International Seabed Authority ISBA/27/C/30

Council

Distr.: General
10 June 2022

Original: English

Twenty-seventh session
Council session, part II
Kingston, 18–29 July 2022
Agenda item 11
Draft regulations on exploitation of mineral resources in the Area

Normative environmental thresholds for deep-seabed mining

Submitted by the delegation of Germany

I. Introduction

1. The draft standards and guidelines so far developed by the Legal and Technical Commission are mainly process-oriented and lack threshold values for the protection of the marine environment. Quantitative environmental thresholds are important to set the normative standard for the maximum level of harm from activities in the Area that can be considered acceptable. The need for such thresholds has been noted repeatedly by members and observers of the Council of the International Seabed Authority. The present note is designed to offer a starting point for discussing thresholds by emphasizing their role and suggesting a process and some key considerations for developing them.

2. Normative environmental threshold values are essential to substantiate the enforcement and implementation of the provisions of the United Nations Convention on the Law of the Sea with regard to the protection of the marine environment.

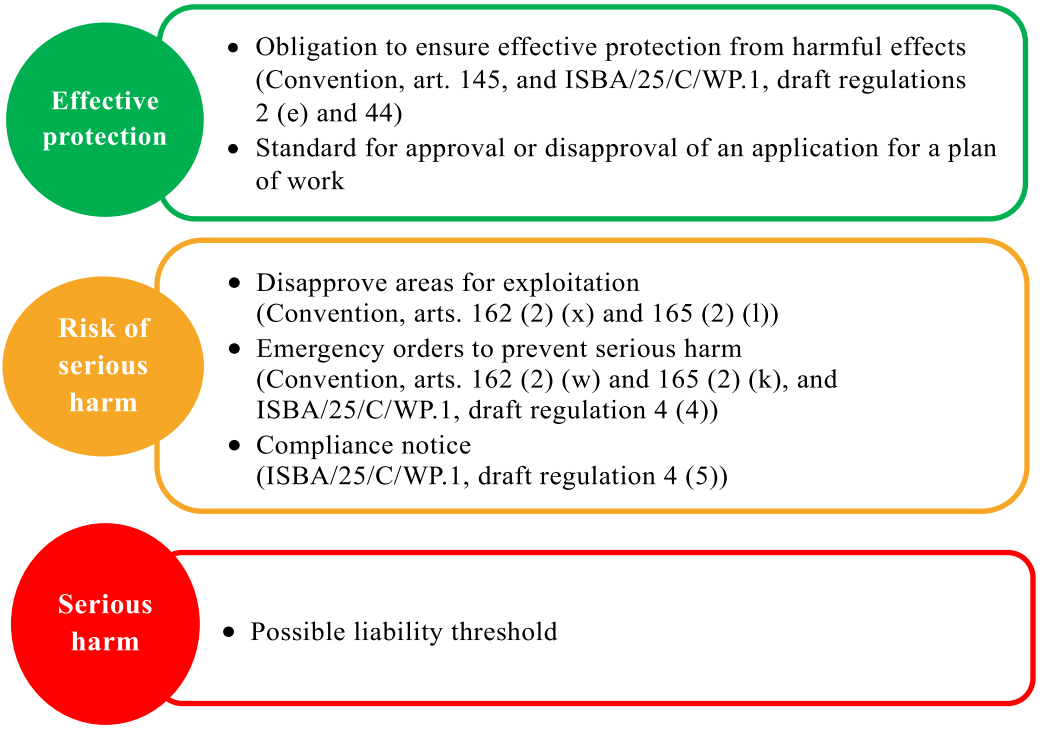
3. The Convention provides for a stepped approach to environmental obligations. As illustrated using a traffic light system in the figure below, the Convention links various levels of environmental impacts from seabed mining to specific legal and environmental management consequences. First, the overarching aim, specified in article 145 of the Convention, is the effective protection of the marine environment from harmful effects that may arise from activities in the Area. This is also the requirement that must be complied with if an application for a plan of work is approved. Second, the Convention provides for emergency orders, including the suspension or adjustment of operations, to prevent serious harm.[1] Similarly, areas for exploitation must be disapproved by the Council should there be substantial evidence indicating the risk of serious harm to the marine environment.[2] Third, the Convention

[1] United Nations Convention on the Law of the Sea, arts. 162 (2) (w) and 165 (2) (k).
[2] Ibid., arts. 162 (2) (x) and 165 (2) (l).

provides for liability and compensation for environmental harm,[3] although it remains unclear whether the liability threshold for compensable damage lies at "serious harm" or below, as is the case in other regimes.[4]

4. Giving effect to the stepped approach to environmental obligations under the Convention requires the development and implementation of normative, measurable and science-based environmental thresholds. These will help to identify the levels of environmental impact that can be linked to the corresponding legal obligations under the Convention. Thresholds are particularly useful as an early warning tool, before a liability threshold is reached.

Levels of environmental obligations under the United Nations Convention on the Law of the Sea and the draft regulations on exploitation of the International Seabed Authority



5. Normative thresholds will facilitate an outcome- or results-based approach, giving contractors flexibility with regard to how to achieve a particular predefined outcome, broken down into measurable thresholds, Regulators and States will then use the thresholds to assess whether the outcome is being achieved. A regional environmental management plan provides region-specific information that facilitates the decision-making process for exploitation activities in the respective areas. Region-specific objectives, taking into account the carrying capacity of the region, cumulative effects and conflict with other legitimate uses, can only be considered appropriately through regional environmental management plans. Furthermore, they provide a long-term planning reliability and a level playing field for contractors, in particular when shifting from exploration to exploitation.

[3] Ibid., arts. 139 (2) and 235 (2).

[4] Ruth Mackenzie, "Liability for environmental harm from deep seabed mining activities: defining environmental damage", Liability Issues for Deep Seabed Mining Series Paper, No. 8 (Waterloo, Ontario, Centre for International Guidance Innovation, 2019), p. 15.

6. While the present note is focused on polymetallic nodules, for practical reasons, many of the considerations explored herein may apply equally to other mineral resources. However, the impacts of deep-seabed mining on the marine environment and their resultant effects on the deep-sea biota will differ in space and time depending on the resources being exploited; consequently, defined threshold values are likely to differ among resource types and their respective ecosystems.

II. Key considerations for threshold values

7. To fulfil the role outlined above, thresholds should not be related to technology but rather be based on the overarching goals and objectives for protecting the marine environment from harmful effects of activities in the Area, and they should help to break those down into measurable units. The relevant science-based indicators need to describe the pre-impact environment, including natural variability, and measure the effects of activities in the Area.

8. Furthermore, measurable thresholds should be in place before an application for a plan of work for mineral exploitation may be considered. In future permitting processes, the Legal and Technical Commission can then assess any proposed plan of work against the agreed normative threshold values. Threshold values should be identified in separate standard documents, while region-wide thresholds could also be included in the applicable regional environmental management plan. This would help to create regulatory certainty and enable contractors with the Authority to design their operations so that they comply with the required thresholds.

III. Addressing uncertainties

9. A key challenge to developing threshold values is the lack of sufficient data and knowledge on deep ocean ecosystems and their functioning. However, there are both legal and scientific options to develop threshold values despite remaining uncertainties, as discussed in the following paragraphs.

10. Effective thresholds should be defined on the basis of robust environmental baseline information on the area under consideration. For example, in order to determine a threshold for a safe level of heavy metal contamination from a mining plume, it will be important to know the naturally occurring level of those metals, including potential variations on monthly to inter-annual timescales, and the reactions of species to elevated levels of toxicity at and around the potential mine site. Such data enable the setting of an appropriate and evidence-based threshold. However, concerns persist over the still limited availability of baseline data for certain environmental parameters in the Area.[5] While the quality of baseline knowledge has significantly improved over the past 20 years in general,[6] the Legal and Technical Commission has recently confirmed that there remain ongoing questions about whether enough is being done for baseline studies, across a range of environmental aspects.[7] Efforts to increase the collection of baseline data will certainly support the definition of threshold values. We therefore also argue in favour of reaching

[5] Diva J. Amon and others, “Assessment of scientific gaps related to the effective environmental management of deep-seabed mining”, *Marine Policy*, vol. 138 (April 2022); and Jeffrey C. Drazen and others, “Midwater ecosystems must be considered when evaluating environmental risks of deep-sea mining”, *Proceedings of the National Academy of Sciences of the United States of America*, vol. 117, No. 30 (July 2020).

[6] ISBA/26/C/43.

[7] ISBA/26/C/12/Add.1, para. 13.

agreement on a binding standard on baseline data collection with a limited set of essential parameters that must be measured by all contractors.

11. In the face of the current uncertainties, the precautionary approach offers a way forward.[8] This approach has, for example, served well in 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.[9] Precautionary buffers should be integrated into threshold values, that is, the thresholds will have to be stricter to begin with. As uncertainties are reduced, the precautionary buffer can be decreased. Similarly, thresholds may have to be particularly strict or precautionary for impacts on vulnerable marine ecosystems or habitats enjoying special protection.[10]

12. Furthermore, uncertainties may affect the type of thresholds and will vary with environmental conditions, in particular with the minerals to be mined. Indicators for environmental standards are usually either pressure-related or state-related. The former is aimed at describing or limiting anthropogenic pressure emitted into the natural environment (usually chemical or physical in nature), whereas the latter is aimed at preserving or creating a desired status of the natural environment (frequently ecosystem-related).

13. Ideally, perfect benchmarks of state-related thresholds would guarantee no lasting damage to the natural heritage of humanity. However, with the majority of species still unknown to science in, for example, nodule resource areas, this approach will remain impractical for the foreseeable future and will require substantially more baseline knowledge. For the same reason, little is known about the potential effects of the removal of sensitive species from ecosystems functioning as a whole. Furthermore, non-biological indicators, such as oxygen concentrations along the sediment column or the turnover of the sediment (due to bioturbation) can only assist but not serve as state-related thresholds. However, state-related standards may be definable for specific types of fauna, flora or habitats on the basis of their uniqueness and vulnerability, such as active vents.

14. In the absence of knowledge about the vast majority of the ecological components and their interactions, the Authority – for the time being – might thus have to rely primarily on pressure-related thresholds. They may provide a way forward, given the present level of uncertainty and research gaps. In the light of the cumulative effects of large-scale ocean acidification and other climate change impacts on the deep ocean, the implementation of a strictly precautionary approach becomes even more important.

IV. Proposals for pressure-related indicators

15. We propose below the development of five pressure-related indicators to be included in the phase 1 standards, addressing the most important chemical and physical factors. The specific quantitative threshold values for those indicators will need to be developed through an expert-driven process, on the basis of the best available scientific evidence, and reviewed regularly as new scientific evidence becomes available. Additional indicators could then be added at any time.

[8] ISBA/19/C/17, annex, regulation 31 (5).
[9] See, in particular, articles 5, 6, and 7 of the Agreement.
[10] ISBA/19/C/17, annex, regulation 31 (4).

1. Toxicity

16. Toxic substances may be released during deep-seabed mining either by emitting chemicals into the environment or by bringing naturally occurring substances into the water column and thus making them biologically available.[11] Both processes are considered herein, even though the latter might be more likely to occur during deep-seabed mining. Trace metals, for example, are bound in the sediment and would be suspended as dissolved and particle-bound metals in mining-related sediment plumes. Anthropogenic emissions, such as added flocculation agents or accidentally leaking hydraulic oils may also prove to be highly toxic. Contractors are required to measure heavy metal background levels occurring naturally in surface sediments, pore waters and in the water column during their baseline studies.[12] Once in solution, they can stay in the water column for hundreds or even thousands of years.[13]

17. To obtain evidence-based threshold values for each substance or trace metal, further research, including (in situ) experiments and modelling approaches, are required for the main (or indicator) species types and main life stages. A pragmatic approach might be to determine the natural variability of trace metal concentrations in defined size fractions in the water column and then set the threshold in relation to that value within a safety margin, to be measured within a defined spatial distance to the operation. It should be kept in mind that, especially at low levels, the impact of increased toxicity may be slow and possibly accumulate with time, so that thresholds would need to be monitored continuously and, if necessary, adjusted downward. Initial threshold values therefore have to be set along precautionary levels, using indicative values from existing baseline and impact-related experimental studies.

2. Sedimentation rates

18. Depending on the type of mining technology used, several thousand tons of sediment may be mobilized and pumped into bottom waters every day. Furthermore, a fraction of that sediment will be pumped to the surface platform along with the nodules. Once the nodules are separated, the water-sediment mixture will be released back into the ocean – possibly at mid-water depths, but preferably back to the seafloor. While most abyssal ecosystems depend on natural sedimentation for nutrients and other vital compounds, the natural sedimentation rate is in the order of 5 mm per 1,000 years as determined for different parts of the Clarion-Clipperton Zone,[14,15] with organisms probably being highly adapted to that low rate. Ideally, to avoid the loss of biodiversity and strictly limit negative effects on living organisms at the bottom of the ocean, it would be necessary, for example, to increase research efforts regarding the tipping points of re-sedimentation of suspended sediments for filtering species. However, a pragmatic approach might be to determine the natural sedimentation rates in an area and to set the threshold in relation to that value as a function of the spatial distance from the mining operation. A more pragmatic – and precautionary – approach

[11] Chris Hauton and others, “Identifying toxic impacts of metals potentially released during deep-sea mining: a synthesis of the challenges to quantifying risk”, *Frontiers in Marine Science*, vol. 4, No. 368 (November 2017).

[12] ISBA/25/LTC/6/Rev.1, paras. 15 (b) and (c) and 40 (f).

[13] K.W. Bruland, R. Middag and M.C. Lohan, “Controls of trace metals in seawater”, in *Treatise on Geochemistry*, 2nd ed., Heinrich D. Holland and Karl K. Turekian, eds. (Philadelphia, Elsevier, 2013).

[14] Alexis Khripounoff and others, “Geochemical and biological recovery of the disturbed seafloor in polymetallic nodule fields of the Clipperton-Clarion Fracture Zone (CCFZ) at 5,000-m depth”, *Limnology and Oceanography*, vol. 51, No. 5 (September 2006).

[15] K. Mewes and others, “Impact of depositional and biogeochemical processes on small scale variations in nodule abundance in the Clarion-Clipperton Fracture Zone”, *Deep Sea Research Part I: Oceanographic Research Papers*, vol. 91 (September 2014).

may be to set an initially low re-sedimentation level, based on existing data from filter-feeding organisms, which is not to be exceeded in a certain spatial distance from the operation, and to adjust that level with additionally available data in future.

3. Turbidity

19. Before settling on the seafloor, the suspended sediment, either from the mining operation or from the discharge of surplus sediment from the mining platform into the water, will spend an extended period of time in the water column. The extent of that period will depend on several factors, such as grain size, settling velocity (aggregation) and turbulence, and will range from minutes to months, depending on the water depth where the suspension is discharged. The smaller the grain size and the shallower the water depth of the discharge, the longer the particles will stay in suspension. Small particles are likely to adhere to plankton, which could clear gelatinous plankton from large swaths of the water column, especially, if the excess water is emitted closer to the surface, for example, directly beneath the oxygen minimum zone, thus leaving several thousand metres of water column for dispersion. The closer the discharged sediment is released to the seabed, the less time and space it has to disperse.

20. To avoid loss of biodiversity, further research on the impacts of turbidity on plankton species would be necessary. A pragmatic approach might be to determine the natural variability of turbidity and then to set the threshold in relation to that value, within a defined distance to the output source. Another pragmatic threshold that could be defined for the mining plume in order to keep its influence close to the seafloor is the maximum vertical height that it will be allowed to reach in the lower water column.

4. Underwater noise

21. Physical pressures, such as noise or light emissions, may have a shorter duration and a more limited spatial extent, but within that period and area, they may still be disruptive. Underwater noise emissions have potential detrimental effects for marine biota, in particular for cetaceans (whales and dolphins).[16] Some of those species, for example, depend on seamounts for feeding[17] and could be affected by mining operations for cobalt-rich crusts at their diving depths.

22. For the development of underwater noise threshold values, the recently developed European Union process within the Directive establishing a Framework for Community Action in the Field of Marine Environmental Policy may provide a helpful example. For impulsive noise, values are currently developed with regard to hearing impairment of marine mammals. For continuous noise, the values will be based, inter alia, on the prevention of masking of biologically important sound. Specific proposals for adoption are expected towards the end of 2022 and may inspire a similar process for the Authority.

[16] B. Southall and others, “Marine mammal noise exposure criteria: initial scientific recommendations”, *Aquatic Mammals*, vol. 33, No. 4 (January 2008).

[17] Simone Baumann-Pickering and others, “Odontocete occurrence in relation to changes in oceanography at a remote equatorial Pacific seamount”, *Marine Mammal Science*, vol. 32, No. 3 (July 2016).

5. Light pollution

23. Owing to the extraordinary clarity of the water column in abyssal plains where polymetallic nodules are found, and the high sensitivity of the eyes of abyssal animals, artificial lighting may be distracting over unknown distances. For mobile species, this may change their behaviour or result in displacement. For benthic species, light may have a direct impact on their probability of survival. Fortunately, the containment of light and noise emissions poses a mostly technological challenge that can be solved with sufficient effort, and we predict that a pragmatic approach to the development of threshold values can be taken.

V. Suggested procedure for developing threshold values

24. Developing environmental threshold values will require input from scientific experts as well as members and observers of the Council. A suggested process is to establish one or more intersessional working groups, led by interested member States of the Authority. Stakeholders could be invited to nominate representatives with relevant expertise, including in environmental management or marine science, for the working groups. The involvement of scientists affiliated with projects studying the risks and impacts of deep-seabed mining is crucial in this regard. The working groups could report to the Council, in order to inform a discussion within the Council about the threshold values that might be acceptable for managing the common heritage of humankind. Germany had already proposed such intersessional working groups in a previous submission.[18]

25. The intersessional working group or groups should work on the basis of terms of reference to be adopted by Council. The terms of reference should include at least the following “work packages”:

- Development of overarching goals
- Determination of indicators for which thresholds are to be developed
- Development of science-based threshold values
- Identification of existing research needs
- Clarification of methodological approach to deal with uncertainties and insufficient data and knowledge and proposal for approaches for future adjustment of threshold values with new knowledge and data

26. The working group or groups should be inclusive of observers and work in a transparent and trustful manner and allow all Council members to identify points of scientific disagreement or uncertainty. This, in turn, will allow the Council to make an informed decision on threshold values for activities in the Area.

[18] ISBA/24/C/18.