AUSTRALIAN
RESEARCH
INDEPENDENT INVESTMENT RESEARCH

Pan Asia Metals Limited

(ASX: PAM)

November 2020

INDEPENDENT
INVESTMENT RESEARCH

WHO IS IIR?

Independent Investment Research, "IIR", is an independent investment research house based in Australia and the United States. IIR specialises in the analysis of high quality commissioned research for Brokers, Family Offices and Fund Managers. IIR distributes its research in Asia, United States and the Americas. IIR does not participate in any corporate or capital raising activity and therefore it does not have any inherent bias that may result from research that is linked to any corporate/ capital raising activity.

IIR was established in 2004 under Aegis Equities Research Group of companies to provide investment research to a select group of retail and wholesale clients. Since March 2010, IIR (the Aegis Equities business was sold to Morningstar) has operated independently from Aegis by former Aegis senior executives/shareholders to provide clients with unparalleled research that covers listed and unlisted managed investments, listed companies, structured products, and IPOs.

IIR takes great pride in the quality and independence of our analysis, underpinned by high caliber staff and a transparent, proven and rigorous research methodology.

INDEPENDENCE OF RESEARCH ANALYSTS

Research analysts are not directly supervised by personnel from other areas of the Firm whose interests or functions may conflict with those of the research analysts. The evaluation and appraisal of research analysts for purposes of career advancement, remuneration and promotion is structured so that non-research personnel do not exert inappropriate influence over analysts.

Supervision and reporting lines: Analysts who publish research reports are supervised by, and report to, Research Management. Research analysts do not report to, and are not supervised by, any sales personnel nor do they have dealings with Sales personnel

Evaluation and remuneration: The remuneration of research analysts is determined on the basis of a number of factors, including quality, accuracy and value of research, productivity, experience, individual reputation, and evaluations by investor clients.

INDEPENDENCE – ACTIVITIES OF ANALYSTS

IIR restricts research analysts from performing roles that could prejudice, or appear to prejudice, the independence of their research.

Pitches: Research analysts are not permitted to participate in sales pitches for corporate mandates on behalf of a Broker and are not permitted to prepare or review materials for those pitches. Pitch materials by investor clients may not contain the promise of research coverage by IIR.

No promotion of issuers' transactions: Research analysts may not be involved in promotional or marketing activities of an issuer of a relevant investment that would reasonably be construed as representing the issuer. For this reason, analysts are not permitted to attend "road show" presentations by issuers that are corporate clients of the Firm relating to offerings of securities or any other investment banking transaction from that our clients may undertake from time to time. Analysts may, however, observe road shows remotely, without asking questions, by video link or telephone in order to help ensure that they have access to the same information as their investor clients.

Widely-attended conferences: Analysts are permitted to attend and speak at widely-attended conferences at which our firm has been invited to present our views. These widely-attended conferences may include investor presentations by corporate clients of the Firm.

Other permitted activities: Analysts may be consulted by Firm sales personnel on matters such as market and industry trends, conditions and developments and the structuring, pricing and expected market reception of securities offerings or other market operations. Analysts may also carry out preliminary due diligence and vetting of issuers that may be prospective research clients of ours.

INDUCEMENTS AND INAPPROPRIATE INFLUENCES

IIR prohibits research analysts from soliciting or receiving any inducement in respect of their publication of research and restricts certain communications between research analysts and personnel from other business areas within the Firm including management, which might be perceived to result in inappropriate influence on analysts' views.

Remuneration and other benefits: IIR procedures prohibit analysts from accepting any remuneration or other benefit from an issuer or any other party in respect of the publication of research and from offering or accepting any inducement (including the selective disclosure by an issuer of material information not generally available) for the publication of favourable research. These restrictions do not preclude the acceptance of reasonable hospitality in accordance with the Firm's general policies on entertainment, gifts and corporate hospitality.

DISCLAIMER

This publication has been prepared by Independent Investment Research (Aust) Pty Limited trading as Independent Investment Research ("IIR") (ABN 11 152 172 079), an corporate authorised representative of Australian Financial Services Licensee (AFSL no. 410381. IIR has been commissioned to prepare this independent research report (the "Report") and will receive fees for its preparation. Each company specified in the Report (the "Participants") has provided IIR with information about its current activities. While the information contained in this publication has been prepared with all reasonable care from sources that IIR believes are reliable, no responsibility or liability is accepted by IIR for any errors, omissions or misstatements however caused. In the event that updated or additional information is issued by the "Participants", subsequent to this publication, IIR is under no obligation to provide further research unless commissioned to do so. Any opinions, forecasts or recommendations reflects the judgment and assumptions of IIR as at the date of publication and may change without notice. IIR and each Participant in the Report, their officers, agents and employees exclude all liability whatsoever, in negligence or otherwise, for any loss or damage relating to this document to the full extent permitted by law. This publication is not and should not be construed as, an offer to sell or the solicitation of an offer to purchase or subscribe for any investment. Any opinion contained in the Report is unsolicited general information only. Neither IIR nor the Participants are aware that any recipient intends to rely on this Report or of the manner in which a recipient intends to use it. In preparing our information, it is not possible to take into consideration the investment objectives, financial situation or particular needs of any individual recipient. Investors should obtain individual financial advice from their investment advisor to determine whether opinions or recommendations (if any) contained in this publication are appropriate to their investment objectives, financial situation or particular needs before acting on such opinions or recommendations. This report is intended for the residents of Australia. It is not intended for any person(s) who is resident of any other country. This document does not constitute an offer of services in jurisdictions where IIR or its affiliates do not have the necessary licenses. IIR and/or the Participant, their officers, employees or its related bodies corporate may, from time to time hold positions in any securities included in this Report and may buy or sell such securities or engage in other transactions involving such securities. IIR and the Participant, their directors and associates declare that from time to time they may hold interests in and/or earn brokerage, fees or other benefits from the securities mentioned in this publication.

IIR, its officers, employees and its related bodies corporate have not and will not receive, whether directly or indirectly, any commission, fee, benefit or advantage, whether pecuniary or otherwise in connection with making any statements and/or recommendation (if any), contained in this Report. IIR discloses that from time to time it or its officers, employees and related bodies corporate may have an interest in the securities, directly or indirectly, which are the subject of these statements and/or recommendations (if any) and may buy or sell securities in the companies mentioned in this publication; may affect transactions which may not be consistent with the statements and/or recommendations (if any) in this publication; may have directorships in the companies mentioned in this publication; and/or may perform paid services for the companies that are the subject of such statements and/or recommendations (if any).

However, under no circumstances has IIR been influenced, either directly or indirectly, in making any statements and/or recommendations (if any) contained in this Report. The information contained in this publication must be read in conjunction with the Legal Notice that can be located at http://www.independentresearch.com.au/Public/Disclaimer.aspx.

THIS IS A COMMISSIONED RESEARCH REPORT.

The research process includes the following protocols to ensure independence is maintained at all times:

1) The research process has complete editorial independence from the company and this included in the contract with the company;
2) Our analyst has independence from the firm's management, as in, management/ sales team cannot influence the research in any way;
3) Our research does not provide a recommendation, in that, we do not provide a "Buy, Sell or Hold" on any stocks. This is left to the Adviser who knows their client and the individual portfolio of the client.
4) Our research process for valuation is usually more conservative than what is adopted in Broking firms in general sense. Our firm has a conservative bias on assumptions provided by management as compared to Broking firms.
5) All research mandates are settled upfront so as to remove any influence on ultimate report conclusion;
6) All staff are not allowed to trade in any stock or accept stock options before, during and after (for a period of 6 weeks) the research process.

For more information regarding our services please refer to our website www.independentresearch.com.au.

Contents

INDEPENDENT INVESTMENT RESEARCH

Pan Asia Metals Limited (ASX: PAM)

Initiation - November 2020

Note: This report is based on information provided by the company as at November 9, 2020

Investment Profile	
Share Price as at Nov 6, 2020	A$0.16
Issued Capital:	
Pre-IPO Shares	104.6 m
IPO Shares	21.4 m
Options	0.0 m
Fully Diluted	126.0 m
Market Capitalisation	A$20.2 m
Cash October 8, 2020	A$4.28 m

Board and Management
Mr Paul Lock: Managing Director
Mr David Hobby: Technical Director
Mr David Docherty: Non-Executive Director
Mr Thanasak Chanyapoon: Non-Executive Director
Mr Ian Mitchell: Non-Executive Director
Mr Roger Jackson: Non-Executive Director

Major Shareholders	
Mr Paul Lock	33.4%
Thai Goldfields NL	16.1%
Metal Tiger PLC	8.6%
Holicarl P/L	5.5%
Mr David Hobby	3.7%
Top 20	81.4%
Board & Management	55.6%

The investment opinion in this report is current as at the date of publication. Investors and advisers should be aware that over time the circumstances of the issuer and/or product may change which may affect our investment opinion.

CRITICAL METALS IN A LOW COST JURISDICTION

Pan Asia Metals ("Pan Asia" or "the Company") is a recent listing on the ASX, with a focus on developing "critical" metals projects in the emerging economic powerhouse of SE Asia.

The overall strategy is to concentrate on those commodities and jurisdictions that provide the opportunity for low cost operations with the potential to value add, and thus maximise returns. As such, SE Asia, a low operating cost region with strong economic growth when compared to other jurisdictions has been targeted.

The initial projects include tungsten and lithium properties located in the Southeast Asian Tin-Tungsten Belt in Thailand, the 21st largest economy globally. Both commodities are considered "critical" in terms of supply and economic importance by the USA and European Union, and also present the opportunity to undertake downstream processing should economically viable deposits be found. This strategy is also in concert with Thailand's "Thailand 4.0" development strategy, which is looking towards high return, value add industry.

The 100% owned Khao Soon Tungsten Project saw significant high grade production until ~1980, and work to date by Pan Asia has highlighted the potential to define high grade mineralisation - this work has already resulted in an Exploration Target of 15 to 29 Mt @ 0.2% to 0.4% WO_3 for 30 to 116 kt contained WO_3 being defined. Drilling by the Company has returned up to 51.2 m @ 0.50% WO_3 from surface, including 12.8 m @ 1.07% WO_3 from 14.8 m.

Lithium projects include Reung Kiet and Bang Now, which host lepidolite-bearing pegmatites that have seen historical tin production. Although currently global hard rock lithium production is from spodumene pegmatites, development studies and pilot scale test work by various companies have demonstrated the potential of lepidolite to be a cost effective source of downstream lithium products when the value of by-products is included. Such by-products may include, amongst others, sulphate of potash ("SoP"), a high quality potassium fertiliser, that should see a growing market with increased intensity of agricultural production in the region.

The Company has an active work programme, largely comprised of drilling (which has commenced at Khao Soon), going forward, and thus we would expect to see steady news flow over coming months. There are no COVID-19 impediments to exploration activities in Thailand, with the country having one of the lowest infection rates globally.

KEY POINTS

Quality projects: Pan Asia has a portfolio of largely brownfields tungsten and lithium projects in an under-explored but globally significant mineralised province with the quality being affirmed by results of work to date. Khao Soon historically was a very high grade producer.

In demand metals: Demand for both lithium and tungsten is forecast to grow over coming years - lithium largely due to growth in electric vehicles, and tungsten due to overall economic growth as we come out of the COVID-19 pandemic and governments printing money to drive growth. Also, production of downstream products (and in the case of tungsten, upstream production) is largely controlled by China, with end users looking for diversity in supply.

Attractive jurisdiction for investment: Recent government initiatives have enhanced Thailand as an investment destination, with these aimed at attracting foreign investment, developing infrastructure, high tech and value add industries and modernising the agricultural industry. The country has also updated the Mining Law, with Pan Asia being one of the first companies to be granted tenements under the new law.

Infrastructure rich: The projects are in a region well endowed with infrastructure, including transport and utilities.

Experienced and committed personnel: Company personnel have extensive experience in the junior resources space (including in SE Asia), In addition directors directly and indirectly hold ~56% of the shares in Pan Asia, a key strength that aligns the interests of company personnel with that of the other shareholders.

Leveraged to exploration success: With an enterprise value ("EV") of ~A$16 million, Pan Asia is well leveraged to exploration success.

SWOT ANALYSIS

Strengths

- **Prospective tenement package:** The Company's has assembled a prospective portfolio of largely brownfields lithium and tungsten tenements, with this supported by results of work to date.
- **Ideal location:** SE Asia is growing into one of the world's manufacturing "hotspots", and thus will see growing demand for materials to feed industry - growth and investment (including direct foreign investment) in certain industries and is being actively supported by government policy.
- **Low cost and infrastructure rich:** Thailand is a low cost and infrastructure rich country, making it ideal for the development of mining operations and downstream processing facilities .
- **Experienced personnel:** Company personnel have significant experience in the resource sector, including in SE Asia. In addition key personnel hold significant shareholdings in Pan Asia, thus aligning their interests with those of other shareholders.

Weaknesses

- **Negative investor sentiment towards Thailand:** Some potential investors may have negative perceptions towards mining in Thailand, given the negative perceptions (whether warranted or not) of past experiences of Australian miners, as well as Thailand not having a well developed mining industry.
- **Time consuming tenement application process:** Although the 2017 Mining Law has brought significant improvements, the tenement applications process is still fairly complex, involving several steps. That being said this is a moot point in the case of Pan Asia, as the Company has had to date six tenements awarded under the new Law.

Opportunities

- **Exploration and evaluation success:** This is a key driver for value creation for Pan Asia prior to any future transition to production.
- **Downstream processing:** The Company is targeting those metals that are amenable to downstream processing, and the value add/profit growth that comes from such activities.
- **Acquisitions:** The Company is on the lookout for any other opportunities that meet its commodity/jurisdiction criteria and overall strategy. Pan Asia is one of only a few ASX-listed explorers active in the region.

Threats/Risks

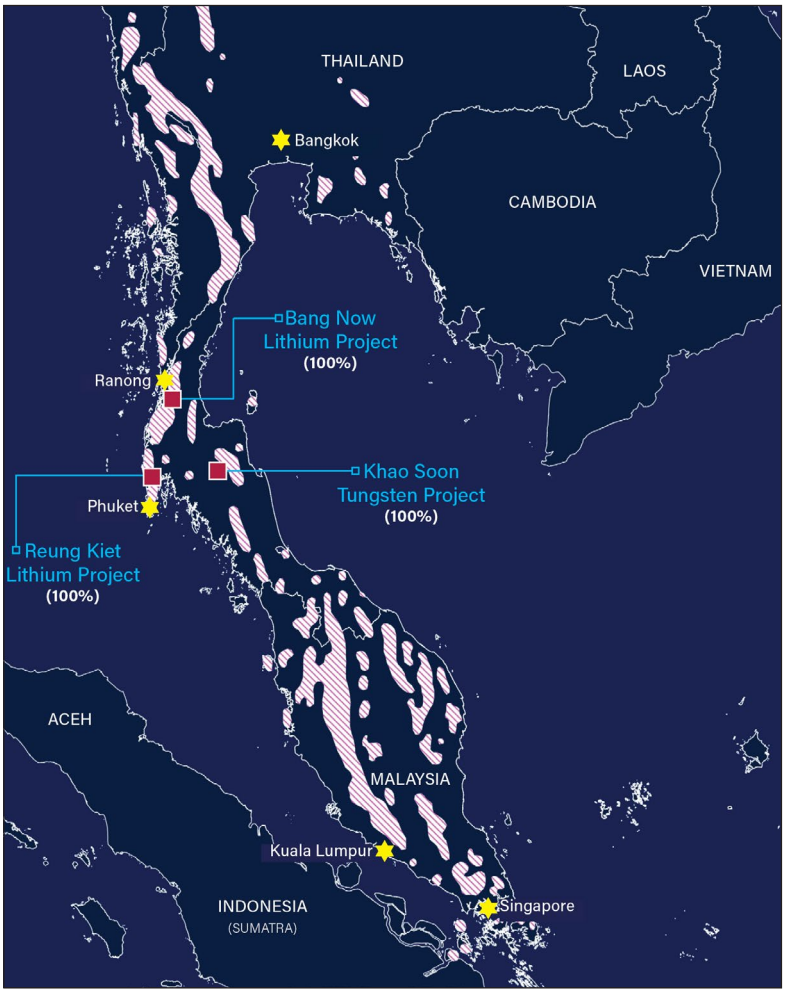
- **Exploration/evaluation results:** This is the key technical risk for any junior resource company, and Pan Asia is no different in this respect.
- **Markets and funding:** In any downturn, either in equities or metals markets, the more speculative juniors are the first to be hit, thus affecting the capacity to raise funds and continue operations in an effective manner.

COMPANY OVERVIEW

STRATEGY AND PROJECT OVERVIEW

- Pan Asia's exploration activities are focused on one tungsten and two lithium projects in peninsula Thailand (Figure 1), a region that has seen globally significant historic tin and tungsten production from the South-East Asian Tin-Tungsten Belt.
- The Company also holds the Minter Tungsten Project, located near Lake Cargelligo in the Central West of New South Wales - given the focus on Thailand, Minter will not be discussed further, although the Company does plan to undertake drilling at this prospect.

Figure 1: Project locations



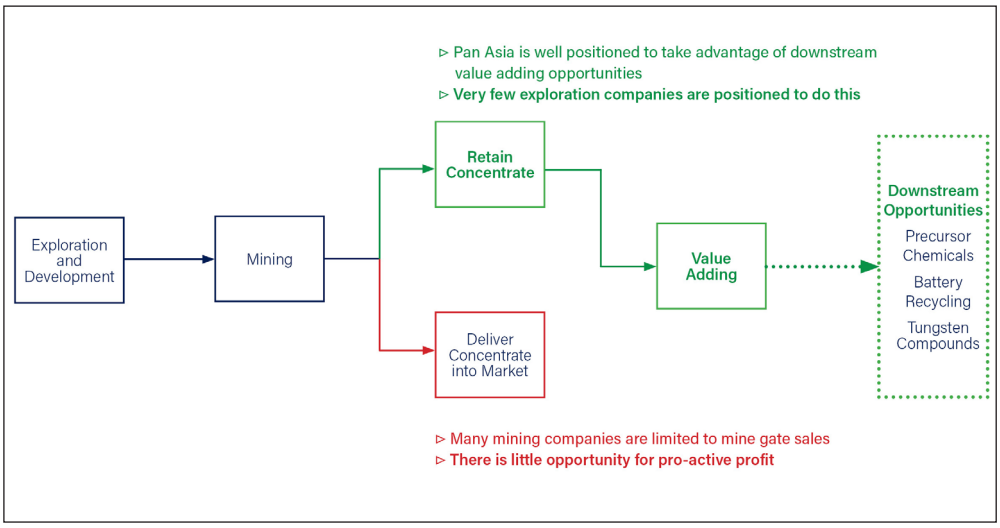
Source: Pan Asia

- The Company has a well considered strategy behind the choice of jurisdiction and commodities, with the understanding that costs can be controlled, and prices, to some degree with downstream processing, can also be controlled (Figure 2):
  - Target critical metals that are amenable to downstream processing to take advantage of the potential value add and profit growth, and not be beholden to customers through "mine gate" concentrate sales prices,
  - Find projects that are located in relatively low cast jurisdictions, and are close to strong markets for the main and by-products; and,
  - Locate operations in areas that have a demonstrated endowment of, and a history of mining the target commodities.
- The current Thai projects fit the criteria:
  - The South-East Asian Tin-Tungsten Belt is a proven historical producer of tungsten, with Khao Soon being one of the largest and highest grade producers,
  - There has been significant tin production from pegmatites, some of which contain lepidolite (particularly in Western Thailand) - this includes the Company's Reung Kiet and Bang I Tum properties,

- SE Asia is a relatively low cost operating environment, however includes rapidly growing and industrialising economies, particularly Thailand and Malaysia,
- Ammonium paratungstate ("APT"), the main traded version of tungsten, can be converted at reasonable a cost from tungsten concentrates, and thus makes an ideal downstream opportunity; and,
- The production of lithium hydroxide from lepidolite has the potential to generate significant additional revenue from by-products, including but not restricted to potassium sulphate (fertiliser) and amorphous silica (used in concrete batching amongst others).

- Another positive is that the projects are located in a region well served by infrastructure, including utilities, transport and communication.
- This strategy, and the projects are also a good match for the current Thailand economic development plans ("Thai 4.0"), in that the country is looking to develop value add industries, particularly in high tech and green fields, next generation automobiles (including EVs), and is also looking at modernising and industrialising agriculture.
- Thailand has also undertaken significant measures to attract direct foreign investment ("DFI").
- Pan Asia however is agnostic about the critical metals that it will look at, however is largely committed to operating in Southeast Asia due the cost structure and access to markets.

Figure 2: Downstream strategy



Source: Pan Asia

FINANCIAL POSITION

- As of October 8, 2020, the Company had A$4.28 million in cash (as raised in the IPO) and no debt.

CAPITAL STRUCTURE

- Pan Asia currently has 126 million shares and no options on issue - the shares include ~104.6 million pre-IPO shares and ~21.4 million $0.20 IPO shares.
- The largest shareholder is the Chairman, Mr Paul Lock, with a 33.4% holding.
- The Company is tightly held, with the top 20 holding 81.4%, and with insiders directly and indirectly holding 55.6%.
- As of the date of listing the Company has 414 shareholders.

CORPORATE STRUCTURE

- Pan Asia Metals Limited is a Singaporean company, registered in Australia.
- Pan Asia holds 100% of Pan Asia Metals (Thailand) Co. Limited, which in turn holds 100% of the rights to the Thai Projects through wholly owned subsidiaries.
- Pan Asia also holds 100% of the Minter Tungsten Project, through the subsidiary Pan Asia Metals (Aus) Pty. Ltd.
- Pan Asia, being a Singaporean, and hence ASEAN company, qualifies as a Thai judicial entity for the purposes of the 2017 Minerals Act, and thus has the same rights as Thai entities in relation to holding mineral rights.

THAI PROJECTS - PAN ASIA 100%

LOCATION AND TENURE

- The Company has three projects all located within 200 km of Phuket, within peninsular Thailand (Figure 1):
  - Khao Soon (tungsten) includes two granted SPLs and one SPL application ("SPLA") with a total area of ~34 km^2 - the SPLs were granted for terms of five years on May 14, 2019 and August 20, 2020 respectively.
  - Reung Kiet (lithium) comprises three granted SPLs covering 38 km^2, which were granted for a term of five years on February 15, 2019; and,
  - Bang Now (lithium) includes two EPLs for 5 km^2 which were granted for a term of two years on February 14, 2020.
- The granted Reung Kiet SPLs were the first titles granted to any mining/exploration company under the 2017 Mining Law.
- One of the Khao Soon applications, TSPLA 1/2549, located over the historic Khao Soon tungsten mine, covers areas of Conserve Forest and Watershed Class 1, special purpose lands which require the approval of the Council of Ministers (the cabinet) for grant. The Company is working closely with the relevant authorities on the application.

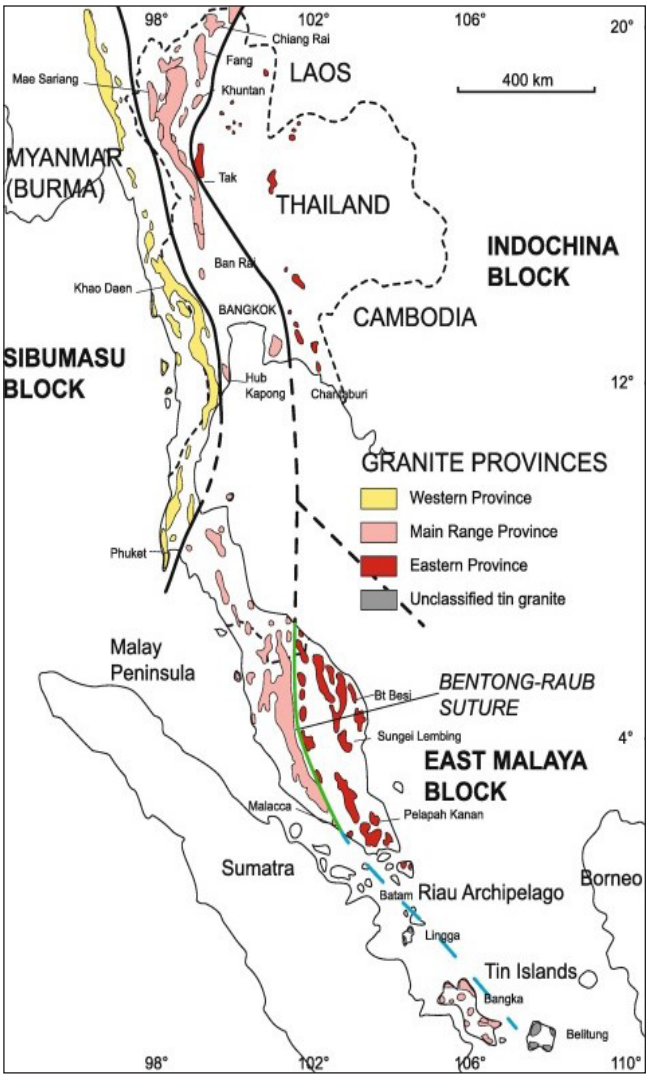
INFRASTRUCTURE

- Peninsula Thailand is well developed, and well served by infrastructure, including road, rail, air and power.
- The three projects are in an area centred around 600 km as the crow flies SSW of Bangkok, and all within 200 km of Phuket, with the closest being Reung Kiet, 70 km north of the city.

REGIONAL GEOLOGY AND MINERALISATION

- The dominant geological feature is the South-east Asian Tin-Tungsten Belt, which comprises three north-south trending parallel granite belts, as shown in Figure 2.
- The region sits at the conjunction of two main tectonic terranes - the Sibumasu (Shan-Thai) Block to the west, and the Indochina Block to the east - these are juxtaposed along the Bentong-Raub Suture and the Sukhothai belts, with the latter representing an island arc terrane.
- Both terranes were rifted off the Australian part of Gondwanaland during the Jurassic/Cretaceous and subsequently collided, with this giving rise to the suture, the Sukhothai Belt and the Loei-Phetchaban Fold Belt.
- The basement rocks in the Gondwana terranes range in age from Precambrian to Mesozoic, and include clastic and chemical sediments, carbonates, with lesser volcanics and ultramafic intrusives.
- The collision of the Indian and Eurasian plates at ~50 Ma to 40 MA resulted in the development of over 60 half-graben basins, which are economically important as they host coal and oil resources.
- The economically important Southeast Asia Tin-Tungsten Belt forms a 3,600 km long arcuate zone extending from NW Thailand in the north to the Indonesian "Tin Islands" in the south (Figure 2).
- This includes three main belts, which young from east to west, and intrude largely Paleozoic to Mesozoic clastic and carbonate shelf sediments:
  - An eastern belt of Permo-Triassic high level granites in Eastern Malaysia,
  - A central belt of deep seated Late Triassic granites, located in the Indonesian Tin Islands, west coast Malaysia and Western Thailand; and,
  - A western belt of Cretaceous granites along the Myanmar-Thai border and Southern Thailand.

Figure 3: Regional geology highlighting the three main granite belts



Source: Metcalfe (2005)

- Khao Soon is located within the Central Belt, whereas the lithium projects are located within the Western Belt.
- Although tin and tungsten occur throughout the belts, tungsten is dominant in the north, and tin in the south - historically, tin was mined largely from alluvial and elluvial deposits sourced from cassiterite bearing vein swarms, whereas tungsten production was largely from primary sources, with Khao Soon being one of the largest.
- Another significant deposit is Mawchi in Myanmar, which produced both tin and tungsten from both hard rock and alluvial mining - operations commenced in 1909, were interrupted by WWII, and which is still operating today.

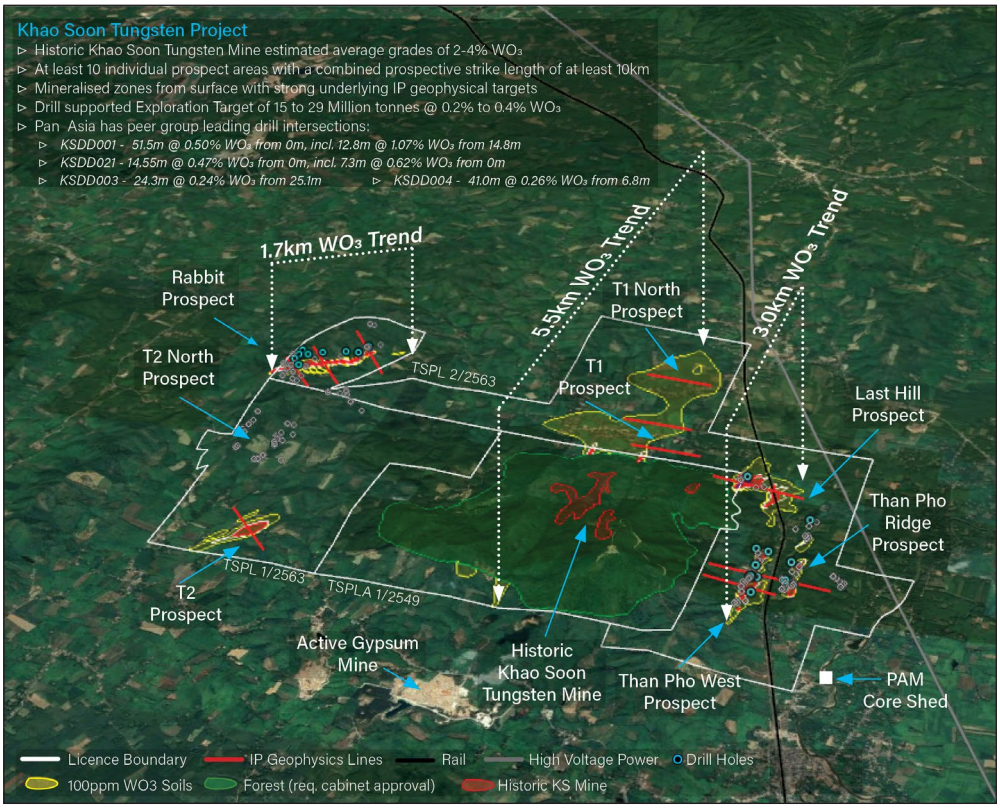
KHAO SOON TUNGSTEN PROJECT

Background and Previous Work

- Khao Soon is located over the historic Khao Soon Tungsten Mine (Figure 4), which reportedly produced in the order of 10,000 to 20,000 tonnes of high grade WO_3 concentrates and direct ship ore between 1970 and 1980 - estimates of production are at best vague, in that most mining was illegal and hence there is only limited record keeping.
- Khao Soon reportedly formed a significant proportion of Thailand's total recorded production of 44,000 tonnes over the same period - this however will most probably underestimate production due to it not accounting for illegal mining.
- Likewise it is hard to estimate average mined grades, but they were likely in the range of 2% to 4% WO_3 although higher grade zones were reported.
- The deposit was discovered by Siam American Mining Enterprise Co. Ltd in October 1970, however was soon over run by the illegal miners, with it estimated that up to 30,000 people operated in the area - unrest led to the army being called in 1976 to control the situation.

- A fall in tungsten price most likely led to the cessation of activities.
- There are over 200 shafts and 60 adits within the 1 km x 1 km historic mining area, which also contains low grade stockpiles and tailings - mining was down to ~80 m and uncoordinated between the numerous operators.
- Pan Asia currently doesn't have access to this area, as it falls within the SPLA that is over the watershed/forest area, and that will require Cabinet approval for grant.
- The first modern work was undertaken by Thai Goldfields from 2006 to 2014, with work including the drilling of 64 aircore holes for 1,540 m over laterite hosted mineralisation - some of these holes have been used in Pan Asia's Exploration Target (discussed later).

Figure 4: Khao Soon Project map



Source: Pan Asia

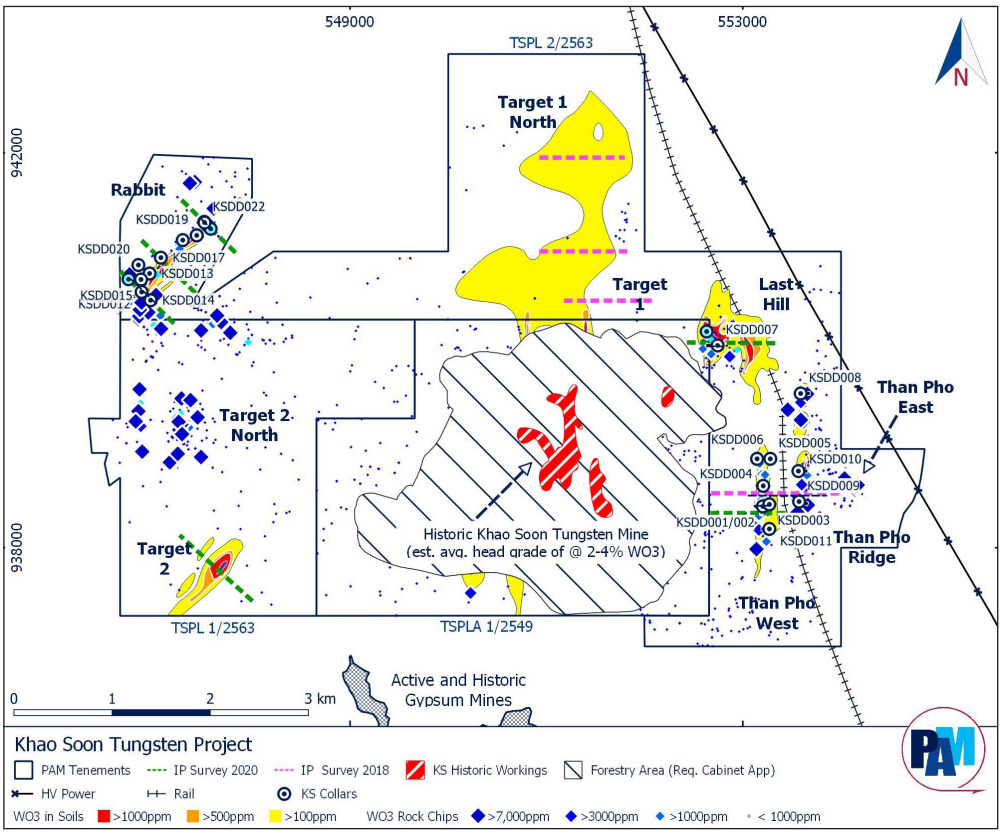
Geology and Mineralisation

- Mineralisation largely comprises breccia and fracture fill within siltstone, minor sandstones and calcareous inter beds of the Silurian-Carboniferous Tanaosi Group.
- Although highly deformed in surrounding areas, the sediments at Khao Soon are generally shallowly to moderately dipping, with bedding parallel fractures and breccia zones possibly being one of the controls on mineralisation, in addition to cross cutting features.
- The sedimentary package has been intruded by granitic rocks of the Triassic-Jurassic Khao Luang Batholith, which outcrops immediately north and east of the tenements.
- Mineralisation however is thought to be related to a younger non-outcropping granite, that has been interpreted from magnetics, and intrudes both the sediments and Khao Luang Batholith.
- The depth to the top of the granite is unknown, but thought to be in the order of one kilometre - as is typical in these styles of system, mineralisation could occur down to the granite contact.
- The mineralisation is hydrothermal in nature, and is largely comprised of a coarse ferberite (the iron-rich end member of the wolframite group) matrix, surrounding unmineralised clasts of silicified wall rocks - the mineralised zones take the form of loosely connected pods, pipes, lodes and fracture fill zones.
- Disseminated pyrite is also associated with the mineralisation, thus making induced polarisation ("IP") geophysics possibly an effective exploration tool - as such Pan Asia has undertaken IP surveying at the Project, which has resulted in anomalies at the key prospects that will be drill tested in upcoming programmes.

Work by Pan Asia

- Pan Asia (and TGF before it) has undertaken comprehensive work programmes at Khao Soon, with these shown in Figure 5 - work has included:
  - Extensional, infill and due diligence soil and rock chip geochemical sampling - TGF collected +10,000 soils and +6,000 rock samples over their 75 km^2 tenement,
  - Geological mapping,
  - IP geophysics,
  - Reconnaissance diamond drilling (22 holes for 1,912 m); and,
  - The estimation of an Exploration Target under JORC (2012).

Figure 5: Khao Soon - summary of work



Source: Pan Asia

- As shown in Figure 5, this work has identified several targets outside of the historic mining area, with three defined by soils, rock chips and confirmed by reconnaissance drilling - IP surveying has also identified targets for recently commenced drilling.
- The Exploration Target has been defined over four of the at least ten targets (with an aggregate strike length of at least 10 km), as shown in Table 1, however with the targets for which no estimation has been made still considered highly prospective, and being defined by soil and rock chip geochemistry, geology and/or geophysics.
- We will discuss a few of the individual prospects below - this however does not downgrade what we consider the good prospectivity of the other prospects, and the project as a whole.
- Other prospects include Last Hill, defined by strong soil geochemical and IP anomalism, and Target 1, again defined by soils and IP.

Table 1: Khao Soon Exploration Target

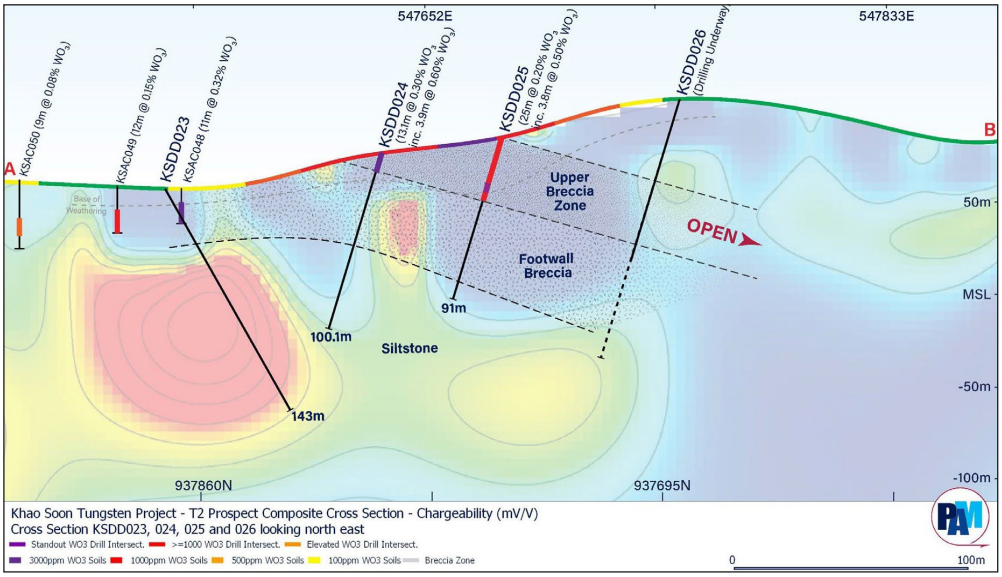
Khao Soon Exploration Target		
Prospect	**Tonnes (Mt)**	**Grade (% WO_3)**
Than Pho West	4 to 8	0.2 to 0.4
Than Pho Ridge	1 to 2	0.2 to 0.4
Target 2	6 to 12	0.2 to 0.4
Rabbit	4 to 7	0.2 to 0.4
Total	**15 to 29**	**0.2 to 0.4**

Source: Pan Asia

Target 2

- Target 2 has been defined by geochemistry, IP surveying and Thai Goldfields aircore drilling, with drilling recently commenced by Pan Asia.
- One NW-SE trending IP line has been completed over the prospect, which highlighted a chargeable zone that dips shallowly to the NE (Figure 6) from the surface soil anomaly; soil sampling defined a strong NE trending soil anomaly with a strike of 700 m and widths of up to 200 m.
- TGF aircore drilling intersected up to 11 m @ 0.32% WO_3 in laterite from 9 m - this possibly reflects weathered primary mineralisation.
- Recent work by PAM has included diamond drilling, with, at the time of writing three holes being completed and one underway - this were planned to test the IP anomalies and weathered aircore intersections.
- As can be seen in Figure 6, hole KSDD023 which was drilled to test the IP anomaly, did not intersect appreciable mineralisation, nor the source for the IP anomalism - this may reflect an IP source off the drill section, as the IP and drill sections are 45 m from each other.
- Holes KSDD024 and KSDD024 intersected mineralisation in the weathered zone, and indicated that there is an east dipping mineralised zone, with overall grades in the mineralised zones being:
  - KSDD024 - 0m to 13.1m - 0.30% WO_3; and,
  - KSDD025 - 0m to 25m - 0.20% WO_3.
- The two intersected zones both include narrower (~4 m thick) zones with grades of 0.50% to 0.60% WO_3.
- It needs to be noted that these are from multiple spot hand-held XRF readings, however based on previous programmes the Company states these present a reasonable comparison to laboratory assays for weathered material.

Figure 6: Target 2 IP section



Source: Pan Asia

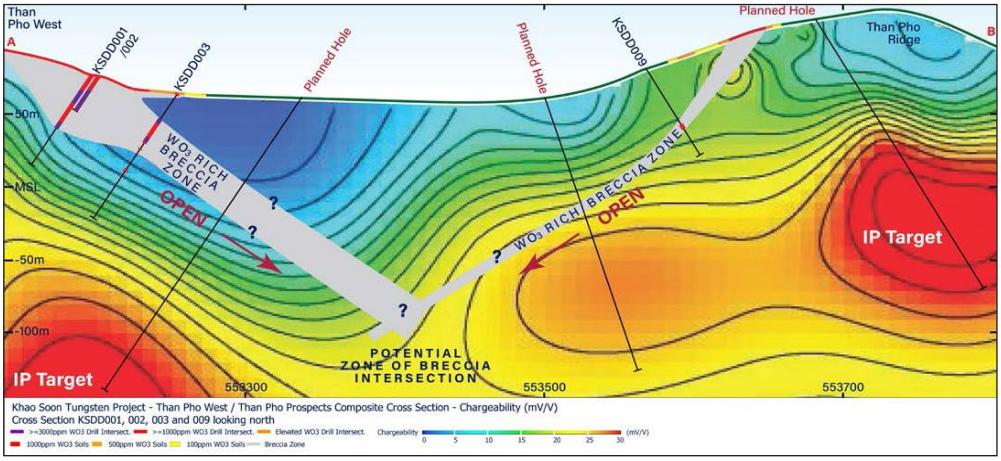
- The T2 North target is located some 1.5 km to the north of T2 (Figure 5), and is defined by old workings, high grade rock chips (with many greater than 0.5% WO_3) - there is also antimony, both associated with and separate from the tungsten.

Than Pho

- Than Pho comprises three prospects (Than Pho West, Than Pho Ridge and Than Pho East) in the eastern side of the project area, and are defined by soil anomalies (up to 1.3 km long) and high grade rock chips.
- Pan Asia has completed two lines of IP and several drill holes, including the highest grade holes drilled by the Company (Figures 7 and 8).
- These holes include KSDD001 (51.2 m @ 0.50% WO_3) and KSDD002 (34 m @ 0.63% WO_3), which we considered as significant grades for tungsten mineralisation.
- The Company has interpreted two moderately dipping breccia zones, with an intersection at around 200 m below surface (Figure 7) - the prospect also has IP anomalies that require drill testing.

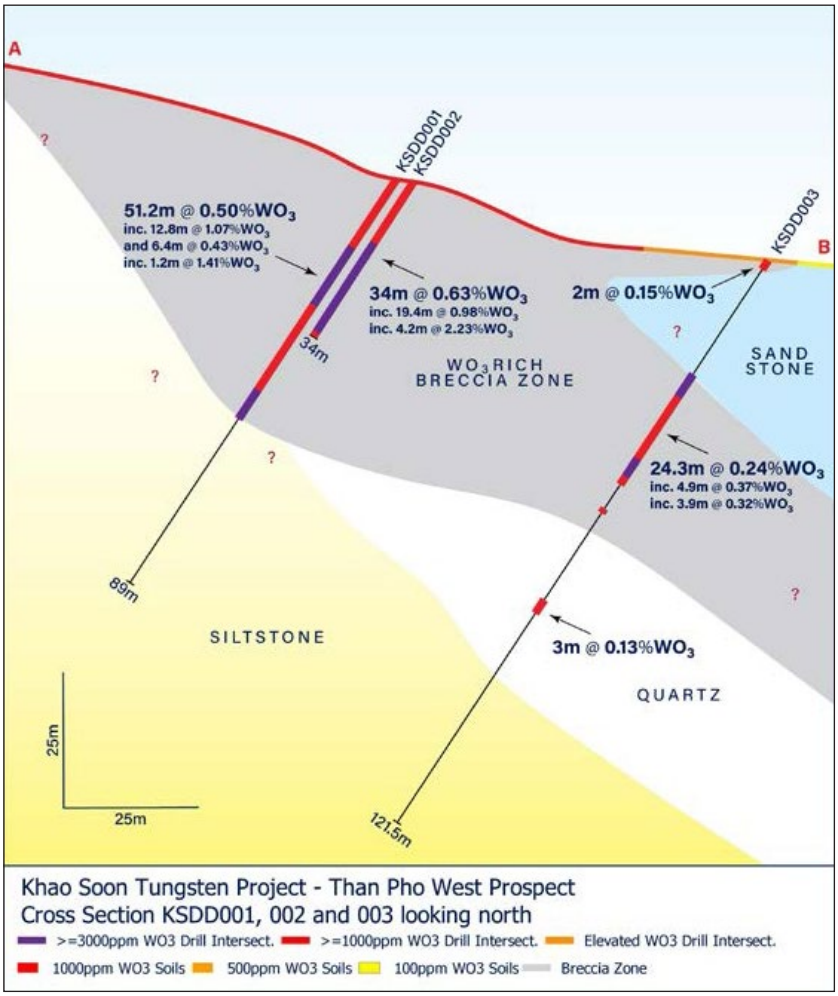
- These breccia zones may possibly be controlled by a lithological contact, however further work is required to fully ascertain controls on mineralisation and structures.

Figure 7: Than Pho West IP section



Source: Pan Asia

Figure 8: Than Pho West - western end of IP section

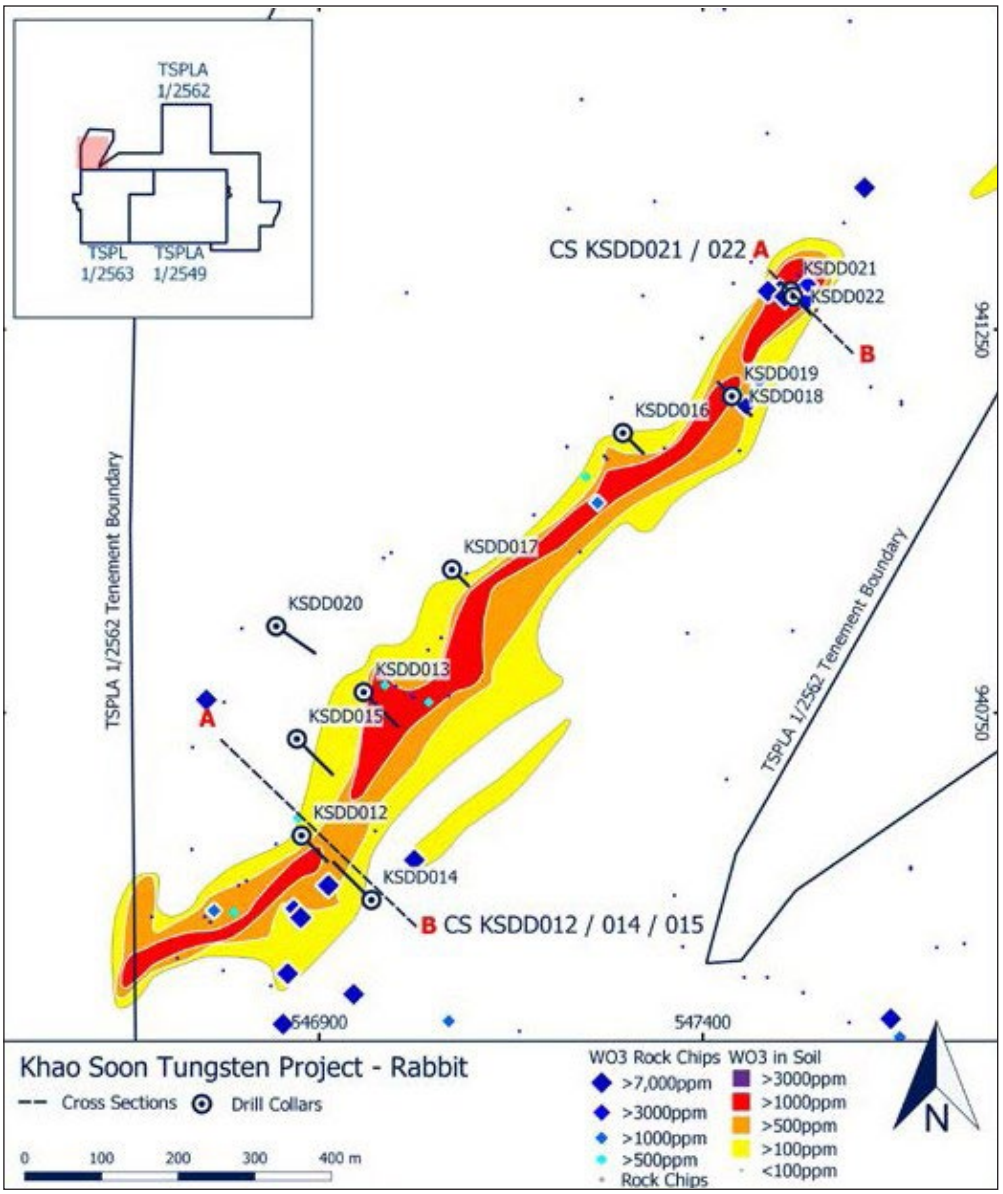


Source: Pan Asia

Rabbit

- The Rabbit prospect is defined by a 1.3 km long, NE trending soil anomaly (Figure 9), with half of the Pan Asian drillholes completed at this prospect.
- Mineralisation again is controlled, at least at the northern end, by a SE dipping breccia, with drillholes KSDD021 and KSD022 respectively returning 14.6 m @ 0.47% WO_3 and 32.2 m @ 0.31% WO_3, both from surface and again which are significant intersections for tungsten mineralisation.
- Intersections from the other broad spaced holes at the Rabbit prospect are however variable, which is to be expected for this style of mineralisation.

Figure 9: Rabbit plan



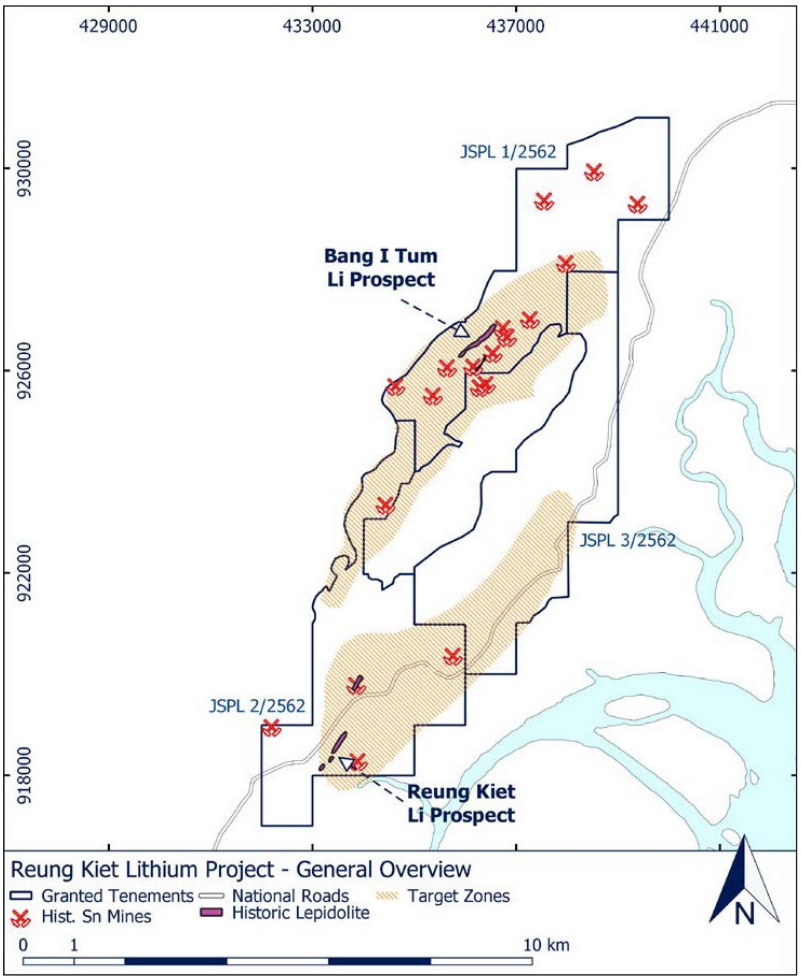
Source: Pan Asia

REUNG KIET LITHIUM PROJECT

Background and Previous Work

- Reung Kiet, which comprises three contiguous SPLs for 38 km^2, is located 70 km north of Phuket includes two key prospects, Bang I Tum and Reung Kiet, which both host lepidolite lithium mineralisation in pegmatite dykes (Figures 1 and 12).
- The project has seen historical tin mining, with open pits located over the two prospects, however with no reliable production records (Figure 11).
- The depth of mining was limited by the effectiveness of the hydraulic methods used.
- Southern Thailand was a significant global tin producer until the late 1980s (with the collapse in prices stopping production) - Phang Nga Province reportedly produced 300,000 tonnes of tin concentrate from 1965 until 1990, largely from alluvial and offshore operations, also with some production from weathered primary mayterial.
- Lepidolite was first identified, during a government study, in the tin bearing pegmatites at Bang I Tum and Reung Kiet in the late 1960s, with the lepidolite found to contain between 3% and 4% Li_2O.
- There has been little recorded exploration activity subsequent to the above-mentioned work, although some limited work, mainly sampling, was carried out by Thai Company Mae Fah Mining Co and UK company ECR Minerals plc in the early 2010s.

Figure 10: Reung Kiet tenements and targets



Source: Pan Asia

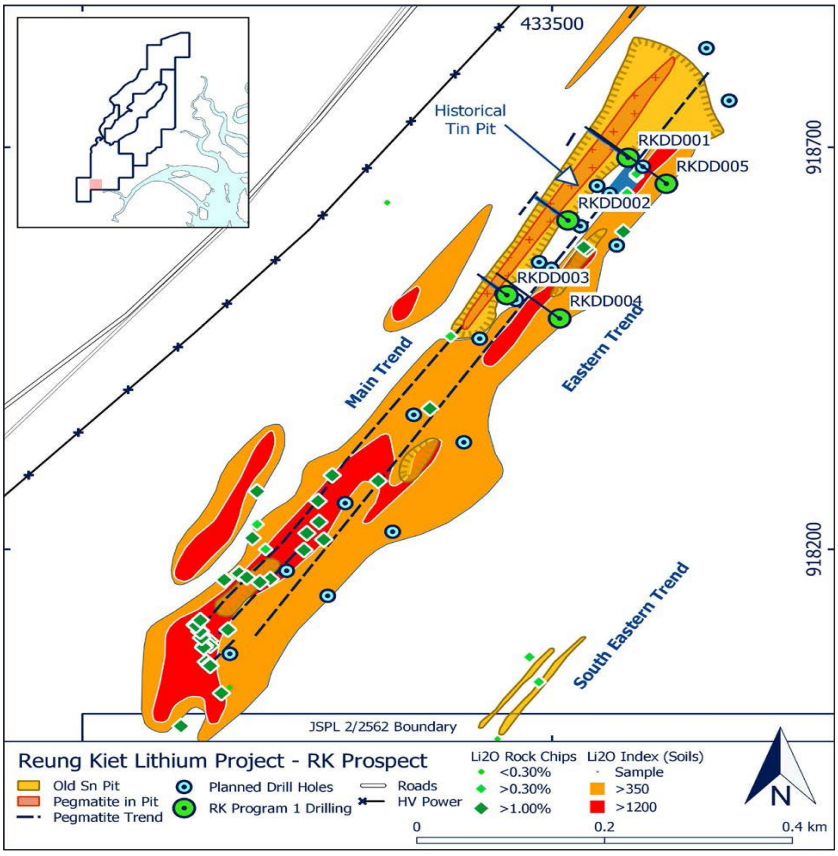
Geology and Mineralisation

- Lepidolite, and accessory tin/tungsten mineralisation, is hosted in unzoned lithium-caesium-tantalum ("LCT") pegmatites within sedimentary rocks of the Phuket Formation that have been intruded by Cretaceous to Tertiary granites of the Western Belt, including the Khao Po and Khao Blai Bang To granites.
- Lepidolite and associated quartz-feldspar pegmatites are largely emplaced along the NE-trending Phang Nga Fault within three kilometres of the granites, with sediments (including turbidites and pebbly mudstones) being metamorphosed up to two kilometres from the granite contact.
- The 1960s study identified the Reung Kiet pegmatite as being 1,300 m long and up to 20 m wide.

Work by Pan Asia

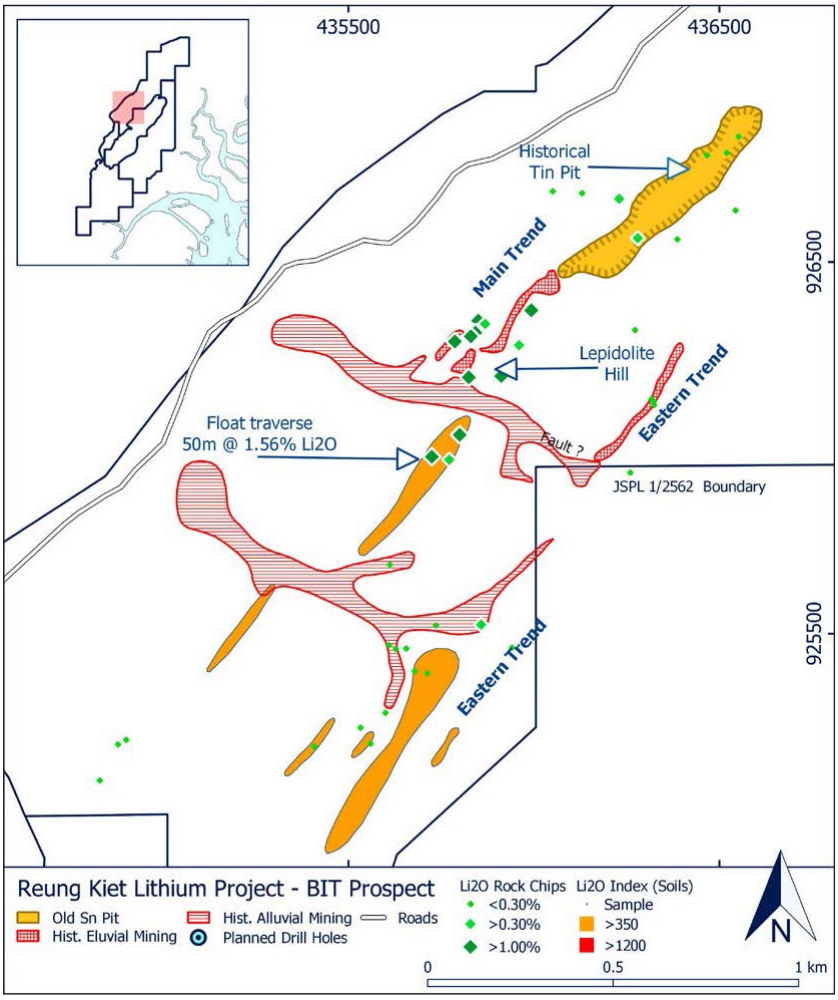
- Work by the Company has been concentrated on the Reung Kiet and Bang I Tum prospects, and has included mapping, geochemical sampling (soils and rock chips), trenching and diamond drilling (5 holes for 587.5 m).
- The drilling identified lithium beneath the open pit (Figure 11), with the best results including:
  - RKDD001: 6.3 m at 0.65% Li_2O from 66 m and 5.8 m at 0.73% Li_2O from 80 m; and,
  - RKDD002: 15.6 m at 0.82% Li_2O from 55 m, including 9 m at 1.0% Li_2O.
- The other holes each intersected three or four generally narrow zones (1 to 3 meters) of between 0.3% to 0.99% Li_2O.
- Geochemical sampling (including trenching) was concentrated to the SW of the pit, and identified lithium anomalism over a strike length of one kilometre (including that in the existing pit), associated with a dyke swarm with an overall width of ~90 m, and with individual dykes with thicknesses ranging from one metre to seven metres, and also identified a largely untested parallel zone.

Figure 11: Reung Kiet prospect showing summary of activities



Source: Pan Asia

Figure 12: Bang I Tum prospect



Source: Pan Asia

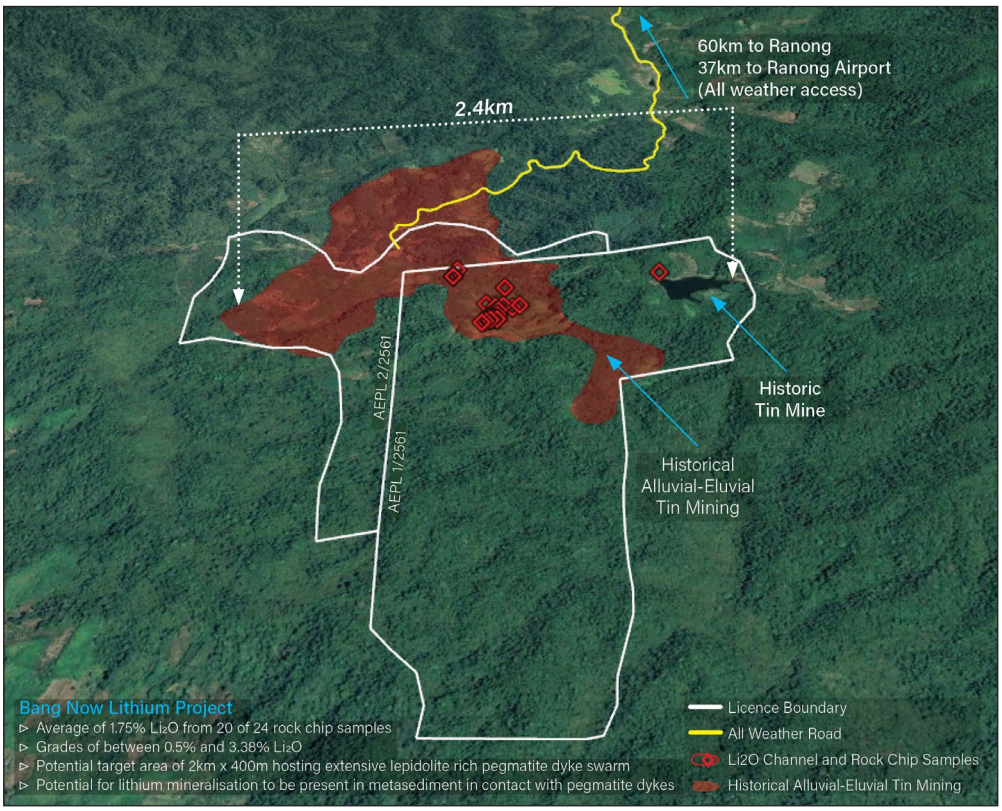
- Mineralogical studies indicate that the pegmatites contain between 25% and 45% lepidolite, with the lepidolite containing between 3.5% to 4.5% Li_2O.
- Sighter metallurgical testwork (rougher flotation) was also completed on weathered trench and rock chip samples, which indicated good 93.3% recoveries to a 2.76% Li_2O concentrate.
- Lepidolite separation and lithium recovery were noted as being very good, however grade could be improved by further steps, such as cleaner flotation and gangue suppression.
- Lesser work, including geochemical sampling, was undertaken at the Bang I Tum prospect, which was also the site of historic tin mining (Figure 12), with the mined pegmatite reportedly being ~25 m thick.
- The old pit, which was 650 m long and up to 125 m wide, extended to the top of fresh rock at 35 m, and now contains ~15 m of water.
- The overall identified mineralised trend is around 1.6 kilometres long, with 14 of 24 rock chips averaging 1.23% Li_2O; a 1.5 km long eastern trend has also been identified, which includes a dyke swarm ~100 m wide, comprised of individual dykes of up to 7 m thickness.

BANG NOW LITHIUM PROJECT

Summary

- Bang Now is an early stage lithium project, which has seen historical soft rock and alluvial tin mining (Figure 13).
- The historical work has resulted in abundant tailings, with these including gravel to boulder sized lepidolite bearing pegmatite, with similar material also being identified in the walls of the historical pit, intruding sediments.
- Work by Pan Asia, largely limited to rock chip sampling, has identified the potential for a lepidolite bearing dyke swarm over an area of two kilometres by 400 m, with 20 of 24 rock chips having grades of between 0.5% and 3.38% Li_2O, with an average of 1.75% Li_2O.

Figure 13: Bang Now map and activities



Source: Pan Asia

UPCOMING ACTIVITIES

- Current activities are focussed on drilling at the Khao Soon Tungsten Project, largely concentrating on the prospects for which Exploration Targets have been generated.
- Drilling is also planned at the Reung Kiet and Bang I Tum lithium prospects.
- Planning of activities for the other projects is also underway.

PEERS

- Table 2 presents a selection of ASX-listed companies that have tungsten or hard rock lithium as their main targets - project stages range from appraisal through to production, however we have included only those companies with published JORC 2012-compliant Resources (and thus Pan Asia is not included, given an Exploration Target only has been published) - there are only a few lithium and/or tungsten exploration companies without a published Resource listed on the ASX.
- As far as we are aware Pan Asia is the only ASX-listed company with a focus on both metals.
- We have compared these on the basis of enterprise value ("EV") per equity tonne of contained metal oxide.
- The EV here does not take into account of the value of other projects that the companies may hold, however most companies in the list are concentrating activities on the applicable resources.
- This comparison method is indicative only and should be treated with caution - a number of different factors can affect the metrics, however it gives an idea as to where the market is valuing companies with Resources, and the potential for uplift on Resource definition.

Table 2: Pan Asia peers

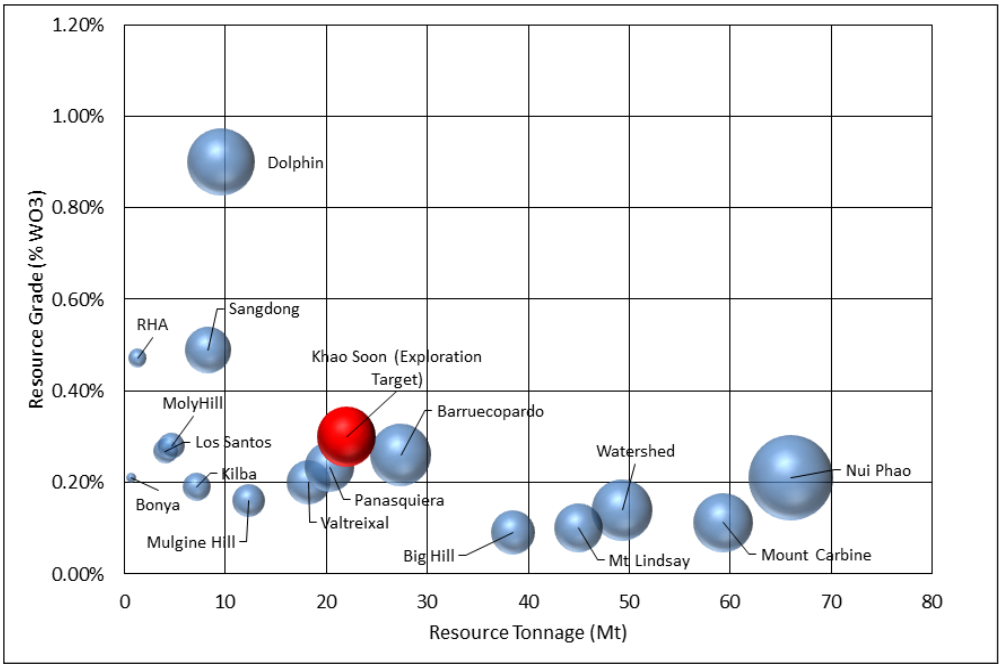
Pan Asia peers								
Company	**Undiluted EV**	**Type**	**Global Resource Tonnes**	**WO_3/Li_2O Grade**	**Contained WO_3/Li_2O**	**Ownership**	**EV/Equity WO_3/Li_2O**	**Stage**
Tungsten Mining	$100 m	Tungsten	354 Mt	0.12%	425 kt	100%	$236/t WO_3	Development Studies
Speciality Metals	$29.3 m	Tungsten	59 Mt	0.11%	67 kt	100%	$439/t WO_3	Development Studies
Venture Minerals	$29.2 m	Tungsten	45 Mt	0.10%	45 kt	100%	$648/t v WO_3	Development Studies
King Island Scheelite	$28 m	Tungsten	10 Mt	0.90%	86 kt	100%	$319/t WO_3	DFS, Permited
Thor Mining Plc	$16.5 m	Tungsten	5 Mt	0.27%	15 kt	94%	$1,199/t WO_3	Development Studies
Pilbara Minerals	$1,025.6 m	Li Pegmatite	223.2 Mt	1.26%	2,823 kt	100%	$363/t Li_2O	Producer
Piedmont Lithium	$415.6 m	Li Pegmatite	27.9 Mt	1.11%	310 kt	100%	$1,342/t Li_2O	PFS
Liontown Resources	$411.6 m	Li Pegmatite	172.0 Mt	1.33%	2,291 kt	100%	$180/t Li_2O	Development Studies
Galaxy Resources	$462.6 m	Li Pegmatite	54.9 Mt	1.37%	752 kt	100%	$615/t Li_2O	Producer
Ioneer	$256.1 m	Li Clays	154.5 Mt	0.35%	537 kt	100%	$477/t Li_2O	Development Studies
European Metals Holdings	$75.7 m	Li Zinnwaldite	696 Mt	0.42%	2,921 kt	100%	$26/t Li_2O	Development Studies
Ardiden	$78.7 m	Li Pegmatite	5 Mt	1.25%	60 kt	100%	$1,312/t Li_2O	Evaluation
Prospect Resources	$38.2 m	Li Pegmatite	43.2 Mt	1.41%	610 kt	87%	$72/t Li_2O	Development
Lepidico	$42.0 m	Li Lepidolite	11 Mt	0.43%	48 kt	80%	$1,094/t Li_2O	Development Studies, Technology Development
Core Lithium	$37.0 m	Li Pegmatite	3.5 Mt	1.43%	49 kt	100%	$749/t Li_2O	Development Studies
Infinity Lithium Corporation	$26.6 m	Li Amblygonite	111.2 Mt	0.61%	680 kt	75%	$52/t Li_2O	Development studies
Sayona Mining	$22.3 m	Li Pegmatite	20.9 Mt	1.00%	210 kt	100%	$106/t Li_2O	Development studies

Source: IRESS, Company Reports, IIR analysis

TUNGSTEN

- With regards to tungsten, one factor that may possibly differentiate Pan Asia from other tungsten-focused companies is the potential for relatively high grade near surface Mineral Resources.
- As discussed earlier, the Company has a JORC (2012) Exploration Target of 15 to 29 Mt @ 0.2% to 0.4% WO_3 for 30,000 to 116,000 tonnes of contained WO_3, with a mid-point of 22 Mt @ 0.3% $WO_3$for 66,000 tonnes contained WO_3.
- Although an Exploration Target is an early stage estimation, and further work may not actually result in the estimation of a JORC 2012-compliant Resource, we have plotted the Khao Soon Exploration Target mid-point against published Measured/Indicated/Inferred Resources for a number of projects globally, including producers (Figure 14) - we note that this does not include any tungsten equivalent grade applicable to by-products.
- Current producers (none of which are listed on the ASX) include Almonty Industries Los Santos (Resource grade of 0.27% WO_3) and Panasquiera (Resource grade of 0.23% WO_3) mines, and Masan Resources' Nui Phao operation (Resource grade of 0.21% WO_3).
- Mitsubishi has recently taken a 10% stake in Masan High-Tech Metals (and thus the Nui Phao mine and downstream processing operation) through a ~US$90 million placement, valuing the operation at ~US$900 million - Masan High-Tech Metals is a subsidiary of the Ho Chi Minh Stock Exchange listed Masan Group.

Figure 14: Tungsten Resources



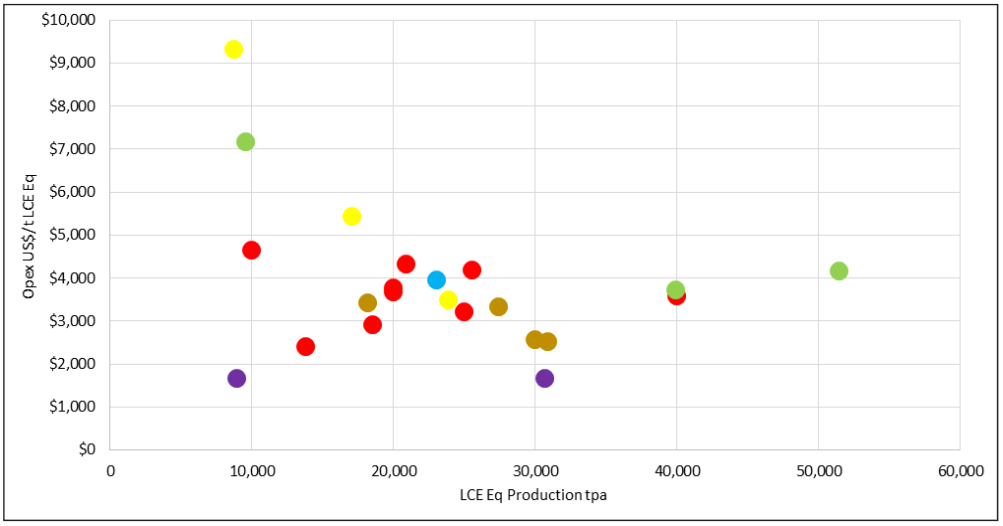
Source: IRESS, company reports, IIR analysis

LITHIUM

- As mentioned earlier, we have included only those companies looking at "hard rock" and not brine projects.
- We note that most lithium companies have lost significant value over the past few years, with notable exceptions being Liontown Resources (ASX: LTR, "Liontown") and Piedmont Lithium (ASX: PLL, "Piedmont"), both of which have advanced their respective projects through the downturn in the markets.
- In the recent past hard-rock activities was concentrated largely on spodumene pegmatite focussed companies/projects, with this being able to be sold at the mine-gate (or FOB) as a spodumene concentrate.
- However, with the forecast growth in lithium markets, more work has been undertaken on the treatment of materials with lower lithium contents (that precludes mine-gate concentrate sales), which have the potential for downstream processing to produce the primary lithium product as well as by-products.
- This is the case with Pan Asia, with the lithium focus on lepidolite-bearing pegmatites, and a strategy of downstream processing to lithium products and by-products.

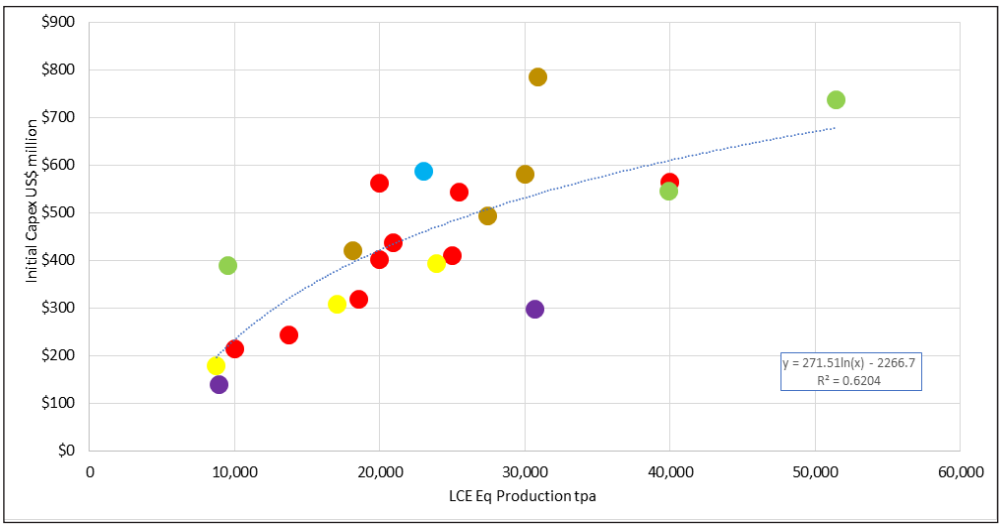
- One of the more advanced such of companies is Lepidico Ltd (ASX: LPD, "Lepidico"), which has developed the processes L-Max® and LOH-Max® to convert lepidolite mineralisation to battery grade lithium carbonate and lithium hydroxide respectively, with by-products including amorphous silica (cement and various high-end uses), potassium sulphate (high quality potash fertiliser), rubidium sulphate and caesium formate.
- In the DFS as released to the market this gave an LCE Eq C1 cash cost on a by-product basis of US$1,656/tonne, and an AISC of US$3,221/tonne - this is very competitive with other production methods, although does rely on the sale of the by-products.
- However, although successful on a pilot plant basis, we note that the process is yet to be proved on a commercially viable basis (unlike spodumene concentration and conversion to downstream products).
- Figures 15 and 16 show comparisons of estimated operating and capital costs as published in development studies for a number of different lithium projects - these figures include forecast by-product production and revenue converted to an LCE Eq basis.
- This highlights the potential for lepidolite based projects to be very competitive with other types of hard rock lithium production.
- We note that this data has been provided by Pan Asia, however ~50% has been validated against IIR's database which has been sourced directly from company reports.

Figure 15 Opex vs LCE Eq production



Source: Pan Asia, IRESS, company reports, IIR analysis. Brine - red, spodumene -light green, lepidolite -purple, clay - brown, tuff- light blue - zinnwaldite -yellow

Figure 16: Initial Capex vs annual LCE Eq production



Source: Pan Asia, IRESS, company reports, IIR analysis. Brine - red, spodumene - light green, lepidolite - purple, clay - brown, tuff- light blue - zinnwaldite -yellow

BOARD AND MANAGEMENT

- **Mr Paul Lock - Executive Chairman and Managing Director:** Paul has been involved in minerals exploration in South East Asia since 2012, with his work in this region forming the foundations of what is now Pan Asia Metals.

  Before Pan Asia Metals Paul was a corporate adviser at Everspring Partners, a boutique Sydney based advisory firm that he founded. Before Everspring Paul worked in corporate advisory and leveraged finance roles at Commonwealth Bank of Australia. Paul initially focused on corporate and single asset project finance in the resource sector before moving into leveraged finance for private equity initiatives and then into a corporate advisory role where he was sector agnostic and focused on generating corporate transactions.

  Prior to banking Paul worked for Rothschild & Co in Australia where he was a derivatives trader and a high yield bond investor focusing on a variety of asset classes, generally distressed or complex assets. Paul also had some involvement in structuring derivatives solutions for resource companies in conjunction with Rothschild's corporate advisory team. Prior to Rothschild Paul worked for Japanese trading conglomerate Marubeni Corporation in the soft commodity trading division.

  Paul graduated from Hale School in Perth, Western Australia, and has obtained the following academic qualifications: Master of Political Economy, University of Sydney; Master of International Studies, University of Sydney; Master of Commercial Law, Macquarie University; Master of Business Administration, Macquarie Graduate School of Management; and Bachelor of Business, Marcus Oldham College. Paul is an associate member of AusIMM.

- **Mr David Hobby - Technical Director:** David is an Economic geologist and has been involved in the minerals industry for over 30 years. Since graduating from the University of Canberra in 1989 David has worked in a variety of geological terrains in Australia, Asia, South America, USA and Africa, and has experience in all facets of the minerals project cycle with a focus on exploration and evaluation.

  David has held senior geological management and consulting positions with listed and private companies and progressed several projects through to feasibility and pre-production, including the Adelong Gold Project, Broula King Gold Project, Webb's Silver Project and the Woodlawn Zn-Cu project.

  David has been focused on SE Asia since 2013. His geological qualifications and experience are complimented with skills in project management, environmental management, Occupational Health and Safety, contractor, government and stakeholder management.

  David has been a member of AusIMM for 24 years and qualifies as a Competent Person under the JORC Code for a range of mineral deposit styles. David has also published and presented at conferences and seminars and is a former member of the NSW Minerals Council, Metalliferous Mining Committee.

  Mr David Docherty - Non-Executive Director: David has gained a lifetime of experience in the resource sector commencing with stockbroking in London before commencing a valuable career experience as an analyst with Investment Bank, Slater Walker London in 1965. David moved to Sydney in 1968 with Slater Walker to develop resource investment strategy, organising finance to enable Poseidon to drill its 'famous' Mt Windarra nickel discovery in 1969, as well as financing many other resource assets of that time. The same year David organised the ASX float of Slater Walker sponsored Mining Finance Corporation, becoming its Managing Director. In later times, David successfully guided Sedimentary Holdings as CEO to joint ownership and open-pit development of the old Cracow Gold Mine (Qld) in 1984-87.

  David became an equity partner in the Thai resource sector in 1987 when the Government deregulated gold exploration and mining. Thereafter, he jointly financed the formation of a team of young, keen local geologists who were responsible for the discovery of what is now the Chatree Gold Mine, a prospect which ultimately developed into the core gold asset of Kingsgate Consolidated and which, at its peak, was capitalised at more than $1 billion.

  In 2002 David was a foundation director and is CEO of Thai Goldfields NL, an unlisted public company which holds Thai applications (and re-applications) over gold resources defined by previous JV partners Oxiana and Tigers Realm Minerals and exploration tenements previously investigated by Newmont, Ivanhoe, Phelps Dodge.

- **Mr Thanasak Chanyapoon - Non-Executive Director:** Thanasak is a Partner at The Capital Law Office, a leading Bangkok based legal practice. Thanasak's area of expertise is tax law, advising national and international financial institutions, equity funds and corporations.

  Thanasak's directorships include: Executive Director of Hillcrest Resorts (Samui) Co., Ltd., Independent Director and Audit Committee Member of Cal-Comp Electronics (Thailand) PCL; Supervisor of XYZprinting Inc., Taiwan (Republic of China), Non-Executive Director of Cal-Comp Holding (Brasil) S.A., Brazil; and Director of Vana Nava Company Limited, Thailand.

  Thanasak's qualifications are: Master degree in law (LL.M.), University of Cambridge, UK; Master degree in law (LL.M. in Business Law), Chulalongkorn University; Certificate of American and International Law, Dallas, USA; and Bachelor degree in law (LL.B. (Hons)), Chulalongkorn University..

- **Mr Ian B Mitchell - Non-Executive Director:** Ian is a practicing solicitor of over 44 years' standing. Ian has been a director of over 13 ASX listed companies since 1987 and also as a company secretary of many more ASX listed and non-listed public companies.

  Ian has over 30 years' experience as a director and company secretary of listed and non-listed mining, exploration and industrial companies. Ian's legal expertise is in commercial law, contract law and ASIC and ASX compliance.

- **Mr Roger Jackson - Non-Executive Director:** Roger has been actively involved in the Mining industry for 25 years as a Mine Operator, in Mine Services and in Mineral Exploration. He has been a founding director of a number of private and public mining and mine service companies. He is currently a Director of NQ Minerals plc.

  Roger has maintained a Geological and Mining Consulting business for the past 10 years whilst holding several executive roles. He has strong knowledge of Gold exploration and Mining. He also has a sound knowledge of base metal mining and exploration. He has developed several mining and ore processing operations in Australia and abroad and has significant experience in marketing gold and base metal concentrate across the globe.

  Roger has a Science degree with a major in Geology and Geophysics, and also holds a Diploma in Financial Management and a Diploma in Education. He is long-standing Member of the Australian Institute of Company Directors, Fellow of the Geological Society of London and a 25 year Member of the Australasian Institute of Mining and Metallurgists (AusIMM) (Competent Person).

- Biographies extracted from Pan Asia's website.

BACKGROUND - THAILAND

Demographics and Government

- With a population of around to 70 million, Thailand is the 20th most populous country globally, with the population split close to 50:50 between urban and rural.
- With a land area of 510,890 km^2, the population density is 136 people/km^2, and the largest city is the capital, Bangkok, with a population in the order of 8.3 million.
- Buddhism is the dominant religion in Thailand, practiced by 95% of the population, with 1.7% of the population Christian - there is freedom of religion in Thailand.
- The country is a constitutional monarchy, however following six months of political unrest, in 2014 the army led a coup d'etat, and established a junta called the National Council for Peace and Order ("NCPO"), which, in 2017 introduced a new constitution aimed at reducing political conflict and corruption through a new political system.
- This includes a bicameral parliament, with a lower house of 500 members (the National Assembly), for which the first elections since the coup were held in 2019; the upper house however has all 250 members appointed by the military.
- This ensures ongoing strong control by the military under a system termed the "Thai Way", a form of guided democracy; on the positive side this should ensure adherence to policy settings put in place under the long-term development plans for the country.
- Thai law is based largely on the civil law, with the constitution being the basis of the legal system, along with statutes and acts, and criminal law; the legal system has also been influenced by common law.

- The current legal system, which has its roots in the early twentieth century, has four courts - the Constitutional, Justice, Administrative and Military Courts.

Finance and Economy

- The Thai currency is the Baht, currently trading at ~31 to the US dollar - over the past five years since 2015 it has appreciated from 35 to the US dollar.
- Thailand has been seen as an international development success story over the last 50 years (similar to its neighbour, Malaysia), moving from a relatively poor country to an upper middle income country ranked by GNI - in 2018 the country was ranked at number 76 globally with a nominal GNI of US$7,260 per capita.
- In the same year Thailand was ranked 74th globally for GPD (PPP), at US$17,910 per capita; however the country has the world's 21st largest economy, with a total GDP of 1.27 trillion, similar to that of Taiwan and not far behind Australia, which is ranked 18th.
- The country has a strong manufacturing sector, which contributed some 39.2% of GDP in 2018 - main manufacturing industries include automobiles and electric appliances and parts.
- The economy relies strongly on exports, with these being ~66% of GDP, with imports at around 56% of GDP (prior to COVID-19).
- In 2016 the NCPO embarked on a development programme called "Thailand 4.0", with the aim to attract DFI, develop infrastructure, develop tourism, become a regional trading hub and restructure the manufacturing base from labour intensive industry to the manufacturing of higher value and value added goods.
- There is also a push to modernise and industrialise the agricultural sector.
- Initiatives introduced to attract DFI and trade include reducing bureaucratic obstacles, improving access to financing, strengthening legal protections for foreign partners and an introduction of a new customs law; in addition the country allows free transfer of currency in and out.
- The economy saw significant improvements following the introduction of "Thailand 4.0", however has been hit relatively hard by COVID-19, given reliance on trade and also tourism.
- On the other hand, Thailand has COVID-19 infection rates per capita amongst the lowest globally, being in the lowest decile.
- Thailand is rated highly (at 21 out of 190 countries) on the World Bank's "ease of doing business" rankings, and is generally ranked well on the other World Bank doing business regulation rankings.

Mining in Thailand

- Although mining makes a relatively small contribution to Thailand's economy, the Government, as part of ongoing reforms, introduced a new Mining Law in 2017.
- At the federal level the mining industry is regulated jointly by the Ministry of Industry ("MOI"), the Ministry of Natural Resources and Environment ("MNRE") and the Department of Primary Industry and Mines ("DPIM"); at the provincial level it is regulated by the local DPIM.
- The main environmental law is the Environment Protection and Promotion Act (1992), administered by an office within the MNRE.
- In 2018 the Council of Ministers approved a 20-year (2017 to 2036) mineral management strategy and a five-year mineral management plan (2017 to 2021), with an aim to integrate the county's management of mineral resources, and to ensure that the industry is environmentally friendly, with this also considering the quality of life of those affected by the industry.
- The 2017 Mining Law has introduced a number of exploration tenement types:
  - A General Prospecting Licence ("GPL"), which has a term of one year, is valid for preliminary surveys only, is non-exclusive and non-renewable, with area dependent upon the province,
  - An Exclusive Prospecting Licence ("EPL"), which has a maximum area of four km^2, is valid for two years and is non-renewable; and,
  - A Special Prospecting Licence ("SPL"), which has a maximum area of 16 km^2, is valid for five years and is non-renewable.

- Although individual licences have statutory maximum areas, there is no limit on the number of licences that can be applied for; also, applications are made in multiples of the "Rai", which has an area of 1,600 m^2.
- Although "non-renewable", terms for EPLs and SPLs can in reality be extended by applying for a new licence - in considering such requests the DPIM will consider the performance of the applicant during the life of the expiring tenement, especially in the case of competing applications.
- Licensees are, as in most jurisdictions, required to meet work programmes, expenditure commitments and reporting requirements during the life of the licences.
- Only EPLs and SPLs can be converted to mining leases.
- Royalties are payable on production and in the case of tungsten based on the Thai Baht value converted from the Chinese WO_3 price.
- The incremental royalty rates range from 0% to 20% as shown in Table 3 below, which also presents the calculation at a price of THB361,900/tonne.
- No royalty rates have been determined as yet for lithium, given no production in Thailand.

Table 3: Tungsten royalty rates and calculation

Tungsten royalty rates and calculation		
65% WO_3 price per tonne	**Royalty Rate (%)**	**Royalty/tonne (THB)**
0 - 50,000	0.00%	
50,001 - 125,000	2.50%	1,875
125,001 - 250,000	5.00%	6,250
250,001 - 500,000	10.00%	11,190
500,001 - 750,000	15.00%	-
750,001 +	20.00%	-
Royalty Payable		19,315
Royalty %	4 to 7	5.34%
Rabbit	15 to 29	0.2 to 0.4

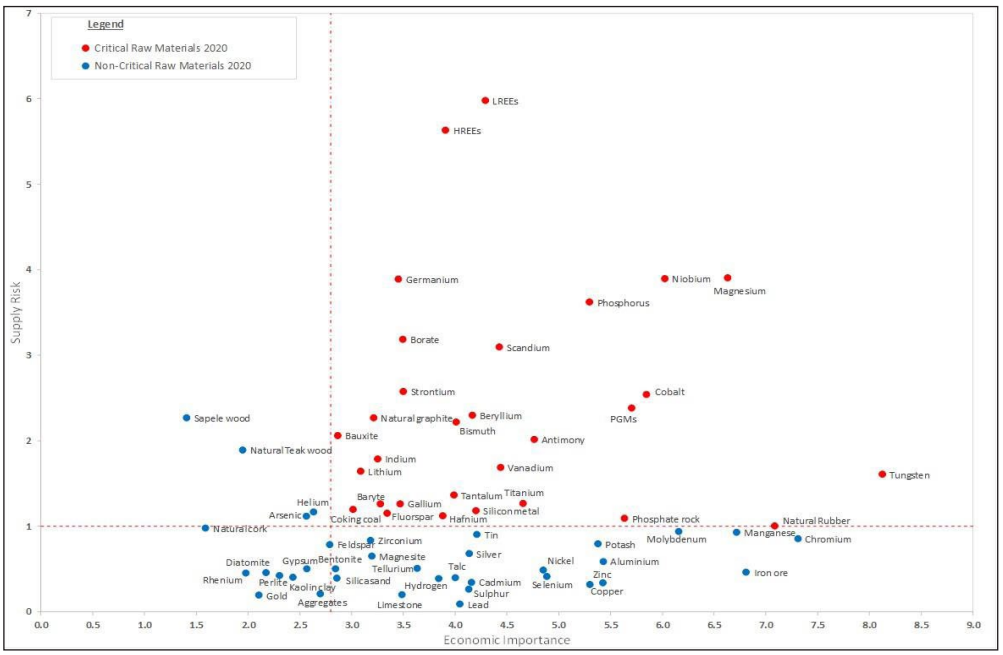
Source: Pan Asia

BACKGROUND - METALS MARKETS

- The following sections present an overview of the tungsten and lithium markets.
- Whilst the overviews of the metals and uses may be up to date, any forecasts of supply, demand and pricing should be considered with caution and considered indicative only (mainly regarding timeframes) - the ongoing COVID-19 "pandemic" has thrown a spanner into the forecasting business, making an already inexact "science" even more uncertain.
- We have included forecasts completed prior to the pandemic - our view is that, with the money to be printed and thrown into the post-pandemic recovery, that demand will reach that as previously forecast, albeit delayed by possibly one to two years.
- Given the relatively immature nature of the lithium markets, forecasting is harder - we have already seen what may be considered a "bubble" that peaked in mid-2018, with the base-line products now trading at lows - premium, including battery grade products have however held value reasonably well given constraints in supply.
- We would expect more certainty as markets mature and the producers get rationalised.
- We do note the renewed interest in lithium companies in the markets over the past few months, particularly with positive announcements by Piedmont Lithium (ASX: PLL) and Liontown Resources (ASX: LTR).
- Another consideration pertinent to Pan Asia is that both lithium and tungsten are considered as "critical raw materials" by the USA and European Union, based both on economic importance and threat to supply (Figure 17).
- In addition, China is the dominant producer (~80%) of tungsten materials, and a significant producer of lithium carbonate and lithium hydroxide - end users are looking for diversification of supply, particularly given the current geopolitical situation.
- Pan Asia's location in Thailand ideally places it at the centre of strongly growing markets for critical metals.

- What we have not considered in detail are the markets for potential by-products from lithium processing, which may include amorphous silica and sulphate of potash if work undertaken by Lepidico is used as a guide - other potential by-products include tantalum, tin, caesium formate, rubidium formate, gypsum and kaolin.

Figure 17: Critical raw material matrix 2020



Source: European Commission "Study on the review of the list of Critical Raw Materials"

- In our view, the location in Thailand is ideal to market these products should the lithium projects be developed:
  - In 2018 East and South Asian demand for muriate of potash (KCl, "MoP") was some 30 million tonnes, with approximately 75% of this being imported,
  - The Lepidico L-Max® (or any similar processes) produce sulphate of potash ("SoP"), which is a superior potassium fertiliser to MoP, however is more expensive than MoP, and as such hasn't seen significant take-up; and,
  - Lepidolite processing may provide the opportunity to supply SoP into the market at a price closer to that for MoP, and hence should be readily marketable.
- One of the uses for amorphous silica, another potential by-product of lithium hydroxide production, is as a partial additive/replacement for cement in concrete - again, given the ongoing development in SE Asia, there should be a ready market for at least some of the anticipated production.
- Gypsum is another potential by-product that is important in cement making.

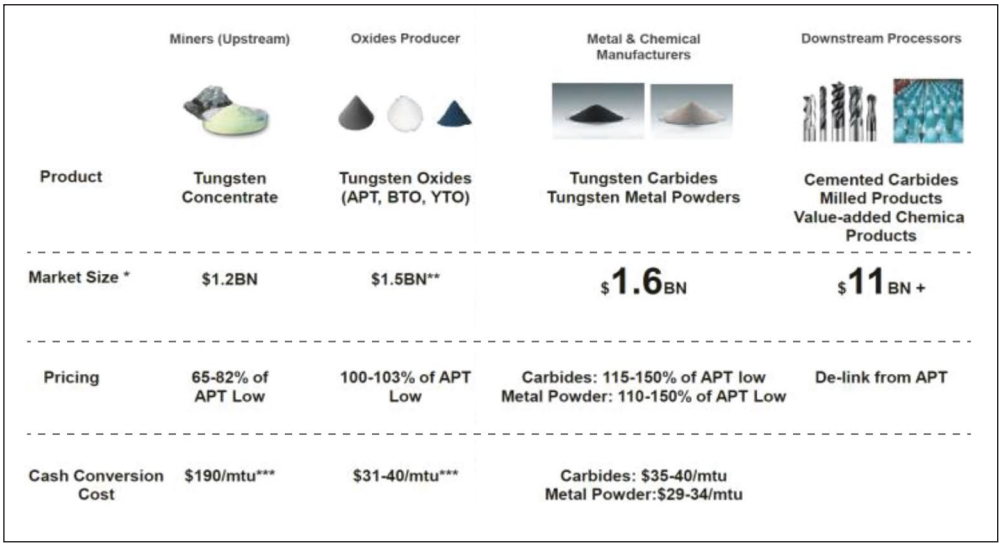
BACKGROUND - TUNGSTEN

Introduction

- Tungsten is unique, having the highest melting point and lowest coefficient of expansion of any metal; it is also environmentally benign, being corrosion resistant and thus neither breaking down nor decomposing. In the form of tungsten carbide, it is extremely hard, being 2nd only in hardness to diamond amongst the more common materials.
- The major use for tungsten is in the form of tungsten carbide, where it is used for applications that require extreme abrasion resistance; these include mining drilling bits and cutting tips, and make up approximately 55% of tungsten demand. It is also an important alloying component for making hardened steels, which comprise around 20% of demand.
- There are also a number of other uses, including in lighting, electronic components, armaments and sporting goods, and with specialist applications in areas such as aerospace now growing.

- Tungsten is primarily found in the minerals scheelite ($CaWO_4$) and wolframite ($(Fe,Mn)WO_4$), and first stage processing involves beneficiation to a concentrate – either a premium +60% WO_3 or a lesser value +50% WO_3 product, however offtakers will accept concentrate grades of down to 45%.
- Ferberite is the iron rich end member of the wolframite series, with hubnerite being the manganese-rich end member.
- The concentrates are generally converted to an intermediate ammonium paratungstate ("APT") or other oxide product, before being converted to elemental powder and tungsten carbide, with these trading at a premium to concentrates as shown in Figure 19 - downstream plants generally have relatively low capital and operating costs.

Figure 18: Tungsten products and relative pricing



Source: EGF Hermes Broker Research Report on Masan Group Corp, April 2, 2019

Markets

- Given the specialty industrial uses for tungsten, demand is tied closely to global economic conditions, and as well the tungsten market is opaque – different sources have different estimates of production and consumption figures, and US figures are generally confidential.
- According to the USGS, world mine production in 2018 (excluding the US) was in the order of 81,100 tonnes of contained tungsten metal, with 65,000 tonnes (80%) of this being produced by China; recycling of scrap is also an important source of supply, which is estimated to comprise 20-30% of total supply.
- World mine production as collated by the USGS over recent years is shown in Table 4; this may differ slightly from figures from other sources, but highlights the dominant position China has in mine production.

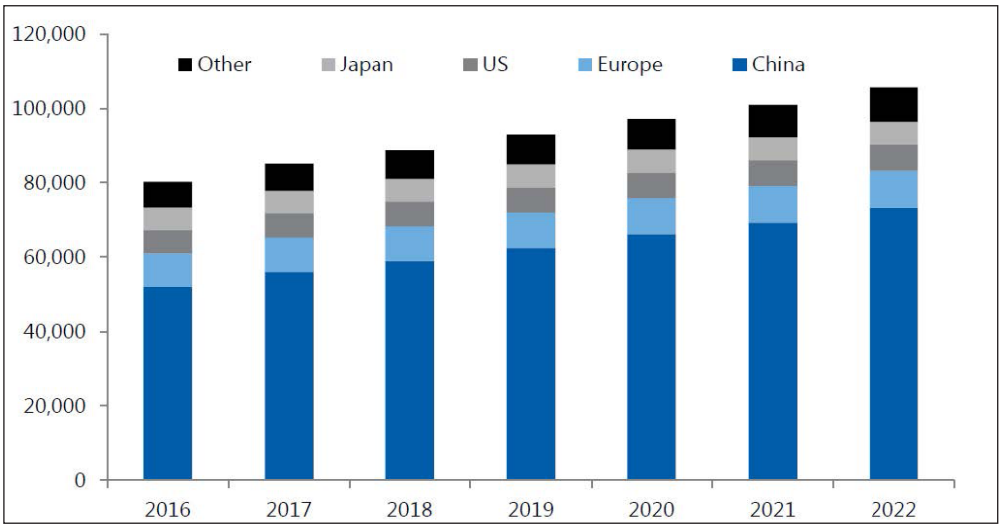
Table 4: Global tungsten mine production - tpa contained metal

Global tungsten mine production - tpa contained metal					
Country	**2015**	**2016**	**2017**	**2018**	**2019e**
Australia	-	-	-	-	-
Austria	861	954	975	936	940
Bolivia	1,460	1,110	994	1,370	1,200
Canada	1,680	-	-	-	-
China	73,000	72,000	67,000	65,000	70,000
DRC	-	-	-	-	-
Mongolia	-	753	150	1940	1900
Portugal	474	549	724	715	700
Russia	2,600	3,100	2,090	1,500	1,500
Rwanda	850	820	720	920	1100
Spain	835	650	574	750	500
UK	150	736	1,090	900	-
Vietnam	5,600	6,500	6,600	4,800	4,800
Others	1,700	928	1,183	2,269	2,360
Totals (exc USA)	**89,210**	**88,100**	**82,100**	**81,100**	**85,000**

Source: USGS

- Chinese production did slow down during the GFC, due to depressed foreign demand, however domestic demand continued to grow during this period.
- China is also the world's largest consumer, with the US, Europe and Japan being the other consumers of note (Figure 19); this figure also highlights the forecast increase in demand over coming years.
- A key factor in demand forecasting is that cemented tungsten carbide demand is strongly linked to GDP per capita – increasing living standards will lead to an increase in demand for these products, with this highlighting the potential in China, as well as other growth economies, including those in SE Asia and Asia more broadly.

Figure 19: Forecast demand by region 2016 to 2022



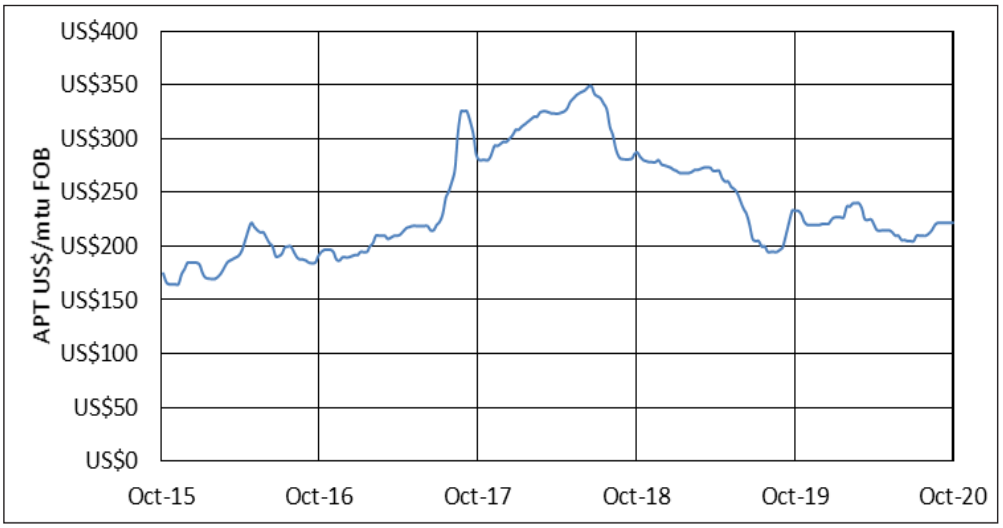
Source: Argus Media, in Tungsten Mining NL August 2018 presentation

- China controls the global tungsten market, and has put a number of measures in place to control domestic supply and restrict production and exports of tungsten - given growing domestic demand in the near future, it is likely China may further restrict exports, thus leading to opportunities for non-Chinese producers.
- There has also recently been a concerted effort by China to clean up environmentally dirty operations, with this taking some supply out of the market.
- Falling domestic demand in China will lead to the reverse position, with the potential to flood the external market with cheap product and thus making non-Chinese production less economic.

Pricing

- Demand/supply fundamentals have historically been very volatile, as reflected in pricing as shown in Figure 20, reflecting the correlation between demand and global economic conditions.

Figure 20: Five year APT prices



Source: Bloomberg

- Published prices are generally for APT in US$/mtu (an mtu, or "metric tonne unit" is equal to 10 kg of WO_3, which contains 7.93 kg of tungsten metal, with 100 mtus being one tonne).
- 65% concentrate prices have historically traded at around a 20-35% discount to the APT price, reflecting the cost of processing the concentrate to produce APT; in addition there can be further penalties for deleterious elements, including molybdenum.

BACKGROUND - LITHIUM

What is Lithium?

- Lithium is an alkali metal; the lightest of all metals and the least dense of any of the elements that are solids at room temperature. Because of its inherent instability and reactivity it never occurs freely in nature, but only in compounds.

Lithium Products

- Lithium is supplied as, and prices quoted for a number of products, with the most common being lithium carbonate, followed by lithium hydroxide (actually lithium hydroxide monohydrate) and lithium concentrates - the strongest growth in demand is for lithium hydroxide, largely for use in batteries.
- Care has to be used in comparing reported grades, tonnages and expected revenues between companies when they are quoted on different bases.
- Lithium carbonate (Li_2CO_3) contains around 18.8% lithium; therefore one tonne of lithium is equivalent to 5.3 tonnes of lithium carbonate.
- Another compound that is often quoted is lithium oxide – Li_2O – which contains 46.5% lithium, around 2.5 times that of LCE, with lithium hydroxide monohydrate ($LiOH.H_2O$, 16.5% Li) increasingly being used – conversion factors are shown in Table 5.
- It should be noted that when "lithium hydroxide" is quoted in articles, it most likely refers to "lithium hydroxide monohydrate".
- Our figures and discussions in the following sections are based on LCE - where necessary we have converted figures from other compounds using the ratios in Table 5.
- Lithium products come in three main specifications, with typical values as follows, and with these commanding different prices:
  - Industrial grade (+96% Li, 0.70% H_2O, 0.50% Na_2O) - glass, casting powders and greases.
  - Technical grade (~99.3% Li, 0.60% H_2O, 0.20% Na_2O) - ceramics, greases and batteries.
  - Battery grade (>99.5% Li, 0.50% H_2O, 0.05% Na_2O) - high end battery cathode materials

Table 5 :Lithium mineral/compound conversion factors

Lithium mineral/compound conversion factors							
Species	**Formula**	**Lithium content**	**Convert to Li**	**Convert to Li_2O**	**Convert to Li_2CO_3**	**Convert to LiOH**	**Convert To $LiOH.H_2O$**
Lithium	Li	100%	1	2.152	5.322	3.451	6.046
Lithium Oxide	Li_2O	46.46%	0.465	1	2.473	1.603	2.810
Lithium Carbonate	Li_2CO_3	18.79%	0.188	0.404	1	0.648	1.136
Lithium Hydroxide	LiOH	28.98%	0.29	0.624	1.542	1	1.752
Lithium Hydroxide Monohydrate	$LiOH.H_2O$	16.54%	0.165	0.356	0.88	0.571	1

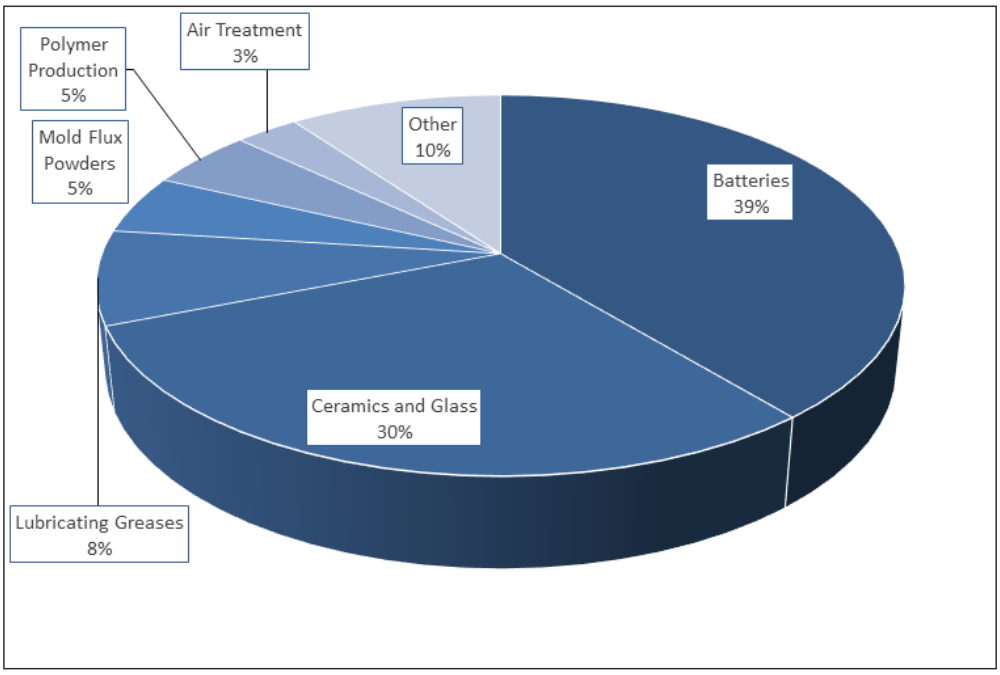
Source: IIR analysis

Lithium Uses and Demand

- Lithium has a large number of uses, with the most relevant now being in rechargeable batteries, which in 2017, according to the USGS made up some 39% of the then annual demand of over 175,000 t of lithium carbonate equivalent ("LCE"), which is the form that lithium grades and prices are most commonly quoted in.

- Figure 21 presents the USGS's breakdown by application in 2017 - we note that the battery demand here differs from that provided by Roskill and SQM, which estimated battery demand (electronics plus EVs) was ~50% of total demand in 2016, rising to 60% in 2018.

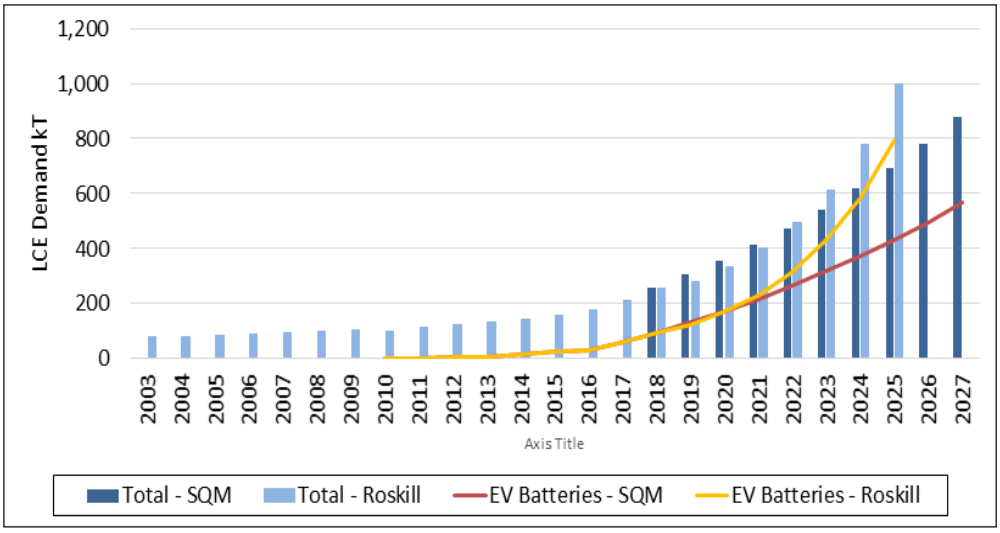
Figure 21: Lithium uses - 2017



Source: USGS

- Demand forecasts also vary quite widely between different parties, with this depending largely on the expected take-up in electric vehicles.
- As noted earlier, these will now change further, given the effects of COVID-19 - we will continue to use pre-COVID-19 forecasts, given our view that any forecasting completed currently will have significantly more uncertainty given current conditions.
- Our view is that demand will reach that as previously forecast, however will take a longer time frame (possibly one to two years more?).
- Figure 22 presents a comparison of forecasts by Roskill (as presented in a Livent presentation) and SQM (as presented in a Millennial Lithium presentation) - historic data and non-EV forecasts are similar, however the difference in total future demand is strongly driven by assumptions as to EV demand.

Figure 22: Forecast LCE demand comparison

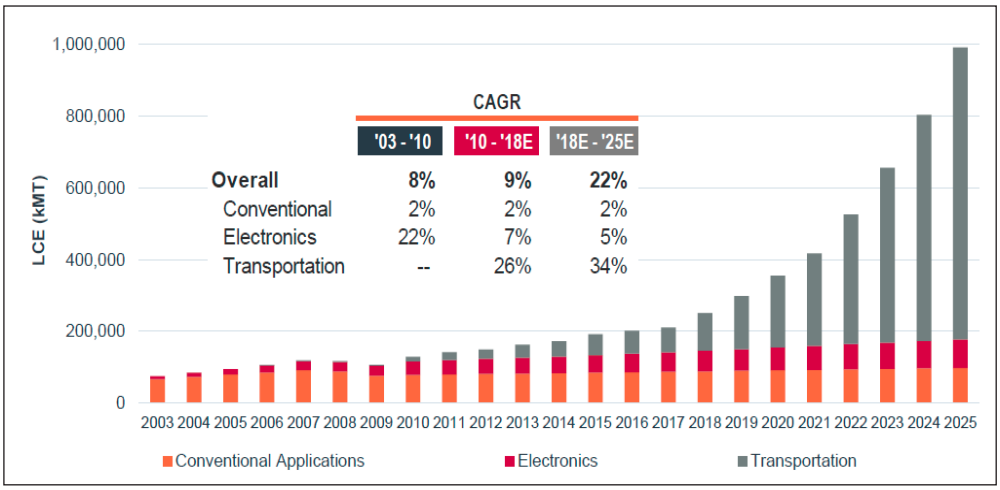


Source: Adapted from Roskill (Livent presentation) and SQM (Millenial presentation)

- The Roskill forecasts uses an EV CAGR of ~34% to 2025, whereas the SQM forecast has a CAGR of 24% out to the same date - these result in significant differences in the forecast demand, with that for Roskill close to 1,000 ktpa LCE and SQM ~700 ktpa LCE.

- The demand forecasts for non-EV applications are however reasonably similar, increasing to around 200,000 tpa LCE by 2025.
- Figure 23 presents the detailed Roskill forecasts as used in Figure 19 - this highlights a forecast overall 22% CAGR from 2018 to 2015, resulting in demand of ~1,000 kt LCE by 2025, largely driven by electric vehicles (31% CAGR); this also shows the slowing in growth rate in consumer electronics as this market matures.
- Other growing battery uses include home storage, and the potential for grid scale storage to be used in conjunction with solar and wind power generation.
- In Australia over the last few years we have seen AGL Energy launching a home storage product in Australia in line with Tesla's "Powerwall" announcements. The major battery producers are Japan, China and South Korea, with Tesla also now joining the fray.

Figure 23: Roskill LCE demand forecast



Source: Roskill, in Livent presentation

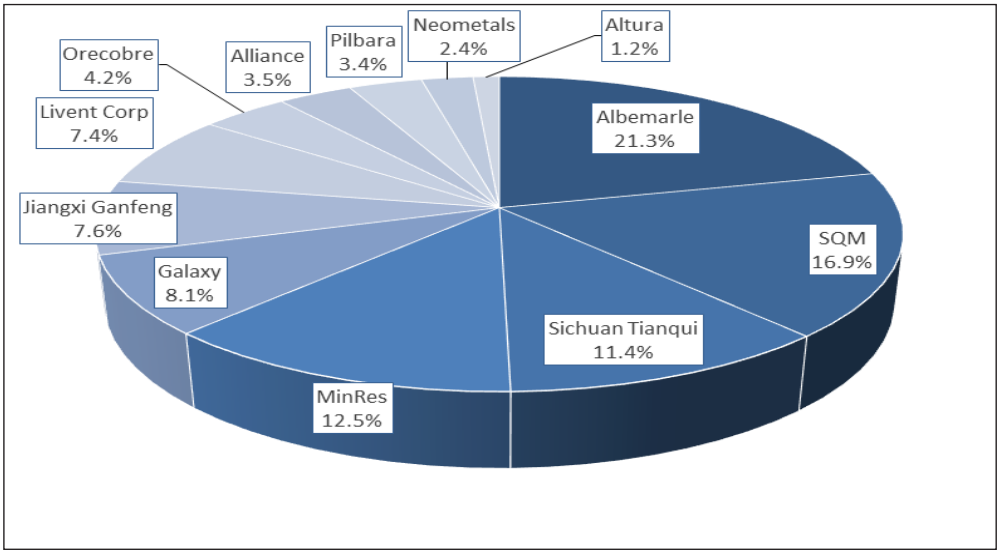
- It needs to be noted that the EV market is still relatively immature - it will take some time for clear trends to develop, which may also lead to some difficulties in getting projects financed, as well as some delaying of projects, including conversion facilities - it has been a shortage of conversion capacity that has partly led to falls in prices over the past two years.
- One example of this is Toyoto Tsusho's (Orocobre's partner at Olaroz) decision to delay any decision to increase supply for at least two years, so as a clear direction in the EV market may be seen.

Lithium Supply

- There are currently two main sources of lithium – brine deposits and hard rock spodumene deposits.
- Production from brine deposits involves the extraction by pumping of lithium rich brines in salt lakes, followed by concentration by evaporation in evaporation ponds. From this, the concentrated solutions are processed to end products, including lithium carbonate and lithium hydroxide.
- Common by- or co-products include potassium and boron salts, which can significantly improve the economics of brine operations.
- Key points that affect potential brine operations include lithium content, magnesium content (this is relatively expensive to remove, with a rule of thumb stating that the ratio of Mg to Li in brines must be below 10:1 for a brine deposit to be economical), sulphate content and evaporation and rainfall rates – high evaporation rates results in lower costs as smaller ponds and shorter residence times are required.
- Currently all global hard rock production is from spodumene deposits, however a number of companies, including Lepidico, and now Pan Asia, are assessing lepidolite deposits, as well as other companies assessing lithium bearing deposits including zinnwaldite (European Metals Holdings) and clays (including the mineral searlisite, Ioneer).
- If brought into production, such projects will produce higher value downstream products, including lithium hydroxide, rather than a low value concentrate.

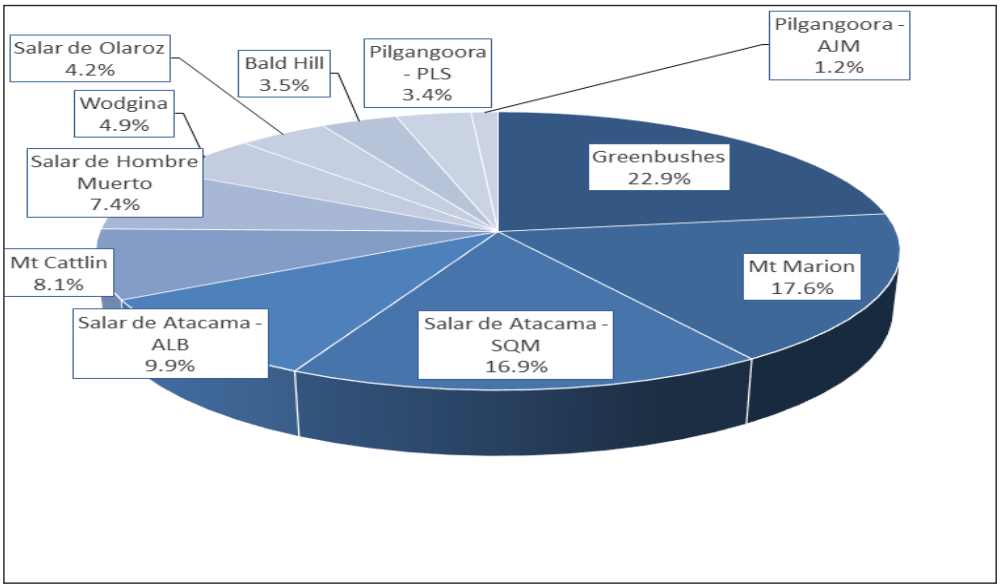
- Although no non-spodumene hard-rock deposits have been advanced to production, development studies (which have included pilot scale processing as discussed earlier) have highlighted the potential for the economically and technical viability of production from these, with this however relying on the production and sale of by-products.
- Such by-products include, amongst others, potassium sulphate and amorphous silica from lepidolite, and boron compounds from searlisite.
- ASX listed companies, including Ioneer and Lepidico have published DFSs on their respective projects, including the downstream production processes.
- Figures 24 and 25 show a breakdown of supply from non-Chinese producers and operations as at the end of 2018 - what this shows is that production outside of China is reasonably concentrated, with only a few companies providing the bulk of supply in the business - note that is some cases accurate production figures are hard to source.
- However, falling demand and prices have seen significant changes over the past two years, with some operations decreasing production, others ceasing production and some companies going into administration.
- These graphs are based on LCE - we have converted reported sales from other sources (DSO, spodumene concentrates and lithium hydroxide) to LCE.

Figure 24: Lithium production by company 2018



Source: Company reports

Figure 25: Lithium production by deposit 2018



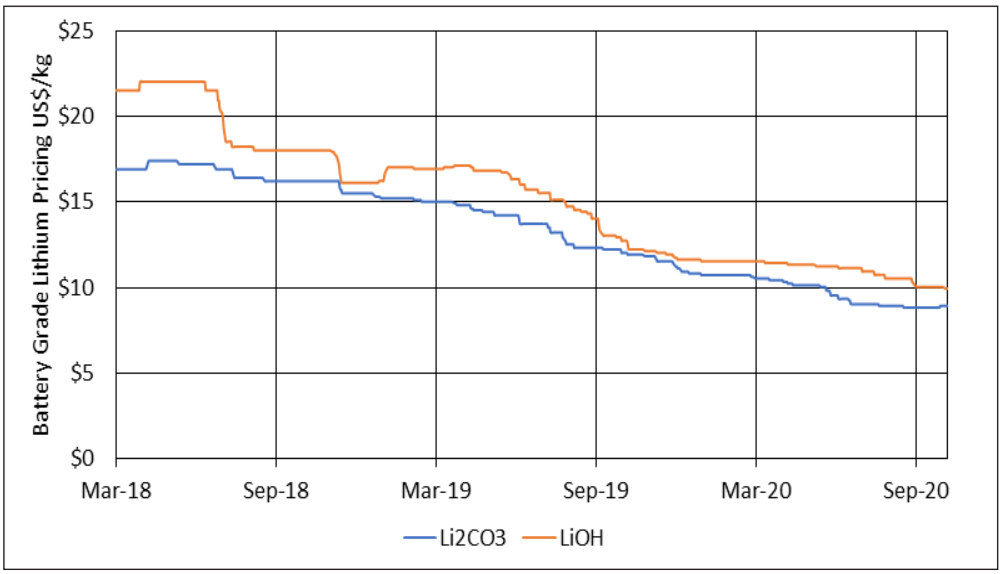
Source: Company reports

- A feature of the hard rock space to date is that these early cycle start-ups have largely relied on mine gate concentrate sales, with these producers therefore reliant on the Chinese converters for product sales - a lack of conversion capacity has led to lack of demand, falls in prices (largely for base quality products) and hence decreases in production.
- This has led, in some cases, in some companies ending in administration.
- These issues have been recognised, with a number of Australian conversion plants being under construction and planned.

Lithium Pricing

- Like most specialty metals, pricing is opaque and set by direct negotiation between producer and customer - pricing is also dependent upon the type and relative quality of the product.
- Another difficulty involves the plethora of lithium products, however prices trend to track each other - as an example lithium hydroxide trades at a ~10% to 15% premium to lithium carbonate.
- Prices increased significantly from late 2015 until mid-2018, with Chinese spot battery grade lithium carbonate prices reaching over US$20,000/tonne CFR in 2018, following on from prices staying around US$5,000 - US$6,000/tonne in the preceding few years.
- These price rises were also evident in the South American brine producers – according to the TRU Group these averaged around US$4,500/tonne in 2014 (with battery grade product at a premium of US$500 to US$1,000/tonne), reached ~US$15,000/tonne in the September quarter 2018, however have now retreated to under US$5,000/tonne as presented in Company financial reports.
- Orocobre has seen a fall in price from US$10,587/tonne LCE in the December 2018 quarter to US$3,913/tonne in the June 2020 quarter - this is equivalent to a spodumene concentrate price of ~US$200/tonne.
- The above largely applies to lower quality products - battery grade hydroxide and carbonate have are still trading at around US$10,000/tonne, having fallen from ~US$20,000/tonne at the peak (Figure 21).

Figure 21: Recent lithium product prices



Source: Bloomberg

- Spodumene concentrate contract prices at the high included US$905/tonne for 6.0% Li_2O product from Galaxy's Mt. Cattlin operation - this is equivalent to US$6,000/tonne LCE.
- Spodumene concentrate prices however vary according to grade and levels of contaminants; these largely track that of lithium carbonate, albeit at a significant discount on an LCE basis due to the requirement for further processing, with this generally having a cost of between US$2,500 and US$3,500/tonne LCE.
- The initial falls in prices may have been largely due to oversupply of concentrates, with a number of new operations coming on stream, and with a slower than expected increase in conversion capacity for the spodumene producers.

- Falls have been more exaggerated in China, with falls in the rest of the world pricing being subdued; this is a similar case to the rises in prices, with this also being exaggerated for Chinese pricing.
- The ongoing COVID-19 situation through 2020 has exacerbated falls in pricing - lithium remained at record low levels in October, trading at 39,000 yuan per tonne as demand for lithium is unlikely to return to pre-coronavirus levels in 2020, even after economic activity resumed.
- However, lithium prices are poised for a rebound in the next few years as a lot of the government measures to combat the fallout from the virus are aimed at EVs, and green projects that will boost demand for lithium-ion batteries.

DISCLAIMER

(a) Disclaimer

The information, reports, financial models, forecasts, strategies, audio broadcasts and other media (referred to as "Content" throughout this Legal Notice), provided on this web site has been prepared and issued by Altavista Research Pty Ltd trading as Independent Investment Research "IIR", Independent Investment Research Holdings Pty Ltd (ACN 155 226 074), as authorised to publish research under an Australian Financial Securities Licence (AFSL No 420170) which allows Independent Investment Research to offer financial service advice to retail and wholesale clients. Users of this web site should not act on any Content without first seeking professional advice. Whilst the Content contained on this web site has been prepared with all reasonable care from sources which we believe are reliable, no responsibility or liability is accepted by Independent Investment Research, for any errors or omissions or misstatements however caused. Any opinions, forecasts or recommendations reflect our judgement and assumptions at the date of publication or broadcast and may change without notice. Content on this web site is not and should not be construed as an offer to sell or the solicitation of an offer to purchase or subscribe for any investment. We are not aware that any user intends to rely on the Content provided or of the manner in which a user intends to use it. In preparing our Content it is not possible to take into consideration the investment objectives, financial situation or particular needs of any individual user.

Access by any user to this website does not create a client relationship between Independent Investment Research and the user. Users seeking to invest must obtain individual financial advice to determine whether recommendations are appropriate to their investment objectives, personal financial situation or particular needs, before acting on any recommendations. Any Content is not for public circulation or reproduction, whether in whole or in part and is not to be disclosed to any person other than the intended user, without the prior written consent of Independent Investment Research.

(b) Disclosure of Interest

General

Independent Investment Research, its officers, employees, consultants and its related bodies corporate have not and will not receive, whether directly or indirectly: any commission; fee; benefit; or advantage, whether pecuniary or otherwise, in connection with making any recommendation contained on this web site. Independent Investment Research, discloses that from time to time, it or its officers, employees and its related bodies corporate: may have an interest in the securities, directly or indirectly, which are the subject of these recommendations; may buy or sell securities in the companies mentioned in the Content; may effect transactions which may not be consistent with the recommendations in the Content; may have directorships in the companies mentioned in the Content; and/or perform paid services for the companies that are the subject of such recommendations.

However, under no circumstances, has Independent Investment Research been influenced, either directly or indirectly, in making any recommendations contained on this web site.

Corporate Research

Independent Investment Research has or may have, received a fee either directly by a company itself or by a third party, to provide coverage and/or corporate research (the "Fee"). Where a Fee has been received, Independent Investment Research does not publish:

Buy / Hold / Sell recommendations for the security or managed investment schemes.

(c) Copyright Protection

All Content at this web site is protected by copyright. Apart from any use permitted under the Copyright Act (Cth) 1968, you must not copy, frame, modify, transmit or distribute the material at this web site, without seeking the prior written consent of the copyright owner. Content on this web site is owned by the business Independent Investment Research. Users are prohibited from copying, distributing, transmitting, displaying, publishing, selling, licensing, creating derivative works or using any content on the web site for commercial or public purposes

(d) Trade Marks

The trade marks and logos displayed on this web site belong to Independent Investment Research or other parties. Such trade marks include registered trade marks and trade marks pending registration. Users are prohibited from using any of these trade marks, without seeking the prior written consent of IIR or such third party, which may own the trade mark content on this web site.

(e) Limitation of Liability

To the fullest extent permitted by the law, Independent Investment Research and any of its officers, employees, agents, consultants or related bodies corporate disclaim any liability, whether based in contract, tort, strict liability or otherwise, for any direct, indirect, incidental, consequential or special damages arising out of or in any way connected with the use of any Content made available on this web site by any person or entity.

(f) No Warranties

Independent Investment Research does not make any claims, promises, guarantees, representations or warranties regarding the accuracy, completeness or fitness for purpose of the Content made available on this web site. All information on this web site is provided to you on an as is basis, without warranty of any kind either express or implied. To the extent that research can be provided by third parties, Independent Investment Research makes no warranty or representation as to the accuracy or completeness of such information displayed on this site, and accepts no liability for errors or omissions arising from such third party information. To the fullest extent permitted by law, under no circumstances will Independent Investment Research be liable for any loss or damage caused by users reliance upon information obtained through this web site. It is the responsibility of the user to evaluate the accuracy, completeness or usefulness of any information, opinion, general advice or other content made available through this web site. Furthermore, Independent Investment Research does not warrant or represent that this web site is error free or free from viruses or defects. A user must do all that is necessary (including using virus checking software) to satisfy itself that accessing this website will not adversely affect its system.

For further information, please contact IIR at: client.services@independentresearch.com.au

INDEPENDENT
INVESTMENT RESEARCH

Independent Investment Research LLC
Independent Investment Research (Aust.) Pty Limited

DENVER OFFICE
200 Quebec Street
Suite 200
Denver Colorado 80230 USA
Phone: +1 720 355 0446

NEW YORK OFFICE
Phone: +1 917 336 0818

SYDNEY OFFICE
Level 1, 350 George Street
Sydney NSW 2000
Phone: +61 2 8001 6693
Main Fax: +61 2 8072 2170
ABN 11 152 172 079

MELBOURNE OFFICE
Level 7, 20–22 Albert Road
South Melbourne VIC 3205
Phone: +61 3 8678 1766
Main Fax: +61 3 8678 1826

MAILING ADDRESS
PO Box H297 Australia Square
NSW 1215