

**1. What sort of group physically enforces the international law of the sea?**

As regards seabed mining, the International Seabed Authority (ISA), established under the United Nations Convention on the Law of the Sea (UNCLOS), is responsible for the regulation of mining in areas beyond national jurisdiction (under Part XI of UNCLOS) on behalf of the 167 countries and one Union (the European Union) who have joined the Convention. UNCLOS Article 153 provides that activities in “the Area” (defined as “the seabed and ocean floor and subsoil thereof, beyond the limits of national jurisdiction”) shall be “organized, carried out and controlled” by the ISA. An excellent summary overview of the ISA is provided in the recent article attached as reading for this webinar: “Challenges to the sustainability of deep seabed mining” (Levin, Amon, & Lily 2020).

**2. Question for Steve: what entity enforces the Law of the Sea and proposed sea bed mining regulations? Wondering how to actually get companies/countries to comply with requirements for protection and clean-up.**

The process of enforcing the Law of the Sea (UNCLOS) and proposed seabed mining regulations could follow a number of possible paths. The short answer is that enforcement efforts could be pursued in domestic courts, or in some sort of international tribunal, such as the International Tribunal for the Law of the Sea, or perhaps the International Court of Justice. The longer answer is a bit more complicated.

With respect to the general question of enforcing the Law of the Sea, each country that signs, ratifies, or accedes to the Law of the Sea (UNCLOS) agrees to subject itself to the jurisdiction of a court or arbitration process in the event of a dispute over the interpretation or application of the provisions of the Treaty itself. Articles 287 and 298 spell out the details, including certain exceptions. Signatory countries can choose one or more forums in which they agree to appear, including the International Tribunal for the Law of the Sea (ITLOS), the International Court of Justice, or certain arbitral panels.

In addition to these general provisions, Articles 186-191 of the Law of the Sea establish the Seabed Disputes Chamber as a separate part of the International Tribunal of the Law of the Sea. These articles spell out the jurisdiction of the Seabed Disputes Chamber, including certain limitations on that jurisdiction. For example, Article 187 grants the Chamber jurisdiction over disputes between countries “concerning the interpretation or application” of the Treaty provisions relating to the ISA.

Articles 189 and 191 provide the Seabed Disputes Chamber a somewhat circumscribed role with respect to ISA regulations. Article 189 limits the jurisdiction of the Chamber by denying it authority to rule on the question whether an ISA regulation complies with the provisions of the Law of the Sea, but states that it does so “without prejudice” to Article 191. And Article 191 requires that the Seabed Disputes Chamber give advisory opinions on legal questions “as a matter of urgency” at the request of the International Seabed Authority.

As an additional bit of background information, countries sponsor companies (called “contractors”) to engage in seabed mining. If a contractor were to violate requirements for environmental protection established by the country that is its sponsor, then the sponsoring country could take enforcement action against that contractor pursuant to any of its applicable domestic laws.

Looking to UNCLOS (instead of domestic law), several provisions require signatory countries to protect the environment. UNCLOS Article 192 imposes “the obligation to protect and preserve the marine environment” upon on each country that agrees to the Law of the Sea. In addition, Article 194 requires signatory countries to take measures “necessary to protect and preserve rare or fragile ecosystems.” And Article 197 directs signatory countries to cooperate in establishing rules and procedures to protect and preserve the marine environment. Separate from these country obligations, UNCLOS Article 145 directs the International Seabed Authority (ISA) “to ensure effective protection of the marine environment from harmful effects which may arise” from seabed mining of The Area.

As this short summary shows, there are many possible scenarios that could arise in connection with efforts to compel countries/companies to protect the environment from the effects of seabed mining. For example, in a situation involving seabed mining activities within the Exclusive Economic Zone of a particular country, that country could pursue an action in its local courts.

As another possible example, in a situation involving seabed mining in The Area, Article 187 would grant the ITLOS Seabed Disputes Chamber jurisdiction to resolve a claim that there had been a mis-interpretation or mis-application of the provisions of Article 145 (which require the effective protection of the marine environment). In the event a country was of the view that another country had taken actions inconsistent with the more general “obligation” to protect the marine environment (per Articles 192, 194, and 197), jurisdiction to resolve that dispute could also reside in another of the chosen forums, such as the International Court of Justice.

Alternatively, upon request from the ISA pursuant to Article 191, the Seabed Disputes Chamber could become involved in questions related to the ISA exploitation regulations, albeit via an advisory opinion.

**3. Hi Megan and Duke team! super important topics. My question on deepsea mining is are there any preferred or lower impact methods?**

There are not designated best-practices for vehicle design, but engineering work is very active in this area. Contractors are developing components independently including lift systems and mining machines drawing from marine applications or land-based mining vehicles like tracked cutters and dredges. Many university, industry, and private consultant organizations are active in work examining how engineering designs will alter ecosystem impacts. Verification of models will be important inputs to engineering iterations. For example, this month (April 2021) GSR is at-sea conducting engineering tests on its vehicle *Patania II* in the Clarion Clipperton Fracture Zone. Assessments

during this time include but are not limited ground truthing model projections for plumes generated by the collector vehicle, assessing operational variables like dredge strength, suction head height, and pick-up efficiency, and monitoring the depth of sediment removed and sediment compression from vehicle tracks. In addition, some companies are looking at ways to better map high-value environmental areas so that these can be excluded from the mine design at the outset, while still delivering an economic mine plan.

- 4. If the ISA fails to adopt exploitation regulations because of the opposition of a critical mass of parties, the “two year trigger” allows a party to petition the ISA directly for permission to mine. My understanding is that the ISA is obligated to approve these applications. How could this be stopped as a practical matter (amending UNCLOS or an implementing agreement is not practical)?**

Part 15(a) of the Part XI UNCLOS agreement requires the Council of the ISA to complete the rules, regulations and procedures for exploitation within 2 years of a request from a country whose contractor intends to apply for an exploitation contract. While Part (c) of that same paragraph does provide that, if the Council has not achieved this within 2 years, that it must “provisionally” approve such an application by a contractor, the ISA has (through the Secretariat, the Council and the Legal and Technical Commission) on numerous occasions indicated that it has every intention of finalising the rules, regulations and procedures for exploitation before any applications for exploitation contracts are received. The current timeframe published by the ISA has these documents being finalised and implemented by 2023 at the latest. In addition, the Council has significant leverage to create “provisions” under that Part which may further delay approval to commence mining. Given the advanced state of drafting of these regulations and supporting procedures, and the pressure that Council would be placed under by the 168 Members to finalise the documents should an application for exploitation be received, it is considered unlikely that Part (c) would ever be invoked. In the event a country were to invoke this “trigger” provision, the ISA would be involved with an issue of first impression, thus it is difficult to predict the manner in which the matter would be taken forward. Under existing ISA procedures, a small number of countries can insist that the Council provide approval for a plan of work for exploitation, even if other countries object. However, it remains to be seen whether these procedures, or other procedures, would be followed if the “trigger” provision were to be invoked.

- 5. What exactly are "inferred" vents? Is this based on seafloor morphology or heat flow?**

Inferred vents are sites with evidence of hydrothermal activity (like a temperature or chemical anomaly) detected along an ocean ridge or back-arc basin. Vent activity is not confirmed (active, inferred active, or inactive) until there has been a visual observation to ground truth the status of the site. InterRidge ([interridge.org](http://interridge.org)) maintains a database with vent locations and information along with a catalog of international research about ocean ridge systems. Identification of hydrothermal vents through bathymetric and topographic

survey can happen only with very high-resolution bathymetry because of their small size, but it is usually guided by water column measurements first.

**6. On plume management/impact are there any best practices or institutions with modelling or understanding long term impacts that you'd reference?**

There are numerous universities as well as private consulting firms who currently undertake modelling of plumes and sediment footprints. Like all models, some are more robust than others, and all depend on the quality of input data. While oceanographic data are available through robust monitoring, the more effective models are those that are able to provide engineering inputs for mining machines that have either already been built and tested under laboratory conditions, or which are based on existing and well-known engineering (such as dredging equipment). Many institutions are working on improving modelling technology and predictions, and data from laboratory tests and test mining activities will assist in this endeavour.

**7. Thanks to all for the excellent presentations. Do you have any thoughts on how the ISA and proposed regulations of seabed mining are being coordinated with the BBNJ treaty process? Especially on addressing/understanding EIAs, and on the management of areas like seamounts with strong competing interests (fisheries, mining, conservation)?**

The BBNJ process is independent of the ISA process, however just as BBNJ refers to the mechanisms of States to enforce protection of biodiversity within their EEZs, the same concept applies to the ISA, and many of the foundation principles in the BBNJ treaty (such as the need for environmental impact assessment, and the protection of environmental values) are reflected in the Part XI Agreement of UNCLOS, the existing ISA exploration regulations, and the current draft exploitation regulations. The precise nature of coordination between the ISA draft exploitation regulations and the BBNJ treaty process remains a work in progress.

**8. Are there requirements to perform remediation at sites where deep sea mining has occurred? If so how is remediation done? Is it effective in restoring the ecosystem?**

Draft exploitation regulations 55 and 59 refer to the development of rehabilitation techniques, and research into rehabilitation. Contractors are required to submit a closure plan as part of the application for exploitation which sets out any rehabilitation commitments and the associated criteria or standards by which they will be measured. Inasmuch as no actual deep seabed mining has yet taken place, there is no remediation experience from which to draw in determining effectiveness. Many scientists who are expert in deep sea ecology have stated that recovery of extremely stable and slow growing ecosystems such as nodules and crusts disturbed by deep sea mining could take thousands of years.

**9. Are there any discussions of requiring environmental performance bonds or guarantee bonds before industries start mining? They are financial guarantees submitted by the proponent for the purpose of ensuring proper management,**

**closure, restoration and potential rehabilitation of the project site. These bonds are a key lesson learned from terrestrial mining where industries walk away from any environmental damage.**

Draft exploitation regulations 54 and 55 refer to the creation of an Environmental Compensation Fund, which will fund measures to limit or remediate unpredicted damage, the promotion of research into methods that may reduce impacts, the promotion of research into rehabilitation and restoration, and restoration and rehabilitation works. In addition, draft exploitation regulation 26 would require contractors to file with the ISA an Environmental Performance Guarantee (EPG). This EPG currently is envisaged as a bond that can be used by the ISA in the event that a contractor does not deliver all elements of its closure plan (which may include post-closure monitoring requirements). Some stakeholders have recently argued also that this EPG requirement should be broadened to serve as a guarantee for all contractor obligations, not only those obligations related to closure and post-closure monitoring.

#### **10. Have there been any large cases brought forward and decided?**

Within Exclusive Economic Zones, there are numerous mining activities (such as diamond mining off the coast of Namibia), but nothing that would be considered “Deep”. In Papua New Guinea, one deep sea mine (Solwara 1) has been approved, but is not operational. In New Zealand, two deep sea miners (Chatham Rock Phosphate and Trans Tasman Resources) have had their applications rejected. In Areas Beyond National Jurisdiction no applications for exploitation (mining) have yet been received.

In Japan’s EEZ on the Okinawa trough, there has been a test mining site on an inactive hydrothermal vent at 1600 m depth. The test has been declared successful in term of technology testing and numerous samples regarding the environmental impact have been collected. If you are interested in the details of the mining test in Japan, please see:

- Okamoto, N., Shiokawa, S., Kawano, S., Yamaji, N., Sakurai, H. and Kurihara, M., 2019, July. *World’s first lifting test for seafloor massive sulphides in the Okinawa Trough in the EEZ of Japan. In The 29th International Ocean and Polar Engineering Conference. International Society of Offshore and Polar Engineers*
- Okamoto, N., Igarashi, Y., Matsui, T. and Fukushima, T., 2019, July. *Preliminary Results of Environmental Monitoring of Seafloor Massive Sulphide Excavation and Lifting Tests in the Okinawa Trough. In The 29th International Ocean and Polar Engineering Conference. International Society of Offshore and Polar Engineers.*

#### **11. Thank you so much for the presentation! I learned a lot. When companies / governments have to conform to / create regulations, what do you find is the most convincing argument to make for why these ecosystems need to be protected? Is the best argument economically focused, environmentally focused, human health focused, etc. ?**

This is a difficult question to answer, as every case is different, but one of the increasingly popular frameworks is that of the “triple bottom line”, which aims to consider social, environmental and financial aspects of an activity or a company, and to balance the focus to ensure all three are equally represented. It is, of course, difficult to achieve this without applying some form of ‘equalizer’ to enable these three very different aspects to be compared. One emerging concept that aims to address this is the concept of ‘monetizing’ environmental and social values, in order to compare the loss of impacting environmental values against the economic gain. Such processes are in their infancy, and are often controversial, but at least contribute to the dialogue on the need to consider all three aspects in decision making processes.

A practical example that partially answers your question is the decision-making process that happens for the proposal of the Regional Environmental Management Plan in the Area. On the Mid Atlantic Ridge, for example, numerous scientists have been participating in multiple workshops which aim to propose protection measures (spatial measures as well as management measures) for certain deep-sea habitats, including active, confirmed and biologically populated hydrothermal vents. These sites have been described one by one for their ecological, biological, scientific and social value against criteria used to describe vulnerable marine ecosystems (VMEs) and Ecologically and Biologically Significant Marine Areas (EBSAs). Each of the active, confirmed sites have been proposed as a site in need of protection. More details can be found in the [Report of the Workshop on the development of a regional environmental management plan for the area of the northern Mid-Atlantic ridge with a focus on polymetallic sulfide deposits](https://isa.org.jm/files/files/documents/Final_Draft_workshop_report-nMAR_REMP.pdf) ([https://isa.org.jm/files/files/documents/Final\\_Draft\\_workshop\\_report-nMAR\\_REMP.pdf](https://isa.org.jm/files/files/documents/Final_Draft_workshop_report-nMAR_REMP.pdf)).

**12. In the image Megan showed of an area ABNJ and then within the Cook Islands' NJ, the image of the Cook Islands area had a much lower density of nodules. Any particular reason why?**

Manganese nodules form from dissolved minerals in overlying seawater as well as water within the sediment. Nodule formation relies on many physical and chemical properties which are not uniformly distributed across the global ocean basins, resulting in uneven nodule density. This phenomenon likely explains the difference in the images presented. Some of the properties key to nodule formation are an extremely low sedimentation rate, a steady mineral presence in bottom water, and steady oxygen-rich bottom water to support chemical reaction of manganese oxides. Precipitating from the water (the hydrogenous process) or from pore water between sediments (the diagenetic process), nodules grow at millimeters to tens of millimeters per million years. Nodule density varies significantly through different parts of the Area and throughout nation’s EEZs. During the exploration phase, characterization of the resource density is one of a contractor’s primary objectives.

**13. If you are a US company, Can you mine nodules in the CCZ and ignore the ISA?**

Technically, UNCLOS binds only its members, which at present excludes the United States.

- 14. Thank you for the presentations, everyone! Renee, you mentioned the difference between countries creating new seabed mining authorities and adapting existing structures that already handle land mining. Do you think there are enough similarities for the two for land mining authorities to be useful, or would it be more effective for states with existing mining laws to develop completely new regulatory structures for seabed mining?**

My view is that if robust terrestrial mining legislation is in place, it can be effectively applied to the seabed, and that often the experience of the regulator in developing and enforcing terrestrial mining legislation is a critical aspect to the successful application of that existing legislation to the seabed environment. In addition, terrestrial legislation in relation to mining is predominantly far more established than 'new' legislation for seabed mining, and has therefore often been subject to amendments and improvements over time, which, in some instances, makes it more applicable and easier to enforce, given the precedents established by the regulator over time for both enforcement and application.

- 15. Is there any international regulatory law to protect the ecological balance in deep seabed?**

UNCLOS obliges States to protect and preserve the marine environment (including rare or fragile ecosystems (Articles 192, 194 and 197). In addition, UNCLOS Article 145 requires the ISA to take measures necessary "to ensure effective protection of the marine environment from harmful effects which may arise" from seabed mining. Article 145 explicitly directs the ISA to adopt regulations and procedures to prevent interference with "the ecological balance of the marine environment." The existing exploration regulations (Regulation 5 for polymetallic nodules) and draft exploitation regulations (Part IV) also provide many mechanisms for protection of the marine environment. See also the responses to Question #1 and #2.

- 16. I am a not as well versed on the industry development of deep sea mining. Is deep sea mining inevitable? Are terrestrial resources not enough for future demand?**

Absent a significant change in existing patterns of consumption, reuse, and recycling, and rapid development of alternative battery technologies, the demand for metals such as copper, cobalt, nickel and manganese which is being driven by the "green economy" (the desire for a low-carbon future), will outstrip existing known and inferred terrestrial resources. While recycling can fill some of this gap, there will remain a deficit, if current commitments (such as those by the United Kingdom and other European nations to abolish petrol and diesel vehicles, and the commitment to be carbon neutral by 2050) are to be achieved. While relatively few marine deposits have been defined to the extent that terrestrial deposits currently are, the few that have indicate that the grade of metals in seabed resources may be much higher than terrestrial deposits. This high grade, along with the high demand, is generally driving the interest in seabed mining. The lithium iron phosphorus battery now being marketed is an example of the kind of technology that could change this equation by reducing demand for metals such as

nickel. Another aspect to highlight about the interest in deep sea minerals is the content and the grade of rare earth elements (REE). Deep sea mineral deposits contain a higher percentage and grade of REE, which are commonly called the vitamins for technology for their roles as catalyst between other metals in technological advancement. Many REE are used in batteries, solar panel and other technological applications related to the “green economy”. Taking all these factors into account, whether or not mining of the deep seabed is inevitable remains to be seen.

**17. Are there requirements regarding exploration results by either private entities or countries? I ask because there is so much that isn't known.**

The ISA requires exploration results to be submitted as part of exploration contract requirements, however aspects of these may be considered confidential by the contractor and therefore not subject to public release. Contractors who are listed on a stock exchange are required to release resource definition results, and several seabed mining companies have done so (including Deep Green Resources [now The Metals Company] and Nautilus Minerals). Companies proposing to mine within Exclusive Economic Zones are normally required to submit feasibility studies to the governing body, which will include resource estimates, however again the extent to which these studies are published is at the discretion of each State and its legislative requirements.

**18. What is the scale of seabed mining at present?**

See response to Question # 10 – at present there are no operational deep-sea mines, however there are some ‘shallow’ mines (up to 200m water depth) such as diamond mining off the coast of Namibia. As noted in response to Question # 10, a deep-sea test mine has been pursued in Japan.

**19. In light of the forthcoming approval of the Global Biodiversity Framework Post 2020 of the CBD, what would be the critical point to consider regarding the Deep sea environment and its hazards, such as mining?**

The CBD aims to highlight the importance of biodiversity and its value in the ecosystem and towards humanity. There are two processes where the negative impact to the deep sea from mining can be considered as a critical point: first, within the context of the Nagoya Protocol and second, within the context of Ecologically and Biologically Significant Areas (EBSAs).

The Nagoya protocol is about the Access to Genetic Resources and the Fair and Equitable Sharing Arising from their Utilization to the Convention on Biological Diversity. Deep sea marine genetic resources are a central topic within the BBNJ process in the development of the New Legally Binding Instrument in discussion under UNCLOS. Hazards to deep sea biodiversity will have to be minimal to allow the sustainable use of deep sea marine genetic resources. In order to address this issue, a strong international collaboration and the harmonization between regulations and governance body will be needed.

Regarding the EBSA process: EBSAs are not management areas, but instead are a technical and scientific exercise that highlights which are the significant areas for

biodiversity. By themselves, EBSAs do not create MPAs or other Area Based Management Tools (ABMTs). However, they can inspire the creation of ABMTs dedicated to the deep sea. One practical example is the Offshore seamount and vent benthic protection area off the coast of Canada, in front of Vancouver. This area is currently protecting from deep sea trawling 100% of the hydrothermal vents known on the continental shelf of Canada. But it has also been proposed to become a massive MPA dedicated to the deep sea. One of the reasons for the implementation of this ABMT is that the northeastern Pacific Ocean has been defined as an EBSA for the deep-sea environment.

So, the CBD with these two processes has a central role in influencing the protection of the deep-sea environment. In addition, it should inspire coastal states to protect their continental shelf as well as to agree to implement MPAs in the high seas, based on scientific and technical evidence.

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