Deep-sea mining: Why deep-sea minerals are not needed

Deposits of minerals such as copper, manganese, cobalt and nickel have been found in the deep sea, although to date, none have been commercially extracted from these fragile environments. Until recently, these minerals were used to build the first generation of batteries for renewable technologies, including electric vehicle batteries; however, next generation batteries do not rely on minerals found in the deep sea. Still, there is an industrial lobby to greenwash the extractive industry and launch deep-sea mining as necessary for the green transition.

With alternatives for a green and just transition already within reach, there is no need and no credible argument to tear up the seabed. Instead, governments can and must prioritize three main areas to meet future demand for minerals: innovation in battery technology (using easy-to-source and readily available elements); circular economy strategies including increased recovery, recycling, repurposing, remanufacturing, refurbishing, repairing, reusing, and reducing capacities; and the continued extraction of metals from terrestrial sources under greatly improved environmental and social governance (ESG) frameworks (Amnesty International, 2021).

Experts and industry aligned against the need for minerals from the deep sea

Scientific analysis and new developments in the electric vehicle (EV) and battery industries show that deep-sea mining is not needed to transition to net-zero by 2050, despite many projections indicating that demand for minerals will increase in the coming years. For example, a study by the Institute for Sustainable Futures concludes that “a transition towards a 100% renewable energy supply...can take place without deep-sea mining.” (Teske et al, 2016)

This position is reflected in the fact that a growing number of businesses, including major EV brands and battery companies such as BMW, Rivian, Renault, Scania, Volvo, and Volkswagen, support a moratorium on deep-sea mining (No Deep Seabed Mining - Call for a moratorium, 2023).

The European Academies Science Advisory Council (EASAC) has also debunked the narrative that deep-sea minerals are needed to fuel a green transition.
A 2023 EASAC report suggests that the pressure for mining is driven by industry and economic interests rather than green technology needs. The report highlights that some States are seeking “new sources of revenue or markets to replace declining industries based on fossil fuels, and technology developers who seek new markets and sources of public funding for assets and expertise are in danger of becoming stranded as their fossil-fuel-driven business declines.” (EASAC, 2023)

Innovations in battery technology

The exponential growth in EV production is one of the biggest drivers of critical minerals demand (International Energy Agency, 2023), but battery technology is advancing equally rapidly. Huge public and private sector investment in innovation means that the next generation of longer-lived batteries that reuse metals are already entering the market. New technologies are unlocking additional applications sooner than expected and are predicted to generate a “seismic shift” in how we power our lives and organize energy systems as early as 2030 (Bloch, Newcomb & Tyson, 2019). Investors are being warned that change will be rapid, with timelines that “may not align with traditional venture capital criteria” (Bloch, Newcomb & Tyson, 2019). A World Bank study concluded that batteries are the fastest changing technology sector, making it virtually impossible to forecast which technology will be the most used from now until 2050 (Hund et al, 2020). Even prospective miners admit that new technologies may not require deep-sea minerals, and that the cost of mining may fail to justify commercial operations (Wamer, 2022).

Alternatives to conventional batteries are on the rise. Current trends include (cobalt-free) lithium iron phosphate (LFP) batteries, (lithium-free) sodium-ion batteries, and solid-state batteries. LFP batteries are already well-established, leaping from 10% of the global EV market share in 2018 to about 31% in 2022 (Kane, 2022), driving a reduction in cobalt demand. Tesla is already using LFP batteries and Ford and Volkswagen have announced plans to adopt the technology (Crownhart, 2023). In April 2021, Chinese EV company BYD announced its investment in LFP batteries and that it would be removing cobalt, nickel and manganese entirely from its vehicle batteries, enabling it to produce vehicles at a lower cost and with a lower fire risk (mining.com, 2021). In 2022, BYD represented 50% of total demand for LFP batteries.

Several carmakers have announced sodium-ion EV models in development, including BYD (Westerheide, 2023) and Shau, a VW-JAC joint venture (Limin & Ding, 2023). In April 2023, Catl, the world’s biggest battery producer, announced that it will supply car maker Cherry with sodium-ion batteries for EVs with a 400 kilometer range (Zhang, 2023). According to the International Energy Agency (IEA), these announcements indicate that EVs powered by sodium-ion will be available for sale in 2023-2024, “highlighting quick technological progress” (IEA, 2023).

Solid-state batteries have been considered the ‘holy grail’ of battery technology (Cuthbertson, 2022). These batteries require no cobalt, increasingly should not require nickel, and can be lighter and provide more range at a lower cost than today’s EVs that use liquid electrolyte batteries. They also have faster charging times and do not contain flammable electrolytes (Teague, 2021). Ford and BMW are leading a US$130 million funding round in a solid-state battery start-up, called Solid Power, with hopes to integrate next-generation batteries into EVs by the end of this decade (Wayland, 2021). As a result of the highly competitive and fast-moving nature of the EV battery industry, venture capital investments in start-up firms developing EV and battery technologies are booming, reaching nearly US$4.2 billion in 2022, up 30% compared to 2021 (IEA, 2023).

Circular economy approaches and innovations A 2022 report by SINTEF demonstrates how a net-zero future can be achieved without mining the fragile deep sea (Simas, Aponte & Wiebe, 2022). The report estimates that demand for critical minerals can be reduced by 58% between 2022 and 2050 via a combination of new technologies, circular economy strategies, and recycling. The authors found that, by 2050, recycling will be able to supply most of the minerals needed for the green transition and that short and medium-term demand for critical minerals can be met by technically viable terrestrial mineral reserves. However, it is essential that this mining adheres to ESG standards, such as the Initiative for Responsible Mining Assurance (IRMA).

Now is the time to invest in recycling plants for critical minerals used in renewable energy systems, in tandem with market shifts. Research into ‘urban mining’ – making smarter use of the metals we have already taken – is underway. As one of the fastest growing global waste streams, the recovery of electronic waste can play a significant role in reducing the need for virgin-mined metals to meet future demand. It also has the potential to be more cost-effective (Zeng, Mathews & Li, 2018).
“Only by adopting a circular approach can we support our ultimate goal of net-zero transport in the coming years, one that is enhanced through partnerships with every player on the electrification journey, at every stage of our sustainable transport’s development.”

Joachim Rosenberg, Exec. Vice President at Volvo Group & President of Volvo Energy (quoted in Ben Dorr, Gupta & Schauffuss, 2022)

Research has shown that it is technologically possible to recover and recycle upwards of 95% of lithium, nickel, cobalt and copper in batteries (Earthworks, 2021), and that a significant reduction in demand for virgin mining is feasible in the near term. Recycled materials can cut about 40% of a battery’s carbon footprint, and address most of an EV’s life cycle footprint (Campagnol, Pfeiffer & Tryggestad, 2022). Even before recycling, batteries should be reused, refurbished and/or repurposed, for as long as they are safe and have remaining capacity (Ambrose, 2020).

It is also vital that battery end-of-life is integrated into the design of both the EV and the battery. In 2021, Earthworks analyzed the recycled content from general end-markets and the recycling of end-of-life EV lithium-ion batteries. Their report found that: “Effective recycling of end of life batteries has the potential to reduce global demand by 55% for copper, 25% for lithium and 35% for cobalt and nickel by 2040 – creating an opportunity to significantly reduce the demand for new mining.” (Earthworks, 2021) The IEA has also confirmed that recycling end-of-life lithium-ion batteries could “relieve a proportion of the burden from mining them from virgin ores” (Khan, 2021).

**International commitments affecting demand for raw minerals**

In December 2022, the EU reached a provisional political agreement on a proposal for a new regulation that aims to create a circular economy for the batteries sector (European Commission, 2022). The proposed legislation will apply to all batteries and regulate the entire life cycle of a battery for the first time. The new regulation includes mandatory recycling targets for raw materials, including cobalt and nickel, which must reach recovery rates of 90% by 2027 and 95% by 2031. This will greatly reduce demand for cobalt, nickel and other raw materials used for batteries and is a benchmark that other markets should follow.

Other governments are also developing new policy or regulatory instruments to encourage the recycling, reuse or refurbishment of consumer electronics and industrial batteries. The ReCell Center, the US Department of Energy’s Li-ion battery recycling Research and Development Center, has the goal of making recycling competitive and profitable (Jacoby, 2019). More recently, the US Battery Supply Chain Review called for more research into “alternatives to critical minerals” and measures to enable “end-of-life reuse and critical materials recycling at scale”. Major private companies are also leading the way. For example, in February 2023, Apple announced that it will use 100% recycled cobalt in its batteries by 2025 (Apple, 2023).

**Reduction in global demand**

Over the past century, there has been a sharp increase in global material extraction, leading to huge disparities in consumption across the planet and unequal allocation and access to resources. The 1.2 billion poorest people account for just 1% of the world’s consumption, with the 1 billion richest accounting for 72% (Simms, Whitmore & Pratt, 2023). In addition, the UNEP International Resource Panel estimates that extraction and processing of natural resources accounts for more than 90% of global biodiversity loss and water stress and approximately half of global greenhouse gas emissions (International Resources Panel, 2019).

It is therefore vital that humanity reduces its extraction footprint and demand for minerals and metals. A circular, holistic approach to the supply chain of low-carbon technologies, from mineral extraction to end-of-life, is essential. The simplest way to reduce the demand for minerals and metals is to reduce societal demand for energy, for example by investing in sustainable and shared transport (i.e., public transit) and infrastructure systems (i.e., low carbon electricity grids) (Intergovernmental Panel on Climate Change, 2022).
Recommendations

- Develop legislative frameworks that require manufacturers to produce technologies that can be fully recycled at end-of-life.
- Increase and upscale recycling rates by establishing effective infrastructure for waste management and recycling and developing innovative industries such as urban mining.
- Incentivize extended product life cycles and intelligent product design.
- Research and develop substitutes for high-demand metals currently considered critical for renewable technologies.
- Combine circular economy policies with policies aimed at reducing overall demand for resource-intensive products and energy, for example through improving energy efficiency, investing in shared economy models, and redesigning towns and mobility in cities.
- Introduce policies and incentives aimed towards a reduction in demand for minerals and metals globally.
- Develop legislative frameworks and standards that require terrestrial extractive industries to improve processes to maximize the capture of minerals, reduce waste, and minimize social and environmental impacts.

References


About the DSCC

The Deep Sea Conservation Coalition (DSCC) was founded in 2004 to address the need to prevent damage to deep-sea ecosystems and the depletion of deep-sea species on the high seas from bottom trawling and other forms of deep-sea fishing. The DSCC is made up of over 100 non-governmental organizations (NGOs), fishers organizations and law and policy institutes, all committed to protecting the deep sea.

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