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The impacts of deep seabed mining on people have not been sufficiently researched or addressed. Using a legitimacy framework, we discuss the social-equity dimensions of this emerging industry in the ocean commons.

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INTRODUCTION

The technology to mine the ocean floor for valuable minerals such as copper, nickel, and cobalt is currently being developed. Scientists have warned repeatedly about potentially serious and irreversible environmental impacts from deep seabed mining (DSM), including but not limited to: removal and destruction of sensitive and poorly known seafloor habitats and species; metal-contaminated and fine-particle sediment plumes that can impact benthic and pelagic fauna; changes to water properties; and increases in noise and light^{1,2}. What remains to be substantially debated are the social impacts of DSM.

After years of exploration, some companies are now pushing to begin commercial mining of the deep seabed. The International Seabed Authority (ISA), the institution responsible for regulating mining on the international seabed, is now under pressure to finalise regulations by mid-2023. This comes after Nauru triggered the so-called “two-year rule” in 2021, which calls on the ISA to finalise regulations within two years³.

Despite this rush, the social legitimacy of DSM is compromised⁴. Not only have major brands rejected deep-sea minerals⁵, but there are also growing calls for a moratorium on DSM, including from the Alliance of Countries for a Deep-Sea Mining Moratorium⁶, which was launched at the 2022 UN Ocean Conference. Given this opposition, there is a risk that seabed minerals will encounter consumer boycotts if the industry does not accord with societal norms and beliefs⁷. This in turn may jeopardise investments by DSM companies and may ultimately lead to a rejection of DSM altogether. Poignant examples include Nautilus Minerals’ failed DSM project in Papua New Guinea, which encountered financial challenges as well as public rejection^{8,9}, and early attempts to regulate and allow mineral mining in the Antarctic, which ultimately resulted in a mining moratorium¹⁰ (1991 Protocol on Environmental Protection to the Antarctic Treaty, Article 7).

Social legitimacy of DSM relates not only to *what* decision is ultimately taken but also to *how* decisions are taken and by *whom*. While the ISA has legal competence to permit DSM under the UN Convention on the Law of the Sea (UNCLOS), there are concerns about whether the ISA’s current decision-making procedures do justice to its mandate to act on behalf of humankind as a whole (UNCLOS, Article 136(2)). This unique and legally binding mandate requires the ISA to consider not only profit and environmental impacts but also social and potential negative economic effects of DSM, particularly for developing states. Yet the social aspects remain understudied.

As detailed in the literature^{11,12} and summarised in Fig. 1, social legitimacy comprises three pillars: (a) a broad range of stakeholders, including ocean-dependent communities, need to have a say in the decision-making processes over DSM, (b) decision-

making must be procedurally fair, inclusive, and transparent, and (c) the outcome must be equitable and generate social and economic benefits, as well as ensure the preservation of the marine environment. Before we assess DSM against these three dimensions below, we briefly discuss the potential impacts of DSM on people.

POTENTIAL IMPACTS OF DSM ON PEOPLE

Seabed mining could affect people through impact pathways that are direct, diffuse and/or acting in combination with other human-induced pressures such as climate change. Cumulative impacts may be a critical concern for global fisheries where 57.3% of stocks are already fished at their maximum limit, and 35.4% are overfished, depleted or recovering¹³. Some fisheries could face new stressors of noise, heavy metal contamination, and large sediment plumes associated with DSM^{1,14,15}. For example, this could be a particular concern for tuna fisheries that overlap with DSM areas¹⁶ and account for up to 84% of GDP for tuna-dependent Pacific small island states. These critically important fisheries provide revenue, nutrition, employment, and livelihoods for Pacific island communities^{17,18}, and are already vulnerable to climate impacts¹⁹. Yet such cumulative impacts on economies, wellbeing, and human rights to food and health, are seldom considered when discussing whether, and under what conditions, it is appropriate to mine the ocean floor.

A further example of the effects of DSM on people relates to cultural connections between communities and the ocean. Indigenous Peoples and Local Communities (IPLCs) in Pacific Islands are intimately connected to the ocean and highly migratory species such as sharks and turtles. IPLCs have historically, and currently, served as custodians of vast ocean spaces^{20,21}. As Tilot et al. (2021)⁹ note, ‘DSM is not distanced from the island environment because the ocean is at the heart of one’s identity, and part of each individual’s future’. Furthermore, the international seabed is an important source of tangible and intangible cultural heritage, for example for the African diasporic cultural memory of the transatlantic slave trade, which has not yet been considered at the ISA²².

Other potential impacts of DSM on people include impacts on tourism from environmental degradation and on communities that might experience loss or degradation of key ecosystem services whether on land or in the ocean. Similarly, economic impacts on land-based mineral industries could lead to flow-on social effects. While the precise risk of these impacts remains unknown, these and other connections between DSM and people will need to be considered when making decisions about whether, where, and under what conditions we should mine the seafloor. The three pillars of legitimacy help to identify the relevant questions and answers.

A. Who gets a say on seabed mining?

To consider and address the social impacts of DSM, it is necessary to involve a diverse group of stakeholders in the

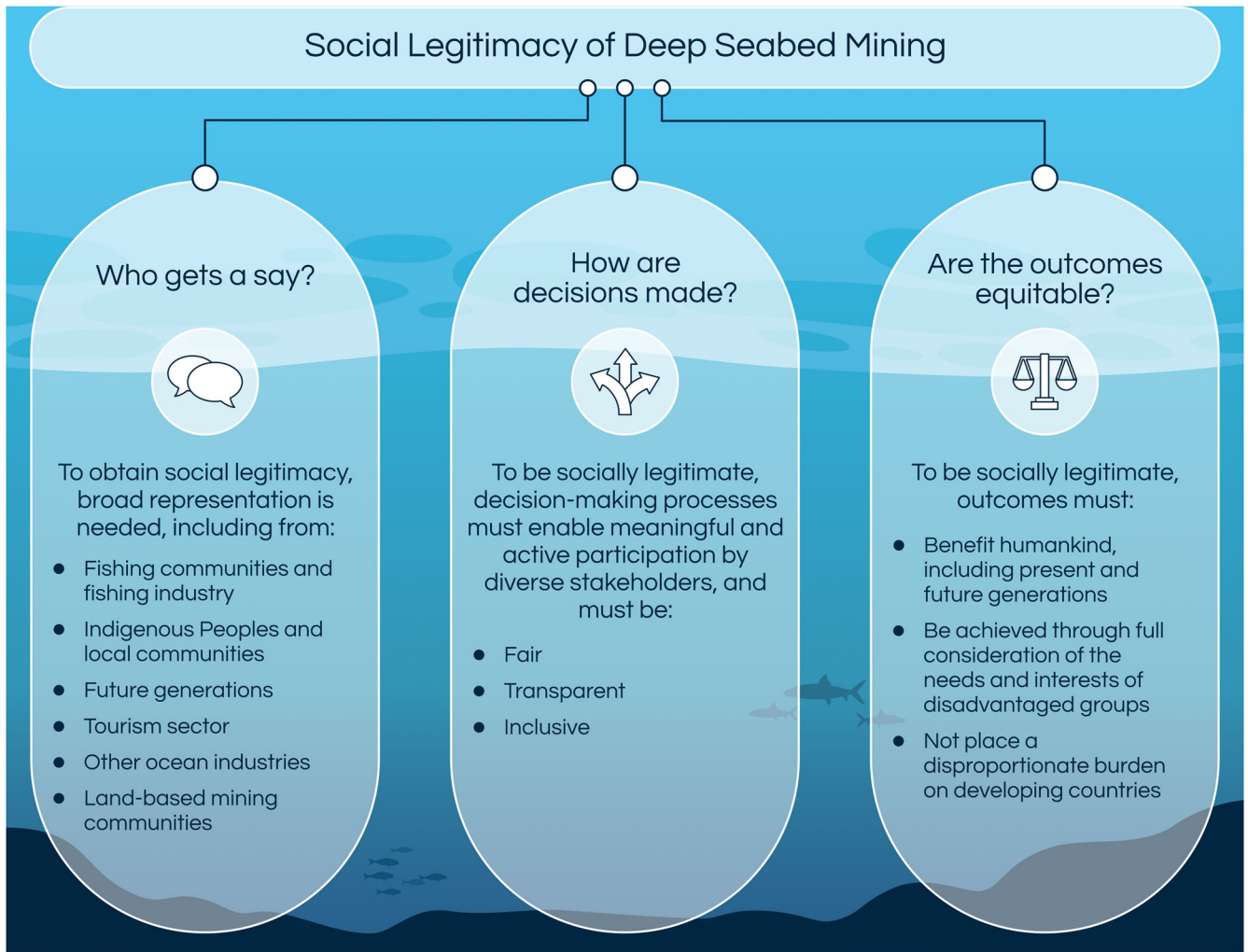


Fig. 1 The three pillars of social legitimacy as applied to deep seabed mining. Social legitimacy is created through equitable representation (who gets a say?), procedural justice (how are decisions made?), and distributive justice (are the outcomes equitable?). Figure designed by Stacey McCormack (Visual Knowledge).

decision-making process. At present, the main actors involved at the ISA are states, mining companies, and observers, some of whom are non-governmental organisations (NGOs), including environmental NGOs and research institutions. Notably, there are currently no observers representing IPLCs or fishing interests, and few representing the Global South. Observers are required to apply for observer status and the extent to which they can participate can be influenced by the goodwill and timekeeping of the meeting Chair^{23,24}.

With the ISA tasked to govern the industry for humankind as a whole, and the potential impacts of DSM having far reaching consequences, legitimacy is unlikely being achieved by the current representation at the ISA. To increase legitimacy, at a minimum, states and the ISA would need to ensure that those groups directly affected by DSM are represented. This may include fishing communities and industries, IPLCs, future generations, but also developing states that depend on land-based mining and whose economies would be negatively impacted by DSM. While the latter group of states has the legal option to participate at the ISA, few of them have attended ISA meetings in recent years. While the reasons are unclear, but likely involve costs or a lack of awareness of DSM, the absence of affected states is concerning because the ISA is negotiating an

economic assistance fund foreseen in UNCLOS (UNCLOS, Art 150(h), 151(10); 1994 Implementing Agreement, annex section 7), designed to offset some of the negative economic and social consequences of DSM for land-based mineral producing states. Holding these negotiations without adequate input of affected states and communities is problematic and undermines any outcome.

IPLCs in particular are often underrepresented in negotiations about governing marine areas beyond national jurisdiction²⁰. As Tilot et al. (2021)⁹ note:

‘Integrating indigenous people into DSM management is not just a mere issue of a ‘participatory approach’ as acknowledged by several Western/international projects or as established in some regulations of Pacific States; it is indeed the very foundation of holistic custom-based relationships. Therefore, any DSM regulation system that had only a minor representation of indigenous communities would be philosophically problematic for oceanian societies’.

A. How are decisions taken?

How decisions about DSM are made is equally important for legitimacy of the industry. At present, the recipients of DSM permits are determined behind closed doors by the ISA’s Legal and Technical Commission. The application

documents are confidential, preventing the public and even ISA member states from knowing and discussing the details of an application. These shortcomings could be overcome by improving transparency at the ISA.

The situation is slightly better for DSM regulations, which are developed by the ISA but are subject to periodic stakeholder comments on draft versions. While, in principle, anyone can submit comments, in practice, only a small group of states and observers do so, partly due to a lack of awareness of such participatory mechanisms and DSM more broadly, and the highly technical nature of the draft regulations. Importantly, though, little is gained if stakeholders can voice their opinion but cannot influence decision-making²⁵. At present, it is unclear whether or how stakeholder comments are considered by the ISA, which is at odds with best practice for stakeholder consultation and could be changed through offering responses to stakeholder comments²⁶.

Increasing legitimacy and procedural equity will require fair, transparent, and inclusive decision-making processes that allow for active and meaningful participation by diverse groups of stakeholders. This includes proactive consultation with underrepresented groups, such as IPLCs, to solicit input on the management of our common seabed and how cultural views and practices can be integrated²⁶.

A. Are the outcomes equitable?

To be seen as legitimate, the outcomes of DSM decisions must distribute the costs and benefits of DSM equitably²⁷. This will require avoiding a situation in which the financial profits from mining flow mainly to the mining company (often from the Global North), leaving developing states worse off, whether through impacts on fishing communities, IPLCs, or their economies. Again, Papua New Guinea serves as an example here as the government had contributed, and ultimately lost, USD 120 million, to Nautilus Minerals' failed DSM venture⁹.

Profit sharing of gains from DSM is required under UNCLOS, yet it remains unclear how to implement it. Moreover, potentially affected groups, such as fishing communities and indigenous and other cultural rights holders, have not been specifically considered by the ISA to date.

Distributional equity also requires considering who shoulders the potential legal liabilities and resulting financial burden in the case of serious environmental harm. The present DSM regime for the international seabed allows the legal liability for this to rest with the state that sponsors the mining contract—even if it is a small island developing state. This can lead to a double burden for small developing states, which may want to increase revenue but could potentially lack the legal and institutional capacity to ensure environmental best practices or shoulder significant financial liability.

While serious environmental harm can trigger liabilities, it is worth noting that social impacts do not generally trigger the same consequences, making it all the more important to ensure social concerns are addressed by the regulatory process.

CONCLUSION

Discussions around DSM have thus far focused on economic and environmental dimensions, with social impacts receiving limited attention. While the former present concerning, and sometimes alarming issues, they often focus solely on the outcomes of DSM, and how to mitigate potentially destructive impacts. Here, we

suggest that it is not only outcomes that are essential, but that DSM currently lacks social legitimacy. Without legitimacy, investors and consumers might reject seabed minerals and their use.

The international seabed belongs to humankind as a whole, and everyone has a stake in how to manage this shared space. A socially legitimate management process involves (a) robust and inclusive stakeholder engagement, (b) fair, open, and transparent decision-making processes, and (c) equitable outcomes that generate a net benefit for humankind, where the few do not benefit at the expense of many, and where burdens are not shouldered by the most vulnerable ocean-dependent communities.

The 2-year trigger and resulting rush to finalise regulations risks further marginalising the communities that will be most affected by DSM. Discussions are warranted about whose voices are reflected in decision-making so far, whose are not, and how those voices are influencing processes and outcomes for our common heritage. History is rife with examples of extractive industries that failed to adequately consider the implications of their operations for people. DSM offers an opportunity to avoid these mistakes, reflect upon what is required to achieve legitimacy, and have an inclusive and open dialogue about the environmental, economic, and social effects of mining our common heritage.

DATA AVAILABILITY

All data generated or analysed during this study are included in this published article.

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COMPETING INTERESTS

The authors declare no competing interests.

ADDITIONAL INFORMATION

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