

OCEAN LAW IN TIMES OF HEALTH EMERGENCY: DEEP SEABED MINING CONTRIBUTIONS AND ITS FEAR OF OVEREXPLOITATION

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Abstract

The deep seabed has one of the most enriched biodiverse places on Earth. Scientists have found some essential biomedical breakthroughs derived from hydrothermal vents involved in treating disease outbreaks among seabed minerals. Futuristic as it may sound, new pharmaceutical discoveries pressure the International Seabed Authority (ISA) into strengthening its global rules on mining exploitation beyond areas of national jurisdiction (ABNJ). This paper presents a general evaluation of the existing legal system of deep seabed mining. It highlights that, increasingly, pharmaceutical companies are shifting to ABNJ seabed areas for exploitation, pressuring the international order for a more coherent and effective mining exploitation system for the next decade. The analysis of international legal frameworks for the Law of the Sea is notable. However, there are still substantial gaps in deep seabed mining's global governance, expected to commence soon, as ISA rushes to approve a new international mining code. The result supports a transparent mining exploitation process in ABNJ, facilitating cooperation between sectors and between countries, fostering equitable sharing, and preserving the fragile ecosystem.

Keywords : Law of the sea, UNCLOS, health emergency, Deep seabed, International Seabed Authority

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I. INTRODUCTION

The deep ocean is one of the most biodiverse environments on Earth. Amongst seabed minerals,¹ scientists have found some of the essential biomedical breakthroughs derived from hydrothermal vents, directly linked to the treatment of disease outbreaks. Therefore, the beneficial outlines of seabed microbiology species are not an unknown territory for science, as many of its components have already given us recent cancer treatments.²

¹ According to article 133 (b) UNCLOS 1982, "Resources, when recovered from the Area, are referred to as 'minerals'." See SDC of the International Tribunal for the Law of the Sea (ITLOS), *Responsibilities and Obligations of States Sponsoring Persons and Entities Concerning Activities in the Area* (Advisory Opinion) (Seabed Disputes Chamber Case No 17, 1 February 2011) [SDC Advisory Opinion 2011], para 200.

² See the usage of seabed minerals towards the pharmaceutical industry: Claire W. Armstrong,

The deep seabed comprises the ocean space beyond the continental shelf, and the Area, defined by UNCLOS as any seabed surface below 200m. It covers around 360 million km² of the Earth's surface (~50%) and represents 95% of the global biosphere in terms of inhabitable volume.³ Attempts to hold a prominent political position on deep-seabed mining have created a legal rush for rights and concessions to extract its minerals. Seabed minerals are part of the concept of humankind's common heritage, calling for the right balance between exploitation and economic development, equitable sharing of benefits, and urgent global research on new pharmaceutical developments.⁴

To halt an epidemic situation, States may resort to their natural resources to tackle basic exploratory research, derived from UNCLOS on the jurisdictional framework for managing the continental shelf. However, unleashing the enormous potential of ABNJ minerals is the new order for the next five years, as regulatory standards are being shaped once again after 1982 with the International Seabed Authority (ISA) to clarify the roles and responsibilities of the various regulators in the Area. The procedure to become a commercial drug is complex. It involves much technical assistance from searching for novel structures to produce compounds that are active against diseases to laborious and commercial processes.⁵ Newman and Cragg observe that, on average, only 10% of preclinical candidates reach Phase I clinical trials, and only one or two will become commercial drugs.⁶

The regulatory regime becomes even more problematic when it is stressed that some of the world's most prominent leaders on biotechnology and drug testing are not State-parties to UNCLOS. Therefore, they are not subjected to Part XI of the Convention. Conversely, the UN Convention introduced the notion of humankind's common heritage to safeguard resources from overexploitation under any circumstances thereof. However, one must observe that, during extraordinary circumstances as a global pandemic, and the urgent search for a new drug capable of halting the massive infection rates caused by a virus, questions about a legal framework for mining over states' sovereign

Naomi S. Foley, Robert Tinch, et al., "Services from the Deep: Steps Towards the Valuation of Deep-Sea Goods and Services," *Ecosystem Services* 2, (2012): 2–13.

³ D. Thistle, "The Deep-sea Floor: An Overview," in *Ecosystems of the World Volume 28 First Edition*, ed. P. A. Tyler (Amsterdam: Elsevier, 2003), 5–39.

⁴ See also, Jennifer Tran Le, Lisa A. Levin, and Richard T. Carson, "Incorporating Ecosystem Services into Environmental Management of Deep-Seabed Mining," *Deep-Sea Research Part 2 Topical Studies Oceanography* 137, (2017): 486–503. DOI: 10.1016/j.dsr2.2016.08.007

⁵ David J. Newman and Gordon M. Cragg, "Political, Legal, Scientific and Financial Aspects of Marine Biodiscovery Programs," in Conference on the Management of Deep-sea Fisheries FAO, 2003, 448.

⁶ *Ibid.*

jurisdiction are keen to society as a whole.

The sea's international law distinguishes exploration or exploitation, and marine scientific research (MSR), as the UNCLOS promotes different legal regimes to these occasions. The implications are multiple: One cannot pursue economic ends once it has been pursuing an MSR in the Area, as it highlights that scientific research under the auspices of the Convention can only be conducted with peaceful purposes. During an unprecedented health emergency, the laws governing the deep-sea ocean floor are pushed for a clear conception of what might constitute lawful mineral exploitation for medical purposes, even though no clear boundaries have been established on commercial intent.⁷

The Convention defines that “Activities in the Area shall be carried out for the benefit of mankind as specifically provided for in this part.”⁸ The Area shall be open to using only for peaceful purposes by all States.⁹ The International Seabed Authority (ISA) has played a dual mandate on environmental friendly seabed mineral extraction, recently announcing a Mining Code development. Today, there are 30 current exploration contracts concerning deep sea activities waiting for the approval to explore.¹⁰ Moreover, its vast, unexplored Area with rich biodiversity will be a critical geopolitical issue for the next decade as the mining code reaches a final version for publication. The ISA is gradually shaping a new international legal order for deep seabed mining, and as the corporations seek a profit-gained mechanism to legitimize their investments in the Area.

This essay intends to assess whether the exploitation of minerals for the medical purpose would follow the criteria of activities in the Area.¹¹ Given the nature, scale, and location of proposed seabed mining activities, adverse

⁷ See the discussion about Covid-19 vaccine developments and whether the access will be public and free of costs to the population in some countries. To what extent the Laws governing the regime of exploration and exploitation in the Area are prepared to deal with pandemic situations and the search of medical novel instruments in the deep-seabed in ABNJ. “The push for a COVID-19 vaccine”, Accessed 04 October 2020, https://www.who.int/emergencies/diseases/novel-coronavirus-2019/covid-19-vaccines?gclid=EAIaIQobChMIqvzL0sKa7AIVTNOyCh3fNAiOEAAAYASAAEgKyEfD_BwE.

⁸ United Nations Convention on the Law of the Sea (Montego Bay) 10 December 1982, in force 16 November 1994, 21 ILM 1261 (UNCLOS), Art. 140.

⁹ *Ibid.* Shall the International Seabed Authority “provide for the equitable sharing of financial and other economic benefits derived from activities in the Area through any appropriate mechanism, on a non-discriminatory basis, under article 160, paragraph 2(f)(i).”

¹⁰ “An Assessment of the Risks and Impacts of Seabed Mining on Marine Ecosystems,” Fauna & Flora International, accessed 21 May 2020, [www. fauna-flora.org](http://www.fauna-flora.org).

¹¹ See Note marked with (1) above, 94.

effects on biodiversity seem inevitable.¹² On the other hand, Commercial mining in national waters could start in 2020¹³, In international waters no earlier than 2025. Perhaps halting a healthy global emergency requires all research material without further ado, economic benefits arising from such seabed exploitation in ABNJ alert to infringements of international law of the sea rules on protecting marine biodiversity Article 22 of Annex III of the UNCLOS.

II. EXISTING INTERNATIONAL LEGAL REGULATION AND GUIDANCE

Exploring the seabed has been an ongoing practice for several decades. Some estimates show a global level rise of 10% by 2030 of exploratory activities on ocean floors.¹⁴ Excessive commercial exploitation of the world's mineral resources may resort to irreversible damages to the deep seabed ecosystem. Oceans have a tremendous potential to contribute to the provision of food.¹⁵ Feed and the new commodities of the technology era, as minerals essential to the sector, e.g., cobalt, are present on a large scale on the ocean floor.¹⁶

The total economic value (TEV) assessed for the deep-sea ecosystem as a whole has been estimated at 266/billion year USD in 2019, which is constituted by 92% by the economic value of abiotic resources (oil and minerals).¹⁷ The economic interest in the deep-sea ocean floor in ABNJ is estimated at 30 billion/year USD for the next years, as mining activities in the deep-sea are still under the exploratory phase.

Four major areas are economically hotspots for commercial exploitation on the ocean floor: (1) manganese (polymetallic) nodules, (2) seafloor

¹² See, for example, Pawan Patil, John Virdin, Michelle Diaz, et al., *Toward A Blue Economy: A Promise for Sustainable Growth in the Caribbean, An Overview* (Washington DC: The World Bank, 2016), 21.

¹³ "Deep-sea Mining," International Union for Conservation of Nature (IUCN), accessed 2 October 2020, <https://www.iucn.org/resources/issues-briefs/deep-sea-mining>.

¹⁴ European Commission, Communication from the Commission to the European Parliament, the Council, the European Economic, and Social Committee and the Committee of the Regions: Blue Growth - opportunities from marine and sustainable maritime growth. COM (2012): 10.

¹⁵ See on fisheries, Rashid Hassan, Robert J. Scholes, Neville Ash, "Ecosystems and Human Well-Being: Current State and Trends," (Millennium & Group, Trends, 2005), 477–511; "The State of the World Fisheries and Aquaculture," Food and Agriculture Organization of the United Nations, 2018.

¹⁶ The ISA has entered five contracts for cobalt-rich crusts in the Western Pacific Ocean.

¹⁷ "Report of the Areas Beyond National Jurisdiction Deep Sea Meeting 2019, 7–9 May 2019, Rome, Italy," Food and Agriculture Organization of the United Nations, 2019, 23.

massive (polymetallic) sulfides, (3) cobalt-rich (polymetallic) crusts, and (4) phosphorites.¹⁸ The associated ecosystem's distinctive environmental and ecological features reinforce the request to evaluate the significance of harm in the deep sea. In the 80s, side effects of harvesting the deep seabed prompted environmentalists to call for legislation protecting the environment. They feared seabed mining would begin without a law of the sea treaty to protect environmental concerns.¹⁹ The discussion on “Who shall be entitled to mine the nodules and thereby appropriate the richest of the ocean floor?; and (2) under what conditions should mining operations be carried out?” was present in the early stages of the manganese nodules discovery, although, in 1980, the economic viability of seabed mining remained unclear.²⁰

The United States, for example, enacted the Deep Seabed Hard Mineral Resources Act of 1980 (Seabed Resources Act), envisioning damages to the ocean floor, such as the suspension of lifted sediments in the water column. It may cause “the transplantation of spores or other dormant forms of organisms from one area to another, where favorable temperature, light, and oxygen conditions in the overlying water may reactivate them.”²¹

All mineral exploration and exploitation activities in the Area must be sponsored by a State Party to UNCLOS and approved by the International Seabed Authority (ISA), the UN-appointed body for dealing with activities in the Area. The Authority renders the following definition regarding the Nodules Regulations and Sulphides:

“Exploitation means the recovery for commercial purposes of polymetallic nodules in the Area and the extraction of minerals from that place, including the construction and operation of mining, processing, and transportation systems for the production and marketing of metals.”²²

¹⁸ See on each of the ecosystems mentioned above: Porter Hoagland, Stace Beaulieu, Maurice A. Tivey, et al., “Deep-Sea Mining of Massive Seafloor Sulfides,” *Marine Policy* 34, (2010): 728–732; G.P. Glasby, “Lessons Learned From Deep-Sea Mining,” *Science* 289, no. 5479 (July, 2000): 551–553; S.V. Margolis, R.G. Burns, “Pacific Deep-Sea Manganese Nodules: Their Distribution, Composition, and Origin,” *Annual Review Earth Planet Science* 4, no. 1 (1976): 229–263.

¹⁹ See J. K. McCall, “A New Combination to Davy Jones’ Locker Melee Over Marine Minerals,” *Loyola University Chicago Law Journal* 9, no. 935 (1978): 962.

²⁰ *Ibid.*

²¹ On the US legislation, see Public Law No. 96-283, 94 Stat. 553 (1980) (codified at 26 USC. §§ 4495-4498 (1982 and 30 USC. §§ 1401-1473 (1982)); Scott C. Whitney, “Environmental Regulation of United States Deep Seabed Mining,” *William & Mary Law Review* 19, no. 1 (1977): 80.

²² “International Tribunal on the Law of the Sea Finally Renders Advisory Opinion Establishing that the Precautionary Principle is Incorporated Within UNCLOS Law,” ITSSD Journal, accessed 21 May 2020, <https://itssdjournalunclos-lost.blogspot.com/2011/03/international->

ISA shall, under the regime for the Area established in Part XI and this Agreement, organize and control activities in the Area, mainly to administer the Area's resources.²³ Contractors willing to submit a proposal for the Council are subjected to the approval of a work plan for exploration, following the receipt of a recommendation on the application from the Legal and Technical Commission.²⁴ Similarly, every project of work shall be accompanied by assessing the potential environmental impacts (EIAs) of the proposed activities and a description of a program for oceanographic and baseline environmental studies. The Commission expressed concern regarding the marine environment protection on the new mining code drafting proposal, mainly how to operate such principles and approaches as the review of contractors' compliance with environmental obligations.²⁵ A member of the Council session suggested a legal-binding regional environmental management Plan (REMPs). However, many uncertainties lie in the legal definition of work plans, as scholars see it as an obligation of general international law.²⁶

The Draft regulation 47 stresses the Commission's priority to adopt a rule or a legally binding commitment of States on minimum EIA aspects. As an example, the provision of public consultations on draft EIAs as part of the approval process and the open availability of EIAs once approved; a requirement to consult with relevant coastal States; a possibility for the Commission to require that certain conditions relating to mitigation of environmental impacts are included in EMMPs.²⁷ Therefore, it is understandable that developing REMPs on the seabed as a scientific challenge to contractors, as minerals

tribunal-on-law-of-sea.html

²³ See Note marked with (5) above, UNCLOS, Annex IV, article 1, paragraph 1, of the Convention mentions the attribution of responsibility to the Enterprise, "the organ of the Authority which shall carry out activities in the Area directly, according to article 153, paragraph 2(a), and the transporting, processing and marketing of minerals recovered from the Area."

²⁴ UNCLOS, Agreement relating to the Implementation of Part XI of the United Nations Convention on the Law of the Sea of 10 December 1982, Annex, Section 01, 6. (a).

²⁵ "Comments on the draft regulations on the exploitation of mineral resources in the Area," International Seabed Authority (ISA), 6 December 2019, accessed 21 May 2020, https://rands3.s3.amazonaws.com/isa.org.jm/s3fs-public/files/documents/advance_isba_26_c_comments.pdf.

²⁶ As clarified in document ISBA/25/C/4, the REMPs are not themselves legal instruments but rather instruments of environmental policy. See *Certain Activities Carried out by Nicaragua in the Border Area (Costa Rica v Nicaragua)* and *Construction of a Road in Costa Rica along the San Juan River (Nicaragua v Costa Rica)* (Joined Cases 16 December 2015) [2015] ICJ Report ('Costa Rica v Nicaragua/Nicaragua v Costa Rica') para 104.

²⁷ See ISA, 17, 13. The first REMP for the Clarion-Clipperton Zone (CCZ) was adopted by the Council in 2012 (ISBA/18/C/22), based on the recommendation of the Legal and Technical Commission (LTC) (ISBA/17/LTC/7). Accessed 21 May 2020, <https://www.isa.org.jm/minerals/environmental-management-plan-clarion-clipperton-zone>.

are still very poorly sampled, whereas biodiversity is high and variable.²⁸ Irrespective of the Council's decision to uphold REMPs, the mining code itself shall have a clear legal definition to UNCLOS state parties. Questions remain on whether the policy instrument acts as a recommendation towards contractors or a full-operation International Treaty.

The existing international governance bodies vary in their mandates and capacities to orchestrate mineral extraction in the deep seabed. UNCLOS directs the deep seabed beyond national jurisdiction to be developed for the benefit of humankind.²⁹ It is authorized to act on behalf of humanity - in the Area's respect - solely the International Seabed Authority (ISA), safeguarding the principles enshrined under UNCLOS to include the substantial and uniform application of protecting the marine environment. At that time, exaggerated estimates on the value of deep-sea minerals projected a massive redistribution of wealth, while their exploitation's environmental implications were hardly considered. Given this adjustment, deep-sea development for humankind's benefit should be regarded as less of an obligation than an opportunity, the economic and social costs of which need to be carefully weighed against the economic and social benefits.

For seabed activities outside areas of national jurisdiction, the ISA shall ensure the adequate protection of the marine environment, particularly the need for protection from harmful effects of such activities as drilling, dredging, excavation, and the conservation of the natural resources of the Area.³⁰ It is therefore understandable that the ISA both grants exploration permits and regulates mining activities. The Managing Impacts of Deep-sea resource exploitation (MIDAS Project)³¹, funded by the European Commission, stresses the need of a regional environmental assessment, apart from the strategic environmental assessments (SEA), EIA approach, and the

²⁸ See Note (17), ISA, the Council relating to an environmental management plan for the Clarion-Clipperton Zone, ISBA/18/C/22, accessed 21 May 2020, <https://www.isa.org.jm/documents/isba18c22>>. The ISBA official guidelines for Regional Environmental Management Plans (REMPs) are accessed 21 May 2020 https://www.isa.org.jm/files/files/documents/remp_guidance_.pdf>.

²⁹ See also A. Jaeckel, J. A. Ardron, K.M. Gjerde, "Sharing Benefits of The Common Heritage of Humankind – Is The Deep Seabed Mining Regime Ready?" *Marine Policy* 70, (2016): 198–204. <http://dx.doi.org/10.1016/j.marpol.2016.03.00>. See also, Kim poses the question: "Is commercial exploitation of non-renewable resources from the ocean floor today really in the interest of humanity?" Rakhyun E. Kim, "Should deep seabed mining be allowed?" *Marine Policy* 82, (2017): 134–137. DOI: 10.1016/j.marpol.2017.05.010

³⁰ See Note marked with (5) above, Art. 145.

³¹ "Implications Of MIDAS Results For Policymakers: Recommendations For Future Regulations," Managing Impacts of Deep-sea Resource Exploitation, 2016, accessed 21 may 2020, http://www.eumidas.net/sites/default/files/downloads/MIDAS_recommendations_for_policy_lowres.pdf

Environmental Monitoring and Management Plans (EMMP).³² The existent natural risk of the operation may not impact itself, but a failure to ensure baseline assessment methods and monitoring requirements. The document goes further and lists 12 gaps in existing knowledge, including transparency standards, terms for defining functional ecological status, and the design and protection of protected areas.³³

Interestingly, Europe's regional assessments assume a format of "environmental management plan for the CCZ." The regional-scale risks may act as general guidelines for ISA on small scale operations and strengthen the scientific understanding of species' distribution and the extent of gene flow among populations.

Inconsistencies are also found in Marine Scientific Research (MSR) in the Area, as UNCLOS art. 143 (3) diverges from Art. 256 on whether non-state parties are eligible to engage in prospecting and exploration for mineral resources in the Area. Defining MSR differently from exploration, exploitation, and survey activities consistent with UNCLOS provisions as envisaged by newer legislation on the sea law since the former Convention did not define those terms.³⁴ The new Mining Code explores legislations attained to seabed mineral exploitation, not to UNCLOS provisions on MSR in the Area. As MSR may include physical oceanography, scientific ocean drilling, marine biology, and other activities with a scientific purpose, it is worth mentioning its characteristics. States willing to engage in exploitation, meaning earning economic profits from their Area activities, shall not participate in UNCLOS provisions on MSR. Further clarifications on their actions must be clear to ISA's Council and Scientific committees.

Part XIII of the Convention regulates MSR alone. Although no clear definition of its content is performed in the Area, it is expected to increase scientific knowledge of the marine environment for all humankind's benefit.³⁵ The Authority may carry out marine scientific research relating to the Area and its mineral resources and entry contracts.³⁶ The revised guide on MSR, published in 2010 by the Division for Ocean Affairs and the Law of the Sea (DOALOS), highlights that "The institutional framework for MSR in the Area, including the role and power of the Authority, was the subject of considerable

³² *Ibid.*, 25.

³³ *Ibid.*, 25-26.

³⁴ J. Ashley Roach, "Marine Scientific Research in the Area," in *Peaceful Order in the World's Oceans: Essays in Honor of Satya N. Nandan*, eds. Myron Nordquist, Michael Lodge (Amsterdam: Brill, 2014): 272.

³⁵ See Note marked with (5) above, Art. 246 (3).

³⁶ See Note marked with (5) above, Art. 143, para. 2.

discussions (...) during the Third United Nations Conference on the Law of the Sea”.³⁷

Intersections between MSR in the Area expect to hold attention to further requirements of Art. 143(3) to promote international cooperation in marine scientific research. States must be planned for “ Ensuring that they develop programs (...) for the benefit of developing States and technologically less developed States to strengthen their research capabilities, train their personnel.” As extensively exposed in the comments on the draft regulations on exploiting mineral resources in the Area, elaborating a complicated economic model and the contract’s financial terms do not create a sharing benefit system as MSR regulations on purpose. Therefore, the apparent inconsistencies regarding the definition of exploitation and MSR are sought from specific regulatory provisions.

The Draft regulations on exploitation of mineral resources in the Area³⁸ Offer a robust skeleton of environmental assessment guidelines for contractors in as much to the civil society. Perhaps ISA’s dual mandate to develop and protect the deep-sea forces the Authority³⁹ To act fiercely on a mining code that contemplates environmental considerations and avoid any allegations of interest conflicts by the Institution. As mining the deep seabed minerals for commercial purposes is still years away, the transition from exploration to exploitation remains uncertain. In the meantime, legal rules are drafted, settling the next steps towards a common ground for states to exploit the Area in conformity with international law.

In retrospect, clarifications on contractors’ legal definition include state parties, state parties acting together through an international organization, state enterprises, and natural or juridical persons.⁴⁰ Besides, the so-called extended continental shelf, under the auspices of State’s sovereign rights to exploit its natural resources, remains a challenge to define the boundary between seabed under national jurisdiction and that part of it considered Common Heritage of Mankind.⁴¹ Draft regulation 44 stresses the need to clarify several critical

³⁷ The various iterations of the draft art. One hundred forty-three are contained in Official Records of the Third United Nations Conference on the Law of the Sea, vol. IV (United Nations publication, Sales No. E.75.V.10) Part I, Art. 10; vol. V (United Nations publication, Sales No. E.76.V.8) Part I, Art. 10; vol. VIII (United Nations publication, Sales No. E.78.V.4) art. 143.

³⁸ See Note marked with (19) above.

³⁹ See J. R. Hein, “Prospects for Rare Earth Elements from Marine Minerals,” International Seabed Authority, Briefing Paper, May 2012: 2–5.

⁴⁰ *Ibid.*

⁴¹ Michael W. Lodge, Kathleen Segerson, and Dale Squires. “Sharing and Preserving the Resources in the Deep Sea: Challenges for the International Seabed Authority,” *The International Journal of Marine and Coastal Law* 32, (2017): 427-457.

elements under the legal mining regime, such as “harmful effects,” “damage to the marine environment,” “Best Available Scientific Evidence.”

In the next chapter, as the legal framework of the new Draft Regulations moves towards an approval, the subtopic on the responsibility of contractors remains vividly in the drafter’s brainbox, as consensus cannot be reached on the economic exploitation of seabed minerals in the Area.

III. RESPONSIBILITIES AND OBLIGATIONS REGARDING THE OCEAN FLOOR

The deep seabed mining involves two key actors: the contractor (who can be a state acting through an international organization, a state enterprise, or a private company), and the sponsoring country. According to UNCLOS, the ISA is the organ that decides upon the attribution of primary responsibility for deep seabed activities.⁴² The current liability regime does not directly attribute responsibility to a third actor, e.g., owner/operator of the vessel/installation or other equipment. Questions remain on whether it may be necessary to impose a certain level of liability under the Draft Resolutions of the mining code to these actors. Perhaps stringent rules on supportive operations may push third actors to take responsibility.⁴³

Legal governing structure for the Area and exploitation of its resources are found in UNCLOS and in the 1994 Agreement relating to implementing Part XI UNCLOS (the 1994 Implementation Agreement). In short, despite the reliance by the international community on the development of its laws on the slow growth of custom, there is a unique field of action in deep seabed mining, which requires a new deliberate amendment. The existing regulatory frameworks for exploring minerals in the Area attracted many critics for its concise information but densely filled with loopholes on the actor’s responsibility.⁴⁴

Art. 153 of the Convention introduces the concept of sponsoring States, although it does not specify its measures. Briefly speaking, the Convention holds a double legal approach to sponsoring the State’s responsibility, one being

⁴² See Note marked with (5) above, Art. 153 (1).

⁴³ See Michael Faure, “Attribution of Liability: An Economic Analysis of Various Cases,” *Chicago-Kent Law Review* 91, (2016): 605.

⁴⁴ The key provisions concerning the sponsoring States’ obligations are article 139, paragraph 1, article 153, paragraph 4 (especially the last sentence), and Annex III, article 4, paragraph 4, of the Convention (especially the first sentence). See David Freestone, “Responsibilities and Obligations of States Sponsoring Persons and Entities for Activities in the Area,” *The American Journal of International Law* 105, no. 4 (2011): 755.

enshrined at Art. 139 and Annex III, and the second in the 1994 Implementation Agreement. Art. 153 exempts the sponsoring country for damages' liability caused by any failure to comply with Part XI of the Convention by an entity sponsored by it under Art. 153, par. 2(b) of the Convention.

As legal scholars observe, liability in deep seabed mining may differ in certain actors' attribution approaches.⁴⁵ Strict liability on States is not commonly preferable as a legal choice, although contract parties and countries may channel sole legal obligations to one actor. It is a safe option for contract parties as the operator holds considerable and efficient control over the source of potential damage. Although, eventually, damage in the mining area, channeling liability also simplifies the victims' process.⁴⁶ Tara Davenport observes that such a legal definition may also have several adverse effects. First, the sole actor "may not have caused the damage deviated from ordinary rules on liability and hence unjust." Perhaps one liable party system" is inefficient to bear the burden of an event which could have been shared equally with other responsible parties to the cause in question.⁴⁷

Eventually, non-channeling liability in the new mining code to the operator, the Draft Resolution, imposes an obligation on several persons involved in hazardous effects on the marine environment. The redaction of the 1999 Protocol to the Basel Convention on Liability and Compensation for Damage Resulting from the Transboundary Movement of Hazardous Wastes and Their Disposal⁴⁸ It shares responsibility between different persons, and it is linked to the sphere of individual responsibility. Each section of operation, and consequently its operator, bears the burden of its actions. The Basel Protocol mentioned above only applies strict liability to the notifier and the importer or the disposer of hazardous wastes.⁴⁹

⁴⁵ See Tara Davenport, "Responsibility and Liability for Damage Arising Out of Activities in the Area: Attribution of Liability," *Center for International Governance Innovation Liability Issues for Deep Seabed Mining Series*, (2019): 2.

⁴⁶ See general, Neil Craik, "Determining the Standard for Liability for Environmental Harm from Deep Seabed Mining Activities" *Center for International Governance Innovation Liability Issues for Deep Seabed Mining Series Paper*, (2018): 23.

⁴⁷ See also Kristel de Smedt, Hui Wang, and Michael Faure, "Towards Optimal Liability and Compensation for Offshore Oil and Gas Activities" in *Civil Liability and Financial Security for Offshore Oil and Gas Activities*, ed. Michael Faure (New York: Cambridge University Press, 2016), 314.

⁴⁸ See, for example, Basel Protocol, Art. 5, "any person shall be liable for damage caused or contributed to by his lack of compliance with the provisions implementing the Convention or by his wrongful intentional, reckless or negligent acts or omissions.". Basel Protocol on Liability and Compensation for Damage Resulting from Transboundary Movements of Hazardous Wastes and their Disposal, 9 December 1999, UNTS 120(2005) art 4 (not yet entered into force).

⁴⁹ See also on the Basel Protocol, Jan Albers, Responsibility, and Liability in the Context of

In 2011, the ITLOS Seabed Disputes Chamber delivered its first Advisory Opinion on Responsibility and Liability for International Seabed Mining,⁵⁰ They are aiming at filling in the gaps left by the previously existing legal frameworks. First, the Seabed Dispute Chamber clarified the two types of obligations derived from Article 139 and Article 4 of UNCLOS's Annex III. Contractors must act with due diligence, and State parties must assist ISA and apply a precautionary approach independent of sponsoring mining operators.⁵¹ The Chamber moved forward on the definition of acting with due diligence to clarify that State parties can avoid liability by taking "all necessary and appropriate measures to secure effective compliance" by the sponsored contractor with its obligations.⁵²

Art. 139 (2) does not directly mention the Authority, but is included in the notion of "international organizations acting together shall bear joint and several liabilities."⁵³ In pursuance of section 5 of Part XI, under the current dispute settlement procedure, the Seabed Disputes Chamber (SDC) expects to act in disputes concerning activities in the Area between States Parties, between a State Party and the Authority.⁵⁴ Also, between parties to a contract, the Authority or the Enterprise,⁵⁵ state enterprises and natural or juridical persons referred to in Art. 153, paragraph 2(b).⁵⁶ Therefore, claims cannot be brought directly before the SDC against those third actors. Still, the new Draft Exploitation Regulations expect to develop further rules on a more detailed obligation on subcontractors.

UNCLOS provides for one type of liability for operators. Many other areas

Transboundary Movements of Hazardous Wastes by Sea (Berlin: Springer-Verlag, 2015): 251.

⁵⁰ See Note marked with (1) above.

⁵¹ See Note marked with (1) above, 99-140.

⁵² See Note marked with (1) above, 170-211.

⁵³ Tara highlights that, historically, "this article suggests that this term refers to a group of states acting together through an international organization (such as the IOM)." The Authority is mentioned in Part XI, which may infer that it was initially not the redactors' intention to include direct liability to the Authority in Art. 139 (2). See Note marked with (38) above.

⁵⁴ See Note marked with (5) above, Art. 187 (a): Disputes between States Parties concerning the interpretation or application of this Part and the Annexes relating to it;

⁵⁵ See Note marked with (5) above, Art. 187 (b): disputes between a State Party and the Authority concerning: (i) acts or omissions of the Authority or a State Party alleged to violate this Part or the Annexes relating to it or of rules, regulations, and procedures of the Authority adopted in accordance in addition to that; or (ii) acts of the Authority alleged to be more than jurisdiction or misuse of power;

⁵⁶ See Note marked with (5) above, Art. 187 (c) (c) disputes between parties to a contract, being States Parties, the Authority or the Enterprise, state enterprises and natural or juridical persons referred to in article 153, paragraph 2(b), concerning: (i) the interpretation or application of a relevant contract or a plan of work; or (ii) acts or omissions of a party to the contract relating to activities in the Area and directed to the other party or directly affecting its legitimate interests;

of responsibility lack a direct assessment by the Treaty, e.g., the standard of accountability (strict negligence), procedural claims, due diligence defenses, and the assessment of damages.⁵⁷ Besides, Art. 22 of Annex III provides that the ISA shall “have responsibility or liability for any loss arising out of wrongful acts in the exercise of its powers and functions, including violations under article 168, paragraph 2, account being taken of contributory acts or omissions by the contractor. Liability in every case shall be for the actual amount of damage.”⁵⁸

“Rules, regulations, and procedures shall be drawn up to secure adequate protection of the marine environment from harmful effects directly resulting from activities in the Area or shipboard processing immediately above a mine site of minerals derived from that mine site, taking into account the extent to which such harmful effects may directly result from drilling, dredging, coring and excavation and from the disposal, dumping and discharge into the marine environment of sediment, wastes or other effluents.”

Similarly, to avoid serious harm, the Legal and Technical Commission (LTC), the ISA’s advisory body, as required by UNCLOS Art. 165(2)(1), addresses ISA’s Council, any disapproved mining in areas where “substantial evidence indicates the risk of serious harm to the marine environment.” As LTC’s operative instruments are not legally binding, the Commission shall act as recommendations towards the Council, being the latter responsible for issuing emergency orders, including requests for the suspension or change of operations.⁵⁹

Potentially, mining disturbs the seafloor’s large swathes, creates noise pollution from machinery, changes to the geochemistry, and may also leave footprints in a more substantial amount. The effects on each mining site will differ. Although deep seabed mineral resources are broadly similar, the site’s deposit and physical conditions may differentiate the direct loss of habitat resulting from mining.⁶⁰ Likely, the mining process will stir up seafloor sediments, resulting in a plume of suspended particles.⁶¹ The

⁵⁷ A. Jaeckel, J. Ardron, and K. Gjerde, “Sharing benefits of the common heritage of humankind: Is the deep seabed mining regime ready?” *Marine Policy* 70, (2016): 198-204.

⁵⁸ Myron H. Nordquist, *United Nations Convention on the Law of the Sea 1982: A Commentary Volume 6*, (The Hague: Kluwer, 2002), 753.

⁵⁹ See Note marked with (5) above, Art. 162(2) (w).

⁶⁰ See also Lisa A. Levin, Kathryn Mengerink, Kristina M. Gjerde, et al., “Defining ‘Serious Harm’ to The Marine Environment in Deep Seabed Mining,” *Marine Policy* 74, (December 2016): 245–259. <https://doi.org/10.1016/j.marpol.2016.09.032>

⁶¹ See Note marked with (26) above.

Managing Impacts of Deep-sea resource exploitation (MIDAS) is a research project funded by the European Union's Seventh Programme for Research, Technological Development, and Demonstration under Grant Agreement No. 603418. It highlights that "Exploration contracts for polymetallic nodules cover extensive areas, ranging from 58,000 to 75,000 km². Exploration contracts for polymetallic sulfides are limited to 10,000 km²."⁶²

The seabed corresponds to the lowest layer of the ocean and is found in territory beyond States' jurisdiction. The remoteness and difficulty of exploring natural resources in these regions are no longer factors that contribute to maintaining their preservation, since, with advances in technology, potentially new threats are being generated to the previously unexplored ecosystem.⁶³ The creation of a new legally binding instrument in spatial planning on the seabed has already become a reality in the UNESCO Commission. It could integrate States and regional spatial planning through a coordinated sectoral organization, fulfilling the fragmentation of governance Area left the Montego Bay Convention (1982).⁶⁴

Mapping the seabed is essential in this new scientific journey in search of untapped marine resources. The promotion of scientific programs, such as Seabed 2030⁶⁵, will enable a greater systematic understanding of the seabed composition, biodiversity, and natural resources. It will have the capacity to improve the dialogue about preserving its natural habitat through more accurate scientific community knowledge. With the increasingly significant changes in its habitat due to global warming, indeed, the knowledge that we can achieve today, in scale and volume of the seabed, will be used by future generations as a way of learning.

⁶² The document goes further on the topic, "comprising a maximum of 100 blocks no larger than 100 km². Unlike existing ocean uses, deep-sea mining is a new marine activity that allows the precautionary approach to be integrated into the regulatory framework before the onset of commercial operations."

⁶³ The "seabed2030" is a collaborative project between the Nippon Foundation of Japan and the General Bathymetric Chart of the Oceans (GEBCO). The project was launched in 2017. It consists of four regional headquarters, responsible for preparing mapping activities, gathering and compiling bathymetric information, and collaborating with existing mapping initiatives in their regions. See "Seabed2030", accessed 18 August 2020 https://seabed2030.gebco.net/about_us/.

⁶⁴ Oliver Steeds is the CEO of Nekton; a non-profit research foundation highlights the importance of the "Seabed 2030" project as "Our ocean regulates the climate of our planet, provides food security for billions, produces more than half of our oxygen, captures most of our anthropogenic heat and is the largest carbon reservoir on the planet." accessed 22 August 2020 https://www.euronews.com/living/2020/06/22/what-s-at-the-bottom-of-the-sea-a-fifth-of-the-world-s-ocean-floor-has-now-been-mapped?fbclid=IwAR1RwWnLb8DTZh0GFIKEZDnyu_RovI5ykHU_rRAK1-VPCIm7jdx5zt_IrTo,

⁶⁵ *Ibid.*

It is therefore understandable that in the Area, all seabed mining-related activities are currently in the exploratory stage, and actual mining is not expected before 2025.⁶⁶ If mining happens irresponsibly, species unknown to humankind would be irreversibly lost. According to UNCLOS, it is ISA's responsibility, where mining activities may cause serious harm, to suspend, alter, or even end operations.⁶⁷ Similarly, the Authority is expected to set aside areas where mining will not be permitted, such as ensuring denial of a new application for a contract to conduct seabed mineral activities.⁶⁸

In turn, uncertainties regarding the definition of "effective protection" and "serious harm" undermine the Treaty's clearness and comprehensiveness for mining proponents. ISA may resort to FAO's guidelines on deep-sea bottom fishing on the high seas⁶⁹ As "those that compromise ecosystem integrity." However, as we will see in the following lines, the Authority's tendency to apply a similar formulation for exploration affects.

IV.COMMENTS ON THE DRAFT RESOLUTION OF THE MINING CODE

In July 2019, the Legal and Technical Commission (LTC) submitted to ISA's Council a Draft's Resolution proposal on deep-sea mining during its twenty-fifth session. The Draft addresses provisions on the approval of a Plan of Work, as a contract, further clarifies the rights and obligations of contractors and develops rules on marine environment protection.⁷⁰ The Authority's work on Operationalizing a strategic plan for environmental protection resumed in the publication of The Earth Negotiations Bulletin in 2019. ISA is pursuing several calls of proposals to clarify further to clarify guidelines on environmental compensation funds in exploiting minerals in the Area.⁷¹

Delegation of States could comment on the Draft Resolution during the

⁶⁶ Luc Cuyvers, Berry Whitney, Kristina M. Gjerde, et al., *Deep Seabed Mining: A Rising Environmental Challenge*, (Switzerland: IUCN and Gallifrey Foundation, 2018), 47.

⁶⁷ See Note marked with (5) above, Art. 162 ((2) (w) and (x) and 165 (2)(k) and (l) and Annex III Article 18). See also: "Such standards will also inform national laws and regulations for mining activities within national jurisdiction, for such rules are to be no less effective than international rules, standards, recommended practices, and procedures," Art. 208.

⁶⁸ *Ibid.*

⁶⁹ "The FAO International Guidelines for the Management of Deep-sea Fisheries in the High Seas," FAO, <http://www.fao.org/fishery/topic/166308/en>

⁷⁰ "ISA Talks Consider Development of Regulations on Deep-seabed Mining" IISD, accessed 21 May 2020, <https://sdg.iisd.org/news/isa-talks-consider-development-of-regulations-on-deep-seabed-mining/>

⁷¹ "Draft Exploitation Regulations," ISA, accessed 21 May 2020, <https://www.isa.org.jm/mining-code/ongoing-development-regulations-exploitation-mineral-resources-area>

meetings scheduled by the Authority. The redaction of Regulation n°4 allows the Commission to “recommend to the Council an emergency order, when there are clear grounds for believing that Serious Harm to the Marine Environment is likely to occur, considering the relevant Guidelines.”⁷² Critics of this Article are two-folded. On the one hand, the Guidelines mentioned above are yet to be developed. The document intends to operationalize many of the draft regulations that would need to be in place. As the Netherlands delegation mentions, there can be counted almost 50 references to “guidelines” during the Drafts’ redaction.⁷³ Besides, the regulation does not make it clear whether the emergency order “may include an order for the suspension or change of operations,”⁷⁴ and corroborates to a sense of stepping in a Resolution with no apparent legal grounds to contractors. In time, Regulation n° 54, responsible for developing the Environmental Compensation Fund, in Paragraph 2, sets “The rules and procedures of the Fund will be established by the Council on the recommendation of the Finance Committee.”⁷⁵ No other functioning procedures have been clarified, but a deadline for ISA on rules has been suggested during the negotiations.⁷⁶

The 26th Session of the International Seabed Authority, held in Kingston, 17–21 February 2020, the need to further clarify the various regulators’ roles and responsibilities (e.g., the Authority, sponsoring States and flag States) continued to be emphasized.⁷⁷ As the industry moves from the national water’s minerals exploitation to the limits beyond the continental shelf, developing standards or guidelines for protecting the marine environment has been a constant discussion topic at the Council’s meetings. The binding or non-binding legal character of regional environmental management plans also should be clarified by the Council, as some States have argued in favor of legally binding policy instruments, although it was also suggested that all matters related to environmental protection should be set out in standards.⁷⁸

The Seabed Disputes Chamber of ITLOS in 2011 highlighted the possibility of creating an “Environmental compensation fund about an

⁷² See Note marked with (63) above.

⁷³ “Draft regulations on exploitation of mineral resources in the Area (ISBA/25/C/WP.1) Comments of the Kingdom of the Netherlands” accessed 21 May 2020, <https://ran-s3.s3.amazonaws.com/isa.org.jm/s3fs-public/files/documents/netherlands.pdf>.

⁷⁴ *Ibid.*

⁷⁵ *Ibid.*

⁷⁶ *Ibid.*

⁷⁷ “Comments on the draft regulations on the exploitation of mineral resources in the Area (ISBA/26/C/2)”, *International Seabed Authority*, accessed 2 October 2020, <https://isa.org.jm/files/files/documents/26-c-2-en.pdf>.

⁷⁸ *Ibid.*

environmental liability gap that may arise.”⁷⁹ Legally, the Authority may request an allocation of a trust fund to compensate for the damage not covered. Hypothetically, suppose a contractor does not meet its liability in full, and the sponsoring State is not liable under Article 139 (2) of the Convention. In that case, the Chamber finds a suitable premise for the fund’s creation to Art 235, paragraph 3, of the UNCLOS.⁸⁰ It is analyzing the redaction of Art. 139 (2), and the “without prejudice clause” to international law rules, the Chamber unveils Art’s openness. 304 of UNCLOS⁸¹It is unnecessary to demonstrate material damage to the deep seabed to request an investigation on the sponsoring State’s liability for an eventual failure to meet its obligations, as covered by customary international law.⁸² Therefore, the new Draft Resolution is an open the door to new developments in deep seabed mining. The Chamber points out to the volatile characteristics of existing international law rules on responsibility and liability. Occasionally, the original document under the Authority’s auspices may even be correlated to the further development of new customary international law.⁸³

We are still learning about the ocean floor’s ecosystem. The lack of scientific knowledge is negotiating upon the next mining code. If information is not available to set particular ecological thresholds,⁸⁴ Key metrics help scientists argue for higher ecological limits in developing projects, such as biodiversity, abundance, habitat quality, population. Additional considerations reflect the habitat variation under the auspices of the new mining code. However, it is possible to summarize the adverse change and effects of mining the seabed floor⁸⁵ These impacts can be tested in local, regional, or global contexts. Therefore, the Draft Resolution must be mindful of each ecosystem-based and its habitat heterogeneity.

The evaluation of cumulative effects in a setting or region is also a

⁷⁹ See Note marked with (1) above, para. 205.

⁸⁰ See Note marked with (1) above, 203-206.

⁸¹ The final version of Art. 304 as follows: “The provisions of this Convention regarding responsibility and liability for damage are without prejudice to the application of existing rules and the development of further rules regarding responsibility and liability under international law,”

⁸² Yearbook of the International Law Commission 1970, p. 306.

⁸³ See Note marked with (1) above, 211.

⁸⁴ See, for example, “A Geological Model of Polymetallic Nodule Deposits in the Clarion Cliperton Fracture Zone,” *International Seabed Authority Technical Report* No. 6, 2010; Peter M. Groffman, Jill S. Baron, Tamara Blett, et al., “Ecological Thresholds: The Key to Successful Environmental Management or An Important Concept with No Practical Application?” *Ecosystems* 9, no.1 (2006):1–13.

⁸⁵ As an example: extinction, a significant decline in abundance, the decline in foundation species, reduction below critical reproductive density, loss of source populations, and loss of critical stepping-stone populations.

multifaceted impact on the new mining code to be wary. Scholars alert to the magnitude of the impact of cumulative mining activities within an area being difficult with current knowledge for the long-run future. An extensive EIA and a precautionary approach help contractors define multiple stressors related to climate change, pollution, marine litter, chemical pollution, and natural products.⁸⁶ In times of law-abiding on climate change de-escalation, allowing large-scale mining activities knowingly that it may stimulate multiple potentially harmful effects throughout- the water column seems collectively irresponsible.

V. CONCLUSION

Deep seabed mining is a complex operation from the scientific point of view as from the rules of the laws' perspective. The Authority is the primary regulator of mining operations in the Area and shares responsibility for damage arising out of their wrongful act in conjunction with the contractor. Eventually, the UN organ is not interested in bearing such a burden of a disastrous operation in a sensible ecosystem as the deep seabed. In the exercise of its powers and functions, it is expected that the Authority will guarantee that violations under Art. Twenty-two of Annex III, and Art. 168 (2) remains unviolated for the future.

The search for a cure in times of global pandemics accelerates the process of exploration of the seabed. The protection of its biodiversity is necessary in a preventive way, despite the international regulation on companies' liability for damages beyond the States' jurisdiction that can still be better elaborated. Genetic resources, as well as seabed minerals, also need attention. Both, when associated with the pharmaceutical industry, have high economic value. Therefore, the Authority's responsibilities are of high interest to the global community, which should also exercise its vigilant and protective role.

The current framework governing deep seabed mining in ABNJ is hybrid. It seeks responsibility for states, international organizations, state enterprises, and private companies. In terms of legal liability, the situation involves different civic and global concepts being applied simultaneously. Worth mentioning that recognizing the responsibility to the Authority and the sponsoring state vis-à-vis the contractor potentially raises the level of due diligence of all actors involved in the process. Although there is no imposition of liability

⁸⁶ See also C.L. Van Dover, C.R. Smith, L. Godet, "Chemosynthetic Ecosystems: understanding what is at Risk and Tools for Effective Management," in *Marine Protected Areas at the High Seas—Symposium*, London, United Kingdom, 2011.

in the current framework to third actors, such as subcontractors, agents, or persons working for the contractor, the latter could be legally responsible for the subsequent agents following the mining operation.

To this end, the new Draft Resolution intends to clarify further the attribution of liability in the bottomless seabed mining forum and the compensation regime (facing harm to the marine environment). Questions remain open on whether ISA would be responsible for paying compensation funds, and it is expected further clarification on the applicable liability rules for the Enterprise.⁸⁷ The Authority sets open communication with society to discuss the remaining controversial topics, although reconciling deep seabed mining with current high environmental protection stages seems demanding.

⁸⁷ See Note marked with (39) above.

BIBLIOGRAPHY

Journals and periodicals

- Armstrong, Claire W., Naomi S. Foley, Robert Tinch, et al. “Services from the Deep: Steps Towards the Valuation of Deep-Sea Goods and Services.” *Ecosystem Services* 2, (2012): 2–13.
- Faure, Michael. “Attribution of Liability: An Economic Analysis of Various Cases.” *Chicago-Kent Law Review* 91, (2016): 603-635.
- Freestone, David. “Responsibilities and Obligations of States Sponsoring Persons and Entities for Activities in the Area.” *The American Journal of International Law* 105, no. 4 (2011): 755-760.
- Glasby, G.P. “Lessons Learned From Deep-Sea Mining.” *Science* 289, no. 5479 (July, 2000): 551–553.
- Groffman, Peter M., Jill S. Baron, Tamara Blett, et al. “Ecological Thresholds: The Key to Successful Environmental Management or An Important Concept with No Practical Application?” *Ecosystems* 9, no.1 (2006):1–13.
- Hoagland, Porter, Stace Beaulieu, Maurice A. Tivey, et al., “Deep-Sea Mining of Massive Seafloor Sulfides.” *Marine Policy* 34, (2010): 728–732.
- Jaeckel, A., J. A. Ardron, K.M. Gjerde. “Sharing Benefits of The Common Heritage of Humankind – Is The Deep Seabed Mining Regime Ready?” *Marine Policy* 70, (2016): 198–204. <http://dx.doi.org/10.1016/j.marpol.2016.03.00>.
- Kim, Rakhyun E. “Should deep seabed mining be allowed?” *Marine Policy* 82, (2017): 134–137. DOI: 10.1016/j.marpol.2017.05.010.
- Le, Jennifer Tran, Lisa A. Levin, and Richard T. Carson. “Incorporating Ecosystem Services into Environmental Management of Deep-Seabed Mining.” *Deep-Sea Research Part 2 Topical Studies Oceanography* 137, (2017): 486– 503. DOI: 10.1016/j.dsr2.2016.08.007.
- Levin, Lisa A., Kathryn Mengerink, Kristina M. Gjerde, et al. “Defining ‘Serious Harm’ to The Marine Environment in Deep Seabed Mining.” *Marine Policy* 74, (December 2016): 245–259. <https://doi.org/10.1016/j.marpol.2016.09.032>.
- Lodge, Michael W., Kathleen Segerson, and Dale Squires. “Sharing and Preserving the Resources in the Deep Sea: Challenges for the International Seabed Authority.” *The International Journal of Marine and Coastal Law* 32, (2017): 427-457.
- Margolis, S.V., R.G. Burns. “Pacific Deep-Sea Manganese Nodules: Their Distribution, Composition, and Origin.” *Annual Review Earth Planet Science* 4, no. 1 (1976): 229–263.
- McCall, J. K. “A New Combination to Davy Jones’ Locker Melee Over Marine Minerals.” *Loyola University Chicago Law Journal* 9, no. 935 (1978): 962.
- Whitney, Scott C. “Environmental Regulation of United States Deep Seabed Mining.” *William & Mary Law Review* 19, no. 1 (1977): 77-97.

Books and book chapters

- Cuyvers, Luc, Berry Whitney, Kristina M. Gjerde, et al. *Deep Seabed Mining: A Rising Environmental Challenge*. Switzerland: IUCN and Gallifrey Foundation, 2018.
- de Smedt, Kristel, Hui Wang, and Michael Faure. “Towards Optimal Liability and Compensation for Offshore Oil and Gas Activities.” in *Civil Liability and*

- Financial Security for Offshore Oil and Gas Activities*, edited by Michael Faure. New York: Cambridge University Press, 2016.
- Hassan, Rashid, Robert Scholes, Neville Ash, et al. *Ecosystems and Human Well-Being: Current State and Trends: Findings of the Condition and Trends Working Group*, Millennium Ecosystem Assessment Series, 2005.
- Internasional Law Commission. *Yearbook of the International Law Commission 1970*. New York: United Nations, 1972.
- Nordquist, Myron H. *United Nations Convention on the Law of the Sea 1982: A Commentary Volume 6*. The Hague: Kluwer, 2002.
- Patil, Pawan, John Virdin, Michelle Diaz, et al. *Toward A Blue Economy: A Promise for Sustainable Growth in the Caribbean, An Overview*. Washington DC: The World Bank, 2016.
- Roach, J. Ashley. "Marine Scientific Research in the Area." in *Peaceful Order in the World's Oceans: Essays in Honor of Satya N. Nandan*, edited by Myron Nordquist, Michael Lodge. Amsterdam: Brill, 2014.
- Thistle, D. "The Deep-sea Floor: An Overview." in *Ecosystems of the World Volume 28 First Edition*, edited by P. A. Tyler, 5-39. Amsterdam: Elsevier, 2003.

Legal documents

- Certain Activities Carried Out by Nicaragua in the Border Area (Costa Rica v. Nicaragua), ICJ Reports 16 December 2015.
- Responsibilities and Obligations of States Sponsoring Persons and Entities concerning Activities in the Area, ITLOS Advisory Opinion on Seabed Disputes Chamber Case No 17, 1 February 2011.
- United States. *Deep Seabed Hard Mineral Resources Act*. Public Law No. 96-283 of 1980.

Web sources

- Euronews. "Plans to Map The Entire Ocean Floor by 2030 are off to A Great Start." accessed 21 May 2020, <https://www.euronews.com/living/2020/11/20/a-fifth-of-the-world-s-ocean-floor-has-now-been-mapped>.
- Fauna & Flora Internasional. "An Assessment of the Risks and Impacts of Seabed Mining on Marine Ecosystems." accessed 21 May 2020, [www. fauna-flora.org](http://www.fauna-flora.org).
- Food and Agriculture Organization of the United Nations. "The FAO International Guidelines for the Management of Deep-sea Fisheries in the High Seas." accessed 21 May 2020, <http://www.fao.org/fishery/topic/166308/en>.
- Food and Agriculture Organization of the United Nations. "The State of the World Fisheries and Aquaculture 2018." <http://www.fao.org/state-of-fisheries-aquaculture>.
- International Seabed Authority. "Draft regulations on exploitation of mineral resources in the Area (ISBA/25/C/WP.1) Comments of the Kingdom of the Netherlands." accessed 21 May 2020, <https://ran-s3.s3.amazonaws.com/isa.org.jm/s3fs-public/files/documents/netherlands.pdf>.
- International Seabed Authority. "The ISBA official guidelines for Regional Environmental Management Plans (REMPs)." accessed 21 May 2020, https://www.isa.org.jm/files/files/documents/rempe_guidance_.pdf.

- International Seabed Authority. “Comments on The Draft Regulations on The Exploitation of Mineral Resources In The Area (ISBA/26/C/2).” accessed 2 October 2020, <https://isa.org.jm/files/files/documents/26-c-2-en.pdf>.
- International Union for Conservation of Nature (IUCN). “Deep-sea Mining.” accessed 2 October 2020, <https://www.iucn.org/resources/issues-briefs/deep-sea-mining>.
- Managing Impacts of Deep-sea Resource Exploitation. “Implications Of MIDAS Results For Policymakers: Recommendations For Future Regulations.” accessed 21 May 2020, http://www.eumidas.net/sites/default/files/downloads/MIDAS_recommendations_for_policy_lowres.pdf.

Others

- Craik, Neil “Determining the Standard for Liability for Environmental Harm from Deep Seabed Mining Activities” Center for International Governance Innovation Liability Issues for Deep Seabed Mining Series Paper, 2018.
- Davenport, Tara. “Responsibility and Liability for Damage Arising Out of Activities in the Area: Attribution of Liability.” Center for International Governance Innovation Liability Issues for Deep Seabed Mining Series, 2019.
- Food and Agriculture Organization of the United Nations. “Report of the Areas Beyond National Jurisdiction Deep Sea Meeting 2019, 7–9 May 2019, Rome, Italy.”
- Hein, J. R. “Prospects for Rare Earth Elements from Marine Minerals.” International Seabed Authority Briefing Paper, May 2012: 2–5.
- International Seabed Authority. “Comments on the draft regulations on the exploitation of mineral resources in the Area.” 6 December 2019, accessed 21 May 2020, https://ran-s3.s3.amazonaws.com/isa.org.jm/s3fs-public/files/documents/advance_isba_26_c_comments.pdf.
- ITSSD Journal. “International Tribunal on the Law of the Sea Finally Renders Advisory Opinion Establishing that the Precautionary Principle is Incorporated Within UNCLOS Law.” accessed 21 May 2020, <https://itssdjournallunclos-lost.blogspot.com/2011/03/international-tribunal-on-law-of-sea.html>
- Newman, David J. and Gordon M. Cragg. “Political, Legal, Scientific and Financial Aspects of Marine Biodiscovery Programs.” in Conference on the Management of Deep-sea Fisheries FAO, 2003.
- Van Dover, C.L., C.R. Smith, and L. Godet. “Chemosynthetic Ecosystems: understanding what is at Risk and Tools for Effective Management.” In Marine Protected Areas at the High Seas–Symposium, London, United Kingdom, 2011.