 kilotons in 2023. China is a major crude steel producer globally, accounting for more than 50% of the global share. Europe, India, and Japan follow China. China is the largest producer of crude steel globally. However, according to the National Bureau of Statistics of China, crude steel production in China reached 67.44 million metric tons in December 2023, registering a decline in production compared to 76.1 million metric tons in November 2023. This decline in steel production was due to recent policy changes in China that sought to reduce steel output to tackle problems related to pollution levels.

According to the IMF, GDP growth was 5% in 2023 and is forecasted to grow by 4.2% in 2024. The National Bureau of Statistics (NBS) has reported that the construction industry's business activity index (BASI) rose to 56.9 as of December 2023 from 55.9 in November 2023. A BASI score above 50 indicates growth in the industry, and the October 2023 BASI score was 53.5, which suggested a strengthening of demand for the market studied. Similarly, China produced 13.59 million metric tonnes of processed paper and cardboard in December 2023, registering a growth of 12.9% compared to 12.03 million tonnes in December 2022.

Due to the increase in urban population throughout China, 70% of the nation's population is expected to reside in cities by 2030. As the urban population increases, they also face an influx of wastewater and sludge. Currently, 80% of sludge in China is improperly dumped, an increasingly controversial environmental issue with urban centres scrambling to decrease pollution by improving their wastewater treatment plants (WWTPs).

In May 2023, Swiss company Omya planned new plants in Guangxi, Guangdong, Shandong, and Fujian to produce GCC and PCC. Minerals Technologies Inc. entered into long-term PCC supply agreements with major paper companies in Beihai and Quzhou, with operations expected to start in late 2023 and early 2024.

2.3.2. India Market Dynamics

India is the second-largest producer of steel globally. According to the Indian Steel Association, demand for steel in India was 119.9 million metric tons in 2023 and forecasted to reach 128.9 million metric tons in 2024. India's construction industry is projected to grow to US$1.4 trillion by 2025. By 2030, an estimated 600 million people will live in urban centres, resulting in a need for 25 million additional mid- and ultra-luxury units. Under the National Investment Plan (NIP), India has an infrastructure investment budget of US$1.4 trillion, with 24% earmarked for renewable energy, roads and highways, and urban infrastructure and 12% for railways. India's paper industry accounts for about 5% of the world's production of paper. According to OEA, the wholesale price index of paper and paper products across India reached 152 in the financial year 2023. All the factors mentioned above are expected to boost the demand for limestone during the forecast period and, thereby, drive the market (Source: *www.mordorintelligence.com).*

3. Demand in Madagascar

This study aims to demonstrate the market viability of Madagascar's pure limestone, highlighting its competitive advantages and economic potential. Identifying strategic investments is essential to capitalize on this opportunity, ensuring that the necessary infrastructure, technology, and human resources are in place. By addressing both market demands and sustainable practices, the project can establish Madagascar as a key player in the global limestone market, driving economic growth and development.

High-purity limestone from Madagascar can be exported to neighbouring countries and beyond for various industrial and construction purposes, leveraging Madagascar's strategic location in the Indian Ocean. By exploring these diverse applications, Madagascar can enhance the economic value of its limestone deposits, contributing to industrial development and economic growth.

Madagascar's strategic geographical position in the Indian Ocean offers significant logistical advantages for exporting limestone to major markets in Asia and beyond. Its proximity to key shipping routes and ports facilitates efficient and cost-effective transportation of bulk limestone. This advantage positions Madagascar as a competitive supplier, capable of meeting the growing demand in the Asia Pacific region and other global markets.

Exploiting the limestone deposits in Madagascar can significantly boost the country's economy. The Soalara project promises to create numerous job opportunities, enhancing local employment and skills development. Additionally, the development of infrastructure related to mining and transportation can stimulate further economic activities. Increased foreign exchange earnings from limestone exports will contribute to national economic growth, reducing reliance on traditional sectors and diversifying the economic base.

4. Limestone Uses

Limestone from Madagascar has several potential applications, owing to its chemical properties and purity. Overall, limestone is a versatile material that plays a crucial role in various aspects of building and construction, contributing to the structural integrity, aesthetic appeal, and functionality of constructed environments.

4.1. Steel Manufacture

High-purity limestone is used as a flux in steelmaking to remove impurities such as sulphur, silica, and phosphorus from the molten iron. Regions like India and China, with their substantial steel production capacities, rely heavily on a steady supply of high-quality limestone. Madagascar's pure limestone can meet this demand, supporting the steel industry's growth and maintaining the quality standards required for steel production.

Lime plays a crucial role throughout the steel-making process, serving multiple purposes from impurity removal to acting as a flux. It is essential in both primary and secondary steel-making stages. Products such

as calcined dolomite and refractories, alongside lime, contribute significantly to the overall process. Lime helps form slag, which accumulates waste materials produced during steel-making. It insulates the metal, maintains high temperatures (1,600-1,800ºC), and protects the metal from atmospheric elements like nitrogen and hydrogen. Introduction of lime eliminates silica, phosphorous and sulphur. To manufacture 1,000 kg of crude steel, the two key steel production routes using integrated steelmaking and the electric arc furnace require around 270 kg and 88 kg of limestone, respectively.

Lime's multifunctional role in steel-making is indispensable by enhancing the quality of the steel, ensuring it meets the required specifications for various applications. Limestone helps in controlling the temperature within the blast furnace. The decomposition of limestone absorbs heat, helping to maintain the appropriate temperature for the steelmaking reactions to occur efficiently. In some processes, limestone acts as a reducing agent for iron ore. It helps in the reduction of iron oxide to produce molten iron, which is then converted to steel.

4.2. Cement Manufacture

Limestone is a primary ingredient in the production of Portland cement. It is heated to produce lime (CaO), which reacts with other materials to form clinker that is ground into cement. When limestone is combined with other materials in the cement-making process, it undergoes a chemical transformation, contributing to the formation of durable and robust construction materials. The resulting concrete is widely employed in various construction projects, including buildings, bridges, roads, and other infrastructure, making limestone a crucial element in modern construction practices.

4.3. Other Uses

- Limestone is processed to produce quicklime (calcium oxide) and hydrated lime (calcium hydroxide), which are used in various industrial processes including steel manufacturing, water treatment, and flue gas desulfurization.
- Limestone is a source of calcium in the production of glass. It improves the durability and hardness of glass products.
- Ground limestone (agricultural lime) is used to neutralize acidic soils, improving soil health and crop yields. Finely ground limestone is added to animal feed as a calcium supplement, essential for the development of strong bones and teeth in livestock.
- Limestone is used in water treatment plants to soften water and remove impurities through chemical precipitation. Limestone is widely used in water treatment processes for neutralizing wastewater, particularly acidic wastewater. Limestone is used to neutralize acidic wastewater by increasing its pH making it less corrosive and safer for discharge into the environment or further treatment processes. The increase in pH caused by limestone can lead to the precipitation of heavy metals from the wastewater. Metals like iron, manganese, and aluminium form insoluble hydroxides at higher pH levels, which can then be removed through sedimentation or filtration. Other contaminants such as phosphates and sulphates can also precipitate out of the wastewater, reducing the overall load of pollutants. Limestone provides a buffering capacity to the wastewater, helping to maintain a stable pH level. This is important in preventing rapid changes in pH that could negatively impact downstream processes or aquatic life if the water is discharged into natural bodies of water. Limestone is a cost-

effective and natural material, making it an environmentally friendly option for wastewater treatment. It is readily available and easy to use in various treatment systems. Neutralizing the pH of wastewater with limestone can improve the efficiency of subsequent biological treatment processes. Many microorganisms involved in biodegradation processes thrive in neutral to slightly alkaline conditions. Urban population growth is expected to reach 70% by 2030, increasing wastewater and sludge challenges.

Currently, 80% of sludge is improperly dumped, prompting improvements in wastewater treatment plants (WWTPs). China announced the construction of 20 million m^3/day additional wastewater treatment capacity over the next five years. Plans include building or renovating 80,000 km of sewage pipelines and increasing sewage treatment capacity by 20 million m^3/day between 2021 and 2025.

- Limestone is used in flue gas desulfurization processes to reduce sulphur dioxide emissions from power plants and industrial facilities. This is a patented process from L'hoist however if suitable, the market is large. Taiwan for example operates more than 10 incinerators to burn municipal waste to produce electricity. Virtually all cities and towns in Asia could benefit from this technology, making it a clean, green process.
- Limestone is widely used as a building stone for construction, both as dimension stone (cut and finished blocks) and crushed stone for aggregate in concrete and road building. It is used in architectural applications, including flooring, wall cladding, and facades, due to its aesthetic appeal and durability.
- Limestone is used as a raw material in the production of various chemicals, including calcium carbide, soda ash (sodium carbonate), and calcium chloride.
- Finely ground limestone is used as a filler and pigment extender in paints and coatings. High-purity limestone is used as a filler and coating material in the paper industry, which is expanding in countries like India and Indonesia.
- Limestone deposits can be evaluated for use in carbon capture and storage (CCS) technologies as a means to mitigate carbon emissions from industrial activities.

5. Potential Markets for Soalara Limestone

Madagascar could potentially become a significant player in the lime production industry, leveraging its natural resources and strategic location. It is recommended that further geological surveys should be carried out to identify high-quality limestone deposits in Madagascar and assess the purity/ volume of available deposits. Lime production is energy-intensive, primarily requiring consistent and reliable energy sources for kiln operations. Potential energy sources include coal, natural gas, biomass, or renewable energy (solar, wind). Strategic partnerships with established companies like Carmeuse and L'Hoist for their expertise and technology should be considered together with the establishment of Joint Ventures with local or international companies to share risks and resources.

The Soalara limestone deposit is sited near the coast and therefore the opportunity of bulk exports is a strong possibility. Discussions with Scott Reid (Reid Pers Comm,) have indicated that the deposit of limestone could be excavated to establish a stockpile and bulk loading facility close to the old port at

Soalara. Limestone product could then be delivered on board with a ship-loading conveyor running out to deep water.

5.1. Lime Decrepitation

Lime decrepitation indicates suitability for lime making as the physical characteristics of limestone play an important role in evaluating a deposit by determining how the limestone will behave during calcination and may determine the type of kiln in which to invest. A bulk sample (usually tens or hundreds of tonnes) test burned in a full-scale operation is the most desirable method, however small pilot kilns for testing purposes also may give a close approximation. The latter is less expensive, involves smaller sample sizes, creates less environmental disturbance at the bulk sample site, and involves fewer personnel. Certain physical characteristics in limestones may indicate a general disposition on toward decrepitation during calcination; however, not all stones with these characteristics will decrepitate. Limestones that display the following a contributes or conditions, alone or in combination on, are prone to decrepitation:

- coarse crystallinity;
- friability;
- foliation (as in marble);
- excessive calcite veining;
- micro-fracturing;
- highly porosity;
- thinly bedded.

The companies who can test the Soalara limestone for suitability for lime production would include the lime kiln manufacturers such as Maerz Ofenbau of Switzerland or Cimprogetti of Italy. Lime Kilns Carmeuse, a Belgium based company, has recently installed kilns in Oman to produce lime from a local limestone for export to India, etc. It is possible that a similar facility could be set up if a source of energy was available in Madagascar.

5.2. Concrete Road Construction

The roads in Madagascar are known to be poor and with heavy rain occurring at various times causing the current roads to turn impassable much of the wet season. In similar regions of the globe, most notably the Philippines, the key roads through the provinces are made of concrete. A comparable road construction method could be used in the south-west of Madagascar. If supported by the local government and potentially partially paid for using funds from the World Bank or similar, it could be the basis of a considerable local offtake arrangement. An approach to Holcim Cement which has an operation on the mid-east coast of Madagascar would seem a logical step as they could consider constructing a plant near the deposit to service that part of the country. With infrastructure such as port expansion and concrete roads they may see it as a major opportunity. Road aggregate for road base and as a key ingredient in the concrete makes this a real prospect. Reserves of limestone rock are large and will last indefinitely, although high-purity deposits may be absent or have limited availability in certain regions. Limestone is widely used as a construction stone and road-base construction and the port expansion will require large amounts of aggregate and the limestone is likely highly suitable for these uses. Holcim has two cement plants in Madagascar, one at Toamasina and the other at Ibity with capacities. Madagascar Long cimenterie (Maloci)

of China has a cement plant at Ambohinmanambola, with a large capacity. High priority items such as dedicated freight corridors, upgrading old and creating new ports and airports, roads and housing is expected to require many tonnes of cement.

5.3. INDIA

Although India has significant reserves of limestone, not all is minable due to issues with accessibility, proximity to infrastructure, urban encroachment sterilising reserves, and environmental constraints. Furthermore, to these constraints, the limestone and hence cement products on capacity across these reserves cannot meet the demand. To make up the shortfall limestone must be imported from nearby countries (normally via Oman which is a major potential limestone source).

5.4. PARTNER COMPANIES

The Belgium company L'Hoist is expanding rapidly and could potentially be a partner. A developing country such as Madagascar could be a potential location as often the first company into a market can be the leader indefinitely. Extensive operations in Malaysia at the Lhoist Bukit Sagu Plant could benefit from additional limestone sources for use in various industries including steel, water treatment, and construction.

Carmeuse Majan, located in Oman's Salalah Free Zone, is a joint venture operated by Carmeuse Group in partnership with Oman's Majan Mining, and is the leading producer of lime and limestone products that provide high-performance, cost-effective, and environmentally friendly attributes and benefits for a broad range of applications. The company has made solid industrial production ground in Salalah. In three years, the company is not only able to operate full capacity of 400 tonnes per day (tpd) with one kiln but is ready for growth depending upon availability of natural gas, which is crucial for any expansion. The plant is expected to reach a production capacity of 800 tonnes per day (tpd) by early July using the locally sourced high-quality limestone, Oman Daily Observer reported, citing a senior official.

Port of Salalah CEO David Gledhill said the port was delighted to see the Carmeuse project showing continued growth in exports from their plant in Salalah Free Zone. Salalah is attracting a diverse range of businesses who benefit from the strategic location and direct global connectivity to serve number of emerging and established markets from a single location, he stated.

Steel Making Jindal Steel and Power Ltd. of India was reportedly exploring for limestone for steel making in Madagascar. This company holds ground south of the Soalara property, but the stage and status of their exploration is unknown.

A potential buyer of limestone in bulk for the Indian steel/lime industry is the large Lime Plant owned by Rashtriya Ispat Nigam Limited.

The nickel and cobalt operations located east of Antananarivo, the capital of Madagascar, and owned by Ambatovy, has a hydrometallurgical recovery circuit which needs acid to be neutralised and limestone (or lime) is needed. The lime component could be currently imported for this process if not made locally in artisan kilns. CSA Global recommends that this operation be investigated to assess the demand for Soalara to supply this material in the future. The Ambatovy mine was reportedly intending to import bulk limestone per year to the Toamasina port (Golder,). It is not known what proportion of this was to be used for the construction of the Ambatovy facilities and for processing at Toamasina. It is understood that they hold ground adjacent to the Soalara property and completed exploration on that included drilling.

Limestone suitable for glass-making is worth considering as the Soalara Calcaire deposit has a relatively low iron content. Nippon Sheet Glass, which acquired Pilkington around is constantly seeking new sources of materials from a variety of sources world-wide. Mr Ian Goodban (Ian.Goodban@nsg.com) at Pilkington Technology Centre at Lathom, England is interested to see a sample.

Adbri Limited (recently acquired by CRH and Barro Group) has various sites across Australia, including Munster, Western Australia. The company supplies cement, concrete, lime products for construction, agriculture, and industry. Australia's proximity to Madagascar makes it a viable candidate for limestone importation.

Sibelco Group has various facilities in Indonesia, including Banten and East Java. Applications include glass, ceramics, construction, and environmental applications.

Shandong Jianzhu University's Lime Production Facility in Jinan, Shandong Province, China requires high-purity lime for construction, steel, and other industries. China's industrial growth requires continuous limestone supply, making Madagascar a feasible source.

Taiheiyo Cement Corporation has various locations in Japan and requires cement and lime products for construction and industry. Japan's limited domestic limestone resources could drive imports from Madagascar.

Lafarge-Holcim has multiple plants across the Philippines and requires cement, concrete, and lime products for various applications. The Philippines' industrial growth may increase demand for imported limestone.

Yabashi Holdings Co. Ltd has a lime production facility in Vietnam for us in the steel, paper, chemical, and construction industries. Vietnam's expanding industrial sector may require additional limestone sources.

PT Indocement Tunggal Prakarsa Tbk has multiple plants in Indonesia and requires cement and lime production for construction and industry. Indonesia's construction boom could necessitate imports of bulk limestone.

Green Island Cement has operations in Hong Kong and Guangdong, China and requires cement and lime products for the construction industry. It is in a strategic location for importing limestone from Madagascar.

In addition, due to their significant production capacities and regional influence, these facilities could benefit from the high-quality limestone deposits found in Madagascar.

- Steel Manufacturers:
  - China Baowu Steel Group (China): One of the largest steel producers globally, requiring substantial quantities of high-purity limestone.
  - Tata Steel (India): A major steel producer with significant demand for high-purity limestone in its integrated steel plants.
  - Nippon Steel Corporation (Japan): Another key player in the steel industry, utilizing high-purity limestone in its production processes.
- Construction Companies:
  - China State Construction Engineering (China): Engaged in large infrastructure projects, requiring high-purity limestone for cement and concrete production.

- Larsen & Toubro (India): Involved in major construction and infrastructure projects across India, necessitating high-purity limestone.
- Obayashi Corporation (Japan): A leading construction company utilizing high-purity limestone for building and infrastructure projects.

- Chemical Producers:
  - Shandong Haihua Group (China): A major chemical company using high-purity limestone for calcium carbonate production.
  - Tata Chemicals (India): Engaged in producing various chemicals, including those derived from high-purity limestone.
  - Sumitomo Chemical (Japan): Utilizing high-purity limestone in its diverse chemical manufacturing processes.
- Paper Manufacturers:
  - Asia Pulp & Paper (Indonesia): One of the largest paper manufacturers in Asia, requiring high-purity limestone as a filler and coating material.
  - JK Paper (India): A significant player in the paper industry, using high-purity limestone in its production processes.
  - Nine Dragons Paper (China): Utilizing high-purity limestone for its extensive paper manufacturing operations.

Other potential partners include Nittetsu Mining Co Japan, GLC Minerals LLC, Imerys SA, Kerford Limestone, Holcim, Minerals Technologies Inc., Omya AG 6.4.9, The National Lime & Stone Company, United States Lime & Minerals Inc.

6. Environmental and Regulatory Consideration

Open pit mining is the most common limestone mining method and causes environmental disturbances, including habitat loss, dust emissions, and changes in aquifers. Sustainable environmental management plans are necessary to mitigate these impacts and restore degraded land after mine closures.

Stricter environmental regulations in countries like China are increasing the use of high-purity limestone in flue gas desulfurization (FGD) processes to reduce sulphur dioxide emissions from industrial plants.

Implementing sustainable mining practices will be crucial to minimize the environmental impact of limestone extraction and processing. These practices include responsible resource management, reducing carbon emissions, and rehabilitating mined areas which will be relatively straightforward on this site. Ensuring social responsibility will involve engaging with the local community, providing fair employment opportunities, and contributing to their well-being. Adhering to environmental and social governance (ESG) standards will enhance the project's credibility and sustainability.