The Last Frontier on Earth

Singapore may soon be diving deep into the unexplored riches of our ocean floors.

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Seventy per cent of the Earth's surface is covered by sea and ocean. However, we seem to know less about ocean space than we do about outer space. On March 26 last year, the award-winning American movie director, James Cameron, descended alone in a submersible called the "Deepsea Challenger" to the bottom of the Mariana Trench. It is the deepest part of the ocean floor at 11km below the surface. He took pictures and collected samples from the ocean floor, and said the ocean was "the last frontier for science and exploration on this planet".

One of the surprising discoveries is the life on the ocean floor. In spite of the darkness and the pressure, scientists have discovered many forms of life such as the shrimp-like crustaceans known as amphipods; gelatinous animals called holothurians; and other strange life forms. Scientists have isolated a compound from one of the amphipods, called scyllo-inositol. It is being investigated for its potential to treat Alzheimer's. Scientists are also studying the rocks from ocean trenches in their quest for a better understanding of the earthquakes that create the powerful tsunamis around the Pacific Rim.

Minerals Below

I agree with Cameron that the ocean space is our last frontier. One of the mysteries of the deep seabed and ocean floor is the discovery of deposits of polymetallic nodules, polymetallic sulphides, and cobalt-rich ferromanganese crusts. The polymetallic nodules contain precious metals such as manganese, cobalt, nickel, copper and rare earth elements.

As the supply of these precious metals from land begins to diminish, as demand continues to increase and as metal prices remain high, interest in recovering the nodules and exploiting the sulphides and crusts has increased.

There are, however, many challenges. The polymetallic nodules, which are black in colour and resemble potatoes and golf balls, lie on top of the floor of the seabed in very deep waters. The depth ranges from 4,000m to 5,000m. Technology has not yet been perfected to harvest them in a way that is commercially viable and environmentally benign. The good thing is that as the nodules lie on the seabed, they need only to be recovered. There is no need for digging or dredging like conventional mines on land. The three methods being considered are to use nets, claws and suction to raise them to the mothership.

Whether deep sea mining will become feasible will partly depend on the technology, and partly on whether the costs of recovering the metals from ocean space can compete with the costs of recovering them from mines on land. The industry is, however, optimistic about the future. It believes the technological problems will be solved by leveraging on established offshore drilling technology in the oil and gas industry, which has ventured into very deep waters. Given our

insatiable demand for these precious metals, it believes it is a matter of time before deep sea mining becomes a reality.

Ownership of Resources

This leads us to the legal question: To whom do these resources belong? The answer is that it depends on where the resources are located. The Papua New Guinea government has granted a concession to a private company to recover the polymetallic nodules located within its territorial sea. The Cook Islands government announced it has rich deposits of polymetallic nodules within its exclusive economic zone and continental shelf and intends to tender out the exploration licences. These resources belong to the Cook Islands. If the resources are located within a coastal country's territorial sea, contiguous zone, exclusive economic zone or continental shelf, they belong to the coastal country.

What about the resources at the bottom of the seabed and ocean floor beyond the national jurisdiction of coastal states? The answer is that they belong to all of us. The 1982 United Nations Convention on the Law of the Sea calls them "the common heritage of mankind".

The convention has established an institution to act on behalf of mankind and to regulate seabed mining - it is the International Seabed Authority (ISA) in Kingston, Jamaica. Any state or company that wishes to mine the seabed has to apply to the ISA for a contract to do so.

In the case of an application by a company, it must be sponsored by a state that is a party to the convention. Without this contract, it would be difficult to raise the financing for a seabed mining project.

To date, the ISA has signed 13 contracts of exploration for polymetallic nodules, four contracts of exploration for polymetallic sulphides and will sign two contracts of exploration for cobalt-rich ferromanganese crusts.

Keppel's Venture

A Singapore company with a sterling reputation and track record in the offshore and marine sector, Keppel, has incorporated a subsidiary company called Ocean Mineral Singapore (OMS) to venture into deep sea mining. The Singapore Government is sponsoring the application of OMS because it has the resources and relevant technology and expertise. OMS is 78.1 per cent owned by Keppel, while UK Seabed Resources Limited (UKSRL) and Lion City Capital Partners hold the remaining shares. OMS is effectively controlled by Keppel.

In July, I led a Singapore delegation to the 19th annual session of the ISA. The delegation consisted of the representatives of the ministries of Foreign Affairs and Trade and Industry, the Attorney-General's Chambers, and Keppel. We submitted an application to the Legal and Technical Commission for a contract of exploration for a mine site which is located in the deep seabed, east of Hawaii and west of Mexico. It is between the Clarion Fracture Zone, in the north, and the Clipperton Fracture Zone, in the south. The Clarion-Clipperton Zone contains one of the richest known deposits of polymetallic nodules.

The mine site that OMS applied for was originally half of a larger mine site that UKSRL had applied for. Under the convention, UKSRL was obliged to give up half the mine site to the ISA as a "reserved area" for the benefit of developing countries. As a developing country, Singapore is therefore entitled to apply for a "reserved area".

Next Year's Prospects

The Legal and Technical Commission unfortunately ran out of time at its meeting in July. As a result, the applications of Russia, Britain, India and Singapore were deferred to its next meeting in February next year.

If the applications are approved, the commission's recommendations will be considered by the council of the ISA, at its next meeting in July next year.

I am optimistic that the application of OMS will be successful. The contract of exploration will give the company 15 years to conduct its research and prospecting.

There is an opportunity for Singapore's oceanographers, marine biologists and marine geologists to participate in the research.

At the same time, the ISA is starting work to develop an exploitation code for deep sea mining. If everything turns out well, Singapore, through OMS, will join four other Asian countries - China, India, Japan and South Korea - in exploring the deep seabed and ocean floor.

Exciting new job opportunities will be created for our young engineers, marine scientists and lawyers. A new era is about to begin.

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