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Can Mongolian copper power the green revolution?

To meet demand miners will have to operate in countries difficult to navigate

Neil Hume in Oyu Tolgoi YESTERDAY

After a four-minute descent in a dark, two-storey lift, the latest shift of workers arrives at Mongolia's largest ever construction project — a huge underground [copper](#) mine called Oyu Tolgoi 1.3km below the Gobi desert.

Along one of the tunnels, a minibus makes its way slowly to a huge cavern. This, a young Australian engineer explains, will house one of the mine's biggest pieces of equipment — a 300 tonne crushing machine, which will pulverise copper bearing rocks blasted from an ore body the size of central Manhattan.

Capable of processing 4,000 tonnes of copper-bearing rock per hour, the machine is a key part of a near \$7bn expansion project that will see Oyu Tolgoi emerge as the world's third largest source of copper by 2027, producing more than 500,000 tonnes a year.

Once finished Oyu Tolgoi will help supply a metal that will be in ever-greater demand as the green energy revolution takes hold. It will also become a mainstay of the Mongolian economy, which has veered between boom and bust since the end of the Soviet satellite regime in the early 1990s.



Oyu Tolgoi mining map

The development of [Oyu Tolgoi, controlled and operated](#) by Anglo-Australian group [Rio Tinto](#), provides a unique insight into the modern mining industry and its quest to find the raw materials that will make the shift to renewable energy possible.

Having tapped most of the world's copper that is easy to mine, companies like Rio Tinto are now being forced to take on complex projects in countries like [Mongolia](#) where foreign ownership and exploitation of natural resources are highly sensitive issues.

“There are a lot of expectations round this project,” says Dorjdari Namkhajantsan, a former adviser to the Mongolia government and now country manager for the Natural Resources Governance Institute. “Trying to manage them is a nightmare.

“Mongolian politics are also turbulent, governments change quite often . . . and obviously Oyu Tolgoi is a very easy subject to try and win votes from people,” he adds. Mongolia has had seven prime ministers since 2007.



Armando Torres, chief executive of the Oyu Tolgoi mine, said the operation was complex © FT montage; company; Bloomberg

As the world moves to cleaner sources of energy, a trend known as decarbonisation, copper will become an increasingly important commodity.

While [electric vehicles](#) dominate most conversations about demand for metals and mineral resources, renewable energy is more relevant for copper, according to Colin Hamilton, head of commodities research at BMO Capital Markets in London.

“Renewable energy is going to be the single largest driver of [copper demand](#) growth in the decades to come, owing to the need to connect significant numbers of small-scale electricity generation units to the grids,” he says.



Storm clouds above Khanbogd, the nearest town near the Oyu Tolgoi mine © Reuters

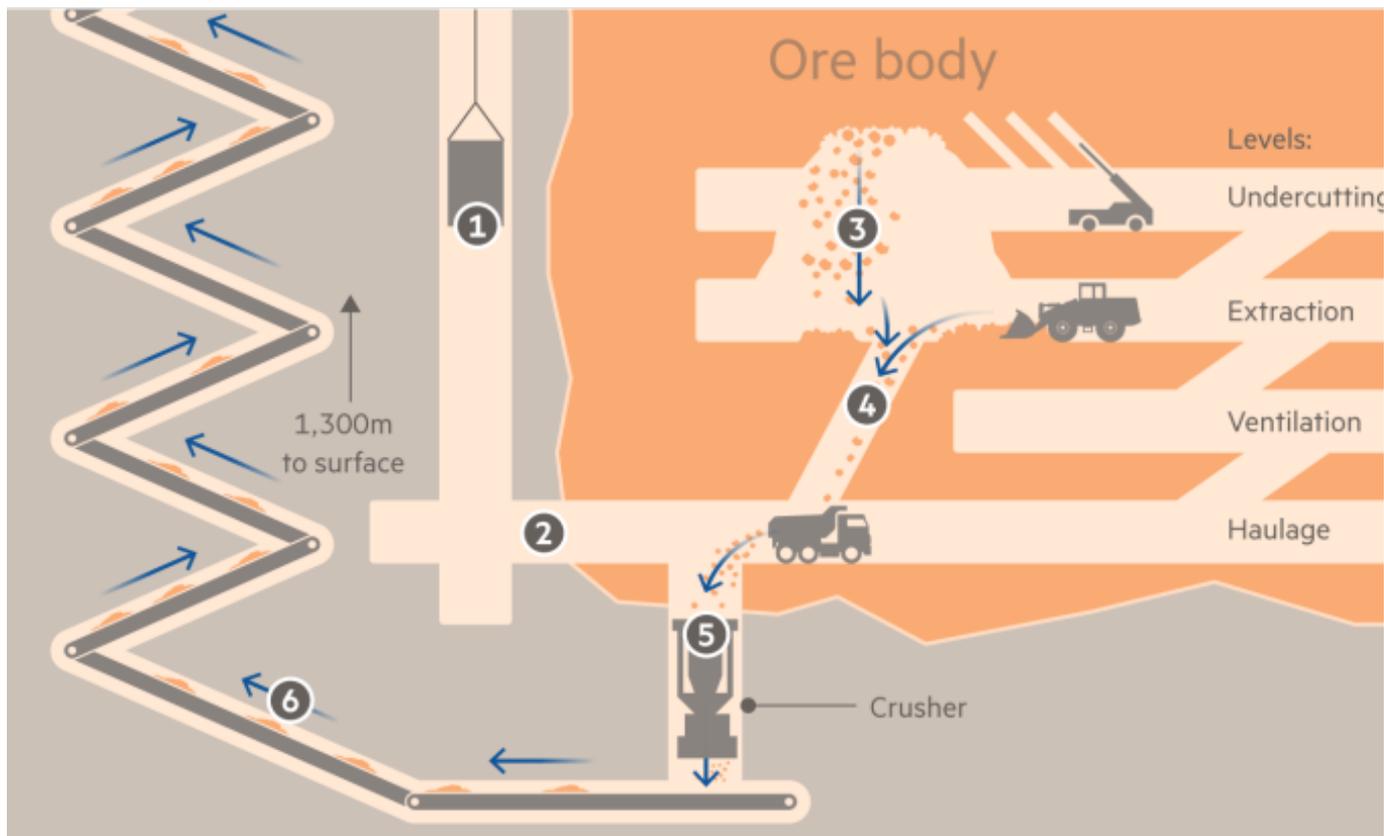
A wind turbine capable of generating a megawatt of power — enough to supply 500 homes — requires more than three tonnes of copper, according to Rio. The problem for Rio and its peers is that most of the easily accessible copper in attractive jurisdictions such as Chile has already been tapped. What is left is either lower grade or requires more technically challenging extraction in parts of the world where corruption is rife or the politics are difficult to navigate.

As a result, the pipeline of copper projects has all but dried up and there are fears the world could be heading for a supply crunch if new mines are not brought online soon. Rio estimates that eight new mines the size of Oyu Tolgoi will be needed within a decade to fill an anticipated 5m tonne-a-year copper supply gap.

Ownership and exploitation of mineral resources by foreign corporations is a sensitive political issue in many developing countries. But it is particularly acute in Mongolia because of its importance to its \$11bn economy; the underground mine could contribute 30 per cent of the country's gross domestic product by the time it reaches peak production in 2027.

Rio Tinto's extraction plan at Oyu Tolgoi

To access the underground deposits from the Hugo North 1 site, Rio will use a method known as block caving:



- ① A series of very deep vertical shafts over 1,000m deep are sunk
- ② A network of tunnels is then dug out under the ore body
- ③ The ore body is undercut and collapses into the extraction level
- ④ It is funneled into the haulage level
- ⑤ Then loaded into the crusher
- ⑥ Finally a 10km conveyor system transports the ore to the surface

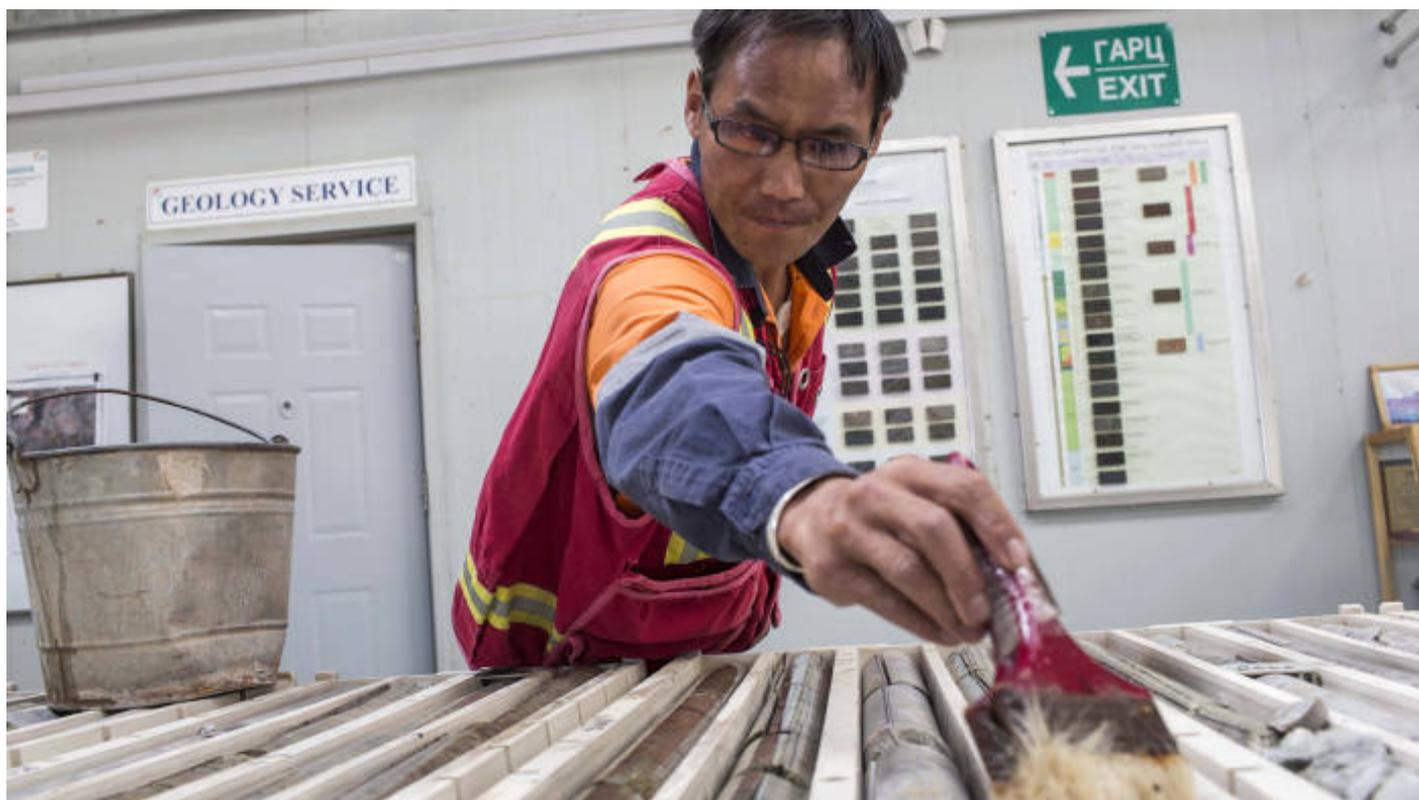
Source: Oyu Tolgoi
© Rio Tinto

Last year, Ulan Bator, which has struggled to keep its finances in check, received its sixth bailout loan from the IMF since 1990 and in return accepted a set of budget reforms and austerity measures.

While growth has picked up thanks to higher commodity prices and Chinese demand for coal, the government is still badly in need of cash to fund its spending commitments.

“It’s in everyone’s interest to unlock the value of this absolutely world-class deposit

that will be producing copper and gold for the next 100 years,” Rio chief executive Jean-Sébastien Jacques said last month.



A worker keeps core samples damp at the geology office of the Oyu Tolgoi mine © Bloomberg

Getting to the current state at Oyu Tolgoi has not been easy. It took six years of tough negotiations before Rio and Mongolia signed in 2009 their first investment agreement, which defined the state’s participation in the first stage of the project — a \$6.5bn open pit that has been in production since 2013 — and set out tax and royalty rates.

Rio then [stopped work on the underground project](#) in 2013 following a series of disagreements with the government over costs, taxes and control of strategic assets.

Digging resumed in 2016 after the two sides signed a development and financing plan. This saw Rio raise a total of \$4.4bn from a group of international lenders and export-import banks in Australia, Canada and the US.

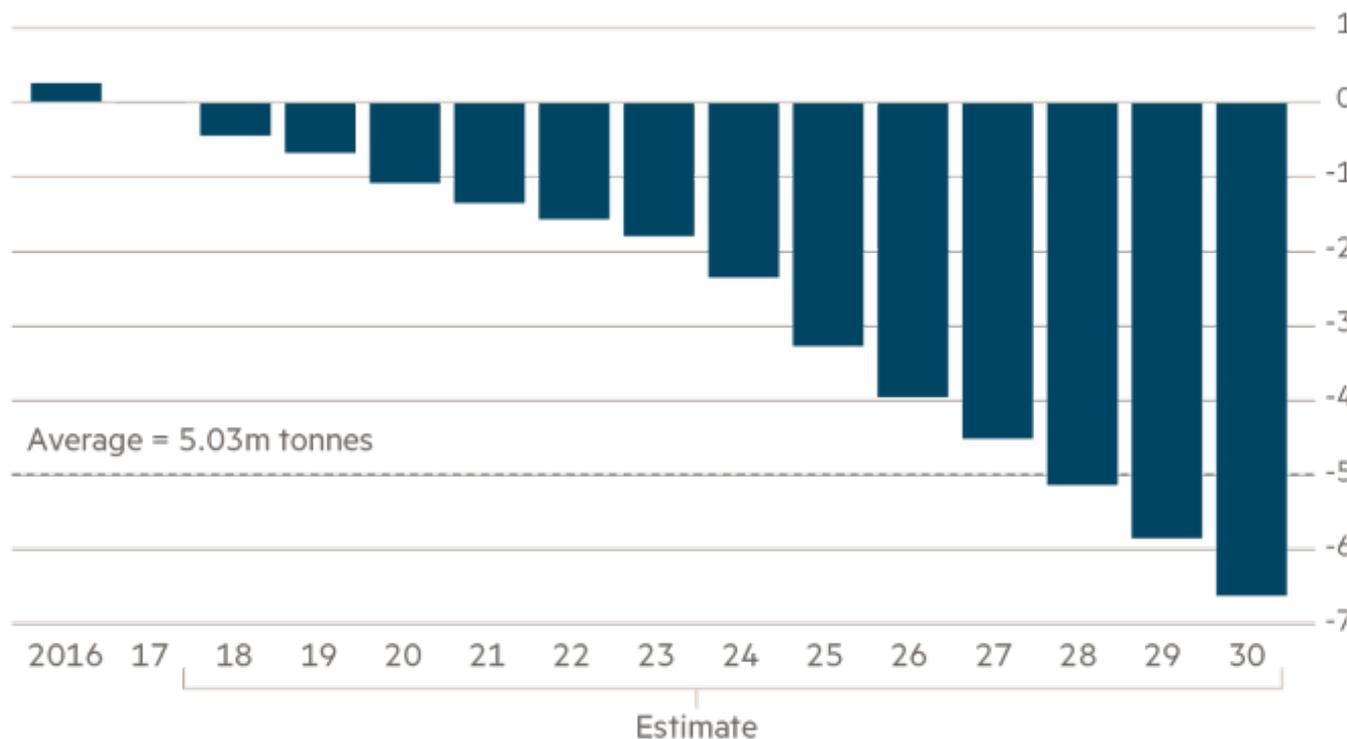
But the politics have remained difficult and 2018 has seen fresh strains in Rio’s relationship with the state.

“There is no real constructive discussion about mining in Mongolia. It’s not

happening. That's one of the big problems at the moment," says Mr Namkhajantsan.

Copper market faces a 5m tonne deficit by 2025

Million tonnes



Source: BMO Capital Markets
© FT

The mine at Oyu Tolgoi, which means Turquoise Hill in English, is 34 per cent owned by the state of Mongolia and 66 per cent by [Turquoise Hill](#), a Canadian listed company, which in turn is 51 per cent controlled by Rio.

Turquoise Hill and the government are heading towards international arbitration over a disputed \$155m tax bill, while a parliamentary working group has been set up to “review the implementation” of the investment agreement. It is due to report later this year and its findings could provide the state with leverage to press for higher returns from the project.

The investment agreements have also been the subject of a [probe by Mongolia's anti-corruption authority](#). While the focus of the investigation is the abuse of power by former government officials — two former prime ministers were arrested in April —

the move has rattled Rio's investors.

"Mongolia has always been quite a volatile place for Rio. That looks like it will continue," says Myles Allsop, analyst at UBS.

Rio has also been told that it must source power for Oyu Tolgoi domestically. The project's energy demands are huge, equivalent to around 25 per cent of Mongolia's total production capacity. It now looks likely that Rio will have to build a dedicated coal-fired power station. "That's a billion dollars of capital expenditure that was not in the original budget," says Mr Allsop.



Jean-Sébastien Jacques, the chief executive of Rio Tinto, said the ore deposits at Oyu Tolgoi could be mined for 100 years © FT montage; Bloomberg

Much of the tension between Rio and the government reflects the way Oyu Tolgoi has been funded.

Earlier this year, SOMO, a Netherlands research group on multinationals, issued a 50-page report that claimed Rio and Turquoise had managed to lower their Mongolian tax obligation by \$232m by using shell companies in the Netherlands and Luxembourg to finance the development of Oyu Tolgoi.

Rio has rejected these claims, saying the structure has not resulted in any reduction of

Mongolian tax revenue and that Oyu Tolgoi is making a substantial contribution to the local economy and the country's development. Over the life of the project, it says Oyu Tolgoi will pay more than \$35bn in tax and royalties.

“It's one of the top two or three risk sharing agreements we have seen anywhere,” said one large mining investor. “It's really beneficial to the Mongolian people, as it should be. It's a great project. It's hugely important to their economy.”



Khanbumbat airport, in Khanbogd, opened in 2013 and was funded by the mine company © Company

However, experts say the overall financing of Oyu Tolgoi requires careful explanation to the public and politicians. “A lot of Mongolians, and that includes politicians, are not entirely persuaded the deal they have over Oyu Tolgoi is a good one,” says Julian Dierkes, an expert on Mongolian civil society at the University of British Columbia.

Rio has paid for the construction of Oyu Tolgoi through equity and shareholder loans. It has also funded the Mongolian's state's share of the development costs. Once Oyu Tolgoi starts generating annual profits, the government had promised to use its share of earnings to repay the money it has borrowed. Once those debts are paid off, the state can start to receive dividends.

This arrangement, known as carried interest, means Mongolia has not had to put up a

single cent to fund its share of the development costs. The downside is that it will not receive any dividends until at least 2030, and that is if the copper price holds up.

“The 34 per cent stake is a nonsense. Why does Mongolia need shares?” says Damdinnyam Gongor, an independent Mongolian researcher. “The government should change one thing — the stake. Give it back and increase the royalties and taxes.”

Arnaud Soirat, the head of Rio’s copper and diamonds business, says the only shareholder to have earned anything from Oyu Tolgoi is the Mongolian state, which has already received \$1.9bn of taxes, fees and royalties since it started work on the open pit in 2010. He points out that it will have received billions more by the time the underground mine is at full capacity in 2027.

“We are employing more than 14,000 people, 90 per cent of them are locals. If you include contractors and suppliers, you are taking an additional 40,000 people. It’s a huge positive impact to the country,” he adds.

Analysts are wary. Oyu Tolgoi is one of Rio’s most important growth projects and a key source of cash generation from 2027 onwards.



Hugo North Lift 1 in the Oyu Tolgoi mine, which is expected to start production in 2020 © Company

They say the big risk for Rio and Mr Jacques is that the relationship with the Mongolian government does not improve and the state looks to change the terms of investment agreement once the underground project is completed. To date, Rio has invested \$7.8bn and is looking to spend another \$5bn.

Such manoeuvres are not without precedent. Shortly after finishing a big investment programme on a copper project in the [Democratic Republic of Congo](#), [Glencore](#), the Switzerland-based miner and commodity trader, was hit by a lawsuit from the state mining company. This was only settled after Glencore agreed to write off \$5.6bn of debt and make a \$150m payment.

This would be a high risk tactic for Mongolia because of the message it would send to outside investors whose help it needs to develop an estimated \$1tn worth of untapped mineral wealth.

“The world is watching Oyu Tolgoi”, says Mr Soirat. “People are looking at Oyu Tolgoi and asking whether it will be a success and whether Mongolia is a good place to do business and invest.”

The project Feats of complexity and scale in the Gobi Desert

Even for a company of Rio Tinto's scale, the underground project at Oyu Tolgoi is a huge undertaking. Located 550km south of Ulan Bator, it is series of copper, gold and silver deposits stretching 12km in length, and containing enough ore to support 100 years of mining.

It will eventually require the sinking of five vertical shafts, 200km of tunnels, some as wide as 12 metres, and enough concrete to fill Mongolia's main sports complex three times over. The water for the mine is transported from a deep untapped source 50km away from the site.

To access the deposits at Oyu Tolgoi, Rio is using a method known as block caving. This involves digging below the ore body and collecting the falling rock, which is then crushed and transported to the surface on a 10km conveyor belt. Block caving has high upfront costs but much lower operating expenses than other underground mining methods. Rio, along with US rival [Freeport-McMoran](#), is one the few miners to employ this technique on a large scale.

If everything goes to plan, Rio expects first production from the underground project, known as Hugo North Lift 1, to start in 2020. Output will then steadily increase, exceeding 500,000 tonnes a year by 2027.

Work is now focused on completing a second production shaft and a 6.6km conveyor system that will carry most of the copper-bearing ore to the surface.

"It is a complex project that has required a lot planning, preparation and designing," said Armando Torres, Oyu Tolgoi's chief executive, during an interview in Ulan Bator.

Most of the copper produced from the underground project will end up in China, where it will feed the country's giant smelters and be forged into metal that can be used in household wiring and electricity transmission networks.

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