Morgan Stanley

INVESTMENT MANAGEMENT

Tales From the Emerging World

Mining for a Greener Future

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After two weeks of UN climate talks in Egypt, COP27 ended with little progress made on climate commitments and the ramping up of finance for emerging markets to transition away from fossil fuels. Given financial constraints in emerging markets, we believe mobilizing capital to climate solutions is key, but with emissions continuing to rise globally we are also looking at what decarbonization means in practice. We believe that corporates can play a more active role in driving decarbonization, especially where economic incentives already exist. For us, COP27 is a reminder that the real delta is about making progress, not lofty promises.

As investors, this suits us just fine. When it comes to evaluating our own portfolio's carbon footprint, we focus on companies that have practical decarbonization pathways and will help drive real change in the emissions landscape over the next three to five years, in particular among our highest emitting companies. Overall, we believe that the "delta of change" is more meaningful than an absolute emissions target. We strive to identify companies that are moving in a positive direction and try to embed this in our investment approach and philosophy.

Industries don't come with much of a worse environmental reputation than mining. The sector contributes about 8% of total global greenhouse gas emissions[1] and is often at the center of environmental disasters, such as the Vale tailings dam failure in Brazil that tragically killed 270 people in 2019. Yet the mining sector has rapidly evolved from an environmental laggard to one consisting of forward-thinking corporations, who are implementing more environmentally sustainable initiatives. This sort of foresight is especially important as the mining sector will be a key provider of raw materials needed in the global energy transition *(Display 1)*. This means a realistic decarbonization roadmap is not only desirable, but it is vital for the industry. In fact, one of our portfolio companies is currently implementing what we believe is a viable decarbonization pathway.

[1] Ritchie & Roser, "Emissions by Sector," 2020.

Portfolio Company Case Study: Driving Decarbonization and Seeding A Green Hydrogen Industry in South Africa

Broadly speaking, mining emissions can be broken down into three categories:

- **SCOPE 1** — Emissions from Operations
- **SCOPE 2** — Emissions from Electricity Purchased
- **SCOPE 3** — Emissions from the Supply Chain

Decarbonization means better energy efficiency, increased electrification or use of alternative clean transport and switching to renewable energy. Thus, mining companies will need to 1) switch to cleaner fuel sources for mine hauling trucks and 2) increase energy independence from the grid by building renewables capacity. About 40-50% of total CO_2 emissions from the sector can come from diesel use in mine hauling trucks (Scope 1).[2] Globally, there are about 28,000 large mine hauling trucks in service that are mostly diesel-powered, emitting 68 million tons of CO_2 per year,[3] more than the carbon footprint of Singapore or Greece.[4] We see miners actively exploring greener solutions ranging from electrification to using alternative and cleaner fuels, including hydrogen, which requires a complex local supply chain involving solar-powered electrolysis, localized storage, and refueling systems.

For one of our portfolio companies, a South African platinum miner, hydrogen-fueled trucks will be the main solution to reduce Scope 1 emissions. Platinum plays an important role in clean technology as a key mineral for catalytic converters and hydrogen fuel cells. The company has built a hydrogen production, storage and refueling complex at one of its sites that includes the largest electrolyzer in Africa and a solar photovoltaic (PV) facility to support production. Earlier this year, the company unveiled the world's first large hydrogen-fueled mine haul truck and plans to roll out another 40 by 2030. The company is not only using these trucks to decarbonize its own production, but also to prove the viability of this solution to the broader industry. We think this will be an interesting opportunity to monitor.

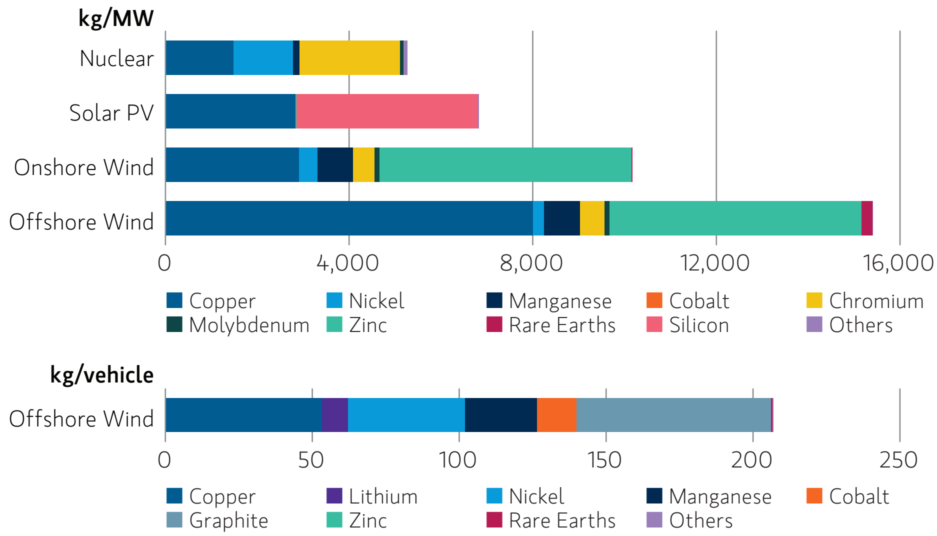
For this miner, Scope 2 emissions account for nearly 90% of its total emissions.[5] The national utility uses coal to generate 80% of electricity in South Africa but has struggled to maintain reliable supply, let alone develop cleaner energy sources.[6] For this company, tackling emissions involves developing a regional network of distributed solar plants that will generate 3-5 gigawatts of energy by 2030. Indeed, this is an example of how an energy trilemma can become an energy trifecta under the right circumstances, by creating energy that is cheaper, cleaner, and more reliable.

This company has also made a conscious effort to develop economic opportunities in South Africa. The mining industry, one of the largest private sector employers, employs almost half a million people and has traditionally accounted for about 8% of South Africa's GDP.[7] Now, the industry could also catalyze an inflection point in private sector investment. Overall

DISPLAY 1

Raw Materials Are Critical to Clean Energy Solutions

Minerals used in selected clean energy technologies



Source: IEA, MSIM.

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[2] Legge, Muller-Falcke, Naucler and Ostgren, McKinsey & Company "Creating the Zero-Carbon Mine." October 2021.

[3] Muralidharan, Kirk and Blank "Pulling the Weight of Heavy Truck Decarbonization." 2019.

[4] Emissions Database for Global Atmospheric Research (EDGAR) "GHG Emissions of all World Countries." 2021.

[5] Company-reported data.

[6] Burkhardt, Paul, Bloomberg "Eskom May Use Coal for Longer as South Africa Develops Renewables." July 2022.

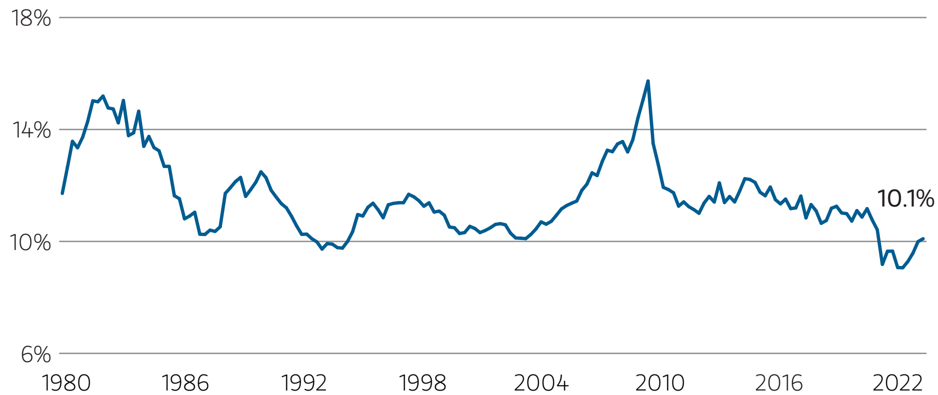
[7] MSIM, Haver, Statistics South Africa.

private investment in South Africa is back to sanctions-era lows, barely marking double digits at 10% of GDP *(Display 2)*. The investment of green energy itself will be material at roughly 3% of GDP.[8] Just as importantly, by investing in their own electricity supply, the mining industry will be able to help solve load-shedding and free up grid capacity for the rest of the economy. In turn, the increased supply of electricity should improve both business and consumer confidence which could meaningfully contribute to economic growth. In the long run, if hydrogen investment takes off, this could also add more investment and jobs, which could help grow GDP. In fact, we believe that this company is providing a viable blueprint for the whole mining industry to follow *(Display 3)*.

DISPLAY 2

Is Private Investment on the Rise in South Africa?

Private Investment as a percentage of GDP

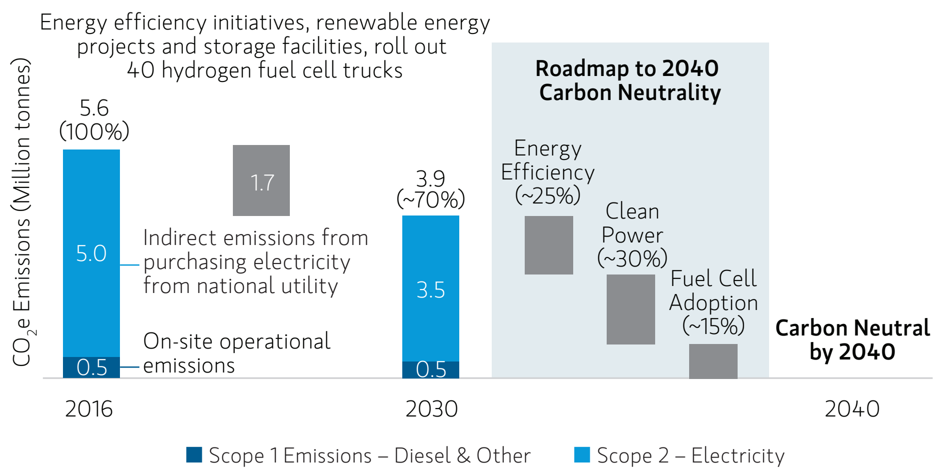


Source: MSIM, Haver, Statistics South Africa.

DISPLAY 3

The Blueprint for a Cleaner Mining Industry

A South African platinum miner's decarbonization roadmap



Source: MSIM, Company-reported data.

Conclusion

In the case of South Africa, mining companies could help provide energy that is cheaper, cleaner, and more reliable. Early investment in hydrogen provides not only a cleaner way to mine but can also seed a new "use case" for the very elements being mined from the earth. For the overall country, these decarbonization investments could result in a revival in private sector investment.

The sector thus offers many examples of hope for actual progress. Mining companies are increasingly being called upon to address climate change and large capital investments are needed for mines to fully decarbonize. Many measures, such as increasing renewable energy usage and improving efficiencies, are already economically viable today. In our view, the mining industry can approach decarbonization as an opportunity to lower its cost base, and catalyze new sources of demand and improve its reputation with the larger public.

[8] MSIM, Standard Bank.

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