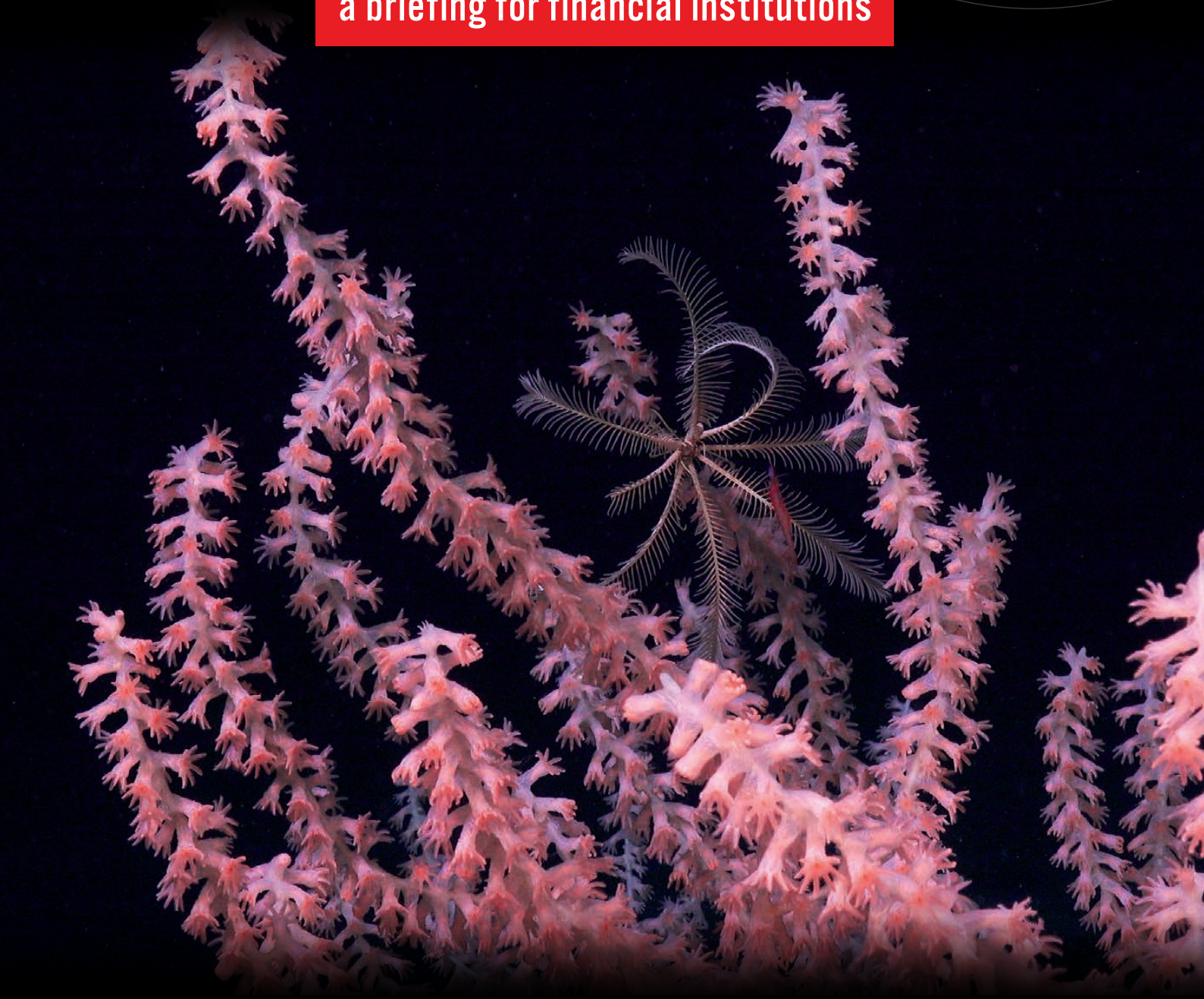
THE PERILS OF DEEP-SEA MINING

a briefing for financial institutions



ENVIRONMENTAL JUSTICE FOUNDATION

Protecting People and Planet

Overview

This briefing for financial institutions (FIs) provides an overview of the nascent industry of deep-sea mining (DSM) and the related environmental, social and governance (ESG) risks that it poses. It also provides several actionable recommendations that will allow FIs to avoid exposure to these risks.

Key findings:

- The latest scientific research indicates that the environmental damage caused by DSM is likely to be extensive, irreversible and unmitigable.[1] DSM risks disrupting the global carbon cycle, threatens fisheries and food security, and would lead to irreparable biodiversity loss with devastating consequences for both people and planet.[2]

- Biodiversity must be placed at the core of FIs' ESG strategies; the likelihood of future disclosure requirements on biodiversity is an important risk for FIs to consider given the inevitable biodiversity loss that would be caused by DSM.

- FI involvement with the DSM industry is at odds with compliance with the International Finance Corporation's Performance Standard 6[3] on biodiversity conservation and the sustainable management of living natural resources, due to its adverse impacts on "*critical habitats*" of significant importance to (Critically) Endangered and/or endemic/restricted-range species.

- The future financial viability of DSM is highly uncertain owing to the unpredictable nature of future demand for seafloor metals, considerable litigation risk, and the technology being largely unproven at operational commercial scale. Consequently, any financial involvement with the DSM industry by FIs should be considered extremely high risk.

- DSM's largest corporate backer, Lockheed Martin, exited the industry in March 2023 following the sale of its UK Seabed Resources subsidiary to Loke Marine Minerals, a Norwegian startup – evidence of major corporations' increasing reluctance to invest in the DSM industry.[4] Shipping company A.P. Moller-Maersk is the latest major name to divest itself of interests in the deep-sea mining industry, with the sale of its stake in leading DSM proponent, The Metals Company (TMC).[5]

- An increasing number of nations are opposing DSM or calling for a precautionary pause or moratorium, including (as of April 2023) Chile, Costa Rica, Dominican Republic, Ecuador, Federated States of Micronesia, Fiji, France, Germany, New Zealand, Palau, Panama, Samoa, Spain, and Vanuatu.[6]

- Major companies including BMW, Google, Philips, Renault, Samsung and Volkswagen have signed a statement supporting a moratorium on DSM and pledging to keep DSM minerals out of their supply chains.[7]

- The growing global movement against DSM, and the industry's lack of social legitimacy, presents a potentially severe reputational risk for FIs who provide support to it. This risk is highly likely to intensify in years to come as public awareness grows of the irreparable and far-reaching environmental impacts of DSM.

Cover image: NOAA Office of Ocean Exploration.

Recommendations to Financial Institutions

EJF recommends that FIs:

- Adopt and publish policies which explicitly exclude the provision of banking or other financial services[8] to:

  - DSM companies, or companies who have a significant share of their revenue or activities within DSM; and
  - companies who have subsidiaries (or divisions of the same company) engaged in DSM within the corporate group.

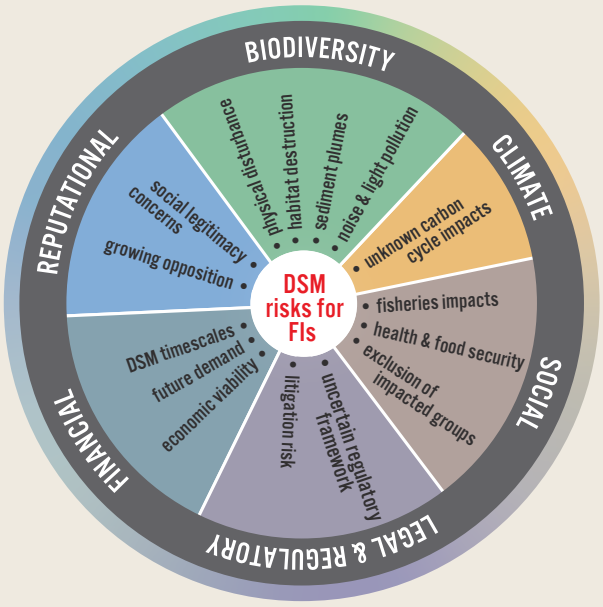
- Engage with non-mining companies[9] who are potential users of DSM metals to encourage them not to provide support for the industry by: (i) supporting calls for a global moratorium on DSM activities[10]; (ii) monitoring and tracking where they source minerals for their business; and (iii) excluding minerals/metals obtained from DSM from their supply chains.

- Engage with investors and other sources of DSM funding to encourage them not to provide support for the industry, in line with the conclusion of the United Nations Environment Programme Finance Initiative (UNEP FI) that there is "*no foreseeable way in which the financing of deep-sea mining activities can be viewed as consistent with the Sustainable Blue Economy Finance Principles*."[11]

- Extend their ESG strategy to cover biodiversity (the protection and restoration of nature).

In order to action the above recommendations, EJF encourages financial institutions to carry out satisfactory due diligence in order to assess their own exposure (both direct and indirect) to the financing of DSM activities.[12]

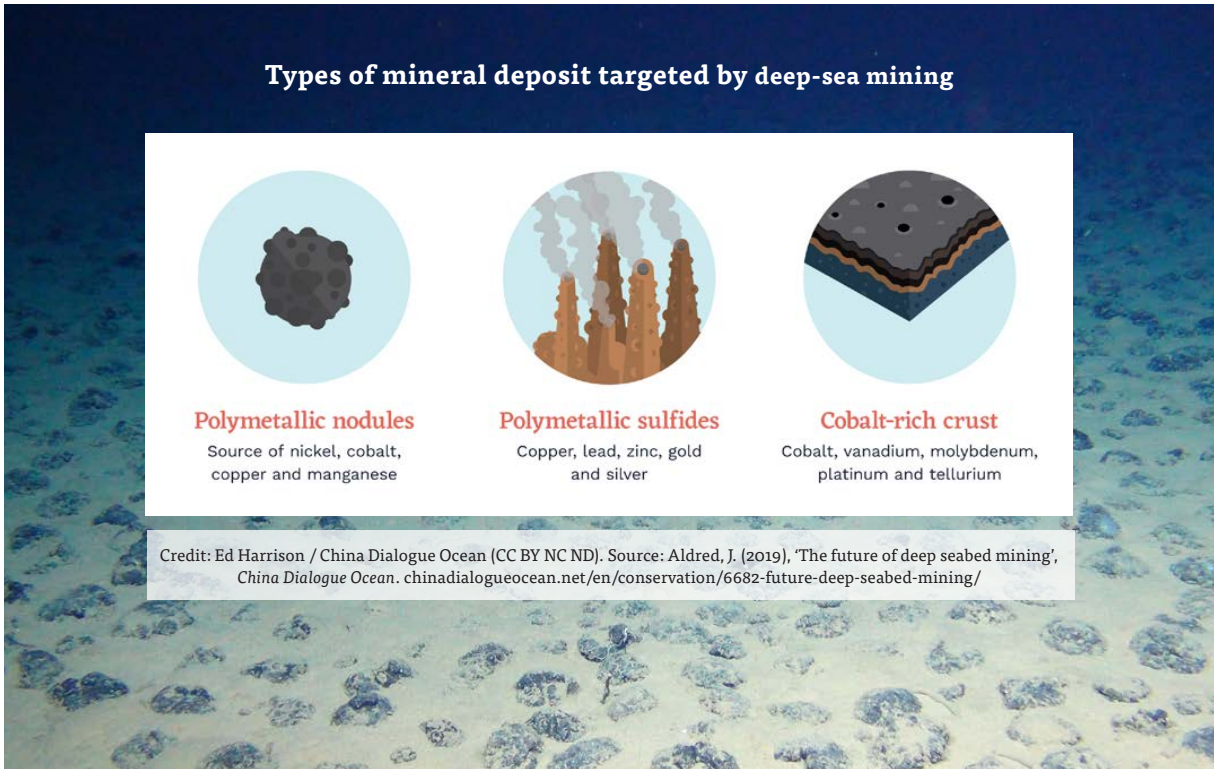
DSM and the risks to financial institutions



1. Background to DSM

1.1. What is DSM?

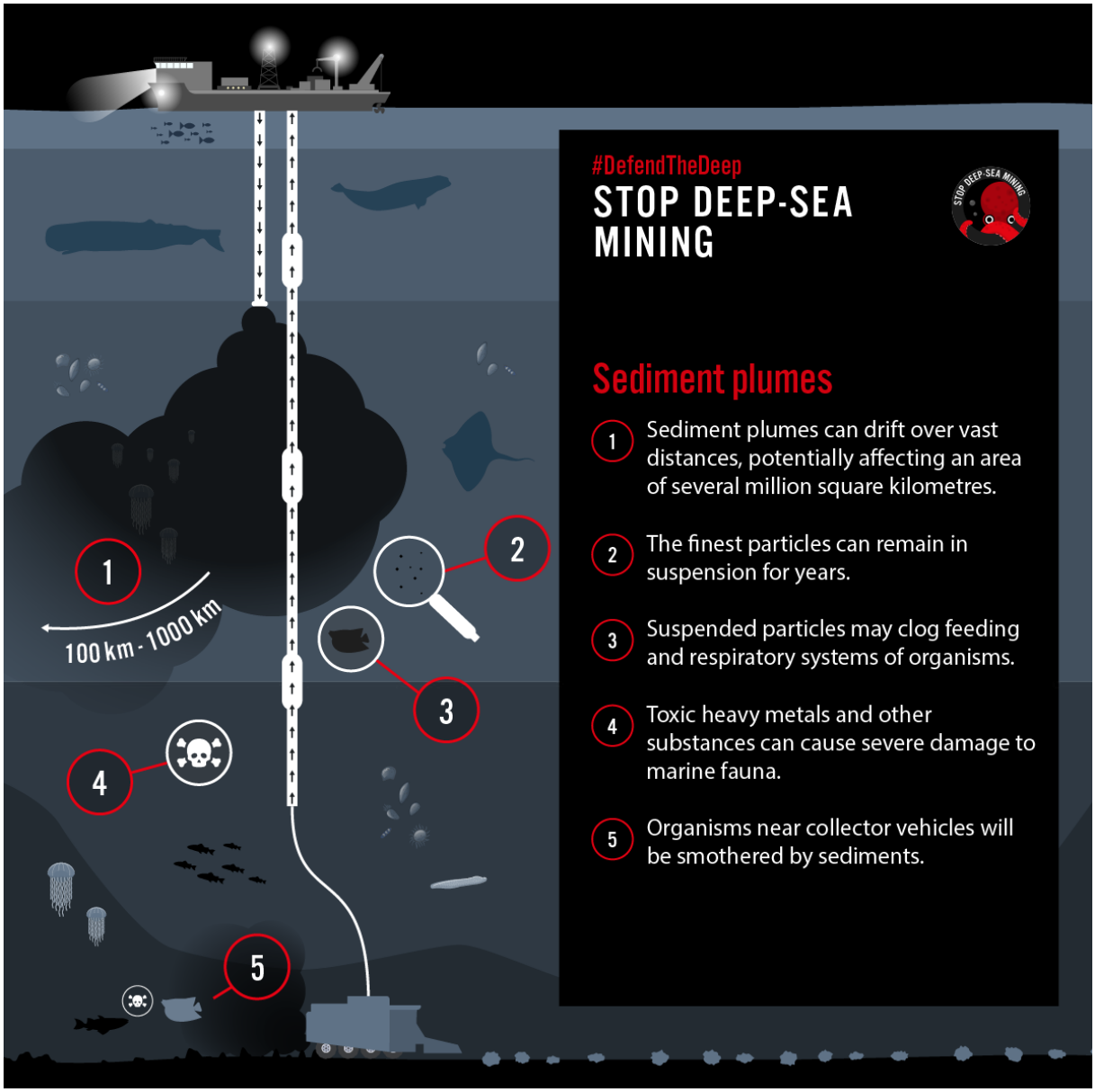
DSM involves the extraction of mineral deposits from the seafloor, seamounts and hydrothermal vents at depths greater than 200 metres. Three types of deep-sea mineral deposits are of significant interest to mineral extraction ventures: polymetallic nodules, polymetallic sulphides, and cobalt-rich ferromanganese crusts. These deposits contain metals such as cobalt, lithium, silver, and rare earth metals.



Credit: Ed Harrison / China Dialogue Ocean (CC BY NC ND). Source: Aldred, J. (2019), 'The future of deep seabed mining', *China Dialogue Ocean*. chinadialogueocean.net/en/conservation/6682-future-deep-seabed-mining/

ROV KIEL 6000, GEOMAR (CC BY 4.0)

Polymetallic nodules, which contain higher quantities of copper, cobalt, nickel, or manganese than any known mineable source on land,[13] are currently the most sought after of the three deposit types. To obtain these nodules, heavy machinery remotely operated from a surface support vessel ploughs the seafloor, extracting a mineral-sediment mixture which is pumped through rigid hoses to production ships on the water's surface. There is widespread concern amongst scientists that the clouds of suspended sediment particles produced by this mining process may have highly damaging and irreversible effects on the fauna of the deep sea.[14] Once the mineral deposits reach the ships, they are then separated from the sediment and cleaned, with the sediment-rich wastewater discharge, laden with toxic heavy metals, released back into the water column[15] where it is likely to further damage the delicate marine ecosystem.[16]



Polymetallic massive sulphides are cleaved from mineral formations found near hydrothermal vents. Large volumes of sediments are first removed from the seabed to make space for a mining tool. The machine, equipped with a drum cutter, carves out blocks of ore which are then disaggregated into smaller pieces and pumped up to the surface vessel for processing. Wastewater is also pumped back into the water column.[17] There is current concern over the potential resurrection of the previously failed Solwara I project (see **Section 2.4**) within the exclusive economic zone of Papua New Guinea, which is seeking to extract massive sulphide deposits.[18]

Cobalt-rich ferromanganese crusts covering the summit and slopes of seamounts are technically more difficult to exploit. The extraction process is similar to that used for polymetallic sulphides,[19] with the increased challenge that blocks of ore need to be carved out directly from the seafloor in a rugged environment.

To date, no large-scale commercial mineral exploitation in waters beyond national jurisdiction has taken place; the regulatory framework to allow DSM activity in such areas is currently being negotiated at the International Seabed Authority (ISA[20]), the intergovernmental body responsible for the regulation of DSM in areas outside of national jurisdiction. Nevertheless, taking action on DSM remains an urgent and critical issue. In July 2021, the Pacific Island nation of Nauru triggered the ISA's "*two-year rule*", giving the body two years to finalise rules and regulations for DSM. This could see applications for contracts for exploitation being accepted by the ISA as early as **July 2023**, before the risks of DSM are fully understood.

1.2. Why mine the deep sea?

The metals found in seafloor deposits are the same metals currently used in renewable energy technologies including solar panels, wind turbines and electric car batteries. The DSM industry claims that mining the deep sea is the only way to successfully manage the green transition to a low-carbon economy, arguing that demand for mined minerals will rapidly increase given the shift away from fossil fuels.[21] However, the need to source these minerals from the deep sea is strongly refuted by states, scientists, businesses and civil society organisations[22] who conclude that such an energy transition is fully feasible without extracting minerals from the deep sea.

Not only does mining deep-sea minerals pose a significant threat to deep ocean ecosystems, but it also has an uncertain future. Future demand for these metals remains unpredictable given growing improvements in battery and metal recycling and the rapid evolution of battery technologies, as well as the potential for demand to be met from terrestrial resources alone (see **Section 2.4 on the financial risks of DSM**).[23]

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Circular Economy. Credit: RecondOil (CC BY 2.0)

2. DSM and the risks for financial institutions

The deep-sea "Casper" octopus lays its eggs on sponges that only grow on manganese nodules.
NOAA Office of Ocean Exploration and Research, Hohonu Moana 2016. (CC BY-SA 2.0)

2.1. Biodiversity risks of DSM

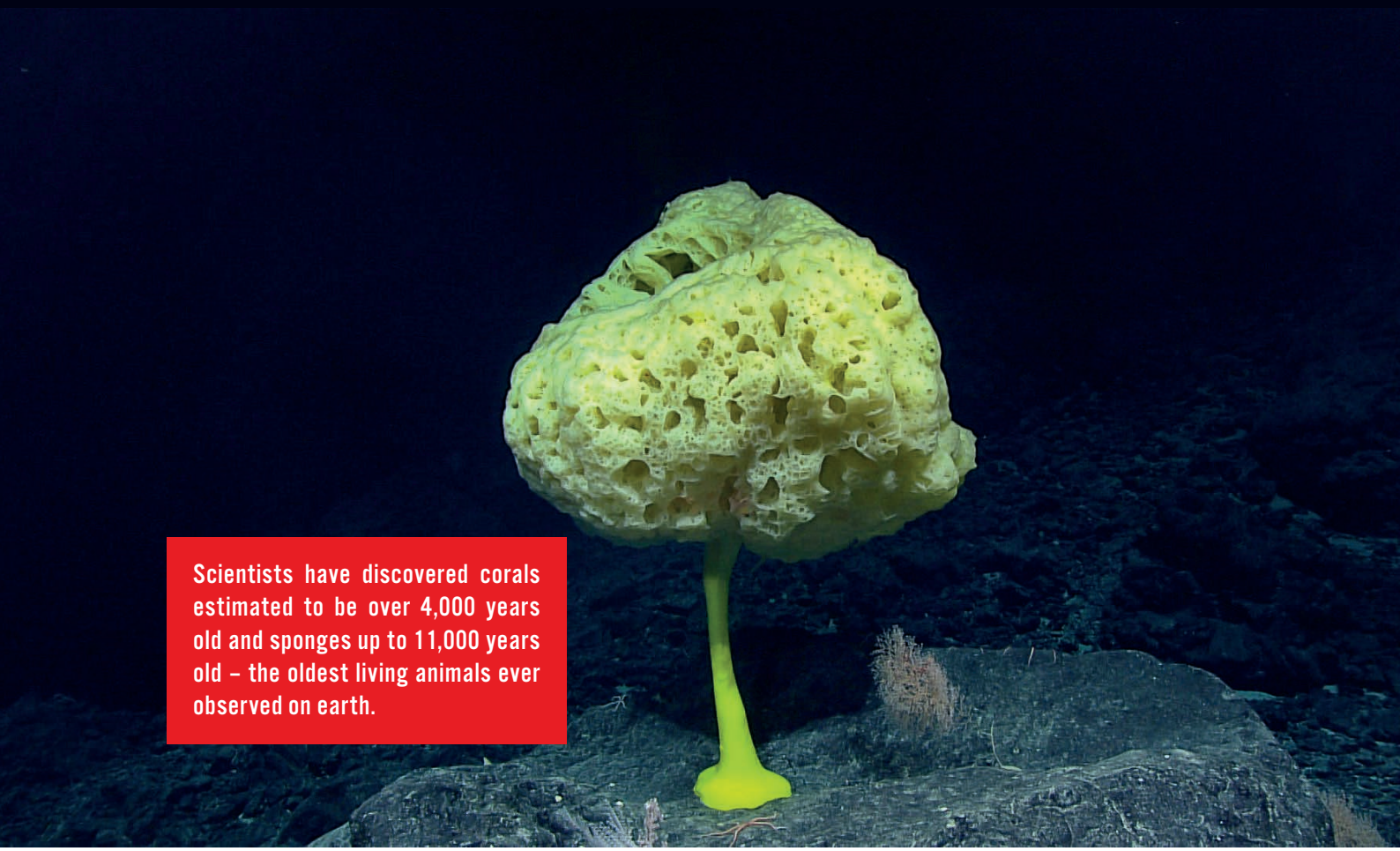
The DSM industry is riddled with uncertainty. We do not yet know enough about the deep sea to understand the magnitude and extent of damage to both the seafloor and the surrounding ocean ecosystem that would be caused by mining activities. **What we do know, however, is that harm would be irreparable and result in a loss of biodiversity, impacting the oldest living organisms on the planet.**

> ***"Loss of biodiversity in the deep sea would be inevitable and could be considered to be 'forever' on human time scales."***

Niner et al. (2018)[24]

The deep sea covers over 65% of the Earth's surface, and makes up more than 95% of the Earth's biosphere.[25] It harbours an incredibly rich variety of organisms, believed to be comparable to the eclectic biodiversity of tropical rainforests.[26] It is one of the last unknown frontiers of scientific knowledge on Earth;[27] in the Clarion-Clipperton Zone of the Pacific Ocean, where mining is proposed to take place, it is estimated that up to 70–90% of the species collected are new to science.[28] Scientists have discovered deep-sea corals estimated to be over 4,000 years old[29] and sponges up to 11,000 years old – the oldest living animals ever observed on earth.[30]

Increasing evidence shows that polymetallic nodules may be an important driver of biodiversity, abundance, and ecosystem functions in the deep sea. For example, the newly discovered deep-sea octopus known as 'Casper' lays its eggs on sponges that only grow on manganese nodules.[31] Seamounts – where cobalt-rich ferromanganese crusts would be harvested – harbour rich and diverse ecological communities, with corals, sponges, feather stars and an abundance of pelagic fish.[32] They are important aggregation, breeding, foraging and resting areas for emblematic species such as whales, sharks, and turtles,[33] and are used as landmarks by migrating species.[34]



Scientists have discovered corals estimated to be over 4,000 years old and sponges up to 11,000 years old – the oldest living animals ever observed on earth.

Bolosoma sp., glass sponge, NOAA Office of Ocean Exploration and Research, Deep-Sea Symphony: Exploring the Musicians Seamounts (CC BY-SA 2.0)

Independent reviews of the available scientific evidence commissioned by governments[35] and conducted by civil society organisations[36] are in agreement that DSM will cause potentially severe adverse impacts to the marine environment, its biodiversity, and ecosystems. Significant disturbances are expected, including direct damage to the benthic fauna, habitat destruction, and pollution from sediment plumes and wastewater discharge.[37] Noise and light pollution will affect the behaviour of organisms; for example, noise from underwater mechanical vibrations will disrupt the ability of marine mammals to communicate and locate prey and predators, disturbing endangered migratory whales.[38] Owing to their life history traits, deep-sea organisms are extremely slow to recover from disturbance; experiments studying the long-term impacts of DSM in the Peru Basin show that wildlife remained significantly impacted 26 years after mining test disturbance.[39]

While the available scientific evidence establishes a clear risk of serious adverse environmental impacts, the extent and magnitude of the damage DSM would cause to the marine environment remain unknown. Critical knowledge gaps remain that prevent fully informed, science-based decision-making. **In the absence of a solid baseline, environmental impact assessments are unreliable[40] and are likely to underestimate the extent and magnitude of environmental impacts.**

Major FIs are already acting on the investment risk posed by DSM due to the severe risk of irreversible biodiversity loss. In December 2022, Norway's largest private asset manager, Storebrand**,** announced it would no longer invest in companies involved in DSM in line with its new policy on nature.[41] Storebrand also divested from The Metals Company[42] (TMC), reaffirming its commitment to "*halting and reversing the loss of biodiversity*".[43]

Box 1: The finance sector and biodiversity conservation

Whilst climate change remains a top ESG priority, biodiversity is rightly continuing to gain status as a key consideration in FIs' ESG strategies. Biodiversity and the climate are interdependent,[44] with the Network for Greening the Financial System (NGFS) highlighting the "*climate-biodiversity nexus*" when considering risks to financial stability in its 2021 report.[45]

There has been a clear global movement within financial services towards nature-positive outcomes. Investment in greener activities has been increasing as FIs react to changes in investor demand, regulation, and litigation risk. At the COP 15 UN Biodiversity Conference in December 2022, 150 financial institutions signed a statement calling for governments to adopt a post-2020 Global Biodiversity Framework.[46] 126 financial institutions representing 21 countries and over 18.8 trillion euros in assets have also signed the Finance for Biodiversity Pledge, committing to protect and restore biodiversity through their finance activities and investments.[47]

Regulators and central banks are also targeting biodiversity, with the following noteworthy recent developments:

- The **European Central Bank** (**ECB**) outlined its supervisory expectations relating to governance and risk appetite (including disclosure) in its guide on climate-related and environmental risks and specifically referred to the risks caused by biodiversity loss.[48] The ECB has taken a strong position and expects compliance with its expectations by banks under its supervision by the end of 2024.
- The **UK's Financial Conduct Authority** is encouraging financial institutions to include wider environmental issues, such as biodiversity loss and nature, in their ESG strategies.[49]
- The **Bank of England** will be publishing its analysis of UK-level nature-related financial risks later this year, in line with its obligations under the Environment Act 2021, to consider how it can support biodiversity.[50]

"Financial institutions will increasingly be expected to be aware of how their business impacts on biodiversity, where their dependencies are and where the potential material financial risks arising out of biodiversity loss lie, and also to incorporate biodiversity considerations into their business strategy, governance, risk management, and public disclosures."

Freshfields Bruckhaus Deringer[51]

Future disclosure requirements on biodiversity also remain an important factor to consider given the severe risk of irreversible biodiversity loss occurring as a result of DSM. While some countries such as France have already put in place mandatory biodiversity disclosures for FIs,[52] this is not the case in many other nations, including the UK. However, FIs should be prepared for this type of regulation to become increasingly commonplace if the recommended biodiversity disclosures outlined in the beta versions of the framework produced by the Taskforce on Nature-Related Financial Disclosures (TNFD) are maintained in its final version.[53]

Box 2: The DSM industry and compliance with International Finance Corporation (IFC) Performance Standard 6 (PS6)

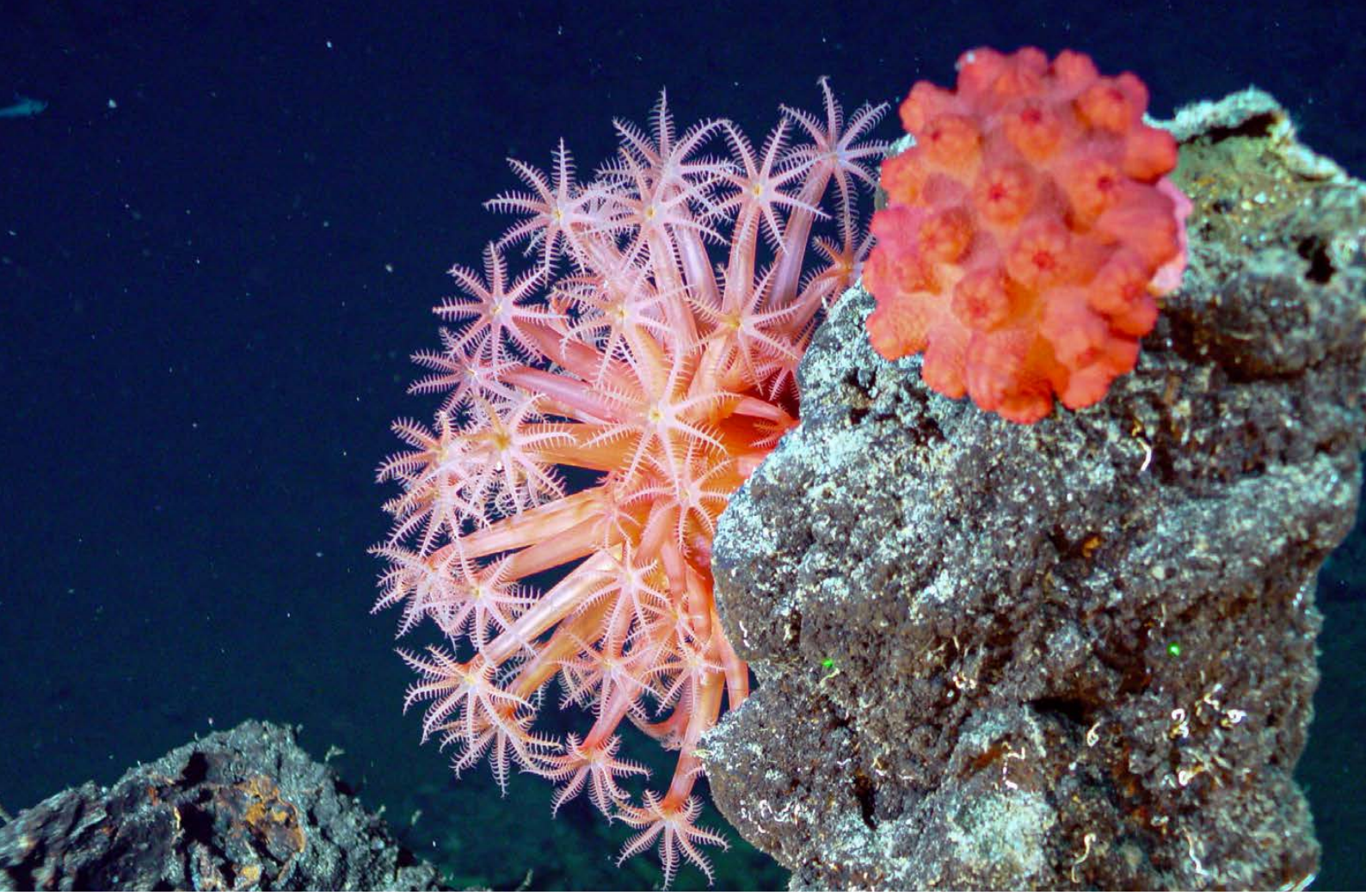
FI involvement with the DSM industry is at odds with compliance with IFC PS6, which provides guidance on biodiversity conservation and the sustainable management of living natural resources. It is one of eight standards used by the IFC to assess and manage environmental and social risks.[54]

It is highly likely that areas of the deep seabed exploited by DSM projects would fall under the definition of "*critical habitat*" outlined in paragraph 16 of IFC PS6, owing to their confirmed or potential status as "*habitat[s] of significant importance to Critically Endangered and/or Endangered species*" (see **Box 3**) and/or "*habitat[s] of significant importance to endemic and/or restricted-range species*".[55] Deep-seabed communities form isolated pockets of life, with a high proportion of species found nowhere else on earth,[56] and even species observed only on polymetallic nodules.[57] If these communities are decimated by mining, unique species may become extinct, causing irreparable biodiversity loss.[58]

According to IFC PS6, no project activities should be undertaken in areas of critical habitat unless the conditions set out in paragraph 17 of the standard are fulfilled, including that the project does not lead to:

- measurable adverse impacts on those biodiversity values for which the critical habitat was designated, and on the ecological processes supporting those biodiversity values;
- a net reduction in the global and/or national/regional population of any Critically Endangered or Endangered species over a reasonable period of time.[59]

The available scientific evidence shows that DSM activities would likely contravene both of these requirements. Measurable adverse impacts from DSM activity on seafloor biodiversity values will be unavoidable.[60] This is all the more concerning as proposals to offset biodiversity loss from DSM are believed to be either impossible or scientifically meaningless.[61] Additionally, the existence of Endangered species such as the Scaly-foot Snail (see **Box 3**) within DSM project areas, and the extremely slow speed at which deep-sea organisms and ecosystems are able to recover from disturbance (see **Section 2.1**) indicate that DSM is likely to cause reductions in the populations of Critically Endangered and/or Endangered species over a prolonged period of time.



Octocorallia: Alcyonacea, mushroom coral. Submarine Ring of Fire 2002, NOAA/OER (CC BY-SA 2.0).

Box 3: Impacts of DSM on species listed in the IUCN Red List of Threatened Species

The Scaly-foot Snail (*Chrysomallon squamiferum*) is the first species to be listed as at risk of extinction as a direct result of DSM activity. A marine gastropod with a known area of occupancy of just 12 km^2, it has only been found at depths of between 2,400 and 2,900 metres within three areas of hydrothermal vents in the Indian Ocean.[62] Two of these vent areas are sites of interest for DSM companies owing to the presence of polymetallic massive sulphides.[63] In 2019, the species was added to the IUCN Red List and classified as Endangered, with the IUCN Red List assessment stating that any DSM activity within the two areas – even initial exploration – is likely to severely reduce or completely destroy the snail's habitat.[64]

The species is a clear example of how deep seafloor areas can fall under the IFC's definition of a critical habitat (see **Box 2**). However, the critical gaps that remain in our knowledge of deep-sea biodiversity[65] may lead to areas subject to DSM activity being mis-identified as non-critical habitat, as Endangered or Critically Endangered species remain undetected. Indeed, scientists are calling for more deep-sea species to be added to the IUCN Red List in order to bolster their recognition and protection,[66] especially given the use of the list for compliance with IFC PS6.[67] A further 184 hydrothermal vent molluscs were added to the IUCN Red List in 2021, of which 39 were Critically Endangered, and 32 were Endangered.[68]

Sperm whales. Credit:
Amanda Cotton / Ocean Image Bank

2.2. Climate risks of DSM

The impacts of DSM on the global carbon budget are not yet fully understood but could be severe, in effect negating millions of years of ecological and biochemical processes in just a few years.

There is scientific consensus on the fundamental role of the deep sea in the global carbon cycle.[69] DSM is projected to stir up millions of tonnes of seafloor sediments each year, potentially unlocking vast amounts of carbon that has been accumulating over millions of years. An unknown proportion of that carbon can be remineralised due principally to microbial activity, increasing the amount of CO2 dissolved in seawater.[70] This in turn would accelerate ocean acidification, with negative effects on growth and reproduction for a wide range of marine organisms.[71] Should that CO2 reach surface waters and be released into the atmosphere, it would also further compound global heating.

The destruction of deep-sea habitats by mining also risks disrupting key carbon sequestration mechanisms.[72] For example, the eradication of chemosynthetic bacteria near active hydrothermal vents will remove a unique source of biological carbon fixation in the deep ocean.[73]

Disturbance to seafloor sediments by collector vehicles is expected to have long-term impacts on carbon flows in benthic communities. 26 years after mining, the amount of carbon stored in marine fauna and the amount of carbon going through the food chain both remain just over half the values observed in undisturbed areas.[74]

> ***"[Deep-sea mining] may be one of the more damaging industrial impacts on the deep oceans, because of the potential for the broad spatial scale of the impacts. Impacts of nodule mining will be particularly extensive (likely 100s km2 per operation)....Long-term (>centuries) and broad-scale (>1,000km2) impacts...are likely."***

UK Deep Sea Mining Evidence Review[75]

2.3. Social risks of DSM

DSM has the potential for significant environmental harm that threatens to severely impact vulnerable groups. Many of these impacts are poorly understood, including major unknown implications for the global carbon cycle.

Local and Indigenous communities, which rely heavily on marine resources for their food security and livelihoods, will likely shoulder the major burden of DSM activities. DSM is predicted to negatively impact fisheries, causing potential declines in fish populations.[76] Tuna fisheries are a critical source of revenue generation for Pacific island nations,[77] accounting for an average of 37% of government revenue, or up to 84% in some cases.[78] Developing island nations such as Samoa and the Cook Islands, which take as much as 20% of their high seas tuna catches within areas subject to mining exploration, could be potentially disadvantaged by DSM impacts on tuna fisheries.[79]

While the exact spatial extent of mining impacts is currently unknown, recent modelling of pollution discharged by operations in the Tonga-sponsored contract area observed it would take only three months to reach the waters of Hawaii and Kiribati.[80] Scientists also warn of the potential for bioaccumulation of toxins in food webs, with possible risks for human consumption.[81] This is a significant concern, with fish critical to food security across the Pacific, providing 50-90% of animal protein consumed by coastal communities across a broad spectrum of Pacific island countries/territories where per capita fish consumption exceeds the global average by more than 3-4 times.[82] Mining operations further risk disrupting local cultural traditions and deep-rooted spiritual connections to the ocean, as highlighted by the impacts of exploration on the local shark calling tradition in Papua New Guinea.[83]

The social legitimacy of DSM has also been called into question, as a result of the exclusionary nature of negotiations at the ISA, which marginalise the voices of those groups – such as fishing communities and Indigenous Peoples and Local Communities – most at risk of DSM's negative effects.[84] A continuing lack of social legitimacy may cause consumers to increasingly reject the use of DSM materials[85] and companies with links to the industry.

Fishing in Fiji. Credit: Tom Vierus / Ocean Image Bank

2.4. The financial risks of DSM

FIs should view any involvement with the DSM industry as high risk, owing to the considerable uncertainty surrounding the economic outcomes and viability of DSM activities.[86]

Largely unproven thus far at the commercial scale,[87] DSM operations require significant capital and operational expenditure.[88] Nautilus Minerals, a Canadian mining company, secured the first-ever permit for DSM in 2011 in the jurisdictional waters of Papua New Guinea. The project – Solwara I – subsequently failed amid legal challenges and heavy criticism from environmental and local groups. This led to Nautilus filing for bankruptcy in 2019, leaving the Government of Papua New Guinea US$120 million in debt. At present, not a single company is carrying out commercial DSM.

The industry's long-term commercial viability rests heavily on whether the level and timing of future demand for the metals targeted by DSM operations will enable their profitable extraction from the seafloor. Owing to various regulatory, technical and economic factors, timescales for the development of DSM operations are highly uncertain and may not align with rates of increasing metal demand.[89] Additionally, a 2016 report by the Institute of Sustainable Futures found that, even under the most ambitious scenario – a transition to a 100% renewable energy economy on a global basis by 2050 – demand for these metals can be met without mining the deep sea, but rather from known terrestrial resources as well as improved recycling of metals.[90] The authors also note the possibility that new terrestrial resource discoveries could occur before 2050, further increasing supply.[91] Indeed, over the past 25 years, the number of known lithium reserves increased by a factor of ten, while cobalt, nickel and copper reserves have more than doubled.[92] A study commissioned by the ISA similarly found that the terrestrial supply of key deep-sea metals is around 60 years of resources for nickel, 100 years for cobalt and more than 100 years for copper.[93] As such, DSM may only serve to contribute to a global surplus of these metals, potentially even depressing market prices and making DSM economically unviable.[94]

Overview of Li-ion battery raw materials

	Graphite	3 Li Lithium 6.94	29 Cu Copper 63.546	25 Mn Manganese 54.938	27 Co Cobalt 58.933	28 Ni Nickel 58.693
Can be produced from polymetallic nodules	No	No	Yes	Yes	Yes	Yes
Current share of world supply used for Li-ion batteries	7%	29%	0.01%	0.2%	57%	5%
Substitutable	Yes	No*	No	Yes	Yes	Yes
Substitution materials	Li	-	-	Co, Ni, Al, Fe, P	Ni, Fe, P, Mn	Co, Fe, P, Mn

Indispensable raw materials for Li-ion battery production

Raw materials largely used in other sectors

Substitutable raw materials for Li-ion battery production

* Substitutable only through shifts to battery types other than Li-ion or Li-metal (e.g. Na-ion batteries)

Source for share of world supply used for Li-ion batteries: Co: (Cobalt Institute 2022) Graphite, Mn, Ni: (DERA 2021); Li: (Ding et al. 2020); Cu: calculated using the following data: total annual Li-ion battery production: 2 million t (assumption based on (Jacoby 2019)); Cu-content of batteries: 12% (DERA 2021), total annual Cu-production: 24 million t (DERA 2021).

Source: Manhart, A. & McLennan, A. (2023). *The rush for metals in the deep sea. Considerations on deep-sea mining.* Study for Greenpeace e.V., Freiburg. February 2023.

Within the global passenger electric vehicle market, battery technologies that require neither nickel nor cobalt, such as lithium-iron-phosphate (LFP) batteries, have seen their market share rise to 31% in September 2022 compared to just 17% in January 2021.

Furthermore, future projections of the amount of these minerals required for the energy transition are extremely uncertain as they are unable to take into account innovations in battery technologies, which are developing rapidly and will significantly impact the mix of metals and materials that will be used, and thus levels of demand, in the coming years.[95] An analysis by RMI concludes that this evolution of battery technologies has set in motion *"a seismic shift in how we will organise energy systems as early as 2030"*, with new battery chemistries expected to compete with the prevailing lithium-ion (Li-ion) technology.[96] Within the global passenger electric vehicle market, battery technologies that require neither nickel nor cobalt, such as lithium-iron-phosphate (LFP) batteries, have seen their market share rise to 31% in September 2022 compared to just 17% in January 2021.[97] Recent breakthroughs in lithium-air batteries – which have the highest projected energy density of any next-generation battery technology – propose designs which use no cobalt at all.[98]

Demand for DSM metals is also highly likely to be negatively impacted by the global shift towards a circular economy. Current recycling rates of high-demand metals such as silver, lithium, neodymium and dysprosium are less than 1% – an increase in recycling would improve production rates and reduce incentives to mine new sources of supply.[99] The introduction of new regulations, such as the forthcoming EU Battery Regulation,[100] which provide mandatory obligations for battery recycling and collection, end-of-life requirements, targets for the recovery of metals and extended producer responsibility may all further reduce demand for virgin metals.

Box 4: Recent market developments illustrate the falling confidence of investors and corporates in DSM's viability

- In March 2023, Lockheed Martin – the DSM industry's largest corporate backer – announced the sale of its DSM-focused UK Seabed Resources subsidiary, which has held ISA exploration licences since 2013, to Loke Marine Minerals, a comparatively small Norwegian startup.[101] While Lockheed Martin declined to give a reason for the sale, the company's withdrawal from the DSM industry is reflective of growing scepticism towards DSM from major corporations.

- Falling investor confidence is also shown by the faltering share price of The Metals Company (TMC), one of the largest DSM companies worldwide by exploration area, which holds three exploration contracts for polymetallic nodules in areas beyond national jurisdiction and, together with Allseas Group, recently completed one of the first pilot tests of nodule mining in the Clarion-Clipperton Zone of the Pacific Ocean. TMC's share price lost 90% of its value in the 12 months after its September 2021 Initial Public Offering (IPO), and its shares have regularly traded at below US$1 in recent months, resulting in the NASDAQ issuing a delisting notice to TMC in December 2022 and again in April 2023.[102]

- Shipping company A.P. Moller-Maersk is the latest major name to divest itself of interests in the DSM industry, announcing it is in the process of selling its stake in TMC.[103] Maersk had previously been issued with shares in TMC in return for the provision of marine vessel services for TMC's DSM exploration activities.[104]

2.5. The legal and regulatory risks of DSM

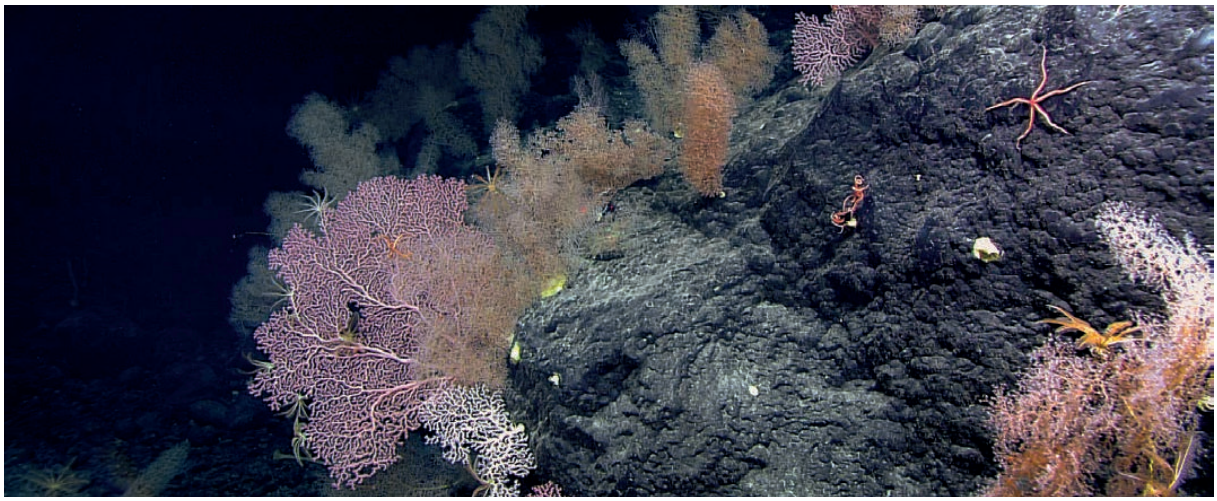
The ISA is still in the process of negotiating the regulatory framework for exploitation of the deep seabed in areas beyond national jurisdiction. However, as a result of mounting opposition (see **Section 3**) and the complexity of issues involved, including a severe lack of knowledge of deep-sea environments, it is highly unlikely that the regulatory framework will be finalised in the near future, given that the adoption of exploitation regulations requires the consensus of all ISA Council member states. Indeed, as scientific knowledge about the environmental impacts of DSM continues to grow, it is possible that any finalised regulations will be crafted in a more restrictive manner. These regulatory uncertainties may well add to costs for DSM companies.

A further threat to the DSM industry comes from risk of litigation. TMC has come under criticism for failing to disclose material environmental, social and economic risks associated with DSM, and is facing two class-action lawsuits from investors who allege that TMC made false and misleading statements, including downplaying *"the environmental risks of deep-sea mining polymetallic nodules"* and failing to *"adequately warn investors of the regulatory risks faced by TMC's environmentally risky exploitation plans"*.[105]

Litigation risk extends to the environmental impacts of DSM upon third parties. Referring to data from *Blue Peril*, the first science-based visual investigation of the impacts of DSM in the Pacific Ocean conducted independently of the industry and the ISA, the Deep Sea Mining Campaign highlights that *"new modelling heralds that should TMC begin commercial operations, significant environmental liabilities are likely to beset TMC, Allseas, and the governments that sponsor their DSM operations in the Pacific Ocean. The modelling indicates that pollution discharged by TMC in its Tonga license area would only take three months to reach the waters of Hawaii and Kiribati"*.[106]

"Claims for loss and damage due to TMC's operations could reasonably be expected to encompass economic impacts on Pacific Island nations, on Pacific islander communities, commercial fisheries, and marine-based tourism. Health impacts may be suffered by consumers of mine waste-contaminated seafood, due to heavy metals released from the mining operations bioaccumulating through the food chain, as well as from the pollution generated by processing plants. These impacts could lead to additional liabilities."

Deep Sea Mining Campaign, Shareholder Advisory on the Proposed Business Combination between Sustainable Opportunities Acquisition Corporation and DeepGreen[107]



Sibelius Seamount, NOAA Office of Ocean Exploration and Research.

3. Growing opposition to DSM: reputational risk for FIs

Dumbo Octopus, NOAA Office of Ocean Exploration and Research, 2019 Southeastern U.S. Deep-sea Exploration.

A growing number of governments, parliamentarians, scientists, NGOs and businesses are calling for a halt to DSM in areas beyond national jurisdiction, as a result of serious concerns over the impacts on marine biodiversity and highly vulnerable ecosystems (see **Table 1** below).

Critically, an increasing number of eminent private companies including BMW, Volkswagen, Samsung and Google have voiced concerns about DSM and publicly committed not to purchase minerals from the deep seabed,[108] casting further doubt on the business case for commercial DSM. Additionally, the Initiative for Responsible Mining Assurance – which offers third-party certification of mining best practices through its Standard for Responsible Mining and counts Ford, Tesla and Microsoft among its members – has repeatedly underlined that it will not allow its certification system to be used by companies involved in DSM.[109]

The United Nations Environment Programme Finance Initiative (UNEP-FI) has cast doubt on the sustainability of DSM, stating that it sees *"no foreseeable way in which the financing of deep-sea mining activities can be viewed as consistent with the Sustainable Blue Economy Finance Principles"*, whilst also highlighting the industry's considerable operational, regulatory, and reputational risks.[110] Work commissioned by another UN body, the High-Level Panel for a Sustainable Ocean Economy, has also highlighted that *"the potential to mine the deep seabed raises various environmental, legal and governance challenges, as well as possible conflicts with the United Nations Sustainable Development Goals"*.[111]

> ***"[T]here is no foreseeable way in which the financing of deep-sea mining activities can be viewed as consistent with the Sustainable Blue Economy Finance Principles, or compatible with the spirit and intent of the Sustainable Blue Economy."***
>
> United Nations Environment Programme's Sustainable Blue Economy Finance Initiative[112]

In sum, the growing global movement against DSM presents a potentially severe reputational risk for FIs who support it. This risk is highly likely to intensify in years to come as public awareness grows of the irreparable and far-reaching environmental impacts of the industry.

Table 1: Opposition to DSM – Groups that have voiced opposition or concern over deep-sea mining

GOVERNMENTS AND PARLIAMENTARIANS	COMPANIES	FINANCIAL INSTITUTIONS	FISHING SECTOR	SCIENTISTS AND CIVIL SOCIETY ACTORS
• Pacific and Oceania: Palau, Vanuatu, Fiji, Samoa, Federated States of Micronesia ("Moratorium Alliance"), New Zealand • Europe: France, Germany, Spain • Latin America and the Caribbean: Costa Rica, Chile, Panama, Ecuador, Dominican Republic • European Commission and the European Parliament • 250 parliamentarians from over 50 countries • IUCN World Conservation Congress*	• BMW Group • Breitling • Google • Microsoft • Patagonia • Philips • Renault Group • Rivian • Samsung SDI • Scania • Volkswagen Group • Volvo Group	• ABN AMRO • BBVA • Cooperative Bank • Credit Suisse • Generation Investment Management • Globalance • Fama Investimentos • Lloyds Banking Group • NatWest (previously Royal Bank of Scotland) • Standard Chartered Bank • Triodos Bank • The European Investment Bank • Storebrand	• African Confederation of Professional Artisanal Fishing Organisations (CAOPA) • EU's Long Distance, North-western Waters and Pelagic Advisory Councils (LDAC, NWWAC and PELAC) • International Pole and Line Foundation • Norwegian Fisheries Association • SATA (South Africa Tuna Association) • SAHLLA (South African Hake Long Line Association)	• 754 marine science and policy experts from over 44 countries have signed a statement calling for a pause to deep-sea mining. • Over 400 civil society organisations from across the world have joined a DSCC initiative calling for a moratorium on deep-sea mining.

* 81 governments and government agencies from 37 countries voted in favour of the motion calling for a moratorium. 577 NGOs and civil society organisations also voted in favour.

"My concern about deep-sea mining is that we know so little about these ecosystems, and that exploration may very well have significant unintended negative consequences for the ecosystem in the wider sense. And of course, we have to remember that the deep sea is really one of the very few pristine ecosystems remaining, and to just open up for exploitation without insight is close to madness."

Jan Erik Saugestad – Executive Vice President,
Storebrand Asset Management

Nations opposed to DSM or which have called for a precautionary pause or moratorium (as of April 2023)

"[There] may be permanent and irreversible risks to deep-sea ecosystems [as a result of deep-sea mining]. As such...the financial sector should join us in excluding deep-sea mining from their financing and investment activities."

Johanna Schmidt – Investment Strategist,
Triodos Investment Management

Credit: Image courtesy of Expedition to the Deep Slope 2007, NOAA-OE. (CC BY 2.0)

For more information or to meet with a policy expert in this area, please email:

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Suzi Shingler, Campaigns Coordinator
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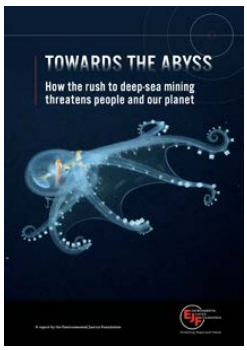
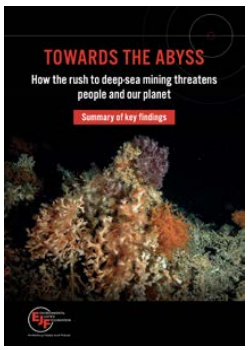
To view EJF's report and film on DSM, *Towards the Abyss: How the Rush to Deep Sea Mining Threatens People and our Planet*, please see the links below:

Watch EJF's new film



Report



Executive summary

EJF's campaign to stop deep-sea mining is generously supported by Arcadia, a charitable foundation that works to protect nature, preserve cultural heritage and promote open access to knowledge. arcadiafund.org.uk

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Anemone attached to a carbonate boulder. Aquapix and Expedition to the Deep Slope 2007, NOAA-OE, (CC BY-SA 2.0).

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