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Tracking the trends 2023
The indispensable role of
mining and metals

Introduction

The indispensable role of mining and metals

The world is at a critical point in time, socially, environmentally, and economically. The latest projections by the United Nations suggest that the global population could hit 8.5 billion in 2030 and 9.7 billion in 2050.¹ With a growing population comes a growing demand for the metals and minerals that underpin societal progress. From civil infrastructure to transportation, and technology to agriculture, the products that the mining and metals sector produces, support and enable virtually every sector globally.

The paradox is that, while the need for mined products has never been greater, public opposition to mining activities has never been higher. The green energy transition is expected to be a mineral-intensive one—the International Energy Agency estimates that the demand for minerals used for electric vehicles and battery storage will grow tenfold by 2040.² Yet, at the same time, approvals for projects that could become important providers of critical minerals, such as lithium (see Rio Tinto's Jadar project in Serbia³), are being hampered due to protests. The juxtaposition between need and want is stark, and the gulf between them creates a very real threat to global climate change mitigation.

For too long, the stories told about the mining and metals industry have centered on the negatives. However, the opportunities

that mining and metals companies can offer to provide for and enhance the prospects of the population, as well as the environments they reside in, are vast. Mining underpins approximately half of the global economy⁴ and therefore, it has the greatest potential of any industry to positively influence social, environmental and economic development.

This year, Deloitte Global's Tracking the trends 2023 focuses on the indispensable value that mining and metals companies can deliver, with the emphasis on taking action now for a better tomorrow. In each of these 10 trends, our network of Mining & Metals sector professionals globally offer up expertise, insights, and examples to spark conversations about how mining and metals organizations can make a difference in the world.

Changing perceptions of the industry by putting people and natural capital front and center in strategies; designing organizations and products for circularity; creating safer, more respectful places of work; and innovating together to make the possibility of ultra-efficient mines a reality will be key to creating a healthy, regenerative ecosystem inclusive of people, planet and industry.

We're excited to discuss these trends with you and explore how they will shape your company's future. Thank you for your ongoing support.

Endnotes

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Trend 3

Driving down embodied carbon in metals

Supporting the decarbonization of economies

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The creation of low-carbon, future-fit building materials, vehicles, energy technologies and more is reliant on the minerals and metals from which their key components are produced. Although the mining and metals industry does contribute to global carbon emissions,¹ the sector's foundational role as a provider of raw materials means that its handprint, or potential to lower carbon emissions across the broader economy, outweighs its footprint.

Across the industry, efforts are well advanced to lower Scope 1 and 2 greenhouse gas (GHG) emissions. Research from the University of British Columbia has shown that 90% of total emissions from mining and metals globally originate from the manufacturing of iron and steel.² Scope 3, or avoided emissions produced by activities up and down the value chain, including smelting and refining, can constitute up to 98% of an individual company's total GHG emissions.³

Scope 3 decarbonization efforts have only recently begun in earnest. Part of this lag can be attributed to the time required for companies to map out their complex supply chains and work with alliances to align their thinking. It also takes time to identify where existing processes and technologies can be adapted to lower emissions and where the development of new ones are required.

John O'Brien, partner, Climate and Sustainability, Deloitte Australia, says: "We're seeing increasing supply chain pressure from the manufacturers of end products, such as batteries, cars, phones, and packaging, for mining and metals companies to provide verifiably carbon-neutral commodities. A proactive approach to lowering Scope 3 emissions will allow early movers to differentiate themselves and their products, capturing a greater share of the market."

Value chain decarbonization is one of the biggest challenges that miners and metal producers face. However, by assembling the different players, embracing their potential as influencers, and helping other organizations to lower their footprints, there are also opportunities to create exciting new roles, speak to younger generations who are keen to work in a purposeful sector, and invite new ways of thinking and working.

Collaborating for progress in steelmaking

According to joint research by Shell and Deloitte Global in their recent report: "[Decarbonising Steel: Forging New Paths Together](#)", the global steel industry currently generates around 10% of global CO₂ emissions, which could increase as demand is expected to rise by 10-35% by 2050 compared to 2019⁴. The steel sector is still highly reliant on coal to meet 75% of its energy demand,⁵ and because metallurgical coal is also the primary reducing agent used during steelmaking, its substitution is complex.

However, because the steel market is relatively concentrated and close knit, there are significant opportunities for decarbonization through coordinated efforts.

Grischa Sauerberg, Vice President, Sectoral Decarbonization & Innovation, and Head of Mining at Shell, frames the possibility: "If the 20 largest steel companies decarbonize their plants, the potential total emissions of the steel industry could be reduced by up to a third."

The International Energy Agency (IEA) states in its 2021 Iron and Steel tracking report: "While energy efficiency is important for net-zero by 2050 alignment, on its own it cannot decarbonize the sector. Transformational change is required, and the groundwork for breakthrough technologies needs to be laid before 2030."⁶

Anticipating this need, many miners and metals producers are forming collaborations to support or actively participate in research and development initiatives with downstream companies in a bid to develop and accelerate breakthrough cleantech.

Dr. Andrew Zoryk, director, Consulting, Deloitte Germany says: "Many miners and metals producers have anticipated this need and are forming partnerships to support or actively participate in research and development initiatives with downstream companies in a bid to develop and accelerate breakthrough cleantech."

For example, in 2016, Swedish miner LKAB teamed up with SSAB and Vattenfall to form the HYBRIT initiative, which aims to create fossil-free steel at an industrial scale by 2026. In June 2021, the HYBRIT pilot plant in Sweden completed test production of hydrogen-reduced sponge iron. Using this reduces around 90% of emissions from steelmaking, and SSAB's transition to it will reduce Sweden's CO₂ emissions by 10% and Finland's by 7%.⁷

BHP, which faces Scope 3 emissions from both iron ore and metallurgical coal, has taken a diversified approach to accelerate green steelmaking. In recent years, it has partnered with steelmakers across four different economies—POSCO, China Baowu, JFE Steel, and HBIS Group—to explore GHG emissions reduction opportunities.

In July 2022, it also signed a Memorandum of Understanding (MoU) with India's Tata Steel to reduce the emission intensity of blast furnace steel through the use of bioenergy and carbon capture and sequestration (BECCS).⁸ Through its venture capital arm, BHP is backing startup Boston Metals, whose molten oxide electrolysis technology aims to decarbonize steelmaking.⁹

Cleantech to decarbonize transport

Vale is also looking to cleantech development to reduce its Scope 3 emissions generated through shipping (the company contracts ships from third parties to transport its ore). In July 2021, the company announced the installation of air lubrication technology on the Sea Victoria, a 325,000-ton capacity Gvaibamax very-large ore carrier (VLOC).¹²

Compressors installed on the ship's deck send air to devices positioned under the ship to produce a carpet of bubbles that reduce friction between the hull and the water, thus reducing fuel consumption and emissions. The technology could be replicated on the remainder of the contracted fleet committed to transporting the company's ore. Conservative estimates point to a 5% to 8% fuel reduction and a 4.4% reduction in annual emissions from Vale's maritime transport of iron ore.¹³

Antofagasta Plc's efforts to lower its own Scope 1 and 3 emissions have also seen the company take on the role of an enabler, developing solutions that help other mining and metals companies to lower their own Scope 3 emissions.¹⁴ The company's transport division is key in supporting the economic activity of the Antofagasta region in Chile through rail cargo services that connect various mining operations with ports on the Pacific coast.

The positive power of mining and metals

Efforts to lower embodied carbon in metals are also spawning opportunities to boost circularity. In 2018, Rio Tinto joined forces with Alcoa, with support from Apple* and the governments of Canada and Quebec, on a joint venture called ELYSIS. ELYSIS is developing a smelting technology that produces no GHGs, only pure oxygen. Its first metal was produced in November 2021, and the technology is now being scaled for industrial deployment beginning in 2023.¹⁰

In September 2022, Rio Tinto also signed a strategic alliance with Volvo Group under which Rio Tinto will supply responsibly sourced, low-carbon products (including ELYSIS aluminum) to Volvo. In turn, Volvo will assist in decarbonizing Rio Tinto's mining operations using autonomous hauling solutions.¹¹



Antofagasta announced in February 2022 that it's evaluating green hydrogen as a potential fuel for its locomotive fleet. The project is in development with the Green Hydrogen Accelerator of Chile's Energy Sustainability Agency, and the team plans to have a pilot running in the next two to three years. Antofagasta has also agreed to evaluate the feasibility of HyEx green ammonia produced in northern Chile (a project led by energy multinational, Engie, and Chilean explosives company, Enaex). As a possible off-taker, Antofagasta would use ammonia as a fuel for its trains, haulage trucks, and ships.

Unique companies need unique solutions

Dr. Adriaan Davidse, director, Consulting, Deloitte Canada, explains: "Every organization has a Scope 3 emissions profile that is influenced by its unique circumstances. Therefore, it should select different alliances and investments to create a net-zero pathway that is optimized for its specific challenges and opportunities. In doing so, organizations can meet their own climate change mitigation goals, create new types of value, and secure off-take agreements in what is fast becoming a buyer's market."

The examples provided earlier detail the efforts of some of the world's largest mining and metals companies as well as their suppliers and consumers. They illustrate how an ecosystem mindset can be harnessed to successfully tackle value chain emissions and support the creation of a more sustainable economy.

Leveraging green hydrogen

Fortescue Metals Group (FMG) is innovating in a different way. The world's fourth largest iron-ore producer is leveraging its subsidiary, Fortescue Future Industries (FFI), an emerging global producer of green hydrogen (made from renewable energy, producing only steam as a by-product) to decarbonize its mining and shipping fleet, including trucks, drill rigs and trains. FMG aims to achieve carbon neutrality by 2030 and responsibility for achieving this lies with FFI¹⁵. Around 10% of FMG's annual profits contribute to funding FFI¹⁶. The aim is to produce 15 million tons of renewable hydrogen annually by 2030, and the company will also supply other organizations that are looking to drive down their emissions¹⁷.

Creating a cleantech portfolio that supports Scope 3 reductions

- **Go digital to map the business ecosystem:** Understand the value chain better by digitally mapping where Scope 3 emissions come from. By gaining a deeper understanding of the different layers of industries involved in the company's value chains, and their associated emissions intensities, organizations can generate better insights about how their business activities are ultimately associated with Scope 1 emissions. This transparency makes it easier to evaluate where companies can influence the development of abatement options.
- **Identify abatement opportunities:** Make time to listen to your suppliers and customers. There may be collaboration, investment, or enablement (or other) opportunities available that the organization hasn't yet considered both with direct and indirect (consumer product companies) players. Once opportunities have been identified, priorities, boundaries, and data-sharing protocols can be established to support the initiative.
- **Be clear on costs:** Transparently assess and address the commercial implications of value chain decarbonization. Understand where capital will be required, value in the end product, and how to redistribute that value along the value chain. Form a view of the least-cost decarbonization pathway for the full value chain.
- **Seek out collective actions for greater impact:** Scope 3 emissions may only be effectively addressed by working together across the value chain. The creation of buying consortiums that value the reduction of Scope 3 emissions and are willing to invest in decarbonization options, or to provide a premium off-take market for investments by others for decarbonizing the value chain, could also catalyze change for others. The ELYSIS project, which involves Apple, Rio Tinto, Alcoa, and the governments of Canada and Quebec working together to develop a GHG emissions-free smelting technology, is an example of this powerful collective action.¹⁸
- **Think circular:** Adopting different roles and strategies to tackle Scope 3 emissions can provide ways for miners to boost circularity in metals supplies, such as urban mining. With the ability to track metals throughout their life cycle with new chemical markers and digital platforms such as blockchain and equivalent applications, effective urban mining and recycling can replace a great share of primary mining over time. It can become a source of continuous revenue for mining companies that think more holistically and adopt business models that benefit from the increased focus on reducing Scope 3 emissions.
- **Understand the time frame:** Decarbonization of end products must happen as soon as possible. Solutions must be developed, optimized, and scaled in the next few years to achieve the goal of net-zero by 2050. Find the appropriate alliances who want to collaborate on developing these solutions, and then synchronize changes needed across the value chain to better time investments and scale solutions more broadly. Once a single value chain has been assessed, develop a road map for scaling across products, and identify the order of priority based on the timing of when carbon-neutral end products will be needed to meet market demand.

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