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## Mining remains the key driver of the green energy transition.

**As the world races towards net zero, mining is central to the green energy transition, supplying the critical minerals powering sustainable solutions. Balancing this demand with ESG responsibilities defines the sector's role in the future energy landscape, writes Karabo Moeletsi, Principal of Mining and Resources at Nedbank Corporate and Investment Banking.**

The green energy transition is one of the most defining challenges of our time and a vast supply of critical minerals underpin its progress. Often cast in a legacy light, mining is emerging as an enabler of this shift, linking the past to a sustainable future. **Yet, this dual role – being a facilitator of progress and a steward of responsibility – places mining companies under sharper scrutiny than ever before.**

The demand for critical minerals such as lithium, cobalt, nickel, copper and graphite is soaring as the world intensifies its efforts to meet net-zero targets. To support this transition, a large expansion of green technology deployment is needed, underpinned by a reliable supply of these essential

materials. However, the supply gap remains considerable, with current projections falling short of what is needed to meet global ambitions by 2050.

**The scale and urgency of this challenge vary across different minerals. Mining companies must carefully evaluate opportunities, ensuring that any expansion aligns with their long-term strategies and investment cases while balancing operational and financial realities.**

Financing is crucial to bridging this gap. Mining companies are pursuing creative mechanisms such as partnerships and green bonds. However, these strategies must align with sustainable business models, avoiding a 1-size-fits-all approach. Investors, especially those driven by environmental, social and governance (ESG) considerations, are taking a similarly nuanced approach. Their mandates call for a large increase in critical minerals but insist on accountability for managing ESG risks and capitalising on ESG opportunities.

These investors closely examine how green minerals are supplied, ensuring operations do not harm local communities or the environment. **While the industry has improved ESG performance, aligning incentives, profit goals and sustainability remains challenging. Incentives include regulatory**

**frameworks, shareholder expectations, and reputational benefits.** However, conflicts with profit-driven goals persist as a major hurdle.

Geopolitical shifts add further complexities. Regional conflicts and bilateral country risks create uncertainty, challenging the ability of mining companies to make long-term decisions. Companies often mitigate these risks by adjusting logistics, using alternative routes for production inputs and exports. However, these measures come with higher costs and lower margins, raising questions about their viability as long-term solutions.

**Technology is helping to tackle some of the key challenges in mining, with the use of tools like collision avoidance systems improving safety, drones transforming surveying processes, and data analytics optimising a mine's plans.** Companies leading the way are already putting these improvements into action. For example, Capital Limited's Chrysos PhotonAssay laboratory in Tanzania offers a cleaner, more sustainable alternative to traditional assay methods, significantly reducing CO<sub>2</sub> emissions and waste. Similarly, De Beers' Tracr platform leverages blockchain technology to track diamonds, promoting transparency and accountability across the supply chain.

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Despite these promising developments, mining is still transitioning to a cleaner, more innovative sector. Investors recognise the potential of these technologies but understand that systemic change requires ongoing innovation and collaboration.

**Partnerships between the mining and renewable energy sectors are also delivering results. Mining companies are spearheading renewable energy projects, some are self-developed to align with operational strategies and others are developed through collaborations with independent power producers (IPPs).**

Long-term agreements, often spanning 20 years, help reduce emissions and electricity costs while enhancing national energy capacity through grid-linked projects. These partnerships show how mining companies can innovate and adapt to environmental and operational pressures while supporting broader sustainability goals.

The green energy transition and mining are deeply connected. Transition metals support technologies like electric vehicles and wind turbines with unique properties that make substitutes difficult to scale. For instance, the unmatched combination of physical characteristics of copper and the role of lithium in batteries highlight their essential role. The electrification of transport,

digitisation of energy grids, and decarbonisation of industries all depend on a steady and responsible supply of these materials. Despite the urgency to deploy green energy technologies, mining must proceed cautiously, embedding sustainability into its core. This requires addressing immediate challenges while preparing for long-term shifts, balancing the demands of energy transition by protecting the environment and local communities.

As Mining Indaba 2025 approaches, the opportunity to engage in these critical discussions becomes more important than ever. It is a time to reflect on the progress made so far and plan for the future, reaffirming the role this sector has as being both a driver of change and a custodian of sustainable development.

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