

CRITICISM OF DEEP SEA MINING AND THE ISA REGULATORY VOID: THE ROLE OF THE BBNJ AGREEMENT AS A PROTECTION MECHANISM

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Abstract

Deep Sea Mining (DSM) in international areas has triggered various controversies due to serious ecological risks and regulatory uncertainty in the International Seabed Authority (ISA). This article aims to examine the legal gaps related to DSM and evaluate the potential of the Biodiversity Beyond National Jurisdiction (BBNJ) Agreement as a temporary protection mechanism until the ISA Mining Code is finalized. The analysis is carried out through a normative approach by reviewing international law of the sea principles such as the “common heritage of mankind,” the precautionary principle, and the ecosystem approach, as well as their relevance in the context of DSM. The study results show that although BBNJ cannot fully replace ISA legally, this agreement offers a significant additional layer of protection for the marine environment through the obligation to conduct environmental impact assessments and the establishment of marine protected areas. This research also reveals conflicts of interest and inequalities in the benefit-sharing mechanism that potentially disadvantage developing countries. In conclusion, BBNJ plays an important role as a complementary instrument that can strengthen DSM oversight, but does not replace the comprehensive regulations required from ISA.

Keywords: BBNJ Agreement; Deep Sea Mining; International Seabed Authority

INTRODUCTION

The 1982 United Nations Convention on the Law of the Sea (UNCLOS) establishes the international seabed beyond national jurisdiction (known as the Area) as the Common Heritage of Mankind (common heritage of mankind). This means that the natural resources of the international seabed are not owned by any particular country or corporation, but rather belong to all of humanity, and are managed for the common benefit of all and future generations. This principle was first affirmed in the 1970 UN General Assembly Declaration 2749, which stated that the seabed must be preserved for peaceful purposes and become the common heritage of mankind.

Seabed mining (*deep-sea mining*) is the extraction of critical mineral resources from the seabed. These critical resources include polymetallic nodule ores (*consisting of manganese, cobalt, nickel, and copper*), minerals from the ocean crust (*such as nickel and cobalt*), and deposits at hydrothermal vents (*metals copper, zinc, gold, and silver*). All of these minerals are highly sought after in modern industry. For example, NOAA notes that seabed mining targets rare earth metals such as manganese, nickel, and cobalt, which are then used in defense systems, electric vehicle batteries, electronic devices, and medical devices.

Despite its enormous economic potential, seabed exploitation poses serious ecological and environmental concerns. Scientists and conservation organizations warn that seabed mining can destroy deep-sea habitats and drive biodiversity loss. For example, hydrothermal vents the mineral-rich lakes are home to unique chemotroph-based organisms (such as Yeti crabs and scaly snails) found nowhere else (Trusts, 2019). Disturbing such habitats can damage the marine food web. Furthermore, WWF warns that this activity could disrupt the ocean's function as a carbon sink, thus exacerbating the climate crisis the crux of this warning is that the deep ocean plays a vital role in regulating the global climate and sustaining marine life; damage to these ecosystems could have far-reaching long-term consequences.

Because scientific knowledge of deep-sea ecosystems is still limited, many are calling for the precautionary principle or even a temporary mining moratorium. WWF asserts that "The deep sea is one of the last untouched ecosystems on Earth, playing a crucial role in regulating our climate and supporting marine life. We cannot afford to sacrifice it for short-term commercial interests". A cautious approach is considered essential to avoid the potential for serious and irreparable damage.

Several recent publications have highlighted these issues. For example, (Xu et al., 2023) discusses the obligation of sponsoring states to require mining companies to comply with environmental regulations in national law. (Ariningtyas, 2024) examines the potential moratorium and the challenges legal precautionary pause in Deep Sea Mining. (Putri et al., 2024) analyzed the delay in ratification mining Code of International Seabed Authority (ISA) from the perspective Third World Approaches to International Law (TWAIL) and Agreement Biodiversity Beyond National Jurisdiction (BBNJ). (Feichtner & Ginzky, 2024) provides an overview of conflicts of interest in the policy process at the ISA. This article aims to combine these various analyses to critique the regulatory situation. Deep Sea Mining and evaluate the possibility of the BBNJ Agreement as an alternative mechanism or temporary safeguard. The expected scientific contribution is to explore the legal and policy implications at the international level for various tensions (*economic psychology*) and the existing regulatory gaps.

RESEARCH METHOD

This study employs a normative-juridical approach, namely doctrinal legal research that focuses on the analysis of literature, legal documents, and relevant international instruments. The choice of this approach is grounded in the nature of the problem, which emphasizes the evaluation of international maritime law norms and regulatory gaps in Deep Sea Mining (DSM). As (Ariawan, 2013) argues, normative legal research is appropriate when the analysis is directed toward principles, doctrines, and legal norms, thereby prioritizing conceptual examination over empirical observation.

The research object is centered on the international law of the sea regime, particularly the provisions of UNCLOS 1982, the regulations of the International Seabed Authority (ISA), and the role of the Biodiversity Beyond National Jurisdiction (BBNJ) Agreement. Accordingly, the scope of inquiry is directed at the normative relationship among these three legal instruments, especially in the context of the principles of common heritage of mankind, the precautionary principle, and the ecosystem approach (Christiansen et al., 2022; Jaeckel, 2017).

The data were obtained through library research, which involved reviewing international treaties, decisions of international judicial bodies, and recent academic publications addressing DSM and BBNJ. Primary legal materials consisted of UNCLOS 1982, ISA regulations, and the BBNJ Agreement. Secondary legal materials included scholarly journal articles, policy analyses, and reports from international organizations (Ariningtyas, 2024; Feichtner & Ginzky, 2024).

The data analysis was conducted using a qualitative-descriptive method with legal interpretation techniques. The steps of analysis included identifying relevant norms, comparing legal principles, and evaluating regulatory gaps. This technique aligns with (Qomaruddin & Sa'diyah, 2024) view that qualitative analysis emphasizes data reduction, data presentation, and systematic conclusion drawing. To maintain argumentative consistency, the study also applies a comparative legal argumentation method, by juxtaposing ISA practices with BBNJ norms as a supplementary protection mechanism.

RESULTS AND DISCUSSION

International Law of the Sea and Deep Sea Mining

International Law of the Sea regulates the management of marine resources on a global scale. UNCLOS 1982 stipulates that the seabed and its contents beyond national jurisdiction constitute "*common heritage of mankind*", or the common heritage of mankind. For this area, *International Seabed Authority* the International Mineral Resources and Spatial Planning (ISA) was established as the primary regulatory body responsible for regulating the exploration and, in the future, exploitation of deep-sea minerals. The principle of common heritage means that all countries are entitled to equitable benefits from these resources, so UNCLOS requires a benefit-sharing mechanism (*benefit-sharing*) which pays attention to the interests of developing countries.

Prior to the existence of exploitation regulations, UNCLOS prohibited any commercial mining operations on the international ocean floor. New exploration provisions could be implemented after the Mining Codification (*Mining Code*) agreed. As of mid-2023, the exploitation code had not been finalized; instead, countries like the United States, which has not ratified UNCLOS, have already taken steps independently. For example, in March 2025, the US announced plans for deep-sea mining exploration with The Metals Company without waiting for a multilateral decision on the ISA. This move sparked tensions because it was seen as undermining the authority of the ISA and the UNCLOS principle of cooperation. Similarly, only UNCLOS states (including a number of developed and developing countries) can act as "state sponsors" for foreign mining companies. Thus, the management *deep sea mining* closely related to the position of UNCLOS and the compliance of sponsoring countries with the basic rules of international maritime law.

In general, the ISA regime recognizes three stages: exploration, preparation for exploitation, and exploitation. During the exploration phase, a number of contractors are granted permits by the ISA to explore for minerals such as polymetallic nodules, sulfide mountains, and ferromanganese crusts. The exploitation phase (*commercial mining*) can only begin after the ISA legislature approves stringent technical and environmental regulations. During this negotiation phase, various conflicts of interest and legal uncertainties arise. For example, the application of sanctions due to lack of awareness of ecological impacts and access to public information are still contentious issues. Illegal activities may also occur, for example, if a contractor in violation withdraws, changes sponsorship to another country, or reverses the agreement on profit sharing. These conditions have been identified as risks by observers and academics. In other words, the legal status deep sea mining is still heavily influenced by the principles of UNCLOS and the dynamics of the ISA, which are not yet equipped with commercial exploitation rules.

However, the international legal framework affirms the general obligation of every state to safeguard the marine environment. Articles 192 and 194 of UNCLOS, for example, require every state to take "necessary measures" to protect and preserve the marine environment and prevent pollution from all sources, including deep-sea exploration activities. UNCLOS Article 208 mandates coastal states to regulate pollution to standards not lower than international standards. However, many researchers consider these provisions too generic and dependent on national implementation. Ed-Darran and El (Ed-Daran & El Hajraoui, 2014) emphasize that deep-sea mining activities "will be one of [the] biggest challenges for the marine environment" if the sponsoring state does not share responsibility with its contractor. In practice, UNCLOS Article 235 only states that states are responsible for fulfilling international obligations to protect the marine environment, but the exact content of these obligations is not formulated in detail in the agreement.

Conceptually, the spirit of deep-sea management is a balance between economic development and ecosystem protection. Articles 136 and 145-146 of UNCLOS mandate a mechanism for sharing economic benefits, taking into account the needs of developing countries. However, since its implementation in 1994, the International Seabed Authority Enterprise initiative has not been implemented, so the only source of benefits to date is exploration royalties paid to the ISA. The establishment of a distribution mechanism for royalties and technology remains in limbo because a draft regulation on benefit sharing has not yet been prepared. It is in this context that the position of deep sea mining rolled out: on the one hand it is justified as a source of minerals for the advancement of low-

carbon technology, on the other hand there are concerns that it will cause ecological damage that is not compensated for by the benefits.

Main Criticism of Deep Sea Mining

Criticism of deep- sea mining emerged from various perspectives; ecological, economic, and socio-political. Ecologically, industrial actors and scientists determine the risk of irreversible damage to deep-sea ecosystems is significant. Mining activities at depths of thousands of meters can destroy unique habitats, disrupt biogeochemical cycles, and threaten species not yet fully understood or even known to science. Pollutants such as dissolved sediments and mining waste have the potential to spread widely, disrupt phytoplankton photosynthesis, and affect the food chain. Engine noise and vibrations can also disturb long-distance marine mammals. Cumulatively, this damage is irreversible in the short term, so scientists recommend a precautionary approach, *precautionary principle*) is strictly enforced. Many studies show that the ecological consequences *deep sea mining* may occur before real economic benefits are achieved.

From an economic and social perspective, the pro-*deep sea mining* it is often claimed that critical mineral needs for green energy cannot be met solely from onshore mining, making the deep sea a "strategic reserve." However, recent political economic analyses refute this. Studies show that currently, onshore mineral reserves (e.g., nickel, cobalt, and copper) remain abundant and can be processed using renewable technologies. (Alger, 2025) showed that "*we already have sufficient terrestrial deposits*" And "*we do not 'need' to augment supplies through deep-sea mining*". Many critical metals (including the elements rare earth) could actually be sustainably supplied through increased recycling and onshore exploration. The fact that three countries and numerous companies are pursuing deep water exploration contracts suggests a strategic perception, not an absolute need, for new sources. Projected demand may increase, but breakthroughs in industrial efficiency, recycling, or material substitution could prevent total shortages. Without that urgent need, *deep sea mining* become "... a multi-billion-dollar solution to problems that do not exist".

Another economic criticism is that *deep sea mining* highly speculative and high risk. Since 2018, major investors such as *Lockheed Martin* and *Maersk* has released shares in the company *deep sea mining* when market clarity is lacking, many contractors operating under the flag of small sponsoring countries tend to receive public subsidies because current deep-sea mining technologies have not yet proven commercially viable. A concrete example is the failure of *Nautilus Minerals* in Papua New Guinea, which resulted in the company's bankruptcy and a debt burden on the host country (Grassi, n.d.). (Alger, 2025) noted that investment and operations *deep sea mining* currently, it is very risky and has not yet been proven profitable. So far, deep-sea exploration is still dominated by large companies and supported by developed countries. Without a strong economic foundation, incentives *deep sea mining* it is feared that it will increase environmental and social debt instead of providing long-term benefits.

On the side of government and public rights, *deep sea mining* raises concerns about transparency and fairness. The system *sponsorship* which requires companies to receive state support in the ISA body has resulted in a complex and less transparent ownership structure. The study revealed at least 22 deep-sea exploration contractors to date, with multiple layers of ownership that frequently change hands. Some developing countries, lacking deep-sea mining technology, are actually providing "sponsorship" to foreign companies in exchange for economic rewards, raising skepticism about the benefits *deep sea mining* actually reaches the general public or only flows to foreign investors. In addition, there is another argument that *deep sea mining* will not cause social conflict and human rights issues like land mining, because of its remote location and high-tech nature. However, this logic is only valid if *deep sea mining* completely replace land mining (which is economically and politically unrealistic) *deep sea mining* itself triggers resistance from an ethical perspective, that the concept of valuing common property for limited benefit is considered dangerous. From a social justice perspective, it is unlikely that the benefits *sea mining* will be enjoyed equitably by coastal communities or developing countries. Conversely, experience shows that large extractive industries are generally profit-oriented, leaving poor countries at risk of simply accepting ecological impacts without significant compensation.

This socio-political criticism has been accompanied by calls for a moratorium or suspension of deep-sea mining. Since early 2020, more than 20 countries including various Pacific, European, and Latin American nations as well as hundreds of scientists and NGOs have urged for such a moratorium until sufficient environmental studies are conducted, in accordance with the precautionary principle. Many major technology companies, such as Google, BMW, and Samsung, have also expressed their support, citing concerns for their reputation and commitment to green business policies.

Regulatory Gaps in ISAs and Sponsor Countries

Structurally, the legal regime *deep sea mining* consists of international rules formulated by the ISA (*Mining Code*) and the application of domestic laws of the sponsoring country. Currently, the ISA has adopted exploration regulations such as *Regulations on Prospecting and Exploration*, including the obligation to conduct an Environmental Impact Analysis (AMDAL) prior to trial exploitation. However, regulations for commercial exploitation are still under negotiation: *Rules for exploitation [are] currently under development*". This delay, which was accelerated by the publication of "two-year rule" after Nauru demanded completion by July 2023, created significant uncertainty. It is important to note that even though exploitation has not yet begun, many companies and countries already hold exploration contracts to prepare future mining sites. Thus, the "common territory" is fragmented into designated mining zones (*reserved areas*), potentially causing environmental impacts if exploitation is carried out simultaneously in various places.

Until 2025, the rules of commercial exploitation (*Exploitation Regulations*) have not been approved, creating a legal vacuum. Under these circumstances, some exploration contractors can exploit loopholes to apply for exploitation permits even without final regulations, forcing the ISA to face a governance dilemma. The ISA has actually included several environmental protection provisions in its exploration regulations, such as the obligation to conduct environmental baseline surveys, monitoring, and environmental management plans. However, comprehensive exploitation regulations are still limited in their formulation. This obscures the specifics of ecosystem protection, technical standards, and sanction procedures for violations. For example, the dimensions of financial responsibility, such as environmental recovery guarantees or liabilities beyond that extent, are not yet clear, nor is the law enforcement mechanism. In practice, the ISA's lack of resources and technical capacity to oversee the behavior of large contractors is also a concern. Moreover, the national laws of sponsoring countries are often not explicitly regulated.

In Article 153 paragraph (2) of UNCLOS, the sponsoring country is obliged to take "all necessary and appropriate actions" to ensure that its contractors comply with the rules of the ISA. The interpretation of this article, based on the 2011 ITLOS Advisory Opinion, is that the sponsoring country's obligations are intrinsic and contain due diligence standards. The sponsoring country must establish national legislation containing environmental requirements that are at least equivalent to, or even more stringent than, those set out in the Mining Code. Domestic regulations of sponsoring countries are expected to strengthen environmental protection and social responsibility. However, Xu et al. (2023) noted that many sponsoring countries have not significantly updated their national laws after the 2011 Advisory Opinion, due to weak local legislative frameworks. As a result, the ISA's minimum standards are often used as the benchmark without further reinforcement by the sponsoring states. This stands in contrast to the UNCLOS principle, which requires sponsoring states to adopt a dual standard: a minimum level (following the Mining Code) and an optimal level (by applying stricter requirements). This discrepancy makes it difficult to develop a fair and equitable mining code, as TWAIL's critics emphasize, noting that the current regime often favors developed countries (those with advanced technology) and widens the technological gap. In reality, many sponsoring countries do not yet have specific domestic regulations *deep sea mining* or their own environmental standards. As a result, oversight of contract implementation in the field depends on the good faith of the contractor and the lax policies of the sponsoring country. In *ITLOS Advisory Opinion 2011* also emphasized: the sponsoring state can only be held liable if it fails to fulfill its main obligations, including establishing "necessary and appropriate" measures or due *diligence*. Without real sanctions at the national level, the risk of compliance failure increases. Furthermore,

Another limitation is the lack of public participation and ecosystem standards. To date, the ISA has not implemented robust public engagement procedures in decision-making, for example in the development of exploitation regulations. Similarly, area-based management instruments (*area-based management*) to protect critical sites in deep-sea ecosystems have not yet been operationally formulated. Another factor is the potential for conflicts of interest. Mining companies' reclamation initiatives can arise if the sponsoring country is chosen for regulatory leniency rather than technical expertise. This can shift the sponsoring country's focus from environmental responsibility to short-term financial gain. All of this exacerbates the gap in protection that the ISA is supposed to provide and the gap between theory (UNCLOS) and practice (national legislation). For example, contractors may switch to a different sponsoring country when regulatory standards in one country are deemed too stringent, or even plan to operate unilaterally in US national territory to circumvent ISA oversight. In short, both the weakness of international rules and the lack of domestic legislation contribute to ineffective marine environmental protection and the equitable distribution of benefits.

(Ariningtyas, 2024) highlights concrete shortcomings at the global and national levels: "UNCLOS provides a framework but no further regulations related to legal protection and benefit sharing. Besides,

ISA is developing the Mining Code... but until now the Mining Code has not been fixed which causes uncertainty about the legal framework." This indicates that, apart from the general framework of Part XI/XII of UNCLOS, no additional rules exist concerning environmental protection or benefit-sharing mechanisms. To date, the draft Mining Code has not been finalized, and the agreement has not yet been ratified, leaving the legal status of exploitation unclear. Moreover, there is no established framework for the distribution of royalties or economic benefits from deep-sea mining, meaning that the challenge of fair benefit-sharing between developed and developing countries remains dependent on negotiations. This condition is what Ariningtyas refers to as a "*vacuum of rules*" in the ISA regime: while a basic legal umbrella exists, critical details remain unaddressed.

Furthermore, internal conflicts of interest have emerged. A number of developed countries and corporate sponsors (Norway, China, the United States, Nauru, etc.) are pushing for accelerated exploitation for economic gain and access to technology. Conversely, developing countries particularly in the Pacific and civil society organizations are emphasizing ecological risks and urging a moratorium. This difference has made negotiations difficult. *Mining Code* in the ISA becomes a complex dispute of interest: for example the formation of *Enterprise* and the regional reserve mechanism has not yet been implemented effectively, while the scope of AMDAL regulations, monitoring, and the assignment of compensation responsibilities between sponsors and contractors also lacks certainty.

Precautionary Principle and Ecosystem Approach

The precautionary principle (*precautionary principle*) and ecosystem approach (*ecosystem approach*) has become a pillar of modern maritime environmental law. Principle 15 of the 1992 Rio Declaration states that "*where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing measures to prevent degradation.*" Application of this principle to deep sea mining supported by various international environmental agreements. Articles 145, 153, 165, 145, and 160 paragraph (2) of UNCLOS contain elements of environmental caution and responsibility. ISA exploration regulations explicitly require all parties (ISA, sponsoring countries, mining operators) to apply the precautionary principle in all underwater research activities. In 2011, Seabed Disputes Chamber (SDC) officially supported this principle as part of its obligations due diligence. This means that if there is a potential risk of serious environmental damage, the country must refrain from exploitation until evidence of safety is available.

Researcher Aline Jaeckel asserts that the precautionary principle demands "adequate environmental protection through early action to address risks" even when scientific uncertainty remains high. Jaeckel points out that the biggest challenge is translating abstract obligations/precaution into concrete operational procedures. This means that the exploitation rules currently being formulated need to include comprehensive risk evaluation mechanisms, pre-scientific due diligence, exploitation, and adaptive management mechanisms for unexpected effects. Given that basic seabed science is still limited, without strong precautionary measures *deep sea mining* has the potential to cause irreparable damage before we fully understand the impact. There needs to be a sanction or *trigger* rules that prevents exploitation if scientific or environmental requirements have not been met.

Meanwhile, the ecosystem approach demands the preservation of the integrity of the marine ecological function as a whole, not just the management of specific species or areas. (Christiansen et al., 2022) describe the problematic sectoral deep-sea regime: the Area (ISA) and the High Seas regime are discussed separately, so management is not integrated. In fact, marine ecosystems are entities that transcend jurisdictional boundaries. The ecosystem approach seeks to address this fragmentation by establishing overall conservation objectives and considering biological interactions between regions. Unsurprisingly, this concept is now enshrined in the general principles of the latest BBNJ Agreement (2023): "the ecosystem approach has been included in the list of general principles and approaches for what is now the new Agreement under UNCLOS on the Conservation and Sustainable Use of Marine Biodiversity of Areas beyond National Jurisdiction."

The BBNJ has listed the ecosystem approach as a general principle, and although the ISA has not been explicitly mentioned in this context, alignment between UNCLOS and the ecosystem approach should still be pursued. The ecosystem approach requires coordinated inter-sectoral management, paying attention to ecological interactions, and involving stakeholders. Some experts emphasize that without real ecosystem approach instruments (such as deep-sea conservation areas outside national jurisdiction), the precautionary principle alone is not sufficient; regulation of all activities must consider systemic impacts such as climate change related to the function of marine ecosystems. This means that the ISA and sponsoring countries need to apply holistic environmental constraints and considerations for example, integrating recovery models (remediation) and sustainable, long-term cumulative impact evaluation as core requirements for mining permits. Otherwise, every deep-sea mining project only adds pressure on the global marine ecosystem.

The official implementation of the ecosystem approach and precautionary measures in deep-sea mining includes the development of Regional Environmental Management Plans (REMPs) in various deep-sea areas and the establishment of Marine Protected Areas (MPAs) to minimize mining impacts. This approach requires baseline ecosystem research, operational limits (e.g., sedimentation range), and emergency response plans for environmental damage. Ariningtyas highlighted that there is no uniform global legal framework integrating the precautionary principle; this lack of uniformity complicates comprehensive risk assessment in deep-sea mining. Therefore, many experts believe that a moratorium or precautionary pause is necessary until scientific criteria and legal requirements are met. At a minimum, the precautionary principle requires delaying exploitation activities until environmental impacts are measurable and mitigation technologies are adequate.

BBNJ Agreement as a Protection Mechanism

The BBNJ Agreement, adopted in June 2023, focuses on marine biodiversity conservation outside national jurisdiction. In substance, the BBNJ consists of four main pillars: international marine genetic resource management (*including benefit sharing*), the use of area-based management tools including Marine Protected Areas (MPAs), environmental impact assessment procedures, and capacity building and technology transfer (Noensie & Prasetyo, 2025). The BBNJ is designed as a supplementary agreement under the umbrella of UNCLOS that synergizes aspects of biodiversity. It does not replace the role of the ISA or the provisions of UNCLOS but enriches the international regime with a focus on high seas conservation.

The scope of the BBNJ encompasses the actions of state parties to protect the living resources of the high seas more comprehensively. For example, Article 7 of the BBNJ includes the precautionary principle, integrated management, and the ecosystem approach as general guidelines. As (De Lucia, 2024) explains, Article 7(e) of the BBNJ explicitly outlines the use of “the precautionary principle or the precautionary approach, as appropriate to the context.” This emphasizes the need for states to adhere to these principles when adopting policies related to the BBNJ. Furthermore, Article 24 of the BBNJ regulates emergency measures to combat serious threats to marine ecosystems, which can be seen as a concrete manifestation of the precautionary principle in critical situations. The BBNJ also recognizes the ecosystem approach: in addition to Article 7, Articles 7(g)–(h) emphasize an integrated approach and the restoration of marine ecosystem integrity. All BBNJ management structures are required to operate in accordance with these principles, including the governance of high seas protected areas and systematic strategic environmental impact assessments. Thus, the BBNJ provides a new normative framework for the holistic protection of the high seas, potentially strengthening the protection of deep-sea natural resources even without explicitly mentioning deep-sea mining.

Although the primary focus of the BBNJ is biodiversity, many of its provisions are relevant to other activities, including deep-sea mining. For example, Article 6 on Area-Based Management Tools (ABMTs) and MPAs can be used to establish deep-sea mining prohibition zones in order to protect sensitive ecosystems. Article 8 on Environmental Impact Assessment (EIA) regulates procedures for marine activities, broadly encompassing high seas activities. This clause could address the shortcomings of the ISA’s procedures by encouraging comprehensive environmental studies before mining permits are granted. Similarly, provisions on capacity building and technology transfer could help developing countries establish stronger domestic legal frameworks and improve oversight quality. Substantively, the principle of “do no harm” and the shared benefits contained in the BBNJ support the argument that before deep-sea mining is widely enforced by the ISA, countries need to achieve a robust environmental understanding. Many BBNJ states emphasized this in negotiations, for instance by promoting an international oversight mechanism for high seas industrial activities coordinated with the ISA. Positively, the BBNJ can complement the ISA by adding additional layers of conservation and benefit-sharing obligations, particularly those not yet covered in detail by the ISA. However, it is important to note that the BBNJ does not directly grant explicit authority to prohibit or regulate deep-sea mining under the ISA regime; its main strength lies in reinforcing conservation norms and cooperation frameworks.

The question that arises is whether the BBNJ can “*supersede*” the provisions of the ISA. According to Article 30 of the 1969 Vienna Convention on the Law of Treaties (VCLT), if a later treaty involving the same countries addresses the same subject matter, then incompatible provisions of the earlier treaty may be modified. However, the condition is that both treaties must address the same subject matter. The BBNJ was adopted under the umbrella of UNCLOS, but its primary focus is marine biodiversity, not mineral exploitation. Article 4 of the BBNJ explicitly states that this treaty “*builds on*” UNCLOS, rather than replacing its provisions. In other words, the BBNJ complements the maritime regime without eliminating the mandate of the ISA. Article 59 of the VCLT (1969) also requires all parties to both treaties to be parties to the new treaty and that a conflict of rules must exist for the previous

treaty to be repealed. These conditions are not met here: although many states are parties to both UNCLOS and the BBNJ, there are also states (e.g., the United States) that are not parties to UNCLOS but are interested in deep-sea mining. Even among countries that are party to both agreements, the scope differs (biodiversity conservation vs. mineral exploitation), making direct normative conflicts difficult to identify. Moreover, Article 34 of the VCLT states that treaties cannot create new obligations for non-ratifying states. Therefore, the BBNJ cannot be considered to replace the ISA's authority over deep-sea mining under international treaty law; it is more accurately viewed as a complementary regime that strengthens environmental requirements.

Supporters of the substitution view might argue that the BBNJ encompasses broader marine protection objectives, and therefore its conservation norms should also apply to deep-sea mining, potentially overriding some of the ISA's ecologically weaker exploitation provisions. This reasoning could invoke the principle that a *lex specialis* (*special law*) overrides a *lex generalis* (*general law*). The BBNJ, for instance, uses strong protective language, which could be interpreted as *lex specialis* for environmental matters on the high seas. Conversely, opponents emphasize the BBNJ's explicit clause that it does not amend UNCLOS. They remind us that in treaty hierarchy, UNCLOS retains superiority over the BBNJ, positioning the latter as subordinate and unable to override the ISA mechanism. From a procedural perspective, the BBNJ does not mention mineral exploitation at all, as it is considered a distinct subject; it only addresses biological and genetic resources. Thus, in formal substance, there is no legal basis for direct substitution.

Given that the BBNJ does not override the ISA's authority, alternative environmental protection options still depend on internal reforms within the ISA regime and the strengthening of national regulations. For instance, Article 24 of UNCLOS requires states to amend their domestic laws to ensure due diligence and limit liability. Sponsoring countries could tighten their own laws, following Xu's description of a two-tiered standard "*minimum and optimal*" in their domestic regulations. At the global level, environmental campaigns and public advocacy could pressure more states to temporarily suspend funding for deep-sea mining and encourage the ISA to strengthen its environmental code of conduct. If the ISA is deemed to have failed to fulfill its ecological responsibilities, some experts propose drawing inspiration from the Antarctic Treaty, which ultimately prohibited all natural resource exploitation in Antarctica demonstrating that international regimes can evolve into full bans for security, political, or environmental reasons.

In essence, while the BBNJ introduces important new policy foundations, its role is to encourage the ISA and sponsoring states engaged in deep-sea mining to enhance protection standards, rather than to legally replace the ISA. Furthermore, it should be emphasized that the BBNJ still requires widespread ratification before it enters into force. Therefore, in the short term, the BBNJ cannot directly enforce prohibitions or regulations on deep-sea exploitation. Within this discussion, the BBNJ is best seen as a catalyst for protection, ideally implemented through the ISA framework, rather than a substitute instrument that overrides the ISA's authority over deep-sea mining.

Conflict of Interest and Benefit Sharing in ISA

One sensitive issue in the ISA regime is the potential for conflicts of interest and unfair benefit sharing. Conflicts of interest arise when some sponsoring countries or ISA board members also have economic interests in deep-sea mining exploration. For example, a number of the world's largest deep-sea mining companies come from developed industrial countries, and some of them, such as Canada, sponsor exploration permits through The Metals Company in partnership with small Pacific nations. This practice resembles the flag of convenience in the shipping industry, where certain countries are chosen as sponsors due to their lax domestic regulations. Such a situation can lead sponsoring countries to prioritize short-term financial interests or business ties over strict environmental oversight. In some cases, the companies involved have pressured the ISA's decision-making process in hopes of expediting deep-sea mining regulations critics argue this puts pressure on the ISA to set aside environmental concerns in order to accelerate commercial plans. (Feichtner & Ginzky, 2024) underscore the reality of ISA policy: "ISA members today have 169 members... While some are pushing for rapid exploitation, others are calling for a moratorium." In other words, countries producing metals and advanced technology (even though the maritime territory lies legally outside their borders) support accelerating mining, while some developing countries and environmental organizations are calling for a delay. This divergence of positions has divided ISA members into interest groups.

On the benefit-sharing side, problems arise when the majority of economic gains are projected to flow to private parties or sponsoring countries, while the ISA (and other member states) receive only a small share. A report compiled by the ISA showed that the 2018 benefit-sharing proposals were met with strong protest: mining companies were projected to receive more than 70% of project proceeds, sponsoring countries about 24%, while only around 6% would flow into ISA funds for distribution to

member countries. Under this scheme, developing countries participating in the ISA are estimated to receive only tens of thousands of dollars per year, an amount disproportionate to the potential extraction worth billions. This arrangement is accused of violating the principle of the common heritage of mankind, because deep-sea mining is supposed to provide benefits across generations and countries, not primarily serve corporate conglomerates.

Empirical analysis supports this concern. Even before exploitation has begun, investors have structured their businesses to ensure benefits flow to a limited group of actors. For example, Blue Minerals Jamaica is owned by the same European investors behind The Metals Company. Likewise, Nauru established a subsidiary (NORI), but its actual ownership is tied to The Metals Company. Thus, even before the first mining results are extracted, hidden mechanisms are already in place to ensure that proceeds from deep-sea mining flow to large corporate investors. Furthermore, more than 30 exploration contracts have been issued, with dozens of mining areas reserved for later commercialization. This governance model risks allowing multiple mining sites to operate simultaneously, exacerbating cumulative ecological damage impacts that regulators have yet to fully consider.

This inequality has fueled calls for improved economic governance of deep-sea mining. Many developing countries, including groups of African states, have questioned the current regulatory model and proposed that the UN increase royalties or ISA contributions as a form of ecological rehabilitation, as mandated by UNCLOS. However, to date, no explicit, final, and agreed-upon regulations have been adopted regarding this mechanism.

The intertwined issues of benefit-sharing and conflicts of interest have prompted criticism that the current ISA regime is not sufficiently equitable. It is seen as prioritizing commercial authority and the interests of powerful sponsoring countries, while marginalizing developing states without deep-sea mining projects that nonetheless will bear the ecological burdens. Scholars and critics emphasize that if deep-sea mining is to proceed, it must be accompanied by a genuine mechanism for benefit sharing, not merely changes in ownership shares or lower taxation. Otherwise, as critics contend, the implementation of deep-sea mining without transparency and fairness will only deepen global inequality, undermining the spirit of the common heritage of mankind.

CONCLUSION

Based on the analysis conducted, several key findings were obtained that address the objectives of this study. First, the existing international maritime law regime, through the ISA, is inadequate in addressing the various environmental challenges and economic injustices created by deep-sea mining activities. The ISA regulations still leave many legal loopholes, particularly the lack of legal provisions for commercial exploitation, which creates both environmental and legal uncertainty. Second, the precautionary principle and the ecosystem approach, although recognized normatively in UNCLOS, have not been fully implemented operationally within the ISA oversight mechanism. Third, the BBNJ Agreement can strengthen the protection of high seas ecosystems through explicit provisions regarding precautionary principle obligations, area-based management, and strategic environmental impact assessments, but legally it cannot directly replace the authority of the ISA. Therefore, the primary alternative is to expedite the development of high-standard ISA exploitation regulations and encourage sponsoring countries to implement stringent national regulations. Furthermore, international pressure for a moratorium or pause on deep-sea mining exploitation until clear regulations are established is a recommended option. Overall, the BBNJ is an important complementary mechanism, but it remains insufficient without profound reform of the ISA regime and firm implementation of conservation principles by participating countries.

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