NOTAT

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Sak: Høring - forslag til konsekvensutredningsprogram for mineralvirksomhet på norsk kontinentalsokkel

Regjeringen har besluttet å igangsette en åpningsprosess for mineralvirksomhet på norsk kontinentalsokkel i henhold til havbunnsmineralloven. Før et område kan åpnes for slik virksomhet, skal det som del av en åpningsprosess, gjennomføres en konsekvensutredning. Første steg i prosessen med en konsekvensutredning er å utarbeide et forslag til program for konsekvensutredningen.

Norsk Institutt for Vannforskning (NIVA) gir med dette sitt høringssvar på foreslått utredningsprogram. NIVAs kommentarer gis på engelsk og er utarbeidet av seniorforskere tilknyttet seksjonene for Marin biologi og Miljøgifter.

General comments:

The wording is vague in general and in particular sections 5 and 6 need to be more concrete to provide robust guidelines for the development of a sound impact assessment programme.

The precautionary principle requires addressing and preventing environmental risks at an early stage, including the identification of knowledge gaps and uncertainties, to ensure these can be addressed and taken into account in a robust decision-making process (Durden et al., 2017; Jaeckel, 2017). The precautionary principle should be included as a key component of the impact assessment framework. This is particularly important in the context of seabed mining, because of the paucity of standardized environmental data from areas targeted by the industry, and especially relevant for hydrothermal vent and seamount ecosystems in the study area.

The text does not recognize clearly enough how little we know about active and inactive vents along the Mohn’s and Knipovich Ridges, particularly for deep vents that are relevant to mineral resources. The only vents that have been studied in detail (excluding the shallow Jan Mayen Vent Field) are the active Loki’s Castle vent field (Pedersen et al., 2010 and unpublished work from UiB) and, to some extent, the inactive Mohn’s Treasure (Ramirez-Llodra et al., 2020 and unpublished work from UiB). In terms of area covered of the whole ridge system in the study area, this is very small. This limited knowledge has important consequences in the assessment and understanding of potential environmental impacts from mineral exploration and exploitation.

Much of the key international literature on strategic management and environmental impacts of seabed mining has not been used. These publications include significant information that can inform and guide the development of an impact assessment (see references provided).

Section 2
The impact assessment, particularly its environmental part, should be developed in the framework of clear Strategic Environmental Goals and Objectives (SEGO). The UN SDGs and "relevant environmental goals" are mentioned as political superstructure, but the text needs clear guidelines on this, following common international practice (Tunnicliffe et al., 2020):

- What will be the environmental goals and objectives at the regional scale?
- How will these goals and objectives be operationalized (targets)?
- How will serious harm/harmful effects to the environment be measured (thresholds)?

In addition, consideration should be given to the establishment of networks of areas where mining and mining impacts are prohibited. The impact assessment should thus address plans for the establishment of reference areas and "no-mining" Areas of Particular Ecological Interest (APEIs) along the area to be opened for mineral exploration and exploitation (e.g. Dunn et al., 2018).

Section 4.2
NIVA does not agree to the sentence at the end of this section which states that industrial extraction of seabed minerals will be locally limited and should not result in general conflicts with interests related to bioprospecting. Seabed mining of SMS on vents and crusts on seamounts may result in the loss of species that can provide valuable marine genetic resources (MGRs). We have the risk of losing those resources before even we know they exist (Van Dover et al., 2018). There could also be conflicts with the fishing industry, particularly for activities on seamounts.

Section 4.3
It is not always correct to say that the benthic fauna around the vents is "more dispersed and consists of more widespread species and communities". It has been shown that in some regions there may be dense aggregations of sponges and of stalked crinoids (Ramirez-Llodra et al., 2020), which in addition may be considered Vulnerable Marine Ecosystems (VMEs) and thus have important implications in regulatory regimes.

When talking about inactive vent sites, the text should stress further that very little information is available from such habitats, that they are much more difficult to locate than active sites (there is no chemical signal in the water column) and that inactive sulphides may have a specific community associated with them. We just do not have the data yet to make statements about fauna composition, community structure, function and species connectivity from inactive sites (Van Dover, 2020; Ramirez-Llodra et al., 2020).

Section 5.1
The discussions about current and future mineral needs should include the arguments that, in particular for SMS, mining such resources may not be a long-term viable activity because of the limited resource available, as suggested by studies from international academics (Hannington et al., 2011; Hein et al., 2013). In addition, the arguments that we need an increasing amount of minerals to support the green shift assume that we are using current battery technologies for electrically driven technology. However, battery technology is evolving rapidly, with research focusing on new solutions that are less dependent on nickel and cobalt (Leisegang et al., 2019).

Section 5.3
Of the 30 ISA exploration licenses in The Area, 18 are for polymetallic nodules, 5 for cobalt-rich crusts and 7 for seafloor massive sulphides, and they include licenses in the Indian Ocean as well as the Pacific and Atlantic Oceans.

Section 5.6
In relation to the closure of the activity, the document states that the Seabed Minerals Act sets requirements in line with the requirements for the petroleum industry. However, the impact of seabed mining on the habitat, fauna, ecosystem functions and services (both benthic and pelagic) are expected to be significantly larger than those of an O&G rig. Thus, specific closure provisions need to be considered for seabed mining, in addition to any provisions that can be adapted from the O&G regulations.

Section 5.7
The main consequences of seabed mining included in this section (from the Research Council review, 2019) are very vague and need more detail:

- Loss of fauna means potential loss of endemic species, potential loss of ecosystem functions and potential loos of MGRs. The loss of fauna may also have impacts on metapopulation dynamics that disrupt connectivity patterns (e.g. reducing the possibility of recolonization and recovery of affected areas, modifying biogeographic patterns, affecting indirectly the maintenance of populations in areas not directly mined).
- The impacts of de-watering would be mostly linked to the creation of a sediment plume that can impact indirectly pelagic and benthic communities (including VMEs such as sponge and crinoid fields, or even species of commercial value).

Section 6.1
Any exploration for mineral resources needs to undertake an EIA prior to the activity. Such exploration will include geological sampling which may have impacts on the habitat and associated fauna. This is particularly important on hydrothermal vents due to the small and patchy nature of these systems. It is imperative that an EIA is applied to any new exploration activities in the study area.

Section 6.2
Environmental impact cannot be prevented in a mining operation (whether on land or in the deep sea). The question is: what will be considered an acceptable impact? What are the indicators and what are the thresholds to measure impact?

Section 6.3
This section needs considerably more detail.

In the **habitat** subsection, the following should be considered for each habitat:

- High-resolution bathymetry.
- Physical oceanography (currents, temperature, plume analyses for vents).
- Geochemistry (particularly important at vents, both active and inactive).

In the subsection on **biological communities**, the following points should be added:

- What are the key ecosystem functions (e.g trophic relations)?
- What are the life-history variables of key species?

- What is the degree of endemism?
- Alpha and beta biodiversity.
- What are the geographic differences in community composition and structure, at the vent field and the regional scale?
- What ecosystem services are supported by the communities (Le et al., 2017)? E.g. at vents: bioactive compounds for medicine and technology, thermophile applications; microbial cycling of C, S and potentially heavy metals; global cycling of Fe. E.g. at seamounts: nursery habitats created by sponges and corals; higher productivity that support fisheries; biotech development from organisms such as sponges and bamboo corals.
- Special consideration should be given to the presence of VMEs (e.g. crinoid fields on Mohn's Treasure, corals and sponges on seamounts).

Section 6.4

The proposed topics for the study of environmental effects need to be much more specific. In addition to what is stated, impact on the following parameters should be included and are discussed further after the bullet points:

- Biodiversity (local and regional).
- Potential for species extinction.
- Community structure.
- Ecosystem functions (e.g. metabolic activity, nutrient cycling, primary and secondary productivity, breeding grounds, nursery habitats, etc).
- Connectivity potential (from other sites for recovery).
- Metapopulation dynamics (source/sink populations).
- Presence of VMEs.
- Potential impact on marine mammals during the different phases of deep-sea mining: Prospecting – Start-up – Production – Cessation.

In addition to biological and physical parameters, geochemical variables need to be considered at vents, as these variables are key drivers of community composition and structure.

Although the document states that inactive vents will be targeted for SMS mineral resources, it is not clear If these are inactive areas within/surrounding active vent fields, or extinct vent fields far away from active fields and thus covered in sediment. Depending on what system is targeted, the impacts will be significantly different, so this needs clarification.

In terms of the adaptation of organisms and species to vent chimneys and vent fields dying out, the text is not in accordance with present knowledge. Organisms are not adapted to vents erupting or stopping activity. They will just die when such an event occurs. However, the dynamism of hydrothermal venting is one of the drivers that has shaped species distributions at the large scale over 10s to 100s thousands of years. This does not mean that if vent sites are mined, the species would simply adapt, move to another site or recolonize the impacted site. The potential for recovery and the maintenance of the population/species will depend on several variables related to meta-population dynamics and regional connectivity (Mullineaux et al., 2018). This is particularly important on slow and ultra-slow spreading ridges where active vents are spread over long distances. An assessment of metapopulation dynamics and population connectivity at the regional scale is an essential component of the impact assessment.

Generally regarding environmental effects from subsea mining, it will be important that effects are not only assessed individually for a specific production area. As mentioned earlier, the ecosystems associated with hydrothermal vents are highly specialized and characterized by endemic species. To avoid extinction of such species, it will be instrumental that populations are contained at certain (maximum) distances to enable drifting larvae in-between different areas. This type of overall assessment of the environmental impact of subsea mining in the area in question ought to be made early in the opening process and, therefore, appears highly relevant to include in the current EIA.

In relation to the assessment of smothering of seafloor fauna (by mine tailings), the effects of changes in particle size and shape, and generally substrate composition of the seafloor as a direct effect of subsea mining should also be addressed.

An assessment comparing the (expected) overall environmental impact from, respectively, sulphide mines (expected production area 0.1–0.5km^2) and crust mines (expected production area 10–20km^2) appears highly relevant to include at this early point in the opening process. Relevant subtopics e.g. include:

- Ore quality (concentration of mined minerals) and thus relative volumes of mine tailings returned to the seafloor, and
- Differences in chemistry management. Experiences from sea disposal projects in Norway, including conclusions drawn in the research project NYKOS[1] (Ramirez-Llodra et al., 2019) should be utilized in the EIA.

It would also be relevant to assess possible logistic and infrastructural challenges and solutions related to mineral extraction from (very) deep waters, and at long distances from shore. Solutions used and discussed by the O&G industry in the Barents Sea appear particularly relevant to look at, also from a climatic perspective. At this early stage of the process, an assessment should be done at a high and general, rather than at a site-specific level. Nevertheless, it is evident that transports and logistics will represent major challenges for the area in question. The possibility (necessity?) to establish a fixed installation (hub) within the area, either on land (e.g. Jan Mayen) or as a floating offshore installation, ought to considered and discussed.

Section 6.5
The document states that all reasonable measures shall be taken to avoid damage to the natural marine diversity or cultural monuments on the seabed and to avoid pollution and littering. This requirement should be operationalized by defining indicators and thresholds.

Section 6.6
An assessment of social acceptance, which first needs social awareness, is lacking.

The document states that it will be difficult to assess the extent of financial effects. However, an attempt can be made to provide some economic assessment. For example, it is possible to estimate benefits from SMS mining and compare it to potential benefits from MGRs for long-term activities (see Van Dover et al., 2018 and references therein).

In addition to the proposed topics for study, the following should be considered:
Potential loss of value through the loss of MGRs: a comparison of the long-term economic and societal gains that could be obtained from MGRs (which have a limited environmental impact, as

[1] https://www.sintef.no/projectweb/nykos/

there is no large-scale exploitation) in relation to the gains obtained from seabed mining (with significant environmental impacts) could be made.

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