

'Playing with fire': the countdown to mining the deep seas for critical minerals

UN-backed regulator at centre of wrangle over future of Pacific Ocean's depths as July deadline looms

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The deepest parts of the Pacific Ocean have rested undisturbed for millennia. But now creatures living thousands of metres beneath the surface may be confronted by new visitors: companies mining minerals key to the green energy transition.

The International Seabed Authority (ISA), the UN-backed regulator, is preparing to consider the world's first commercial deep-sea mining application as soon as July, despite many member states warning it is too soon for extraction to leap from land into water.

Two years ago, Nauru activated the countdown for a potential start to commercial deep-sea mining, a practice hotly debated since the 1960s. The tiny Pacific island triggered a legal clause compelling the ISA to consider applications for commercial mining permits under the skeleton framework designed for exploration, if it cannot agree on a full set of safeguards for the industry before this summer.

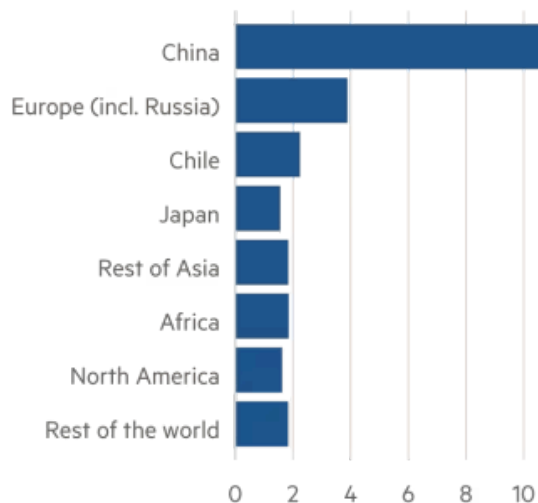
Facing that deadline, companies and countries have been racing to influence what comes next. While Nauru is explicitly pushing for applications to be considered from July, nations such as Norway have adopted a softer pro-mining position, opposing proposals to make it easier to veto applications. Several European countries are urging caution while also carrying out their own exploratory work, while China too is sending vessels to explore the ocean floor for minerals such as nickel, manganese and cobalt.

Environmentalists have warned of the risks as countries seek to balance moving away from fossil fuels against the need to protect marine ecosystems, pointing out that ecological standards and liability mechanisms will still be in limbo when the deadline passes. Ecological treasures on the seabed include creatures such as the transparent ghost fish, dumbo octopus and giant sea anemone, as well as microscopic worms that scientists say could hold the key to understanding human evolution.

“We need these commodities,” said Michael Widmer, metals strategist at Bank of America. But he added: “Can you justify ripping up the ocean floor to facilitate the energy transition?”

Increased copper demand to meet green targets risks over-reliance on Chinese supplies

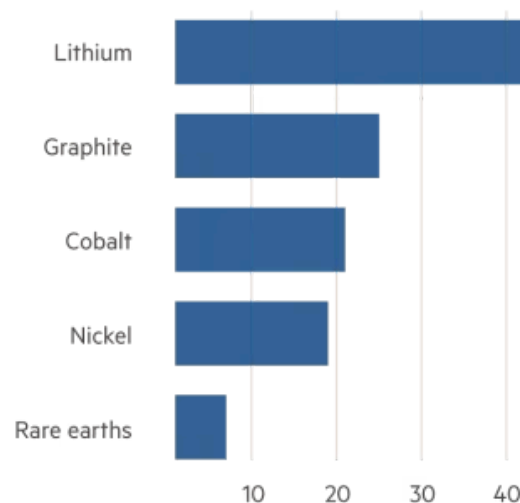
Refined copper production, by country/region, 2022 (mn tonnes)



Global total = 25.4mn tonnes
Source: S&P Global Market Intelligence
© FT

Growth in demand for selected minerals if the world reaches net zero by 2050

2040 relative to 2020, index (2020=1)



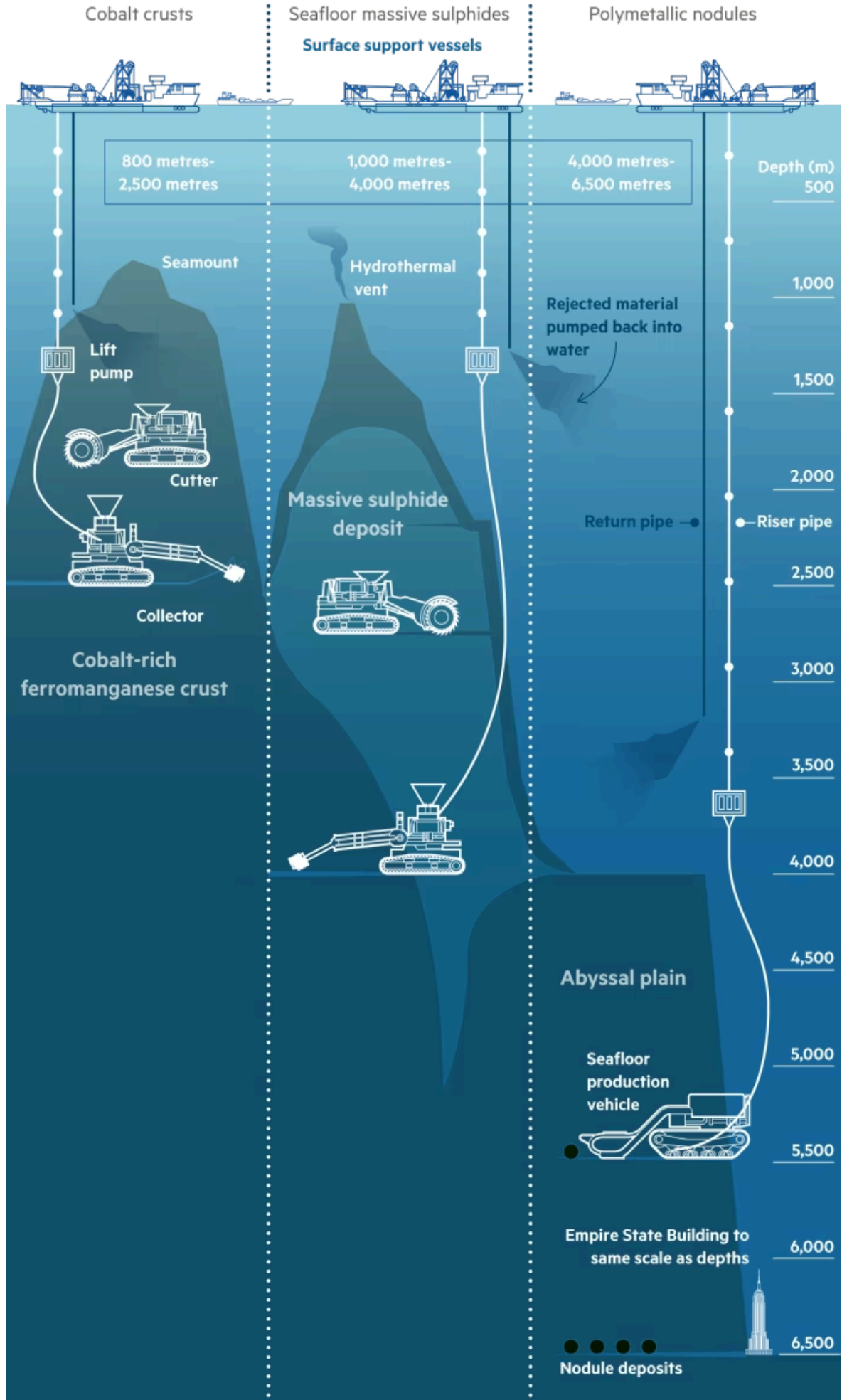
Source: IEA

Companies can currently explore international waters for minerals, but not exploit them. The move by Nauru, which is sponsoring Vancouver-based miner The Metals Company (TMC), could hasten the arrival of commercial-scale extraction.

Deep-sea mining advocates say the transition is needed because terrestrial mining cannot meet the demand for metals vital to batteries, wiring and other hardware key to the shift away from fossil fuels. The boom in electric cars and grid batteries resulting from the push to meet the Paris Climate Agreement means mineral demand is set to increase fourfold by 2040, says the International Energy Agency. Increasing terrestrial mining to that extent would mean depending on China and would entail a huge environmental cost.

Offshore groups are testing three ways of obtaining minerals, with the most promising option involving vacuuming up individual polymetallic nodules from the ocean floor that are then transported via four kilometre-long flexible hoses to offshore vessels. These nodules contain copper, cobalt, nickel and manganese — metals that are already controversial because their extraction on land is linked with deforestation, forced labour and the displacement of communities.

Seabed mining options



Vehicles not to scale Graphic: Ian Bott Sources: New Zealand Environment Guide; USGS; Frontiers in Marine Science; UNED; Royal ICG; Nautilus Minerals; ET research

At the centre of the wrangle over the future of deep-sea mining stands the ISA, a body created in 1982 to ensure that mineral extraction from international waters would benefit humankind. Its decisions are taken by a small rotating council of member states on behalf of 167 countries plus the EU — the US has never joined. From July, this council could approve exploitation licences — after reviewing applications for a year — with the backing of just a third of members.

Some diplomats have accused the ISA of adopting an excessively pro-mining position. At a conference last year, Michael Lodge, its British secretary-general, blamed opposition to deep-sea mining on “growing environmental extremism and dogmatism bordering on fanaticism in some instances”.

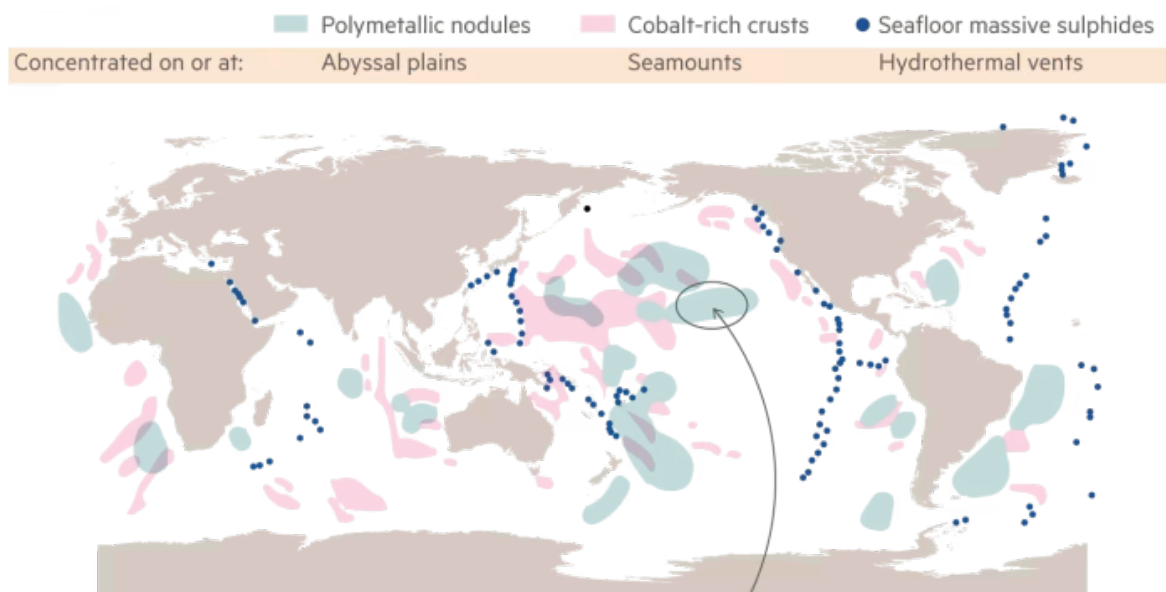
He previously said a moratorium would be “anti-science, anti-knowledge, anti-development and anti-international law”, and appeared in a promotional video for miner TMC. The Metals Company said Lodge had toured its exploration vessel in 2018 and “agreed to share his thoughts on the development of this industry via video”.

A member of the ISA’s governing council said Lodge triggered unease among diplomats in February when he shared a statement seen as seeking to assert the regulator’s supremacy over a landmark UN treaty to protect biodiversity at sea. The new agreement will create a body that could intervene in the case of a man-made disaster at sea. The treaty must not “duplicate or undermine” the ISA, Lodge wrote in a February statement seen by the FT.

A member of Germany’s ISA delegation wrote to Lodge in March with concerns that he was resisting efforts by some delegates to slow down the approval process for commercial mining deals. Lodge rejected these concerns as “bold and unsubstantiated” in a letter seen by the FT and first obtained by the New York Times.

The ISA said it would take a “precautionary approach” to seabed mining applications and “welcomes” the new UN treaty. The characterisation of Lodge’s comments on deep-sea mining was “misleading” and he did not consent to appearing in TMC’s video, the regulator added. The regulator “welcomes” the conclusion of a new UN treaty, whose objectives are “at the core of the ISA’s mandate,” it said.

The three main types of mineral deposits on the seabed



Source: Frontiers in Marine Science

Clarion-Clipperton Zone, the most significant known concentration of polymetallic nodules

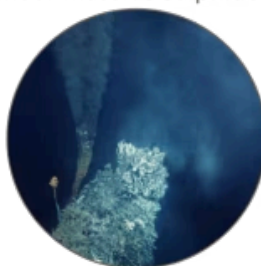
The mineral deposits

Cobalt-rich crusts



Cobalt, manganese and other rare metals can precipitate onto sediment-free rock surfaces of seamounts at depths of 800 to 2,500 metres. It can take a million years to build up a crust of 1mm to 5mm.

Seafloor massive sulphides



Seawater heated by molten rock along volcanically-active mid-ocean ridges at 1,000 to 4,000 metres rises and leaches metals from rocks it passes through. When it vents and cools, the metals are deposited on the ocean floor in the form of mounds or chimneys. Rich in copper, zinc and, in some cases, gold and silver

Polymetallic nodules



Ball-shaped objects formed by accretion of iron and manganese oxides around nuclei such as grains of sand. They acquire the metals from seawater around them or sediment on which they sit at depths of 4,000 to 6,500 metres. Can contain manganese, nickel, copper, cobalt and traces of rare earth elements

Applications

Copper Construction, electronics, transportation

Zinc Rust prevention, alloy in brass and bronze

Gold Jewellery, electrical products

Silver Jewellery, mirrors, cutlery, mobile phones, laptops, antibacterial products

Manganese Steel, aluminium alloys, electric vehicle batteries

Nickel Stainless steel, jet engines, turbines, electric vehicle batteries

Copper Construction, electronics, transportation

Cobalt Rechargeable batteries, petrochemical catalysts

REEs Superconductors, permanent magnets, lasers

Graphic: Ian Bott Sources: USGS; Frontiers in Marine Science; UNEP; Lockheed Martin; FT research

© FT

Some European countries appear to be playing for time. France, Germany and Spain all sponsor deep-sea exploration licences. But at meetings in Jamaica last month, they argued for a precautionary pause on seabed mining. At least a dozen countries have called for a temporary halt following advice by scientists that the seabed's role in storing carbon and supporting wildlife was still too poorly understood.

The UK government, which is funding a £6mn scientific research project in its own Pacific exploration zones, said in March that it would not support commercial mining in these areas until the ISA can agree on global rules.

China sponsors more exploration licences than any other state. But its dominance of critical mineral supply chains could be threatened if deep-sea mining proceeds before Beijing is ready, analysts say. At ISA meetings last month, Chinese diplomats did not back an immediate go-ahead, but argued environmental concerns should not outweigh the economic benefits of mining, said two people who were present.

Backed by FTSE 100 miner Glencore and Swiss subsea contractor Allseas as well as Nauru, TMC is pushing ahead. Chief executive Gerard Barron confirmed it plans to submit an application for commercial mining this year.

“We have a legal right to do so,” said Barron. “The ISA is finalising the exploitation regulations, not sitting around deciding whether this should happen or not.”

TMC collected 4,500 tonnes of polymetallic nodules in a trial last year and plans to collect 1.3mn a year once it has a commercial licence. The lossmaking group has promised revenue from commercial mining by the end of next year.

This contrasts with other deep-sea mining companies, which said they needed regulatory certainty now to start commercial operations near the end of the decade.

“Nobody wants to go seabed mining, at least for a few years, other than The Metals Company,” said Duncan Currie, a lawyer at the Deep Sea Conservation Coalition. “It's created enormous tension, diplomatic anxiety, frustration and activity, all for one company.”



Engineers inspect the first batch of polymetallic nodules collected from the sea floor during TMC's trial last November © Richard Baron/The Metals Company



Polymetallic nodules represent the planet's largest source of energy transition metals with high grades of nickel, cobalt, copper and manganese © Richard Baron/The Metals Company

The Clarion-Clipperton Zone in the Pacific Ocean, where most exploration has taken place, is “one of the most biodiverse sedimented marine habitats on our planet”, according to a paper co-authored by Adrian Glover, a Natural History Museum scientist who returned from a UK government-funded deep-sea exploration mission last month.

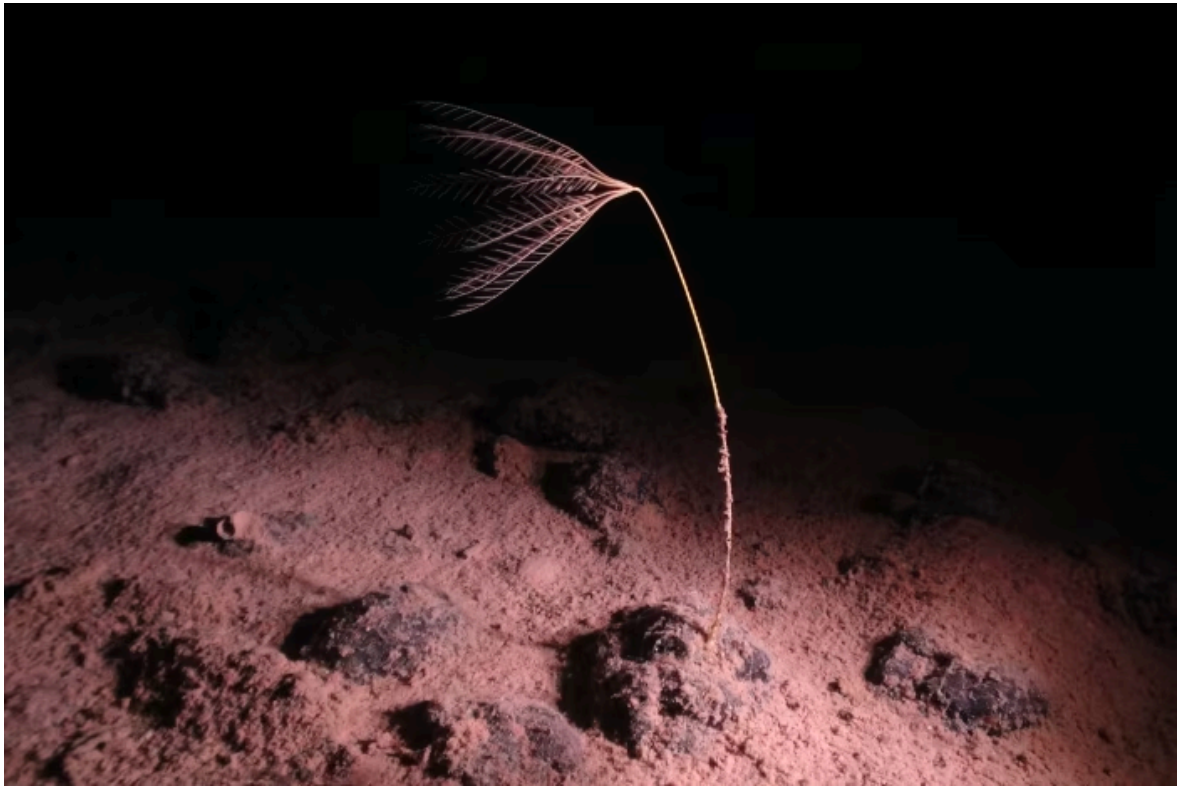
Environmentalists say the plume of waste water emitted by deep-sea mining machinery could disturb “marine snow”, or carbon and nutrient-rich particles of biological matter, that usually settles on the seabed. Noise pollution may also disturb marine mammals.

Deep-sea ecosystems “take millennia to establish and can take seconds to destroy”, said Tony Worby, a marine scientist at Australian non-profit Minderoo Foundation. “We’re playing with fire to think we can go down to the deep sea and strip-mine it without massive repercussions.”

“It’s a trade-off,” said Kris Van Nijen, managing director of Global Sea Mineral Resources, a Belgian deep-sea mining company. “If we mine Indonesia, Papua New Guinea and Philippines and destroy their rainforests, then to what degree can polymetallic nodules be a better resource than land-based mining?”



A sea cucumber in a polymetallic nodule field of the Clarion-Clipperton Zone at a depth of 4,200m © SMARTEX Project, Natural Environment Research Council, UK



A sea lily marine animal on the sea floor of the Clarion-Clipperton Zone at a depth of 4,800m © SMARTX Project, Natural Environment Research Council, UK

Deep-sea mining faces other unresolved questions. For example, if a miner released waste water too close to the surface or severely damaged the seabed, it remains unclear who would be liable for compensation.

“You could end up with a situation where Nori [a TMC subsidiary] or any mining company could go bankrupt or insolvent with no access to funds [to pay fines],” said Pradeep Singh, a maritime law expert at Germany’s Research Institute for Sustainability.

Offshore mining would also need to show it could compete on costs with land-based supplies — and persuade carmakers and customers to embrace it.

Profit-sharing among member states is another question. It will be worked out based on population size, investments in deep-sea mining and revenue lost from terrestrial mining, according to the ISA.

Any decision to proceed with deep-sea mining would not be a “scientific” one, said Glover. “It just depends how much risk you’re willing to take on — it’s a political decision.”