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Deep-Sea Mining: Navigating Legal Challenges

Deep-sea mining is increasingly viewed as a potential source of critical minerals needed for the energy transition and advanced technologies, yet it operates within a complex and evolving legal and regulatory landscape. The regulatory regime varies depending on whether activities take place within national jurisdictions or in areas beyond national jurisdiction, where projects are subject to authorization, contractual oversight, and evolving financial obligations under the International Seabed Authority.

While certain countries are actively positioning themselves to facilitate exploration and future exploitation, unresolved issues relating to environmental standards, benefit-sharing mechanisms, liability allocation, and regulatory stability continue to weigh heavily on bankability. Investor and lender caution and the absence of finalized exploitation regulations underscore that legal certainty, predictable fiscal terms, and enforceable environmental safeguards remain key prerequisites for mobilizing large-scale public and private financing in the deep-sea mining sector.

Studies indicate that the world's seabed holds extensive mineral deposits containing critical minerals, positioning deep-sea mining as an emerging frontier for obtaining resources important to clean and high-tech industries. Key seabed resources include ferromanganese nodules, seafloor massive sulphides, and cobalt-rich crusts.[1]

Defined as the extraction of minerals from the seafloor, often hundreds or even thousands of meters below the ocean surface, deep-sea mining sits at the intersection of opportunity and controversy.

While deep-sea mining primarily focuses on mineral resources, it is distinct from the extraction of liquid or gaseous hydrocarbons, which falls outside the scope of this discussion. However, overlapping environmental issues make comparative legal analysis valuable, as regulatory approaches from the hydrocarbon sector can provide useful insights for the developing legal frameworks governing deep-sea mining.

While commercial interest in exploiting these resources is not new—as early as 1970, John L. Mero was already advocating for the exploitation of ocean mineral resources and discussing possible legal frameworks[2]—the debate over governance has intensified in recent years, driven by growing strategic demand for these resources and advances in technical capabilities.

In April 2025, the U.S. president signed an executive order titled "Unleashing America's Offshore Critical Minerals and Resources," instructing the Secretary of Commerce and the Secretary of the Interior to fast-track permits for deep-sea mineral exploration and to develop a plan for mapping priority areas of the seabed.[3] The order also directs the chief executive officer of the U.S. International Development Finance Corporation, the president of the Export-Import Bank of the United States, the director of the Trade and Development Agency, and the heads of other relevant agencies to jointly report to the assistant to the president for Economic Policy and the chair and vice chair of the National Energy Dominance Council, identifying tools to support domestic and also international seabed mineral resource exploration, extraction, processing, and environmental monitoring.

Meanwhile, several Pacific Island nations, including the Cook Islands, Nauru, and Tonga, are advancing their own seabed mining initiatives. Notably, in February 2025, the Cook Islands Seabed Minerals Authority and the Ministry of Natural Resources of the People's Republic of China signed a Memorandum of Understanding for a "Blue Partnership in the Field of Seabed Minerals Affairs" to cooperate in, among other things, exploration of seabed mineral resources.[4]

The governance of these resources, both within and beyond national jurisdictions, presents notably complex legal, environmental, and political challenges and is increasingly central to global negotiations.

The legal framework for deep-sea mining depends on the jurisdictional area in which the activity occurs or is considered to take place. Broadly, mining falls into two categories: "domestic seabed mining activities," occurring within areas under a country's sovereign rights as defined by international treaties, and "international seabed mining activities," taking place in areas beyond national jurisdiction and governed by the international seabed regime under international law.

DOMESTIC SEABED MINING ACTIVITIES

Area of Jurisdiction

The core treaty governing the oceans is the United Nations Convention on the Law of the Sea ("UNCLOS"),[5] which has been ratified by most countries, although notably not by the United States.

Under the UNCLOS, a coastal country has sovereign rights to explore and exploit natural resources in the seabed and subsoil in different areas: the Territorial Sea (up to 12 nautical miles, full sovereignty),[6] the Exclusive Economic Zone (up to 200 nautical miles, rights over seabed, subsoil, and water column),[7] and the Continental Shelf (extending up to 350 nautical miles if geological criteria are met, rights over seabed and subsoil only).[8]

In some cases, seabed mineral formations or geological structures may extend across the limits of one country's jurisdiction into areas claimed by another. These situations require precise legal and technical assessment to establish the applicable regime and ensure coordinated management of transboundary deposits.

National Disparities

In recent years, several coastal countries have actively prepared to enable the exploration and eventual extraction of mineral resources within zones under their sovereignty. This includes countries such as the United States[9] and Norway,[10] as well as island countries, including the Cook Islands[11] and Nauru.[12]

Conversely, some countries, national bodies, or regional organizations have expressed strong opposition to seabed mining activities, including those carried out within domestic waters.[13]

For instance, in 2024, the European Parliament adopted a resolution responding to Norway's decision to advance seabed mining in the Arctic.[14] The resolution reiterated calls on the European Commission and EU Member States to promote an international moratorium on deep-seabed mining until the effects on the marine environment, biodiversity, and human activities at sea are sufficiently studied and understood.

Environmental Requirements

While domestic seabed mining activities are governed by norms specific to the relevant jurisdiction, countries must, where appropriate, also comply with obligations set out under the UNCLOS.

Article 192 of the UNCLOS establishes the overarching principle that countries have a duty to protect and preserve the marine environment.

More specifically, Article 208 of the UNCLOS requires countries to adopt laws and regulations to prevent, reduce, and control pollution of the marine environment arising from or connected to seabed activities, and to take any other necessary measures to that end. These national laws, regulations, and measures must be no less effective than applicable international rules, standards, and recommended practices.

Given that the UNCLOS defines "pollution of the marine environment" broadly,[15] these provisions might apply to seabed mining activities. This means that countries cannot rely solely on their domestic laws. They must also ensure that their national legal frameworks incorporate and align with relevant international environmental rules, standards, and practices.

A violation of the UNCLOS may subject a country to legal proceedings initiated by other countries or by contractors, through the UNCLOS dispute settlement mechanisms. Depending on the dispute's nature and the parties concerned, cases can be referred to various fora provided under the UNCLOS.[16]

Depending on the location of the activity, seabed mining may also be subject to additional environmental or sector-specific requirements, such as those related to fisheries, which must be assessed on a case-by-case basis. Examples include the Espoo Convention on Environmental Impact Assessment in a Transboundary Context,[17] the SEA Protocol on Strategic Environmental Assessment,[18] and the Oslo-Paris Convention for the Protection of the Marine Environment of the North-East Atlantic.[19]

INTERNATIONAL SEABED MINING ACTIVITIES

The "Area"

The UNCLOS establishes a distinct international regime for the "Area," defined as the seabed, ocean floor, and subsoil beyond the limits of national jurisdiction.[20]

Under the UNCLOS, the Area and its resources are the common heritage of humankind.[21] No country may claim or exercise sovereignty or sovereign rights over any part of the Area or its resources, nor may any country, natural person, or legal entity appropriate any part of it.[22]

Legal Regime

Deep-sea mining in the Area is established under Part XI of the UNCLOS and the Agreement relating to its implementation,[23] and is organized and regulated by the International Seabed Authority ("ISA").

Environmental protection is central to this regime, with the ISA mandated to adopt rules, regulations, and procedures to prevent pollution, safeguard ecological balance, and conserve marine resources and biodiversity.[24]

Commercial activities in the Area are undertaken on behalf of mankind as a whole under the organization and control of the ISA, either directly through its commercial arm, the "Enterprise,"[25] or in association with countries, their enterprises, or sponsored natural or juridical persons.[26] These activities must be conducted pursuant to a formal plan of work, approved by the ISA Council and implemented through contracts.[27]

The ISA has adopted three main sets of regulations, collectively known as the Mining Code, governing exploration for polymetallic nodules,[28] polymetallic sulphides,[29] and cobalt-rich ferromanganese crusts.[30]

The ISA has reported entering into 31 15-year contracts for the exploration of polymetallic nodules, polymetallic sulphides, and cobalt-rich ferromanganese crusts in the deep seabed with 22 contractors.[31]

The ISA is also developing draft exploitation regulations, with a consolidated text issued on February 16, 2024. The draft provides, *inter alia*, that an exploitation contract grants an exclusive right to explore and exploit specified resources for a maximum term of 30 years.[32] However, the text remains incomplete and under negotiation and would benefit from further clarification of key concepts and obligations, such as the definition of "best practices," termination compensation, and detailed financial obligations, to ensure it is robust enough to support substantial investment by public or private parties. The future regulations could also include a relinquishment mechanism to promote efficient resource management and progressive exploration of the Area.

Equitable sharing of financial and other economic benefits derived from activities in the Area is also a critical point of discussion within the ISA,[33] with the "Common Heritage Fund" being a major focus during the latest ISA session in July 2025.

ISSUES

In addition to the complex and still-evolving legal framework, deep-sea mining raises a range of pressing environmental and other legal issues.

Environmental concerns are central, given the impacts on fragile deep-sea ecosystems, biodiversity, and ecological balance. Some countries, international organizations, non-governmental organizations, and even corporate actors[34] have called for moratoria on deep-sea mining, contributing to political and legal uncertainty. The fact that some companies themselves support moratoria also indicates that they are unlikely, at this stage, to serve as offtakers of minerals produced through deep-sea mining, which is an important commercial consideration.

Moreover, financing institutions and investors have shown marked caution, with several public and private financial institutions explicitly excluding deep-sea mining from their portfolios or applying stringent environmental, social, and governance criteria.[35] This reluctance further constrains the availability of capital for project development and underscores the need for a stable, transparent, and credible regulatory framework before large-scale investment can be mobilized.

The adoption of the High Seas Treaty in 2023 further underscores the objective of conserving and sustainably using the marine biological diversity of areas beyond national jurisdiction, both for the present and for the long term.[36]

Beyond environmental concerns, deep-sea mining presents significant benefit-sharing and economic issues. Companies and investors must carefully evaluate these arrangements, especially once the exploitation regulations are fully stabilized, as they will determine the scope of rights, obligations, and revenue-sharing mechanisms.

Legal liability is another key concern. Responsibility for damage, accidents, or environmental harm during exploration or exploitation must be clearly defined, including potential obligations for remediation, insurance, or compensation.

The combination of legal uncertainty, environmental risks, benefit-sharing obligations, and investor concerns makes the regulatory and commercial environment for deep-sea mining particularly challenging. Before committing significant capital, investors need these key issues to be resolved, including long-term stability of the exploitation regime, safeguards for their investments, and assurance of reliable offtakers for the minerals produced.

LAWYER CONTACTS

Adam Conway
Perth
+61.8.6214.5719
adamconway@jonesday.com

Rémy Fekete
Paris
+33.1.56.59.39.39
rfekete@jonesday.com

François-Guilhem Vaissier
Paris
+33.1.56.59.39.70
fgvaissier@jonesday.com

Emma France, an associate in the Paris Office, authored this White Paper*, with contributions from Nicolas Heurzeau, legal manager in the mining industry.*

ENDNOTES

1 Vysetti, B. Deep-sea mineral deposits as a future source of critical metals, and environmental issues—a brief review. Miner. Miner. Mater. 2023, 2, 5.

2 John L. Mero, A Legal Regime for Deep Sea Mining, 7 San Diego L. Rev. 488 (1970).

3 Executive Order, Unleashing America's Offshore Critical Minerals and Resources, April 24, 2025.

4 Paragraph 2 (Areas of Cooperation) of the Memorandum of Understanding. *See also*, *A Deep-Sea Milestone: Cook Islands and China Partner on Sustainable Seabed Resource Development*.

5 United Nations Convention on the Law of the Sea ("UNCLOS"), December 10, 1982.

6 Article 2 *et seq*. of the UNCLOS.

7 Article 55 *et seq*. of the UNCLOS.

8 Articles 76 *et seq*. of the UNCLOS.

9 Deep Seabed Hard Mineral Resources Act (DSHMRA, 1980) and the Outer Continental Shelf Lands Act.

10 Act relating to mineral activities on the Continental Shelf (2019).

11 Seabed Minerals Act (2019).

12 Nauru Seabed Minerals Authority Act (2024).

13 European countries have been particularly active, with Portugal, France, and Spain calling for or adopting bans on deep-sea mining within their national waters.

14 Motion for a resolution on Norway's recent decision to advance seabed mining in the Arctic dated January 31, 2024 (2024/2520(RSP)).

15 Article 1.1.4 of the UNCLOS: "'pollution of the marine environment' means the introduction by man, directly or indirectly, of substances or energy into the marine environment, including estuaries, which results or is likely to result in such deleterious effects as harm to living resources and marine life, hazards to human health, hindrance to marine activities, including fishing and other legitimate uses of the sea, impairment of quality for use of sea water and reduction of amenities."

16 Section 5 of Part XI and Part XV of the UNCLOS.

17 Convention on Environmental Impact Assessment in a Transboundary Context, February 25, 1991.

18 Protocol on Strategic Environmental Assessment to the Espoo Convention, May 21, 2023.

19 The Convention for the Protection of the Marine Environment of the North-East Atlantic, September 22, 1992.

20 Article 1.1(1) of the UNCLOS.

21 Article 136 of the UNCLOS.

22 Article 137 of the UNCLOS.

23 Agreement relating to the Implementation of Part XI of the UNCLOS, December 10, 1982.

24 Article 145 of the UNCLOS.

25 Section 2 of the Annexe of the Agreement relating to the Implementation of Part XI of the UNCLOS of December 10, 1982.

26 rticle 153(2) of the UNCLOS.

27 Article 153(3) of the UNCLOS.

28 Decision of the Assembly of the International Seabed Authority regarding the amendments to the Regulations on Prospecting and Exploration for Polymetallic Nodules in the Area (2013 ISBA/19/A/9) and decision of the Council of the International Seabed Authority relating to amendments to the Regulations on Prospecting and Exploration for Polymetallic Nodules in the Area and related matters (2013 ISBA/19/C/17).

29 Decision of the Assembly of the International Seabed Authority relating to the regulations on Prospecting and Exploration for Polymetallic Sulphides in the Area (2010 ISBA/16/A/12).

30 Decision of the Assembly of the International Seabed Authority relating to the Regulations on Prospecting and Exploration for Cobalt-rich Ferromanganese Crusts in the Area (2012 ISBA/18/A/11).

31 International Seabed Authority, *Exploration Contracts*.

32 Regulations no. 18 and no. 20.

33 The Agreement relating to the Implementation of Part XI of the UNCLOS of December 10, 1982, Annex, Section 8. This provision establishes the financial and institutional mechanisms for the practical implementation of the principle of equitable sharing, including a system of fees and contributions to be redistributed among Member States, with particular consideration for developing countries.

34 https://www.stopdeepseabedmining.org/endorsers/

35 https://deep-sea-conservation.org/solutions/no-deep-sea-mining/momentum-for-a-moratorium/companies-and-finance/

36 The Agreement under the UNCLOS on the Conservation and Sustainable Use of Marine Biological Diversity of Areas beyond National Jurisdiction, June 19, 2023.