Orior Capital
HONG KONG

Emmerson Plc, EML.L

The premier potash play

Simon Francis
simonfrancis@oriorcap.com
+852 9389 5506
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Executive summary

Emmerson Plc is developing the Khemisset potash (muriate of potassium, MOP) project located in northern Morocco. The company aims to produce 735,000 tpa MOP and 1.0m tpa de-icing salt. A Feasibility Study was completed in June 2020, and a Phased Development Strategy, that included the potential for complementary sulphate of potash (SOP) production, was released in April 2021. The Government of the Kingdom of Morocco awarded Emmerson a Mining Licence for the project in February 2021.

Emmerson looks incredibly undervalued: A valuation framework is established that values Emmerson based on a percentage of NPV prior to production, and at a multiple of earnings once production commences. **Trading at an enterprise value of just 3% of estimated post-tax NPV_8 of US$2.1bn, Emmerson looks unjustifiably cheap.** Generally speaking, projects that are fully financed and approved and a year from cash flow can trade at 30% or more of NPV. Emmerson is expected to be in this position by the end of this year. **Valuing Emmerson at 30% of NPV would support a valuation of 46p/share.**

As Khemisset starts production, Emmerson should be valued on earnings. Assuming estimated EBITDA of US$340m in 2025, the first full year of operations, and financing of 70% debt and 30% new equity issued at 15p/share, and an EV/EBITDA multiple of 8x, **Emmerson could be valued at 110p/share, 18x the current share price.** Assuming the market starts to value Emmerson on earnings in early-2025, this would represent an annual return of 164% over the next three years. These valuations may look high in the context of Emmerson's current (unjustifiably cheap) share price, yet they are based on the feasibility study production and cost metrics, potash prices that are based on long-run marginal costs, and typical fertiliser sector valuation multiples.

Plenty of further valuation upside: Expanding MOP capacity by 50% to 1.1m tpa could increase estimated average annual EBITDA to US$509m. **This could support a valuation of 170p/share** at 8x EV/EBITDA if the incremental capex is funded out of operating cashflow. Emmerson has also examined the potential opportunity in SOP, completing a preliminary economic assessment (PEA) in 2019. Expanding into SOP with capacity of 240,000 tpa, could support a valuation of 188p/share.

Khemisset is an important and strategic asset: The project is superbly situated on the Atlantic corridor with ready access to key markets in Brazil, Africa, southern USA, the Caribbean, and southern Europe. Shipping routes to Brazil are approximately 10,000km and 20 days shorter when compared to shipping from Canada. This key geographical advantage means that **Khemisset will be in the bottom quartile on an all-in sustaining cost, CFR Brazil basis.** By virtue of the simple, relatively shallow nature of the orebody, and Morocco's excellent infrastructure, capex costs are expected to be low.

Huge opportunity to contribute directly to improved African food security: Africa has 24% of the world's arable land, yet accounts for less than 4% of world fertiliser demand, and less than 3% of world potash demand. Sub-Saharan Africa has chronically under-invested in fertilisers. Now that this is starting to be addressed, **Africa has become one of the fastest growing potash markets globally.** If Africa were to catch up with areas such as South Africa, the Caribbean and Central America in terms of fertiliser use, African potash demand could increase five-fold. **Khemisset is expected to become the only producing MOP asset in Africa,** and will be the nearest producer to most African markets.

Emmerson is bound to attract attention: The Khemisset project is situated in Morocco, a highly-regarded jurisdiction with low political risk. The project is expected to supply potash, a vital and strategic commodity, over multiple decades. Given Khemisset's strategic advantages, and the fact that Emmerson is one of very few independent potash developers globally, there is expected to be significant strategic interest. Moroccan state-owned phosphates giant, OCP Group, imports MOP and SOP, and could benefit from cheaper and more readily available domestic supplies. Yara International and Sociedad Química y Minera de Chile (SQM) have both invested in African fertiliser projects, and could view Emmerson as offering an opportunity to develop a low cost, high margin project that will come to market sooner. Anglo American is developing the Woodsmith polyhalite project in the UK. The size of the market for polyhalite is believed to be small at less than 1% of the market for MOP. Anglo could see Emmerson as a chance to develop distribution channels before Woodsmith starts up.

Substantially de-risked: Over the past two years, management has completed three economic studies on various aspects of the project, secured a Mining Licence from the Government of Morocco, secured strategic investment from a fund connected to Indonesia's Sinar Mas Group, which owns one of the largest agribusinesses globally, and commenced basic engineering. Emmerson has also completed the public enquiry process with no objections and full support from local stakeholders. Design and engineering work, including additional geophysical surveys and shallow drilling are currently underway.

Management believes the Environmental and Social Impact Assessment (ESIA) is in the final stages of approval. The company has provided all requested information. Approval of the ESIA is likely to be discussed at the highest levels of relevant government and associated entities, and as a result, ESIA approval should be viewed as an indication of broad Moroccan support for the development of the project. **It is also likely to be a significant catalyst for the shares.**

Structural upturn in potash: Potash prices rebounded sharply through 2021 driven by strong demand and limited new supply. Prices for granular MOP, CFR Brazil (the biggest market) rose by 229% from an average of US$240/t in 2020 to US$790/t in February 2022, according to data published by Mosaic. Spot prices have reached as high as US$850/t in recent weeks. Average industry utilisation rates are expected to remain around 95%, a level which in many commodities signals 'tightness'. **This represents an important structural shift in the market that is expected to underpin sustained higher prices.** The current situation in Ukraine has created additional uncertainty around security of supply. Russia and Belarus account for some 37% of world potash supply. Wheat prices are up 18% over the past one month, and soybean prices have risen by 9%.

Drivers are long term and dependable: Fertiliser demand is driven by demand for food, feed and fuel, which in turn are driven by a combination of macro factors including population growth, the reduction in arable land per capita, dietary changes in the developing world where protein consumption is increasing, and demand for biofuels. These drivers have proven to be reliable over the long-term. World crop production has grown faster than world population as income levels and diets have improved. Potash demand has grown faster than crop production as land has come to be farmed more efficiently.

Substantial resource: The project has a JORC Resource Estimate (2012) of 537Mt @ 9.24% K_2O and significant development potential. In August 2018, Emmerson published an **exploration target at Khemisset of 264Mt to 616Mt at a grade of 5% to 14% K_2O**. The exploration target extends about 7km, and lies immediately northeast and along strike, from the existing resource. The mid-point of the exploration target, 440Mt at 9.5% K_2O, suggests

there is potential to increase resources by more than 80%. At the top end of the target, total resources could increase almost three-fold. **Successfully demonstrating a greater resource could underpin a substantially larger operation than currently envisaged.**

Excellent opportunity in SOP: SOP is a speciality, premium priced, fertiliser comprising potassium (50-52%), sulphur (17.5%) and very low chlorine (0.5-1.0%). It is applied to crops that are chlorine sensitive such as citrus fruits, potatoes and berries, on high value crops such as coffee, and on crops that have high sulphur demand such as sunflowers and canola. **Emmerson's 2019 PEA for its proposed SOP project demonstrated a post-tax NPV_8 of US$503m, and an IRR of 52.1%** over a project life of 20 years. The project would benefit from a captured supply of MOP feedstock, be ideally located in the port and industrial area of Jorf Lasfar, and boast low delivered costs into key markets. The SOP market is supply constrained; SOP is under-applied in non-producing regions. Whereas the US applied 57 kg/Ha of SOP and Europe applies 43 kg/Ha, Africa only applies 4 kg/Ha and India only 2 kg/Ha. **Additional supply is likely to meet ready demand; there is potential for rapid demand growth over the next decade.**

Morocco is a great jurisdiction: Morocco is politically stable, has a strategic location at the nexus of Europe, the Middle East, and Sub-Saharan Africa, has robust infrastructure, encourages and facilitates foreign investment through investment incentives and structural reforms, and is investing heavily in renewable energy. Morocco boasts the world's largest concentrated solar power facility with storage, located near to Ouarzazate. In the Ease of Doing Business Index, Morocco climbed from 115 in 2010 to 53 in 2020, ranking the third highest country in Africa (after Mauritius (13) and Rwanda (38)). According to the US Department of State (2020) Morocco is the only African country with a Free Trade Agreement with the United States. Emmerson estimates the Khemisset project will increase Moroccan tax revenues by 1%, and add 40% to the GDP of the local area.

Highly experienced management team: CEO Graham Clarke is an experienced potash mining executive who was Managing Director of ICL UK, and later, Operations Director at Sirius Minerals where he oversaw all technical aspects of the development of the Woodsmith Mine, advancing the project into construction. Hayden Locke is an experienced mining executive who was previously Head of Corporate and Technical Services (Geology, Mining and Processing) at ASX-listed potash developer Highfield Resources. James Kelly, Emmerson's Non-Executive Chairman, was a founder of Trident Royalties Plc, a senior member of the Xstrata Plc group business development team, and part of the team that founded Greenstone Resources LP. Rupert Joy is a Non-Executive Director who served at UK diplomatic missions in Yemen, Saudi Arabia, Morocco and Iraq, and as British Ambassador to Uzbekistan. He has more than seven years' experience as a diplomat in Morocco, as Deputy Head of Mission at the British Embassy in Rabat from 2000-2003, and as EU Ambassador and Head of the EU Delegation in Rabat from 2013-2017.

Share price catalysts: The award of the ESIA, greater recognition among investors of Emmerson's fundamental value, project financing, completion of basic engineering, and a final investment decision, are key factors expected to propel the share price.

Emmerson represents one of the very few ways to gain exposure to potash developers. Its Khemisset project has natural competitive advantages, and huge strategic potential. The market has not yet recognised the opportunity in Emmerson shares; when it does, it should drive a significant re-rating.

Simon Francis March 2022

Key financial data

Figure 1: Shareholding structure

LSE code		EML.L
Share price, 1 March, 2022	pence/share	6.00
Shares on issue	Millions	915.5
Options, warrants	Millions	101.8
Fully diluted shares	Millions	1,017.3
Market capitalisation	£ millions	54.9
Net cash, estimated	£ millions	5.3
Enterprise value	£ millions	49.6

Source: Emmerson Plc

Key Individuals:

Graham Clarke, CEO: Graham is a highly experienced potash mining executive who has managed large multi-disciplinary teams for underground fertiliser mines. During his 26-year career at Cleveland Potash, which owned the Boulby Potash Mine in Yorkshire, UK, Graham was Director of Mining. He became Managing Director of ICL UK when Israel Chemicals (ICL) acquired Cleveland Potash, with full operational responsibility. At Boulby, Graham was responsible for numerous operational improvements, and shaped a safety-first culture driven by prudent risk management and best practice operational procedure. From 2011 to 2020, Graham was Operations Director at Sirius Minerals where he oversaw all technical aspects of the development of the Woodsmith Mine. Woodsmith is one of the largest and most complex underground mine developments in the United Kingdom for a generation. Graham advanced the project from concept, through various phases of study and design, into construction.

Hayden Locke, Director: Hayden is an experienced mining executive with ~15 years' experience in mining, private equity and investment banking. Most recently he was Head of Corporate and Technical Services (Geology, Mining and Processing) at ASX listed potash developer Highfield Resources. Prior to this, he was Head of Corporate for ASX listed Papillon Resources which was sold to B2Gold in 2014 for $650 million. Hayden studied engineering, commerce and geology.

Joshua Mitchell, Project Control Manager: Josh is approaching 15 years' experience in the mining industry, all of which have been spent in project control capacities on capital projects and portfolios. Josh has spent the past 5 years working on a major potash mining project in the UK. At Emmerson Plc, Josh's responsibilities cover a wide range of engineering and construction management, including contracting strategy, policy and procedure implementation, budgeting and cost control, and planning and schedule development.

James Kelly, Non-Executive Chairman

James has nearly 20 years' experience in the mining and natural resource industry, principally in corporate finance, strategy and capital allocation. He was a founder of Trident Royalties Plc, a senior member of the Xstrata Plc group business development team, and following the merger with Glencore Plc, part of the team that founded Greenstone Resources LP, a mining private equity fund focused on post-exploration development assets.

Rupert Joy, Non-Executive Director

In the course of a diplomatic career of more than 25 years, Rupert Joy has served at UK diplomatic missions in Yemen, Saudi Arabia, Morocco and Iraq, and as British Ambassador to Uzbekistan. He has over seven years' experience as a diplomat in Morocco, as Deputy Head of Mission at the British Embassy in Rabat from 2000-03 and as EU Ambassador and Head of the EU Delegation in Rabat from 2013-17. Mr. Joy has worked as an independent consultant for the past four years, providing support to UK government departments and private clients on issues relating to regional stability, investment, security, and migration in North Africa. He speaks French and Arabic.

Enrique Sanz, PhD, Consultant Geologist: Enrique is a geologist with 20 years' experience in industrial minerals, primarily evaporite minerals. He was formerly project geologist for worldwide exploration with Rio Tinto Plc. He has extensive experience in Khemisset Basin and other Triassic – Liassic salt basins of Morocco.

Lahcen Alloubabne, Manager Logistics and Operations: Lahcen is a Moroccan national with a Masters of Business Administration and nearly 10 years' experience in the mining sector including with Moroccan based tin developer Kasbah Resources.

See Appendix 3 for Board of Directors.

Figure 2: Emmerson share price chart

Source: London Stock Exchange

Emmerson looks unjustifiably cheap

- Trading at just 3% of NPV, Emmerson looks unjustifiably cheap; valuing the company at 30% of NPV would underpin a valuation of 46p/share
- As Khemisset moves into production, the valuation could reach 110p/share based on long-run marginal cost based pricing, and typical sector multiples
- Share price catalysts include greater market recognition of Emmerson's value, approval of the ESIA, project financing, and a final investment decision

Base case valuations and upside scenarios

The valuation framework is based on valuing Emmerson at a percentage of NPV prior to production, and at a multiple of earnings once production commences. 'Base case' valuations are derived from the production and cost metrics set out in the Feasibility Study, with a reappraised pricing outlook to reflect the recent upturn in the potash market. Two upside scenarios are considered. The first is based on expanding potash production by 50% to 1.1m tpa. This would be supported by the existing resource. The second scenario considers the incremental earnings potential of adding a SOP plant with capacity of 240,000 tpa, as envisaged in the preliminary economic assessment (PEA) for an SOP project in November 2019.

The financial modelling herein is based on a long-run potash price of US$550/t CFR Brazil. This is derived from BHP's assessment of long-run marginal costs (US$350/t) plus estimates of producer margins, incentives to build new projects, and shipping costs. The Feasibility Study, completed after a prolonged downturn in potash prices, was based on a price of US$412/t CFR Brazil. Current spot prices are around US$800/t.

One year valuation of 46p/share

The market is valuing Emmerson at just 3% of its estimated post-tax NPV_8 of US$2.1bn. This looks incredibly cheap. Over the next year, greater recognition by the market of Emmerson's fundamental value, approval of the ESIA, project financing, completion of basic engineering and a final investment decision, are expected to propel the share price.

Figure 3: Valuation framework and potential outcomes

Timeframe	Valuation pence/share	Methodology	Comments
One year	46p	30% of NPV	Fully financed and approved, construction underway Construction start targeted for 4Q22, project start-up 1Q24 Long-run potash price of US$550/t CFR Brazil
Mid-2025	110p	8x EV/EBITDA	First year of full production 2025, after ramp-up through 2024 Estimated mid-cycle valuation multiple of 8x
Scenario 1 MOP expansion	170p	8x EV/EBITDA	MOP capacity increased by 50% to 1.1m tpa Could potentially come on stream in 2027
Scenario 2 SOP capacity	188p	8x EV/EBITDA	Adds 240,000 tpa SOP capacity, potentially by 2028 Incremental EBITDA of US$48m pa

Source: Orior Capital

Figure 4: Emmerson Plc valuation model

Shares on issue, current	millions	915	
Options, rights and warrants	millions	102	
Fully diluted shares	millions	1,017	
Development phase			
NPV_8, post-tax	US$ m	2,106	Orior Capital estimate based on reappraised
NPV_8, post-tax	£ m	1,553	MOP price of US$550/t
NPV_8, post-tax	**pence/share**	**153**	Fully diluted
£:US$ fx rate		1.356	
1 year valuation based on % of NPV			
20%	pence/share	31	
30%	**pence/share**	**46**	
40%	pence/share	61	
50%	pence/share	76	
Production: 735,000 tpa MOP			**Projected start-up 1Q24**
Capex	US$ m	411	Construction start 4Q22
Capex	£ m	303	
Debt	£ m	212	Assume 70% debt
Equity	£ m	91	Assume 30% equity…
New shares	millions	606	…Issued at 15p/share
Fully diluted shares	millions	1,623	
Annual EBITDA, 2025	US$ m	340	Orior Capital estimate
Annual EBITDA, 2025	£ m	250	
EV/EBITDA valuations			
6x	pence/share	79	
8x	**pence/share**	**110**	**Implies a market cap. of £1.8bn**
10x	pence/share	141	
12x	pence/share	172	
Scenario 1: 50% expansion in MOP capacity to 1.1m tpa			
Capex for expansion	£ m	96	US$130m, based on the 6/10ths rule
Debt	£ m	67	Assume 70% debt and remainder funded from
Funded from operating cash flow	£ m	29	operating cashflows
Total debt	£ m	241	
Annual EBITDA	US$ m	509	1.5x average annual EBITDA from 735,000 tpa
Annual EBITDA	£ m	376	
EV/EBITDA valuations			
6x	pence/share	124	
8x	**pence/share**	**170**	**Implies a market cap. of £2.8bn**
10x	pence/share	217	
12x	pence/share	263	
Scenario 2: Adds 240,000 tpa SOP capacity			
Capex for SOP project	US$ m	144	Phased development strategy, April 2021
Capex for SOP project	£ m	106	Assume all funded out of cash flows
Incremental annual EBITDA	US$ m	48	
Incremental annual EBITDA	£ m	35	
Annual EBITDA, annual average	US$ m	558	Sales of 895,000 tpa MOP, 240,000 tpa SOP
Annual EBITDA, annual average	£ m	411	
EV/EBITDA valuations			
6x	pence/share	137	
8x	**pence/share**	**188**	**Implies a market cap. of £3.0bn**
10x	pence/share	238	
12x	pence/share	289	

Source: Orior Capital

Generally, projects that are fully financed and approved and a year from cash flow can trade at 30% or more of NPV. Emmerson is expected to be in this position by the end of this year. **Valuing Emmerson at 30% of NPV suggests a valuation of 46 pence/share.**

Valuation of 110p as production commences

The Khemisset project is expected to commence production in 2024, and to generate EBITDA of US$340m in 2025, the first full year of operations. Assuming the project is financed 70% debt and 30% equity with new shares issued at 15p/share (equivalent to 10% of NPV, and a substantial discount to the one-year valuation), and applying an EV/EBITDA multiple of 8x, **Emmerson could be valued at 110p/share. This represents 18x the current share price.** Assuming the market starts to value Emmerson on earnings in early-2025, **this would represent an annual return of 164% over the next three years**.

These valuations may look high in the context of Emmerson's current valuation, yet they are based on the feasibility study production and cost metrics, potash prices that are based on long-run marginal costs, and typical fertiliser sector valuation multiples.

The valuation is sensitive to the price at which Emmerson issues new shares. As discussions around financing and potential offtakes, and as engineering studies and an updated feasibility study are advanced, the expectation is for the shares to re-rate. That said, were Emmerson to raise new equity at the current share price it would add an additional 909m shares compared to the estimates herein. This would reduce the potential valuation from 110p to 71p.

Importantly, Emmerson is unlikely to need to raise substantial funds from the market. Khemisset is considered a highly valuable and important strategic asset that is likely to attract funding from industry and strategic participants.

Two expansion scenarios

In addition to the 'base case' valuations, two upside scenarios are considered. Emmerson has already alluded to the potential to expand potash capacity, and also to produce SOP.

Scenario 1: 50% increase in MOP capacity to 1.1m tpa

Scenario 1 considers the potential to expand MOP capacity by 365,000 tpa (50%) to 1.1m tpa. The additional production would be supported by Emmerson's existing resource; no resource expansion would be required. In this scenario, average annual EBITDA is estimated at US$509m, 50% greater than in the base case estimate of US$340m. Companies often derive substantial unit cost savings from capacity expansion, both in terms of capex costs and operating costs; for the sake of simplicity, potential operating cost benefits are ignored in this scenario.

Capex estimates for the expansion are based on the feasibility study capital costs being scaled using the 'six-tenths rule', as explained in AusIMM Monograph 27 – The Cost Estimation Handbook (2nd Edition, 2012). According to the rule, the cost of expansion may be estimated by the following: Phase 1 cost x [(Total capacity / Phase 1 capacity) ^0.6].

Applying this to the expected cost breakdown of the Khemisset project, and assuming the unit engineering and construction costs (EPCM) are the same as for the current planned capacity, the incremental capital cost for an expansion to 1.1m tpa could be US$130m. Total capital for the

project (1.1m tpa) would be US$541m. Unit capital costs would fall from US$559/t for the currently envisaged project, already among the lowest expected intensities of any potash project globally, to US$357/t for the expansion.

Figure 5: Capital cost estimates based on the Six-Tenths rule

US$ m	735,000 tpa	1.1m tpa MOP	Incremental
Direct costs	**284.6**	**362.5**	**77.9**
Mining	89.6	114.1	24.5
Processing plant	146.6	186.7	40.1
Surface infrastructure	17.9	22.8	4.9
Tailings storage	30.5	38.8	8.3
Indirect Costs	**80.7**	**120.8**	**40.1**
Construction indirect	47.9	71.7	23.8
EPCM allocation	32.8	49.1	16.3
Total direct & indirect costs	**365.3**	**483.3**	**118.0**
Contingency	45.5	58.0	12.5
Total capital cost	**410.8**	**541.2**	**130.4**

Source: Emmerson Plc, Orior Capital

Given estimated EBITDA of US$904m in the first three years of operations, the expectation is that this expansion would be funded out of additional debt and cash from operations; no further equity raises are anticipated. On this basis, at an EV/EBITDA multiple of 8x, **Emmerson could be valued at 170p/share. This is 28x the current share price.** Assuming this expansion came on stream by, say 2027, this would represent an annual return of 95%.

In terms of ultimate expansion plans this scenario is probably conservative. The Feasibility Study was based on utilising just 43% of the current potash resource. There is also potential to expand the resource in the exploration areas to the northeast of the project area. **It seems likely that with some additional confirmatory drilling, Emmerson could both increase the scale of the business and extend the project life.**

Scenario 2: Addition of 240,000 tpa SOP capacity

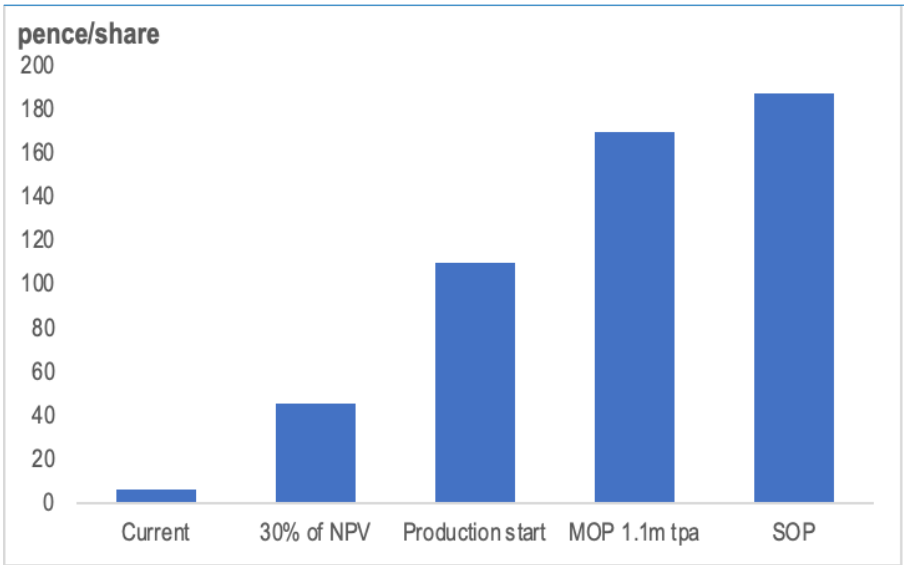
In this second scenario, Emmerson is assumed to add 240,000 tpa of SOP production. This would absorb some 205,000 tpa of MOP as feedstock. Based on a SOP price premium of US$220/t over the MOP price (based on data from Mosaic) and conversion costs of US$100/t SOP, Emmerson could achieve incremental EBITDA of US$48m pa. (In the Phased Development Strategy, April 2021, the SOP business is expected to achieve EBITDA of US$71m. This figure is based on buying MOP at cost rather than at market prices as in the incremental EBITDA calculation here). Capex costs are taken as being US$143.7m, as in the SOP PEA, November 2019. This is assumed to be entirely funded out of operating cashflows. **At 8x EV/EBITDA, Emmerson could be valued at 188p/share**.

Figure 6: Simplified incremental EBITDA calculation for 240,000 tpa SOP capacity

SOP revenues	**US$ m**	**185**
SOP sales volume	Tonnes	240,000
SOP price	US$/t	770
SOP price premium over MOP	US$/t	220
SOP costs		**137**
MOP costs	US$ m	113
MOP volume absorbed in SOP	Tonnes	205,000
MOP price	US$/t	550
Conversion costs	US$ m	24
Conversion cost per tonne SOP	US$/t	100
Incremental EBITDA	**US$ m**	**48**

Source: Emmerson Plc, Orior Capital

Figure 7: Summary of valuations



Source: Orior Capital

There are a number of reasons why the opportunity in Emmerson may have so far been missed by the market:

- Emmerson's Feasibility Study was released at the trough of the market in June 2020 at a time when investors may not have been paying attention to the sector
- Although the potash market rebounded strongly in 2021, investors may not yet recognise the structural shift to long-run marginal cost-based pricing, nor fully appreciate its implications for profitability
- Investors may not fully appreciate the value of Golden Strategic Minerals (GSM) as a strategic investor; GSM is funded by interests of Mr Indra Widjaja, whose family owns Sinar Mas Group, one of the world's leading agribusinesses, and one of the largest conglomerates in Indonesia
- Even though Morocco is an excellent pro-mining jurisdiction with an attractive fiscal regime, investors may not be familiar with the country as an investment destination

A greater understanding by the market of the strong fundamentals of the Khemisset project is expected to be a significant driver of Emmerson shares.

Fertiliser producer valuations

A portfolio of six leading potash companies has traded at average EV/EBITDA multiples of 8x to 10x over the past few years. Current sector valuations are lower than this at around 5x. This reflects the sharp increase in expected earnings over the next year or so resulting from higher potash prices. After several years of fairly anaemic sector earnings – potash prices trended downwards from 2012 to 2020 – earnings are expected to rebound strongly in 2021 and 2022. Aggregate EBITDA earnings of the six companies in the portfolio fell by an estimated 8% YoY in 2019 and by a further 5% YoY in 2020. In contrast, the **consensus is for aggregate EBITDA growth of 94% in 2021 and a further 35% in 2022.** Taking 2020 as being the trough in earnings (sector simple average EV/EBITDA multiple of 10.4x) and 2022 as being a peak (5.4x) suggests a mid-cycle sector multiple of around 8x.

Notably, Emmerson completed its Feasibility Study in June 2020, at the trough of the market. Since then, potash prices have staged a substantial recovery.

Figure 8: Long-run potash prices

Source: Mosaic, Market Update, November 2021, Orior Capital

Figure 9: Potash sector EV/EBITDA multiples

Company	Code	2018	2019	2020	2021	2022	2023
Intrepid Potash	IPI	7.1	7.6	17.3	8.4	4.4	7.7
Compass Minerals	CMP	13.2	10.7	12.1	17.7	11.3	8.6
Nutrien	NTR	9.0	9.4	9.9	6.9	5.0	7.0
The Mosaic Co	MOS	7.5	9.1	8.1	5.1	3.4	5.2
K+S Group	SDF.F	9.9	8.1	10.1	5.5	3.3	4.9
Tessenderlo Group	TESB.BR	9.0	6.4	5.1	4.7	4.0	4.0
Simple average		**9.3**	**8.5**	**10.4**	**8.1**	**5.4**	**6.4**
Weighted average		**9.0**	**9.2**	**9.5**	**6.9**	**4.8**	**6.8**

Source: Orior Capital estimates

Very few peers

There are few other listed potash development companies that might be regarded as peers. The most obvious company is probably ASX-listed **Highfield Resources**, which is developing the Muga project in Spain. The project is expected to have a capacity of 1.0m tpa MOP, to be built in two phases at a total projected cost of €607m. Highfield completed a DFS for Muga in March 2015. At that time, production was anticipated to commence in 2017. Highfield has a current market cap. of A$277m (£149m) which is about 2.7x that of Emmerson. Muga is a well-positioned project with good access to Atlantic corridor and European markets. One differentiating factor is that Emmerson probably has greater strategic potential in that Emmerson has already attracted a strategic partner, and also given the strategic value of potash to Morocco due to the presence of state-owned fertiliser giant, OCP Group.

Another company is **Kore Potash**, which is developing two projects in the Sintoukola potash basin in the Republic of Congo. Kore Potash has a current market cap. of £31m. In November 2021, Kore said that an optimisation study for the Kola project was on track for completion in 1Q22, and that it was targeting a reduction in capex to less than US$1.65bn, and a shortening of the construction period to 40 months.

There are also a number of listed SOP project developers, though these companies are not regarded as true peers for Emmerson. SOP is a speciality fertiliser, the market for which currently represents about 9% of the total market for potassium-based fertilisers.

ASX-listed **Danakali** is developing the Colluli SOP project in Eritrea. The project is a 50:50 joint venture with the Eritrean National Mining Corporation (ENAMCO). Colluli boasts a large reserve of 1.1 billion tonnes, sufficient for a 200-year mine life and is amenable to low-cost open-cut mining. Eritrea had been on the list of countries the US Department of State deemed to have been “not cooperating fully” with U.S. counter terrorism efforts pursuant to section 40A of the Arms Export Control Act. The Department of State removed Eritrea from the list in May 2019.

A number of companies are developing solar evaporation SOP projects in Australia, though the industry has gotten off to a somewhat shaky start. **Salt Lake Potash** was developing the Lake Way project which, at one stage, looked like becoming Australia’s first domestic potash producer. After encountering technical issues, the company was placed into administration in November 2021. In 2020, another company, **Kalium Lakes,** suffered cost overruns related to design changes aimed at appeasing project lenders and its offtake partner K+S Group, and because of lower than expected brine extraction rates. In May 2020, the company accepted A$60m in emergency funding at a 70% discount to the previous close.

An important and strategic asset

- Khemisset's excellent location, cost advantages, opportunities for expansion, and independence from major potash groups, make it a key strategic asset
- Emmerson will be the only potash producer in Africa, a rapidly growing market where increased potash use is key to improving crop yields and reducing hunger
- The company is bound to attract attention; groups such as Moroccan fertilisers giant, OCP Group, and others, stand to benefit from cooperation with Emmerson

Khemisset is viewed as an important and strategic asset. In particular:

- The project is superbly situated on the Atlantic corridor with ready access to key markets in Brazil (the biggest), Africa (the fastest growing), southern USA, the Caribbean and southern Europe. Shipping routes from Morocco to Brazil are 10,000km and 20 days shorter when compared to shipping from Canada.
- This geographical advantage means that **Khemisset will be in the bottom quartile on an all-in sustaining cost CFR Brazil basis**, and among the bottom 2-3 projects globally if by-product credits from salt are included.
- **The project benefits from low capex** by virtue of the simple and relatively shallow nature of the orebody and as a result of Morocco's excellent infrastructure.
- **Khemisset will become the only producing MOP asset in Africa**, and also the nearest producer to most African markets. Africa has historically under-invested in potash and this is reflected in low crop yields. This is only now being addressed; BHP has said it expects African potash demand to grow by 5-10% pa this decade. **The Khemisset project is in an excellent position to contribute to improving food security in Africa.**
- **Emmerson is one of few independent potash developers globally.** The potash market is mostly controlled by major producers. For investors looking for potash development opportunities, and for potential strategic partners looking for independent new sources, there are very few options.
- There is plenty of scope to expand the project in MOP, and to enter the market for SOP.

Fertilisers is an acquisitive space

There has been plenty of recent M&A activity in the fertiliser sector. Mosaic bought CF Industries' phosphates business in 2014. The same year, it bought Archer Daniel Midland's fertiliser distribution business in Brazil and Paraguay. Mosaic also bought Vale Fertilizantes in 2018. K+S Group fended off a hostile takeover bid from PotashCorp of Saskatchewan in 2015. PotashCorp merged with Agrium to form Nutrien in 2018. Compass Minerals acquired its South America business in 2016. Swiss agrichemicals group Syngenta was acquired by ChemChina in 2017. Monsanto was acquired by Bayer in 2018. Anglo American acquired Sirius Minerals in 2020. **The upturn in potash prices will likely result in additional firepower for incumbent producers to do deals; Emmerson is bound to attract attention.**

Moroccan fertiliser giant, OCP Group, is the second largest producer of phosphate-based fertilisers globally. In 2020, OCP had market shares in phosphorus products of 54% in Africa, 46% in South America, and 41% in Europe. In 2020, the group accounted for about 20% of Moroccan export revenues. All plant life requires phosphorus, and Morocco hosts about 70% of the world's phosphate rock reserves, from which phosphorus is derived. The Washington-based Middle East Institute has described Morocco as a 'gatekeeper of global food supply chains'. OCP Group is Morocco's key operating entity.

OCP has sole access to Morocco's phosphate reserves. It owns substantial processing facilities in Jorf Lasfar, where Emmerson plans to build an SOP plant, and in Safi. The group currently produces six major types of phosphate-based fertilisers, and more than 40 specialised fertilisers. OCP has a stated aim to increase its fertiliser capacity from 12m tpa in 2020 to 18-20m tpa by 2030.

One of OCP's strategic initiatives is to develop the African fertiliser market. The group has invested heavily in production and logistics, including blending and storage facilities, across Africa. For example, the group has a joint venture agreement to develop an NPK fertiliser plant and distribution network in Nigeria, is in discussions to bring blending facilities on-line in Zambia, and has signed a US$2.4bn partnership in Ethiopia aimed at creating domestic fertiliser capacity of 2.5m tpa. OCP also has a number of initiatives aimed at supporting farming in Africa, including the Africa Caravan, OCP School Lab, and Agribooster programs, which are aimed at promoting farming best practice and optimising fertiliser use in the region.

This build out of production and blending facilities across Africa suggests OCP is expanding from being a predominantly phosphates producer to becoming a more integrated fertilisers company. The three primary macronutrients used in fertilisers are nitrogen (N), phosphorus (P) and potassium (K). OCP is already dominant in phosphates. It has also entered into joint ventures to procure ammonia (NH_3, the primary source of nitrogen) including with the Abu Dhabi National Oil Company in 2018, and with various parties in Nigeria in 2021. Yet, in terms of potassium, it is believed that OCP has not secured any long-term supplies. Currently, the group sources MOP and SOP from independent third parties located overseas. Much of this material is believed to be sourced from Russia and Belarus; there is increased uncertainty around the supplies of this material given the current situation in Ukraine. **In terms of securing MOP supplies, Khemisset could be the missing link;** the project could readily provide OCP with a stable source of MOP, and potentially SOP, and at much cheaper cost than imports.

Yara International and Sociedad Química y Minera de Chile (SQM) have also both invested in African fertiliser projects. Yara invested in the 600,000 tpa Dallol SOP project in Ethiopia, which has now been on hold for a number of years. SQM is a shareholder in Kore Potash. Emmerson might offer the opportunity of developing a low cost, high margin project that will come to market sooner.

K+S Group is Europe's largest potash group. It produces MOP and speciality fertilisers including SOP, as well as salt. K+S sold its Americas salt business in 2021 in a bid to reduce borrowings and realign the business. K+S' January 2022 Compendium states that a strategic objective is to achieve "positive free cash flow from 2023, even with a low potash price and mild winters". Khemisset stands to be a highly profitable operation aligned with K+S' core business.

Other SOP producers include Compass Minerals in the US, and Tessenderlo, which is based in Belgium and exports to more than 80 countries. Both companies have established distribution and

could potentially benefit from low cost production at Khemisset.

Another company, perhaps from left field, could be **Anglo American.** Anglo's Woodsmith project in the UK is being developed with construction of the main shafts and the underground transportation system underway. Anglo expects to have completed design engineering, capital budgets and a schedule by the end of this year. Khemisset is likely to come on stream ahead of Woodsmith. A tie up of some kind with Emmerson, could give Anglo a head start in developing distribution into key markets.

None of this is to suggest a deal is on the cards; rather it is a thought process aimed at outlining some possibilities.

Figure 10: Selection of US and European fertiliser and industrial minerals companies

Company	Code	Market cap. US$ m	Comments
Anglo American	AAL.L	65,322	Acquired the Woodsmith polyhalite project in the UK in 2020 Construction is underway on the main shafts Could benefit from a tie-up with Emmerson in terms of distribution
CF Industries	CF	15,327	Largest producer of ammonia and nitrogen globally Focused on core business and capital management
Compass Minerals	CMP	1,869	The only producer of SOP in the US Now looking to enter the market for lithium
Intrepid potash	IPI	601	Largest producer of potassium chloride (MOP) in the US Has previously said it is actively looking for accretive opportunities A subsidiary launched a SPAC in Jan 2022 to raise US$200m
K+S Group	SDF.F	4,825	Europe's largest potash company Produces a range of speciality fertiliser products Stated strategy is to "grow the core"
Mosaic	MOS	16,368	Leading producer of MOP and phosphate fertilisers Stated strategy is to pursue diverse opportunities A tie-up with Emmerson could add incremental, low-cost capacity
Nutrien	NTR	41,759	World's largest producer of crop nutrients Strategy includes investing in proprietary product innovation, and developing the retail footprint
OCP Group			Moroccan state-owned company based in Jorf Lasfar and Safi Second largest producer of phosphate-based fertilisers globally Currently purchases both MOP and SOP from third parties Actively developing the Africa fertiliser market
SQM	SQM	17,947	Lithium and plant nutrition; can produce MOP, SOP, and KNO_3 Invested in Republic of Congo potash projects with Kore Potash
Tessenderlo Group	TESB.BR	1,618	European SOP producer with global distribution A tie-up with Emmerson could be earnings enhancing
Yara International	YAR.OL	12,406	World's largest producer of nitrates Invested in the Dallol SOP project in Ethiopia

Source: Company data, Orior Capital

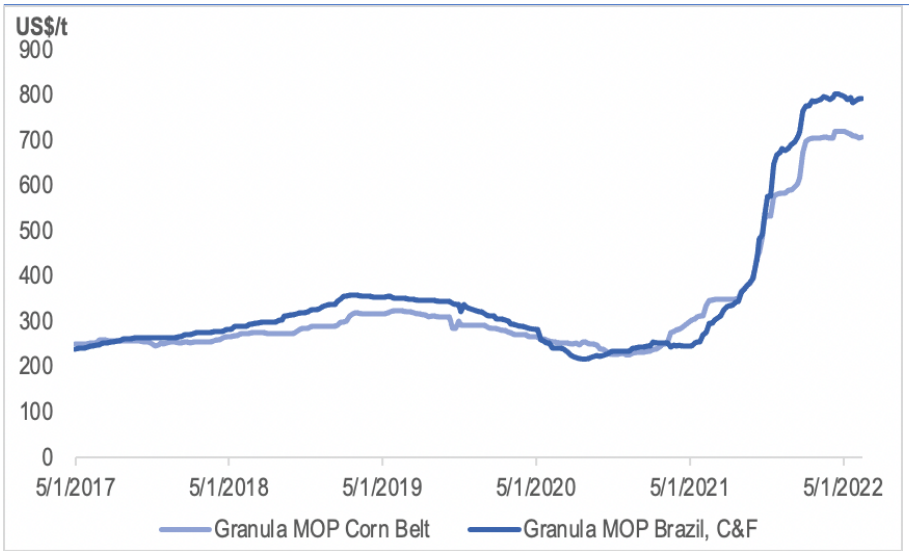
Structural upturn in potash

- The potash market is seeing a structural shift to higher prices driven by higher industry utilisation rates, robust demand, and limited new supply
- Demand drivers are long-term and dependable, and include population growth, the reduction in arable land per capita, dietary changes, and biofuels
- Historical under-investment in fertilisers in Africa suggests strong future demand growth, and a huge opportunity for an incumbent producer like Emmerson

Structural shift to higher prices

Potash prices rose sharply through 2021 driven by stronger-than-anticipated demand and limited new supply. Prices for granular MOP, CFR Brazil (the biggest market) rose by 229% from an average of US$240/t in 2020 to US$790/t in February 2022, according to data published by Mosaic. Spot prices have reached as high as US$850/t in recent weeks. Although demand in China and India in 2021 was lower than in 2020, demand in all other markets increased.

Figure 11: Potash prices

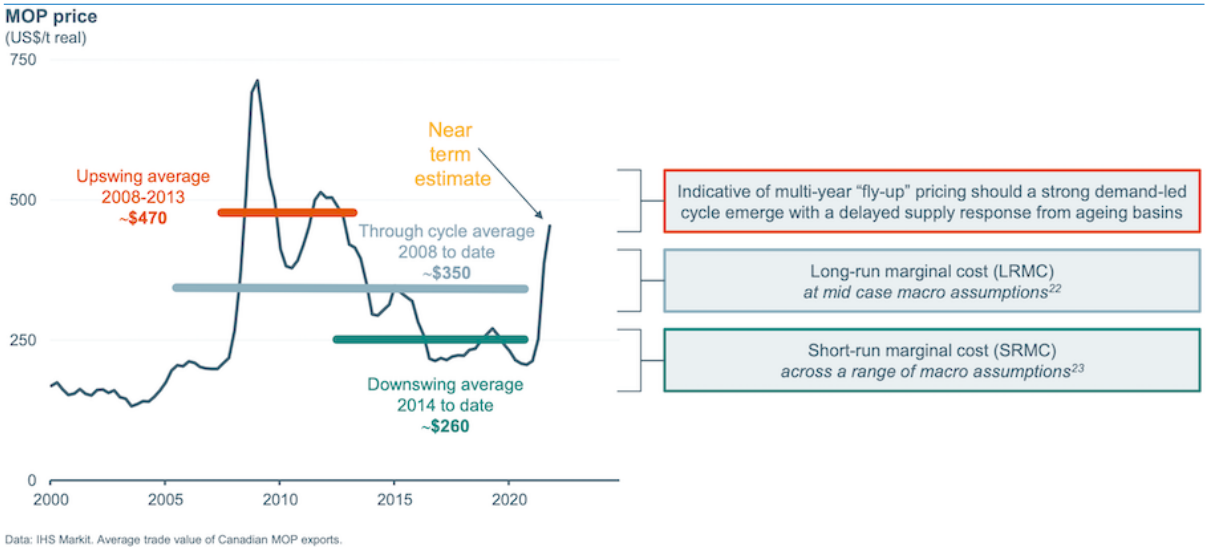


Source: Mosaic

Higher industry utilisation rates to drive prices

The outlook for demand is positive; the major producers are forecasting long-run growth of 2-3% pa. There is limited new supply. Most existing supply comes from mature basins. Average industry utilisation rates are expected to remain around 95%, a level which in many commodities signals tightness. BHP describes this structural shift in the market as being away from short-run marginal costs to long-run marginal costs with periods of 'fly-up' pricing.

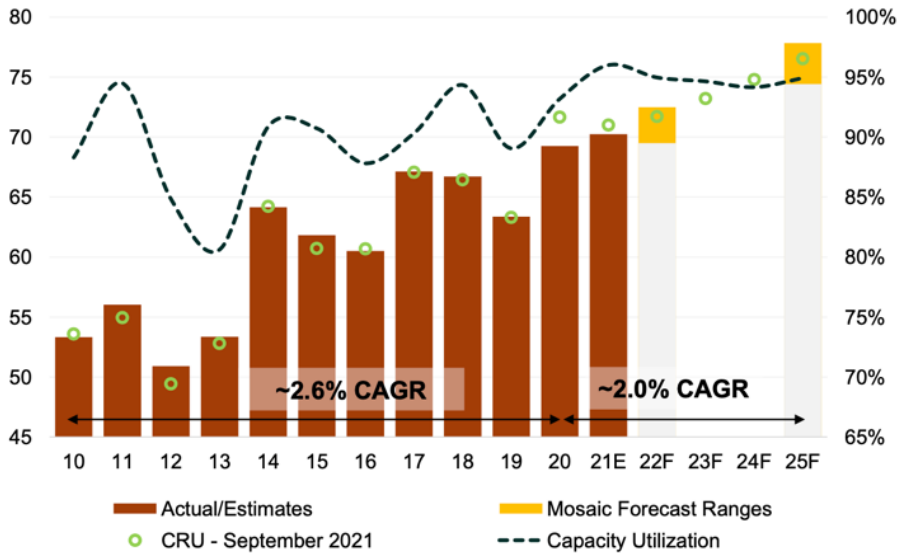
Figure 12: The potash market is graduating to long-run marginal cost based pricing



Source: BHP, Jansen Briefing, 15 September 2021

In its November 2021 Market Update, Mosaic said it expected new supply to slightly trail demand, leading to higher industry operating rates.

Figure 13: Industry average utilisation rates expected to remain high



Source: Mosaic, Market Update, November 2021

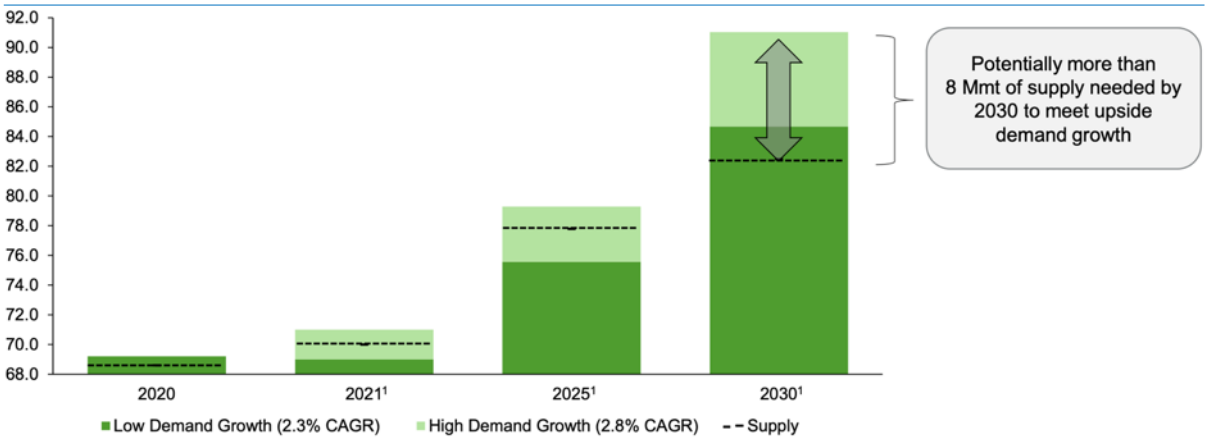
Robust outlook for demand

Nutrien, the world's largest potash producer, said in its November 2021 Investor Presentation, it expected potash demand to increase by 2.3% to 2.8% pa to 2030, representing an increase of 18m tpa to 22m tpa by 2030. Nutrien commented that compared to its current supply forecasts, as much as 8m tpa of additional potash capacity could be needed to meet the higher end of these forecasts.

The short-term outlook is also positive. Mosaic forecasts demand growth of 1.5% this year and a small market surplus of less than 1.0m tonnes, based on cautious views on recovery in China and India. Management admits the risks are to the upside and that a more pronounced recovery in China or India could "flip the script" to around a 1m tonnes deficit. Mosaic is not forecasting a reduction in

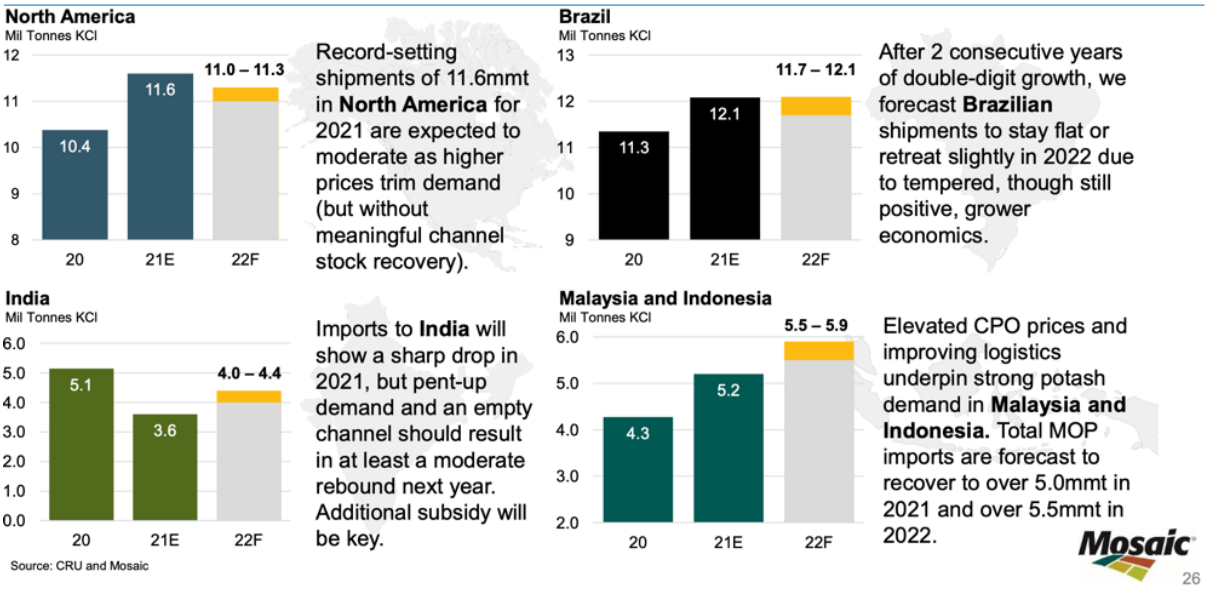
exports from Belarus this year, despite the sanctions. Demand has been strong in Indonesia and Malaysia where high crude palm oil prices have pushed up potash demand.

Figure 14: Long-term global potash supply and demand growth, KCl, tonnes m



Source: Nutrien, Company Presentation, November 2021

Figure 15: Major potash markets demand summary



Source: Mosaic, Market Update, November 2021

Figure 16: Global potash shipments by region

	2020	2021E	2022F Low	2022F High	Comments
China	16.4	14.8	15.3	15.7	Restocking, moderate demand growth
India	5.1	3.6	4.0	4.4	Low inventories, imports set to rebound
Indonesia, Malaysia	4.3	5.2	5.5	5.9	Strong demand driven by high CPO prices
Other Asia	4.9	5.2	4.9	5.1	Small decline in affordability
W Europe	5.0	5.2	5.0	5.2	Mature market
E Europe and FSU	5.9	6.3	6.3	6.5	Some growth, supportive policies
Brazil	11.3	12.1	11.	12.1	Conservative forecast after a record year
Other L America	3.0	3.3	3.0	3.2	Slight decline reflects high potash prices
N America	10.4	11.6	11.0	11.3	Slight decline assuming little inventory refill
Other	2.9	3.0	2.8	3.1	Includes Africa where affordability is key
Total	**69.3**	**70.2**	**69.5**	**72.5**	**Meaningful upside risks**

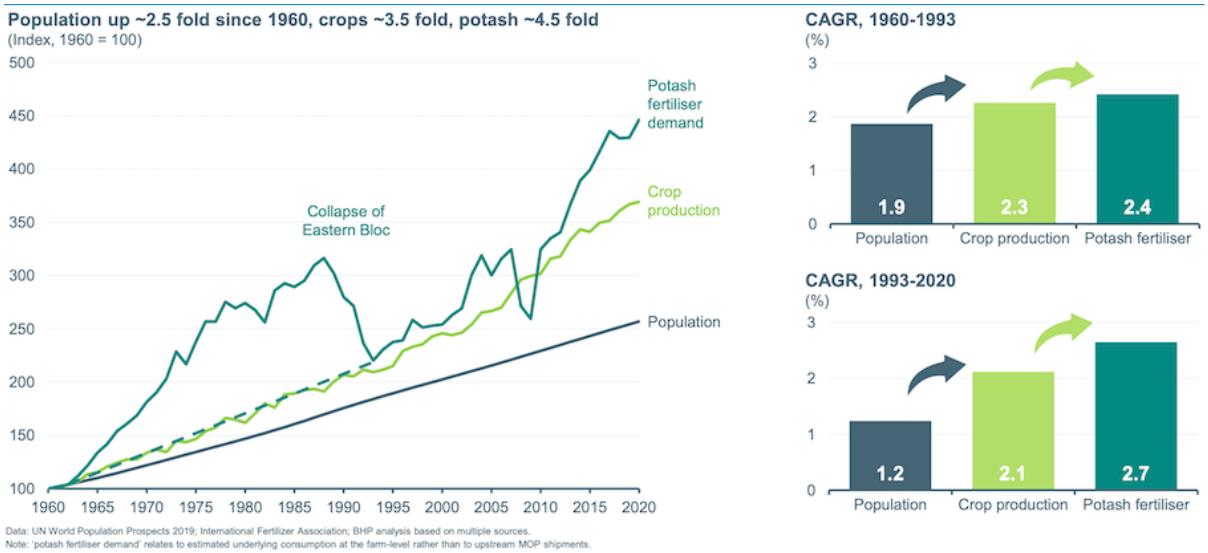
Source: Mosaic, Market Update, November 2021, Orior Capital

Key drivers – food, feed and fuel

Well established long-run relationships

Fertiliser demand is driven by demand for food, feed and fuel. These in turn are driven by a combination of macro factors including population growth, the reduction in arable land per capita, dietary changes in the developing world where protein consumption is increasing, and demand for biofuels. These drivers have proven to be reliable over the long-term. World crop production has grown faster than world population as income levels and diets have improved. Potash demand has grown faster than crop production as land has come to be farmed more efficiently.

Figure 17: Reliable long term relationships between population, crop production and potash demand



Source: BHP, Jansen Briefing, 15 September 2021

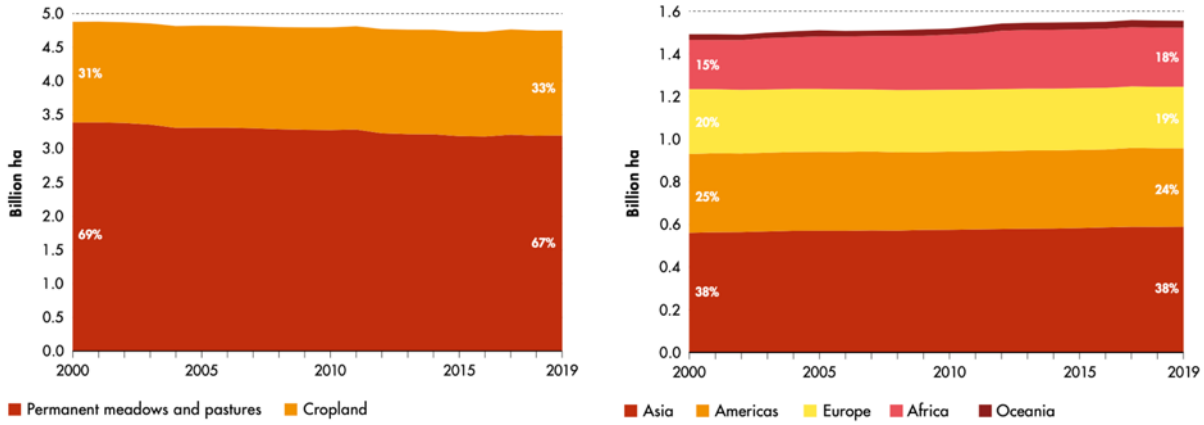
More people, less land

Population growth is an important driver of fertiliser demand. The United Nations Population Prospects 2019 estimates the global population will grow from 7.7bn in 2019 to 8.5bn by 2030, and to 9.7bn by 2050. From 2019 to 2050, the world's population is expected to grow at an average rate of 65m people pa. According to the UN, global population could reach 10.9bn by 2100.

The population of Africa is expected to almost double from 1.34bn in 2020 to 2.49bn by 2050. This represents about 60% of the total expected increase in world population. The populations of India, Indonesia and Pakistan are also expected to grow rapidly. Many of the fastest growing populations are also poor. This presents additional challenges in terms of food security, and combating hunger.

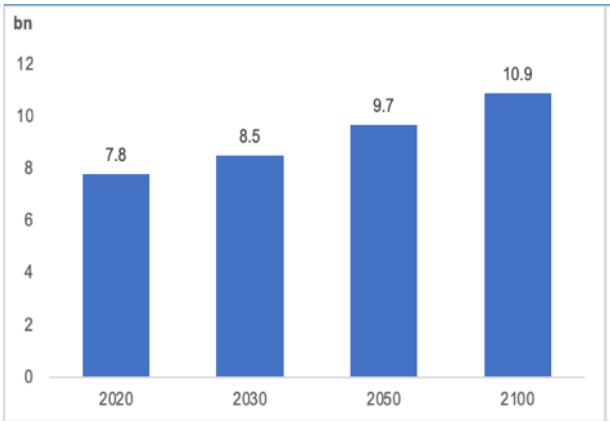
Whereas the world's population is growing quickly, available agricultural land is decreasing. According to the Food and Agricultural Organization of the United Nations (FAO), the area of global agricultural land declined by 3% from 2000 to 2019, to 4.8 bn Ha. This compares to global population growth of 26% in the same period. Arable land per capita is declining. Over the past 20 years, arable land per capita has declined from 0.25 Ha to 0.21 Ha. It is expected to decline further to 0.17 Ha by 2050. This alarming trend means that land will need to farmed more efficiently, which requires more plant nutrients. In short, **more mouths to feed means greater demand on agricultural efficiency, and increased fertiliser use.**

Figure 18: World agricultural land by use (LHS) and cropland area by region (RHS)



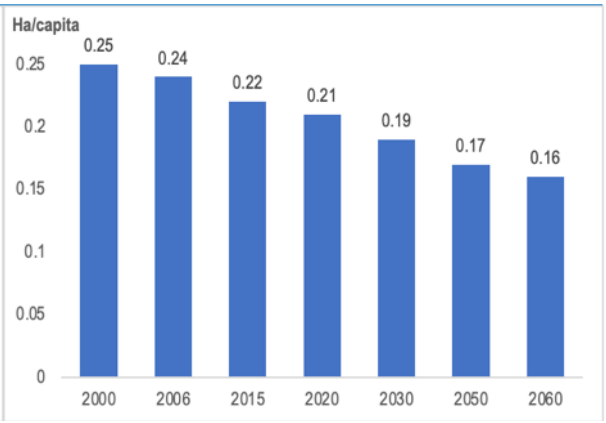
Source: FAOSTAT, 2021

Figure 19: World population (billions)



Source: UN World Population Prospects

Figure 20: Arable land, Ha per person



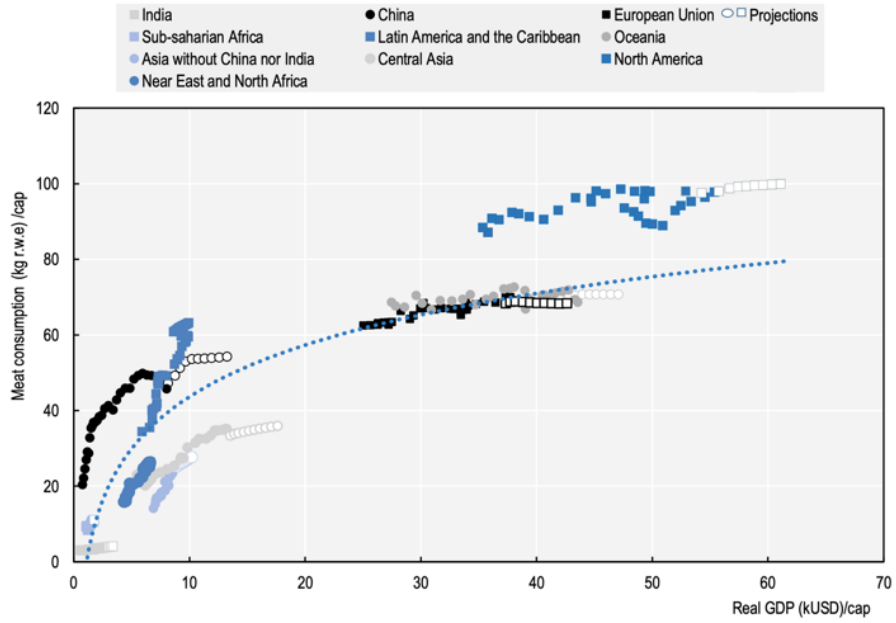
Source: FAOSTAT, 2021

Improving diets in the developing world

Another major driver of potash demand is improving diets. In developing countries, as income levels increase, diets tend to become more protein-rich. Data from the OECD and FAO demonstrates a good correlation between income levels and meat consumption, which in turn drives demand for grain for animal feed. Meat consumption is grain intensive; according to FAO it takes as much as 7kg of grain to produce 1kg of beef, 4kg to produce 1kg of pork, and 2kg to produce 1kg of poultry meat.

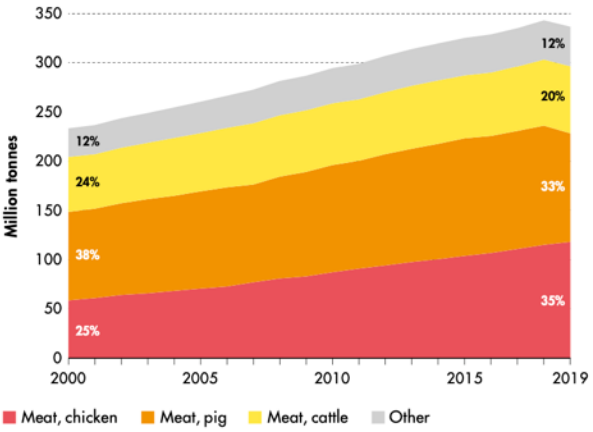
World meat production reached 337m tonnes in 2019, having increased by 44% since 2000. According to the OECD-FAO Agricultural Outlook 2021-2030, world meat production is expected to rise by a further 11% to 374m tonnes by 2030. By 2050, global consumption of animal protein will be two-thirds more than it is today. Brazil, China, the European Union, and the United States are expected to account for almost 60% of global meat production by the end of this decade.

Figure 21: Income impact on per capita meat consumption per region, 1990 to 2030



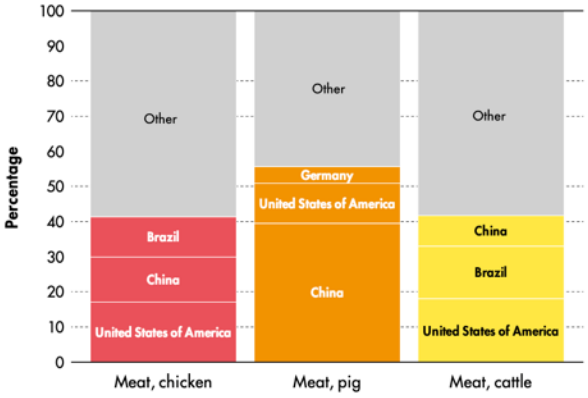
Source: OECD-FAO Agricultural Outlook, 2021-2030

Figure 22: World production of meat



Source: FAOSTAT

Figure 23: World output of main meat items, 2019



Source: FAOSTAT

Biofuels

A third driver of potash demand is increased use of biofuels. 'Biofuel' refers to fuels produced from biomass including plants, algae and animal waste. As these feedstocks can be readily replenished, biofuels are considered renewable. In particular, they are viewed as potentially diversifying energy sources away from hydrocarbons, and as a way to reduce greenhouse emissions. The two most common biofuels are bioethanol and biodiesel. In 2019, global production of biofuels reached 161bn litres, providing 3% of the world's fuel for road transportation. The International Energy Agency's target is that biofuels will represent more than 25% of road transportation fuel by 2050, though this seems unlikely to be met. Although originally hailed as a way to reduce emissions, there is now also greater understanding that biofuel production competes with food production for scarce land.

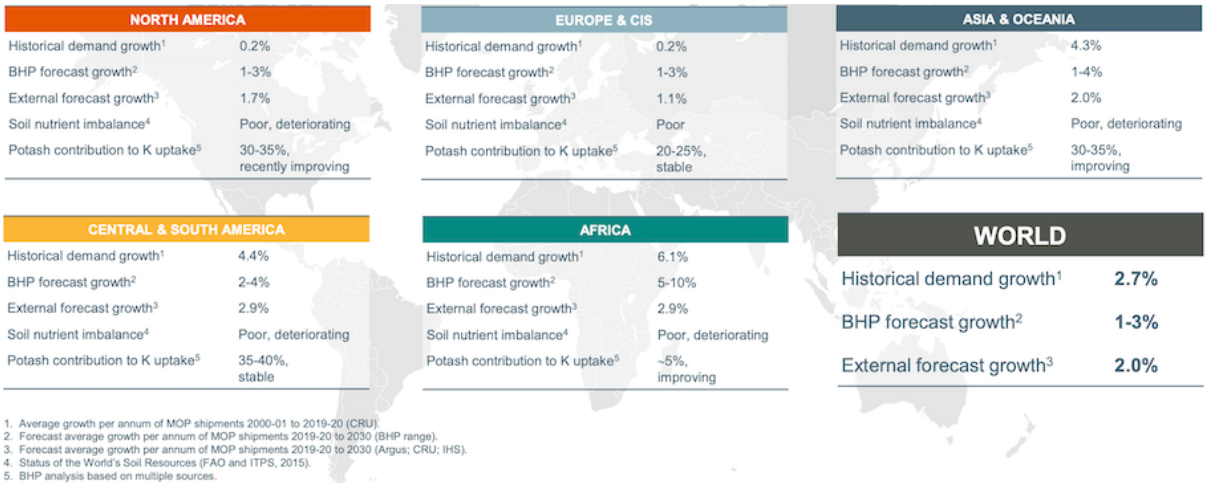
Bioethanol is made by fermentation of sugar or starch crops such as corn and sugarcane. Ethanol is usually used as a gasoline additive to improve fuel emissions, but it can also be used in its pure form (E100). Bioethanol is mainly used in the USA and Brazil. Biodiesel is produced from oils or fats using

transesterification. It is used as a diesel additive to reduce carbon monoxide, hydrocarbon and particulates levels. It can also be used as a fuel for vehicles (B100). Biodiesel is the most common biofuel in Europe.

Huge opportunity in Africa

In addition to the established markets, Emmerson has an excellent opportunity to develop markets closer to home. Sub-Saharan Africa has historically under-invested in fertilisers, and as a result, crop yields have been relatively poor. This has recently started to be addressed; **Africa is now one of the fastest growing potash markets globally.** BHP estimates that potash demand in Africa will grow by 5% to 10% pa. **As the closest MOP producer to many African markets, Emmerson would be well-placed to participate in this growth.**

Figure 24: BHP assessment of main potash markets



Source: BHP, Jansen Briefing, 15 September 2021

Africa is playing catch-up

In 2012, the International Potash Institute (IPI) predicted that "Africa will face unprecedented challenges in food production and increased pressure on its natural resources in the 21st century". The Institute cited rapid population growth and already high malnutrition rates in Sub-Saharan Africa as being two factors undermining regional food security. Malnutrition rates have remained stubbornly high. According to the FAO, 23% of Africans and 26% of Sub-Saharan Africans experienced severe food insecurity in 2018-2019.

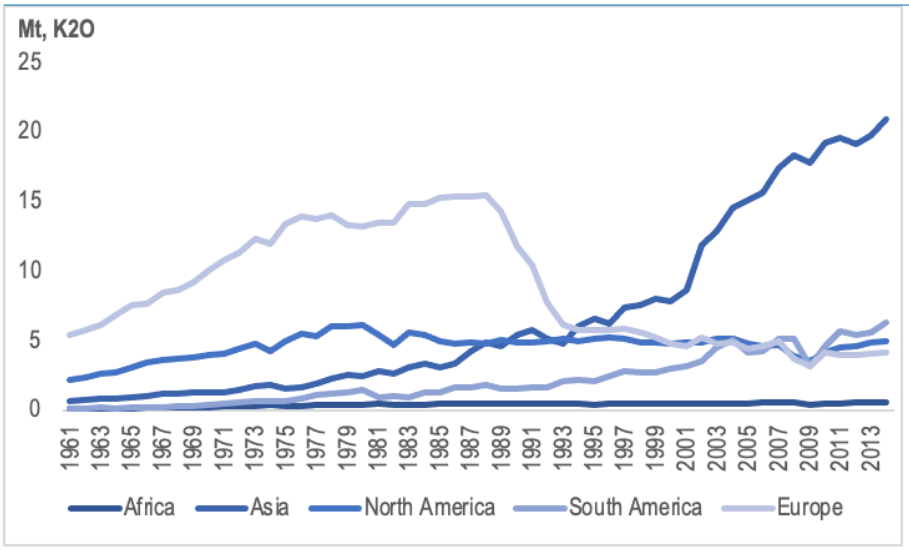
Sub-Saharan Africa, in contrast to South Africa and the North Africa countries, is characterised by poor agricultural productivity. Sub-Saharan Africa largely missed the Green Revolution of the 1950s to 1970s. During this time, world farm productivity increased dramatically driven by the use of improved germplasm, fertilisers, irrigation and better management practices. Fertiliser use rose sharply in Asia and Latin America in this period, but essentially stagnated in Sub-Saharan Africa.

Between 1961 and 2010, African food production managed to keep pace with population growth largely because of an expansion in agricultural land area rather than improved farm productivity. In fact, fertiliser use in Africa is so low that in 2015 scientists at the Massachusetts Institute of Technology described "Africa's potash problem" as a "silent crisis" noting that farming methods at the time stripped more potassium out of soils than was being replaced with fertiliser. Newcastle

University, UK, estimated that that only 10% of the potassium removed during harvesting was being replaced. **Currently, some 24% of the world's arable land is in Africa, yet Africa accounts for less than 4% of world fertiliser consumption, and less than 3% of world potash consumption.** According to BHP analysis, potash contributes 30% to 35% of potassium uptake in most of world, but only 5% in Africa.

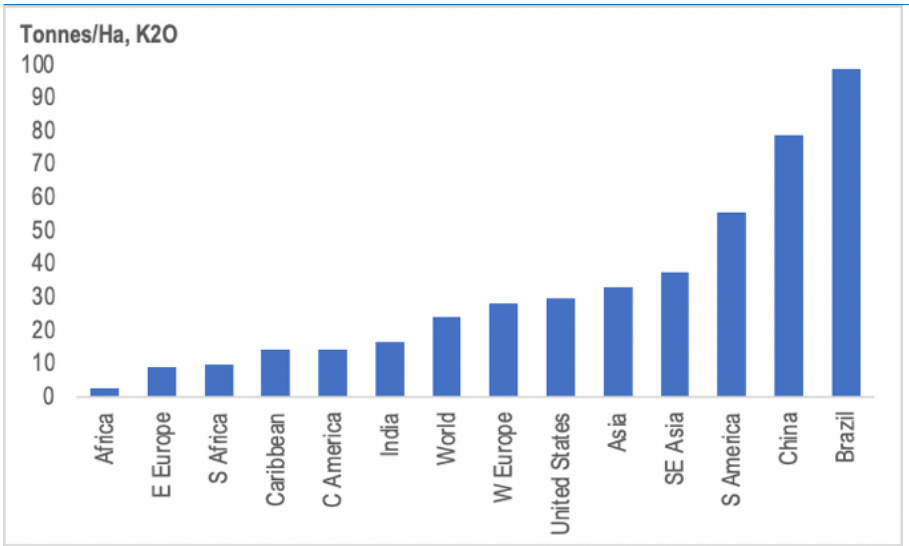
Sub-Saharan Africa's use of more land to boost food production creates a number of issues. Low crop yields result in high unit production costs. It can threaten other eco-systems. In an International Fertiliser Development Centre (IFDC) paper published in 2006, authors Henao and Baanante estimated that each year Africa lost 50,000 Ha of forest and 60,000 Ha of grasslands to agricultural area expansion. Low productivity also decreases vegetive soil cover which can cause increased erosion and further depletion of nutrients. Even in 2006, Henao and Baanante warned that some 95m Ha of agricultural lands were approaching such a depredated state that it would not be economically viable to return them to productivity.

Figure 25: Potash consumption, selected regions 1961 to 2014



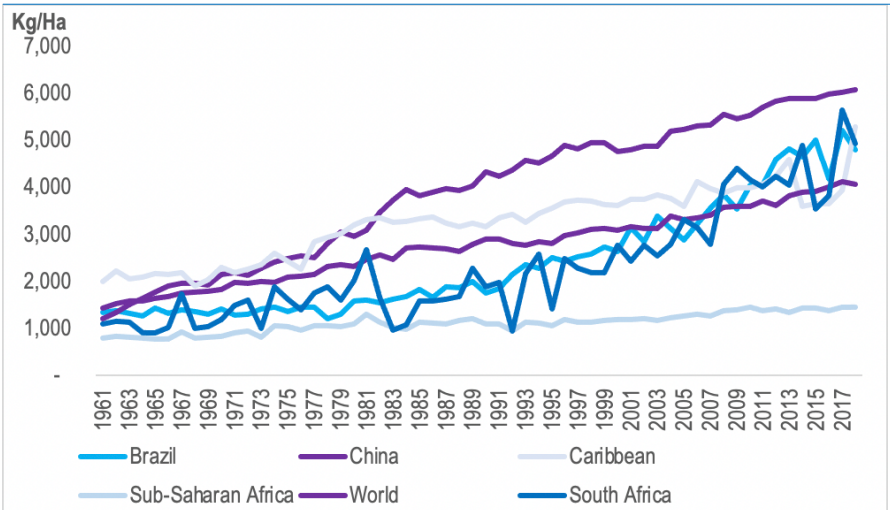
Source: FAO

Figure 26: Potash consumption per hectare arable land, selected regions, 2017



Source: FAO

Figure 27: Cereal yields, selected areas, 1961 to 2018



Source: FAO

This historical under investment in fertilisers in Africa presents a huge opportunity. In 2017, according to data from FAO, Africa applied some 4.3 tonnes of potash (KCl) per hectare of cropland. This compares to 14.8 tonnes/Ha in South Africa, 21.9 tonnes/Ha in the Caribbean and 22.0 tonnes/Ha in Central America. **If Africa were to catch up with these areas in terms of potash application rates, it could mean a 4-5x increase in potash usage.** If this is achieved, in say the next two decades, it would represent demand growth of 7-8% pa over the next 20 years. During this time, Africa's population is expected to increase by 55% from 1.34bn in 2020 to 2.1bn in 2040. Assuming this larger population will be fed by local produce, and that a further 30% increase in fertiliser use is required to boost farm productivity (on the same amount of land), then African potash use could increase by roughly 5-7x over the next 20 years. This represents long-run demand growth of 8-10% pa. **In terms of potash demand, African demand could increase from around 1.0m tpa in 2020 to 5-7m tpa by 2040.**

Emmerson stands to be the only producer of potash in Africa, and the closest producer for most of the continent.

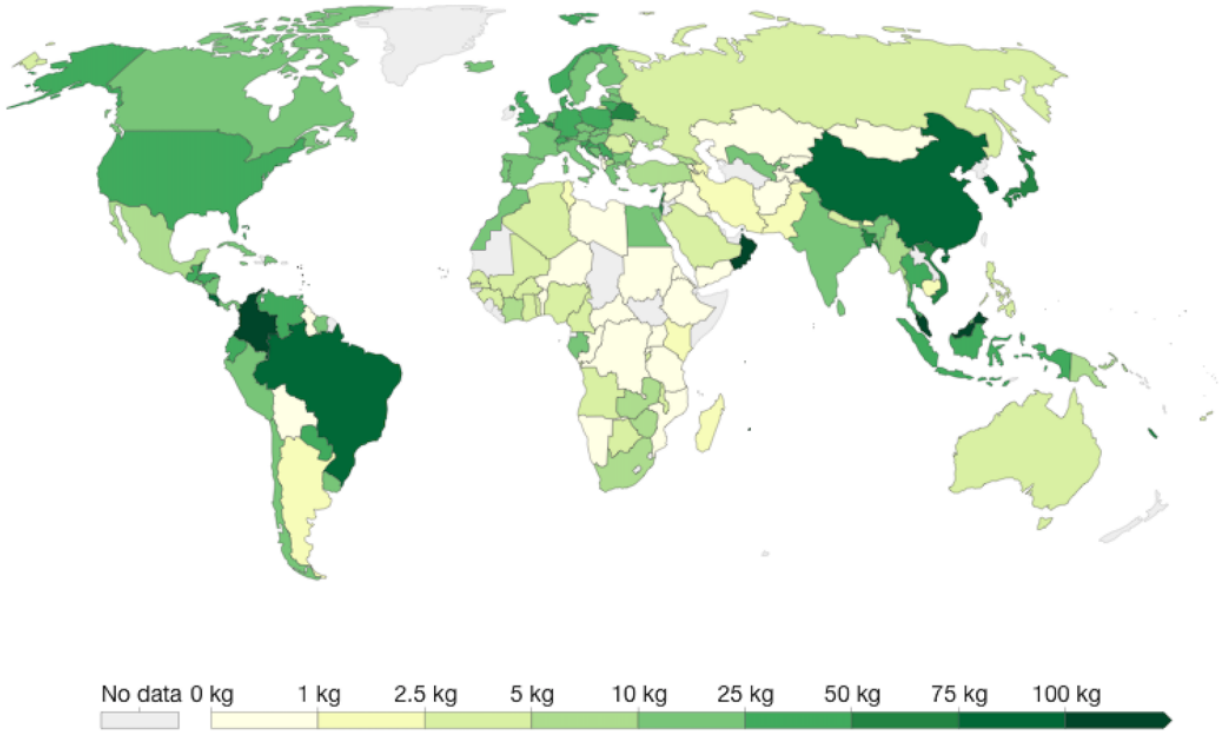
Increasing African demand is already apparent in the data for Moroccan potash imports which are estimated to have risen at an average of more than 100% pa from 2013 to 2019, with much of this material being blended and sold to other parts of Africa.

FAO's The State of Food Security and Nutrition in the World 2021, https://www.fao.org/documents/card/en/c/cb4474en

Potash; A silent crisis brews, https://news.mit.edu/2015/potash-silent-crisis-brews-1124

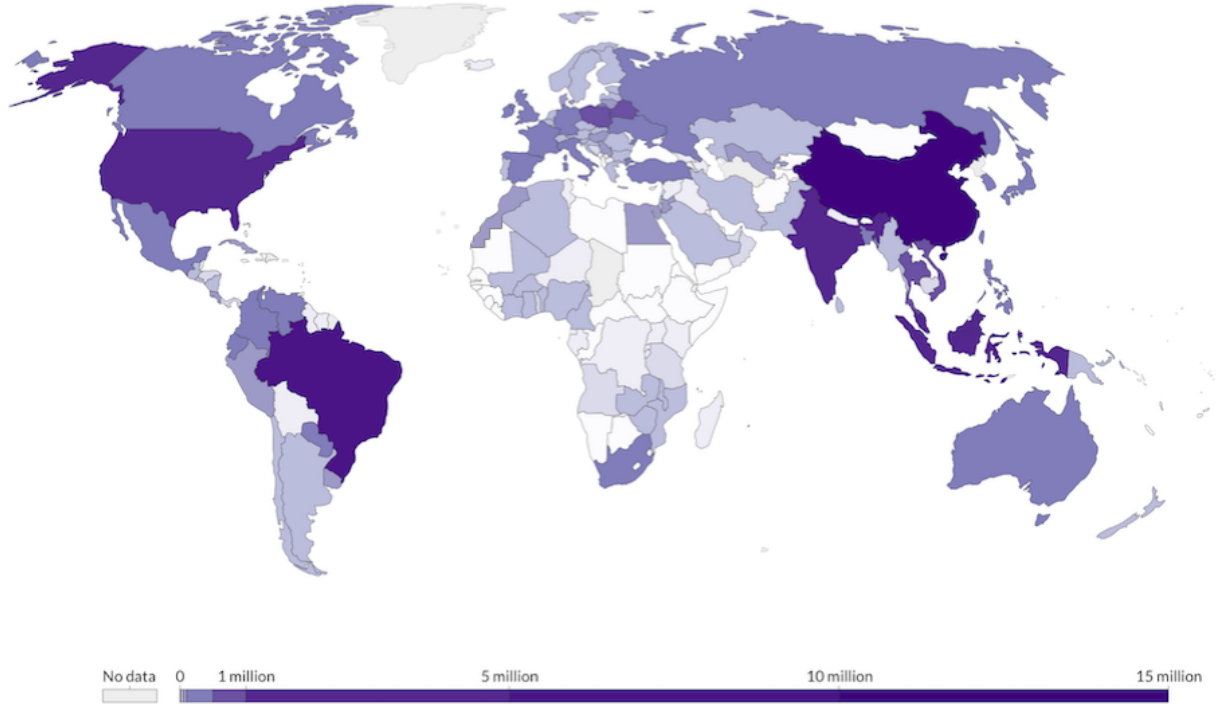
Africa's Potash Problem; https://www.weforum.org/agenda/2015/11/africas-potash-problem/

Figure 28: Potash fertiliser use per area of cropland, kg/Ha, 2017



Source: UN FAO, Orior Capital estimates

Figure 29: Potash fertilizer consumption, tonnes K_2O, 2014



Source: UN FAO, Orior Capital estimates

Khemisset is a compelling project

- The Khemisset project boasts an estimated post-tax NPV_8 of US$2.1bn and an IRR of 54%, based on an MOP price of US$550/t
- The project is one of the lowest capital intensity potash projects globally, and will be one of the lowest in terms of delivered costs to key markets
- Khemisset has been significantly de-risked with economic studies, the award of a Mining Licence, and the securing of a strategic investor

The Khemisset project is located about 90km from Rabat, the capital city of Morocco, and about 180km to the east of the port of Casablanca. The project is situated in the Khemisset evaporite basin, a half graban measuring some 60km by 20km. Emmerson has already secured a Mining Licence for the project that covers an area of 558 km^2. While the company is focused on developing its MOP business, management has also examined the potential for an SOP plant that would be located in Jorf Lasfar, a major industrial and port area, located about 110km southwest of Casablanca.

The Khemisset project is both financially and strategically compelling. It boasts healthy margins and high returns. Capex and operating costs are low. It will be the first producing MOP asset in Africa. It is excellently located on the Atlantic corridor with ready access to key markets. The resource is substantial and Emmerson's exploration target suggests there is potential to more than double the existing resource. There is plenty of scope to expand operations. Morocco has excellent transportation and utilities infrastructure.

Substantially de-risked

Over the past couple of years, the project has been substantially de-risked through a number of economic studies, the award of a mining licence, and the securing of a strategic investor that has connections to one of the world's largest agribusinesses.

Feasibility Study completed

In June 2020, Emmerson completed a Feasibility Study led by global, independent mining and engineering consultants, Golder Associates, and with input on the processing design from Global Potash Solutions and Barr Associates. The study was based on average annual potash production of 735,000 tpa and salt production of 1.0m tpa over a mine life of 19 years, and a constant real potash price of US$412/t. The study, completed at a trough in the potash market, boasted a post-tax NPV_8 of US$1.4bn, and an IRR of 38.5%. It incorporated extensive metallurgical test work that was designed to establish optimum brine chemistry, and which now underpins the proposed flow sheet.

In addition to the Feasibility Study, Emmerson has completed two other economic evaluations.

In November 2019, the company released a PEA examining the potential for a low capex SOP project with an annual steady state production of 240,000 tpa. SOP is an important fertiliser that is used predominantly on chlorine sensitive and high value crops, and those that benefit from additional sulphur. The project demonstrated a post-tax NPV_8 of US$503m, and an IRR of 52.1%

over an initial 20-year project life. Management estimated the delivered cost of SOP to the US market at US$411/t. This is about 35% lower than the operating costs of incumbent US producers.

In April 2021, Emmerson published an update on the potential for a Phased Development Strategy. This was aimed at reducing upfront capital costs and completed to Scoping Study levels. The strategy incorporated the SOP project, and an expansion wherein MOP production was eventually increased to 1.0m tpa. The study boasted a post-tax NPV_8 of US$2.37bn. Companies often aim to reduce upfront capital costs by phasing development in the manner suggested in the Phased Development Strategy. Usually this is to appease existing shareholders who may not welcome a large capital raise. In contrast, strategic partners often want the opposite. Usually well-funded, they aim to complete projects in short order. Given the considerable strengths of the project, and the likelihood of attracting industry partners, the assumption is that Khemisset will be built as envisaged in the Feasibility Study.

Figure 30: Summary of Khemisset potash project economic studies

Date	Study	Post-tax NPV_8 US$ m	Comments
November 2019	PEA for SOP	503	240k tpa SOP, using 205k tpa MOP as feedstock IRR of 52.1% Delivered costs to the US of US$411/t Project based in Jorf Lasfar
June 2020	Feasibility Study	1,400	735k tpa MOP and 1.0m tpa salt IRR of 38.5% MOP price of US$411/t *(Note: Orior Capital estimated NPV_8 of US$2.1bn based on an MOP price of US$550/t CFR Brazil)*
April 2021	Phased Development Study	2,370	Project split into 4 phases, incorporating MOP capacity of 1.0m tpa and SOP capacity of 240k tpa

Source: Emmerson Plc

Mining Licence Granted

In February 2021, Emmerson was granted a Mining Licence for its Khemisset project by the Moroccan Ministry of Energy, Mines and the Environment that grants exclusive rights to develop and mine the potash deposit within the licence area. Emmerson's mineral resource is wholly within the licence area meaning **no further mining permits will be required for potential expansions or mine life extensions from the existing resource.** The Mining Licence is valid for an initial 10-year period and is renewable in 10-yearly increments until the resource is exhausted.

Strategic investment secured

In November 2021, Emmerson announced it had secured strategic investment of up to US$46.75m. The funds comprised an immediate equity investment of US$6.75m at 6p/share (an 8% premium to the 30-day VWAP), and US$40m in two-year convertible loan notes that convert at 8.2p/share. **The loan notes are designed to contribute directly to the construction funding for Khemisset**, and are accessible once the complete funding package is in place. The convertible loan note holders were also granted 82.39m 12-month warrants at 8.2p/share, the conversion of which would generate a further US$9.2m for Emmerson. On conversion, the loan note holders will hold up to a maximum of 29.9% of Emmerson.

The Sinar Mas connection

Of this investment, two funds based in Singapore, Global Sustainable Minerals Pte Ltd (GSM) and Gold Quay Capital Pte Ltd (GQC) subscribed for about 86% of the equity raise and will invest 100% of the loan notes. GSM has committed to US$36m of the loan notes, and GQC the remaining US$4m. GSM is funded by way of a fully committed secured financing facility provided by Asia Star Fund Ltd, a fund that is controlled by Mr Indra Widjaja. Mr Indra Widjaja is the third son of Mr Eka Widjaja, the founder of the Sinar Mas Group, one of the largest conglomerates in Indonesia, with interests in agribusiness, paper, commodities, real estate, financial services, and telecommunications. Asia Nikkei estimated Sinar Mas Group revenues at US$30bn in 2018.

GSM is managed by Mr Mark Zhou You Chuan. Mr Zhou is also an executive director and Chief Investment Officer of Singapore listed Golden Energy and Resources. Golden Energy is the majority shareholder of Stanmore Resources. In 2021, Stanmore acquired BHP's 80% stake in BHP Mitsui Coal, which owns two metallurgical coals mines in the Bowen Basin, Australia, for up to US$1.35bn.

GSM's investment as a strategic investor into Emmerson is viewed as a huge endorsement of the Khemisset project.

Basic engineering awarded

Importantly, the upfront cash injection from GSM, GQC and other investors, has enabled management to continue to advance the project through basic engineering, whilst at the same time pursuing financial close. In December 2021, Emmerson said it had awarded a Basic Engineering Contract to Barr Associates for the Mineral Processing Facility. In January 2022, management awarded the balance of the basic engineering to Reminex S.A., the engineering arm of Moroccan mining company Managem Group. Reminex has decades of experience in the Moroccan mining sector.

Robust financials

Potash prices, the biggest driver of earnings, have firmed significantly since the Feasibility Study was completed in June 2020. Management's approach in the study was sensibly conservative, aiming to demonstrate a robust project even at low selling prices. The fact remains though that spot prices for granular MOP have doubled since the study was completed. Prices are expected to remain elevated with strong demand, and limited new supply keeping the market tight. **Operating margins and profitability are expected to be meaningfully better than envisaged at the time of the Feasibility Study.** The Khemisset project is expected to come on stream in 1Q24, ramping up to full production by 2025. Based on a long-run potash price of US$550/t CFR Brazil, the project boasts:

- Post-tax NPV_8 of US$2.1bn, representing an NPV per fully diluted share of 152p per share
- A post-tax IRR of 54%
- Revenues from potash are expected to represent 91% of life-of-project revenues, with the remainder coming from sales of salt
- EBITDA of US$340m in 2025, the first full year of operations, average annual EBITDA of US$398m, and total EBITDA in the first three years (including start-up) of US$904m
- Average EBITDA margins of 75% over the life of the project

- Low initial capital costs of US$411m, representing a capex cost per tonne of US$559/t including salt
- Very low cash operating costs estimated at US$125/t and all-in sustaining costs (AISC) estimated at US$158/t, both fob Casablanca

Figure 31: Key parameters of the Khemisset project

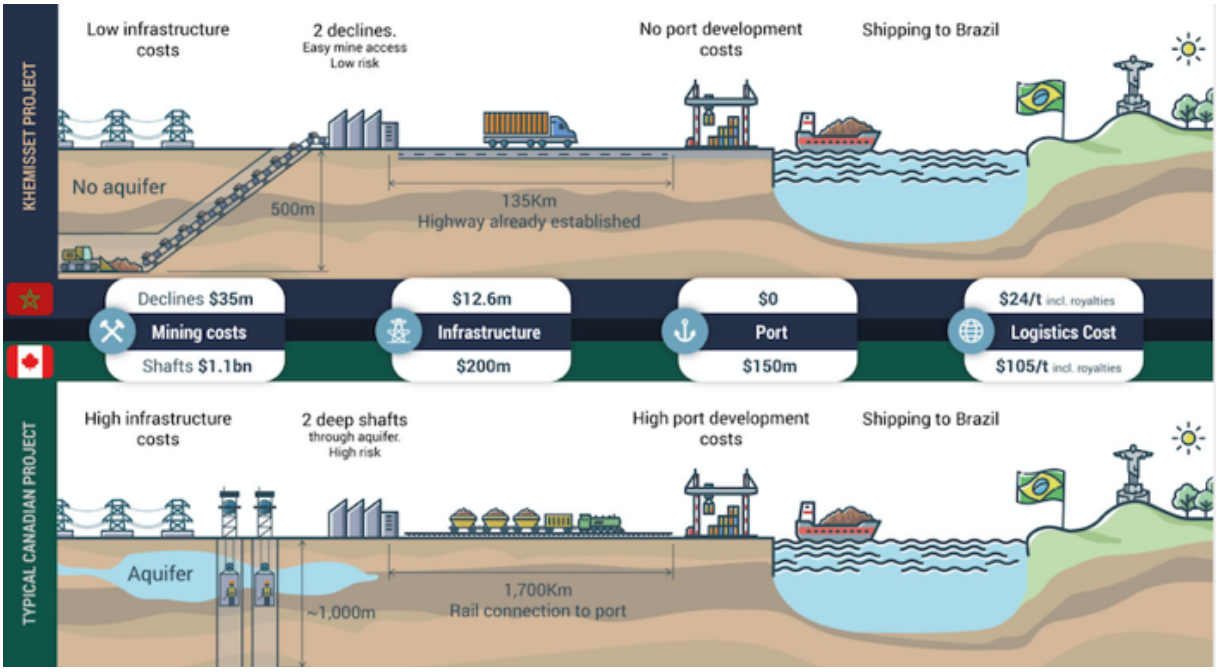
		Feasibility Study, 2020	Orior estimates
Initial operating life	Years	19 years	19 years
ROM extraction rate per annum	Mtpa	6.0	6.0
Life-of-mine grade to mill	% K_2O	8.6%	8.6%
Metallurgical recovery, LOM		85.2%	85.2%
MOP Production, annual average	Tonnes	735,000	735,000
Salt production, annual average	Tonnes	1,000,000	1,000,000
MOP price, CFR Brazil, real	US$/t	412	550
Salt price, CFR US East Coast	US$/t	60	60
Capital cost, potash	US$ m	387	387
Capital cost, salt	US$ m	24	24
Capital costs, total	US$ m	411	411
Cash cost, fob Casablanca	US$/t	125.3	125.3
AISC fob Casablanca	US$/t	158.0	158.0
EBITDA, annual average	US$ m	307	398
EBITDA margin, average		61.5%	75.5%
Cash flow, annual average, post-tax	US$ m	235	312
Cash margin, average, post-tax		47.1%	59.1%
Post-tax NPV_8	US$ m	1,400	2,106
Post-tax IRR		38.5	54.0
Post-tax payback period	Years	2.6	1.8

Source: Emmerson Plc, Orior Capital estimates

Low capital and operating costs

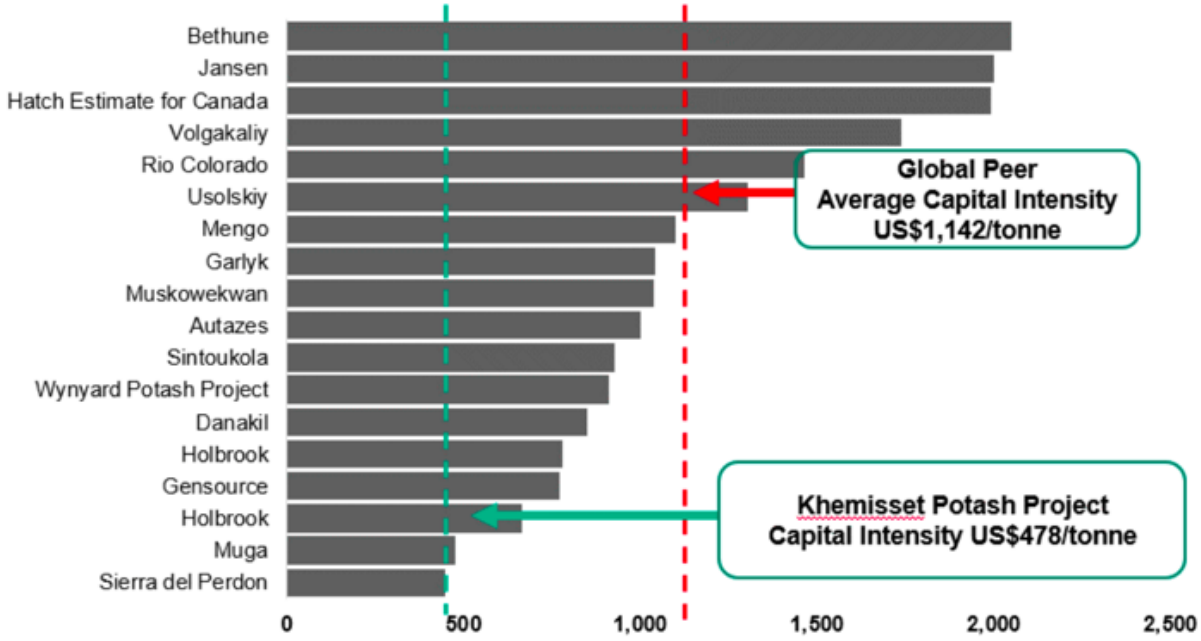
The Khemisset project will benefit from straightforward geology, a significant geographical advantage, and well developed infrastructure in Morocco. The orebody is relatively shallow. There are no aquifers overlaying the ore body which would add technical complexity and cost to the project. Morocco has well-developed port infrastructure. Located immediately south of the Strait of Gibraltar, the country plays a significant role in global supply chains with many ships heading to the Suez Canal passing through Morocco for transhipment. Morocco also has well-developed road and rail networks, and power. Many potash projects are in remote locations and infrastructure costs are a substantial portion of overall project costs. Compared to typical Canadian potash mine projects, Emmerson has identified pre-production capital cost savings of more than US$1.2bn. This includes 90% cost savings for infrastructure and mine access.

Figure 32: Khemisset benefits from substantial development advantages



Source: Emmerson Plc

Figure 33: Capital intensity, US$/tonne production



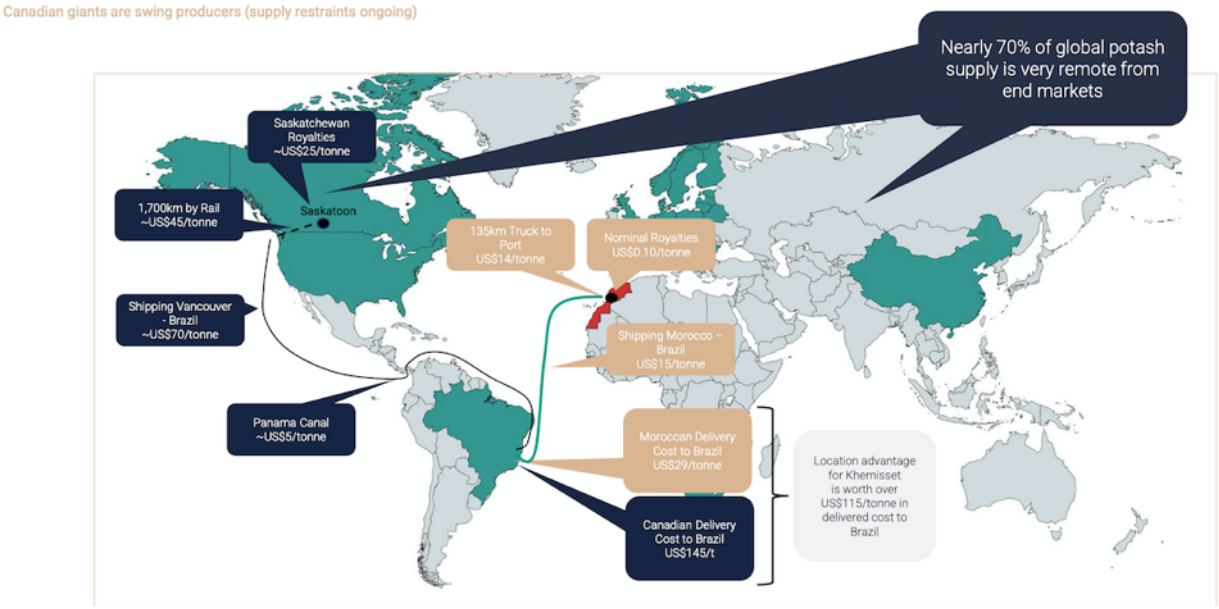
Source: Emmerson Plc, Feasibility Study, June 2020

Great location

In addition to low capital costs, Khemisset has a significant geographical advantage. Transportation and logistics typically account for more than 50% of the cost of delivering potash to customers. As an example, potash being shipped from a mine in Saskatchewan, Canada, to Brazil has to travel more than 20,000km to market including about 1,700km across Canada to the Port of Vancouver, and a further 18,590km (10,037 nautical miles to the Port of Paranaguá, according to ports.com) to Brazil. The route requires transit through the Panama Canal. This compares to a distance of about

10,000km (5,400 nautical miles) from the Port of Casablanca, Morocco. Shipping from Vancouver takes about 43 days, compared with about 23 days from Casablanca.

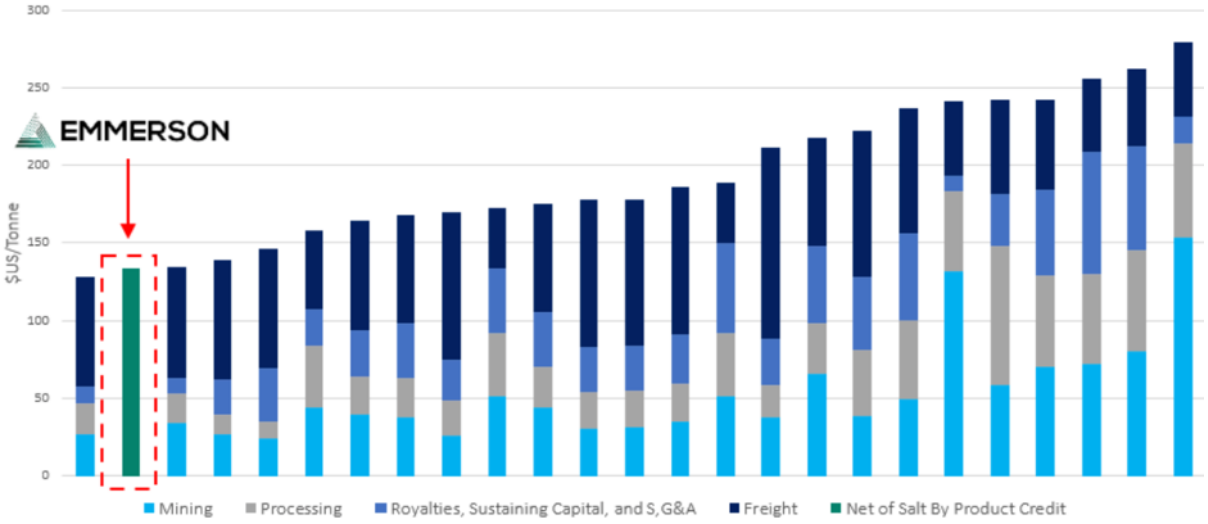
Figure 34: Morocco's location offers major cost advantages



Source: Emmerson Plc

This means that although Khemisset has higher operating costs to the mine gate when compared to low-cost Russian and Canadian peers, **the project will be in the bottom quartile in terms of delivered cost to all of its target markets.** Including salt revenues as by-product credits, Khemisset is among the bottom 2-3 projects globally on an AISC CFR Brazil basis.

Figure 35: All-In Sustaining Costs, CFR Brazil



Source: Emmerson Plc

This advantage might extend further if Morocco builds the planned port of Kenitra Atlantique, a planned deep-water commercial port to be situated half-way between Tangiers and Casablanca, which is 150km to the south. Khemisset is located about 100km from the proposed Kenitra Atlantique site.

Figure 36: Operating cost summary, potash only, first full year of operations

Operating cost item	US$/t ROM	US$/t MOP
Mining, including contract mining	7.8	60.2
Processing	5.5	42.7
Other site operating costs	0.7	5.6
Administration	0.4	2.8
Total cash costs to mine gate	**14.4**	**111.2**
Trucking to Port of Casablanca	2.0	14.1
Sustaining capital	4.2	32.7
All-in sustaining costs, fob	**20.6**	**158.0**
Freight to Brazil	1.4	10.0
All-in sustaining cash costs to Brazil	**22.0**	**168.0**

Source: Emmerson Plc

Taxation and royalties

Morocco is highly supportive of mining investment. The country offers reduced rates of corporation tax for exports, a tax holiday for new mines of five years from the start of production, and minimal royalties. Royalties are paid to the local government and are MAD1-3 (Moroccan dirhams) (US¢11-33) per tonne of extracted product. In addition, unlike many African countries, there is no Government free carried interest.

In addition to the attractive tax regime, the Government of Morocco offers an incentive program aimed at attracting foreign investment. The program applies to investments of more than €10m. The level of funding is negotiated with the government and depends on the scale of the project and its expected socio-economic impact. The program provides for the following Government contributions:

Up 10% of total project investment can be subsidised by the Moroccan Government including:

- Up to 5% of total investment in external infrastructure such as power connections, road access, water intakes, used water treatment facilities and port upgrades
- Up to 20% of land acquisition costs
- Up to 20% of approved employee training costs

Tax concessions including:

- Exemption from import duties on plant, equipment, and mining machinery
- A three-year exemption from VAT on equipment and plant purchases
- A reduced corporate tax rate of 17.5%, down from 31%

Morocco is in the process of implementing new investment incentives to further boost selected strategic projects which, once adopted, are expected to provide additional tax concessions and/or subsidies to the Khemisset project.

Sensitivity

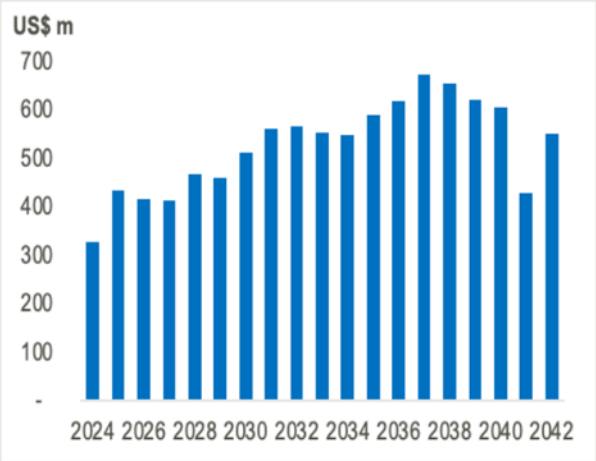
The estimated post-tax NPV_8 and the IRR are sensitive to changes in capex, operating costs and selling price. A 10% reduction in average selling prices would reduce the post-tax NPV_8 by 23% to US$1.6bn, and the IRR to 48%. A 20% increase in capex would reduce the post-tax NPV_8 by 6% to US$2.0bn, and the IRR to 46%.

Figure 37: NPV and IRR sensitivities

NPV_8, post-tax							
Opex	70%	80%	90%	100%	110%	120%	130%
4%	3,737	3,606	3,475	3,344	3,213	3,082	2,950
6%	2,959	2,853	2,746	2,639	2,532	2,426	2,319
8%	**2,370**	**2,282**	**2,194**	**2,106**	**2,018**	**1,930**	**1,842**
10%	1,917	1,844	1,770	1,697	1,623	1,550	1,476
Capex	70%	80%	90%	100%	110%	120%	130%
4%	3,554	3,484	3,414	3,344	3,274	3,203	3,133
6%	2,830	2,766	2,703	2,639	2,576	2,512	2,449
8%	**2,280**	**2,222**	**2,164**	**2,106**	**2,048**	**1,990**	**1,932**
10%	1,857	1,804	1,750	1,697	1,643	1,590	1,536
Price	70%	80%	90%	100%	110%	120%	130%
4%	1,893	1,893	2,618	3,344	4,069	4,795	4,795
6%	1,462	1,462	2,051	2,639	3,228	3,816	3,816
8%	**1,138**	**1,138**	**1,622**	**2,106**	**2,590**	**3,074**	**3,074**
10%	891	891	1,294	1,697	2,100	2,503	2,503
Combined	70%	80%	90%	100%	110%	120%	130%
4%	2,496	2,779	3,061	3,344	3,626	3,909	4,191
6%	1,973	2,195	2,417	2,639	2,861	3,084	3,306
8%	**1,576**	**1,753**	**1,929**	**2,106**	**2,282**	**2,459**	**2,635**
10%	1,272	1,414	1,555	1,697	1,838	1,980	2,121
IRR							
Opex	70%	80%	90%	100%	110%	120%	130%
4%	59%	57%	56%	54%	52%	51%	49%
6%	59%	57%	56%	54%	52%	51%	49%
8%	59%	57%	56%	54%	52%	51%	49%
10%	59%	57%	56%	54%	52%	51%	49%
Capex	70%	80%	90%	100%	110%	120%	130%
4%	74%	66%	59%	54%	49%	46%	42%
6%	74%	66%	59%	54%	49%	46%	42%
8%	74%	66%	59%	54%	49%	46%	42%
10%	74%	66%	59%	54%	49%	46%	42%
Price	70%	80%	90%	100%	110%	120%	130%
4%	35%	42%	48%	54%	60%	66%	71%
6%	35%	42%	48%	54%	60%	66%	71%
8%	35%	42%	48%	54%	60%	66%	71%
10%	35%	42%	48%	54%	60%	66%	71%
Combined	70%	80%	90%	100%	110%	120%	130%
4%	57%	55%	55%	54%	53%	53%	53%
6%	57%	55%	55%	54%	53%	53%	53%
8%	57%	55%	55%	54%	53%	53%	53%
10%	57%	55%	55%	54%	53%	53%	53%

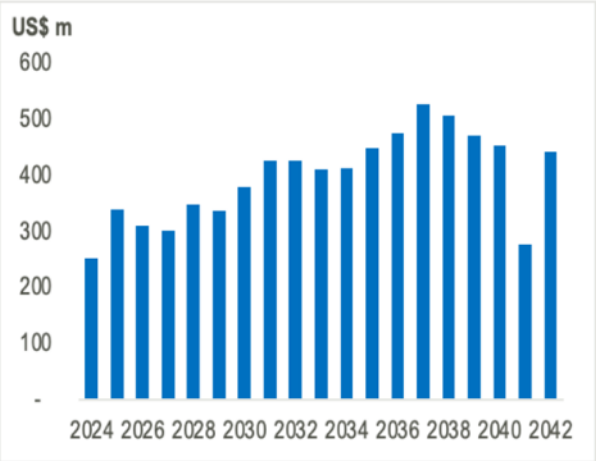
Source: Emmerson Plc, Orior Capital estimates

Figure 38: Revenues



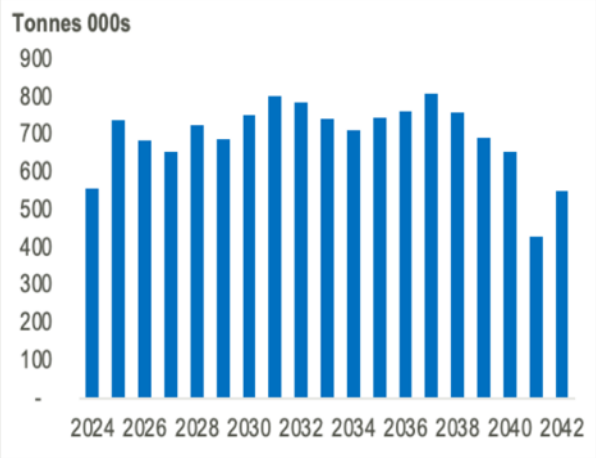
Source: Emmerson Plc, Orior Capital

Figure 39: EBITDA



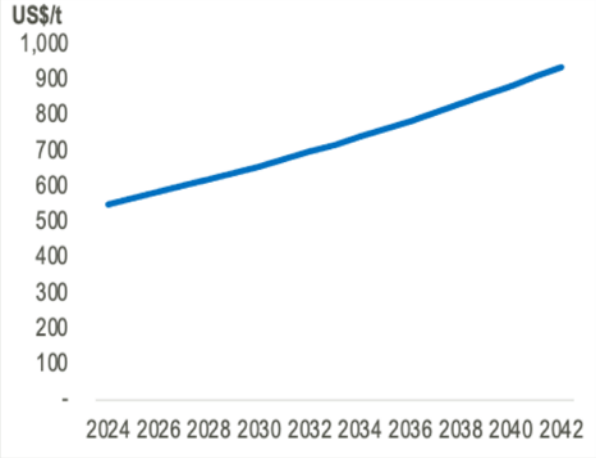
Source: Emmerson Plc, Orior Capital

Figure 40: MOP production



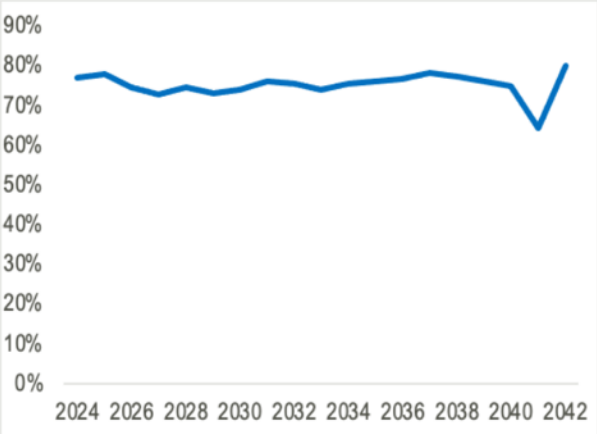
Source: Emmerson Plc, Orior Capital

Figure 41: MOP price



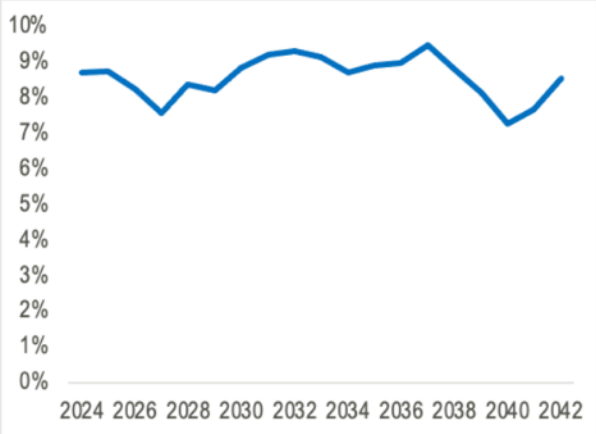
Source: Emmerson Plc, Orior Capital

Figure 42: EBITDA margin



Source: Emmerson Plc, Orior Capital

Figure 43: Potash grade



Source: Emmerson Plc, Orior Capital

Substantial resources

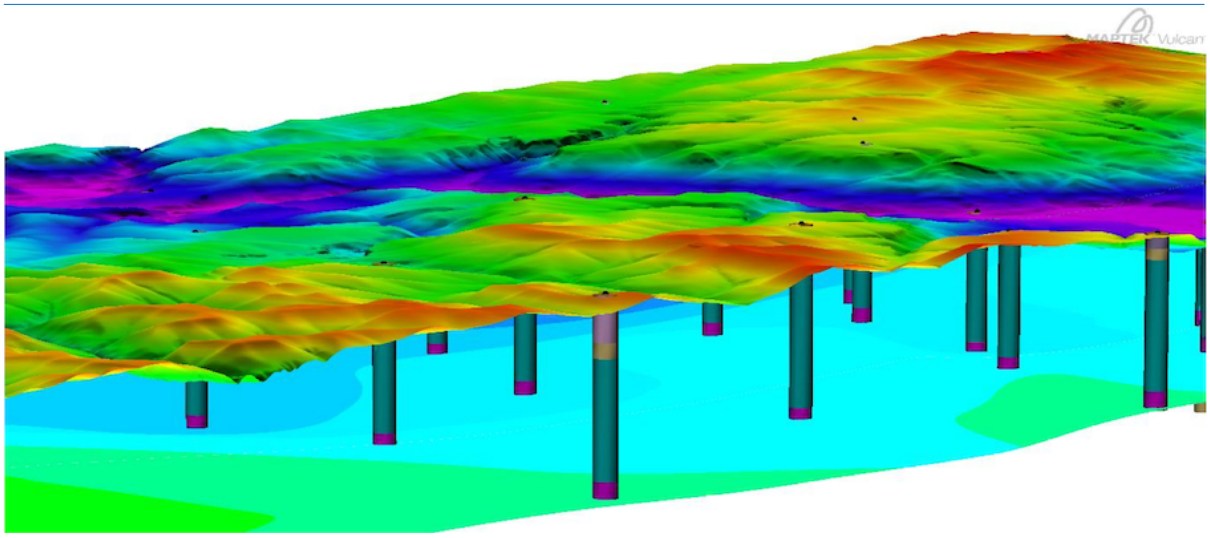
The project has a current JORC 2012 compliant resource of 536.9Mt at an average grade of 9.24% K_2O. About 71% of the contained KCl is in the Indicated category. The resource is based on the historical drilling undertaken between 1955 and 1969, three confirmatory holes for 1,543m drilled by Emmerson in 2016, and a 9 hole, 6,485m infill program undertaken by Emmerson in 2019. The resource is based on a value cut-off (grade x thickness) of 7.5%, as well as absolute cut-offs of a grade of 7.5% K_2O, and a minimum seam thickness of 0.8m. The current mine plan includes just 43% of the total mineral resource estimate.

Figure 44: JORC-compliant Mineral Resources

Potash ore	Resource Tonnes, m	K_2O grade %	KCl grade %	Contained KCl Tonnes, m
Indicated	375.2	9.36	14.9	55.8
Inferred	161.8	8.96	14.2	23.0
Total	**536.9**	**9.24**	**14.7**	**78.8**

Source: Emmerson Plc

Figure 45: Oblique view of the geological model showing topography, drill traces, and the potash seam



Source: Emmerson Plc

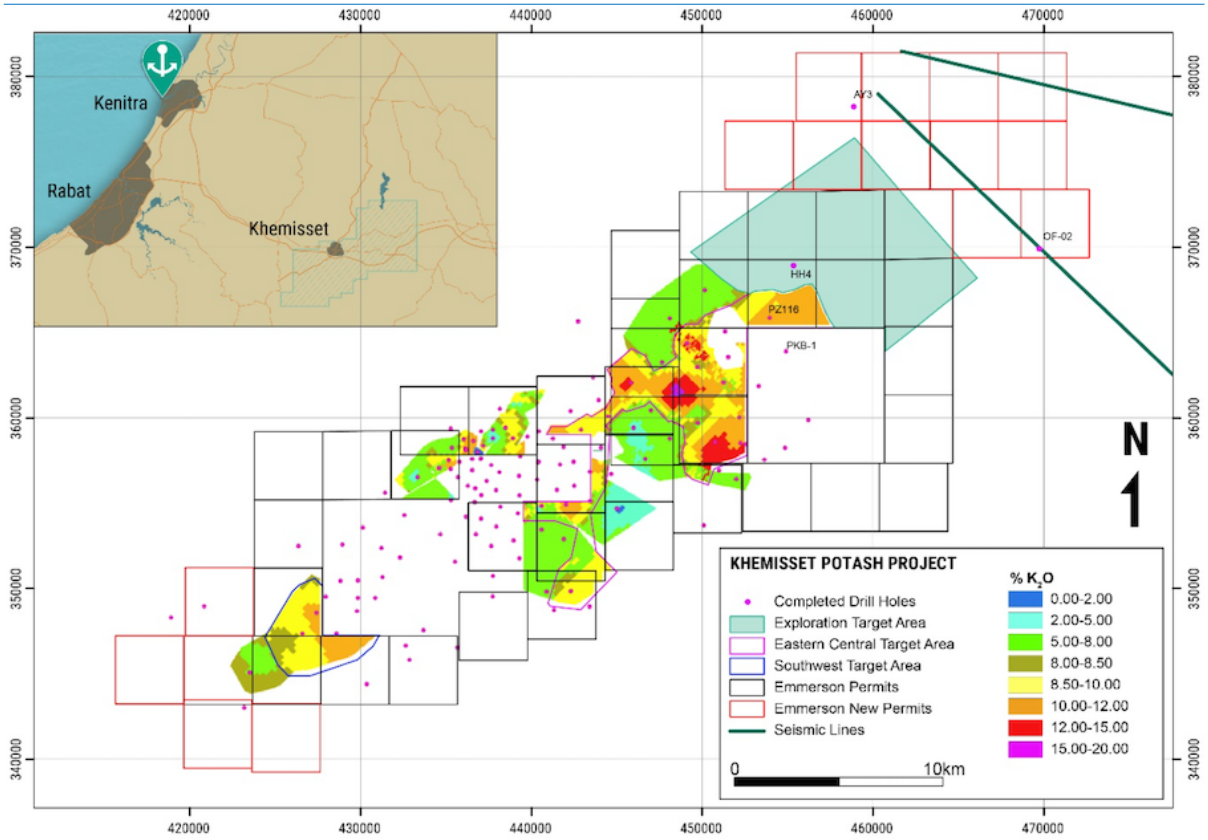
As part of the Feasibility Study, a JORC-compliant Mineral Reserve was completed comprising 80.5Mt at an average grade of 9.06% K_2O.

Exploration target

In August 2018, Emmerson published an **exploration target at Khemisset that amounts to 264Mt to 616Mt at a grade of 5% to 14% K_2O**. The exploration target has an estimated seam thickness range of 1.5m to 3.5m. It covers an area of 86.8 km^2. It extends about 7km, and lies immediately northeast and along strike, from the existing resource.

Taking the mid-point of the exploration target, 440Mt at 9.5% K_2O, suggests there is potential to increase resources by more than 80%. At the top end of the target, total resources could increase almost three-fold. **Successfully demonstrating a greater resource could underpin a substantially larger operation than currently envisaged.**

Figure 46: Khemisset exploration target (licence boundaries shown before amalgamation)



Source: Emmerson Plc

The opportunity in SOP

- Emmerson's 2019 PEA for its proposed SOP project demonstrated a post-tax NPV_8 of US$503m, and an IRR of 52.1% over a project life of 20 years
- The project would benefit from a captured supply of MOP feedstock, be ideally located in Jorf Lasfar, and boast low delivered costs into key markets
- The SOP market is supply constrained; there is potential for rapid demand growth over the next decade

SOP a premium fertiliser

SOP is a speciality, premium priced, fertiliser comprising potassium (50-52%), sulphur (17.5%) and very low chlorine (0.5-1.0%). SOP has traded at an average premium of US$220/t to MOP over the past decade. The SOP market is the second largest for potassium based fertilisers after MOP, with demand of about 7m tonnes in 2020. It is marketed both as being low chlorine for plants that are chlorine sensitive and also as containing sulphur.

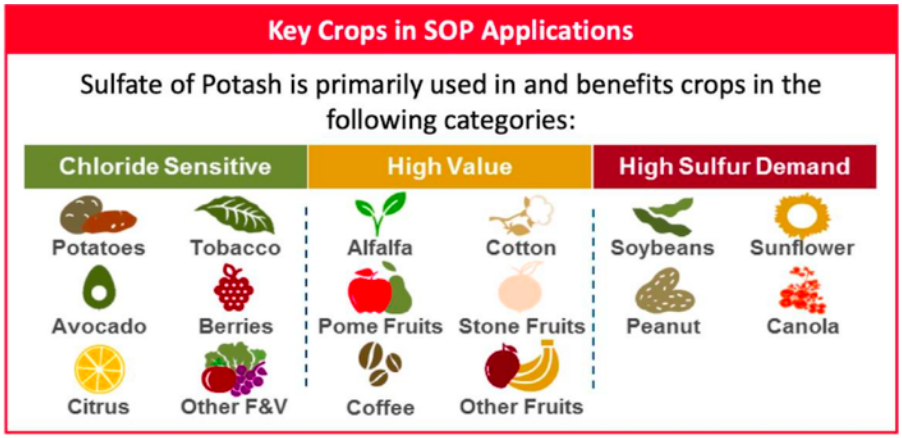
Although chlorine is an essential micronutrient, some plants such as citrus fruits, are sensitive to chlorine levels. In arid areas, such as in the Middle East, low rainfall means chlorine can accumulate in soil. Chlorine toxicity can impact crop yields and can also be detrimental in acidic soils. In these instances, SOP is used for its low chlorine content.

SOP contains sulphur, a second macro nutrient. Although sulphur was once an abundant nutrient in soils, research suggests that sulphur deficiencies in crops have increased over the past decade. This has been driven by a number of changes over recent years including the move towards earlier planting in colder weather (which restricts microbial processes needed for sulphur to become available to plants), stricter emissions controls which have resulted in less sulphur being deposited through precipitation ('acid rain'), and the use of 'high analysis' fertilisers which contain more than 30% of the key nitrogen, phosphate and potassium minerals. Pioneer's Ordinary Super Phosphate (0-20-0) contains up to 10% sulphur, whereas the newer Concentrated/Triple Superphosphate (0-46-0) contains less than 3% sulphur.

Another advantage of SOP is that it has a salinity index of 46, compared to an index of 116 for MOP. The lower salinity of SOP can make it easier for some plants to absorb water and nutrients, thus improving the yield and quality of the crop.

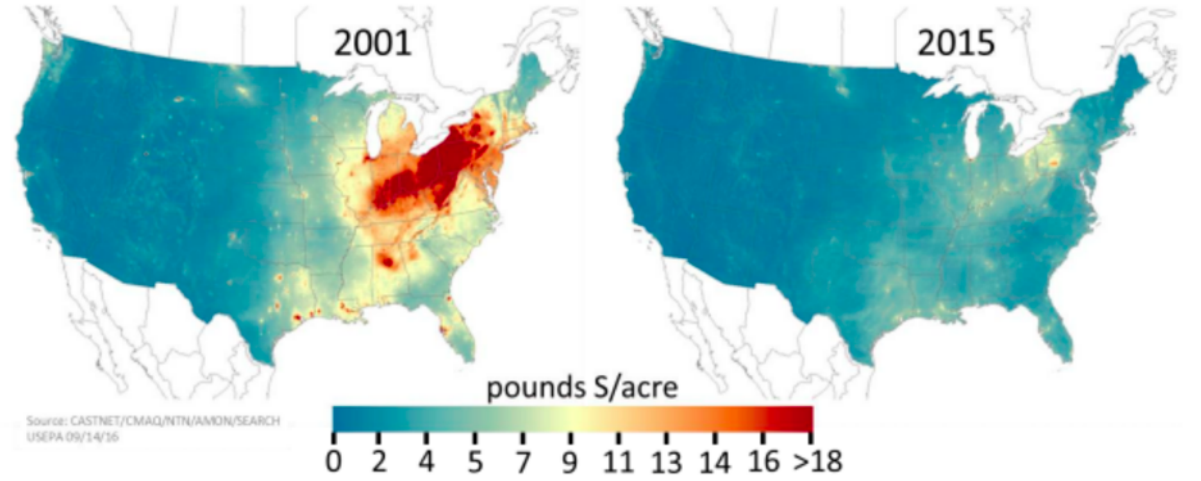
As a result, SOP is primarily used on crops that are chlorine sensitive such as citrus fruits, potatoes and berries, on high value crops such as coffee, and on crops that have high sulphur demand such as sunflowers and canola.

Figure 47: Major crops for SOP application in the United States



Source: Compass Minerals, Annual Report, 2019

Figure 48: Sulphur deposition in the US



Source: National Atmospheric Deposition Program http://nadp.slh.wisc.edu/

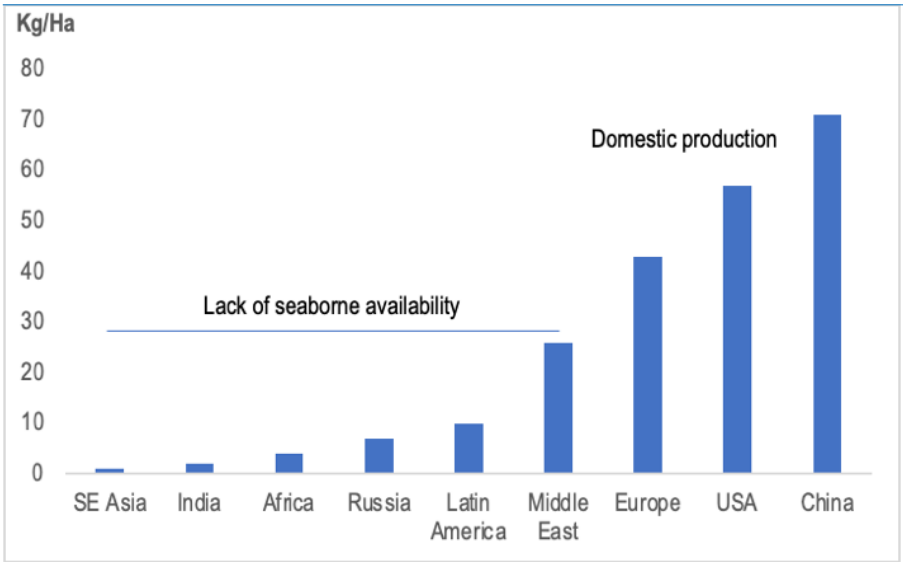
Outlook

Global SOP consumption is believed to be supply constrained at around 7m tpa. This represents about 9% of the total potassium-based fertiliser market. Over the past 20 years, global demand for SOP has grown at about 5% pa. In addition to population growth, SOP demand is being driven by the growth of the middle class. As people become more affluent, they tend to consume more fruits and vegetables, that is crops that require SOP. In 2015, some 3.0bn people were regarded as middle class. This had risen by 24% to 3.8bn by 2020, and is expected to rise by a further 44% to 5.4bn by 2030.

As a result of the current supply constraints in SOP, MOP is sometimes used on crops that would do better with a low chlorine alternative. Sirius Minerals, in its 2019 prospectus (before the acquisition by Anglo American), estimated that 32% of potassium fertiliser use was on crops that are chlorine sensitive. Given global SOP production represents about 9% of the potassium-fertiliser market, the implication is that about 23% of potassium fertiliser use is on crops that would benefit from the use of low-chloride fertilisers. Potentially, the remaining 23% of the market represents unmet demand for SOP.

The extent of this unmet demand is born out in regional SOP application rates. Whereas the US, Europe and China use 43 kg/Ha to 71 kg/Ha SOP, in Latin America SOP application is just 10 kg/Ha, and in Africa it is even lower at just 4 kg/Ha. India uses only 2 kg/Ha, just 3% of the application rate in China. These figures mainly reflect a lack of availability. The US market is served by incumbent producer Compass Minerals, and Europe by K+S Group and Tessenderlo. China produces SOP using Mannheim furnaces. Very little SOP is available on the seaborne market. This suggests there is an excellent opportunity for a new producer such as Emmerson.

Figure 49: SOP application rates by region

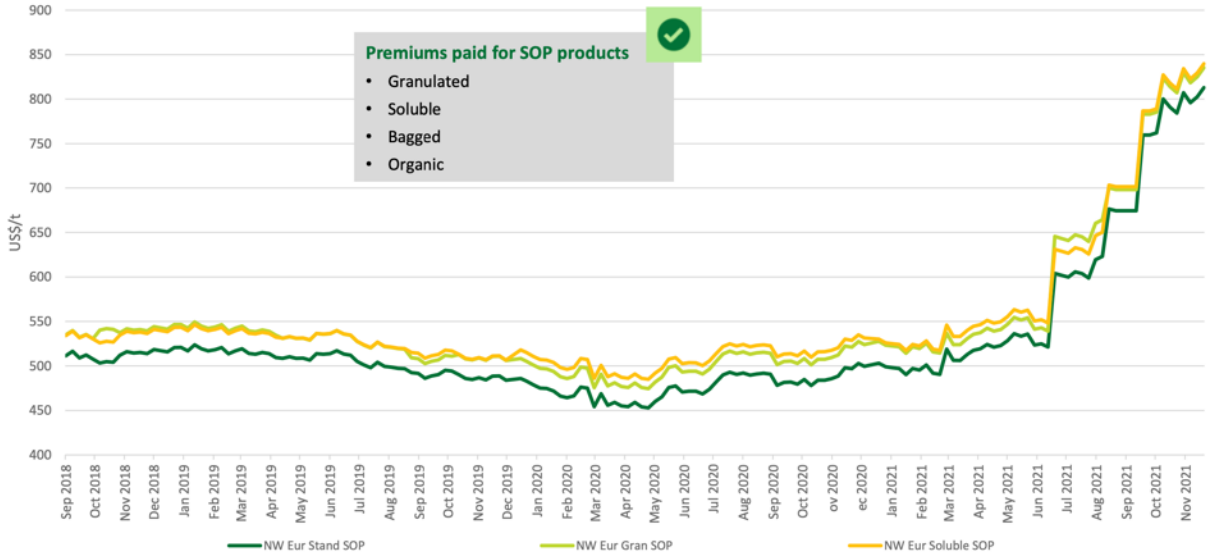


Source: Danakali

Even assuming that a portion of this unmet demand relates to affordability rather than scarcity of SOP, it does suggest that **additional supplies of SOP will find a ready market**. This is especially so given that SOP is used on many high-value crops including tea, coffee, citrus fruits and some vegetables.

Against this outlook for strong demand, there is scarce new supply. SOP supply usually comes from either the Mannheim process, or salt lakes. In the Mannheim process, producers need secure supplies of MOP, and a method of disposing of the waste hydrochloric acid. Unusually, Emmerson's proposed plant at Jorf Lasfar would have both. Increasing environmental controls tend to act against rapid increases in Mannheim furnace capacity. In salt lake production, the focus has shifted to lithium.

Figure 50: SOP prices



Source: Australian Potash

Competitive advantages

With an SOP plant located at Jorf Lasfar, Emmerson would enjoy significant competitive advantages:

Captive source of MOP: About half of global SOP production comes from Mannheim furnaces where MOP typically accounts for 60-70% of costs. Management notes that despite this high cost component, other SOP producers that use the Mannheim process are not integrated into MOP, relying instead on sourcing the key feedstock from third parties. In contrast, Emmerson would have a captive source of potash, located comparatively close to the proposed site of the SOP plant at Jorf Lasfar. Jorf Lasfar is only about 305km from the Khemisset project site.

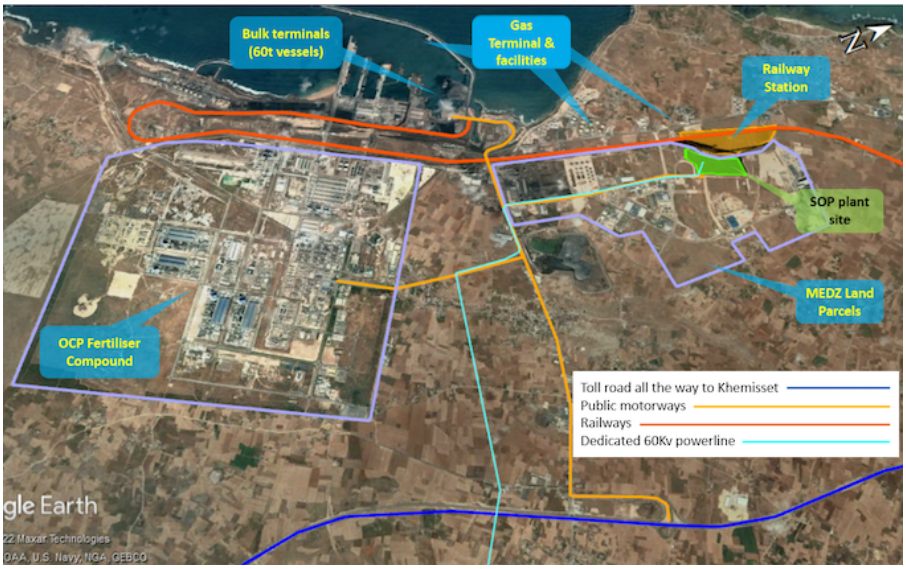
Onsite sulphuric acid: Low-cost and proximal supplies of sulphuric acid are available at the Port of Jorf Lasfar. OCP Group's third integrated fertiliser plant, Jorf Fertilisers 3, was inaugurated in March 2017. The plant hosts a 1.4m tpa sulphuric acid plant, one of the largest in Africa.

Access to global shipping: Jorf Lasfar is a deep water commercial port on Morocco's Atlantic coast, located close to Casablanca and El Jadida. The primary shipments are of fertilisers, chemicals including sulphur, ammonia and sulphuric acid, and petrochemicals. Jorf Lasfar is the primary port for exports of phosphate rock. It is ideally located to serve the primary SOP markets of the US and Northwest Europe. Notably, OCP imports both MOP and SOP into the Port of Jorf Lasfar and would seem to be an ideal customer, or potentially joint venture partner, in SOP, as well as in MOP.

Superb infrastructure: The Port of Jorf Lasfar also hosts important industrial facilities including a desalination plant, thermal power plants and hydrocarbon depots. Emmerson would benefit from availability of "plug-and-play" industrial sites, that include availability of water, gas and power.

Options to sell hydrochloric acid: One of the challenges with the Mannheim process is to dispose of the waste hydrochloric acid. There are a number of options available to Emmerson. There are limestone and phosphate quarries situated within about 50km of Jorf Lasfar where the hydrochloric acid could be neutralised to produce dicalcium phosphate ('DCP', used as animal feed) or calcium chloride, which is used as a de-icing salt.

Figure 51: Overview of potential sites and infrastructure at Port of Jorf Lasfar



Source: Emmerson Plc

Economics

The PEA delivered an estimated post-tax NPV_8 of US$503m based on capacity of 240,000 tpa, an SOP price of US$675/t and an MOP cost US$345/t. Assuming an MOP price of US$550/t, an SOP price of US$770/t and conversion costs of US$100/t SOP, the SOP project would add an estimated US$48m pa (non-inflated) in incremental EBITDA.

Figure 52: SOP project sensitivity to price and discount rate

SOP price, CFR USA	Discount rates				
	5%	8%	10%	12%	15%
525	253	169	129	97	61
600	474	336	270	218	159
675	695	**503**	411	339	257
750	916	671	553	460	355
800	1,063	782	647	541	420

Source: Emmerson Plc

Figure 53: SOP PEA key parameters

Initial operating life	Years	20
Production, annual average	Tonnes	240,000
SOP price, fob Morocco	US$/t	675
Capital cost, inc contingency	US$ m	119
AISC fob Morocco (exc MOP)	US$/t	101
AISC fob Morocco (inc MOP at US$345/t	US$/t	396
EBITDA, annual average	US$ m	74
EBITDA margin, average		42%
Cash flow, annual average, post-tax	US$ m	71
Cash margin, average, post-tax		40%
Post-tax NPV_{10}	US$ m	411
Post-tax IRR		52.1%
Post-tax payback period	Years	<2

Source: Emmerson Plc

Capital costs

Costs for the Mannheim equipment were estimated at US$4.3m per 20,000 tpa twin-furnace unit including piping, electricity and instrumentation. Total capital costs, including site preparation, utilities connections and associated infrastructure were US$92m. With a 30% contingency of US$27m, total capex costs were estimated at US$119m.

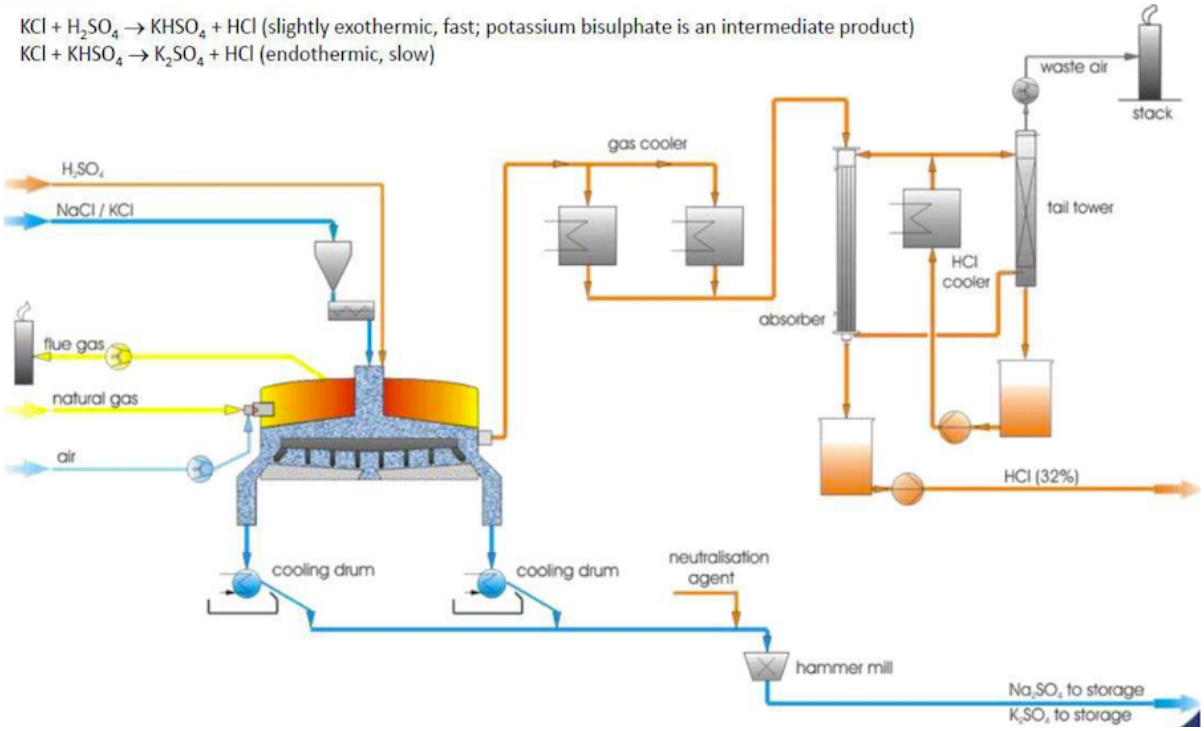
Operating costs

The Mannheim process is well-established and cost metrics are well-understood. Based on vendor quotes for the various operating costs and predicted maintenance, and industry quotes for sulphuric acid, total costs excluding MOP were estimated at US$89/t SOP. Including MOP costs at an estimated delivered cost of US$345/t MOP, and sustaining capital, resulted in a cost of SOP of US$396/t fob Morocco.

Mannheim process well established

Mannheim furnaces work by combining 570kg to 580kg of 98% sulphuric acid and 850kg to 860kg of MOP at a temperature of about 600^{0}C to produce 1,000kg of SOP. The by-product chlorine gas is absorbed by water in absorption towers to produce hydrochloric acid. Atmospheric emissions are limited. Each furnace produces a maximum of around 10,000 tpa, but furnaces can be combined to build facilities with total capacity of 500,000 tpa or more. Nowadays, furnaces are fully automated meaning lower labour costs.

Figure 54: Mannheim process diagram



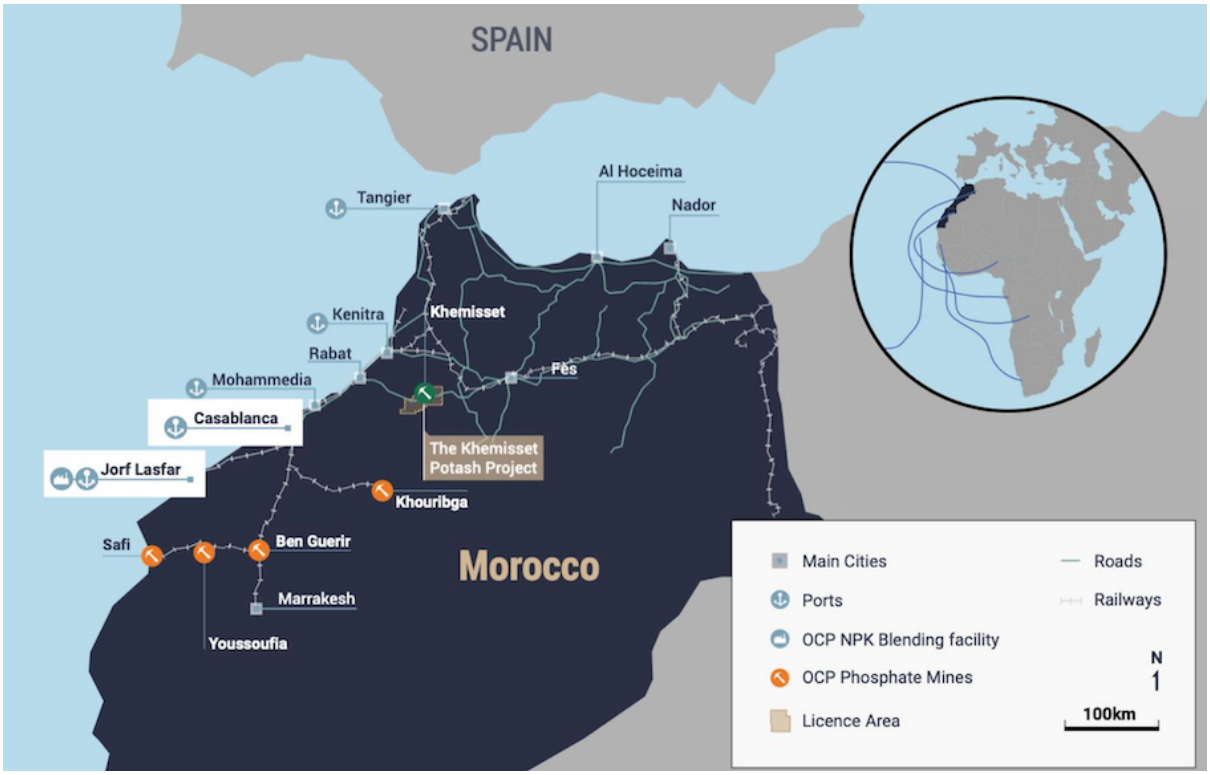
Source: Emmerson Plc

Appendix 1: The Khemisset potash project

Location

The Khemisset potash project is located in Northern Morocco, about 90km east-southeast of the capital city of Rabat, and about 286km south of Tangiers. The port of Mohammedia is located some 150km west of the project, with the Port of Casablanca about 30km further south. Khemisset is located at an elevation of 435m above sea level. The area has a Mediterranean hot summer climate. Temperatures average around 24ºC and range from 15ºC in January to February to 34ºC in August. The wettest months are September to May. The area around the town is cultivated with cereals (mostly wheat) and citrus fruits, and sheep are raised.

Figure 55: Location map



Source: Emmerson Plc

Licence area

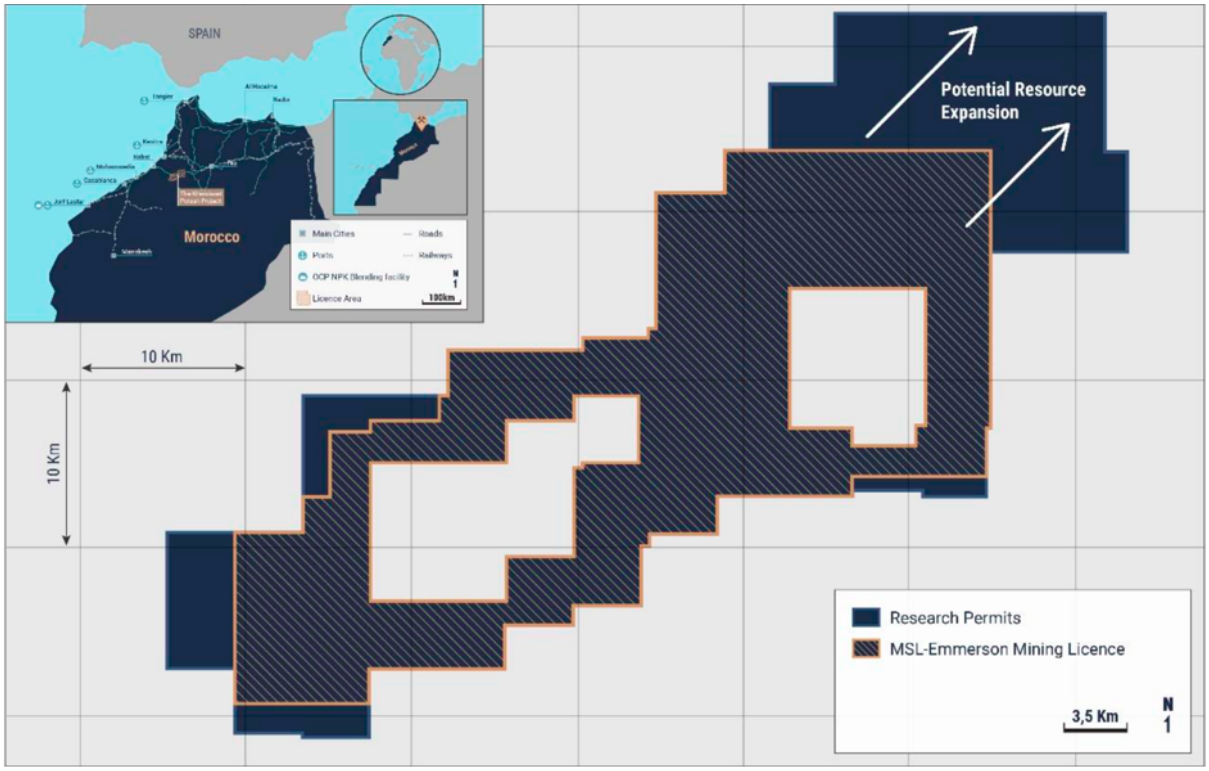
In February 2021, Emmerson received a Mining Licence for the Khemisset project from the Moroccan Ministry of Energy, Mines and the Environment. The licence covers an area of 558 km^2. It provides Emmerson with exclusive rights to develop and mine the potash deposit within the Mining Licence area. Emmerson's mineral resource is wholly within the Mining Licence area; **no further mining permits will be required for future potential expansions or mine life extensions from the existing resource.** As part of the grant process, 22 Research Permits, including the already fused Research Permit were amalgamated into a single Mining Licence.

The Mining Licence is valid for an initial 10-year period and is renewable in 10-yearly increments until

the resource is exhausted. Emmerson has retained its rights to explore in the highly prospective Research Permits areas around the Mining Licence area, including the extensions to the northeast of the project.

The 'gaps' in the licence area are areas held by OCP Group. OCP secured some tenements with the idea of producing potash in-house. Historical drilling suggests these areas are predominantly carnallite mineralisation, typically with lower grade, and unlikely to economically viable as currently held. This is another factor suggesting OCP would benefit from some form of tie-up with Emmerson.

Figure 56: Map of licence area



Source: Emmerson Plc

Geology and mineralisation

In north-western Africa, the Triassic period was marked by tectonic activity related to the separation of North America from Africa and Eurasia. This extensional regime gave rise to a complex network of predominantly northeast trending half-grabens across north-western Africa (and also north-eastern America). In Morocco, there are a number of geologically important Triassic aged graben basins including the Khemisset Basin (marked KB in Figure 57) and the Boufekrane Basins that opened to towards the north, and the Doukkala and Berrechid Basins that opened towards the axis of the Atlantic rift.

These half-grabens filled with terrigenous clastics and evaporites that overlay the basalt rocks beneath. According to Van Houten, 1977, and Manspeizer et al, 1978, the rift sediments have been dated to Carnian (237 Ma to 227 Ma) to Sinemurian (199.3 Ma to 190.8 Ma) age. The deposition of evaporites is believed to have ended with the onset of a major marine transgression in Sinemurian time.

Figure 57: Locations of the Lower Mesozoic Moroccan salt basins

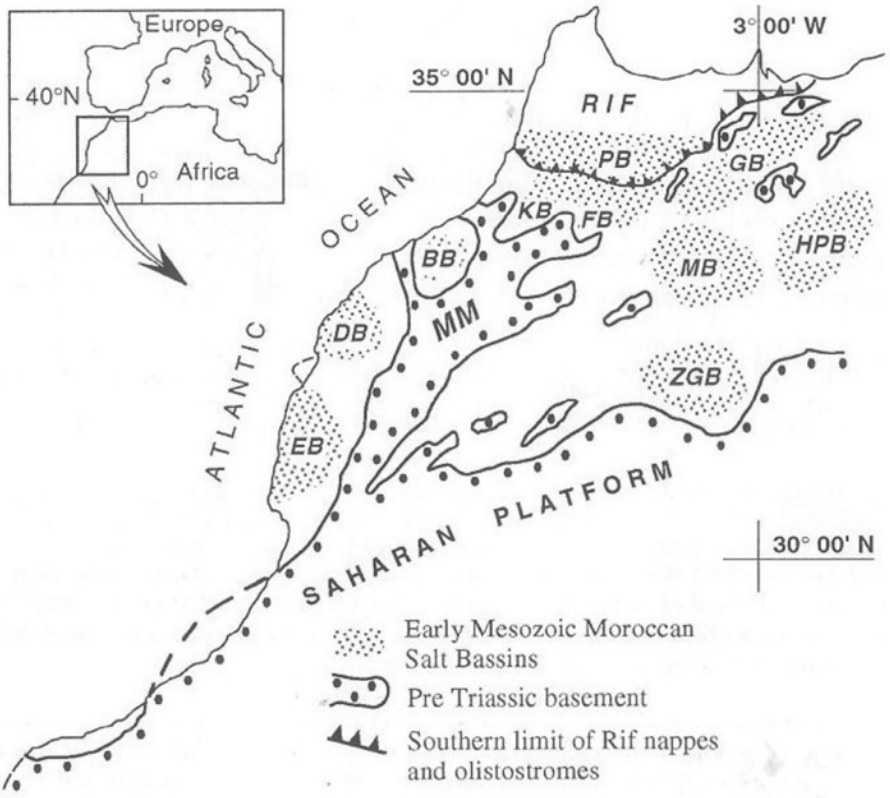
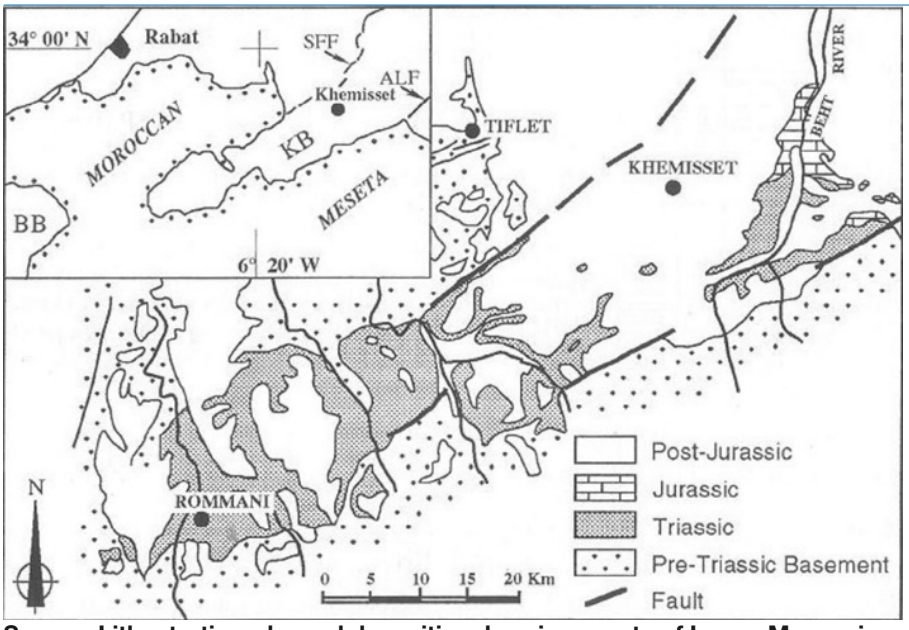


Fig. 1. Locations of major Lower Mesozoic Moroccan Salt Basins. Key: BB: Berrechid Basin; DB: Doukkala Basin; EB: Essaouira Basin; FB: Boufekrane Basin; GB: Guercif Basin; HPB: Haut-Plateaux Basin; KB: Khemisset Basin; MB: Moulouya Basin; MM: Moroccan Meseta; PB: Prerif Basin; ZGB: Ziz-Guir Basin.

Source: Lithostratigraphy and depositional environments of Lower Mesozoic evaporites and associated red beds, Khemisset Basin, north-western Morocco, Mohammed Et-Touhami, 2000

Figure 58: Location and simplified geology of the Khemisset Basin, showing the Khemisset Basin (KB), the Berrechid Basin (BB), the Ain Lorma Faiult and the Sidi Fili Fault (SFF)

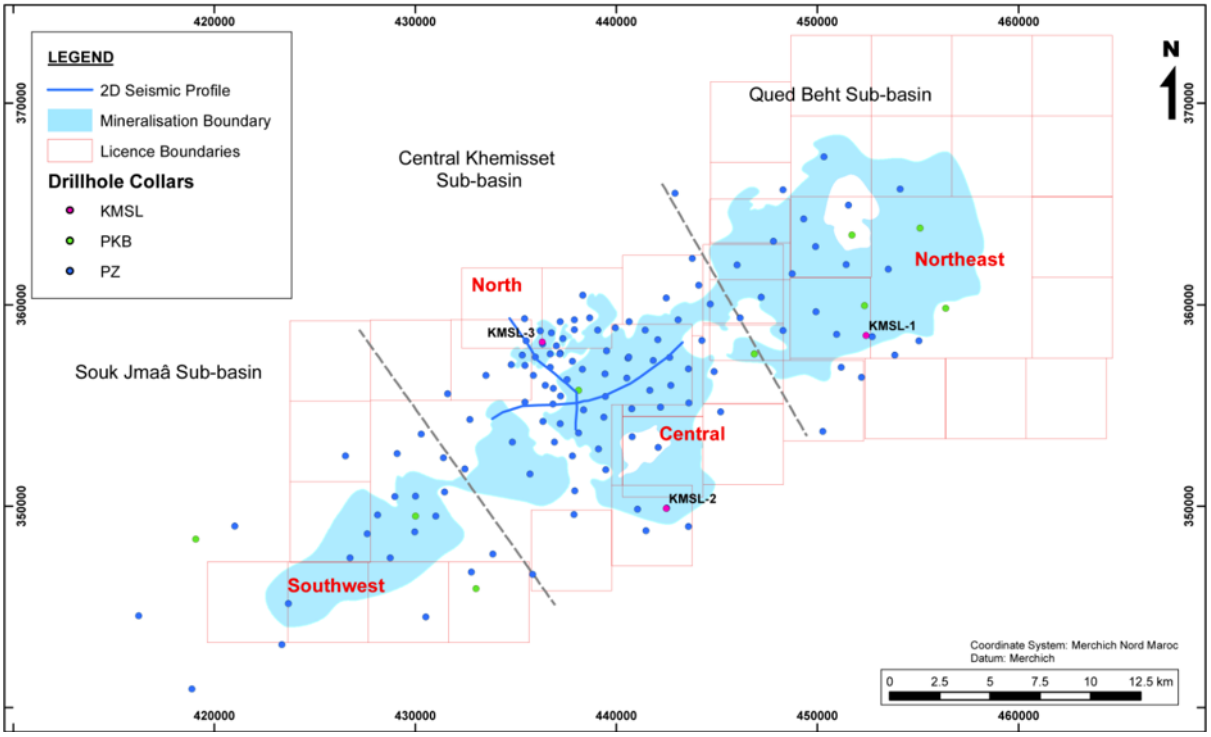


Source: Lithostratigraphy and depositional environments of Lower Mesozoic evaporites and associated red beds, Khemisset Basin, north-western Morocco, Mohammed Et-Touhami, 2000

The Khemisset potash basin is a half-graben approximately 60 km long and 20 km wide. It is bounded by Paleozoic uplifts of Moroccan Meseta, a highly deformed quartzite schist and cut by mainly northeast-southwest oriented faults. The Late Triassic deposits only outcrop in the southwestern portion of the basin. The deposits dip gently (0-10 degrees) towards the northeast and are overlain by Early Jurassic marine dolostones and dolomitic limestones, or directly by Miocene marls and conglomerates. The entire sequence has a maximum thickness of 1,000m in the axial part of the basin. The town of Khemisset is located close to the northwestern boundary of the basin.

The Khemisset basin is divided into three distinct sub-basins that are separated by sterile areas where potash mineralisation is either absent or very thin. Four deposit areas have been identified within these three basins.

Figure 59: Plan view of Khemisset sub-basins



Source: Emmerson Plc

Southwest deposit: situated in the Souk Jmaâ sub-basin, the potash horizon occurs 500m to 600m below surface. It is generally flat-lying, dips 1-3° to the north, has an average thickness of 3.0m (ranging from 0.4m to 5.4m) and an average grade of 9.4% K_2O (ranging from 7% to 12%). The deposit hosts a central carnallite zone that is surrounded by sylvinite.

Central deposit: situated in the Central Khemisset sub-basin, covering an area of 28km^2. The potash horizon occurs 430m to 960m below surface, dips up to 8° to the northeast and varies in thickness from 1.1m to 9.4m with an average thickness of 3.7m. The deposit comprises a central carnallite zone, with sylvinite to the southwest and northwest, and mixed intermediate zones in between. Grades vary from 6% to 16% K_2O, with an average grade of 9.5%.

North deposit: also situated in the Central Khemisset sub-basin, and covering an area of 3km^2, the potash horizon lies 490m to 800m below surface, mostly below Khemisset city. The deposit has an average thickness of 3.0m (ranging from 0.3m to 8.2m) and dips 7° to the northeast. Potash grades vary from 5% to 17% K_2O with an average grade of 10%. The main potash mineralisation is sylvinite,

though there is a mixture of carnallite and sylvinite at the southern edge of the deposit.

Northeast deposit: situated in the Oued Beht sub-basin, the Northeast deposit covers an area of about 53 km^2. The potash horizon occurs at 390m to 1,170m beneath surface, and dips gently at 6° to the northeast. The deposit has an average thickness of 1.7m (ranging from 0.2m to 5.2m) and an average grade of 9% K_2O (ranging from 4% to 15%). The distribution of potash mineralisation in the Oued Beht sub-basin is more complex, displaying a mixture of carnallite, rinneite and sylvite. One fault has been interpreted, though management believe that other faulting, parallel to the NE-SW trending structures are likely. These are not anticipated to meaningfully impact mining operations.

Historical work

The Khemisset basin was first explored for potash in the 1950s by Bureau de Recherches et de Participation Minières (BRPM) and Mines domaniales des potasse d'Alsace (MDPA). BRPM undertook further exploration in the 1960s with assistance from the United Nations Development Program (UNDP). Surface geophysical surveys, 2D seismic surveys and surface drilling have been undertaken.

Figure 60: Historical drilling work at Khemisset, and Emmerson drilling

Date	Work completed
1955 to 1958	Nine drill holes, 560m to 1,302m in depth, and totalling 7,525m Four of these drill holes are within Emmerson's tenements, of which two intersected potash
1962 to 1969	A further 124 drill holes completed, totalling some 75,000m Of these, 61 drill holes totalling some 35,000m lie with Emmerson's tenement areas; 35 of these holes intersected potash mineralisation In the central area, the basin has been drilled to about 1,500m
2016	Moroccan Salts Limited, a 100% owned subsidiary of Emmerson completed a 3 hole verification program for a total of 1,543m
2019	Emmerson completed a 9 hole infill drill program totalling 6,485m that provided new geological data in the Oued Beht basin, which is the target of the initial mining operations

Source: Emmerson Plc

Exploration target

The exploration target draws upon the results of historical oil drilling and seismic lines. The target area lies in the southwestern section of the Saiss Plain. Between1939 and 1954, Société Cherifienne des Pétroles drilled some 30 oil wells and completed a large amount of seismic reflection profiles that covered the Saiss Plain south of the Prérifaine. Emmerson notes that four of these wells, HH-4, OF-2, AY3 and NS1 provide insight into the potential potash endowment of the basin, and two intersected potash. A gravimetric survey was completed in the 1950s that demonstrated a well-defined NE-SW trending negative Bouger residual gravity anomaly that defines the extension of the Khemisset Basin for at least 30km to the northeast of the current resource area, all the way to the Prérifaine Front where oil well hole NS1 intersected potash.

Historic drill holes PZ116 and PKB-1, which are located in the far northeast of the Oued Beht sub-basin both intersected significant grade and thickness of potash mineralisation:

- PZ116 intersected 1.84m from 1,022.96m of sylvinite, grading 10.2% K_2O
- PKB-1 intersected 2.59m from 1,066.80m of sylvinite/carnallite grading 11.39% K_2O

The exploration target is limited to areas where potash mineralisation is modelled to depths of

1,500m or less. Management considers 1,500m to the practical limit for conventional, underground room and pillar mining. The Boulby Potash Mine in the United Kingdom, now owned by Israel Chemicals (ICL), is mined to this depth. Anglo American is planning to mine the Woodsmith Mine to beyond 1,500m. Sierra del Perdon in Spain was mined to a depth of some 1,200m.

The exploration target is constrained by a number of factors:

- The depth to potash estimate stems from the contour of the base of the basalt which is modelled using information from drill holes PKB-1, PZ116 and HH4. Depth is constrained by the NW and SE basin boundaries, which are ascertained from historical drilling and seismic surveys.
- The lower end of the estimated seam thickness of 1.5m represents the assumed minimum mining width of conventional underground mining, and the minimum expected thickness for resource estimation. The upper seam thickness of 3.5m is slightly lower than the widest seam thickness encountered in the Oued Beht sub-basin. The mid-point of 2.5m is consistent with the seam thickness in the north-eastern part of the established Khemisset resource estimate.
- The exploration target is based on a mineral composition of 75% sylvinite and 25% carnalite in the potash seam, and a corresponding density of 2.03 tonnes/m^3.
- The exploration target tonnage range is based on a model of 30,450 tonnes per Ha for a 1.5m thick potash seam and 71,050 tonnes per Ha for a 3.5m seam
- In the north-eastern part of the mineral resource, observed grades range from 5% K_2O to as much as 20% K_2O in narrow seams that correspond to a grade of about 14% K_2O over a 1.5m intercept

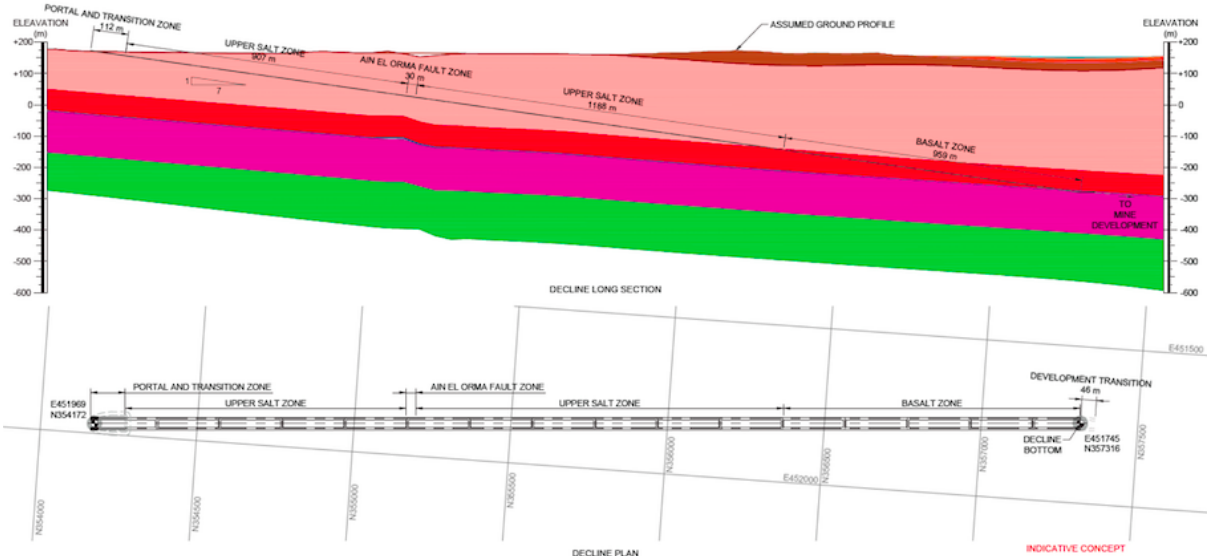
Mining

Khemisset will be mined using conventional room-and-pillar mining techniques which are commonly employed in most of the world's potash mines. Room and pillar mining is used for flat lying deposits, typically with thicknesses of 1.5m to 10m. The 'rooms' and pillars are usually arranged in regular patterns, with the pillars being left behind to support the roof of the mine. While some material (the pillars) is left behind, room and pillar mining is less capital intensive than longwall mining, is readily mechanised, and has more faces that be mined. As a result, productivity is high, and unit extraction costs are low. Emmerson intends to use contract miners for development of the mine as well as production. Run-of-mine production is expected to be about 5.7m tpa.

A trade off study, conducted as part of the Feasibility Study, concluded that while both shaft and decline access are viable at Khemisset, in terms of cost, timeline and execution risk, dual declines with a conveyor transport system were the optimal solution. This reflects two factors. One is that there are no overlying fresh water aquifers in the targeted potash basin which would increase technical difficulty and risk. The Feasibility Study states that of the 136 drill holes completed at Khemisset, none have provided any evidence of any major aquifer unit in the project area. Another factor is that most of the development is through salt, enabling rapid development. Twin access declines will also act as ventilation intake and return airways. Emmerson estimates mine development will take just 14 months.

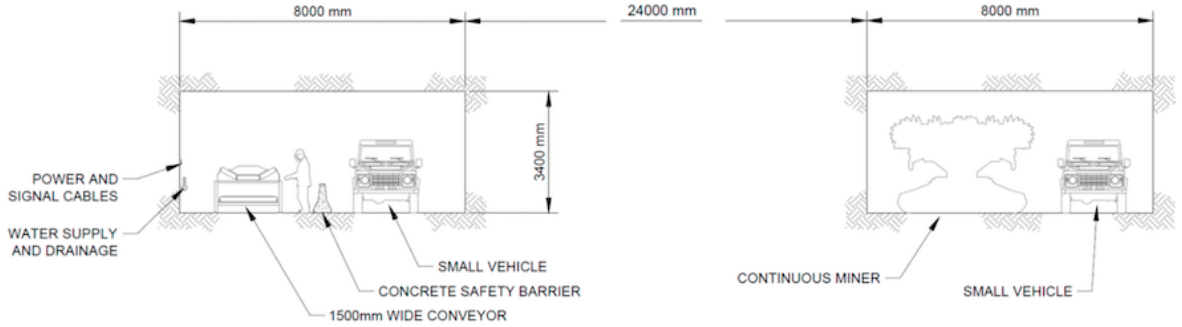
The twin access declines, about 3,200m long, will be driven at a gradient of 1:7, reaching the potash horizon about 450m below surface. A 24m barrier will separate the two declines, far enough to

Figure 61: Long section of the proposed decline



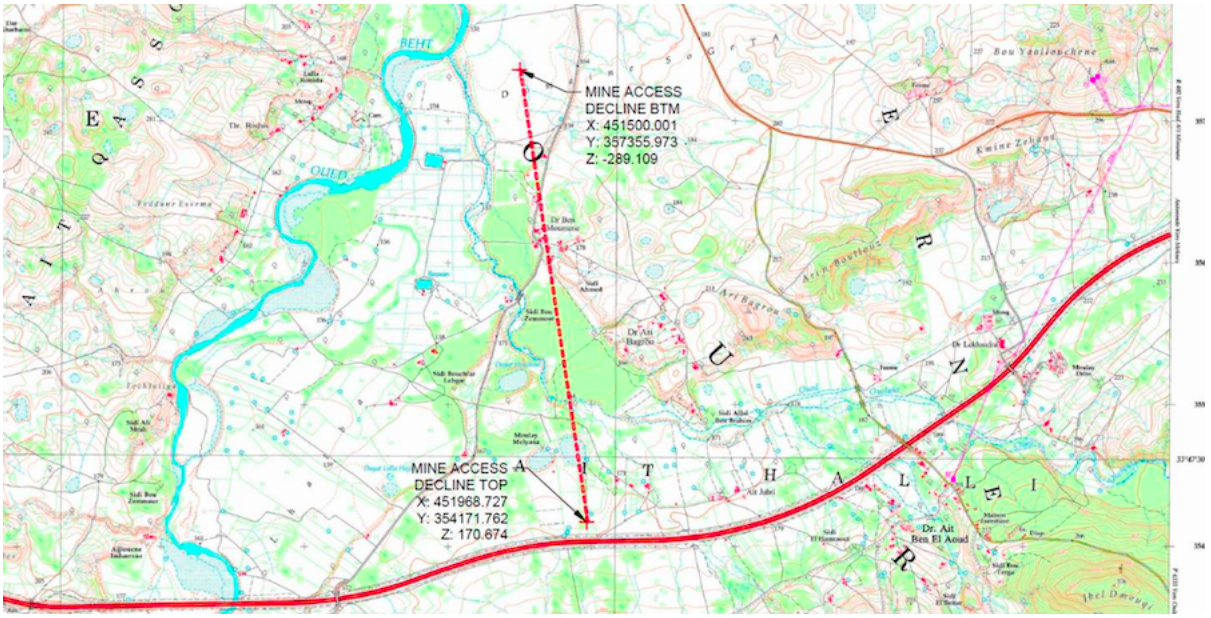
Source: Emmerson Plc

Figure 62: Cross section of the proposed decline



Source: Emmerson Plc

Figure 63: Plan view of the proposed mine decline



Source: Emmerson Plc

isolate one decline from the other if needed, but close enough to minimise the cost of connecting cross cuts. Cross cuts will be spaced every 200m which is both efficient for construction and allows the use of 200m power cables, a typical tether length.

Air cooling is included in estimated costs, and water cooling will be required for coolant water for the continuous miners. The temperature gradient is estimated at 17.6°C (average surface temperature) plus 1°C per 40m of depth. At the maximum planned mining depth of 1,000m, virgin rock temperature is estimated at 42.6°C.

Processing

Given the impracticalities of separating the plant feed by ore type, the flowsheet has been designed to process a mixed ore feed comprising sylvinite (KCl), carnallite ($KMgCl_2(H_2O)_6$), and rinneite ($K_3Na[FeCl_6]$). The flowsheet is based on decomposition, hot leaching and crystallisation. This is a standard processing route for carnallite rich ores for which capital and operating costs are well-understood. The processing flowsheet comprises:

- Two-stage crushing comprising a first stage 12-15mm crush, and a second stage 0.4mm crush, with this smaller size determined by the rinneite component of the ore feed. Tests conducted by the Saskatchewan Research Council demonstrated that 0.4mm size was required to achieve efficient decomposition of the rinneite; in the absence of rinneite, the second stage crushing could be omitted.
- Decomposition of the rinneite and carnallite to solid KCl, mixed with NaCl, and rejection of the high-Mg and high-Fe brine. Residence time of the ore in decomposition is 1.5 to 2.0 hours. Mixed, crushed ore is combined with recycled brine and fresh water. The following reactions occur:

$$\text{Sylvite: } KCl\ (s) \longleftrightarrow KCl\ (a)$$

$$\text{Carnallite: } KMgCl_2(H_2O)_6\ (s) \rightarrow 6H_2O\ (l) + KCl\ (s) + MgCl_2\ (a)$$

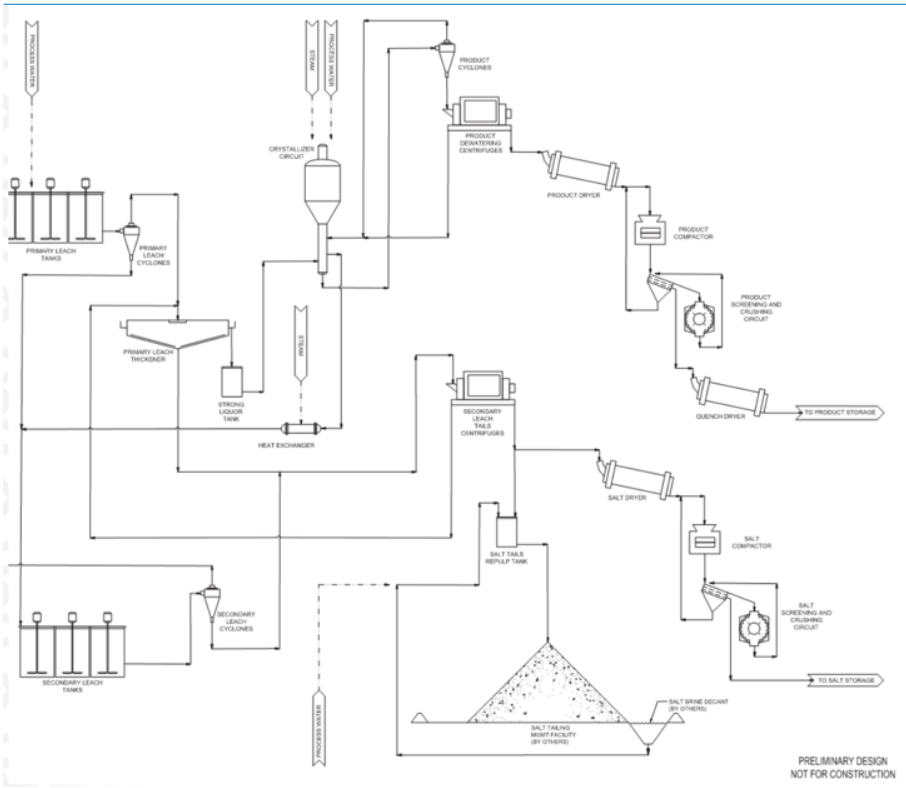
$$\text{Rinneite: } K_3Na\ [FeCl_6]\ (s) \rightarrow 3KCl\ (s) + NaCl\ (a) + FeCl_2\ (a)$$

The resulting slurry from the decomposition stage is dewatered and washed to separate the sylvite/halite from the brine and to rid the solids of the remaining Mg (from the carnallite) and Fe (from rinneite). This Mg and Fe containing brine is partially recycled to the decomposition circuit, with the rest pumped to a brine storage pond for eventual disposal via deep well injection. This washing stage is essential. Mg can foul the crystallisation circuit. Fe renders the brine acidic which would create the need for alloy construction and added cost.

- Hot leaching of KCl from KCl/NaCl solids
- Crystallisation and de-brining of purified KCl product
- Drying, compaction, and sizing of KCl product and the NaCl product
- Slurry transport of remaining NaCl tailings to storage

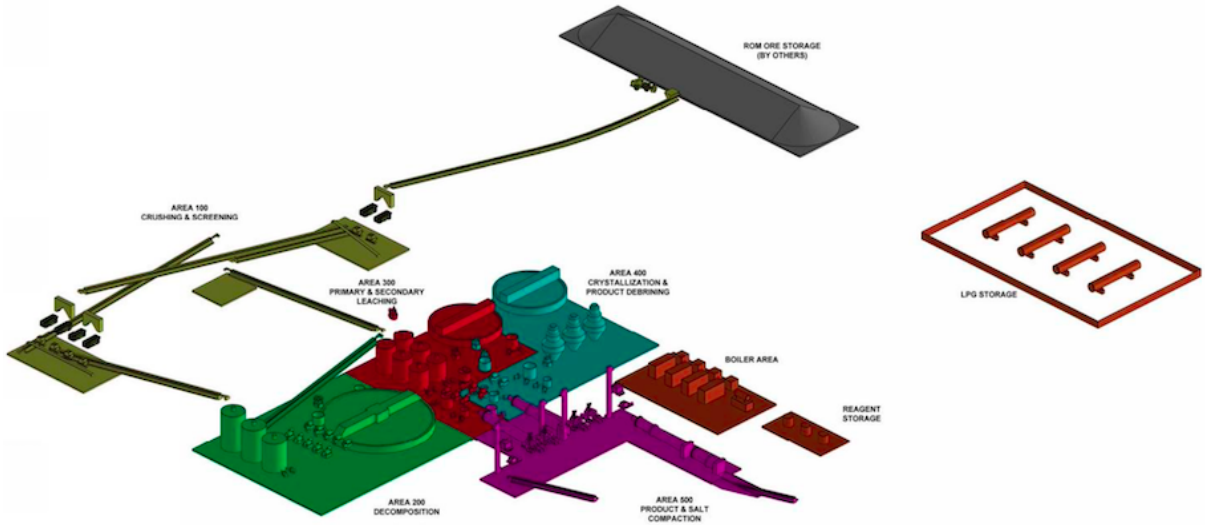
Based on the average mineral composition for each mining panel, recoveries are expected to reach an overall recovery rate of 87.2%.

Figure 64: Proposed flow sheet for Khemisset



Source: Emmerson Plc

Figure 65: Isometric view of the plant layout



Source: Emmerson Plc

Salt by-products

Salt (NaCl) is produced as the primary by-product, typically with 95% purity. Khemisset will produce about 4.5m tpa over the life of the mine. Emmerson intends to sell 1.0m tpa of this into the de-icing salt market. The de-icing salt market in the eastern states of USA (New York, Massachusetts, Baltimore, Maine, New Jersey, and Connecticut) is about 10m tpa, and more in severe winters, of 95% pure NaCl. Some 80% of this requirement is imported, predominantly from Chile, Mexico and

Morocco. Prices in the US are typically US$55/t to US$65/t. At this price level, Khemisset should generate good margins from salt sales. The capex cost for a 1.0m tpa sale plant is estimated at US$24m.

Figure 66: Estimated costs for the salt business

Operating cost item	US$/t NaCl
Process plant	5.8
Labour and materials	1.1
Compacting	1.7
Cash cost to mine gate	8.6
Trucking to Port of Casablanca and port charges	14.1
All-in sustaining cost (Fob Casablanca)	22.7
Freight to East Coast USA	10.0
All-in sustaining costs to East Coast USA	32.7

Source: Emmerson Plc

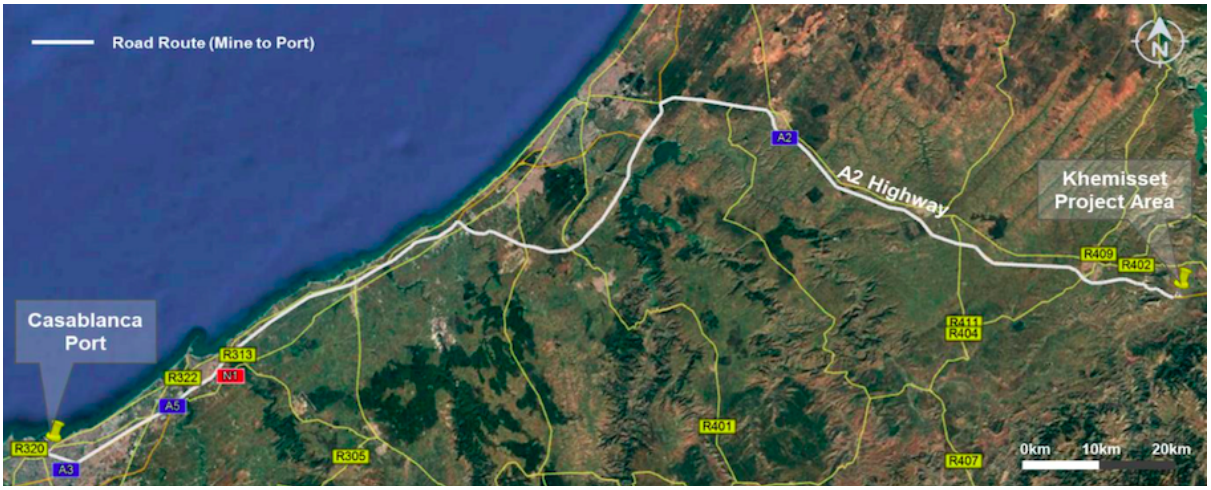
According to USGS, US salt consumption was 54Mt in 2021, of which about 23Mt (42%) was de-icing salt. Imports reached 16Mt, about 30% of total consumption. Compass Minerals is guiding for salt sales of 12.5Mt to 13.2Mt in fiscal 2022.

Infrastructure

Roads and access

Emmerson's plan is to truck product from the project location to the Port of Casablanca. The A2 highway, a high quality, four lane highway, crosses the project area, and passes close to the proposed project site. It connects via other high quality roads to the port. Emmerson will need to build the connecting roads and slip lanes, about 3.2km of which will be paved.

Figure 67: Project location and main route to the Port of Casablanca



Source: Emmerson Plc

Figure 68: The A2 highway crosses the project area

Source: Emmerson Plc

Power

Morocco has invested heavily in power generation and transmission infrastructure, and has also developed a renewables framework. The Office National de l'Electricité et de l'Eau Potable (ONEE) is the leading operator in electricity, drinking water and liquid sanitation. ONEE has 11GW of installed capacity, of which 34% comes from renewables. As Morocco has become something of regional crossroads for power exchange between Africa and Europe, ONEE has been able to develop strong interconnections with neighbouring countries.

The Khemisset project location is close to a number of Very High Voltage power lines that connect the Rabat and Meknes regions and are considered strategic to the national grid. ONEE has granted approval on feasibility for Khemisset to be connected to one of these lines, the closest of which is less than 15km from the project site. These lines are maintained to very high standards; ONEE expects only 8 hours pa of planned outages for preventative maintenance. The connection to the Khemisset substation will be of similar high standard meaning that Emmerson is not expected to have to invest heavily in contingency power facilities.

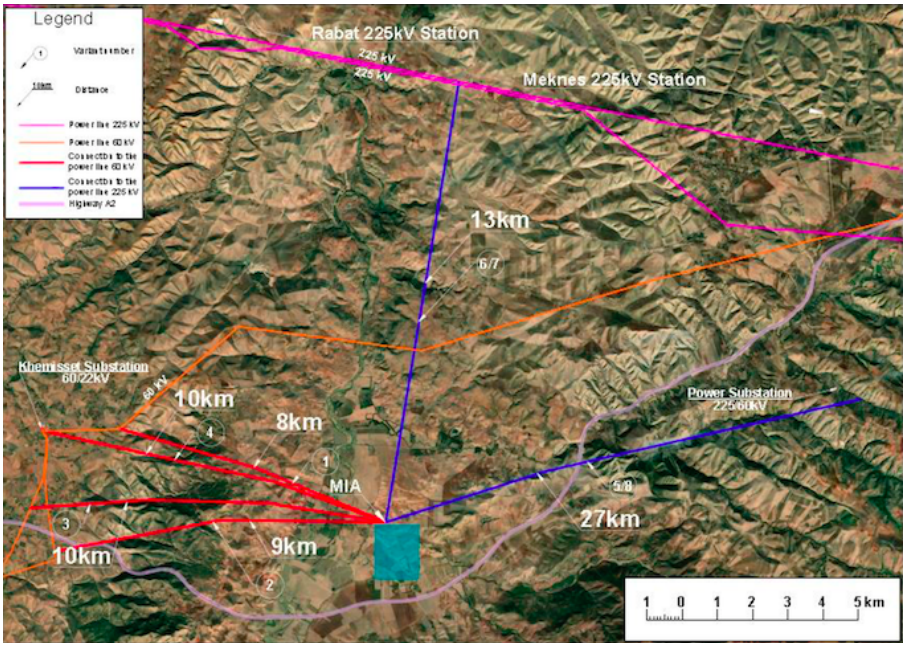
The Feasibility Study envisages the installation of 1,000 kVA of onsite generation capacity as an emergency Uninterruptable Power Supply, which is mandatory for health and safety protocols. It will provide back-up power for underground utilities including lighting, rescue, and ventilation.

Emmerson believes it stands to benefit significantly from the Moroccan Government's renewables legislation. The company has signed an MOU with Voltalia, a global renewable energy group, and hopes to achieve both a substantial reduction in carbon footprint and significant savings in tariffs.

Gas

A gas supply will be needed for the processing plant where brines need to be heated, and for the drying circuits. Emmerson announced in February 2020 it was in discussions with a leading LPG storage and distribution company with respect to a long-term supply partnership. Emmerson's partner is expected to be responsible for the design, supply, installation, and maintenance of all onsite gas storage facilities, with Emmerson providing civil works, electricity and other support services. Emmerson would have no capex responsibilities. Gas prices would be determined by reference to global market prices, freight costs and taxes. Emmerson will be able to hedge its gas costs to protect against short term volatility. Morocco is a net importer of gas.

Figure 69: Selected option for project connection to the national grid



Source: Emmerson Plc

Figure 70: Moroccan gas infrastructure relative to the Khemisset potash project

Source: Emmerson Plc

Appendix 2: Potash basics

Vital elements

Potassium (K), together with nitrogen (N) and phosphorus (P), are the three primary macronutrients used in fertilisers to improve soil fertility and crop production and yields. Each nutrient serves a different function in plant health. Potassium improves the water regime in plants. It helps regulate plant metabolism, promotes flowering, and improves hardiness, meaning plants ability to withstand the stresses of drought, disease, cold, weeds and insects. Nitrogen is a building block of protein and chlorophyll and thus an important determinant of plant growth and crop yield. Phosphorus is required for photosynthesis and seed germination, and is essential to root development. Nutrients are naturally occurring, but are depleted through farming, and must be replenished through the application of fertilisers.

Fertilisers are sold with 'N-P-K' labels that indicate the content of the product. A '5-10-15' label, for instance, would indicate the product contains 5% nitrogen, 10% phosphorus, and 15% potassium in the form of potash. The optimal blend of these nutrients depends on various factors including the species of plant, and the soil conditions.

Potash

The term 'potash' refers to a variety of mined and manufactured potassium salts in water soluble form. 'Potash' is used to refer to potassium chloride (KCl) as well as sulphate, oxide and nitrate. Nearly all potash (95%) is used in fertilisers where its use helps to improve crop yields as well as improving the colour, flavour and texture of crops used as foods, feed and in biofuels. **Potash has no known substitutes in fertiliser use.**

The two main products are potassium chloride (KCl), known as muriate of potash (MOP) and potassium sulphate, known as sulphate of potash (SOP). **MOP is the most commonly used potash fertilizer, representing about 90% of the total market**. MOP is appropriate for carbohydrate crops such as wheat, barley, oats and palm oil, and is suitable for plants that are resilient to chloride such as sugar beets, celery and others. The chlorine content means it is beneficial to soils that exhibit chlorine deficiencies. SOP is used predominantly in soils with high salinity and because it is less soluble in water which means a longer residence time in soils than MOP in areas with high rainfall, and on chlorine sensitive crops. Potassium based fertilisers include:

Potassium Chloride (KCl or MOP): Most common form of potash, it comprises 50-52% K (60-63% K_2O) and 45-47% chloride. Particularly effective on carbohydrate crops such as wheat and barley.

Potassium Sulphate (K_2SO_4 or SOP): SOP comprises 50% K_2O and 17.5% S. It is primarily used in the cultivation of fruits, vegetables, berries, potatoes, beans, cocoa, tobacco and tree nuts. SOP is an important source of sulphur, a secondary macronutrient.

Potassium Nitrate (KNO_3): A speciality fertiliser comprising 44% K_2O and 13% N, and used on chlorine sensitive crops that benefit from nitrogen addition.

Sulphate of Potash Magnesia (SOPM): A speciality fertiliser comprising 28% K_2O, 16% S, and 10% MgO that is used on high-value crops.

Figure 71: Chloride tolerance of various crops and applicable fertilisers

Chloride Tolerance of Various Crops		
Tolerance	**Crop Type**	**Recommended Product**
Chloride-loving	Sugar beet, fodder beet, celery, Swiss chard, coconut	Muriate of Potash (MOP)
Chloride tolerant	Cereals, maize, oilseed rape, asparagus, cabbage, beetroot, rhubard Grassland, clover, oil palm, rubber, rice, groundnut, cassava, soybean, sugar cane, banana, cotton	Muriate of Potash (MOP)
Partly chloride tolerant	Sunflowers, grape vines, stone fruits, blackcurrants, seed potatoes, potatoes for human consumption, tomatoes, radish, kohirabi, peas, spinach, carrots, leek, horse-radish, chicory, pineapple, cucumber, kiwifruit, cofee, tea	Sulphate of Potash (SOP)
Chloride sensitive	Starch potatoes, potatoes for processing, tobacco, redcurrants, gooseberry, raspberry, strawberry, blackberry, blueberry, mango, citrus, pepper, chilli, avocado, cashew, almond, peach, cocoa, hops, pomes and stone fruits (especialy cherries), bush beans, broad beans, cucumber, melon, onion, lettuce, early vegetables, all crops under glass, conifers, flowers and ornaments as well as seedlings and transplants of most plants	Sulphate of Potash (SOP)

Source: SOPerior Fertilizer Corp

Potash deposits

Geology and mineralogy

Potash deposits most commonly occur in halite-rich evaporite sequences in pre-Quaternary sedimentary marine and terrestrial basins. These basins had limited siliciclastic input, formed in arid climates, and had restricted seawater access, though periodic replenishment (Hardie, 1991; Warren, 2010). Potash mineralisation results from the progressive concentration of saline solutions and cyclic or repeated precipitation of carbonates, gypsum, salt, and potassium and magnesium salts. In many basins, there are cyclic sequences of varying scale and carbonate to salt ratios, with potash mineralisation only present in the youngest precipitations.

The primary potash deposits tend to be flat lying or gently dipping and strata bound. They can extend for hundreds of thousands of square kilometres. Economic horizons are typically one metre to tens of metres thick, though repeated precipitation can result in thicknesses of up to 800m to 1,200m, as found in the Pripyat Basin, Belarus. Potash bearing salts are highly soluble. As a result, they are rarely exposed at surface except in very arid areas such as in Ethiopia, Eritrea and Iran. Deposits may be preserved by being overlain by relatively impermeable sedimentary sequences.

The most important potash minerals from an economic perspective are sylvite and carnallite. Other potash bearing minerals include polyhalite (such as at Anglo American's Woodsmith mine in the UK), langbeinite, kainite and leonite.

Strata bound potash deposits typically display large tonnages because of the wide areas they cover. Deposits range from tens of millions of tonnes to more than 200m tonnes K_2O in the Elk Point Basin, Canada. Grades also vary widely and depend on host mineralisation and the abundance of the potash mineral and halite. Sylvite contains 63.2% K_2O. Carnallite has a maximum of 16.9% K_2O.

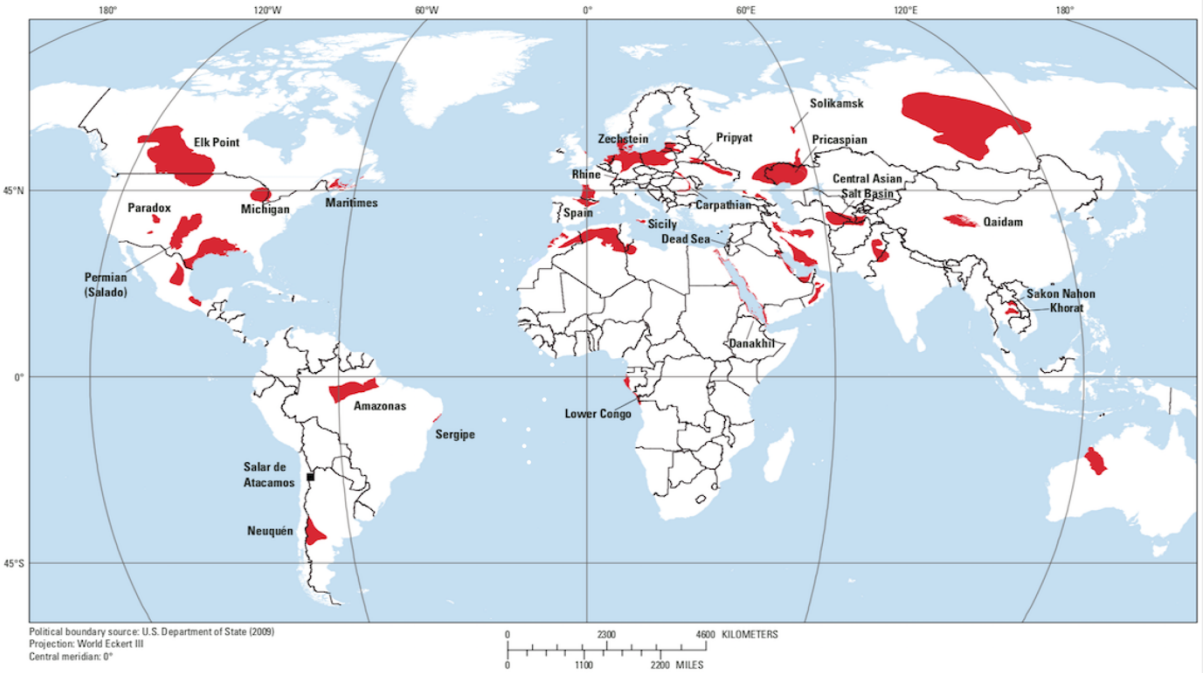
Major deposits

The world's largest potash deposits are typically found in North Hemisphere salt basins. According to USGS, important deposits include those at Elk Point, Maritimes, Paradox, and Salado Basins in North America; in the Zechstein, Pripyat, Solikamsk, and Pricaspian Basins in Europe; in the Danakali and Lower Congo Basins in Africa; at the Dead Sea, Khorat, Sakon Nakon, Qaidam, and Central Asia Basins in Asia; and in the Amazonas, Sergipe, and Neuquén Basins in South America. USGS notes the Elk Point Basin may contain the largest known accumulation of potash, with some 40% of the known potash reserves.

Mining

Potash is usually recovered using either convention underground mining techniques or solution mining. Stratabound deposits are typically worked using room-and-pillar, panel, or longwall mining techniques. In solution mining, a hot brine is injected into the potash deposit to selectively dissolve the ore soluble potash minerals, leaving the halite and insoluble minerals in-situ. Solution mining is mostly used in North America; it is used in the Elk Point, Paradox, and Salado Basins.

Figure 72: Globally significant potash-bearing marine evaporite basins



Source: U.S. Geological Survey assessment of global potash production and resources, 2016

According to USGS, conventional mining methods are employed to depths of about 1,500m, for instance in Germany (Beer, 1996). Solution mining can be used to depths of as much as 2,500m, as in Michigan (Orris et al., 2014).

U.S. Geological Survey assessment of global potash production and resources—A significant advancement for global development and a sustainable future. GSA Special Papers. By: Mark D. Cocker, Greta J. Orris, and Jeff Wynn. https://pubs.er.usgs.gov/publication/70160599

Potash salts are highly soluble, and salt deforms under pressure which can give to rise to plastic flow problems. Further, the influx of nearby groundwater can cause the loss of the ore body. This means that greater precautions have to be taken compared to in other underground mining. During shaft sinking, the ground has to be frozen to prevent such contamination. Over the years, a number of mines have been lost or damaged through flooding or salt dissolution. This results in increased costs of exploration, development, and ultimately production.

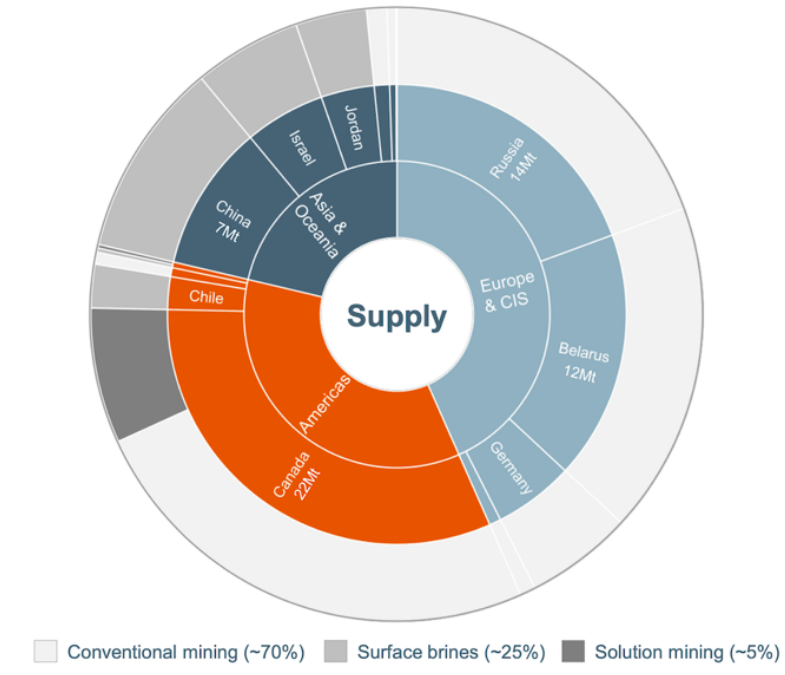
Potash grades

Historically, the practice in Saskatchewan has been to report potash grades in terms of potassium oxide (K_2O). This is the basis adopted by FAO. International projects are usually reported in terms of potassium chloride (KCl). The conversion from K_2O to KCl is based on their relative atomic masses. Potassium oxide has a relative atomic mass of 94.196 g/mol. Potassium chloride has an atomic mass of 74.5513 g/mol. The conversion ratio is K_2O = 0.65317 x KCl, since 94.2 / (2 x 74.6) (two potassium atoms) = 0.65317. Final product potash grades are typically around 60% K_2O. This corresponds to a grade of 95% KCl.

Supply

Potash production is highly concentrated in Canada, Russia and Belarus, which together accounted for almost 70% of global production in 2020. Production in Canada (32% of global output) is dominated by Nutrien, Mosaic, and K+S Group, and comprises both conventional mining and solution mining. Production in Russia and Belarus (37% of global output) is dominated by Uralkali, Belruskali, and EuroChem, all of which employ conventional mining techniques. China accounted for about 10% of global production in 2020, predominantly from brines. The main producer is QSL Industry. The Middle East accounts for the further 9% of global production from ICL and Arab Potash.

Figure 73: Geography of potash supply



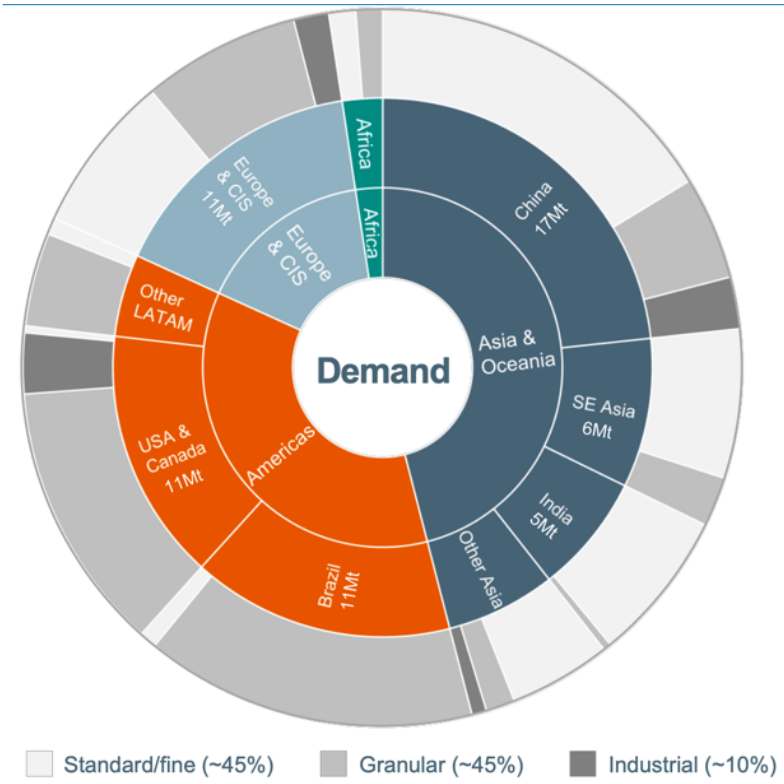
Data: BHP analysis based on multiple sources.
Note: 2020, 70 Mt MOP production, 72 Mt MOP sales (CRU). Split by grade is approximate.
Source: BHP, Potash Outlook Briefing, June 2021

Demand

Potash demand is also highly concentrated, with consumption in the biggest five countries representing almost 70% of demand. Based on data from BHP, China is biggest market, accounting for about 24% of demand in 2020, followed by Brazil (16%), the United States (16%), and India (7%). Indonesia represents about another 5% of demand. Global demand is being increasingly driven by developing markets. Over the last 20 years, both China and Brazil have overtaken the United States in terms of consumption. Data from the FAO demonstrates that in the period 2000 to 2019, Chinese consumption grew at an average of 5.9% pa, and Brazilian consumption grew at an average of 5.3% pa. In the same time period, US demand contracted at a rate of 0.2% pa and European demand fell by 0.4% pa.

Potash deposits are mostly located in the northern hemisphere. Consequently, potash typically has to be transported over substantial distances by rail or ship to southern markets. As in most bulk commodities, transportation costs are a key factor in determining competitiveness. **Emmerson's proximity to key markets is a substantial and sustainable competitive advantage.**

Figure 74: Geography of potash demand



Source: BHP, Potash Outlook Briefing, June 2021

Appendix 3: Board of Directors

Graham Clarke, Chief Executive Officer

Graham is a highly experienced potash mining executive with extensive experience managing large multi-disciplinary teams for underground fertiliser mines. During his 26 years at Cleveland Potash, which owned the Boulby Potash Mine in Yorkshire, Graham held multiple positions from Graduate Trainee through to Director of Mining and, finally, as Managing Director of ICL UK (the owner of Cleveland Potash) with full operational responsibility. At Boulby, Graham was responsible for numerous operational improvements which resulted in both operational efficiency and profitability enhancements, but also shaped a safety-first culture driven by prudent risk management and best practice operational procedure. From 2011 until early 2020, Graham was a key member of the senior executive team at Sirius Minerals, overseeing all technical aspects of the development of the Woodsmith Mine, moving it successfully from concept, through various phases of study and design, into construction. The Woodsmith Mine is one of the largest and most complex underground mine developments in the United Kingdom for a generation and Graham was an instrumental member of the team in delivering numerous positive outcomes including all technical and engineering work, but also the receipt of permissions to build the mine following years intensive stakeholder engagement.

Hayden Locke, Director

An experienced mining executive with ~15 years' experience in mining, private equity and investment banking. Most recently he was Head of Corporate and Technical Services (Geology, Mining and Processing) at ASX listed potash developer Highfield Resources. Prior to this, Hayden was Head of Corporate for ASX listed Papillon Resources which was sold to B2Gold in 2014 for $650 million. Hayden studied engineering, commerce and geology.

Dr Robert Wrixon, Executive Director

Led Moroccan Salts Limited since its inception in 2013. Rob has 18 years' commercial experience in mining including five years with Xstrata in various strategy roles, and as MD and CEO of ASX listed Manhattan Corporation Limited and Haranga Resources Limited. He is a Director and founding partner of Starboard Global, a natural resource PE group based in Hong Kong and holds a PhD in mineral engineering from the University of California, Berkeley.

James Kelly, Non-Executive Chairman

James Kelly has nearly 20 years' experience in the mining and natural resource industry, with extensive experience in corporate finance, strategy and capital allocation. James is non-executive chairman and founder of Trident Royalties plc, a growth focused, diversified mining royalty and streaming company. Prior to founding Trident, James was a senior member of the Xstrata Plc group business development team and following the merger with Glencore Plc, was part of the team which founded Greenstone Resources LP, a mining private equity fund focused on post-exploration development assets. James served as an Executive Director of ASX listed Cradle Resources Limited from May 2016 to July 2017 having been appointed a Non-Executive Director in February 2016. James is a Fellow of the Institute of Chartered Accountants of England and Wales and holds a BA (Hons) from University College London.

Rupert Joy, Non-Executive Director

In the course of a diplomatic career of more than 25 years, Rupert Joy has served at UK diplomatic missions in Yemen, Saudi Arabia, Morocco and Iraq, and as British Ambassador to Uzbekistan. He has over seven years' experience as a diplomat in Morocco, as Deputy Head of Mission at the British Embassy in Rabat from 2000-03 and as EU Ambassador and Head of the EU Delegation in Rabat from 2013-17. As EU Ambassador, he worked to build on Europe's multi-faceted strategic partnership with Morocco at a senior level in a wide range of areas, with a strong focus on sustainable development. Mr. Joy has worked as an independent consultant for the past four years, providing support to UK government departments and private clients on issues relating to regional stability, investment, security, and migration in North Africa. He speaks French and Arabic.

Appendix 4: Companies mentioned

Figure 75: Companies mentioned in this report

Company	Stock code
Emmerson Plc	EML.L
Anglo American	AAL.L
CF Industries	CF
Compass Minerals	CMP
Danakali	DNK.AX
Highfield Resources	HFR.AX
Intrepid Potash	IPI
K&S Group	SDF.F
Kalium Lakes	KLL.AX
Kore Potash	KP2.L
Mosaic	MOS
Nutrien	NTR
SQM	SQM
Tessenderlo Group	TESS.BR
Yara International	YAR.OL

Source: Company data

The author

Simon Francis is a UK qualified chartered accountant with significant experience in the natural resources and minerals sector. Simon led research in the sector in various roles at major financial institutions including Macquarie, Samsung and HSBC, in a career spanning more than 20 years. He has been involved in approximately US$4bn of capital raising, for a number of natural resources companies. Simon has been engaged in the financing of early stage companies using production agreements, and has privately funded exploration companies in various metals and jurisdictions. Simon seeks to deploy capital in undervalued mining and resources opportunities that have been missed by the market.