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Sea Mining: Frequently Asked Questions

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Sea Mining: Frequently Asked Questions

Sea mining, or ocean mining, is sometimes considered as an alternative to land-based mining, especially in relation to increasing the supply of some critical minerals. Various concerns surround sea mining, including those relating to jurisdiction over different locations and environmental safeguards.

This report addresses several frequently asked questions, including

- What is sea (ocean) mining?
- What minerals could be obtained by sea mining?
- How does sea mining differ from land-based mining?
- What is the international framework governing sea mining?
- Where does the United States have authority to mine the sea?
- Which U.S. agencies oversee sea mining activities?
- Where are sea mining exploration and operations occurring?
- What regulations cover domestic sea mining?
- What are some environmental concerns of sea mining?

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Sea mining, or ocean mining, is sometimes considered an alternative to land-based mining, especially in relation to increasing the supply of critical minerals. Some critical mineral resources identified in ocean deposits include cobalt, manganese, nickel, and rare earth elements.¹ While sea mining in shallow waters near coastlines is not uncommon, focus has been shifting to deeper waters, including international waters. This report addresses some common questions related to sea mining. It does not address questions related to the economic viability of sea mining, due to insufficient available data.

What Is Sea (Ocean) Mining?

A variety of terms are used to describe the extraction of mineral resources from the seabed and subsurface of the sea; some of these terms include sea mining, deep-sea mining, seabed mining, seafloor mining, and ocean mining. These terms are often used interchangeably, and “deep sea” often refers to sea depths greater than 200 meters (656 feet).² Sea mining generally includes the notion of extracting a solid mineral from the seabed or the subsurface. While oil and natural gas are sometimes defined as minerals and offshore oil and gas leases can be called mineral developments, oil and natural gas are not commonly included within the topic of sea mining.³ Sea mining generally does not include the extraction of elements, compounds, or ions from seawater.

What Minerals Could Be Obtained by Sea Mining?

A 2022 study reports estimated tonnages of 60 elements contained in ocean crusts and nodules (without including seafloor massive sulphides).⁴ Estimates of some metals are included in **Table 1**. These estimates are based on a review of the limited available samples of crusts and nodules; the sample information is extrapolated to various ocean regions.

¹ Rahul Sharma, “Approach Towards Deep-Sea Mining: Current Status and Future Prospects,” in *Perspectives on Deep-Sea Mining: Sustainability, Technology, Environmental Management and Policy*, ed. Rahul Sharma (Springer, 2022), pp. 13-16. For more information on these minerals, see CRS Report R47227, *Critical Minerals in Electric Vehicle Batteries*, by Brandon S. Tracy, and CRS Report R46618, *An Overview of Rare Earth Elements and Related Issues for Congress*, by Brandon S. Tracy.

² National Oceanic and Atmospheric Administration, “What Is the ‘Deep’ Ocean?” at <https://oceanexplorer.noaa.gov/facts/deep-ocean.html>.

³ 43 U.S.C. §1331(q) states “The term ‘minerals’ includes oil, gas, sulphur, geopressured-geothermal and associated resources, and all other minerals.”

⁴ “Crusts” can be described as “layered manganese and iron oxides with associated metals on hard substrate rock of subsea mountains and ridges”; “nodules” can be described as “concretions of layered iron and manganese oxides with associated metals from the water column or sediment”; and “seafloor massive sulphides” can be described as “concentrated deposits of sulphidic minerals (>50–60%) resulting from hydrothermal activity on the seabed” (Rahul Sharma, “Approach Towards Deep-Sea Mining: Current Status and Future Prospects,” in *Perspectives on Deep-Sea Mining: Sustainability, Technology, Environmental Management and Policy*, ed. Rahul Sharma (Springer, 2022), p. 14).

Table 1. Estimates of Selected Metals in Ocean Nodules and Crusts

Element	Tons (billions)
Manganese (Mn)	227
Iron (Fe)	219
Magnesium (Mg)	16.9
Titanium (Ti)	11.1
Potassium (K)	7.68
Cobalt (Co)	5.15
Nickel (Ni)	4.48
Rare Earth Elements	2.35
Copper (Cu)	1.65
Zinc (Zn)	0.81
Molybdenum (Mo)	0.51

Source: Kira Mizell, James R. Hein, and Manda Au, et al., “Estimates of Metals Contained in Abyssal Manganese Nodules and Ferromanganese Crusts in the Global Ocean Based on Regional Variations and Genetic Types of Nodules,” in *Perspectives on Deep-Sea Mining: Sustainability, Technology, Environmental Policy and Management*, ed. Rahul Sharma (Springer, 2022), pp. 70-71.

Notes: Rare earth elements include the 15 lanthanoids (or lanthanides) and yttrium. See citation for the methodology employed to create these estimates. Availability of metals in nodules and crusts does not necessarily indicate an economically viable resource.

How Does Sea Mining Differ from Land-Based Mining?

Onshore mining consists of three general processes: open pit, underground, or brine mining. Open pit mines remove soil and rock (the “overburden”) above the mineral deposit to allow removal of the ore. The removal process is typically assisted by blasting of the ore body and loading the shattered ore into haul trucks. Underground mining is typically used when the deposit is sufficiently deep that removal of the overburden would be prohibitively expensive. Underground mining typically consists of an access shaft to the ore body, and drilling, blasting, or other ore removal processes underground. The ore is then trucked, trammed, or elevated to the surface. Brine operations extract desired minerals or ions from an aqueous solution, which could be natural (e.g., geothermal brines) or created by injecting or pumping liquids into the deposit (e.g., in situ leaching).

Sea mining operations generally follow or are expected to follow an ore collection process followed by an elevation process. Three generic ore bodies can be considered as representative for sea mining deposits: unconsolidated sediments like sands or muds; nodules and crusts; and seafloor massive sulfides. Sediment-type deposits are commonly dredged, which entails pumping a slurry of the material from the sea floor to the surface. Nodules and crusts can be gathered by an autonomous collector vehicle and pumped or elevated to the surface. Seafloor massive sulfides require some amount of excavation from the seafloor, with the potential additional step of

separation on the seafloor before being pumped or elevated to the surface. Minerals mined from the sea are or would need to be processed at traditional onshore processing facilities.⁵

What Is the International Framework Governing Sea Mining?⁶

The location of the seabed (or seafloor) determines jurisdiction over the sea mining activities. As discussed below, if the seabed pertains to a coastal country, that country has jurisdiction over sea mining within a specific area of the ocean and seabed extending out from the coastline. The area of the seas and oceans (and associated seabed) outside of coastal countries' jurisdiction is commonly called 'international waters,' while the formal term referring to the submerged lands beneath these waters is the *Area* (see "International Seabed Authority" below).

In 1982, the United Nations adopted the Convention of the Law of the Sea (UNCLOS); the United States Senate has not ratified UNCLOS.⁷ Since international adoption of UNCLOS, Congress has considered supporting and not supporting its ratification. For example, H.R. 3764, H.Res. 361, and S.Res. 220 in the 117th Congress⁸ supported ratification of UNCLOS, while H.Con.Res. 56 in the 109th Congress opposed ratification of UNCLOS; H.Con.Res. 268 and S.Con.Res. 72 in the 103rd Congress opposed the sea mining amendments to UNCLOS.

Coastal Country Jurisdiction

UNCLOS defines terms relevant to jurisdiction of oceans and seas for various purposes, including sea mining. When establishing a country's right to its sea waters and sea beds, UNCLOS defines a coastal country's *exclusive economic zone* (EEZ), which "shall not extend beyond 200 nautical miles" from the country's coastline. UNCLOS further defines the EEZ as the "area beyond and adjacent to the territorial sea ... under which the rights and jurisdiction of the coastal [Country] and the rights and freedoms of other [Countries] are governed by the relevant provisions of this Convention."⁹ A coastal country's territorial sea can extend up to 12 nautical miles from its coastline.¹⁰

When further establishing the coastal country's right to regulate and exploit mineral resources, UNCLOS defines a country's *continental shelf* (CS), which includes "the seabed and subsoil of the submarine areas that extend beyond its territorial sea," generally up to 200 nautical miles from the country's coastline.¹¹ A coastal country has exclusive "sovereign rights for the purpose of

⁵ Tetsuo Yamazaki, "Analysis of Different Models for Improving the Feasibility of Deep-Sea Mining," in *Perspectives on Deep-Sea Mining: Sustainability, Technology, Environmental Policy and Management*, ed. Rahul Sharma (Springer, 2022), pp. 425-444.

⁶ For additional information on seabed mining in the Area, see CRS Report R47324, *Seabed Mining in Areas Beyond National Jurisdiction: Issues for Congress*, by Caitlin Keating-Bitonti.

⁷ United Nations (UN), "Oceans and the Law of the Sea," at <https://www.un.org/en/global-issues/oceans-and-the-law-of-the-sea>.

⁸ Similar resolutions were introduced in the 116th and 115th Congresses.

⁹ UNCLOS, Articles 55 and 57, at https://www.un.org/Depts/los/convention_agreements/texts/unclos/part5.htm.

¹⁰ UNCLOS, Article 3, at https://www.un.org/Depts/los/convention_agreements/texts/unclos/part2.htm.

¹¹ UNCLOS, Article 76, at https://www.un.org/Depts/los/convention_agreements/texts/unclos/part6.htm. Additional information is given in Article 76 for special cases where the continental shelf (CS) may exceed the 200-nautical mile limit. This report uses "coastline" in place of the UNCLOS term "baseline"; Part II provides technical definitions of different baselines that can be used to establish sea and seabed jurisdiction (UNCLOS, Part II, at <https://www.un.org/>

exploring [its CS] and exploiting [its CS's] natural resources.”¹² While a country's EEZ and CS are often similar or identical in covered area, the term CS is more relevant to discussions of sea mining, given its specific reference to the seabed and subsoil.¹³

UNCLOS allows a coastal country to extend its sea mining jurisdiction beyond the 200 nautical-mile limit typically used to define the CS and EEZ.¹⁴ This larger area is known as a country's *extended continental shelf* (ECS) and cannot exceed 350 nautical miles from the territorial sea. An ECS may be identified by certain criteria, including ratios between the thickness of sedimentary rocks and the shortest distance to the foot of the continental slope; distances not more than 60 nautical miles from the foot of the continental slope; or distances not more than 100 nautical miles from the 2,500 meter isobath.¹⁵

International Seabed Authority

The term *Area* (or *the Area*) is defined as the “seabed and ocean floor and subsoil thereof, beyond the limits of national jurisdiction.”¹⁶ **Figure 1** depicts the Area in blue and areas under jurisdiction of coastal countries in white. While exclusive authority to allow sea mining within a country's CS is retained by that country, the International Seabed Authority (ISA) governs sea mining in the Area. The ISA is

an autonomous international organization established under the 1982 United Nations Convention on the Law of the Sea (UNCLOS) and the 1994 Agreement relating to the Implementation of Part XI of the United Nations Convention on the Law of the Sea (1994 Agreement).

ISA is the organization through which States Parties to UNCLOS organize and control all mineral-resources-related activities in the Area for the benefit of mankind as a whole. In so doing, ISA has the mandate to ensure the effective protection of the marine environment from harmful effects that may arise from deep-seabed related activities.¹⁷

Depts/los/convention_agreements/texts/unclos/part2.htm). UNCLOS established the Commission on the Limits of the Continental Shelf (CLCS) to assist coastal countries, if requested, with determining the limits of their CS (UN, “Commission on the Limits of the Continental Shelf (CLCS),” at https://www.un.org/Depts/los/clcs_new/commission_purpose.htm#Purpose).

¹² UNCLOS, Article 77, at https://www.un.org/Depts/los/convention_agreements/texts/unclos/part6.htm.

¹³ Article 56, which addresses a country's EEZ, states “The rights set out in this article with respect to the seabed and subsoil shall be exercised in accordance with Part VI”; Part VI contains Articles 76 and 77, defining the CS (UNCLOS, Article 56, at https://www.un.org/Depts/los/convention_agreements/texts/unclos/part5.htm).

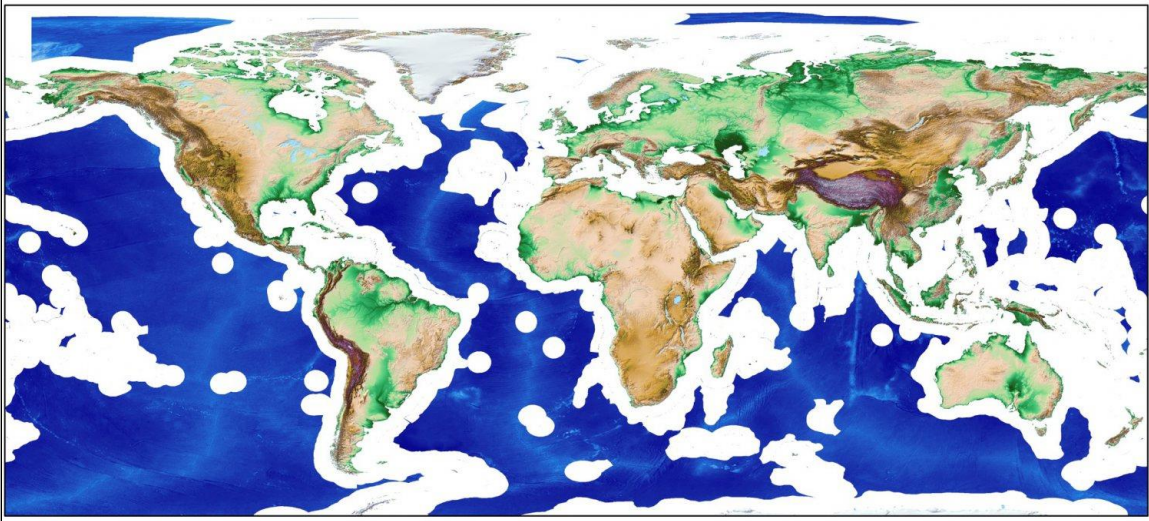
¹⁴ UNCLOS, Article 76, at https://www.un.org/Depts/los/convention_agreements/texts/unclos/part6.htm.

¹⁵ *Ibid.*

¹⁶ UNCLOS, Article 1, at https://www.un.org/Depts/los/convention_agreements/texts/unclos/part1.htm.

¹⁷ International Seabed Authority (ISA), “About ISA,” at <https://isa.org.jm/about-isa>.

Figure 1. The Area



Source: ISA, “Map of the Area,” at <https://isa.org.jm/media/image/450>.

Notes: The Area (under international waters) is shown in blue and areas of coastal country jurisdiction are shown in white.

Where Does the United States Have Authority to Mine the Sea?

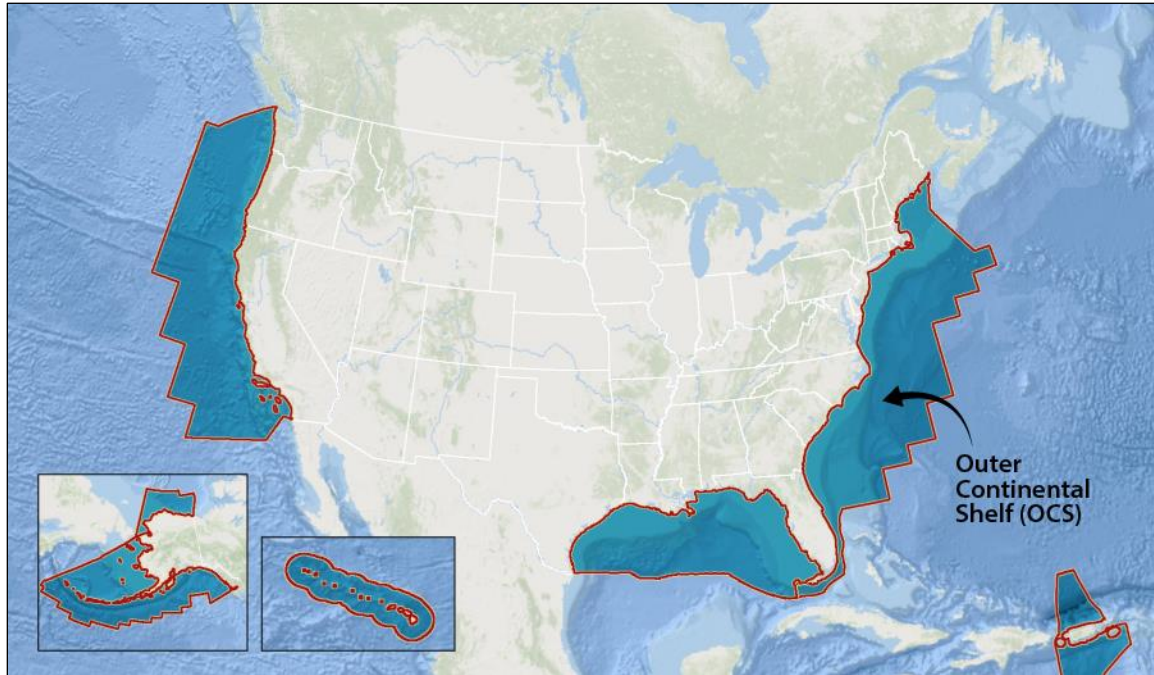
The Outer Continental Shelf Lands Act (OCSLA), as amended, authorizes and directs the U.S. Department of the Interior (DOI) to establish regulations for the leasing of minerals on the U.S. *outer continental shelf* (OCS).¹⁸ The OCS excludes state waters, which in most cases extend seaward 3 nautical miles from the state’s coastline.¹⁹ **Figure 2** depicts the extent of the U.S. OCS, without showing the OCS of the U.S. territories Guam, the Commonwealth of the Northern Mariana Islands, the Virgin Islands, and American Samoa, and without showing state waters.

P.L. 117-169, commonly known as the Inflation Reduction Act of 2022, amended the definition of the OCS to include the seabed and subsoil “adjacent to any territory of the United States” whose control has not been conveyed to the territorial government.²⁰ Prior to this amendment, the OCSLA did not authorize sea mining in U.S. territorial waters.

¹⁸ See 43 U.S.C. §1331(a) for a definition of outer continental shelf (OCS).

¹⁹ 43 U.S.C. §1311. For further information, see CRS Report RL33404, *Offshore Oil and Gas Development: Legal Framework*, by Adam Vann.

²⁰ 43 U.S.C. §1331(a).

Figure 2. U.S. Outer Continental Shelf (OCS)

Source: CRS using data from the Bureau of Ocean Energy Management (BOEM), “Maps and GIS Data,” at <https://www.boem.gov/oil-gas-energy/mapping-and-data>. Data for Hawaii is sourced from Sovereign Limits, at <https://www.sovereignlimits.com>.

Notes: Excludes the OCS of the U.S. territories Guam, the Commonwealth of the Northern Mariana Islands, the Virgin Islands, and American Samoa. In most cases, coastal states have authority over sea mining in the 3 nautical miles from their coasts. Not all areas may be available for mining. Map and map inserts are not on the same scale.

As indicated above, UNCLOS allows a coastal country to extend its sea mining jurisdiction to include an ECS, which would lie beyond the 200 nautical-mile limit used to define its CS.²¹ The National Oceanic and Atmospheric Administration (NOAA), U.S. Geological Survey (USGS), and U.S. Department of State are actively involved in the mapping, exploration, and documentation of the U.S. ECS.²² Even though the United States has not ratified UNCLOS and is not a member to the ISA, “customary international law ... confers rights and obligations relating to the continental shelf on a coastal [Country].”²³

One particular area of interest to the United States is in the Arctic region, where some coastal countries are collecting data to support claims of an ECS.²⁴ Regarding efforts to map and determine the U.S. ECS in the Arctic, the U.S. Department of State notes

²¹ UNCLOS, Article 76, at https://www.un.org/Depts/los/convention_agreements/texts/unclos/part6.htm.

²² For more information on these efforts, see USGS, “USGS Law of the Sea,” at <https://www.usgs.gov/centers/whcm/science/usgs-law-sea>, and U.S. Department of State, “Frequently Asked Questions” at <https://www.state.gov/frequently-asked-questions-u-s-extended-continental-shelf-project/>.

²³ U.S. Department of State, “Frequently Asked Questions,” at <https://www.state.gov/frequently-asked-questions-u-s-extended-continental-shelf-project/>.

²⁴ See CRS Report R41153, *Changes in the Arctic: Background and Issues for Congress*, coordinated by Ronald O’Rourke, section on “Extent of the Continental Margin,” for more information on ECS exploration efforts in the Arctic.

The United States has potentially overlapping ECS areas with two countries in the Arctic: Russia and Canada. The United States and the Soviet Union (now Russia) agreed to a maritime boundary (including in the Arctic) in 1990. In determining its ECS limits, Russia has respected this agreement, which continues to be provisionally applied pending its entry into force. The United States is taking the same approach. Canada and the United States have not yet established a maritime boundary in the Arctic.²⁵

Which U.S. Agencies Oversee Sea Mining Activities?

U.S. Outer Continental Shelf (OCS)

DOI has delegated the mineral leasing authorities established by the OCSLA to the Bureau of Ocean Energy Management (BOEM).²⁶ According to BOEM, “BOEM is the only federal agency with the authority to lease marine minerals from the OCS, including responding to commercial requests for OCS minerals such as gold, manganese, or other hard minerals.”²⁷ To date, BOEM has only issued leases for sand and gravel (see “U.S. Outer Continental Shelf (OCS)”).

The Area (International Waters)

The Deep Seabed Hard Mineral Resources Act (DSHMRA, P.L. 96-283), enacted in 1980, authorizes and requires the Administrator of NOAA to issue licenses for exploration and permits for commercial recovery in the Area, if certain conditions are met.²⁸ For example, NOAA can only issue a license or permit to U.S. citizens, corporations, and similar entities.²⁹ The DSHMRA only authorizes licenses and permits for four minerals (*hard mineral resources*, defined as “any deposit or accretion on, or just below, the surface of the deep seabed of nodules which include one or more minerals, at least one of which contains manganese, nickel, cobalt, or copper”).³⁰ NOAA has issued two exploration licenses that are still active.³¹

The DSHMRA was enacted before international ratification of UNCLOS and formation of the ISA. The United States is not a member country of the ISA, but it is an observer country.³² International law does not recognize U.S. authority to issue exploration licenses or exploitation permits in the Area. Congress noted the intended temporary purpose of the DSHMRA, which includes

²⁵ U.S. Department of State, “Frequently Asked Questions,” at <https://www.state.gov/frequently-asked-questions-u-s-extended-continental-shelf-project/>.

²⁶ OCSLA, 43 U.S.C. §§1331-1356c. For more information on governing statutes related to BOEM and mining on the OCS, see BOEM, “BOEM Governing Statutes,” at <https://www.boem.gov/about-boem/regulations-guidance/boem-governing-statutes>.

²⁷ BOEM, “Marine Minerals,” at <https://www.boem.gov/marine-minerals>.

²⁸ 30 U.S.C. §1412.

²⁹ 30 U.S.C. §1412(c)(1)(f).

³⁰ 30 U.S.C. §1403.

³¹ Lockheed Martin, the only entity authorized by NOAA for mineral exploration in the Area, holds two exploration licenses that were issued in 1984; the licenses were most recently renewed in 2022 (NOAA, “Deep Seabed Mining: Approval of Exploration License Extensions,” 87 *Federal Register* 52743, 2022).

³² See ISA, “Observers,” at <https://isa.org.jm/observers> for more information on the role of observers in ISA activities.

to encourage the successful conclusion of a comprehensive Law of the Sea Treaty, which will give legal definition to the principle that the hard mineral resources of the deep seabed are the common heritage of mankind and which will assure, among other things, nondiscriminatory access to such resources for all nations.³³

to establish, pending the ratification by, and entering into force with respect to, the United States of such a Treaty, an interim program to regulate the exploration for and commercial recovery of hard mineral resources of the deep seabed by United States citizens.³⁴

Unlike the OCSLA and UNCLOS, the DSHMRA does not authorize the assessment of a royalty on mineral production in the Area. This difference could lead to incentives for entities looking to mine in the Area: entities could seek a permit for commercial recovery from NOAA rather than from the ISA, to avoid paying royalties on mineral production.

Where Are Sea Mining Exploration and Operations Occurring?

U.S. Outer Continental Shelf (OCS)

BOEM, often in conjunction with other agencies, explores the OCS for solid minerals and issues leases for their recovery. For example, BOEM issues leases for sand and gravel, which are commonly used for shoreline and other coastal restoration projects.³⁵ BOEM has not yet issued a lease for minerals other than sand or gravel.

Regarding its mineral exploration efforts, BOEM notes that “[f]or more than 35 years, the Marine Minerals Program (MMP) has funded marine minerals research using cooperative agreements, interagency agreements, and contracts. Our expert partners have included other federal agencies, state agencies, universities, and private-sector contractors.”³⁶ The MMP was established by the Marine Mineral Resources Research Act of 1996 (MMRRA, P.L. 104-325), and directs the Secretary of the Interior to “promote and coordinate partnerships between industry, government, and academia to research, identify, assess, and explore marine mineral resources in an environmentally sound manner.”³⁷

NOAA explores domestic and international waters for minerals through its Ocean Exploration program, stating

With the mission to explore the ocean for national benefit, NOAA Ocean Exploration is the only U.S. federal organization dedicated to exploring the deep ocean.... NOAA Ocean Exploration works with partners to explore previously unknown areas of our deep ocean, making discoveries of scientific, economic, and cultural value and supporting innovations in exploration tools and capabilities.³⁸

³³ 30 U.S.C. §1401(b)(1).

³⁴ 30 U.S.C. §1401(b)(3).

³⁵ BOEM, “Requests and Active Leases,” at <https://www.boem.gov/marine-minerals/requests-and-active-leases>.

³⁶ BOEM, “Marine Mineral Resource Evaluation Studies,” at <https://www.boem.gov/marine-minerals/marine-mineral-research-studies/marine-mineral-resource-evaluation-studies>.

³⁷ 30 U.S.C. §1902(c)(1).

³⁸ NOAA, “Our Mission,” at <https://oceanexplorer.noaa.gov/about/what-we-do/welcome.html>. See Title XII, Subtitle A, of the Omnibus Public Land Management Act of 2009, P.L. 111-11 for legislation establishing the Ocean Exploration program. For additional information on federal ocean research efforts, see CRS Report R47021, *Federal*

The USGS’s Global Marine Mineral Resources project “researches deep ocean minerals within the U.S. Exclusive Economic Zone and throughout the Earth’s oceans,” sometimes working jointly with BOEM and NOAA.³⁹

Joint research and exploration of the Escanaba Trough is an example of USGS, NOAA, and BOEM working “together to identify the location and extent of mineral resources within the EEZ, as well as to better understand the biology and ecology of the deep-sea environments where they are located.... USGS partners with BOEM to characterize the U.S. EEZ with modern remote sensing systems to find areas favorable for critical minerals.”⁴⁰ Another example of joint efforts among these agencies includes the exploration of the Blake Plateau in the Atlantic Ocean.⁴¹

The Area (International Waters)

Currently, there is no ISA-authorized mining in the Area, beyond exploration activities. The ISA cannot authorize mining in the Area until it adopts Exploitation Regulations, which are currently in draft form and awaiting adoption by the ISA Council.⁴²

The ISA has issued 31 exploration contracts, including 17 for exploration for polymetallic nodules in the Clarion-Clipperton Fracture Zone in the central Pacific Ocean; two for exploration for polymetallic nodules in other regions; seven for exploration for polymetallic sulphides (or sulfides) in various ocean regions; and five for exploration for cobalt-rich crusts in the Western Pacific Ocean.⁴³ **Figure 3** shows the location, entity (government or private), and deposit type for the 31 exploration contracts issued by the ISA.⁴⁴

One company operating under an ISA exploration contract has recently completed a test of its pilot nodule collection system. A Canadian-based firm, The Metals Company (TMC), reports that its wholly owned subsidiary, Nauru Ocean Resources, Inc. (NORI), collected approximately 14 tons of polymetallic nodules in the Clarion-Clipperton Zone during a one-hour trial.⁴⁵ The Metals

Involvement in Ocean-Based Research and Development, by Caitlin Keating-Bitonti.

³⁹ USGS, “Global Marine Mineral Resources,” at <https://www.usgs.gov/centers/pcmssc/science/global-marine-mineral-resources>.

⁴⁰ USGS, “Deep Dive: Critical Mineral Resources in Escanaba Trough,” at <https://www.usgs.gov/centers/pcmssc/news/deep-dive-critical-mineral-resources-escanaba-trough>, and USGS, “USGS Leads Research Expedition to Deep-Sea Escanaba Trough,” at <https://www.usgs.gov/centers/pcmssc/news/usgs-leads-research-expedition-deep-sea-escanaba-trough>.

⁴¹ See NOAA, “Searching for Historic Deep-Sea Mining Impacts on the Blake Plateau,” at <https://oceanexplorer.noaa.gov/oceanos/explorations/ex1907/logs/nov7/nov7.html>, and BOEM, “BOEM and Research Partners Resume Southeast Atlantic Exploration April 9–30, 2019,” press release, April 9, 2019, at <https://www.boem.gov/newsroom/notes-stakeholders/boem-and-research-partners-resume-southeast-atlantic-exploration-april>.

⁴² ISA, “The Mining Code: Draft Exploitation Regulations,” at <https://isa.org.jm/mining-code/draft-exploitation-regulations>.

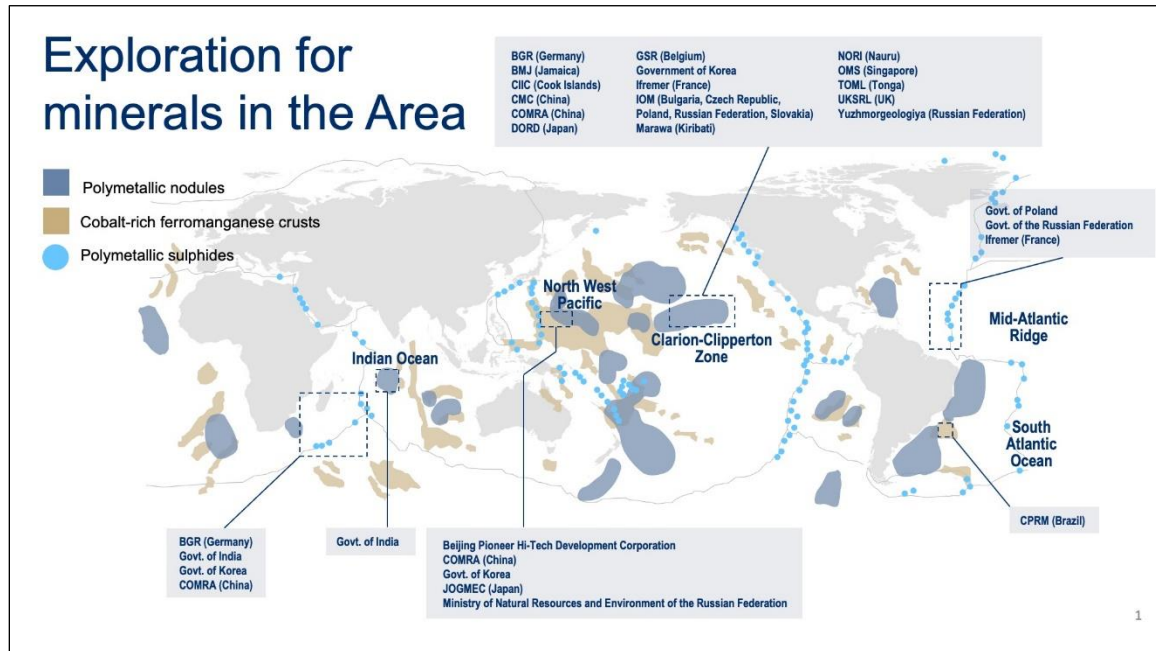
⁴³ ISA, “Exploration Contracts,” at <https://isa.org.jm/exploration-contracts/>.

⁴⁴ Contractors can hold more than one contract. For a list of the complete name of the contractors conducting exploration under the ISA contracts, see ISA, “Exploration Contracts,” at <https://www.isa.org.jm/exploration-contracts>.

⁴⁵ The Metals Company, “TMC and Allseas Achieve Historic Milestone: Nodules Collected from the Seafloor and Lifted to the Production Vessel Using 4 km Riser During Pilot Trials in the Clarion Clipperton Zone for First Time Since the 1970s,” press release, October 12, 2022, at <https://investors.metals.co/news-releases/news-release-details/tmc-and-allseas-achieve-historic-milestone-nodules-collected>.

Company also states, “NORI expects to submit an application to the ISA for an exploitation contract for NORI-D in the second half of 2023.”⁴⁶

Figure 3. Exploration for Minerals in the Area



Source: ISA, “Exploration Areas,” at <https://www.isa.org.jm/minerals/exploration-areas>.

What Regulations Cover Domestic Sea Mining?

U.S. Outer Continental Shelf (OCS)

Regulations pertaining to sea mining on the OCS, as administered by BOEM, are generally found in Title 30 of the *Code of Federal Regulations*, Chapter V, including the following parts.

Part 580, Prospecting for Minerals Other Than Oil, Gas, and Sulphur on the Outer Continental Shelf, generally covers how to apply for a permit or notice to conduct exploration activities, including geological and geophysical activities, and related obligations in conducting such activities.⁴⁷

Part 581, Leasing of Minerals Other Than Oil, Gas, and Sulphur in the Outer Continental Shelf, generally covers the leasing process for sea mining, including determinations of rental payments, production royalties, and bonding requirements.⁴⁸

Part 582, Operations in the Outer Continental Shelf for Minerals Other Than Oil, Gas, and Sulphur, generally covers the obligations and responsibilities of the lease operator, including

⁴⁶ The Metals Company, “NORI-D Project—Nauru Ocean Resources Inc.,” at <https://metals.co/nori/>. NORI-D refers to one of NORI’s exploration areas.

⁴⁷ 30 C.F.R. Part 580.

⁴⁸ 30 C.F.R. Part 581.

requirements for delineation plans, testing plans, mining plans, contingency plans, and environmental protection measures.⁴⁹

The Area (International Waters)

Regulations pertaining to sea mining in the Area, as administered by NOAA, are generally found in Title 15 of the *Code of Federal Regulations*, Chapter IX, including the following parts.

Part 970, Deep Seabed Mining Regulations for Exploration Licenses, generally covers the application process and requirements for an exploration license, including information on financial resources, exploration plans, and environmental information sufficient to allow NOAA to develop an environmental impact statement (EIS).⁵⁰ Exploration licenses are issued for an initial period of 10 years, and if requested, must be renewed unless NOAA determines that the licensee has not substantially complied with the terms of the license.⁵¹

Part 971, Deep Seabed Mining Regulations for Commercial Recovery Permits, generally covers the application process and requirements for a commercial recovery permit, including information on financial resources, commercial recovery plans, and environmental information sufficient to allow NOAA to develop an EIS.⁵² Commercial recovery permits are issued for an initial period of 20 years.⁵³

Federal Environmental Requirements

The National Environmental Policy Act of 1969 (NEPA, P.L. 91-190) establishes processes and requirements that federal agencies must follow to consider environmental impacts of certain federal actions.⁵⁴ Broadly speaking, NEPA applies to the implementation of requirements under other environmental laws, including the Clean Water Act, the Endangered Species Act, and the National Historic Preservation Act, among others. BOEM and NOAA must meet applicable NEPA requirements when authorizing sea mining exploration and extraction activities.⁵⁵

In addition to meeting requirements under NEPA, the OCSLA requires BOEM to “to establish information needed for assessment and management of environmental impacts on the human, marine, and coastal environments of the outer Continental Shelf and the coastal areas which may be affected by oil and gas or other mineral development in such area or region.”⁵⁶ Once a lease has been issued, BOEM notes that

⁴⁹ 30 C.F.R. Part 582.

⁵⁰ 15 C.F.R. Part 970.

⁵¹ 15 C.F.R. §970.515. Lockheed Martin, the only entity authorized by NOAA for mineral exploration in the Area, holds two exploration licenses that were issued in 1984; the licenses were most recently renewed in 2022 (NOAA, “Deep Seabed Mining: Approval of Exploration License Extensions,” 87 *Federal Register* 52743, 2022).

⁵² 15 C.F.R. Part 970.

⁵³ 15 C.F.R. §971.415.

⁵⁴ The National Environmental Policy Act of 1969 (NEPA, P.L. 91-190) is generally codified at 42 U.S.C. §§4321 et seq. For more information on NEPA, see CRS Report RL33152, *The National Environmental Policy Act (NEPA): Background and Implementation*, by Linda Luther.

⁵⁵ BOEM and NOAA have agency-specific procedures for implementing NEPA. The Department of the Interior’s (DOI’s) NEPA implementation procedures, which apply to BOEM and other DOI agencies, are codified at 43 C.F.R. Part 46, and in various agency manuals at <https://www.doi.gov/nepa/requirements-guidance/DOI-requirements>. NOAA procedures can be accessed at <https://www.noaa.gov/nepa>.

⁵⁶ 43 U.S.C. §1346(a). BOEM notes that some activities are expected to “not cause significant environmental impact

Exploration, testing, development, production, and processing activities proposed to be conducted under a lease will only be approved by the Director upon the determination that the adverse impacts of the proposed activities can be avoided, minimized, or otherwise mitigated. The Director shall take into account the information contained in the sale-specific environmental evaluation prepared in association with the lease offering as well as the site- and operational-specific environmental evaluations prepared in association with the review and evaluation of the approved Delineation, Testing, or Mining Plan.... If the baseline data available are judged by the Director to be inadequate to support an environmental evaluation of a proposed Delineation, Testing, or Mining Plan, the Director may require the lessee to collect additional environmental baseline data prior to the approval of the activities proposed.⁵⁷

By regulation, BOEM has the authority to suspend exploration and operation activities at any time, including due to concerns about adverse environmental impacts.⁵⁸ BOEM also monitors the environmental impacts of exploration and exploitation activities.⁵⁹ BOEM's Marine Minerals Program funds environmental research related to sea mining, including biological studies, physical modeling studies, and environmental impact investigations.⁶⁰ The program uses study results to analyze "potential environmental impacts that could result from exploring for or using marine minerals located on the Outer Continental Shelf (OCS)," and "prepares programmatic and project-specific environmental documents and undertakes related environmental consultations with other government agencies."⁶¹

The DSHMRA requires NOAA to conduct an EIS prior to issuance of any license or permit for sea mining activities.⁶² NOAA categorizes exploration and recovery activities as those with no significant adverse environmental effects or those with potential impacts, and regarding licenses, regulations indicate that

NOAA "may modify any term, condition, or restriction in such license ... [i]f relevant data and other information (including, but not limited to, data resulting from exploration activities under the license) indicate that modification is required to protect the quality of the environment or to promote the safety of life and property at sea."⁶³

Similarly, for commercial recovery permits, regulations authorize NOAA to modify the terms and conditions, "if relevant data and information (including, but not limited to, data resulting from activities under a permit) indicate that modification is required to protect the quality of the environment or to promote the safety of life and property at sea."⁶⁴

and will normally be categorically excluded from additional environmental analysis" (30 C.F.R. §580.30).

⁵⁷ 30 C.F.R. §582.28.

⁵⁸ 30 C.F.R. §§580.25-580.27.

⁵⁹ 30 C.F.R. §580.29.

⁶⁰ BOEM, "Research and Studies," at <https://www.boem.gov/marine-minerals/research-and-studies>.

⁶¹ BOEM, "Environmental Oversight," at <https://www.boem.gov/marine-minerals/environmental-oversight>.

⁶² 30 U.S.C. §1419(d).

⁶³ 15 C.F.R. §970.512.

⁶⁴ 15 C.F.R. §971.414.

What Are Some Environmental Concerns of Sea Mining?⁶⁵

Environmental concerns related to sea mining operations can vary by location, as sea mining operations could employ different technologies to mine various materials in a range of shapes and sizes (e.g., sand, nodules, crusts). Some examples of sea mining activities likely to cause environmental impacts include:

- physical disturbance and separation of minerals from the seafloor;
- impacts due to light and sound during mining operation;
- oil spills and leakages from mining platform and transport vessels; and
- at-sea processing, dewatering, waste disposal including chemicals and debris.⁶⁶

These activities would be expected to result in environmental impacts, some examples of which include:

- mortality of organisms during mining;
- suspension of sediment in the water column;
- mortality of zooplankton species at mid-water depths;
- depletion of oxygen by bacterial growth on suspended particles;
- smothering of the seafloor by sediment; and
- incorporation of heavy metals into the food chain.⁶⁷

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⁶⁵ For additional information potential environmental concerns, see CRS Report R47324, *Seabed Mining in Areas Beyond National Jurisdiction: Issues for Congress*, by Caitlin Keating-Bitonti.

⁶⁶ Rahul Sharma, “Approach Towards Deep-Sea Mining: Current Status and Future Prospects,” in *Perspectives on Deep-Sea Mining: Sustainability, Technology, Environmental Management and Policy*, ed. Rahul Sharma (Springer, 2022), p. 31.

⁶⁷ *Ibid.*, pp. 31-32.

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