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Tracking the trends 2024

Navigating global challenges and opportunities in mining and metals

Contents

Introduction	3
Trend 1: Putting purpose at the heart of mining and metals— Creating social momentum	4
Trend 2: Navigating global uncertainty—Building capacity to thrive in the face of disruption	10
Trend 3: Dealmaking for future-focused growth—Rethinking minerals and metals investments	16
Trend 4: Working toward net-zero—Building capacity and future- proofing ESG strategies for a credible transition	22
Trend 5: Collaborating with governments to rethink regulation— Unlocking critical resources through permitting	28
Trend 6: Going back to grassroots—Nourishing growth through investments in exploration	36
Trend 7: Addressing workforce challenges through a skills-based approach—Equipping mining and metals companies for the future	42
Trend 8: Unlocking new value in existing assets—Balancing complex priorities and meeting supply demand through operational optimization	48
Trend 9: Bringing generative AI into mining and metals—Capitalizing on current and future opportunities	54
Trend 10: Third party delivery models—Gaining agility and competitive advantage through next-gen approaches to outsourcing	61
Global contacts	67
Authors	68

Introduction

Navigating global challenges and opportunities in mining and metals

As we enter 2024, the mining and metals industry finds itself at the center of a complex matrix of challenges and opportunities, expectations, and demands.

With supply shortages looming in metals that are critical, not just to the energy transition but to global urbanization and industrialization, stakeholders are acting strategically to secure their supply chains (copper, for instance, is expected to see a supply deficit of 9.9Mt by 2035¹). With supply source alternatives such as urban mining still in their infancy, downstream companies and even governments are striking deals with miners and metals providers in a reshuffle that has seen some traditional value chains realign over the past 12 months.

Organizations also remain under pressure to improve the efficiency of existing assets and operations by embracing generative artificial intelligence (gen AI), leveraging third party delivery models with specialized back office capabilities and to unlock new value in assets. Additionally, the need for mining and metals companies to collaborate with industry peers, suppliers, and competitors to tackle productivity and environmental issues, all while upholding environmental, social, and governance (ESG) expectations in day-to-day operations remains a priority.

With strong business strategies in place and 2050 sustainability targets as its North Star, now is the time for the mining and metals industry to accelerate growth. However, with heightened uncertainty in the global geopolitical sphere and volatility in commodity markets, to do so may not be easy. Companies that navigate uncertainty, work with governments to address permitting issues for new projects, rethink the strategic value of exploration, work with regional players to address skills shortages, and drive toward becoming more purpose-led organizations are most likely to prevail.

In this, the 16th edition of Deloitte Global's *Tracking the trends*, a team of professionals from around the world provides insights and examples as well as practical ideas to help mining and metals companies rise to the challenges that lie ahead and capitalize on new opportunities. We're looking forward to discussing these trends with you in more depth and helping your organization to continue forging its own pathway to success. Thank you for your ongoing support.

Endnotes

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Trend 1

Putting purpose at the heart of mining and metals: Creating social momentum

Ian Sanders, Global Mining & Metals Sector leader, Deloitte Global
Mike Robitaille, partner, Purpose & Momentum practice lead, Deloitte Canada

Despite mining companies taking significant action over the past decade to change the narrative surrounding the role they play within society—for example, through enhanced transparency and focusing on responsible mining methods—the industry remains undervalued.

Research from GlobeScan across 27 countries saw mining ranked second-to-last when asked how well different types of companies fulfill their responsibilities to society.¹ However, demand for certain critical metals will outstrip supply in the near term, and to meet this shortfall, the industry will most likely need to develop greater capacity, often in previously unmined regions. As they seek to expand, companies will therefore need to put even greater effort into building trust.²

“Purpose has been a key movement in industries such as consumer products over the past 20 years, and it’s one that we see increasingly in energy and resources. This is not about creating a better narrative or setting out a new vision, but rather organizations actively living a wider purpose in the world.”

**Ian Sanders, Global Mining & Metals Sector leader,
Deloitte Global**

Why is purpose important?

A clear purpose is vital to an organization. It articulates why the organization exists, what problems it exists to solve, and who or what it wants to be to each human it touches.³ Increasingly, businesses are living out their purposes in ways that create deeper connections with customers, to do more for the communities with which they work, and to attract and retain talent. At the heart of this effort can be powerful collaboration across many players, and in the process, they’re achieving greater results and impacts.⁴

Examples from the consumer products sector include Lego, lululemon, and Starbucks. These are companies that, through their work, aim to go beyond making money to becoming agents of human idealism and societal progress. When brands become a force for their ideals, they give people a compelling reason to care about and contribute to their successes. And when people genuinely care about a company and the change it is bringing about in the world, that company becomes more valuable and advantaged.

Not every organization sees purpose as an all-encompassing ideal. Some consider it a tool to advertise what they do and stand for and to capture more market share. However, research from Deloitte US⁵ has shown that what separates purpose-driven businesses from the rest are longevity and authenticity.⁶ Purpose-driven companies can witness higher market share gains and grow, on average, three times faster than their competitors, while achieving higher employee and customer satisfaction.⁷

For example, outdoor clothing brand Patagonia, the ownership of which founder Yvon Chouinard famously placed into a trust for the benefit of the planet in 2022,⁸ is purpose-led. The company is ranked number one in its US\$12 billion market⁹ and scores higher than its main competitor on many employee satisfaction metrics.¹⁰

“Companies that lead with purpose and build around it can achieve continued loyalty, consistency, and relevance for their customers, consumers, communities, suppliers, and employees. Those that fail to identify and articulate their purpose may survive in the short term, but over time, people are likely to demand more.”

Ian Sanders, Global Mining & Metals Sector leader, Deloitte Global

Purpose can help businesses navigate change

While purpose is important to every organization, it's particularly pertinent in mining and metals because the products of this industry touch the lives (directly or indirectly) of humans in even the remotest reaches of the planet. Mining and metals providers are already influential forces for economic development in many regions and, if they can harness the powers of their purposes, they have the chance to not only help secure their own sustainability ambitions, but also drive social development and environmental restoration, too.

“Over the past five years, one of the biggest shifts we've seen, which is highly relevant for mining and metals, is away from exclusively business-to-business models. Thanks to social media and online information, organizations that traditionally have had little exposure to the public are now expected to be more transparent. Almost every company now has a business-to-public model and that requires an evolution in their value proposition.”

Mike Robitaille, partner, Purpose & Momentum practice lead, Deloitte Canada

This is not the only change that mining and metals organizations face. As discussed in [trend 7](#), today, employees want more than a job; they want to be emotionally invested in doing something that they believe is meaningful through their daily work. This is particularly evident with Generation Z, a generation characterized by people who are highly driven to make career decisions in ways that align with their personal values.¹¹ Downstream consumers of metals also want to know what companies in their value chains stand for, and expect them to create a better world for the communities in which they operate as well as deliver their own sustainability goals. Additionally, governments want to see that operators are good corporate citizens, and investors are demanding the aggressive management of environmental, social, and governance (ESG) risks.¹²

Putting purpose at the heart of a company could help to address these challenges. However, it requires more than just good storytelling, ESG reporting, or financial handouts to communities. Purpose-led growth requires new value to be created for stakeholders, rightsholders and operations; plans and strategies to be rearchitected toward common goals; and leaders and employees to demonstrate that intention consistently (figure 1). Most importantly it requires commitment and alignment over time.

Bringing purpose into mining and metals

Due to the cyclical nature of the mining and metals industry, sustaining transformation programs through commodity cycles requires unequivocal buy-in from leadership and a commitment to their resourcing and investment, whatever the economic weather. Also, while the industry prides itself on meeting quantifiable operational metrics, such as production targets, ESG efforts in recent years have proven that it's much harder to address nonfinancial stakeholder expectations.

The industry isn't alone in finding this difficult; research from Deloitte Canada across various sectors found that while 86% of companies have stated a "purpose beyond profit," only 18% showed any evidence of associated change.¹³ However, there are some early case studies that could offer valuable lessons.

Worley is investing AU\$100 million (approximately US\$65 million) over three years to target and develop solutions for customers in high-growth areas aligned with its purpose. The company has put in place initiatives focused on the education of its workforce, challenging traditional approaches and identifying innovative ways to meet sustainability challenges across the company and its customers' operations.¹⁴ In FY2023, 41% of Worley's total revenue was sustainability-related, up from 35% in FY2022, and by FY2026, the company aims for 75% of its total revenue to be sustainability-related. To date, more than 40,000 sustainability-related learning modules have been undertaken by Worley people, and the company now boasts 700 sustainability champions.¹⁵

Fueling future growth and longevity

There is a tremendous opportunity for forward-thinking mining and metals companies to reorient their corporate brands and to become instruments of progress and idealism, increasing their profit growth and product demand as a result. The environmental and social challenges that we see today are the harbingers of change, and society is asking more of businesses. The question is, *Which organizations will rise to the challenge?*

Figure 1: Steps to operationalizing purpose



Source: Isaac by Deloitte Canada, *Companies for the people*, 2023

From ideas to actions

- **Ignite a founders fire:** A CEO can become the founder of an era within their company. The key lies in identifying the ideals that they value most and how these values could align with the company's values and business model and be leveraged to drive value. This process could take the form of a simple interview with the board or could be much more complex. It will look different for every business. Either way, test the outcomes with the wider leadership team to ensure their commitment.
- **Establish a reputation team:** Organize a subset of the executive leadership team whose responsibility is to infuse purpose into the actions and communications throughout the company. Clear governance helps ensure oversight and delivery.
- **Think about branding:** This will act as a creative platform to cohere communications, actions, and ESG efforts of the company. Give people reasons to join in support of the company and the change it aims to lead through linking these reasons to important human ideals, such as equality, freedom, and peace.
- **Create a social momentum strategy:** Social momentum strategies can make a company an active agent of idealism and progress in its programs, policies, and impact. For example, Starbucks created a "Third Place" for its customer—we all have home and work (our first and second places), but we also need a place for "me time."¹⁶ This experience enhances the company's value proposition, making its strategy about more than just selling coffee. To unlock next-level value for their stakeholders, mining and metals providers could determine what's required to methodically earn their trust and support, show enthusiasm following patterns of social movements, and create strategies based upon them.
- **Use horizon planning to make change tangible:** Assess interactions between the organization and its stakeholders to determine whether they demonstrate the company's stated purpose, the potential cost to innovate or reconceive each interaction, and its ability to create momentum among stakeholders. Based on these answers, actions to reorient or realign each aspect of the business can then be prioritized across different time horizons to meet the company's overall transformation strategy and budget.
- **Develop a socialization plan:** Develop communications plans for key stakeholder groups to spark enthusiasm for the progress the company can bring about. Build enthusiasm by adding meaning, humanity, and purpose to transactional interactions.

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Trend 2

Navigating global uncertainty: Building capacity to thrive in the face of disruption

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Patricia Muricy, partner, Energy, Resources & Industrials leader, Deloitte Brazil

During 2023, the level of uncertainty that mining and metals businesses were required to handle—economic, geopolitical, environmental, and more—reached new heights. The Russia-Ukraine war continued to disrupt commodity markets, impacting global supplies of nickel, pig iron, and fertilizers, to name a few.¹ This, combined with an escalation of conflict in the Middle East, could affect the commodity market further over the next 12 months² as well as create wider security implications for raw material supply chains.

Trade allies around the world hastened to secure critical resource supplies, navigating the outsized influence of Russian and Chinese investments in mineral-rich central Africa—an area that could prove pivotal to future metals production.³ There was the constant threat of conflict in the South China Sea, which houses some of the world's busiest shipping routes.⁴

A notable increase in extreme weather during the year⁵ also underscored the human and environmental risks posed by climate change and the need for urgent action at a global scale—a matter that was reiterated at the United Nations Climate Change Conference (COP28) held in Dubai in November 2023.

This level of uncertainty and its complexity shows no signs of abating. Navigating it and ensuring that businesses have the people and tools they need to not only survive but thrive is a key focus for executives. Dynamic strategizing, building greater optionality through portfolios, incorporating long-range sensing into business planning, increasing supply chain resilience, and elevating risk on the board agenda can play a role. In this trend, we'll explore a few of these options and the advantages they can bring.

Disruption spreads far in an interconnected world

There are four key areas of uncertainty that have converged to create the environment in which mining and metals businesses find themselves today:

- Rising geopolitical tensions and global shifts in power;
- The rise of artificial intelligence (AI), specifically gen AI;
- A change in the availability and requirements of talent; and
- The urgent need for progress toward net-zero.

“Unlike many challenges of the past, none of these are exclusive. In fact, it’s the areas where these topics overlap that present the greatest risk for disruption, but also some of the most interesting opportunities.”

Andrew Swart, partner, Energy, Resources & Industrials leader, Deloitte Canada

Next-generation mining equipment and processes that harness AI, data analytics, and automation are changing the nature of work in the sector and increasing pressure on the workforce to adjust to new skill requirements and different workplace roles and personnel structures.⁶

According to the World Economic Forum, 50% of all employees will need reskilling by 2025 as adoption of technology increases.⁷ However, technologies like gen AI could also play an important role in reskilling or upskilling the workforce. For example, algorithms could help to personalize training programs that build on workers' existing skill sets to prepare them for future opportunities that leverage technology.⁸

At the nexus of global geopolitical uncertainty and net-zero sit critical mineral supply chains. The mining of critical minerals is highly concentrated in specific geographical locations. For example, Australia is the world's main producer of lithium, China of graphite and rare earths, Chile of copper and lithium, and the Democratic Republic of Congo of cobalt. Processing is even more geographically concentrated, with China accounting for the production of more than 50% of the world's refined supply of natural graphite, dysprosium, cobalt, lithium, and manganese.⁹

While the energy transition requires a dramatic increase in the supply of these critical materials, their supply chains remain vulnerable to a range of geopolitical risks. Additionally, supply disruptions could impact the speed of the energy transition in the short-to-medium term unless urgent steps are taken to diversify them.¹⁰

Businesses have begun to shift their focuses away from vertical integration toward an ecosystem approach in recent years, and as those networks have grown and become more intricate, changes in markets, politics, and regulation, as well as their impacts, are now transmitted further. Moreover, the boundaries that traditionally existed between industries and sectors, geographies, businesses, and suppliers are blurring so that changes in one domain can resonate across many others.¹¹

For example, there are concerns that investment portfolios intended to uphold environmental, social, and governance (ESG) principles may be exposed to human-rights abuses and environmental damage via mining and metals supply chains. This could affect downstream consumers such as automotive or clean energy tech manufacturers.¹²

It's these factors and the fast-moving nature of today's digitally supported business environments that require mining and metals companies to become more agile if they are to capture opportunities created by disruption and minimize or manage associated risks.

Preparing for change through strategy and scenario planning

One way to prepare for change is through the development of more dynamic strategic planning. A dynamic strategy is one that enables a business to proactively adapt to changing scenarios, making it possible to minimize operational threats and seize new opportunities. These strategy features offer a framework that allows mining and metals leaders to respond appropriately to shifting demands, building flexibility and innovation into decision-making and strategic planning exercises.¹³

“Uncertainty doesn’t remove the need for companies to develop five- or 10-year strategies, but it does mean that they need to become more agile in their planning. It makes sense to develop a market scanning capability so that, if disruptions start to manifest, the company can spot them early and choose whether to pivot to a different strategy.”

Patricia Muricy, partner, Energy, Resources & Industrials leader, Deloitte Brazil

There are many ways that this capability could take shape, but the most obvious is to harness a combination of people and technologies (AI-based sensing, for example) to understand important changes in the markets. The information gathered and its proliferation throughout the organization could allow leaders and the workforce to be more agile in their choices from the enterprise level through to regional or local operations.

Scenario planning is another tool that encourages executive teams to explore different business situations. By challenging assumptions and testing different strategies in a hypothetical environment before making decisions, companies can better equip themselves to handle different challenges. Additionally, there can be immense value in getting executives to “live in” hypothetical, but plausible, worlds for a few hours to test how their organization might have to adapt if the world panned out as simulated.

Shell has been using scenario-based planning to help inform its strategy since the 1970s. The company's scenarios team has expertise in a range of fields including economics, politics, energy analysis, climate policy, sociocultural change, and competitive intelligence. The team's work explores possible versions of the future by identifying drivers, uncertainties, enablers, and constraints, and uncovers potential issues and their implications. As part of this, the team has developed two long-term models of the world's energy system that test, quantify, and explore possible future scenarios. When viewed together, they offer a perspective on the current global energy landscape, as well as the ability to model a number of futures.¹⁴

ING Bank is another example. The company's research team uses scenario planning to scan the "highly uncertain future of the energy transition" to better understand the trends that are driving the global energy market and, thus, predict demand for metals. The scenarios generated help corporate decision-makers to better understand the factors that drive opportunities and risks in the global energy transition. This knowledge helps them to make better investment and lending decisions and minimize the risk of stranded assets.¹⁵

While we have seen several mining companies use these techniques in creating more robust strategy processes, the industry could benefit from thinking through the wider uncertainties in a more structured way.

Future-proofing companies through optionality and governance

Embedding optionality within an organization's strategy and portfolio could also help it prepare for the future by allowing the business to exercise different options to meet its overarching goals as situations and priorities change. For instance, in a speech at the Gold Forum America's event in September 2023, Mark Bristow, president and CEO of Barrick Gold, said that the miner projected a 30% increase in production by the end of the decade on the back of the growth options embedded in its asset portfolio. The company has built various levels of optionality into its five and 10-year base cases through its portfolio of current operating assets to help ensure sustainable growth in the face of change.¹⁶

As the forces shaping the mining and metals industry evolve, and transparency and accountability become ever-more important to stakeholders, companies should have the best possible governance at the board level. Scenario planning can help identify the skills and experiences that may be required of board members, and regular independent board reviews could allow boards to open themselves up to a more diverse range of people from different functions, sectors, and skills.¹⁷

For example, establishing a position for one or more ESG professionals on the board of directors and bringing in expertise from the worlds of technology, robotics, and AI could offer new perspectives that may help businesses to reduce costs, increase efficiencies, and lessen the environmental and social impacts of operations.¹⁸ This is something that companies including Barrick Gold, Anglo Gold Ashanti, and Vale have done in recent years.¹⁹

"It's important to think about the skills and knowledge that boards need going forward and how these can be scaled where necessary to support businesses through future uncertainty."

Andrew Swart, partner, Energy, Resources & Industrials leader, Deloitte Canada

Preparing today for a volatile tomorrow

As the world continues to grapple with change and businesses race to stay on top of evolving challenges and opportunities, it's important that leaders in the mining and metals industry lay the foundations for greater agility and optionality to prepare for lack of productivity in the future.

From ideas to actions

- **Develop a sensing function to stay ahead:** Have team members attend important industry events, engage with think tanks, and stay on top of the latest news. Deploying AI-based technologies to conduct online research and understand a particular political development via the media is another option. This effort will look differently for each company depending upon its scope and available resources.
- **Rethink the annual strategic planning process:** Shift away from a linear and incremental view of planning to build in scenario planning and scenario discussions at the executive table. Not to be confused with risk, mining and metals companies should develop views on the key uncertainties that could shape the markets and regions in which they operate and use these to create long-range scenarios.
- **Assess where the optionality lies in the portfolio:** It is important for companies to look at the explicit and implicit options that are built into the portfolio and how they might exercise them at some stage. Optionality often comes at a cost, so understanding the upside and degrees of freedom that the option gives is key.
- **Join forces to address wide-scale disruption:** The nature and scale of some changes mean they are best tackled collaboratively. For example, the skills shortage that mining and metals companies are currently experiencing is so pervasive that it cannot be effectively addressed by companies individually. For example, in Saskatchewan, Canada, members of the province's mining and resources ecosystem (including government, industry bodies, organizations, Indigenous communities, and academic institutions) are exploring ways to focus their collective labor efforts on critical skills. The aim is to better fill gaps in workforce requirements and help the province to fulfill its 2030 economic goals.²⁰

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Trend 3

Dealmaking for future-focused growth: Rethinking minerals and metals investments

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As the energy transition continues to shift the bedrock of the mining and metals industry, companies are seeking new ways to maintain their competitive edges, increase access to resources that could prove critical to growth in a sustainability-conscious future, and accelerate new production capacities.

For some, capital allocation into mergers and acquisitions (M&A) is helping to shape a portfolio of assets that provide exposure to critical minerals and metals. For instance, BHP acquired OZ Minerals in May 2023 to gain greater exposure in nickel and copper.¹ While, for others, organic growth into new markets is the order of the day. For example, in May 2022, Rio Tinto began producing tellurium at its Kennecott copper operation in Utah, becoming one of only two miners operating in the United States producers of this critical mineral, which is used in photovoltaic solar panels.² Companies like these could garner greater interest from investors going forward, and many are looking to trade at premium multiples.

Alternatively, companies whose portfolios contain higher carbon commodities are exploring ways to create more attractive investment options. For example, in February 2023, Teck Resources announced the reorganization of its business. In creating Teck Metals Corp and Elk Valley Resources, the company said it would “provide investors with choice for allocating investment between two businesses with different commodity fundamentals and value propositions.”³ This paved the way for a full sale to Glencore to take a 77% interest in Elk Valley Resources in November 2023, and for two major steelmakers to take the remaining shares in the deal.⁴

Most, if not all, major energy, resources, and industrial (ER&I) players now have firm net-zero emissions targets in place for 2050 or sooner and, as such, greenhouse gas (GHG) emissions statements are fast becoming a key investment criterion. In this trend, we’ll explore how strategic investments can fuel growth in fast-changing and sometimes fickle markets, while bringing important metals supplies online faster.

M&A for critical metals exposure heats up

The fourth quarter of 2022 heralded a run of M&A transactions in mining and metals the likes of which have not been seen in a decade. This resulted in a total of 288 deals worth US\$88.2 billion for the year.⁵ Recent rises in commodity prices have left big players with plenty of cash and opportunities to invest it, whether through purchasing mines that align with their core growth strategies or by diversifying into new metals. Companies are also increasingly open to innovative pathways, such as joint ventures, alliances, and partnerships, to secure long-term, ESG-friendly growth.⁶

“There have been some big deals in mining and metals over the past year, and most of the activity has been critical minerals related. The US Critical Minerals list details 50 elements,⁷ and there’s a race on to gain access to those.”

Nicki Ivory, partner, Mining & Metals leader, Deloitte Australia

Lithium and nickel have seen the greatest volume of activity, with companies both big and small looking to grow their competitiveness through economies of scale. For example, in May 2023, US-based Livent Corporation and Australian company Allkem Limited, agreed to combine their stock in a US\$10.6 billion deal to create the world’s third-largest producer of lithium.⁸

Alternative capital expedites projects

Mining and metals companies aren't the only ones with an agenda in critical metals. For a metal to be designated "critical" it must be both important to a specific purpose (i.e., the manufacture of green energy technologies) and carry a certain level of supply risk. With supply shortfalls predicted in many commodities, including lithium and copper by 2030,⁹ there has been a notable increase in downstream consumers, including automotive manufacturers and defense companies, considering direct investments in mining, refining, and precursor materials in addition to offtake commitments.¹⁰

For example, Contemporary Amperex Technology Co., the world's largest battery cell maker, has made the acquisition of critical mineral assets a central element of its strategy. Other examples include General Motors' US\$650 million investment in Lithium Americas Corp,¹¹ and Tesla breaking ground to build a new lithium refinery in the United States.¹²

Even governments are beginning to play a more prominent role; for instance, the US Department of Defense (DOD) signed an agreement with Alaska-based Graphite One in July 2023 to secure graphite for the production of large-capacity batteries. Access to this funding is expected to allow Graphite One to fast-track its feasibility study by a full year.¹³

While many large mining companies are able to self-fund project developments, the majority of junior project owners, and some mid-tier mining companies, are searching for investment to finance projects through construction and into operation.

"While there's clear demand for critical metals, traditional capital markets are cautious about investing in certain projects and jurisdictions. This is primarily due to their risk profiles, but also because of the need to build resilience, which requires diversity of supply."

Stacey Toder Feldman, partner, Mining & Metals leader, Deloitte UK

Current mining and processing of certain metals is highly concentrated in specific geographies. China, for instance, dominates the global supply chain for rare earth elements (REEs)—around 70% of global REE extraction and 90% of processing takes place in China.¹⁴ Building supply chains exclusive of that capacity poses practical challenges and will likely take time and a significant injection of capital.

For example, Botswana's transparency, and regulation of taxation and policies have been highlighted as one success story where in-country beneficiation has been implemented. Downstream beneficiation could create jobs through increased labor requirements. However, beneficiation of high value-add products from unprocessed materials requires skilled labor, of which southern African countries have a shortage.¹⁵

“Many explorers get through the project study phases to the point where they need funding to move into construction and hit a dead end, because project financing is difficult to access. Companies are therefore looking to alternative sources of capital and to nontraditional models to bridge that gap.”

Mark Upton, partner, Tax, Deloitte Australia

Multi-user infrastructure models for metals processing that allow users to share their knowledge and pool their resources could help to bring supply online faster and more inexpensively, irrespective of competition. These “hub”-type business models are already proving successful in the hydrogen sector (many of which benefit from government funding), and there’s similar potential in critical metals.

Governments as a force for change

Governments around the world have an increasingly important role to play in expediting the commercialization of critical metals projects. Their funding not only supports development but helps to lower the risk associated with projects that could, in turn, encourage more cautious investors to get involved.

The US government has been the quickest off the mark, making vast sums available through its 2022 Inflation Reduction Act (IRA).¹⁶ This provision extends to companies based outside of the United States, too, but with operations that are critical to US supply chains. For example, in August 2023, Australian REE miner Lynas Rare Earths, which is the world’s largest producer of REEs outside of China, signed a contract with the US DOD for the construction of a heavy REE processing facility in Texas.¹⁷

The European Union is also looking to secure supplies through its Critical Raw Materials Act,¹⁸ and the European Raw Materials Fund, which will invest in critical minerals needed for a transition to zero carbon emissions, is due to launch in 2024 with around €2 billion (approximately US\$2.1 billion).¹⁹ In Australia, the federal government announced a AU\$2 billion (approximately US\$1.3 billion) expansion in critical minerals financing in October 2023, doubling the capacity of the critical minerals facility to finance Australian critical minerals mining and processing projects.²⁰

Funds such as these have dramatically changed the investment landscape in certain countries. Australia, for example, thanks to its wealth of natural resources and attractive ESG profile, proved lucrative for dealmaking through 2022–2023.²¹ Canada, and particularly Saskatchewan with 22 of the 30 Canadian-designated critical minerals, especially potash and uranium, is receiving global investment and interest from many players across the value chain, not just the large mining and agricultural companies.²²

Investors and explorers are also considering Africa. Ghana, for instance, gave its first lithium mine (Barari DV Ghana’s Ewoyaa operation) the green light in October 2023.²³ With its vast mineral endowment (Africa is home to about 30% of the world’s mineral reserves²⁴) but less mature risk profile, there are questions as to the reliability and transparency of supply chains based there. Nevertheless, it’s a promising destination for future deal activity.

From ideas to actions

- **Put an ESG lens over deals:** Due diligence with a view to environmental, social, and governance (ESG) issues is essential to help ensure that investments fit the organization's needs over time and work with its wider portfolio of assets and interests. Thorough due diligence will help ensure that any potential conflicts of interest are identified and resolved in good time.
- **Consider your own organization through an ESG lens:** Targets looking for capital may also want to demonstrate their ESG credentials for due diligence purposes, including how they will solve any potential issues—for example, which energy sources they will use to mine (renewable and/or sustainable sources will likely be front-of-mind).
- **Think outside the traditional investment box:** Joint ventures, alliances, and other collaborations can all be harnessed to gain exposure to critical metals. Ownership need not be outright.
- **Create attractive investments:** Companies looking for capital could prepare by considering their assets through a potential investor's eyes. Taking the time early on to highlight synergies with investment criteria, answer any potential questionnaires, and, where necessary, seek out alternative forms of capital to help ensure a smoother process.
- **Look for different investor types:** In addition to thinking creatively about investment structures, think more widely about where to look and who to approach for investment. Governments, OEMs, and others throughout the supply chain are now making minerals and metals part of their security agendas.

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Trend 4

Working toward net-zero:

Building capacity and
future-proofing ESG strategies
for a credible transition

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According to the United Nations, while global greenhouse gas (GHG) emissions are trending downward, countries' efforts remain insufficient to help limit global temperature rise to 1.5°C by the end of the century. In fact, the combined climate pledges of 193 parties under the Paris Agreement could put the world on track for 2.5°C of warming by the end of the century,¹ a scenario that could result in severe consequences for both people and the environment.

Research by the [Deloitte Economics Institute](#) has found that, if left unchecked, climate change could create US\$178 trillion in global economic losses between 2021 and 2070.² In contrast, a coordinated effort in climate change mitigation could deliver an additional 300 million jobs by 2050³ and boost the economy by more than US\$43 trillion by 2070.⁴

The private sector has a role to play in helping accelerate a credible energy transition with shared outcomes for all stakeholders. As providers of the raw materials needed to create sustainable infrastructure, low-carbon technologies and electrify transportation, mining and metals companies should be positioned to lead the way, and organizations that act swiftly could be rewarded through enhanced resilience and value generation opportunities.

In this trend, Deloitte looks at some of the practical ways that companies can help build their climate leadership capacity, ensure their transition action plans are set up for transformative success, and wield their influence to inspire coordinated actions across business ecosystems.

Creating a climate transition action plan

According to the Climate Leaders Coalition, “a credible, responsible and equitable transition is a transition to a net-zero economy that is grounded in integrity by bringing together organization, government and community perspectives”.⁵

To help achieve this may require organizations to move beyond tackling emissions as a standalone challenge and apply a broad and forward-thinking approach to help mitigate climate change.

“Effective transition planning requires companies to understand their role with respect to all of their stakeholders, and then to evaluate climate-related risks and opportunities from the perspective of each stakeholder group.”

John O'Brien, partner, Sustainability & Climate leader, Mining & Metals, Deloitte & Touche LLP

A Climate Related Transition Plan (CTAP), which the International Sustainability Standards Board (ISSB) describes as an “aspect of an entity's overall strategy that lays out the entity's targets, actions or resources for its transition towards a lower carbon economy”,⁶ can provide an architecture for this.

Unilever was one of the first multinational companies to implement a CTAP. In March 2021, the organization made history by announcing, of its own volition, that it would put its plan to a shareholder vote; a move that garnered much respect. The company committed to providing an annual report on its progress in reducing GHG emissions and to submitting an updated plan for a shareholder vote every three years.⁷

Good CTAPs feature science-based net-zero targets supported by goals over short-, medium- and long-term time horizons. These should be informed by achievable decarbonization pathways with steep emissions reductions in the near term supported by enabling capital allocation frameworks, operational and organizational impacts and portfolio optimization. They also integrate with corporate strategy, actions and investments and provide transparency on the data and methodologies used.⁸

In September 2021, BHP published its first CTAP, which sets out the company's strategic approach to help achieve its long-term GHG emission reduction targets and goals, and its commitment to additional actions. As part of this, BHP has embedded decarbonization into its capital allocation framework. This means that each major investment decision requires an assessment of investment viability under BHP's 1.5°C scenario. Ultimately, by taking a strategic approach to analyzing future scenarios, the global challenge of decarbonization has been turned into a potential growth opportunity for the company and its portfolio is aligned to help support the global response to climate change.⁹

Making actions credible and meaningful

In addition to growing alignment on what a CTAP should look like and contain, thought leadership is now focusing on what truly counts as “credible” and how companies can uphold leading practices. This will likely vary by sector and geography to accommodate technological and physical dependencies, as well as just and equitable transition principles.¹⁰

For transition plans to stand the test of time, it's expected that mining and metals leaders understand evolving external regulatory frameworks and socio-environmental shifts in the jurisdictions in which their organizations operate.

In areas where IFRS S2¹¹—the latest ISSB standard on climate-related disclosures—applies, companies are required to disclose their CTAP along with its critical assumptions and dependencies. For example, Brazil intends to adopt the standards on a voluntary basis starting in 2024 before mandatory use comes into play in 2026.¹² The UK Transition Plan Taskforce Disclosure Framework,¹³ launched in March 2022, has also been designed to align with IFRS S2 and is recognized globally as a leading practice for transition plan disclosures.¹⁴

There is growing scrutiny on corporate climate disclosures globally and varying sentiment with regard to environmental, social, and governance (ESG) in certain geographies. Many European markets continue to help drive forward on ESG, raising the bar for companies, while others, like the United States, have started to avoid the term as it has become highly politicized.¹⁵ These growing policy disputes have seen ESG-focused companies and funds come under fire over the past year, at shareholder meetings and in the media. Data from fintech, Broadridge, showed that 44 sustainable funds removed the label from their brand name during the first half of 2023.¹⁶

Now more than ever, companies should think beyond disclosure and target-setting to real actions that can demonstrate credibility and integrity and ultimately help drive value for shareholders and other stakeholders through ESG.

Building leadership for climate action

The transition to a low-carbon economy demands synchronized transformation of multiple, interdependent systems and, as such, mining and metals organizations could look to collaborate with their customers, suppliers, regulators, traditional owners, and competitors to help create material change and, where necessary, act as an orchestrator for joint projects and activities.¹⁷

To do this, leaders should understand who the various actors are within their ecosystems, including those who may be less obvious or may affect competitive positions, as well as their differing priorities and values. From there, they could identify common goals and opportunities for collaboration and use systems thinking to help understand the impacts and opportunities created through every interaction, including noticing potential intervention points.¹⁸

"In understanding their ecosystem, mining leaders should recognize that many of their client base will be looking to transition to a low-carbon business. These companies will likely start to examine their supplier relationships more closely, look for collaborative action on climate change and make purchasing decisions accordingly. This could present risk but also opportunity for mining and metals organizations"

Celia Hayes, partner, Risk Advisory, Deloitte Australia

Schneider Electric has a good example of this in action. In 2022, carbon emissions from its procurement of goods and services amounted to 7.6 million metric tons of CO₂, making it the largest contributor to the group's scope 3 upstream emissions. In response, Schneider developed The Zero Carbon Project. This saw the organization collaborate with more than 1,000 suppliers, who were responsible for 70% of its upstream carbon emissions, with the goal of halving its collective carbon footprint by 2025. The project enables leading practice exchange with peers and partners to access solutions for decarbonization. More than 1,000 companies have joined, and 1,300 supplier participants have now undertaken technical training about decarbonization.¹⁹

At the organizational level, leadership for climate transformation usually involves bold decision-making and directing resources and efforts toward a unifying net-zero ambition. This requires leaders to define and commit to that ambition, innovating and changing the organization's products and/or services to transition to a low-carbon revenue model. It also requires courage to take decisive actions with regard to suppliers, employees, customers, and communities in adapting to and mitigating climate change. Leaders who are cautious with regards to climate change, may find themselves and their business lagging as the economy transitions.

For example, in 2022, Deloitte launched a globally coordinated learning program to help increase the sustainability, climate knowledge, and skills of its more than 450,000 people across its businesses. The effort stems from Deloitte's Sustainability & Climate practice, which is dedicated to guiding clients as they redefine their climate strategies; embedding sustainability into their operations; meeting tax, disclosure, and regulatory requirements; and accelerating the transformations of their organizations and value chains. This learning program aims to enhance the skills and capabilities of Deloitte professionals, enabling them to address sustainability and climate topics while advising clients and other stakeholders—creating one of the largest networks of sustainability specialists.²⁰

No time to lose

Climate change is one of the greatest challenges of our time. However, with the right plans, strategies, and leadership in place, mining and metals companies have the potential to help lead at each step, paving the way for a safe, prosperous, and opportunity-filled future for people and the planet. The action points—based on steps from the Climate Leaders Coalition's seminal report *Credible transition to net zero*,²¹ which was delivered by Deloitte Australia—provide ideas for companies that are keen to supercharge their ESG efforts.

From ideas to actions

- **Get comfortable asking questions:** Laying the foundation for a credible CTAP begins with leaders asking questions of their teams, boards, and investors. Creating mechanisms for this and maintaining an open and constructive dialogue and encouraging the challenging of long-held assumptions, throughout the process can be vital to helping produce meaningful outcomes.
- **Foster ecosystems thinking:** The ability to think across ecosystems—both business and natural—is a critical skill for the future and one well worth investment. Organizations that adopt a strategic and rounded approach to collaboration across a network of vendors, clients, and peers should be able to better recognize their impacts on and dependencies upon nature, communities, and society. This can inform opportunities to add value over time and help mitigate or manage any potential threats to a business.
- **Leverage relationships:** The scale and urgency of climate change requires a coordinated effort. Timely and impactful actions require organizations to work within, and beyond, their historic sectors and ecosystems, with governments, peers, and communities to help identify synergies and overcome potential barriers. Industry associations and working groups often convene thought leaders to discuss shared challenges and can provide critical mass to help accelerate plans and actions.
- **Take action strategically:** Embedding credible actions toward the climate transition into an organization's strategy and capabilities is critical. To do this, identify, prioritize, and resource key actions in line with targets that reflect areas of focus, stakeholder engagement, and value-creation opportunities. From there, determine the governance mechanisms, leadership, and team capabilities that may be needed to help operationalize the transition.
- **Be clear on the importance of ESG:** Effective ESG programs should be underpinned by a materiality assessment whereby a company looks at its business and strategy through an ESG lens. Identify key ESG factors that can impact the business from the perspective of its stakeholders and ensure that ESG-related activities are structured around these. By clearly linking actions to business objectives and purpose, the company should be better positioned to respond to both pro- and anti-ESG crowds.²²

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Trend 5

Collaborating with governments to rethink regulation: Unlocking critical resources through permitting

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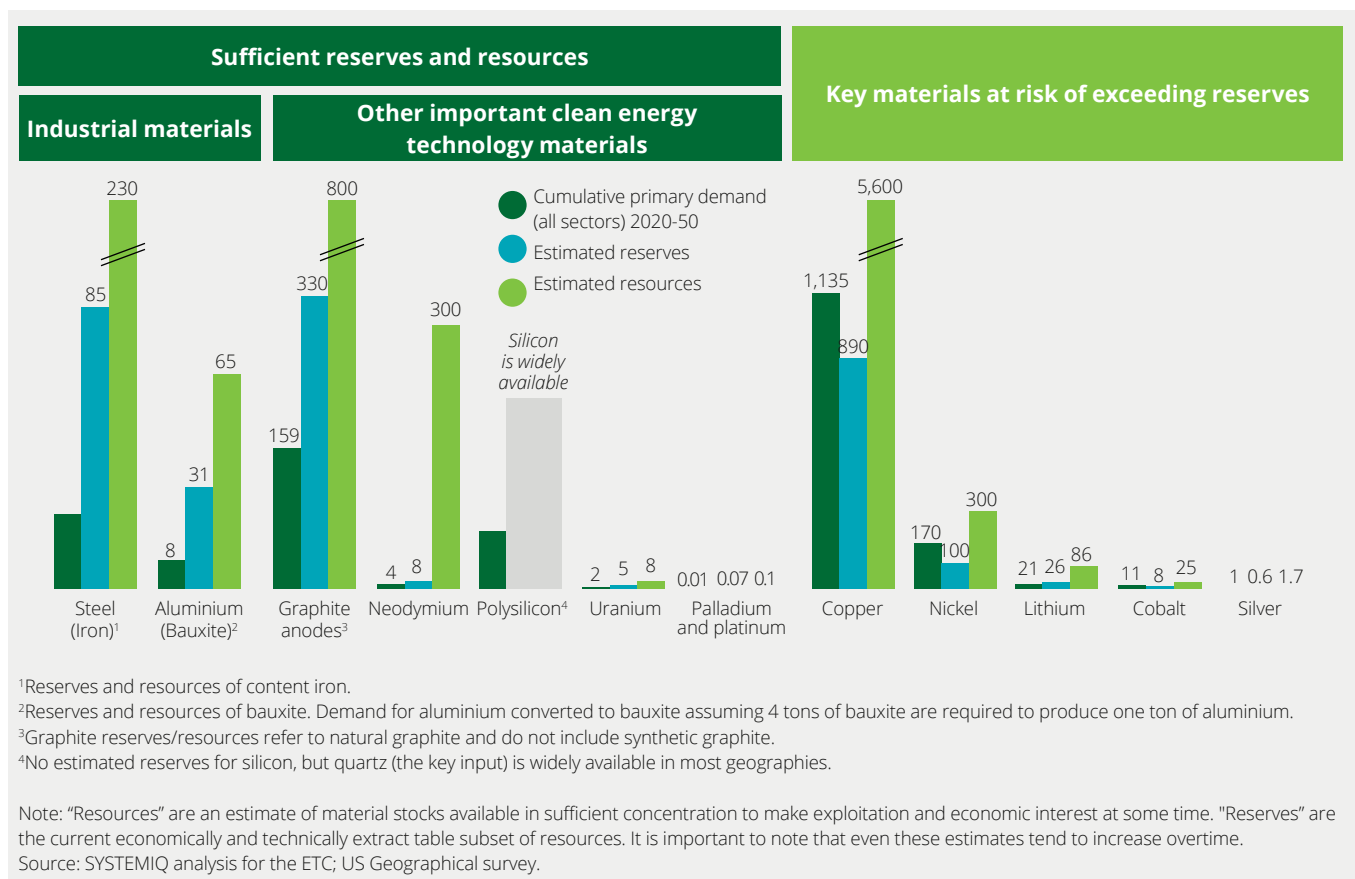
As the source industry for raw materials that underpins global socioeconomic growth and decarbonization, the prosperity and sustainability of this world depends heavily upon the regulatory environments that surround mining and metals projects.

According to the Energy Transitions Commission (ETC), there's no fundamental shortage of raw materials needed to support the global transition to a net-zero economy—geological resources exceed the total projected cumulative demand from 2022–2050 for key materials (figure 1). The key matters are, therefore, ramping up supply fast enough to decarbonize economies before crucial climate tipping points are exceeded, and ensuring that mining occurs in a sustainable and responsible way.¹ Project evaluation and development are central to both.

In many parts of the world, permitting processes for mines span years, even decades. While it's important that projects receive proper scrutiny and approval from relevant parties, there's consensus that a new approach is needed to enable the creation of local supply chains for critical minerals within a timeframe that reflects 2050 net-zero goals.

Going forward, regulatory reform undertaken in consultation with key industries and rightsholders could influence the flow of capital and talent to and from jurisdictions, enhancing their competitiveness. This provides the chance to turbocharge economies, drive investment into communities, and help countries around the world meet their decarbonization goals.² In this trend, we'll look at some steps that are ripe for improvement and how governments, industry, and communities can work together to improve permitting and approvals.

Figure 1: Cumulative primary demand 2022–2050 from energy transition and other sectors, compared to estimated reserves and resources



Note: Billion metric tons = industrial materials; million metric tons = all other materials.
Source: Energy Transitions Commission

The risk of inaction

According to S&P Global, the average mine takes 15.7 years to reach commercial production.³ Although this number varies greatly by commodity and mine type, even in highly developed jurisdictions, such as the United States, Australia and Canada, permitting can be an expensive and lengthy process. For example, Northern Dynasty Minerals' Pebble project in Alaska—one of the world's largest undeveloped copper resources—has been making its way through permitting for several years, with no imminent resolution.⁴

Northern Ontario's Ring of Fire district is another example. There are concerns that projects like Eagle's Nest, which, together with its associated battery metals plant, could become an important source of nickel for electric vehicle production in North America, and could be at risk due to overly complex environmental assessments and extensive consultation requirements.⁵

In today's high-interest and high-inflation environment, the cost of financing for capital projects can be expensive and access to capital can be limited. While some governments are working to remove red tape and duplication—more could be done globally. Additionally, there may be more cautious decision making by regulatory bodies resulting in longer lead times. These problems are magnified for projects harnessing emerging technologies like small modular reactors, which have a long regulatory road ahead of them.

These challenges may intensify over the coming years as climate targets draw nearer and access to specialized skills becomes tougher. Rather than introducing new measures to resolve existing regulatory challenges created by complex systems, governments could consider a collaborative approach by consulting with the mining and metals industry and other stakeholders to revise regulations or policies for greater suitability and sustainability.

Sequencing: The right projects at the right time

Areas that might benefit from attention include sequencing (identifying which projects to build, where, and in which order, with a view to balancing risk and opportunity); the integration and amalgamation of review processes into a single, streamlined application; establishing clear leadership; and working collaboratively with local and Indigenous communities rather than in parallel to them.

Choosing an optimized pipeline of projects with the right technologies requires intentional prioritization. Mining and beneficiating material efficiently, effectively, and consistently is dependent on numerous external factors such as power supply, water availability, labor, rail and road networks as well as capital investment. Without systematic planning and prioritization, the development of a beneficiation sector would be inhibited.

“By coming together, government and industry can identify and prioritize critical projects for urgent acceleration. This is especially important given the economic and skills opportunities that capital projects can unlock.”

Louis Kruger, partner, Energy, Resources & Industrials leader, Deloitte Africa

If industry can align with governments, there is a chance to better understand which projects need to be built, where, and when to deliver on critical metals and decarbonization targets.

Process integration speeds reviews

Unlocking the investment needed to supply critical minerals involves continued efforts to streamline regulatory approvals, including shortening permitting timelines. Most major projects require authorizations from multiple regulators and jurisdictions, including federal, provincial/territorial, and/or Indigenous governments. When proposals are reviewed in an uncoordinated way, the result can be duplicated efforts, confusing and erratic processes, and delays. On the contrary, using a single, integrated process for collecting information allows regulators to hear from proponents, experts, and rightsholders, and to assess the impacts and mitigation strategies in a timely and coordinated fashion.⁶

In 2020, Australia's National Cabinet introduced a single-touch environmental approvals approach for mining projects to cut "excessive" wait times from the average 3.5 years to 21 months by eliminating duplicative processes and documentations. It estimated that such projects were worth more than AU\$72 billion (approximately US\$46.2 billion) in public and private investment and supported more than 66,000 direct and indirect jobs.⁷

More recently, in November 2021, the Canadian provincial government of Alberta introduced a strategy to reenergize its minerals sector. As part of this, changes were made to the Mineral Resource Development Act to give the Alberta Energy Regulator (AER) sole regulatory authority over mineral exploration and production in the province. This approach creates a more certain regulatory environment for investors and reduces compliance burden for industry, as they no longer need to submit multiple, duplicative applications to different regulatory authorities.⁸

Process integration may be needed across jurisdictions as well as among various organizations within a single jurisdiction, to the extent that each has its own discrete review powers.

"It's important to consider the interconnection between permitting issues at the federal, regional, and local levels to avoid challenges, for instance, where municipalities rezone land, such as farmland."

Michelle Leslie, senior manager, Financial Advisory, Deloitte Canada

The power of economic relationships with rightsholders

In many mining jurisdictions, a big challenge and opportunity in permitting lies in not just collaborating with Indigenous rightsholders through mandated consultation and accommodation procedures, but in establishing effective collaborations that provide communities with direct participation in the project and the fruits of its success.

Such relationships can take different forms and one strategy is having relevant Indigenous parties or local communities take equity stakes and integrate Indigenous traditional knowledge systems into project design, environmental monitoring, and decision-making. This approach means that concerns from both parties are heard and can be addressed or designed-out as soon as possible, lowering barriers to approvals.

Canadian miner Cameco has several such agreements with Indigenous communities to solidify the socioeconomic benefits they receive from its projects, as well as the miner's responsibilities. In 2012, Cameco and the northern village of Pinehouse Lake, Saskatchewan signed an agreement that provides the community with jobs, investment payments, and business through the village's economic development arm Pinehouse Business North (PBN).

In 2015, Cameco and PBN established a business development contract to develop and implement management procedures to increase PBN's capacity and to complete projects at various Cameco sites. The project provided support to PBN as it executed three contracts at the McArthur River site. Cameco also provided funding for PBN to hire trainees, as well as develop and implement internal procedures. This included equipment maintenance and project controls to ensure greater efficiency and safety, and Cameco made internal subject-matter specialists available to PBN to help them in the process. This part of PBN's business is seen as an area of future growth and one that can be a sustainable piece of business for them in the volatile resource sector.⁹

“Governments can also facilitate this approach through capacity-building and the initial capitalization of Indigenous investment funds. For example, the Alberta Indigenous Opportunities Corporation (AIOC) facilitates up to CA\$3 billion (approximately US\$2.2 billion) in investment by Indigenous groups and communities in natural resource, agriculture, transportation, and telecommunications projects.¹⁰ Additionally, the Government of Canada recently announced a national Indigenous loan guarantee program to support Indigenous equity ownership. Just how this program is administered will be vital for its ability to realize reconciliation.”¹¹

**Michelle Leslie, senior manager, Financial Advisory,
Deloitte Canada**

Harnessing Indigenous leadership and knowledge

While many mining and metals projects take place on lands that are under Indigenous ownership or custodianship—around 54% of projects extracting clean energy minerals overlap with Indigenous lands¹²—involvement of Indigenous peoples as potential investment leaders and ecological knowledge-holders is often limited.

It's important that projects respect both the rights and responsibilities of Indigenous peoples in their landscapes. For example, following the framework of the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP),¹³ including key components of the right to self-determination and free, prior and informed consent (FPIC), is fundamental, as is respect for Indigenous responsibilities.¹⁴

Integrating contemporary, non-Indigenous tools and technologies with traditional Indigenous knowledge systems can create opportunities for Indigenous peoples to play direct roles in the design, delivery and management of mining and metals projects, creating alignment between culture and employment, and generating jobs in regions where employment is limited.¹⁵

Indigenous leadership in mining and metals projects will also help ensure that operations are designed and implemented in ways that drive long-term, systemwide benefits and positive outcomes. This, in turn, can bring value to corporate action on nature which could help to smooth permitting processes and lead to a just transition.

“Engaging in new relationships with Indigenous peoples can be complex, rich and beneficial. However, as a precursor, mining and metals leaders should seek to understand the complexities that emerge from the legacies of settler-colonial movements, including power imbalances, trust building issues, knowledge transfer, gender roles and cultural load among others.”

Professor Deen Sanders OAM, partner, Integrity lead, Deloitte Australia

No time for project delays

These are just a few ways that governments, industry, and rightsholders can come together to improve project permitting for mutual benefit. Ensuring projects receive appropriate reviews, while delivering the required volume of metals supply, is a challenge that miners and regulators should tackle collaboratively.

From ideas to actions

- **Engage early and often:** Proper engagement with communities and rightsholders is not only the right thing to do but is also key to ensuring that capital projects are built. Nationally coordinated engagement, integration, collaboration, and coordination efforts are vital given the capital lift that lies ahead and the environmental, social, and governance (ESG) standards that are coming into effect. Mining and metals companies can play a pivotal role in creating and coordinating these efforts through industry associations, and in making them a non-negotiable part of industry status quo.
- **Ensure clear leadership:** Major projects are complex, and unexpected considerations in the assessment process are usually inevitable. Nominating a leader who's comfortable dealing with sporadic demands and concerns, adapting to shifting circumstances, and finding ways to keep multifaceted processes on track without sacrificing fairness and rigor is important. This leader should be capable of balancing project needs and building strong relationships with communities and rightsholders.
- **Build a road map and timeline:** Creating a road map and timeline for each project is beneficial for the review process. Such action could help focus everyone involved and provide greater clarity, certainty, and confidence about how a review will unfold and when it's expected to conclude.
- **Build in Indigenous knowledge:** Working with Indigenous communities who are affected by capital projects to develop environmental monitoring and project objectives with traditional knowledge woven into science-based targets will ensure that their views are properly integrated. This should also help with government approvals and processes.
- **Get ready for reporting:** As mining companies and governments are planning projects it's imperative that baselines across the entire value chain are established and climate and sustainability planning are factored in. In June 2023, the International Sustainability Standards Board (ISSB) issued its inaugural set of standards with reporting beginning January 2024 for most filers. These standards create a common language for understanding and disclosing the effect of climate-related risks and opportunities on a company's prospects.¹⁶ Gap and materiality assessments are the first steps.

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Trend 6

Going back to grassroots: Nourishing growth through investments in exploration

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Attitudes toward exploration, both from the mining and metals industry and investors, are currently a tale of two halves. In copper, a key metal to help drive the energy transition, companies are focusing capital expenditures on extending or expanding high-grade, profitable assets, rather than exploring for and developing new projects to meet increasing demand. This has resulted in a dwindling pipeline, which, if left unchecked, could manifest as a supply deficit in just a few years.

In contrast, battery metals have seen an explosion in spend on both exploration and development—lithium, for example, saw a 90% increase in exploration spend during 2022.¹ With this explosion, there's catching up to do around evaluating, permitting, and downstream processing if supply is to keep pace with demand as well as environmental, social, and governance (ESG) expectations.

Several factors have contributed to this dichotomy, but at the core, there is a historical fluctuation in investment into exploration (based on commodity prices) as a mechanism for organizational and industrial growth. In this trend, we'll consider how becoming more intentional with investments as well as strategy, leadership, and technology could contribute to more plentiful metals supplies and preserve market capital.

Put spending into perspective

According to the International Energy Agency, global exploration spending rose by 20% in 2022, driven mainly by record growth in lithium exploration. Canada and Australia led the way in this, with more than 40% year-over-year growth. Uranium also experienced a 60% surge in spending due to renewed interest in nuclear power amid concerns over Russian supplies; and nickel at 45%, led by Canada, where high-grade sulfide resources, proximity to existing infrastructure, and access to low-emissions electricity offered attractive investment opportunities.²

In copper, budgets remain largely focused on Latin America, which hosts the world's largest reserves.³ 2022 saw a 21% increase in spend on copper exploration to US\$2.79 billion (the highest level since 2014) driven by strong prices through 2021 and into the start of 2022. However, persistently high inflation rates as well as a predicted slowdown in economic growth from 3.5% in 2022 to 2.9% in 2024⁴ have affected commodity prices and, thus, dampened projected spend somewhat.⁵

Despite these recent increases, it's important to take a step back and look at the bigger picture. The mining and metals industry is highly cyclical and exploration budgets are intrinsically linked to commodity prices (figure 1). This means that, when prices dip, exploration budgets tend to get cut (and vice versa), and the impact this volatility can have on exploration teams, the success of their programs, and, subsequently, project pipelines can be significant.

Figure 1: Indexed metals prices and exploration spend for nonferrous metals, 1996–2022



Source: S&P Global⁶

"In mining and metals, the percentage of exploration spend over time compared to the size of markets, like copper, is decreasing. The market size continues to increase, but we're not seeing equivalent growth in the funding of exploration."

Charles Hooper, director, Consulting, Deloitte Canada

Additionally, the past decade has seen a shift away from grassroots exploration toward "safer" brownfield sites in established jurisdictions. This stems, in part, from the increasing difficulty and cost of finding quality deposits, which, in turn, has made it tougher for investors to fund riskier early-stage exploration.⁷ Consequently, elevated spending over the past few years has not necessarily led to an increase in the number of major discoveries. S&P Global states that, while volume of supply in copper has increased by 50 million metric tons compared to 2021, most of that increase came from assets that were discovered in the 1990s.⁸

S&P Global reports, "All the new copper came from older, well-developed discoveries ... In fact, we have only been able to identify three additional discoveries over the past five years, which added only 5.6Mt. This is a direct result of companies shifting more of their exploration budgets toward known deposits and existing mines."⁹ It adds that this decade-long tendency could take time to reverse, as most producers have enjoyed record earnings from high copper prices.¹⁰

Balancing investments in growth

Exploration is just one facet of the larger growth conversation, alongside mergers and acquisitions (M&A) and innovation, but it's an important one. M&A is generally more expensive, but less risky compared to exploration. However, with so few significant discoveries coming to light in commodities, such as copper, and an industry-wide shift away from grassroots exploration, sooner or later options for M&A could deteriorate.

To counteract this, major miners may decide to start spending more on exploration instead of relying heavily on the acquisition of smaller exploration companies. Ultimately, both pathways have a role to play in the growth of the mining and metals industry, but finding a balance between the two will likely be key to companies' longevity.

"It takes approximately 15 years for a mine to go from discovery to production. It's important that companies think about their decline curves today and determine the role exploration can play in their strategy to replenish and/or grow reserves."

Charles Hooper, director, Consulting, Deloitte Canada

To change this cycle, organizations could look to better align their exploration efforts with their strategic direction, invest in the attraction and development of talent, and harness technologies, such as artificial intelligence (AI), to reduce the cost of campaigns and speed the identification and evaluation of targets.

Using tech to speed discoveries and lower costs

It's tempting to think of technology as an easy solution to mineral exploration. However, the real value lies in augmenting human knowledge and capabilities, particularly where large datasets are involved.

For example, Curtin University researchers have developed an advanced machine learning tool to help identify undiscovered mineral deposits in Western Australia. As part of the project in collaboration with the Geological Survey of Western Australia, geochemical data collected across the state is being analyzed to reveal patterns that are difficult to see with standard methods. The database contains more than 50 million samples, which would present time, cost, and quality control challenges if examined manually.¹¹

BHP has attributed its Oak Dam discovery in South Australia to applying a combination of "know-how and technology to sift through information that was previously available, but which people had interpreted in a different way."¹²

"Technology provides new tools to help humans do their jobs better and faster. The industry must stay on top of these developments and upskill its current workforce if it's to counteract rising exploration costs, scarcity of new economic deposits, and the retiring technical talent."

**Van Ramsay, partner, Mining & Metals leader,
Deloitte Canada**

Satellite-based technologies are also proving valuable in speeding the identification and enhancing the accuracy of exploration programs. For example, Atlantic Lithium used Fleet Space's ExoSphere satellite-based mineral exploration system during 2023 to conduct geophysical surveys and identify concealed lithium pegmatites within the existing resource footprint at the Ewoyaa lithium project in Ghana.¹³

In time, generative AI (gen AI) could also help to find and summarize information that's important to exploration campaigns, for example, from technical and government reports, and even core logs going back decades as company records are digitalized.¹⁴

Funding higher-risk forms of exploration

Finding ways to fund higher-risk forms of exploration without affecting market capitalization is a topic that's of increasing interest, and one that many major miners have started to investigate in recent years.

BHP's Xplor program is one high-profile example. It is a six-month accelerator program for early-stage explorers looking to fast-track and de-risk their geological concepts and become investment ready. BHP provides funding, coaching, and advice to juniors to ensure technical, business, and operational readiness. Members of each cohort also have the chance to pitch for follow-up funding or BHP relationships.¹⁵

California-based KoBold Metals has another interesting proposition. The company has built what it describes as a "full-stack digital prospecting engine, using computer vision, machine learning and data analysis" that it's applying to find critical minerals. Rather than selling the software as a product, KoBold generates revenue by taking ownership stakes in the mineral resources it discovers. The company already has relationships in place with BHP, which is using KoBold in its search for copper and nickel deposits in Australia, and Rio Tinto, which is working with KoBold on its Winu lithium project, also in Australia.¹⁶

Exploring for a richer future

There are lots of ways that companies can expand their focus on grassroots exploration over the short and long terms, for both their own benefit and that of society. The key to success lies in starting now or doubling down on current efforts to minimize potential critical metal supply deficits, help enable the manufacturing of clean energy technologies, and support the global population.

From ideas to actions

- **Invest in ESG competence:** Access to land is a key factor in grassroots exploration. Investing in appropriate ESG training for teams, both in the field and the office, and implementing leading practices could help manage potential risks (social, financial, and reputational) in the right way.
- **Build relationships in new jurisdictions:** Building relationships with local communities, rightsholders, and governments in emerging jurisdictions that could prove critical to future growth is a solid investment. Understanding priorities, pain points, and where they intersect with company interests could help in securing public support to operate locally if opportunities develop. It could also uncover possibilities to add value, for example, through shared value initiatives.
- **Augment teams with technology:** Consider where strategic investments in technology can be made to complement human talent. For example, AI-based core scanning and logging technologies could free up geologists for higher-level tasks, such as interpretation, and improve orebody knowledge and accuracy.
- **Sustain exploration through cycles:** Leadership and governance are key to sustained exploration efforts. Having a strong voice at the executive table—one who can represent the exploration function, communicate its needs effectively, and explain its importance to the wider organization—could prove critical in maintaining spend through market cycles and leadership changes.
- **Expose talent to exploration:** To understand the importance of grassroots exploration and how it feeds other business activities, graduates, managers, and leadership candidates need exposure to a range of organizational teams and functions. Consider creating a rotational program that provides talent with these experiences.

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Trend 7

Addressing workforce challenges through a skills-based approach:

Equipping mining and metals companies for the future

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Skills shortages have dominated the headlines over the past 12 months, causing one research group to declare the issue “persistent”, rather than “transitory”.¹ At the same time, organizations face the reality of an aging workforce. The United States is just one example—more than half of the country’s mining and metals workforce is set to retire by 2029 (some 221,000 workers),² and with it could go knowledge that’s critical to future ways of operating.

Diversity, equity, and inclusion (DEI) also remains a priority. While there’s a clear business case for a more diverse workforce,³ many organizations continue to grapple with creating workplaces that are physically, psychologically, and culturally safe.

These matters are indicative of the need for broader change in the way the industry values and treats talent to become a more desirable industry to work in. By coming together to tackle workforce challenges, mining and metals companies, educational institutions, and governments might have a better chance of success.

Speaking to younger generations

Recent research from Mining Journal⁴ cited general labor scarcity as a significant factor globally; in July 2023, Australia and the United States had respective unemployment rates of 3.6% and 3.7%, and Canada 5.2%.

Mining and metals faces the difficulty in appealing to talent, particularly younger generations.⁵ A December 2020 survey of 3,000 young Canadians by the Mining Industry Human Resources Council (MiHR) and Abacus Data found that 11% would definitely, or probably, consider working in mining and metals.⁶

In a 2023 article for Euractiv, Rohitesh Dhawan, president and CEO of the International Council of Mining and Metals (ICMM), wrote, “Just when we need the best and brightest talent to build the responsible mining industry of the future, graduates and potential future employees appear to be turning away from mining or being encouraged by their universities to do so.”⁷

Dhawan attributed this partly to a lack of trust in the sector. He acknowledged that, despite considerable progress in environmental and social commitments, the industry still has a ways to go to appeal to the next generation of workers. Gen Zs and millennials for example, are values-driven and concerned about the environment⁸ so sustained positive performance over time could be critical in changing the industry’s image and in linking the mining and metals to clean energy, global food security, and development.⁹

Realigning education with industry

A shift of this magnitude also demands a step-change in the way that the mining and metals industry is taught and talked about. This requires government investment aligned with critical minerals strategies, as well as collaboration between industry players and universities to produce courses, curricula, and credentials as well as vocational education and training that better match current and future objectives.

A good example comes from the Bradshaw Research Institute for Minerals and Mining (BRIMM) at the University of British Columbia (UBC), which works closely with mining companies and Original Equipment Manufacturers (OEMs) to determine its offerings. The team established an executive microcertificate in Economic Leadership for Mining program in 2020. This 13-course program allows candidates to mix and match seven or more courses to achieve a UBC microcertificate.¹⁰

“Micro-credentialing can accelerate the entry of talent into mining and metals and can prove valuable in creating pathways for underrepresented groups—for instance, Indigenous communities—where access to tertiary education may be limited.”

**Joanne Doyle, senior manager, Consulting,
Deloitte Canada**

While people naturally learn in different ways and it's important to tailor training accordingly, there's also a shift in the way that different generations learn. Research from Deloitte US has shown that members of Gen Z proactively seek out personalized learning opportunities to enhance skills and prefer to learn independently via online platforms.¹¹

Experiential learning tools, such as online games, could be used more widely to educate students about the role that the mining and metals industry plays in their lives, and to introduce organizations in this industry as a potential employer. For example, the Briefcase game, developed by the European Union and EIT Raw Materials, familiarizes students and teachers in three age groups with the minerals used to build everyday objects and where they come from.

Broadening the DEI lens

A 2018 survey from the Pew Research Center found that Gen Z is the most ethnically and racially diverse generation in history.¹² While the mining and metals workforce is slowly becoming more diverse, it's vital that companies move beyond numbers and targets and address the systems that sit around diverse talent.

At BHP's fly-in, fly-out South Flank iron ore mine in Western Australia, women comprise 40% of the more than 850-person strong frontline workforce, making it the first gender-balanced mining operation in Australia. Research has found that this is attributable to multiple factors, including strong engagement from senior leaders, strict gender equity targets, major technological investments to support inclusivity, and new onboarding procedures for new employees.¹³

Wiring organizations and their systems to support intersectional diversity is central to workforce well-being. For example, individuals can be racially, culturally, and gender diverse. This is essential, not only in attracting and retaining skilled talent, but also in creating organizations that can adapt to change.

"Some companies are challenging different processes, practices, and systems, and building DEI principles into wider projects, such as HR system implementations. This attitude should be applauded."

Kristy Delaney, partner, Consulting, Deloitte Australia

Shifting from jobs to skills-based work

Prospecting for a future pipeline of talent is important, but so, too, is filling the vacancies that exist in the mining and metals workforce today. One way to broaden the talent pool and help ensure that individuals have the knowledge needed for the future, is to switch the focus throughout the industry from roles to skills.

Mining and metals organizations, like most others, are structured around jobs and hierarchies. However, with workplace agility and flexibility growing in importance, and with innovation and creativity increasing in value, separating some work from job descriptions, and workers from being seen as job holders, could allow organizations to tap into a wider range of workers' capabilities and to find new ways of working. That said, there are certain mining and metals jobs that are legislated, so there is a balance to be struck with a skills-based approach in this industry.

Deloitte US has developed an operating model called the **"the skills-based organization,"** In this, skills can be technical abilities (hard skills), human capabilities (such as emotional intelligence), or potential skills (including latent qualities, abilities, or adjacent) that may be developed and lead to future success. Research has found that organizations that embed a skills-based approach are 107% more likely to place talent more effectively and 98% more likely to retain high performers.¹⁴

For example, Schneider Electric was able to improve employee retention by creating an internal gig economy, which allowed more than 2,300 people to move to areas within the business where their skills were of more value.¹⁵

The skills-based approach also applies at a macro-level. In Saskatchewan, Canada—a key region for future critical metals production—Deloitte Canada recently convened companies at a skills accelerator summit to address workforce challenges in the mining and minerals industry, so that Saskatchewan and its people can achieve their collective employment, empowerment, and economic ambitions for 2030.

Following an economic assessment, the summit identified the occupations needed by various industries, including mining and metals, and then deconstructed the roles, examining the skills needed to complete the work. It then looked at how rearchitecting work could help to increase each role's capacity as well as adjacent industries where talent with the requisite skills might be found. Research showed that this approach could cut the talent gap in half, by almost 2,400 workers.¹⁶

Upskilling for future challenges

As the work involved in mining and metals operations evolves, so too will the type and range of skills required to execute on it. Access to critical skills and knowledge—for instance, surrounding climate adaptability and decarbonization—and, in sufficient volumes, could become a point of increasing differentiation for companies in the future.

“Not all educational establishments are turning out job-ready mining candidates today. In certain countries, there’s a lack of educational courses altogether and, where courses are available, curricula don’t always align with the industry’s needs. This means that new entrants often require a period of upskilling before they are fully job-ready.”

Kristy Delaney, partner, Consulting, Deloitte Australia

Upskilling and reskilling of the current workforce, both at the individual level and in mass (ICMM states that 48% of mining employees will require upskilling or reskilling in the next four years)¹⁷ pose a challenge and an opportunity. However, the industry already has some experience and capability in this area. For example, some organizations have established digital academies to help transition their workforces to new ways of working.

In March 2020, Antofagasta Minerals opened a digital academy in Chile to speed up and deepen the implementation of its digital road map.¹⁸ The academy provides courses that increase the company's productivity and competitiveness, and improve the skill sets and employability of its workers. In its first year, more than 1,500 employees completed nine courses on the basics of design thinking, agile project management, big data, Internet of Things, cybersecurity, and digital technologies such as collaborative tools and robotic process automation.

Replicating operations and programs such as these for systems thinking, climate-based skilling, and more could prove critical in organizational change and help companies respond quickly to future opportunities and anticipate which skills might be required in time.

Artificial intelligence (AI) can also play an important role in reskilling or upskilling the workforce; for example, AI algorithms can help to personalize training programs that build on workers' existing skill sets to prepare them for future opportunities that leverage technology. For example, the EdCast platform by Cornerstone combines an assessment of workers' skills with analysis of future labor market needs, allowing users to identify potential future jobs and gain the skills and qualifications they need to secure them.¹⁹

Laying the foundations for modern work

In summary, by investing time and resources now to create systems that increase and accelerate the entry of young talent into mining and metals, widen the search for skilled candidates at organizational and regional levels, and improve the well-being of current workers, companies could not only improve their productivity but help ensure they have the capacity and know-how required to deliver on their future ambitions.

From ideas to actions

- **Think long term:** By using strategic workforce planning to assess the business's long-term strategy, organizations could become better equipped to identify potential future skills shortfalls, that is, in areas such as climate resilience and digital disruptions. This will inform workforce strategy choices, and prioritize and accelerate investments in training, such as the development of a skills academy or the creation of a regional labor force ecosystem. This will also allow organizations to implement strategies to attract talent locally and regionally.
- **Map out the organization's needs:** By defining a skills taxonomy or framework and a common way of validating skills, organizations can lay the groundwork for making decisions about work and workers based on skills rather than jobs. They can expand from there, transforming one talent practice at a time, or experiment with new ways of organizing work so that workers can flexibly flow to the work based on their skills.
- **Put a DEI lens over every implementation:** A standard part of the evaluation process for new projects, processes, or technology implementations throughout organizations should be consideration through an intersectional DEI lens. Making this a standard metric or procedure, regardless of the nature of the project, will help embed DEI thinking into company culture.
- **Prioritize skills-based changes:** When transforming companies to a skills-based model, start with practices that have clear connections to skills—for example, learning and development, internal mobility, and talent acquisition. Prioritizing these areas makes sense, as organizations may be able to use mature, off-the-shelf technologies as readily available upgrades to existing HR information systems, such as talent marketplaces.
- **Explore skills ecosystems:** Companies could start by exploring the regional and local skills ecosystems surrounding each operation and identifying groups or sources of talent, such as adjacent industries or communities, who are underrepresented in their current workforces. From there, barriers to entry can be determined and programs developed to support talent transfer, and educational and upskilling opportunities can be created.

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Trend 8

Unlocking new value in existing assets: Balancing complex priorities and meeting supply demand through operational optimization

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As demand for metals and minerals soars, fueled by a burgeoning global population,¹ record levels of urban development² and impending decarbonization targets in key economies, mining and metals companies are under increasing pressure to bring new supplies online. In addition to speeding up new developments to counteract potential supply shortages, organizations are focusing their efforts on extracting greater value from existing assets.

Operational efficiency and productivity improvement initiatives are two ways to do this. These were already front-of-mind for mining and metals companies, which have, for years now, faced declining ore grades and rising operating costs; in 2022, the 40 leading mining companies had operating expenses of US\$670 billion—an increase of 5.5% over the previous year.³

Today, data-led insights and digital technologies are enabling companies to balance complex and, sometimes, conflicting interests while meeting supply imperatives. The combination of operational technologies (OT), advanced visualization, and analytical tools are revolutionizing decision-making and changing the approach in long-standing functions, such as mine planning and maintenance, while also improving operational metrics. In this trend, we'll explore how organizations can use these techniques and technologies to enhance their operational productivity and efficiency.

Establishing a solid data foundation

As mining companies automate, electrify and connect ever more devices, applications and machines, there is a proliferation of data across the value chain. For example, in 2018, Rio Tinto's Iron-Ore operations, which, at the time, included 16 mines, 1,500km of rail and three ports, created 2.4 terabytes of data every minute from mobile equipment and sensors.⁴ This number would likely be much higher today. However, despite mining and metals companies having a wealth of data, most of it is not properly collected, contextualized, normalized, stored or analyzed, and therefore cannot always be reliably used in decision-making.

To address data value leakage requires a back-to-basics approach, establishing a solid foundation with a comprehensive data model that's well-defined and understood by parties across each organization's value chain. Architectural approaches such as creating a unified namespace (the practice of integrating consistent naming conventions across systems and applications in an organization)⁵ are gaining in popularity. These serve as methods for organizing data to reflect both the structure and current state of an entire enterprise.

One foundational area where mining and metals companies are focusing time and effort in the pursuit of predictive and prescriptive maintenance ambitions is in the asset master data and metadata domain of their enterprise resource planning (ERP) or enterprise asset management (EAM) solutions. Technical object structures (or equipment hierarchies) and damage and cause codes describing failures are critical in helping ensure that equipment failures are not only documented against the right equipment, but also captured accurately. This helps to establish a trusted data set that enables both reliability engineers and more sophisticated analytics to improve asset performance.

Harnessing tech-assisted decision-making

Most operational optimization programs in mining and metals to date have centered on achieving incremental productivity and safety gains and/or cost reductions in certain processes and functions. However, with a solid data foundation in place, companies can use a more sophisticated and integrated approach to address the wide-ranging requirements and constraints that they face today.

"If we take the example of a concentrator, asset performance has traditionally been measured by recovery, which is primarily constrained by throughput, and that has guided strategy and decision-making for these operations. However, in the future, the need to report each asset's carbon footprint and balance that against traditional productivity and profitability measures could lead to conflicting priorities on how best to operate the asset."

Shak Parran, Ecosystems & Alliances leader, Energy, Resources & Industrials, Deloitte Canada

For example, by leveraging OT to gather information relating to physical assets—such as a mill, truck or smelter—and contextualizing that data, companies can re-create those assets as well as their inputs and outputs in the digital world (i.e., a “Digital Twin”). This allows the asset, processes, and systems surrounding them to be visualized and simulated, enabling better predictability of performance and possible future failures.

Simulation has been used for some time in mining and metals, although its applications are expanding. Its primary use is in validating the feasibility of new designs and concepts and to model changes to processes and operations over time. Companies can use simulations in advance of starting new projects or making changes, both big and small, to see whether the long-term gains could outweigh any short-term costs or production losses before finalizing their choices.⁶

Increasingly, simulation is being used with mathematical optimization tools to find the best possible solution to a problem given a business’ objectives and operational constraints. For example, Australian data science specialist PETRA recently helped an iron-ore operation in Western Australia to achieve a 5.5% improvement in plant throughput by optimizing the drill-and-blast phase of its operation. Data fusion ore tracking was used to create digital twins that correlated crusher downtime with geology and drill-and-blast designs. The program resulted in an estimated annual financial benefit of more than AU\$450 million (approximately US\$285 million).⁷

Agility through automated decision-making

Both simulation and optimization can be deployed strategically, tactically, and operationally to determine which investment, scenario, or process is most likely to deliver the greatest value across different time horizons.⁸ Advances in software packages and computer processing capacity mean that simulations that used to take days or weeks to run can now be completed within minutes, leading to new opportunities and applications.

Another of these is automated decision-making, for example, in functions such as mine planning. This concept is still relatively nascent in mining and metals, but it can ultimately make for more agile and adaptive operations.

Another area where automated decision-making could prove useful is in predictive maintenance of equipment. This is high on the priority list of many mining and metals companies; a 2023 survey by GlobalData revealed that, 68% of mines had made moderate investments into predictive maintenance for mobile equipment, 40% expected to either invest in the technology for the first time or invest further over the next two years.⁹

Maintenance costs typically represent 1-3% of total annual revenues for mining and metals companies,¹⁰ so even small savings in this area can deliver significant bottom-line savings, in addition to minimizing hazardous hands-on work for their technicians.

“Predictive maintenance has proven difficult for many companies because it’s an approach that’s based on statistics (which requires high quality data) and it changes the paradigm of how miners run and maintain equipment. It also requires companies to excel at some foundational practices, such as up to date asset master data, metadata and strong EAM work management discipline in areas like failure data collection, which few companies have achieved to date.”

Herman Lombard, partner, Industrial Smart Operations leader, Deloitte Canada

Many companies struggle to optimize maintenance practices because they want to both increase uptime and reduce operating costs. Using automated decision-making is a departure from the traditional engineering mindset given its statistical nature and requires a cultural shift; however, over time, it has the potential to deliver positive outcomes for businesses, given their objectives. Demonstrating this could help teams to work more harmoniously and help companies grow their trust in data.

Moving from reactive to proactive maintenance

Tata Steel, which began its digital transformation journey in 2016, is taking its maintenance approach a step further. Through its Shikhar 25 transformation initiative, the company is creating digital twins for all its critical and complex processes, including mines, factories, and blast furnaces. Once in place, these will help the company to move from a predictive maintenance approach to a prescriptive one, which is expected to lead to greater efficiencies, fewer breakdowns, and lower costs.¹¹

Prescriptive maintenance is an asset maintenance strategy that uses machine learning to adjust operating conditions for desired outcomes, as well as intelligently scheduling and planning asset maintenance.¹² This is a step-up from predictive maintenance and represents a shift from reactive to proactive asset performance management. If organizations can contextualize and standardize their data, then there could be more opportunities to tackle rising operational expenditures through reduced maintenance and parts costs, and they could expect to deliver greater safety performance.

For example, a multinational mining company recently implemented the Aspen Mtell machine learning solution from AspenTech and was able to improve its production uptime. AspenTech said the customer now uses its autonomous agents for early warnings of degradation in metals refining processes and equipment. These regularly advise a time-to-failure of around 40 days on pumps.¹³

Turning information into competitive insights

Due to technological advances and digitization, mining and metals companies have access to more valuable data than ever before.¹⁴ Making greater use of widely available tools, such as simulation and mathematical optimization, could turn information into a significant business advantage by driving more predictable operational outcomes, saving money and improving operational safety and sustainability. In turn, these practices can be expected to help satisfy wide-ranging stakeholder expectations and bring new supply online for future-critical metals and minerals.

From ideas to actions

- **Establish a solid data foundation:** Invest in the development of a data model and data dictionary for your organization to help ensure that data is understood and can be collected, contextualized, normalized and used in reporting, simulation, analytics and, finally, decision-making.
- **Look for easy-to-implement advances:** Find a small, high return-on-investment (ROI) use case to implement as a minimal viable product. Starting in this way can help build experience and confidence within teams and deliver tangible benefits that can be used to develop larger business cases.
- **Buy rather than build:** Many software-based simulation and optimization programs are available for different mining and metals applications. Today, use of the cloud means that these programs can often be deployed relatively quickly and inexpensively to address operational bottlenecks.
- **Scale current applications:** Explore whether data and digital technologies for assisted decision-making could be expanded across other business operations and functions for maximum ROI.
- **Consider outsourcing data preparation:** High-quality data is essential for accurate simulation and optimization. Assess the state of the data and, if preparation work is necessary, consider whether there are resources to handle it internally. Outsourcing to a team of specialist data scientists could prove to be a faster and more cost-effective option in the short term until internal teams develop the requisite knowledge, skills, and abilities.
- **Appoint a chief data officer (CDO):** The data held by mining companies can be of tremendous value. Appointing a CDO to manage data with appropriate risk, governance and control mechanisms could improve OT usage.

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Trend 9

Bringing generative AI into mining and metals:

Capitalizing on current and future opportunities

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2022 was a landmark year for artificial intelligence (AI) with the release of ChatGPT, Midjourney, and Bard, which brought generative capabilities and foundational models into homes and businesses around the world. While early traction with these technologies was mainly in consumer-facing industries, generative AI (gen AI) also holds huge potential in industrial and enterprise applications.

In the mining and metals industry, adopting gen AI presents a range of attractive opportunities, including addressing energy security and improving profitability, improving operational efficiencies and resilience, and reducing emissions. Although companies are beginning to realize the potential that gen AI could offer, adding contextual awareness and humanlike decision-making to workflows could significantly change how companies do business in time.

This trend will explore some potential uses that could help to drive productivity and streamline tasks in the short term; look

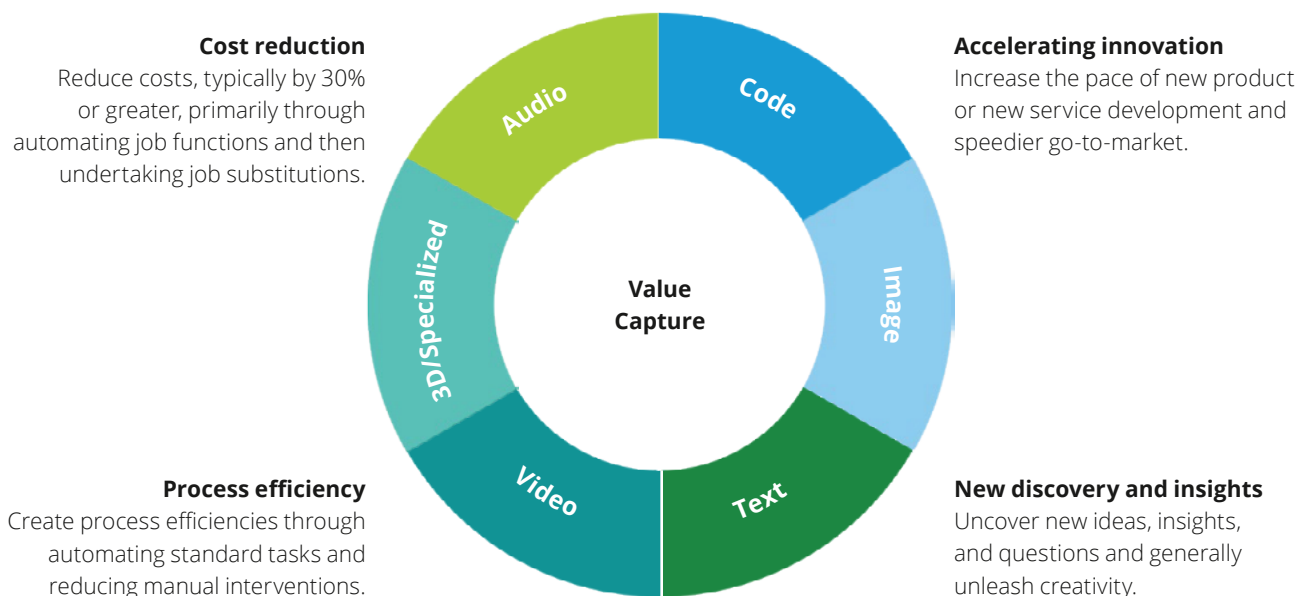
at how early adopters in other sectors are using gen AI to navigate complex and uncertain environments; and discover how mining and metals organizations can prepare for more radical, long-term opportunities enabled by gen AI (figure 1).

Getting a head start with gen AI

While gen AI may be nascent in mining and metals, it's far from new in other industries. For example, [research from Deloitte Digital](#) has found that one in four business to business (B2B) and business to customer (B2C) organizations are already harnessing gen AI in content marketing,² and industry-specific solutions are helping to accelerate pharmaceutical drug discovery and reduce associated costs.³

Historically, the sector has taken a conservative approach to deploying novel technologies and, consequently, companies may be hesitant to become early adopters of gen AI.⁴

Figure 1: The value that Gen AI use cases can enable can be conceived across four dimensions: cost reduction, process efficiency, accelerating innovation, and new discovery and insights.



Source: Deloitte AI Institute, *The Generative AI Dossier*, 2023¹

“Mining and metals organizations have an inherent advantage in this domain, as most possess exclusive and proprietary data that can be used to finely calibrate gen AI models for specific requirements and value-driving use cases. This presents the potential to take a market-leading position when leveraging gen AI models in applications, such as operational optimization or reducing emissions.”⁵

**David Alonso, partner, Generative AI leader,
Deloitte Australia**

According to the Deloitte AI Institute, initiating the adoption of gen AI at this juncture goes beyond gaining a competitive edge in the present, it also creates a foundation for future growth by investing in the workforce. The Institute's [2023 Generative AI Dossier](#) states, “Contemplating the energy, resources and industrial sector’s future, gen AI will assume a central role in many functions. For example, in optimizing and mitigating health and safety risks by generating worksite-specific safety training that replicates real-world settings and critical scenarios.”⁶

As companies transition to more environmentally sustainable business models—for instance, those built on circularity and climate action—gen AI could also help develop real-time, bespoke training materials that support workforce transitions and the adoption of sustainable practices.

Understanding potential use cases

There are various uses for gen AI that could transform the way mining and metals organizations operate over time, from changing the way that individuals work, to the way that enterprises and their value chains operate. Opportunities and applications will also span different business teams and functions, from exploration to mine design through to shipping and metals trading.

Foundation models are what differentiate gen AI from traditional AI. These are complex learning models that have been pretrained on a broad dataset and can be adapted to solve various problems. Many foundation models today are in the text domain and are driven by vast quantities of available training data. However, gen AI can create artifacts across various modes, including code, images, video, audio, and 3D models. Text, image, and voice are the modes frequently used by consumer-facing gen AI applications today. However, increasingly, the possibility for different modes and even multimodal models could both disrupt and drive step changes in productivity across a range of functions (figure 1).

Transforming work in mining and metals

In the near term, gen AI will likely have an impact on mining and metals organizations mostly through workforce productivity and efficiency. For instance, in the back office, employees are beginning to use tools such as Microsoft Copilot to handle emails, schedule meetings, and write documents. Developers could also use gen AI to enhance their efficiency when writing code, ensure its compliance with various standards, and reduce cybersecurity risk.

“In the field, gen AI could be used for knowledge retrieval, to help individuals access information held within the organization that might be relevant to the task they’re completing.”

Shak Parran, partner, Ecosystems & Alliances leader, Energy, Resources & Industrials, Deloitte Canada

For example, if a technician is changing a part on a haul truck, gen AI could scour the organization’s data for manuals and information that could help them to complete the job more effectively. It could tell the technician which tools and skills they need, and where accidents or mistakes have occurred in the past and how to avoid them.

Virtual “field assistants” like these could help to not only improve safety, but also bridge skills and knowledge gaps by capturing valuable information and experience that could otherwise be lost from institutions as experts retire. Additionally, they could guide new recruits and contractors through processes and workflows where human mentors are not available.

In the future, organizations could use gen AI’s ability to simulate, model, and generate data-driven insights to support supply chain resilience and optimization. For instance, gen AI could help identify and simulate potential disruptions in metals supply chains through assessments of port congestion, shipment routes, and supplier mapping. Supply chain managers could also use these tools to run what-if scenarios in a digital twin environment that reflect the real-world supply chain.⁷

Navigating supply chain complexity with gen AI

Some multinational companies are using gen AI to navigate increasing complexity in their supply chains in the face of geopolitical tensions and pressure to eliminate links to environmental and human rights abuses. For example, Unilever, Siemens, and Maersk are among those using AI to help negotiate contracts, find new suppliers, or identify those connected to human rights matters.⁸

Gen AI can also explore many possible designs to find the most suitable match for a company’s objectives. It not only augments and accelerates design in many fields but has the potential to “invent” designs or objects that humans may have otherwise missed.⁹ This means that, in the long term, it could transform the way in which operations are designed and run.

“Today, engineers spend months, even years, optimizing the design and delivery of mine sites from different dimensions, not just spatially, but also from cost and sustainability perspectives. Once the design is locked in, it can take years to develop and commission the mine, by which time the technologies selected might have been superseded. The ability to generate and adopt new designs through gen AI could be a game-changer.”

David Alonso, partner, Generative AI leader, Deloitte Australia

Capital project delivery and mine design are two functions that could potentially benefit from this capability, which is already proving its worth in other sectors. For example, drug discovery company Insilico Medicine uses an NVIDIA solution to develop new therapies for diseases, such as pulmonary fibrosis. In June 2023, the company announced it had used gen AI for each step of a new preclinical drug discovery process. Doing this using traditional methods would have cost US\$400 million and taken up to six years. But with gen AI, Insilico Medicine accomplished it for one-tenth of the cost and in just two-and-a-half years.¹⁰

Unlocking the value of data

One of the most important capabilities that gen AI provides mining and metals businesses is that it helps people to interact more deeply with data. Despite significant investment in digital transformation over the past decade, some companies continue to work to implement the right infrastructures that allow their workers easy access to the data they need to do their jobs more effectively.

“For many people, interacting with data is still an intimidating process. Even where systems do exist to provide data-based insights to workers, they may not be in formats that are easily understandable or usable. Because gen AI allows people to interact with data through different modalities, like speech and video, it has the potential to act as a facilitator. This could enable a huge leap in the way that organizations interact with their data.”

**Sonia Solova, senior manager, Consulting,
Deloitte Canada**

Although gen AI platforms are still relatively nascent, they're already well-developed, and their capabilities are advancing quickly. Goldman Sachs predicts that as tools using advances in natural language processing work their way into businesses and society, they could drive a 7% (almost US\$7 trillion) increase in global gross domestic product (GDP) and lift productivity growth by 1.5% over a 10-year period.¹¹

By embarking on the exploration and implementation of gen AI now, mining and metals companies could acquire valuable insights, adapt to its nuances, and evolve alongside the advancing technology. This strategic approach may position organizations to leverage the full capabilities of gen AI as it reaches maturity.¹²

From ideas to actions

- **Educate the workforce:** Educating and upskilling the workforce could help remove the fear of the unknown, create buy-in as new gen AI tools are introduced, and help workers perform their tasks better and more efficiently. Education will also help leaders pose the correct questions of gen AI. Investing in this knowledge now will help ensure a strong foundation for when gen AI becomes more widely used in the workplace.
- **Identify and prioritize use cases:** Determine use cases that might be relevant to the organization in both the short and long terms and that can be scaled for the greatest return on investment. Mapping and prioritizing implementations in this way can also help establish whether a build or buy approach is best suited for each solution.
- **Centralize and prepare data:** To produce useful results in knowledge retrieval applications, gen AI models require access to a company's data. Creating a data lake, or similar repository, could help. For more advanced applications that require the tuning of a large language model (LLM), it's important to assess the current state of the organization's datasets ahead of time, as this could affect deployment timelines.

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Trend 10

Third-party delivery models:

Gaining agility and competitive advantage through next-gen approaches to outsourcing

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The continued evolution in the global risk landscape, with a prioritized focus on sustainability and increasing regulatory requirements, has resulted in organizations seeking new ways to reduce costs and evolve their capabilities in an agile and non-labor-intensive manner.

Furthermore, supply chain disruptions due to geopolitical events saw organizations seeking new ways to source regionally and locally during 2023, all while the global economy faced a possible recession.¹ In response, many companies are turning toward third-party delivery models (TPDMs) for certain business functions, such as cybersecurity, data and analytics, and environmental, social, and governance (ESG) reporting, to fill capability gaps, drive value and agility, and provide end-to-end solutions as they build blueprints for the future.²

Why consider third-party delivery models?

The early 2000s saw a wave of outsourcing arrangements across different industries. Typically, these would target low value-add transactional services and take advantage of labor arbitrage in relatively cost-effective jurisdictions, like India or the Philippines.

“In the last few years we have seen organizations once again turning toward external companies to operate key portions of their business. Mining and metals companies are looking to create contracts around a range of areas, including tax compliance services, data management to enable AI and ESG reporting, applications management and modernization, supply chain management, maintenance, systems implementation, and cyber services, to name a few.”

Tim Boehm, principal, Global Operate leader, Energy Resources & Industrials, Deloitte Consulting LLP

The cyclical nature of mining and metals means that these organizations need flexibility and agility to maximize their profitability. TPDMs provide an attractive way to dial certain activities and their output up and down quickly as required by demand or commodity and metals prices, without compromising the quality of work.

Likewise, the fast pace at which technology is moving, particularly in areas like artificial intelligence (AI) and data science, means that building and sustaining capabilities internally in these areas in a way that keeps pace can be difficult and costly. Companies may also be reluctant to invest heavily in creating internal capabilities based on emerging technologies, such as generative AI, before seeing the value they can deliver for their businesses. TPDMs also provide a cost-effective way to test these technologies before investing and embedding them into permanent in-house capabilities.

The challenges of attracting and retaining skilled talent to resource core business functions are well known and something we have explored in detail in trend seven. Hiring and retaining highly skilled employees is one of the greatest challenges facing enterprise leaders today. The [2022 Global Outsourcing Survey](#) from Deloitte US found that 50% of executives see talent acquisition as a leading challenge in meeting their organizations' strategic priorities, and 56% do not feel their organizations have the right mechanisms to retain employees.³

By rethinking operating models and outsourcing certain functions or tasks to third parties who have the latest knowledge and capabilities, as well as an organization whose business centers on delivering value in specific areas, mining and metals companies can dedicate more time, people, and resources to their core operations.

TPDM: A new paradigm for outsourcing

Traditional outsourcing efforts focused on cost reduction for simple, discrete tasks that could be automated—for instance, payroll or network administration. With this type of arrangement, the relationship between clients and vendors tended to be transactional in nature.

TPDM services move beyond this, combining cost reduction and discrete value-addition, where vendors support more complex processes, applications, or full business functional areas requiring specialized expertise. These might include hosting/cloud operations, analytics-as-a-service, cyber detect and respond services, or infrastructure support. These relationships are usually longer term and tied to performance service level agreements (SLAs) based on outcomes and volume consumption. Clients are typically given on-demand access to hard-to-source talent, experiences, skills, and leading technology.

Deloitte US recently helped a multinational pharmaceutical company to optimize its supply chain and improve operational efficiency using data-led insights. To do this, the team developed a data modernization strategy and a use case collection and prioritization framework designed to target key business priorities effectively. The result was enhanced supply chain visibility across teams, locations, and systems. More than 20 manufacturing sites and over 400 users were enabled with modernized data. There was also an overall 75% reduction in time required to transform the data into insights at manufacturing sites and an 85% reduction in the manual effort required to extract and consolidate raw data before it could be consumed by the analytics applications.⁴

“We’re seeing momentum in mining and metals from clients who are looking for help with insource and outsource business case development. That’s leading them to define their hybrid service delivery model, determining which portions of the supply chain they keep onshore, and which portions can be outsourced via TPDMs. These services might include strategic sourcing-as-a-service, contract management-as-a-service or procure to pay-as-a-service, and supplier enablement-as-a-service. Another play, particularly for large mining companies, is managing or consolidating their tail spend (spend that’s not covered by contracts) across operations via TPDMs.”

**Mahendra Dedasaniya, partner, Consulting,
Deloitte Canada**

TPDMs like these are usually dynamic in scope and the relationship tends to be highly collaborative or viewed as an extension of the organization.⁵ In fact, these third-party resources are becoming so important that 87% of respondents from Deloitte's [2022 Global Outsourcing Survey](#) said they consider external workers as part of their own workforce.⁶

The [2023 Global Chief Procurement Officer Survey](#) from Deloitte US also identified the increased use of hybrid delivery models that leverage TPDMs as a key value driver for top-performing procurement teams across businesses globally.⁷

Transforming occupational safety through TPDMs

Deloitte Brazil recently developed its Smart Safety analytics solution in conjunction with Gerdau Acos Longos S.A., the largest producer of long steel in the Americas. Deloitte's knowledge in AI technologies applied together with Gerdau's knowledge in safety management resulted in the development of a predictive e-tool. The solution uses multiple data sources and applies leading-edge AI technology to detect risk factors and trends in each operational area. The result is risk predictability for the next week, automatic identification of critical risks, root causes, and hot topics that allow operators to define and implement preventive actions. Gerdau Acos Longos S.A is now using the solution in Portuguese, English, and Spanish at more than 25 manufacturing plants and five countries.

A tool to stay on top of technology trends

In the mining and metals industry, migration to cloud-based services has been another factor in the uptake of TPDMs. The shift to next-generation enterprise resource planning (ERP) systems, many of which utilize a subscription-based model rather than licensing, is another function that companies are looking to outsource.

“Each year seems to bring a new technology trend that demands attention. During 2023, it was gen AI, and in 2022, it was blockchain and Web3. Before that, it was the cloud. The move toward TPDMs brings much of this together.”

Rob Hillard, Consulting leader, Deloitte Asia Pacific

The move to the cloud offers a way to better leverage company IP and capability. Most recently, this is turning into “industry cloud,” an approach that embeds industry-specific intellectual property (IP) (particularly data) directly into the cloud. For this to work well, the expertise must be shared, even if the data is private, which requires a TPDM.

Web3 was about sharing trust without waiting for platforms. The expense and complexity of these solutions has challenged their blockchain-based foundations, but the principles of decentralized trust and embedded value remain important, particularly in supply chain and operations. In this way, shared TPDMs provide platforms that can accelerate opportunities to share and empower supply chains.

“While mining and metals companies are still early stages of realizing value from gen AI, the technology is again fueled by data, which is best managed centrally through TPDM agreements.”

Mahendra Dedasaniya, partner, Consulting, Deloitte Canada

Using TPDMs to get ahead

Amid an increasingly complex business environment, now is an opportune time for mining and metals companies to revisit their sourcing strategies. Traction has mainly been among major miners. However, as competition in the market increases, mid-tier mining companies could leverage these services to gain an edge, and unlock and expedite value realization in an agile way.

From ideas to actions

- **Identify where TPDMs could add value:** Look for business processes that are routinely affected by regulatory change or other new requirements; areas where technology is evolving rapidly, required to keep pace, and outside the core competency of the enterprise; and areas where talent is limited and in high demand, thus making it hard for the enterprise to compete for resources. The key is to identify functions where a combination of capabilities and teaming with key stakeholders and solutions could allow a third-party provider to deliver distinctive value.
- **Find the right TPDM providers:** Consider providers who offer access to and experience working with an ecosystem of vendors at the leading edge of technology disruption and who can bring purpose-built solutions. Those who are familiar with the latest industry regulations and have a track record of supporting organizations in your specific geography or industry could also prove beneficial. For organizations with international operations, seek TPDM providers that have the critical mass to support the areas in which the organization does business, whether the ambitions include an onshore, nearshore, offshore, or hybrid operational model.
- **Move beyond vendor management:** Aligning multiple vendors to a single objective can be challenging and time-consuming. This is underscored by the need for end-to-end talent and service integration, cyber control over the extended enterprise ecosystem, and a single source of reliable data. In this new environment, vendor management capability must evolve from traditional procurement-oriented vendor management to a strategic ecosystem management approach. Consider engaging one or more TPDM providers to focus on a critical goal and provide incentives that align with achievement of the goal. Given the longer-term nature of managed services, the relationship should have the ability to adjust to increasing or changing goals.
- **Interlock business ecosystems with TPDMs:** Building standard capabilities to manage a holistic network of vendors that is fully aligned to information technology (IT) or business strategy is vital. Ensure that each vendor fits the business's culture and vision, understands the organization, and provides innovative thought leadership to realize maximum potential through collaboration.
- **Service level agreements are necessary, but not sufficient:** When the goal is highly integrated teams working as one, service level agreements (SLA) set the baseline, but cannot reliably ensure peak outcomes. To unlock the most value from these teams, organizations must go beyond SLAs and create true relationships with vendors based on mutual trust and transparency that yields innovative thinking and mutually beneficial outcomes. Traditional penalties for SLA violations can be combined with incentives for continuous innovation to achieve this. Establishing a collaboration culture should be a priority at the beginning of a relationship and reinforced throughout.

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Trend 9: Bringing generative AI into mining and metals—Capitalizing on current and future opportunities

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Trend 10: Third party delivery models—Gaining agility and competitive advantage through next-gen approaches to outsourcing

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