Expert Explains: Why India needs to develop its deep sea capabilities

Operating in the depths of the ocean is a challenge that India must embrace to maximise its economic potential and protect its security interests. This is more so given that China is the world leader in the field.

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Matsya-6000 has been developed by the National Institute of Ocean Technology as part of the Samudrayaan Project under India's Deep Ocean Mission. (Image source: PIB)

Last month, India completed wet testing of its **Matsya-6000 submersible**, capable of diving up to 6 km below the surface to look for underwater minerals off the coast. The launch of the first deep-sea manned vehicle is planned for later this year — it will put India in a select group of nations with the capability to send humans to these depths.

Last week, China unveiled a compact deep sea cable-cutting device that can be mounted on certain submersibles — and which is capable of severing the world's most fortified underwater communication or power lines. China reportedly operates the largest fleet of submersibles in the world.

Deep sea challenge

The intense oceanic activity around the world over the past two decades has focused on the Deep both for its economic resources and as the theatre of possible future conflicts.

According to the United Nations Convention on the Law of the Seas (UNCLOS), the Exclusive Economic Zone (EEZ) of a country extends from the baseline of its coast to 200 nautical miles (about 370 km) into the sea. A nation has exclusive rights to living and non-living resources in the waters and on the seabed within its EEZ.

Average depth in the Indian EEZ is 3,741 metres — this is more than four-and-a-half times the height of Burj Khalifa, the world's tallest building. But it is shallow compared to the deepest ocean — the bottom of the Challenger Deep in the Mariana Trench in the western Pacific lies more than 10 km under the surface, more than the cruising altitude of most aircraft.

Operating in the deep sea requires a distinct technology and extremely specific capabilities that are challenging and expensive to develop. Consider:

* While sound can travel long distances underwater, its propagation is seriously affected by hydrological conditions such as temperature, pressure, and salinity. Generally speaking, the lower the frequency of the sound wave, the better the propagation of sound underwater.

Very low frequency (VLF) and extremely low frequency (ELF) sound technologies represent the cutting edge of science, and require deep research and enormous funding to develop.

* Pressure underwater increases by approximately one atmosphere (atm) for every 10 metres of ocean depth. One atm is roughly equivalent to the mean sea-level atmospheric pressure on Earth, or 101,325 Pascals. The pressure at the ocean bed in the Indian EEZ is upwards of 380 atm, or 380 times that on the surface of the Earth.

Vessels that descend to such depths need to be constructed using particular material and processes in order for them to operate safely. (Remember the OceanGate Titan submersible disaster of June 2023?)

Need for such technology

It is, however, imperative that India overcomes the challenge posed by the deep sea. To be able to ride on the blue economy in the future, India must have the technologies to harness the resources of the ocean and the seabed.

The ocean is a storehouse of resources, from fish, minerals, gas hydrates, oil and gas, and nutraceuticals to oceanographic data that may help in combating climate change and contribute to meteorological research. It is essential to harness these resources to maximise India's economic potential.

This will require the development of technologies for hydrographic research and exploration activity, as well as supporting capabilities such as diving, salvage, and submarine rescue.

Then there is the development of underwater infrastructure. Undersea cables crisscrossing the oceans are the backbone of modern communications technology. They are responsible for transmitting more than 95% of the intercontinental Internet traffic, seamlessly enabling activities from digital communication and transmission of video to banking transactions worth billions of dollars.

Developing the capability to lay and maintain these cables is critical to provide millions of Indians with digital connectivity, and to sustain an economy that increasingly relies on the same.

Apart from undersea cables, other deep sea infrastructure can include oil pipelines, equipment for mining, and scientific research.

Beyond exploiting the oceans' resources, mapping of the deep sea and maintaining a high degree of underwater domain awareness is critical for safeguarding maritime and security interests.

Take for instance the deep sea cable-cutter that China has announced. The development of complex underwater sensors and response mechanisms to act against any such disruption will be crucial to tackling any threats from hostile actors.

What India must do

As for every niche technology, the essential prerequisites for developing deep sea tech are financial strength, academic and research capabilities, and highly qualified and skilled human capital.

It is not surprising, therefore, that China, France, Japan, Norway, Russia, South Korea, and the US are far ahead of the rest of the world in this area. Chinese investments in deep sea science and engineering centres are paying rich dividends today.

In 2018, the Indian government launched the Deep Ocean Mission under the Ministry of Earth Sciences. The development of the Matsya-6000 submersible is a part of this mission. While this is welcome, the fact is India currently does not have even decent deep sea fishing capability — and needs to do much more.

The establishment of institutes of excellence in deep sea research will nurture academic excellence, expertise, and skill in the area. India also needs to incentivise every aspect of deep ocean science and engineering through generous funding and a strong, empowered body to drive this multi-dimensional mission forward at a faster-than-usual pace.

It is time to upgrade the Department of Ocean Development to a full-fledged ministry, led by a cabinet-rank minister, and make all departments and agencies responsible for ocean development accountable to this minister.

Well-funded, time-bound and result-oriented projects must be executed in “mission-mode”, with quick approvals, ease of doing business, and high accountability of stakeholders. A “ten year plan” will be helpful in this regard.

Lastly, India must remember that all these deep sea technologies are inherently “dual use” — the very vessels and equipment developed for ocean research and exploitation could also have disruptive uses in conflict. This too needs active consideration in its deep ocean strategy.

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