





Solutions for People, Ocean, Planet

Briefing on Deep Sea Mining July, 2023

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Agenda

- Briefing (25mn)
 - The risks of deep sea mining are large and science and technology make it clear we don't need it.
 - There is a key legal justification for executive action calling for a pause in deep sea mining.
- Q&A (25mn)



It is Widely Recognized that DSM Involves Significant Known and Unknown Risks

- Biodiversity and habitat destruction
- Sediment plumes
- Negative effect on carbon pump and other ecological processes
- Release of metals and toxins affecting fisheries and human health
- Noise pollution
- Potential significant impact on carbon sequestration

Supported by <u>Statement From Over 750 Marine Scientists</u>



Based on Already Widely Used Technology, such as LFP Batteries, DSM Is Unnecessary

Miners claim DSM is necessary to obtain cobalt, nickel, manganese and copper for the green transition (specifically EV batteries).

Projected demand for deep sea metals is driven by demand for EV batteries. "*Demand for EV batteries will account for 80% to 90% of demand for cobalt, 75% to 85% for nickel, and 45% to 65% for manganese in 2050.* "[The Future is Circular, 29-30]

So if there is no need for these metals in EV batteries, there is no need for DSM.

LFP (lithium iron phosphate) batteries, representing close to 50% of global EV battery sales, use no cobalt, nickel or manganese.

On this basis alone, there is no need for DSM for EV batteries or the green transition.



Several Battery Technologies Don't Use Deep Sea Metals

- <u>Lithium Iron Phosphate (LFP)</u>: Close to 50% of the global EV battery market in 2023 (BYD, 50% of 2022 Teslas, and soon VW, Ford, Rivian)
- <u>Sodium-Ion</u>: CATL to mass produce starting 2023; over 30 other brands pursuing it
- Lithium Silicon: Washington facility to serve Mercedes in 2024, targeting 1M EVs by 2027
- <u>Certain Lithium-Metal & Solid State Batteries</u>: Like SES backed by GM, Hyundai, Honda
- <u>Sodium Sulfur</u>: Low-cost, high-capacity technology expected to be game changer
- <u>Lithium Sulfur</u>: Under development with potential for higher energy density

Also for long-duration, low-hysteresis, grid storage: Iron-Air and Iron Flow



Recycling underway with major growth potential

- Battery recycling to grow 6 fold by 2030 (<u>Bloomberg</u>)
- At least 40 companies pursuing the \$20B Li-ion recycling market (Volta Foundation)
- Recycling technologies are improving (<u>MIT</u>)
- First generation batteries will soon be retiring bringing in big inflow of new metals
- Policies from US (subsidies) and EU (quotas) are fast-tracking growth



Additional Opportunities Making DSM Unnecessary

- Cobalt from seawater
- Hydrogen
- Cleaner and more efficient land mining, including from tailings
- Policy and societal shifts affecting overall demand for private transportation



Business Viability of DSM is Questionable

- 8 car manufacturers and major tech companies committed not to use deep sea metals in supply chains (e.g., BMW, Rivian, VW, Volvo, Ford, GM, Google, Philips, Samsung)
- 17 financial institutions have vowed not to support the DSM sector (e.g., European Investment Bank, Lloyds Bank, ABN Amro)
- Maersk recently divested from The Metals Company
- Lockheed Martin recently exited from its UK based mining interest
- Lockheed Martin stated it is not currently pursuing its US granted exploration license







(BGR; Germany)

uzhmorgeologiya

(Russian Federation)

Basemap Souces: GEBCO, NOAA





DSM in the International Seabed Area Will Result in Relatively Small Increase in Primary Metal Supplies

Mining the Clarion-Clipperton Zone will not come anywhere close to doubling global production of cobalt, nickel and copper, as claimed, much less producing "100s of millions of tons" of these metals over the next 30 years.

It will only result in relatively small increase in global primary supplies of cobalt, nickel and copper - even less when compared to the amounts on market. (see appendix for details).

For example, even by mining all 17 areas currently licensed for exploration in the CCZ, we could only obtain merely 2-3% of the current global supply of copper.

Structural/political concerns with the ISA



- Legal and Technical Commission/LTC lack of transparency (contracts, meetings); granting mining contracts heavily influenced by LTC
- ISA Conflict of interest regulator as well as beneficiary of licenses (UK House of Commons Environment Audit Committee 2019)
- Use it or lose it incentives: mine or risk losing exploration claim/contract (15yr); potentially 'perverse' incentive to mine
- 25 of 30 ISA exploration contracts in the hands of 7 countries & 3 companies
- All countries have equal right/opportunity to mine or become a Sponsoring State Politically/legally difficult for the ISA to deny application from any country
- Economics likely to drive development of industry even with "good regulations"
- Profoundly undemocratic decision-making (on behalf of humankind?) if LTC recommends approval of a mining license, only 2-13 countries' approval needed to issue a contract by ISA



Growing Global Calls for a DSM Moratorium

General Momentum for a Moratorium

States California, Washington and Oregon

<u>Corporations</u>

Financial Institutions

Fishing sector

750+ Scientists

Indigenous Leaders

Civil Society Organisations

General Public

Countries and Parliamentarians



DSM: Corporations for a Moratorium and/or Banning DS Minerals from their Value Chain







Indigenous Leaders from 65 Groups and 44 Countries Calling for a Ban on DSM





Government Calls for a Moratorium: 18 and counting...

The wave of resistance continues to grow. Be the next one to say no to deep-sea mining.



+ Canada on July 10th

> Canadian July 10th Announcement



A Precautionary Approach Is Called For Under Existing Legislation

A moratorium or pause to provide an opportunity for environmental assessment and protection prior to any DSM is called for under the Deep Seabed Hard Mineral Resources Act.

The Act, designed to establish an interim legal regime pending adoption of the Law of the Sea Treaty, included as one of its purposes: "to accelerate the program of environmental assessment of exploration for and commercial recovery of hard mineral resources of the deep seabed and assure that such exploration and recovery activities are conducted in a manner which will encourage the conservation of such resources, [and] protect the quality of the environment...." 30 U.S. Code §1401(b)(4)

The Secretary of State is expressly encouraged to take action to ensure protection from any DSM:

"Until [the Law of the Sea] Treaty is concluded, <u>the Secretary of State is encouraged to promote any</u> <u>international actions necessary to adequately protect the environment from adverse impacts</u> which may result from any exploration for and commercial recovery of hard mineral resources of the deep seabed carried out by persons not subject to this chapter. 30 U.S. Code §1402(b)(2).



Importance of US Call for a DSM Moratorium or Precautionary Approach

There is urgent need and clear data for the US to lead on this issue, that would be coherent with recent action such as the CHIPS and Science Act and the IRA.

The US has a duty to speak up against needless environmental destruction in the high seas especially given the threat posed to US national waters.

A call for a pause by the US until sufficient information is gathered for an informed decision is critically important.

The US can use its influence to convince the G7 and other countries to establish a moratorium at the ISA even if not a signatory to UNCLOS.

This is last best opportunity for US to have a voice in the decision.







We ask you to support a call for a moratorium on Deep Sea Mining

Thank You .

Prof. Dan Kammen, University of California Berkeley Matthew Gianni, Deep Sea Conservation Coalition Jeanne Everett, Blue Climate Initiative Stan Rowland, Blue Climate Initiative

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ADDITIONAL MATERIALS:

Each ISA mining claim area in CCZ approximately 75,000 Km2



- Each CCZ mine would strip mine est 10-12,000 km2 of seabed in 30-year license period to mine 3MT/year nodules (Smith et al 2020)
- Sediment plumes across seabed could "easily" cover another 10,000-30,000 km2 & millions of km3 in water column from discharge from ships (MIT 2021; Smith et al 2020)
- Only produce app 0.14% Cu; 1.1% Ni;
 3.2% Co per year over and above terrestrially mined supplies (Gianni)

Netherlands, Belgium, Luxemburg combined/app 75,000 km2

The ISA licensing could never match current annual terrestrial production given tremendous geographical coverage involved

Main metals found in polymetallic nodules in the CCZ	Estimated annual production per mining license in CCZ in tons based on 3MT nodules (dry wt) mined per year	Land-based mined production per year (2022) in tons	Number of CCZ mines needed per year to equal annual terrestrial production	Est total CCZ seabed area that would be directly mined per year in km2	Cumulative impact over 30-year license period km2: Area directly mined/ total seabed footprint including plumes
Nickel (Ni)	36,000	3,300,000	92	27,600	828,000/ 1.6 - 3.2 million km2
Copper (Cu)	30,000	22,000,000	733	220,000	6,600,000/ 13 - 26 million km2
Cobalt (Co)	6,000	190,000	32	9,500	285,000/ 0.6 - 1.2 million km2
Manganese (Mn)	810,000	20,000,000	25	7,500	225,000/ 450,000 – 900,000 km2

Sources: MIT; USGS, ISA publications. GSR: Financial Model Presentation: Techno-Economic Assessment & Financial Payment Regime. Presentation by Kris Van Nijen, Global Sea Mineral Resources NV, to the Deep Seabed Mining Payment Regime Workshop #3: Exploring a Financial Model and Related Topics. Singapore, 19-21 April 2017. GBR: Analysis of the Economic Benefits of Developing Commercial Deep Sea Mining...Operations in Regions where Germany has Exploration Licences of the International Seabed Authority..." Study on Behalf of the Federal Ministry for Economic Affairs and Energy Division I C 4. Project No. 59/15. 30 September 2016; COMRA; GBR; GSR - estimates of metal content of nodules and percentages of recovery, Smith et al., 2020...

Structural/political concerns with the ISA



- All countries have equal opportunity to mine and/or become a Sponsoring State Politically/legally difficult for the ISA to deny application from any country.
- Economics likely to drive industry development
- Profoundly undemocratic decision-making weighted toward mining (on behalf of humankind as a whole?) if LTC recommends approval of an application for a mining license then:
 - even if a majority of the 167 member countries of the ISA do not want the contract approved or DSM to go forward, the ISA may still license deep-sea mining - ISA voting/decision-making structure requires at least 2/3rds vote of Council against recommendation from LTC to award a mining contract.
 - As few as 2-13 countries on the Council can guarantee a license is approved even if all others opposed.
 - Only the Council members have a vote on regulations and approval of licenses; the 131 additional members of the Assembly do not have a vote.

The Debate over Deep Seabed Mining

TIME

https://time.com/6224508/deep-sea-mining-threat-ban/

IDEAS • CLIMATE CHANGE

The Case Against Deep-Sea Mining

BY SYLVIA EARLE AND DANIEL KAMMEN

OCTOBER 25, 2022 1:15 PM ED7

Earle served as the Chief Scientist at the National Oceanic and Atmospheric Administration. She is the founder of Deep Ocean Exploration and Research, and Mission Blue, a National Geographic Explorer in Residence, and an Ocean Elder. Kammen is Professor of Sustainability at the University of California, Berkeley. He has served as Chief Technical Specialist for Reneuable Energy at the World Bank, and Science Envoy in the Obama Administration

 ${f S}$ eldom do we have an opportunity to stop an environmental crisis

before it begins. This is one of those opportunities. The mining industry is on the brink of excavating the deep ocean, creating a new environmental disaster with irreversible consequences for our ocean and climate. We urgently need a deep-sea mining moratorium to thoughtfully assess the full impact before a new crisis is created.



Climate

Initiative









Invest in Promising Innovation, Not Ecosystem Damage

Energy & Environmental Science



PAPER

2021, 14, 3152

View Article Online View Journal | View Issue

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rsc.li/ees

Continuous electrical pumping membrane process for seawater lithium mining⁺

Zhen Li, Chunyang Li, Xiaowei Liu, Li Cao, Peipei Li, Ruicong Wei, Xiang Li, Dong Guo, 🔞 Kuo-Wei Huang 🕲 and Zhiping Lai 😉 *

Seawater contains significantly larger quantities of lithium than is found on land, thereby providing an almost unlimited resource of lithium for meeting the rapid growth in demand for lithium batteries. However, lithium extraction from seawater is exceptionally challenging because of its low concentration (~0.1–0.2 ppm) and an abundance of interfering ions. Herein, we creatively employed a solid-state electrolyte membrane, and design a continuous electrically-driven membrane process, which successfully enriches lithium from seawater samples of the Red Sea by 43.000 times (i.e., from 0.21 to 913.43 ppm) with a nominal Li/Mg selectivity >45 million. Lithium phosphate with a purity of 99.94% was precipitated directly from the enriched solution, thereby meeting the purity requirements for application in the lithium battery industry. Furthermore, a preliminary economic analysis shows that the process can be made profilable when coupled with the Chlor-alkali industry.

Conclusions:

Lithium & Cobalt from seawater cheaper than mining



Renewable and Sustainable Energy Reviews Volume 105, May 2019, Pages 301-309

An offshore solution to cobalt shortages via adsorption-based harvesting from seawater

Maha N. Haji 🝳 🖂 , Alexander H. Slocum 🖂

Abstract

The predicted dominance of electric vehicles and the need for grid-scale energy storage have heightened concerns that cobalt, a key constituent of lithium-ion batteries, could become a critical limiting factor. With limited terrestrial resources and over half the global production coming from politically challenging regions increasing risk, a shortage of cobalt could be experienced by the early 2020s. Fortunately, the oceans contain about 70 times more cobalt than on land and can be harvested sustainably with passive adsorption technologies; and a symbiotic system using existing <u>offshore structures</u> to harvest cobalt could enhance the <u>economic feasibility</u> of seawater cobalt harvesting. Our study finds that retrofitting just 76 unused oil platforms in the <u>Gulf of Mexico</u> could extract an average of 27.3% of the nation's 2017 cobalt consumption. New Offshore to cobalt supply pinch point in lithium-ion battery production.

Key References



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- May 2023 publication in Current Biology: *5,000 deep-sea animals new to science turned up in ocean records* <u>News</u> <u>article</u> and <u>full paper</u>.
- May 2023 publication in Nature: Alpha radiation from polymetallic nodules and potential health risks from deep-sea mining. <u>Press release</u> and <u>full paper</u>.
- March 2023 publication from Environmental Justice Foundation: How the rush to deep-sea mining threatens people and our planet <u>20p summary</u> and <u>full report</u>
- April 2022 article in Marine Policy: Assessment of scientific gaps related to the effective environmental management of deep-seabed mining. Full paper.
- February 2022 article One Earth: *Heading to the deep end without knowing how to swim; Do we need deep-sea mining* ? <u>full article</u>.
- July 2020 publication: *Deep-Sea Misconceptions Cause Underestimation of Seabed-Mining impacts*. Full paper.

ISSUE REGARDING ISA GOVERNANCE AND OVERSIGHT

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- April 2021 China Global South: DRC Take Note: China's BYD Says It'll No Longer Used Cobalt in Its Electric Vehicles. Article.

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- September 2022 Explorers' Club Presentations by Victor Viscovo. Recording.

ENVIRONMENTAL AND SOCIAL JUSTICE

- March 2023 Greenpeace article: Indigenous Peoples from 34 nations call for total ban on deep sea mining. Article.
- February 2023 Nature article: *Deep seabed mining lacks social legitimacy* full article.
- August 2016 article in Marine Policy: *Sharing benefits of the common heritage of mankind Is the deep seabed mining regime ready?* <u>full article</u>



ADDITIONAL MATERIALS PROVIDED POST PRESENTATION

Recent EASAC Study concludes that DSM is not necessary to meet green economy goals

Source: EASAC. June 2023

40% - 77% of Europe's clean energy metal needs by 2050 could be covered by recycling.

of the main metals targeted in deep-sea mining (manganese, copper and nickel) are considered to be of **low supply risk** while cobalt is moderate. Globally, as much cobalt is lost every year as is needed to equip up to **3 million** electric cars.

Nodules take

MILLIONS

OF YEARS

The current trajectory of efficiency gains in metal intensity through innovation means that terrestrial mineral reserves will be sufficient to meet the renewable technologies demand to realise 2050 Paris Agreement targets.

> Terrestrial mining requires a small fraction of areas compared to those needed at the seabed and has a 4-stage mitigation hierarchy that cannot be applied at the deep sea.

The extraction process kills all life 60 - 70% of megafaunal species use nodules as an attachment point or shelter.

> The deep sea is characterised by high biodiversity, thousands of rare and highly adapted species, unique habitats, vulnerable ecosystems, low metabolic rates and long life.

A 16-metre-wide robot gathering 400 tonnes of nodules per hour removes 100,000 tonnes from 10,000 km² of seabed over 25 to 30 years, creating irreparable ecological damage.





According to a very recent study of the European Academies Science Advisory Council (EASAC), world supplies of manganese, nickel and copper are very low risk, and cobalt is listed as only moderate risk. Blue Climate

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LFP batteries (free of deep sea minerals) are rapidly taking over the market

Blue

Climate Initiative

Once-dominant EV batteries with cobalt are quickly losing market share

■ NMC and NCA share of global light-duty passenger EV sales ■ LFP ■ Others



Source: BloombergNEF Note: NMC is nickel-manganese-cobalt, NCA is nicekl-cobalt-aluminum oxide and LFP is lithium-ironphosphate. 2022 is BNEF's forecast

Statement of the United States on the Roadmap International Seabed Authority Council, Part 3, Oct-Nov 2022

The United States believes that the Council should remain focused on developing a regulatory framework that will ensure effective protection of the marine environment from harmful effects of activities in the Area. We are keenly sensitive to the concerns being raised on the need for more scientific research on the marine environment and the possible harmful effects of seabed mining. For an effective regulatory regime, we must have sufficient research to understand the potential for negative impacts on the marine environment from exploitation activities in the Area and the necessary steps to minimize and mitigate them.

The United States exclusive economic zone and continental shelf are immediately adjacent to the Clarion-Clipperton Zone. A broad range of interests, including those of our Indigenous communities, that rely on an accessible and sustainable marine environment have the potential to be directly impacted by negative effects from seabed mining. The United States, particularly as a potentially affected coastal state, continues to believe that, if exploitation activities in the Area are to proceed, a stable, internationally recognized framework for seabed mining is necessary to ensure effective protection for the marine environment from harmful effects which may arise from those activities.

Given the large amount of work remaining to develop the regulatory framework, it is difficult to see this necessary framework being completed by the summer of 2023. Among other items that need to be finalized, the framework needs to include standards for threshold values that will be key to monitoring and assessing the potential environmental impacts, building upon the German proposal that was discussed yesterday. It may take some time for these standards to be established.

In the meantime, in the absence of threshold values, regulations, standards, or guidelines for exploitation activities in the Area, it is difficult to see how there would be measures in place to ensure "effective protection for the marine environment from harmful effects which may arise from such activities" as required by Article 145. This is of great concern to us. In short, it is critically important to adopt exploitation regulations expeditiously and to work assiduously towards that end we are committed to continuing to work with others on the development of sound, scientifically-based documents that can support a robust regulatory Framework.



US Statement at the ISA, Nov. 2022

Greg O'Brien Office of Ocean and Polar Affairs (OES/OPA) U.S. Department of State

deepsea conservation coalition

The New York Times

Leader of International Seabed Mining Agency Admonished by Diplomats

The United Nations-affiliated agency faces pressure from some member nations to greenlight ocean mining — and from others to slow it down.

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Researchers aboard the Maersk Launcher, a ship chartered by the Metals Company, observing the sea floor in the Clarion-Clipperton Zone of the Pacific Ocean in early 2022. Business Wire

By Eric Lipton

March 19, 202

Michael Lodge, the head of the United Nations-affiliated agency with jurisdiction over international ocean waters, has pushed diplomats to accelerate the start of industrial-scale mining at the bottom of the Pacific Ocean, members of the International Seabed Authority's governing council said in interviews.

The criticism of Mr. Lodge, who has served as secretary general of the authority since 2016, comes as the diplomats struggle to decide how to respond when the authority receives an application for commercial seabed mining in international waters, which is expected to happen later this year.

ISA Under Fire from Member Countries and Civil Society for Poor Governance and Politics

Los Angeles Times

A gold rush in the deep sea raises questions about the authority charged with protecting it



Michael Lodge, secretary-general of the International Seabed Authority, near center with hand at his chin, stands with DeepGreen Chief Executive Gerard Barron, Ieff center, and DeepGreen chief ocean scientist Greg Stone, second from right, while touring the Maersk Launcher used by the mining company in 2018. (Samph Hulfaker / AP Images for DeepGreen Resources

BY TODD WOODY, EVAN HALPER

APRIL 19, 2022 4 AM PT

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The startup's pitch was simple and cinematic:

The mining company would send large robots to explore the bottom of the ocean and harvest minerals, millions of years old, that could be <u>used to make electric car</u> <u>batteries</u>.





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The Obscure Organization Powering a Race to Mine the Bottom of the Seas Anna Bianca Roach • November 8, 2021 LEAVE A COMMENT

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The secretary-general of the International Seabed Authority, Michael Lodge, Feb. 21, 2020. As corporate and national interests in seafloor mining intensifies, critics of the organization, an autonomous body mandated by the UN Law of the Sea treaty, balk at its seeming lack of transparency and minimal public oversight. ISA

On the seafloor, anemones with eight-foot-long tentacles live alongside blind crabs that cultivate food in their arm hair, sharks with glow-in-the-dark bellies and glass sponges that have been thriving since before the invention of the wheel.

"Because of the lack of light and the fact that creatures do need to see each other to eat each other, you get these amazing photoluminescent animals down there," said Helen Rosenbaum, the coordinator of

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Indigenous Voices Rising Against DSM on ISA Floor (March 2023)

Indigenous Peoples from 34 nations call for total ban on deep sea mining March 20. 2022

Indigenous activists have made clear that they don't give their consent to deep sea mining. In a petition presented today to the International Seabed Authority (ISA), over 1,000 signatories from 34 countries and 56 Indigenous groups called for a total ban on this destructive industry.



Partial of Uncle Sol's Intervention at the ISA





Beth Orcutt @DeepMicrobe - Mar 22

Replying to @DeepMicrobe

For the first time, Indigenous stakeholder voices were heard in council negotiations, supported by the @DeepSeaConserve and the #StopDeepSeaMining coalition with Greenpeace.

Schastian Losada @slosada - Mar 20

Uncle Sol Kaho'ohalahala offered delegates an Oli, Hawalian traditional chant. The Oil is about gathering people who have come from very far. "The ocean is our country and we come from the deepest depths of the seas." #StopDeepSeaMining #ISA28



DSCC @DeepSeaConserve · Mar 22

As negotiations get underway @ISBAHQ today, Germany echo Interventions from @DeepStewardship the DSCC and others, stating that "On restoration and rehabilitation, the German delegation reiterated that neither terms are scientifically possible." #ISA28 #DefendTheDeep



Key Corporate Backers Dropping Out of DSM

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Deep Sea Mining Just Lost Its Biggest Corporate Backer

As activists accuse International Seabed Authority leadership of pushing ocean mining without due diligence, Lockheed Martin is exiting the nascent industry.



A Greenpeace vessel arrives in Kingston, Jamaica, at the start of a meeting of the International Seabed Authority. Photographer: Gladstone Taylor/Greenpeace International

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DEEP OCEAN Private Company

NEW YORK TIMES-A 39.71 USD V -0.25%

HEMPHILL Private Company



By Todd Woody March 22, 2023 at 2:20 PM EDT

A growing number of countries are calling to delay plans to <u>strip</u>-<u>mine the seabed</u> for metals to make electric car batteries as US defense giant Lockheed Martin Corp., the biggest corporate player in deep sea mining, exits the nascent industry.

Last week's sale of Lockheed's UK Seabed Resources subsidiary to Norwegian startup Loke Marine Minerals was announced just as the United Nations-affiliated organization tasked with regulating deep sea mining kicked off a conference in Jamaica. The <u>International</u> <u>Seabed Authority</u> (ISA) is meeting to hit a July deadline for approving regulations that would allow unique deep ocean ecosystems to be mined as soon as 2024. Tensions at the conference are rising as scientists, lawyers and activists charge the Authority's administrative arm, known as the Secretariat, with pushing a promining agenda. Last week, some of the ISA's 167 member nations accused ISA Secretary-General Michael Lodge of overstepping his role as a neutral administrator.

Bloomberg Green

German Court Delays Vote on Controversial Bill to Phase Out Gas



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Shipping Giant Maersk Drops Deep Sea Mining Investment

Maersk is selling its stake in The Metals Company, the latest big name to divest itself of its seabed mining interests





ISSB's First Stan Global Baseline for Sustainability Dis