

# DEEP SEA MINING ISN'T WORTH THE RISK

HIGH COSTS, FINANCIAL DEVELOPMENTS SINCE  
2021, AND EXTERNALITIES STAND TO DIMINISH  
THEORETICAL RETURNS ON INVESTMENT

# EXECUTIVE SUMMARY

**Deep seabed mining (DSM)** is a prospective commercial industry aimed at extracting mineral deposits from the ocean floor, targeting the four minerals that dominate their composition: manganese, copper, cobalt, and nickel.

While no DSM yet exists (except for scientific exploration), potential miners continue to actively seek capital. Despite interest in launching this new industry, DSM is an unproven industrial endeavor fraught with technical, financial, and regulatory uncertainty, lacking in social license (e.g., Indigenous opposition, human rights concerns), and carrying significant potential financial and legal liabilities for both public and private investors.

This report critically examines the business case for DSM, highlighting a suite of risks compounded by numerous unknown factors.

## 1

**Unrealistically optimistic financial models** ignore major technical difficulties in extraction (at unprecedented depths below the surface), a volatile metals market, and substantial negative changes in key economic assumptions since 2021.

- Demand fluctuations may affect the industry's ability to sell DSM products, as business models rely on expected growth in demand for EV minerals. A report commissioned by the International Seabed Authority (ISA) found that there is high uncertainty around prices for commercial metals once contractors begin production, leading to the possibility that relatively high-cost minerals from the seabed are not competitive, and thus generate little or no profit. **In fact, metals prices have not risen in tandem with EV production: between 2016 and 2023 EV production is up 2,000% and cobalt prices are down 10%.**
- Routine due diligence on the operational or processing aspects of proposed DSM may prove difficult, as much remains undefined or speculative.
- In Fall 2022, the first DSM collection trial in international waters, done at a very small scale, had significant technological hitches.
- There would be a large up front operational cost associated with DSM, on par with highly industrial extractive industries including oil and gas. It is unreasonable to assume DSM projects would fare better than standard industrial projects, two-thirds of which go over budget by an average of 50%.

## 2

Seabed minerals are not, as mining companies quip, “a battery in a rock.” Polymetallic nodules contain only four minerals that are potentially economically attractive: nickel, cobalt, manganese, and copper. DSM proponents speak of supplying cobalt and nickel to the electric vehicle (EV) industry, an industry that is rapidly moving away from cobalt and from nickel toward new battery chemistries such as lithium iron phosphate (LFP).



Relicanthus daphneae, an anemone-like organism in the CCZ, stuck on top of the stalk of a dead sea sponge. Its tentacles can extend several feet long. Credit: Diva Amon and Craig Smith/University of Hawai'i

## 3

**Innovation design for the energy transition**, including batteries, is moving away from minerals found on the seabed, particularly cobalt. In tandem with the growing circular economy, this will likely render DSM unnecessary.

- New chemistries for electric vehicle batteries and reducing dependence on lithium-ion batteries for non-moveable uses could **reduce the demand for cobalt, nickel, and manganese** by 40-50% between 2022 and 2050.
- Currently, just 8.6% of the world's materials are part of a circular economy, but **by 2050, researchers predict 45–52% of cobalt, 22–27% of lithium, and 40–46% of nickel could be supplied from recycled materials.**



## 4 Potential Costs and “Long Tail” Liabilities are exacerbated by known and unknown threats present in all aspects of DSM, making return on investment uncertain. These threats take the form of:

- An **unfinished regulatory scheme** that – in its draft form – is rife with high costs and extreme liabilities and is overseen by a problematic regulator.
  - A peer reviewed paper published in January 2024 found that 30 major issues in the ISA regulations remain outstanding and that the ISA internal target date to complete the regulations in 2025 is unrealistic.
  - It is notable that both at the ISA and under state jurisdictions, financial guarantees for restoration obligations will be required before mining begins – a significant up-front expenditure.
- **Reputational concerns** associated with companies that would engage in, or support, DSM may jeopardize investment.
- While damage to the ocean and its ecosystems is guaranteed, **who will pay that damage and how much it will cost** is undefined.
  - A 2023 report estimated “the total biosphere impacted by nodule mining in abyssal plains in international waters alone would be up to 25–75 million km<sup>3</sup>, more than the volume of all freshwater in the world, including ice and snow.”
  - A study published in May 2023 analyzed more than 100,000 records of animals in the Clarion Clipperton Zone (CCZ), (the primary target of DSM at the time of this report writing), and found over 90% of species from the records were unknown to science.
- **Lack of social license** (Indigenous opposition, human rights concerns), misleading comparisons to terrestrial mining and overstated Environmental, Social, and Governance (ESG) claims.
  - Environmentalists, scientists, cultural leaders, and individuals are showing their support for the value of the deep sea before an unproven extractive industry begins commercial production of a nonrenewable resource.

## 5 Front runner company The Metals Company (TMC) has not addressed risk or actual damages from environmental spills nor protests (with their attendant costs and liabilities), giving potential investors and decision-makers an incomplete picture.


- Originally, when TMC was first listed on the U.S. stock exchange, civil society argued that its prospectus **did not sufficiently disclose risks**; the Securities Exchange Commission agreed, and required TMC to file an update.

## 6

**International pressure is building to halt DSM:** the decision-making body of the International Seabed Authority has said there should be no DSM without regulations; major companies, Indigenous people, civil society, and scientists are calling for a moratorium; and banks, financial institutions, and insurers are rejecting investment in DSM.

- **24 countries have called for a ban, moratorium, or precautionary pause.**
- **39 companies have signed onto a business statement indicating their commitment to not invest in DSM,** allow for mined minerals to enter their supply chains, and to not source minerals from the deep sea. These companies include Google, Samsung, Philips, BMW, Rivian, Volkswagen, and Salesforce. Their signature commits them to support a moratorium, not source minerals from the deep seabed, exclude those minerals from their supply chains, and not finance DSM activities.

Operational challenges in the deep sea, such as extremely high pressure (4,000+ pounds per square inch), freezing temperatures, corrosive seawater, a high particulate environment, and limited light jeopardize the efficiency and efficacy of equipment, thus hindering the viability of this commercially untested industry. *The high operational, processing, and establishment costs inherent in DSM greatly threaten any potential profits across the industry, with no way to capture the risk.*



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Meanwhile, innovation in design is leading industry toward rapidly emerging alternatives to minerals found on the seabed. Battery innovation is transitioning away from cobalt and nickel towards safer, more efficient, and recyclable chemistries, reducing reliance on new extractive methods. Investment in the circular economy is reducing dependence on new extractive methods and industries in favor of recycling and reuse of the materials already in the supply chain.

The potential impacts of DSM on fragile ocean ecosystems and human rights cannot be overlooked. DSM carries the risk of irreparable damage to ocean ecosystems and violations of human rights and Indigenous Peoples' rights, exposing investors to significant liabilities and reputational risks.

Despite a handful of vocal proponents, including early-stage private sector companies and a handful of countries, opposition to DSM is mounting. Major corporations like Google, Samsung, Phillips, Volvo, BMW, and Salesforce have already committed not to use DSM-sourced minerals, and – since June 2022 – 24 countries have called for a moratorium on DSM. Established mining companies, financial institutions, and even a major insurer have also taken positions against DSM.

In light of these considerations, investors—whether in fixed assets or public/private equity—should **exercise extreme caution when evaluating potential investments in DSM.**

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