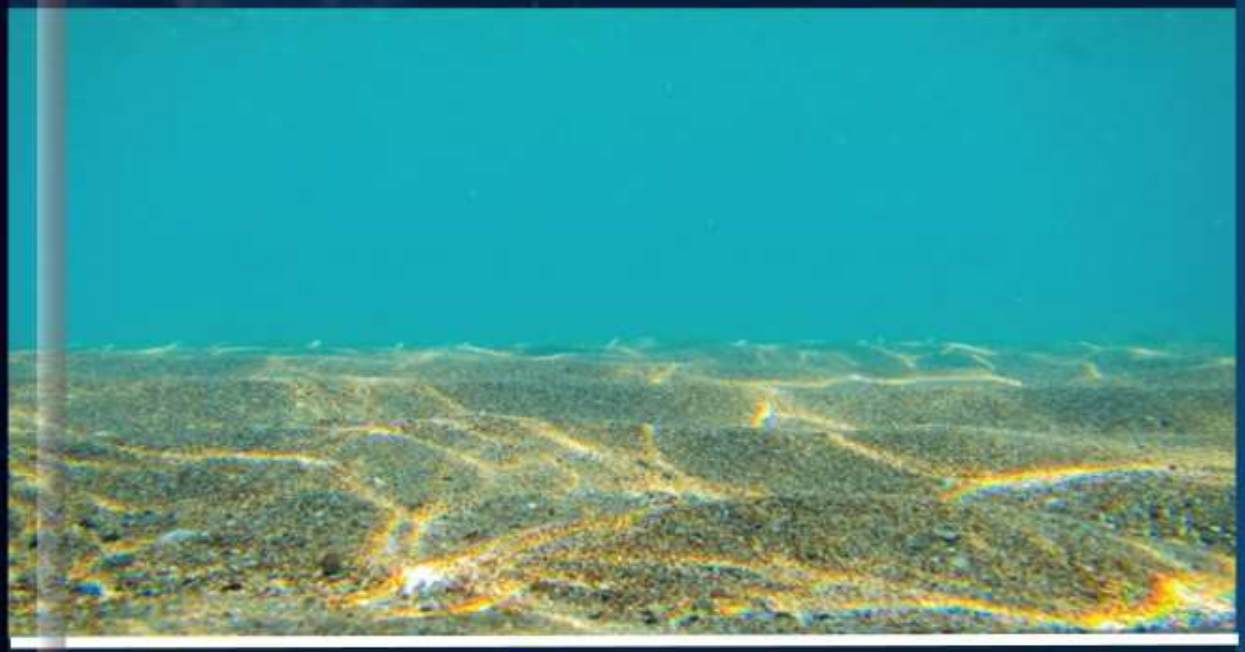
PROSPECTS OF EXPLORATION/ EXPLOITATION OF OFFSHORE MINERALS IN PAKISTAN, -FEASIBILITY OF RAISING NATIONAL SEABEDAUTHORITY TO SPEARHEAD DEEP SEA EXPLORATION / EXPLOITATION ACTIVITIES IN PAKISTAN



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CHAPTER 1

Exploring Sea Beyond EEZ

1.1 Introduction

a. The vast expanse of the high seas, extending beyond Exclusive Economic Zones (EEZs), covers over half of the Earth's surface and comprises 65% of the ocean's area and 90% of its volume[1]. As these waters are international territory, a regulatory framework was imperative to govern activities conducted within them. The United Nations Convention on the Law of the Sea (UNCLOS) serves as the cornerstone, establishing legal parameters for resource extraction in the deep-seabed Areas Beyond National Jurisdiction (ABNJ). Notably, UNCLOS underscores those activities in these areas benefit humanity, irrespective of a state's coastal or landlocked status, as articulated in Article 140.

b. To ensure equitable distribution of benefits derived from the high seas, Article 82 of UNCLOS delineates mechanisms for managing dividends. The International Seabed Authority (ISA), established under the auspices of the 1982 UNCLOS and its 1994 Implementation Agreement, oversees this process. As an autonomous intergovernmental body, the ISA is entrusted with managing payments and contributions related to the exploitation of the continental shelf beyond 200 nautical miles.

c. The latest convention on Conservation of biodiversity in areas beyond national jurisdiction (BBNJ) lays emphasis on living resources therefore it becomes irrelevant in case of exploration of the nonliving resources of seabed of high seas. In view of this, exploration of minerals from the deep seabed of high seas is regulated in accordance with the UNCLOS only.

d. Pakistan with regards to exploration of minerals from sea has so far been restricted to extracting salt, sand, and gravel only. The costs associated with mining resources offshore are generally higher than those associated with land-based activities. Due to this, only shallow seabed resources close to heavily populated onshore areas are being exploited. Offshore exploration by Pakistan remained restricted to energy (Oil and Gas) only but no project was fruitful. This aspect will be discussed in chapter 5.

e. Deep-sea mineral deposits refer to mineral accumulations found beyond the continental slope. There are currently three main types of deposits recognized: large-scale seafloor sulfides, cobalt-rich crusts, and polymetallic manganese nodules. These will be discussed in more detail in the next chapter.

f. A complete plan for managing marine mineral resources requires a good understanding of the objectives of mining operations as well as the capacity to assess and maintain an appropriate balance between costs, uncertainties,

[1] https://www.nausicaa.fr/en/the-ocean-magazine/what-are-high-seas#:~:text=The%20high%20seas%20take%20up,and%2090%25%20of%20their%20volume.

possible benefits, and drawbacks[2]. Globally, offshore mineral exploration promotes energy security by utilizing batteries for electric cars and storing renewable energy. Minerals such as cobalt, nickel, and rare earth elements help promote sustainable energy transitions by reducing dependency on fossil fuels.

g. The exploration of salt, sand and gravel may not have a large impact on environments, but deep seabed exploration is quite likely to disturb the ecosystems therefore ISA has developed a stringent regulatory framework for deep seabed exploration, which shall be discussed in chapter 6.

h. Pakistan has a coastline stretching approximately 1001 kilometers, bordering Iran to the west and India to the east. Our Exclusive Economic Zone (EEZ) and continental shelf extend out to 350 nautical miles, covering a total area of around 290,000 square kilometers. This vast area holds great promise for boosting the economy by better utilizing natural resources like minerals found beneath the seabed. However, all the exploration efforts made so far have been focused on energy (oil and gas) only. Setbacks in offshore exploration have compelled us to entirely shift our focus away from maritime ventures. There has been no headway in search of offshore mineral exploration.

i. States whose borders are coastal embrace unique rights and jurisdiction over resources located within a 200-nautical mile exclusive economic zone (EEZ). In addition, some states have a continental shelf that extends beyond the EEZ, giving them sovereignty over the seabed and its mineral resources but not the water above it. The Area Beyond National Jurisdiction (ABNJ), which includes the high seas water column and the seabed (referred to as the "Area"), is located beyond this. Under UNCLOS, the "Area" is regarded as the collective legacy of humankind. Figure 1.1 depicts the area.

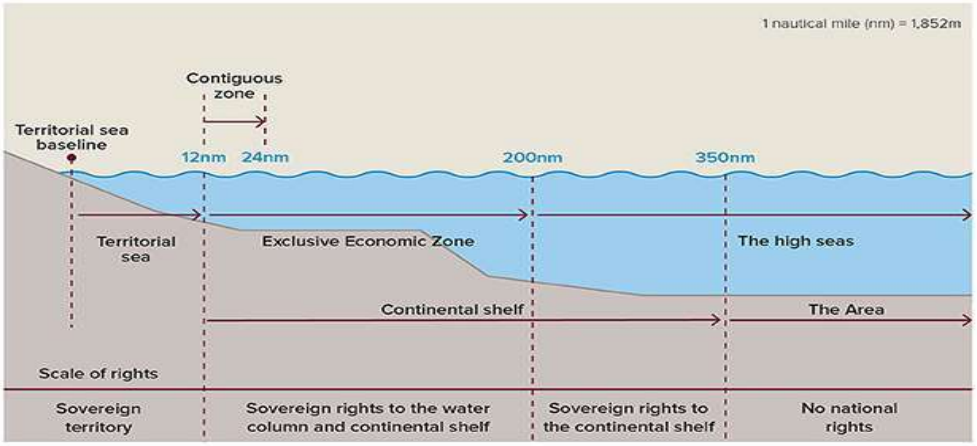
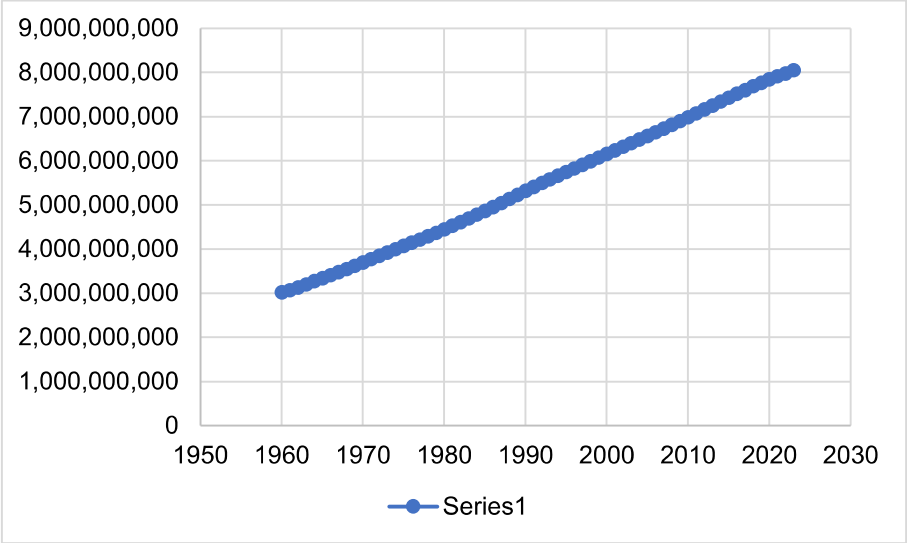


***Figure 1.1**: A diagram displaying the jurisdictional zones starting from a country's coast (Source: The Royal Society, London)*

[2] Ellefmo, S. L., Aberle, N., Hagspiel, V., Ingulstad, M., & Aasly, K. (2023). Marine minerals' role in future holistic mineral resource management.

j. Global population growth has remained steady over time. The graph below illustrates that from 1960 to 2024, there hasn't been even the slightest deviation in the upward trajectory of growth. It is anticipated that the demand for metals worldwide will increase in the coming years owing to consistent population growth, projected to reach 10 billion by 2050.



World Population Graph from 1960 to 2024[3]

k. The economies of countries like China, Brazil, and India are growing, and they're starting to focus more on exploration of high sea for minerals through environmentally friendly practices. Even in these countries, initially, commercial marine mining has mostly focused on commodities found in shallow waters near shore, such as aggregates, diamonds, tin, magnesium, salt, etc. However, the mining industry is evolving, and minerals discussed in next chapter are being mined in deeper waters because they are seen to present attractive potential in the future.

l. Pakistan does not currently have an organization specifically devoted to the exploration and exploitation of offshore minerals in deep sea. The existing stakeholders and their roles are discussed in chapter 4.

m. The Government of Pakistan for long-term prosperity and development can obtain substantial revenue streams from offshore mineral exploration in deep sea through the license fees, royalties, and taxes on produced minerals. The purpose of this study is to analyze the setting up of a dedicated organization focusing on seabed resources and their exploitation. The country like Sri Lanka that has limited land has finally turned to sea. It has made rules to issue two-year oil and gas exploration licenses for as many as 900 offshore blocks [4]for foreign firms to explore for energy resources and bring in vital

[3] https://www.worldometers.info/world-population/world-population-by-year/
[4] https://www.reuters.com/business/energy/sri-lanka-finalises-oil-exploration-rules-earmarks-900-offshore-blocks-2023-01-12/

investments to the crisis-hit country. Pakistan-China friendship can play a vital role for initiation of joint ventures of deep seabed exploration for minerals.

1.2 Conclusions

Since this report has been generated on direction of NHQ, to be furnished by a certain date therefore due to time constraints, limited literature review on formation and presence of minerals in the deep seabed and innovative technologies required to explore was carried out. However, thorough qualitative research on laws and policies governing offshore exploration and exploitation was carried out for their assessment. Besides this, international laws related to seabed exploration and exploitation were studied to identify the role of different international authorities. Process of obtaining approvals was assessed for future compliance. Considering the research outcomes Need for one window solutions was deliberated and assessments on possible ways forward was made.

CHAPTER 2

Offshore Minerals Resources

2.1 Introduction

a. Article 86 of UNCLOS defines high seas as all parts of the sea that are not included in the exclusive economic zone, in the territorial sea or in the internal waters of a State. Article 140 declares those as common heritage of mankind. Interest of the developed countries towards the possible energy or mineral resources in the high seas surged when remote sensing devices enabled them to explore things beyond visual ranges. According to Roonwal (1986), just as there are things buried under the ground, there are also things hidden under the ocean water. Scientists find and study these hidden underwater deposits using different methods that involve understanding the Earth's structure and using special tools for exploration.

b. Due to continuous sedimentation process in the sea, minerals can be found anywhere in the sea. The sedimentation process on the seabed results in formation of clusters and nodules. Nodules are small, rounded masses or concretions of mineral or organic matter found in sedimentary rocks, soils, or sometimes on the ocean floor. Clusters and chains are the result of accumulation of alike material at a particular point or over a specific area.

c. Marine minerals can be present anywhere on the seabed because most of the ocean floor remains undisturbed for millions of years therefore it can be investigated for clusters of minerals or polymetallic nodules, which have may manganese, zinc, copper, silica, nickel, cobalt, phosphates etc. mineral clusters and polymetallic nodules are mainly located in specific areas like mid-ocean ridges and deep ocean plains.

d. Deep Sea mining refers to the extraction of minerals and resources from the seabed located at considerable depths in the ocean, typically beyond continental shelves and often within international waters or areas beyond national jurisdiction. This mining process involves using specialized equipment and techniques to access and recover valuable resources. The innovative technologies to be used for this purpose will be discussed in next chapter here we shall discuss the offshore mineral resources only.

e. In this cutting-edge modern period minerals underwater are often much more valuable than those found on land. Some of these minerals come from processes that happen on land and others from processes in deep ocean beds.

(1) Marine mineral resources can be roughly divided into following three groups:

(2) Marine Minerals deposits originating from land.

(3) Marine minerals originating from ocean basins.

(4) Marine minerals formed with combination of minerals deposits originating from land and yielding from ocean basins.

2.2 Marine Minerals Deposits Originating from Land

a. This category encompasses all the mineral resources formed through the breakdown of rocks on land due to both chemical and mechanical processes. Once these rocks are broken down, the resulting debris is carried by rivers to the oceans, where the waves sort them based on their density, which is determined by the minerals they contain. The distance that a mineral can travel without undergoing any change depends on its ability to withstand the mechanical forces during transportation, such as hardness, cleavage, density, and solubility. There are following three primary kinds of placer deposits:

(1) Disseminated Beach Placers, which are primarily composed of light minerals like zircon and rutile that are carried offshore by currents and waves in the ocean.

(2) Eluvial or Lag Deposits, which are composed of heavy metals.

(3) Drowned Fluviatile Placers, which are often found on riverbeds and contain coarse sand and gravel along with heavier metals like gold and Casserite

b. An overview of some of the significant placer or marine mineral deposits is given in the ensuing paragraphs.

c. **Phosphorites**. Phosphorites are sedimentary rocks with a high concentration of phosphate bearing minerals (hydroxyapatite and fluroapatite). Phosphorite also originates in areas of oceanic upwelling, where cold water abundant in phosphate rises from deep ocean levels to the surface. It is used in a variety of industries, including fertilizer, detergents, herbicides, animal feed, and food additives.

d. **Marine Sand and Gravel**. The sand and gravel found on land are transported by rivers and deposited into seas and oceans. Once in the water, wave action, tides, and currents move this sediment to offshore areas and beaches, where it accumulates and concentrates[5]. Globally, each year, between 32 to 50 billion tons of sand and gravel are extracted, primarily for construction purposes. Of this amount, roughly 30 billion tons are specifically used in the construction industry. Furthermore, sand finds applications in land reclamation, coastal development, road embankments, and various industrial processes. [6]

[5] Arbab, K. A., Shayinda, K., Zadan, K., & Sayed, M. A. (2015). Marine mineral resources: a newfangled treasure to explore. *Research Journal of Marine Sciences ISSN*, *2321*, 1296.
[6] Wang, Q. Z., Li, L. J., Zhao, Y. X., Song, Y., & Zhang, C. L. (2024, February). Feasibility assessment and application of sea sand in concrete production: A review. In *Structures* (Vol. 60, p. 105891). Elsevier.

e. **Marine Solutes.** These minerals, such as salt (NaCl), Magnesium, Bromine, and metal compounds, dissolve in seawater. The extraction of salt from the ocean water is very common. In the process of desalination salts are extracted. The beaches and trenches are used to let sea water in and then the inlets are plugged. After a few days water gets evaporated and remains (salt) is collected.

2.3 Marine Minerals Originating from Ocean Basins

a. These deposits are made up of materials that have broken down at the ocean floor and the minerals that have settled within them. The most significant minerals are discussed in the ensuing paragraphs.

b. **Metalliferous Sediments.** The rocks are believed to be remnants of materials settled from hot fluids released at the ocean floor, possibly resembling older versions of the metallic sediment and oxyhydroxides found in volcanic regions. Efforts to use the trace element patterns in these rocks to locate volcanogenic massive sulfide (VMS) ores have often failed due to unreliable outcomes. The metal depletions were hypothesized to be caused by seawater seeping through fissures and faults in the young crust, mobilizing metals. In the Red Sea, metalliferous deposits have been seen to precipitate in relation to submerged brine pools. Some of these deposits are significantly enriched in Cu, Zn, and Fe. (Bischoff, 1969; Ku, 1969).

c. **Sea-floor Massive Sulfides (SMS).** Seafloor Massive Sulfide (SMS) deposits are regions of solid ground on the ocean floor characterized by abundant metals and sulfides. They are created by the movement of hot water through the Earth's crust near underwater volcanic vents. Seafloor Massive Sulfide (SMS), also called black smoker deposits, are mineral formations rich in metals that develop on and beneath the ocean floor due to the interaction between seawater and heat from magma in volcanic areas under the sea. These formations often create habitats that support unique life forms relying on chemosynthesis. Most SMS formations are relatively small, three-dimensional structures containing valuable metals like copper, zinc, gold, and silver. Additionally, they may concentrate on other trace elements useful in various industries, making them potentially valuable as by-products.

d. In the past few years, surprising discoveries have been made of mineral deposits in geological settings where hydrothermal systems were not previously thought to exist. These unexpected locations include slow-spreading mid-ocean ridges found in the Atlantic, Arctic, and Indian Oceans, where the Earth's mantle rocks are visible on the seafloor, as well as shallow-marine island arc volcanoes in the western Pacific.[7]

[7] Petersen, S., Krätschell, A., Augustin, N., Jamieson, J., Hein, J. R., & Hannington, M. D. (2016). News from the seabed–Geological characteristics and resource potential of deep-sea mineral resources. *Marine Policy*, *70*, 175-187.

2.4 Marine Mineral Deposits Combining Deep Ocean and Land Resources

a. These comprise the marine mineral deposits that come from deep-sea and terrestrial sources collectively. The most significant are discusses in the ensuing paragraphs.

b. **Polymetallic Nodules**. We have discussed nodules in article 2.2. Polymetallic refers to the nodules containing many metals within themselves. Manganese or polymetallic nodules were the first minerals to be taken from the sea floor by the Challenger Expedition in 1872–1876, which took place in 1876. (Mero, 1965) Manganese nodules are typically discovered within the first 5 kilometers below the ocean surface, primarily on the abyssal plains. The gathering of manganese happens through two methods. Firstly, some nodules that extend beyond the ocean's surface form through a process called hydrogenetic precipitation, where manganese and other metals from the ocean water slowly build up over time. Secondly, some nodules form through diagenetic precipitation, where manganese and other metals from the pore water within ocean sediments accumulate and solidify over time[8].

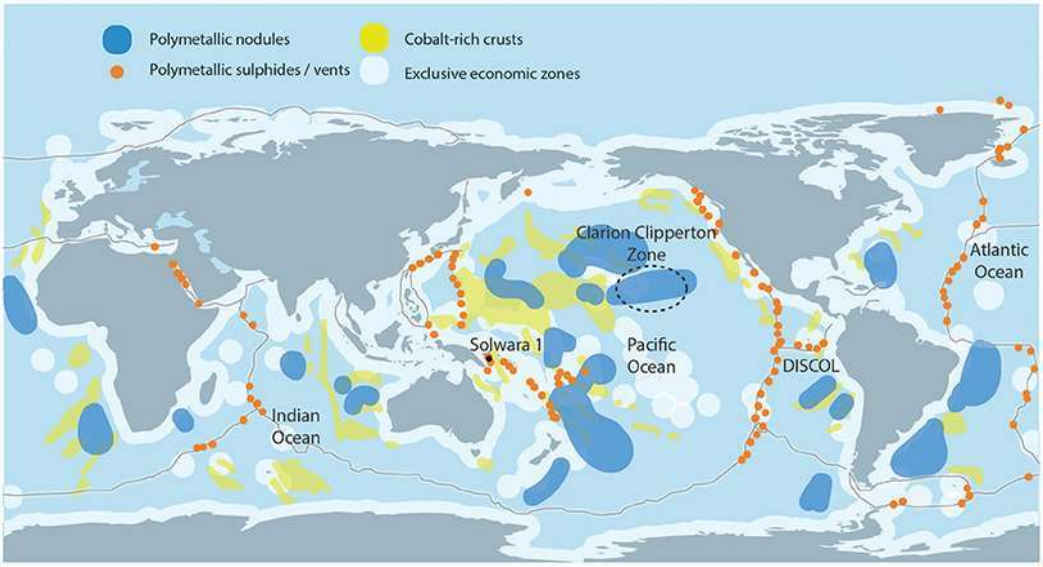


***Figure 1.2**: Global Distribution of three main marine mineral deposits: polymetallic nodules (blue); polymetallic or seafloor massive sulfides (orange); and cobalt-rich ferromanganese crusts* [9][10]

c. **Cobalt-rich Ferromanganese Crusts**. The metals found in cobalt-rich crusts, including cobalt, manganese, and nickel, are utilized to enhance various characteristics of steel, such as durability, toughness, and protection against

[8] Halbach, P., Friedrich, G., & von Stackelberg, U. (Eds.). (1988). *The manganese nodule belt of the Pacific Ocean: geological environment, nodule formation, and mining aspects*. Stuttgart, Germany: F. Enke

[9] Miller, K. A., Thompson, K. F., Johnston, P., & Santillo, D. (2018). An overview of seabed mining including the current state of development, environmental impacts, and knowledge gaps. *Frontiers in Marine Science*, *4*, 312755

[10] Hein, J. R., Koschinsky, A., Mikesell, M., Mizell, K., Glenn, C. R., & Wood, R. (2016). Marine phosphorites as potential resources for heavy rare earth elements and yttrium. *Minerals*, *6*(3), 88

rust. In developed nations, a significant portion of cobalt usage, ranging from a quarter to half, is attributed to the aerospace sector for making superalloys. Additionally, these metals find application across diverse industries like chemistry and high-tech manufacturing, contributing to the production of items like solar panels, superconductors, precision laser systems, catalysts, fuel cells, and potent magnets, as well as for crafting cutting-edge tools. Cobalt-rich ferromanganese crusts develop on almost all rock surfaces deep in the ocean. Their thickness can range from less than a millimeter to about 260 millimeters. These crusts are found only on rock surfaces that are clear of sediment, forming layers of mixed manganese and iron oxides. Additionally, they can cover small rocks like pebbles and cobbles. These crusts are typically found at depths of 600 to 7,000 meters on the sides of undersea mountains (seamounts) that rise over 1,000 meters, as well as on knolls (200 to 1,000 meters high), ridges, and plateaus. The comprehensive study and mapping of cobalt-rich ferromanganese crusts have been completed on approximately 30,000 underwater mountains (seamounts) in the Pacific Ocean. However, similar seamounts in the Atlantic and Indian Oceans have not been extensively sampled as needed[11].

2.5 Countries Involved in Mining the International Waters

a. There are currently 31 contracts that have been signed off on by the ISA, 30 of which are active, and each of which is involved for the last 15 years. Several of these involve governmental entities - for example, the Government of India, the Government of Poland, the Government of the Republic of Korea all appear on the ISA website. However, the majority are private companies that have so far directly engaged in contracts for deep-sea mining with the ISA[12].

b. However, innovative technologies are required for exploration of offshore minerals. Those technologies are discussed in next chapter.

[11] Arbab, K. A., Shayinda, K., Zadan, K., & Sayed, M. A. (2015). Marine mineral resources: a newfangled treasure to explore. *Research Journal of Marine Sciences ISSN*, *2321*, 1296

[12] https://www.statista.com/chart/31999/where-isa-contractors-for-deep-sea-mining-are-based/

CHAPTER 3

Innovative Technologies for Exploration of Offshore Mineral Resources

3.1 Introduction

a. As the global need for mineral resources expands, it's crucial to adopt upcoming trends and technologies in mineral exploration. Innovations like artificial intelligence, machine learning, big data analysis, remote sensing, and unmanned aerial vehicles (UAVs) are transforming the way exploration initiatives are organized, carried out, and assessed. The following are some of the most cutting-edge technologies being used to explore offshore mineral resources:

(1) Autonomous Underwater Vehicles (AUVs).

(2) Remotely Operated Vehicles (ROVs).

(3) Seafloor Mapping and Imaging Systems

(4) Deep-Sea Drilling Technologies.

(5) Underwater Remote Sensing.

(6) Real-Time Data Transmission Systems.

(7) Environmental Monitoring Technologies.

b. The aforesaid technologies are briefly described in the ensuing paragraphs.

c. **Autonomous Underwater Vehicles (AUVs)**. These are robotic devices that can operate underwater without requiring input from an operator. These vehicles are equipped with sensors, navigation systems, and propulsion systems that allow them to navigate underwater environments autonomously. AUVs are used for a variety of purposes, including oceanographic research, underwater mapping, marine archaeology, and offshore oil and gas exploration. They are particularly useful for exploring environments that are too deep or too dangerous for human divers to reach.

***Figure 1.3**: [13]The UK Natural Environment Council (NERC) Autosub6000 AUV, depth-rated to 6000 m*

d. **<u>Remotely Operated Vehicles (ROVs)</u>.** These are underwater robots that are controlled by an operator at the surface. Unlike Autonomous Underwater Vehicles (AUVs), which operate autonomously, ROVs are connected to the surface by a series of cables that provide power and allow for data transmission and control. ROVs are equipped with cameras, lights, and other sensors, as well as manipulator arms for interacting with the underwater environment. They are used for a variety of purposes, including underwater inspections, deep-sea exploration, and offshore oil and gas operations. ROVs are particularly valuable for tasks that are too deep or too dangerous for human divers. The same was used to locate Titan Submersable in north Atlantic.

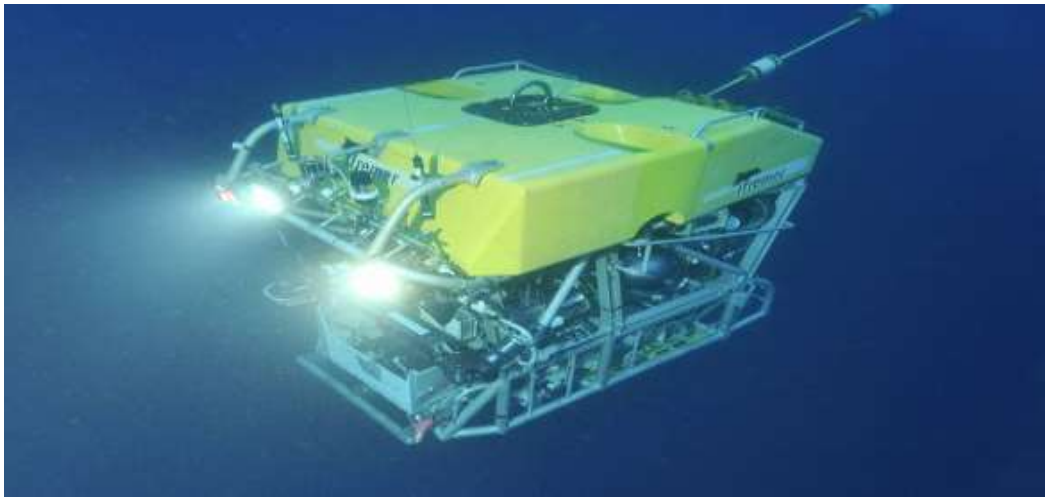


Figure 1.4: [14]The unmanned French ROV Victor 6000

[13] Fernandes, P. G., Stevenson, P., & Brierley, A. S. (2002). AUVs as research vessels: the pros and cons. *ICES ASC*

[14] https://www.marinelink.com/news/french-send-deep-diving-robot-help-505989

e. **Seafloor Mapping and Imaging Systems**. These are technologies used to study and visualize the ocean floor. These systems use a variety of techniques, including sonar, acoustic imaging, and satellite remote sensing, to create detailed maps and images of the seafloor.

f. **Deep-Sea Drilling Technologies**. These are specialized tools and techniques used to extract samples and data from the seabed and underlying rocks beneath the ocean floor. These technologies are critical for scientific research, as they provide insights into Earth's history, geology, and the marine environment. They are also used in the exploration and extraction of offshore oil and gas reserves. Some common deep-sea drilling technologies include, rigs, bits sampling kits, wires, pressure control systems etc.

g. **Underwater Remote Sensing**. Underwater remote sensing refers to the use of various technologies to gather information about the underwater environment without direct physical contact. These technologies allow researchers, scientists, and industries to study and map the seafloor, track underwater objects, monitor marine life, and assess environmental conditions.

h. **Real-Time Data Transmission Systems**. Real-time data transmission systems are technologies that allow for the immediate or near-immediate transfer of data from one location to another. These systems are crucial for various applications where timely access to data is critical, such as in remote monitoring, emergency response, and real-time analytics.

i. **Environmental Monitoring Technologies**. Environmental monitoring technologies are tools and techniques used to collect data about the environment, including air, water, soil, and ecosystems. These technologies are essential for assessing the health of the environment, detecting pollution, and understanding the impact of human activities on natural systems.

3.2 Conclusions

The aforesaid cutting-edge technologies are available with the exploration and production companies. Once those are given license to do reconnaissance and surveys to prospect minerals. Even Pakistan Navy Survey Vessel PNS BEHR MASAH has capabilities to undertake oceanographic as well as geophysical surveys. The ship is designed in accordance with international trend of modern hydrographic and oceanographic ships. It has vast survey capabilities such as Multibeam bathymetry by ship at medium ocean depth, Multibeam bathymetry by Survey Motorboats in Coastal areas, Dual Frequency Side scan survey-Coastal area and upper continental shelf, ROV fitted with high resolution underwater camera and other sensors etc[15]. It can conduct geological survey of the deep seabed[16]. However, it needs to be tasked for such expeditions if a prospecting firm having license to surveys the area enters in contract with the ship.

[15] https://hydrography.paknavy.gov.pk/pns-behr-masah/
[16] VLM with Dr Asif Inam on 3 May 24

CHAPTER 4

Key Stakeholders and their Roles in Offshore Mineral Exploration and Exploitation

4.1 Introduction

a. Pakistan is a large country and has tremendous natural resources, especially the province of Baluchistan is internationally known for its mineral wealth. The province of Khaybar Pashtun Khaw (KPK) is well known for marble and gemstones. The province of Sindh is known for its gas fields and mineral wealth in thar. In Punjab various coal mines and oil fields are hurling energy daily. For extracting the minerals from soil following are primarily involved in Pakistan:

(1) Geological Survey of Pakistan.

(2) Pakistan Mineral Development Corporation of Pakistan (PMDC).

(3) Oil and Gas Regulatory Authority (OGRA).

(4) Government Holding (Pvt) Limited (GHPL).

(5) Ministry of Energy (Petroleum Division).

(6) Ministry of Climate Change and Environmental Coordination.

(7) Public Limited Companies like, PPL, OGDCL, PEL etc.

(8) Distribution Companies PSO, SNGPL, SSGPL etc.

b. In case of offshore exploration in sea or deep seas following will be involved additionally:

(1) Ministry of Maritime Affairs.

(2) Ministry of Foreign Affairs.

(3) National Institute of Oceanography (NIO).

c. The aforesaid entities are controlled differently because their primary focus is distinct from each other. Responsibilities of each of the above entities are very briefly discussed in the ensuing paragraphs.

d. **Geological Survey of Pakistan**. By this organization, geological information is compiled and disseminated in the form of geological reports and maps. Geological maps provide a bird's eye view of the surface (and subsurface) distribution of various types of rocks and economic minerals that are found in a particular region. These maps are, thus, essential for all future detailed geological works including mineral exploration, civil engineering, soil

surveys, land use and soil conservation projects. Worldwide experience suggests that geological maps on 1:50,000 scale provide the most useful information and meet the requirement of most of the demands.

e. **Pakistan Mineral Development Corporation of Pakistan (PMDC)**. PMDC is an autonomous corporation under the administrative control of Ministry of Petroleum and Natural Resources, Government of Pakistan. It was established in 1974 to expand and help mineral development activities in the country. It is involved in exploration and evaluation of economic mineral deposits, preparation of techno-economic feasibility reports, mining and marketing.

f. **Oil and Gas Regulatory Authority (OGRA)**. Oil and Gas Regulatory Authority (OGRA) was established by the Federal Government on March 28, 2002, in pursuance of the Oil and Gas Regulatory Authority Ordinance, 2002 The objective of OGRA was to foster competition, increase private investment and ownership in the midstream and downstream petroleum industry, protect the public interest while respecting individual rights and provide effective and efficient regulations. The Authority comprises of Chairman/Chairperson and three Members viz; Member (Gas), Member (Finance), and Member (Oil) who are professionals with rich experience in their respective fields.

g. **Government Holdings (Private) Limited (GHPL)**. Government Holdings (Private) Limited (GHPL) is the 5th largest oil and gas exploration and production Company of Pakistan. GHPL is a holding Company fully owned by the Government of Pakistan with investments in exploration and production sector. It was incorporated in the year 2000 as a private limited company under the Companies Ordinance, 1984 (current Companies Act 2017). It is the third public sector Oil and Gas Exploration Company working under the Petroleum Division of Ministry of Energy, Pakistan.

h. **Ministry of Energy (Petroleum Division)**. The Ministry of Energy is an executive ministry of the federal Government of Pakistan that is charged with implementation of the national energy policy and energy production and electricity transmission throughout the country. The ministry functions are split in two divisions Petroleum and Power, each independent of its tasks and objectives. The ministry oversees overall domestic hydropower generation, petroleum and energy production by means of alternative energy sources, and energy conservation.

i. **Ministry of Climate Change**. The Ministry of Climate Change is a government body responsible for addressing environmental issues, climate change, and sustainable development within the country. It formulates policies, plans, and programs to mitigate the impacts of climate change, promote environmental conservation, and ensure sustainable development practices. The ministry also represents Pakistan in international forums related to climate change and environmental issues.

j. **Public Exploration Companies**. There are many public companies to explore energy and minerals like PPL, OGDCL, PEL etc.

k. **Public Energy Distribution Companies**. There are many public companies like PSO, SSGPL, SNGPL etc.

l. **Ministry of Maritime Affairs**. The Ministry of Maritime Affairs is responsible for the development and regulation of the maritime sector in the country. It oversees various aspects of maritime affairs, including ports and shipping, maritime security, and marine environment protection. The ministry formulates policies, plans, and strategies to promote the growth of the maritime industry, improve port infrastructure, and enhance maritime trade and transportation. It also represents Pakistan in international maritime forums and works to ensure compliance with international maritime regulations and standards.

m. **Ministry of Foreign Affairs**. In case of deep seabed exploration, presently this ministry act as post office between international organizations and relevant organizations in the country.

n. **National Institute of Oceanography (NIO)**. This institute is a research institution that focuses on studying various aspects of the ocean, including its physical, chemical, biological, and geological characteristics. It is responsible for conducting research and providing scientific advice to support sustainable development and management of marine resources in Pakistan. The NIO also plays a role in monitoring and assessing environmental changes in the marine environment, as well as in promoting awareness and understanding of ocean-related issues.

4.2 Conclusions

For coordinating with the international organizations and shifting of focus from energy to minerals requires dealing with so many organizations, which extremely difficult because each has its own mandate and goals. To come up with a coherence response to an eventuality related to deep seabed, setting up of a dedicated organization is very important that will be discussed in Chapter 8.

CHAPTER 5

Assessment of Existing Policies and Laws Governing Offshore Mining Activities

5.1 Introduction

a. Under the Constitution of Pakistan[17], petroleum is a federal subject. Laws of Pakistan on this subject are Petroleum Act 1934 as amended by Petroleum (Amendment) Act 2023[18]and Regulation of Mines and Oilfields and Mineral Development (Government Control) Act, 1948[19]. The former is the basic law that governs the import of Petroleum, and the latter is the basic law that regulates Mines and Oil Fields etc. This act of 1948, including the Amendment of 1976, is still operative. Under its section 3 the appropriate governments have the power to make rules for granting licenses for exploration of petroleum and minerals. Rules framed under this act are discussed in the ensuing paragraphs.

b. **Pakistan Petroleum (E&P) Rules 1949, 1986, 2001 and 2009**[20]. These rules are generally called E&P rules. Under section 3 of the aforesaid act the federal government first made rules in 1949. These rules were silent about minerals and only talked of petroleum and gas. These rules were repealed by new rules promulgated in 1986. The minerals exploration was covered in these rules. However, the seaward limitation of the area to be explored were up to territorial waters only. These rules were repealed by subsequent rules promulgated in 2001, which included more details on training and safety measures. However, these were also repealed by E&P rules 2009 but in 2003 exclusive rules for offshore exploration were introduced.

c. **Pakistan Offshore Petroleum (E&P) Rules, 2003**[21]. Under section 3 of the governing law of 1948 the offshore E & P rules were promulgated in 2003. In these exclusive rules for offshore exploration and production for the first time a reference was made to the Territorial Waters and Maritime Zones Act 1976. The term “offshore area” was defined in these words “all *the areas that lies completely seaward from the high-water mark* within *the jurisdiction of Pakistan, and includes all areas within the territorial waters, the historic waters, the contiguous zone, the continental shelf and the exclusive economic zone, as are defined in the Territorial Waters and Maritime Zones Act, 1976*”. In these rules terms “bathyorographical” and “National Oceanographic Institute” were mentioned. The term "bathyorographical" refers to the study or description of the underwater topography of the Earth's surface, particularly the ocean floor and its underwater features such as ridges, trenches, and seamounts. Mentioning of such term and National Oceanographic Institute indicates the sea floor came under the limelight from 2003 onwards. Apart from this, all laws, rules, and regulations of Pakistan applicable to petroleum exploration and

[17] Constitution of Pakistan
[18] Petroleum Act 1934 as amended by Petroleum (Amendment) Act 2023
[19] Petroleum Act 1934 as amended by Petroleum (Amendment) Act 2023
[20] Pakistan Petroleum (Exploration and Production) Rules1949, 1986, 2001 and 2009
[21] Pakistan Offshore Petroleum (Exploration and Production) Rules, 2003

production activities in onshore area were made deemed to be applicable mutatis mutandis to such activities in offshore areas. However, land and sea are two distinct realms, each governed by its own set of rules that do not necessarily apply to the other.

d. **Pakistan Offshore Petroleum (E&P) Rules, 2023**. These rules repealed the Pakistan Offshore Petroleum (Exploration and Production) Rules, 2003. The new thing in these latest rules was the issue of royalty rule 43 (2) provides, *"the Government shall consult the concerned province if it is in kind, to the extent of their share only if the block falls within the territorial waters. Provided further if majority of a block falls beyond the* territorial *waters of Pakistan, the royalty shall be paid to the Government*". The government here means the government of Pakistan. With this provision the issue between the federal or provincial governments stands settled if exploration and production take place beyond territorial waters. Since exploration for minerals is the subject matter of this study and those are found in deep waters only. However, these rules have been framed inter alia under section 14 of the Territorial Waters and Maritime Zones Act, 1976[22], which was repealed by Pakistan Maritime Zones Act, 2023[23]. Section 32 of the new law is relevant, which is identical to section 14 of the repealed law.

5.2 Policies Governing Onshore / Offshore Mining Activities

a. The voyage of "rules governing mining activities" towards sea began in 2003. The inception of offshore exploration rules was very late but on parallel Petroleum Policies have been promulgated from time to time. The development of petroleum policies started in 1991. The policies were succeeded by subsequent ones in 1993, 1997, 2001, 2007, and 2009[24], culminating in the Petroleum Exploration and Production Policy of 2012. Whenever previous policies were superseded by a subsequent policy document, the then rights granted under a policy were not affected. It is hard to say that a new policy will not follow. The policies are discussed in the ensuing paragraphs.

e. **Petroleum-Policy-1991**. After military rule in 1988, this policy was developed by the second political government that labeled itself for liberal policies to attract foreign direct investments. However, the policy did not speak much on offshore exploration but mentioned it four times in its various paragraphs. It can be considered as the beginning of the development of a regulatory framework regarding offshore exploration.

f. **Petroleum-Policicy-1993**. The policy spoke for offshore exploration in various areas. However, most of the provisions were the same except for price fixing of associated gas and non-associated gas. The policy talked of the different incentives to be given for offshore exploration.

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[22] Territorial Waters and Maritime Zones Act, 1976
[23] Pakistan Maritime Zones Act, 2023
[24] Petroleum polices issued by petroleum division 1991, 1993, 1997, 2001, 2003,2007, 2009 and 2012

g. **Petroleum-Policy-1997**. In the preamble of this policy, it has been stated that the previous Petroleum Policy proved attractive for the upstream sector, but it could not evoke sufficient interest in offshore areas and Balochistan Basin. It was further stated that this Petroleum Policy offers major incentives in the upstream and downstream petroleum sectors including a package based on Production Sharing Arrangement for offshore areas. The policy provided several incentives and guidelines for offshore exploration. A new geological Zone '0' to cover offshore areas was defined and shown in Annexure VIII of the policy. The economic package for this zone was prepared based on the Production Sharing Arrangement and its details were given in Annexure IX of the policy. The policy elaborated in detail all features of the introduced offshore package.

h. **Petroleum E&P Policy 2001**. With regards to offshore exploration, this policy did not introduce anything new. All provisions of the previous policy were repeated verbatim except that a model Offshore Production Sharing Agreement was annexed to this policy.

i. **Petroleum E&P Policy 2007**. With regards to offshore exploration, this policy did not introduce anything new. This policy repeatedly mentioned Pakistan Onshore / Offshore Petroleum (Exploration and Production) Rules, 2007 but those rules were never promulgated. The error was rectified as subsequent policies did not mention those rules. This fact was highlighted to Director PC, during a visit to his office on 22 April 2024. All provisions of the previous policy were repeated verbatim except following three distinct procedures for granting Onshore and Offshore E&P rights were provided:

(1) The granting of Petroleum Exploration Licenses for entering Petroleum Concession Agreement (PCA) or Production Sharing Agreement (PSA) in relation to onshore and offshore blocks offered through competitive bidding as per a laid down procedure.

(2) The granting of Petroleum Exploration Licenses for entering PCA or PSA in relation to onshore and offshore blocks without competitive bidding to Strategic Partner Companies on Government-to-Government basis.

(3) The granting of non-exclusive Reconnaissance Permits for undertaking studies and multiclient surveys after direct negotiation.

j. **Petroleum E&P Policy 2009**. Through this policy for offshore operations, a system based upon a better PSA was introduced which had separate 6 sections on:

(1) Licensing Process

(2) Exploration and Production Regimes

(3) Regulatory Process and Obligations

(4) Pricing and Incentives for Petroleum Exploration and Production

(5) Implementation and Removal of Difficulties

(6) Conversion to 2009 Policy

k. **Petroleum E&P Policy 2012.** Contrary to previous policies this policy was promulgated through SRO in April 2012. In the introduction of this new policy, it is stated that Policy 2009 had to be amended by this Petroleum Policy 2012 as the new market conditions warranted urgent changes. With regards to offshore exploration and production, the policy repeated the content of the previous policies without a substantial change.

5.3 Offshore Exploration Projects Undertaken Before Promulgation of E&P Policy and Rules Governing Offshore Exploration

a. The preceding discussion reveals that the offshore exploration and production rules were made in 2003 and the petroleum policies started covering offshore exploration from 1991 onwards. Does this imply that offshore exploration in Pakistan did not occur prior to these rules and policies? Certainly not, Offshore exploration in Pakistan traces its origins back to 1961. Let's now have a glance at offshore explorations conducted from independence until 1991, when the Petroleum Policy of 1991 first time addressed offshore exploration. A list of offshore projects ended before 1991 is appended below (Jian-ming Gong et. Al 2019)[25]:

No.	Well Name	Operator	Year
1	Dabbo Creek 1	Sun	1963
2	Patiani Creek 1	Sun	1964
3	Korangi Creek 1	Sun	1964
4	Indus Marine A-1	Wintershall	1972
5	Indus Marine B-1	Wintershall	1972
6	Indus Marine C-1	Wintershall	1975
7	Jal Pari 1A	Marathon	1976
8	Karachi South A-1	Husky	1978
9	Pakcan 1	OGDC	1985
10	Sadaf 1	Occidental	1989

***Table 1.1**: Offshore exploratory projects ended before 1991.*

b. The rules promulgated prior 2003 were silent on offshore exploration. The 1991 petroleum policy for the first time mentioned offshore exploration therefore the above projects were executed under independent PCA. Law allows regulating a matter through a contract even if special laws/rules on the subject are not in place. The nation had a great appetite for energy therefore in the absence of specific laws, authorities resorted to framework of a contract, entered on equitable commercial considerations.

[25]Exploration prospects of oil and gas in the Northwestern part of the Offshore Indus Basin, Pakistan

c. After 1991 till 2003 following offshore exploration projects were initiated and ended in the year mentioned below against each:

No.	Well Name	Operator	Year
1	Shaikh Nadin 1	Canterbury	1992
2	Pasni 1	OPC	1999
3	Gwadar 1	OPC	2000

Table 1.2: Offshore exploratory projects ended before 2003.

d. In the presence of petroleum policy 1991, the above projects should have been regulated under this policy, but these were also regulated through PSA probably because a precedence had been set for such projects.

e. After 2003, when exclusive rules for offshore exploration were promulgated, following projects were initiated and ended in the year mentioned below against each:

No.	Well Name	Operator	Year
1	Pak-G2 1	Total	2004
2	Pasni X-2	PPL	2005
3	Anne 1x	Shell	2007
4	Shark 1	Eni	2010
5	Kekra 1	Eni	2019

Table 5.3: Offshore exploratory projects ended before 2013.

f. In the presence of Pakistan Offshore Petroleum (Exploration and Production) Rules, 2003, the above projects should have been strictly regulated under the said rules. However, these were also regulated through PSA because latter policies not only mentioned PSAs but also incorporated Model PSA therein.

5.4 Offshore Exploration Projects Undertaken After Promulgation of Petroleum Policy 1997 and Pakistan Offshore Petroleum (E&P) Rules, 2023[26]

After promulgation of Pakistan Offshore Petroleum (Exploration and Production) Rules, 2023 no project has been initiated yet. However, these rules have now evolved to the point where they cover all offshore exploration activities. Nonetheless, any activities beyond the Exclusive Economic Zone (EEZ) will require some amendments to these rules.

5.5 Analysis of the Regulatory Framework of Offshore Exploration Project

a. Exploration in the Indus Offshore started in 1961 and continued till May 2019 when Kekra 1 well in Offshore Indus basin was closed and abandoned. Presently, no exploration is in progress in any offshore area. However, licenses issued in the past to ENI, PEL, PPL etc. are still operative[27]. It is hard to

[26] Pakistan Offshore Petroleum (Exploration and Production) Rules, 2023.
[27] Meeting with Mr Raza, Director PC on 22 April 2024.

conclude why the projects went unproductive. However, the scope of this chapter is legal so from that point of view it is concluded that the exclusive rules for offshore exploration were introduced in 2003. The policies started coming up in 1991 but the offshore exploration started in 1961. Even after the upcoming of the rules and policies the offshore explorations were regulated through PCAs or PSAs.

b. 5.21 for the projects in table 5.3 and 5.3 there was provision of executing a project through PSA therefore it can be concluded that to some extent the established rules, or policies were followed. For such agreements Government Holdings (pvt) Limited (GHPL) as licensee enters in the contract for surveys and reconnaissance with foreign and national firms like Pakistan Petroleum Limited (PPL), Oil and Gas Development Corporation Limited (OGDCL) etc. Upon prospecting, Production Sharing Agreements are concluded.

5.6 Conclusions

a. The Ministry of Energy, Petroleum Division (MoEPD) under Regulations of Mines Act, Petroleum Policies and relevant Rules governs E&P activities in Pakistan. The PCAs and Production Sharing Contracts (PSCs) include additional supplemental regulations. Model PCAs and PSCs are part of the existing Petroleum Policies and Rules. MoEPD is mainly represented by Director General Petroleum Concession (DGPC) being the primary regulator. Prior approval of DGPC is required for all major activities including, but not limited to, the following:

(1) Start of activity i.e. seismic data acquisition, drilling, building of infrastructure, abandonment of wells and infrastructure etc.

(2) Extension of exploration license.

(3) Relinquishment or surrender of exploration license.

(4) Grant and extension of the D&P lease.

(5) Sharing of the geological/geophysical and wells data to any non-related party.

(6) Assignment / sale of working interest in any PCA or PSC to any other company.

b. While all the offshore exploration projects may have been unproductive, it doesn't negate the existence of further opportunities at sea. The figure below depicts that all the offshore exploration endeavors were initiated within EEZ.

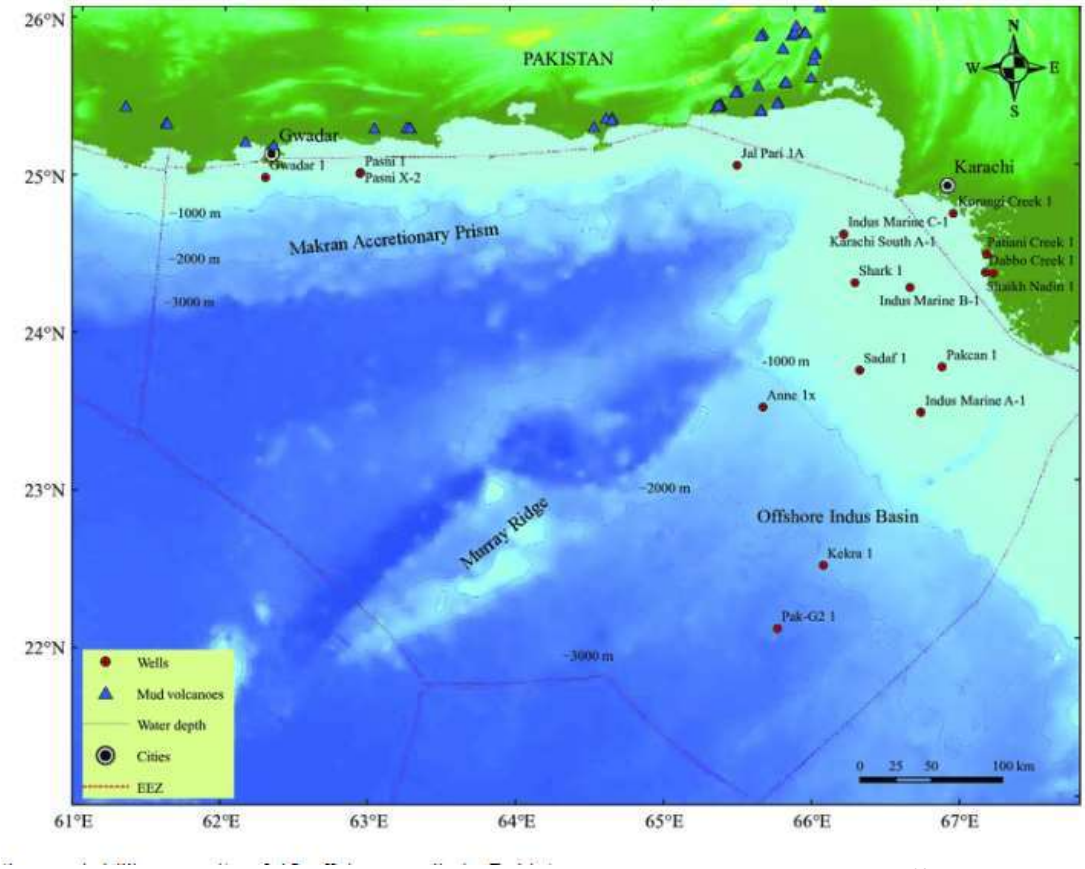


***Figure 1.5**: Locations of the offshore projects undertaken so far.*[28]

c. In search of energy, we might have missed minerals that can be found beyond EEZ. The disappointment of the offshore exploration project initiated within EEZ, should not tempt Pakistan to close this chapter rather area beyond EEZ should be considered for exploration of minerals. India initially explored deep seabed in the southern Indian Ocean and has now moved to northern part of it. These moves of India to new area indicate that it had harvested many costly minerals from deep seabed and expects more in northern Inian Occean. Many other nations have explored the deep seabed and have been successful in exploiting these nonliving resources of mother nature. Our study in chapter 2 also reveals the presence of minerals in the deep seabed. For this new avenue all the dealings will have to be done with international organizations those are discussed in the next chapter.

[28] https://www.researchgate.net/figure/Location-and-drilling-results-of-18-offshore-wells-in-Pakistan_fig2_348750883

CHAPTER 6

Collaboration With the International Seabed Authority

6.1 Introduction

a. National waters, the contiguous zone, and the exclusive economic zone (EEZ) primarily consist of shallow waters where tidal effects continuously disturb the sea-bed sedimentation process. In contrast, the deep seabed remains undisturbed, making it an ideal environment for the formation of mineral deposits and nodules over millions of years. The existence of these valuable resources in the deep sea was once beyond imagination, but now presents a lucrative opportunity for exploration and mining. All the projects undertaken so far at the seabed were focused on energy (oil and gas) only. These efforts were made within 145 NMs from the coast, which means it was confined to the Exclusive Economic Zone only. Exploration on the high seas was never considered. Since this treasure is in the international waters therefore any activity done in the international waters will have to be done strictly in accordance with international laws. Our study (Chapter 2) reveals that there are treasures of polymetallic nodules in the high seas.

b. Convention on the Law of Sea on the conservation and sustainable use of Marine Biological Diversity of areas Beyond National Jurisdiction is not applicable because it is specific to living resources whereas energy and minerals are nonliving resources. UNCLOS recognizes the high seas as a common heritage of mankind. If Pakistan also considers exploring deep seabed in search of costly minerals, many local or foreign firm may like to join the venture especially the Chinese companies, but this would require collaboration with the International Seabed Authority, which is discussed in this chapter.

c. United Nations Convention on the Law of the Sea 1982 (UNCLOS[29]) is an international convention that sets out the legal framework for the seas and the oceans by defining the rights and obligations of States Parties with respect to the maritime environment. Its main functions are to promote the peaceful use of the seas, regulate the use of marine resources, promote the conservation of living resources and the preservation of the marine environment. Article 140 of UNCLOS, provides that activities in the area beyond EEZ shall be carried out for the benefit of mankind, irrespective of the geographical location of States, whether coastal or landlocked, taking into consideration the interests and needs of developing States.

d. International Seabed Authority (ISA) is an autonomous intergovernmental body under the 1982 UNCLOS and its 1994 Agreement on Implementation. UNCLOS establishes a legal framework for governing resource extraction in deep-seabed regions beyond national jurisdiction. To this end, ISA has developed a mechanism for the equitable sharing of financial and

[29] https://www.curtis.com/glossary/public-international-law/unclos#:~:text=UNCLOS%20is%20the%201982%20United,respect%20to%20the%20maritime%20environment

other economic benefits derived from activities in the area. ISA is the organization through which States Parties to UNCLOS organize and control all mineral-resources-related activities in the Area for the benefit of humankind. In so doing, ISA has the mandate to ensure the effective protection of the marine environment from harmful effects that may arise from deep-seabed-related activities.

e. ISA, which has its headquarters in Kingston, Jamaica, came into existence on 16 November 1994, upon the entry into force of UNCLOS. It became fully operational as an autonomous international organization in June 1996.

f. In accordance with UNCLOS, Article 156(2), all States Parties to UNCLOS are *ipso facto* members of ISA. As of 18 May 2023, ISA has 169 Members[30], including 168 Member States and the European Union. The Area and its resources are the common heritage of humankind. The Area covers around 54 per cent of the total area of the world's oceans.

g. ISA has a 38-members Council and 41-members Legal and Technical Commission[31] it has established codes for exploration of Polymetallic Nodules, Polymetallic Sulphides, Cobalt Rich Ferromanganese Crusts, and others nonliving resources of the high seas.

h. ISA ensures equitable sharing of financial and other benefits derived from deep-sea mining activities. It allocates a portion of revenue to developing countries, particularly landlocked and geographically disadvantaged states, to support their participation in marine scientific research and capacity-building initiatives.

6.2 Salient Features of the ISA Regulations on Exploration of Deep Seabed

a. Salient features of the ISA Regulations are summed up here under:

(1) Exploration work plan is submitted with fee of US $ 500000. This includes all the details of the work to be carried out in the area identified.

(2) Work plan is marked to Technical and Legal Commission (TLC) for vetting and evaluation. The commission thoroughly discusses the proposal and either recommends it to the council or rejects for improvements.

(3) Concurrently member states are notified by ISA secretariate for raising concerns (if any).

(4) If no concern is raised from states and TLC also approves the proposal, SA assigns deep-sea mining areas and approval is accorded.

[30] https://www.isa.org.jm/about-isa/
[31] https://www.isa.org.jm/organs/

(5) Contract is signed between ISA and the Contractor.

(6) Annual fee is submitted @ 5 US$ per Sq Ft of proposed areas during the period the work is in progress.

b. Pakistan is signatory to UNCLOS hence is member of the ISA assembly. To explore and exploit the nonliving resources from the deep seabed of the high seas it will have to abide by the ISA regulations.

c. To achieve this, Pakistan must first grant licenses to interested foreign or local firms to conduct surveys for mineral exploration in the deep sea. In doing so, the International Seabed Authority (ISA) will have to be notified. Under the current regime, the Ministry of Energy is responsible for this task, but its focus has traditionally been on land-based activities. Therefore, there may be reluctance or delays in transitioning to a new concept. The nonproductive results of the so far offshore exploration may also pose an hinderance to the pursuit of this new avenue. A representative of this institute attended a seminar on "*Exploring Pakistan's Mineral Wealth: Navigating Global Dynamics to Monetize Pakistan's Untapped Mineral Wealth*[32]" on 16 April 2024. During the seminar, a question was posed to a panelist, an official of PMDC, regarding the exploration of minerals in the high seas. The official responded negatively, stating, "*Let's focus on land exploration first; we can consider sea exploration later*." This mindset appears to be common among higher-ranking officials.

d. A new authority, dedicated to offshore exploration, will always welcome the new ventures. This authority, if established, should be mandated to coordinate research and development in offshore area through foreign and local firms.

e. The foremost purpose of this authority shall be to coordinate with ISA in accordance with UNCLOS and other international laws. Once a work plan is submitted to ISA and then to TLC it can be returned with observations, those may be technical or legal. In such a scenario, the plan would require a defense at international forums to address any observations raised. If there is a need to contest an observation, a strong defense will be necessary, which can only be effectively presented by a dedicated authority.

f. Once the proposed work plan is submitted to the ISA, it is shared with all member littoral states for them to raise any concerns they may have. If a member littoral state raises serious concerns, the work plan can still be debated between the concerned state and the proposing state. In such a scenario, significant diplomatic efforts will be required to address these concerns and obtain a no-objection note from the concerned state. This can be done by a dedicated authority only.

g. New authority will have to collaborate with diplomatic channels for seeking representation in ISA council and its TLC for better projection of

[32] KCFR email inward Diary No 286 dated 3 Apr 24

Pakistan in international organizations. Such and other challenges are discussed in the next chapter.

CHAPTER 7

Challenges In Offshore Minerals Exploitation

7.1 Introduction

a. Deep Sea mining is the process of retrieving mineral deposits from the deep seabed. There is growing interest in the mineral deposits of the deep seabed because of Depleting terrestrial metal deposits like copper, nickel, aluminum, manganese, lithium, cobalt etc. and Increasing production of technologies like smartphones, wind turbines, solar panels, batteries, and other emerging technologies.

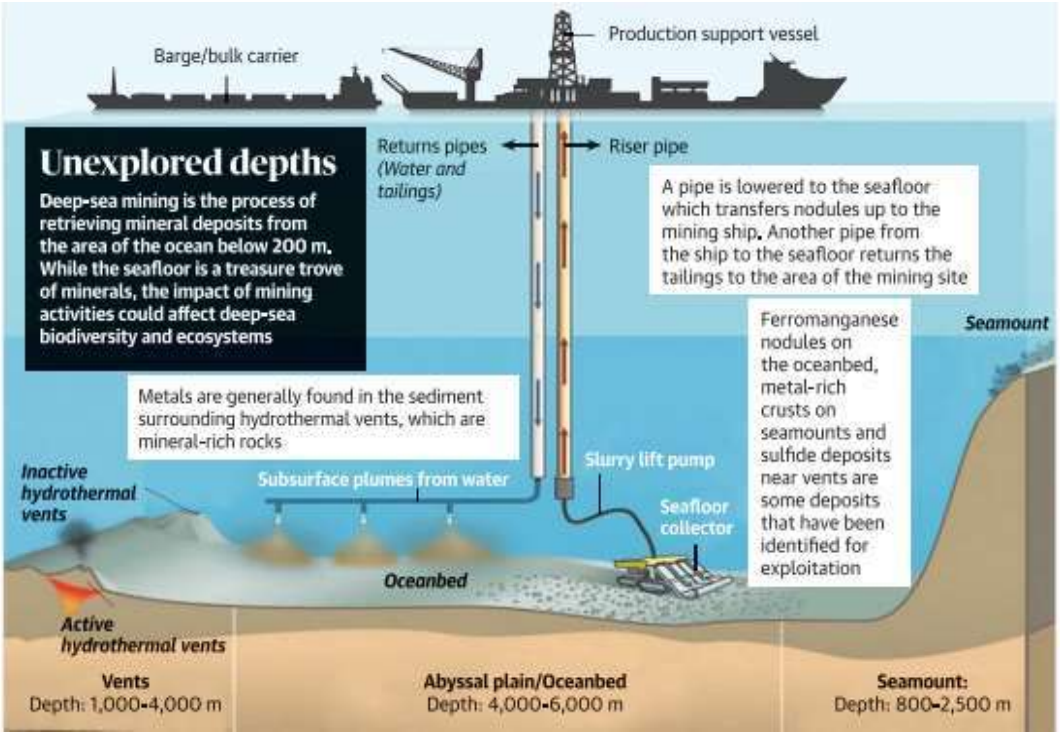


***Figure 1.6**: Pictorial Description of Deep Seabed Mining*

b. The above figure depicts that deep-sea mining is a complex and costly endeavor. Hence it poses different challenges, the envisaged challenges are discussed in the ensuing paragraphs.

c. **Technical Challenges**. Deep-sea mining necessitates the utilization of modern technologies and sophisticated equipment. Undertaking such projects will only be feasible after conducting a detailed survey and reconnaissance of the area. The seabed lies beyond visual reach, and exploring such areas is only possible using modern devices, which are not manufactured locally. Therefore, there will be a need not only for this equipment but also for the human resources capable of operating it.

d. **Economic Challenges**. Embarking on any project, the initial and recurring costs must be carefully considered. The costs associated with such

projects are likely to be high due to the use of drill ships and the remote location of the work site. Transporting human resources, equipment, and other logistics will require the establishment of a base in Karachi and the use of helicopters to travel between the site and the base. Given the significant investment involved, only experienced and financially stable foreign or local companies are likely to participate. The government of Pakistan alone may not be able to finance such large-scale ventures.

e. **Organizational Challenges**. Pakistan had ministry of petroleum and natural resources that has now become Ministry of energy with a petroleum division. Exploration in the Indus Offshore started in 1961 and continued till this date, lastly Kekra 1 exploration well in Offshore Indus basin was closed and abandoned. All the offshore exploration efforts were licensed by the government through this ministry. Implementing changes within an organization, whether related to processes, technology, or culture, can be met with resistance and challenges in adoption. In this case the traditional concept of not providing room for a new organization to duct in the net of the bureaucratic control of the lucrative Ministry of Energy may not be an easy task to accomplish. Leadership will pose another significant challenge in this context. Determining who will head the new setup in the current nepotistic environment will not be straightforward. Choosing based on merit versus selecting a favored individual will be a crucial decision to make.

f. **Stakeholders Engagement**. As discussed in Chapter 4 there are many stakeholders therefore taking onboard all the stakeholders will be an uphill task. Careful planning, collaboration, and evaluation to ensure the sustainable development and management of Pakistan's seabed resources in consultation of so many stakeholders will be difficult.

g. **Establishment of Specialized Bodies**. Advisory bodies like the financial committee, legal and technical committee, Marine scientific research committee etc. will have to be set up through careful selection and planning. Designing and maintaining portfolio of each minimizing overlapping will not be easy too.

h. **Legal and Jurisdictional challenges**. Since this will be an international activity, meeting regulatory requirements and ensuring compliance with laws and regulations can be a significant challenge. Formulating laws and regulations to govern activities in the seabed, ensuring compliance with international maritime laws will be an uphill task. As discussed in Chapter 5, the formulation of rules was significantly delayed, and subsequent adherence to those rules was also questionable. Therefore, new laws will be necessary for establishing a new organization. However, given the historical context, it is not expected that lawmakers in Pakistan will legislate quickly. The issue of jurisdiction has been polarized between provinces and the federation after the 18th constitutional amendment. Pakistan Maritime Zones Act, 2023 establishes federal jurisdiction over waters, while the accompanying rules stipulate that provinces must receive royalties for exploration within territorial waters. The potential establishment of a seabed authority will be critical in resolution of such matters.

i. **Environmental Challenges**. Deep-sea mining ventures will jeopardize unique species adapted to certain conditions. Environmentalists fear sediment plumes, noise, light, and oil pollution as threats disrupting ocean ecosystems. Poor understanding of deep-sea biodiversity complicates environmental impact assessment and guideline development.

j. **Diplomatic Challenges**. Pakistan is though member of the ISA assembly, but it has no representation in council of ISA and TLC of ISA. Our diplomates in the United Nations and in foreign countries will have to make solid effort to gain representation in ISA so that once a proposed project is tabled for discussion or assessment it can be well defended.

k. **Strategic / Military Challenges**. There are concerns surrounding the military implications of deep-sea exploration, particularly in geopolitically sensitive regions. Military interests could exploit deep-sea resources to gain strategic advantages, escalating tensions and competition among nations. The deployment of advanced technologies and sensitive equipment in such operations pose security risks, including monitoring, espionage, and sabotage.

l. The new exploration initiatives of India [33]underscore the broader strategic competition unfolding in the Indian Ocean region, with littoral states vying for control and influence over key maritime spaces. India may seek to secure control over these resources for strategic purposes, potentially leading to competition and tensions in the region. This competition heightens the risk of maritime disputes, territorial tensions, and even conflict escalation, necessitating robust defence planning and readiness to address potential security challenges. India with advanced deep-sea exploration and mining capabilities could gain an advantage in controlling access to resources and potentially influencing regional security and power dynamics. This could further lead to gaining control of strategic locations on the seabed and potentially escalate tensions. For Pakistan it is on obligation to show presence in high seas.

[33] MoFA letter UN (III) 16/3/23 dated 9 Feb 24

Chapter 8

Requirement of One Window Solution

8.1 Introduction

a. We have discussed in chapter 4, there are different stakeholders for exploration and exploitation of natural resources.

b. The absence of a clear, centralized control framework leads to administrative red tape, disruptions in decision-making, and obstacles to investment and development that complicate matters. For handling a venture through international forums requires quick responses and prompt inhouse coordination.

c. In case of exploration at high seas, when a new exploration work plan is submitted to the ISA by any state, current regulations require the ISA to share the proposal with all member states. Recently, two Indian proposals were received by the Ministry of Foreign Affairs[34]. The ministry then notified all entities involved in maritime affairs. Responses from each entity were required to be sent to the Ministry of Foreign Affairs. The Ministry of Foreign Affairs is dedicated to diplomatic work and has its own priorities. If there had been a National Seabed Authority (NSA), it would have been on the ISA's mailing list, allowing it to receive proposals much earlier than through traditional mailing channels. This would have saved time for studying the proposals in their entirety. However, this institute generated a response, which is the basis of this report. This is sufficient to support the idea of creating a National Seabed Authority. However, an official from the Ministry of Energy confirmed that they had received a proposal for setting up a National Seabed Authority, but they have rejected the idea[35].

d. Many countries Have national seabed authorities or agencies, responsible for managing and regulating activities in their own seabed and ocean resources within their territorial waters and exclusive economic zones (EEZs). These agencies typically oversee activities such as seabed exploration, exploitation of marine resources, environmental protection, and enforcement of relevant laws and regulations. For example, in the United States, the Bureau of Ocean Energy Management (BOEM[36]) manages offshore energy and mineral resources on the outer continental shelf in federal waters. In the United Kingdom, the Crown Estate [37]manages the seabed around the UK, leasing areas for activities such as offshore wind farms and seabed mining. Other countries with significant maritime interests often have similar agencies or authorities tasked with overseeing their maritime resources.

[34] MoFA letter UN (III) 16/3/23 dated 9 Feb 24
[35] Meeting with Mr Raza, Director PC on 22 April 2024
[36] https://www.boem.gov/
[37] https://www.thecrownestate.co.uk/

e. India has Ministry of Earth Sciences (MoES[38]), to coordinate and superintend all the onshore and offshore explorations whether those are oil, gas, or minerals. MoES was formerly the Department of Ocean Development, which was created in July 1981 as a part of the Cabinet Secretariat directly under the charge of the Prime Minister of India. It came into existence as a separate department in March 1982. Previously it functioned as a nodal institution for organizing, coordinating, and promoting ocean development activities in the country. The Government of India notified it as the Ministry of Ocean Development in February 2006. In July 2006, the Ministry of Ocean Development was reorganized by the Government of India vide presidential notification into the new Ministry of Earth Sciences (MoES). This brought the Indian Meteorological Department, Indian Institute of Tropical Meteorology, and National Centre for Medium Range Weather Forecasting under the purview of MoES administration. The Government also approved the setting up of Earth Commission on the pattern of Space Commission (government department responsible for administration of the Indian space program) and Atomic Energy Commission (governing body of the Department of Atomic Energy). This shows that in India the departmental growth has been far better than in Pakistan.

f. Needless to say, "One window operation" refers to a streamlined process where all necessary steps or requirements for a particular task or service are accessible or completed in one place. This approach aims to simplify procedures, reduce bureaucracy, and improve efficiency by eliminating the need for individuals or businesses to interact with multiple departments or agencies for a single transaction or service. In case of offshore exploration of nonliving resources there is need to create National Seabed Authority (NSA) under Ministry of Maritime Affairs for following responsibilities:

(1) Search for availability of nonliving resources in seabed of EEZ and beyond EEZ through geological surveys and to maintain databank of those findings.

(2) Hydrographic surveys of the Seabed of EEZ

(3) Coordination with International Seabed Authority (ISA) and other relevant international organizations.

(4) Formulation of policies and rules for seabed exploration.

(5) Bringing national laws in line with the international laws on the subject.

(6) Oversee all exploration projects on the seabed.

(7) Vigilance on the ongoing seabed explorations in the world specially in Indian Ocean and particularly in Arabian Sea.

[38] https://www.moes.gov.in/

(8) Search for new exploration techniques and the possibility of their adoption for local use.

(9) Vigilance on ecology of the national seabed and adjacent areas.

g. One window of National Seabed Authority if opened it would ensure seamless management of seabed for economic benefits, environmental protection, and international coordination. However, it will be crucial to decide in which organization it should be placed. Let's discuss possible options in the ensuing paragraphs.

h. **Option-I, Under Planning Division**. The proposed National Seabed Authority (NSA) could be placed under the Ministry of Planning, Development, and Special Initiatives. The ministry's name suggests a focus on special initiatives, and establishing the NSA would indeed be a special initiative. Therefore, it would be logical to house it within this ministry. Once matured and equipped with appropriate human resources to undertake operations it may be placed either under any ministry or directly under cabinet division.

i. **Option-II, Under Ministry of Science & Technology (MoST)**. Since it will be a new avenue therefore for initial period it can also be placed under MoST till maturity.

j. **Option-III, Under Ministry of Energy**. Another option is to house the National Seabed Authority (NSA) within the Ministry of Energy, Petroleum Division. To understand its potential placement within this organization, let's look at the current organizational structure of the Ministry of Energy, Petroleum Division. Following is the existing setup of this ministry:

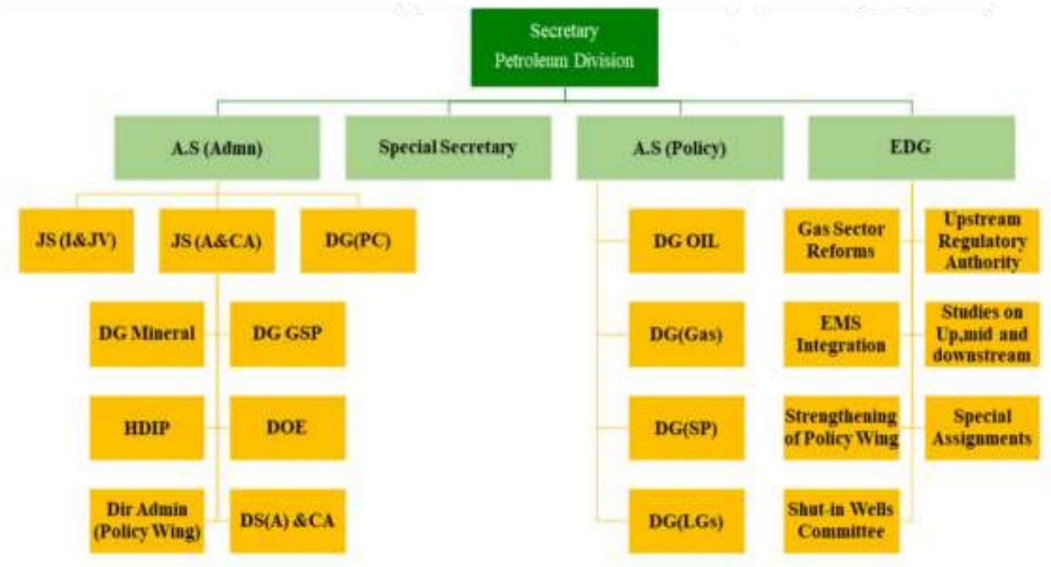


***Figure 1.7**: Organization of MoEPD*[39]

[39] https://petroleum.gov.pk/Detail/MzcwNzY4MjgtOGYzNi00MjhjLWJmOWEtNWU3ODRjNzZkOTdk

k. The above organogram shows that Director General Oil and Director General Gas are under policy wing whereas Director General Minerals is under Admin wing. Seabed is likely to give oil, gas and minerals so where it will fit in the MoPD is a crucial decision to make but considering the earth exploration linkage with the MoEPD there appears no other option to place the proposed NSA. For this, MoEPD will have to restructure itself to bring DG Minerals under policy wing where there are DG oil and DG gas separately. Proposing a restructuring of the MoEPD to accommodate the National Seabed Authority (NSA) might face challenges. The MoEPD has already rejected the idea of the NSA and suggested an alternative approach where the NSA could be established but without control over petroleum-related matters. This indicates that the MoEPD might be resistant to such a restructuring, making it less likely for the NSA to be established within this ministry. However, if MoEPD is willing to restructure itself then following could be its organogram with NSA.

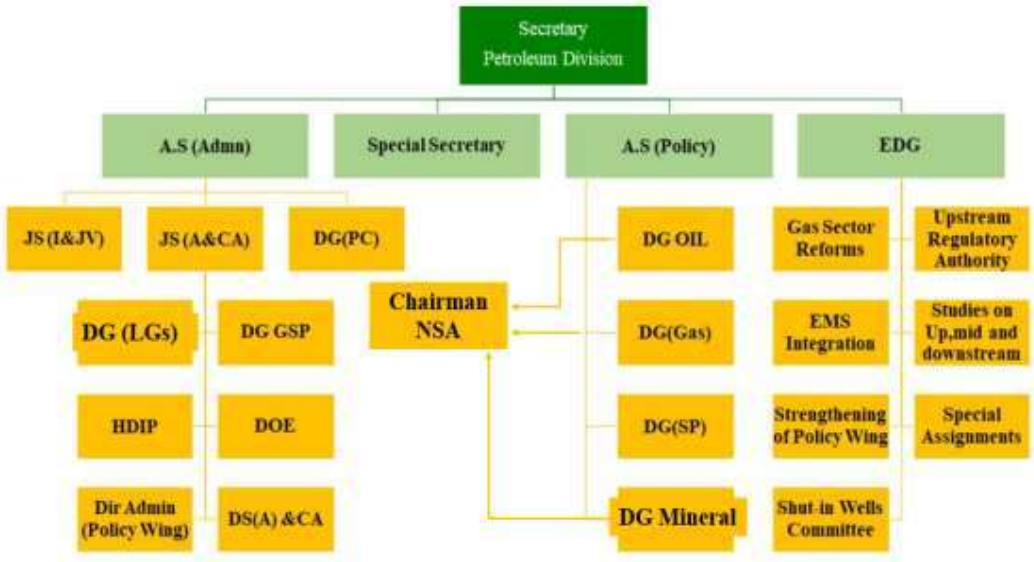


***Figure 1.8**: Proposed Organization of MoEPD with NSA*

l. **<u>Option-IV, Under MoMA</u>.** This Ministry focuses on Ports and Shipping only. To understand its potential placement of NSA within this organization, let's look at the current organizational structure of this Ministry Following is the existing organogram of this ministry:

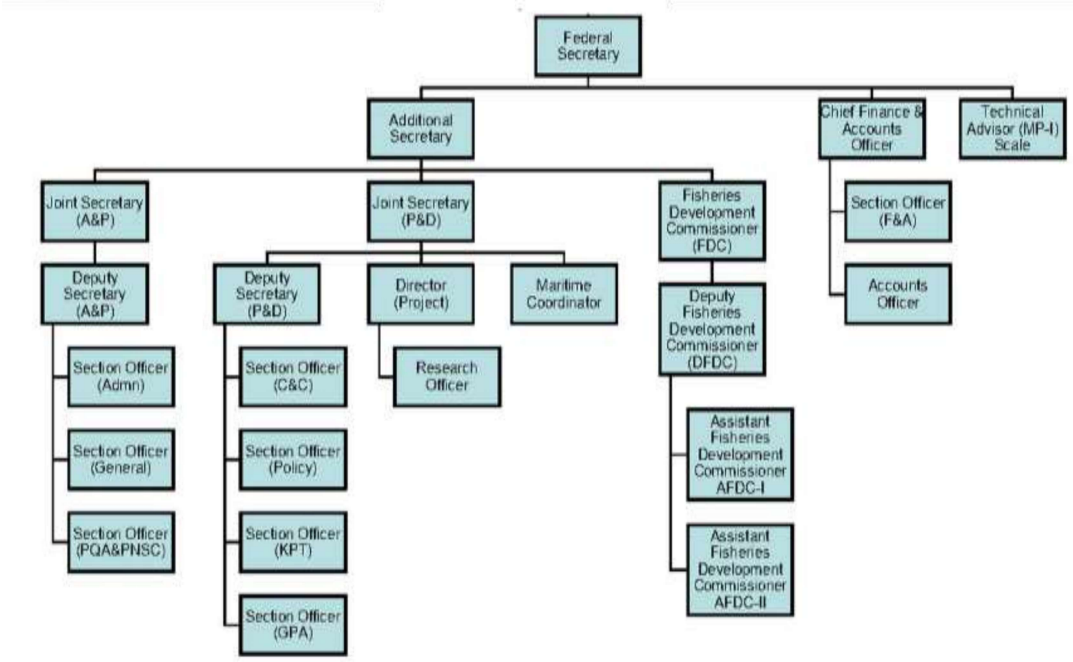


***Figure 1.9**: Existing Organogram of MoMA*[40]

m. The phrase "Maritime Affairs" is a broader term, exploration on seabed is indeed a maritime affair therefore Ministry of Maritime Affairs cannot escape from any affair that is related to sea or its bed. However, it is a new ministry with a weak structure it may not welcome housing proposed NSA in it. Nevertheless, following is the proposed organization if NSA is placed in it.

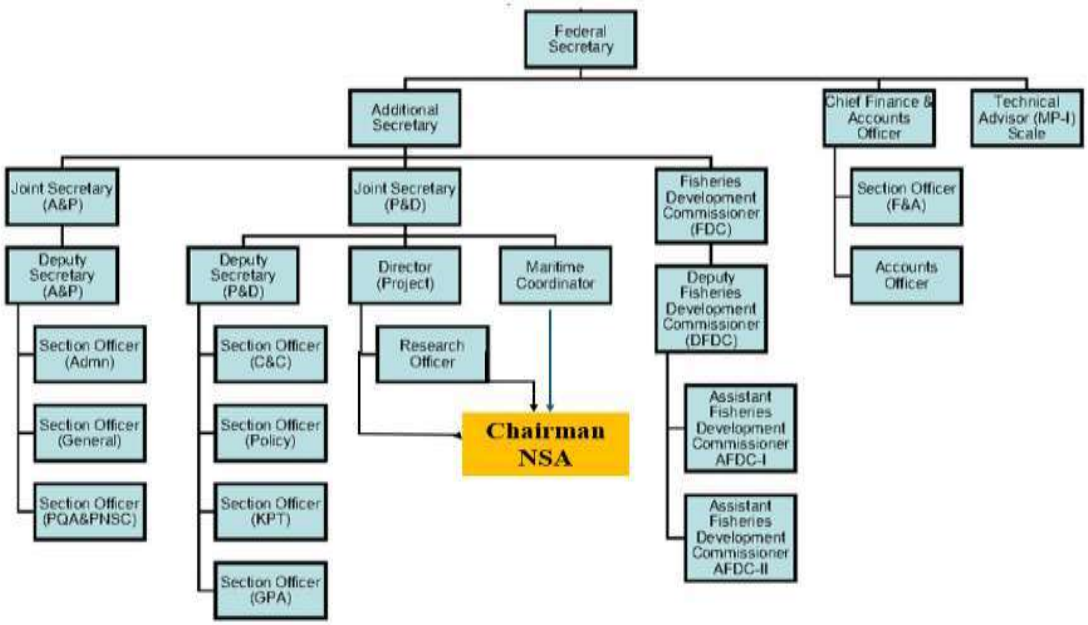


***Figure 1.10**: Proposed Organization of MoMA with NSA*

[40] https://www.moma.gov.pk/Detail/NWQ1OWIxZTktOTE4Zi00YzkwLTg2NDYtMzMwNmY4OTkxOTA4

n. We can see the organization of MoMA, already there are three desks of Research Officer, Director Projects, and Maritime Coordinator all under Joint Secretary P&D. If NSA is placed in parallel to them it can coordinate licensing activities through coordination desk, it can research on seabed through research desk and can execute exploration projects through P&D desk. However, under a joint secretary it will be a weaker setup not capable to perform operational responsibilities.

8.2 Conclusions

In offshore explorations, shifting focus from energy to minerals and expanding beyond territorial waters and the Exclusive Economic Zone (EEZ) represents a significant initiative. This ambitious endeavor necessitates careful conceptualization, meticulous planning, and strategic development, all of which must occur at the highest national planning level to ensure its success. Way forward for the same, will be discussed in next chapter.

Chapter 9

Way Forward, Conclusions, and Recommendations

9.1 Way Forward

a. The way forward to establish NSA following options are envisaged:

(1) Through Act of Parliament.

(2) Through Presidential Ordinance.

(3) By Amending Rules.

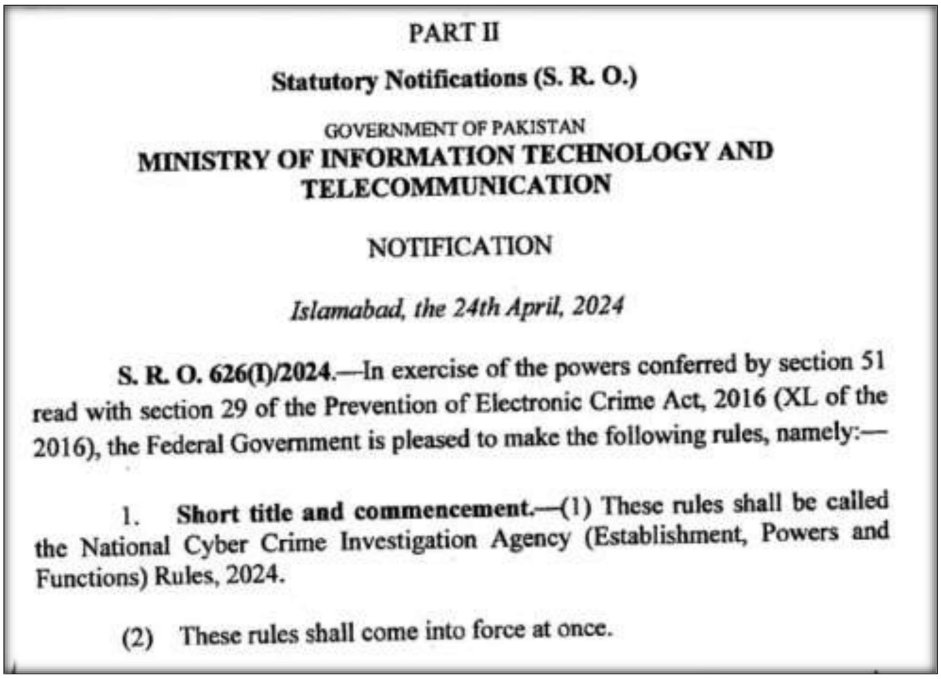
(4) By delegation of powers.

b. **Through Act of Parliament**. The organizations that carry prefix "national" with their names are normally established through an act of parliament because parliament represents the nation. To establish NSA, recommended ministry / department may prepare a draft statute to be called "Establishment of National Seabed Authority Act". The draft statute may then be sent to the Ministry of Law for vetting. Once vetted by the Ministry of law, the case may be taken up with the Cabinet Division for approval. After Cabinet approval, it may be introduced as a bill in any house of the parliament by the Minister of recommended ministry for debates and approval. Once the proposed law is passed by parliament and it assented by the President of Pakistan, further processes of recruitment, selection and appointments may be initiated. After filling the positions created by establishment of National Seabed Authority Act, National Seabed Authority Rules may be prepared by the authority itself. The National Institute of Maritime Affairs can provide necessary research in this regard.

c. **Through Presidential Ordinance**. It is a shorter route to establish a national organization but for this sufficient justification is required highlighting urgency for the purpose. It is envisaged that there is no apparent urgency for setting up NSA.

d. **By Amending Rules**. Section 32 of Pakistan Maritime Zones Act, 2023 empowers the Federal Government to make rules for regulating sea affairs. As discussed in chapter 5, presently rules made under this act are Pakistan Offshore Petroleum (E&P) Rules, 2023 but erroneously those were made under section 14 of a repealed Territorial Waters and Maritime Zones Act, 1976. Hence these rules already require amendment or reframing under the existing law of 2023. Recommended ministry can take up case for amendment or reframing of the said rules and may incorporate in the new rules that all affairs related to exploration of nonliving resources of sea shall be regulated, coordinated, and executed by recommended ministry through NSA.

e. **Precedence of Setting up New Agency Under Rules.** Recently, government of Pakistan established National Cyber Crime Investigation Agency (NCCIA), replacing the Federal Investigation Agency's (FIA) Cyber Crime Wing. The Ministry of Information Technology and Telecommunication issued an official notification for the abolition of the FIA's cyber-crime wing, saying that the federal government in the exercise of powers conferred by section 51 read with section 29 of the Prevention of Electronic Crime Act, 2016 has established the new Agency. Picture of the notification is appended below as figure 9.1 for ready reference:



PART II

Statutory Notifications (S. R. O.)

GOVERNMENT OF PAKISTAN
MINISTRY OF INFORMATION TECHNOLOGY AND TELECOMMUNICATION

NOTIFICATION

Islamabad, the 24th April, 2024

S. R. O. 626(I)/2024.—In exercise of the powers conferred by section 51 read with section 29 of the Prevention of Electronic Crime Act, 2016 (XL of the 2016), the Federal Government is pleased to make the following rules, namely:—

1. **Short title and commencement.**—(1) These rules shall be called the National Cyber Crime Investigation Agency (Establishment, Powers and Functions) Rules, 2024.

(2) These rules shall come into force at once.

***Figure 1.11**: Establishment of new agency under rules*

f. **By Delegation of Powers.** Section 33 of Pakistan Maritime Zones Act, 2023 can be invoked to setup NSA by delegation of powers and functions by MoEPD to the recommended ministry. The said section is reproduced below:

> "33. Delegation. —The federal Government may, by notification in the official Gazette and subject to such conditions as may be specified in the notification, direct that all or any of its powers under this Act or rules made thereunder shall also be exercisable by an authority or officer subordinate to it or by a provincial government or any authority or officer subordinate to it."

g. Using power under the aforesaid section, MoEPD may delegate the powers and functions of seaward exploration to NSA of recommended ministry.

9.2 Conclusions

a. Coordinating with international organizations and shifting focus from energy to minerals is not possible with existing regulatory control because of

varying mandates and goals of different agencies presently involved[41]. Establishing a dedicated organization is crucial for a coherent response to deep seabed issues[42].

b. MoEPD regulates E&P activities in Pakistan under the Regulation of Mines and Oilfields and Mineral Development (Government Control) Act, 1948, Petroleum Policies, and relevant rules. However, due to bureaucratic inertia, it is unlikely to restructure itself for establishing the envisaged NSA within it[43].

c. Shifting focus from energy to minerals and exploration beyond territorial waters and the EEZ will be a significant initiative. This major shift requires careful deliberation, planning, and coordination at the highest levels. The Ministry of Planning, Development, and Special Initiatives (MPD&SI) focuses on special initiatives, making it the appropriate body to establish the envisaged NSA.

d. Setting up NSA through Act of Parliament will be long process, for setting up through ordinance there is no urgency and by amending rules is the most convenient and quick process of setting up of NSA.

e. Due to limited human and financial resources, coupled with time constraints, this report was compiled in a short span of time as NHQ desired its submission on a particular date. However, for through research including geological and technological aspects 8 to 12 months are required with access to Pakistan Navy Survey Vessel PNS BEHR MASAH[44].

9.3 Recommendations

a. In view of the above conclusions establishing the NSA under MPD&SI is recommended. However, other options discussed in the previous chapter can also be considered. It is further recommended that MPD&SI may take up case for promulgation of new Offshore E&P rules for taking over seaward exploration from MoEPD to NSA of MPD&SI. Taking up case for amendment will be easy as the existing rules already have the lacuna of promulgation under a repealed act.

b. During the establishment of the envisioned NSA, input from this institute should be regularly sought. Once the NSA is established, the institute's research services will continue to be available for the formulation of rules.

c. In addition to establishing the NSA, geological research on the prospects of polymetallic nodules, cobalt-rich crusts, and ferromanganese nodules in the deep seabed of the Indian Ocean should be initiated. Or the research already done in this direction by others be retrieved from those corners for careful technical evaluation by National Institute of Oceanography (NIO), the PN Hydrographic Department (using the survey vessel PNS Behr Masah), the

[41] Conclusions of chapter 8 of this report.
[42] Conclusions of Chapter 4 & 5 of this report.
[43] Conclusions of Chapter 6 & 7 of this report.
[44] Conclusions of Chapter 1, 2 & 3 of this report.

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5. Pakistan Maritime Zones Act, 2023

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3. Pakistan Offshore Petroleum (Exploration and Production) Rules, 2023

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