

This article is related to General Studies-Paper III (Sci & Tech. and Environment & Ecology)

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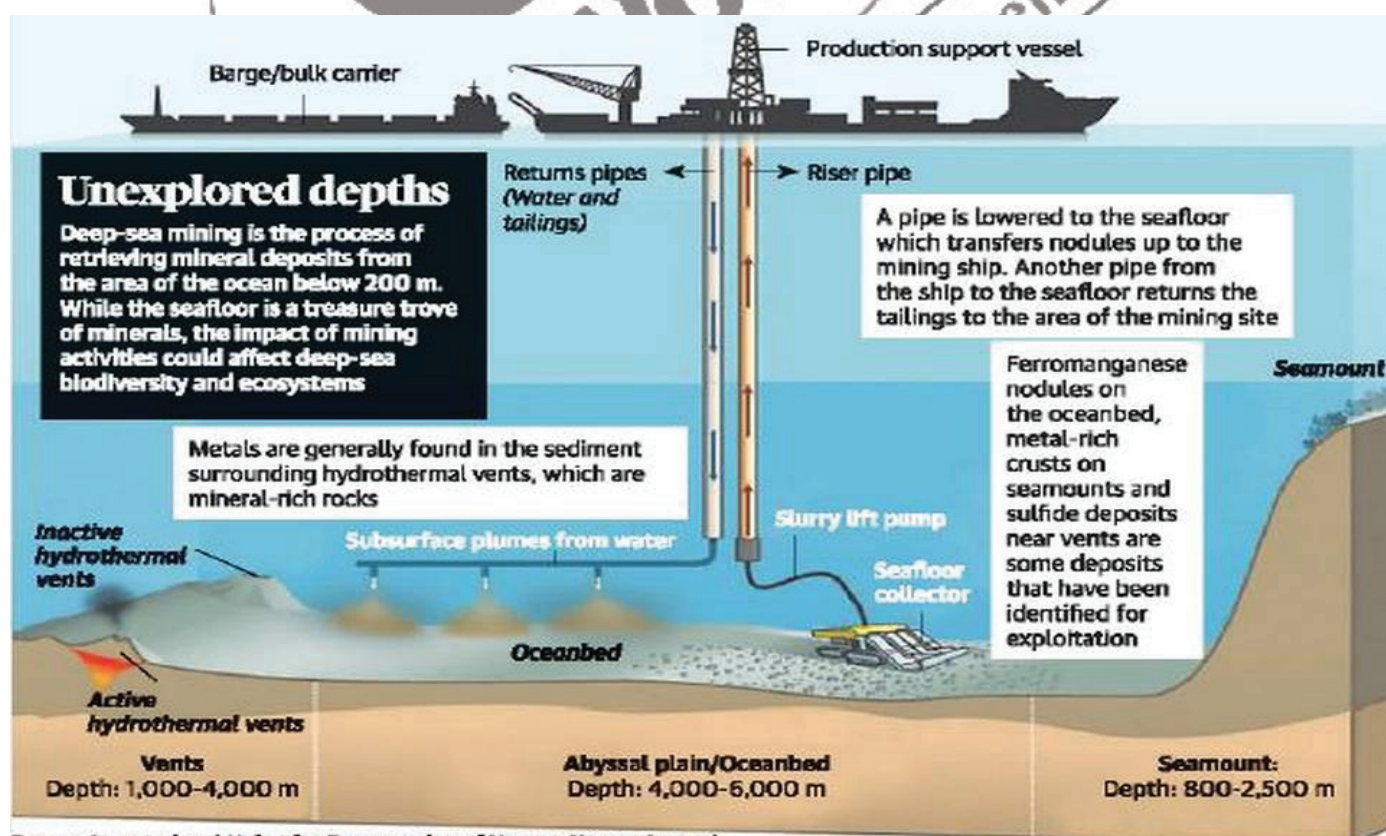
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## "What is the country's Deep Ocean Mission all about? What are the metals that can be extracted?"

The story so far: India's ambitious 'Deep Ocean Mission' is all set to be launched this year. Dr. Madhavan Rajeevan, Secretary, Union Ministry of Earth Sciences, announced on July 27 that the ₹8,000-crore plan to explore deep ocean minerals will start from October. He said, "We finally have the in-principle approval to go ahead with the mission. Now expenditure plans will be drawn up and circulated [to various institutions affiliated to the Ministry] for executing programmes and we hope to launch by October 31."

### What will be mined from the deep ocean?

One of the main aims of the mission is to explore and extract polymetallic nodules. These are small potato-like rounded accretions composed of minerals such as manganese, nickel, cobalt, copper and iron hydroxide. They lie scattered on the Indian Ocean floor at depths of about 6,000 m and the size can vary from a few millimetres to centimetres. These metals can be extracted and used in electronic devices, smartphones, batteries and even for solar panels.



Source: International Union for Conservation of Nature. Nature Journal

## Where will the team mine?

The International Seabed Authority (ISA), an autonomous international organisation established under the 1982 United Nations Convention on the Law of the Sea, allots the 'area' for deep-sea mining. India was the first country to receive the status of a 'Pioneer Investor' in 1987 and was given an area of about 1.5 lakh sq km in the Central Indian Ocean Basin (CIOB) for nodule exploration. In 2002, India signed a contract with the ISA and after complete resource analysis of the seabed 50% was surrendered and the country retained an area of 75,000 sq km. According to a release from the Ministry of Earth Sciences, the estimated polymetallic nodule resource potential in this area is 380 million tonnes (MT), containing 4.7 MT of nickel, 4.29 MT of copper, 0.55 MT of cobalt and 92.59 MT of manganese. Further studies have helped narrow the mining area to 18,000 sq km which will be the 'First Generation Mine-site'.

## Which are the other countries that are in the race to mine the deep sea?

Apart from the CIOB, polymetallic nodules have been identified from the central Pacific Ocean. It is known as the Clarion-Clipperton Zone.

According to the ISA's website, it has entered into 15-year contracts for exploration for polymetallic nodules, polymetallic sulphides and cobalt-rich ferromanganese crusts in the deep seabed with 29 contractors. Later it was extended for five more years till 2022. China, France, Germany, Japan, South Korea, Russia and also some small islands such as the Cook Islands, Kiribati have joined the race for deep sea mining. Most of the countries have tested their technologies in shallow waters and are yet to start deep-sea extraction.

## When will India start mining?

India's mining site is at about a depth of 5,500 metres, where there is a high pressure and extremely low temperature. Explains Dr. G.A. Ramadass, head of the Deep Sea Technologies Group, National Institute of Ocean Technology, Chennai, "We have developed and demonstrated the mining technology with artificial nodules at 500 metres depth. We have also deployed Remotely Operated Vehicle and In-situ Soil Tester in the depth of 6,000 metres and have a thorough understanding of the mining area at the Central Indian Ocean Basin." He adds, "The mining machine newly developed for 6000 metres depth was able to move about 900 metres and will be deployed soon at 5,500 metres. We hope to test it in October this year. Weather conditions and availability of ships also play a role. More tests are being conducted to understand how to bring the nodules up to the surface. A riser system comprising an umbilical cable or electromechanical cable and a hose is being developed."

## What will be the environmental impact?

According to the International Union for Conservation of Nature (IUCN), these deep remote locations can be home to unique species that have adapted themselves to conditions such as poor oxygen and sunlight, high pressure and extremely low temperatures. Such mining expeditions can make them go extinct even before they are known to science. The deep sea's biodiversity and ecology remain poorly understood, making it difficult to assess the environmental impact and frame adequate guidelines.

Dr. Ramadass adds that though strict guidelines have been framed, they are only exploration guidelines. A new set of exploitation guidelines are being worked out and discussions are on with the ISA. Environmentalists are also worried about the sediment plumes that will be generated as the suspended particles can rise to the surface harming the filter feeders in the upper ocean layers. Additional concerns have been raised about the noise and light pollution from the mining vehicles and oil spills from the operating vessels.

## Is deep sea mining economically viable?

The latest estimate from the ISA says it will be commercially viable only if about three million tonnes are mined per year. More studies are being carried out to understand how the technology can be scaled up and used efficiently.

### Deep Ocean Mission

#### Why in the discussion?

- Recently the Government of India has approved the "Deep Ocean Mission". 8000 crores of funds have been allocated for this five year plan.
- The purpose of this mission is to explore the deep ocean, it will search for minerals and metals.
- The UN International Sea Bed Authority has allotted India an area of 75,000 square kilometers in the Central Indian Ocean Basin.

#### The background

- In the year 1987, India is the first country to get investor rating, which is in connection with the exploration and utilization of polymetallic nodules a U.N. A special area was allocated in the Central Indian Ocean Basin by U.N.
- India is one of the top 8 countries / contractors conducting a long term program on exploration and use in relation to polymetallic nodules through the Ministry of Earth Sciences.
- This long-term program covers areas such as survey and exploration, environmental studies, technological development in the mining sector and metal extraction in relation to polymetallic nodules. Not only this, some important achievements have been achieved in these areas.

#### What is it?

- The Marine Technology and Ocean Mining Group is responsible for the development of technology for the mining of polymetallic nodules.
- India has joined the race to explore and develop deep-sea mining for rare earth elements.
- The purpose of deep sea mining will help to meet the country's important and strategic needs.

#### main point

- In this campaign, work will be done in relation to deep sea excavation, submerged vehicles, submerged robotics, ocean climate change etc.
- The Exclusive Economic Zone of India is spread over 2.2 million square kilometers, in which there

is a vast maritime area of India, which has not yet been exploited.

- Metals like iron, nickel, manganese and cobalt are found in these rocks. According to an estimate, there is a reservoir of approximately 380 million metric tons of polymetallic nodules in the Central Indian Ocean Basin.

#### Polymetallic nodes

- Polymetallic nodules contain magnesium, copper, nickel, cobalt, molybdenum, iron, lead, cadmium, vanadium.
- In the Central Indian Ocean Basin (CIOB) program has been carried out to exploit these nodules lying in the sea at water depths from 4000 m to 6000 m.
- Polymetallic nodules (also called manganese nodules) are potato shaped, with large porous tubules.
- There are four components in the Polymetallic Nodule Program, discussed below: -
  1. Surveying and exploration
  2. Environmental Impact Assessment
  3. Technology Development (Mining)
  4. Metallurgical (element extraction)
- India has been allocated a 1,50,000 sq km site in the Central Indian Ocean Basin (CIOB) by the United Nations International Sea-bed Authority for this program.
- These are rocks scattered on the ocean floor containing iron, manganese, nickel and cobalt. "It has been estimated that 10% of the recovery of that big reserve can meet India's energy requirement for the next 100 years.

#### International maritime authority

- International Seabed Authority, is a body of the United Nations Organization.
- This body has been set up to regulate extraction and exploitation etc. in relation to the nonliving resources found in oceans in international waters.
- India actively contributes to the work of the International Maritime Authority.
- India was re-elected as a member of the Council of ISA in the year 2016.



### Expected Questions (Prelims Exams)

**1. Consider the following statements-**

1. International Seabed Authority (ISA) was established by United Nations Convention of the Law of Sea in 1982.
2. ISA allots region of deep sea for mining.
3. India was the first country to get status of pioneer investor.

Which of the above statements are correct?

- (a) 1 and 2                      (b) 2 and 3  
(c) 1 and 3                      (d) All of the above

### Expected Questions (Mains Exams)

**Q. What is Deep Ocean Mission of India? Discuss its environmental effects along with benefits.**

(250Words)

**Note:** Answer of Prelims Expected Question given on 3 Aug. is 1(a).

