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Deep Seabed Mining: A Perspective on Metal Demand, Biodiversity, Ecosystems Services, and Benefit Sharing

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Introduction

The perceived or expected need to fulfill increased demand for minerals, notably in support of a "green transition," as well as the financial advantages that could result from exploitation of metal-rich deposits, are driving interest in deep-sea mineral mining. As of May 2021, the International Seabed Authority had issued 31 exploration contracts, the majority of which were with private businesses based in the global north [1]. The ISA is working on exploitation regulations. No exploitation contracts for mining in the area beyond national jurisdiction have been awarded by the ISA to date, and no commercial deep-sea mining has taken place on continental shelves.

Despite the fact that environmental impacts are irreversible and that the scale and severity of those impacts are unknown, the deep-sea mining industry is gaining traction, aided by carefully crafted narratives that position proposed operations as a viable option for supplying virgin mineral resources [2]. In some circumstances, seabed mining is portrayed as an inescapable result of rising demand, while in others, it is portrayed as the "lesser of two evils" in compared to land-based mining. Deep-sea mining proponents cite a decline in terrestrial ore quantity and quality, the possibility for societal conflict in locations where natural resources are mined, and the possible impact of terrestrial mining, notably on the environment, as reasons for exploiting ocean mineral reserves. Deep sea mining is drawing rising opposition from civil society groups, and there are calls for industry to consider the deep cultural and spiritual ties that many remote island nations have with the sea.

The ocean ecosystem will be severely harmed and will have long-term consequences if the deep sea is mined. Climate change, acidification, deoxygenating, pollution, and overexploitation of living marine resources are already putting strain on marine ecosystems in unprecedented ways [3]. Targets for worldwide ocean protection have been defined, methods developed, and conservation programmes launched, yet these are all eclipsed by the lack of a cohesive approach. Sustainable Development Goal 14 ("to maintain the health of the ocean"), for example, is not on track to meet all ten targets by 2030, and none of the Aichi targets have been met during the previous UN Decade on Biodiversity Secretariat of the Convention on Biological Diversity, 2020). Last year work on a legally enforceable document for the conservation and sustainable use of marine biological diversity in places outside of national authority will continue. Industrial-scale mining on the deep seafloor would be fundamentally incompatible with such promises.

Deep-Sea Mining's Perceived Benefits and Risks

Increased demand for minerals such as cobalt, lithium, nickel, copper, vanadium, and indium for use in electric vehicles green energy technologies, and storage batteries is expected as the world moves toward a low-carbon economy, with large increases in demand predicted for cobalt, nickel, and lithium 4. Such projections have fueled interest in mining virgin deep sea minerals, as well as a desire to retain supply diversification and worries about the environmental and human rights implications of terrestrial mining.

Despite thorough predictions of the amounts of minerals and metals required to complete the transition to green technology, the size of future demand remains a major unknown. The assumptions on which forecasts are founded are fraught with uncertainty and are likely to change dramatically during the next few decades. Future availability of energy-related technologies (particularly for batteries) and what that means in terms of metal demand, as well as the rate and scale of manufacturing of those technologies, are two significant elements that determine modeled demand. With the probable exception of lithium-containing batteries, Mn berger and Stenqvist indicate that terrestrial mineral stocks are sufficient to support a transition to renewable technology given potential future breakthroughs (planned exploitation of deep-sea reserves generally does not target lithium).

Batteries have been identified as a major future need for certain metals that are also linked to deep bottom resources, and they serve as an excellent illustration Despite available and in-development alternatives such as Svolt's cobalt-free lithium-ion car battery and Tesla's use of lithium-ion phosphate batteries in certain vehicles, many projections assume continued use of current lithium-ion battery technology (incorporating cobalt and nickel) for both EV and stationary storage uses .The proposed transport model and the proportional magnitude of different modes of transportation influence projected future demand for EV batteries. The projections are based on a variety of models, ranging from business as usual to sustainable transportation strategies that are less reliant on personal vehicles. Even fewer vehicles and batteries could be possible with more integrated transportation systems. Improved technical design, such as the removal of built-in obsolescence, could have a significant impact on future raw material and finished goods demand [4-5].

Conclusion

Seabed mining will disrupt deep-sea ecosystems in an inescapable, irreversible way, putting the health of the entire ocean at danger, adding to existing stressors such as pollution (litter, noise, and chemical), inadequate fisheries management, and climate change. Light and noise pollution, sediment plumes, and biodiversity loss due to habitat fragmentation are all effects of mining. Midwater ecosystems, which make up more than 90% of the biosphere, hold 100 times the global

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annual fish catch, connect shallow and deep-sea ecosystems, and play important roles in carbon export and nutrient regeneration, are under risk from deep-sea mining. The return sediment plume, which is expected to be discharged at roughly 1,200 metres and might last for hundreds of kilometres, could harm deep and midwater ecosystem services by clogging respiratory and olfactory surfaces, among other things.

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Conflict Of Interest

The authors declare that they are no conflict of interest.

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