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Should deep seabed mining be allowed?

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ABSTRACT

Commercial interest in deep sea minerals in the area beyond the limits of national jurisdiction has rapidly increased in recent years. The International Seabed Authority has already given out 26 exploration contracts and it is currently in the process of developing the Mining Code for eventual exploitation of the mineral resources. Priority issues have so far been feasibility and profitability of this emerging industry, while relatively little consideration has been given as to how, and to an even lesser extent, whether deep seabed mining should proceed. This article makes a case that the global community should question and scrutinize the underlying assumption that deep seabed mining is going benefit humankind as a whole before commercializing the common heritage of humankind.

1. The benefit of humankind principle

Deep seabed mining is looming in the area beyond the limits of national jurisdiction, known as “the Area”. The number of 15-year exploration contracts approved by the International Seabed Authority (ISA) under the 1982 United Nations Convention on the Law of the Sea (UNCLOS) has soared to an impressive 26 as of May 2017, covering 1.2 million km^2 of the Area [1]. The ISA is currently in the process of developing a set of rules, regulations, and procedures – the Mining Code – for eventual exploitation of the mineral resources. An increasing number of developing countries such as Fiji, Nauru, Tonga, Tuvalu, Kiribati, and China are preparing domestic legislation to regulate their prospective activities in the Area [2]. Hopes and concerns have been expressed about the future of deep seabed mining [3].

Despite far-reaching consequences, however, “the issue is widely seen as not whether mining should proceed, but how it can be done profitably and safely” [4]. Since its inception in 1994, the ISA has been more or less encouraging the development of the Area by offering appropriate commercial incentives for investors [5]. Yet UNCLOS stipulates that activities in the Area must be carried out *for the benefit of humankind* as a whole [6]. This is not an empty rhetoric, but a legal principle [7], which sets a precondition for deep seabed mining. In other words, the exploitation of the resources of the Area is justified under international law only if and to the extent that it serves the common interest of humankind. In the 1970s, there was general agreement that deep seabed mining “will yield a net balance of benefits to the international community as a whole” [8], and that it would benefit no one if the Area is left undeveloped [9]. That still seems to be the prevailing view today. The benefits have been consistently assumed and rarely questioned.

However, the world has changed drastically. A new set of global goals for humanity have been agreed upon and captured in the 2030 Agenda for Sustainable Development [10]. The meaning of benefit and humankind should be reinterpreted in light of the Sustainable Development Goals. The benefit has so far been defined by the ISA almost exclusively in the economic or financial terms, but social and environmental interests, especially those of future generations, deserve equal consideration [11]. It is time to question the assumption that commercializing the Area will benefit all humankind. Is commercial exploitation of non-renewable resources from the ocean floor today really in the interest of humanity?

2. Who controls the seabed, and for whom?

When polymetallic nodules were first identified in abundance from the bottom of the Pacific Ocean in the early 20th century, they were seen as a source of enormous wealth [12]. Developing countries in particular viewed the mineral deposits as a potential source of revenue for alleviating poverty and building a new and just international economic order by closing the North-South divide [13]. The marine environment received little attention back then as the ocean was thought to be of infinite capacity. The question was not whether to mine or not, but who should control the seabed [14].

After contentious decade-long negotiations, UNCLOS was opened for signature in 1982. The convention defines the Area and its non-living resources as the common heritage of humankind, which is subject to protection under some general environmental provisions [15]. All rights to the resources are accordingly vested in humankind as a whole,

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and on whose behalf and for whose benefit, the ISA must act [16]. Reflecting this, the ISA was originally designed to make decisions on a "one country, one vote" basis [17]. Worrying that this would give the numerically superior developing world significant leverage over the Area and its resources, however, developed countries refused to sign UNCLOS and prevented it from entering into force. Consequently, the Agreement Relating to the Implementation of Part XI of UNCLOS was adopted in 1994, through which the decision-making system of the ISA was substantially modified to prevent majority rule [18].

One could argue that the ISA has since become structurally incapable of representing the common interest of humankind, but rather national interests of (certain) states parties. This problem of misrepresentation may be inherent in the common heritage regime itself as "it is motivated in large part by states' desire for access to resources rather than by genuine community interest in their protection" [19]. Nonetheless, in the spirit of the common heritage principle, "agencies engaged in commercial profit or private gain would be deemed inappropriate, unless they operated to enhance the common benefit of all [hu]mankind" [20]. The mere fact that deep sea mineral deposits are commercially attractive as ore is not a sufficient justification to exploit them. The pros and cons of deep seabed mining should be assessed from the perspective of humankind, paying particular attention to the needs and interests of developing countries and future generations.

3. Who wins and loses from deep seabed mining?

A key driver of deep seabed mining is the underlying assumption that the demand for metals will continue to increase while the supply will peak and decline [21]. Notwithstanding the accuracy of this conjecture, it is reasonable to assume that, if everyone on Earth were to enjoy the same levels of use as those in developed countries for a similar lifestyle, the amount of global in-use metal stocks required would be 3–9 times those existing at present [22]. Furthermore, only a few countries possess the majority of global metal reserves, making the supply unreliable globally. For example, in 2012, the Democratic Republic of Congo was responsible for 68% of global cobalt production, Chile produced 32% of copper, and China produced over 90% of rare earths [23]. The temporary closure of the Chinese rare earth industry in 2011 was a wake-up call for the international community of the vulnerability of the global economy to unilateral decisions relating to the supply of strategic metals, and increased interest in "deep-sea mud" in the Pacific Ocean as a potential resource for these materials [24].

It has been speculated that deep seabed mining could contribute to global sustainable development by providing financial and other economic benefits that will be equitably shared among all states on a non-discriminatory basis. Under the parallel system of reserved access to the Area, both states parties and the ISA (or the Enterprise to be specific) would exploit the seabed side-by-side. Even least developed countries with very limited capacities have a chance at directly engaging in deep seabed mining by sponsoring financially and technologically capable contractors. Nauru and Tonga, for example, signed contracts with the ISA, and the emerging industry could help alleviate poverty in these countries. For humankind, however, the ISA has yet to work out a payment mechanism and financial terms for mineral resources recovered from the Area (such as fees and royalties), and how humanity's share will be distributed globally [25]. It is reasonable to assume that the ISA will offer competitive rates comparable to those of land-based mining of the same or similar minerals, while taking into account the existing regime of the exploitation of minerals of the outer continental shelf [26]. Under these assumptions, the share-out of financial benefits derived from the Area are most likely be modest [27]. It seems the only meaningful benefit for humankind is the greater availability of key strategic metals, which arguably benefits those in industrialized (consumer) countries while those in least developed countries would barely feel any economic benefits.

Deep seabed mining proponents argue that deep seabed mining has potential environmental benefits. Increasing supply of certain metals would allow green technologies to be deployed at a greater scale or at a cheaper price. But more importantly, they make a counterfactual argument that, if humanity does not mine the seabed, the shortage of metals will need to come from terrestrial sources, which are notorious for their social and environmental problems. The grade and tonnage of land-based mineral deposits are declining, hence increasing the footprint of these mining operations. Deep sea minerals, on the other hand, are high-grade deposits, requiring less substrates to be removed. In the case of Nautilus Minerals' Solwara 1 Project in Papua New Guinea, footprint is in fact relatively small, covering just 0.112 km^2, with eight times better ore grade in the case of copper compared to terrestrial mines [28].

Nonetheless, a significant environmental impact is anticipated as mining operations on the seabed will cause benthic disturbance, sediment plumes, noise and vibration, and changes in chemical characteristics of the water column [29]. The scale and magnitude of such adverse effects will vary between three main types of deep sea mineral deposits, namely polymetallic nodules, seafloor massive sulphides, and cobalt-rich ferromanganese crusts. The geographical extent of the impact will be particularly extensive during nodule and crust mining operations because these minerals are spread out over a large area. Damage to deep seabed habitats following the removal of these substrates will be irreversible on human time scales [30].

A range of environmental management measures are available for mitigating the impact, such as protecting certain portions of the seabed as reference sites and imposing restorative obligations on miners [31]. However, it is reasonable to assume that best practices can reduce environmental risks by only so much, and serious harm will inevitably occur. Solwara 1, for example, is, after all, an open-pit mine. The miners claim that the "overall effects [will be] reversible and moderate" as animals will recolonize on the excavated sites within a few years [28], but this is an untested hypothesis. It is uncertain what the impact will be to highly unique and productive ecosystems around the hydrothermal vents that support many hundreds of species that were only recently discovered [32]. The significance of environmental impact of deep seabed mining is simply indisputable. The integrity of seafloor [33], on which the welfare of current and future generations depend, is at stake.

4. Governance challenges and opportunities

The ISA has a significant role to play on behalf of humankind to conserve and transmit the common heritage to future generations [34]. Constrained by its institutional design, however, the ISA has been entrenched in the mindset of a developer rather than a custodian of the common heritage of humankind. It should be reminded that the ISA is not mandated to simply promote deep seabed mining, but more broadly "to organize and control activities in the Area" [35]. Disallowing any extractive mining activities should remain available as an option [36]. The protection of the physical environment against unnecessary degradation would make a significant contribution to the betterment of humankind. One concrete step the ISA could take is to follow the approach taken by New Zealand's Environmental Protection Authority in its consideration of a seabed mining application, and adopt a broader understanding of the notion of benefit to include "total economic value", which encompasses "the direct and indirect values of [natural] resources as used by others or for their intrinsic and ecosystem services values" [37].

More fundamental societal transformation should be sought after to cope with the foreseeable shortage of metals and guard them against future exhaustion. There are at least three avenues to explore in parallel. First, more can be done to improve recycling, while acknowledging it may not be a panacea [38]. According to the United Nations Environment Programme, globally, metals relevant to deep seabed

mining, such as cobalt, copper, gold, iron, lead, manganese, nickel, silver, and zinc, already have relatively high end-of-life recycling rates – the share of end-of-life metal that is recycled – above or close to 50% [39]. However, recycled contents – the fraction of scrap metal in the total metal input of metal production – remain rather low. For example, copper in all old and new, refined or remelted scrap contributes 32% of the United States copper supply [40]. In many cases, the recycling rates of metals are far lower than their potential for reuse. The recycling potential is especially great for rare earth metals, whose current recycling rates and recycled contents are below 1%. Investment can increase efficiencies in the collection and processing of metal-bearing discarded products, and improve recycling technologies.

Second, the global resource governance vacuum should be filled [41]. No international body is currently mandated to plan and oversee the conservation and sustainable use of geologically scarce mineral resources for the long-term future. Some limited advisory roles are played by, for example, the International Resource Panel and the Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development. The ISA should cooperate with these nascent organizations and coordinate international regulations of mining activities. It might be helpful or even necessary to adopt a new international agreement on mineral resources to decrease the currently unsustainable extraction rates to a sustainable rate [42]. Furthermore, the ISA should take into account relevant multilateral environmental agreements, in particular the forthcoming high seas biodiversity agreement under UNCLOS, which will be instrumental in representing the interest of future generations and counterbalancing the commercial interest in deep seabed mining.

Third, deep seabed mining needs to be (re)viewed through the lens of the Anthropocene. Humans have been extracting metals from the lithosphere for greater material wealth, and in the process, caused irreversible damage to the biosphere and its life-supporting capacity. The metals shifted to the anthroposphere have not been shared equitably between the rich and the poor and between current and future generations [43]. Deep seabed mining will reinforce unsustainable patterns of production and consumption, divest from recycling, and will further exacerbate inequality in both spatial and temporal dimensions. Humanity should stop moving on to new mineral deposits when old ones run out, and shift our paradigm toward dematerialization to “do more with less”.

5. Protect the ocean floor

Deep seabed mining is still at an experimental phase with unknown impact on the ocean, a vital component of Earth's life-support system. It is yet uncertain whether states will be able to capture substantial revenues from mining the Area and its resources. This emerging venture is based on the assumption that increased metal supply is beneficial to both developed and developing countries, as well as current and future generations. From the perspective of humankind and peoples of Earth, however, it is questionable whether there is an urgent need to commercialize the deep sea. It is uncertain whether deep seabed mining will promote the right of all nations and peoples of the world to greater human dignity, freedom, justice, and equality. Scientists have urged caution against deep seabed mining in the face of uncertainties about its impact on marine ecosystems. Potential adverse effects on the environment of deep seabed mining are likely to outweigh any potential benefit from increased metal supply. In accordance with the precautionary principle in international law, full-scale commercial extraction of deep sea minerals must be delayed until the long-term pros and cons of deep seabed mining are scientifically scrutinized and democratically deliberated [44].

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