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Seabed Mining in Areas Beyond National Jurisdiction: Issues for Congress

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Seabed Mining in Areas Beyond National Jurisdiction: Issues for Congress

On April 24, 2025, as part of a broader national effort to secure reliable supplies for critical minerals, the Trump Administration issued Executive Order (E.O.) 14285, “Unleashing America’s Offshore Critical Minerals and Resources,” making it a policy of the United States to advance U.S. leadership in seabed mineral development. Some scientists estimate that certain mineral deposits, including those containing critical minerals, are more abundant on the seafloor than on land. Such estimates, coupled with demand for critical minerals for national security and other purposes, have increased interest in the recovery of minerals from areas beyond national jurisdiction (ABNJ). Minerals may be extracted through *seabed mining*, a process that involves recovering minerals from the seafloor. Although some entities hold licenses or contracts to explore the seafloor for potential commercial recovery, deep-seabed mining in ABNJ has not been authorized by an international organization or the United States. The potential of seabed mining in ABNJ raises several issues for Congress given the United States’ demand for critical minerals and concerns about potential environmental impacts.

International and U.S. Context for Seabed Mining in ABNJ

The International Seabed Authority (ISA), established under the 1982 United Nations Convention on the Law of the Sea (UNCLOS), is an autonomous organization that regulates parties to UNCLOS conducting mineral-related activities in ABNJ. Since 2001, the ISA has issued 31 exploration contracts for seabed mineral resources to parties to UNCLOS. The ISA has yet to adopt a regulatory regime for extraction of seabed minerals and therefore has not issued exploitation contracts. In 2021, the Republic of Nauru, a Pacific Island country, notified the ISA of its sponsorship of Nauru Ocean Resources Inc. (a subsidiary of The Metals Company [TMC], a Canadian firm) and its intention to recover minerals from an ABNJ in the Pacific Ocean. Nauru’s action triggered a provision within UNCLOS that required the ISA to establish by summer 2023 a “Mining Code” (with exploitation regulations) that would allow for deep-seabed mining. At the close of the ISA’s March 2026 session, it had not finalized its mining code. The Secretary-General for the ISA reportedly aims to have a draft mining code completed by the end of 2026.

The United States has not ratified UNCLOS and therefore cannot sponsor companies seeking ISA contracts. However, the Deep Seabed Hard Mineral Resources Act (DSHMRA; P.L. 96-283), enacted in 1980 prior to the establishment of the ISA, authorized the National Oceanic and Atmospheric Administration (NOAA) to regulate deep-seabed mining activities (exploration and commercial recovery) of U.S. citizens in ABNJ. NOAA has used this authority and issued licenses to U.S.-based companies to explore the seafloor in ABNJ. Following the issuance of E.O. 14285, which directed NOAA to “expedite the process for reviewing and issuing seabed mineral exploration licenses and commercial recovery permits” in ABNJ, NOAA has reportedly received over 10 DSHMRA applications.

Issues for Congress

Sourcing minerals from the deep sea could reduce U.S. dependency on importing land-based minerals and reduce potential supply disruptions, including critical mineral supplies controlled by the People’s Republic of China (PRC, or China). The U.S. Senate could ratify UNCLOS, which would allow U.S. companies to seek ISA contracts, or the United States could unilaterally authorize deep-seabed mining in ABNJ under DSHMRA. Some Members introduced legislation in the 119th Congress that would codify E.O. 14285 (e.g., H.R. 3803) or mandate certain federal agencies to carry out aspects of it (e.g., H.R. 4018, S. 2860), which would include (1) directing NOAA to expedite the review and issuance of seabed mining applications and (2) requiring certain federal entities to provide a report about U.S. seabed mineral processing capacity and directing other federal entities to support domestic processing capabilities for such resources. Congress may consider any potential geopolitical consequences of NOAA issuing commercial recovery permits outside of the ISA framework, particularly because, at present, parties to UNCLOS may not be able to proceed with exploitation activities in the absence of an ISA mining code.

Some Members of Congress have expressed concerns about deep-sea habitat disturbance and biodiversity loss associated with seabed mining activities. In the 119th Congress, H.R. 664 would authorize NOAA to “conduct a comprehensive study of the environmental impacts of mining activities on the deep seabed” and would prohibit NOAA from issuing exploration licenses and commercial recovery permits. Another bill in the 119th Congress, H.R. 663, would instruct the President to direct U.S. representatives of relevant international organizations to call for a moratorium on deep-seabed mining until “regulations have been promulgated by the [ISA]” that effectively protect the marine environment from harmful effects.

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Introduction

Interest in mining the seabed in areas beyond national jurisdiction (ABNJ) for deposits that contain valuable minerals, such as critical minerals, has grown in recent years for a few reasons.¹ First, increased investment and improved technologies dedicated to the exploration and mapping of the deep sea have advanced knowledge of seafloor deposits that contain minerals of interest.² Second, the development of technologies for systems to collect seabed minerals from the deep ocean and deliver them to ships or surface-based mining platforms has made mining the seafloor more technologically possible and potentially economically feasible.³ Third, some seabed deposits of some minerals could present an alternative to, and reduce reliance on, terrestrial minerals sourced and/or processed in certain countries of concern, such as the People's Republic of China (PRC, or China).⁴ On April 24, 2025, President Trump issued Executive Order (E.O.) 14285, “Unleashing America’s Offshore Critical Minerals and Resources,” which made it a priority of the United States to “rapidly develop ... domestic capabilities for the exploration, characterization, collection, and processing of seabed mineral resources.”⁵

Different types of technologies rely on elements found in both terrestrial deposits and seafloor deposits (e.g., cobalt, copper, manganese, nickel).⁶ For example, some batteries—including those that power electric vehicles—commonly use nickel, cobalt, and manganese.⁷ According to some scientific estimates, these minerals of interest are more abundant in seafloor deposits than in land

¹ Section 7002 of the Energy Act of 2020 (Division Z, P.L. 116-260) codifies the methodology to be used by the Secretary of the Interior to determine a list of critical minerals. In 2025, the U.S. Geological Survey (USGS) published a list of 60 critical minerals. Department of the Interior, USGS, “Final 2025 List of Critical Minerals,” 90 *Federal Register* 50494, November 7, 2025. For more information about the USGS list, see CRS In Focus IF13145, *U.S. Geological Survey’s Critical Minerals List*, by Linda R. Rowan.

² For example, National Oceanic and Atmospheric Administration (NOAA), “New Autonomous Vehicle Helps Advance Understanding of the Deep Ocean and its Critical Minerals,” July 7, 2025, <https://oceanexplorer.noaa.gov/news/orpheus-update/>; and NOAA, “NOAA to Map Critical Mineral Deposits in Deep Waters off American Samoa,” January 22, 2026, <https://www.noaa.gov/news-release/noaa-to-map-critical-mineral-deposits-in-deep-waters-off-american-samoa>. For more information about U.S. ocean mapping efforts, see CRS Report R47623, *Frequently Asked Questions: Mapping of U.S. Ocean and Coastal Waters*, coordinated by Caitlin Keating-Bitonti.

³ U.S. Government Accountability Office (GAO), *Science & Tech Spotlight: Deep-Sea Mining*, GAO-22-105507, December 15, 2021; and Rosanna Carver et al., “A Critical Social Perspective on Deep Sea Mining: Lessons from the Emergent Industry in Japan,” *Ocean and Coastal Management*, vol. 193 (August 2020). Some contend deep-seabed mining cannot be profitable due to the challenges of operating seabed mining machinery at depths of between 3,500 meters and 5,000 meters, under extreme water pressure and cold temperatures. For example, see Brandon Keim, “The Dubious Economics of Deep-Sea Mining,” *Nautilus*, June 7, 2023, <https://nautil.us/the-dubious-economics-of-deep-sea-mining-309597/>.

⁴ GAO, “Deep-Sea Mining Could Help Meet Demand for Critical Minerals, But Also Comes with Serious Obstacles,” *WatchBlog*, December 16, 2021; GAO, *Science & Tech Spotlight: Deep-Sea Mining*, GAO-22-105507, December 15, 2021; Yasuhiro Kato et al., “Deep-Sea Mud in the Pacific Ocean as a Potential Resource for Rare-Earth Elements,” *Nature Geoscience*, vol. 4 (2011), pp. 535-539 (hereinafter Kato et al., “Deep-Sea Mud”); and International Energy Agency (IEA), *The Role of Critical Minerals in Clean Energy Transition*, 2022, p. 156 (hereinafter IEA, *Role of Critical Minerals*).

⁵ Executive Office of the President, Executive Order (E.O.) 14285 of April 24, 2025, “Unleashing America’s Offshore Critical Minerals and Resources,” 90 *Federal Register* 17735, April 29, 2025 (hereinafter E.O. 14285).

⁶ Minerals can be composed of single elements (e.g., copper) or a compound of elements (e.g., olivine). This report uses the term *mineral* for both. Olive Heffernan, “Deep-Sea Dilemma,” *Nature*, vol. 571 (2019), pp. 465-469; and Kato et al., “Deep-Sea Mud.”

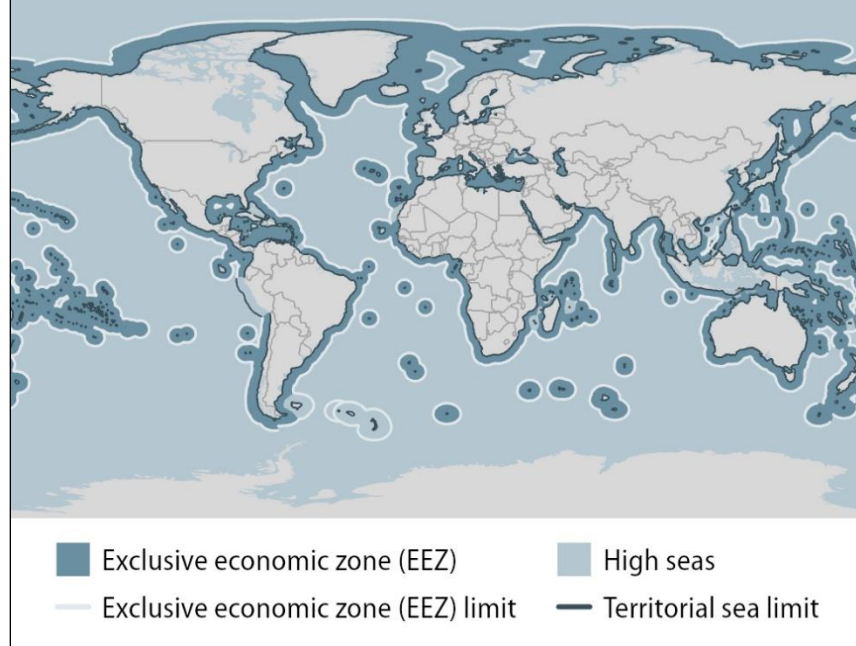
⁷ IEA, *Role of Critical Minerals*, p. 5. For more information about critical minerals for energy technologies, see CRS Report R48149, *Critical Minerals and Materials for Selected Energy Technologies*, by Emma Kaboli.

deposits.⁸ Critical minerals used in the magnets of wind turbines or military weapons systems, the motors of electric vehicles, and stationary energy storage also occur in seafloor deposits.

This report focuses on deep-seabed mining activities that could take place in ABNJ (**Figure 1**).⁹ The report outlines the history of international agreements that establish guidelines and standards for deep-seabed mining activities and provide protection to the marine environment in ABNJ. It also outlines domestic regulations for U.S. interests in pursuing seabed-mining activities in ABNJ as well as the potential geopolitical consequences of the United States operating outside the international framework for seabed mining. The report then examines potential seabed mining effects on ocean ecosystems and discusses calls for a moratorium on deep-seabed mining over environmental concerns. Finally, the report discusses issues for Congress, including U.S. participation in international agreements regarding deep-seabed mining, possible tradeoffs between domestic- and foreign-supplied minerals, and the potential for domestic processing of seabed minerals to bolster U.S. critical mineral supply chains. For information about seabed mining activities within U.S. waters, see CRS Report R48302, *Critical Minerals on the U.S. Outer Continental Shelf: The Bureau of Ocean Energy Management's Role and Issues for Congress*, by Caitlin Keating-Bitonti and Laura B. Comay.

⁸ For example, James R. Hein and Kira Mizell, "Chapter 8: Deep-Ocean Polymetallic Nodules and Cobalt-Rich Ferromanganese Crusts in the Global Ocean," in *The United Nations Convention on the Law of the Sea, Part XI Regime and the International Seabed Authority: A Twenty-Five Year Journey*, eds. Alfonso Ascencio-Herrera and Myron H. Nordquist (Leiden, The Netherlands: Koninklijke Brill NV, 2022), pp. 177-197, see p. 188.

⁹ The United Nations Convention on the Law of the Sea (UNCLOS) established national boundaries for coastal nations that extend to an adjacent *territorial sea*, which extends up to 12 nautical miles from the baseline of the coast of a nation. The territorial sea includes the *exclusive economic zone* (EEZ), which generally extends up to 200 nautical miles from the baseline of low sea level (usually near the coastline). See United Nations, *United Nations Convention on the Law of the Sea of 10 December 1982, Overview and Full Text*, https://www.un.org/depts/los/convention_agreements/convention_overview_convention.htm. Although the United States has not ratified UNCLOS, it generally has abided by the convention's terms, as dictated by Presidential Proclamation 5030. See "Proclamation 5030: Exclusive Economic Zone of the United States of America," 48 *Federal Register* 10605 (March 10, 1983).

Figure 1. Illustration of High Seas and Exclusive Economic Zone Boundaries

Source: Illustration created by CRS using the Sovereign Limits database (sovereignlimits.com).

Notes: The term *high seas* applies to areas beyond national jurisdiction (ABNJ). The figure is an illustration and is not for official purposes of identifying ABNJs, exclusive economic zones (EEZs), or territorial sea limits. Boundaries of coastal countries' national jurisdictions (i.e., EEZs) are illustrated in dark blue. ABNJ are illustrated in light blue. As defined in the United Nations Convention on the Law of the Sea (UNCLOS), the territorial sea extends up to 12 nautical miles from the shoreline; the EEZ extends up to 200 nautical miles from the baseline of low sea level (usually near the coastline); and the high seas are "all parts of the sea that are not included in the [EEZ], in the territorial sea or in the internal waters of a State, or in the archipelagic waters of an archipelagic State" (see, UNCLOS Articles 3, 57, and 86). Peru claims a single maritime zone of 200 nautical miles, which it refers to as a *maritime domain*, not an EEZ. Antarctica does not have a territorial sea or an EEZ because it is not a sovereign nation and its governance is carried by the Consultative Nations of the Antarctic Treaty.

Background on Seabed Mining

Seabed mining is a process of extracting sediment and mineral resources from the seafloor. Seabed mining activities can occur within a nation's exclusive economic zone (EEZ), to which a coastal nation may claim sovereign rights for the purpose of exploring and exploiting the natural resources of its continental shelf, or in ABNJ (commonly referred to as deep-seabed mining). Seabed mining activities occurring within a coastal nation's EEZ are regulated by that nation's domestic laws.¹⁰ In the United States, the seaward boundary of coastal states is generally 3 nautical miles offshore,¹¹ and certain states and territories prohibit seabed mining within their

¹⁰ UNCLOS Article 77(1). The Bureau of Ocean Energy Management (BOEM) is the federal agency authorized to oversee mineral leasing in the U.S. outer continental shelf. For more information about BOEM's role in leasing U.S. submerged lands for critical minerals, see CRS Report R48302, *Critical Minerals on the U.S. Outer Continental Shelf: The Bureau of Ocean Energy Management's Role and Issues for Congress*, by Caitlin Keating-Bitonti and Laura B. Comay.

¹¹ Submerged Lands Act (43 U.S.C. §§1301 et seq.).

waters (e.g., American Samoa, California, Hawaii, Oregon, and Washington).¹² This report focuses on seabed minerals found beyond the EEZ in ABNJ.

Deep-seabed mining was first explored in the 1960s, with commercial test mining for metal-rich nodules on the seabed starting in the 1970s.¹³ In 1994, the International Seabed Authority (ISA) was created under the United Nations Convention on the Law of the Sea (UNCLOS) as an autonomous organization to regulate and control deep-seabed mining activities taking place in ABNJ.¹⁴ The ISA can issue exploration and exploitation (i.e., commercial recovery) contracts for three types of deep-seabed mineral deposits (**Table 1**).¹⁵ The technologies and machinery to extract raw seabed material vary depending on the type of mineral deposit.¹⁶ Once the seabed material is extracted, it would be transported to land for mineral processing.

Table 1. Types of Seabed Mineral Deposits in Areas Beyond National Jurisdiction

Marine Deposit Type	Deposit Description	Minerals	Occurrences
Polymetallic Nodules	Potato-shaped rocks composed of concentric layers that form over millions of years as minerals from the seawater and sediment pore water accrete around a hard nucleus (e.g., shark tooth, whale ear bone, rock fragment) lying on the deep seafloor.	Cobalt, copper, lithium, manganese, nickel, tellurium, and titanium; and some metallic REEs.	Abyssal plains, such as the Clarion-Clipperton Zone in the Pacific Ocean.
Polymetallic Sulfides or Seafloor Massive Sulfide	Mineral accumulations that form from hot waters emitted at seafloor spreading ridges and areas of undersea volcanic activity.	Antimony, bismuth, copper, gallium, germanium, gold, iron, lead, silver, tellurium, and zinc.	Mid-Atlantic Ridge, Red Sea, East Pacific Rise, Galapagos Rift, and Juan de Fuca and Gorda Ridges (located off the Pacific Northwest coast of North America).
Ferromanganese Crusts or Cobalt-rich Crusts	Mineral encrustations that form on hard surfaces from seawater rich in dissolved metals occurring in volcanically active regions such as seamounts.	Cobalt, copper, manganese, nickel, platinum, scandium, and tellurium; and some metallic REEs.	All ocean basins. Also occur at shallower depths within countries' exclusive economic zones.

Sources: Bureau of Ocean Energy Management, “Types of Relevant Marine Mineral Deposits,” <https://www.boem.gov/marine-minerals/critical-minerals/types-relevant-marine-mineral-deposits>; International Seabed Authority (ISA), “Minerals: Polymetallic Nodules,” <https://www.isa.org.jm/exploration-contracts/polymetallic-nodules>; ISA, “Minerals: Polymetallic Sulphides,” <https://www.isa.org.jm/index.php/exploration-contracts/polymetallic-sulphides>; ISA, “Minerals: Cobalt-Rich Ferromanganese Crusts,” <https://www.isa.org.jm/>

¹² Or. Rev. Stat. §196.405 (1991); S.B. 5145, 67th Leg., Reg. Sess. (Wash. 2021); A.B. 1832, 2021–2022 State Leg., Reg. Sess. (Cal. 2022); S.B. 2575, 32nd Leg., Reg. Sess. (Haw. 2024); and Office of Governor Lemanu P.S. Mauga, Exec. Order No. 006-2024: An Order Implementing a Moratorium on Deep Seabed Mining Exploration and Exploitation Activities (Am. Sam. July 24, 2024).

¹³ Helen Scales, *The Brilliant Abyss* (New York: Atlantic Monthly Press, 2021), p. 184.

¹⁴ UNCLOS Article 156.

¹⁵ International Seabed Authority (ISA), “Exploration Contracts,” <https://www.isa.org.jm/exploration-contracts/>.

¹⁶ For a discussion about the technologies and machinery used to extract raw seabed material, see the section entitled “Proposed Seabed Mining Operations.”

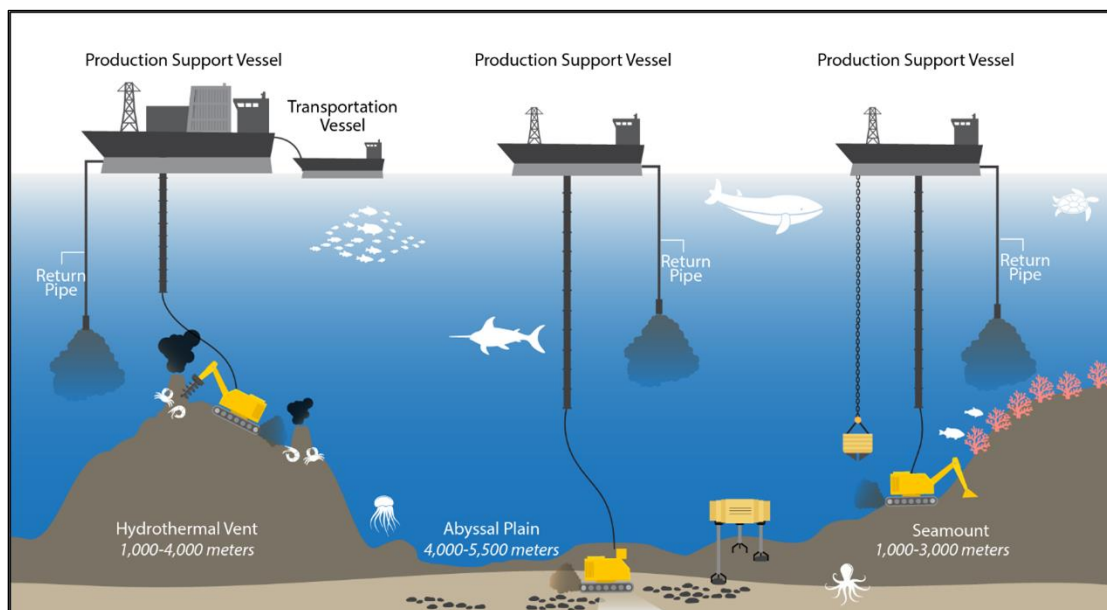
index.php/exploration-contracts/cobalt-rich-ferromanganese; and Department of the Interior, U.S. Geological Survey (USGS), “Final 2025 List of Critical Minerals,” 90 *Federal Register* 50494, November 7, 2025.

Notes: REEs = rare earth elements. Critical minerals as determined by the USGS are bolded. The three types of marine deposits in the table are of commercial interest. The list of minerals is not exhaustive and includes common minerals of commercial interest. Minerals may not all occur simultaneously in an ocean deposit, and the quality and quantity of minerals within a deposit may vary geographically across the global ocean.

Proposed Seabed Mining Operations

While no commercial-scale seabed operations have been authorized in ABNJ, some companies have tested equipment during deep-sea mining trials.¹⁷ **Figure 2** illustrates some of the machinery proposed to mine polymetallic sulfides deposits at hydrothermal vents and ferromanganese crusts at seamounts, as well as machinery and technologies proposed to collect polymetallic nodules from the deep-sea abyssal plain. Some seabed mining approaches require a production support vessel (PSV) and a transport vessel. A PSV launches the mining machinery or collector vehicle and provides power to it while operating on the seafloor. A transportation vessel would ship the seabed material to land, where it would be processed and refined into useable metals.

Figure 2. Proposed Machinery and Technology for Collecting Seabed Minerals



Source: Illustration created by CRS, modifying figure 4 in Kathryn Miller et al., “An Overview of Seabed Mining Including the Current State of Development, Environmental Impacts, and Knowledge Gaps,” *Frontiers in Marine Science*, vol. 4 (2018), and using Allseas, “Hidden Gem,” <https://www.allseas.com/en/who-we-are/our-fleet/hidden-gem>; International Seabed Authority, *CARMU Inspection Report 01/2023*, February 21, 2023, pp. 1-38; Impossible Metals, Inc., “Eureka Collection System,” <https://impossiblemetals.com/technology/robotic-collection-system/>; and Wendy Laursen, “The Nodule Collectors Are Lining Up, Ready to Go,” *Maritime Magazine*, March 2024, <https://www.maritimemagazines.com/offshore-engineer/202403/the-nodule-collectors-are-lining-up-ready-to-go/>.

Notes: Proposed seabed mining machinery, with associated vessels, for polymetallic sulfides deposits at hydrothermal vents and ferromanganese crusts at seamounts, as well as machinery and technologies proposed to collect polymetallic nodules from the deep-sea abyssal plain. Depths depicted in meters refer to the typical depth

¹⁷ For example, see Qi Zhang et al., “Technology and Equipment of Deep-Sea Mining: State of the Art and Perspectives,” *Earth Energy Science*, vol. 1 (2025), pp. 65-84.

at which these seafloor features (and potential mineral deposits) are located below the surface of the ocean. For illustrative purposes only, not to scale.

For polymetallic nodules, remotely operated collector vehicles fitted with caterpillar-like tracks use a water stream aimed at nodules laying on the seafloor to lift sediment with nodules into a collector system.¹⁸ These vehicles have been tested in deep-sea mining trials.¹⁹ Some companies have proposed using sonar technology on the collector vehicles to identify the location of nodules.²⁰ As a vehicle moves across the seafloor, a diffuser at the rear of the vehicle would emit seafloor sediment back into the environment, forming a sediment *plume* (i.e., resuspended sediment).²¹ The slurry (i.e., mix of water, sediment, and nodules) would be transported via a riser pump to a PSV.²² At the ocean surface, nodules would be separated and the sediment and water mix would be returned to the ocean at an unspecified water depth via a return pipe,²³ creating a sediment plume at the discharged depth.²⁴ One company has proposed an autonomous underwater vehicle (AUV) that would hover over the seafloor and use robotic arms with a vision system to pick individual nodules from the seafloor.²⁵ Once the AUV was full, it would return to the support vessel to offload nodules and have its battery recharged.

For polymetallic sulfides (or seafloor massive sulfide) deposits at hydrothermal vents, some companies have proposed remotely operated mining machines to cut and drill into the hydrothermal vent chimney to crush and extract internal minerals.²⁶ For ferromanganese crusts (or cobalt-rich crusts) at seamounts, remotely operated mining machines have been proposed to scrape across the surfaces of the seamount (or other geologic features) to remove surficial mineral crusts.²⁷ The mining processes for both polymetallic sulfides and ferromanganese crusts would create a slurry (i.e., mix of water and crushed material), which would be transported via a riser

¹⁸ For example, Zenghui Liu et al., “Deep-Sea Rock Mechanics and Mining Technology: State of the Art and Perspectives,” *International Journal of Mining Science and Technology*, vol. 33, no. 9 (September 2023), pp. 1083-1115, see pp. 1099-1100 (hereinafter Liu et al., “Deep-Sea Rock Mechanics and Mining Technology”); Allseas, “Hidden Gem,” <https://www.allseas.com/en/who-we-are/our-fleet/hidden-gem> (hereinafter Allseas, “Hidden Gem”); Deep Sea Mining, “Mining Subsea Minerals—How It Works,” https://deepseamining.ac/how_it_works; and Wendy Laursen, “The Nodule Collectors Are Lining Up, Ready to Go,” *Maritime Magazine*, March 2024, <https://www.maritimemagazines.com/offshore-engineer/202403/the-nodule-collectors-are-lining-up-ready-to-go/> (hereinafter Laursen, “The Nodule Collectors Are Lining Up, Ready to Go”).

¹⁹ For example, The Metals Company (TMC), “The Metals Company and Allseas Announce Successful Deep-Water Test of Polymetallic Nodule Collector Vehicle in the Atlantic Ocean at a Depth of Nearly 2,500 Meters,” May 5, 2022, <https://investor.metals.com/news-releases/news-release-details/metals-company-and-allseas-announce-successful-deep-water-test>.

²⁰ Laursen, “The Nodule Collectors Are Lining Up, Ready to Go.”

²¹ Kathryn Miller et al., “Challenging the Need for Deep Seabed Mining from the Perspective of Metal Demand, Biodiversity, Ecosystem Services, and Benefit Sharing,” *Frontiers in Marine Science*, vol. 8 (July 2021), pp. 1-7, see p. 15 (hereinafter Miller et al., “Challenging the Need for Deep Seabed Mining”).

²² Allseas, “Hidden Gem.”

²³ ISA, *CARMU Inspection Report 01/2023*, February 21, 2023, p. 18, https://www.isa.org.jm/wp-content/uploads/2023/02/ISA_inspection_report_NORI_mining_collector_system_test.pdf (hereinafter ISA, *CARMU Inspection Report 01/2023*).

²⁴ Miller et al., “Challenging the Need for Deep Seabed Mining,” p. 15.

²⁵ Impossible Metals Inc., “Eureka Collection System,” <https://impossiblemetals.com/technology/robotic-collection-system/> (hereinafter Impossible Metals Inc., “Eureka Collection System”).

²⁶ For example, Liu et al., “Deep-Sea Rock Mechanics and Mining Technology,” pp. 1100-1102; and David Hambling, “Giant Robots Are the Future of Underwater Mining,” *Popular Mechanics*, February 13, 2018, <https://www.popularmechanics.com/technology/robots/a16674275/underwater-robot-mining-nautilus-solwara-1-papua-new-guinea/> (hereinafter Hambling, “Giant Robots Are the Future of Underwater Mining”).

²⁷ Liu et al., “Deep-Sea Rock Mechanics and Mining Technology,” pp. 1102-1103.

pump to a PSV.²⁸ At the ocean surface, the fine crushed material would be separated from the water.²⁹ The water and discarded material would be returned to the ocean at an unspecified water depth via a return pipe, creating a sediment plume at the discharged depth.³⁰ In addition, some companies propose lifting large whole rock material in buckets to a PSV.³¹

Certain federal agencies have previously supported research and development of seabed mining technologies. For example, the Department of Energy's (DOE's) Advanced Research Projects Agency-Energy (ARPA-E), authorized by P.L. 110-69 (commonly known as the America COMPETES Act), has supported transformational energy technology research projects. In the past, ARPA-E has funded several projects related to seabed mining, including the design and development of technologies for seabed mineral collection and monitoring systems to assess sediment disturbance associated with seabed mining.³²

Regulations for Deep-Seabed Mining in Areas Beyond National Jurisdiction

International bodies and agreements regulate international exploration and exploitation of seabed minerals or provide guidance to prevent harm to the marine environment associated with deep-seabed mining. The following sections describe the international bodies and agreements that regulate deep-seabed mining in ABNJ, as well as relevant U.S. domestic laws.

United Nations Convention on the Law of the Sea and the 1994 Agreement

In 1982, UNCLOS established a framework governing activities on, over, and under the world's ocean. A recurring theme throughout UNCLOS is the "protection and preservation of the marine environment."³³ UNCLOS specifies that necessary measures be taken to protect the marine environment with respect to certain activities. For example, Article 145 states

Necessary measures shall be taken in accordance with this Convention with respect to activities in the Area to ensure effective protection for the marine environment from harmful effects which may arise from such activities. To this end the Authority shall adopt appropriate rules, regulations and procedures for *inter alia*:

(a) the prevention, reduction and control of pollution and other hazards to the marine environment, including the coastline, and of interference with the ecological balance of the marine environment, particular attention being paid to the need for protection from harmful

²⁸ Miller et al., "Challenging the Need for Deep Seabed Mining," p. 14.

²⁹ Liu et al., "Deep-Sea Rock Mechanics and Mining Technology," pp. 1100-1102; and Hambling, "Giant Robots Are the Future of Underwater Mining."

³⁰ Liu et al., "Deep-Sea Rock Mechanics and Mining Technology," pp. 1100-1102.

³¹ Liu et al., "Deep-Sea Rock Mechanics and Mining Technology," p. 1098.

³² For example, Department of Energy (DOE), Advanced Research Projects Agency-Energy (ARPA-E), "Deep Reach Technology," <https://arpa-e.energy.gov/programs-and-initiatives/search-all-projects/improved-nodule-collector-design-mitigate-sediment-plumes>; DOE, ARPA-E, "Artimus Robotics," <https://arpa-e.energy.gov/programs-and-initiatives/search-all-projects/low-cost-electronics-pressure-agnostic-actuators-driving-bio-inspired-vehicles-deep-sea-mining>; and DOE, ARPA-E, "Sequoia Scientific," <https://arpa-e.energy.gov/programs-and-initiatives/search-all-projects/real-time-situ-sensing-sediment-properties-environmental-monitoring-deep-sea-polymetallic-nodule-mining-real-time-situ-sensing-sediment-properties-environmental-monitoring-deep-sea-polymetallic-nodule-mining>.

³³ For example, see UNCLOS's Preamble and Part XII: "Protection and Preservation of the Marine Environment."

effects of such activities as drilling, dredging, excavation, disposal of waste, construction and operation or maintenance of installations, pipelines and other devices related to such activities;

(b) the protection and conservation of the natural resources of the Area and the prevention of damage to the flora and fauna of the marine environment.

In 1982, the United States and some other industrialized nations did not sign the convention or announced they could not ratify it without important changes to Part XI of UNCLOS, which deals with deep-seabed resources in ABNJ.³⁴ UNCLOS refers to resources recovered from ABNJ as *minerals*, which includes all solid, liquid, or gaseous mineral resources as well as polymetallic nodules at or beneath the seabed.³⁵ UNCLOS also considers minerals collected from ABNJ as the *common heritage of humankind* and provides that activities carried out in ABNJ shall benefit humankind as a whole, meaning seabed resources are available for everyone's use and benefit, including Small Island Developing States, Landlocked Developing Countries, and Least Developed Countries.³⁶ The Reagan Administration was not comfortable with some of these seabed mining provisions.³⁷

In 1994, the United Nations 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 Agreement*), which amended UNCLOS Part XI by removing many of the provisions objectionable to industrialized nations.³⁸ Following the adoption of the 1994 Agreement, UNCLOS entered into force. In October 1994, President Clinton submitted UNCLOS and the 1994 Agreement as a package to the Senate for advice and consent to ratification. To date, the Senate has not ratified UNCLOS or the 1994 Agreement, which are to be applied and interpreted together as a single treaty.³⁹ Some members of the executive branch have stated that some (but not all) provisions of UNCLOS reflect customary international law, except for the seabed mining provisions.⁴⁰ Some stakeholders have argued that U.S. practice with regard to seabed activities has been consistent with customary international law, such as signing the 1994 Agreement and engaging with the ISA as an observer since 1998.⁴¹ A 2025 article published in the journal *International Law Studies* contends that while the United States signed the 1994 Agreement, this action “does not make it sufficiently clear that the United States intended to be bound by it.”⁴² The article's author argues that the “historic and contemporary actions of the

³⁴ Bernard Gwertzman, “U.S. Will Not Sign Sea Law Treaty,” *New York Times*, July 10, 1982, p. 5.

³⁵ UNCLOS Article 133.

³⁶ UNCLOS Articles 136 and 140.

³⁷ Bernard Gwertzman, “U.S. Will Not Sign Sea Law Treaty,” *New York Times*, July 10, 1982, p. 5.

³⁸ For more information about UNCLOS implementing agreements, see CRS In Focus IF12578, *Implementing Agreements Under the United Nations Convention on the Law of the Sea (UNCLOS)*, by Caitlin Keating-Bitonti and Matthew C. Weed.

³⁹ In the past, some Members of Congress have expressed concerns regarding the ability of an international organization to regulate a commercial activity (i.e., deep-seabed mining) and distribute revenues from such activity.

⁴⁰ For example, Department of Defense (which is “using a secondary Department of War designation,” under E.O. 14347, dated September 5, 2025), Joint Chiefs of Staff, *Joint Maritime Operations: 8 June 2018*, Joint Publication 3-32, 2018, see p. xiv.

⁴¹ For example, ISA, “FAQs for the Media About the International Seabed Authority and Deep-Sea Mining,” <https://www.isa.org.jm/faq-for-media/> (hereinafter ISA, “FAQs for the Media”). In particular, see “What Is ISA's Reaction to the US Executive Order Unleashing America's Offshore Critical Minerals and Resources?”

⁴² James Kraska, “The U.S. Executive Order on Seabed Mining is Consistent with International Law,” *International Law Studies*, vol. 106 (2025), p. 507 (hereinafter Kraska, “The U.S. Executive Order on Seabed Mining is Consistent with International Law”).

United States qualify it as a persistent objector to customary international law that might be embodied in [UNCLOS] Part XI.”⁴³

International Seabed Authority

UNCLOS established the ISA, an autonomous organization that regulates and controls mineral-related activities in ABNJ for parties to UNCLOS.⁴⁴ According to the ISA, it has a “mandate to ensure the effective protection of the marine environment from harmful effects that may arise from deep-seabed-related activities.”⁴⁵ Deep-seabed activities include exploration of the seabed and exploitation of seabed mineral resources. Parties to UNCLOS are members of the ISA.⁴⁶ As a United Nations member nation, the United States has an observer delegate status at the ISA.⁴⁷

As of January 31, 2026, the ISA had issued 31 exploration contracts to public and private mining enterprises for seabed mineral resources.⁴⁸ The ISA has issued 17 exploration contracts for polymetallic nodules in the Clarion-Clipperton Zone (CCZ; **Figure 3**).⁴⁹ The CCZ is estimated to contain more copper, cobalt, nickel, and manganese than all known land deposits combined,⁵⁰ but the *economic recoverability* of nodules from the CCZ remains unknown.⁵¹

⁴³ Kraska, “The U.S. Executive Order on Seabed Mining is Consistent with International Law,” p. 510.

⁴⁴ ISA, “About ISA,” <https://www.isa.org.jm/about-isa/>.

⁴⁵ ISA, “About ISA,” <https://www.isa.org.jm/about-isa/>.

⁴⁶ As of April 14, 2026, the ISA had 172 signatories (171 states and the European Union). The lists of ratifications of, accessions to, and successions to UNCLOS and related agreements can be viewed at http://www.un.org/Depts/los/reference_files/chronological_lists_of_ratifications.htm (accessed April 13, 2026).

⁴⁷ The U.S. delegation to the ISA includes representatives from the Department of State’s Bureau of Oceans and International Environmental and Scientific Affairs, NOAA, BOEM, and USGS.

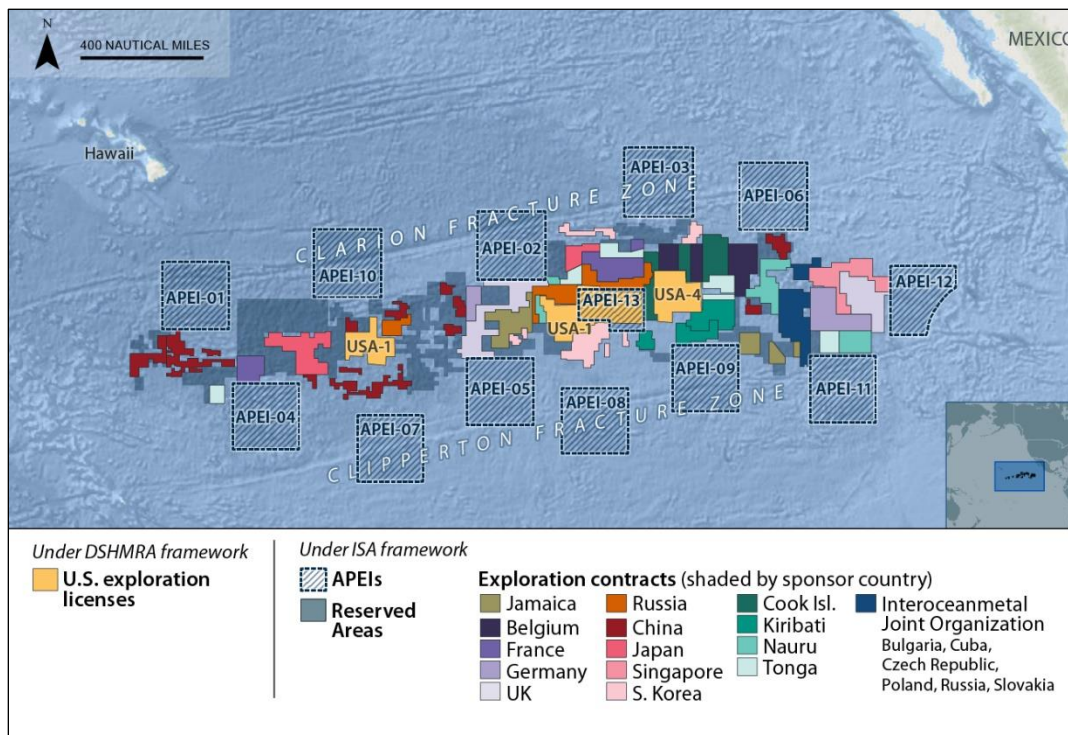
⁴⁸ ISA, “Exploration Contracts,” <https://www.isa.org.jm/exploration-contracts/>; and ISA, *Status of Contracts for Exploration and Related Matters, including Information on the Periodic Review of the Implementation of Approved Plans of Work for Exploration*, ISBA/31/C/3, February 9, 2026 (hereinafter ISA, ISBA/31/C/3).

⁴⁹ See CRS Infographic IG10053, *Seabed Mining in the Clarion-Clipperton Zone*, by Caitlin Keating-Bitonti and Emma Kaboli. In September 2025, the ISA received an application for an exploration contract for polymetallic nodules in the Clarion-Clipperton Zone from a subsidiary of Impossible Metals, a U.S. seabed mining company, sponsored by the Kingdom of Bahrain. At the close of the ISA’s March 2026 session, this application remains under consideration by the ISA. ISA, *Application for Approval of a Plan of Work for Exploration for Polymetallic Nodules by Impossible Metals Bahrain W.L.L.*, ISBA/31/LTC/2, October 17, 2025 (hereinafter ISA, ISBA/31/LTC/2).

⁵⁰ For example, Olive Heffernan, “Deep-Sea Dilemma,” *Nature*, vol. 571 (2019), p. 467.

⁵¹ Economic recoverability depends on environmental constraints, metal prices, and technological readiness, among other factors. ISA, “FAQs for the Media.” In particular, see “What Are the Estimates of the Minerals Available on the Seabed and the Projected Economic Value?”

Figure 3. Clarion-Clipperton Zone (CCZ)



Source: Map created by CRS using International Seabed Authority (ISA), “Maps,” <https://www.isa.org.jm/exploration-contracts/maps/>; and National Oceanic and Atmospheric Administration (NOAA), *Deep Sea Mining: A Report to Congress*, 1995, p. 6; and ESRI.

Notes: APEI = Areas of Particular Environmental Interest, which refers to no-mining zones as designated by the ISA to protect the full range of biodiversity and habitats; DSHMRA = Deep Seabed Hard Mineral Resources Act (30 U.S.C. §§1401 et seq.); and UK = United Kingdom. Most commercial interest in deep-seabed mining focuses on the CCZ. The CCZ is approximately 1.7 million square miles (up to 3.4 miles beneath the ocean’s surface), spanning an area as wide as the continental United States on the Pacific seafloor. Since 2001, ISA has awarded 17 exploration contracts for polymetallic nodules in the CCZ. The ISA had received extension requests for eight exploration contracts for polymetallic nodules in the CCZ that were set to expire in 2026. At the close of the ISA’s March 2026 session, six of these applications had been approved (ISA, *Report of the Chair of the Legal and Technical Commission on the Work of the Commission at the First Part of Its Thirty-First Session, ISBA/31/C/4*, March 6, 2026). The remaining two applications (Germany and Nauru) are to be considered at the ISA’s June-July 2026 session. In addition to APEIs, the ISA also designates reserved areas to ensure developing countries have access to mineral resources in areas beyond national jurisdiction. NOAA issued two exploration licenses in the CCZ in 1984 that have been extended through June 2027 pursuant to DSHMRA. For more information about ISA exploration contracts and U.S. exploration licenses issued by the NOAA pursuant to DSHMRA in the CCZ and the duration of these contracts and U.S. licenses, see CRS Infographic IG10053, *Seabed Mining in the Clarion-Clipperton Zone*, by Caitlin Keating-Bitonti and Emma Kaboli.

Because the United States is not a party to UNCLOS, the United States cannot sponsor companies interested in seeking ISA contracts for exploration or exploitation of seabed mineral resources through the ISA framework. Under domestic law, however, the United States has authorized exploration licenses to U.S.-based companies in the CCZ (see “Deep Seabed Hard Mineral Resources Act and Other Applicable U.S. Laws,” below).

The ISA has yet to develop a regulatory regime for extraction of seabed minerals and therefore has not issued exploitation contracts. The issuance of exploitation contracts would include information about mining operations and actions to minimize harm to marine habitats and species

at the proposed site.⁵² In 2014, the ISA began to draft standards and guidelines for exploitation of seabed minerals in ABNJ and initially set a self-imposed deadline of 2020 for the release of its “Mining Code” (with exploitation regulations), which was delayed due to the COVID-19 pandemic.⁵³

In 2021, the Republic of Nauru, a Pacific Island country, notified the ISA of its sponsorship of Nauru Ocean Resources Inc. (NORI; a subsidiary of The Metals Company [TMC], a Canadian firm) and its intention to mine the CCZ by early 2026.⁵⁴ Nauru claimed its efforts to mine the seabed would support the global transition to clean energy technologies and would help reduce carbon emissions.⁵⁵ Nauru’s action triggered a legal provision within UNCLOS that compels the ISA to establish standards and guidelines for mining deep-sea resources while minimizing environmental risks.⁵⁶ According to the provision, commonly referred to as the *two-year rule*, the ISA must finalize its deep-seabed mining regulations within two years (i.e., by summer 2023).⁵⁷ The ISA did not meet this two-year deadline and pushed the deadline to 2025, which it subsequently missed.⁵⁸ Outstanding matters to be considered within the ISA’s regulations for exploitation of seabed minerals could include the following, for example:

- Threshold of environmental harm to apply when assessing applications, including knowledge of environmental baseline data
- Processes relating to the preparation and evaluation of environmental plans
- Monitoring programs
- Environmental performance guarantees
- Environmental compensation fund
- Adjacent coastal states and transboundary harm⁵⁹

On January 1, 2025, Leticia Carvalho began her four-year term as Secretary-General of the ISA, replacing Michael Lodge, who had held the position since 2017.⁶⁰ Secretary-General Carvalho reportedly stated that a draft of exploitation regulations could be completed by the end of 2026, but some stakeholders and advocates caution that rushing to complete the ISA mining code might

⁵² ISA, “Protection of the Marine Environment,” <https://www.isa.org.jm/protection-of-the-marine-environment/> (hereinafter ISA, “Protection of the Marine Environment”).

⁵³ ISA, “Protection of the Marine Environment;” and Helen Scales, *The Brilliant Abyss*, (New York: Atlantic Monthly Press, 2021), p. 187.

⁵⁴ ISA, “Letter Dated 30 June 2021 from the President of the Council of the International Seabed Authority Addressed to Members of the Council,” ISBA/26/C/38, July 1, 2021; and TMC, “NORI-D Project – Nauru Ocean Resources Inc.,” <https://metals.co/nori/>.

⁵⁵ Republic of Nauru, “Statement Delivered by His Excellency David Adeang, President of the Republic of Nauru at the 29th Session of the International Seabed Authority,” July 30, 2024, https://www.isa.org.jm/wp-content/uploads/2024/07/National_Statement-by-H.E.-David-Adeang_ISA-Assembly.pdf.

⁵⁶ United Nations, Agreement Relating to the Implementation of Part XI of the United Nations Convention on the Law of the Sea of 10 December 1982, July 28, 1994, https://www.un.org/depts/los/convention_agreements/texts/agreement_part_xi/agreement_part_xi.htm (hereinafter 1994 Agreement).

⁵⁷ Pradeep Singh, “The Two-Year Deadline to Complete the International Seabed Authority’s Mining Code: Key Outstanding Matters That Still Need to Be Resolved,” *Marine Policy*, vol. 134, no. 104804 (2021).

⁵⁸ Although the ISA Council had aimed to adopt exploitation regulations during the 30th session of the ISA, it did not meet the deadline. ISA, *Decision of the Council of the International Seabed Authority on a Timeline following the Expiration of the Two-year Period Pursuant to Section 1, Paragraph 15, of the Annex to the Agreement relating to the Implementation of Part XI of the United Nations Convention on the Law of the Sea*, ISBA/28/C/24, July 21, 2023 (hereinafter ISA, ISBA/28/C/24).

⁵⁹ ISA, ISBA/28/C/24.

⁶⁰ ISA, “The Secretary-General,” <https://www.isa.org.jm/the-secretary-general/>.

lead to “sloppy work.”⁶¹ ISA Council decisions provide that if an ISA exploitation application is submitted before the exploitation regulations have been adopted, the council will consider the process for reaching a decision on such an application at its next meeting.⁶² TMC had previously announced that NORI and Nauru would submit their ISA exploitation application by June 27, 2025, but they did not submit an application to ISA by that date.⁶³ In a March 2025 statement, TMC asserted that “the ISA has neither the Mining Code nor the willingness to engage with their commercial contractors,” signaling a shift in the company’s priority away from pursuing ISA seabed mining options toward those under the U.S. framework for seabed mining in ABNJ (discussed in the following section).⁶⁴ As of March 19, 2026, which marked the close of the Part I of the 31st session of the ISA, the ISA had not adopted regulations for exploitation.⁶⁵ Other matters, such as a mechanism for the equitable sharing of financial and other economic benefits derived from deep-seabed mining activities, have yet to be developed and adopted by the ISA (see textbox below entitled, “International Benefit-Sharing Mechanism for Seabed Resources”).

International Benefit-Sharing Mechanism for Seabed Resources

The United Nations Convention on the Law of the Sea (UNCLOS) considers seabed resources collected from areas beyond national jurisdiction (ABNJ) to be *common heritage of humankind* (UNCLOS Article 136). Further, UNCLOS provides that seabed activities taking place in ABNJ shall “be carried out for the benefit of [hu]mankind as a whole, irrespective of the geographical location of States, whether coastal or land-locked, and taking into particular consideration the interests and needs of developing States” (UNCLOS Article 140). Under UNCLOS, the International Seabed Authority (ISA) is tasked to develop a mechanism for the equitable sharing of financial and other economic benefits derived from seabed mining activities in ABNJ. UNCLOS gives equal weight to financial benefits and nonmonetary benefit-sharing, which may include capacity building, protection of the marine environment, and scientific knowledge of the marine environment. The ISA Finance Committee has developed proposals for a potential benefit-sharing mechanism. It remains unclear if the benefit-sharing mechanism would apply to UNCLOS parties or all nations. An advocacy group contends that ISA proposals would not “satisfy the [UNCLOS] equity standard” and recommends a global moratorium on seabed mining as a “safeguard” until a benefit-sharing mechanism is in place that preserves the UNCLOS principle. Once the finance committee has a proposal, it would make a recommendation to the ISA Council and the council would present it to the ISA Assembly for approval.

Questions remain whether the common heritage principle is *customary international law* and how it might apply to the United States as a nonparty to UNCLOS, if at all. While the 1980 Deep Seabed Hard Mineral Resources Act (DSHMRA; P.L. 96-283) anticipated that UNCLOS would “give legal definition to the principle that the hard mineral resources of the deep seabed are the common heritage of [hu]mankind” (see 30 U.S.C. §1401), some legal experts contend the United States, as a nonparty, is not bound to the UNCLOS common heritage principle. Further, some objectors to U.S. ratification of UNCLOS contend that the common heritage principle gives perceived preference for developing countries’ interests. On April 24, 2025, the Trump Administration issued Executive Order (E.O.) 14285, “Unleashing America’s Offshore Critical Minerals and Resources,” which, among other things, directed NOAA to “expedite the process for reviewing and issuing seabed mineral exploration licenses and commercial recovery permits” in ABNJ. Although E.O. 14285 did not acknowledge the common heritage principle, the executive order directed the Secretary of Commerce, along with other federal entities, to

⁶¹ Sachi Kitajima Mulkey, “Can Nations Agree How to Mine the Sea? This Is the Year, She Says,” *New York Times*, updated March 1, 2026, <https://www.nytimes.com/2026/02/28/climate/seabed-mining-rulebook-isa-metals-company.html>.

⁶² ISA, ISBA/28/C/24; and ISA, *Decision of the Council of the International Seabed Authority Relating to the Understanding and Application of Section 1, Paragraph 15, of the Annex to the Agreement Relating to the Implementation of Part XI of the United Nations Convention on the Law of the Sea*, ISBA/28/C/25, July 21, 2023.

⁶³ TMC, “TMC Announces June 27, 2025 Submission Date for Subsidiary NORI’s ISA Application, and Expanded Company Strategy,” November 12, 2024, <https://investors.metals.co/news-releases/news-release-details/tmc-announces-june-27-2025-submission-date-subsidiary-noris-isa>.

⁶⁴ TMC, “CEO Statement on ISA and USA,” March 2025, <https://metals.co/ceo-statement-on-isa-and-usa/>.

⁶⁵ ISA, “The Council of the International Seabed Authority Advanced Negotiations on the Mining Code,” press release, March 31, 2026, <https://isa.org.jm/news/the-council-of-the-international-seabed-authority-advanced-negotiations-on-the-mining-code/> (hereinafter ISA, “Advanced Negotiations on the Mining Code”).

provide a joint report on the “feasibility of an international benefit-sharing mechanism for seabed mineral resources.” The ISA stated that the executive order would “privilege the interests of the few at the expense of the many.” It remains unknown whether, and to what extent, a U.S. international benefit-sharing mechanism would apply to seabed resources recovered under DSHMRA.

Sources: Executive Office of the President, Executive Order 14285 of April 24, 2025, “Unleashing America’s Offshore Critical Minerals and Resources,” 90 *Federal Register* 17735, April 29, 2025; ISA, “FAQs for the Media About the International Seabed Authority and Deep-Sea Mining,” <https://www.isa.org.jm/faq-for-media/>; ISA, “A Collective Vision of a Shared Future,” <https://isa.org.jm/equitable-sharing-of-benefits/>; ISA, *Equitable Sharing of Financial and Other Economic Benefits from Deep-Seabed Mining*, ISA Technical Study No. 31, 2021; ISA, *Equitable Sharing of Financial and Other Economic Benefits from Deep-Sea Mining*, Policy Brief 01, 2022; James Kraska, “The U.S. Executive Order on Seabed Mining is Consistent with International Law,” *International Law Studies*, vol. 106 (2025), pp. 498-514; and Harvey Mpoto Bombaka and Ben Tippet, *Equity, Benefit-Sharing and Financial Architecture in the International Seabed Authority*, Greenpeace International, February 2026.

Deep Seabed Hard Mineral Resources Act and Other Applicable U.S. Laws

In 1980, Congress passed the Deep Seabed Hard Mineral Resources Act (DSHMRA; P.L. 96-283) as an interim measure to allow U.S. citizens to proceed with seabed mineral exploration and recovery until an international regime was in place (i.e., UNCLOS).⁶⁶ The 96th Congress stated among the findings of DSHMRA that “the nations of the world, including the United States, will benefit if the hard mineral resources [, including nickel, copper, cobalt, and manganese,] of the deep seabed beyond limits of national jurisdiction can be developed and made available for their use.”⁶⁷ Further, the 96th Congress stated the purposes of DSHMRA are to “encourage the successful conclusion of a comprehensive [UNCLOS],”⁶⁸ and to “assure that such exploration and recovery activities are conducted in a manner which will encourage the conservation of such resources, protect the quality of the environment, and promote the safety of life and property at sea,”⁶⁹ among others.

DSHMRA establishes a framework for authorizing U.S. citizens to explore for and recover minerals from the seabed in ABNJ. Congress authorized the National Oceanic and Atmospheric Administration (NOAA) to issue exploration licenses and commercial recovery permits for polymetallic nodules to U.S. citizens.⁷⁰ Prior to 2026, applicants would have followed a two-step sequential application process where the applicant first applies for and obtains an exploration license and then applies for a commercial recovery permit.⁷¹ According to NOAA, although the agency has not issued any new exploration licenses since 1984, “many entities have performed substantial deep-sea mining exploration- and development-type work over the last decade ... which means that many eligible entities may now be ready to move to commercial recovery.”⁷² On January 21, 2026, NOAA issued a final rule revising its regulations to include a consolidated application process.⁷³ Under this process, an *eligible applicant* applies for and obtains an

⁶⁶ 30 U.S.C. §1401(b)(3). The Deep Seabed Hard Mineral Resources Act (DSHMRA; P.L. 96-283) refers to UNCLOS as the *Law of the Sea Treaty*.

⁶⁷ 30 U.S.C. §1401(a).

⁶⁸ 30 U.S.C. §1401(b)(1).

⁶⁹ 30 U.S.C. §1401(b)(4).

⁷⁰ 30 U.S.C. §1412. 15 C.F.R. §970 and 15 C.F.R. §971.

⁷¹ 15 C.F.R. §970.102(c) and 15 C.F.R. §971.102(c).

⁷² NOAA, “Deep Seabed Mining: Revisions to Regulations,” 91 *Federal Register* 2642.

⁷³ NOAA, “Deep Seabed Mining: Revisions to Regulations for Exploration License and Commercial Recovery Permit (continued...)”

exploration license and commercial recovery permit at the same time.⁷⁴ After the issuance of the final rule, applicants who had previously submitted exploration license applications to NOAA had 60 days to notify the Administrator of their intention to proceed under the consolidated process.⁷⁵ In cases where an applicant fails to demonstrate their eligibility for a consolidated license and permit, “NOAA may issue an exploration license while withholding the granting of a permit.” An applicant may pursue either the two-step sequential process or the consolidated process.

Under deep-seabed mining regulations for exploration licenses, NOAA is to provide written notice to the applicant regarding the agency’s determination whether the application is in substantial compliance with DSHMRA within 30 days (i.e., the eligibility of an applicant).⁷⁶ Under deep-seabed mining regulations for commercial recovery permits, NOAA is to notify the applicant whether an application is complete within 60 days after it is received.⁷⁷ Once NOAA has determined an exploration license application is in full compliance with DSHMRA or a commercial recovery permit application is complete, the application is to be published in the *Federal Register* with at least 60 days available to submit written comments to the NOAA Administrator.⁷⁸ Under deep-seabed mining regulations for the consolidated application process, NOAA is to certify an application which is in full compliance with DSHMRA within 100 days.⁷⁹ NOAA’s determination addresses the eligibility of an applicant, and NOAA’s certification of an application is an intermediate step between receipt of an application and its actual issuance.⁸⁰

After NOAA receives a DSHMRA application by an U.S. entity seeking an exploration license or commercial recovery permit and before it issues the license or permit, NOAA is to produce an environmental impact statement (EIS) for its issuance of the license or permit.⁸¹ Under the consolidated application process, NOAA may prepare a single EIS that evaluates the impacts of both exploration activities and commercial recovery activities, rather than one EIS for the exploration license and another for the commercial recovery permit.⁸² The National Environmental Policy Act (42 U.S.C. §§4321-4347) is the source of the substantive requirements for preparing an EIS. U.S. companies pursuing deep-seabed mining activities in ABNJ may be subject to other U.S. federal laws, such as the Marine Mammal Protection Act (16 U.S.C. §§1361-1423h). In addition, Section 109(e) of DSHMRA provides that any discharge of a pollutant from a vessel or other floating craft associated with deep-seabed mining activities is subject to the provisions of the Clean Water Act (33 U.S.C. §§1251-1387).⁸³

Applications,” 91 *Federal Register* 2642, January 21, 2026 (hereinafter NOAA, “Deep Seabed Mining: Revisions to Regulations,” 91 *Federal Register* 2642).

⁷⁴ 15 C.F.R. §971.214. According to 15 C.F.R. §971.214(b), any U.S. citizen “who can demonstrate that he, she, or it possesses the scientific, technical, and financial resources to pursue commercial recovery activities in an expeditious and diligent manner may apply to the Administrator for issuance or transfer of an exploration license and a commercial recovery permit.” In its response to comments on the proposed rule, NOAA stated it “is not pre-determining, even by providing non-binding examples, what information a prospective applicant for the consolidated license and permit might propose to NOAA to demonstrate that it is eligible for a consolidated license and permit application” (NOAA, “Deep Seabed Mining: Revisions to Regulations,” 91 *Federal Register* 2642).

⁷⁵ 15 C.F.R. §971.214(g).

⁷⁶ 15 C.F.R. §970.209.

⁷⁷ 15 C.F.R. §971.210.

⁷⁸ 15 C.F.R. §970.212(a); 15 C.F.R. §971.212(a).

⁷⁹ 15 C.F.R. §971.214(e).

⁸⁰ See 15 C.F.R. §970.400; 15 C.F.R. §§970.501-970.524; 15 C.F.R. §971.300; 15 C.F.R. §§971.400-971.430.

⁸¹ 30 U.S.C. §1419(d).

⁸² 15 C.F.R. §971.214(b).

⁸³ 30 U.S.C. §1419(e).

The lack of accession by the United States to UNCLOS does not preclude NOAA from issuing exploration licenses or commercial recovery permits pursuant to DSHMRA.⁸⁴ However, “any rights a U.S. company may have domestically [under DSHMRA] are not secured internationally,” according to a 2017 NOAA notice.⁸⁵ According to the ISA, parties to UNCLOS have “a duty not to recognize activities conducted outside the ISA framework” and “should take measures to prevent their nationals or entities from engaging in unregulated deep-sea mining.”⁸⁶ The ISA could issue an exploration or exploitation contract to a company sponsored by a nation party to UNCLOS in an area that overlaps with a DSHMRA exploration license or commercial recovery permit, and NOAA could issue a DSHMRA license or permit to a U.S. company in an area that overlaps with an ISA contract or other designation (e.g., areas of particular environmental interest, reserved areas).⁸⁷ The ISA also could make designations in the same area where NOAA has issued a license or permit (see the section below).⁸⁸ Without the United States being a party to UNCLOS, U.S. citizens issued licenses or permits by NOAA would have no legal recourse under UNCLOS mechanisms to protect their claims to explore and/or recover seabed minerals in ABNJ.⁸⁹ At the same time, U.S. citizens applying for DSHMRA licenses or permits might not need to recognize ISA contracted or designated areas (see the section below). Before issuing an exploration license or commercial recovery permit, NOAA must determine that it would not “unreasonably interfere with the exercise of the freedoms of the high seas” by other nations, among other considerations.⁹⁰

Exploration Licenses Issued Under the Deep Seabed Hard Mineral Resources Act

In 1984, NOAA issued exploration licenses pursuant to DSHMRA for four sites located in the CCZ, predating the establishment of the ISA in 1994. NOAA has not issued any exploration licenses since 1984, although the agency has approved extension requests. To date, two exploration licenses (USA-1 and USA-4), both held by Lockheed Martin, remain active pursuant to DSHMRA (**Figure 3**). According to a 2017 *Federal Register* notice, Lockheed Martin has delayed at-sea exploration activities, citing “the need to have security of tenure through international recognition of the licenses by the [ISA] following accession by the United States to

⁸⁴ Email correspondence between CRS and NOAA, November 23, 2022 (hereinafter CRS correspondence with NOAA, 2022).

⁸⁵ NOAA, “Deep Seabed Mining: Approval of Exploration License Extensions,” 82 *Federal Register* 42327, September 7, 2017 (hereinafter NOAA, “Deep Seabed Mining: Approval of Exploration License Extensions,” 82 *Federal Register* 42327).

⁸⁶ ISA, “FAQs for the Media.” In particular, see “What Is Expected of ISA Member States in case One of their Citizens, Corporations or Ships Takes Part In a Deep-Sea Mining Operation Outside the Jurisdiction of the ISA? Should these ISA Member States Prevent their Citizens or Corporations from Being Part of such a Mining Operation?” UNCLOS Article 137(3) states, “No State or natural or juridical person shall claim, acquire or exercise rights with respect to the minerals recovered from the Area except in accordance with [Part XI of UNCLOS]. Otherwise, no such claim, acquisition or exercise of such rights shall be recognized.”

⁸⁷ The ISA designates *areas of particular environmental interest* to “protect biodiversity and ecosystem structure and function across the region and are protected from future exploitation of mineral resources” (ISA, “Environmental Management Plan for the Clarion-Clipperton Zone,” <https://www.isa.org.jm/protection-of-the-marine-environment/regional-environmental-management-plans/ccz/>). The ISA designates *reserved areas* (i.e., areas contributed by developed nations when they apply to the ISA for exploration rights) to ensure that “developing countries can access deep-sea mineral resources.”

⁸⁸ CRS correspondence with NOAA, 2022.

⁸⁹ NOAA, “Deep Seabed Mining: Approval of Exploration License Extensions,” 82 *Federal Register* 42327.

⁹⁰ 30 U.S.C. §1415(a).

the UNCLOS.”⁹¹ In December 2021, the ISA designated an area of the CCZ that partially overlaps with USA-1 as an area of particular environmental interest, thereby precluding seabed mining activities conducted by parties to UNCLOS from taking place in the area (refer to APEI 13 in **Figure 3**).⁹² In response to this APEI designation, the United States stated “[i]f and when the United States joins the Convention, we would seek to better align the foregoing interest with decisions that may be taken here” by the ISA.⁹³ In 2022, NOAA extended Lockheed Martin’s USA-1 and USA-4 exploration licenses through June 2, 2027.⁹⁴ Following E.O. 14285, Lockheed Martin reportedly is considering options to allow mining companies to recover polymetallic nodules from within USA-1 and USA-4.⁹⁵ For more information about the history and status of these licenses, see CRS In Focus IF12608, *U.S. Interest in Seabed Mining in Areas Beyond National Jurisdiction: Brief Background and Recent Developments*, by Caitlin Keating-Bitonti.

Pending Applications to the National Oceanic and Atmospheric Administration

Following the issuance of E.O. 14285, NOAA reportedly has received more than 10 applications for seabed mining activities.⁹⁶ Some companies publicly announced that they have submitted seabed mining applications to NOAA pursuant to DSHMRA. For example, on April 29, 2025, TMC’s U.S. subsidiary, TMC USA LLC (TMC USA), announced that it had submitted applications to NOAA for two exploration licenses and one commercial recovery permit for areas in the CCZ.⁹⁷ On January 22, 2026, the day after NOAA issued its new rule regarding the consolidated application process, TMC USA submitted a consolidated application to NOAA and, on March 9, 2026, announced that NOAA had determined this application to be in “substantial compliance.”⁹⁸ Another U.S. seabed mining company, Deep Sea Rare Minerals, Inc., announced on January 8, 2026, that NOAA had determined its exploration license application to be in “substantial compliance” with DSHMRA.⁹⁹ American Ocean Minerals Corporation, a U.S.

⁹¹ NOAA, “Deep Seabed Mining: Approval of Exploration License Extensions,” 82 *Federal Register* 42327.

⁹² ISA, *Decision of the Council of the International Seabed Authority Relating to the Review of the Environmental Management Plan for the Clarion-Clipperton Zone*, ISBA/26/C/58, December 10, 2021.

⁹³ United States, “U.S. Intervention at ISA Council Meeting on Proposed APEI-13 Designation,” December 9, 2021, https://www.isa.org.jm/wp-content/uploads/2022/06/US_Intervention_on_Proposed_APEI-13_Designation.pdf.

⁹⁴ NOAA, “Deep Seabed Mining: Approval of Exploration License Extensions,” 87 *Federal Register* 52743, August 29, 2022.

⁹⁵ Sylvia Pfeifer and Kenza Bryan, “Lockheed Martin in Talks to Develop Seabed Mines,” *Financial Times*, July 14, 2025.

⁹⁶ Hannah Northey, “Trump Official: Deep-Sea Mining Just Years Away,” *E&E News*, January 27, 2026, <https://www.eenews.net/articles/trump-official-deep-sea-mining-just-years-away/> (hereinafter Northey, “Trump Official: Deep-Sea Mining Just Years Away”).

⁹⁷ TMC, “World First: TMC USA Submits Application for Commercial Recovery of Deep-Sea Minerals in the High Seas Under U.S. Seabed Mining Code,” April 29, 2025, <https://investors.metals.co/news-releases/news-release-details/world-first-tmc-usa-submits-application-commercial-recovery-deep>. While TMC had announced that its subsidiary TMC USA had submitted two exploration license applications to NOAA on April 29, 2025, TMC USA submitted “an amended application” on July 27, 2025. See NOAA, “Deep Seabed Mining: Notice of Receipt of Applications for Deep Seabed Mining Exploration Licenses and Announcement of Public Comment Period and Virtual Public Hearings,” 90 *Federal Register* 60064, December 23, 2025 (hereinafter NOAA, “Deep Seabed Mining: Notice of Receipt of Applications,” 90 *Federal Register* 60064).

⁹⁸ TMC, “NOAA Determines TMC USA’s Consolidated Deep-Seabed Mining Application is in Substantial Compliance,” March 9, 2026, <https://investors.metals.co/news-releases/news-release-details/noaa-determines-tmc-usas-consolidated-deep-seabed-mining> (hereinafter TMC, “NOAA Determines TMC USA’s Consolidated Deep-Seabed Mining Application”).

⁹⁹ Deep Sea Rare Minerals, “Deep Sea Rare Minerals, Inc. Receives NOAA Determination of ‘Substantial Compliance’ (continued...)”

subsidiary of Deep Sea Mineral Corporation, reportedly has two exploration licenses determined to be in full compliance with DSHMRA.¹⁰⁰

As of April 14, 2026, NOAA has published information in the *Federal Register* about four applications, all for areas located in the CCZ, that are fully compliant with DSHMRA application requirements:¹⁰¹

- two exploration license applications submitted by TMC USA (further discussed below);¹⁰²
- one exploration license application submitted by American Metal Resources that overlaps with some ISA-designated reserved areas as well as a portion of another U.S. company's DSHMRA application to NOAA;¹⁰³ and
- one exploration license application submitted by SeaX that overlaps with some ISA-designated reserved areas.¹⁰⁴

As previously discussed, NOAA's determination addresses the eligibility of an applicant and is one step between receipt of an application and its actual issuance.¹⁰⁵

TMC USA's two exploration license applications are for areas in the CCZ that overlap with areas currently under ISA-issued exploration contracts, specifically areas the ISA has contracted to other TMC subsidiaries.¹⁰⁶ (For a visual of the location of TMC USA's exploration licenses in the CCZ that NOAA determined to be fully compliant, see CRS Infographic IG10053, *Seabed Mining in the Clarion-Clipperton Zone*, by Caitlin Keating-Bitonti and Emma Kaboli, updated February 4, 2026). TMC subsidiaries hold two ISA exploration contracts for polymetallic nodules in the CCZ: (1) Nauru has sponsored TMC's subsidiary NORI, and (2) the Kingdom of Tonga has

Advancing Exploration License Application Process," January 8, 2026, <https://www.accessnewswire.com/newsroom/en/metals-and-mining/deep-sea-rare-minerals-inc.-receives-noaa-determination-of-%22substantial-compliance-1125506>.

¹⁰⁰ Deep Sea Minerals, "Deep Sea Minerals Corp. Submits Application to NOAA Under Deep Seabed Hard Mineral Resources Act," March 23, 2026, <https://deepseamineralscorp.com/news-release/deep-sea-minerals-corp-submits-application-to-noaa-under-deep-seabed-hard-mineral-resources-act/>; and Business Wire, "American Ocean Minerals Corporation to Merge with Odyssey Marine Exploration, Inc., Creating a \$1B U.S.-Controlled Deep-Sea Critical Minerals Platform," April 8, 2026, <https://www.businesswire.com/news/home/20260408786194/en/American-Ocean-Minerals-Corporation-to-Merge-with-Odyssey-Marine-Exploration-Inc.-Creating-a-%241B-U.S.-Controlled-Deep-Sea-Critical-Minerals-Platform>.

¹⁰¹ NOAA, "Deep Seabed Hard Minerals Mining," <https://oceanservice.noaa.gov/deep-seabed-mining/> (hereinafter NOAA, "Deep Seabed Hard Minerals Mining").

¹⁰² NOAA, "Deep Seabed Mining: Notice of Receipt of Applications," 90 *Federal Register* 60064.

¹⁰³ NOAA, "Deep Seabed Mining: Notice of Receipt of Applications for Deep Seabed Mining Exploration Licenses and Announcement of Public Comment Period and Virtual Public Hearings," 91 *Federal Register* 13822, March 23, 2026 (hereinafter NOAA, "Deep Seabed Mining: Notice of Receipt of Applications," 91 *Federal Register* 13822). The *Federal Register* notice links to American Metal Resources' application. In the application, the company "acknowledges that a portion of its proposed exploration area overlaps with ISA-designated 'reserved areas'" and states it was "informed that a portion of its application overlaps with an earlier-in-time applicant." See American Metal Resources, *Final Formal DSHMRA Application Submission*, August 7, 2025, pp. 141-142.

¹⁰⁴ NOAA, "Deep Seabed Mining: Notice of Receipt of Applications," 91 *Federal Register* 13822. The *Federal Register* notice links to SeaX's application. In the application, the company "acknowledges that a portion of its proposed exploration area overlaps with ISA-designated 'reserved areas.'" See SeaX, *Final Formal DSHMRA Application Submission*, August 10, 2025, p. 141.

¹⁰⁵ See "Deep Seabed Hard Mineral Resources Act and Other Applicable U.S. Laws" and footnote 80.

¹⁰⁶ TMC USA, *Application for Polymetallic Nodule Exploration License for USA-A*, July 2025, p. 23 (hereinafter TMC USA, *Application USA A*); and TMC USA, *Application for Polymetallic Nodule Exploration License for USA B*, July 2025, p. 31 (hereinafter TMC USA, *Application USA B*). TMC USA's applications for USA A and USA B can be accessed at NOAA, "Deep Seabed Mining: Notice of Receipt of Applications," 90 *Federal Register* 60064.

sponsored TMC’s subsidiary Tonga Offshore Mining Limited (TOML).¹⁰⁷ The ISA exploration areas contracted to TMC’s subsidiaries sponsored by Nauru and Tonga were set aside for developing countries (i.e., ISA-designated reserved areas). In its DSHMRA exploration applications to NOAA, TMC USA stated that NORI and Nauru had updated their 2017 sponsorship agreement to consider TMC USA’s applications to NOAA—the updated sponsorship agreement included the following clause:

Save to the extent that the Republic seeks to defend its rights or reputation, the Republic will not, and will not cause any natural or legal person under the Republic’s effective control to take any action or make any statements, whether oral or in writing, in any international or domestic forum, which disputes, opposes, obstructs, interferes with or brings into disrepute: (a) any application made by TMC Subsidiary to the US for the issuance of an exploration license or commercial recovery permit from the US; or (b) any exploration or commercial recovery activity undertaken by TMC Subsidiary pursuant to such a license or permit.¹⁰⁸

TMC USA’s application to NOAA also conveyed that TOML and Tonga were negotiating an update to their 2021 sponsorship agreement.¹⁰⁹ In August 2025, TMC announced that an updated sponsorship agreement had been signed.¹¹⁰ NORI’s ISA exploration contract is set to expire on July 21, 2026, and TOML’s ISA exploration contract is set to expire on January 10, 2027. TMC communicated through its U.S. Securities and Exchange Commission filing that both NORI and TOML intend to submit applications for a five-year contract extension to the ISA.¹¹¹ Nauru and NORI applied to the ISA for a contract extension, and the ISA stated its intent to review this application, along with others, during its June-July 2026 session.¹¹² NOAA has no precedent for evaluating and issuing exploration license or commercial recovery permit applications that overlap with ISA contracted areas. It remains to be seen whether NOAA would determine DSHMRA applications that overlap with ISA designated areas an “unreasonable interference,” as discussed above.¹¹³

¹⁰⁷ TMC, “Nodules,” <https://metals.co/nodules/> (hereinafter TMC, “Nodules”). Also see ISA, “Nauru Ocean Resources Inc.,” <https://isa.org.jm/contractor/nauru-ocean-resources-inc/>; and ISA, “Tonga Offshore Mining Limited,” <https://isa.org.jm/contractor/tonga-offshore-mining-limited/>.

¹⁰⁸ TMC USA, *Application USA A*, p. 23; and TMC USA, *Application USA B*, pp. 31-32. Also, see TMC, “TMC and Nauru Announce Updated Sponsorship Agreement for Nauru Ocean Resources Inc. (NORI),” June 4, 2025, <https://investors.metals.co/news-releases/news-release-details/tmc-and-nauru-announce-updated-sponsorship-agreement-nauru-ocean> (hereinafter TMC, “Updated Sponsorship Agreement for NORI”).

¹⁰⁹ TMC USA, *Application USA A*, p. 23; and TMC USA, *Application USA B*, p. 32.

¹¹⁰ TMC, “TMC and Tonga Announce Updated Sponsorship Agreement for Tonga Offshore Mining Ltd (TOML),” August 4, 2025, <https://investors.metals.co/news-releases/news-release-details/tmc-and-tonga-announce-updated-sponsorship-agreement-tonga> (hereinafter TMC, “Updated Sponsorship Agreement for TOML”).

¹¹¹ TMC, U.S. Securities and Exchange Commission, Form 10-Q for the Quarterly Period Ended September 30, 2025, November 13, 2025, p. 44. Also, see ISA, “Minerals: Polymetallic Nodules,” <https://isa.org.jm/exploration-contracts/polymetallic-nodules/> (hereinafter ISA, “Minerals: Polymetallic Nodules”).

¹¹² ISA, *Report of the Chair of the Legal and Technical Commission on the Work of the Commission at the First Part of Its Thirty-First Session*, ISBA/31/C/4, March 6, 2026, p. 3 (hereinafter ISA, ISBA/31/C/4); and Republic of Nauru, *Item 13: Report of the Chair of the Legal and Technical Commission on the Work of the Commission at the First Part of its Thirty-First Session*, March 16, 2026 (hereinafter Republic of Nauru, *Item 13: Report of the Chair of the Legal and Technical Commission*).

¹¹³ 30 U.S.C. §1415(a).

Partially in response to ongoing U.S. seabed mining interests, the ISA has stated that any private contractors holding a current ISA contract that proceed with mineral-related activities outside the ISA framework may

- have ISA contracts suspended or terminated,
- receive financial penalties, or
- face other corrective actions.¹¹⁴

The ISA also stated that it “lack[s] precedent” for acting under such a scenario, but it would likely issue formal warnings (ideally after consulting with the contractor or sponsoring nation) and then submit the issue for the ISA Council’s consideration.¹¹⁵ The ISA stated that parent companies are “not legally recognized as contractors” and asserted that “TMC and Allseas are not exploration contractors.”¹¹⁶ It remains unclear if the ISA will consider Nauru and Tonga to be in violation of their ISA contracts should Nauru and Tonga either allow TMC USA seabed mining activities authorized under DSHMRA to proceed or take no action to prevent such activities in their ISA-granted contracted areas with other TMC subsidiaries, NORI and TOML.¹¹⁷ During the ISA’s March 2026 session, an ISA Legal and Technical Commission report recommended that the ISA Council request clarification and information on any agreements sponsoring nations have already entered into, citing a TMC USA exploration contract to NOAA (discussed above), or may enter into in the future that may counter UNCLOS provisions, including the common heritage of humankind.¹¹⁸ Nauru responded to the report, stating that it supports the common heritage principle, but such UNCLOS provisions “should not be understood as attributing to a State Party responsibility for the independent sovereign acts of a non-party acting pursuant to its own domestic legal framework.”¹¹⁹ Nauru also requested that the two unnamed contractors referenced in the Legal and Technical Commission report be identified.¹²⁰

Some stakeholders speculate that TMC USA’s applications to NOAA may be part of “a tactic to put pressure on the ISA” to adopt its exploitation regulations,¹²¹ a notion that TMC has rejected.¹²² The adoption of the ISA’s exploitation regulations would aim to allow seabed mining companies sponsored by nations party to UNCLOS to apply for exploitation contracts and potentially proceed with commercial-scale mining through the ISA framework.¹²³ However,

¹¹⁴ ISA, “FAQs for the Media.” In particular, see “What Are the Potential Global Implications of the US Executive Order?”

¹¹⁵ ISA, “FAQs for the Media.” In particular, see “What Are the Sanctions and Measures Provided by UNCLOS?”

¹¹⁶ ISA, “FAQs for the Media.” In particular, see “Does ISA Consider TMC or Allseas ‘Contractors’ in this Regard?” Allseas is a Dutch-Swiss ocean engineering company that is in partnership with TMC to develop the “world’s first complete seabed-to-shore deep-sea nodule supply chain” (Allseas, “Polymetallic Nodule Collection,” <https://www.allseas.com/en/what-we-do/polymetallic-nodule-collection>).

¹¹⁷ For example, see Coalter Lathrop and Franka Nodewald, “Reclaiming Authority: Forcing Seabed Mining Contractors to Choose between the ISA and the USA,” *EJIL: Talk!*, December 9, 2025, <https://www.ejiltalk.org/reclaiming-authority-forcing-seabed-mining-contractors-to-choose-between-the-isa-and-the-usa/>.

¹¹⁸ ISA, *Report of the Legal and Technical Commission on the Implementation of the Council’s Decision Relating to a Request for Additional Information from Contractors at Risk of Non-Compliance with their Contractual Obligations*, ISBA/31/C/4/Add.1, March 6, 2026.

¹¹⁹ Republic of Nauru, *Item 13: Report of the Chair of the Legal and Technical Commission*.

¹²⁰ Republic of Nauru, *Item 13: Report of the Chair of the Legal and Technical Commission*.

¹²¹ SDG Knowledge Hub, “Amid Concerns over Exploitation, ISA Forges Ahead with Deep Sea Mining Rules,” April 2, 2025, <https://sdg.iisd.org/news/amid-concerns-over-exploitation-isa-forges-ahead-with-deep-sea-mining-rules/>.

¹²² Email correspondence between CRS and TMC, December 30, 2025.

¹²³ Article 10 of the Annex to UNCLOS states that an operator who holds an ISA-issued exploration contract “shall (continued...)”

TMC’s chair and chief executive officer testified in a House Natural Resources Subcommittee on Oversight and Investigation hearing in the 119th Congress that the “ISA failed to deliver on its goal to adopt the final mining code, in 2020, 2023 and will almost certainly fail again in 2025.”¹²⁴ As of March 19, 2026, which marked the close of the Part I of the 31st session of the ISA, the ISA had not adopted a mining code with exploitation regulations.¹²⁵

Ratification of the United Nations Convention on the Law of the Sea

The U.S. Senate has considered ratifying UNCLOS multiple times.¹²⁶ From the 115th through 119th Congresses, some Members have introduced resolutions calling on the U.S. Senate to give its advice and consent to the ratification of UNCLOS.¹²⁷ Members of Congress and other stakeholders may call for the United States to join UNCLOS for several reasons related to deep-seabed mining issues, including allowing the United States to (1) sponsor U.S. companies seeking ISA contracts and (2) formally participate in the ISA decisionmaking. UNCLOS has not been ratified by the Senate for a variety of reasons, including that some Members and stakeholders believe the United States already has the authority to explore and recover seabed minerals in ABNJ.¹²⁸

ISA Seabed Mining Options for U.S. Companies

By ratifying UNCLOS, the United States would become a member of the ISA and then could sponsor U.S. companies seeking ISA contracts. Currently, U.S. companies would have to establish a subsidiary in a nation party to UNCLOS to seek ISA contracts. For example, the United Kingdom (UK) arm of Lockheed Martin established UK Seabed Resources.¹²⁹ Through sponsorship of the UK, UK Seabed Resources held two ISA exploration contracts for polymetallic nodules in the CCZ.¹³⁰ On March 16, 2023, Loke Marine Minerals, a Norwegian

have a preference and a priority among applicants for a plan of work covering exploitation of the same area and resources.”

¹²⁴ U.S. Congress, House Committee on Natural Resources, Subcommittee on Oversight and Investigations, *Exploring the Potential of Deep-Sea Mining to Expand American Mineral Production*, hearing, 119th Cong., 1st sess., April 29, 2025 (hereinafter *Exploring the Potential of Deep-Sea Mining*, hearing, 119th Cong.). In particular, see Gerard Barron, chairman and CEO, TMC, written testimony for *Exploring the Potential of Deep-Sea Mining*, hearing, 119th Cong.

¹²⁵ ISA, “Advanced Negotiations on the Mining Code.”

¹²⁶ To date, UNCLOS and the 1994 Agreement have been considered by Senate Committee on Foreign Relations three times (1994, 2003, and 2007).

¹²⁷ S.Res. 598 and H.Res. 339 in the 115th Cong.; S.Res. 284 and H.Res. 454 in the 116th Cong.; S.Res. 220 and H.Res. 361 in the 117th Cong.; S.Res. 466 in the 118th Cong.; and S.Res. 331 in the 119th Cong.

¹²⁸ For example, see the Statement of Steven Groves, Bernard and Barbara Lomas Fellow, the Heritage Foundation, Washington, DC, in U.S. Congress, Senate Committee on Foreign Relations, *The Law of the Sea Convention (Treaty Doc. 103-39)*, 112th Cong., 2nd sess., May 23, June 14, and June 28, 2012, S.Hrg. 112-654 (GPO, 2013), p. 191; Gerard Barron, Chairman and CEO, TMC, written testimony for *Exploring the Potential of Deep-Sea Mining*, hearing, 119th Cong.; and Kraska, “The U.S. Executive Order on Seabed Mining is Consistent with International Law.” Some Members in the 119th Congress introduced legislation (e.g., H.R. 3803, H.R. 4018, S. 2860) that would direct NOAA to expedite the authorization of U.S. seabed mining activities in areas beyond national jurisdiction under DSHMRA.

¹²⁹ Reuters, “Lockheed Martin Sells Deep-Sea Mining Firm to Norway’s Loke,” March 16, 2024, <https://www.reuters.com/markets/deals/norways-loke-buys-uk-deep-sea-mining-firm-lockheed-2023-03-16/>.

¹³⁰ ISA, “Minerals: Polymetallic Nodules.”

company, acquired 100% of UK Seabed Resources.¹³¹ This acquisition also included the transfer of UK Seabed Resources' two ISA-issued exploration contracts to Loke Marine Minerals (**Figure 3**).¹³² However, Loke Marine Minerals filed for bankruptcy in April 2025, claiming "it was difficult to raise capital" due to uncertainty over the ability of the ISA to adopt exploitation regulations in the near future.¹³³ Following Loke Marine Minerals' bankruptcy, Glomar Minerals, an American critical minerals company, acquired UK Seabed Resources and its two ISA exploration contracts.¹³⁴ As another example, Impossible Metals, a California-based company, established a subsidiary (Impossible Metals Bahrain W.L.L.) and, through a Kingdom of Bahrain sponsorship, submitted an application for an exploration contract to the ISA in September 2025.¹³⁵

Some stakeholders, including some who oppose U.S. ratification of UNCLOS, contend that the United States already has the authority to explore and recover seabed minerals in ABNJ.¹³⁶ Several U.S. companies have submitted DSHMRA applications to NOAA since the issuance of E.O. 14285.¹³⁷ Other U.S.-based companies may find it too risky to pursue NOAA exploration licenses for seabed mining or to act on such licenses in the absence of U.S. ratification of UNCLOS.¹³⁸ Lack of accession by the United States to UNCLOS has not precluded NOAA from extending two DSHMRA exploration licenses to Lockheed Martin through 2027,¹³⁹ and determining four post-E.O. 14285 applications to be "fully compliant" with DSHMRA, as of April 14, 2026.¹⁴⁰ While some seabed mining companies have secured strategic investments,¹⁴¹ conflicting claims between DSHMRA licenses and permits and ISA contracts could deter some financiers from backing U.S.-authorized deep-seabed mining projects.¹⁴²

In addition to uncertainties facing private companies, state actors ranging from European nations to China have commented on U.S. actions to promote seabed mining in ABNJ.¹⁴³ For example, a

¹³¹ Reuters, "Lockheed Martin Sells Deep-Sea Mining Firm to Norway's Loke," March 16, 2023, <https://www.reuters.com/markets/deals/norways-loke-buys-uk-deep-sea-mining-firm-lockheed-2023-03-16/> (hereinafter Reuters, "Lockheed Martin Sells Deep-Sea Mining Firm").

¹³² Reuters, "Lockheed Martin Sells Deep-Sea Mining Firm."

¹³³ Yusuf Khan, "A Miner Goes Bust, Another Goes Solo as Progress on U.N. Seabed Rules Stalls," *Wall Street Journal*, April 11, 2025.

¹³⁴ ISA, ISBA/31/C/3; and Glomar Minerals, "Company," <https://glomarminerals.com/company/>.

¹³⁵ ISA, ISBA/31/LTC/2.

¹³⁶ See footnote 128.

¹³⁷ Northey, "Trump Official: Deep-Sea Mining Just Years Away."

¹³⁸ For example, NOAA, "Deep Seabed Mining: Approval of Exploration License Extensions," 82 *Federal Register* 42327.

¹³⁹ NOAA, "Deep Seabed Mining," 87 *Federal Register* 52743.

¹⁴⁰ NOAA, "Deep Seabed Mining: Notice of Receipt of Applications," 90 *Federal Register* 60064.

¹⁴¹ For example, see TMC, "TMC Announces Strategic Investment from Korea Zinc—a World-Leader in Non-Ferrous Metal Refining and pCAM Technology—to Advance Development of Deep-Seabed Critical Minerals in the U.S.," June 16, 2025, <https://investors.metals.co/news-releases/news-release-details/tmc-announces-strategic-investment-korea-zinc-world-leader-non> (hereinafter, "TMC, 'TMC Announces Strategic Investment from Korea Zinc'"); and TMC, "TMC Announces \$37 Million Strategic Investment to Advance Deep-Sea Mineral Development," March 12, 2025, <https://investors.metals.co/news-releases/news-release-details/tmc-announces-37-million-strategic-investment-advance-deep-sea/>.

¹⁴² CRS correspondence with NOAA, 2022. Some financial institutions have made statements that they will not fund exploration and extraction activities associated with deep-seabed mining. For example, see Stop Deep Seabed Mining, "Endorsers," <https://www.stopdeepseabedmining.org/endorsers/>.

¹⁴³ For example, see Kraska, "The U.S. Executive Order on Seabed Mining is Consistent with International Law," pp. 503-504; Cain Burdeau, "Deep Divide: US Angers World as It Pushes Go-It-Alone Approach to Deep-Sea Mining," (continued...)

spokesperson for China’s Ministry of Foreign Affairs criticized the U.S. issuance of E.O. 14285 as showing that the United States “would brush aside international law and international order in pursuit of its selfish interests.”¹⁴⁴ Also, the Secretary-General of the ISA warned that any unilateral action outside the UNCLOS framework “sets a dangerous precedent that could destabilize the entire system of global ocean governance.”¹⁴⁵ Should NOAA and ISA approvals vary in some measure, the pathway for resolving such geopolitical disagreements is unclear. Some experts have alluded to the contrast between nonparties and parties to UNCLOS in pursuing unilateral actions. In particular, they have asserted that if any of the 171 nations party to UNCLOS “were to participate in or allow their citizens to participate in U.S.-authorized mining activity in [ABNJ], they would violate their treaty obligations. Any other Convention partner could bring them before the International Tribunal for the Law of the Sea in Hamburg, Germany.”¹⁴⁶

ISA Decisionmaking

During the negotiation of the 1994 Agreement, one permanent seat on the 36-member ISA Council was created for the country “having the largest economy in terms of gross domestic product” on the date UNCLOS entered into force, which at the time was the United States.¹⁴⁷ Because that is still the case, if the United States ratified UNCLOS, it would occupy the only permanent seat on the ISA Council.¹⁴⁸ The Council establishes ISA policies, proposes rules of procedure, enters into agreements with the United Nations or other international organizations, exercises control over activities occurring on or within the seabed in ABNJ (for parties to UNCLOS), and disapproves areas for exploitation, among other powers.¹⁴⁹ In general, the Council makes decisions by consensus for administrative, budgetary, and financial matters, including distribution fees.¹⁵⁰

Negotiations are ongoing for ISA regulations for the exploitation of mineral resources in ABNJ,¹⁵¹ and some stakeholders contend that the United States should ratify UNCLOS to

Courthouse News Service, March 11, 2026, <https://www.courthousenews.com/deep-divide-us-angers-world-as-it-pushes-go-it-alone-approach-to-deep-sea-mining/>; and Elizabeth Claire Alberts and Kara Fox, “China’s Deep-Sea Mining Fleet may also Track US Submarines,” *Mongabay*, March 24, 2025, <https://news.mongabay.com/custom-story/2026/03/chinas-deep-sea-mining-fleet-may-also-track-us-submarines/> (hereinafter Alberts and Fox, “China’s Deep-Sea Mining Fleet may also Track US Submarines”).

¹⁴⁴ The People’s Republic of China, Ministry of Foreign Affairs, “Foreign Ministry Spokesperson Guo Jiakun’s Regular Press Conference on April 25, 2025,” April 25, 2025, https://www.mfa.gov.cn/eng/xw/fyrbt/lxjzh/202504/t20250425_11604503.html.

¹⁴⁵ ISA, “Statement on the US Executive Order: ‘Unleashing America’s Offshore Critical Minerals and Resources’,” April 30, 2025, <https://www.isa.org.jm/news/statement-on-the-us-executive-order-unleashing-americas-offshore-critical-minerals-and-resources/>.

¹⁴⁶ Coalter G. Lathrop, “In Its Hunt for Critical Minerals, the US Is Misconstruing What Is and Is not America’s,” *The Conversation*, March 13, 2026, <https://theconversation.com/in-its-hunt-for-critical-minerals-the-us-is-misconstruing-what-is-and-is-not-americas-278185> (hereinafter Lathrop, “In Its Hunt for Critical Minerals”). Refer to footnote 46.

¹⁴⁷ Section 3, paragraph 15(a), of the Annex to the 1994 Agreement.

¹⁴⁸ For example, see U.S. Congress, Senate Committee on Foreign Relations, *The Law of the Sea Convention (Treaty Doc. 103-39)*, 112th Cong., 2nd sess., May 23, June 14, and June 28, 2012, S.Hrg. 112-654 (Washington, DC: GPO, 2013), p. 222. The permanent seat is currently occupied by Italy. ISA, “The Council,” <https://isa.org.jm/organs/the-council/>.

¹⁴⁹ UNCLOS Article 162.

¹⁵⁰ Section 3, paragraphs 2 and 4, of the Annex to the 1994 Agreement.

¹⁵¹ ISA, “The Mining Code,” <https://www.isa.org.jm/the-mining-code/draft-exploitation-regulations-2/>.

formally participate in the development of these regulations.¹⁵² Despite not ratifying UNCLOS, however, the United States' input as an observer delegate to the ISA has been generally respected and accepted in the drafting of the ISA's exploitation regulations, according to the Department of State.¹⁵³

Global Critical Minerals Marketplace and China's Dominance

Dependence on foreign sources of critical minerals may lead to U.S. supply uncertainties, ranging from cost instability to supply disruptions. The International Energy Agency (IEA), an autonomous intergovernmental organization, has highlighted the "risks of high supply concentration of critical mineral supplies, especially in processing and refining."¹⁵⁴

An IEA report identified that in 2024 China had a monopoly over the global midstream and downstream battery supply chain for lithium, cobalt, and manganese (critical minerals found in seabed deposits; **Table 1**).¹⁵⁵ In addition to processing and refining, China owns or finances mines in the Democratic Republic of the Congo (DRC), the world's largest cobalt supplier.¹⁵⁶ Some of these mines in the DRC have been associated with unsafe working conditions and forced labor.¹⁵⁷ China has restricted or prohibited the export of certain critical minerals to the United States.¹⁵⁸ In October 2025, President Trump and China's President Xi Jinping agreed that China would suspend its export controls on rare earth elements (REEs) for one year, among other things, and the United States would agree to a one-year suspension of a Department of Commerce Bureau of Industry and Security rule on export controls to China.¹⁵⁹

Some stakeholders may look to seabed mining to reduce dependence on sources associated with weak protective labor and environmental standards and practices.¹⁶⁰ Other stakeholders have promoted seabed mining "as an opportunity to introduce new mineral supplies that are

¹⁵² For example, Dan Ackerman, "Why the U.S. Is Absent from International Seabed Mining Talks," *NPR*, March 29, 2024, <https://www.npr.org/2024/03/29/1241726831/why-the-u-s-is-absent-from-international-seabed-mining-talks>.

¹⁵³ Telephone conversation between CRS and the U.S. Department of State, October 17, 2022.

¹⁵⁴ Tae-Yoon Kim et al., "With New Export Controls on Critical Minerals, Supply Concentrations Risks Become Reality," *IEA*, October 23, 2025, <https://www.iea.org/commentaries/with-new-export-controls-on-critical-minerals-supply-concentration-risks-become-reality>.

¹⁵⁵ IEA, *Global Critical Minerals Outlook 2025*, 2025, p. 53.

¹⁵⁶ IEA, *Global Critical Minerals Outlook 2025*, 2025, p. 36.

¹⁵⁷ Andrew L. Gulley et al., "China's Domestic and Foreign Influence in the Global Cobalt Supply Chain," *Resources Policy*, vol. 62 (2019), pp. 317-323; and Eric Lipton and Dionne Searcey, "Chinese Company Removed as Operator of Cobalt Mine in Congo," *New York Times*, February 28, 2022.

¹⁵⁸ For example, see See Institute for Energy Research, "China Has Banned Exports of Some Rare Minerals to the United States," December 12, 2024, <https://www.instituteforenergyresearch.org/international-issues/china-has-banned-exports-of-some-rare-minerals-to-the-united-states/>; Joseph Sopcisak, "China Imposes Export Controls on Medium and Heavy Rare Earth Materials," *Holland & Knight, Holland & Knight Alert*, April 4, 2025, <https://www.hklaw.com/en/insights/publications/2025/04/china-imposes-export-controls-on-medium-and-heavy-rare-earth-materials>; and Center for Strategic and International Studies, "China's New Rare Earth and Magnet Restrictions Threaten U.S. Defense Supply Chains," October 9, 2025, <https://www.csis.org/analysis/chinas-new-rare-earth-and-magnet-restrictions-threaten-us-defense-supply-chains>.

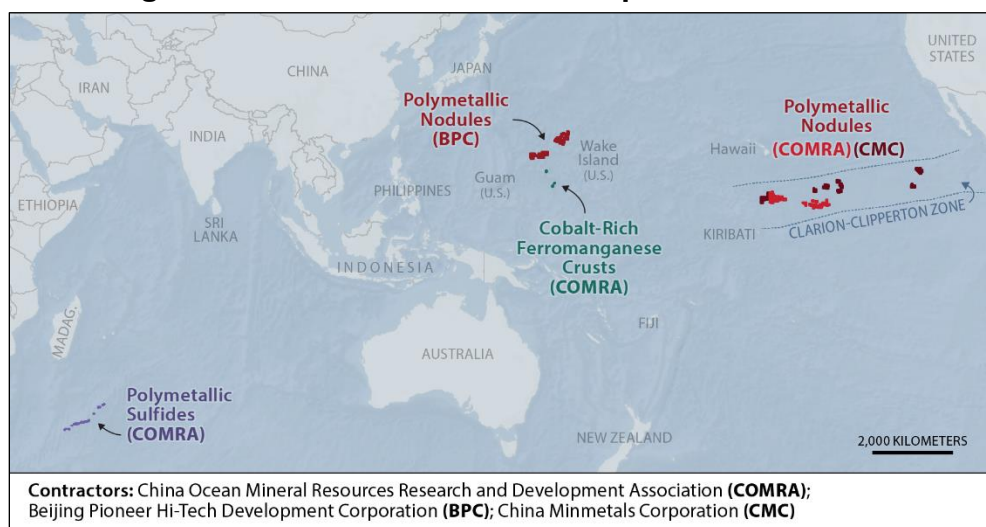
¹⁵⁹ Kyle Chan et al., "What Happened When Trump Met Xi?," *Brookings Institute*, November 5, 2025, <https://www.brookings.edu/articles/what-happened-when-trump-met-xi/>. For the U.S. rule on export controls to China, see Department of Commerce, Bureau of Industry and Security, "Expansion of End-User Controls to Cover Affiliates of Certain Listed Entities," 90 *Federal Register* 47201, September 30, 2025.

¹⁶⁰ NOAA, *Deep Sea Mining: A Report to Congress*, 1995, p. 2 (hereinafter NOAA, *1995 Report to Congress*).

independent of Chinese-controlled supply chains.”¹⁶¹ In addition to seabed minerals as potential alternative sources for critical minerals, the Biden Administration promoted recycling and recapture of minerals from waste or mine tailings as other options.¹⁶²

Some Members of Congress have expressed concern about China’s dominance of the global critical mineral market place and potential dominance over deep-sea assets, pointing to China’s five ISA exploration contracts (the most of any country).¹⁶³ China holds three contracts for polymetallic nodules (two of these are located in the CCZ); one contract for polymetallic sulfides; and one contract for cobalt-rich ferromanganese crusts (**Figure 4**).¹⁶⁴ In addition, according to the ISA, China will be the largest funding contributor to the ISA in 2026.¹⁶⁵ Some stakeholders speculate that China has acquired several exploration contracts in order to quickly convert them to exploitation contracts when the ISA adopts its regulations for the exploitation of seabed minerals.¹⁶⁶ Some stakeholders also have expressed concerns about China’s seabed mining interest and activities within some Pacific Island countries’ EEZs.¹⁶⁷

Figure 4. Locations of China’s Five Exploration Contracts



Source: Map created by CRS using International Seabed Authority (ISA), “Maps,” <https://www.isa.org.jm/exploration-contracts/maps/>.

Notes: The ISA issues exploration contracts for three types of seabed deposits: polymetallic nodules, cobalt-rich ferromanganese crust, and polymetallic sulfides. Under the ISA framework, exploration contracts can include

¹⁶¹ Tom LaTourrette et al., *The Potential Impact of Seabed Mining on Critical Mineral Supply Chains and Global Geopolitics*, RAND, 2025, p. 3 (hereinafter LaTourrette et al., *Potential Impact of Seabed Mining*).

¹⁶² For example, White House, *Executive Order on America’s Supply Chains: A Year of Action and Progress*, February 2022, see p. 16, <https://bidenwhitehouse.archives.gov/wp-content/uploads/2022/02/Capstone-Report-Biden.pdf>.

¹⁶³ For example, Letter from U.S. Representative Robert J. Wittman and 30 other Members to then-U.S. Secretary of Defense Lloyd Austin, December 7, 2023, https://wittman.house.gov/uploadedfiles/20231207_-_wittmanstefanik_-_national_security_impacts_of_seabed_mining_-_signed.pdf.

¹⁶⁴ ISA, “Exploration Contracts,” <https://www.isa.org.jm/exploration-contracts/>.

¹⁶⁵ ISA, “Contributors Dashboard,” <https://isa.org.jm/contributors-dashboard/>.

¹⁶⁶ Article 10 of the Annex to UNCLOS states that an operator who holds an ISA-issued exploration contract “shall have a preference and a priority among applicants for a plan of work covering exploitation of the same area and resources.”

¹⁶⁷ For more information about U.S. and PRC seabed mining engagement with certain Pacific Island countries, see CRS In Focus IF12974, *Seabed Mining Interests Across the Pacific Islands*, by Caitlin Keating-Bitonti and Jared G. Tupuola.

more than one locality but may not exceed 75,000 square kilometers (km²) for polymetallic nodules (red shades), 3,000 km² consisting of 150 blocks (no block greater than 20 km²) for cobalt-rich ferromanganese crusts (green), and 10,000 km² consisting of 100 blocks (no block greater than 100 km²) for polymetallic sulfides (purple).

In 2023, some Members of Congress voiced concerns about China's seabed mining activities and China's potential to "seize unfettered control of deep-sea assets."¹⁶⁸ Some stakeholders also have expressed concern that "deep-sea mining could act as cover for less peaceful activities."¹⁶⁹ Although a 2022 RAND report "found no evidence to support the notion that China's seabed mining program is intended as cover for military purposes," the authors stated that they "urge continued monitoring" of China's seabed mining technology development and ship activity.¹⁷⁰

Some speculate that data collected from ABNJ by PRC civilian vessels for research or other purposes may be used for military purposes and may present national security concerns for some countries.¹⁷¹ For example, in 2021, a PRC research vessel detoured from its ISA exploration site in the CCZ and spent five days offshore of Hawaii.¹⁷²

On March 24, 2026, Mongabay and CNN published an investigation that identified that, over the past five years, eight China-owned research vessels claiming to be involved in deep-seabed mining exploration spent the majority of their time operating outside ISA exploration areas assigned to China.¹⁷³ The authors of this investigation speculated that "the ships may serve dual-use purposes, having a strategic military role as well as a scientific one," and the information gathered by these ships may be used to locate telecommunications cables and gather information to track foreign submarines, among other potential uses.¹⁷⁴

Potential Marine Environmental Impacts of Seabed Mining

The potential effects of seabed mining on the marine environment remain incompletely understood. This is in part because commercial-scale deep-seabed mining in ABNJ has not been authorized. Some governments and stakeholders, including some Members of Congress, have raised concerns regarding the potential environmental impacts of seabed mining and have called for a moratorium, precautionary pause, or ban on deep-sea mining, either in international waters, national waters, or both (see textbox below entitled, "Calls for a Deep-Seabed Mining Moratorium"). Proponents of seabed mining that is "properly managed with appropriate governance safeguards" argue that sourcing minerals from the deep sea has the potential to have less pollution (e.g., tailings, waste), fewer impacts on freshwater sources, and fewer social impacts (e.g., human fatalities, injuries, health effects) than traditional land-based open-pit and

¹⁶⁸ Letter from U.S. Representative Robert J. Wittman and 30 other Members to then-U.S. Secretary of Defense Lloyd Austin, December 7, 2023, https://wittman.house.gov/uploadedfiles/20231207_-_wittmanstefanik_-_national_security_impacts_of_seabed_mining_-_signed.pdf. Also see the majority's hearing memorandum for *Exploring the Potential of Deep-Sea Mining*, hearing, 119th Cong.

¹⁶⁹ *Economist*, "China Is Itching to Mine the Ocean Floor," July 28, 2024.

¹⁷⁰ Tom LaTourrette et al., "China's Role in the Global Development of Critical Resources," RAND, November 22, 2022, p. ix.

¹⁷¹ Austin Ramzy, "China Is Mapping the Seabed to Unlock New Edge in Warfare," *Wall Street Journal*, updated March 12, 2025; and Alberts and Fox, "China's Deep-Sea Mining Fleet may also Track US Submarines."

¹⁷² *Economist*, "China Is Itching to Mine the Ocean Floor," July 28, 2024.

¹⁷³ Alberts and Fox, "China's Deep-Sea Mining Fleet may also Track US Submarines."

¹⁷⁴ Alberts and Fox, "China's Deep-Sea Mining Fleet may also Track US Submarines."

underground mining.¹⁷⁵ Although commercial-scale deep-seabed mining in ABNJ has not been authorized, some stakeholders have argued that seabed mining should not be considered a substitute for land-based mining because seabed deposits would be “exploited *in addition* to land-based deposits, not instead of them.”¹⁷⁶

Calls for a Deep-Seabed Mining Moratorium

Some stakeholders point to the lack of deep-sea *environmental baseline* data—which are used to discern whether, and to what degree, habitats and species are vulnerable to disturbance—as one reason to delay or ban deep-seabed mining. Several technology companies (e.g., Apple, Google, Samsung) and automakers (e.g., BMW, Volkswagen, Volvo) announced support for a moratorium on seabed minerals being used in electric vehicle batteries and other technologies until seabed mining activities can be performed in a way that protects the marine environment. More than 40 foreign governments also have called for a moratorium on deep-seabed mining. France both holds an International Seabed Authority (ISA) exploration license for seabed mining in areas beyond national jurisdiction (ABNJ) and supports a moratorium. France’s State Secretary for the Sea has said that France will continue to hold its ISA contract and use it for “more research, more science, more data” to better understand the deep sea.

In 2024, some Members of Congress signed a letter urging President Biden to “support a precautionary pause or moratorium on deep-seabed mining until and unless there is sufficient scientific information and knowledge of the deep sea.” While some Members in the 119th Congress introduced legislation to support U.S. seabed mining in ABNJ (e.g., H.R. 3803, H.R. 4018, S. 2860), other Members introduced legislation to establish a moratorium. Some Members introduced H.R. 663 instructing the President to direct U.S. representatives to relevant international organizations to call for a moratorium on deep-seabed mining until “regulations have been promulgated by the [ISA].” Some Members of Congress proposed legislation in the 119th Congress that could improve understanding of seabed mining. For example, H.R. 664 would authorize the National Oceanic and Atmospheric Administration (NOAA) to enter into an agreement with the National Academies of Sciences, Engineering, and Medicine to “conduct a comprehensive study of the environmental impacts of mining activities on the deep seabed and the Outer Continental Shelf.” The bill also would prohibit NOAA from issuing a license, permit, or other authorization for exploration or commercial recovery under the Deep Seabed Hard Mineral Resources Act (P.L. 96-283).

Sources: Elizabeth Claire Alberts, “The Deep Sea Is Vital to Protect the Ocean: Q&A with France’s Hérnè Berville,” *Mongabay*, August 2, 2023, <https://news.mongabay.com/2023/08/the-deep-sea-is-vital-to-protect-the-ocean-qa-with-frances-herve-berville/>; Diva Amon et al., “Assessment of Scientific Gaps Related to the Effective Environmental Management of Deep-Sea Mining,” *Marine Policy*, vol. 138 (2022), pp. 1-22; Deep Sea Conservation Coalition, “Voices Calling for a Moratorium: Governments and Parliamentarians,” <https://deep-sea-conservation.org/solutions/no-deep-sea-mining/momentum-for-a-moratorium/governments-and-parliamentarians/>; ISA, “Institut Français de Recherche pour l’Exploitation de la Mer,” <https://www.isa.org.jm/contractor/institut-francais-de-recherche-pour-l-exploitation-de-la-mer/>; Letter from U.S. Representatives Grijalva, Case, Tlaib, Huffman, Norton, McCollum, Cohen, Lofgren, Jackson, Kamlager-Dove, Garcia, and Jayapal to President Biden, June 28, 2024, <https://plus.cq.com/pdf/8043575>; Lisa Levin et al., “Defining ‘Serious Harm’ to the Marine Environment in the Context of Deep-Seabed Mining,” *Marine Policy*, vol. 74 (2016), pp. 245-259; Stop Deep Seabed Mining, “Endorsers,” <https://www.stopdeepseabedmining.org/endorsers/>.

Exploration of deep-sea habitats can provide *environmental baselines* for understanding whether—and to what degree—these habitats and their species are vulnerable to disturbance or change. NOAA’s 1975-1980 Deep Ocean Mining Environmental Studies Project and subsequent projects through the 1990s as directed by Congress under DSHMRA were limited to the biological effects of increased sedimentation on the seafloor.¹⁷⁷ In more recent years, NOAA has collaborated with the Bureau of Ocean Energy Management (BOEM) and the U.S. Geological

¹⁷⁵ For example, Daina Paulikas et al., “Life Cycle Climate Change Impacts of Producing Battery Metals from Land Ores Versus Deep-Sea Polymetallic Nodules,” *Journal of Cleaner Production*, vol. 275 (2020), p. 17. Also see TMC, “Nodules.”

¹⁷⁶ Justin Alger et al., “The False Promise of Deep-Sea Mining,” *npj Ocean Sustainability*, vol. 4, no. 21 (2025), p. 2.

¹⁷⁷ The Deep Ocean Mining Environmental Study conducted by NOAA was directed by Congress under DSHMRA (30 U.S.C. §1419(a)). The study focused primarily on determining the biological effects of increased sedimentation on the seafloor that would result from seabed mining operations. See, NOAA, *1995 Report to Congress*, p. 12.

Survey (USGS) to study a 1970s test site for seabed mining equipment on the Blake Plateau, off the Georgia coast, “to quantify the extent of the impacts, search for visual signs of ecosystem recovery, plan for additional research, and, ultimately, inform reviews, future decisions, and mitigation measures related to deep-sea mining in other areas.”¹⁷⁸ Mining technologies for the recovery of seabed minerals have evolved since DSHMRA was enacted.¹⁷⁹ For example, Impossible Metals Inc., a U.S. seabed mining company, has developed an AUV fixed with robotic arms and computer vision system that would hover over the seafloor to pick up individual polymetallic nodules.¹⁸⁰ Impossible Metals posits its AUV would have less sediment disturbance compared with other collection approaches and claims that its computer vision could help avoid nodules with attached marine life.¹⁸¹

Seabed mining companies have worked with scientists to collect environmental and biological data in deep-sea areas with mineral deposits of interest.¹⁸² These companies collect and share data with the ISA—a requirement of ISA exploration contracts—in part to understand the potential impacts of seabed mining activities.¹⁸³ Although scientists have worked with seabed mining companies to establish environmental baselines, some stakeholders may perceive their scientific research as a potential conflict of interest.¹⁸⁴ Some stakeholders may call for a third party or independent scientific institution to collect deep-sea data, although this type of research may be considered cost prohibitive.¹⁸⁵

Mineral deposits occur in various ocean environments, so different machinery and technology would be required to collect seabed material from different locations (**Figure 2**). Consequently, extrapolating changes to the marine environment from one area of the ocean to another may be challenging. For instance, some companies plan to use a self-propelled, remotely operated mining vehicle connected by a riser pump and pump system to a surface ship to collect polymetallic nodules from the surface of the seabed. In general, this operation would disturb the seafloor in three ways: (1) leave tracks in the seafloor, (2) remove nodules and sediment between the tracks, and (3) create a plume of resuspended sediment released by the movement of the mining

¹⁷⁸ NOAA, “Investigation of a Historic Seabed Mining Equipment Test Site on the Blake Plateau,” September 19, 2022, <https://oceanexplorer.noaa.gov/explorations/22seabed-mining/welcome.html>.

¹⁷⁹ NOAA, “Deep Seabed Mining: Revisions to Regulations,” 91 *Federal Register* 2642. The 96th Congress included among the purposes of DSHMRA “to encourage the continued development of technology necessary to recover the hard mineral resources of the deep seabed.” See 30 U.S.C. §1401(b)(5).

¹⁸⁰ Impossible Metals Inc., “Eureka Collection System.”

¹⁸¹ Impossible Metals Inc., “Frequently Asked Questions (FAQS),” <https://impossiblemetals.com/frequently-asked-questions/faqs-environmental-and-social-responsibility-for-deep-sea-mining/>.

¹⁸² For example, TMC, “The Metals Company Partners with Global Research Institutions to Advance Deep-Sea Science Program,” August 2020, <https://metals.co/deepgreen-partners-with-global-research-institutions-to-advance-deep-sea-science-program/>.

¹⁸³ ISA, *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*, ISBA/19/C/17, July 22, 2013; ISA, *Decision of the Assembly of the International Seabed Authority Relating to the Regulations on Prospecting and Exploration for Polymetallic Sulphides in the Area*, ISBA/16/A/12/Rev.1, November 15, 2010; and ISA, *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*, ISBA/18/A/11, October 22, 2012. The ISA stores and makes publicly available the data collected by seabed mining companies at <https://data.isa.org.jm/isa/map/>.

¹⁸⁴ For example, Elham Shabahat, “‘Antithetical to Science’: When Deep-Sea Research Meets Mining Interests,” *Mongabay*, October 4, 2021, <https://news.mongabay.com/2021/10/antithetical-to-science-when-deep-sea-research-meets-mining-interests/>.

¹⁸⁵ For example, Laura Ruth, “Gambling in the Deep-Sea,” *EMBO reports*, vol. 7, no. 1 (2006), pp. 17-21.

vehicle.¹⁸⁶ Some additional potential seabed mining changes to the marine environment are described below.

Biodiversity Loss and Habitat Disturbance

Deep-sea benthic organisms (i.e., those living on or within the seafloor) continue to be discovered in remote ocean habitats, and in March 2026, scientists discovered 24 new species of crustaceans in the CCZ.¹⁸⁷ Seabed mining machinery could crush, smother, or disperse benthic organisms while disturbing their habitats.¹⁸⁸ Some species inhabiting the deep sea live under cold conditions without sunlight and survive on little food.¹⁸⁹ To be successful under such conditions, deep-sea species have low metabolic rates—they move slowly, live for a long time, and take many years to reproduce.¹⁹⁰ In general, these traits mean species may be slow to recover from disturbances, making them potentially vulnerable to deep-sea exploitation activities, such as seabed mining, and making the deep-sea environment potentially susceptible to biodiversity loss.¹⁹¹ In 2023, scientists compared modern-day conditions of a 1979 mining test collector site in the CCZ with seafloor photographs of the area taken in 1978 that were provided for analysis by a seabed mining company.¹⁹² The analysis showed that some types of organisms “are living in the most disturbed areas” 44 years later. Although the analysis compared the modern-day biological abundance (i.e., how many organisms) with pre-disturbance conditions, it did not provide information about biological diversity (i.e., the number of different types of organisms).¹⁹³ Another study examined a 2022 large-scale test of a commercial deep-sea mining machine in the CCZ that recovered over 3,000 tons of nodules.¹⁹⁴ The study found a 32% reduction in species richness (i.e., the number of different species) within the mining tracks two months after test mining.¹⁹⁵

The removal of nodules and other hard mineral resources from the seabed also may impact species living or depending on these resources.¹⁹⁶ For example, some organisms require a hard surface, such as a mineral nodule, to attach their bodies to in order to live and grow. Some species

¹⁸⁶ Daniel O. B. Jones et al., “Long-Term Impact and Biological Recovery in a Deep-Sea Mining Track,” *Nature*, vol. 642 (2025), pp. 112-118 (hereinafter Jones et al., “Long-Term Impact and Biological Recovery”).

¹⁸⁷ Anna M. Jażdżewska and Tammy Horton, “New Deep-Sea Amphipoda from the Clarion-Clipperton Zone: 24 New Species Described under the Sustainable Seabed Knowledge Initiative: One Thousand Reasons Campaign,” *ZooKeys*, 1274 (2026), pp. 1-16.

¹⁸⁸ Holly Niner et al., “Deep-Sea Mining with No Net Loss of Biodiversity—An Impossible Aim,” *Frontiers in Marine Science*, vol. 5 (2018) (hereinafter Niner et al., “Impossible Aim”); and Rahul Sharma, “Environmental Issues of Deep-Sea Mining,” *Procedia Earth and Planetary Science*, vol. 11 (2015), pp. 204-211 (hereinafter Sharma, “Environmental Issues”).

¹⁸⁹ NOAA, “What Conditions Exist for Life in the Deep Ocean?,” <https://oceanexplorer.noaa.gov/facts/deep-habitat.html>.

¹⁹⁰ Craig R. McClain et al., “Energetics of Life on the Deep Seafloor,” *Proceedings of the National Academy of Sciences*, vol. 109, no. 38 (2012), pp. 15366-15371; and Robert Danovaro, “The Deep-Sea Under Global Change,” *Current Biology*, vol. 27, no. 11 (2017), pp. R461-R465.

¹⁹¹ Niner et al., “Impossible Aim;” and Daniel Jones et al., “Biological Responses to Disturbance from Simulated Deep-Sea Polymetallic Nodule Mining,” *PLOS One*, vol. 12, no. 2 (2017).

¹⁹² Jones et al., “Long-Term Impact and Biological Recovery.”

¹⁹³ Jones et al., “Long-term Impact and Biological Recovery in a Deep-sea Mining Track.”

¹⁹⁴ Eva C. D. Stewart et al., “Impacts of an Industrial Deep-Sea Mining Trial on Macrofaunal Biodiversity,” *Nature Ecology & Evolution*, vol. 10 (2026), pp. 318-329 (hereinafter Stewart et al., “Impacts of an Industrial Deep-Sea Mining Trial”).

¹⁹⁵ Stewart et al., “Impacts of an Industrial Deep-Sea Mining Trial.”

¹⁹⁶ Lisa Levin et al., “Defining ‘Serious Harm’ to the Marine Environment in the Context of Deep-Seabed Mining,” *Marine Policy*, vol. 74 (2016), pp. 245-259.

of sponges and some microbes live on seabed nodules,¹⁹⁷ and a species of deep-sea octopus lays its eggs on sponges attached to seabed nodules.¹⁹⁸ Because deep-sea nodules form over millions of years,¹⁹⁹ their removal in an area of the seafloor could equate to the permanent loss of a part of the marine habitat that some deep-sea species depend on for their survival.²⁰⁰ Scientists suggest that “in a typical mining scenario near complete removal of nodules would likely lead to further reductions in nodule-dwelling [organisms’] density” in the collector’s tracks.²⁰¹

An open question remains whether polymetallic nodules produce *dark oxygen*—a potentially new source of oxygen, independent of photosynthesis—and how the removal of nodules may impact this potential deep-sea oxygen source.²⁰² A 2024 study spurred this debate when authors found evidence of dark oxygen production at polymetallic nodule sites in the CCZ.²⁰³ TMC, which commissioned the work that informed the study, has questioned the study’s findings.²⁰⁴ Some scientists plan to test the possibility that the chamber used to seal the seafloor sediments collected oxygen as it was dropped through the water column, among other possibilities that may have introduced oxygen into the chamber, in follow-up cruises.²⁰⁵ A USGS scientist also has proposed a laboratory experiment to replicate some of the claims made by the study’s authors.²⁰⁶

Resuspended Sediment and Buried Carbon

Resuspended sediment dispersal (i.e., the plume) by seabed mining machinery disturbing seafloor deposits has the potential to impact environments immediate and adjacent to the mined area.²⁰⁷ The distance to which resuspended sediment disperses through the water column primarily depends on the presence of ocean currents and, if near the surface of the ocean, wave energy. A modeling study of a plume associated with a self-propelled remotely operated mining vehicle in the CCZ predicts deposition of sediment up to 10 millimeters in thickness over a distance of tens of meters.²⁰⁸ Suspended sediment in the water column could reduce water quality and clarity. The dispersion of seafloor sediment may threaten certain groups of benthic invertebrate organisms in specific ways:

- *Deposit feeders*, organisms that feed on organic matter that settled onto the seafloor, may be impacted by sediment diluting or burying their food resources.²⁰⁹

¹⁹⁷ Diva Amon et al., “Assessment of Scientific Gaps Related to the Effective Environmental Management of Deep-Sea Mining,” *Marine Policy*, vol. 138 (2022), pp. 1-22 (hereinafter Amon et al., “Assessment of Scientific Gaps”).

¹⁹⁸ Autun Purser et al., “Association of Deep-Sea Incirrate Octopods with Manganese Crusts and Nodule Fields in the Pacific Ocean,” *Current Biology*, vol. 26 (2016), pp. R1268-R1269.

¹⁹⁹ ISA, *Polymetallic Nodules*, 2022, <https://www.isa.org.jm/wp-content/uploads/2022/06/eng7.pdf>.

²⁰⁰ Helen Scales, *The Brilliant Abyss* (Atlantic Monthly Press, 2021), p. 192.

²⁰¹ Jones et al., “Long-Term Impact and Biological Recovery.”

²⁰² ISA, “FAQs for the Media.” In particular, see “Do polymetallic nodules (PMNs) produce dark oxygen?”

²⁰³ Andrew K. Sweetman et al., “Evidence of Dark Oxygen Production at the Abyssal Seafloor,” *Nature Geoscience*, vol. 17 (2024), pp. 737-739.

²⁰⁴ TMC, “TMC Rebuttal to Claims of ‘Dark Oxygen Production,’” September 2024, <https://metals.co/tmc-statement-on-claims-of-dark-oxygen-production/>.

²⁰⁵ Paul Voosen, “Claim of Seafloor ‘Dark Oxygen’ Faces Doubts,” *Science*, vol. 385, no. 6715 (2024).

²⁰⁶ Paul Voosen, “Claim of Seafloor ‘Dark Oxygen’ Faces Doubts,” *Science*, vol. 385, no. 6715 (2024).

²⁰⁷ Sharma, “Environmental Issues”; Amon et al., “Assessment of Scientific Gaps”; Niner et al., “Impossible Aim”; and NOAA, *1995 Report to Congress*, p. 12.

²⁰⁸ Jones et al., “Long-Term Impact and Biological Recovery.”

²⁰⁹ Sharma, “Environmental Issues.”

- *Suspension feeders* (also known as *filter feeders*), organisms that filter small food particles directly from the water, may be affected by suspended sediment clogging the water column.²¹⁰

One study found that areas impacted by sediment plumes generated during a large-scale test of a commercial deep-sea mining machine in the CCZ exhibited lower species diversity two months after test mining.²¹¹ For this study, the authors determined that sediment plumes from the mining can affect areas on the seabed as far as 400 meters laterally from the mining track.

Some extractive activities, including seabed mining and bottom trawling, could disturb the natural processes (i.e., microbes) that regulate carbon in the deep sea, in addition to existing carbon buried in deep-sea sediments.²¹² Some scientists speculate that activities affecting carbon burial in sediments could have “far-reaching effects on carbon sequestration that in turn is connected to climate regulation”;²¹³ others have stated that “deep seabed mining may be directly at odds with current climate goals if such regulatory services [provided by microbial communities] are degraded.”²¹⁴ Other stakeholders state that the scale at which seabed mining would take place would have minimum impact on net deep-sea carbon storage.²¹⁵ The 2023 analysis of modern-day versus pre-disturbed conditions of a 1979 mining test collector site in the CCZ found microbial biomass was similar in and out of the disturbed areas.²¹⁶

Noise Pollution

Noise and vibration associated with seabed mining operations may affect the behaviors of marine mammals and other animals living near the ocean’s surface.²¹⁷ Sound waves travel through the ocean approximately four times faster than they can travel through air and could increase the ambient background noise level in areas up to 500 kilometers away from the mining site, potentially impacting animals in that radius.²¹⁸ Noise pollution from mining operations may mask communication and echolocation sounds of cetaceans (whales, porpoises, and dolphins), affecting their abilities to detect and avoid predators and to find food and mates.²¹⁹ It also may cause

²¹⁰ Sharma, “Environmental Issues.”

²¹¹ Stewart et al., “Impacts of an Industrial Deep-Sea Mining Trial.”

²¹² For example, Miller et al., “Challenging the Need for Deep Seabed Mining,” p. 4; and Beth Orcutt et al., “Impacts of Deep-Sea Mining on Microbial Ecosystem Services,” *Limnology and Oceanography*, vol. 17, no. 7 (2020), pp. 1489-1510, see p. 1499 (hereinafter Orcutt et al., “Impacts of Deep-Sea Mining”).

²¹³ Kristen F. Thompson et al., “Seabed Mining and Approaches to Governance of the Deep Seabed,” *Frontiers in Marine Science*, vol. 5 (December 2018), pp. 1-12, see p. 7. *Carbon sequestration* refers to the process of removing carbon dioxide from the atmosphere and storing it in carbon stocks (e.g., deep-sea sediments, soil, plant vegetation).

²¹⁴ Miller et al., “Challenging the Need for Deep Seabed Mining,” p. 4.

²¹⁵ For example, Orcutt et al., “Impacts of Deep-Sea Mining,” p. 1499; and Seaver Wang, “No, Collecting Seafloor Metals Won’t Wreck the Ocean Carbon Cycle,” *The Breakthrough Institute*, July 9, 2024, <https://thebreakthrough.org/issues/energy/no-collecting-seafloor-metals-wont-wreck-the-ocean-carbon-cycle>. Also see ISA, “ISA Fact-Check 2004/1 – The Carbon Cycle in the Area,” July 2024, <https://isa.org.jm/isa-fact-check-2024-1/>.

²¹⁶ Jones et al., “Long-Term Impact and Biological Recovery.”

²¹⁷ Christine Erbe et al., “The Effects of Ship Noise on Marine Mammals—A Review,” *Frontiers in Marine Science*, vol. 6 (2019) (hereinafter Erbe et al., “The Effects of Ship Noise on Marine Mammals—A Review”). For an additional overview of noise and vibration impacts on marine animals, see CRS Report R47894, *Potential Impacts of Offshore Wind on the Marine Ecosystem and Associated Species: Background and Issues for Congress*, coordinated by Caitlin Keating-Bitonti.

²¹⁸ Rob Williams et al., “Noise from Deep-Sea Mining May Span Vast Ocean Areas,” *Science*, vol. 377 (2022), pp. 157-158.

²¹⁹ Erbe et al., “The Effects of Ship Noise on Marine Mammals—A Review.”

temporary or permanent hearing loss in some marine mammals and may increase their stress levels.²²⁰

Concerns Associated with Ship Activity

The processing of recovered seabed material at the ocean surface and its transport to land may have effects near or at the ocean surface. For example, seabed material may be processed on a production support vessel (PSV) or surface-based mining platform and seafloor sediment discarded back into the ocean may cloud the near surface water column (**Figure 2**), potentially inhibiting photosynthesis in some plankton.²²¹ Collected seabed material and water also may potentially overflow off the PSV or mining platform.²²² In addition, ship traffic associated with seabed mining operations may pose a threat to animals living near the ocean's surface. The increased potential for a vessel strike is one concern.²²³

Processing of Seabed Mineral Resources in the United States

Because commercial-scale deep-seabed mining for critical minerals has not been authorized in ABNJ, there are no identifiable facilities dedicated to the processing and refining of seabed materials.²²⁴ According to a 2019 Department of Commerce report, the United States “lacks domestic processing and manufacturing capabilities for some critical minerals,”²²⁵ including those derived from seabed deposits. During the 118th Congress, the House Armed Services Committee directed the Department of Defense (which is “using a secondary Department of War designation,” under E.O. 14347, dated September 5, 2025) to provide reports about U.S. capacity to process polymetallic nodules in the United States as well as the feasibility of improving U.S. capabilities for refining nodules for defense purposes.²²⁶ Some Members have introduced legislation in the 119th Congress that would direct the Secretary of Energy to establish a pilot program to support the processing of not fewer than three different types of critical materials (S. 596), which could include seabed deposits with critical minerals.²²⁷

²²⁰ Erbe et al., “The Effects of Ship Noise on Marine Mammals—A Review.”

²²¹ Sharma, “Environmental Issues.”

²²² For example, ISA, *CARMU Inspection Report 01/2023*, pp. 33-34.

²²³ NOAA, “Understanding Vessel Strikes,” <https://www.fisheries.noaa.gov/insight/understanding-vessel-strikes>.

²²⁴ Zohan Hasan Tariq and Tom LaTourrette, “The Missing Piece: Minerals Processing and Deep Sea Mining,” *RAND*, September 18, 2025, <https://www.rand.org/pubs/commentary/2025/09/the-missing-piece-minerals-processing-and-deep-sea.html> (hereinafter Tariq and LaTourrette, “The Missing Piece”); and Michael Barnard and Lyle Trytten, *A Techno-Economic Assessment of Seabed Mining: American Samoa and Global Implications*, August 2025, p. 17, <https://drive.google.com/file/d/1RettUw5s1sn0rHeyDDj6VzcBcimieY9e/view> (hereinafter Barnard and Trytten, *A Techno-Economic Assessment of Seabed Mining*).

²²⁵ U.S. Department of Commerce, *A Federal Strategy to Ensure Secure and Reliable Supplies of Critical Minerals*, June 4, 2019, p. 9, https://www.commerce.gov/sites/default/files/2020-01/Critical_Minerals_Strategy_Final.pdf.

²²⁶ See H.Rept. 118-125, the House Armed Services Committee (HASC) report that accompanied HASC’s reported version of the National Defense Authorization Act for Fiscal Year 2024 (P.L. 118-31); and Section 1724 of H.Rept. 118-529, which was adopted in the joint explanatory statement accompanying the Service Member Quality of Life Improvement and National Defense Authorization Act for Fiscal Year 2025 (P.L. 118-159).

²²⁷ In the 118th Congress, H.R. 7636 would have instructed the President to direct certain federal departments to “coordinate and expedite across Federal agencies the development of infrastructure to process and refine seafloor [polymetallic] nodules within the United States.”

Attempts to establish processing facilities in the United States have “encountered challenges such as lengthy permitting timelines, competition for feedstock, lack of price competitiveness against global competitors, and low investor interest due to market volatility,” according to some experts.²²⁸ A processing facility for seabed minerals in the United States would likely have to be constructed in a state with a deepwater port.²²⁹ Some have speculated whether deepwater ports located in California, Oregon, and Washington would be “receptive to storage and processing of seabed nodules,” because each of these states has a ban on seabed mining within their respective state waters.²³⁰ Texas also has been considered for a potential site for processing critical minerals from polymetallic nodules,²³¹ a proposal that some Members of Congress have supported.²³² According to TMC, “TMC USA currently holds an exclusive right of negotiation with the Port of Brownsville on a lease and / or lease option for land sufficient to develop a domestic nodule processing and refining ecosystem for TMC USA and other American nodule developers, with the ultimate decision conditional on U.S. government support.”²³³ American Ocean Minerals reportedly indicated that future processing plants for seabed resources would need to be built in “states like Texas and Louisiana” for the company’s purpose.²³⁴

Other U.S. seabed mining companies also have announced their intentions for building domestic processing and refining facilities for seabed minerals. In March 2026, Glomar Minerals and Cobalt Blue Holdings Limited, an Australian company, announced their intention to build a commercial-scale polymetallic nodules processing facility in the United States.²³⁵ Glomar Minerals and Cobalt Blue reportedly plan to choose a location for the facility by June 2026 and aim to be in “commercial production before President Trump’s term ends in 2029.”²³⁶ In July 2025, Impossible Metals and ReElement Technologies Corporation, a subsidiary of American Resources Corporation, signed a memorandum of understanding that describes how ReElement would use its refining capabilities to deliver copper, cobalt, nickel, manganese, and REEs from

²²⁸ Tariq and LaTourrette, “The Missing Piece.”

²²⁹ Barnard and Trytten, *A Techno-Economic Assessment of Seabed Mining*, p. 17; and Rifat Jabbar et al., *Polymetallic Nodules and the Critical Mineral Supply Chain: A North American Approach*, Wilson Center and Hatch, 2022, p. 11 (hereinafter Jabbar et al., *Polymetallic Nodules and the Critical Mineral Supply Chain*).

²³⁰ Barnard and Trytten, *A Techno-Economic Assessment of Seabed Mining*, p. 17.

²³¹ Barnard and Trytten, *A Techno-Economic Assessment of Seabed Mining*, p. 17; Jabbar et al., *Polymetallic Nodules and the Critical Mineral Supply Chain*, p. 12; and TMC, *The Metals Company: Capital Light Strategy for Allied Processing of Polymetallic Nodules*, June 2024, p. 8 (hereinafter TMC, *Strategy for Allied Processing of Polymetallic Nodules*).

²³² James Osborne, “Texas Congressmen Angling to Have Deep-Sea Mined Minerals Refined on the Gulf Coast,” *Houston Chronicle*, December 13, 2023, <https://www.houstonchronicle.com/business/energy/article/deep-sea-minerals-gulf-coast-refinery-18540332.php>; and TMC, *Strategy for Allied Processing of Polymetallic Nodules*, p. 10.

²³³ TMC, “TMC Announces Fourth Quarter and Full Year 2025 Results,” March 27, 2026, <https://investors.metals.co/news-releases/news-release-details/tmc-announces-fourth-quarter-and-full-year-2025-results>.

²³⁴ Hannah Northey, “Deep-Sea Miners Pursuing Pacific Exploration Merge in \$1B Deal,” *E&E News*, April 9, 2026, <https://www.eenews.net/articles/deep-sea-miners-pursuing-pacific-exploration-merge-in-1b-deal/>.

²³⁵ Glomar Minerals, “Glomar Minerals and Cobalt Blue Launch Seabed Mineral Processing Consortium,” March 29, 2026, <https://glomarminerals.com/glomar-minerals-and-cobalt-blue-launch-seabed-mineral-processing-consortium/>.

²³⁶ Ernest Scheyder and Melanie Burton, “US Deep-Sea Mineral Processing Plant Planned by Glomar, Australia’s Cobalt Blue,” *Reuters*, March 29, 2026, <https://www.reuters.com/business/energy/us-deep-sea-mineral-processing-plant-planned-by-glomar-australias-cobalt-blue-2026-03-29/>.

polymetallic nodules.²³⁷ ReElement has facilities in Indiana.²³⁸ A processing facility not located in a coastal state could incur additional transportation costs and logistical constraints.²³⁹

Some U.S. seabed mining companies have proposed that seabed minerals they harvest could be processed in “friendly nations.”²⁴⁰ Some experts contend that some international facilities, including those located in Indonesia, South Korea, Japan, and Colombia, could be modified to process seabed materials.²⁴¹ A facility in Japan has evaluated polymetallic nodules for processing and refining purposes.²⁴²

In the absence of U.S. processing facilities for critical minerals, some have proposed that the United States stockpile critical minerals in facilities across the country. In February 2026, the Export-Import Bank of the United States and the White House established the U.S. Strategic Critical Minerals Reserve, “an independently governed public-private partnership that will store essential raw materials in secure facilities across the United States” through an initiative known as *Project Vault*.²⁴³ Some have argued that the inclusion of seabed resources such as polymetallic nodules in the strategic reserve may provide an incentive to U.S. companies to build nodule mineral processing facilities near strategic U.S. stockpile sites.²⁴⁴ Others have countered that nodules should not be mined until sufficient processing and refining capacity exists.²⁴⁵

²³⁷ Impossible Metals, “ReElement Technologies Corporation and Impossible Metals Announce Collaboration on First U.S. Deep Sea Nodule Refinement Program,” July 21, 2025, <https://impossiblemetals.com/blog/reelement-technologies-corporation-and-impossible-metals-announce-collaboration-on-first-u-s-deep-sea-nodule-refinement-program/>.

²³⁸ ReElement, “Facilities,” <https://www.reelementtech.com/facilities>.

²³⁹ For example, Barnard and Trytten, *A Techno-Economic Assessment of Seabed Mining*, p. 17.

²⁴⁰ Remarks of Oliver Gunasekara, CEO and co-founder, Impossible Metals, in U.S. Congress, House Committee on Natural Resources, Subcommittee on Energy and Minerals Resources, *Deep Dive: Examining the Regulatory and Statutory Barriers to Deep Seabed Mining*, hearing, 119th Cong., 2nd sess., January 22, 2026 (hereinafter *Deep Dive: Examining the Regulatory and Statutory Barriers to Deep Seabed Mining*, hearing, 119th Cong.).

²⁴¹ Barnard and Trytten, *A Techno-Economic Assessment of Seabed Mining*, p. 17; and Jabbar et al., *Polymetallic Nodules and the Critical Mineral Supply Chain*.

²⁴² TMC, “World First: TMC and PAMCO Achieve Breakthrough in Commercial-Scale Processing of Polymetallic Nodules, Successfully Producing Calcine,” September 9, 2024, <https://investors.metals.co/news-releases/news-release-details/world-first-tmc-and-pamco-achieve-breakthrough-commercial-scale>; TMC, “World First: TMC and PAMCO Achieve a New Nodule Processing Milestone, Unlocking Critical Energy & Steelmaking Materials at Existing Facilities,” February 18, 2025, <https://investors.metals.co/news-releases/news-release-details/world-first-tmc-and-pamco-achieve-new-nodule-processing>; and remarks of Gerard Barron, Chairman and CEO, The Metals Company USA, in *Deep Dive: Examining the Regulatory and Statutory Barriers to Deep Seabed Mining*, hearing, 119th Cong.

²⁴³ Export-Import Bank of the United States, “Week in Review: Project Vault and the U.S. Strategic Critical Mineral Reserve,” February 6, 2026, <https://www.exim.gov/news/week-review-project-vault-and-strategic-critical-mineral-reserve>.

²⁴⁴ Impossible Metals, “Opinion: The US Should Create a Strategic Stockpile of Polymetallic Nodules,” April 8, 2025, <https://impossiblemetals.com/blog/opinion-the-us-should-create-a-strategic-stockpile-of-polymetallic-nodules/>. Also, see Remarks of Oliver Gunasekara, CEO and co-founder, Impossible Metals, in *Exploring the Potential of Deep-Sea Mining*, hearing, 119th Cong. and *Deep Dive: Examining the Regulatory and Statutory Barriers to Deep Seabed Mining*, hearing, 119th Cong.

²⁴⁵ For instance, one hearing witness stated that “current proposals involve a significant amount of stockpiling of nodules due to a lack of refining capacity, and the cheapest place to stockpile a nodule is to leave it on the seafloor.” Remarks by Andrew Thaler, CEO, Blackbeard Biologic: Science and Environmental Advisors, in *Deep Dive: Examining the Regulatory and Statutory Barriers to Deep Seabed Mining*, hearing, 119th Cong.

Issues for Congress

Deep-seabed mining in ABNJ could help diversify U.S. critical mineral supply chains. New technologies in defense and energy may continue to drive demand for some critical minerals, including those sourced from seabed deposits.²⁴⁶ However, some stakeholders contend that by the time deep-seabed mining becomes operational at a commercial scale, future technologies may not depend as much on critical minerals commonly found in ABNJ.²⁴⁷ An issue for Congress is weighing the advantages of mining critical minerals from the deep seabed against how that process may deleteriously affect deep-sea habitats, along with concerns about the potential geopolitical consequences of permitting exploration and commercial recovery outside the ISA framework. As previously discussed, an original U.S. objection to ratifying UNCLOS was over the convention's deep-seabed mining provisions. Given the changes in geopolitical incentives for securing critical minerals—such as expanding diversity of critical mineral supply chains away from those dependent on China—the factors under congressional consideration over whether to ratify UNCLOS may be different now than they were in the 1980s.

On April 24, 2025, President Trump issued E.O. 14285, “Unleashing America’s Offshore Critical Minerals and Resources,” which, among other things, directed the Administrator of NOAA, in consultation with the Secretary of State and the Secretary of the Interior (acting through the BOEM Director) to “expedite the process for reviewing and issuing seabed mineral exploration licenses and commercial recovery permits” in ABNJ under DSHMRA.²⁴⁸ Some Members have introduced legislation in the 119th Congress that would codify E.O. 14285 (e.g., H.R. 3803) or mandate that certain federal departments and agencies act on aspects of the executive order (e.g., H.R. 4018, S. 2860). In addition, NOAA’s FY2026 budget request identified “expedit[ing] NOAA review and support for the advancement of deep seabed mining” as an objective for FY2026-FY2030.²⁴⁹ How U.S. policies, as expressed in E.O. 14285 and partially implemented in NOAA’s revised deep seabed mining regulations (15 C.F.R. §971.214), may conflict with the ISA framework for seabed mining or the policies of UNCLOS signatories is uncertain within the statutory authority provided by DSHMRA. For example, TMC’s studies, research, and mining trials that have taken place in the CCZ for more than a decade were conducted under ISA exploration contracts, not a DSHMRA exploration license issued by NOAA.²⁵⁰ Some stakeholders argue that TMC has “benefitted from ISA granted exploration rights” to developing nations, through its subsidiaries NORI and TOML, and now the company’s U.S. subsidiary has applied to NOAA to extract some of these deep-sea mineral resources in the CCZ.²⁵¹

Another issue for Congress is whether the United States has a responsibility to distribute benefits derived from U.S. seabed mining activities in ABNJ (see textbox above entitled, “International Benefit-Sharing Mechanism for Seabed Resources”). Following the issuance of E.O. 14285, stakeholders have debated who has rights to and who should benefit from seabed resources, such as critical minerals, recovered from ABNJ. Article 137 of UNCLOS states that “no state shall claim or exercise sovereignty or sovereign rights over any part of the Area or its resources” and that “no such claim of exercise of sovereignty or sovereign rights nor such appropriation shall be

²⁴⁶ For example, NOAA, “Deep Seabed Hard Minerals Mining.”

²⁴⁷ For example, LaTourrette et al., *Potential Impact of Seabed Mining*, p. 14.

²⁴⁸ See §3(a)(i) of E.O. 14285.

²⁴⁹ NOAA, *Budget Estimates: Fiscal Year 2026*, NOS-19.

²⁵⁰ TMC, “NOAA Determines TMC USA’s Consolidated Deep-Seabed Mining Application.”

²⁵¹ Eva Cahill, “New Evidence Suggest Breaches by Deep Sea Mining Contractors,” *Oceanographic*, March 10, 2026, <https://oceanographicmagazine.com/news/new-evidence-suggest-breaches-by-deep-sea-mining-contractors/>.

recognized.” The ISA has argued that Article 137 “applies to all States, whether they are parties to UNCLOS or not, as it constitutes general international law and customary international law.”²⁵² A legal expert has argued that “since the United States is not a party to UNCLOS, the only way that it can be bound by the framework in the treaty, including the “common heritage” principle, is if Part XI reflects customary international law.”²⁵³ The expert further argues that the United States’ consistent opposition to Part XI of UNCLOS, which deals with deep-seabed resources in ABNJ, “has culminated in the recent executive order, underscor[ing] the intent of the United States not to be bound by the principles and rules of Part XI.”²⁵⁴

In addition, in January 2026, NOAA’s Administrator claimed that the agency’s revised seabed mining regulations for ABNJ were “key to unlocking a domestic source of critical minerals for the United States.”²⁵⁵ Some have responded by saying that the NOAA Administrator “mischaracterized” seabed resources collected from ABNJ as a domestic source.²⁵⁶ While E.O. 14285 called for a report on the “feasibility of an international benefit-sharing mechanism for seabed mineral resources extraction and development that occurs in [ABNJ] of any country,” it remains unknown whether, and to what extent, a U.S. benefit-sharing mechanism would apply to seabed resources recovered by a U.S. company under a DSHMRA permit. TMC has stated that its subsidiaries’ updated sponsorship agreements “guarantee” continued benefits (e.g., financial benefits, capacity-building programs, in-country social programs) to Tonga and Nauru should NORI, TOML, or another TMC subsidiary proceed to commercial production.²⁵⁷

E.O. 14285 also directed the Secretary of Commerce, in coordination with the Secretaries of the Interior and Energy and in consultation with other federal entities, to provide a report about private sector interest and opportunities for seabed mineral processing capacity in the United States or on U.S.-flagged vessels.²⁵⁸ In addition, the executive order directed other department and agency heads, including the Secretary of Defense, to support domestic processing capabilities for seabed mineral resources.²⁵⁹ As previously discussed, the United States lacks domestic seabed mineral processing capacity.²⁶⁰

²⁵² ISA, “FAQs for the Media.” In particular, see “What Is ISA’s Reaction to the US Executive Order Unleashing America’s Offshore Critical Minerals and Resources?”

²⁵³ Kraska, “The U.S. Executive Order on Seabed Mining is Consistent with International Law,” p. 508.

²⁵⁴ Kraska, “The U.S. Executive Order on Seabed Mining is Consistent with International Law,” p. 509.

²⁵⁵ NOAA, “NOAA Accelerates Permitting Timeline for Deep Seabed Mining Applications,” January 21, 2026, <https://www.noaa.gov/news-release/noaa-accelerates-permitting-timeline-for-deep-seabed-mining-applications>.

²⁵⁶ Lathrop, “In Its Hunt for Critical Minerals.”

²⁵⁷ TMC, “Updated Sponsorship Agreement for NORI;” and TMC, “Updated Sponsorship Agreement for TOML.”

²⁵⁸ See §3(a)(ii)(B) of E.O. 14285.

²⁵⁹ See §§3(d)(ii) and 3(e) of E.O. 14285.

²⁶⁰ See the section entitled “Processing of Seabed Mineral Resources in the United States.”

Another issue for Congress is where to process seabed minerals resources. Congress may weigh the tradeoffs of incentivizing the U.S. private sector to invest in processing capabilities in the United States versus seeking out partnerships with allied and partner nations that have existing processing capabilities. For example, some have estimated that it will take at least 5 years to build relevant processing facilities for seabed minerals.²⁶¹ Meanwhile, some Members of Congress have noted that it could take 10 to 20 years for new processing and refining plants to become operational in the United States.²⁶² At the same time, Korea Zinc, the world's largest zinc smelter and one of the few sources of zinc independent of China, is evaluating polymetallic nodules provided by TMC to validate processing and refining pathways.²⁶³ In addition, as previously discussed, a facility in Japan has evaluated polymetallic nodules for processing and refining purposes.

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²⁶¹ Mahlet Mesfin, "Current Geopolitics Shift Deep-Sea Mining Debates," *Stimson Center*, February 23, 2026, <https://www.stimson.org/2026/current-geopolitics-shift-deep-sea-mining-debates/>.

²⁶² See Rep. Gary Palmer, Chairman of the Subcommittee on Oversight and Investigation, opening statement in U.S. Congress, House Committee on Energy and Commerce, Subcommittee on Oversight and Investigation, *Examining Ways to Enhance Our Domestic Critical Mineral Supply Chains*, hearing, 119th Cong., 1st sess., May 21, 2025, <https://www.congress.gov/119/meeting/house/118291/documents/HHRG-119-IF02-MState-P000609-20250521.pdf>.

²⁶³ TMC, "TMC Announces Strategic Investment from Korea Zinc." Korea Zinc also is considering establishing processing and refining operations in the United States, reportedly (Yusuf Khan, "Korea Zinc Backs Trump Plan for Deep Sea Mining," *Wall Street Journal*, updated June 16, 2025).