SEABED MINING AND INTERNATIONAL LEGAL OVERSIGHT UNDER UNCLOS

Komal Aggarwal, Assistant Professor, GS Foundation College of Law, Ludhiana

Shivam Aggarwal, Assistant Professor, GS Foundation College of Law, Ludhiana

ABSTRACT

Under the United Nations Convention on the Law of the Sea (UNCLOS), the seas are divided into distinct maritime zones with the deep seabed area designated as the common heritage of mankind. Owing to rapid technological advancements, deep seabed exploration and mining-once theoretical-have now become a practical reality, attracting global attention due to the immense economic potential of seabed mineral resources. At the same time, these activities pose serious environmental risks to fragile and largely unexplored marine ecosystems, increasing the likelihood of international disputes.

This paper examines the legal regime governing deep seabed exploration and mining, with emphasis on international dispute settlement mechanisms. It begins by outlining the extent, economic significance and environmental importance of the seabed area, highlighting the need for its protection. The paper then analyses the existing legal framework under UNCLOS related to deep-seabed exploration and mining. It provides a detailed discussion of the International Seabed Authority, focusing on its structure, functions, regulatory role and development of the mining Code. Additionally, special attention has been given to the Seabed Disputes Chamber of the International Tribunal of the Law of the Sea (ITLOS). The paper also examines the landmark 2011 Advisory Opinion of the ISA. The paper concludes by underscoring the need for strong environmental safeguards and effective dispute resolution to ensure the sustainable and equitable exploitation of deep seabed resources.

Keywords: Seabed Mining**,** UNCLOS**,** International Seabed Authority (ISA)**,** Dispute Resolution**,** Environmental Protection

1) OVERVIEW OF SEABED AREA

Meaning of Seabed Area

Under the United Nations Convention on the Law of the Sea 1982 (UNCLOS), the sea has been divided into various maritime zones and in each zone, there are different rules, regulations and rights. These rules, regulations and rights depend on how far a particular zone is from the coastline.

The territorial sea extends to 12 nautical miles from the coastline. It includes: the air space, the water body to the seabed and the subsoil. After this, there is an Exclusive Economic Zone (EEZ), and over this zone, the coastal states have exclusive rights and jurisdiction related to mineral extraction, fishing, etc. Certain states even have an extended Continental Shelf beyond the EEZ over which they have sovereign rights. The area beyond this does not fall under the jurisdiction of any state and is termed the Seabed Area, and the water column above it is termed as the high sea.[1]

Sea bed area covers around 65% of the surface of Earth and refers to the area of the ocean that exists at a depth of 200 meters or below.[2] Even though many planets and their moons have been mapped with precision till now, the seabed area has neither been mapped properly nor has been explored properly.[3] Estimates reveal that humans have been able to explore only 10% of the sea till now.[4]

Economic Significance of Seabed Area

The deep ocean forms the largest biome on the Earth and holds exorbitant quantities of untapped energy resources, precious metals and minerals.[5] Seabed areas are rich in various minerals such as Manganese, Copper, Lead, Barium, Gold, Platinum, Zinc, etc. Manganese nodules, which are potato-like in shape and around 4-10 cm in diameter, are formed as a

[1] An Overview of Seabed Mining Including the Current State of Development, Environmental Impacts, and Knowledge Gaps, *available at*: https://www.frontiersin.org/articles/10.3389/fmars.2017.00418/full (Last visited on January 9th 2026).
[2] Deep Sea Mining, *available at:* https://www.iucn.org/resources/issues-briefs/deep-sea-mining (Last visited on January 9th 2026).
[3] Mark John Costello, "Surface Area and the Seabed Area, Volume, Depth, Slope, and Topographic Variation for the World's Seas, Oceans, and Countries" *Environment Science Technology* (2010).
[4] Ibid.
[5] Supra note 1.

result of processes which take millions of years. These nodules are rich in manganese, nickel, cobalt, molybdenum and various other rare mineral resources.[6]

There are many active and inactive hydrothermal vents along the oceanic ridges and these vents are rich in sulfide, copper, gold, zinc, barium, silver, etc. The seabed area also consists of around 33,400 seamounts which rise to 1000 meters or more from the seafloor and many knolls, which rise from 500 meters to 1000 meters. The seamounts are rich in cobalt, copper, nickel and platinum.[7]

Solid crystalline structures known as gas hydrates containing methane, ethane, propane, butane and methyl hydrate, etc., also exist in this area.[8]

These mineral resources are worth trillions of dollars. Reports reveal that the deep-sea mining industry can contribute up to $ 1 trillion every year to the US economy. The gold deposits on the seafloor are estimated to be worth $150 trillion.[9] The value of all metals extracted from the seabed globally is estimated to be worth $2 trillion per year.[10]

The seabed area is thus rich in mineral resources and can go a long way in quenching the never-ending thirst of mankind to get more and more resources. These resources have high economic significance and can fuel the global economy for many years.

2) PROTECTION AND PRESERVATION OF SEABED AREA

The seabed area has a lot of economic significance, but a green flag to seabed mining can cause irreparable damage to the still unexplored and unknown world inside the sea.

Process of Seabed Mining

Mineral extraction through seabed mining usually involves three processes: firstly, mineral crusts are separated from the sea floor, secondly, crusts are crushed and ground to dislodge attached deposits. At last, the disaggregated material or slurry is lifted in a pumping

[6] Ibid.
[7] Ibid.
[8] Ibid.
[9] Deep-sea mining could provide access to a wealth of valuable minerals, *available at:* https://www.theneweconomy.com/energy/deep-sea-mining-could-provide-access-to-a-wealth-of-valuable-minerals (Last visited on January 9th 2022).
[10] Deep Sea Mining, *available at:* https://www.sciencedirect.com/topics/engineering/deep-sea-mining (Last visited on January 9th 2022).

mechanism through the water column to a processing vessel. Excess water from this slurry is removed and is returned to the ocean.[11]

Impacts of Seabed Mining

The impacts of seabed mining are associated with the presence of marine vessels at the surface and include the introduction of noise and air pollution generated by ships, discharges from vessels and equipment, vibrations, etc. Light is also introduced into the otherwise light-deprived seafloor environments. This light might attract or deter some fish species and may also alter their feeding and reproduction behaviours.[12]

Dewatering of slurry in the water column can lead to a clouding effect and reduce oxygen levels. The water discharged after removal of the slurry has a high temperature, salinity and toxic chemicals. If this contaminated water is ingested by organisms, then it might lead to bioaccumulation in the food chain.[13]

Hydrothermal vents have many endemic organisms, such as barnacles, snails, mussels, tubeworms, etc. These organisms are localized and even small-scale mining has the potential to wipe them out. Many filter feeders, such as corals and sponges, require clean currents for nutrients. Mining disturbs sediments on the seafloor, and the presence of particulate matter results in the alteration of the food supply. Seabed mining causes irreversible damage to the organisms on the sea floor and those living on the surface below the mined area. Disposal of waste and deep-sea pollution also adds to the other environmental concerns related to deep-sea bed mining.[14]

Beyond immediate mining impacts, attention must also be paid to the ecosystem connectivity and cumulative effects. Deep-sea ecosystems are interconnected, and disturbances in one area can affect nutrient cycles, migration patterns, and food webs far beyond the mining site. Long-term impacts may include shifts in species composition and changes in microbial communities that play a crucial role in ocean chemistry. Additionally,

[11] Wealth in the Oceans: Deep sea mining on the horizon?, *available at:* https://na.unep.net/geas/getuneppagewitharticleidscript.php?article_id=112 (Last visited on Janaury 9th 2022).
[12] Ibid.
[13] Ibid.
[14] Ibid.

the potential for invasive species to spread via mining equipment or waste plumes is a also a growing concern.

3) EXISTING LEGAL FRAMEWORK RELATED TO SEABED AREA

Part XI of the UNCLOS 1982 deals with the seabed area.[15] Provisions related to seabed mining and exploration are given in ***Articles 136, 137 and 145*** of the UNCLOS 1982.

Article 136 lays down the principle of the common heritage of mankind regarding the deep-sea bed exploration and mining.[16]

This article states that the seabed area and its resources are a part of the common heritage of mankind. This principle also extends to environmental conservation and preservation. As interest in commercial seabed mining is escalating, the need to refine regulations related to exploitation also arises. Setting conservation targets can provide effective environmental protection.[17]

Article 137 lays down the legal status of the seabed area. This article states that rights in the resources of the seabed area are vested in all mankind, and the International Seabed Authority shall work on its behalf. The resources recovered from this area may be alienated only under Part XI.[18]

Article 145 deals with the protection of the marine environment. This article states that the steps must be taken to protect the marine environment from the harmful effects of activities such as drilling, dredging, disposal of waste, construction, maintenance or installation of pipelines and other activities. Additionally, steps must also be taken to protect the marine environment, mainly flora and fauna, from any sort of damage.[19]

The regulations for conservation are limited not only to the protection of the seabed area but also to the protection of the coastline. A lot of discussions are underway for defining the

[15] Part XI, The United Nations Convention on the Law of the Sea 1982.
[16] Article 136, The United Nations Convention on the Law of the Sea 1982.
[17] An Overview of Seabed Mining Including the Current State of Development, Environmental Impacts, and Knowledge Gaps, *available at*: https://www.frontiersin.org/articles/10.3389/fmars.2017.00418/full (Last visited on January 9th 2026).
[18] Article 137, The United Nations Convention on the Law of the Sea 1982.
[19] Article 145, The United Nations Convention on the Law of the Sea 1982.

threshold of harmful effects and also what might constitute acceptable harm.[20]

4) WHAT IS THE INTERNATIONAL SEABED AUTHORITY

The International Seabed Authority (ISA) is an autonomous international organisation that came into existence on November 16th, 1994.[21] It was established under the UNCLOS 1982 and the 1994 Agreement Relating to the Implementation of Part XI of UNCLOS. Through ISA, parties to UNCLOS can organise and control all mineral resources related to activities in the Area for the benefit of mankind.[22]

The mandate of ISA is to ensure the effective protection of the marine environment from any sort of harmful effects that might arise from the activities conducted in deep-seabed areas.[23]

The headquarters of ISA is in Kingston, Jamaica, and it became fully operational in June 1996. By virtue of Article 156 (2) of UNCLOS, all the state parties to UNCLOS are ipso facto members of ISA. Presently, ISA has 168 members consisting of 167 member States and the European Union.[24]

The ISA is responsible for the mineral resources and also for the protection of marine environment in this area. It considers applications for exploration of deep-sea resources from the contractors and assesses environmental impact assessments along with supervising mining activities. Till date ISA has approved 27 exploration contracts. These contracts are valid for 15 years, and after this, these contracts can be extended further for 5 years. It has also developed a mining code and made provisions related to marine scientific research.[25]

5) SEABED DISPUTES CHAMBER

Overview of this Chamber

The Seabed Dispute Chamber has been established in accordance with Part XI, section 4 of

[20] Supra note 11.
[21] Supra note 17.
[22] Ibid.
[23] Ibid.
[24] About ISA, *available at:* https://www.isa.org.jm/about-isa (Last visited on January 9th 2026).
[25] Ibid.

the Convention and Article 14 of the Statute of the ITLOS.[26] It deals with disputes related to the exploration of the International Seabed Area.[27]

Composition

This Chamber consists of 11 judges, and a quorum of 11 members is required to constitute the Chamber. Members of this chamber are elected for a period of 3 years and may also be re-elected. While selecting the members of this chamber, care is taken to represent the principal jurisdictions of the world and also to give an equitable representation to various geographical areas.[28] The Chamber consists of judges in the way mentioned hereinafter.

i. Three judges are nationals of the African Group

ii. Three judges are nationals of the Asian Group

iii. Two judges are nationals of the Latin American and Caribbean Group

iv. Two judges are nationals of Western European and other states.

v. One judge is a national of the Eastern European Group[29]

From all the judges in this chamber, one judge is appointed as the president and in case of vacancy, a new president is appointed for the remaining term.[30]

Establishment of Ad Hoc Tribunals

Parties may request the Chamber to form Ad Hoc Tribunals for dealing with certain cases over which it has jurisdiction. In an Ad Hoc Chamber, there are three members. Care is taken to ensure that the members of the chamber are not nationals of any of the countries which are in dispute.[31]

[26] Article 14, The Statute of the International Tribunal for the Law of Sea.
[27] Chambers, *available at:* https://www.itlos.org/en/main/the-tribunal/chambers/ (Last visited on January 9th 2026).
[28] Ibid.
[29] MOM Ravin, "ITLOS and Dispute Settlement Mechanisms of the United Nations Convention on the Law of the Sea" (2005).
[30] Ibid.
[31] Ibid.

If parties are unable to decide on the members of the ad hoc tribunal, then in such a case, both parties appoint one member each and a third member is appointed by the two members who were appointed by the parties to the dispute. If any party fails to make an appointment, then in such a case a member is appointed by the President of the Seabed Disputes Chamber after consulting the parties to a dispute.[32]

Initiation of Proceedings Before the Seabed Disputes Chamber

The Council of ISA initiates proceedings before the Seabed Dispute Chamber under Article 185, paragraph 2 of the UNCLOS. For initiating the proceedings, an application is submitted to the Chamber along with a certified copy of the decision of resolution upon which that application is based. Along with it, full records of all the discussions which have taken place within the ISA are also submitted to the Chamber.[33]

Jurisdiction of the Seabed Disputes Chamber

The Seabed Disputes Chamber is a separate and independent body within the ITLOS. It has both advisory and compulsory jurisdictions on the matters which come under the ambit of Part XI of the UNCLOS and other annexes related to this Area. It plays a crucial role in the enduring good governance of the area.[34]

The Chamber has jurisdiction over various disputes, such as disputes between the state parties on any matter relating to the interpretation or application of Part XI and over disputes between a State Party and Authority over the acts or omissions by the ISA or any state party which violates provisions of UNCLOS and misuse of power by the Authority.[35]

The chamber also has jurisdiction to deal with disputes between parties to exploration contracts, which may be states, the ISA, or a juridical person. It also deals with disputes between ISA and a state-sponsored prospective contractor. It also deals with those disputes

[32] Ibid.
[33] Proceedings before the Seabed Disputes Chamber, *available at:* https://www.itlos.org/en/main/jurisdiction/contentious-cases/proceedings-before-the-seabed-disputes-chamber/ (Last visited on January 9th 2026).
[34] Seabed Dispute Chamber Moving Forward, *available at:* https://brill.com/view/book/edcoll/9789004352544/B9789004352544_015.xml (Last visited on January 9th 2026).
[35] Article 187, The United Nations Convention on the Law of the Sea 1982.

in which the liability of the Authority has arisen or over any other dispute.[36]

Submission of Matter to Seabed Disputes Chamber

The disputes may be submitted to any ad hoc chamber of ITLOS or Seabed Disputes Chamber specially created at the request of contesting parties. If the dispute is related to any of the contracts, then it may be referred for binding commercial arbitration. But under commercial arbitration, arbitrators do not have a right to deal with any issue related to the interpretation of any provision of UNCLOS. The arbitration tribunal has the power to declare that the issue will be resolved as per the decision that will be given by the Seabed Disputes Chamber. The arbitration is conducted as per the rules of UNCITRAL or by any other rules and regulations which are agreed upon between the parties.[37]

Relevance of Article 287 of UNCLOS

Under this article, states can make a declaration and can choose among different means for settling disputes. Parties to the dispute have a right to choose between various means, such as ITLOS, the International Court of Justice, an arbitral tribunal established under Annex VII and a special arbitral tribunal established under Annex VIII. This article further states that the declaration made by any state party shall neither affect nor be affected by a state party's obligation to accept the jurisdiction of the Seabed Disputes Chamber to the extent mentioned in Part XI of the UNCLOS.[38]

This implies that parties have a right to choose any methods for settling the disputes but in case the dispute is related to Part XI then they must choose the Seabed Disputes Chamber. But if parties agree then by making a declaration, they may do away with this obligation.

Power of Judicial Review

The Chamber has certain powers of judicial review. It can decide whether or not the rules that have been made by the ISA conflict with provisions of UNCLOS or not. In this way the Chamber plays a crucial role in checking any abuse of power by ISA. ***Article 39*** of the ITLOS Statute clarifies that there exists a link between Seabed Disputes Chamber and

[36] Ibid.
[37] Article 188, The United Nations Convention on the Law of the Sea 1982.
[38] Article 287, The United Nations Convention on the Law of the Sea 1982.

national courts. It further states that the decisions of the Chamber shall be enforceable in the same manner as judgments that are delivered by the highest court of any State Party in its Territory. [39]

Limitations of Seabed Disputes Chamber

The Seabed Disputes Chamber lacks some features which could make it a central component as far as disputes related to Part XI are concerned.[40] Due to the immunities which are granted to the ISA, its properties are immune from any form of seizure. Similarly, immunities granted to states make it difficult to attach the property of the State Parties.[41] This Chamber is not authorised to invalidate any rules, regulations or procedures of ISA.[42]

Effectiveness of the Seabed Disputes Chamber

The Chamber is not able to deal with the disputes in an effective manner. One of the reasons given for this is inconsistent interpretations of UNCLOS due to the multiplicity of dispute resolution mechanisms. But this argument is not well-founded. International jurists and arbitrators interpret the provisions of UNCLOS or any other document by relying on similar sources and by applying similar reasoning. Thus, a standard method for treaty interpretations avoids any inconsistent interpretations.[43]

It is also argued that due to the multiplicity of dispute resolution mechanisms, inter-forum competition might arise. But in reality, all the institutions deal with only those matters in which they have the expertise and leave the matters in which they do not have the expertise to the other institutions.[44]

6) THE ADVISORY OPINION OF THE SEABED DISPUTES CHAMBER

On 1 February 2011, the Seabed Disputes Chamber issued a landmark ***Advisory Opinion on the Responsibilities and Obligations of States Sponsoring Persons and Entities with***

[39] John E Noyes, "International Tribunal for the Law of Sea" *Cornell International Law Journal* (1999).
[40] Ibid.
[41] Ibid.
[42] Article 187, The United Nations Convention on the Law of the Sea 1982.
[43] Supra note 34.
[44] Ibid.

respect to Activities in the Area. This was the first time that the advisory jurisdiction of ITLOS was invoked. It was also the first case addressed by the Seabed Disputes Chamber.[45]

The Seabed Disputes Chamber, finding it had jurisdiction under UNCLOS Article 191, addressed three questions posed by the ISA regarding the responsibilities and liabilities of sponsoring states in the Area.[46]

Question 1: Legal Responsibilities of Sponsoring States

The Chamber clarified that "activities in the Area" include drilling, dredging, coring, excavation, and the disposal of wastes, but exclude transportation and processing, which are covered by ISA regulations. Under Article 139(1) UNCLOS, sponsoring states must ensure that activities carried out by their nationals or enterprises comply with Part XI. Additionally, the Chamber clarified that certain obligations must apply regardless of the ISA Regulations. These include:

i. Application of the precautionary principle (Rio Declaration Principle 15)

ii. Adoption of best environmental practices

iii. Requirement of technical and financial guarantees

iv. Conduct of Environmental Impact Assessments (EIAs)[47]

Question 2: Extent of Liability

Under Article 139(2), states are liable for failure to comply if they do not take "all necessary and appropriate measures" to secure compliance by their contractors. While the Convention does not impose strict liability, failure to meet this high due diligence standard may result in state liability. The Chamber noted that future regulations or trust funds could expand liability mechanisms.[48]

[45] Advisory Opinion of the Seabed Disputes Chamber of the International Tribunal for the Law of the Sea on Responsibilities and Obligations of States Sponsoring Persons and Entities with Respect To Activities in the Area, *available at:* https://www.asil.org/insights/volume/15/issue/7/advisory-opinion-seabed-disputes-chamber-international-tribunal-law-sea (Last visited on January 31, 2026).
[46] Ibid.
[47] Ibid.
[48] Ibid.

Question 3: Necessary Measures

The Chamber stated that the sponsoring states must maintain laws, regulations, and administrative measures throughout the duration of the contract. Moreover, compliance cannot rely only on contractual obligations with contractors. It should either meet or exceed ISA standards and applicable international law.[49]

7) INTERNATIONAL SEABED MINING CODE

The Mining Code refers to the comprehensive set of rules, regulations and procedures issued by the International Seabed Authority (ISA) to regulate prospecting, exploration and exploitation of mineral resources in the international seabed area. The Code comprises two major components: exploration and exploitation. To date, the ISA has issued exploration regulations for:

i. Polymetallic Nodules

ii. Polymetallic Sulfides

iii. Cobalt-rich ferromanganese crusts[50]

In 2014, the ISA began developing regulations for the exploitation of mineral resources in the Area. While exploration contracts have been issued, no exploitation contracts have yet been finalised. The ISA initially targeted July 2020 for completion of its exploitation regulatory regime; however, progress was delayed due to the COVID-19 pandemic. Despite this, the ISA has continued to advance the development of the regulatory framework. In July 2023, the Council revised its roadmap and, in February 2024, released a consolidated draft text for negotiation, making a transition to the final phase of regulatory development.[51]

The exploitation component of the Mining Code consists of three major elements:

i. Exploitation regulations

[49] Ibid.
[50] Mining Code, *available at:* https://www.isa.org.jm/mining-code (Last visited on January 31, 2026).
[51] Ibid.

ii. Standards and guidelines

iii. Benefit-sharing mechanisms [52]

Draft exploitation regulations were prepared by the ISA Legal and Technical Commission (LTC), on the basis of expert workshops, studies and stakeholder consultations. To ensure effective implementation, the LTC recommended a three-phase development approach for standards and guidelines.

i. Phase 1: Standards and guidelines to be in place at the time of adoption of the draft exploitation regulations.

ii. Phase 2: Standards and guidelines required before receipt of an application for a plan of work for exploitation.

iii. Phase 3: Standards and guidelines necessary before commercial mining begins in the area.[53]

The Mining Code also establishes a financial regime, requiring contractors to pay royalties to the ISA. These proceeds are to be shared according to equitable benefit-sharing criteria, ensuring that the resources of the Area benefit mankind as a whole.[54]

CONCLUSION

The Seabed Disputes Chamber plays a vital role in resolving disputes between states, individuals, organisations, and the International Seabed Authority concerning the interpretation of Part XI of the UNCLOS. The seabed area holds enormous economic and environmental significance. Part XI and deep-sea exploration and mining are controversial issues under the regime of the Law of the Seas. The USA considers the provisions of Part XI as unfair.

Owing to the advancements in technology, many countries are now gaining access to technology for mining deep-seabed areas. With advancements in technology, the International Seabed Authority might allow various countries and other entities the right to

[52] Ibid.
[53] Ibid.
[54] Ibid.

explore and mine the seabed, increasing the likelihood of conflicts. In this context, the Chamber will help in resolving conflicts between parties amicably and effectively, leveraging the expertise of its members. The advisory jurisdiction of The Chamber further enhances its significance in international dispute settlement.

Looking ahead, deep-sea mining not only offers immense economic potential but also poses serious environmental risks to largely unexplored and fragile marine ecosystems.

i. To balance these interests, the International Seabed Authority must adopt clear environmental thresholds.

ii. It must enforce the precautionary principle.

iii. Continuous monitoring of the activities must be mandated to prevent irreparable harm.

iv. Integrating climate resilience into seabed mining operations, such as avoiding areas critical for carbon storage or mitigating impacts on methane-rich sediments, can ensure that deep-sea exploitation does not exacerbate global climate change.

By combining robust regulation with the oversight and dispute resolution capacity of the Chamber, the economic benefits of seabed resources can be harnessed responsibly and sustainably, while upholding the principle of the common heritage of mankind.