

Decarbonising mining in an era of growing demand for critical metals and minerals



Part one

Original research: Stocktake, barriers and complexities, opportunities, and a way forward

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Executive summary

From **reporting difficulties** to **implementation barriers**, miners have cited various obstacles to decarbonising their operations. Through research and interviews with 52 mining companies, we have uncovered the **primary reasons why decarbonisation has posed challenges for mining companies**. We have also compiled several recommendations for how miners can overcome these challenges.

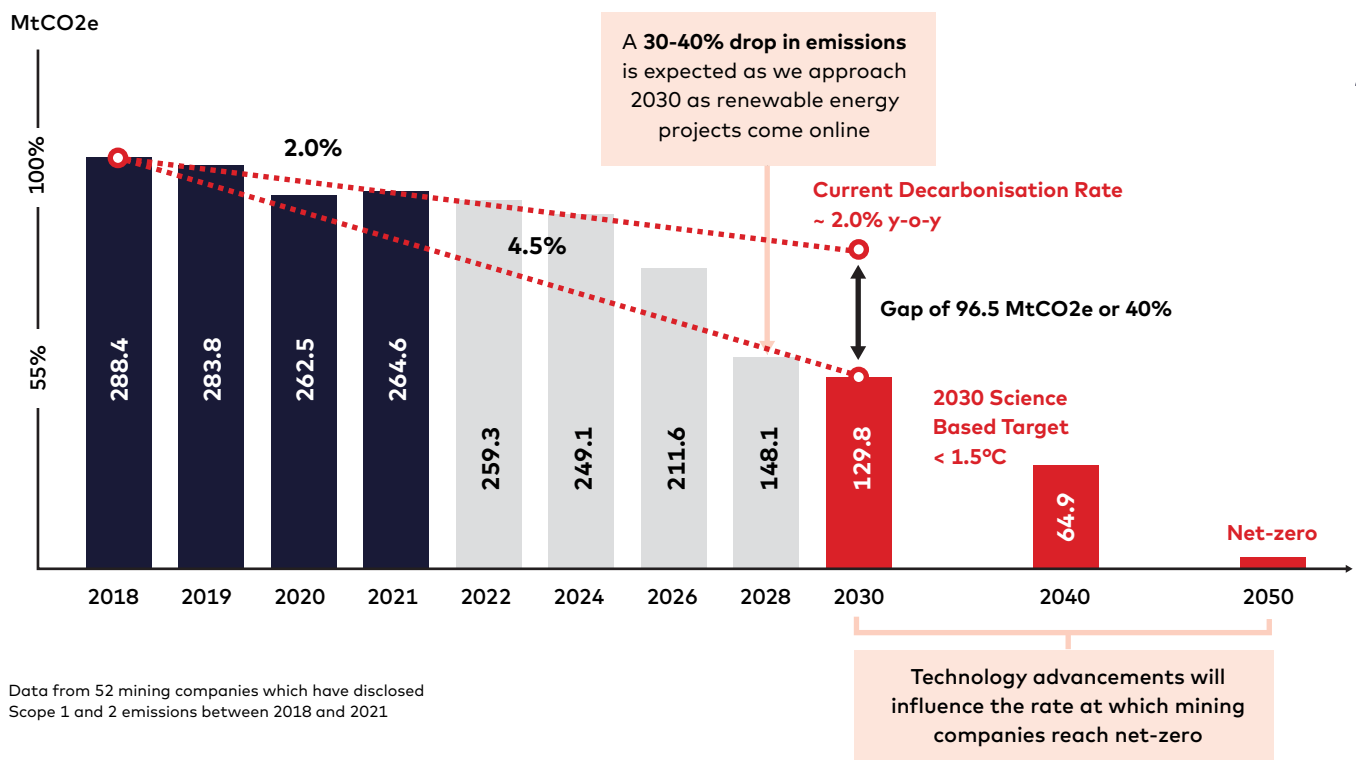
Part 2 of this series will provide a more in-depth perspective on **how to create an enabling environment for decarbonisation**, including adaptation of processes and systems, as well as cultural transformation.

The current rate of decarbonisation is too slow to meet Science-Based Targets

Mining accounts for 4-7% of direct global greenhouse gas (GHG) emissions.¹ However, when scope 3 downstream emissions are included, this rises to 28%, or 19,440 megatons of carbon dioxide equivalent which is second only to agriculture/land use/waste at 30% of global emissions.²

Little is changing, with roughly the same amount being emitted per tonne of mineral output every year.³ This holds especially true for deep gold and platinum mines that are experiencing reduction in ore grades and increasing demand for ventilation and cooling services - technological advances proving insufficient to offset an increase emissions intensity.

Based on our analysis of 52 mining companies that disclose scope 1 and 2 emissions, we found that the average annual rate of emission reductions was approximately 2% between 2018 and 2021. The current 2% annual reduction rate would result in a 40% gap to 2030 targets as seen in Figure 1. The current decarbonisation rate aligns to a future of more than 2°C of warming, far above the target of 1.5°C future set out by the Paris Agreement and associated Science-Based Targets (SBTi). To achieve such reductions, the decarbonisation rate must increase to 4.5% per annum across the mining industry and be extended to include scope 3 emissions.



Data from 52 mining companies which have disclosed Scope 1 and 2 emissions between 2018 and 2021

Figure 1: Global mining decarbonisation performance against SBTi (MtCO2e)

1. Globaldata. "Total GHG Emissions of Major Metals and Mining Companies Worldwide by Revenue in 2021"
 2. Sustainalytics. "The Mining Industry: Challenges and Opportunities of Decarbonisation". 21 November 2022.
 3. International Energy Agency. "Critical Minerals Market Review 2023."

Our research showed that where significant emissions reductions have taken place, they tend to be through portfolio optimisation – namely through divestment of coal assets – rather than through operations optimisation or targeted decarbonisation strategies.

This stagnation in emission reductions is increasingly seen as problematic by the investors needed to fund the exploration and expansion of mining operations – 63% of investors would be willing to divest from or avoid investing in a mining operation that does not pursue decarbonisation effectively or that fails to meet its targets.⁴ Inaction or ineffective action on emissions is increasingly a material risk for miners as they seek greater investment.

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The challenge with measuring progress against targets

When assessing the mining industry's progress on decarbonisation, the disparity between companies' reporting of scope 1 and 2 emissions, and indeed scope 3 emissions, quickly becomes evident.

To accurately compare the progress of mining companies, we must first determine whether their commitments pertain solely to Scope 1 and 2 emissions or also include Scope 3. Scope 3 emissions are included, it's crucial to identify which segments of the miners' complex supply chains the targets apply to and assess the reliability of available data.

Furthermore, miners tend to use the terms 'carbon-neutral' (a less stringent goal focussed on defined emissions) and 'net zero' (a more ambitious target comprising all emissions) interchangeably, when the distinction between the two terms can be of crucial importance to lenders and regulators.



Evaluating the mining industry's progress toward decarbonisation requires considering each company's impact over time, yet many sustainability reports provide only a snapshot without historical information. It was evident that mining companies worldwide are still struggling to establish consistent methods and data sources to enable effective scope 3 emissions reporting. Figure 2 gives an indication of the quantum of scope 1 and 2 emissions and decarbonisation objectives.

We anticipate that the ICMM guidance on scope 3 emissions reporting, the Corporate Sustainability Reporting Directive (CSRD) requirements, the introduction of ISSB IFRS Scope 1 and Scope 2 disclosure requirements⁵ and heightened focus from regulatory bodies and investor groups will lead to more precise and standardised definitions. This, in turn, will facilitate easier like-for-like comparisons in the future and help prevent greenwashing by discouraging the use of vague and interchangeable terms.

4. Investing News Network. "ESG Now the 'Price of Admission' for Miners as Investors Seek Responsible Companies". 5 April 2024

5. The ISSB IFRS S1 stands for the International Sustainability Standards Board (ISSB) IFRS Sustainability Disclosure Standard 1. It requires entities to disclose information about their sustainability-related risks and opportunities. Specifically, it sets out general requirements for the content, presentation, and timing of sustainability-related financial disclosures.

Sustainability targets of mining majors

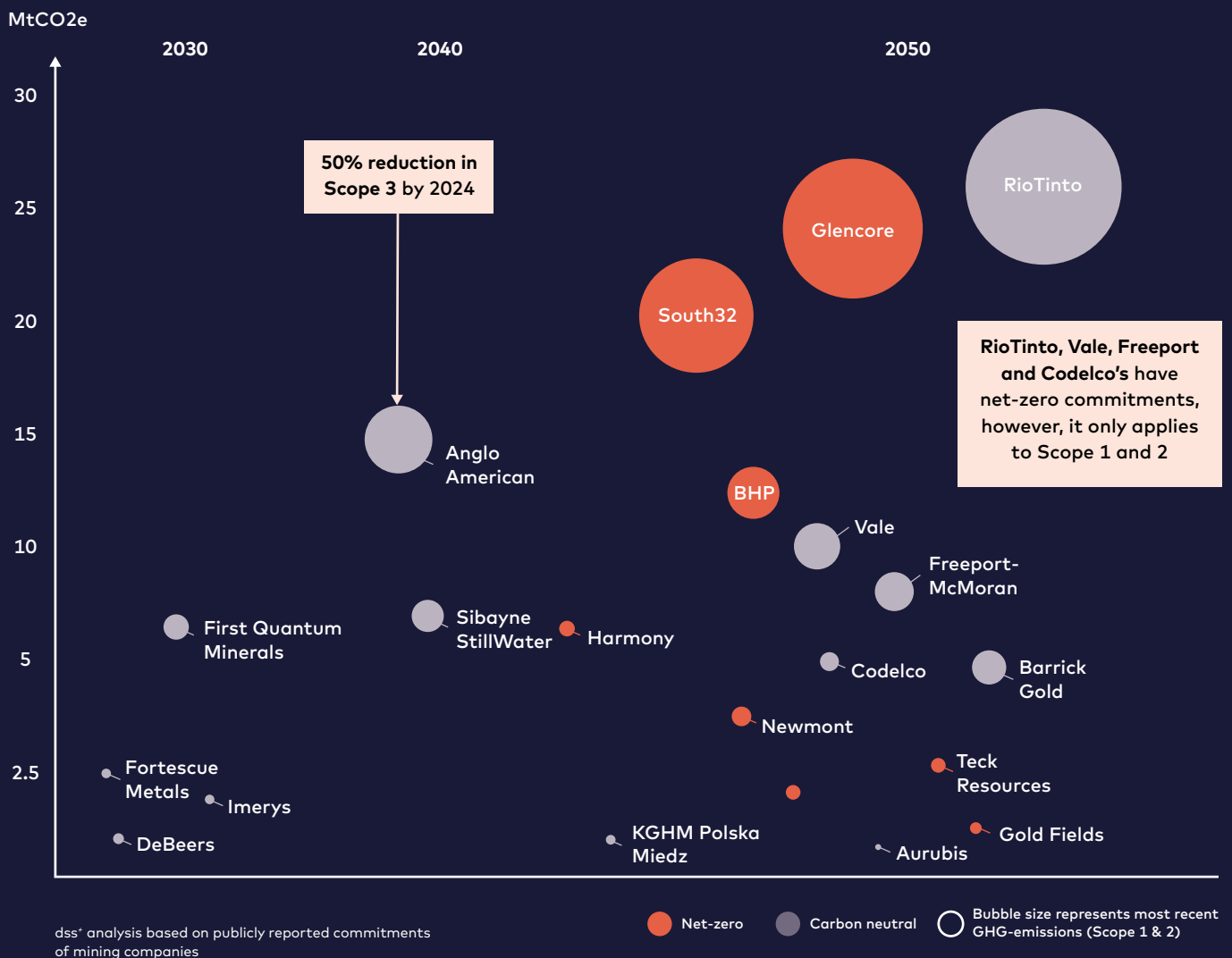


Figure 2: Most mining companies' sustainability commitments focus on Scope 1 and 2 emission reductions, but Scope 3 emissions remain a challenge⁶

6. Based on analysis of publicly available data in 2023.

The paradox: mines must increase capacity with urgency, and decarbonise concurrently

The decarbonisation challenge is further compounded by the need for miners to expand beyond their current capacities to support the energy transition. According to the International Energy Agency (IEA), between 2017 and 2022, demand from the energy sector was the primary driver behind a threefold increase in overall demand for lithium, a 70% surge in cobalt demand, and a 40% rise in nickel demand as seen in Figure 3.⁷ This rapid growth trajectory is expected to persist. Indeed, for cobalt and lithium, existing mines will only be able to produce half the requisite amount by 2030.⁸ The figure stands at around 80% for copper.⁹

In the IEA's Announced Pledges Scenario, critical mineral demand is projected to more than double by 2030. In the Net Zero Emissions by 2050 scenario, it grows three and a half times by 2030, reaching over 30 million tonnes. The IEA emphasises that minerals like copper, lithium, nickel, cobalt, graphite, and rare earth elements are crucial for a secure and swift transformation of the global energy sector. Mining companies engaged in the extraction and processing of these commodities must urgently expand their capacity to facilitate the future generation, transmission, and storage of renewable energy.

To address the rising demand, companies must substantially expand exploration efforts across diverse geographical regions while simultaneously enhancing the efficiency of their existing assets. This situation presents a paradox: miners must reduce emissions to align with decarbonisation goals and improve their environmental, social, and governance (ESG) performance, but must ramp up production to meet the unprecedented demand for energy transition minerals – using more energy and producing more absolute greenhouse gas emissions in the process.

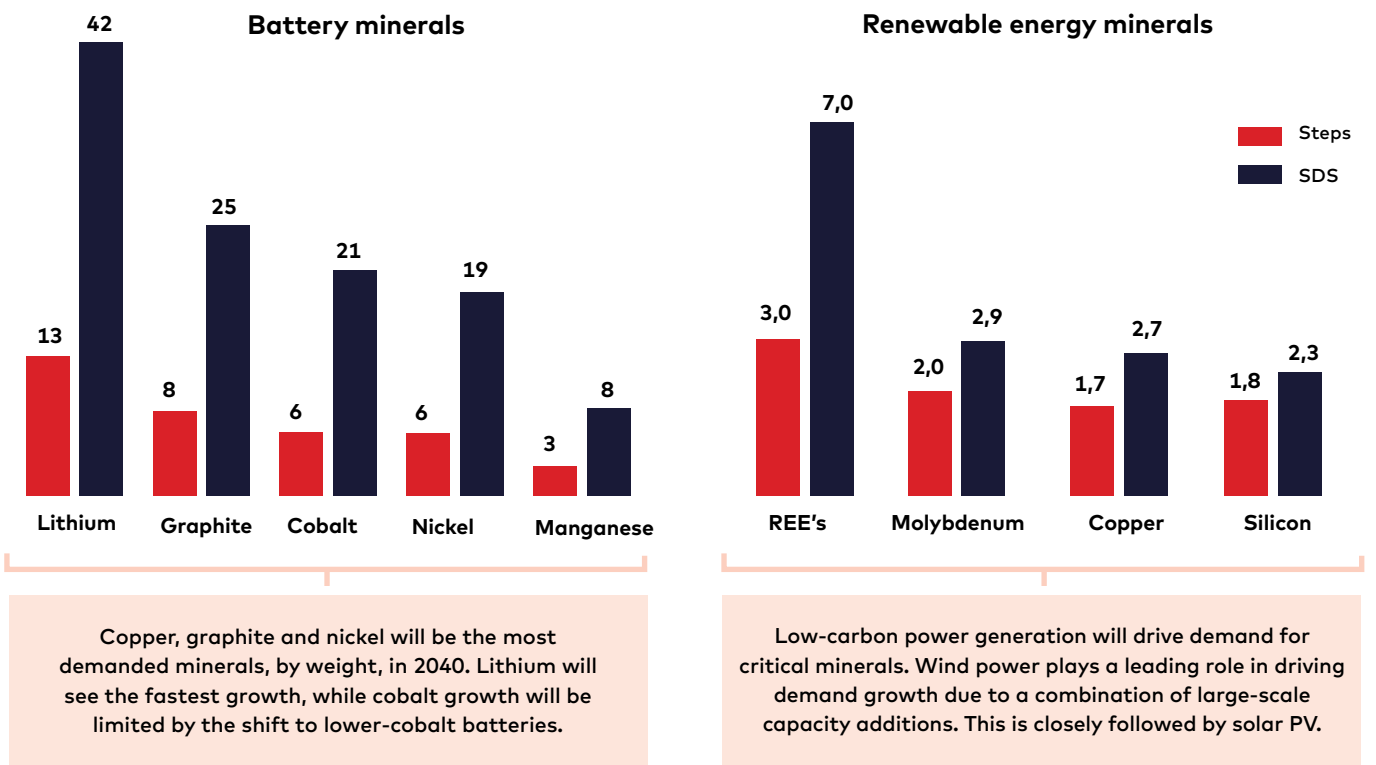


Figure 3: Growth in demand for critical minerals in 2040 relative to 2020 levels – implies 12.2Mt increase

7. International Energy Agency. Critical Minerals Market Review 2023. July 2023.
 8. International Energy Agency. The Role of Critical Minerals in Clean Energy Transitions. May 2021
 9. ibid



Decarbonisation barriers and opportunities

Although many mining companies have committed to decarbonising their operations, our interviews with mining executives across commodities and geographies reveal that several barriers still exist.

The top barriers to decarbonisation, according to mining industry executives, are:

1.

Inadequate capital management frameworks

Capital allocation frameworks need to be redesigned to enable better provision for, and valuation of environmental attributes and sustainability initiatives such as decarbonisation and climate change mitigation. Introduce decision making metrics like internal cost of carbon to mimic anticipated carbon taxes, add biodiversity and social impact measure to assess the net positive impact and not just net present value to activate the decarbonisation pathway. A good example is how BHP illustrates in their 2023 Operational Decarbonisation report how decarbonisation capital is assessed in line with maintenance showcasing the integral part of decarbonisation of daily operations.

2.

Upfront costs are often extensive

Mines are designed to maximise economies of scale, so any large changes, including decarbonisation, are extensive and require significant capital expenditure (capex). For example, electrification of hauling vehicles supported by renewables requires significant capex. This in itself can present an opportunity for Original Equipment Manufacturers (OEMs) to revisit commercial models and consider providing equipment on an "as a service" or leased basis. Performance contracting measures can then add further comfort that decarbonisation targets will be met.

3.

Lack of operationalisation and centralisation

Current decarbonisation efforts are often fragmented and uncoordinated between sites. Many if these decisions are based on cost savings and energy security initiatives and not linked to corporate decarbonisation objectives. This lack of organisational alignment hinders the effectiveness of a company-wide implementation of decarbonisation best practices.

4.

Organisational structures that prohibit improvement

Often, sustainability leaders are accountable for emissions reductions, but they often have little to no operational authority, and thus little ability to deliver meaningful reductions. Siloed structures endemic in mining companies prohibit productive collaborations between sustainability, operations, procurement, IT and engineering teams and the associated decarbonisation KPIs that each function is supposed to pursue.

5.

Lack of felt leadership and appropriate mindsets

It is challenging for employees to buy into and act on ambitious emissions targets if leaders at all levels of the organisation - from corporate executives to team leaders - do not champion the change and build alignment with day-to-day activities of employees. Decarbonisation, as with safety, can benefit greatly when leaders demonstrate their belief and act upon decarbonisation ambitions in a way that aligns the entire organisation. This is called visible felt leadership. For example, if leaders are seen overlook or delay maintenance schedules for equipment using diesel fuel, or procure non-reusable or recyclable materials, employees may not consider emissions reduction a priority. Inaction on such items can create a cultural context that inhibits progress.

6.

Insufficient data and monitoring frameworks

Most companies are only measuring emissions on an annual basis, rather than using real-time data and a mix of leading and lagging indicators that can give more meaningful insights on carbon intensity across operations. This makes it challenging to proactively manage reduction efforts.

7.

Skill gaps

As decarbonisation efforts include introduction of new technologies and significant optimisation of processes and systems, the workforce will need to be upskilled and adapt to new risk profiles, while also adopting mindsets and behaviours that allow for continuous improvement on decarbonisation. This is a challenge for an industry facing significant skill gaps and shortages, as well as competition for talent.

8.

Lack of cohesive and conducive international, national and local policy framework

Inadequate policy frameworks in certain geographies can inhibit financing, delay capex or remove incentives to decarbonise. An example of this is state monopoly electricity providers that prohibit independent power producers or have prohibitive grid connection fees and wheeling charges to protect their income. The US Inflation Reduction Act (IRA), on the other hand, is a good example of a policy that could accelerate the decarbonisation of grid electricity that will inherently support miners to reach their scope 2 objectives.

9.

Shortage of affordable funding (transition finance)

A combination of perception, regulatory pressure, and the need for sustainable transitions affects mining companies' ability to attract funding for green initiatives. These challenges are underpinned by the perception that mining is inherently linked to fossil fuels, energy transition uncertainty, lack of commitment to net-zero targets and the implications thereof. Clean energy investors want to see a just energy transition that balances economic realities with environmental goals.

10.

No financial incentives

For many mining firms, neither government subsidies/incentives nor carbon taxes are high enough to be an adequate incentive to reduce carbon emissions drastically. On the other hand, demand for carbon-based products, from affordable coal-based electricity to the convenience of the internal combustion engine remains high in many economies due to continued subsidisation of fossil fuel based energy production by governments.



Accelerating decarbonisation in the mining sector through leadership, capabilities and culture

Whilst an immediate focus on practical solutions is showing incremental improvements (as evident in the 2% annual reduction from the analysis) it will still fall short of SBTi. The step change required can only be achieved if leadership adopts a values-based approach and ensures the organisational capabilities drives a sustainable operations imperative.

When leaders demonstrate moving beyond just doing things right to doing the right things this values-based mindset will propagate into the organisation resulting a culture that overcomes these barriers.

Leaders can consider the following to demonstrate their commitment and spur action on decarbonisation:



Adopt internal carbon pricing aligned to net-zero targets

Traditionally miners have been very effective in solving and optimising operations for cost effectiveness. Adding an internal cost of carbon ensures all company functions (CAPEX and OPEX allocations) will inherently drive this “virtual” cost down through decarbonisation projects. The internal cost of carbon can be adjusted periodically depending on how well the company tracks on its objectives to ensure a sustainable decarbonisation pace. An external market-based index can also be used as a reference when setting internal cost of carbon.



Create a cultural context conducive to transformation

A commitment by leadership that is demonstrated through action and consistent engagement with employees helps to instil the mindsets and requisite behaviours within operational, strategic and normative management levels. Furthermore, eliminating siloes and encouraging collaboration between departments and functions can unlock opportunities to generate practical and innovative solutions to reduce emissions.



Improve data collection and monitoring

Increasing the availability of real-time data on emissions through a combination of carbon accounting software, IoT devices and AI analytics can help to provide the insights necessary to effectively optimise operational processes, and support decision-making.



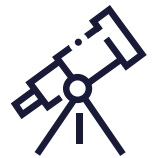
Improve productivity, reliability and energy efficiency

Improving in these areas can deliver significant reductions in carbon emissions while also significantly reducing costs. When comparing operational efficiencies with other decarbonisation levers such as sustainable fuels, alternative drivetrains and renewables the capital requirements are the lowest and the emission reduction potential as high as 20% of total emissions.



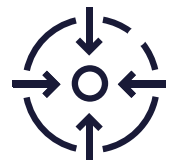
Take a long-term view on energy security and supply

Though some decarbonisation strategies require large capital investment, they can also greatly reduce risk and deliver significant value. For example, by using proven renewable energy technologies and electrifying hauling fleets, mines can eliminate a significant amount of risk related to energy security and supply. Therefore, companies should not discount longer-term investments due to high up-front cost.



Improved decarbonisation planning

Mining companies will be able to realise greater economies of scale by taking a global approach. When planned holistically, sustainability delivers multiple strategic, operational and financial upsides, especially when coordinated centrally through an executive vice president role dedicated to decarbonisation.



Co-creation of policy and financing frameworks

Mining companies have significant scope to help governments improve the regulatory and business environment and enable best practices for the decarbonisation of the sector. Furthermore, working with governments to introduce incentives and tax breaks can encourage uptake of existing technologies as well as state-of-the-art clean tech that may not yet be fully financially viable. Such co-creation of policies can assist individual companies to meet their targets which ultimately contribute to meeting Nationally Determined Contributions at a country level.



Better quantify value of decarbonisation efforts

Quantifying the impact of decarbonisation efforts, both in terms of emissions avoided and value created, can help unlock further investment and demonstrate commitment to shareholders and stakeholders. Companies should also consider the cost they will incur by missing their targets – difficulties in raising capital for further investment or erosion of right-to-operate, for example.



Ultimately, there are clear, proven strategies that can help miners to overcome barriers and accelerate their decarbonisation journeys.

Underpinning this is the requirement for a mindset shift within the industry – leaders must recognise the value of reducing emissions, create the appropriate cultural context, build the right organisational and individual capabilities, and develop enabling structures and processes.

In doing so, they can drive significant reductions that are sustainable in the long-term, and thereby support more positive outcomes for all stakeholders.

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