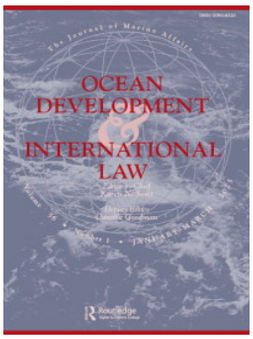

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A Pause or Moratorium for Deep Seabed Mining in the Area? The Legal Basis, Potential Pathways, and Possible Policy Implications

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ABSTRACT

The International Seabed Authority is currently negotiating regulations that will determine the future of deep seabed mining in areas beyond national jurisdiction. While some states and industry actors are interested in turning seabed mining into a reality in the near future, a sizeable number of states now support a pause or moratorium on deep seabed mining. This article examines the legal basis and potential pathways for a precautionary pause or moratorium for deep seabed mining of the international seabed "Area", should members of the International Seabed Authority choose to do so, and discusses possible unintended policy implications that could arise therefrom.

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Introduction

Deep seabed mining (DSM), the exploration and exploitation of marine minerals at depths greater than 200 m, has become a controversial topic. While some states and a few companies are hoping to start DSM in the near future, calls for a hiatus are also growing. Focusing on activities in areas beyond national jurisdiction, this article explores the legal basis, potential pathways, and possible policy implications of a precautionary pause or moratorium for DSM.

The International Seabed Authority (ISA) is currently developing rules, regulations, and procedures (the "Mining Code") for mineral exploitation of the international seabed 'Area' that lies beyond national jurisdiction, as defined in the United Nations Convention on the Law of the Sea (UNCLOS).[1] Once in force, the Mining Code will set the requisite environmental, financial, and management standards for this emerging

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[1] United Nations Convention on the Law of the Sea, adopted 10 December 1982, entered into force 16 November 1994, 1833 UNTS 3, Art 1(1)(1) [hereinafter, UNCLOS].

industry. The ISA is an intergovernmental organization through which member states administer the mineral resources of the Area.[2] The Area and its mineral resources are legally designated as the common heritage of humankind.[3] The ISA's core mandate is to act on behalf of humankind and to organize and control DSM in the Area.[4] This involves ensuring that activities in the Area benefit humankind as a whole and that the benefits are shared equitably amongst states.[5] In addition to benefit-sharing, the ISA is also required to protect the marine environment from "harmful effects that may arise" from DSM,[6] including preventing damage to marine flora and fauna.[7] To deliver on its mandate, the ISA has far-reaching competencies including regulatory, enforcement, inspection, and oversight powers.[8]

In the context of transitioning from exploration to exploitation, calls for a pause or moratorium on DSM have emerged. Indeed, such calls have increased dramatically since Nauru triggered a treaty provision (the so-called "2-year rule") in 2021 and thus imposed pressure on the ISA to finalize its exploitation regulations by July 2023.[9] That deadline has passed and the ISA is still quite a distance away from finalizing the exploitation regulations and the accompanying standards.[10] Meanwhile, the ensuing policy discussions around the possibility of a moratorium or pause in DSM have broadened to include questions about the contemporary interpretation of the ISA's mandate as set out in UNCLOS and the accompanying 1994 Implementing Agreement (which modified certain aspects in Part XI of UNCLOS relating to the Area).[11]

UNCLOS was mostly negotiated in the 1970s, a time of genuine ignorance as to the environmental risks of DSM when little was known about the deep ocean. It is now known to be highly biodiverse, with many organisms new to science.[12] Though much remains undiscovered,[13] in the intervening 50 years, scientific knowledge of the deep sea has unquestionably changed dramatically. Nevertheless, many scientists argue that in order for states to be in a position to take informed decisions on the environmental impacts of DSM, critical knowledge gaps will still need to be filled.[14]

[2] UNCLOS, Art 157(1).

[3] Ibid, Art 136.

[4] Ibid, Art 157(1). For an in-depth discussion of the ISA's mandate and competences, see A.L. Jaeckel, *The International Seabed Authority and the Precautionary Principle* (Brill Nijhoff, 2017), chapters 3, 4.

[5] UNCLOS, Art 140.

[6] Ibid, Art 145.

[7] Ibid.

[8] See, e.g., Ibid, Arts 137(2), 145, 153, 157, 160(2), 162(2).

[9] For details on the 2-year rule and its legal implications, see P.A. Singh, "The Invocation of the 'Two-Year Rule' at the International Seabed Authority: Legal Consequences and Implications" (2022) 37(3) *The International Journal of Marine and Coastal Law* 375; P.A. Singh, "What Are the Next Steps for the International Seabed Authority after the Invocation of the 'Two-Year Rule'?" (2022) 37(1) *The International Journal of Marine and Coastal Law* 152.

[10] C. Pickens, H. Lily, E. Harrould-Kolieb, et al., "From What-If to What-Now: Status of the Deep-Sea Mining Regulations and Underlying Drivers for Outstanding Issues" (2024) 169 *Marine Policy* 105967.

[11] Agreement Relating to the Implementation of Part XI of the United Nations Convention on the Law of the Sea, adopted 28 July 1994, entered into force 28 July 1996, 1836 UNTS 3 [hereinafter 1994 Implementing Agreement].

[12] G. Bribiesca-Contreras, T.G. Dahlgren, D.J. Amon, et al., "Benthic Megafauna of the Western Clarion-Clipperton Zone, Pacific Ocean" (2022) *ZooKeys* 1113.

[13] D.O. Jones, E. Simon-Lledó, D.J. Amon, et al., "Environment, ecology, and potential effectiveness of an area protected from DSM (Clarion Clipperton Zone, abyssal Pacific)" (2021) 197 *Progress in Oceanography* 102653.

[14] D.J. Amon, S. Gollner, T. Morato, et al., "Assessment of scientific gaps related to the effective environmental management of DSM" (2022) 138 *Marine Policy* 105006.

Table 1. Countries calling for some form of a pause or moratorium or ban on DSM in the Area (as of August 2024).

Type of measure	States
Precautionary pause	Austria, Brazil, Costa Rica, Chile, Kingdom of Denmark, Dominican Republic, Ecuador, Federated States of Micronesia, Fiji, Finland, Germany, Greece, Guatemala, Honduras, Ireland, Malta, Monaco, Palau, Panama, Portugal, Spain, Samoa, Sweden, Tuvalu, Vanuatu
Moratorium	Canada, Mexico, New Zealand, Peru, Switzerland, United Kingdom
Ban	France

Regarding the development and management of DSM activities, UNCLOS anticipates a specific regime for the Area and established the ISA primarily for this purpose. However, UNCLOS only provides the framework, and mandates the ISA member states to collectively work out the regulatory details and conditions under which DSM activities may occur. Consequently, it is up to ISA member states to negotiate how DSM can be effectively regulated and managed, if indeed it can be, through the development of the Mining Code.

In the context of growing calls by countries against the commencing of DSM in the Area (Table 1), this article seeks to discuss relevant previous moratoria in international law, explore why calls for a moratorium on DSM have arisen and what form they might take, conduct an academic analysis of the legal basis for a moratorium, explore potential pathways towards the adoption of one should it be seen to be necessary, and underline some policy consequences that may arise if this action is taken, before offering concluding thoughts.

The Concept of Moratoria Under International Law

International law has seen several moratoria being decided upon and imposed over previous decades. Consequently, a brief discussion of some of them and their ensuing implications in their respective contexts may offer some insights when analyzing the current proposals for a moratorium on DSM.

A moratorium is a measure that postpones, puts on hold, defers, suspends or rejects the conduct of a particular activity or transaction.[15] Under a moratorium, all applicable rights, interests, obligations, claims, responsibilities or liabilities covered under the terms of the moratorium are generally preserved with the understanding that there will be no performance, execution or enforcement, either over a certain pre-determined period or indefinitely.[16] The concept of a moratorium has its roots in domestic law, where it was, and still is, largely associated with the deferral of debts.[17] Nevertheless, the concept has been extended in international law to include the postponement or suspension of treaty rights and obligations, including the conduct of activities, such as resource exploitation.[18]

[15] W. Yin, "Moratorium in international law" (2012) 11(2) *Chinese Journal of International Law* 321.

[16] S. Asrani-Dann and P. Dann, "Moratorium" in *Max Planck Encyclopedias of International Law* (last updated March 2011) at https://opil.ouplaw.com/display/10.1093/law:epil/9780199231690/law-9780199231690-e1538 (accessed 3 December 2024).

[17] Ibid.

[18] See: ibid; Yin, note 15.

In the context of international law, a moratorium can be a unilateral, bilateral or multilateral arrangement. It can have legally binding implications on states that have agreed to it (or on member states in the case of an international organization), if this was so intended, or conversely, it can be of a non-binding nature. Typical examples of the latter are resolutions adopted by the United Nations General Assembly (UNGA),[19] and prohibitory measures that have been expressed by state parties to the arrangement as being voluntary.[20] Likewise, the effect of a moratorium is also contingent upon its very content and, as Yin identifies, can have (a) a freezing effect and (b) a reversing effect.[21] A freezing effect simply means to freeze the status quo, whereby the current state of affairs is maintained. One example is Article 4 of the 1959 Antarctic Treaty, which freezes territorial claims in Antarctica.[22] Another example is the 2000 Treaty between the United States and Mexico delimiting the continental shelf in the Gulf of Mexico, which included a 10-year moratorium on petroleum or natural gas drilling or exploitation in areas extending across the agreed boundaries of the continental shelf's transboundary reservoirs.[23] Conversely, a reversing effect connotes a prohibition on the conduct of an activity that was earlier considered as permissible or expected pursuant to an agreement; in other words, rejecting the status quo. One marine example is the moratorium on commercial whaling adopted by the International Whaling Commission (IWC) under the 1946 International Convention for the Regulation of Whaling in 1982.[24]

While there are numerous instances where a moratorium has been imposed (or proposed) under international law, four examples are presented here as relevant

[19] A prime example is the UNGA, *Moratorium on the use of the death penalty*, A/RES/62/149 (2007), A/RES/63/168 (2008), A/RES/65/206 (2010), A/RES/67/176 (2012), A/RES/69/186 (2014), A/RES/71/187 (2016), A/RES/73/175 (2018). On this point, see also the UNGA resolutions on disarmament: e.g., A/RES/2604 (1969), A/RES/48/69 (1993), A/RES/49/69 (1994), A/RES/57/59(2002), A/RES/58/51 (2003), which call for a moratorium on nuclear tests; A/RES/57/78 (2002), A/RES/58/59 (2003), A/RES/59/76 (2004), which propose a moratorium on production of material for nuclear weapons; and A/RES/48/75K (1993), A/RES/49/75D (1994), A/RES/50/70O (1995), which call for a moratorium on the export of anti-personnel landmines.

[20] See for instance the 2007 "Interim Measures Adopted by Participants in Negotiations to Establish South Pacific Regional Fisheries Management Organization" which prohibited the states participating in the negotiations from expanding their pelagic and bottom fisheries in the applicable marine region (albeit not prohibiting the conduct of fishing at existing levels). The Preamble states: "These interim measures are voluntary and are not legally binding under international law." Source: https://www.sprfmo.int/assets/Meetings/Meetings-before-2013/International-Consultations-2006-to-2009/IntCons-3-2007-Renaca-Chile/SPRFMO-Interim-Measures-Final.pdf (accessed 3 December 2024).

[21] See Yin, note 15.

[22] The Antarctic Treaty, adopted 1 December 1959, entered into force 23 June 1961 402 UNTS 71. Art 4 of the Antarctic Treaty prescribes:

1. Nothing contained in the present treaty shall be interpreted as:
   (a) a renunciation by any Contracting Party of previously asserted rights of or claims to territorial sovereignty in Antarctica;
   (b) a renunciation or diminution by any Contracting Party of any basis of claim to territorial sovereignty in Antarctica which it may have whether as a result of its activities or those of its nationals in Antarctica, or otherwise;
   (c) prejudicing the position of any Contracting Party as regards its recognition or non-recognition of any other State's right of or claim or basis of claim to territorial sovereignty in Antarctica.
2. No acts or activities taking place while the present treaty is in force shall constitute a basis for asserting, supporting or denying a claim to territorial sovereignty in Antarctica or create any rights of sovereignty in Antarctica. No new claim, or enlargement of an existing claim, to territorial sovereignty in Antarctica shall be asserted while the present treaty is in force.

[23] See Art 4 of the Treaty between the United States and Mexico on the Delimitation of the Continental Shelf in the Western Gulf of Mexico beyond 200 Nautical Miles, adopted 9 June 2000, entered into force 17 January 2001, TIAS 01-117.

[24] See Schedule 10(e) of the International Convention for the Regulation of Whaling, adopted 2 December 1946, entered into force 10 November 1948, 161 UNTS 72 [hereinafter the Whaling Convention].

owing to their parallels with DSM. Mentioned above, the moratorium on commercial whaling is analogous to DSM activities because whaling involves the exploitation of a marine resource and is governed by a treaty that established an international organization, clothing it with the specific mandate to regulate the activity.[25] However, whaling was an ongoing commercial activity that had been undertaken for over a century before coming to be internationally regulated by the IWC in the mid-20th century,[26] whereas DSM in the Area is an activity that is yet to commence and is being regulated before-the-fact. Interestingly, a proposal recommending a 10-year moratorium on commercial whaling, though not legally binding, was adopted in 1972 at the UN Conference on the Human Environment at Stockholm before one was eventually agreed to at the IWC a decade later.[27] While the whaling moratorium is binding under the Whaling Convention (though only imposed much later through an addition to a schedule of the treaty),[28] member states have the option to "opt out" from its application to them, which some have chosen to do as persistent objectors.[29]

The second example is the 2008 decision by the Conference of the Parties to the 1992 Convention on Biological Diversity (CBD)[30] urging for a moratorium on ocean fertilization,[31] and a separate similar resolution adopted later that year pursuant to the 1972 London Convention and 1996 Protocol (LCLP)[32] that prohibits ocean fertilization activities other than for legitimate scientific research.[33] These are both examples of a prohibition of a broad-scale marine activity before it has commenced commercially, and therefore are comparable to the DSM context, though the regulation of ocean fertilization is not resource-related.[34]

A third relevant example is the 1991 Protocol on Environmental Protection to the Antarctic Treaty (Madrid Protocol),[35] which includes an express 50-year (minimum)

[25] Note that the Whaling Convention explicitly refers to whales as an exploitable "resource".

[26] For an in-depth discussion of the whaling moratorium, see S. Scott, *The Political Interpretation of Multilateral Treaties* (Brill/Nijhoff, 2004), chapter 6.

[27] United Nations Conference on the Human Environment, *Stockholm Action Plan, Recommendation 33*, UN Doc. A/CONF.49/14/Rev.1 (1972).

[28] Paragraph 10(e) of the Schedule to the Whaling Convention. Arts. 1 and 5 of the Whaling Convention provide that the Schedule is an integral part of the Convention, which member states may agree to amend from time to time in order to carry out the objectives and purposes of the Convention.

[29] Source: https://iwc.int/management-and-conservation/whaling/commercial (accessed 3 December 2024).

[30] Convention on Biological Diversity, adopted 5 June 1992, entered into force 29 December 1993, 1760 UNTS 79 [hereinafter CBD].

[31] CBD, Decision IX/16.C, *Ocean Fertilization (under Biodiversity and climate change),* UNEP/CBD/COP/DEC/IX/16 (9 October 2008), which requested contracting parties and other governments to ensure that ocean fertilization activities do not take place until there is an adequate scientific basis on which to justify such activities. See also CBD, Decision X/33, *Biodiversity and climate change*, UNEP/CBD/COP/DEC/X/33 (29 October 2010) [8(w)].

[32] 1972 Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, adopted 29 December 1972, entered into force 30 August 1975, 1046 UNTS 120, and 1996 Protocol, adopted 7 November 1996, entered into force 24 March 2006, 36 ILM 1.

[33] LCLP Meeting of the Contracting Parties, *Resolution LC-LP.1 on the Regulation of Ocean Fertilization*, LC 30/16, Annex 6 (31 October 2008), in which the contracting parties agreed that ocean fertilization activities, other than legitimate scientific research, should not be allowed. They further agreed that the Resolution should be reviewed at appropriate intervals in light of new and relevant scientific information and knowledge.

[34] For a detailed discussion of these non-use measures, see K.N. Scott, "From Ocean Dumping to Marine Geoengineering: The Evolution of the London Regime" in R. Rayfuse, A. Jaeckel and N. Klein (eds), *Research Handbook on International Marine Environmental Law* (Edward Elgar Publishing, 2023), 240.

[35] Adopted 4 October 1991, entered into force 14 January 1998, 2941 UNTS 3.

mining-related moratorium in Antarctica.[36] Given that the exploitation of (marine) mineral resources in Antarctica is, similarly, an activity that is yet to commence, the current and ongoing imposition of a moratorium within that regime is exemplary.[37]

The fourth example is reflected in the 2018 Agreement to Prevent Unregulated High Seas Fisheries in the Central Arctic Ocean, which entered into force in 2021.[38] Here, the contracting parties (comprising Canada, Iceland, the Kingdom of Denmark, Norway, the United States and Russia, as well as the EU, China, South Korea and Japan), in the face of climate change and melting sea ice, agreed to refrain from engaging in commercial fishing activities in the high seas portion of the Central Arctic Ocean for an initial period of 16 years from the date of entry into force, which upon expiry extends automatically every five years unless one party objects.[39] This precedent is viewed as precautionary on the basis that it prohibits the conduct of an activity, in this case, commercial fisheries, in an area where it has never occurred.[40]

Thus, there are relevant examples of marine moratoria under international law, some of which have been applied before the activity in question has begun, and some after. However, it is worth noting that while not all calls for international moratoria end up with a moratorium, they can nonetheless be helpful in addressing some of the issues of concern. For example, calls at the UN General Assembly to adopt a moratorium on sea-bottom trawling in 2006 were met with resistance and did not pass, even though such a resolution would have been non-binding. Nevertheless, the efforts did result in other resolutions being passed requiring regional fisheries management organizations to better manage bottom fisheries, including the identification and protection of "vulnerable marine ecosystems",[41] which in turn led to a reduction of some of the harms associated with the practice of bottom trawling.[42]

The above summary demonstrates that it is not uncommon for regimes to change directions or reorder priorities, since it is up to the member states that constitute such regimes to determine the appropriate course of action for their creations. An in-depth

[36] Art 7 (entitled "Prohibition of mineral resource activities") states that "[any] activity relating to mineral resources, other than scientific research, shall be prohibited", read together with Art 25.

[37] For details on the moratorium of Antarctic mineral mining, see N.R. Kirkham, K.M. Gjerde and A.M.W Wilson, "DSM: Policy Options to Preserve the Last Frontier – Lessons from Antarctica's Mineral Resource Convention" (2020) 115 *Marine Policy* 103859.

[38] International Agreement to Prevent Unregulated Fishing in the High Seas of the Central Arctic Ocean, adopted 3 October 2018, entered into force 25 June 2021, OJ 2019, L 73/3.

[39] Arctic Council, "An Introduction To: The International Agreement to Prevent Unregulated Fishing in the High Seas of the Central Arctic Ocean", 25 June 2021, at https://arctic-council.org/news/introduction-to-international-agreement-to-prevent-unregulated-fishing-in-the-high-seas-of-the-central-arctic-ocean (accessed 3 December 2024).

[40] C. Calderwood and F. A. Ulmer, "The Central Arctic Ocean Fisheries Moratorium: A Rare Example of the Precautionary Principle in Fisheries Management" (2023) 59 *Polar Record* e1; A.N. Vylegzhanin, O.R. Young and P.A. Berkman, "The Central Arctic Ocean Fisheries Agreement as an Element in the Evolving Arctic Ocean Governance Complex" (2020) 118 *Marine Policy* 104001; V. Schatz, A. Proelss and N. Liu, "The 2018 Agreement to Prevent Unregulated High Seas Fisheries in the Central Arctic Ocean: A Critical Analysis" (2019) 34(2) *The International Journal of Marine and Coastal Law* 195.

[41] UNGA Resolution 61/105 *Sustainable fisheries, including through the 1995 Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, and related instruments* (6 March 2007), [83].

[42] A.D. Rogers and M. Gianni, *Implementation of UNGA resolutions 61/105 and 64/72 in the management of deep-sea fisheries on the high seas* (DIANE Publishing, 2011); G. Wright, J. Ardron, K. Gjerde, et al., "Advancing Marine Biodiversity Protection through Regional Fisheries Management: A Review of Bottom Fisheries Closures in Areas Beyond National Jurisdiction" (2015) 61 *Marine Policy* 134.

analysis of each of the above examples in the context of DSM is beyond the scope of this article, but would be a useful area for further scrutiny.

Calls For a Moratorium on DSM

Rationale

Against the background of previous moratoria under international law, it is timely to examine the current calls for a moratorium or precautionary pause on DSM. While the terminology is further discussed below, it suffices to say here that the outcome of a moratorium or that of a precautionary pause is largely the same—a deferral or halt in processing and approving applications that would allow deep sea mineral exploitation to commence. Both terms align with the precautionary principle (or approach), which is widely accepted in international law, and required by the ISA Mining Code.[43] The precautionary approach requires that where there are risks of environmental harm, early measures need to be taken to protect the marine environment, even if scientific uncertainties remain. These measures must be both effective in reaching the environmental objective and also proportionate to it.[44] The regulator, in this case the ISA, needs to determine which measures meet both the effectiveness and proportionality requirements. In the case of DSM, the risk of serious and irreversible harm combined with the paucity of scientific understanding is relevant to trigger the consideration of precautionary measures. As state practice demonstrates elsewhere, precaution can be used as a justification to defer activities until sufficient information about the environmental risks has been collected to allow regulators, states, and mining contractors to manage the risks.[45]

Environmental concerns are at the forefront of calls for a moratorium or precautionary pause on DSM in the Area, but there are also other contributing factors, which can be seen generally as "gaps" that need to be filled before DSM can be properly regulated, considered and permitted. They can be sub-categorized as either scientific and technical gaps, regulatory gaps, institutional and procedural gaps, or other issues related more broadly to good global governance—as summarized in Table 2. Any combination of these issues might be argued as legitimate cause for a pause; however, ISA members may hold differing views on which of these reasons are valid or pressing. Therefore, while a pause or moratorium may be agreed upon, it is unlikely that there would be universal agreement on the reasons why.

Given the varying reasons cited for a pause or moratorium, states and non-state actors are currently converging under a rather patchwork umbrella that could unravel if some of the above conditions are met in the future. It is worth noting that none

[43] See *Responsibilities and obligations of States with respect to activities in the Area*, Advisory Opinion, 1 February 2011, ITLOS Reports 2011, p. 10. The term "precautionary approach" or "principle" also features in several ISA instruments and recent draft versions of the exploitation regulations, as noted in M. Guilhon, F. Montserrat, and A. Turra, "Recognition of Ecosystem-Based Management Principles in Key Documents of the Seabed Mining Regime: Implications and Further Recommendations" (2021) 78 *ICES Journal of Marine Science* 884.

[44] A. Trouwborst, "The Precautionary Principle in General International Law: Combating the Babylonian Confusion" (2007) 16 *Review of European Community & International Environmental Law* 185–195, 188.

[45] R. Makgill, A. Jaeckel and K. MacMaster, "Implementing the Precautionary Approach for Seabed Mining: A Review of State Practice" in V. Tassin Campanella (ed), *Routledge Handbook of Deep–Sea Mining & the Law of the Sea* (Routledge, 2024) 48.

Table 2. Summary of reasons that have been used to justify a DSM pause or moratorium.

Scientific and technical gaps	
Scientific understanding	There are significant knowledge gaps regarding deep sea ecosystems, which restrict our ability to gauge the potential harm that mining could induce, and to develop adequate protective measures.[46] In particular, determining "thresholds of harm"—levels of harm deemed tolerable by humankind—requires more comprehensive scientific exploration and understanding before they can be adequately defined.[47] However, current scientific knowledge indicates that DSM will likely result in significant environmental harm,[48] including biodiversity loss.[49]
Data availability	Concurrent with the gaps in scientific knowledge is the paucity of geographically comprehensive baseline and ecological data, thereby hindering the development of environmental standards, guidelines, and impact assessments suitable for the large areas in question.[50]
Economic evaluation	A comprehensive understanding of the economic costs and benefits associated with DSM, including potential earnings, additional costs incurred by the ISA, the value of affected deep sea ecosystem services,[51] and the impacts on developing economies reliant on the export of terrestrial minerals (as required by UNCLOS),[52] is currently lacking.
Technological challenges and risk management	DSM presents significant technical challenges given the extreme conditions of the deep-sea environment (e.g., high pressures, low temperatures, and absolute darkness). Ensuring the safety of operations, managing potential equipment failures, and mitigating the risk of accidents need to be considered and addressed. Achieving cost-effective yet technologically robust monitoring systems to ensure compliance with environmental standards and guidelines is likewise difficult in the deep sea realm.
Regulatory gaps	
Regulating environmental impact	Regulating anticipated adverse environmental consequences arising from DSM activities is a paramount concern. The various causes, pathways, and durations of potentially harmful activities to deep sea ecosystems are yet to be fully comprehended, and therefore regulating them effectively, *ante facto*, is very challenging. Enforcement of standards through ISA regulations will be likewise challenging, given the remoteness of the deep sea environment and of DSM operations more generally.
Benefit-sharing mechanism	A mutually agreed-upon mechanism to share the benefits derived from the exploitation of marine resources in the Area has not been established, a central equity issue and indeed requirement under UNCLOS.[53] Initial modelling work suggests that the monetary benefits may be small, which raises several pragmatic questions,[54] not least of which is whether DSM should proceed if the shared benefits are indeed meagre or if only a handful of actors or private individuals stand to make a profit while burdens are shared disproportionately. Likewise, it remains unclear if and how economic profits (if any) would be shared equitably with humankind at large, as per UNCLOS.

(*Continued*)

[46] D.J. Amon, S. Gollner, T. Morato et al., "Assessment of Scientific Gaps Related to the Effective Environmental Management of DSM" (2022) 138 *Marine Policy* 105006.

[47] B. Hitchin, S. Smith, K. Kröger, et al., "Thresholds in DSM: A Primer for Their Development" (2023) 149 *Marine Policy* 105505.

[48] J. Hein, P. Madureira, M. Bebianno, et al., "Changes in seabed mining" in United Nations, *The Second World Ocean Assessment* (United Nations 2021), 820.

[49] H.J. Niner, J.A. Ardon, E.G. Escobar, et al., "DSM With No Net Loss of Biodiversity—An Impossible Aim" (2018) 5 *Frontiers in Marine Science* 53; C.L. Van Dover, J.A. Ardron, E. Escobar, et al., "Biodiversity Loss from DSM" (2017) 10 *Nature Geoscience* 464.

[50] M. Rabone, T. Horton, D. Jones, et al., "A Review of the International Seabed Authority Database DeepData from a Biological Perspective: Challenges and Opportunities in the UN Ocean Decade" (2023) 2023 *Database* baad013.

[51] L. Brander and V. Guisado Gõni, "Report on the value of ecosystem services and natural capital of the Area" 31 May 2023, at https://www.isa.org.jm/wp-content/uploads/2023/06/Report-on-Valuation-of-ecosystem-services.pdf (accessed 30 November 2024).

[52] International Seabed Authority "Study of the potential impact of polymetallic nodules production in the Area on the economies of developing land-based producers of those metals which are likely to be most seriously affected", Technical Study 32, 12 December 2022, available at https://www.isa.org.jm/publications/21773.

[53] UNCLOS, Art 140.

[54] D. Wilde, H. Lily, N. Craik et al., "Equitable Sharing of DSM Benefits: More Questions than Answers" (2023) 151 *Marine Policy* 105572.

Table 2. Continued.

Incomplete regulatory framework more generally	Regardless of the two-year trigger that has been driving the rush for finalisation of the regulations, the ISA requires more time. Regulations need to be responsive to the evolving understanding of deep-sea ecosystems and the potential impacts of DSM. This gap would have created a de facto pause were it not for the two-year rule having been triggered, which has created some speculation that DSM might proceed regardless. However, as argued in a recent legal opinion, it is unlikely that an incomplete ISA Mining Code would meet the whole of the requirements under UNCLOS, notwithstanding the two-year rule.[55]
Institutional and procedural gaps	
Monitoring, enforcement and compliance mechanism	Monitoring, enforcement and compliance mechanisms are required under UNCLOS[56] and critical to ensuring the success of the ISA regime, but are not yet established by the ISA. Moreover, the practical modalities and effectiveness of any potential future ISA enforcement measures are unclear given potential jurisdictional issues that could arise.
Operationalization of the enterprise	Premised on the proposal by developing states, the original Part XI of UNCLOS envisages an entrepreneurial arm of the ISA that conducts DSM on behalf of humankind. Many developing states see the Enterprise as the only means for them to directly participate in activities in the Area. Yet, in part because of the 1994 Implementing Agreement, which has amended sections of Part XI, the Enterprise is yet to enter into operation. Whether commercial DSM should proceed in the absence of an operational Enterprise is an unresolved political question.
Transparency and accountability	There is need for institutional reforms within the ISA,[57] including improvements in transparency and accountability, particularly regarding how the ISA's Legal and Technical Commission makes its decisions,[58] as well as appeal procedures. Without these attributes of good governance in place, the ISA will likely continue to face difficult questions and opposition[59] that undermine confidence in its decisions and its social legitimacy.[60]
Limited public engagement	There have been limited societal consultations, which has curtailed the inclusion of a wider range of perspectives in the decision-making process of the ISA. Lack of general awareness about the risks of DSM and a social license to operate are also related issues that require more attention. Greater involvement from different stakeholders, including civil society and marginalised groups, will be necessary to achieve balanced and inclusive DSM decisions broadly acceptable to society.[61]
Other broader issues[62]	
Consideration of alternatives	Alternatives to DSM, such as promoting a circular economy that reduces reliance on raw materials, have not been explored in international fora. Consideration of the implications of a potential "no-seabed-mining" scenario would help clarify the urgency of, or options other than, DSM.

(*Continued*)

[55] Z. Douglas, T.B. Heather-Latu, T. Fisher et al., "In the matter of a proposed moratorium or precautionary pause on DSM beyond national jurisdiction" 10 February 2023, *The PEW Charitable Trusts* at https://www.pewtrusts.org/-/media/assets/2023/03/deep-sea-mining-moratorium.pdf (accessed 30 November 2024).

[56] UNCLOS, Arts 153(4), (5), 162(2)(z), 165(2)(h).

[57] D. Bosco, A. Jaeckel and P. Singh, *Ready to Regulate? The International Seabed Authority on the Brink of Commercial Mining* (Ostrom Workshop, 2023) at https://dlc.dlib.indiana.edu/dlc/handle/10535/10897 (accessed 30 November 2024).

[58] J.A. Ardron, H.A. Ruhl and D.O.B. Jones, "Incorporating Transparency into the governance of DSM in the Area Beyond National Jurisdiction" (2018) 89 *Marine Policy* 58; K. Willaert, "Transparency in the Field of Deep Sea Mining: Filtering the Murky Waters" (2022) 135 *Marine Policy* 104840.

[59] J.A. Ardron, "Transparency in the Operations of the International Seabed Authority: An Initial Assessment" (2018) 95 *Marine Policy* 324.

[60] A. Jaeckel, H. Harden-Davies, D. J. Amon, et al., "Deep Seabed Mining Lacks Social Legitimacy" (2023) 2 *npj Ocean Sustainability* 1.

[61] E. Morgera and H. Lily, "Public Participation at the International Seabed Authority: An International Human Rights Law Analysis" (2022) 31 *Review of European, Comparative & International Environmental Law* 374; J. Ardron, H. Lily and A. Jaeckel, "Public Participation in the Governance of DSM in the Area" in R. Rayfuse, A. Jaeckel and N. Klein (eds), *Research Handbook on International Marine Environmental Law* (Edward Elgar Publishing, 2023), 240.

[62] Other issues that often arise concern the legitimacy of DSM and bigger planetary picture of where we are headed as a whole and whether DSM is the best choice at this point in time. See P. Singh, "The Two-Year Deadline to Complete the International Seabed Authority's Mining Code: Key Outstanding Matters that Still Need to be Resolved"(2021) 134 *Marine Policy* 104804.

Table 2. Continued.

Long-term implications and legacy	The potential long-term and transboundary effects of DSM, and the legacy it could leave for future generations, need to be taken into account, including issues such as potential species loss, habitat destruction, and long-term changes to ecosystem dynamics and functions, as well as how many mineral resources might remain. The principle of the common heritage of humankind requires overall benefit as a whole and that we consider not just the immediate economic benefits to current generations, but also the potential long-term and largely irreversible environmental, social, and economic implications and burdens to future generations.

of the states calling for a pause or moratorium have suggested that the development of the Mining Code should be halted. In fact, some of those states calling for a pause or moratorium have been among the more active participants in the negotiation process.[63]

Potential Form of a Moratorium on DSM in the Area

At the outset, there was historically a moratorium for DSM in the Area. The so-called 1969 UN General Assembly "Moratorium Resolution",[64] led by developing countries and fiercely contested by developed countries,[65] was passed by a vote of 62 to 28 (with another 28 abstaining). Effectively a *de jure* moratorium (albeit non-binding as it is a UN General Assembly Resolution), it contained the following terms:

> The General Assembly […]
>
> Declares that pending the establishment of [an] international regime:
>
> a. States and persons, physical or juridical, are bound to refrain from all activities of exploitation of the resources of the area of the sea-bed and ocean floor and the subsoil thereof, beyond the limits of national jurisdiction; and
> b. No claim to any part of that area or its resources shall be recognized.[66]

The 1969 Moratorium Resolution, which called for the establishment of an international regime for DSM in the Area, preceded the UNCLOS negotiations from 1973 to 1982. Subsequently, the ISA came into existence in 1994, once UNCLOS entered into force. As the ISA since its inception has been working to complete and operationalize the international regime for the Area, it may well be contended that the establishment of an international regime, as anticipated by the 1969 Moratorium Resolution, is still a work in progress.

[63] For instance, in the context of the ongoing negotiations of the regulations, Chile and Costa Rica are leading the informal working group on institutional matters and Fiji is leading the informal working group on environmental matters, while Micronesia, Germany, and the UK have led various intersessional working groups.

[64] UNGA Resolution A/RES/2574D (XXIV), *Question of the Reservation Exclusively for Peaceful Purposes of the Sea-Bed and the Ocean Floor, and the Subsoil Thereof, Underlying the High Seas Beyond the Limits of Present National Jurisdiction, and the Use of Their Resources in the Interests of Mankind* (15 December 1969) [hereinafter Moratorium Resolution]. See M.C. Wood, "International Seabed Authority: The First Four Years" (1999) 3 *Max Planck Yearbook of United Nations Law* 174.

[65] Ibid; see also M.A. Morris, *International Politics and the Sea: The Case of Brazil* (Routledge, 1979).

[66] Moratorium Resolution.

Should the ISA make a formal decision to put DSM on hold, there will need to be a common understanding among member states on the terms (e.g., scope and duration) of any such measure. The terms of such measures may differ based on the mineral deposit type, the potential harm of different extractive methods, the vulnerability of the particular ecosystem, and the level of uncertainty pertaining to all these factors. For instance, calls for a deferral of DSM might be understood as a lack of confidence in (some of) the proposed engineering techniques for extraction, which could be addressed through development of next-generation mining technologies and methods that significantly reduce the environmental impacts from footprint, plumes, noise, light, and so on. In any case, the terms of any non-absolute moratorium or pause would need to be specific enough to determine if or when they could be lifted.

In reviewing DSM discussions, we have identified six formulations of possible "non-use measures", as outlined in Table 3, which are not mutually exclusive, and could be employed in combination or sequentially.

Table 3. Potential formulations of temporary or permanent "non-use measures" as applied to DSM.

1. Boycott	A self-imposed commitment by states and/or non-state actors, including consumers, manufacturers (e.g., auto makers), financial institutions, or wholesale distributors, to refrain from dealing in deep-sea minerals.
2. Political conditionality	A self-imposed political commitment by individual states to abstain from conducting or sponsoring DSM until stipulated conditions are met (e.g., appropriate regulations are adopted by the ISA, or a given threshold of scientific knowledge is met).
3. De facto moratorium	A broad acceptance, without a formally adopted decision, by ISA member states that certain requisite legal and scientific conditions for responsible DSM management currently cannot be met, and consequently, exploitation activities should not proceed. It is possible to contend this is the existing status quo in the absence of exploitation regulations, noting also two Council decisions in July 2023 (ISBA/28/C/24 and ISBA/28/C/25), which state in their preambles: "the commercial exploitation of mineral resources in the Area should not be carried out in the absence of rules, regulations and procedures relating to exploitation".
4. Precautionary pause/recess/delay	Occupying the middle ground between *de facto* and *de jure* moratoria, a precautionary pause is a shared recognition among member states that additional time is needed to develop a defensible Mining Code (for a multiplicity of reasons—see Table 2), and following the obligation to apply the precautionary approach, appropriate measures should be imposed until then. It nonetheless presumes that the situation can be improved in the foreseeable future, and the pause may be lifted when (some or all of) the outstanding issues are perceived to have been sufficiently addressed. Such a pause could be simply a shared understanding that could be collectively upheld and reviewed, perhaps through a standing Council agenda item, or a decision by the Council or Assembly. However, unlike a *de jure* moratorium (below), its lifting would likewise only require a shared willingness to do so, rather than necessarily being dependent on specific terms and conditions or a formal assessment process.
5. (*de jure*) Moratorium	A formally adopted decision featuring explicit conditions and/or a specified timeframe, a *de jure* moratorium would halt mining activities until the stipulated conditions are assessed and met. Any decision regarding its lifting would be arrived at following a previously agreed-upon process. If time bound, it would also be reviewed at the end of that period, *sensu* the Antarctic Treaty Process.
6. Ban	A formal, indefinite or "permanent" decision to prohibit and abstain from DSM activities, which can be overturned should member states decide to revisit and reverse in future.

Legal Basis For a Pause or Moratorium on DSM

This section analyzes the possible legal basis for the imposition of a precautionary pause or moratorium at the ISA. As outlined above, UNCLOS sets out the framework for managing the Area and its mineral resources and places a number of obligations on the ISA. Conferred with jurisdiction over the common heritage of humankind and entrusted to act on behalf of humankind as a whole, such obligations of the ISA include those found in Article 145, which requires member states to take necessary measures to ensure the effective protection of the marine environment from the harmful effects of activities in the Area, as well as Article 140, requiring activities in the Area to be carried out for the benefit of humankind as a whole. If these obligations cannot currently be met, a delay in mineral mining until they can be met is *prima facie* consistent with UNCLOS. Indeed, a recent legal opinion by a group of barristers opined that until these conditions are met, "a moratorium or precautionary pause is not only consistent with UNCLOS, but is actually required by it."[67] Other legal commentators have made similar contentions, arguing that member states are legally bound to first meet a number of preconditions set by UNCLOS and the 1994 Agreement—requirements which they fulfil through the negotiation and adoption of a robust and enforceable set of rules, regulations and procedures—before allowing commercial exploitation activities to commence.[68]

In the context of ISA decision making, it should be noted that UNCLOS does not create a hierarchy amongst the ISA's various obligations. As the barristers note:

> Exploitation activities that cause significant harm to the marine environment cannot be justified by the economic benefits they bring, however overwhelming they may be. There is simply no support for such an approach in UNCLOS or the 1994 Agreement, and it conflicts with the precautionary approach.[69]

Thus, any DSM must be consistent with all of the ISA's obligations. If those obligations cannot yet be met, a temporary moratorium or pause for DSM is necessary and defensible. In this light, a *de jure* moratorium would enjoy the same legal basis as a precautionary pause, as it is essentially a temporary measure, albeit based on a decision by the regulator. However, recent ISA Assembly discussions pertaining to the proposed agenda item to discuss the possible introduction of a pause demonstrate that a *de jure* moratorium (or an indefinite ban) would likely face challenges.[70]

Indeed, counter arguments contend that a pause or moratorium might be incompatible with UNCLOS. For instance, Article 150 of UNCLOS on policies relating to

[67] Z. Douglas, T.B. Heather-Latu, T. Fisher, et al., "In the matter of a proposed moratorium or precautionary pause on DSM beyond national jurisdiction" 10 February 2023, *The PEW Charitable Trusts* at https://www.pewtrusts.org/-/media/assets/2023/03/deep-sea-mining-moratorium.pdf (accessed 3 December 2024).

[68] Such as UNCLOS, Arts 136, 137, 140 and 145, as well as Annex III, Art 17, and the 1994 Implementing Agreement, Annex, Section 1(5), among others. See P. Singh, "A 'Deadline' Expires: Quo Vadis, International Seabed Authority?" RIFS Discussion Paper, July 2023, available at https://www.rifs-potsdam.de/en/output/publications/2023/deadline-expires-quo-vadis-international-seabed-authority; and M.E. Salamanca-Aguado, "The 'Two Years Rule' and the Common Heritage of Mankind", 12 March 2024, *EJIL:Talk!* at https://www.ejiltalk.org/the-two-years-rule-and-the-common-heritage-of-mankind (accessed 3 December 2024).

[69] Douglas, Heather-Latu, Fisher, et al., note 50, [103].

[70] See the IISD Earth Negotiations Bulletin summary of ISA Assembly discussions in 2023 and 2024. Source: https://enb.iisd.org/international-seabed-authority-isa-council-28-2-28jul2023 and https://enb.iisd.org/international-seabed-authority-isa-council-29-2-summary (accessed 3 December 2024).

activities in the Area speaks of "the development of the resources of the Area" and "the expansion of opportunities for participation in such activities". Such arguments may also rely on Articles 153(1) and 157(1), which stipulate the following: "Activities in the Area shall be organized, carried out and controlled" by the ISA "with a view of administering the (mineral) resources of the Area". These provisions tend to suggest that UNCLOS was negotiated on the presupposition that exploitation activities will occur in future. However, it is worth bearing in mind that the negotiators did not have the benefit of the scientific knowledge that we now have, as well as recognizing that norms of international environmental law have developed substantially since UNCLOS was negotiated and adopted. During the negotiations of the 1994 Implementing Agreement, many observations were made regarding environmental protection[71] and the 1994 Implementing Agreement expressly recognized the "importance" of UNCLOS for the protection and preservation of the marine environment and the "growing concern for the global environment".[72] Member states agreed not only that environmental concerns would be addressed through the ISA's future rules, regulations, and procedures, but also that environmental protection should be a priority task of the ISA.[73]

Additionally, UNCLOS requires the ISA Council to "disapprove areas for exploitation […] in cases where substantial evidence indicates risks of serious harm to the marine environment."[74] This provision demonstrates the intention under UNCLOS to not allow DSM if it risks serious environmental harm. Given that current science indicates as-yet-unresolved risks of serious environmental harm, which are not site specific but encompass all DSM, this provision could offer additional legal basis for a pause or moratorium.[75]

On closer examination, it is clear that the negotiators were meticulous in ensuring that numerous safeguards are included in UNCLOS and the 1994 Implementing Agreement, demonstrating that activities in the Area should not commence until such safeguards are met.[76] In addition to Article 136 (common heritage nature of the Area and its mineral resources), Article 145 (protection of the marine environment) and Article 140 (benefit for humankind as a whole), Article 137, for example, prescribes that activities in the Area must be conducted in accordance with Part XI of UNCLOS and ISA rules, regulations and procedures, which member states will have to negotiate and agree upon in the case of future exploitation. These must include regulations for effective environmental protection as a matter of priority, which the ISA "shall concentrate on", as per the 1994 Implementing Agreement, before "the approval of the first plan of work for exploitation".[77] Given that the ISA is responsible for "administering the (mineral) resources of the Area" in accordance with Part XI, the decision

[71] D. Anderson, "Further Efforts to Ensure Universal Participation in the United Nations Convention on the Law of the Sea" (1994) 43(4) *International and Comparative Law Quarterly* 886.

[72] 1994 Implementing Agreement, Preamble.

[73] Ibid, Annex, Section 1(5)(g)–(k).

[74] UNCLOS, Art 162(2)(x).

[75] It is worth noting that UNCLOS allocates different obligations to the ISA with respect to different levels of environmental harm. For example, the ISA's general obligation is to ensure effective protection from harmful effects of DSM (Art 145), whereas the term "serious harm" is only used in UNCLOS in relation to disapproving or halting DSM. See, e.g., ISA, *Normative Environmental Thresholds for Deep-Seabed Mining—Submitted by the Delegation of Germany*, ISBA/27/C/30 (10 June 2022).

[76] See Singh, note 52; Salamanca-Aguado, note 51.

[77] See 1994 Implementing Agreement, Annex, Section 1(5)(g)–(k).

to effect a pause or moratorium should mirror UNCLOS requirements in their entirety, and give effect to their underlying spirit and intention.

In parallel, exploration contractors (i.e., prospective exploitation applicants) might argue that the introduction of measures that would hinder them transitioning to exploitation would contravene UNCLOS and the 1994 Implementing Agreement; specifically, Section 1(9) of the Annex to the latter, which anticipates the progression of contractors from exploration to exploitation.[78] That provision, however, addresses contractors and does not speak to the duties of sponsoring states and member states. When deciding whether or not to sponsor mining activities, the absence of binding regulations for exploitation is likely to be an important factor in states' considerations. Furthermore, the existence of Part XI provisions that anticipate the eventuality of commercial DSM do not preclude ISA member states from agreeing to a pause or moratorium for the time being, although member states may choose to take steps to ensure that the rights of exploration contractors are preserved over the duration of such period (e.g., through the extensions of exploration contracts).

The legal rationale for the temporary nature of a pause or moratorium can be linked, in part, to the paucity of scientific information, and consequently the current inability to assess and conduct DSM in a manner that assuredly would not harm the marine environment, as required by Article 145. That said, it leaves the possibility open that future advances in science and technology may enable DSM. In this sense, a pause or moratorium at the ISA would effectively be serving the "freezing effect" role described earlier. However, it is also possible that the more that is learned about the deep ocean, the clearer it might become that ensuring effective environmental protection while allowing DSM is increasingly unlikely. In that case, a future ban having a "reversing effect" may become conceivable, guided by both the principles of precaution and prevention[79] as well as environmental obligations under UNCLOS.

The ISA's mandate is broad and its powers and competencies are unusually far-reaching.[80] States created the ISA to collectively manage the international seabed and its mineral resources as the common heritage of humankind,[81] and as such it can be viewed as the "institutional manifestation" of the common heritage concept.[82] In this light, the role of the ISA should be understood as giving effect to the interests of humankind as a whole, rather than only particular interest groups. Some legal commentators hold the view that the ISA could expose itself to legal responses if it

[78] Section 1(9) to the Annex of the 1994 Implementing Agreement stipulates as follows: "A plan of work for exploration shall be approved for a period of 15 years. Upon the expiration of a plan of work for exploration, the contractor shall apply for a plan of work for exploitation unless the contractor has already done so or has obtained an extension for the plan of work for exploration. Contractors may apply for such extensions for periods of not more than five years each. Such extensions shall be approved if the contractor has made efforts in good faith to comply with the requirements of the plan of work but for reasons beyond the contractor's control has been unable to complete the necessary preparatory work for proceeding to the exploitation stage or if the prevailing economic circumstances do not justify proceeding to the exploitation stage."

[79] A. Trouwborst, "Prevention, Precaution, Logic and Law: The Relationship between the Precautionary Principle and the Preventative Principle in International Law and Associated Questions" (2009) 2 *Erasmus Law Review* 105, 116.

[80] For a detailed discussion, see Jaeckel, note 4, 143 onwards.

[81] UNCLOS, Arts 136, 137.

[82] A. Jaeckel, "The Area and the Role of the International Seabed Authority" in V. Tassin Campanella (ed), *Routledge Handbook of Seabed Mining and the Law of the Sea* (Routledge, 2024) 157, 157.

were to approve a mining application when circumstances indicate that such a decision may be against the better interests of humankind.[83]

ISA member states remain bound not only by UNCLOS but also by other obligations under international environmental law and human rights law.[84] A recent publication argues that at present, DSM would conflict with a host of such obligations as well as political commitments to reverse the decline in ocean health.[85] Therefore, when considering an ISA decision to commence or delay DSM, member states may wish to do so with the totality of their commitments in mind, some of which lie beyond ISA headquarters in Jamaica.[86]

This brief analysis suggests that the ISA, through its member states, can decide to not allow any exploitation activities to commence until their responsibilities under UNCLOS and international law more generally have been met.[87] As the examples introduced earlier demonstrate, it is not unprecedented for a regime created to permit an exploitative activity to change its approach, provided states find agreement through the relevant procedures. After all, international law is based on state consent and allows for changes in course if states so agree, perhaps due to changing societal values, improved knowledge, or in response to evolving international norms.

Potential Pathways Towards a Pause or Moratorium

This section is a non-exhaustive exploration of potential pathways available to the ISA should member states choose to establish a moratorium or pause.

ISA Assembly

The Assembly, being the sole organ where all member states are represented, has the power to establish general policies, in accordance with UNCLOS, on any question or

[83] See, e.g., C. Payne, "State Responsibilities for Deep Seabed Mining Obligations" in Tassin Campanella, note 65, 107, where the author argues that "international organization responsibility might be invoked if the ISA were to issue mining licenses that failed to adequately consider its international legal obligation to protect the marine environment and human life, to act on behalf of humankind as a whole, to ensure equitable sharing of economic benefits, give due regard to the rights and interests of coastal states". See also Singh, note 52, noting that "member states stand to be liable under international law for any wrongful acts or contraventions of UNCLOS provisions, primarily as the [ISA] but possibly also as individual states. This would extend to any decision to approve a mining application before the [ISA] is confident that it has met its responsibility to ensure the effective protection of the marine environment from the harmful effects of mining activities".

[84] See, e.g., E. Morgera, "Participation of Indigenous Peoples in Decision Making Over Deep-Seabed Mining" (2024) 118 *American Journal of International Law Unbound* 93; Graham J. Hamley, "The Implications of Seabed Mining in the Area for the Human Right to Health" (2022) 31 *Review of European, Comparative & International Environmental Law* 389; United Nations Office of the High Commissioner for Human Rights, *Key Human Rights Considerations on the Impact of Seabed Mining* (July 2023) at https://www.ohchr.org/sites/default/files/documents/issues/climatechange/information-materials/ohchr-seabed-mining-10-july.pdf (accessed 3 December 2024); IUCN, *Deep Seabed Mining and Human Rights Statement*, 28 March 2024 at https://www.iucn.org/resources/grey-literature/deep-seabed-mining-and-human-rights-statement (accessed 3 December 2024).

[85] P. Singh and A. Jaeckel, "Undermining by Mining? Deep Seabed Mining in Light of International Marine Environmental Law" (2024) 118 *American Journal of International Law Unbound* 72.

[86] For example: 2022 United Nations Conference to Support the Implementation of Sustainable Development Goal 14, *Our Ocean, Our Future, Our Responsibility: Draft Declaration*, UN Doc A/CONF230/2022/12 (17 June 2022), [7]; and *Our Ocean, Our Future: Call for Action,* UN Doc A/RES/71/312 (6 July 2017), Annex [5].

[87] Douglas, Heather-Latu, Fisher, et al., note 51; Singh, note 52.

matter that falls within the ISA's competence.[88] This would include policies in relation to the organization and control of activities in the Area, as well as protection of the marine environment. A general policy introduced at the Assembly would encourage full discussion by all member states present, and as such has the greatest chance of reflecting their views.

However, the Assembly must establish general policies "in collaboration with the Council".[89] This terminology in the 1994 Implementing Agreement is unspecific but suggests consultation between the two organs.[90] In practice, however, the Assembly appears to have adopted instruments establishing general policies, such as the ISA strategic plan,[91] without prior consultation with the Council.[92] Consequently, "collaboration" could be interpreted to depend upon the nature of the policy. Given that a general policy establishing a moratorium or pause will be controversial, some sort of engagement with the Council would seem likely.[93]

Indeed, the controversial nature of the topic was amply demonstrated at the ISA Assembly in July 2023 when a group of five member states submitted a proposal to include a new agenda item to debate the "Establishment of a general policy by the Assembly related to the conservation of the marine environment, including in consideration of the effects of the two-year rule", which included a draft decision to establish "a precautionary recess of exploitation activities".[94] A small number of delegations objected to including the proposed agenda item on procedural grounds and the Assembly was unable to debate the item further at that meeting.[95] The topic was revisited at the next Assembly meeting in 2024, based on a request from a group of nine member states (including the original five) to discuss "A general policy of the Authority for the protection and preservation of the marine environment".[96] The proposed item was included in the Assembly's agenda and opened for debate. While many countries welcomed the timely development of such a general policy at the Assembly, a sizeable number of states were not supportive of the process, citing reasons such as the need to first seek prior recommendations from the Council and the need to prioritise addressing environmental considerations through the Mining Code or ISA strategic plan.[97] The issue therefore remains unresolved and is likely to resurface again in 2025.

[88] UNCLOS, Art 160(1).

[89] Section 3(1) of the Annex to the 1994 Implementing Agreement.

[90] Noteworthy, however, is Section 3(4) of the Annex to the 1994 Implementing Agreement, which provides: "Decisions of the Assembly on any matter for which the Council also has competence or on any administrative, budgetary or financial matter shall be based on the recommendations of the Council. If the Assembly does not accept the recommendation of the Council on any matter, it shall return the matter to the Council for further consideration. The Council shall reconsider the matter in the light of the views expressed by the Assembly."

[91] ISA, *International Seabed Authority Strategic Plan 2019–2023* at https://www.isa.org.jm/strategic-plan (accessed 3 December 2024).

[92] P. Singh, "Deep Seabed Mining: A General Policy at the International Seabed Authority?", 10 June 2024, *EJIL:Talk!* at https://www.ejiltalk.org/deep-seabed-mining-a-general-policy-at-the-international-seabed-authority (accessed 3 December 2024).

[93] Ibid.

[94] See ISA, *Supplementary list of agenda items for the twenty-eighth session of the Assembly,* ISBA/28/A/INF/8 (27 June 2023), Annex II.

[95] See IISD (2023), note 54.

[96] See the proposal of Brazil, Chile, Costa Rica, France, Germany, Ireland, Palau, Switzerland and Vanuatu for the inclusion of a new agenda item to the provisional agenda of the twenty-ninth session of the Assembly, titled "A General Policy of the Authority for the protection and preservation of the marine environment": ISA, *Note verbale dated 19 April 2024 from the Permanent Mission of Chile to the International Seabed Authority addressed to the secretariat of the Authority,* ISBA/29/A/4 (22 April 2024), Annex.

[97] See IISD (2024), note 54.

ISA Council

The 36-member ISA Council can establish specific policies in conformity with UNCLOS and any general policies established by the Assembly.[98] The Council exercises the executive functions of the ISA and day-to-day control over activities in the Area and decides whether or not to approve applications for exploration or future exploitation activities.[99]

It would be possible for the Council to pause the commencement of exploitation activities through the establishment of a specific policy. For example, in 2012 the Council, without any involvement from the Assembly, adopted the first regional environmental management plan (REMP), which, *inter alia*, establishes areas of particular environmental interest (APEIs) that are closed to future mining applications (albeit indefinitely, not permanently).[100] Moreover, the Council must "disapprove areas for exploitation […] where substantial evidence indicates the risk of serious harm to the marine environment".[101] Hence, when faced with substantial evidence, the Council could decide to close from mining activities certain areas, such as hydrothermal vent fields, sensitive seamount areas, or particular nodule fields, until such time as specified environmental protection conditions are met.

At its July 2023 session, the Council adopted two decisions that have broad policy implications, namely, an understanding of the application of the two-year rule[102] and a revised timeline for negotiation of the Mining Code.[103] A follow-on Council decision (or Assembly, acting in collaboration with the Council, as discussed above) could agree that any exploitation applications received during the negotiation phase may be considered, but not approved until the Mining Code is adopted.

The Mining Code

States could pause the adoption or entry into force of the regulations until certain conditions are met, such as reducing specific scientific gaps relating to baselines to enable a full environmental impact assessment prior to mining. More nuanced precautionary safeguards can be inserted directly into the exploitation regulations or accompanying standards. These could be procedural (e.g., no approval of an application without a REMP for the relevant region) or substantive (e.g., relating to scientific baselines or financial and operational requirements). Since the regulations must be adopted by consensus at the Council (where a single objection would mean that the regulations cannot be adopted),[104] it is plausible that member states supportive of

[98] UNCLOS, Art 162(1).

[99] UNCLOS, Art 162(2)(l) and 1994 Implementing Agreement, Annex, Section 3(11).

[100] ISA, *Decision of the Council of the International Seabed Authority Relating to an Environmental Management Plan for the Clarion-Clipperton Zone*, ISBA/17/C/19 (21 July 2011).

[101] UNCLOS, Art 162(2)(x).

[102] See ISA, *Decision of the Council of the International Seabed Authority relating to the understanding and application of section 1, paragraph 15, of the annex to the Agreement relating to the Implementation of Part XI of the United Nations Convention on the Law of the Sea,* ISBA/28/C/25 (21 July 2023).

[103] See ISA, *Decision of the Council of the International Seabed Authority on a timeline following the expiration of the two-year period pursuant to section 1, paragraph 15, of the annex to the Agreement relating to the Implementation of Part XI of the United Nations Convention on the Law of the Sea*, ISBA/28/C/24 (21 July 2023).

[104] UNCLOS Art 161(8)(d) and (e). For a detailed explanation, see Singh, note 9.

deferring DSM would attempt to insert further safeguards into the exploitation regulations, while member states in favour of immediate DSM may not agree, which could end up in delays in passing the Mining Code.

Other Processes

There are other avenues that could be potential pathways towards deciding a pause or moratorium at the ISA. One such option could be through an amendment of UNCLOS and the 1994 Implementing Agreement, or through a new implementing agreement, while another option could be to pursue a pause or moratorium through judicial avenues. In addition, (groups of) ISA member states could agree to not conduct or sponsor exploitation activities under the ISA regime, which would fail to meet the universality requirement of a moratorium but would nonetheless send a strong political message, and may act as a prelude to a pause or moratorium. This does not appear to be politically realistic at this point in time and will hence not be discussed here. The following non-exhaustive list offers additional plausible pathways through which the ISA or its member states may consider a pause or moratorium.

UNCLOS Article 154 Review. The ISA is required under UNCLOS to conduct a periodic review of the operation of the regime every five years, and one is currently overdue. In 2023, the Assembly agreed to revisit the convening of the next periodic review of the ISA during its following meeting in mid-2024. In determining the terms of reference for the next Article 154 review, the Assembly could request an assessment of the readiness of the ISA to properly manage exploitation activities, which could lead to a pause on mining activities until the ISA's readiness is established.

UNCLOS Article 155 Review Conference. The Assembly is also empowered under UNCLOS, on the recommendations of the Council, to convene at any time a review conference of the ISA to ensure its work is in conformity with fundamental principles under Part XI, including the common heritage of humankind principle.[105] Notably, Article 155 does require the review conference to "ensure the maintenance of […] the international regime designed to ensure equitable exploitation of the resources of the Area for the benefit of all countries"[106] and cannot "affect rights acquired under existing contracts".[107] In contrast to the review under Article 154, which has occurred once before (despite being legally required every five years), the convening of a review conference under Article 155 is a major exercise that has not yet been contemplated by the ISA. Recommendations arising from a review conference, however, would carry considerable political weight and might lead to the introduction of a pause or moratorium.

[105] See also 1994 Implementing Agreement, Annex, Section 4.
[106] UNCLOS, Art 155(2).
[107] UNCLOS, Art 155(5).

Meeting of the State Parties to UNCLOS. Member states can consider discussing DSM and the ISA at the Meetings of the States Parties to UNCLOS (SPLOS).[108] Currently, some states believe that the SPLOS meetings should be restricted to formal matters and not used for discussing related issues (although attitudes could change in the future).[109] Unlike the above two review options, SPLOS offers a platform independent of the ISA to consider whether the direction of the ISA is consistent with the vision and objectives of UNCLOS and norms and expectations of contemporary international (environmental and human rights) law. Given the use of moratoria in other international fora, it might find favour here as well.

UN General Assembly. States, including non-parties to UNCLOS, could table a resolution at the UN General Assembly concerning when, and under what conditions, a pause or moratorium may be an appropriate tool in the management of humanity's shared mineral resources. Although such a resolution, if passed, would not have a binding effect, it would certainly send a strong signal to the ISA.

Other International Agreements, Arrangements and Processes. Other international agreements, arrangements and processes can also play a role. In recent years, EU decision-making organs have called for a moratorium on DSM and urged EU member states to pursue one at the ISA.[110] In September 2021, the World Conservation Congress of the International Union for Conservation of Nature (IUCN) overwhelmingly adopted a resolution calling for a DSM moratorium.[111] In December 2022, the parties to the CBD reached a decision calling for DSM exploitation activities to be postponed until certain conditions are met.[112] Likewise, in February 2024, parties to the Convention on Migratory Species[113] passed a resolution on DSM and expressed their concerns about the potential impacts on migratory species.[114] Such developments elsewhere, whether regional or global, reflect a breadth of views not always present at the ISA. While there may be resistance in other fora to discussions relating to DSM or any potential overstepping of the ISA's mandate over the mineral resources in the Area, these other processes also possess mandates relating to the protection and conservation of the marine environment, for which DSM poses concerns that may warrant the attention of state parties to those processes.[115]

[108] The Meetings of the States Parties to the 1982 United Nations Convention on the Law of the Sea (SPLOS). Source: https://www.un.org/depts/los/meeting_states_parties/meeting_states_parties.htm (accessed 3 December 2024).

[109] United Kingdom House of Lords International Relations and Defence Committee Inquiry, *UNCLOS: the Law of the Sea in the 21st Century* (2022), available at https://committees.parliament.uk/publications/9005/documents/159002/default/(accessed 3 December 2024).

[110] P. Singh, V. Tassin, and F. Maes, "European Union and Seabed Mining" in Tassin Campanella, note 66, 290, 307–310.

[111] IUCN, *Protection of Deep-Ocean Ecosystems and Biodiversity through a Moratorium on Seabed Mining*, WCC-2020-Res-122-EN (22 September 2021).

[112] See CBD, Decision 15/24, *Conservation and Sustainable Use of Marine and Coastal Biodiversity*, CBD/COP/DEC/15/24 (19 December 2022) [16].

[113] Convention on the Conservation of Migratory Species of Wild Animals, adopted 23 June 1979, entered into force 1 November 1983, 1651 UNTS 333 [hereinafter CMS].

[114] See CMS, *Deep-Seabed Mineral Exploitation Activities and Migratory Species*, UNEP/CMS/Resolution 146, (February 2024).

[115] Further exploring the potential powers and influence of these processes external to the ISA is useful but beyond the scope of this article. See, e.g., Singh and Jaeckel, note 69.

Other Processes Under the Auspices of the UN. Other UN processes also provide platforms for discussing DSM and the appropriateness of a pause or moratorium. These include the UN Agenda 2030 and the Sustainable Development Goals,[116] the UN Ocean Conference,[117] the UN Decade for Ocean Science,[118] the UN Open-ended Informal Consultative Process on Oceans and the Law of the Sea (the Consultative Process),[119] and the UN Regular Process for Global Reporting and Assessment of the State of the Marine Environment, including Socioeconomic Aspects (the Regular Process).[120] These processes include but are not limited to environmental concerns, and can also weigh in on the wider implications of DSM, such as ocean equity and human rights. Indeed, UN officials have published a statement on the human rights implications of DSM[121] as well as an open letter urging changes to the ISA's draft regulations thereof.[122] Though soft and non-binding in nature, external initiatives undertaken through UN processes can send nudges to ISA member states and build pressure to take decisive action at the ISA. As noted earlier, a non-binding moratorium on whaling was initially passed at the UN Conference on the Human Environment at Stockholm in 1972, before one was adopted at the IWC some ten years later.

Unintended Consequences

It is well established in the governance literature that policy and legal interventions can have unintended consequences, both positive and sometimes alarmingly negative, which can weaken or worsen the outcome that the intervention was supposed to correct.[123] Some possibilities, negative and positive, are discussed below. Being *unintended* they are also *somewhat difficult to predict*, meaning that this section should be read in the spirit of policy exploration—a mixture of current reality and hypothetical futures.

[116] United Nations 2030 Agenda for Sustainable Development. Source: https://sdgs.un.org/goals (accessed 3 December 2024).

[117] United Nations Decade of Ocean Science for Sustainable Development 2021-2030. Source: https://oceandecade.org/(accessed 3 December 2024).

[118] United Nations Ocean Conference 2025. Source: https://sdgs.un.org/conferences/ocean2025 (accessed 3 December 2024).

[119] United Nations Open-ended Informal Consultative Process on Oceans and the Law of the Sea. Source: https://www.un.org/depts/los/consultative_process/consultative_process.htm (accessed 3 December 2024).

[120] United Nations Regular Process for the Global Reporting and Assessment of the State of the Marine Environment, Including Socio-Economic Issues. Source: https://www.un.org/regularprocess (accessed 3 December 2024).

[121] United Nations Office of the High Commissioner for Human Rights, note 68.

[122] Open Letter by the Working Group on the issue of human rights and transnational corporations and other business enterprises, the Special Rapporteur on the implications for human rights of the environmentally sound management and disposal of hazardous substances and wastes and the Special Rapporteur on the issue of human rights obligations relating to the enjoyment of a safe, clean, healthy and sustainable environment to the International Seabed Authority, 15 March 2024, at https://www.ohchr.org/sites/default/files/documents/issues/business/activities/2024-03-15-open-letter-to-isa.pdf (accessed 3 December 2024).

[123] K. Lambert and C.J. Coyne, *Unintended Consequences*, GMU Working Paper in Economics No. 22-36 (22 July 2022), available at https://ssrn.com/abstract=4170219. See also R.K. Merton, "The Unanticipated Consequences of Purposive Social Action" (1936) 1 *American Sociological Review* 894 (as cited by Lambert and Coyne, ibid, 4), who highlights lack of knowledge, error, and "imperious immediacy of interest" as the three major factors underlying unanticipated negative consequences, each of which could be applicable to the governance of DSM.

The Two-Year Rule and the Increased Calls For a Moratorium. The first unintended outcome of the moratorium debate is arguably the debate itself. Until the two-year rule was invoked in 2021, calls for a moratorium were limited to a few environmental NGOs and high-profile environmentalists.[124] However, the triggering of the two-year rule changed all that, leading to increasing calls for a moratorium by the IUCN, followed by a growing number countries (depicted in Table 1). With the two-year limit now reached, fear that DSM might well commence without a robust regulatory framework has fuelled both urgency and concern.[125] The pressure created by the need to finalize regulations by July 2023 ironically led to the above-mentioned motion to discuss a pause, which was proposed for debate at the ISA meeting that very month, with this context explicitly stated in the rationale and title of the proposal.[126] Therefore, without the invocation of the two-year rule, which was meant to hurry up DSM, it is unlikely that this motion—and growing sentiment—to pause DSM would have been put forward.

A Moratorium Would Hamper the Green Energy Transition. An oft-made argument in favour of DSM is that it is needed to meet metal demand arising from the global energy transition towards renewables.[127,128] However, terrestrial mining "majors" (such as Glencore, Jiangxi Copper, BHP Group, and Rio Tinto)[129] are not directly invested in DSM, which suggests that they do not yet see a competitive threat or need to diversify into DSM. Rio Tinto, in a recent announcement, has explicitly stated that it does not currently support seabed mining.[130] Furthermore, over the past five years,

[124] The Deep-Sea Conservation Coalition was one of the earliest voices calling for a moratorium (e.g., https://deep-sea-conservation.org/solutions/no-deep-sea-mining (accessed 3 December 2024).

[125] The two-year deadline has stirred up media interest; e.g., K. McVeigh and C. Michael, "Future of DSM hangs in balance as opposition grows" 8 July 2023, *The Guardian* at https://www.theguardian.com/environment/2023/jul/08/future-of-deep-sea-mining-hangs-in-balance-as-opposition-grows (accessed 3 December 2024).

[126] The rationale for the proposed pause discussion in 2023 noted as follows: "The 'two-year rule', triggered under section 1(15), subparagraph (c) of the Annex to the [1994 Implementing Agreement], has raised significant challenges for the functioning of the Authority and the actions that can take place under its mandates." See the proposal of the Republic of Chile, Costa Rica the Republic of France, the Republic of Palau, and the Republic of Vanuatu on a new agenda item to be incorporated at the twenty-eighth session of the Assembly, titled "Establishment of a general policy by the Assembly related to the conservation of the marine environment, including in consideration of the effects of the 'two -year rule'": ISA, *Supplementary list of agenda items for the twenty-eighth session of the Assembly,* ISBA/28/A/INF/8, 27 June 2023, Annex II.

[127] The Metals Company, which was often quoted by media on this issue, now presents a more nuanced view in its FAQs: "While there may be technically enough metal-bearing deposits on land to meet future demand, those resources can only be extracted at increasingly high economic, social, and environmental cost. We believe that polymetallic nodules could contribute to supplying metal resources and alleviate some of the pressures on fragile terrestrial ecosystems." Source: The Metals Company, https://metals.co/frequently-asked-questions (accessed 3 December 2024).

[128] Analyses of critical minerals typically only look at known terrestrial reserves and do not account for possible future ocean resources. In one highly-cited study, referenced below, vanadium was identified as a "distinctly critical" metal. However, vanadium is not commonly found in the seabed (though ironically, it can be found as a byproduct in petroleum residue). K. Tokimatsu, M. Höök, B. McLellan, et al., "Energy Modeling Approach to the Global Energy-Mineral Nexus: Exploring Metal Requirements and the Well-Below 2 C target with 100 Percent Renewable Energy" (2018) 225 *Applied Energy* 1158. See also: K.A. Miller, K. Brigden, D. Santillo, et al., "Challenging the Need for Deep Seabed Mining from the Perspective of Metal Demand, Biodiversity, Ecosystems Services, and Benefit Sharing" (2021) 8 *Frontiers in Marine Science* 706161.

[129] M. Johnston, "10 Biggest Mining Companies" 7 June 2023, *Investopedia* at https://www.investopedia.com/biggest-mining-companies-5077594 (accessed 3 December 2024).

[130] Rio Tinto, "Our position on deep-sea mining", 8 November 2023 at https://www.riotinto.com/en/news/trending-topics/deep-sea-mining (accessed 3 December 2024).

metal and mineral commodity prices have, in general,[131] not been rising as would be expected if they were coming into short supply in the immediate future,[132] all of which suggests that a *short-term* DSM pause or moratorium might not have much impact on the green transition.

> Whether a medium- to longer-term moratorium or pause in DSM production would be sufficient to stymie future green transitions remains unanswered, but will hinge on economics; that is, whether DSM would result in significantly lower commodity prices than otherwise. DSM capital and operating expenses cannot yet be accurately predicted as they will depend on technologies that are still immature, environmental actions contractors will need to take,[133] the royalty rates set by the ISA,[134] and the quantum needed to compensate metal exporting developing states.[135] However, lower commodity prices may come with other costs, as discussed below.

DSM and a Moratorium Could Affect Terrestrial Mining Practices. An unintended consequence of new DSM metals entering the marketplace in sufficient quantities to drive down commodity prices could be an environmental and labour "race to the bottom" to reduce existing terrestrial mining costs. In effect, this would mean that allowing DSM to commence could result in an increase of terrestrial mining negative impacts, as opposed to reducing them as some DSM proponents suggest.[136] On the other hand, a DSM pause or moratorium, with associated higher commodity prices, might provide an opportunity for terrestrial mining to invest in improved practices. Moreover, higher commodity prices that some proponents are predicting as a result of a pause or moratorium might have the unintended but positive effect of encouraging reduced consumption, increased product re-use, metals recycling and recovery from terrestrial tailings and other sources, thus incentivising greater efficiencies in current industrial loops.

Geopolitical Risk and "Critical" DSM Minerals. Increasing the diversity of sources of metals and minerals, such as from the deep sea, reduces the geopolitical risk associated with a major producer withholding certain ones from other countries; i.e. the risk of near-monopolies. A DSM pause or moratorium could increase such risk. In 2012, a World Trade Organization (WTO) dispute settlement was launched against

[131] Lithium prices, on the other hand, have soared based on projected electric vehicle demand. Not a potential product of DSM, lithium is currently extracted from ores and brine on land. However, in the future it could also be extracted from seawater (i.e., outside of the competence of the ISA, which is limited to the Area): S. Yang, F. Zhang, H. Ding, et al., "Lithium Metal Extraction from Seawater" (2018) 2 *Joule* 1648.

[132] The World Bank's aggregated Metals & Minerals Price Index (I:MMPI) has shown recovery from a low in April 2020, but as of October 2024 has dropped since a high in March 2022 and largely plateaued. Source: https://ycharts.com/indicators/metals_and_minerals_index_world_bank (accessed 30 December 2024).

[133] S. Petersen, A. Krätschell, N. Augustin, et al., "News from the Seabed—Geological Characteristics and Resource Potential of Deep-Sea Mineral Resources" (2016) 70 *Marine Policy* 175; R. Sumaila, L. Alam, K. Pradhoshini, et al., "To Engage in Deep-Sea Mining or Not to Engage: What Do Full Net Cost Analyses Tell Us?" (2023) *npj Ocean Sustain* 2, 19.

[134] D. Wilde, H. Lily, N. Craik, et al., "Equitable Sharing of DSM benefits: More Questions than Answers" (2023) 151 *Marine Policy* 105572.

[135] UNCLOS, Arts 150(h), 151(10), 164; 1994 Implementing Agreement, Annex, Section 7.

[136] P. Singh "Deep Seabed Mining and Sustainable Development Goal 14" in W. Leal Filho, A.M. Azul, L. Brandli, et al. (eds), *Life Below Water. Encyclopedia of the UN Sustainable Development Goals* (Springer, Cham, 2021).

China with regard to quotas it had set in 2010 on rare earth elements (REEs), as well as tungsten and molybdenum.[137] In the intervening two years, the markets responded. The spike in REE prices incentivised mines outside of China to re-open. Molycorp's (USA) now infamous "Project Phoenix" was one of these. However, it later went bankrupt after the WTO dispute was resolved and prices stabilised back to historic levels, favouring less costly Chinese operations.[138] Nevertheless, a certain elasticity in the mineral marketplace was demonstrated.

> There are no critical metals or minerals that have been exclusively identified in seabed minerals (that is to say, metals and minerals like nickel, copper, manganese and cobalt are also found in land-based sources). However, the case for cobalt has been made, because it comprises about two to three percent of the weight of polymetallic nodules,[139] and due to human rights concerns,[140] it could represent an alternative supply to the major terrestrial source, the Democratic Republic of Congo. In the meantime, industry is already turning away from cobalt-based batteries in search of more palatable alternatives.[141] Consequently, if viable alternatives are established, the role of cobalt in future green technologies may no longer be a driver for DSM. Thus, an unintended outcome of a DSM pause or moratorium might be that technology continues to develop in a direction away from cobalt.

Reduced or Increased Scientific Research. Much of the recent research, mostly in the Clarion-Clipperton Zone (CCZ), has been financed in part,[142] or wholly,[143] by DSM contractors in anticipation of the commercial exploitation of polymetallic nodules.[144] On the one hand, a ban on DSM could cause a reduction in research funding by

[137] See WTO Dispute Settlement DS431: *China—Measures Related to the Exportation of Rare Earths, Tungsten and Molybdenum*. Source: https://www.wto.org/english/tratop_e/dispu_e/cases_e/ds431_e.htm (accessed 3 December 2024).

[138] Ironically, Molycorp's Mountain Pass mine was purchased out of bankruptcy by a consortium that included a Chinese-owned firm: J.A. Green, "The Collapse of American Rare Earth Mining—and Lessons Learned" 12 November 2019, *Defense News* at https://www.defensenews.com/opinion/commentary/2019/11/12/the-collapse-of-american-rare-earth-mining-and-lessons-learned (accessed 3 December 2024).

[139] MIDAS Project, "Polymetallic Nodules" at https://www.eu-midas.net/science/nodules#:~:text=In%20the%20CCZ%2C%20polymetallic%20nodules,important%20to%20high%2Dtech%20industries (accessed 3 December 2024).

[140] E.g., M. Fabiola Lawson, "The DRC Mining Industry: Child Labor and Formalization of Small-Scale Mining" 1 September 2021, *Wilson Centre* at https://www.wilsoncenter.org/blog-post/drc-mining-industry-child-labor-and-formalization-small-scale-mining (accessed 3 December 2024). See also: A. Kelly, "Apple and Google Named in US Lawsuit over Congolese Child Cobalt Mining Deaths" 16 December 2019, *The Guardian* at https://www.theguardian.com/global-development/2019/dec/16/apple-and-google-named-in-us-lawsuit-over-congolese-child-cobalt-mining-deaths (accessed 3 December 2024).

[141] M. Petrova, "Here's Why Battery Manufacturers Like Samsung and Panasonic and Car Makers Like Tesla Are Embracing Cobalt-Free Batteries" 17 November 2021, *CNBC* at https://www.cnbc.com/2021/11/17/samsung-panasonic-and-tesla-embracing-cobalt-free-batteries-.html (accessed 3 December 2024).

[142] Often, government and non-governmental organizations are also funders alongside industry—for example, the UK Natural History Museum. See A. Glover, "Biodiversity in Deep-Sea Mining Exploration Areas", *Natural History Museum* at https://www.nhm.ac.uk/our-science/our-work/biodiversity/deep-sea-systematics-ecology-group/establishing-biodiversity-baselines-deep-sea-mining.html (accessed 3 December 2024).

[143] E.g., The Metals Company. Source: https://metals.co/research/#:~:text=The%20Metals%20Company%20is%20undertaking,Impact%20Assessment%20(ESIA)%20program (accessed 3 December 2024).

[144] For a discussion of the ethical concerns around industry-founded research, see E. Shabahat, "'Antithetical to Science': When Deep-Sea Research Meets Mining Interests" 4 October 2021, *Mongabay News & Inspiration from Nature's Frontline* at https://news.mongabay.com/2021/10/antithetical-to-science-when-deep-sea-research-meets-mining-interests (accessed 3 December 2024).

contractors, as it would leave little hope of commercial return for years to come. On the other hand, a precautionary pause or moratorium that was contingent upon filling certain scientific criteria might have the opposite effect, incentivising a short-term research drive to quickly fill those knowledge gaps. Moreover, the EU has already committed to providing substantial funding towards independent deep-sea scientific research tailored to close gaps, allowing for better informed decision-making.[145]

Possible Litigation. As calls for a moratorium or pause increase, a countervailing view has arisen, suggesting that a moratorium would infringe upon rights relating to DSM in the Area.[146] However, as discussed above, while mining applications can be submitted to the ISA for consideration, legally speaking, UNCLOS does not confer a right *per se* to mine the Area. Article 137 prohibits any exercise of sovereign rights over any part of the Area or its resources, and the ISA is given a broad suite of powers[147] which extends to actions *not necessarily anticipated by UNCLOS*, and could include the enactment of a moratorium or similar. For example, Regional Environmental Management Plans were not anticipated by UNCLOS, but nonetheless were adopted by the Council.[148] In areas beyond national jurisdiction (ABNJ), there is no equivalent to the investor protection laws found in national jurisdictions, thereby hampering the ability of contractors to sue or otherwise seek legal remedies from the ISA on this basis.[149] Nonetheless, a pause or moratorium could trigger attempts at litigation by an affected party.[150] Conversely, if the ISA were to allow DSM despite the current concerns listed in Table 2, actions might arise from states or other parties arguing that the ISA is not meeting its environmental obligations.

Weakening UNCLOS. A consequential but highly unlikely risk of a pause or moratorium on DSM in the Area would be for some states to leave UNCLOS (or not join, in the case of non-parties), potentially citing fundamental changes of circumstances under the Vienna Convention on the Law of Treaties.[151] Such a drastic step could affect the state's maritime entitlement and a range of other rights and responsibilities under UNCLOS. Given that DSM remains an unproven industry with an as-yet-unclear economic profile, and that any pause or moratorium would likely be temporary,

[145] Singh, Tassin Campanella and Maes, note 94.

[146] E.g., Watson Farley and Williams, "Deep Seabed Mining Insights: Potential Pitfalls with a 'Precautionary Pause' to Deep Seabed Mining", 15 August 2023 at https://www.wfw.com/articles/deep-seabed-mining-insights-potential-pitfalls-with-a-precautionary-pause-to-deep-seabed-mining (accessed 3 December 2024).

[147] UNCLOS, Arts 145, 157(1)(2).

[148] M.W. Lodge, "International Seabed Authority" (2011) 26 *The International Journal of Marine and Coastal Law* 463.

[149] A. Pecoraro, H. Lily and P. Singh, "The International Seabed Authority and the Push for Exploitation of Deep Seabed Minerals: Does the Doctrine of Legitimate Expectations Apply?" (2024) 25 (5–6) *The Journal of World Investment and Trade* 698.

[150] Ibid.

[151] Adopted 23 May 1969, entered into force 27 January 1980, 1155] UNTS 331 [hereinafter, VCLT]. As per Art 62 of the VCLT, a state party to a treaty may cite a "fundamental change of circumstances" in order to withdraw from the treaty. In the present context, state parties may contend that the imposition of a moratorium on DSM is a fundamental change that affects the rights and interests of the parties to the treaty, and therefore, it is no longer acceptable to them to be bound by UNCLOS.

states are unlikely to risk the time, effort, and political capital needed to abandon "the constitution of the ocean".[152]

Mining in Seabed Areas Within National Jurisdictions. A pause or moratorium in the Area may drive some state and private actors towards mining areas within national jurisdiction.[153] Already there has been interest in seabed mining, for example, in Papua New Guinea (but abandoned after bankruptcy alongside social opposition),[154] New Zealand (curtailed by court decisions),[155] Mexico (rejection of environmental permit for exploitation by government authorities),[156] and Japan and the Cook Islands (in the exploration phase), as well as emerging plans in Norway (which has attracted criticism from the European Parliament, a lawsuit, and a December 2024 reversal by the government in deciding to defer plans).[157] Therefore, seabed mining approval within national jurisdiction should not be taken for granted, and may be declined or paused by these sovereign states as part of their due process, or in response to public opposition, administrative challenges, or litigation. Regardless, because the amount of seabed minerals within national jurisdictions is comparatively small, deep seabed minerals in ABNJ will likely remain of interest to many states in the long run, not least because they are legally the common heritage of humankind.

Conclusion

The terms "moratorium" and "precautionary pause" have been liberally used by states, non-governmental organisations (NGOs), and the media, particularly after the invocation of the two-year rule. However, there has been a notable lack of shared understanding regarding the definition, practical application, and broader implications of the terms. To capture the various possibilities, this article identifies six categories of "non-use measures", four of which can be directly applied to ISA decision-making. The article analyzes how these might be adopted by the ISA, and considered outside

[152] M. Chaves and K. Gjerde, "Ocean Governance" in F. Obaidullah (ed), *The Ocean and Us* (Springer, Cham, 2023) 215.

[153] Unless a moratorium or pause is accompanied by a massive industry or consumer boycott, which would reduce the potential market for DSM metals more generally.

[154] E. van Putten, S. Aswani, W. Boonstra, et al. "History Matters: Societal Acceptance of DSM and Incipient Conflicts in Papua New Guinea" (2023) 22 *Maritime Studies* 32.

[155] P. McCabe and J. Hita, "New Zealand Ruling against DSM Set a Global Precedent—now Ardern Should Ban It", 4 October 2021, *The Guardian* at https://www.theguardian.com/world/commentisfree/2021/oct/05/new-zealand-ruling-against-deep-sea-mining-set-a-global-precedent-now-ardern-should-ban-it (accessed 3 December 2024). See also R. Martin, "Trans Tasman Resources Pulls Out of Pātea Seabed Mining Hearings" 2 April 2024, *NZ Herald* at https://www.nzherald.co.nz/stratford-press/news/trans-tasman-resources-pulls-out-of-patea-seabed-mining-hearings/VLYQ42IHQZBTLPSGOOYKOTVZQQ/(accessed 3 December 2024).

[156] Latin News, "In brief: Mexico to challenge ruling in favour of US ocean exploration firm" 20 September 2024 at https://www.latinnews.com/component/k2/item/102995-in-brief-mexico-to-challenge-ruling-in-favour-of-us-ocean-exploration-firm.html (accessed 3 December 2024).

[157] See, European Parliament, *European Parliament resolution of 7 February 2024 on Norway's recent decision to advance seabed mining in the Arctic,* P9_TA(2024)0068 (7 February 2024) at https://www.europarl.europa.eu/doceo/document/TA-9-2024-0068_EN.html (accessed 3 December 2024); WWF Norway, "Deep seabed mining: WWF has filed a lawsuit against the government", at https://www.wwf.no/dyr-og-natur/hav-og-fiske/gruvedrift-pa-havbunnen/wwf-takes-legal-action-against-the-state (accessed 3 December 2024); and M. Davies, "Norway Suspends Controversial Deep-Sea Mining Plan" 2 December 2024, *BBC* at https://www.bbc.com/news/articles/c9wlj8l8kr7o (accessed 3 December 2024).

of the ISA, as well as some possible unintended consequences—both positive and negative.

While this article discusses the legality of a pause or moratorium on DSM and their possible applications, we note there is a distinction between the *legality* and the *legitimacy* of DSM activities. Legality pertains to the adherence to appropriate rules and regulations under the framework provided by UNCLOS, whereas legitimacy encapsulates the broader acceptance and social license to operate. Earning legitimacy requires inclusive and participatory discussions about how to manage the common heritage of humankind—discussions that have been to date largely absent at the ISA.

The evolving debate on the merits of proceeding immediately with DSM versus taking a precautionary pause, moratorium, or indefinite ban has unearthed several issues that warrant further consideration:

- Additional research: One of the main arguments advocating for a pause or moratorium has been to buy time for further research into deep-seabed ecosystems. The scientific consensus on the need for more research should be seriously heeded and used to meaningfully inform precautionary ISA decisions moving forward.
- Managing risk and uncertainty: While some risks can be mitigated through a pause or moratorium, ultimately the management of DSM, now or later, will still need to be adaptive and agile. Managing risk and uncertainty should be incorporated into the Mining Code and ISA decision-making. The enabling conditions for invoking precautionary measures should be given serious consideration, and could include minimizing irreversible decisions of potentially serious consequences, regular reviews with the power to alter plans and procedures, and building into the Mining Code the expectation of continuous improvement in "best" technology and practices.
- Transparency, accountability and inclusivity: Ensuring more transparency, accountability and inclusivity in ISA decision-making is necessary for good governance and legitimacy of decisions taken on behalf of humankind, including whether to proceed with, or pause, DSM.
- Future generations: The legal obligations associated with the common heritage of humankind principle are not trivial. As today's custodians, society has a moral and legal responsibility to leave the planet habitable and with ample mineral resources for future generations. A DSM moratorium can be seen as securing minerals and ensuring intact ecosystems for future generations.
- The transition towards sustainability: Views on resource extraction are quickly evolving, and governance bodies are increasingly expected to consider how they can encourage greater efficiency and sustainability, alongside resource extraction. A pause or moratorium, properly applied, could encourage efficiencies in existing resource loops.

The ISA offers a unique opportunity in collective resource management. Its mandate to act on behalf of humankind as a whole only underlines the importance of listening to the diverse opinions on DSM. While different actors undoubtedly have different motives and views concerning what constitutes best practice, delaying DSM could provide the time needed to find political compromises and fill critical scientific gaps.

The proverb "look before you leap" has a prosaic corollary: be sure to give yourself enough time to look and then decide whether leaping is a good idea.

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Disclosure Statement

The authors' views expressed here are their own and do not reflect upon their affiliated organizations. PS and AJ advise governments on matters around deep seabed mining, including some governments that support a moratorium or precautionary pause on deep seabed mining. No government had any input into the manuscript whatsoever. The paper arose from an academic project.

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