Task Force 6
Accelerating SDGs: Exploring New Pathways to the 2030 Agenda

IMPROVING GOVERNANCE OF DEEP-SEA MINING

July 2023

Puneeta Pandey, Fulbright Postdoctoral Research Fellow, Stanford University, USA

Pushp Bajaj, National Consultant - Blue Economy and G20 at UNDP India

Baban Ingole, Scientist, National Centre for Polar and Ocean Research, India

Fenjie Chen, Senior Manager, Environmental Defense Fund, USA

Yasunori Sakurai, Professor, Hokkaido University, Japan

Abstract

International cooperation is vital for the sustainable use and protection of global commons, especially the ocean. The G20 should take the lead in initiating a global ocean governance process and promoting discussions, plans, and regional collaboration for the ocean economy. Deep-seabed mining, regulated by the International Seabed Authority (ISA) under UNCLOS, involves extracting mineral deposits from the deep seabed. The ISA must ensure effective protection of the marine environment from mining impacts. Biodiversity conservation is also crucial, and deep-sea mining can have extensive ecological effects on deep midwater ecosystems, which are essential for carbon export, nutrient regeneration, and larval dispersal. Recommendations for the G20 include strengthening their capacity and assisting non-G20 states in comprehensively evaluating the risks associated with deep-sea mining. This will enable environmental resource managers and societies to make informed decisions about whether and how mining should proceed.

The Challenge

1

Deep-sea mining (DSM) refers to the extraction of all types of minerals from the ocean floor, typically at depths greater than 200 meters.[1] The International Seabed Authority (ISA) is entrusted with the responsibility, as stipulated in the United Nations Convention on the Law of the Sea (UNCLOS), to safeguard the marine environment from potential detrimental impacts originating from deep-seabed activities in regions beyond the control of any particular country (referred to as the Area). Some of the types of resources that can be mined from the deep sea include:

1. Polymetallic nodules (PMN): These are small, potato-shaped lumps of minerals found on the seabed, containing high concentrations of metals like manganese and iron, though significant amounts of other metals also occur, including nickel, copper, cobalt, molybdenum, rare-earth elements and lithium.

2. Seafloor massive sulphides (SMS): These are deposits of metal sulphides formed around hydrothermal vents, containing valuable minerals such as copper, gold, silver, and zinc.

3. Cobalt-rich ferromanganese crusts: These are crust-like deposits that form on seamounts and other underwater mountains, containing high concentrations of cobalt, as well as other metals like nickel, copper, and platinum.[2]

As of March 2023, the ISA has issued permits and entered into 31 contracts for exploring resources in the deep seabed with 22 contractors.

Environmental risks on the marine ecosystem and human well-being

Seabed mining may cause harmful effects by direct removal and destruction of seafloor habitat and organisms, modification of sedimentation rates and food webs, changes in substrate availability, suspended sediment plumes, released toxins and contamination associated with noise, light or chemical leakage during the extraction and removal processes. Deep-sea mining (DSM) also causes air pollution and greenhouse gas (GHG) emissions, which have negative impacts on ecosystems and human livelihoods.[3,4] Consequently, there is increasing concern that deep-sea exploration's direct and indirect impacts will result in

significant biodiversity loss. Given the very slow natural recovery rates, these losses may be irreversible on timescales relevant to management and possibly for many human generations.[5]

Moreover, it is also important to weigh the environmental pros and cons of DSM compared to mining on land. In the Democratic Republic of the Congo, for example, which supplies around 60 percent of the world's cobalt, terrestrial mining causes deforestation, water and air pollution, and child labour. Processing facilities for nodules brought onshore from seabed mining will also have land consequences. If only 30 percent of a nodule is desirable metals, 70 percent is waste, typically a slurry. Land miners often send this slurry back down the hole they have created. Slurry from millions of ocean nodules will be new material that has to go somewhere.[6] Furthermore, exploration and exploitation of deep sea can also impact cultural traditions and norms: i) concession of traditional land ownership; ii) modifications in societal norms; iii) changes in employment patterns; and iv) loss of access to subsistence fisheries.[7]

Recognising the environmental risks, as of March 2023, 12 countries[a] have taken positions (ban, pause or moratorium) against DSM in international waters.[8] Some financial institutions, such as the European Investment Bank, have added DSM to their list of prohibited activities, meaning that they will not invest in such projects due to environmental concerns. However, financial investments are required to understand and quantify the possible impacts arising from various DSM activities.

Socio-economic viability and equity considerations

The growing demand for raw materials such as metals and rare-earth elements (REEs) used for electronic devices, construction materials, and renewable energy technologies—together with the growing depletion of these resources on land—have led to the exploration of the seabed so that such minerals remain available to industry.[9,10] However, there are various risks and uncertainties on the financial benefits of DSM. For example, early technology developers face higher risks from unknown technology, higher

a New Zealand, The French Polynesian assembly, Germany, Costa Rica, Chile, Spain, Panama, Ecuador, France, Palau, Fiji, Federated States of Micronesia and Samoa.

costs of technology development, an absence of proven commercial viability, and higher capital costs.[11] Preliminary analysis on returns on investment (ROI) indicates that the DSM industry can survive only with substantial governmental financial assistance in the form of no-interest construction loans and funding pioneering research and development, and assurance of percentage depletion allowance to reduce the income tax burden.[12]

Given the financial risks associated with such a billion-dollar venture, coupled with the limited technological capacity to minimise harm, significant gaps in ecological knowledge, and uncertainties of recovery potential of deep-sea ecosystems,[13] ISA will have its work cut out establishing rules and policies with respect to the sharing of financial benefits. This entails engaging in extensive consultations with member states, stakeholders, and experts to address complex issues such as revenue distribution, royalty rates, and mechanisms to ensure equitable sharing among nations and the global community.

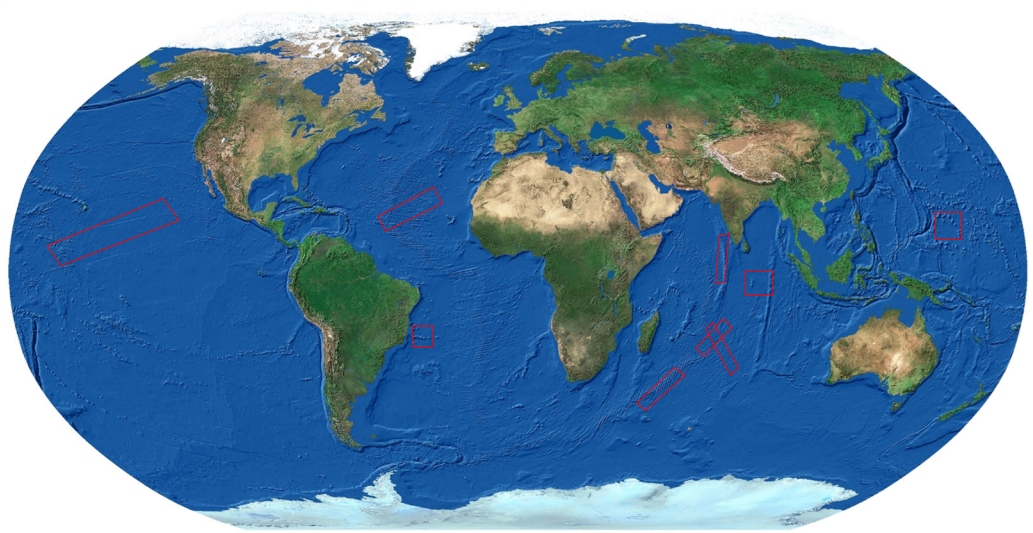
The G20's Role

2

The governance of more than 50 percent of the oceans that make up international waters is a crucial issue that countries need to address over the next decade. Many global maritime economic activities occur in these areas (Figure 1).

There exists a complex set of international and regional legal instruments for conserving and managing international waters. Among them are UNCLOS (Articles 204-206), the Convention on Biodiversity (CBD) (Articles 4 and 14), and the Sustainable Development Goals (SDGs) commitments. There are also ambitious new proposals, such as 30 by 30 (or 30x30), that are getting global attention. This is a worldwide initiative for governments to designate 30 percent of Earth's land and ocean area as protected areas by 2030.[14]

Fig. 1. Areas Beyond National Jurisdiction (ABNJ) Claimed for Mining Exploration



Source: Adapted by IGCMC, WWF.[15]

What the world lacks, and what the G20 countries need to focus on, is a coherent governance system which ensures the assessment and regulation of new activities that might endanger marine ecosystems. After nearly two decades of planning and negotiations, the historic United Nations High Seas Treaty was adopted on 4 March 2023—it is a pivotal step towards such a goal.

Recommendations to the G20

3

Recommendation 1: Assist with integrated environmental planning and collaboration.

Promote a precautionary approach to ensure biodiversity conservation.

The ISA has imposed regulations on 'exploration' activities in the Area, but there are concerns that 'exploitation' will result in a more significant environmental impact compared to exploration. Consequently, the current debate revolves around the potential loss of biodiversity resulting from commercial operations in the Area. Regardless of the significant differences among the deep-sea resources and the ecosystems within which they are located, the scales implicated by deep-sea mining suggest that exploitation of all four resource classes will result in significant biodiversity losses.[16,17] Accordingly, a precautionary approach is warranted. At the time of writing this brief, the ISA was still working on creating a set of regulations (the mining code[b]) that would govern how commercial mining activities in the Area would be managed, so there is an opportunity to set desirable precedents.

One practical step to achieve the precautionary approach is to build ecosystem services (ES) into the environmental planning of DSM.[18] ES are the direct and indirect contributions to human well-being, which are grouped into four categories: provisioning, regulating, cultural, and supporting (see Figure 2).

Fig. 2. Biological Ecosystems, Ecological Functions, and Ecosystem Services[20]

Ecosystem Structures		
Species abundance	Species distribution	Biodiversity
Ecological Functions (Supporting Services)		
Element cycling	Nutrient cycling	Metabolic activity
Breeding grounds	Primary productivity	Bioturbation
Nursery habitat	Secondary productivity	Dispersal

b The mining code provides a framework for regulating DSM activities. The code covers a range of topics, including: Environmental impact assessments, Licensing and regulation, Monitoring and reporting, Financial guarantees, Benefit sharing, Protection of the marine environment and Transfer of technology and capacity building.

Ecosystem Structures		
Refugia	Respiration	Connectivity
Provisioning Services	**Regulating Services**	**Cultural Services**
Fisheries	Climate regulation	Educational
Pharmaceuticals	Biological control	Aesthetic
Industrial agents	Waste absorption	Existence
Biomaterials		Stewardship

Incorporating an ES framework that prioritises the assessment and integration of DSM valuation and implementation can improve the decision-making processes. This may lead to a recommendation of delaying large-scale DSM operations until there is a better understanding of their potential impacts on ecosystem linkages. G20 must conduct a comprehensive analysis of the costs—including environmental costs, and benefits—including benefits from leaving ecosystems intact, of deep-seabed mining. Mining should only proceed if such an analysis yields a net positive result.

Strengthening the 2023 UN High seas treaty.

The United Nations landmark high seas treaty agreed upon under the UNCLOS represents several positive outcomes. Among them is the capacity to create marine protected areas (MPAs) through decisions of a conference of the parties (COP) to the treaty. It also recognises that the marine genetic resources (MGR) of the high seas must benefit all of humanity. Moreover, companies planning commercial activities and organisations considering other large projects (such as DSM) will need to carry out environmental impact assessments.[19] At least 60 nations must formally adopt and ratify this agreement to enable the treaty to enter into force. As humanity's first serious attempt to challenge the disaster that looms offshore, the high seas treaty is a triumph for diplomacy that G20 governments must play a leading role in adopting.

Recommendation 2: Improve existing administration efficiencies and invest in metal recycling.

Prioritise regulation of the Common Heritage of Humankind (CHM) by increasing the capacity of the International Seabed Authority (ISA).

The 1982 UNCLOS (Part XI, Article 136) declared the seabed beyond national jurisdiction and its mineral resources as the "common heritage of mankind" (CHM), effectively establishing a legal distinction between 'the Area' which is regulated and the 'water column', which is governed by the principle of the freedom of the high seas. The conception of CHM as a jurisdictional principle can be understood as having two components: it forbids states to establish sovereign jurisdiction and appropriate a territorial domain; and it demands that if economic exploitation of resources is to take place, it must be administered by an international institution that grants exploitation rights and establishes a regime for the equitable sharing of benefits.[21] While we emphasise non-appropriation and equitable benefit sharing (Article 140:2 of UNCLOS) as the primary focus of the CHM principle, it is important to recognise that CHM also allows for the authorised exploitation of resources through the allocation of exclusive rights. This feature is sometimes overlooked in discussions of CHM.

Equitable sharing of the exploited benefits from DSM is a contentious issue, and there are ongoing debates about the most effective mechanisms to ensure that the exploitation is conducted in an equitable manner. A financial regime for DSM has two components. The first, a payment regime, initially obtains part of the financial returns from DSM contractors (which can include States) in return for the extraction of deep-sea minerals. The second component is a mechanism for distributing—based on equitable sharing—the financial and other economic benefits, which include revenue collected by the ISA from contractors under the payment regime.[22] One such financial mechanism aimed at achieving distribution is the Seabed Sustainability Fund proposed by the Finance Committee of the ISA.[23] The proposed fund would be financed through a levy on the value of minerals extracted from the international seabed. However, it would be naïve to

expect the severely understaffed ISA to be able to implement it. This brief suggests that the G20 governments focus on enhancing the ISA's capability to implement three key sections of the UNCLOS that are specifically relevant to DSM. These sections are Article 136, which pertains to the concept of the CHM; Article 137:2, which deals with the regulation of resources; and Article 145, which focuses on the protection of the marine environment.

Improve the metal recycling loop.

At present, there is no established market for deep-sea minerals, and one needs to be actively created. Even if a market does emerge, achieving fair and equitable sharing of profits may take time as contractors and investors typically prioritise recovering their costs before paying out any royalties. The process of extracting these minerals is expensive and complex, and operating machinery effectively in the harsh conditions of the deep ocean can be challenging. Furthermore, transporting materials from the ocean floor to land-based processing facilities can be prohibitive. Additionally, fluctuations in metal prices, throughput, capital and operating costs can all impact the market return.[24] Given these factors, some experts[25,26,27] have expressed concerns that DSM may not be profitable from an economic sustainability perspective.

Continuing with the notion of sharing the benefits, the shared dividends to humanity, particularly poorer nations, will be modest at best.[28] Given the high costs associated with exploration and extraction, state support and fiscal incentives may also be necessary to make DSM a viable investment. Taking a holistic view of the DSM, it is apparent that the various perspectives presented in this policy brief cannot be reconciled and as the DSM moves closer to realisation, the current controversies are likely to become more complex. For at least the next decade, the responsible course of action is to prioritise improving recycling techniques and closing the loop on metals on land instead of pursuing new exploitation. The G20 can contribute to this cause by promoting and enhancing recycling technologies for metals already available in the market. Developing such technologies will strengthen international stability in the metal market.

Attribution: Puneeta Pandey et al., “Improving Governance of Deep-Sea Mining,” *T20 Policy Brief*, July 2023.

Endnotes

1 L. Cuyvers, W. Berry, K. Gerde, T. Thiele and C. Wilhem, Deep Seabed Mining, a Rising Environmental Challenge, Gland, Switzerland: IUCN, 2018.

2 K. Miller, K. Thompson, P. Johnston and D. Santillo, “An overview of seabed mining including the current state of development, environmental impacts, and knowledge gaps,” *Frontiers in Marine Science,* vol. 4, 2018.

3 L. Levin, K. Mengerink, K. Gjerde and et al. , “Defining “serious harm” to the marine environment in the context of deep-seabed mining,” *Marine Policy,* vol. 74, pp. 245-259, 2016.

4 L. Heinrich, A. Koschinsky, T. Markus and P. Singh, “Quantifying the fuel consumption, greenhouse gas emissions and air pollution of a potential commercial manganese nodule mining operation,” *Maine Policy,* vol. 114, p. 103678, 2020.

5 H. Niner, J. Ardron, E. Escobar and et al., “Deep-sea mining with no net loss of biodiversity-an impossible aim. Front Mar Sci. 2018;5(MAR):53,” *Frontiers in Marine Science,* vol. 5, p. 53, 2018.

6 T. Peacock and M. Alford, “Is deep-sea mining worth it?,” *Scientific American,* vol. 318, no. 5, pp. 7-77, 2018.

7 J. Wakefield and K. Myers, “Social cost benefit analysis for deep sea minerals mining,” *Marine Policy,* vol. 95, pp. 346-355, 2018.

8 IUCN, “IUCN Director General’s open letter to ISA Members on deep-sea mining. https://www.iucn.org/dg-statement/202303/iucn-director-generals-open-letter-isa-members-deep-sea-mining#_ftn4.,” 2023. [Online].

9 N. Mejjad and M. Rovere, “Deep-Sea Mining and Potential Risks, Opportunities, and Challenges,” in *Global Blue Economy*, CRC Press, 2022, pp. 341-359.

10 F. Lehnen, M. Rahn, S. Volkmann, P. Kukla and B. Lottermoser, “Economic Evaluation of Deep-Sea Mining,” *Mining Report Glückauf,* vol. 155, no. 2, pp. 158-169, 2019.

11 K. Van Nijen, S. Van Passel, C. Brown, M. Lodge MW, K. Segerson and D. Squires, “The Development of a Payment Regime for Deep Sea Mining Activities in the Area through Stakeholder Participation,” *International Journal of Marine and Coastal Law,* vol. 34, no. 4, pp. 571-601, 2019.

12 B. Andrews, J. Flipse and F. Brown, The Economic Viability of a Four-Metal Pioneer Deep Ocean Mining Venture, Texas A & M University, Sea Grant College Program, NOAA, 1983.

13 Niner et al., "Deep-sea mining," 5

14 E. Dinerstein, C. Vynne, E. Sala and et al., "A Global Deal for Nature: Guiding principles, milestones, and targets," Science Advances, vol. 5, no. 4,

15 Levin et al., "Defining," 74

16 Miller et al., "An overview," 4

17 Levin et al., "Defining," 74

18 J. Le, L. Levin and R. Carson, "Incorporating ecosystem services into environmental management of deep-seabed mining," *Deep Sea Research Part II: Topical Studies in Oceanography,* vol. 137, pp. 486-503, 2017.

19 Nature Editorial, "How science can help fill gaps in the high seas treaty," Nature, vol. 615, pp. 373-374, 2023.

20 Levin and Carson, "Incorporating," 137

21 I. Feichtner, "Sharing the Riches of the Sea: The Redistributive and Fiscal Dimension of Deep Seabed Exploitation," *European Journal of International Law,* vol. 30, no. 2, pp. 601-633, 2019.

22 Nijen et al., "The Development," 34

23 M. Lodge and M. Bourrel-McKinnon, "Sharing Financial Benefits from Deep Seabed Mining: The Case for a Seabed Sustainability Fund," in *Perspectives on Deep-Sea Mining*, 2022, pp. 559-578.

24 H. Cameron, L. Georghiou, J. Perry and P. Wiley, "The economic feasibility of deep-sea mining," *Engineering Costs and Production Economics,* vol. 5, no. 3, pp. 279-287, 1981.

25 Levin and Carson, "Incorporating," 137

26 Feichtner, "Sharing the Riches," 601-633

27 A. Jaeckel, J. Ardron and K. Gjerde, "Sharing benefits of the common heritage of mankind – Is the deep seabed mining regime ready?," *Marine Policy,* vol. 70, pp. 198-204, 2016.

28 A. Hallgren and A. Hansson, "Coflicting narratives of deep sea mining," *Sustainability,* vol. 13, p. 5261, 2021.

वसुधैव कुटुम्बकम्

ONE EARTH • ONE FAMILY • ONE FUTURE