“Standards for the Assessment of Impacts of Deep-sea Mining Projects on Marine Ecosystems"

Expert workshop
Hamburg, 29 January 2019

Minutes

Approximately 20 experts from science, public authorities and civil society participated in this one-day expert workshop organised by the German Environment Agency (UBA). The purpose of this workshop was to have an open exchange of thoughts on fundamental methodological approaches to the development of assessment standards with respect to the impacts that deep-sea mining projects can have on marine ecosystems.

The main discussion points and findings are summarised below.

1. General remarks

- The following statements relate exclusively to deep-sea mining projects.
- In addition to specific input requirements still pending in the draft exploitation regulations, terminological and fundamental conceptual issues relating to "environmental standards" have to be clarified and clearly defined first (e.g. standards/guidelines, criteria/indicators, threshold values, assessment values, reference values, environmental objectives/goals/targets). The term 'assessment standards' will be used hereafter to cover all the various aspects of assessing the environmental impacts of mining projects.
- Assessment standards are required so that the mining project operators (usually referred to as “contractors”) and the competent authorities at the national level (e.g. State Office for Mining, Energy and Geology (LBEG) in Germany) and the international level (International Seabed Authority) can decide whether a specific project meets the legal standard of the UN Convention on the Law of the Sea, which is: "effective protection of the marine environment".
- In order to evaluate and regulate impacts on the marine environment, different categories of assessment standards are necessary. They must relate to at least the following four categories:
    - Quality of the environment after mining activities[1]
    - Requirements concerning the use of technical equipment
    - Requirements regarding surveillance and environmental monitoring[2]
    - Requirements regarding measures to mitigate impacts[3]

[1] The term ’activities‘ shall include projects on exploration and exploitation
[2] In the further course of these minutes, the term used is ‘monitoring’
[3] In the further course of these minutes, the term used is ‘mitigation’

- It can be assumed that for the three types of mineral resources - polymetallic nodules, polymetallic crusts and massive sulphides - different assessment standards are needed.
- The significant knowledge gaps with respect to the marine ecology of the deep seabed in general, but also regarding the specific ecosystems surrounding the three types of mineral resources as well as their sensitivity to change, do not fundamentally inhibit the development of assessment standards. Dealing with knowledge gaps is a general problem of environmental regulation.
- The third draft "Exploitation Regulations" do not provide any detailed specifications for the definition or derivation of assessment standards.
- In its statement on the second draft of the "Regulations on Exploitation of Mineral Resources in the Area" (September 2018), Germany clearly stipulated that no exploitation activities should be permitted by the Authority unless the relevant assessment standards are adopted. Furthermore, the development of assessment standards with regard to the above four categories was set as a requirement.

2. Current status-quo of scientific knowledge: Environmental impacts of mining activities

   Scientific knowledge on environmental impacts caused by the exploitation of polymetallic nodules (afterwards referred to as manganese nodules)

- Seventeen licenses for exploration have currently been granted by the ISA.
- The following information is essentially based on findings from the European research project JPI-O "MiningImpact" and its predecessor "EcoMining".
- The mining of manganese nodules will remove several centimetres of the seabed sediment and has a large spatial extent (approximately 200 km^2 per contractor per year).
- Removing manganese nodules from the seafloor can eliminate entire ecosystems, as each individual nodule can be home to unique ecosystems. Other sources of environmental impact include sediment plumes and the dumping of separated materials after primary processing of nodules on ships.
- The following deductions on the scales of environmental impacts can be made:
    - Due to the sediment plumes, the area affected is much larger than the mining area itself.
    - Sediment plumes can negatively impact their environment both when being dispersed in the water column and after deposition on the seabed. Even a deposited layer of one centimetre leads to a considerable increase in faunal mortality.
    - Manganese nodule ecosystems recover extremely slowly from disturbance (traces of ploughing are still seen decades later).
- Knowledge gaps mainly concern both the long-term impacts on the fauna of the affected areas (on the seafloor and in the water column) and the baseline requirements that are necessary for gene exchange over to safeguard the preservation of species. Ecological responses to various sediment loads could be designed as a potential indicator of impact.

- Technical measures can reduce environmental impacts, e.g. with respect to the development of sediment plumes or the dumping of sediments and nodule debris.

Scientific knowledge on environmental impacts caused by the exploitation of massive sulphide deposits

- In contrast to manganese nodule fields, economically interesting massive sulphide deposits are limited to small areas. They are usually found in a water depth of approx. 3,000 to 1,600 meters (manganese nodules: 6,000 - 4,000 meters). The minable deposits are three-dimensional and are expected to be mined as such. Alternatively, several deposits as close as possible to each other are required for economically feasible mining.
- Currently, seven licenses for exploration have been granted by the ISA.
- As with manganese nodules, negative environmental impacts result from the removal of massive sulphide deposits, from sediment plumes and, possibly, from dumping after the sulphides' initial processing. However, the sediment plumes are likely to be much smaller than those resulting from the exploitation of manganese nodules, although the potential for toxicity of the wastewater is higher.
- Other negative impacts include potential shifts of the vent thermal liquid discharge sites as well as light and noise pollution. Tectonic transformations have also been observed.
- Massive sulphide deposits must be differentiated according to whether they are located at active or non-active hydrothermal vents. It is known that especially in the immediate vicinity of active hydrothermal vents, there are regional or site-specific, highly specialised ecosystems which are likely to react very sensitively to changes.
- The megafauna has been relatively well studied. However, there are considerable gaps in knowledge for macrofauna and meiofauna.
- In the case of exploitation, impacts on marine ecosystems in the vicinity of massive sulphide deposits cannot be predicted at present.
- The mining of inactive massive sulphide deposits, which are likely to be buried underneath sediment deposits, could prove to be economically feasible. However, a high exploration effort is necessary to detect them.

Summary

- There are still considerable gaps in our scientific knowledge of mineral-related ecosystems. However, the main sources of potential environmental impact can be identified.
- It is currently very difficult to derive threshold values or quantified environmental requirements on this basis.
- Further measures are necessary to close the existing gaps in knowledge.

3. Experiences from deep-sea fishing and offshore wind power plants

- The development of appropriate assessment criteria for environmental impacts is also a challenge for other uses of the marine environment, such as deep-sea fishing or offshore wind farms. Therefore, available experience deriving from the regulation of such uses should be explored.

Deep-sea fishing

- The discussions on assessment criteria for the effects of deep-sea fishing show that the necessity to preserve the ecosystem services of the deep-sea floor should be the core guiding objective for the development of assessment standards. The ecosystem services provided by the deep-seafloor biota were described as a highly effective and adaptive system of processing sinking waste from the upper water layers.
- Regional Fisheries Management Organisations (RFMOs) are responsible for deciding on catch limits, technical measures and the establishment of protected areas with regard to deep-sea fishing. Thus, regional specificities are managed by these organisations which usually involve the adjacent States. Organisations of civil society are normally invited to take part in consultations on decision-making procedures.
- Project operators must document their fishing activities. In some RFMOs, for example in the northwest Atlantic, independent observers on ships are obligatory.

Offshore wind power plants in the German North Sea

- The initial knowledge gaps with respect to potential environmental impacts caused by offshore wind power plants were addressed by developing strict standards that corresponded to the precautionary principle/approach.
- In order to close these gaps, a standardised investigation program (Standard Investigation Concept, StUK) was developed. The requirements were gradually eased with increasing knowledge levels.
- The StUK mainly contains guidelines for environmental monitoring before, during and after the project, for the respective investigation period, the investigation area and the sampling scheme.
- The StUK serves exclusively to structurally organise the generation of information and data, but does not provide any assessment criteria or threshold values. It is continuously updated.
- With regard to the evaluation of projects that could potentially influence protected areas, the fundamental principle applies that a significant impairment may be assumed if more than 1% of the protected area is affected by the project.

4. Recommendations for the development of assessment standards

Categories and general requirements

- Assessment standards for expected environmental impacts are necessary to decide on whether applications for exploitation may be approved. They may incorporate qualitative requirements. In case of doubt, however, they should include quantified specifications in terms of threshold values. In any case, their verifiability must be ensured.
- Assessment standards, possibly also including threshold values, should be developed in such a way as to ensure that the ecosystem services of the deep seafloor environment are maintained.
- When developing assessment standards, due consideration should be given to the various legal standards ("effective protection of the marine environment", "serious harm", "risk of serious harm") that are inherently linked with different legal consequences and obligations. It should be examined whether different assessment standards need to be defined depending on the legal standard(s) to be adopted.
- Assessment standards must also be developed for the designation of protected areas including Areas of Particular Environmental Interest (APEI), Impact Reference Zones (IRZ) and Preservation Reference Zones (PRZ).
- The precautionary principle/approach requires that risks to the marine environment should be prevented or at least minimized. It is therefore not sufficient to simply avoid harm/damage to the marine environment. Technical assessment standards thus have to be adjusted to include these precautionary requirements.

Procedures, responsibility and transparency

- The development of assessment standards is a task of public concern and should not be left over to contractors or project operators. However, like all other stakeholders, these should also be involved in the decision-making process.
- Assessment standards are to be developed and updated through a well-structured interaction process that includes planning instruments ("Regional Environmental Management Plans") and the approvals of individual projects as well as their monitoring. This also includes the instruments - strategic environmental assessment and environmental impact assessment. In addition, development of assessment standards based on the precautionary principle (see section "Assessment standards for offshore wind power plants") and the continuous adaptation of assessment standards to the current level of scientific knowledge must be ensured.
- Access to all relevant environmental information is an essential prerequisite for the design of appropriate assessment standards. This applies both to scientific publications and to all environmental information available to contractors.
    - To date, the annual reports of contractors, for example, are not available to the public.
    - For this reason, it is not possible to check to what extent these contractors actually comply with the obligation to survey the environment as prescribed in the "Plans of Work".

Dealing with uncertainty

- The knowledge of deep-sea ecosystems is limited. This applies to the composition of species, their behaviour in the environment, their resilience and their ability to regenerate.
- Comprehensive mapping could be a measure to fill the gap of knowledge. However, this is not considered feasible because of its complexity and the required resources.
- However, a step-by-step approach is recommended which allows mapping of ecosystems based on the outcomes of scientific projects, of test mining projects and other information available to the contractors (e.g. annual reports) in the currently relevant areas.
- Furthermore, general basic ocean-wide mapping is recommended.

Need for a standardized investigation concept

- In addition to access to all existing environmental information and a strategic approach to its evaluation - including the involvement of the scientific community - the development of a standardised investigation concept is of utmost importance.
- The contractors have to apply such a standard investigation concept when preparing the documents for the application of an exploitation project; this extends to the monitoring phase as well.
- The German standard investigation concept for offshore wind power plants may be used as a blueprint in this regard.

Monitoring

- In order to ensure effective monitoring and to appropriately evaluate monitoring results, it is of primary importance to obtain adequate baseline data of the marine ecosystems and their environment in order to identify and, if necessary, evaluate changes.
- Secondly, due consideration of the extent to which the development of overarching as well as medium-term objectives and indicators is necessary to effectively organise monitoring is required.
- Experts agreed that monitoring should extend beyond the area of exploitation to other potentially affected areas on the seafloor and in the water column.

Other aspects

- A reversal of the burden of proof (the contractor is obliged to prove that negative impacts on the environment are prevented) is considered to further promote the development of verifiable assessment standards.
- The designation of exclusion (no mining) areas is encouraged. However, for the definition of such areas, selection and assessment criteria must be developed.

- Parameters for which threshold values could potentially be defined were discussed and are shown in the Annex 1.
- Relevant future research topics are:
  (1) Improvement of knowledge on biodiversity,
  (2) Preparation of methodological concepts to describe worst-case scenarios,
  (3) Determination of appropriate investigation and monitoring concepts.

5. Further steps at the national and international level

- In Germany, an informal working group of academics and representatives of ministries, competent authorities and civil society should be established to further discuss specific topics with regard to assessment standards. The German Environment Agency (UBA) should lead and coordinate this informal working group.
- The international workshop to be held in Pretoria, South Africa, in May 2019 should focus on the following questions:
    - Terminology: clarification of terms
    - Development of a roadmap
    - Clarification of formal procedures for the adoption of assessment standards
    - If appropriate, an international working group should be set up.
- Germany has offered to host an international workshop in the first half of 2020 intended to focus in particular on environmental standards/criteria/thresholds.
    - The workshop should build on the results of the Pretoria workshop.
    - The informal working group described above will be tasked with the preparation of the environmental standards workshop.

Parameter / Threshold value	Practicability	Measurability	Comprehensibility	Period
Prevent or limit species extinction	Time-consuming	(+)	(+)	Define time frame and reference area
Maximum increase of sedimentation rates	(+)	(+)	(+)	continuously
Occurrence of noise and light	(+)	(+)	(+)	continuously
Maximum heavy metal concentration	(+)	(+)	(+)	continuously
Gelatinous plankton (sedimentation velocity?)	(-)	(+/-)	(+/-)	continuously
Percentage of mineable areas that should not be affected by exploitation and turbidity plume (= extent of Preservation Reference Zones, PRZ ?)	(+)	(+/-)	(+)	permanently
Maximum quantity of dispersed sediments / time unit	(+)	(+)	(+)	continuously
Maximum energy consumption per quantum of extracted ore	(+)	(+)	(+)	continuously
Maximum particle concentration in the plume of the collector	(-)	(+/-)	(+/-)	continuously
Maximum total amount of displaced sediments	-	-	-	-
Maximum ground pressure of the collector	-	-	-	-
No exploitation of active vents	-	-	-	-
Define VMEs and protect these	-	-	-	-
Microbial activity	-	-	-	-
Diversity parameter	-	-	-	-
Percentage of habitat loss (scale-dependent)	-	-	-	-
Oxygen penetration	-	-	-	-