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Deep-Sea Mining and the Race for Critical Minerals to Fuel the Clean Energy Transition

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Status: **Maintained** | Jurisdiction: **United States**

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A Practice Note discussing deep-sea mining including its environmental and other risks and global and national efforts to regulate this practice. This Note also discusses the factors leading governments and companies to consider deep-sea mining including the importance of critical minerals (notably copper, manganese, nickel, and cobalt) found on the ocean floor in the manufacture of battery technology for electricity storage and electric vehicles, electricity transmission infrastructure, solar energy development, and onshore and offshore wind energy development.

One of the outcomes of COP 28, the international climate change conference that took place in late 2023, was the UAE Consensus, which is an agreement to "transition away from fossil fuels" (see Legal Update, COP 28 Global Climate Change Conference in Dubai: Formal Outcomes and Other Key Announcements and COP 28: COP28 and International Energy Agency Reaffirm 1.5°C-Aligned Energy Transition (December 7, 2023)). Debate continues on whether the UAE Consensus represents a promising step forward or a missed opportunity in the drive towards climate neutral energy systems. However, the global agreement to triple renewable energy power capacity by 2030 spotlights the need for governments to further embrace and invest in clean energy technologies and pursue strategies required to achieve this goal.

Achieving the COP 28 goals and national commitments to reduce greenhouse gas (GHG) emissions requires significant amounts of scarce resources including critical minerals (generally defined as minerals and metals important for the clean energy transition). These raw materials are essential in the manufacture of wind and solar turbines, energy storage solutions, electricity infrastructure, and electric vehicles (EVs). But issues with the current supply of these materials are forcing investors, companies, and governments to consider alternative supply sources, including deep-sea mineral resources.

This Practice Note provides an introduction to deep-sea mining, an alternative and controversial practice being considered to secure the critical minerals needed to facilitate the deployment of clean energy technologies and the clean energy transition. Critical minerals include aluminum, cobalt, copper, dysprosium, gallium, germanium, graphite, iridium, lithium, magnesium, manganese, nickel, platinum, silicon, and certain rare earth elements (REEs), but this Note focuses on the minerals that can be found in abundance on the ocean floor.

This Note also discusses:

- The international regulation of deep-sea mining including different national approaches to this practice.
- The environmental and other implications of deep-sea mining.
- Issues investors and other stakeholders should consider before engaging in deep-sea mining.

Defining Deep-Sea Mining

Also referred to as seabed mining or seafloor mining, deep-sea mining is generally defined as the exploration and extraction of minerals (not including hydrocarbons) at depths greater than 200 meters (or 656 feet). Improved technologies that have mapped the mineral resources of the ocean floor, coupled with new methods of extraction to collect minerals from the seabed and deliver them to the surface, have increased interest in deep-sea mining as a way to provide the natural resources needed in manufacturing and industrial processes, and to fuel the clean energy transition (see Critical Minerals and the Energy Transition).

Why Parties Are Considering Deep-Sea Mining

Current technology for the generation of wind and solar power (as well as the batteries needed to store this power) requires significant amounts of mineral raw materials, including nickel, manganese, cobalt, and copper (see Critical Minerals and the Energy Transition). According to a 2023 report from the International Energy Agency (IEA), between 2017 and 2022 the demand for cobalt and nickel rose by 70% and 40% respectively (see International Energy Agency (IEA): Critical Minerals Market Review 2023 (July 2023) (download required)). Demand for these and other critical minerals is also projected to more than triple by 2030 (see The UN Secretary-General's Panel on Critical Energy Transition Minerals (April 26, 2024)).

Under announced clean energy pledges, between 2023 and 2050 the demand for:

- Copper is expected to increase from about 27,000 kilotons (kt) to about 40,000 kt.
- Cobalt is expected to increase from about 200 kt to about 500 kt.
- Lithium is expected to increase from about 240 kt to about 1600 kt.
- Nickel is expected to increase from about 3000 kt to about 6000 kt.
- Manganese is expected to increase from about 200 kt to about 2900 kt.

These numbers are even higher in a net zero emissions by 2050 scenario (see IEA: Critical Minerals Data Explorer which sets out global demand projections for 37 critical minerals needed for the clean energy transition, adopting three scenarios and 11 technology-specific cases).

While supplies of critical minerals are expected to increase in coming years as both the public and private sectors increase investment in the mining sector, and implement other strategies to strengthen supply chains, challenges with terrestrial mining sources may still result in a demand-supply mismatch that may delay or derail clean energy initiatives (see Critical Minerals and the Energy Transition). As a result, governments and companies are looking at deep-sea mining to reduce reliance on land-based resources (including those subject to national security and geopolitical risks), to ensure the resilience and security of their supply chains.

Issues with Terrestrial Critical Minerals Supplies

Terrestrial mineral reserves are expected to be sufficient to meet the clean energy demand and the Paris Agreement emissions reduction targets (see Practice Note, UNFCCC, the Kyoto Protocol and the Paris Agreement). This is in large part due to technological developments and operational efficiency gains that the mining sector has implemented. But land-based mining presents many issues that are causing governments and investors to consider deep-sea mineral resources as an alternative supply source. These issues include:

- The time required to develop new mines. It can take up to 15 years to develop a mine depending on the mineral, the project, and the legal and regulatory regime to which the project is subject.
- The concentration of important minerals in specific geographical locations. For example, as of 2023:
  - Australia, Chile, and China dominate lithium production. They produce 46.9%, 30%, and 14.6%, of the world's lithium respectively;
  - Chile, Peru, and the Democratic Republic of Congo (DRC) dominate copper production. They produce 23.6%, 10%, and 10%, of the world's copper respectively;
  - The DRC, Indonesia, and Russia dominate cobalt production. They produce 70% 5.4%, and 4.8% of the world's cobalt respectively, although mines in the DRC are primarily owned or financed by Chinese investors;
  - South Africa, Gabon, and Australia dominate manganese production. They produce 35.8%, 22.9%, and 16.4% of the world's manganese respectively; and
  - Indonesia, the Philippines, and Russia dominate nickel production. They produce 48.8%, 10.1%, and 6.7% of the world's nickel respectively.

  (See International Renewable Energy Agency: Geopolitics of the Energy Transition: Critical Materials (2023).)

  Some of these sources are subject to export and other trade restrictions, national security concerns, resource nationalism, and geopolitical machinations that limit access to these resources.
- Decline in mineral ore grades.
- Environmental considerations, including the effects on air quality, water supplies, fauna and flora, and

deforestation that provoke opposition to mining projects.

- Human rights abuses and environmental justice issues. Mining operations may encroach on the land of Indigenous and other vulnerable communities, contaminate their land and water supplies, and decimate the resources these communities rely on for their sustenance and livelihood.
- Access to the capital needed to exploit these resources. Mining requires significant capital. According to a 2023 McKinsey report, investments in mining, refining, and smelting will need to increase to between approximately $3 trillion-$4 trillion by 2030 (about $300 billion-$400 billion per year), representing a 50% increase compared to the previous decade (see McKinsey: The Net-Zero Materials Transition: Implications for Global Supply Chains (July 2023) (The McKinsey Report) (download required)). Developers must also be able to secure these funds (whether from private or public sources) to exploit mining reserves. But as some banks look to decarbonize their loan portfolios and improve their environmental, social, and governance (ESG) ratings, some developers may find it difficult to secure financing.

Governments and investors are implementing several initiatives and strategies to secure the critical minerals needed to meet the needs of the clean energy transition. These include:

- Government incentives and other support to investors to increase investment in mining (see the Inflation Reduction Act of 2022 (IRA) (Pub. L. 117-19, 136 Stat. 1818), Sections 45X and 48C(e) of the Code, the EU's Critical Raw Materials Act, and Canada's critical minerals strategy; for more information, see Legal Updates, Inflation Reduction Act: Key Energy Provisions and Critical Raw Materials: European Parliament Formally Adopts Regulation Establishing Framework for Ensuring Secure and Sustainable Supply; Government of Canada: The Canadian Critical Minerals Strategy).
- Implementing more extensive and consistent recycling efforts.
- Increasing the efficiency of land-based mining operations.
- Developing strategies that incorporate circular economy principles in their value and supply chains.
- Developing technologies and product innovations and redesigns that reduce reliance on critical minerals. For example, new battery technologies that use iron, sodium-ion, and other materials not subject to the same issues as critical minerals.
- Restrictions on exports. Many governments are limiting the export of key minerals to safeguard their value chains and on the basis of national security concerns.

For more information on these issues and initiatives, see Articles, Geopolitical Outlook for Investors in 2024: Managing Risk and Protecting Cross-Border Investments: Demand for Raw Materials and Export Bans on Key Minerals and Resource Nationalism: A Return to the Bad Old Days?

Critical Minerals and the Energy Transition

Critical minerals are used in wide range of clean energy technologies. According to a report by the IEA, an electric car requires six times the mineral resources of a traditional vehicle, an onshore wind project requires nine times the resources needed for a gas-fired plant, and an offshore wind project requires 13 times more mineral resources than a similarly sized gas-fired plant (see IEA: The Role of Critical Minerals in Clean Energy Transitions (May 2021)).

Critical minerals are also used throughout the clean energy supply chain. For example:

- Copper wiring is needed to build transmission lines and other infrastructure to connect projects to the electricity grid. The amount of copper needed for offshore wind projects is even greater given their distance from onshore load centers.
- Nickel is used in wind turbines, battery energy storage systems (BESS), and EV batteries.
- Copper, silicon, silver, and zinc are used in the manufacture of solar panels.
- Lithium, cobalt, manganese, and graphite are used in BESS and EV batteries.
- REEs are important in the manufacture of magnets used in wind turbines and EVs.

While these resources are also used in fossil fuel generation and other manufacturing and industrial processes, they are critical for the deployment of clean energy technologies and significant amounts of these minerals are needed as more of these projects are built to meet clean energy targets. According to the IEA, under the net zero emissions by 2050 scenario, by 2040, green or zero-emissions technologies including hydrogen will be responsible for about 50% of the demand for copper, 60% of the demand for cobalt, 90% of the demand for lithium, and 55% of the demand for nickel (see EIA: Critical Minerals Data Explorer).

Securing these supplies is also needed to limit GHG emissions and meet the goals of the Paris Agreement. According to a 2023 report from McKinsey, "[b]ased on current supply and technology outlooks, the materials shortages and associated inability to shift to lower-carbon technologies would lead to the release of an additional 400 to 600 metric megatons of CO_2-equivalent emissions in 2030 alone" (see the McKinsey Report).

Deep-Sea Mineral Resources

It has been estimated that the ocean floor contains billions of tons of manganese (227), cobalt (5.15), nickel (4.48), REEs (2.35), and copper (1.65). The Clarion Clipperton Zone (CCZ), an environmental management area of the Pacific Ocean between Hawaii and Mexico representing about 1.3% of the ocean floor, is reported to contain more nickel, cobalt, and manganese than all land deposits combined (see Reuters: The Promise and Risks of Deep-Sea Mining (Nov. 15, 2023) and Congressional Research Service: Seabed Mining in Areas Beyond National Jurisdiction: Issues for Congress (December 5, 2022)).

The availability of this vast reserve of critical minerals gives rise to a debate on whether deep-sea mining should be pursued. This issue attracted considerable attention in 2023 when the International Seabed Authority (ISA) Assembly and Council held its 28th Session, and in January 2024 when Norway's parliament (the Storting) made Norway the first country to formally authorize deep-sea mining activities in its waters (see Norway's Deep-Sea Mining Plan).

Types of Deep-Sea Mineral Deposits

The ISA can issue permits for three types of deep-sea mineral deposits:

- **Polymetallic nodules.** These are potato-sized nodules formed over millions of years from the precipitation of metals out of seawater and onto small, hard fragments on the ocean floor. These nodules contain cobalt, manganese, nickel, iron, copper, molybdenum, and metallic REEs. Remotely operated collector machines or robots are sent down to the ocean floor to remove the nodules.
- **Polymetallic sulfides.** These are hydrothermal vents along seafloor spreading ridges that contain iron, copper, zinc, lead, barium, silver, and gold. Remotely operated collector machines are used to cut and drill into the hard substrate of the hydrothermal vent chimney to extract the internal minerals.
- **Ferromanganese crust.** This refers to crusts that form in volcanically active regions, such as seamounts and ridges on hard surfaces (such as rocks) from seawater rich in dissolved metals. These crusts contain cobalt, manganese, nickel, iron, copper, platinum, and metallic REEs. These deposits can be extracted using remotely operated machines that scrape the surfaces of geologic features on the seafloor to remove surficial mineral crusts.

This Note focuses on polymetallic nodules because they can be extracted with less disturbance to the marine habitats. The other sources use methodologies more akin to terrestrial mining practices which are potentially more environmentally disruptive, although the extraction of nodules from the seabed presents its own environmental and other risks (see Risks of Deep-Sea Mining).

International Regulation of Deep-Sea Mining: UNCLOS and ISA

The United Nations Convention on the Law of the Sea (UNCLOS) provides a comprehensive regime for the management of the world's oceans. It also established the ISA to regulate deep-sea mining activities in areas beyond the limits of national jurisdiction (ABNJ). UNCLOS has been ratified by more than 160 parties including the EU (see United Nations Treaty Collection: United Nations Convention on the Law of the Sea (Status as of May 18, 2024)). The US has not ratified this treaty.

The ISA is authorized under UNCLOS to:

- Issue contracts for international seabed exploration and mining in the ABNJ countries party to the UNCLOS.
- Collect and distribute deep-sea mining royalties for areas outside each nation's exclusive economic zone (EEZ). The EEZ is the area extending 200 nautical miles beyond a nation's territorial sea over which it can exercise "sovereign rights" for the purpose of exploring and exploiting the natural resources of its continental shelf (see UNCLOS Article 77.1). Mining and other activities within that zone are subject to that coastal country's domestic laws (see National Approaches to Deep-Sea Mining).

Since 1994, the ISA has approved over 30 ocean-floor mining exploration contracts in the Atlantic, Pacific, and Indian oceans, with most covering the CCZ. China holds five of these contracts, the most of any country. These contracts run for 15 years and permit contract holders to seek out (but not commercially exploit) polymetallic nodules, polymetallic sulfides, and cobalt-rich ferromanganese crusts from the deep-seabed.

No extraction authorizations have been issued since the ISA has not finalized the regulations governing the commercial exploitation of the ocean's natural resources.

UNCLOS Two-Year Rule and ISA's 28th Session

In 1994, the UN General Assembly adopted a resolution opening the Agreement Relating to the Implementation of Part XI of the United Nations Convention on the Law of the Sea (the 1994 Implementation Agreement). Section 1(15) of the annex to the 1994 Implementation Agreement includes a provision known as the "two-year rule" which allows any member state of the ISA that intends to apply for approval of a plan of work for exploitation of the seabed to request that the ISA Council draw up and adopt regulations governing this exploitation within two years. In July 2021, the Republic of Nauru sought authority to undertake commercial exploitation of polymetallic nodules under license, triggering the two-year rule and setting up an operative deadline of July 9, 2023.

At meetings of the ISA Assembly and ISA Council in July 2023, the ISA Council determined that more time was needed to establish processes for prospecting, exploring, and exploiting mineral resources, and a new target of July 2025 was set for finalizing the rules.

The expiration of the two-year rule in July 2023 does allow mining companies to submit a mining license application at any time. However, the above extension gives the ISA Council direct input into the approval process, which will make approval of any application difficult.

National Approaches to Deep-Sea Mining

State legislation regulates deep-sea mining in different EEZs. While a few states have taken steps toward deep-sea mining, many others have sought to ban the practice (at least temporarily) until more analysis can be conducted on the environmental and other impacts of deep-sea mining. This Article discusses the positions adopted by certain governments, including Norway, the US, and the UK.

Norway's Deep-Sea Mining Plan

Norway is one of the only countries that has its own legislation (the Norway Seabed Minerals Act of 2019) regulating the exploration and extraction of deep-sea minerals. In December 2023, Norway agreed to allow seabed mineral exploration off its coast, ahead of a formal parliamentary decision. The Storting voted 80-20 in favor of the proposal in January 2024. The proposal permits exploratory mining across a large section of the Norwegian seabed, after which the Storting can decide whether to issue commercial permits.

The decision initially applies to Norwegian waters and exposes an area larger than Great Britain to potential sea-bed mining, although the Norwegian government has noted that it will only issue licenses after more environmental research has been done.

The Norwegian government defended the plan as a way to seize an economic opportunity and shore up the security of critical supply chains. However, there is concern that this will pave the way towards deep-sea mining around the world. Green activists, scientists, fishermen, and investors have called on Oslo to reconsider its position, citing the lack of scientific data about the effects of deep-sea mining on the marine environment, as well as the potential impact on Arctic ecosystems.

In November 2023, 120 EU lawmakers wrote an open letter to Norwegian members of the Storting, urging them unsuccessfully to reject the project, and in February 2024, the European Parliament voted in favor of a resolution that raised concerns about Norway's deep-sea mining regulations. This resolution carries no legal power, but it does send a strong signal to Norway that the European Union does not support its plans (see EU Moratorium on Deep-Sea Mining). The decision is also being challenged in the courts.

In May 2024, the Norwegian branch of the World Wide Fund for Nature (WWF-Norway) took legal action against the Norwegian government arguing that the government did not conduct adequate environmental due diligence on the plan. WWF-Norway also claim that the government has failed to properly investigate the consequences of its decision, has acted against the counsel of its own advisors, and has breached Norwegian law.

US Deep-Sea Mining Regulation

The US has not ratified UNCLOS or the 1994 Implementation Agreement (see Department of State: Law of the Sea Convention). US companies, therefore, cannot request mining authorization from the ISA to exploit seabed mineral resources beyond its EEZ. But legislation has been introduced to begin the ratification process. In November 2023, S. Res. 466 was introduced calling on the US Senate to give its advice and consent to ratify this treaty.

The US has adopted legislation to address deep-sea mining, however. In 1980, Congress enacted the Seabed Hard Mineral Resources Act of 1980 (DSHMRA; Pub. L. 96-283, 94 Stat. 553) which authorized the National Oceanic and Atmospheric Administration (NOAA) to regulate deep-sea mining activities (exploration and commercial recovery) by US citizens and corporations in areas beyond the EEZ. This act was intended to be an interim measure to allow these activities pending an international agreement.

Under the DSHMRA, NOAA can issue exploration licenses or commercial recovery permits for four minerals (manganese, cobalt, nickel, and copper) (30 U.S.C. §1403(6)). But since the US is not a party to UNCLOS these commercial recovery permits may not be recognized by parties to that treaty. Moreover, the ISA can issue exploitation contracts to a company sponsored by a party to the UNCLOS in the same area covered by a NOAA permit, and US citizens to which a NOAA permit has been issued would have no legal recourse to protect their claim to explore or recover seabed minerals in the ANBJ.

The IRA also amended the definition of Outer Continental Shelf to include submerged lands, seabed, and subsoil "subject to [the] jurisdiction and control or within the exclusive economic zone of the United States and adjacent to any territory of the United States" whose control has not been conveyed to the territorial government (43 U.S.C. §1331(a)).

Other actions taken in the US with respect to deep-sea mining include:

- A bill to review and assess the environmental impacts of deep-sea mining (H.R. 3764, Ocean-Based Climate Solutions Act of 2022). No significant action was taken to advance this bill.
- A bill to "prohibit certain mining activities on the deep-seabed and Outer Continental Shelf" until further research establishes the impacts of mining on the marine environment (see American Seabed Protection Act, H.R. 4537, 118th Cong. (2023)). The bill provides a framework for a comprehensive impact study of deep-sea mining that would include a description of the impacted ecosystems, an assessment of potential impacts from mining, the capacity for the sequestering of GHGs, sediment plume impacts, and an assessment of alternatives to the minerals mined. No significant action has been taken on this bill.

US State Approaches to Deep-Sea Mining

Each US state is authorized to regulate deep-sea mining. While this issue has not been taken up by most coastline US states, three states have banned the practice:

- In 2022, California passed the California Seabed Mining Prevention Act (AB 1832) which protects the California coastline from deep-sea mining.
- In 2021, Washington passed Bill 5145 banning deep-sea mining of hard minerals (RCW 79.14.300).
- In 1991, Oregon passed a precautionary law banning deep-sea mining in its state waters (Ocean Resources Management Act of 1987/1991 (ORS 196.405 to 196.583)).

Countries Restricting or Banning Deep-Sea Mining

As of 2024, about 25 countries have announced support for a moratorium, a precautionary pause, or a ban on deep-sea mining.

Canada's Deep-Sea Mining Approach

In July 2023, the Canadian Government issued a statement that "in the absence of both a comprehensive understanding of seabed mining's environmental impacts and a robust regulatory regime, Canada supports a moratorium on commercial seabed mining in areas beyond national jurisdiction and will not support the provisional approval of a plan of work" (see Government of Canada: Canada's Position on Seabed Mining in Areas Beyond National Jurisdiction).

EU Moratorium on Deep-Sea Mining

In response to Norway's decision to conduct deep-sea mining activity, the European Parliament adopted a resolution reaffirming support for a moratorium on deep-sea mining and calling on all countries to apply a precautionary approach and promote a moratorium on deep-sea mining.

France Bans Deep-Sea Mining

In November 2022, President Macron at the COP 27, called for a ban on deep-sea mining and in January 2023, the French parliament voted to ban the practice in its waters.

Belgium Introduces Deep-Sea Mining Legislation

In May 2024, Belgium's Federal Parliament adopted new laws to ensure that deep-sea mining is undertaken responsibly. The measures make clear that extraction of minerals from the seabed must be guided by science and data and carried out in a careful manner with a view to preserving the marine environment.

UK Support for Moratorium on Deep-Sea Mining

In October 2023, the UK government announced its support for a moratorium on the granting of exploitation licenses for deep-sea mining by ISA. The UK will not sponsor or support the issuing of any exploitation licenses until it deems sufficient scientific evidence is available to assess the impact of deep-sea mining activities on marine ecosystems and enforceable environmental regulations, standards, and guidelines have been developed and adopted by ISA. In February 2024, the UK government launched a UK-based scientific network to gather scientific data and carry out research to help assess the environmental impacts of deep-sea mining, to work alongside the support for a moratorium.

Methods of Polymetallic Nodule Extraction

Should Norway, or any other nation, initiate commercial deep-sea mining for nodules, there are three established methods of mineral extraction that may be employed:

- Continuous line bucket system.
- Hydraulic suction system.
- Remotely operated vehicles (ROVs).

Key to all three methods of mineral extraction is the production support vessel, the main facility for collecting, gathering, filtering, and storing polymetallic nodules. Dynamically positioned drill ships, formerly utilized in the oil and gas sector, have been identified or converted for this purpose, and market-leading companies active in deep-water operations, including drilling and subsea construction, are investing in this area. It will be interesting to see how the approach to the inherent engineering and technological challenges will continue to develop.

Continuous Line Bucket System

This system utilizes a surface vessel, a loop of cable with dredge buckets attached at 20–25 meter intervals, and a traction machine on the surface vessel, which circulates the cable. Operating much like a conveyor belt, ascending and descending lines complete runs to the ocean floor, gathering and carrying the nodules to a ship or station for processing.

Hydraulic Suction System

A riser pipe attached to a surface vessel vacuums the seabed, for example, by lifting the nodules on compressed air or by using a centrifugal pump. A separate pipe returns tailings to the area of the mining site.

ROVs

Large ROVs traverse the ocean floor collecting nodules in a variety of ways. This might involve blasting the seafloor with water jets or collection by vacuuming. Recent progress has been made in the development of these vehicles. A pre-prototype polymetallic nodule collector was successfully trialed in 2021 at a water depth of 4,500 meters. In December 2022, the first successful recovery of polymetallic nodules from the abyssal plain was completed, using an integrated collector, riser, and lift system on an ROV. The future of deep-sea ROVs may come from the development of robotic nodule-collection devices, equipped with artificial intelligence that allows them to distinguish between nodules and aquatic life.

Risks of Deep-Sea Mining

As a nascent industry, deep-sea mining presents risks to both the environment and the stakeholders involved.

Environmental Risks

ISA's delayed operative deadline for finalizing regulations has been welcomed by parties concerned about the environmental impact of deep-sea mining. Scientists warn of several risks of deep-sea mining including. These include:

- Irreversible loss of biodiversity to deep-sea ecosystems. The deep-ocean floor supports thousands of unique species, despite being dark and nutrient-poor, including microbes, worms, sponges, and other invertebrates.
- Damage to the unique chemistry of the ocean. Mining waste may affect the ocean's pH levels, increasing acidification in the mining area, ocean temperature, and oxygen levels, as well as damaging food supplies and marine life.
- Disruptions in animal migration patterns.
- Pollution caused by the emission of sediment fumes.
- Noise pollution that may interfere with echolocation and other communications systems of ocean life.
- Loss of marine habitats. The nodules and other mineral deposits are home to many species.

There are also concerns that mining will impact the ocean's ability to function as a carbon sink, resulting in a potentially wider environmental impact.

Human Rights and Social Risks

Deep-sea mining may impact fish and seafood stocks critical to certain communities. Mining waste may also threaten the viability of these resources and the life and food security of the communities that depend on them.

Stakeholder and Investor Risks

While deep-sea mining does not involve the recovery and handling of combustible oil or gas, which is often associated with offshore operations, commercial risks associated with the deployment of sophisticated (and expensive) equipment in water depths of 2,000 meters or more are significant.

In April 2021, a specialist deep-sea mining subsidiary lost a mining robot prototype that had uncoupled from a 5-kilometer-long cable connecting it to the surface. The robot was recovered after initial attempts failed, but this illustrates the potentially expensive problems that deep-sea mining poses.

With stakeholders increasingly holding companies accountable for the environmental and social effects of their decisions (whether through litigation or boycotts), companies wishing to become involved in deep-sea mining will also need to be careful to protect their reputation. Involvement in a deep-sea mining project that causes (or is perceived to cause) environmental damage, or that experiences serious problems, could attract strong negative publicity. (See Practice Note, Environmental, Social, and Governance (ESG): Overview.)

Investor Considerations

Regulations have not kept up with the increased interest in deep-sea mining, and there are no clear guidelines on how to structure potential deep-sea investments. This is especially true in international waters, where a relationship with a sponsoring state is necessary. Exploitative investments have not been covered by ISA, and it is unclear how much control investors will have over the mining process. It is also unclear how investors might be able to apportion responsibility for loss or damage, and what level of due diligence needs to be conducted ahead of operations. Any involvement carries with it significant risk, and stakeholders will do well to manage their rights and obligations as matters evolve.