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# **NAVIGATING THE DEPTHS: AN EXPLORATION OF LEGAL FRAMEWORKS FOR DEEP SEA MINING CONSERVATION.**

AUTHORED BY - DR. N VANI SHREE<sup>1</sup> & MS. RAJESWARI H<sup>2</sup>

*“Deep Sea Mining could end up having the largest footprint of any single human activity on the planet in terms of area of impact” - Craig Smith*

## **ABSTRACT**

Deep-sea mining refers here to the excavation of 3 types of marine mineral deposits on the seafloor: polymetallic or manganese nodules, ferromanganese crusts, and seafloor massive sulfide deposits. These minerals comprise substances such as nickel, rare earths, cobalt, and other essential elements required for batteries, as well as other materials utilized in harnessing renewable energy. Moreover, these materials are also vital for everyday technology devices like cell phones and computers. They are the most crucial element required for the batteries that power the vehicles of the future. The extraction of these minerals is seen as a necessary step towards achieving a more sustainable future, as they are essential components in the production of renewable energy technologies such as solar panels and electric vehicle batteries. By reducing our reliance on fossil fuels, we can decrease greenhouse gas emissions and combat climate change. Despite the potential benefits of utilizing these minerals, the environmental impact of mining operations cannot be ignored. The disruption of marine ecosystems, destruction of habitats, and pollution of waterways are all serious concerns that must be addressed. Environmental advocates are calling for stricter regulations and more sustainable mining practices to minimize these negative effects. In order to enhance economic performance and ensure a self-sufficient metal supply, both public and private entities are once again delving into the possibilities of commercial deep-sea mining, a practice that was previously considered economically impractical for over two decades. Alongside financial analysis and environmental studies conducted by different public and private organizations, the International Seabed Authority (ISA) is now in the process of formulating guidelines and

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policies for the investigation and utilization of deep-sea mineral resources. This scholarly article delves into the legal framework governing mining the mighty ocean beds and the environmental concerns pertaining to it. This interdisciplinary study brings forth the scientific, technical, environmental, social, historical and legal implications of sea-bed mining.

**KEY WORDS:** Deep Sea mining, Minerals, Renewable source of energy, Legal Framework, Environmental Impact.

## Introduction

Deep seabed mining (DSM) is an important and emerging field within the Law of the Sea as countries and companies expand their excavation of minerals in the depths of our ocean. Deep sea mining is an industrial business practice that digs deep into the sea bed to extract polymetallic nodules, hydrothermal sulfides, and ferro-manganese crusts<sup>3</sup>. These minerals possess significant commercial potential as they serve as vital components in the production of batteries, smartphones, and modern electric vehicles. They represent a valuable source of renewable energy, the extraction of which could yield tremendous profits for our economy. Furthermore, this extraction would enable the development of more advanced technologies, facilitating the discovery of sustainable alternatives to fossil fuel combustion. However, it is important to acknowledge that mining and excavating deep sea beds have adverse effects on both marine and terrestrial ecosystems. These activities contribute to noise pollution and disrupt and contaminate our oceans. Consequently, we face a significant challenge in striking a balance between the lucrative business opportunities presented by extracting these metals, which are abundant in seabeds and necessary for meeting current demands, and the environmental consequences associated with mining. The presence of numerous deposits in the global waters, ranging from valuable minerals to hydrocarbons, has sparked significant interest and potential for exploitation. However, the complex issues associated with these deposits, such as environmental concerns, potential conflicts over resources, and the need for equitable distribution of benefits, have made it crucial to establish a regulatory framework. To address these challenges, the United Nations Convention on the Law of the Sea (UNCLOS) was adopted in 1982<sup>4</sup>. UNCLOS is an international treaty that sets out the legal framework for the

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<sup>3</sup> Beaudoin, Yannick; Baker, Elaine. Deep Sea Minerals: Manganese Nodules, a physical, bio-logical, environmental, and technical review Vol. 1B, Secretariat of the Pacific Community p8 [https://www.researchgate.net/publication/260596851\\_Deep\\_Sea\\_Minerals\\_Manganese\\_Nodules\\_a\\_physical\\_biological\\_environmental\\_and\\_technical\\_review](https://www.researchgate.net/publication/260596851_Deep_Sea_Minerals_Manganese_Nodules_a_physical_biological_environmental_and_technical_review) (2013)

<sup>4</sup> United Nations Convention on the Law of the Sea Montego Bay, 10 December 1982

use and conservation of the world's oceans and their resources. It establishes the rights and responsibilities of nations in their use of the seas and oceans, including the regulation of seabed mining activities. Under UNCLOS, the International Seabed Authority (ISA)<sup>5</sup> was established as an autonomous international organization. The ISA is responsible for the regulation and control of all mineral-related activities in the international seabed area, which encompasses the seabed and ocean floor beyond national jurisdiction. The ISA grants nations the rights to explore and exploit mineral resources in the international seabed area. However, these rights are subject to certain conditions and regulations aimed at ensuring the sustainable and responsible exploitation of these resources. The ISA issues licenses and contracts to qualified entities, including both states and private companies, for seabed mining activities. The regulations enforced by the ISA cover various aspects of seabed mining, including environmental impact assessments, technology transfer, financial obligations, and the equitable sharing of benefits. These regulations aim to minimize the potential negative impacts of seabed mining on the marine environment and ensure that the benefits derived from these activities are shared fairly among all nations. The environmental effects are anticipated to be extensive and irreversible, with additional significant issues including fairness, responsibility, openness, and accountability. Coastal states possess sovereign rights to investigate and utilize seabed mineral resources; however, these rights are not absolute. States are required to adhere to their domestic policies, national regulations, and fulfill obligations under international law and regional agreements. This scholarly article studies the environmental effects of deep sea mining and legal implications on mining in the depths of the sea.

## EXPLORING THE MEANING OF DEEP SEA MINING

Extracting solid mineral resources from the seabed at depths exceeding 200 meters characterizes deep-sea mining. Extensive regions of the uncharted abyss, notably in the Pacific Ocean, contain polymetallic nodules abundant in manganese, nickel, copper, cobalt, and various other trace minerals.<sup>6</sup> According to the International Union For Conservation of Nature (IUCN) Deep-sea mining is the process of retrieving mineral deposits from the ocean below 200 meters the deep seabed, which covers around two-thirds of the total seafloor. Submersible crafts equipped with giant suction pipes creep across the seabed in rows, stirring up metallic

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<https://legal.un.org/avl/ha/uncls/uncls.html>

<sup>5</sup> The International Seabed Authority (ISA) <https://www.isa.org.jm/about-isa/>

<sup>6</sup> [Karen McVeigh](https://www.theguardian.com/environment/2024/jan/09/deep-sea-mining-why-is-interest-growing-and-what-are-the-risks) “Deep-sea mining: why is interest growing and what are the risks?” <https://www.theguardian.com/environment/2024/jan/09/deep-sea-mining-why-is-interest-growing-and-what-are-the-risks>

objects the size of potatoes. The oceanic bed harbors extensive reserves of essential minerals that are crucial for various purposes, including the production of aircraft components and rechargeable batteries. The growing need for these minerals has spurred advancements in technology for the exploration and extraction of resources through deep-sea mining. Nevertheless, the long-term ecological impacts resulting from deep-sea mining remain uncertain. Deep-sea mining is the process of exploring for and retrieving minerals from the deep seabed. Three types of deposits hold most of these minerals: polymetallic nodules, also called manganese nodules, which are lying on the seabed; sulfide deposits around hydrothermal vents; and ferromanganese crusts, which are rich in cobalt and manganese and line the sides of ridges and seamounts. These sources hold a wide variety of critical minerals, including cobalt, manganese, titanium, and rare earth elements, as well as gold, copper, and nickel<sup>7</sup>. The discovery of deep sea mining has sparked interest and investment from countries and companies around the world, as the demand for these minerals continues to grow. However, there are concerns about the potential environmental impact of deep sea mining, as it can disrupt fragile ecosystems and habitats on the ocean floor. In recent years, there have been calls for more research and regulation to ensure that deep sea mining is conducted in a sustainable and responsible manner. This includes developing technologies to minimize the environmental impact, as well as establishing guidelines for protecting marine life and ecosystems. Overall, the process of deep sea mining has the potential to provide valuable resources for industries and economies, but it also raises important questions about how to balance economic development with environmental conservation in the deep sea.

## HISTORICAL BACKGROUND OF DEEP SEA MINING

The process of deep sea mining was discovered and became widely recognized during the 19th century. Numerous excavations have been carried out since then to investigate the minerals present in the ocean, aiming to support the sustainable development of life on Earth. The exploration and exploitation of mineral resources from the seabed — generally referred to as seabed mining — has been theoretically known since HMS Challenger's discovery of polymetallic nodules on the ocean floor in 1876<sup>8</sup>. when the expedition leader C.W. Thomson described the dredge haul of polymetallic nodules on 7 March 1873 as 'peculiar black oval

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<sup>7</sup> Karen L. Howard, science & tech spotlight: deep-sea mining, GAO-22-105507(2021) <https://www.gao.gov/products/gao-22-105507> (accessed on 4<sup>th</sup> April 2024)

<sup>8</sup> John Murray and Alphonse François Renard, "Report on Deep-Sea Deposits Based on the Specimens Collected During the Voyage of HMS Challenger in the Years 1872 to 1876", Her Majesty's Stationery Office, 04 November 1891 [https://epic.awi.de/id/eprint/38636/2/challenger-report\\_1891.pdf](https://epic.awi.de/id/eprint/38636/2/challenger-report_1891.pdf)

bodies about 1 inch long' and the chemist J.Y. Buchanan revealed that they were 'almost pure manganese oxide', it was Mero (1965)<sup>9</sup> who unraveled the economic potential of these deposits and predicted that deep-sea mining would commence in 20 years time that steered the world's attention towards developing these resources as an alternative source of metals for the future. A global effort during the conference on 'Ferro-manganese deposits on the ocean floor' at Lamont Doherty Geological Observatory in January 1972 to collate existing data on nodules was followed by studies dealing with distribution, geochemistry, and mineralogy of the deposits in different parts of the Pacific Ocean. Simultaneously, hydrothermal sulfides and cobalt-rich ferromanganese crusts were also identified as potential resources in the International waters.<sup>10</sup> Deep Seabed Mining, also known as DSM, was brought up for discussion during the sessions of the United Nations General Assembly. Negotiations for a legal framework regarding DSM commenced in 1967 under the guidance of the UN. The result of these extensive negotiations was Part XI of the 1982 United Nations Convention on the Law of the Sea.<sup>11</sup> The International Seabed Authority ('ISA') was established upon Pt XI's entry into force in 1994, and came into operation in 1996<sup>12</sup>. The ISA is empowered under the Convention to 'organize and control activities in the Area, particularly with a view to administering the resources of the Area. The International Seabed Authority (ISA) is currently working on establishing guidelines for the exploration and exploitation of deep-sea mineral deposits. The International Seabed Authority (ISA), established pursuant to the United Nations Convention on the Law of the Sea, is tasked with regulating deep-sea mining activities in areas of the ocean that are not under any country's jurisdiction, which involves formulating rules, regulations, and procedures related to deep-sea mining. After conducting initial studies, extensive exploration programs were carried out, resulting in multiple organizations claiming large areas of the seafloor that held potential resources in international waters. These claims were made in order to obtain exclusive rights under the United Nations Convention on Law of the Sea. As a result, the International Seabed Authority was established in 1994 with its headquarters in Jamaica. This authority was tasked with regulating activities in the 'Area', which refers to the international waters beyond the jurisdiction of any specific country.

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<sup>9</sup> John Mero, "Mineral Resources of the Sea", Elsevier Oceanography Series, 1, (1965). <https://www.sciencedirect.com/bookseries/elsevier-oceanography-series/vol/1>

<sup>10</sup> Rahul Sharma, Deep-Sea Mining Resource Potential, Technical and Environmental Considerations, p3, Springer International Publishing AG (2017) ISBN 978-3-319-52556-3

<sup>11</sup> United Nations Convention on the Law of the Sea, opened for signature 10 December 1982, 1833 UNTS 396 (entered into force 16 November 1994) pt XI ('Convention').

<sup>12</sup> International Seabed Authority ('ISA'), Deep Seabed Mineral Resources (2017) <<https://www.isa.org.jm/mineral-resources/55>> archived at <<https://perma.cc/WR8Y-DQV4>>

Initially, there were eight Registered Pioneer Investors, also known as 'Contractors', who were granted rights for polymetallic nodules only. These contractors included France, Russia, Japan, China, Korea, Germany, Inter Ocean Metal Joint Organization (a consortium of East European countries) in the Pacific Ocean, and India in the Indian Ocean. However, a significant increase in applications occurred after 2010, leading to a total of 25 contractors by 2015. These applications were for the extraction of nodules, crusts, and sulfides from the seafloor. ISA has entered into 26 contracts for exploration in the Area. These contracts involve 16 contractors who can be categorized into three groups: states, publicly funded companies or institutions, and private companies. It is worth noting that private companies did not participate in exploration activities in the Area until 2011. The first private company to collaborate with ISA was Nauru Ocean Resources Inc, which was sponsored by Nauru. Subsequently, four more private companies joined in. Currently, all five private companies are actively engaged in the exploration of polymetallic nodules in the Area. The inclusion of private companies has brought about a more diverse range of contractors. Moreover, private investment has played a significant role in driving DSM towards the exploitation stage.<sup>13</sup> The report provides an overview of the progress made by ISA since July 2022 to implement its unique and multifaceted mandate to manage marine mineral resources sustainably, on the basis of equality between States and for the benefit of all humanity.

## **MINERALS FOUND IN THE DEEP-SEA OCEAN**

There are majorly three types of minerals found in the ocean bed, Polymetallic or manganese nodules, Ferromanganese crusts, Seafloor massive sulfide deposits.

### **Polymetallic or manganese nodules:**

Manganese nodules are very slow-growing potato-shaped mineral concretions, which form through the precipitation of metals from sediment porewater (diagenetic formation) and seawater (hydrogenetic formation) or a combination thereof. Manganese nodules mainly consist of intergrown concentric layers of Manganese and Iron oxides and contain substantial quantities of Copper, Cobalt, Nickel, Molybdenum, Platinum, Tellurium, and Zinc, as well as many Rare Earth Elements<sup>14</sup>. Manganese nodules are found in sediment-covered abyssal plains

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<sup>13</sup> Assembly, Report of the Secretary-General of the International Seabed Authority under Article 166, Paragraph 4, of the United Nations Convention on the Law of the Sea, 22<sup>nd</sup> sess, ISBA/22A/2 (11–22 July 2016) [46]; Council, Status of Contracts for Exploration and Related Matters: Report of the Secretary-General, 23<sup>rd</sup> sess, Provisional Agenda Item 7, ISBA/23/C/7 (5 June 2017)

<sup>14</sup> Koschinsky, A., Heinrich, L., Boehnke, K., Cohrs, J.C., Markus, T., Shani, M., Singh, P., Smith Stegen, K. and

at depths ranging from 3000 to 6000 m. They are most commonly found in the Clarion-Clipperton Fracture Zone (CCZ), the Peru Basin, the Penrhyn-Samoa Basin, and the Central Indian Ocean Basin. Legally, these nodules are primarily situated in "the Area," a maritime zone outlined in the United Nations Convention on the Law of the Sea (UNCLOS 1982), which refers to the seabed, ocean floor, and subsoil beyond national jurisdiction areas<sup>15</sup>.

### **Ferromanganese crusts**

Ferromanganese crusts are layers that grow at a very slow rate, ranging in thickness from 1 to 26 cm. These layers are composed of manganese and iron oxides, along with notable amounts of copper, cobalt, nickel, molybdenum, tellurium, rare earth elements, tungsten, titanium, thorium, zirconium, niobium, and small traces of various other metals, such as platinum found within the oxide mineral structures<sup>16</sup>. Ferromanganese crusts are created when metals precipitate from cold seawater onto the sediment-free slopes of seamounts. The highest quality crusts, rich in valuable metals, are predominantly found at depths ranging from 800 to 2500 meters. These areas are mostly situated beyond the jurisdiction of any specific nation. Ferromanganese crusts are considerably more difficult to mine than Polymetallic or manganese nodules, given that they are firmly attached to the rock substrate of slopes of seamounts<sup>17</sup>. They occur not only in 'the Area' but also in territorial or archipelagic waters, exclusive economic zones (EEZ), or extended continental shelf areas over which the adjacent coastal states have either absolute sovereignty or exclusive rights over living and nonliving resources<sup>18</sup>.

### **Seafloor massive sulfide**

Seafloor massive sulfide deposits are made up of metal-S compounds that give rise to substantial structures on and below the seafloor at depths between 250 and 4000 m. These deposits are located in geologically active areas near plate boundaries, which are characterized by an abundance of hydrothermal vent systems, or at shallower depths near volcanic chains and island arcs<sup>19</sup>. SMS deposits are present in both the Area (especially along midocean ridges)

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Werner, W., 2018. Deepsea mining: Interdisciplinary research on potential environmental, legal, economic, and societal implications. *Integrated environmental assessment and management*, 14(6), pp.672-691.

<sup>15</sup> Hein JR, Spinardi F, Okamoto N, Mizell K, Thorburn D, Tawake A. 2015. Critical metals in manganese nodules from the Cook Islands EEZ, abundances and distributions. *Ore Geol Rev* 68:97–116.

<sup>16</sup> Halbach P, Manheim FT, Otten P. 1982. Co-rich ferromanganese deposits in the marginal seamount regions of the Central Pacific Basin # results of the Midpac'81. *Erzmetall* 35:447–453.

<sup>17</sup> Hein JR, Mizell K, Koschinsky A, Conrad TA. 2013. Deep-ocean mineral deposits as a source of critical metals for high- and green-technology applications: Comparison with land-based resources. *Ore Geol Rev* 51:1–14.

<sup>18</sup> [UN] United Nations. 1982. Convention on the Law of the Sea (UNCLOS). Montego Bay (JM).

<sup>19</sup> Francheteau J, Needham HD, Choukroune P, Juteau T, Seguret M, Ballard RD, Fox PJ, Normark W, Carranza A, Cordoba D, et al. 1979. Massive deep-sea sulphide ore deposits discovered on the East Pacific Rise?

and the EEZ of island or coastal states. Seafloor massive sulfide deposits are created by the metal precipitation caused by the mixing of cold seawater with extremely hot hydrothermal fluids abundant in metals and sulfur<sup>20</sup>. SMS deposits encompass significant amounts of Fe, Cu, Zn, Ag, and Au metals, alongside minor quantities of REEs. Unlike Mn nodules and FeMn crusts, SMS deposits exhibit rapid growth and form intricate 3-dimensional structures that extend irregularly into the ocean floor. This characteristic poses challenges in accurately evaluating their resource potential and extracting them, making SMS deposits considerably more complex. However, due to their potential, SMS deposits might be the initial deep-sea deposits to be commercially exploited<sup>21</sup>.

## ENVIRONMENTAL IMPACT OF DEEP SEA MINING

The ocean floor comprises valuable minerals that hold significant commercial worth, contributing to the economy by offering sustainable solutions for human existence on Earth. However, these practices pose a threat to the ocean ecosystem and can result in irreversible damage. The ocean depths house numerous pristine ecosystems that are vital for regulating the Earth's climate. Exploiting this intricate and unique region would result in irreversible damage to ecosystems and habitats, while also eliminating a valuable source of carbon storage. Numerous civil society groups, as well as manufacturers and private organizations, have expressed their concerns regarding deep-sea mineral extraction due to the significant scientific uncertainty and the potential for severe environmental consequences.

These are main severe issues raised by International union for conservation of Nature (IUCN)  
Disturbance of the seafloor

The excavation and measurement of the ocean floor using machinery have the potential to change or devastate deep-sea habitats. This results in the extinction of species, some of which are exclusive to these areas, as well as the disruption or disappearance of ecosystem organization and operation. This represents the primary consequence of deep-sea mining, with the resulting harm likely to be irreversible.

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Nature277:523–528

<sup>20</sup> Hannington MD, De Ronde CEJ, Petersen S. 2005. Sea-floor tectonics and submarine hydrothermal systems. *Econ Geol* 111–141.

<sup>21</sup> Monecke T, Petersen S, Hannington MD. 2014. Constraints on water depth of massive sulfide formation: Evidence from modern seafloor hydrothermal systems in arc-related settings. *Econ Geol* 109:2079–2101

### Sediment plumes

Deep-sea mining operations have the potential to disturb the delicate sediments on the seafloor, resulting in the formation of suspended particle plumes. This issue is further aggravated by the discharge of wastewater from mining vessels at the ocean surface. The scientific community is deeply concerned about the dispersion of these particles over vast distances, as they may take a considerable amount of time to settle back onto the seafloor. This could have detrimental effects on both the marine ecosystems and commercially valuable or vulnerable species. For example, these plumes have the potential to suffocate marine animals, cause harm to filter-feeding species, and impede visual communication among various marine organisms.

### Pollution

Marine creatures like whales, tuna, and sharks may face negative impacts from noise, vibrations, and light pollution stemming from mining activities and surface vessels, in addition to the risks posed by fuel leaks and toxic spills

The report highlights the numerous environmental consequences associated with nodule mining. Polymetallic nodules, which require millions of years to develop, serve as a crucial habitat for a variety of unique and largely unexplored species such as deep-sea corals, sponges, sea urchins, starfish, jellyfish, squid, octopus, shrimp, and sea cucumbers. Given the slow growth rate of deep-sea habitats and species, the report indicates that a complete recovery post-mining may span thousands, if not millions, of years — assuming recovery is even feasible<sup>22</sup>.

Furthermore, the report warns that sediment plumes and waste discharge resulting from mining activities could disrupt phytoplankton blooms at the ocean's surface and introduce harmful metals into marine food chains. This mining waste has the potential to spread throughout the ocean, causing harm to nearby seamounts and coral reef systems that serve as vital habitats for numerous fish and marine mammal species, thereby jeopardizing entire fisheries. Additionally, the report raises concerns about the impacts of light pollution, which could disturb a wide range of species adapted to dark environments, as well as noise pollution that could alter the swimming and schooling behavior of tuna, and lead to dolphins and whales becoming stranded<sup>23</sup>.

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<sup>22</sup> Chin, A., & Hari, K. (2020). *Predicting the impacts of mining of deep sea polymetallic nodules in the Pacific Ocean: A review of scientific literature*. Deep Sea Mining Campaign and MiningWatch Canada.

<sup>23</sup> Elizabeth Claire Alberts, "Deep-sea mining: An environmental solution or impending catastrophe?" Mongabay Series <https://news.mongabay.com/2020/06/deep-sea-mining-an-environmental-solution-or-impending-catastrophe/> (Accessed on 6<sup>th</sup> April 2024)

### Environmental initiatives

IUCN Members adopted Resolution 122 to protect deep-ocean ecosystems and biodiversity through a moratorium on deep-sea mining unless and until a number of conditions are met.

These include:

- The risks of mining are comprehensively understood and effective protection can be ensured;
- Rigorous and transparent impact assessments are conducted based on comprehensive baseline studies;
- The Precautionary Principle and the ‘Polluter Pays Principle’ are implemented;
- Policies incorporating circular economic principles to reuse and recycle minerals have been developed and implemented;
- The public are consulted throughout decision-making;
- The governance of deep-sea mining is transparent, accountable, inclusive, effective and environmentally responsible.

The reduction of reliance on mining metals can be achieved through the process of redesigning, reusing, and recycling. Furthermore, it is crucial for research efforts to prioritize the development of sustainable alternatives to metal usage. This is particularly important due to the potential irreversible damage that deep-sea mining can cause to marine ecosystems, which in turn would restrict the numerous advantages that the deep sea offers to humanity. The evolution of environmental impact assessment and environmental conservation measures, especially concerning the deep sea, is ongoing, and we anticipate modifications to the system and structure as we progress. Therefore, it is crucial to align ourselves with global trends and possess the adaptability to operate under any circumstances, regardless of national jurisdiction.

## **LEGAL IMPLICATIONS ON DEEP SEA MINING**

Nations are responsible for overseeing their maritime territory and exclusive economic zones, whereas the United Nations Convention on the Law of the Seas (UNCLOS) governs the high seas and the international ocean floor. The United Nations Convention on the Law of the Sea was adopted in 1982. It lays down a comprehensive regime of law and order in the world's oceans and seas establishing rules governing all uses of the oceans and their resources. It embodies in one instrument traditional rules for the uses of the oceans and at the same time introduces new legal concepts and regimes and addresses new concerns. The Convention also

provides the framework for further development of specific areas of the law of the sea<sup>24</sup>. The coastal State has the authority to explore and exploit its natural resources, including non-living resources in the seabed and subsoil, as part of its sovereign rights.<sup>25</sup> These rights do not depend on occupation or explicit declaration. Under the treaty, the seabed and its mineral resources are considered the “common heritage of mankind” that must be managed in a way that protects the interests of humanity through the sharing of economic benefits, support for marine scientific research, and protecting marine environments<sup>26</sup>. The Area's resources, which encompass solid, liquid, or gaseous mineral resources located at or below the seabed, including polymetallic nodules<sup>27</sup>, are considered the shared heritage of humanity. Any attempt to assert sovereignty or sovereign rights over the Area or its resources is explicitly forbidden<sup>28</sup>. The Area can be defined as the area beyond the national jurisdiction and any such excavation in those areas are under regulations of the authority established by UNCLOS<sup>29</sup>.

#### International Seabed Authority<sup>30</sup>

The Area. In accordance with the concept of shared heritage of humanity, UNCLOS establishes the ISA as a means for the State parties to coordinate and oversee the operations within the Area, specifically focusing on the management of its resources (Article 156, 157 UNCLOS). Consequently, the ISA functions as the collective framework for governing seabed mining activities in the Area. The ISA is responsible for issuing exploration and exploitation licenses for mineral resources in the international seabed beyond national jurisdiction. It aims to ensure that these activities are conducted in an environmentally sustainable manner and that the benefits derived from seabed mining are shared equitably among all member states, particularly developing countries. The ISA also promotes scientific research and cooperation in the exploration and study of the seabed, including its biodiversity and geology. It works to develop regulations and guidelines for the protection of the marine environment and the conservation of marine resources in the international seabed. In addition to its regulatory functions, the ISA plays a key role in capacity-building and technology transfer to help developing countries participate in seabed mining activities. It also facilitates the transfer of financial and

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<sup>24</sup> United Nations Convention on the Law of the Sea, <https://www.imo.org/en/ourwork/legal/pages/unitednationsconventiononthelawofthesea.aspx> (Accessed on 4<sup>th</sup> April 2024)

<sup>25</sup> (ART 77) UNCLOS

<sup>26</sup> (ART136) UNCLOS

<sup>27</sup>(ART 133a) UNCLOS

<sup>28</sup> (ART 137 ) UNCLOS

<sup>29</sup> Ibid

<sup>30</sup> SUPRA 12

technological benefits from seabed mining to developing countries through the establishment of a system of payments and royalties. Overall, the International Seabed Authority plays a crucial role in ensuring the sustainable and responsible management of mineral resources in the international seabed for the benefit of all humankind.

#### *Article 156*

##### *Establishment of the Authority*

- 1. There is hereby established the International Seabed Authority, which shall function in accordance with this Part.*
- 2. All States Parties are ipso facto members of the Authority.*
- 3. Observers at the Third United Nations Conference on the Law of the Sea who have signed the Final Act and who are not referred to in article 305, paragraph 1(c), (d), (e) or (f), shall have the right to participate in the Authority as observers, in accordance with its rules, regulations and procedures.*
- 4. The seat of the Authority shall be in Jamaica.*
- 5. The Authority may establish such regional centres or offices as it deems necessary for the exercise of its functions.*

In 2021, the Pacific island nation of Nauru, in collaboration with mining company Nauru Ocean Resources Inc, a wholly-owned subsidiary of The Metals Company based in Canada, submitted an application to the ISA to extract minerals from a designated deep sea area. This action activated a provision of the UN treaty mandating the ISA to establish regulations overseeing deep sea mining by July 2023. Should the regulations not be finalized by then, Nauru would have the option to proceed with mining activities without any governing framework in place. In the event that the UN body fails to approve a comprehensive set of rules and regulations, other countries and private entities may begin applying for provisional licenses<sup>31</sup>. The Government of India's application to the International Seabed Authority (ISA) on 18 January 2024, seeking approval for its plans-of-work for the exploration of polymetallic sulfides in the Carlsberg Ridge, and for cobalt-rich ferromanganese crusts at the Afanasy-Nikitin Seamount in the Central Indian Ocean, demonstrates increasing interest in India for minerals from the seabed<sup>32</sup>. India has been an active participant in the exploration of seabed resources. The

<sup>31</sup> Deep sea mining permits may be coming soon. What are they and what might happen? Times New India ( July 4 2023)<https://indianexpress.com/article/explained/explained-sci-tech/what-deep-sea-mining-permits-implications-8698411/> ( Accessed on 5<sup>th</sup> April 2024)

<sup>32</sup> International Seabed Authority, "The Government of India submits two applications for approval of plans of

National Institute of Oceanography's research vessel (RV), the *RV Gaveshani*, collected polymetallic nodules from the Indian Ocean in 1981<sup>33</sup>

## CONCLUSION

Deep-sea mining refers to the extraction of valuable minerals and resources from the ocean floor, which has gained attention in recent times due to the increasing demand for these resources and the depletion of terrestrial reserves. However, the potential impacts of deep-sea mining on the environment, economy, coastal communities, and society as a whole are still largely unknown and require careful examination. From an economic perspective, deep-sea mining holds the promise of unlocking vast reserves of valuable minerals such as copper, nickel, cobalt, and rare earth elements. These minerals are essential for various industries, including electronics, renewable energy, and electric vehicles. The potential economic benefits of deep-sea mining include job creation, revenue generation, and reduced dependence on terrestrial resources. However, the economic viability of deep-sea mining is still uncertain, as it involves significant upfront costs, technological challenges, and uncertain market conditions. The environmental impacts of deep-sea mining are a major concern. The ocean floor is a unique and fragile ecosystem, hosting diverse and poorly understood species. Mining activities can cause physical disturbances, such as the removal of sediment and the creation of plumes, which can smother and disrupt marine life. Additionally, the release of toxic chemicals and heavy metals during the mining process can have long-lasting and detrimental effects on marine ecosystems. The potential loss of biodiversity and the disruption of deep-sea habitats are significant environmental risks that need to be carefully assessed. The social implications of deep-sea mining are also complex. Coastal communities that rely on fishing and tourism may be directly affected by the disturbance of marine ecosystems and the potential loss of livelihoods. Indigenous communities, who have deep cultural and spiritual connections to the ocean, may face the loss of traditional practices and knowledge. Furthermore, the distribution of benefits and potential conflicts over resource ownership and access need to be addressed to ensure social equity and justice. Legal and regulatory frameworks for deep-sea mining are still in the early stages of development. The International Seabed Authority (ISA) is responsible for

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work for seabed exploration in the Indian Ocean”, ISA Press Release, 18 January 2024. <https://www.isa.org.jm/news/the-government-of-india-submits-two-applications-for-approval-of-plans-of-work-for-seabed-exploration-in-the-indian-ocean/>.

<sup>33</sup> Dr S Rajan, “Polymetallic Nodules Resource Classification: Proceedings of the International Seabed Authority and Ministry Of Earth Science, Government Of India Workshop Held In Goa, India 13-17 October 2014”, *International Seabed Authority*, 1 (2017) [https://www.isa.org.jm/wp-content/uploads/2022/06/goa-20aug2018\\_0.pdf](https://www.isa.org.jm/wp-content/uploads/2022/06/goa-20aug2018_0.pdf)

regulating deep-sea mining activities in international waters, but there are ongoing debates and discussions regarding the adequacy of existing regulations. Issues such as liability for environmental damage, the protection of vulnerable marine ecosystems, and the equitable sharing of benefits need to be addressed through international cooperation and collaboration. Technically, deep-sea mining poses significant challenges. The extraction of minerals from the ocean floor requires advanced technologies and engineering solutions that can operate at extreme depths and withstand harsh conditions. The development of these technologies and the associated infrastructure require substantial investments in research and development. With the increasing global demand for metals in the world market and with deep-sea mining still being an activity of the future, such an interdisciplinary approach would help pave the way for finding necessary solutions to any issues or concerns toward deep-sea mining through proper consultations and would help ensure that future actions consider sustainable development in the sense of the Common Heritage of Mankind.

