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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 4

Collaborate, incubate, accelerate

Speeding successful innovation for greater value

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While innovation is a topic that's been addressed many times in the Tracking the trends report over the years, the imperative continues to build.

Technological innovation can lower the costs, dangers and environmental impacts associated with mining ever-deeper deposits, helping to ensure that operations remain profitable and sustainable over time. Social innovation can help mining companies secure and maintain a social license to operate, allowing smoother permitting for projects, which is required to meet the needs of the green energy transition. Through business model innovation, companies can incorporate circular principles, realize the full value of their assets and safeguard their businesses against disruption.

It's easy to assume that the benefits of innovation stop at the company; however, in continuing to strive for excellence, mining and metals companies are providing the highest-quality materials at the lowest cost, with the lowest possible environmental impact (even reaching net-positive in the future). They can also provide employment and development opportunities for communities in areas that might be less attractive to other types of investment and rehabilitate landscapes damaged by legacy industrial activities, to name just a few.

The environmental, social, and governance (ESG) revolution in mining has acted as a catalyst for collaborative innovation efforts in particular, driving many companies of all sizes and types to join forces to tackle problems, such as decarbonization, that transcend the capability of any one organization. Now, mining and metals companies should take the insights garnered from those initiatives—what works and what doesn't—and use them to scale and speed different innovations across the value chain for the best possible impact.

Business ecosystems: What, why, how?

In Deloitte Canada's 2016 report, [Business ecosystems in exploration](#), business ecosystems are described as “dynamic and co-evolving communities of diverse actors who create and capture new value through increasingly productive and sophisticated models of both collaboration and competition.”¹

Christopher Lyon, partner, Energy, Resources & Industrials Leader, Deloitte Chile, says: “Most ecosystems are formed to achieve something that lies beyond the scope and capacity of a single business or group of similar players. They provide a structured way for organizations to share information and risk to advance their mutual objectives, and usually include (but are not limited to) a mix of mining companies, nonprofits, research institutions, original equipment manufacturers (OEMs), and technology providers.”

Research has shown that, over the years, collaborative efforts have been more successful in developing breakthrough innovations than individuals or organizations working in isolation. As part of the aforementioned report, Deloitte conducted a review of more than 200 of the most important innovations over a 600-year period (from 1400 to 2010). The results showed that 85 were developed through a small, coordinated team within an organization, while 122 evolved through collective, distributed processes, with many groups working on the same problem.²

The positive power of mining and metals

The demand for low-carbon and responsibly sourced minerals and metals is growing as consumer companies produce the wind turbines, electric vehicles, building materials and more needed for net-zero by 2050. Mobile equipment accounts for 40% to 50% of mining's CO2 emissions, and collaborative innovation with companies in adjacent industries are helping to break down the technological barriers that stand in the way of decarbonizing mine haulage.

In October 2022, Shell announced the formation of a nine-member consortium to develop an end-to-end, interoperable electrification system for mining vehicles that reduces emissions without compromising on efficiency or safety.³ The pilot combines a high-powered battery solution with ultrafast charging and a standardized microgrid energy system. This can be complemented with renewable electricity generation onsite or through the grid to create a holistic, low-carbon haulage solution.

Addressing common challenges

Business ecosystems are not new in mining and metals. Australia-based Amira Global was established more than 60 years ago by six mining companies to tackle challenges that were larger than any one organization could address.⁴ The group continues to develop projects at scale that support its members across a range of topics, including characterizing and optimizing the extraction of complex ore types and the evaluation of tailings storage monitoring technologies.⁵

More recently, the Canada Mining Innovation Council (CMIC) was founded in 2009 as a nonprofit. It's now 100% funded by the private sector and led by more than 30 mining companies globally with a focus on the co-development and co-deployment of technologies.⁶ Current projects include BluVein, which is adapting the e-highway technology developed by Swedish company, Evias, for heavy haulage in underground mines, thus overcoming the limitations of today's battery electric vehicles.⁷ CMIC is also leading development of the Conjugate Anvil Hammer Mill, which provides a more efficient alternative to high-pressure grinding rolls and semi-autogenous grinding mills.⁸

The caveat is that collaborative innovation does not come easily to an industry that is characterized primarily by capital-intensive, long-life assets and companies that are not designed or accustomed to sharing their data openly.

Developing a new technology, strategy or concept is one thing, but proving it at commercial scale and achieving widespread adoption are quite another. Time and time again, there have been instances where innovations stall, not because they're unviable, but because the structures, finance and growth mechanisms needed to progress them are not in place.

High-performance pressure filters for the dewatering of mine tailings are an example of a technology that, for social and environmental reasons, is crucial to the future of mining. However, the perceived financial and operational risks of deploying the technology at full scale in copper and iron ore operations (which produce the largest share of the 8 billion tons of tailings produced globally each year⁹) have meant that widespread adoption is yet to be achieved.

In October 2022, BHP and Rio Tinto announced a partnership to tackle this. The organizations will work in collaboration with technology and equipment providers, technical experts, research groups and the academic sector to test a large-volume filter unit at a BHP copper mine in Chile. This would remove up to 80% of the water in the tailings stream before it is deposited in a storage facility. The pilot construction is due to begin in early 2023 and operations are scheduled to commence in early 2024.¹⁰

Ecosystem evolution

Traditional mining ecosystems continue to bring forth valuable innovations, but what's interesting is the way in which the innovation ecosystem model is maturing and evolving (devolving really) to deliver different types of value for different players and through nonlinear pathways. The aim is to overcome some of the stumbling blocks that have prevented certain innovations from reaching their full potential thus far.

Van Ramsay, Partner, Mining & Metals Leader, Deloitte Canada, says: "Today, the key to success in collaborative innovation is taking a tailored approach depending on what companies want to achieve and the types of value they do and don't want to create. Once these have been determined then it's possible to define a program or model that could deliver those innovations in the most time-, capital-, and resource-efficient ways possible."

One example of a next-generation innovation ecosystem is the Charge On Innovation Challenge. The challenge is facilitated by Austmine, the crowdsourcing project that was founded in 2021 by BHP, Rio Tinto and Vale to

accelerate commercialization of solutions for charging large (220-ton capacity and above) electric haul trucks. The challenge, which now has 21 mining company patrons, received hundreds of technology entries in its initial open application phase and, in May 2022, eight were selected for further development.¹¹

What makes Charge On different is the level of due diligence that the patron companies performed as part of the initial assessment to help de-risk the adoption process, and the structures in place, including commercialization opportunities with OEMs and venture capital, to progress the winning entries.¹²

Joining forces to decarbonize steelmaking

In October 2022, BHP signed an agreement with ArcelorMittal and Mitsubishi Heavy Industries Engineering for a multiyear trial of Mitsubishi's carbon capture technology in steelmaking. The agreement includes a trial at ArcelorMittal's steel plant in Ghent, Belgium, and at one of its North American direct reduced iron plants. The companies will also conduct a feasibility and design study to support progress to full-scale deployment. The move was described as "a critical milestone in BHP's strategy to support decarbonization efforts in steelmaking."¹³

Venture capital: The next frontier

Some tier one mining companies, such as BHP and Vale, have gone a step further and created venture capital divisions to collaborate with innovative startups.¹⁴ This represents a very different approach to the noncompetitive-type ecosystems outlined previously and serves a different purpose, although the aim is still to incubate and accelerate.

Independent, consortium-type programs tend to focus on identifying, incubating and accelerating a range of innovative solutions to urgent, large-scale industry challenges; there is an understanding that these efforts are “for the greater good.” However, challenges that are more site or company specific, for example, mechanical rock cutting or mineral exploration, may provide a chance for companies to differentiate themselves or their product based on the development of new solutions. By taking a stake in a range of startups, mining and metals companies with more generous balance sheets can spread their risk, maximize their chances of returns and potentially create a competitive advantage.

Andrew Swart, Partner, Energy, Resources & Industrials Leader, Deloitte Canada, explains: “We are seeing tier one miners standing up venture capital to support the development of innovations that could, in time, prove strategic to their businesses. As a result, we’ve seen a marked increase in career creation, progression, and capabilities in innovation, ventures and collaboration teams. This represents an exciting frontier for the sector.”

For example, in August 2022, Vale announced the creation of Vale Ventures, a US\$100 million venture capital fund designed to create new business opportunities and innovative technologies to incorporate into Vale’s operations. Through this, the company will acquire minority stakes in startups focused on four themes: value chain decarbonization, zero-waste mining, energy transition metals and disruptive technologies.¹⁵

Purpose-driven innovation for the 21st century

Next-generation collaborative innovation efforts, whether internally or independently led, are the future of mining and metals innovation. The key lies in determining which approaches best suit each organization based on the desired outcomes and the resources available to incubate, accelerate and capture the value of different innovations.

Regardless of the models or strategies chosen, there are a number of things that mining and metals providers can do to help ensure they get the most from any collaborative innovation effort.

Laying the foundations for collaborative innovation

- **Sequence your relationships:** Collaboration is hard. It's important to establish relationships between collaborating companies at different technical levels and to have ongoing coverage and support from senior management. Supporting functions, such as legal and procurement teams, should also be introduced at the appropriate time.
- **Sharing the appropriate data:** Data sharing and security are naturally concerns in any collaborative innovation effort. Mining and metals companies should ensure that they're sharing only the necessary data at the appropriate time with the appropriate parties in order to achieve the desired outcomes. Digital tools such as homomorphic encryption, which anonymizes data but allows relationships within data sets to be maintained thus allowing analysis and trends to be identified, can prove useful in this respect. User errors can also result in unwanted data sharing. Review and test data governance procedures ahead of any new collaborative effort.
- **Security equals trust:** Organizational risk frameworks (enterprise, supply chain and cyber) should be set up in a way that supports dynamic and collaborative innovation. For example, using a zero trust architecture that supports real-time verification each time a person, device, or product connects with the business will help to foster trust between partners.
- **Scan the ecosystem:** The startup space is evolving rapidly. It's important to scan the wider ecosystem for startups that are aligned with your organization's key focus areas. Consider looking to adjacent industries, such as oil and gas or manufacturing, for potential new partners.
- **Communicate successes:** Innovation is an attractive characteristic to investors, stakeholders and potential employees. Make successful innovation projects a key part of your marketing activities. Cross-correlate campaigns with those of your innovation partners for greater impact.

Endnotes

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