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Mineral Exploration in the Indian Ocean: India's Policy Response

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India's lack of a concrete policy towards exploration for mineral resources in high seas and offshore areas has played a role, though to a limited extent, in the exploration projects being awarded to countries like Korea and China in the Indian Ocean. In 2011, China was awarded a large area in the Indian Ocean for mineral exploration. India has thence awakened to the issue and has made amends to its bureaucratic inertia. However, the question is whether these mineral exploration projects and demarcated ocean areas have economic implications only, or have larger strategic significance. In the contemporary debates, the ocean economy is gaining traction with more and more littoral nations seeking to generate revenue as well as royalty from ocean resources. This paper therefore attempts to address the issues of ocean economy, mineral exploration, exclusive economic zones (EEZ), interests of small island nations, and how these issues have a larger strategic implication.

Blue Economy and Seabed Mining

In his book *The Blue Economy*, Gunter Pauli has expressed his view that any business concept which would be based on the "Blue Economy" concept would bring about a

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new transition from scarcity to abundance. The Blue Economy was seen as facilitating the convergence of different environmental challenges through openly available possible solutions. These open-source scientific solutions drawing inspiration from myriad physical processes have provided environmentally sustainable solutions along with economic, social and financial benefits. The solution to different industrial processes utilising a large amount of energy and resources, having a cumulative effect on the environment, is a gradual and incremental shift to cleaner technologies.[1] Gunter Pauli has claimed to have a blueprint for zero emissions in processes such as manufacturing and production. The concept has been promoting those entrepreneurial techniques which can provide jobs while at the same time cutting down on energy consumption, thereby providing direct benefits to the communities. *The Blue Economy* explores the deficiencies in the present-day economies and provides alternative models of sustainable growth.[2]

The advocates[3] of the Blue Economy have been professing that the localised production processes utilising available resources would create more spinoffs in developing economy at much lower costs. The example that has been cited is that of the abundant supplies of mushrooms in local markets, because of better transportation and reduced production costs. This transformation is brought about because of relatively limited transportation costs providing the acceptable margins to the producers, and the benefit also trickles down to the customers.[4] Taking a cue from this argument, it advocates the increasing utility of oceans, seas and coasts. Interestingly, these are seen as indispensable vectors providing a large number of jobs, while at the same time providing alternative industrial models for production and sustainable economic growth.

> *The Blue Economy, according to its proponents, accounts for almost €500billion a year and provides 5.4 million jobs across Europe, and by rough estimates could grow by as much as €100billion and 1.5 million posts a year, if properly implemented.*[5]

In comparison to the Blue Economy concept, the "ocean economy" takes a futuristic vision of economy, advocating development potential through increasing reliance on ocean-based activities.[6] The ocean economy concept proposes much attention to existing oceanic activities and stresses to expand marine-based activities. The primary oceanic activities include fisheries, shipping and shipbuilding, maritime

tourism, and handling of inbound and outbound trade at harbours.[7] Emerging ocean-based industries, according to an Organisation for Economic Co-operation and Development (OECD) report, include:

1. Generating energy through offshore wind, tides and waves;
2. Offshore exploration and extraction of oil and gas;
3. Seabed mining for metals and minerals;
4. Marine aquaculture and coastal biodiversity activities;
5. Marine-based biotechnology;
6. Ship cruises, ocean tourism and other related activities;
7. Ocean monitoring, control and surveillance.[8]

However, there are apprehensions about how these alternative models would be implemented in small nations, particularly island nations which have limited resources, and whether these would be sustainable in the long run. Bigger nation with human and capital resources would try to exploit these much faster than the small island economies would. As it has been highlighted that seabed mining comprises an important component of an ocean economy, however, it should be done in an environmentally sustainable way.

The European Union's "Blue Growth" strategy, which has been approved unanimously by its Council of Ministers, proposes to stress more attention to these sea- and ocean-based activities to promote competitive practices while at the same time generating employment. Hydrographic surveys and better mapping of the ocean floor, and extensive data about ocean resources, might promote investments in maritime-based activities, which would support offshore economy. In this regard, two specific sectors can benefit from stable and secure investment. These are renewable energy and biotechnology.[9] As the concept of Blue Economy is still in its infancy, there is a debate whether oceans can support increasing populations through sustained growth. The ocean economy has a focused agenda primarily related to the maritime sector, while the Blue Economy provides a more comprehensive picture – albeit the two concepts are nearly identical.

For many developing countries, the Indian Ocean is seen as a possible source of energy, and mineral resources[10] in the ocean floor have also drawn the attention of their scientific and research communities. Primarily two mineral resources – polymetallic nodules (PMN) and polymetallic massive sulphides (PMS)[11] – are noted

for potential exploration and extraction in the Indian Ocean.[12] PMN are composite compounds containing minerals such as cobalt, nickel, manganese and iron. These complex compounds were formed over a very long period of time and are found at subsurface levels. PMN are found in large scattered surfaces on the ocean floor; PMS are found closer to "the hot springs in underwater volcanic ranges".[13] The composition of PMS comprises minerals such as iron, copper, zinc, gold and silver. Sulphide formation is catalysed by the reaction between cold, heavy seawater and hot magma over a very long period of time.[14] These sulphides also contain "galena (lead), sphalerite (zinc) and chalcopyrite (copper), [and] accumulate at and just below the seafloor".[15] The high contents of zinc, lead and copper as well as gold and silver in these sulphide deposits have generated commercial interest in the international mining industry.[16]

The seabed in the Indian Ocean also contains other minerals such as titanium and zirconium, rare earth metals used in aerospace and high-tech military industries, and surgical and medical appliances. These are found along "the coast of South Africa and Mozambique".[17] Myanmar, Thailand, and Indonesia coasts contain tin deposits. In the global market, "South Africa is the second largest producer of titanium dioxide and zircon in the world, primarily because of its heavy mineral sands".[18] Given the potential of these minerals in adding to any country's gross domestic product (GDP), countries have started forwarding exploration requests to the International Seabed Authority (ISA).

International Seabed Authority (ISA) and Mineral Exploration

In the Indian Ocean, experts have opined that there is an abundance of non-energy renewable and non-renewable resources which has been unexplored. However, there are legal, economic, political and commercial issues involved in the exploration and exploitation of these resources. In terms of relative comparative costs, fisheries and minerals exploration are seen as economically viable.[19]

Since the mid-20th century, oil and gas resources at seas have kept countries interested.[20] However, this interest was concentrated not only among the littoral nations but also other states having access to the sea. The exploration of potential resources propelled many coastal states and littoral nations to explore the possibility of extending "their national jurisdiction over ever-larger areas of the sea and the seabed up to a 200 nautical miles zone". This approach relegated the concept of "*mare*

liberum".[21] This stance of an extended claim over large areas of territorial sea forced the need for regulation, but any attempt to institute any international treaty failed in 1930. Subsequently, "the four Geneva Conventions were finally adopted under United Nations auspices in 1958. The aim of these international agreements was to prevent the sea from being divided up, once and for all, between various countries".[22] However, the primary objective of defining clear-cut guidelines for territorial seas was defeated as discovery of manganese nodules in the seabed on the continental shelf in the eastern and central Pacific Ocean in the 1960s triggered competition among the industrialised countries to exploit those seabed resources.[23]

In order to promote deliberations to address the issue of the demarcation of the sea boundary, the United Nations Convention on the Law of the Sea (UNCLOS), a multilateral treaty, was instituted. This treaty has defined "a complete set of guidelines and framework of rules to administer the global ocean space". The 1982 UNCLOS has been ratified by more than 150 countries, including 47 Commonwealth member countries, and it "examined the submission by the Commission on the Limits of the Continental Shelf, a body established under the Convention to make recommendations to states seeking to determine the outer limits of the continental shelf".[24] The primary achievement of the 1982 UNCLOS was to introduce the exclusive economic zone (EEZ) regime and, to a certain extent, to address the legality of the EEZ.[25]

It can be seen that legal provisions for exploitation and extraction of manganese nodules are relatively developed in comparison to those governing sulphides:

> *The 1982 UNCLOS established ISA to regulate, monitor any feasibility studies, exploration, and mining of marine resources. Formal guidelines and regulatory framework has been instituted for mining of mineral rich nodules. In comparison to this, regulatory provisions about sulphides have been in a drafting stage since 2007. The formation of legal mechanisms for sulphides exploration has been delayed because of paucity of data and scientific information about possible environmental effects of ocean mining.*[26]

However, market dynamics and the lure to exploit these seabed resources have dominated exploration initiatives despite the lack of sufficient data. Mining companies and big conglomerates have made plans to exploit these resources due to the technology dividend which makes seabed exploration and exploitation more cost-effective and commercially viable: "As an interim measure, marine scientists have

requested ISA to amend its stance on resources in international waters".[27] The ISA regulations have made certain provision so that this sea-based resource exploitation is done to preserve "the common heritage of mankind," with equitable distribution and promoting sustainable growth.[28]

As part of the current provision, the ISA and the 1994 agreement about implementation of Part XI of the 1982 UNCLOS have clearly defined the guidelines related to seabed, surface and subsurface exploration, study and research activities. As per the provisions under the agreement, "State parties to the Convention shall, in accordance with the regime for the seabed and ocean floor and subsoil thereof beyond the limits of national jurisdiction (called the 'Area') will follow the laid down guidelines and procedures". Further, ISA has been endowed with enough powers to manage, overlook and control exploration activities in the designated Area. This has been done to inculcate a feeling of resource security among nations, and administration of resources of the Area.[29]

> *The "Mining Code" refers to the comprehensive set of rules, regulations and procedures issued by the ISA to regulate prospecting, exploration and exploitation of marine minerals in the international seabed "Area." All rules, regulations and procedures are issued within a general legal framework established by the 1982 UNCLOS and its 1994 implementing agreement relating to deep seabed mining.*
>
> To date, the authority has
>
> *provided guidelines for Regulations on Prospecting and Exploration for PMN in the Area (adopted on 13 July 2000); the Regulations on Prospecting and Exploration for Polymetallic Sulphides in the Area (adopted on 07 May 2010) and the Regulations on Prospecting and Exploration for Cobalt-Rich Crusts (adopted on 27 July 2012).*[30]

The regulations are seen as indispensable for any nation seeking exploration rights through officially set procedures, and also provide standard binding stipulations for exploration contracts. However, there is a need for a discourse on the future challenges, and to address the concerns of nation-states. With each island nation now aspiring for an extended EEZ, things are likely to get a little more complicated in future. There would be overlapping claims and also the problems of protection and monitoring in future. These need to be addressed at the level of both the UN and the ISA.

India's Policy – A Historical Backdrop

India started conducting scientific research towards exploration of mineral resources in the Indian Ocean in early 1960s, but it was accorded "Pioneer Investor" status much later, in 1987. Endorsing India's sustained interest and scientific endeavour, the UN, in the initial stages, allocated one 50,000-km^2 area in the Central Indian Ocean Basin (CIOB), for undertaking feasibility and research activities for exploring PMN. After detailed hydrographic surveys were conducted, an area of 75,000 km^2 was earmarked for further development.[31] However; in 1994, India relinquished 20% of the Pioneer Area as part of its obligation to the UNCLOS.[32] Subsequently, India relinquished 10% of the Pioneer Area in 1994 and later, when it became a member of ISA, it surrendered 20% of its allocated seabed area to ISA in 1996.[33]

> *In accordance with the prevailing regulations for exploration of PMN in the area, the Ministry of Earth Sciences (previously known as Department of Ocean Development), as a nodal agency of Government of India, signed a contract in 2002 for 15 years for various developmental activities in the area.*[34]

In 2002, in order to show its keen interest in deep-sea exploration, it rechristened and upgraded its Department of Ocean Development as the Ministry of Earth Sciences so as to expand its mandate.

India undertook a multibeam bathymetry survey in the initial years of exploration work in the designated area, in order to map the surface of the ocean floor. Subsequently, it was found out that the resource potential of PMN in the designated area, as per the rough estimates, was about 380 million tonnes.[35] This propelled the earmarking of a first-generation mine site for further studies. A comprehensive, detailed Environmental Impact Assessment (EIA) was undertaken and India also successfully tested technology for extracting metals, particularly copper, nickel and cobalt, with a yield of 500 kg per day.[36] Further, "India has also developed a remotely operated vehicle and in situ soil sampler which can dive at a depth of more than 5000 metres in the oceans".[37] In 2011, India upgraded its capacity and development for the exploitation of nodules from a seabed depth of about 6000 m, in gradual phases. Technically, India is seen to be "at par with other Pioneer Investors in respect of various developmental activities including development of mining technology for exploitation of nodules from the seabed".[38]

Subsequently, "the Indian government appointed a Committee of Secretaries (COS) in consultation with National Security Council Secretariat (NSC) to formulate policies for mineral exploration in Indian Ocean. The active intervention of NSCS was seen as India looking at this frontier both from economic and strategic aspect. Later, a coordination meeting of the COS headed by Cabinet Secretary was held on July 20, 2011 to discuss an "application for deep sea mining exploration license for hydrothermal sulphide mineral in the Indian Ocean by China". After due deliberations, it was it decided to have interministerial group meetings led by the Ministry of Earth Sciences (MoES), at regular intervals, to address the issue.[39] The meetings have been regularly held, but there is apprehension that if India asserts its strategic thinking through commercial means then the island nations might be concerned. Also, in terms of integrated policy planning in this field, different agencies have differences over the strategic and scientific objectives of mineral exploration policy.

India's Approach to Mineral Exploration in the Indian Ocean

The ISA administers mineral resources in the international seas and regulates deep-sea mining activities.[40] The ISA has listed 100 high-potential deep-sea sulphide exploration sites and about 25% of them are "having high-temperature black-smoker venting".[41] In 2014, India made its first ever claim before the ISA for exploration of PMS in close proximity to the Mauritius seas. Before sending its proposal for the mineral exploration, India conducted a preliminary study with assistance from the National Centre for Antarctic and Ocean Research (NCAOR) in the Rodriguez Triple Junction, a geological tri-junction of three tectonic plates in the southern Indian Ocean. India has also completed an ocean survey using remotely operated vehicles (ROVs) in the deep-sea area near the region.[42] The encouraging results during the preliminary mining explorations for cobalt, nickel and magnesium might spur further investment.[43]

As the EEZ lacks any considerable mineral resources, India is keen to undertake deep-sea mining and is now waiting for approval of its application, which was submitted to the ISA. India has a number of ships to conduct surveys: ORV *Sagar Kanya*, FORV *Sagar Sampata*, TDV *Sagar Nidhi*, BTV *Sagar Manjusha* and CVR's *Sagar Purvi* and *Sagar Paschmi*. India possesses six oceangoing vessels which have been assigned the task of deep-sea exploration and research. Out of these six, four need

replacement.[44] Funds have been allocated for the construction of a polar research vessel (PRV). In 2013, India acquired an ocean research vessel which was named *Samudra Ratnakar*.[45] The ship is a highly sophisticated platform having scientific equipment and tools for conducting oceanographic research. India has lacked deep-sea exploration capability and its diving capability is only to 6000 m. In such circumstances, the ship has given the extra technological edge for deep-sea exploration capability. The sophisticated scientific equipment onboard as well as its scientific laboratory has reduced the time needed for analysing mineral compositions as well as complex compounds found on the sea floor. Given the limited capability in terms of deep-sea exploration because of constrained technical equipment on board *Sagar Nidhi*, a scientific vessel owned and operated by the National Institute of Ocean Technology, the *Samudra Ratnakar*, with its state-of-the-art technical equipment onboard as well as its sophisticated lab is seen as a leap for India in deep sea exploration, mining and research.[46]

The Indian government has shown its commitment to explore 10,000 km^2 of the Indian Ocean seabed which has been allocated to the country by the ISA for mineral exploration. The Ministry of Earth Sciences (MoES), which is the nodal agency, has drafted a contract to get formal approval from the ISA.[47] It has been found that "central and south western parts of the Indian Ocean were rich in metals like copper, lead, zinc as well as other noble metals like gold, silver, palladium and platinum".[48] Crystalline formations of methane and water are known as gas hydrates. The gas hydrates are located near the outer continental margins. The gas hydrates are seen as alternative source of energy for any country.[49] It has been expressed that deep-sea sites which can be explored for hydrates, "offshore wind farms, wave and tidal energy stations need to be protected against any sabotage or scavenging from underwater threats".[50] India has laid out a plan for setting up an "International Training Centre for Operational Oceanography under the Indian Ocean Global Ocean Observing System for boosting ocean research programmes".[51]

Given the magnitude of the challenge as well as the commercial interest involved, there is a need for global cooperation to evolve a cooperative framework. This would help in governance, joint research and better management of continental mineral-rich coasts. Further, from India's perspective, a "comprehensive ocean policy is required to address ocean governance, research and management as well as sustainable use of resources for social benefit".[52] As more and more human and capital resources would be deployed in the ocean for scientific pursuits, there is a need for better weather

forecasting, and search and rescue as well as creating greater awareness amongst policy-makers and society about the economic and environmental benefits related to the ocean resources.[53]

Multi-Nation Interests and Struggle for Resources

Hydrothermal vents were discovered in 1976; a year later, the first manned submersible collected samples to verify the existence of such vents. Subsequently, many countries along with their multinational corporations have joined the pursuit to explore the commercial value of such minerals and to conduct a cost–benefit analysis. Major economies such as China, Japan, US and Russia, and even regional groupings such as the EU, have invested heavily in exploration technology.[54] China, which needed minerals and other resources to sustain its growth trajectory, embarked on its global quest for minerals through its oceanographic mission, Dayang 1, in 2005–2006. Consequent to its discovery of "active hydrothermal vents in the mid-ocean ridge Southwest Indian Ridge between Africa and Antarctica where giant tectonic plates are spreading apart at an ultra-slow pace. Among other things", scientists onboard *Dayang* acknowledged through their analysis deposits of lead, zinc and copper, usually found close to the mid-ocean ridges.[55]

China entered a long-term contact with the ISA in November 2011, which created concerns among the Indian strategic community, and this was also reflected in media reports. It was expressed that the China Ocean Mineral Resources Research and Development Association (COMRA) had gained exclusive rights to explore 10,000 km^2 of seabed. This allotted area was located in the southwest Indian Ocean near Madagascar.[56] As per the contract, COMRA has the rights for 15 years' exploration of PMS. As per the ISA guidelines, like to other exploring countries, China would have to relinquish 75% of the area after 10 years but would have the right to explore and mine the remaining 25% area.[57] This does not mean that China can infringe on the environmental and other related obligations, and would have to subject itself to International Sea Bed Authority's monitoring. Among different agencies in India, the Directorate of Naval Intelligence "had expressed concern that COMRA's access could have strategic implications for India's security".[58]

As per the reports, China has already scouted the ocean floor for PMS and has found "two hydrothermal areas and four hydrothermal anomaly areas in southwest Indian Ocean in 2014".[59] China's State Oceanic Administration (SOA) in its

statement has expressed that it has developed a fair understanding about the ocean floor and the location of hydrothermal vents in the area.[60]

Similar to China, South Korea also won the rights for exploration of a vast area of underwater ocean resources including mineral deposits in the Indian Ocean:

> *An agreement was signed in June 2014 between South Korea's Ministry of Oceans and Fisheries, and the ISA that allows South Korea to explore an area of 10,000 square kilometres for hydrothermal mineral deposits in the middle of the Indian Ocean.*

South Korea would be exploring the allotted area till 2029 and, as per the contract with ISA, it can explore and develop 25% of the area within the exploration zone.[61] South Korea has been developing an underwater mining robot, *MineRo*, having the capability to mine minerals to a depth of 5000 m.[62]

Apart from China and South Korea, small island states in the Indian Ocean are looking towards the oceans for sustainable development and exploration projects so as to reap the benefits from seabed mining.

Small Island Nations – New Stakeholders in Resources Exploration

Minerals and oceanic resources have been getting the attention of not only the littorals of the oceanic space but also of the island nations, which have started looking at these resources as a means for sustainable development. Mauritius and Seychelles were endorsed by the UN in 2011, for an extended EEZ of 396,000 km^2. The two countries were granted joint access to the additional area of seabed and underwater mineral resources. These resources included not only living and non-living resources but also oil and gas. As the two countries are also members of the Commonwealth, the organisation's secretariat advocated and even prepared the groundwork for their submission. "The joint submission made under the 1982 UNCLOS guidelines was the first representation made by any two small island states." [63] India strongly supported the bid of the two island nations in 2008.[64]

The successful representation, followed by granting of a claim to Mauritius and Seychelles, gave an example to those island countries which have overlapping continental shelf entitlements to cooperate. This also presented an incentive to the small island states in vast oceans "to delimit their maritime boundaries and make

proper case for any additional areas of the continental shelf".[65] However, for these vulnerable island states with limited resources and capital, protecting these zones was seen as an arduous task.

The area allotted to Seychelles and Mauritius is supposedly rich in rare earth materials, in which China has an international monopoly. Given the fact that India and Japan have signed an agreement to explore rare earth materials, India's approach needs better planning. COMRA has already got seabed exploration rights in the south of Madagascar, in close proximity to the joint additional seabed area of Mauritius and Seychelles.[66] These countries are therefore apprehensive about the extended seabed areas which are under their authority, and their protection. Ambassador Milan J.N. Meetarbhan of Mauritius was elected President of the Assembly at the 18th Session of the ISA held July 16–27, 2012, in Kingston, Jamaica,[67] and he remarked that the "landmark Convention allowed the world to celebrate a treaty addressing the concept of the common heritage of mankind, and the establishment of its appurtenant legal regime and implementing agency".[68]

Given the eminent position of India in the ISA, as it is the only member in Group B of the Council of the Authority for the next few years, Mauritius and Seychelles want India to project their concerns at the international level. At the same time, they want the guidelines for the management of the seabed resources to not be in the favour of large multinationals or large nations supporting those multinationals. Seychelles and Mauritius have also initiated a project called "Global Partnership for Oceans", which is aimed at protecting fisheries and marine resources and at generating consensus on strict enforcement of guidelines and a code of conduct for the oceans. This is meant to dissuade corporate exploitation of any small island nation's marine resources and to encourage consensus about ocean economies as the major decision-makers. India can therefore involve the two countries under its maritime security initiative and also develop their capabilities for protecting the resources.

Conclusion

There is a need for a comprehensive, structured ocean exploration policy which should look into the aspects of sustainable exploration of minerals as well as energy sources in the oceans. This should be done so as to build extraction capability for both minerals and rare earths, which have become a critical component in space and

semiconductor technology. Further, the mineral exploration strategy would give the necessary monitoring capability for geological exploration, while at the same time it would build ocean exploration capability for scientists, and geologists in particular. The need to look towards the oceans for sustained development and growth has been clearly articulated, and India needs to finance and coordinate joint exploration projects with different agencies within India as well as with international partners so as to provide technological and functional support in ocean exploration. This needs better coordination between agencies, including the national security establishment, so that the strategic aspects of ocean exploration could be clearly articulated. Further, with its long coastline, and huge swathes of ocean floor being granted by ISA for exploration, India needs to take up the issue on a priority basis and work towards finding both economic and strategic benefits out of the mineral exploration projects in the Indian Ocean.

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