

Legal Implications of Deep Seabed Mining on the Sustainability of the Blue Economy in Indonesia

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ABSTRACT

This research examines the legal implications of deep seabed mining on blue economy sustainability. Indonesia, as an archipelagic country, has enormous marine potential that needs to be managed with a blue economy approach to support sustainable economic growth and community welfare. This research uses a normative legal method with a statutory approach to analyze various related regulations. The results show that deep seabed mining can make a significant contribution to the economy, especially through the extraction of minerals such as nickel, copper and cobalt. However, this activity also poses serious environmental risks, including damage to marine ecosystems and increased carbon emissions that impact climate change. Therefore, a comprehensive and sustainable regulatory framework is needed, integrating blue economy and precautionary principles to ensure that the exploitation of deep-sea resources is carried out responsibly and sustainably.

Keywords: Deep Seabed Mining; Blue Economy; Sustainability; Legal Implications; Marine Ecosystem.

INTRODUCTION

Indonesia, as an archipelagic country, consists of land and sea areas. The number of islands in Indonesia, both large and small, reaches 17,508 islands. This argument is the basis for referring to Indonesia as an "Archipelagic State". Archipelagic State is the concept of a country that has many islands. These islands can be a source of inspiration and management innovation by the government or local communities in increasing the economic value of their country (Baldacchino, 2016). When measured as far as 12 miles of the sea/territorial boundary from the continental baseline, the area of Indonesia's sea area is 3,257,357 km² and is 1,919,443 km² of Indonesia's land area. So, the overall area of Indonesia reaches 5,176,800 km². Meanwhile, the area of Indonesian waters is 6,400,000 km².

Proper and good management is what is needed in the management of a large sea area. The purpose of managing the marine area is that the existing natural potential can be useful, gain profits, and provide added value for the community (Cassotta & Goodsite, 2023; Niner et al., 2018). However, the marine potential in Indonesia has not been utilized properly until now. Therefore, careful and appropriate planning by the local government is needed for such a large

marine potential, for example a marine and coastal development strategy based on the principles of the Blue Economy or Blue Economy. Blue Economy is a business principle in marine-based regional development (Katila et al., 2019).

The Blue Economy is an innovative approach to utilizing sustainable marine resources to support economic growth and improve people's welfare (Ebarvia, 2016). Blue economy sectors include a variety of important sectors, including fisheries, renewable energy, tourism, water transportation, waste management, and climate change mitigation. The blue economy has important potential as a source of sustainable economic growth. The development of a blue economy model can be one of the main strategies in improving the economy in Indonesia (Pauli, 2010; Smith-Godfrey, 2016; Voyer & van Leeuwen, 2019).

The Blue Economy concept is the sustainable use of marine resources for the rate of economic growth, while maintaining the health of the marine ecosystem (Hallgren & Hansson, 2021). Initially, all fishery products were the initial scope of the Blue Economy principle, but the scope of the principle extends to the sustainability of marine ecosystems (Eisman, 2024; Levin et al., 2016). The sustainability of marine ecosystems is one of the largest contributors to GDP in Indonesia. The sustainability of the marine ecosystem must be able to align with the triple bottom line of sustainable development, namely environment, social, and governance (ESG).

The United Nations Environment Programme Finance Initiative (UNEP-FI) states that Deep Seabed Mining (DSM) is so damaging to the environment that it is a major challenge that must be overcome before this sector can be recognized as an economically viable sector or as a responsible industry (Sen, 2010). Dennis Fritsch, senior project coordinator, Sustainable Blue Economy at UNEP-FI, said that "deep-sea mining presents a complex set of pressures, power imbalances and little regulation or scientific understanding even in domestic waters." Given the headwinds in various sectors, it is important to rethink whether Deep Seabed Mining should be financed or not (Ascencio-Herrera & Nordquist, 2022; Durden et al., 2017; Tortorella et al., 2018).

The development of Deep Seabed Mining has increased significantly close to the level of commercial mining (Smith et al., 2020). The goal of mineral extraction is to implement comprehensive marine environmental ecosystem-based management practices in identifying and developing urgent commercial needs. Prior to commercial mining and the utilization of deep-sea mineral resources, there is a need for effective management and preservation of the marine environment through the development of environmentally focused technologies, practices, frameworks, and extractive policies and paying attention to the principle of prudence.

RESEARCH METHOD

This type of research is normative legal research. Legal research developed based on legal science with all its peculiarities gave birth to unique legal research which was later known as normative legal research (Matz-Lück et al., 2022). Thus, the emphasis in normative law research is placed on positive legal inventory, legal principles and doctrines, legal discovery in concreto cases, legal systematics, synchronization level, legal comparison, and legal history. The approach

method in this study is a statutory approach. The legislative approach is used in a normative research because what will be studied are various legal regulations that are the focus and central theme of the research (Leeuw & Schmeets, 2016).

The research data sources consist of primary data and secondary data. Primary data is obtained from primary legal materials (legislation and other legal documents), secondary legal materials (books and related scientific study results), and tertiary legal materials (additional information from dictionaries, monographs, brochures, and others). Data collection is carried out by literature and literature research methods which include books, journals, theses, and other media to support research results and preparation for writing. The data collection technique used in this study is a literature study.

RESULT AND DISCUSSION

Deep seabed mining affects marine ecosystems and environmental sustainability

Aria Cakra Wibawa (2018) stated that it is mandatory to distinguish between deep seabed mining and underwater mining. Deep Seabed Mining is an important and potential sector in supporting the strengthening of the blue economy. This is due to land-based mining and mineral recycling not being able to meet future resource needs. Therefore, the depletion of mining reserves along with environmental and social risks through onshore mining results in a high demand for minerals but with few resources.

The latest marine-based energy sources have the potential to meet all of the world's current energy needs as energy demand continues to increase and industries look for alternatives to conventional fossil fuels. There are three core minerals under the sea. First, Poly Metallic Nodules that produce nickel, copper, manganese, and cobalt that can be found at depths of 4,000 to 6,000 meters below sea level in ocean basins. Second, Polymetallic Sulfides which can be found at depths of 1,000 to 4,000 meters in areas of volcanic activity on the seabed and seabed. Third, Cobalt crust which can be found at depths of 800 to 2,500 meters on the peaks and sides of underwater mountains.

Minerals have the potential for a wide range of industrial applications, including for environmentally friendly technologies, which is why attention to the extraction of minerals from the deep sea is increasing. The exploitation of materials such as polymetallic sulfides, polymetallic nodules, cobalt crusts is of particular economic importance because these marine resources are often high-grade ores so they are very valuable. Some of the key focus areas for the industry are polymetallic nodules in the abyssal plains in the Clarion-Clipperton zone (CCZ) in the middle of the Pacific Ocean, massive sulfide deposits on the seafloor in the Indian Ocean region, and cobalt crusts adjacent to underwater mountains in the Western Pacific Ocean.

Deep Seabed Mining activities that fall within the scope of national jurisdiction are managed by local governments, but Deep Seabed Mining outside the EEZ will be under the jurisdiction of the International Seabed Authority (ISA). In national jurisdictions, Deep Seabed Mining can generate state revenue for those who regulate and manage it. However, this also has the potential

to provide risks that are difficult to know, resulting in large losses and environmental damage. Environmental, social, and potential future risks must be considered and understood as a whole compared to temporary gains. In addition, there are other adverse impacts on biodiversity and ecological processes such as the formation of sediment clumps, the spread of toxic chemicals, commotion, and so on.

The main impacts of Deep Seabed Mining on the three types of minerals are:

1. The substrate cannot be recovered, the storage potential and the function of the animal's habitat become lost;
2. Physical disturbances in operations and resedimentation on the seabed so that biota is damaged and filter feeders become clogged;
3. Plume discharges that impact pelagic and/or benthic fauna, as well as carbon pumps that function to sequester marine carbon;
4. Damage to underwater cultural heritage.

Destruction of seabed habitats, fauna extinction, habitat fragmentation and modification and the spread of toxic water are the biggest risks estimated as a result of deep-sea mining activities. Experts believe the permanent extinction of marine organisms and genetic material will make it difficult to manufacture new antibiotics, anti-cancer drugs, and nutritional supplements. Then, the depletion of seawater causes a blurring effect that results in a decrease in oxygen levels. In addition, organisms can ingest contaminated water that gives rise to the potential for bioaccumulation through the food chain, this is due to the composition of the released seawater in contrast to the composition of seawater collected with minerals or ores so that it has a level of salinity, temperature, and the amount of toxic chemicals.

Based on research, marine sediments store about twice as much organic carbon as soil on land, for example, 79 percent of global marine sediment carbon is in the abyss/basin zone. However, human interference in marine carbon protection causes remineralization into CO₂, resulting in an increasingly severe impact of climate change. Therefore, deep seabed mining contributes to carbon emissions on global climate change. Other common impacts include underwater noise, the ingress of artificial light into the normally poorly lit deep-sea environment, the entry of oxygen-rich water into low-oxygen environments, and the release of toxic metals. In addition to these environmental impacts, there are socio-economic impacts for the local community. First, large-scale development can result in the loss of access to certain coastal areas which has a direct impact on the livelihoods of local communities. Second, the loss of access to sites that have cultural and construction values that cause damage to cultural heritage sites. Third, there are environmental disturbances caused by construction lights, noise, and dust.

In addition to the impact previously explained, Deep Seabed Mining activities have a negative impact on the blue economy sector. First, the disruption of pelagic fishery stocks caused by sedimentation and pollution into the water column. Second, it has the potential to cause conflicts with fishing activities. Third, the potential for conflicts with shipping or mining occurs at or near the main shipping routes. Fourth, there is an absence of legal clarity and certainty regarding the

responsibilities and legal implications caused by mining activities that inadvertently damage submarine cables. Submarine cables are the cornerstone of global telecommunications in many areas of the deep seabed. Fifth, the potential for extinction of species that have not yet been discovered, thus eliminating the opportunity to create new types of drugs.

Policies and regulations can be adapted to support the sustainability of the blue economy in the context of deep seabed mining.

Deep Seabed Mining has a noble goal: to support human needs, especially the Clean Energy transition and as an alternative to onshore mining, which is increasingly damaging to the environment. Conceptually, Deep Seabed Mining can be carried out with the condition of caution and compliance with the principle of Common Heritage of Mankind, which means the common heritage of mankind, this principle is also listed in Article 139 of UNCLOS. The embodiment of this finally gave birth to the International Seabed Authority (ISA) which is tasked with supervising and also overseeing the seas outside the EEZ or International Jurisdiction (high seas) based on Article 1 Paragraph 2 and Article 156 of UNCLOS. In addition to the concept of Common Heritage Of Mankind, the implementation of Deep Seabed Mining also pays attention to the protection of marine ecosystems as stated in Article 145 of UNCLOS, especially in Paragraph (a) which reads "the prevention, reduction and control of pollution and other hazards to the marine environment, including coastlines, and disturbances to the ecological balance of the marine environment, special attention is paid to the need for protection from harmful impacts from such activities as drilling, dredging, excavation, waste disposal, construction and operation or maintenance of installations, pipelines and other devices related to these activities". Judging from this explanation, in fact, in the design of UNCLOS, there are principles and also concepts of how Deep Seabed Mining is carried out. However, the question is how the concept is implemented and whether it is in accordance with the principles in UNCLOS.

ISA as the only Authority authorized to handle Deep Seabed Mining has made several efforts, especially in running Deep Seabed Mining, both from the Exploration process to Exploitation. The ISA in this case issued the so-called Mining Code which regulates a comprehensive set of rules, regulations and procedures aimed at regulating the prospects for exploration and exploitation of marine minerals in the international seabed area. In terms of exploration, at least ISA has 3 regulations regarding this, including Polymetallic Nodules, Polymetallic Sulphides and Cobalt-Rich Ferromanganese Crusts. The ISA has signed 31 Contracts for exploration in several areas such as the Clarion-Clipperton Fracture Zone, the Central Indian Ocean Basin, the Southwest Indian Ridge, the Central Indian Ridge and the Central Atlantic Ridge as well as in the Pacific Ocean. In carrying out exploration, ISA makes a contract agreement with the State or Company that wants to carry out exploration. In exploration, the contractor must comply with several procedures regulated by the ISA, especially regarding the environmental impact regulated in ISBA/25/LTC/6/Rev.3 where the contractor must first conduct an Environmental Impact Analysis (EIA) and submit it to the Secretary General of the ISA. Although exploration has rules and has been implemented, Deep Seabed Mining has not yet been able to be

carried out considering the Regulations on Exploitation which have not been completed since the beginning was designed in 2014. On July 21, 2023, in Kingston, Jamaica, a meeting was held to finalize regulations regarding exploitation which are planned to be completed by July 2025. Therefore, it is necessary to see the urgency of how to implement the exploitation of Deep Seabed Mining. Considering that there are some who refuse such as Costa Rica, Canada, Chile, France, New Zealand.

Therefore, in planning exploitation rules, it is necessary to formulate properly and apply the concept of the Blue Economy in it. The Blue Economy basically has the principle of blue ocean blue sky which must be used responsibly. The Blue Economy becomes appropriate when planned in the exploitation of Deep Seabed Mining. There are at least 3 Blue Economy approaches initiated by Gunter Pauli in his book entitled *The Blue Economy, 10 Years, 100 Innovations, 100 Million Jobs*. First, a clearer understanding of the value of marine ecosystems, especially in terms of Deep Seabed Mining, should be an investment in research to understand the deep sea and the future impacts of this mining. Second, linking the marine ecosystem to food security. This is related to the sustainability of food with economic and social strategies. In this context, the role of Deep Seabed Mining must be harmonized; what does this function to meet what needs? If we look at the results of exploration, there are many raw materials such as copper, cobalt, manganese, gold, nickel and lithium that can be used for the operation of electric cars as a strategic step in the energy transition. Third, there needs to be an economic transition that concerns the market as well as industry and communities towards a fairer development pattern. So here, the principle of the Common Heritage of Mankind must be obeyed properly. Because in exploitation solely for the welfare of humanity itself and in its implementation later, ISA must play an active role in the supervision of Deep Seabed Mining. This aims to make this principle run well. Furthermore, in the readiness of technology and infrastructure. Countries in the world must work hand in hand and there must be no sectoral egos that want to take advantage of it themselves.

This is what must be criticized, especially in the exploitation regulations issued by the ISA later. ISA has actually included several environmental aspects in its draft exploitation regulations entitled regulations on exploitation of mineral resources in the Area. However, it is still based on the environment in general such as Environmental Impact Analysis (EIA), Monitoring of environmental impacts, environmental work assurance which is only procedural and not substantial. Therefore, it is necessary to reformulate the ISA exploitation regulation draft and include the principles of the Blue Economy so that the Blue Ocean Blue Sky is created as an implementation of the principles of the Common Heritage of Mankind.

CONCLUSION

The utilization of marine resources is crucial for supporting sustainable economic growth through the blue economy concept. Indonesia, as an archipelagic country, has significant potential to develop a marine-based economy, particularly through Deep Seabed Mining (DSM). DSM can provide essential minerals for green technologies and the clean energy transition, such as Poly

Metallic Nodules, Polymetallic Sulfides, and Cobalt Crusts. However, DSM also poses significant environmental and social risks, including damage to marine ecosystems, pollution, carbon emissions, and social impacts like loss of local community access to coastal areas. Effective DSM management requires strict policies and regulations to ensure sustainability. The International Seabed Authority (ISA) oversees exploration and exploitation beyond national jurisdictions, but exploitation regulations still need to be refined with substantial environmental considerations. The development of the blue economy must be based on sustainability principles, balancing economic growth with marine ecosystem protection, investing in research, ensuring food security, and promoting equitable development. Although DSM has great potential to support sustainable economic growth, significant environmental and social challenges necessitate careful and responsible management. Strict regulation and adherence to blue economy principles are essential to minimize negative impacts and ensure DSM contributes positively without harming valuable marine ecosystems.

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