

NOAA Office of Ocean Exploration and Research

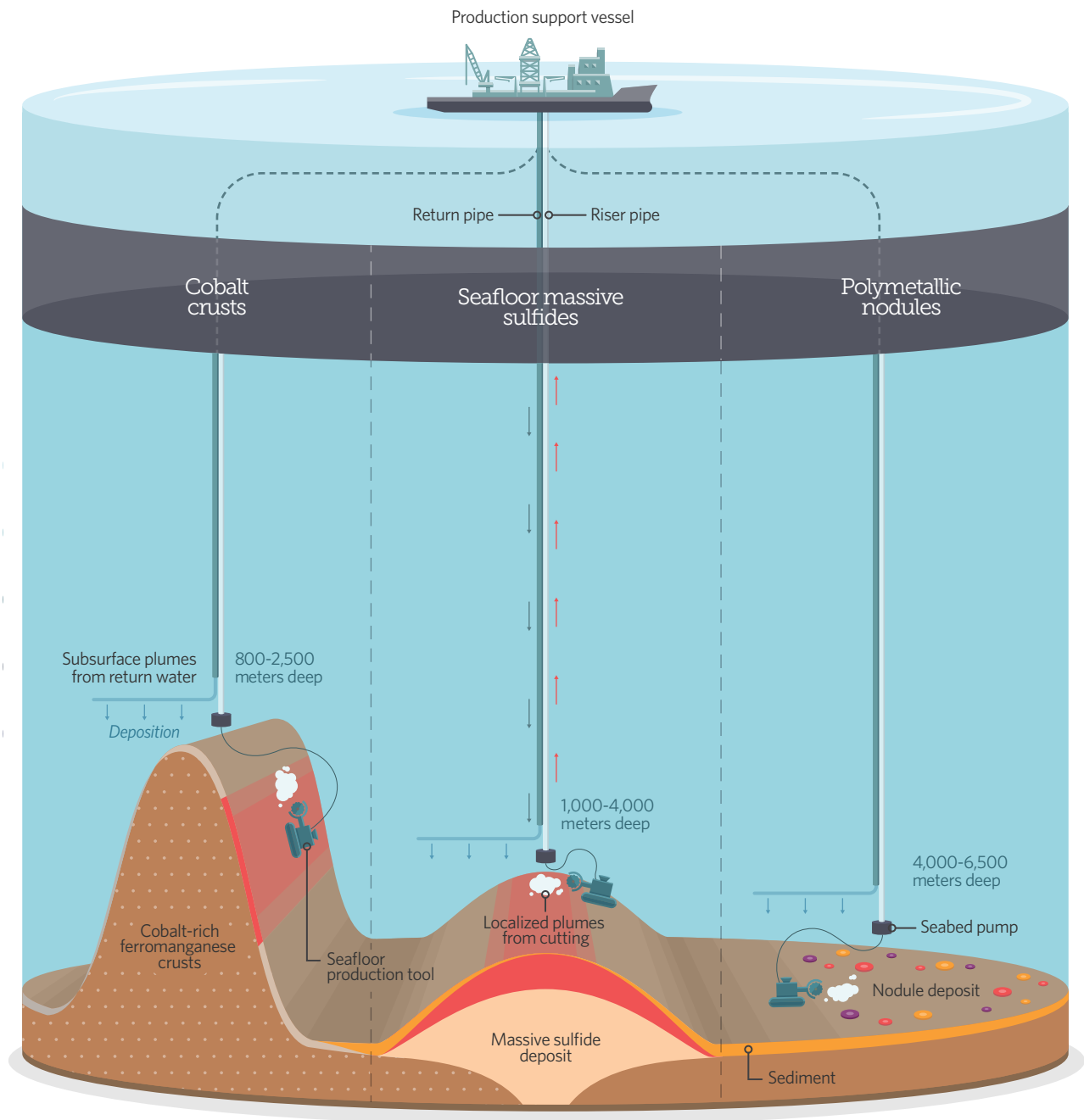
# Deep Sea Mining: The Basics

## Overview

The deepest parts of the world's ocean feature ecosystems found nowhere else on Earth. They provide habitats for multitudes of species, many yet to be named. In these vast, lightless regions are also found deposits of valuable minerals in rich concentrations. Deep sea extraction technologies may soon develop to the point where exploration of seabed minerals can give way to active exploitation.

The International Seabed Authority (ISA) is charged with formulating and enforcing rules for all seabed mining that takes place in areas beyond national jurisdiction. These rules are now under development. Environmental regulations, liability and financial rules, oversight, and enforcement protocols all must be written and approved within three to five years.

Figure 1  
Types of Deep Sea Mining



Source: New Zealand Environment Guide  
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## The legal foundations

- **United Nations convention.** The constitutional document governing mineral exploitation on the 60 percent of the world seabed that lies beyond national jurisdictions is the **U.N. Convention on the Law of the Sea** (UNCLOS), also known as the Law of the Sea Treaty. UNCLOS took effect in 1994 upon passage of key enabling amendments designed to spur commercial mining. One of the distinguishing features of UNCLOS is its declaration that the international seabed must be considered “the common heritage of mankind” and that mining operations should be conducted to reflect that fact. The definition and monetization of “common heritage” present a significant challenge to the ISA and its commercial contractors.
- **The Area.** The seabed beyond the exclusive economic zones (EEZs) of individual countries is known as the Area. Coastal nations can monopolize economic activity only within their EEZs, which extend no more than 200 nautical miles beyond national shores.

The ISA is solely responsible for regulating seabed mining in the Area. But UNCLOS also requires state parties to govern any seabed mining within their EEZs with national regulations that conform to the environmental standards mandated by the treaty.

- **International Seabed Authority (ISA).** The ISA is the U.N. body invested by UNCLOS with broad powers to establish the conditions under which UNCLOS Member States can explore and exploit the mineral resources found along the Area’s seabed floor. The ultimate authority of the ISA is its **Assembly**, which elects members of the ISA **Council**, an executive body that considers agenda items for final disposition by the Assembly. Many of the matters under consideration by the council come as reports and recommendations by the **Legal and Technical Commission (LTC)**, the ISA’s expert advisory body. All three bodies convene during the ISA annual meeting each summer at the organization’s headquarters in Kingston, Jamaica. Day-to-day activities of the authority are managed by the ISA **Secretary-General**.
- **ISA contracts.** ISA Member States are eligible to apply for an ISA contract. There are two kinds: Exploration contracts govern data-gathering, sampling, prospecting, and reporting. Exploitation contracts govern all aspects of actual mining. At the end of 2016, 26 exploration contracts and no exploitation contracts were in effect. It is expected that there will be no exploitation contracts until 2018 at the earliest.
- **Mining Code.** The ISA uses the term Mining Code to denote “the whole of the comprehensive set of rules, regulations and procedures issued by the ISA to regulate prospecting, exploration and exploitation of marine minerals in the Area.” Currently under development, the Mining Code will cover all environmental, financial, reporting, and regulatory obligations incurred by contractors and the ISA itself. No mineral exploitation can occur until all elements of the Mining Code are finalized. One key element is the set of environmental protection regulations that will govern all exploitation contracts. The ISA published an official Discussion Paper in January 2017 to prompt and inform stakeholder comments on the development of an environmental rulebook.



## Deep sea minerals and where they are found

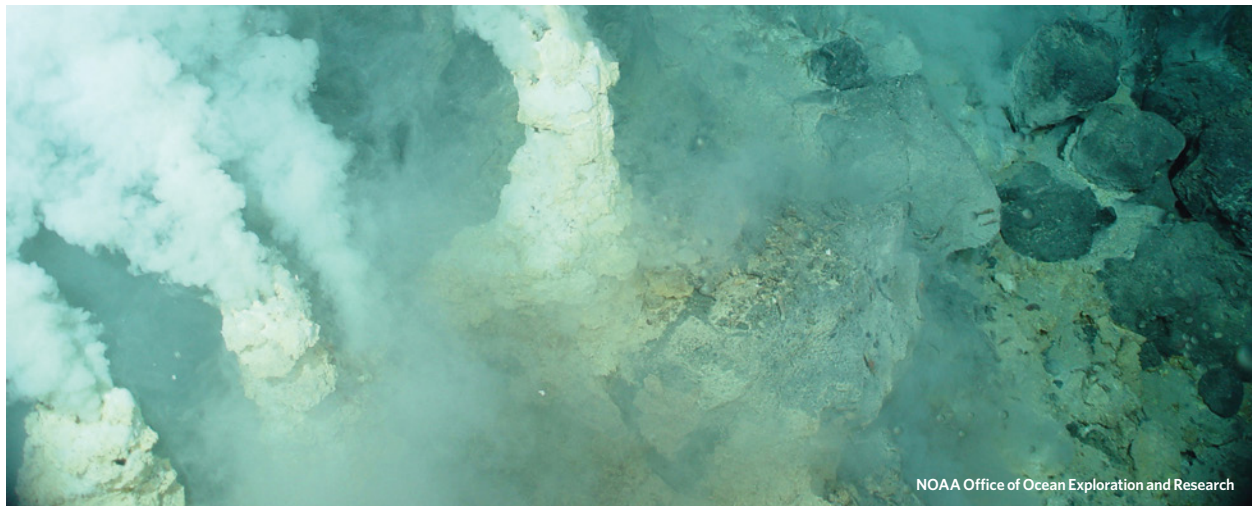
Hopes for the exploitation of seabed minerals rely on the fact that valuable substances can exist in greater concentrations on the ocean floor than in many terrestrial sites. These sought-after commodities include **gold, copper, manganese, nickel, lead, cobalt, lithium, titanium, platinum, and zinc**. The ISA has signed exploration contracts for investigating three sources of these minerals:

### Polymetallic nodules (16 ISA exploration contracts)



Polymetallic nodules contain rich concentrations of manganese, nickel, copper, and cobalt. They are found in abundance in the Clarion-Clipperton Zone (CCZ), a great abyssal plain as wide as the continental United States that lies 4,000 to 6,000 meters below the surface of the eastern Pacific Ocean. There, millions of the potato-size nodules are scattered on top of or half-embedded within the muddy bottom of the CCZ. Their exploitation would probably involve scraping 5 to 10 centimeters (2 to 4 inches) off the top of the abyssal plain, separating the nodules from the mud, pumping the nodules to a surface ship by means of a giant tube, and returning the water and fine particles through another tube.

## Massive sulfides (six ISA exploration contracts)



Underwater volcanic activity exists at depths of 1,000 to 4,000 meters, usually at tectonic plate boundaries. Hydrothermal vents on the seabed release superheated solutions with high concentrations of valuable minerals that precipitate out into polymetallic sulfides. Deposits formed by these eruptions, along with shallow subsurface deposits, could provide rich but modest-size areas for mineral exploitation. Operations would remove the sulfide-rich deposits and return water and fine particles through a tube.

## Cobalt crusts (four ISA exploration contracts)



Concentrations of valuable minerals are often found on the sides and summits of underwater mountains. The richest deposits are found at depths of 800 to 2,500 meters as crusts of seamounts in the western Pacific. Crust thicknesses can reach 25 centimeters (almost 10 inches), but more typical deposits run 10 to 15 centimeters (4 to 6 inches). The basic mode of exploitation would be to remove the seamount skin without including too much of the less valuable rock beneath it. The skinning operation would require a large impact area.



## Who is exploring where?

As of 2016, there are 26 ISA-approved contracts for exploration in the Area.

Table 1

### Contracts to Explore Polymetallic Nodule Areas

Sponsoring State(s)	Contractor	Expiration date
India	N/A	2017
China	China Ocean Mineral Resources Research and Development Association	2021*
France	IFREMER (French Research Institute for Exploitation of the Sea)	2021*
Germany	Federal Institute for Geosciences and Natural Resources	2021
Japan	Deep Ocean Resources Development Co. Ltd.	2021*
South Korea	N/A	2021*
Russia	Yuzhmorgeologiya	2021*
Bulgaria, Cuba, Czech Republic, Poland, Russia, Slovakia	Inter Ocean Metal Joint Organization	2021*
Nauru	Nauru Ocean Resources Inc.	2026
Tonga	Tonga Offshore Mining Ltd.	2027
Belgium	Global Sea Mineral Resources	2028
United Kingdom (1 of 2)	UK Seabed Resources Ltd.	2028
Kiribati	Marawa Research and Exploration Ltd.	2030
Singapore	Ocean Mineral Singapore Pte Ltd.	2030
Cook Islands	Cook Islands Investment Corp.	2031
United Kingdom (2 of 2)	UK Seabed Resources Ltd.	2031

\* These contracts were to expire in 2016 but received a five-year extension for exploration. International Seabed Authority, "Seabed Council Puts Forward Two Candidates for Election of Secretary-General; Approves Six Exploration Contract Extensions; Begins LTC Election Debate" (July 18, 2016), <https://www.isa.org.jm/news/seabed-council-puts-forward-two-candidates-election-secretary-general-approvessix-exploration>.

Source: International Seabed Authority, "Deep Seabed Minerals Contractors," accessed Nov. 28, 2016, <https://www.isa.org.jm/deep-seabed-minerals-contractors>

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Table 2

## Contracts to Explore Polymetallic Sulfide Areas

Sponsoring State(s)	Contractor	Expiration date
<b>China</b>	China Ocean Mineral Resources Research and Development Association	2026
<b>Russia</b>	N/A	2027
<b>France</b>	IFREMER (French Research Institute for Exploitation of the Sea)	2029
<b>South Korea</b>	N/A	2029
<b>Germany</b>	Federal Institute for Geosciences and Natural Resources	2030
<b>India</b>	N/A	2031

Source: International Seabed Authority, "Deep Seabed Minerals Contractors," accessed Nov. 28, 2016, <https://www.isa.org.jm/deep-seabed-minerals-contractors>

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Table 3

## Contracts to Explore Carbon-Rich Crust Areas

Sponsoring State(s)	Contractor	Expiration date
<b>China</b>	China Ocean Mineral Resources Research and Development Association	2029
<b>Japan</b>	Japan Oil, Gas, and Metals National Corp.	2029
<b>Brazil</b>	CPRM (Geological Survey of Brazil) contractors	2030
<b>Russia</b>	Ministry of Natural Resources and Environment	2030

Source: International Seabed Authority, "Deep Seabed Minerals Contractors," accessed Nov. 28, 2016, <https://www.isa.org.jm/deep-seabed-minerals-contractors>

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*An earlier version of this fact sheet included several incorrect data points regarding the current status of seabed mining and the rules being developed to guide international seabed mining policy. We take accuracy very seriously and as a result, revised and updated the page on March 24, 2017.*

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**For further information, please visit:**  
[pewtrusts.org/seabed](http://pewtrusts.org/seabed)

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