

Deep-sea mining and the International Seabed Authority: science and the current state of play from a conservation perspective

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IES-iAtlantic webinar “Examining the Environmental Impacts of Deep-sea Mining”

31 Jan 2024

deepsea
conservationcoalition

The logo for the Deep Sea Conservation Coalition features the words "deepsea" in a bold, dark blue font above the words "conservationcoalition" in a lighter blue font. A white, wavy graphic element resembling a wave or a ribbon is positioned behind the text, extending from the bottom left towards the top right.

Members include

deepsea
conservationcoalition



UNCLOS Part XI: Seabed Mining

Negotiated in the 1970s, amended in early 1990s

Key provisions/foundational principles

- No mining in the international seabed area without permission from the ISA
- All nations to benefit financially from ISA charging royalty fees for mining licenses: 'share the wealth', esp w/ developing nations
- All countries must have equal opportunities to mine, in particular developing countries – 'non-discrimination'
- **Mining must be managed to ensure effective protection of the marine environment from harmful effects and to prevent damage to the fauna and flora of the marine environment (Article 145)**
- The international seabed Area and its resources are the common heritage of (hu)mankind; use of the Area for peaceful purposes
- ISA must 'act on behalf of' and 'for the benefit of' humankind as a whole

ISA set up in 1994: Exploration permitted beginning in 2001 “Exploitation” regulations / Mining Code currently under negotiation



ISA Governance:

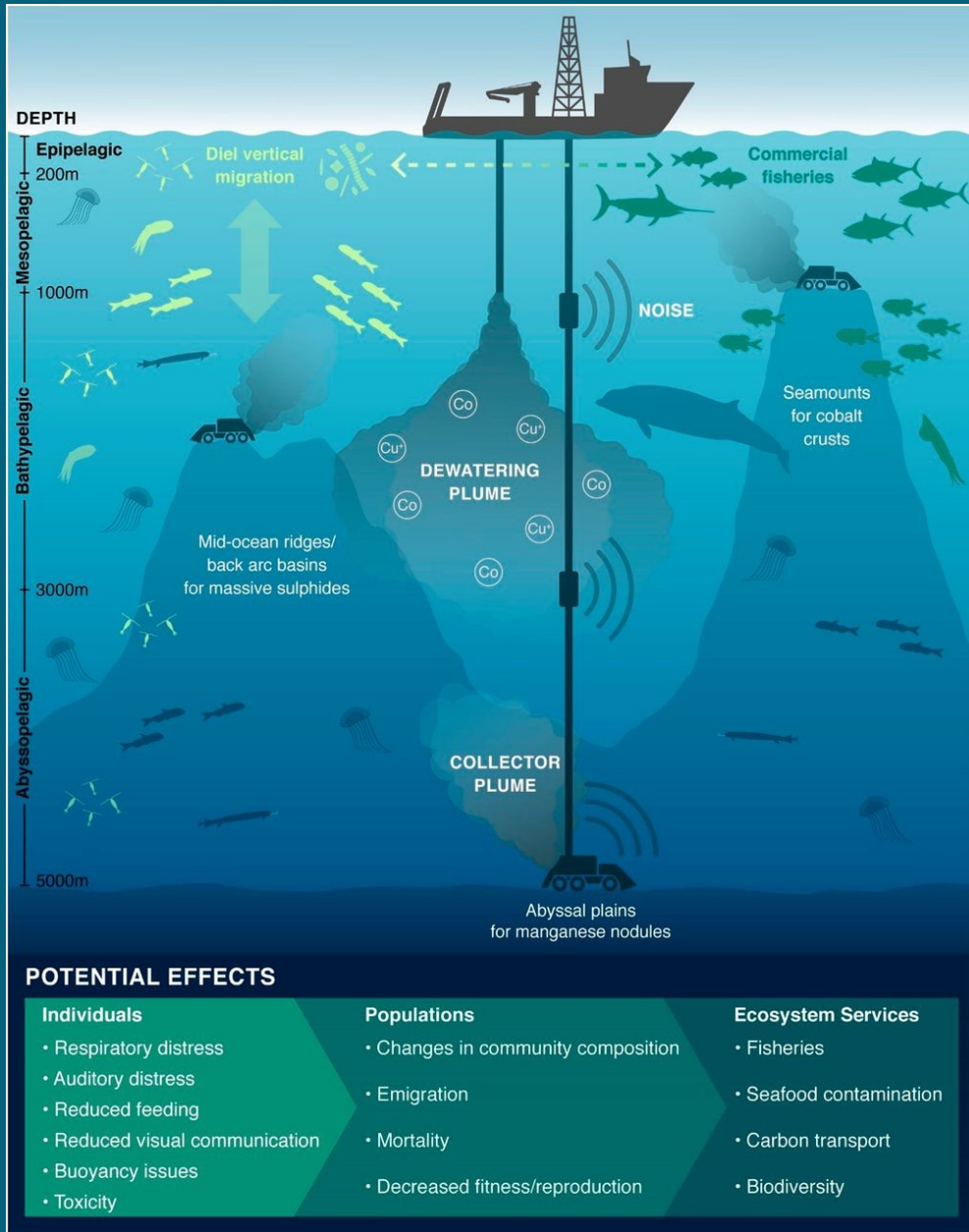
- Council: 36 countries (5 Groups) - Holds most of decision-making power
- Assembly: 168 countries + EU - ‘Supreme’ body of ISA; can set General Policy
- Secretariat & Legal and Technical Commission

- Nauru triggered two-year rule on behalf of The Metals Company
 - Deadline: July 2023 after which any country or company may apply for ‘provisional’ approval of a mining license.
- Political disagreement:
 - Some States & companies argue for urgent/quick adoption of Mining Code (e.g. Nauru, Norway)
 - Others (24 so far) call for moratorium and/or no deep-sea mining

Three main deposits/ores

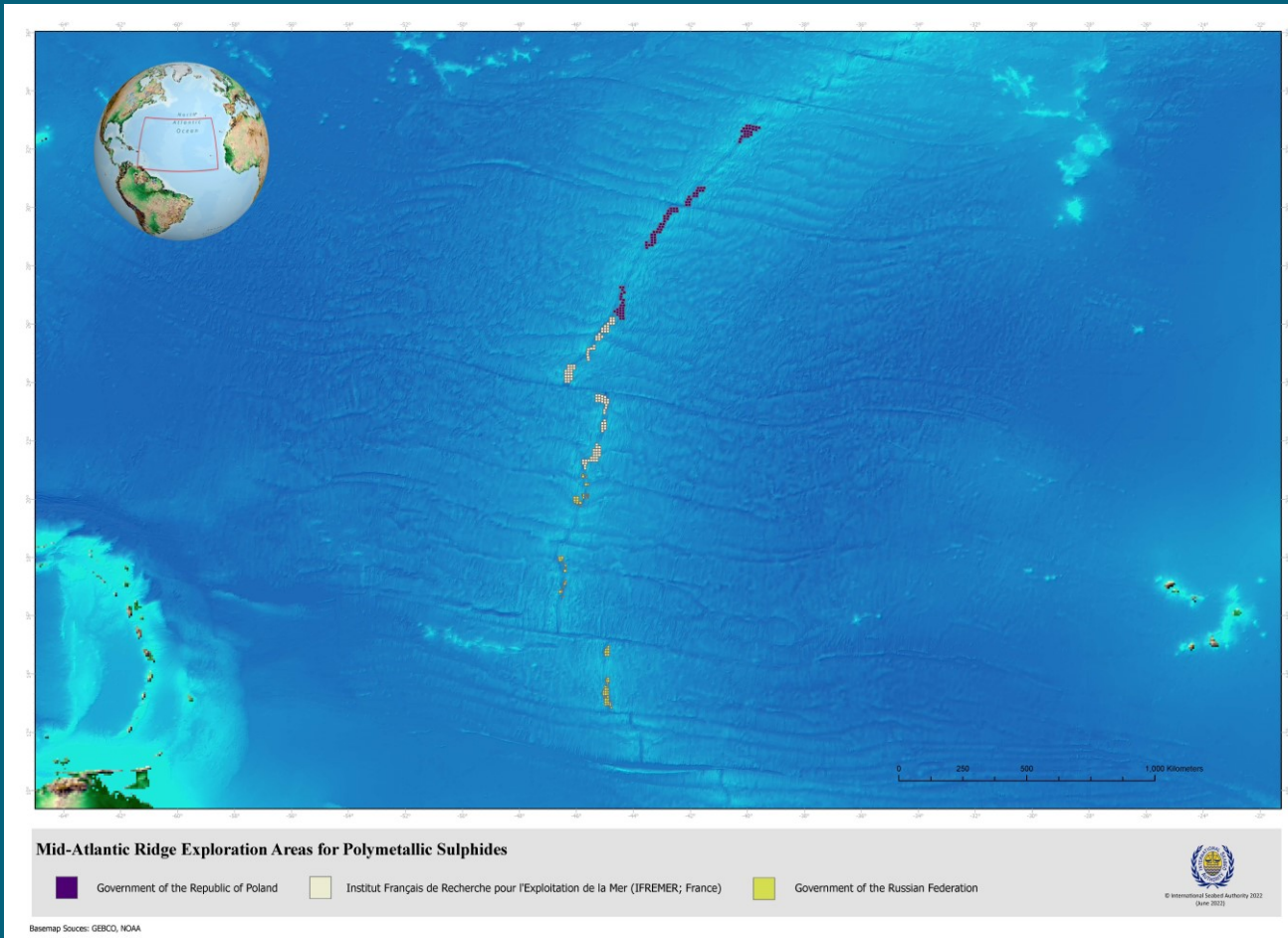
Type of deposit	Deep-sea areas	Main metals
Polymetallic nodules	Deep abyssal plains	Mn, Ni, Cu, Co
Polymetallic sulfides	Hydrothermal vent fields	Au, Ag, Cu, Zn
Fe/Mn Cobalt crusts	Sides/flanks of seamounts	Fe, Mn, Co, Ni

Most commercial interest: Nodules/metal content
 Mn ~27%; Ni ~1.3%; Cu ~1.1%; Co ~0.2%

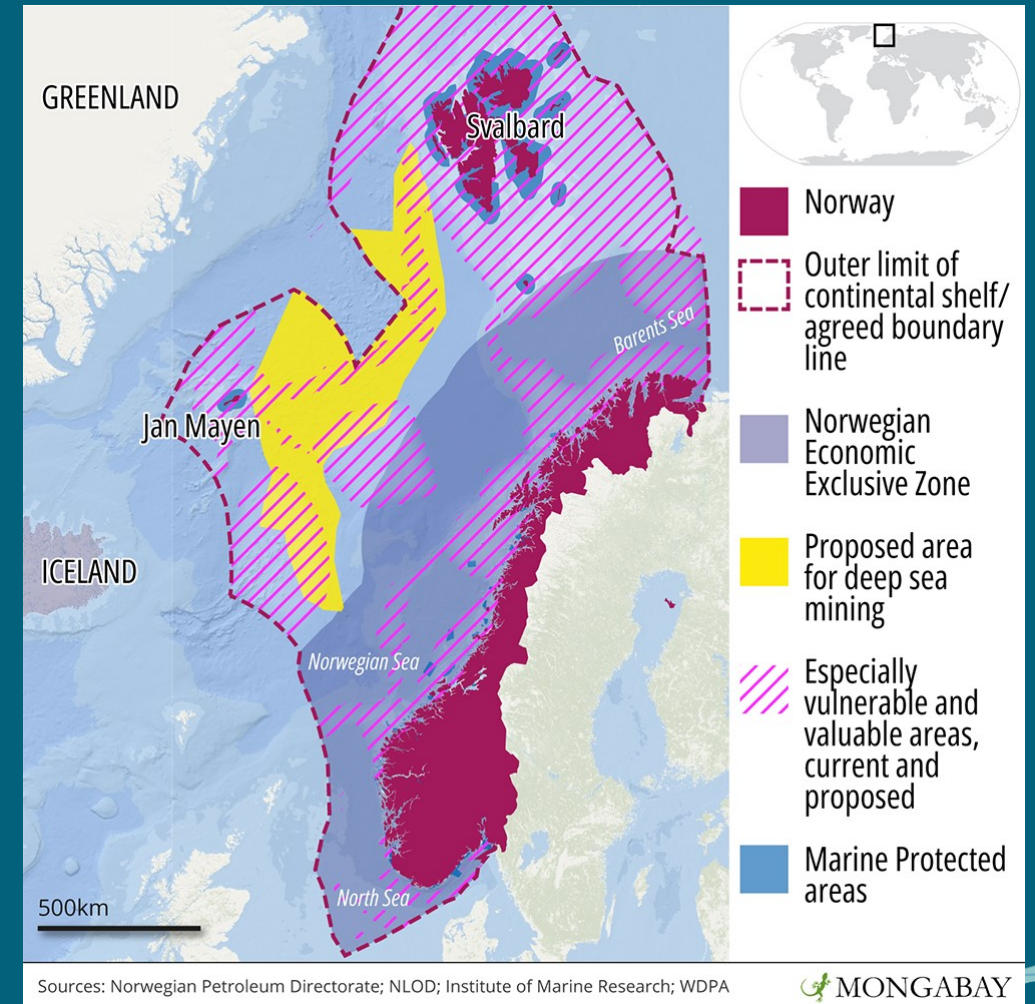


Source: IUCN

Three ISA exploration contracts for polymetallic sulfides in the Atlantic: Russia, France, Poland

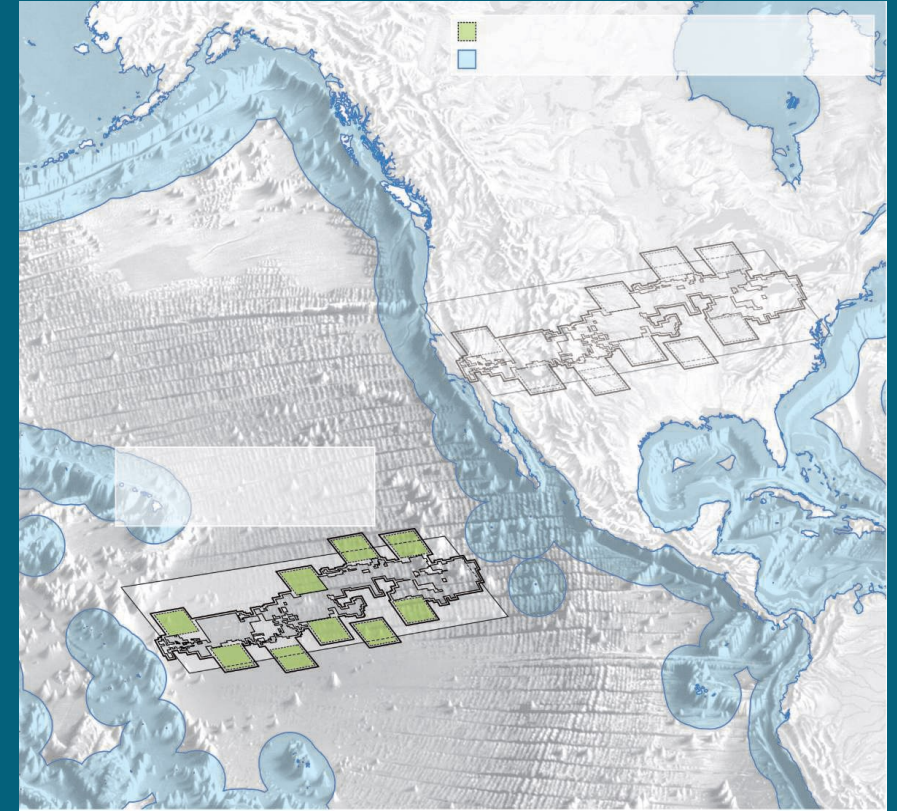
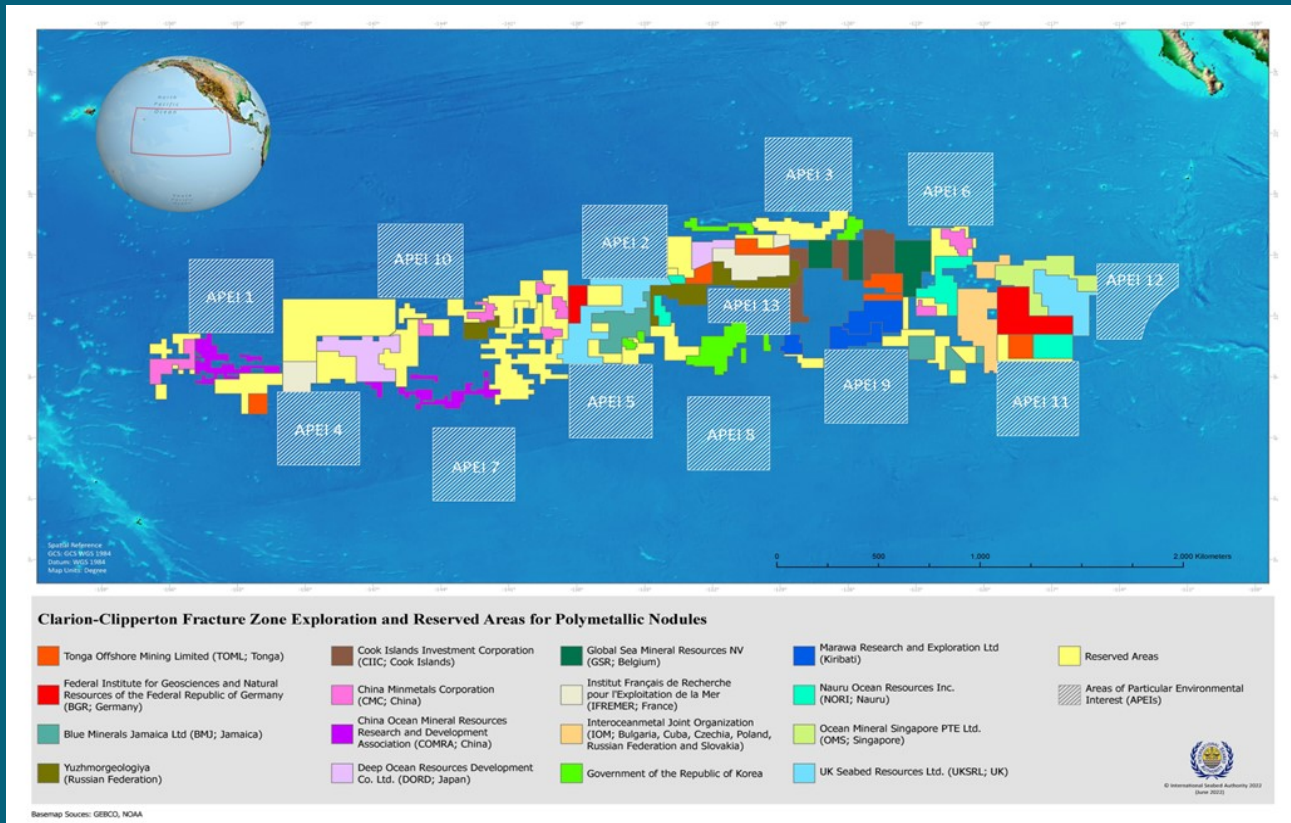


Norway opening its extended continental shelf to exploration for polymetallic sulfide deposits along Arctic Mid Ocean Ridge



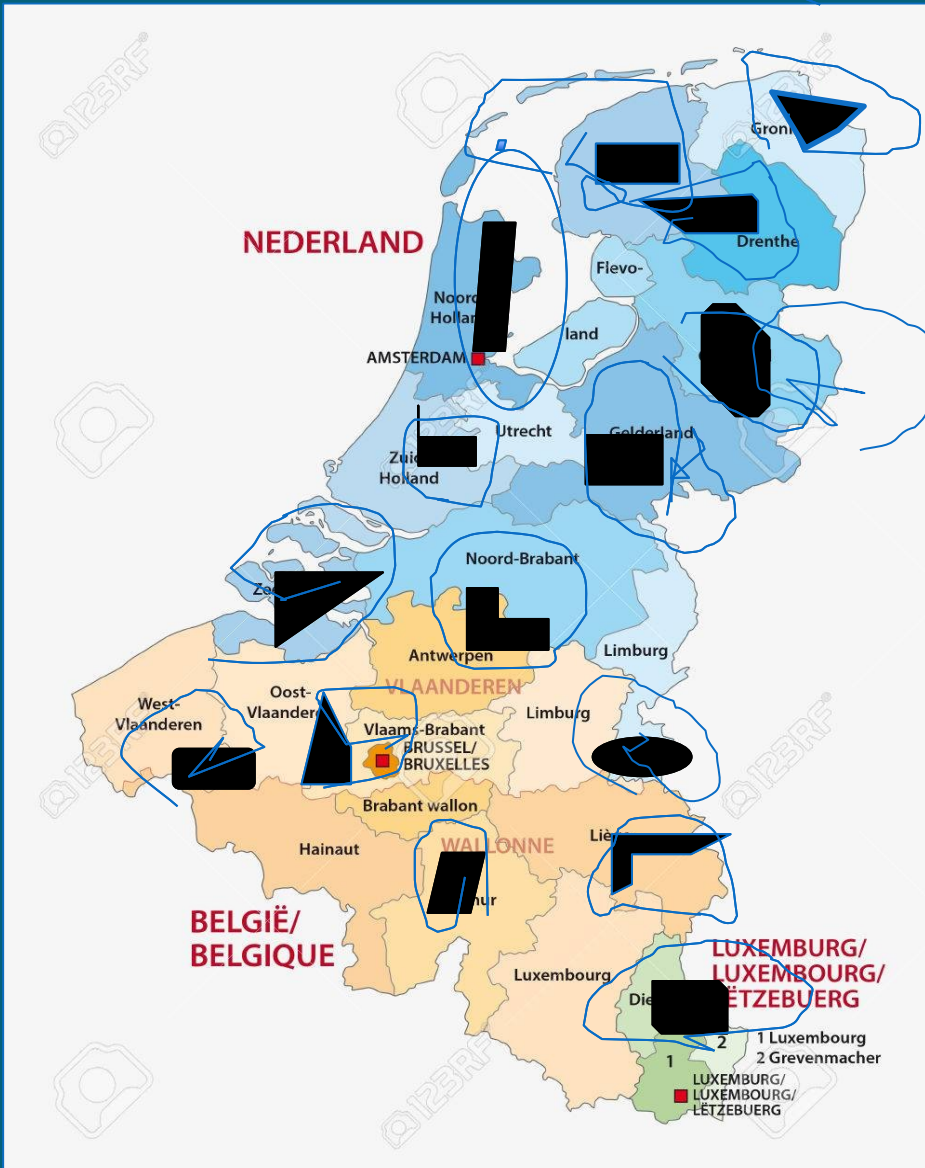
iAtlantic research timely & relevant to DSM in other ocean regions as well

Potential scale of mining: Clarion Clipperton Zone ISA Nodule Exploration contracts (2023)



17 Exploration contracts: Belgium, China, Cook Islands, France, Germany, Jamaica, Japan, Kiribati, Korea, Nauru, Russia, Singapore, Tonga, UK & IOM - Bulgaria, Cuba, Czech Republic, Poland, Russian Federation and Slovakia = app 1.25 million km²

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



- Each CCZ mine would strip mine est **10-12,000 km² of seabed over 30-year license period** to mine production target 3MT/year nodules (Smith et al 2020); seabed plumes could 'easily' cover another 20-30 Km²
- **Only produce app 0.14% (30-35K tons) Cu; app 1.1% (30-35K tons) Ni; & app 3.2% (5-6K tons) Co** per year over and above terrestrially mined supplies in 2022 (Gianni/revised 2023); even less when taking into account recycling (25-50% US market)

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

Mid-water plumes

Up to 1,400 km - Wastewater, sediment & mining fines discharged from ships could travel up to 1,400 km through mid-water in **multiple directions** before fully settling on bottom

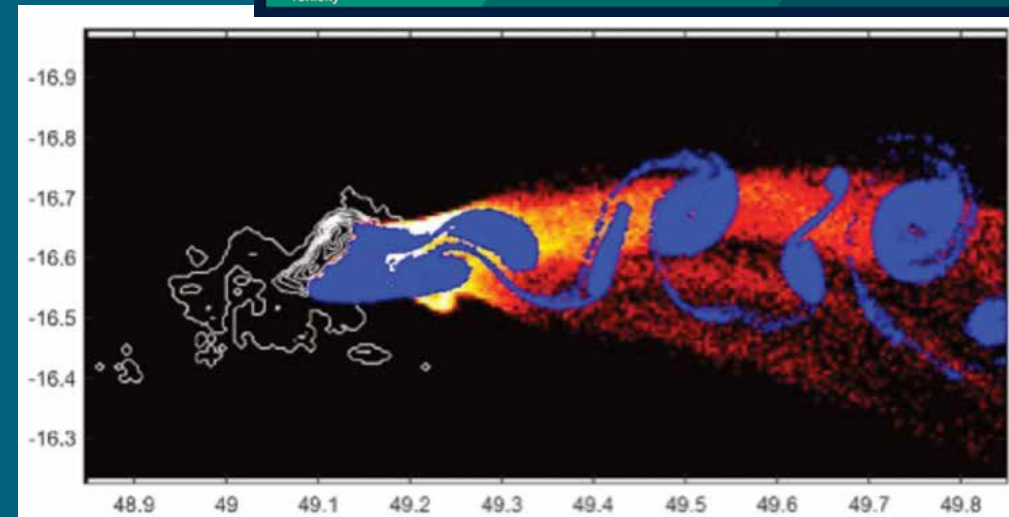
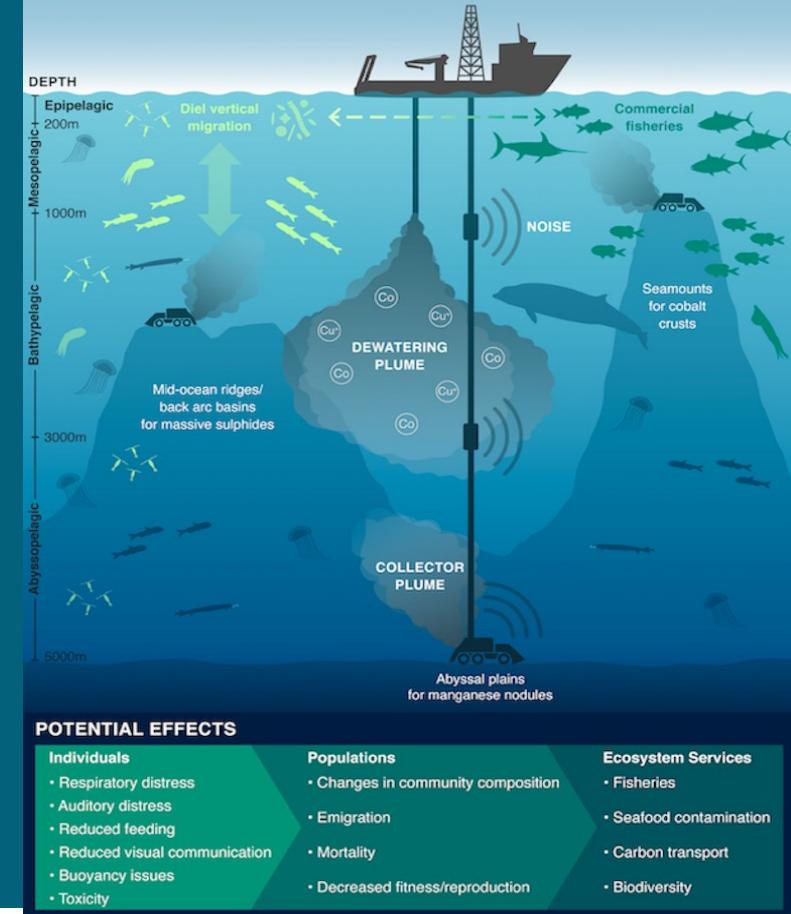
(Muñoz-Royo et al., (2021) "Extent of impact of deep-sea nodule mining midwater plumes is influenced by sediment loading, turbulence and thresholds.

COMMUNICATIONS EARTH & ENVIRONMENT | <https://doi.org/10.1038/s43247-021-00213-8>)

Impacts of sediment, wastewater, noise & light on fisheries (e.g. tuna fisheries in eastern Pacific, western Indian Ocean, Mid Atlantic), migratory species (e.g. cetaceans, sea turtles, sharks, rays), & crucially – the biological carbon pump

(Drazen et al., (2020) "Opinion: Midwater ecosystems must be considered when evaluating environmental risks of deep-sea mining" Proceedings of the National Academy of Sciences.

<https://www.pnas.org/content/117/30/17455>)



Biodiversity loss from deep-sea mining

Nature Geoscience July 2017

Biodiversity loss from deep-sea mining unavoidable, irreversible on human timescales and offsets in the deep-sea “scientifically meaningless”

Biodiversity of the Clarion Clipperton Fracture Zone Marine Biodiversity May 2017

One-half of species discovered to date depend on nodules. Nodules and nodule-dependent animals may take millions of years to recover from the impacts of mining, and even the partial recovery of the animals living in the sediment may take hundreds to thousands of years.

Kaiser, S., Smith, C.R. & Arbizu, P.M. Editorial: Biodiversity of the Clarion Clipperton Fracture Zone. Mar Biodiv 47, 259–264 (2017).

correspondence

Biodiversity loss from deep-sea mining

To the Editor — The emerging deep-sea mining industry is seen by some to be an engine for economic development in the maritime sector¹. The International Seabed Authority — the body that regulates mining activities on the seabed beyond national jurisdiction — must also protect the marine environment from harmful effects that arise from mining². The International Seabed Authority is currently drafting a regulatory framework for deep-sea mining that includes measures for environmental protection. Responsible mining increasingly strives to work with no net loss of biodiversity³. Financial and regulatory frameworks commonly require extractive industries to use a four-tier mitigation hierarchy to prevent biodiversity loss in order of priority, biodiversity loss is to be avoided, minimized, remediated and — as a last resort — offset⁴. We argue here that mining with no net loss of biodiversity using this mitigation hierarchy in the deep sea is an unattainable goal.

The first tier of the mitigation hierarchy is avoidance. Potentially useful mitigation strategies in the deep sea include patchwork extraction, whereby some minerals with associated fauna are left undisturbed, or other means to limit the direct mining footprint. Even so, loss of biodiversity will be unavoidable because mining directly destroys habitat and indirectly degrades large volumes of the water column and areas of the seabed due to the generation of sediment plumes that are enriched in bioavailable metals.

Although biodiversity loss within mines is inevitable, innovative engineering design could reduce or minimize some risks to near- and far-field biodiversity. For example, shrouds fitted to cutting equipment might reduce the dispersion of sediment plumes and the footprint of plume impacts such as the burial of organisms. Similarly, vehicle design might limit compaction of seabed sediments. Of course, the efficacy of such efforts in mitigating biodiversity loss would need to be tested.

Remediation addresses the residual loss of biodiversity at and around a mine site after avoidance and minimization interventions. In the deep sea, native species are often slow to recruit and recolonize disturbed habitats. Slow



The 'Tu'i' Matia vent field in the Lau Basin, southwest Pacific. Lau Basin foundation species (*Aliviviconcha* spp. snails, *Vermetus nautilus* snails, and *Bathymodiolus septentemium* mussels) live in diffuse flow on the surfaces of metal-rich sulfide deposits.

recovery on the scale of decades to centuries, enormous spatial scales of mines for certain mineral resources (a single 30-year operation license to mine metal-rich nodules will involve an area about the size of Austria⁵) and the high cost of working in the deep sea may mean that remediation is unrealistic⁶. Further, the science of deep-sea benthic remediation is a nascent field⁷. It is far from established that remediation of industrial mine sites in the deep sea is feasible for any mineral resource, and we know of no remediation actions that can be applied to the water column.

The last resort in the mitigation hierarchy is in-kind or like-for-like offsets within a biogeographical region. When offsets cannot be located where the affected biodiversity is found, and where the affected biodiversity is important for geographically restricted functions such as connectivity (as is the case for the deep sea), in-kind offsets are not an appropriate mitigation strategy⁸. Out-of-kind offsets⁹, such as restoring coral reefs in exchange for loss of deep-sea biodiversity, have been proposed, but this practice assumes that

loss of largely unknown deep-sea species and ecosystems is acceptable. We question this assumption on scientific grounds. The relationship between any gain in biological diversity in an out-of-kind setting and loss of biological diversity in the deep sea is so ambiguous as to be scientifically meaningless. Further, compensating biodiversity loss in international waters with biodiversity gains in national waters could constitute a transfer of wealth that runs counter to the Law of the Sea, where benefits from deep seabed mining must accrue to the international community at large, as part of the common heritage of humankind. Given the paucity of other industrial activities in the deep sea (except perhaps fisheries), it is difficult to imagine a scenario where averted risk offsets¹⁰ could apply; that is, where a mining operation could avert biodiversity losses from other activities.

The four-tier mitigation hierarchy used so often to minimize biodiversity loss in terrestrial mining and offshore oil and gas operations thus falls when applied to the deep ocean. Residual biodiversity loss cannot be mitigated through remediation or offsets and the goal of no net loss of biodiversity is not achievable for deep-seabed mining. Focus therefore must be on avoiding and minimizing harm. Most mining-induced loss of biodiversity in the deep sea is likely to last forever on human timescales, given the very slow natural rates of recovery in affected ecosystems. It is incumbent on the International Seabed Authority to communicate to the public the potentially serious implications of this loss of biodiversity and ask for a response. □

References

1. *Nature Geoscience*, **10**, 100 (2017).
2. *International Seabed Authority*, **10**, 100 (2017).
3. *Nature*, **547**, 100 (2017).
4. *International Seabed Authority*, **10**, 100 (2017).
5. *Nature Geoscience*, **10**, 100 (2017).
6. *Nature Geoscience*, **10**, 100 (2017).
7. *Nature Geoscience*, **10**, 100 (2017).
8. *Nature Geoscience*, **10**, 100 (2017).
9. *Nature Geoscience*, **10**, 100 (2017).
10. *Nature Geoscience*, **10**, 100 (2017).

C. L. Van Dover, J. A. Ardron, E. Escobar, M. Gianni, K. M. Gjerde, A. Jaeckel, D. O. B. Jones, L. A. Levin, H. J. Niner, L. Pendleton, C. R. Smith, T. Thiele, P. J. Turner, L. Watling and P. E. Weaver. |VOL 10| JULY 2017|

<https://t.co/2guyyvGfmC>

So why mine the deep-sea?

True or false?

- “The green transition is going to require hundreds of millions of tonnes of nickel, copper and cobalt...”

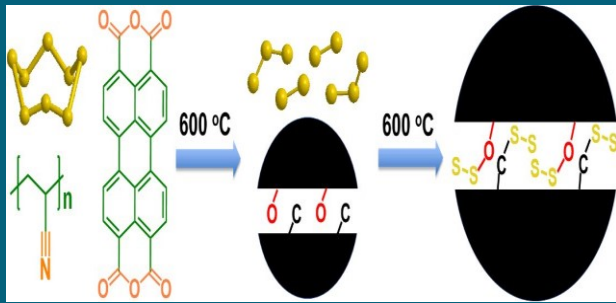
Gerard Barron, CEO The Metals Company (TMC) formerly
DeepGreen Metals

TMC has 3 ISA exploration contracts in the CCZ sponsored by Nauru, Tonga & Kiribati

<https://im-mining.com/2020/03/02/allseas-buys-deepwater-drill-ship-adapt-polymetallic-nodule-mining-partner-deepgreen-metals/>

Changing technologies: Batteries without CCZ metals planned/already in production – no nickel, no cobalt

Sulfur provides promising 'next-gen' battery alternative
Phys.org 16 June 2020



“Lithium-sulfur batteries... high energy density, low cost, abundance, nontoxicity and sustainability.”

“Cobalt, nickel free electric car batteries are a runaway success”
Mining.com 11 March 2021



Lithium-ion and lithium-iron phosphate (or LFP) dominate the current EV battery landscape.

Green New Energy
Sodium in Batteries: Shift May Herald Another Shakeup
Bloomberg 11 November 2023



<https://www.bloomberg.com/news/articles/2023-11-26/sodium-in-ev-and-storage-batteries-may-herald-another-shakeup#xj4y7vzkg>

These and other alternatives to LMNC/LNCA batteries exist:

LFP: Tesla (50%), BYD (100%), Ford, Volkswagen, others

Deep-sea mining not needed to transition to renewable energy economies



RENEWABLE ENERGY AND DEEP-SEA MINING:
SUPPLY, DEMAND AND SCENARIOS

Sven Teske
Nick Florin
Elsa Dominish
Damien Giurco

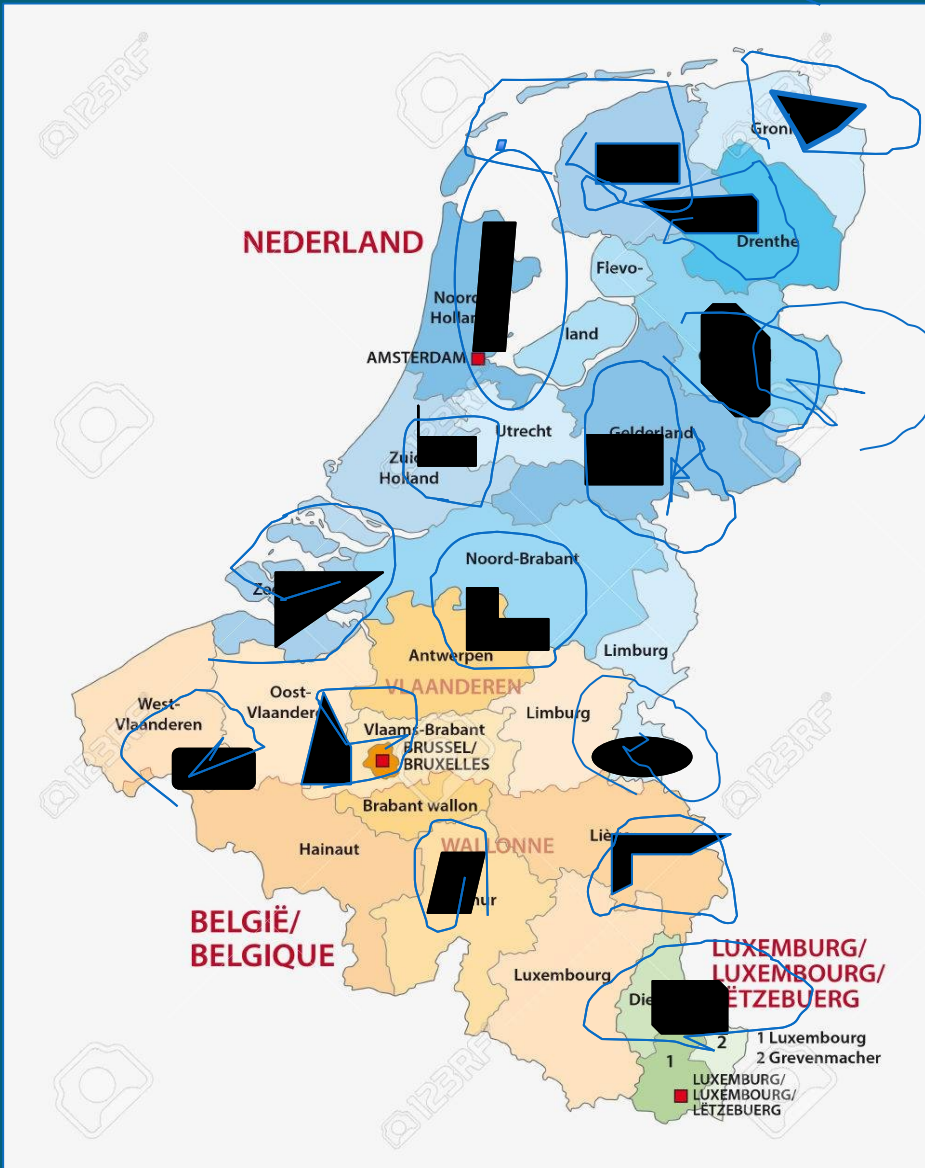


2016

- Metal demands for renewable energy - Transition to 100% renewable energy economy by 2050 can be done without sourcing metals from deep-sea
- (alternative technologies, substitute materials, recycling, better product design etc.)
- **Copper** **Cobalt**
- **Nickel** Lithium
- Silver
- Specialty metals (Tellurium)
- Rare Earths (Neodymium, Dysprosium)

Teske, S., Florin, N., Dominish, E. & Giurco, D. 2016, Renewable Energy and Deep Sea Mining: Supply, Demand and Scenarios. University of Technology Sydney
<https://opus.lib.uts.edu.au/handle/10453/67336>

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



- At 3 million metric tons production per year dry weight, each CCZ mine would **Only produce app 0.14% (30-35K tons) Cu; app 1.1% (30-35K tons) Ni; & app 3.2% (5-6K tons) Co** per year over and above terrestrially mined supplies in 2022 (Gianni/revised 2023)
- Even less when taking into account recycling (25-50% of these metals on the US market are from scrap or recycled)

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

ISA Structural & Political Concerns

- **Lack of transparency** (contracts, meetings)
- **Use it or lose it** - potentially 'perverse' incentives to mine or risk losing exploration claim/contract (15yr)
- **Monopolization** – 25/26 of the 30 exploration contracts are with:
 - 7 countries - China, France, Germany, India, Japan, Korea, Russia
 - 3 companies UKSR (Norway), GSR (Belgium), TMC/Allseas (Canada/Switzerland/Netherlands)
- **Difficult to prevent run away development of the industry** due to structure, bylaws and voting/decision-making procedures hardwired into ISA – profoundly undemocratic

Benefit to humankind as a whole?

Is DSM “needed”? No


- Massive R&D for alternative, cheaper materials (Tesla, BYD etc replacing LNMC with LiFePO4 batteries in EVs, trends away from high priced metals in utilities and home batteries)
- Increased circular economy investment and innovation
- Corporate ESG policies, governments, consumers can make choices

Does DSM have lower environmental impact than terrestrial mining? Not necessarily

- Even DeepGreen/TMC Life Cycle Analysis (2020) says cannot compare the two
- “Misleading” European Academies of Science Advisory Council (8 June 2023)
- DSM not likely to replace terrestrial mining & could actually make it worse

“Incompatible with Sustainable Blue Economy” - UNEP Finance Initiative 2022 report

Don't need to exacerbate biodiversity crisis to solve climate crisis & ocean - **greatest ally to combat climate change.** DSM could impact ocean capacity to absorb/sequester CO2

The logo for the Deep Sea Mining Coalition is located in the bottom right corner. It features the words "deep sea" in a light blue, lowercase font, with "mining" in a smaller, darker blue font below it. To the right of "mining" is the word "coalition" in a bold, teal, lowercase font. The text is overlaid on a stylized, wavy graphic that resembles ocean waves or a seabed profile.

Political context 2023: New (3rd) UNCLOS Implementing Agreement for the conservation and sustainable use of marine biodiversity in ABNJ – The BBNJ Agreement



© UN Photo

A Tale of Two Instruments

On the one hand, an UNCLOS 'implementing agreement' for the conservation and sustainable use of marine biological diversity in ABNJ:

Article 7 General principles and approaches

- (e) The precautionary principle or precautionary approach
- (f) An ecosystem approach
- (g) An integrated approach to ocean management
- (h) **An approach that builds ecosystem resilience, including to adverse effects of climate change and ocean acidification, and also maintains and restores ecosystem integrity, including the carbon cycling services that underpin the role of the ocean in climate;**

A Tale of two Instruments

On the other hand, States negotiating new instrument under UNCLOS – the ISA Mining Code/exploitation regulations - that may well lead to biodiversity loss in deep-sea ecosystems systems already under stress from climate change related impacts, pollution, plastics and other anthropogenic impacts

How do governments reconcile these two instruments?

CBD COP-15 2022

Kunming-Montreal Global Biodiversity Framework

“halt and reverse biodiversity loss”

Decision CBD/COP/DEC/15/24

“before deep seabed mineral exploitation activities take place, the impacts on the marine environment and biodiversity are sufficiently researched and the risks understood, the technologies and operational practices do not cause harmful effects to the marine environment and biodiversity”

United Nations Conference on Sustainable Development 2012 (Rio+20)

Heads of State and Government and high-level representatives committed to:

“protect and restore the health, productivity and resilience of ocean and marine ecosystems, to maintain their biodiversity and enable their conservation and sustainable use for present and future generations”

& “urgent actions that effectively reduce the rate of, halt and reverse the loss of biodiversity”.

(The Future We Want, Paragraphs 158 & 198)

Key provisions/foundational principles: How does it look in 2023?

- No mining in the international seabed area without permission from the ISA: **Still applies - critical that global seabed/commons be 'managed' collectively by all nations**
- All nations to benefit financially from ISA charging royalty fees for mining licenses: 'share the wealth', esp w/ developing nations: **Individual companies/countries may make money; very little money for benefit of all countries (MIT; Sumaila et al, 11/23)**
- All countries must have equal opportunities to mine/non-discrimination: **Problematic: difficult for ISA to say no to any country; northern companies using developing countries to get access to deep-sea resources**
- Mining must be managed to ensure protection of marine environment from harmful effects and to prevent damage to fauna and flora Article 145): **ISA member countries beginning to recognize this may not be possible; significant lack of scientific information to know/assess if possible (Amon et al, 2022)**
- ISA must 'act on behalf of' and 'for the benefit of' humankind as a whole: **Monopolization – a handful of companies & countries may benefit; loss to humankind as a whole – species, MGRs, ecosystem services?**

Growing support for a moratorium – lack of scientific understanding of deep-sea species & ecosystems and potential impacts key reason

Since June 2022 – 24 countries calling for pause, moratorium, ban (e.g. Brazil 'minimum' 10 year moratorium)

Over 800 marine science & policy experts from 44 countries- precautionary pause
<https://www.seabedminingsciencstatement.org/>

BMW Group, Volvo Group, Samsung SDI, Philips, Google, Volkswagen Group, Patagonia amongst others. Northvolt and Microsoft stated they will avoid DSM metals in supply chains. EU fishing industry opposed, more companies likely...

Banks/Financial institutions: ABN AMRO, Lloyds Banking Group, NatWest, BBVA, European Investment Bank etc

IUCN – moratorium 2021 (44 government agencies, over 500 civil society and Indigenous Peoples' organizations)

<http://www.savethehighseas.org/momentum-for-a-moratorium/>

ISA meeting July 2023

Council (36 countries)

- Did not adopt mining regulations in spite of push from several countries and ISA Secretary General to do so by July 2023
- Agreed to continue negotiating 'with a view to' adopt mining regulations in 2025 (not binding; moreover debate re costing the 'externalities in the royalty regime)
- Did not close the 2 year 'loophole' but added additional hurdle for provisional approval
- Agreed that no mining should be permitted before regulations are adopted

Assembly – 168 countries + EU

- Major stalemate/debate over whether to debate a moratorium during Assembly (proxy) – will likely do so in 2024
- Agreed to consider initiating a 'systematic' review of the ISA beginning in 2024
(Less than half of 168 members attended the 2023 meeting)

The Anthropocene

“Clearly we are in the midst of one of the great extinction spasms of geological history”

E.O. Wilson, *The Diversity of Life* (1992)

A million species at risk of extinction, many in the next few decades
Form direct exploitation/mortality, habitat loss, climate change...
IPBES report (May 2019)/UNEP (February 2021)

Do we really ‘need’ to open up a whole new planetary frontier of industrial resource extraction, biodiversity loss and risk species extinctions in the deep sea before we fully understand the consequences?

iAtlantic is a multidisciplinary research programme seeking to assess the health of deep-sea and open-ocean ecosystems across the full span of the Atlantic Ocean

UN 1st World Ocean Assessment 2016

“This truly vast deep-sea realm constitutes the largest source of species and ecosystem diversity on Earth...evidence that the richness and diversity of organisms in the deep sea exceeds all other known biomes... and supports the diverse ecosystem processes and functions necessary for the Earth’s natural systems to function”



iAtlantic
INTEGRATED ASSESSMENT OF ATLANTIC
MARINE ECOSYSTEMS IN SPACE AND TIME

iAtlantic Project: Science for the benefit of humankind as a whole

Can the ISA be better transformed to do the same?

deepsea
conservationcoalition

Thank-you!

DSM in the news

<https://www.esginvestor.net/on-the-edge-of-the-abyss/>

<https://news.mongabay.com/list/deep-sea-mining/>

<https://www.washingtonpost.com/business/2023/04/05/deep-sea-mining-electric-vehicles/>

<https://apnews.com/article/deep-sea-mining-permission-isa-591536eff7adba104256b4829d93977d>

<https://www.nytimes.com/2023/03/15/opinion/ocean-mining-climate.html>

https://www.lemonde.fr/en/opinion/article/2022/12/16/herve-berville-and-steffi-lemke-the-global-ocean-is-in-distress-we-are-determined-to-act_6007988_23.html

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<https://www.latimes.com/politics/story/2022-04-19/gold-rush-in-the-deep-sea-raises-questions-about-international-seabed-authority>

<https://www.theguardian.com/environment/2021/sep/27/race-to-the-bottom-the-disastrous-blindfolded-rush-to-mine-the-deep-sea>

<https://www.theguardian.com/environment/2021/sep/28/false-choice-is-deep-sea-mining-required-for-an-electric-vehicle-revolution>

<https://www.bloombergquint.com/business/a-mining-startup-s-rush-for-underwater-metals-comes-with-deep-risks>

<https://www.theatlantic.com/magazine/archive/2020/01/20000-feet-under-the-sea/603040/>

United Nations Convention on the Law of the Sea (UNCLOS)

Part XI – The Area

Article 136

Common heritage of mankind

The Area and its resources are the common heritage of mankind.

Article 140

Benefit of mankind

1. Activities in the Area shall, as specifically provided for in this Part, be carried out for the benefit of mankind as a whole

UNCLOS Part XI: Seabed Mining

Article 145

Protection of the marine environment

- “Necessary measures shall be taken...to ensure effective protection for the marine environment from harmful effects”
- “the [International Seabed] Authority shall adopt appropriate rules, regulations and procedures for:
 - “the prevention, reduction and control of pollution and other hazards to the marine environment
 - “[the prevention of] interference with the ecological balance of the marine environment;
 - “the prevention of damage to the flora and fauna of the marine environment”

Additional obligations in Part XII: Protection and preservation of the marine environment (e.g. Art 194.5)