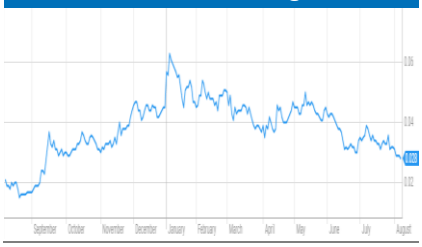
CLA AU | Mining & Metals



Source: LSE

Market data	
Price (A$)	0.03
Valuation (A$)	0.11
12m High (A$)	0.07
12m Low (A$)	0.02
Shares (m)	1,047
Mkt Cap (A$ m)	29.3

Company summary

Celsius owns a suite of highly prospective copper-gold properties in the Philippines. This includes the flagship MCB project, a high-grade porphyry deposit with a JORC compliant resource that Celsius is now advancing through technical-economic assessment with a view to fast-tracking to production.

Management

Chairman	Martin Buckingham
Executive Director	Blair Sergeant
Operations Director	Peter Hume
Non-Exec Director	Attilenore Austria

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Celsius Resources*

Turning up the heat at MCB

Celsius has emerged as a fast-progressing copper-gold exploration and development company following its acquisition of Makilala Mining, operator of the advanced MCB porphyry project in the Philippines. MCB holds significant development optionality, its high-grade core potentially amenable to exploitation at smaller scale, and therefore lower capex, than might typically be expected of a porphyry project. A development scoping study is being progressed apace, with completion expected by the end of Q3 2021. Crucially, management has extensive operational and stakeholder-engagement experience in the Philippines, a mineral-rich country that is growing increasingly supportive of mining. With copper riding high against a backdrop of robust demand and constrained long-term supply growth, now is thus the perfect time for MCB's rejuvenation. Yet Celsius is trading at a heavy discount to peers on MCB alone, before even accounting for any value from its other assets, which include an advanced cobalt project in Namibia. This offers a compelling entry point to a fast-growing company in a market light on quality copper-gold development opportunities. We believe the MCB scoping study results later this year could trigger the start of a deserved re-rating.

- **Substantial Cu-Au resource defined:** Benefitting from US$10m of historic exploration work (including 25,000m of drilling that delivered some of the highest-grade intersections from a porphyry exploration programme in recent years), Makilala has declared a maiden resource estimate for MCB of 314Mt at 0.5% Cu and 0.2g/t Au. With over 90% of the 1.5Mt copper, 1.5Moz gold resource already in the higher confidence indicated category, development options are now being assessed.
- **High-grade core offers early development potential:** The central body of MCB carries particularly high grade for a porphyry – when a higher cut-off is applied, the resource consolidates to a still substantial core of 94Mt, but at materially higher average grades of 0.8% Cu and 0.3g/t Au. This core is the focus of a scoping study underway to assess early development potential. We believe the geometry and grade could allow MCB to be mined by underground methods at a lower production scale than typically required for a porphyry project to deliver attractive returns. The nearby past-producing Batong Buhay mine – of which MCB is considered an extension – employed underground mining and conventional flotation processing to recover copper and gold to concentrate with yields of over 80%.
- **Upside potential on further drilling:** A 4,000m drilling programme is underway in parallel with the scoping study aimed at confirming the continuity of the high-grade core and testing depth extensions to mineralisation. It will also provide useful data for the development study work. Results received to date are highly encouraging, and we see scope for resource upside at MCB with further drilling. Planned drilling at Celsius' earlier-stage Philippines projects (notably Sagay, which also benefits from significant past exploration work) could deliver further positive news flow.
- **Exposure to attractive commodity suite:** Celsius is leveraged to copper, one of the best performing commodities of recent times. Despite its highs, we remain bullish on copper's long-term prospects given compelling supply-demand fundamentals, including its important role in many emerging 'green' technologies. Celsius also offers exposure to another key 'green-tech' commodity via its Opuwo cobalt project in Namibia, for which a doubling of resources was recently announced.
- **Valuation:** Celsius is trading at a heavy discount to its porphyry developer peers, reflecting, we believe, a lack of market awareness of both MCB and the improving mining environment in the Philippines. Applying the peer median EV/resource multiple to MCB points to fair value at over 3x Celsius' current share price. And this is before accounting for upside from the group's earlier-stage projects. Our preliminary NPV estimate of MCB's future cash-flowing potential is over US$200m, illustrating the potential for material valuation progression as the project evolves.

Contents

Summary

ASX-quoted Celsius Resources has transformed into an advanced copper-gold explorer/developer with its acquisition earlier this year of a portfolio of highly-prospective assets in the Philippines, a mineral-rich country that has demonstrated a fresh commitment to growing its mining industry over recent times.

MCB benefits from US$10m of historic expenditure by copper major Freeport-McMoRan

Celsius' flagship Maalinao-Caigutan-Biyog (MCB) project is a high-grade copper-gold porphyry deposit located 320km north of Manila on the island of Luzon. Past owner Freeport-McMoRan invested US$10m across 2006-13, completing 25,000m of drilling that delivered some of the highest-grade intersections from a porphyry exploration programme globally in recent years (Figure 1).

The Freeport era data was processed by Makilala Mining – Celsius' now wholly-owned Philippines subsidiary that has been operating the project for many years – to derive a maiden JORC-compliant resource estimate of 314Mt at 0.48% copper and 0.15g/t gold (using a 0.2% Cu cut-off grade). Over 90% of the estimate is classified in the higher confidence indicated category, and mineralisation is considered open.

Figure 1: MCB has returned some of the highest-grade intercepts of copper-gold porphyries drilled over recent years

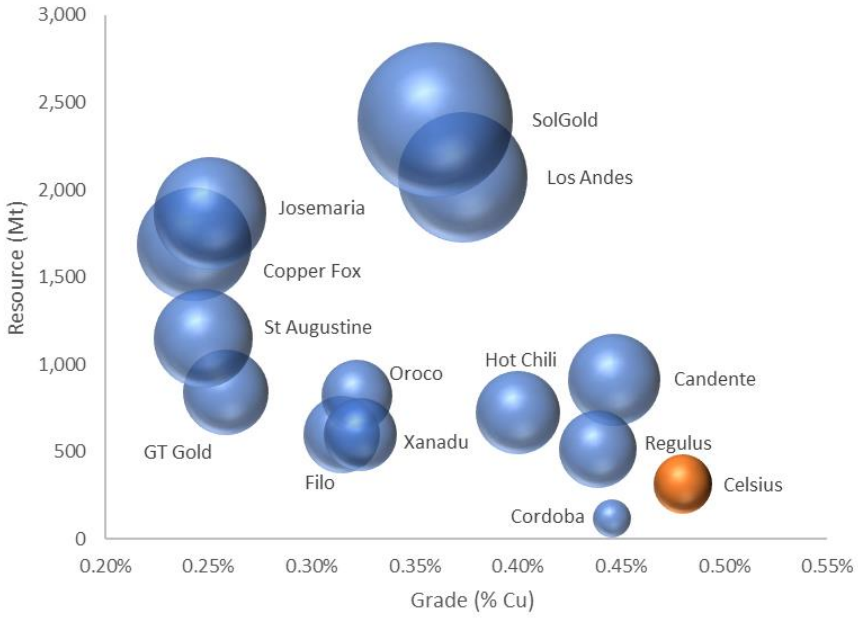
Project name	Company	Country	From m	To m	Intercept m	Cu %	Au g/t
Timok	Zijin Mining	Serbia	1,310	1,867	557	1.0	0.2
Cascabel	SolGold	Ecuador	1,004	1,668	664	0.9	1.0
MCB	**Celsius Resources**	**Philippines**	**29**	**534**	**505**	**0.9**	**0.4**
Cascabel	SolGold	Ecuador	620	1,124	504	0.9	0.6
Cascabel	SolGold	Ecuador	740	1,592	852	0.8	0.6
Timok	Zijin Mining	Serbia	1,354	2,202	848	0.8	0.2
MCB	**Celsius Resources**	**Philippines**	**30**	**797**	**767**	**0.8**	**0.3**
MCB	**Celsius Resources**	**Philippines**	**12**	**642**	**630**	**0.8**	**0.3**
MCB	**Celsius Resources**	**Philippines**	**18**	**630**	**612**	**0.8**	**0.3**
AntaKori	Regulus Resources	Peru	4	614	610	0.8	1.0
Cascabel	SolGold	Ecuador	886	1,914	1,028	0.7	0.9
Cascabel	SolGold	Ecuador	278	1,124	846	0.7	0.5
AntaKori	Regulus Resources	Peru	5	719	714	0.7	0.4
AntaKori	Regulus Resources	Peru	127	746	619	0.7	0.4
Kwanika	Kwanika Copper	Canada	25	525	500	0.7	0.8
Cortadera	Hot Chilli	Chile	204	954	750	0.6	0.2
Kwanika	NorthWest Copper	Canada	33	547	514	0.6	0.8
Altar	Aldebaran	Argentina	482	1,537	1,055	0.5	0.2
Cascabel	SolGold	Ecuador	600	1,574	974	0.5	0.4
Cortadera	Hot Chilli	Chile	0	972	972	0.5	0.2
Cascabel	SolGold	Ecuador	926	1,779	853	0.5	0.6
Cascabel	SolGold	Ecuador	736	1,560	824	0.5	0.4
AntaKori	Regulus Resources	Peru	165	985	820	0.5	0.2
Winu	Rio Tinto	Australia	68	809	741	0.5	0.5
MCB	**Celsius Resources**	**Philippines**	**34**	**714**	**680**	**0.5**	**0.2**
Cortadera	Hot Chilli	Chile	328	924	596	0.5	0.2
Cortadera	Hot Chilli	Chile	422	964	542	0.5	0.2
Cortadera	Hot Chilli	Chile	112	960	848	0.4	0.2
Winu	Rio Tinto	Australia	46	809	763	0.4	0.7
Cortadera	Hot Chilli	Chile	330	979	649	0.4	0.1

Source: Celsius Resources

High-grade core offers early development potential

By copper grade, MCB compares very favourably against other undeveloped porphyry resources globally. By necessity, many of these lower-grade deposits may need to be developed as large-scale, bulk-mining operations. Such developments typically require substantial upfront capital to construct, which can prove a steep hurdle for junior companies to overcome independently. A key point of difference with MCB is its potential for early exploitation at a smaller, and less capital intensive, starter scale.

Figure 2: Independent copper porphyry developers by project resources



Source: Company reports, Bloomberg

High-grade core of 94Mt at 0.8% Cu and 0.3g/t Au offers early development potential

The core of the MCB porphyry carries particularly high grades – the resource consolidates on a centralised 94Mt grading 0.80% copper and 0.28g/t gold when a 0.5% copper cut-off grade is applied. Some 85% of this core resource is in the indicated category, and recent drilling results confirm good continuity.

In our opinion the geometry and grade of the core lends itself to exploitation by modest-scale underground mining and simple processing techniques. The nearby past-producing Batong Buhay mine (to which MCB is considered an extension and therefore is expected to exhibit similar mineralogical characteristics) employed underground mining methods and conventional flotation processing to recover copper and gold to concentrate with yields of over 80%.

Celsius has already initiated a scoping study of the potential for early development of MCB's high-grade core, with the study expected to be completed by the end of Q3 2021. Given the well above-average copper grade, we believe development could prove economically viable at a smaller production scale than typically required by porphyry projects to deliver attractive returns.

Our preliminary analysis assumes 'ball-park' capex of approximately US$250m capex could deliver a c2Mt pa scale operation capable of producing c13-17kt pa copper in concentrate at total cash costs (net of gold credits) of under US$1.00/lb.

Resource upside potential

MCB mineralisation, including the high-grade core, is considered open at depth, and several targets close to the currently delineated resource also hold significant potential. With an aim of testing depth extensions but also enhancing confidence levels in the already-established high-grade core, Celsius has initiated a drilling campaign in tandem with the scoping study. Early results are extremely encouraging. The first two completed holes each intersected over 600m of >0.4% copper mineralisation from near surface, and included 70-90m sections grading c1.0% copper and higher from around 300-350m.

Moreover, Celsius is working several earlier-stage copper-gold prospects in the Philippines that we believe also hold significant resource potential. Chief amongst these is Sagay which, though it does not yet have a formal JORC resource estimate, is a property that has been subject to extensive (US$8.5m) historic exploration work and in our view has potential to emerge as a project of real significance.

Strong management team with unrivalled in-country experience

Management has vast experience of operating in the Philippines, an improving mining jurisdiction

Any development project is only as strong as its management team, and in this regard Celsius benefits from senior personnel with substantial Philippines mining experience. Chairman Martin Buckingham is a long-serving director of Atlas Consolidated Mining & Development Corp (once the Philippines' largest copper producer), and Country Operations Director Peter Hume resides in the Philippines and has worked on numerous major mining developments, including until recently the large-scale Tampakan copper-gold project. Non-executive director Attilenore Austria has substantial experience in planning and stakeholder engagement for major Philippines public infrastructure, mining and hydropower projects.

The Philippines Government has become far more supportive of mining in recent times

This collective experience – together with Makilala Mining's long-established presence as a domestic project operator – is a key strength as Celsius looks to progress its Philippines projects. Under the leadership of President Duterte the Philippines has made significant moves to encourage investment back into the industry over recent times as it seeks to stimulate growth of an economy badly affected by the coronavirus pandemic. In line with the President's policy of "build, build, build", the government recently lifted a nine-year ban on new mining projects and has indicated that a moratorium on open-pit mining may also end imminently. We are optimistic this shift in policy stance could see the Philippines re-emerge as the major mining nation that its enviable mineral endowment undoubtedly merits.

Exposure to key 'green-tech' growth commodities

MCB offers Celsius investors significant leverage to copper (with a gold 'kicker'), one of the strongest performing commodities of the past year as pandemic-related supply issues and rising demand from both traditional markets and emerging 'green-tech' end-use applications boosted prices.

We think copper has strong long-term market fundamentals

We expect copper to continue to flourish as the global economy rebuilds post-pandemic. Though there may be potential for some retreat from recent highs as supply normalises, we believe the long-term market fundamentals are supportive of elevated pricing levels. Structural supply-side constraints (declining production grades, limited exploration investment over the past decade and significant funding hurdles for new projects) could see mined output struggle to keep pace with growing demand beyond the current wave of approved expansions and developments.

One of the fastest-growing markets for copper consumption is the electric vehicles industry. Growth of this sector is positively impacting other 'battery metals',

including cobalt, a commodity Celsius is also exposed to via its advanced Opuwo project in Namibia, where a doubling of project resources was recently declared. Given concerns over cobalt supply being concentrated in troublesome jurisdictions, Opuwo's location in a well-respected mining jurisdiction holds strategic significance.

Compelling market comparable valuation metrics

Celsius is significantly undervalued relative to copper porphyry peers

Given uncertainty around development parameters ahead of completion of the MCB scoping study, peer comparable analysis is arguably the most appropriate valuation approach at this time. At just US$9 per tonne of currently delineated copper and copper-equivalent resources, Celsius is trading at a heavy discount to its copper porphyry developer peer group median of $41 per tonne.

Applying the peer median multiple to Celsius – and assuming US$10m of nominal value for the group's other exploration assets – would imply a current fair valuation of A$0.11 per share, over three times the company's current share price. We think this discount should narrow as potential development parameters become more transparent with further study work, and as the resource is further de-risked (and potentially expanded) with additional drilling.

Given "grade is king" when it comes to the commercial viability of porphyry projects, we see potentially significant upside to our valuation as MCB is advanced. Our preliminary DCF analysis suggests potential for an MCB project-level NPV of over US$200m for a starter-scale operation, illustrating the scope for valuation progression as the project is advanced through technical-economic studies and, ultimately, to a construction decision over next 18 months.

Upcoming catalysts

- MCB resource in-fill and extension drilling results – September Quarter 2021
- MCB scoping study results – September Quarter 2021
- MCB updated resource estimate – December Quarter 2021
- Further exploration and feasibility study – 2022
- Government Mineral Agreement – 2022

Valuation considerations

Market peer comparable analysis

MCB carries higher average copper grade than most of its porphyry project peers

Figure 3 below illustrates that Celsius and its MCB project compares very favourably against peers in terms of average copper grade. As discussed elsewhere in this report, the resource has an even higher-grade core, which we believe could potentially lend itself to early development on a smaller and less capital-heavy scale than might typically be expected of a porphyry deposit.

This is a clear point of difference from most pre-production copper porphyry peers in the market. Many have demonstrated large tonnage but relatively low-grade reserves or mineable resources that will require substantial capex to develop. This can be a high hurdle to overcome for junior independent project developers.

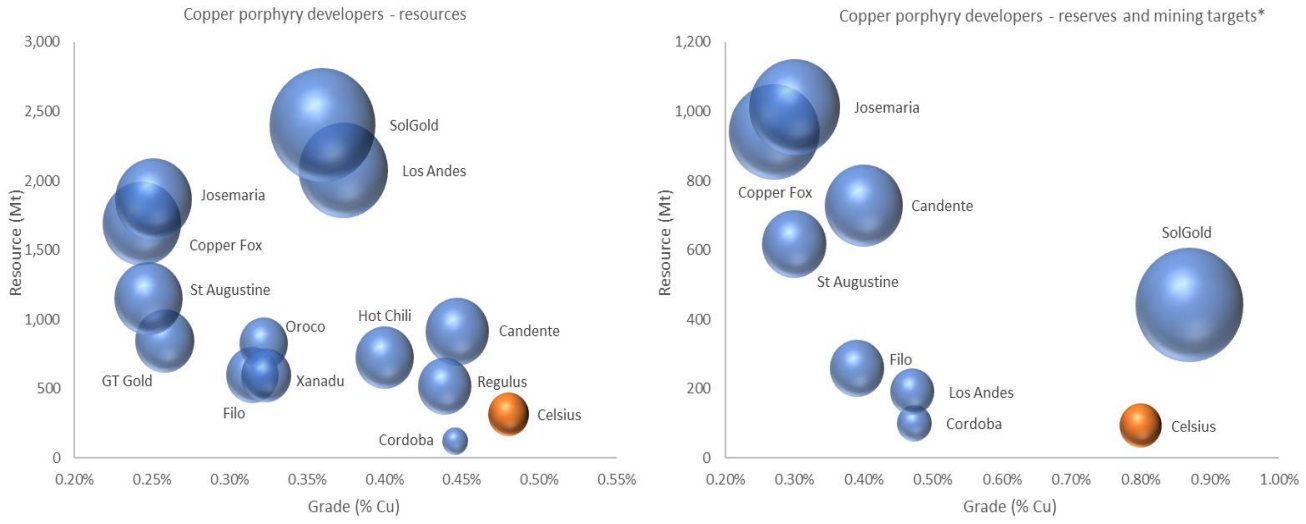
Despite MCB's favourable geological characteristics, at just US$9 per tonne of currently delineated copper and copper-equivalent resources, Celsius is trading at a heavy discount to its peers (Figure 4). And this is before even considering potential value contribution from its earlier-stage Philippines copper-gold prospects and its Opuwo cobalt project in Namibia.

We believe this discount reflects a general lack of knowledge of the MCB project within the market despite its extensive exploration history, perhaps unsurprising given that for several years it was under-exposed as a small component of the larger exploration portfolio of a copper major. But it also potentially reflects a lack of appreciation in the market of the Philippines move to a more pro-mining policy stance in recent times (see Appendix 1 for further discussion).

Peer comparable analysis points to fair value around A$0.11/share

Applying the peer median EV/resource value of US$$41/t to MCB's copper and copper equivalent resource – and adding US$10m of nominal value for Celsius' other exploration assets (broadly equal to the group's EV immediately prior the Anleck transaction) and current cash – implies a fair market valuation of A$0.11 per share. This equates to over three times Celsius' current share price.

*Figure 3: MCB demonstrates higher copper grades than many porphyry peer resources and mining targets**



*Includes non-reserve mining targets. Copper-equivalent values calculated at $4.25/lb Cu and $1,800/oz Au. Source: Company reports, Bloomberg

Figure 4: Independent copper-gold porphyry developers market valuation metrics

Name	EV	Key project & location	Reserve/Mining target*			EV/CuEq**	Resource			EV/CuEq**
	US$m		Mt	Cu %	Au g/t	US$/t	Mt	Cu %	Au g/t	US$/t
Candente Copper	24	Cañariaco Norte (Peru)	728	0.40	0.07	7	910	0.45	0.07	5
Celsius Resources	**17**	**MCB (Philippines)**	**94**	**0.80**	**0.28**	**19**	**314**	**0.48**	**0.15**	**9**
Copper Fox Metals	164	Schaft Creek (Canada)	941	0.27	0.19	150	1,689	0.24	0.15	96
Cordoba Minerals	35	San Matias (Colombia)	100	0.47	0.24	56	119	0.45	0.25	49
Filo Mining	872	Filo del Sol (Argentina)	259	0.39	0.33	567	600	0.31	0.32	282
GT Gold	331	Tatogga (Canada)	-	-	-	-	841	0.26	0.33	85
Hot Chili	93	Costa Fuego (Chile)	-	-	-	-	724	0.40	0.12	25
Josemaria Resources	271	Josemaria (Argentina)	1,012	0.30	0.22	62	1,863	0.25	0.17	41
Los Andes Copper	156	Vizcachitas (Chile)	191	0.47		156	2,073	0.37	-	17
Oroco Resource Corp	426	Santo Tomas (Mexico)	-	-	-	-	822	0.32	-	161
Regulus Resources	52	Antakori (Peru)	-	-	-	-	517	0.44	0.27	17
St Augustine Gold & Copper	70	King-king (Philippines)	618	0.30	0.08	54	1,151	0.25	0.32	23
SolGold	880	Cascabel (Ecuador)	442	0.87	0.86	167	2,400	0.36	0.27	82
Xanadu Mines	21	Kharmagtai (Mongolia)	-	-	-		598	0.32	0.22	10
Median (ex-Celsius)			**530**	**0.40**	**0.22**	**106**	**841**	**0.32**	**0.25**	**41**

**Includes non-reserve mining targets. Copper-equivalent values calculated at $4.25/lb Cu and $1,800/oz Au.* *Source: Company reports, Bloomberg*

Preliminary cash-flow model analysis

As the MCB project is still subject to preliminary economic analysis and therefore does not yet have development and operational parameters fully defined, we think the above market peer comparable analysis is the most appropriate base-case valuation approach at this juncture.

However, to illustrate potential future value build we have developed a speculative cash-flow model of an MCB operating scenario. This assumes the high-grade core of the resource is exploited by underground mining using operational and cost assumptions informed by peer project analysis and discussion with Celsius management (p20).

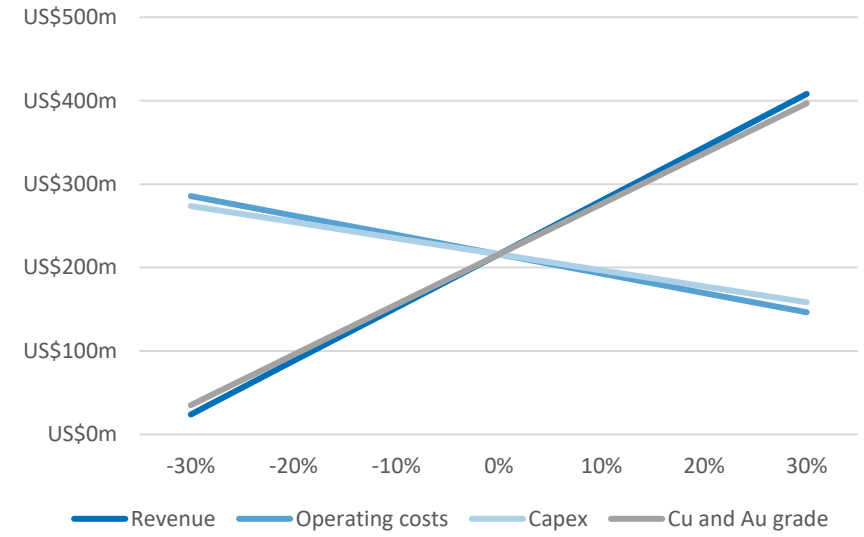
Our preliminary cash flow analysis of MCB points to NPV potential of >US$200m

At our house long-term commodity price assumptions of US$3.50/lb copper and US$1,600/oz gold, our model yields a project IRR of over 20% and an $NPV_{10\%}$ of US$216m. This equates to just under A$0.30 per Celsius share (diluted for the future issue of the deferred acquisition consideration shares).

It must be emphasised that this is a speculative pre-funded indicative valuation and does not account for any future equity dilution from financing. Pre-development stage companies typically trade at heavy discounts to underlying NPV in recognition of funding and development challenges ahead.

Our model is most sensitive to changes in assumed head grade and metal prices (Figure 5). Our NPV estimate would rise to over US$340m (over A$0.40/sh) were we to use long-term copper and gold prices in line with current spot levels (which respectively are 22% and 13% above our base-case long-term price assumptions).

Figure 5: MCB project $NPV_{10\%}$ sensitivity



Source: ARC estimates

Risks

- Given much of the MCB resource is already in the higher confidence indicated category, we consider geological risk to be relatively low. However, the commercial viability of developing the project (and thus its potential value) remains uncertain until more detailed metallurgical test work and more advanced technical and economic assessment is completed.
- On demonstration of economic viability, realisation of project value will be subject to funding, the availability of which cannot be guaranteed and will be somewhat dependent on factors out of the company's control (e.g. prevailing equity and commodity market conditions).
- Future financing initiatives, for further exploration and/or development thereafter, may result in equity dilution.
- The Philippines has proved difficult for foreign mining companies at times in the past. However, with the lifting earlier this year of a moratorium on new mineral agreements – and indications that the country's ban on open-pit mining may also soon be ended – the environment is improving.

Company overview

Celsius' evolution to its current form traces back to September 2020 when the company agreed the all-share acquisition of Anleck Ltd, a UK-based private group that had itself recently acquired a portfolio of copper-gold projects in the Philippines, including the flagship MCB project.

Celsius issued Anleck an upfront 100m new shares, of which 50m are subject to a buy-back and cancellation right if an economically viable and JORC-compliant scoping study of the MCB project is not completed and reported to the ASX within one year of the transaction. Celsius also agreed to issue to Anleck's shareholders a deferred consideration of an additional 100m new shares in two equal tranches on achievement of the following project milestones at MCB:

- 50m shares to be issued upon a financial and technical assistance agreement (FTAA) or a mineral production sharing agreement (MPSA) for the MCB project being secured, provided this occurs within 36 months of the transaction closing
- 50m shares to be issued upon an economically viable definitive feasibility study (DFS) of the MCB project being completed and announced to the ASX, provided this occurs within 36 months the transaction closing

On completion of the deal early this year, two pre-transaction directors resigned to make way for two Anleck nominees, Chairman Martin Buckingham and Attilenore Austria. Mr Buckingham was a founder of Anleck and drove its acquisition of MCB and the wider Philippines portfolio, and Ms Attilenore is a Philippines resident. Both have an in depth understanding of the MCB project and substantial experience of developing mines and large-scale industrial projects in the Philippines (see p25).

Finances

Successfully completed A$6m equity raise in April 2021

Celsius had cash reserves of A$6.5m at its last reported balance sheet date of 30 June 2021. This included the net proceeds from a A$6m share placement with institutional and sophisticated investors (including several new Australian and international institutions, in addition to existing shareholders) in April. The issue comprised 167m new ordinary shares (equating to just under 19% of the group's pre-placing total issued shares) at A$0.036/share, a 13% discount to the company's volume-weighted average share price over the 20 days preceding the placement. The proceeds are being used to fund a scoping study of the MCB project, further drilling, renewal of an exploration permit for the Sagay project and general working capital.

Share structure and holders

Following the April equity fundraise Celsius had a total of 1,047m shares in issue, giving it a market capitalisation of just under A$30m at current share price. The stock is widely held, with no single institution or individual owning more than 5%

Figure 6: Top five shareholders

Entity	Shareholding
BNP Paribas Nominees Pty Ltd	4.5%
HSBC Custody Nominees (Australia)	4.2%
Martin Buckingham (management)	3.0%
JP Morgan Nominees (Australia	2.8%
Citigroup Nominees	2.7%

Source: Celsius Resources

MCB copper-gold project, Philippines

Located 320km from Manila in the municipality of Pasil within the Central Cordillera region on the Philippines island of Luzon, MCB is the flagship project in Celsius' Makilala portfolio. It is accessible from Manila via the Cagayan Valley road to the city of Tabuk, from which Pasil is then just a 60km, three-hour drive via the Tabuk-Lubuagan-Bontoc highway. The property is then reached via a final 24km drive along dirt road from the Lubuagan junction.

The 2,720 hectare property is characterised by rugged topography, with elevations ranging from 1,000-1,800m. Surface features consist of sharp-crested peaks, steep slopes and deeply incised valleys, including the Pasil river which bisects the tenement. Vegetation is natural grassland with sporadic pine tree growth. Settlements are generally small.

MCB lies adjacent to the past-producing Batong Buhay mine

The license surrounds, but does not include, the past-producing Batong Buhay underground gold-copper mine, which is currently owned by state-controlled Philippine Mining Development Corp (PMDC).

Figure 7: The MCB project is located on the northern Philippines island of Luzon

Source: Celsius Resources

Ownership structure

Property holder Makilala Mining Company Inc (a Philippines-registered company) was acquired by Anleck for US$3m in cash, to be paid on the following schedule:

- Upfront payment of US$0.25m on settlement
- A further US$0.55m upon renewal of the project exploration permit, which occurred in November 2020
- First deferred portion of US$1.1m on the first anniversary of the permit renewal
- Second deferred US$1.1m on the second anniversary of the permit renewal

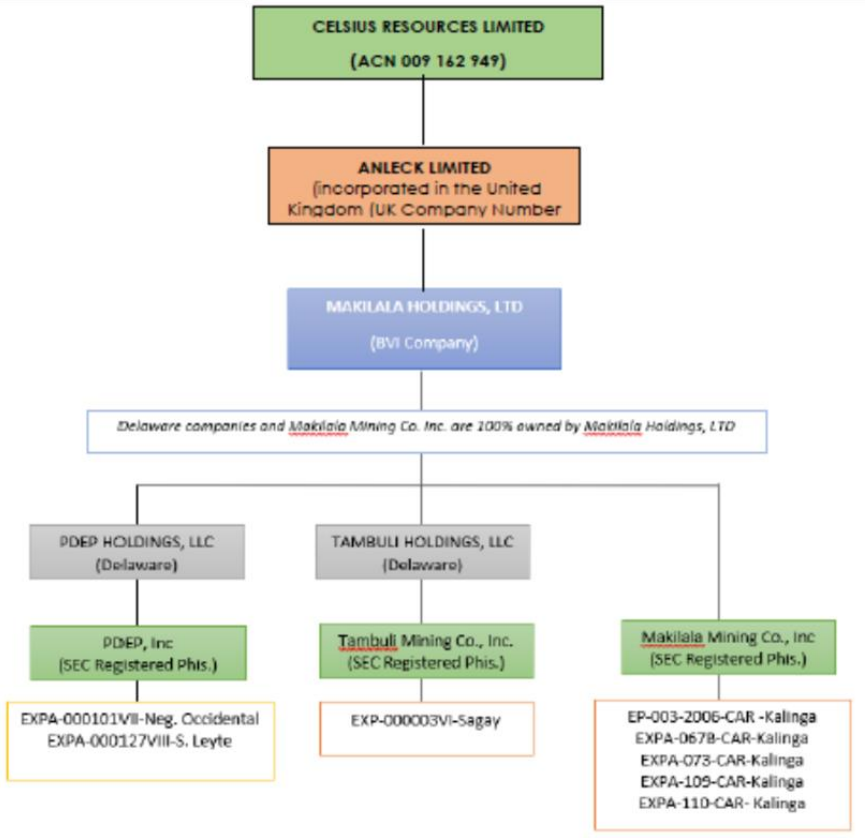
The vendor will also be entitled to a 1% net smelter return royalty – capped at US$3m over ten years – with minimum pre-payments of US$0.1m per annum (up to a cap of US$1m) commencing on the third anniversary of the permit renewal. The vendor has

also been granted a lien over some of the shares owned by Anleck (now Celsius) in the project's local holding company as security against the deferred cash payments set out above.

Exploration permit was successfully renewed in November 2020

The MCB project is covered by Exploration Permit EP-003-2006-CAR, which was issued to Makilala Mining in 2006. A third renewal of the licence was approved in November 2020. Makilala Mining is wholly-owned by private BVI company Makilala Holdings Ltd, which in turn is a subsidiary of Celsius.

Figure 8: Ownership structure



Source: Celsius Resources

Geology and historic exploration

The local geological setting is an eroded volcanic centre truncated by a NE-SW trending fault zone along which the narrow ravine of Pasil river is channelled. This structure is known as the Pasil River Fault Zone (PRF), and is thought to control the trend of the intrusive bodies and mineralisation observed in the area. Copper and gold mineralisation is characteristic of porphyry-epithermal systems, with intermediate to high-sulphidation epithermal mineralisation superimposed on three phases of porphyry mineralisation.

Freeport-McMoRan invested US$10m in exploration across 2006-13, drilling 25,000m

The focus of Celsius' exploration is an area of elevated (generally >0.2% Cu) copper-gold porphyry mineralisation that was subject to a substantial programme of exploration by Makilala Mining's then owner Freeport-McMoRan between 2006-13. Some US$10m was spent on the property during that period by Freeport, including on geological mapping, soil sampling, geophysical surveying (magnetic and some limited IP) and a 46-hole (for over 25,000m) diamond-core drilling programme covering four target zones – MCB, West MCB, Caigutan and Binasalan.

Mineralisation is typical of porphyry settings, but with above-average copper grades

The copper-gold mineralisation identified is typical of that encountered in porphyry settings, occurring (together with associated alteration) across the contact between a genetically-related intrusive tonalite body and the surrounding host rock that is generally older mafic volcanics.

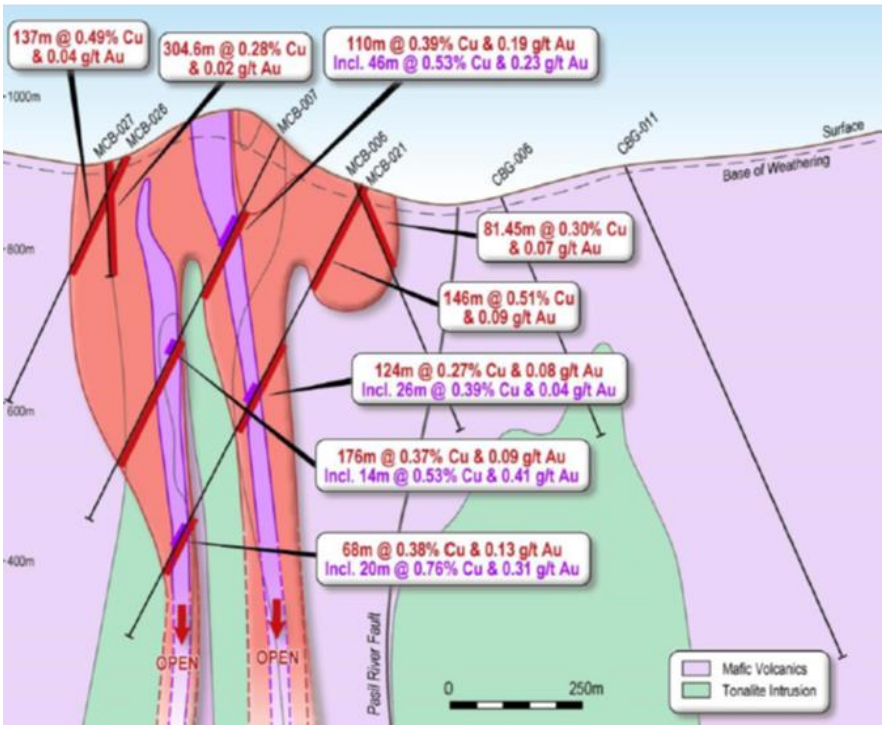
The location and trend of mineralisation is influenced by two dominant structural trends parallel to major faulting, with the broad fabric and trend of the intrusive bodies and associated alteration extending in a north-east direction and exhibiting a near vertical dip.

Broad copper-gold domains have been defined based on a combination of continuous zones of mineralisation that correspond with alteration features and the controlling geological host rocks and structures.

High-grade mineralisation is typically associated with dense porphyry quartz stockworks in phyllic to intermediate argillic alteration zones. Moderate-grade copper mineralisation with lower gold values tends to be associated with sparse porphyry quartz veining and sulphide disseminations in intermediate argillic alteration zones. The earlier porphyry mineralisation is partially overprinted by late high-sulphidation epithermal mineralisation, often associated with advanced argillic alteration overprints along faults.

There is also evidence of epithermal vein-type mineralisation at MCB, although to date it is only porphyry-style copper-gold mineralisation that is included in the mineral resource estimate (see below).

Figure 9: MCB schematic cross-section with selected historic drill holes overlain



Source: Celsius Resources

Currently defined mineral resources

Maiden global resource estimate of 314Mt at 0.5% Cu and 0.2g/t Au

Following thorough review and interpretation of the Freeport-era work, including validation and analysis of the historic drill hole information, Makilala completed a maiden JORC-compliant resource estimate for MCB in January 2021. The global resource totals 314Mt at an average grade of 0.48% copper and 0.15g/t gold, of which 290Mt is classified as indicated and the 24Mt balance is inferred.

The MCB resource is defined as a body of copper and gold mineralisation which is predominantly above 0.2% copper in grade. The boundaries of this mineralisation trend parallel to the dominant geological structures and the genetically related intrusive tonalite bodies.

A 0.2% copper grade is considered in-line with the expected economic limits of the likely mining and processing options that will be considered for future exploitation of the deposit, and as such was used as the preferred lower cut-off grade in deriving the resource estimate.

Figure 10: JORC-compliant mineral resource statement (at 0.2% Cu cut-off)

Category	Tonnes	Grade		Contained metal	
	Mt	Cu %	Au g/t	Cu kt	Au koz
Measured					
Indicated	290.3	0.48	0.15	1,387	1,387
Sub-total M&I	**290.3**	**0.48**	**0.15**	**1,387**	**1,387**
Inferred	23.5	0.48	0.10	113	79
Total resources	**313.8**	**0.48**	**0.15**	**1,500**	**1,467**

Source: Celsius Resources

Advanced exploration and scoping study underway

The exploration programme currently underway – which will fulfil the requirements for the third renewal of the MCB permit – is aimed at advancing the project through scoping study while also gathering information to support the compilation of a definitive feasibility study thereafter.

At higher copper cut-off, the resource shows a high-grade core of 94Mt at 0.8% Cu and 0.3g/t Au

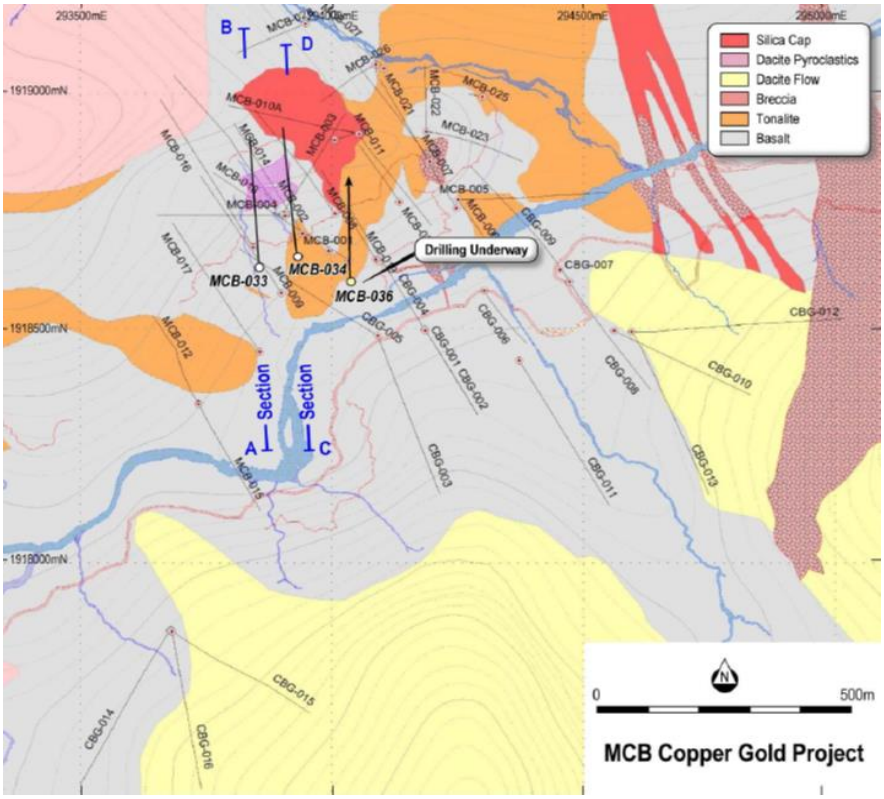
The global MCB resource is a large, moderate-to-high grade porphyry deposit, with even more tonnes coming into the equation at lower cut-off grades. However, the scoping study is wisely focusing on developing an underground mine plan for the early exploitation of a central, higher-grade core. **At a higher cut-off grade of 0.5%, the MCB resource measures 94Mt at an average grade of 0.80% copper and 0.28g/t gold.** Successful exploitation of this higher-grade material could be expected to maximise economic returns in the early years of production.

4,000m drilling campaign underway to confirm high-grade core and test extensions

Celsius commenced a six-hole, 4,000m diamond drilling programme at MCB in February 2021 aimed at increasing confidence in the high-grade portion of the resource, testing depth extensions to the high-grade mineralisation, and testing the strike extension potential of the deposit across a defined fault (which appears to offset mineralisation on its western boundary).

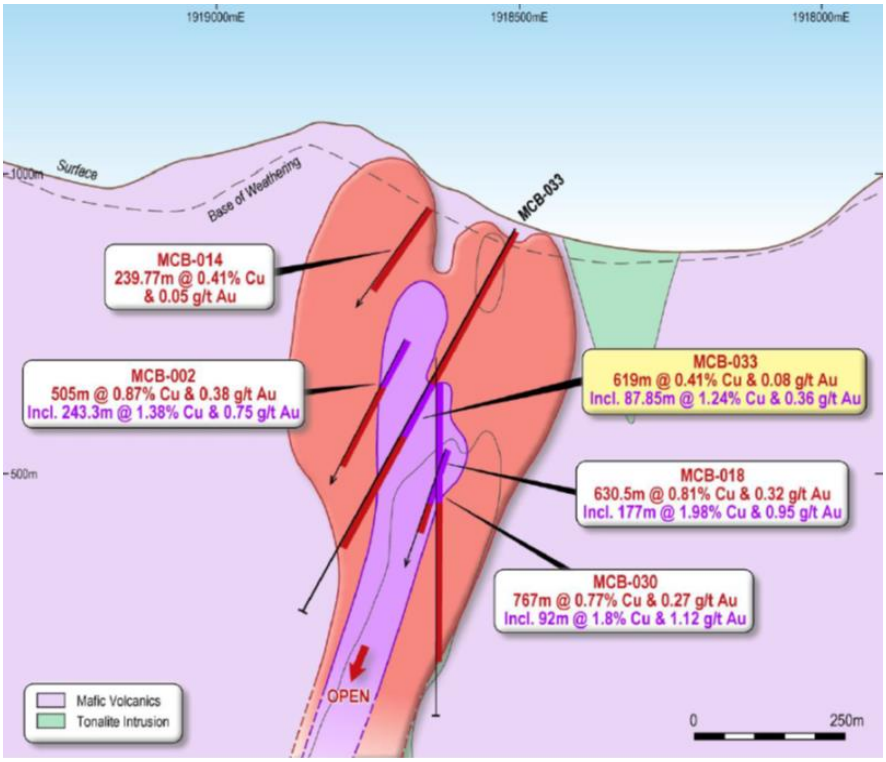
Assay results for the first two completed holes have been received to date. MCB-033 intersected 619m grading 0.41% copper and 0.08g/t gold from 17m down hole. The intersection included 88m at even higher grades of 1.24% copper and 0.36g/t gold from 305m down hole. MCB-034 hit 607m at 0.44% copper and 0.04g/t gold from 26m down hole, including 74m at 0.97% copper and 0.14g/t gold from 353m.

Figure 11: MCB surface geology with drill hole MCB-033 and MCB-034 locations



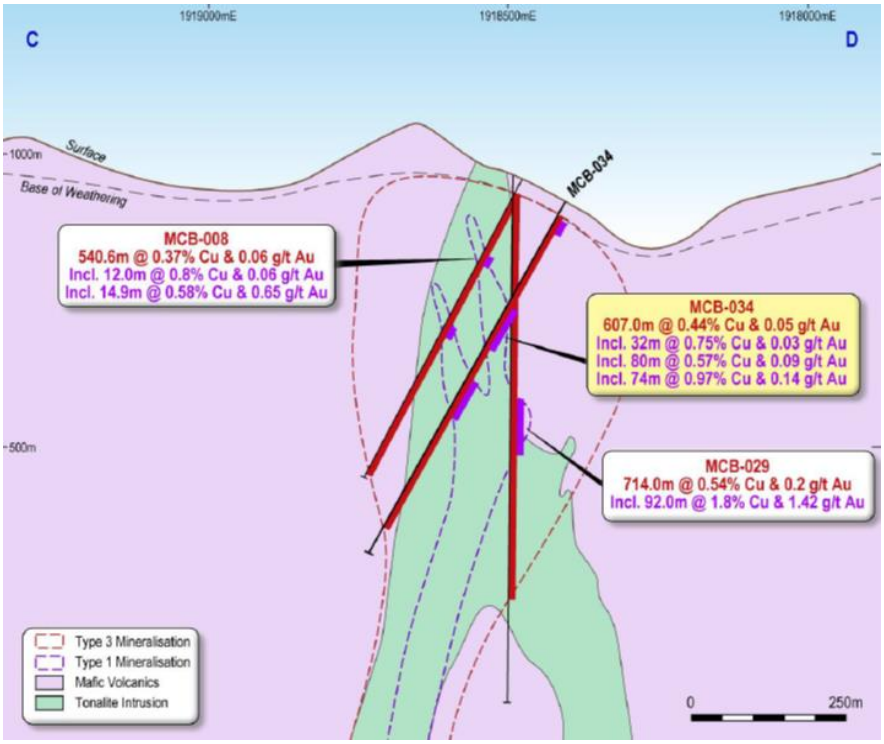
Source: Celsius Resources

Figure 12: MCB cross-section highlighting recent drill hole MCB-033



Source: Celsius Resources

Figure 13: MCB cross-section highlighting recent drill hole MCB-034



Source: Celsius Resources

These initial results confirm the position and high-grade nature of the central core of MCB, and have enhanced the company's confidence in the overall continuity of mineralisation for this portion of the resource.

Drilling of MCB-036 has now commenced, which, together with another planned hole (MCB-035), is aimed at testing deeper-lying extensions to the high-grade copper mineralisation at MCB.

Figure 14: Drilling continues at hole MCB-036, testing depth extension potential

Source: Celsius Resources

In addition to further refining the orebody modelling, the drilling and accompanying down-hole survey data will support other aspects of the ongoing scoping study, including: the development of an underground mine plan; metallurgical testing; development of a conceptual hydrological model and; high-level financial modelling.

Resource upside potential

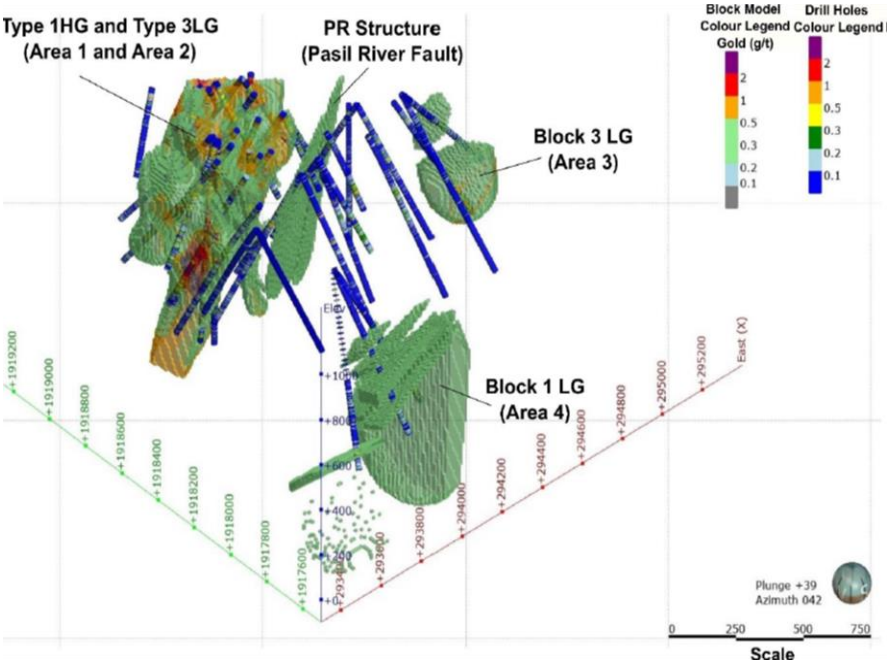
Mineralisation included in the current resource estimate is considered open at depth, including from the higher-grade core. Moreover, there are other areas of identified mineralisation close to the resource that hold potential for resource delineation with further drilling.

Other zones of potential identified proximal to current resource

Three distinct zones were identified as having significant copper-gold mineralization when the historic drilling information was assessed ahead of the maiden resource estimate. However, only one of these zones had sufficient data points to fulfil all the required criteria for inclusion in a mineral resource estimate under the JORC Code (Type 1HG and Type3LG in the schematic block model depicted in Figure 15 below).

Assay results from the other two zones (Block 1 LG and Block 3 LG in Figure 15) suggest these localities may be the edge of a new zone of significant copper-gold mineralization. We therefore see potential for these areas to be converted into additional resources (and potentially extended) with future drilling.

Figure 15: Oblique view of MCB block model illustrating the relative location of each of the currently-defined mineralised domains



Source: Celsius Resources

Scoping study key workstreams and schedule

Celsius is aiming for overall completion of the MCB project scoping study towards the end of Q3 2021. The key areas of focus and progress to completion at the time of this report are as follows:

- Mine plan and design trade-off study – 80% complete
- Infrastructure requirement and project layout – 95% complete as of July 2021

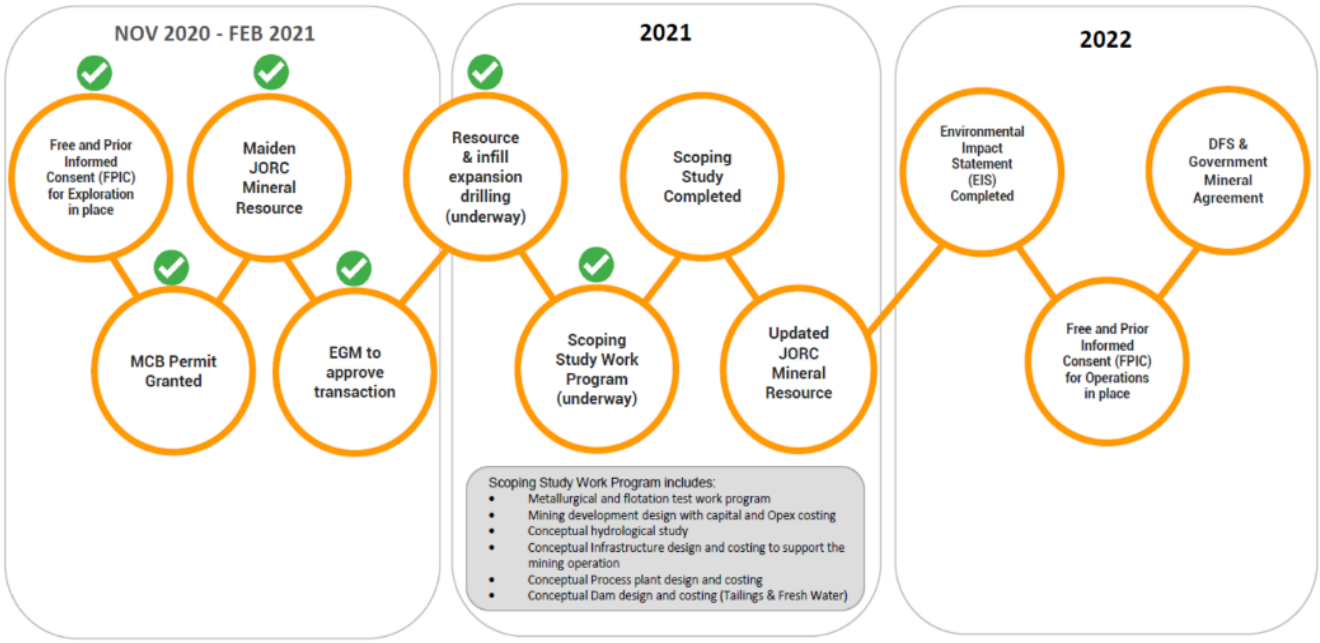
- Paste back-fill study – 20% complete as of July 2021
- Metallurgical test work (crushing, comminution and flotation) – 20% complete as of July 2021 (anticipated completion by end of August 2021)
- Process plant design – 20% complete as of July 2021
- Tailings dam conceptual design – 10% complete as of July 2021

Metallurgical testing underway – MCB expected to exhibit similar properties to Batong Buhay

No significant metallurgical test work on MCB ore has been undertaken by previous owners. However, given the deposit is essentially an extension of the nearby past-producing Batong Buhay mine, Celsius anticipates similar mineralogical characteristics – Batong Buhuy achieved metallurgical recoveries to concentrate of over 80% through conventional flotation processing. Celsius has used technical information from Batong Buhay to assist in formulating the metallurgical testing programme for MCB, which is now underway at ALS laboratories in Perth, Australia.

Subject to a positive scoping outcome, preparation and planning for a definitive feasibility study will commence later this year. This should ultimately lead to the Declaration of Mining Project Feasibility (DMPF) pursuant to Philippine mining code.

Figure 16: Indicative MCB project development timeline and upcoming milestones



Source: Celsius Resources

Social and environmental study work underway

Gathering of field data and laboratory analysis for social and environmental base-line studies has also commenced. This is being undertaken in partnership with the Kalinga State University. The results of the studies may feed into the development of the project's future environmental and social impact management plans, together with other studies which are essential to receiving development approvals.

The studies cover socio-economic, pedology, terrestrial and aquatic resources, and climatology, and will be progressively completed by November 2021. Water monitoring studies were conducted during past exploration activities, the results from which will supplement the overall environmental study programme for MCB.

Development potential – preliminary ARC thoughts

The geometry and high-grade nature of MCB lends itself to exploitation by underground mining methods, and the scoping study is assessing various options, including long-hole open-stoping. The nearby mothballed Batong Buhay operation (which exploited similar geology) employed underground mining and achieved metallurgical recoveries to concentrate of over 80% using flotation processing.

Given the challenging topography of the project area – and ever-increasing scrutiny amongst both authorities and investors on tailings storage solutions – paste back-filling of tailings underground is also being considered by the company.

We think MCB holds early development potential as a c2Mt pa underground mine

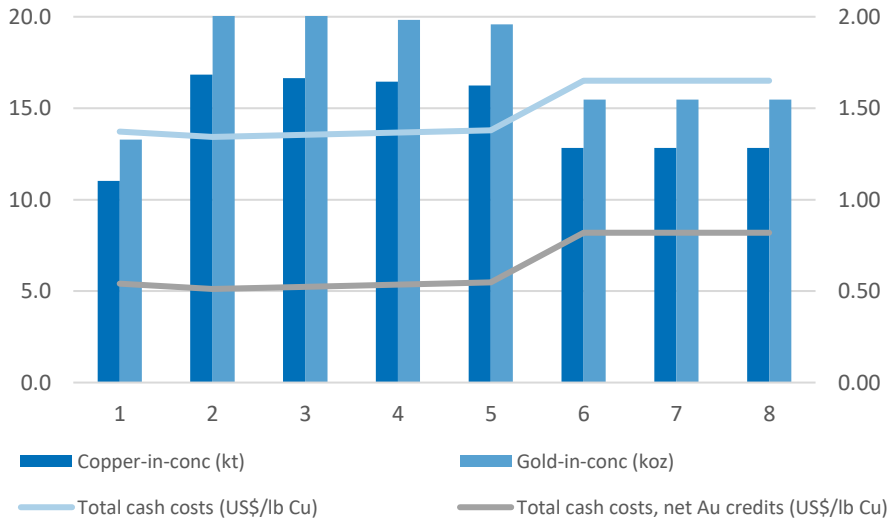
We believe the higher-grade core of the resource could prove economically viable to develop at a smaller scale than might typically be expected of a porphyry project. Informed by discussions with management and a review of peer projects, we have developed a preliminary cash flow model of an assumed US$250m capex development comprising a 2Mt pa underground mine/back-fill operation feeding a conventional flotation-technology based processing facility to produce a mixed copper-gold concentrate.

Adjusting the currently defined high-grade core for our own assumptions on mine scheduling, recovery and dilution – and assuming industry-standard process recovery rates for this type of deposit – we estimate such an operating scenario could be capable of sustaining c13-17kt pa of copper contained in concentrate, at total cash costs (after netting off revenue from an estimated c16-20koz pa of gold co-product) of under US$1.00/lb copper.

Assuming US$3.50/lb and US$1,600/oz long-term copper and gold prices, we estimate this could generate annual operational-level EBITDA of around US$70-100m, and free cash flow (after tax and sustaining capex) of US$50-75m pa.

We must caveat that, given the absence of completed technical-economic studies thus far, our preliminary model should be considered speculative in nature.

Figure 17: Illustrative first eight years potential production and cost profile



Source: ARC estimates

Earlier-stage Philippines projects

Celsius' Philippines portfolio also comprises other earlier-stage copper-gold prospects, of which the most notable is the Sagay project. Sagay is operated through Philippines company Tambuli Mining, a subsidiary of Celsius (p13). Tambuli Mining holds an exploration permit for Sagay, which it is currently looking to extend.

Sagay

The Sagay project is situated on the flanks of the Mandalagan and Silay volcanoes in the northern part of Negros Island. It lies at the intersection of major faults and lineament geological structures and an 8x4km alteration zone has been observed, suggesting the presence of a large magmatic hydrothermal system.

Figure 18: The Sagay project is located on the

Source: Celsius Resources

Sagay benefits from US$8.5m of previous investment in drilling, which returned encouraging initial gold-copper results

Some 28 exploratory holes – for over 22,500m – were drilled by previous owners at a cost of around US$8.5m. Highlights include: 77m at 0.69% Cu and 0.19g/t Au (within a total intersection of 521m at 0.47% Cu and 0.13g/t Au); 114m at 0.68% Cu and 0.20g/t Au (within 461m at 0.49% Cu and 0.14 g/t Au); 24m at 1.03% Cu and 0.51g/t Au (within 207m at 0.44% Cu and 0.12g/t Au); 27m at 0.89% Cu and 0.02 g/t Au (within 80m at 0.64% Cu and 0.03g/t Au); 26m at 0.98% Cu and 0.01g/t Au (within 57m at 0.58% Cu and 0.02g/t Au); and 390m at 0.46% Cu and 0.11 g/t Au.

All the historic drilling data is being compiled and analysed by Tambuli Mining to derive priority targets for follow-up exploration work later this year, and an updated work programme will be submitted to the Philippines Mines and Geosciences Bureau for approval of an extension to the project's exploration permit.

Sagay is considered to hold potential for both porphyry and epithermal-style mineralisation. Tambuli Mining plans to initially test the broader extents of what it believes may be a very large-scale porphyry copper system at depth, as indicated by numerous thick intersections from historic drilling. An initial 5,000m drilling programme is scheduled accordingly.

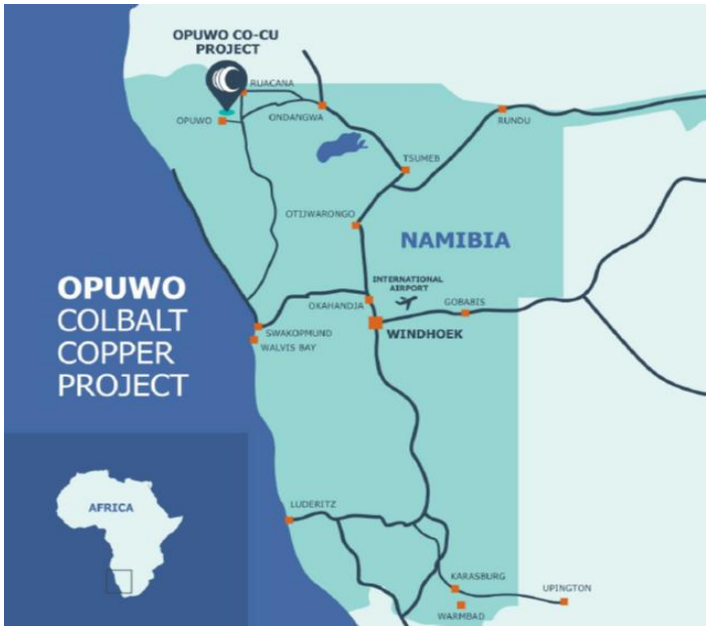
Opuwo cobalt project, Namibia

Celsius holds a 95% interest in the Opuwo cobalt project in north-western Namibia, an asset that pre-dates its acquisition of the Philippines portfolio. The Opuwo project comprises four exclusive prospecting licences covering 1,470km^2 of ground, of which the key licence – EPL 4346, which contains the entire currently-delineated resource – was recently renewed until March 2023.

Opuwo benefits from an array of nearby infrastructure

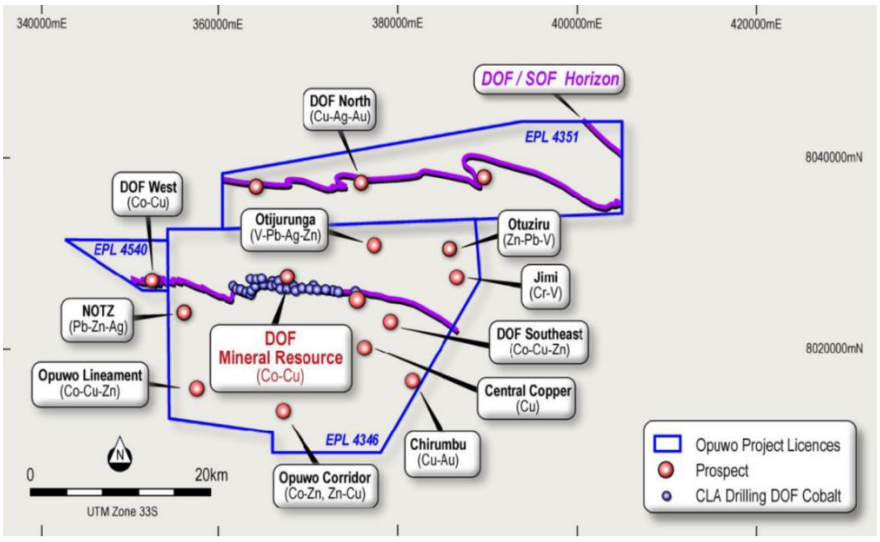
Opuwo is situated approximately 800km from the capital city of Windhoek and around 750km from the Walvis Bay port, both of which are accessible by good-quality bitumen road. The 320MW Ruacana hydro-power station – which supplies most of Namibia's power – is located nearby, and a 66kV transmission line with ample available capacity passes through the eastern boundary of the project.

Figure 19: The Opuwo project is located in north-west Namibia



Source: Celsius Resources

Figure 20: Opuwo tenement map



Source: Celsius Resources

Progress to date and future project development plans

Initial drilling by Celsius in March 2017 identified sediment-hosted copper-cobalt mineralisation over more than 15km of strike extent at Opuwo, and the company believes mineralisation may extend over a much greater strike length still.

After initial metallurgical testing confirmed simple, sulphide-hosted mineralogy, Celsius embarked on an intensive resource definition drilling campaign in 2017, focusing on the most prospective areas identified during the initial reconnaissance programme earlier that year. This culminated in a maiden JORC-compliant resource estimate in 2018 of 112Mt at an average grade of 0.11% cobalt, 0.41% copper and 0.43% zinc (calculated using a cut-off grade of 0.06% cobalt), of which 72Mt was indicated and 40Mt inferred.

Project resources were recently doubled to 22Mt at 0.12% Co, 0.43% Cu and 0.54% Zn

Earlier this year the company announced a doubling of the overall resource – to 226Mt at 0.12% cobalt, 0.43% copper and 0.54% zinc – after including in its calculation a large anticlinal structure – named the NW Extension – that was defined by drilling undertaken between 2017 and 2019. The updated resource incorporates data from 48,000m of drilling in total across 269 holes, and covers a mineralized zone extending for some 13.5km. Approximately 20% of the updated resource has been classified in the indicated category with the balance inferred.

Celsius is now considering commencing further metallurgical test work and other work streams, including a prefeasibility study, later this year.

*Figure 21: Opuwo project JORC-compliant mineral resources**

Category	Tonnes	Grade			Cobalt
	Mt	Co %	Cu %	Zn %	Co kt
Measured	-	-	-	-	-
Indicated	45.3	0.11	0.44	0.51	48
Sub-total M&I	**45.3**	**0.11**	**0.44**	**0.51**	**48**
Inferred	180.2	0.12	0.43	0.55	211
Total resources	**225.5**	**0.12**	**0.43**	**0.54**	**259**

**At cobalt equivalent cut-ff grades of 0.06-0.16%* *Source: Celsius Resources*

The 259kt of contained cobalt in the updated resource makes Opuwo a cobalt project of global significance, and the 970kt of added copper mineralisation could be expected to further enhance the project's viability given prevailing commodity prices.

With demand for cobalt rising as the 'green-tech' revolution gathers pace (cobalt is a vital component of most lithium-ion battery technology for electric vehicles) and concerns over concentration of supply from unstable jurisdictions, we think Opuwo has development potential given its scale, favourable mineralogy and location in a mining-friendly, politically stable jurisdiction with access to already installed infrastructure.

Celsius plans to "assess ways to advance" Opuwo in parallel with progressing its core MCB project in the Philippines. Given its understandable focus on the latter, we think this may include looking at the potential to farm-out a stake in the project, or spinning it off.

Board and Senior Management

Martin Buckingham – Non-Executive Chairman

Martin Buckingham has over 40 years' experience in the natural resources industry, and has been a director of and/or held senior management positions with numerous mining companies, including: Clogau Gold Mines plc; Atlas Consolidated Mining & Development Corp (and its wholly-owned subsidiary Carmen Copper Corp); Berong Nickel Corp; Electrum NL; and Philippine Gold plc. Mr Buckingham is a director and co-founder of Consort Research Ltd, a metallurgical consultancy based at London's Royal School of Mines. In 2007 Mr Buckingham took a lead role in the consortium which successfully re-opened the Carmen Copper Mine, now the Philippine's largest copper producer at over 40kt pa of metal. He recently retired from executive duties with Atlas but remains a director. Mr Buckingham founded Anleck Ltd, the group established to acquire and develop the Makilala project portfolio.

Blair Sergeant – Executive Director, Corporate

Blair Sergeant is an experienced mining executive, previous roles including founding managing director of coal exploration and development group Lemur Resources Ltd and finance director of Coal of Africa Ltd. In the latter role, Mr Sergeant oversaw the development and construction of two operating coal mines, with total production capacity of over 8Mt pa. Mr Sergeant graduated from Curtin University, Western Australia with a Bachelor of Business and, subsequently, a Post Graduate Diploma in Corporate Administration. He is a Chartered Secretary, member of the Governance Institute of Australia, member of the Australian Institute of Company Directors and an Associate of the Australian Certified Practising Accountants. Mr Sergeant is currently a non-executive director of ASX-quoted companies Rincon Resources Ltd, Bowen Coking Coal Ltd and Vmoto Ltd.

Attilenore Austria – Non-Executive Director

Attilenore Austria has worked with major Philippine public infrastructure, mining and hydropower projects for over ten years, managing diverse teams of local and international experts to develop plans and programmes in compliance with national regulatory requirements and international standards. Ms Austria has experience of working closely with environmental and engineering teams to ensure that social impacts are avoided/minimised while developing key project consultation and negotiation strategies to manage anticipated social, economic and cultural. Earlier in her career, Ms Austria spent over ten years working in development roles on World Bank and EU-funded integrated rural development programmes across the Philippines. She holds a PhD in Rural Development and has extensive experience in stakeholder engagement, risk management, project scheduling, community development and social impact assessment.

Bill Oliver – Non-Executive Director

Appointed to the board in late 2010, Bill Oliver has 14 years' experience in the global resources industry with both major and junior companies. He has led large-scale resource definition projects for Rio Tinto and previously worked in near-mine exploration and resource definition roles for Harmony Gold, Bellamel Mining and BC Iron. Most recently, Mr Oliver was Managing Director of Signature Metals Ltd, guiding the company's Konongo gold project through to production within two years of acquisition. He holds an honours degree in geology from the University of Western Australia and a post-graduate diploma in finance and investment from FINSIA.

Peter Hume – Country Operations Director, Philippines

Peter Hume has over 40 years' experience working in lead roles on major mining and construction development projects across the world. During this time he has developed substantial experience in project, construction and operational management, dispute resolution, and infrastructure and process design. Mr Hume has worked with numerous mining companies, including the Porgera Joint Venture, Xstrata Copper, Xstrata Coal, Anglo Coal, Glencore, Newmont Mining Corp, BMA Coal, Kaltim Prima Coal and Dyno Nobel. He has undertaken operational assignments in mining, materials handling, processing and infrastructure, with responsibilities ranging from concept planning through to commissioning and operations.

Pine Van Wyk – Country Operations Director, Namibia

Pine Van Wyk is a metallurgical engineer with extensive experience in the mining industry, particularly in developing and operating mines in Namibia. He spent eight years at Rössing Uranium, where his roles included Superintendent Acid Plant and Metallurgical Services, Superintendent Strategic Projects and Engineering Manager. Mr van Wyk joined Paladin Energy Ltd in 2005 as Operations Manager of the company's Langer Heinrich uranium project, progressing the project from feasibility to production. In 2008, he joined Gecko Namibia as Projects Director, and in 2014 became Managing Director of the Gecko Namibia group of companies. In 2018 Mr Van Wyk also became chief executive officer of Namibia Critical Metals Inc.

Appendix 1: The Philippines – an improving mining jurisdiction

The Philippines archipelago sits on the tectonically active zone that encircles the Pacific Ocean basin commonly referred to as the 'Ring of Fire'. Geological processes associated with this activity have resulted in the Philippines being blessed with extensive mineral wealth – globally the country ranks third, fourth and fifth for gold, copper and nickel resources respectively.

Despite its enviable mineral endowment, the country has previously been viewed a problematic jurisdiction for foreign mining investors given anti-mining attitudes in certain parts of the country and, at times, non-supportive governmental legislation. This has its roots in historic environmental and social mismanagement by domestic miners, exacerbated by indigenous rights issues and populist policymakers. This culminated in the imposition in 2012 of a moratorium on the signing of new mineral agreements, followed by a nationwide ban on open-pit mining in 2017.

However, mining has nonetheless helped drive significant foreign direct investment into the Philippines, aided by relatively benign fiscal terms. Notable foreign mining companies with past or present activities in the country include Sumitomo, Oceana Gold, Glencore, B2Gold, Freeport McMoRan, Newcrest, Goldfields and Newmont Mining.

Recognising the potential of mining to help boost an economy decimated by the COVID pandemic, the state has recently adopted a more pro-mining stance under the Presidency of Rodrigo Duterte. This manifested itself in the lifting in April of a previous moratorium on new mineral agreements. The industry received further encouragement the following month when the head of the Mines and Geosciences Bureau told media sources that he expects a ban on open-pit mining to also be lifted imminently. A lifting of the open-pit ban would be a major positive landmark for the Philippines mining industry, and could potentially see notable large-scale stalled projects restarted (e.g. the giant Tampakan copper-gold development).

Overview of Philippines mining legislative structure

The Republic Act 7942 – also known as the Philippines Mining Act of 1995 – determines the rights and obligations of mining contractors and tenement holders. The law defines the type of agreements the government can undertake with investors and the process of development from exploration through to construction, commercial operation and subsequent decommissioning.

The Act vests authority in the Bureau of Mines and Geosciences (MGB) – an affiliated agency of the Department of Environment and Natural Resources (DENR) – to regulate conduct within the industry. The MGB is therefore the body that issues requisite permits for mining activity to take place as well as monitoring that subsequent mining activity is undertaken in compliance with state regulations.

The Mining Act coexists with other related operational laws, several of which are environment-related (e.g. air-quality, water and waste laws) and therefore also regulated by departments within the DENR.

Under the law, explorers engage with the State via an Exploration Permit and developers/miners on a contractual basis via either a Mineral Production Sharing Agreement (MPSA) or a Financial and Technical Assistance Agreement (FTAA).

- **Exploration Permit:** grants the right to explore specified areas for two years, renewable for a maximum of eight years for metallic mines and six years for non-metallic mines.
- **Mineral Production Sharing Agreement (MPSA):** grants the contractor the right to conduct mining operations within a specified contract area and share the gross output. MPSAs have an initial 25-year term, renewable for a further 25 years.
- **Financial or Technical Assistance Agreement (FTAA):** a contract involving financial and technical assistance for large-scale exploration, development and exploitation of mineral resources. This type of contract is open to domestic and foreign corporations with up to 100% foreign equity ownership. FTAAs have an initial 25-year term, renewable for a further 25 years.

A prerequisite for securing development agreements is environmental permitting (via an Environmental Compliance certificate) and evidence of project feasibility (via a Declaration of Mine Project Feasibility certificate).

Changes to the current mining laws have been proposed and are currently under consideration by the legislature. Among proposed changes is a move to a standard 3% gross royalty (from 2% currently) and the introduction of an additional sliding-scale (1-5%) margin-based royalty tax. A windfall profit tax of 1-10% has also been proposed.

Appendix 2: Copper market outlook

Copper has been amongst the best performing of all commodities over the past year having risen by more than 65% from July 2020 to May 2021 when it hit multi-year highs of US$4.85/lb. Despite a slight cooling-off over recent weeks, copper remains comfortably above US$4.00/lb, a level unimaginable when prices were down close to US$2.00/lb in March 2020 as the first wave of the coronavirus pandemic peaked.

Short-term pandemic-related supply constraints partially explain the surge in prices, but robust consumption on the back of industrial recovery (particularly in China) as stimulus packages kicked in and fast-growing demand from 'green-tech' applications (particularly electric vehicles) have also played an important role.

Energy transition set to drive significant demand growth…

A substantial rise in Chinese imports of refined copper more than offset a pandemic-related decline in economic activity and therefore copper consumption in other regions of the world in 2020, as overall global demand increased by 2.5% according to the International Copper Study Group (ICSG). The ICSG expects global consumption of refined copper to remain largely unchanged this year, before growing by about 3% in 2022 as the post-pandemic global economic recovery gathers momentum.

Thereafter, we see potential for sustained consumption growth rates of 2-4% pa, with the global trend of decarbonisation driving fast-growing demand from 'green-tech' end-use applications such as renewable energy hardware and infrastructure (solar and wind power generators need up to six times more copper compared with conventional power-generating sources) and the electric vehicle market (electric and hybrid-electric vehicles contain up to four times more copper compared with combustion engine vehicles).

We believe demand from 'green-tech' markets will more than offset potentially softer growth rates from more traditional end-use markets as pandemic-related economic stimulus packages are tapered off. Commodities consultant Wood Mackenzie has forecast that, under an accelerated energy transition scenario, global primary demand for copper could double over the next 20 years.

…while supply growth constrained by declining grades and historic under-investment in exploration

Given this robust demand outlook, can copper supply keep pace? Global mine production was flat year-on-year in 2020 according to the ICSG, as the addition of supply from new projects and expansions was offset by pandemic-related curbs in output from some countries, most notably in South America. Refined copper production increased by just 1.6%.

Both mined and refined supply are expected to increase by around 3% pa this year and next as the industry recovers post-pandemic and as projects sanctioned over the past few years come on stream. However, thereafter we think copper will face increasing fundamental supply constraints. The main copper producing countries are characterised by ageing mines with declining head grades, and relatively depressed markets over much of the last decade has inhibited exploration investment in resource/reserve replenishment. Moreover, new discoveries are typically large-scale, low-grade deposits, which will require significant time and investment to bring on stream.

Wood Mackenzie estimates that, despite the global copper industry having committed around US$120bn in expansionary capex to offset the impact of grade decline and depletions, world production will decline from 2024 onwards without significantly more investment. In order to avoid a theoretical market deficit of around 16Mt by 2040, the consultant estimates that an additional US$325-500bn of investment could be required. Moreover, it sees under 2Mt pa of probable new projects, which if successfully developed would be sufficient to meet no more than three years of projected demand growth.

Future pricing implications

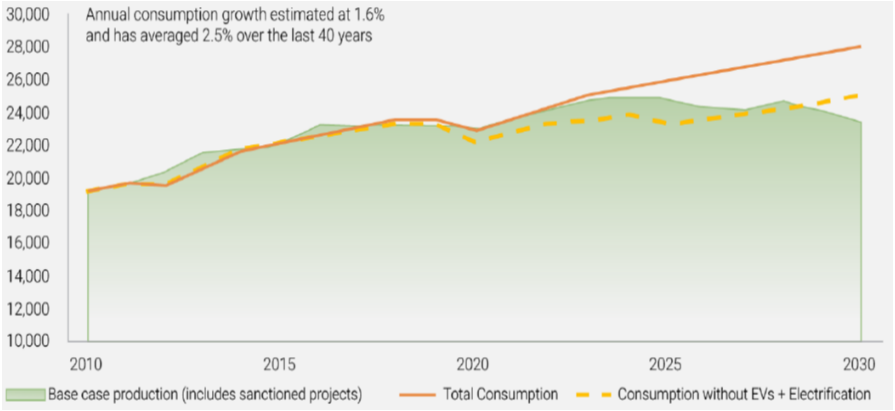
We expect copper demand to remain robust in the near term as the global economy rebuilds post-pandemic, underpinned by China. Though there is potential for some retreat from recent multi-year copper price highs in the near-term as supply normalises and markets re-attain a degree of balance, we believe the long-term market fundamentals as described above are supportive of elevated pricing levels.

Notwithstanding current pandemic-related supply issues, we think structural growth constraints could see mined output struggle to keep pace with demand from the second half of this decade onwards. Put simply, we don't see where new production of scale is going to come from without significantly more investment in both exploration and development.

At the same time demand growth from the green-tech applications shows no signs of abating, and we believe will more than offset potentially more modest growth rates from traditional end-use markets as post-pandemic stimulus spending is eventually tapered.

We assume a **long-term copper price of US$3.20/lb** for equity valuation purposes. We believe such a pricing level to be a minimum required to incentivise new production of scale, and therefore consider it a conservative long-term assumption (particularly if market deficits open as wide as some forecasts suggest later this decade).

Figure 22: Copper demand growth could severely stress supply growth capabilities later this decade under an accelerated energy transition scenario



Source: Celsius Resources, Bloomberg, Wood Mackenzie

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