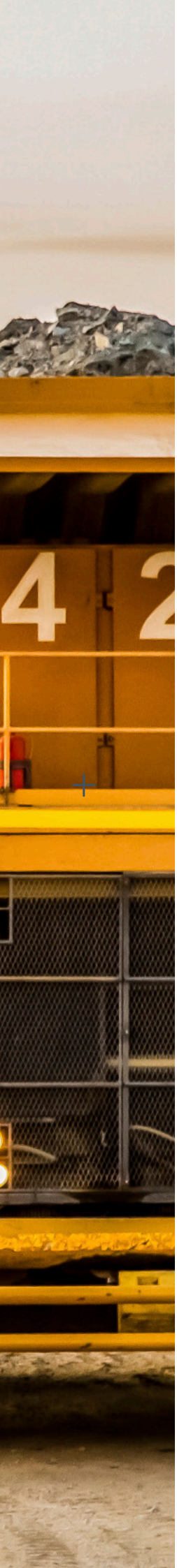
Key trends shaping the mining and metals sector in Southern Africa

HATCH



Introduction

Organizations are shifting focus and adapting to changes shaping global industries, resulting in an increased focus on sustainability, the adoption of digital tools and artificial intelligence, and adaptation to global supply chain changes.

These shifts are affecting companies across all sectors, especially in mining and metals. In Southern Africa, these trends have been amplified by infrastructure challenges, reduced risk appetite, and limited capital flows. With this in mind, executives are thinking strategically across five key themes for their businesses:

1. Growth and portfolio diversification
2. Digital
3. Resilience in uncertain business environment
4. Navigating pathways to net zero
5. Maximizing value from capital spend.

1

Growth and portfolio diversification

As the world works to reduce carbon emissions and mitigate climate change, there's an increase in the expected demand for resources enabling the energy transition, especially for renewables and energy storage technologies. These resources also include nickel, cobalt, copper, graphite, phosphates, and manganese as positive contributors to the overall commitment to greener, safer solutions.

The diversification of global supply chains is driving the need for mining and metals companies to rethink their portfolios, including consideration of regions within which they have not historically participated. Choices exist across three dimensions: new commodities, new regions, and down-streaming in the value chain. Harmony Gold, traditionally a single-commodity-focused operator, acquired a copper project in Australia. Similarly, Anglo American moved further down the value chain by collaborating with Aurubis on copper recycling, while Thungela resources entered a new region by acquiring an Australian coal mine.

When considering where to invest, organizations need to understand the demand-growth forecast for commodities of interest and overlay this with the flow of capital, and assess if the flow matches or exceeds the expected demand growth, or if there are commodities that are under-capitalized.

Platinum and nickel have experienced significant increases in capital between 2019 and 2022, whereas manganese and aluminium experienced low levels of capital by comparison over the same period. Combining the forecasted demand growth rates and historic capital flows, we see four specific groupings of commodities emerge:

- ***High growth.*** Commodities with high demand growth forecast that are under-capitalized such as lithium and zinc-lead. Here, investors want to capture prime assets for long-term return.
- ***Pragmatic investment***. Close matching between capital investment and anticipated growth in commodities such as aluminium, copper, and manganese. There are still opportunities for investment, but companies must ensure that investments lie within cost-competitive assets.
- ***Capacity rich***. Commodities with high capital investments compared to demand growth forecasts, such as platinum and nickel. Investors need to exercise caution and revisit existing assets for resilience against lower prices and review new investments.
- ***Harvest zone***. This includes commodities whose long-term demand is in decline. Value needs to be maximized to reinvest in the energy transition in the medium- to long-term.

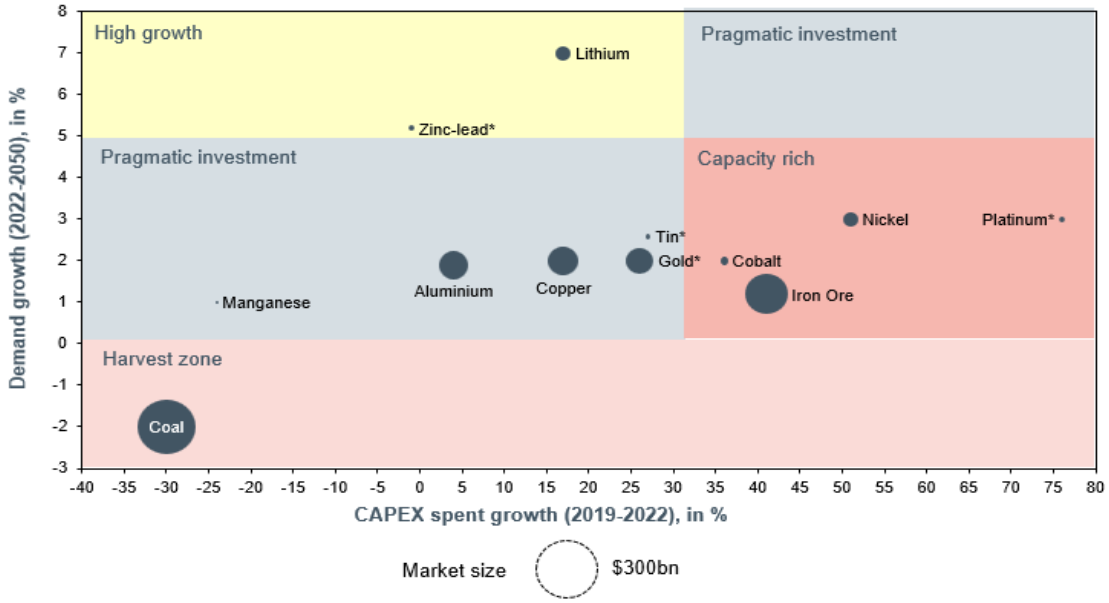


Exhibit 1: Four investment zones based on demand growth and capital flows (non-exhaustive).
Source: S&P Global, Wood Mackenzie
Notes: *forecasted up to 2030

To understand Africa's opportunities, players are assessing how investment in exploration and production compares to Africa's share of global resources and reserves. In the high-growth zone, we see proportionately higher exploration spending for lithium, indicating availability of explored assets on the market for acquisition and further investment.

In the pragmatic investment zone, we see exploration matching the resources and reserves, coupled with proportional capital investment and increased demand. Focus in this zone should be on gaining interest in existing viable assets or extending existing operations.

In the capacity-rich zone, we see lower levels of exploration. Assets in this zone have already progressed to project stages and the market is cautious about oversupply.

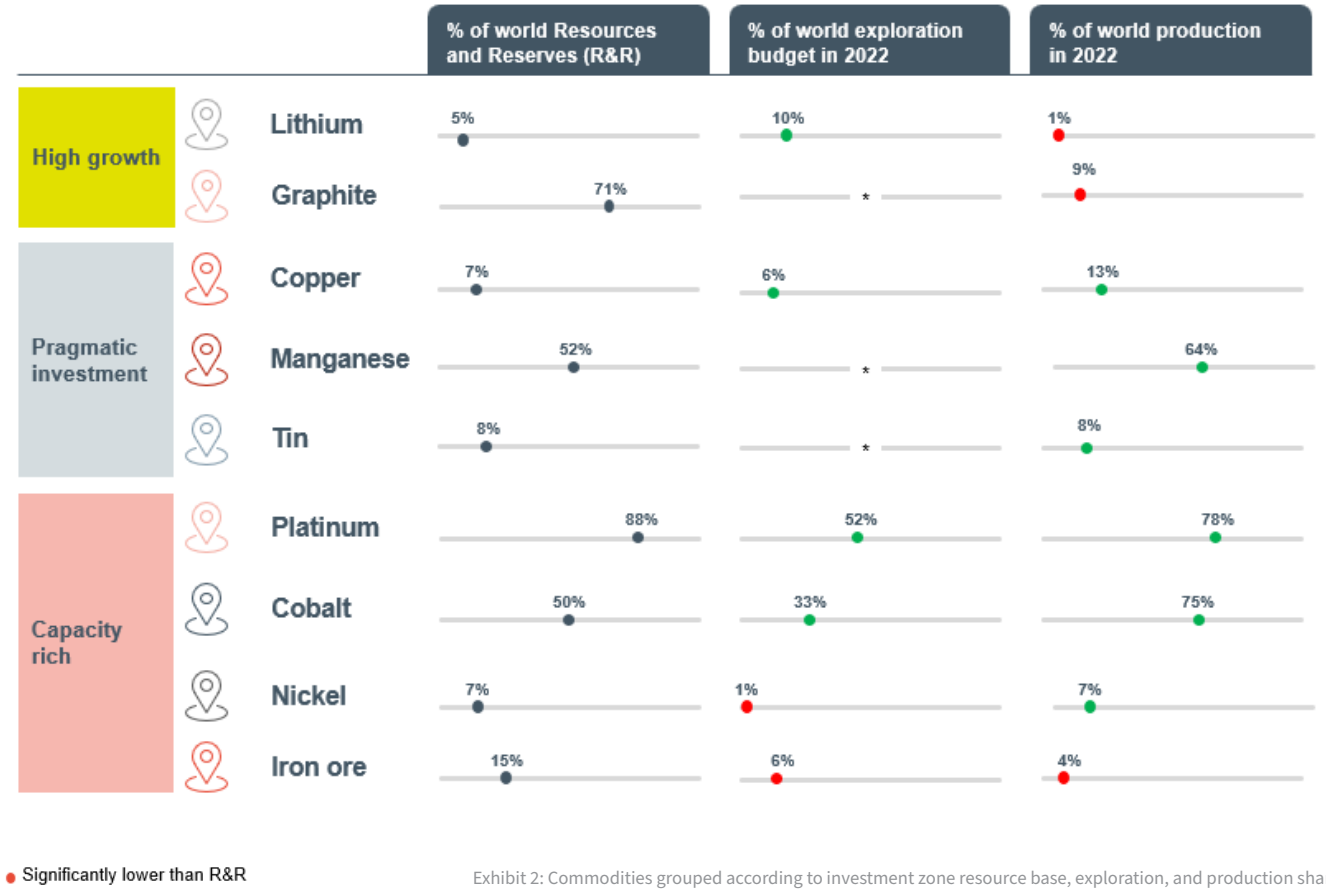


Exhibit 2: Commodities grouped according to investment zone resource base, exploration, and production share.
Source: S&P Global
Notes: *no data

For further downstream participation, mining companies must understand the relationship between processing capacity and mining production in Africa. There are two clusters of commodities, with some *moderately* under capacitated, such as iron ore and nickel, while others are *significantly* under capacitated, such as cobalt and manganese.

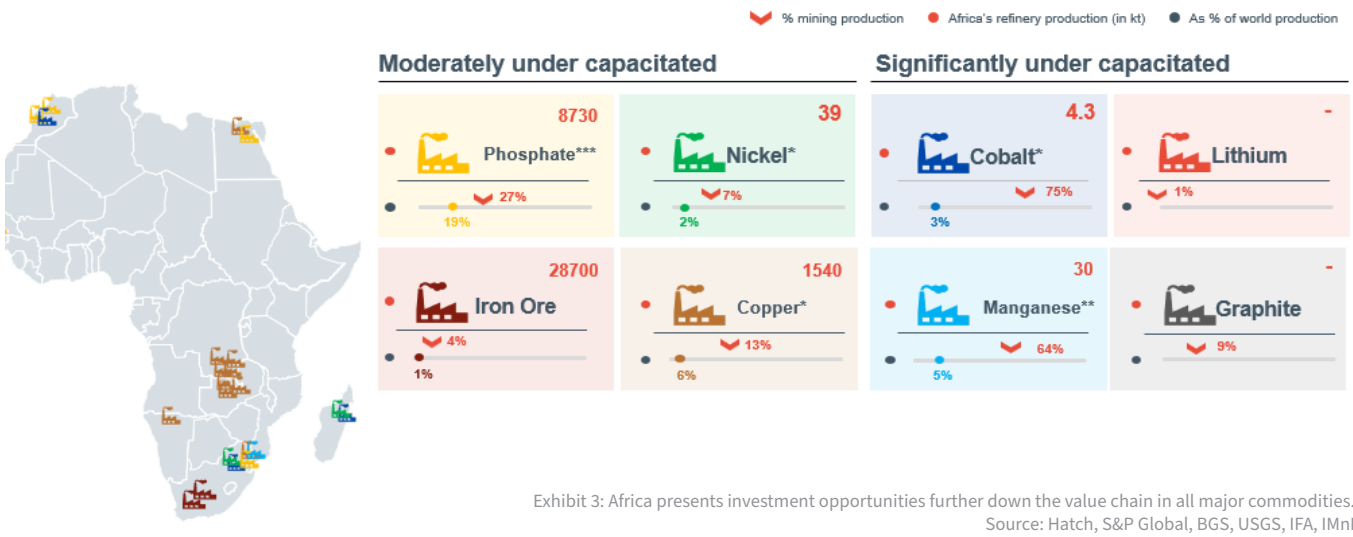


Exhibit 3: Africa presents investment opportunities further down the value chain in all major commodities.
Source: Hatch, S&P Global, BGS, USGS, IFA, IMnI
Notes: *as of 2020 **as of 2022 ***as of 2021

Having considered the factors influencing portfolio composition, we see players consolidating this into a portfolio strategy and roadmap. Six dimensions are considered when configuring the portfolios: location (e.g., local, regional, and continental); value chain (e.g., extraction, processing, refining, first use, and final product); commodity mix (e.g., existing commodities, adjacent commodities with a similar mining method, and transformational commodities); go-to-market (e.g., customized products for green downstream such as green steel and battery manufacturing, in contrast to generic products targeted at metals traders, etc); investment return profile; and investment scale.

Organizations are making gradual transitions. Sibanye Stillwater, once an operator of limited-life gold assets in South Africa, transitioned to a global portfolio of commodities that are relevant to the energy transition and circular economy. The progressive nature of their journey gave them the capacity to grow geographically and develop global functionality, ultimately enabling the integration of multiple commodities.

There's a three-step approach to developing and executing a growth and diversification strategy of this magnitude:

1. Set strategic direction by assessing where the value is. Assess risk-comfort and review strategic strengths before prioritizing areas of interest.
2. Prioritizing potential investments by defining key evaluation criteria, performing asset scans, and shortlisting the best options.
3. Developing deal structures, conducting due diligences, and executing deals.

2

Digital

The implementation of digital tools has created a shift in the way of working, most notably in the reduction of the management information gap, which is moving from *reactive* reporting to *proactive* actions and ultimately resulting in faster decision-making.

A series of building blocks are needed to operationalize digital initiatives such as sensors, networks, platforms, and analytics. However, the value of digital is only realized when it leads to better and faster decision-making such as the reallocation of equipment or changing of plant set-points in real time.

The challenge is that only 30% of digital transformations succeed, as they are often driven by taking a shotgun approach, rather than by embedding solutions into ways of working and aligning solutions with value.

This observation has been echoed from industry executives claiming that digitization has been approached haphazardly, that the overall vision and strategy lacks clarity, and that point-solutions are being deployed without an understanding of the impact on people and processes.

Companies that deliver their digital transformation successfully tend to focus on six key factors:

- A clear strategy and vision that aligns operations objectives with digital capabilities and opportunities.
- The identification of value cases that impact operational decision levers.
- The combination of data-driven recommendations with expert knowledge for optimal decisions.
- Implementation at scale with enterprise-grade solutions ready for operations deployment.
- Clarification of analytical recommendations that build the "human-machine" partnership.
- Deployment of the full life cycle of the asset.

By setting clear parameters surrounding *ambition* and *approach*, organizations can operationalize these factors and align initial launch with scaled roll-out and execution.

The *ambition phase* is aimed at taking stock of current initiatives, understanding value, and informing a set of use cases. We have seen an expanded portfolio of use cases across the value chain. These include effective asset management through digital and predictive maintenance; improved operational decision-making and operating stabilities through digital twins; advanced process controls; and the management of catastrophic risk- and environmental-impact through digitization in tailings management and rehabilitations.

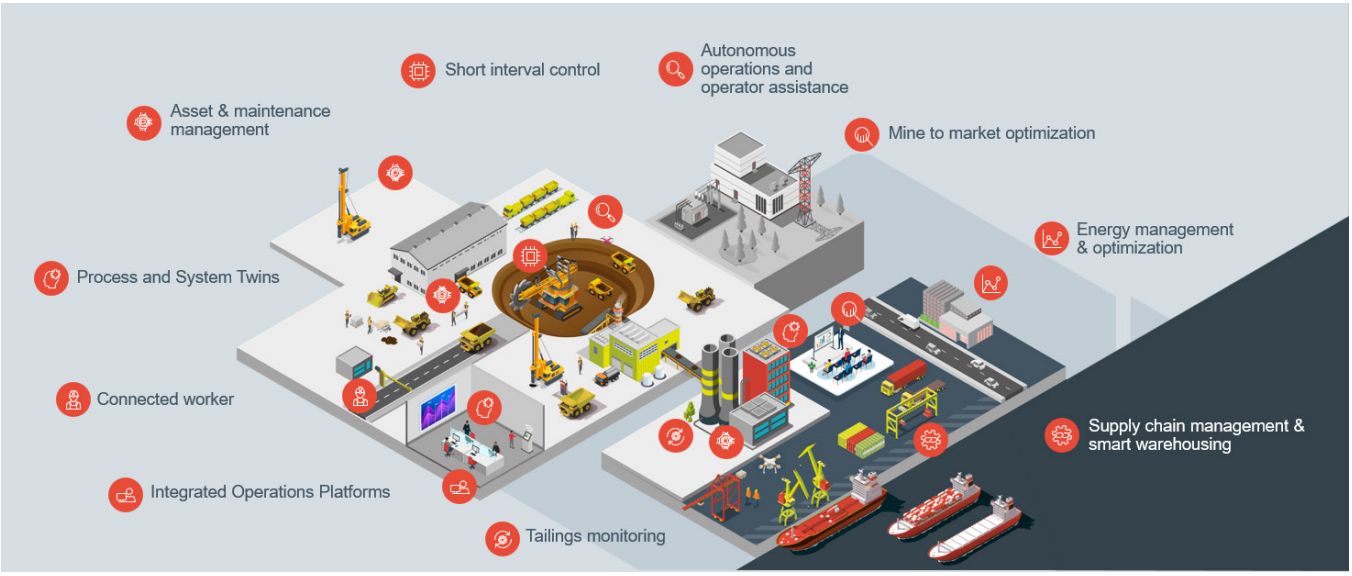


Exhibit 5: Multiple digital opportunities across the value chain.

EXAMPLE USE CASE: Integrated operations

Companies can experience challenges with integrated operations due to a lack of clarity on decision rights across the operations and limited in-shift optimization. This leads to a reactive view on Key Performance Indicators (KPIs) and operational performance.

These challenges can be addressed by the implementation of Integrated Remote Operation Centre (IROC), which provides real-time monitoring of all operational KPIs across the value chain and operations. Performed by specialists with experience in cross-functional co-ordination and issue resolution, this results in integrated planning and performance reporting while increasing production throughput by 10 – 20%, reducing operating costs by at least 3%.

Exhibit 6: Integrated Remote Operation Centre (IROC)

EXAMPLE USE CASE: Processing twins

The deployment of digital twin technology can address challenges faced in process performance such as the reliance on operator knowledge and experience, variability in operator performance across shifts, and delay in process adjustments due to feed variability; all of which can lead to inconsistent production.

Processing and smelting digital twins can provide a central view and repository of historical operating conditions, creating real-time insights and process adjustments to balance feed, process controls, and target production output. Digital twin technologies have been seen to deliver significant value of 10 – 20% campaign life improvement and $5.00 – $10.00/t reduction in production cost.

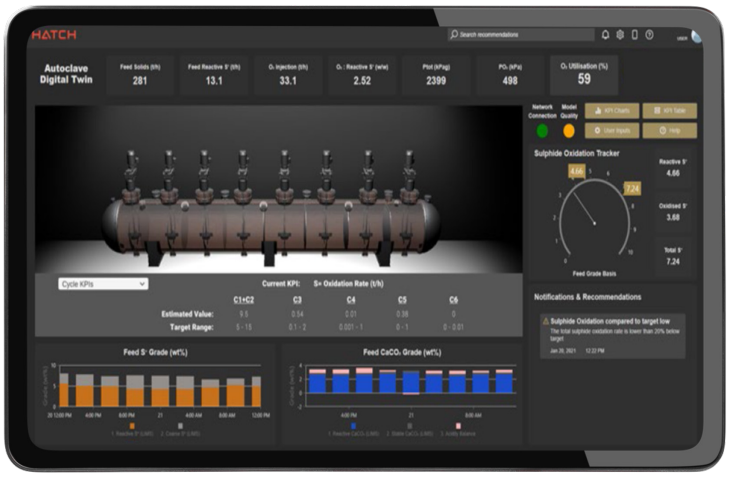


Exhibit 7: Process twin – Autoclave digital twin.

EXAMPLE USE CASE: System twin mine-to-market optimization

Some organizations are also experiencing challenges in managing their value chain due to decentralized data resources, isolated planning tools, and insufficient production scenario planning, with simplified optimization methodologies also contributing to the complexity of operations.

A mine-to-market optimization tool can address this by providing a multi-objective decision-making feature to minimize operating costs while ensuring operational, quality, and decarbonization targets are met. These platforms provide the best blending strategies in the case of stockpile optimization, delivering significant value improvement of $0.5 – $1.00/t.

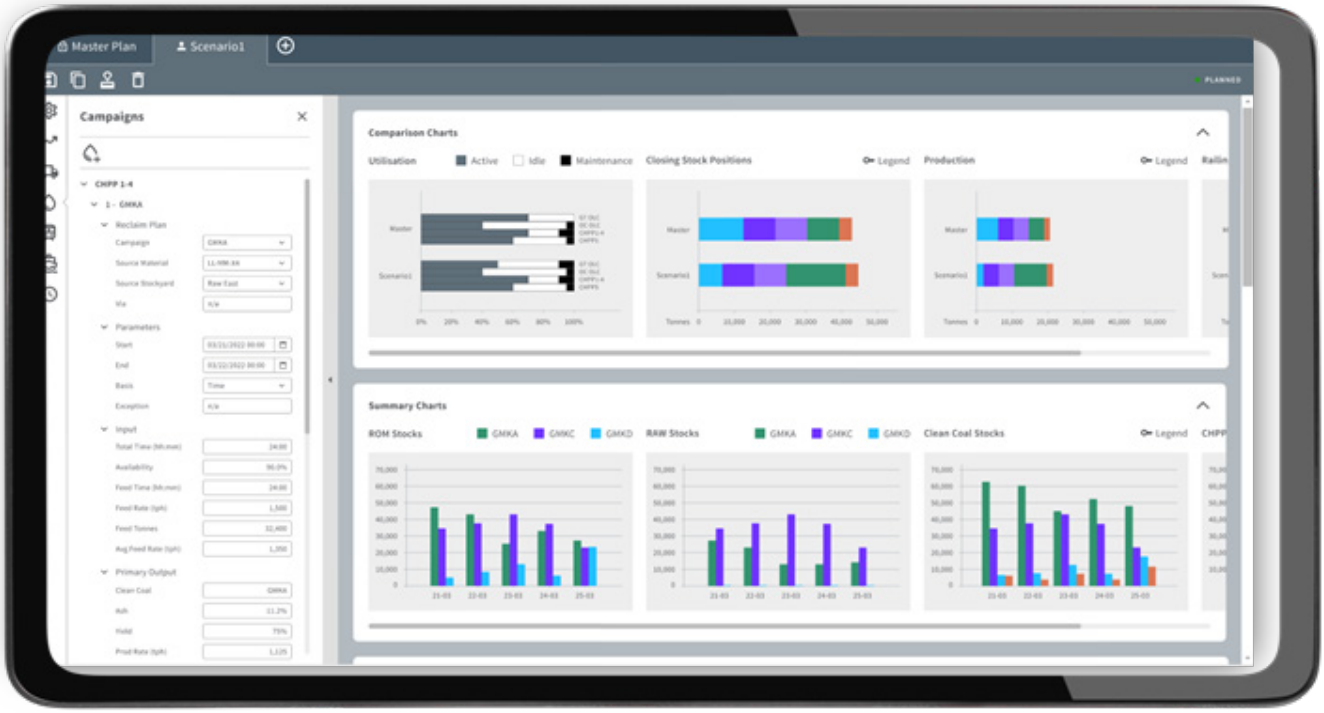
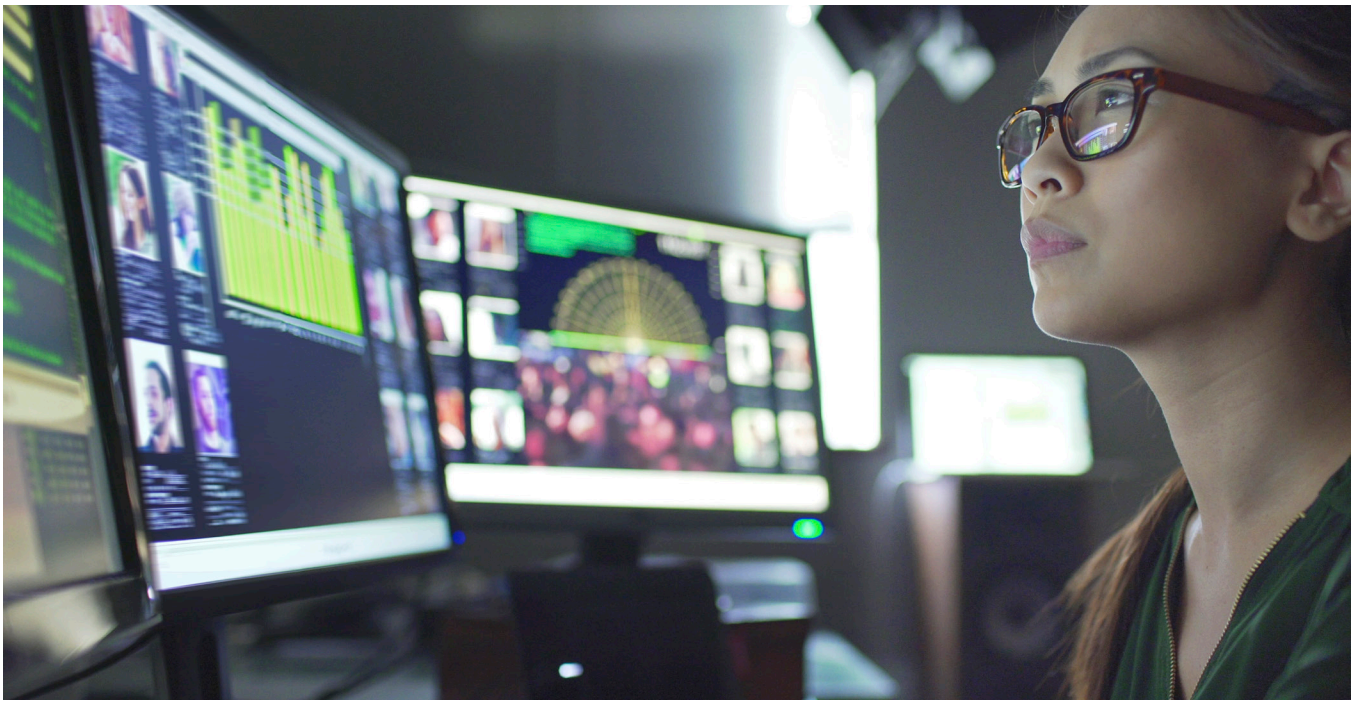


Exhibit 8: System twin – Mine-to-market optimization.



3

Resilience in uncertain business environment

Organizations need to adapt to an increasingly uncertain business environment with more disruption and risk than before, especially in Southern Africa. Some of these disruptions are specific to the region, such as deteriorating infrastructure, policy uncertainty, social unrest, and increasing operating costs. For example, South Africa has seen deterioration within energy infrastructure, translating into loadshedding increasing from 1,190 hours in 2021 to 1,900 hours 2022, and an 11% reduction on rail and port export capacity in the last year.

As a result, organizations are taking additional measure to building resilience. The implementation of various mitigation strategies is evidence of this—including Anglo American forming a renewable energy partnership with EDF, Rio Tinto partnering with Motorola to design and roll out a back-up communications solution for an Integrated Operating Centre (IOC), and a major building resilient and innovative supply chain partnerships including localization.

Infrastructure risk is top of mind for executives, particularly energy, water, rail, and ports. There are four key levers that organizations can use to address their systemic infrastructure risks:

1. Reduce infrastructure demand
2. Build in-house infrastructure capabilities
3. Partner with the private sector to reduce reliance on public infrastructure
4. Collaborate with the public sector to resolve capacity constraints.

These four levers can be implemented over three horizons to build business resilience:

Short-term focus. This is largely centred around reducing infrastructure reliance and demand e.g., via energy and water efficiency programs.

Mid-term focus. This focus is premised around the in-sourcing of infrastructure capacity and partnering with the private sector through establishment of in-sourced renewable energy capacity and scaling up of water recycling and treatment projects.

Long-term focus. In the long-term, interventions are focused on collaboration with infrastructure providers and decreased reliance on bulk commodity export requirements through local beneficiation and offtake agreements.

Time horizon: Short-term (0-12 months) · Mid-term (1-3 years) · Long-term (>3 years)

Infrastructure Options vs Resilience Levers	Reduce Reliance	In-Source	Partner with Private Sector	Collaborate With Infrastructure Provider
Energy	• Drive energy efficiency program • Implement new technology that require less power	• Build captive power plant (e.g. renewable plant) • Build energy storage	• Partner with Independent Power Producers (IPP) for power off-take	• Collaborate with utility producer to access and improve the generation and transmission performance • Support utility producer with off-take certainty for investment justification
Rail & Ports	• Beneficiate more locally, especially bulk commodities • Attract off-takers into the local market to reduce bulk commodity exports requirements	• Utilise road network to uptake additional production volume	• Create long term demand visibility to enable expansion investment • Partner with private ports. E.g., Port of Matola (TCM) in Moz. • Partner with Private Sector to operate & maintain key sections of rail and port	• Enter Public-Private Partnership (PPP) for joint funding, efficiency improvement programs • Create long term demand visibility to enable expansion investment
Water	• Implement water efficiency programs and advanced analytics	• Execute water treatment, capturing and storage projects	• Collaborate with other mining houses on building water lines	• Work with municipalities to upgrade and operate water systems utilising SLP funding • Collaborate with water utilities for bulk water schemes

Exhibit 9: Infrastructure resilience initiatives.

An example of private sector collaboration is the formation of Intensive User Energy Group (IUEG) in Zimbabwe. Sustained power outages affect mining operations and industrial users with an 8,000 MW electricity deficit, representing 40% of installed capacity. This demand deficit is expected to reach 10,000 MW by 2030.

In response to this challenge, IEUG was formed with the intention to pool financial resources and procure cost-effective baseload electricity for their members. To date, over 600 MW generation capacity has been secured with investment programs, with an additional 8,000 MW set to come online in the next decade.

Another example of addressing infrastructure constraints through collaboration is the Tonkolili Iron Ore Mine expansion in Sierra Leone. The mine needed an increased rail and port export capacity from 20 to 25 mtpa to support its growth. The mine partnered with a rail operator to implement an improvement program to increase line capacity by identifying bottleneck constraints and implementing operational initiatives in a phased manner. Jointly, they were able to record a 40% improvement in volumes within the first four months.

Improving supply chain resilience requires implementation of a combination of initiatives across inbound and outbound supply chains. Increasing resilience of inbound supply chains requires a combination of digital risk exposure and inventory buffer management, as well as diversifying and localizing suppliers and capabilities. Similar to inbound, de-risking outbound supply chains can be achieved through a diversification and nearshoring of customer base as well as dynamic value chain simulation and optimization.

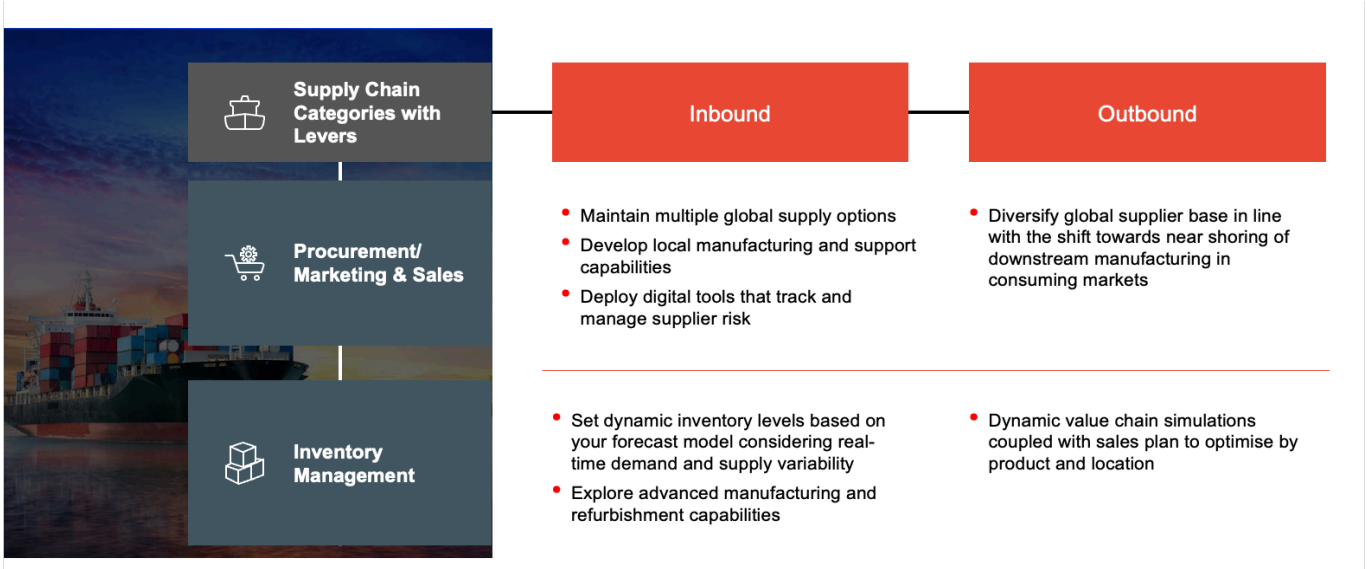


Exhibit 10: Supply chain levers.

An example of successfully localizing supply chains with an independent power producer focusing on distributed, decentralized and onsite energy solutions in South Africa, who were able to increase local sourcing to 37%, with plans to increase further to further increase to 50%. They were able to achieve this by mapping their components against local manufacturing capacity and engaging with local supply networks, including community-based suppliers.

In another case, a Southern African bulk commodity player wanted to manage outbound supply chain risks. In response, they implemented a digital solution that balances supply and demand and optimizes logistics and inventory management. The solution maximized capacity usage on the export logistics by modelling the entire value chain and reconciling discrepancies between operational and sales plans using real-time data.

4

Navigating pathways to net zero

Globally, more countries and organizations are committing to net zero and carbon neutrality. We see countries in Eastern Europe and Asia committing to carbon neutrality by 2060 while the rest of the world has set their targets toward 2050, including Southern African countries. Many major mining companies have set their net zero commitments to 2050, with significant emissions reduction by 2030, with Southern African mining companies having set similar commitments. Key trends that are driving global movements on targets arise from stakeholder pressure, policy drivers in key operational locations, competitive advantages for greener products, and the increase in stringent customer requirements across commodity markets.

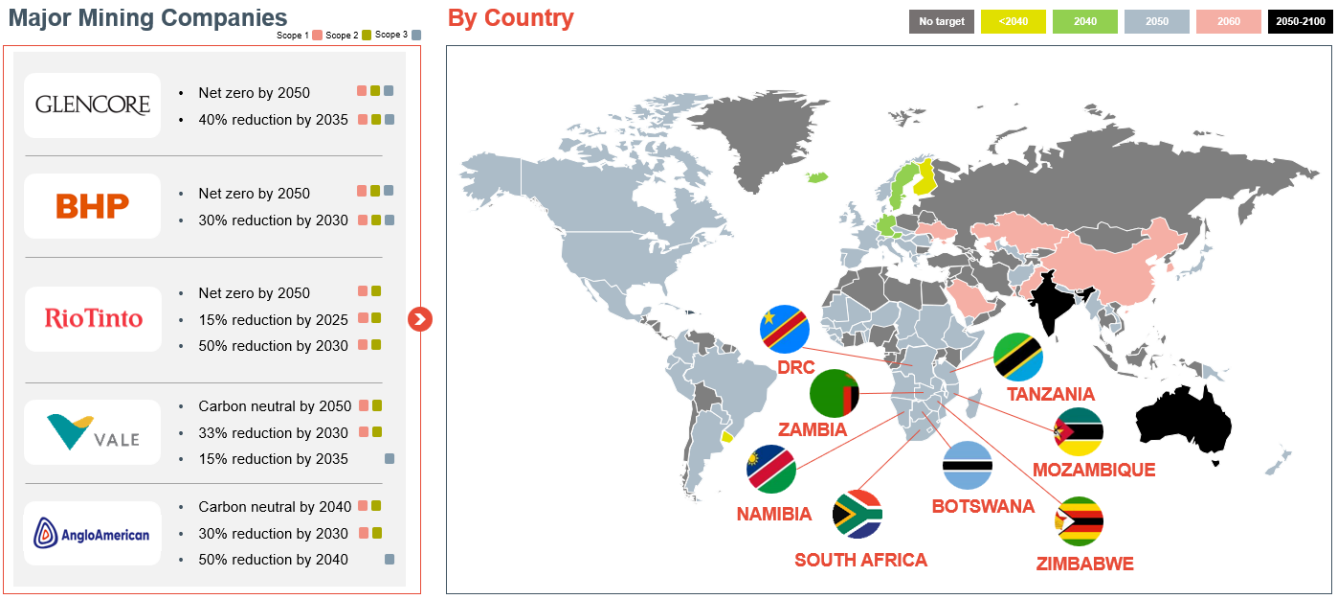


Exhibit 11 : Net zero commitments by Southern African Countries.
Source: https://www.visualcapitalist.com/wp-content/uploads/2021/06/Race-to-Net-Zero-Carbon-Neutral-Goals-by-Country-Full-Size.html

Domestically, we see significant Scope 1 and 2 reduction targets by 2030 that will be unlocked by switching from high grid emissions factor to renewable power alternatives. Most mining activities in Southern Africa lie further upstream in the value chain, where the decarbonization of these processes will be a key requirement for green product demand. Beyond their own operations, mining companies are also under pressure to undertake more Scope 3 abatement by focusing increased attention on decarbonization opportunities and developments in the total value chain.

Southern African mining companies' commitments

Exhibit 12: Net zero commitment by Southern African mining players.

Organizations are operationalizing their commitments by acting on initiatives spanning three-time horizons.

In the short-term, companies are accelerating adoption of renewable power, driven by recent developments such as the removal of 100 MW registration threshold in South Africa, as well as the streamlining of regulatory processes including Independent Power Producers (IPPs) and Virtual Power Purchase Agreements (VPPAs). However, there are still challenges that need to be addressed for the at-scale adoption of renewable energy. These include addressing constraints on grid capacity and infrastructure, frequent changes to regulation, and the high intermittency of solar and wind, which become a challenge at higher penetration of renewable generation.

There are several ways industry players can unlock the next wave of renewable projects and address current challenges. These include moving from on-site to distributed renewable power generation; managing intermittency through hybrid technologies; (e.g., concentrated solar power for process heat, captive vs. wheeling, molten salt storage vs battery energy storage systems, etc.); implementing demand-side levers to optimize load profiles needed when operating at higher renewable generation shares; and collaborating with renewable energy players or aggregators to pool demand.

In addition, we see a focus on accelerating adoption of process efficiency initiatives such as waste heat recovery, use of energy management systems including smart switches and variable speed drives, and advanced process control and productivity improvements.

There are, however, challenges limiting the full value-capture of process-efficiency initiatives. These include the high number of process and energy efficiency projects needed to meaningfully reduce emissions; resource and specialist skill constraints to implement the large number of initiatives; insufficient instrumentation for automation and reporting of energy consumption; competing funding priorities; and marginal business cases due to low energy costs (on a global basis) and limited government and tax incentives.

To fully capture the benefit of the process efficiency initiatives, organizations should consider implementing a carbon lens in the project evaluation, having dedicated teams to drive the portfolio of initiatives, and developing a framework for quick opportunity evaluation and prioritization.

For initiatives that need to come online *in the medium-term*, projects on the Marginal Abatement Cost Curve (MACC) are evolving rapidly. This is driven by low confidence in capital estimates, evolving regulatory landscape, and rapid changes in technology.

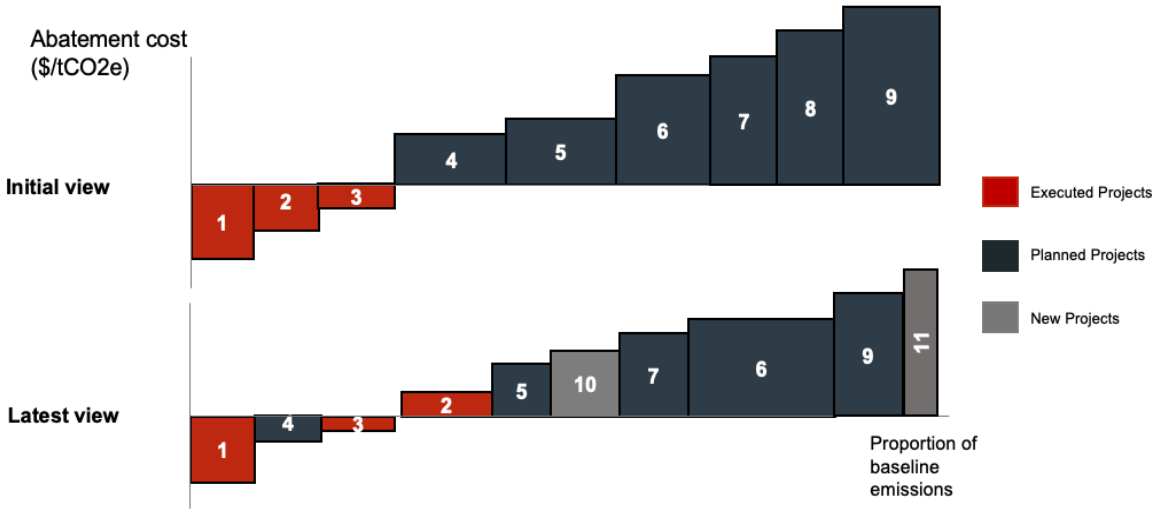


Exhibit 13: Sustainability projects Marginal Cost Abatement Curve (MACC).

To address the uncertainty of medium-term sustainability projects, increased rigor is needed in the project definition and business case development with earlier collaboration with Original Equipment Manufacturers (OEMs) and development partners. In addition, the MACCs should be seen as dynamic, constantly evolving with new technologies and updated project financials that influence both project-level stage-gate and overall project portfolio decisions.

Long-term decarbonization technologies needed to mitigate hard-to-abate emissions are still at early maturity stages with large investments required to bring them to commercial viability. The maturing of these technologies has long lead-times, making it important to drive required Research and Development (R&D) in a timely manner.

There are two dimensions that drives an organization's potential approach to R&D. First, the openness of intellectual property, and next, the organization's ability and/or desire to lead in new technology adoption.

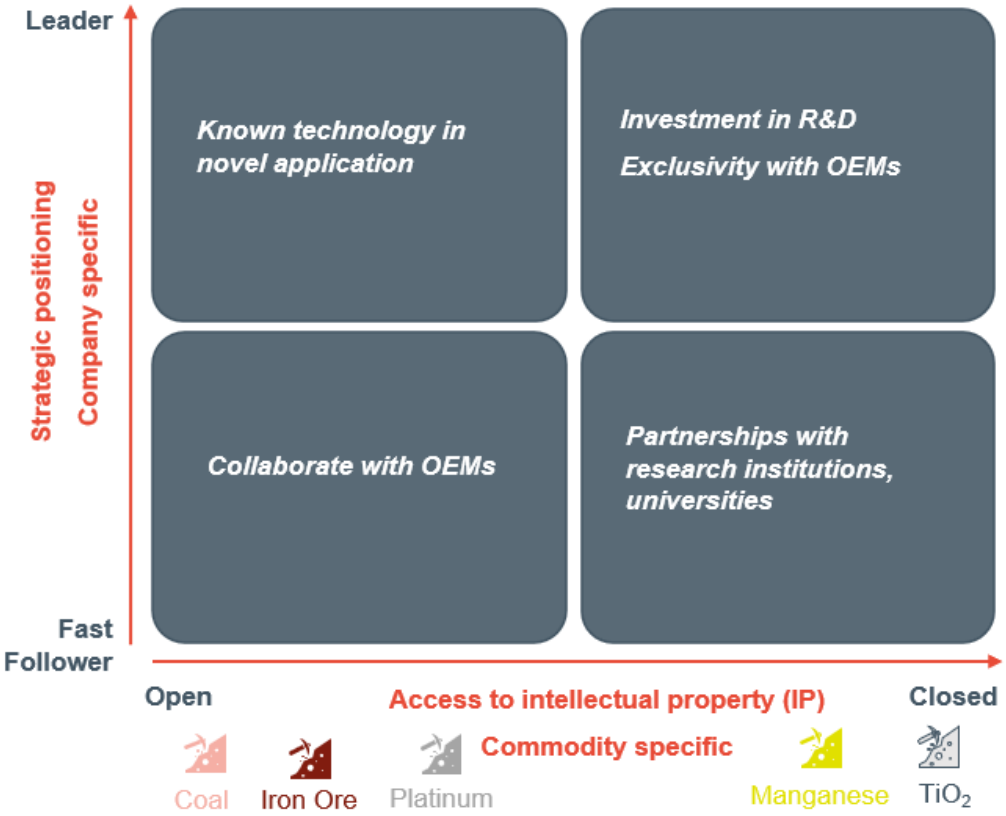


Exhibit 14: R&D two-dimension approach.

Four quadrants emerge through these two strategic dimensions. Companies who wish to lead in a closed environment need to invest in R&D, secure partnerships with original equipment manufacturers OEMs, or adopt technology from OEMs and research institutions. Fast followers need to evaluate partnerships with research institutions in a closed environment or with OEMs in an open environment.

There are six dimensions companies should consider to successfully achieve their decarbonisation goals:

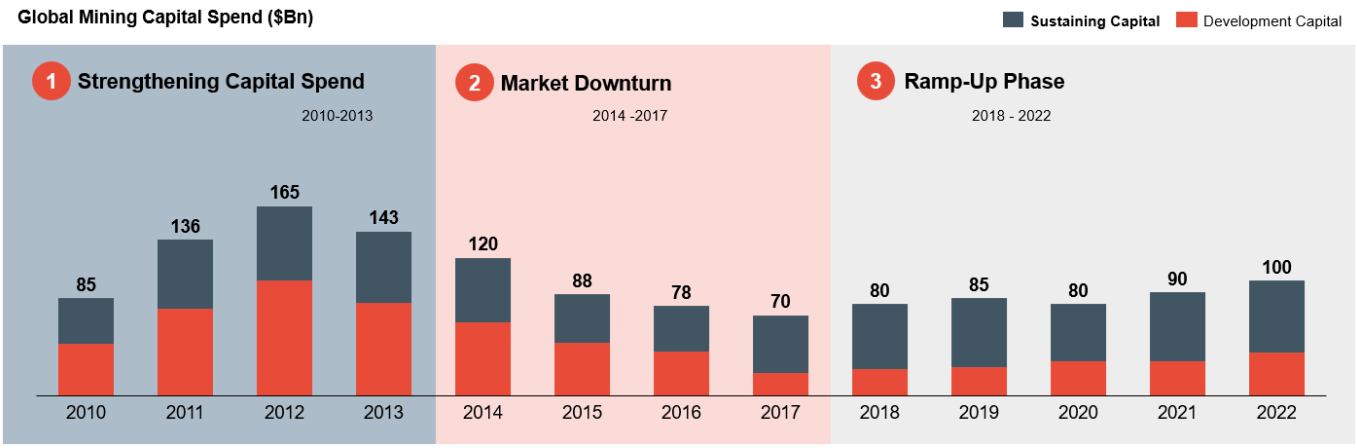
- Abatement curves that focus on realistic estimates that are credible and ensure interdependencies are well considered.
- A multi-pronged approach across energy and process efficiency, technology, and innovation.
- Initiatives tailored for greater value and using strategic advantage (e.g., access to renewable energy sources) with realistic constraints in the local supply chain.
- The evolution of the organization's operating model to ensure the decarbonization agenda is embedded into their core business processes.
- Site and front-line level visibility of Greenhouse Gas (GHG) flows.
- Capacity management that enables middle management with resources to execute initiatives.

5

Maximize value from capital spend

Throughout the last two years, there has been an uptick in capital spending by mining and metals players. The recent increase in capital projects in Southern Africa have faced several challenges, which include internal capacity to execute, availability of funding and skills, deteriorating sovereign ratings, and supply chain disruptions. The above-mentioned challenges have the potential to reduce project value and success.

While many of these challenges are external and need to be navigated, organizations have the most influence on the internal capacity to execute capital projects. In the past, owner-project teams have tracked in-line with capital projects spending. With the increased capital spending activity since 2018, owner teams must match requirements from the increase in projects.



Strong owner megaproject teams with significant local engineering and construction capabilities.

Commodity downturn driving dramatic cost transformation programs, with megaproject teams heavily downsized.

Uptick in the number of projects and capital projects. Due to downsized teams, there is lack of capacity to execute megaprojects properly.

Exhibit 15: Captial projects and teams phases since 2010.

External disruptions have translated into increased lead-times and above-inflation price increases for key capital equipment. We have seen lead times of over a year for material handling equipment and nine months for electrical components and instrumentation. Similarly, the price increase for these categories have remained substantially high, increasing above inflation rates with 13%, 15%, and 10% for material handling equipment, electrical components, and instrumentation, respectively.

These lead times and price increases are mainly driven by the increase in the cost of raw materials (energy, copper, freight), limited manufacturing capacity, and limited supply in green battery minerals.

Key Supply Chain Categories	Average Lead Times		Average Price Increase		Key Insights
	Q1 2022	Q2 2023	Q1 2022	Q2 2023	
Material Handling	9 Months	>1 Year	8%	13%	Demand driven by growth in **construction, FMCG and industrial and mining sectors** has led to increasing lead times and sustained price increases. Components like conveyors and apron feeders now have a lead time of at least 1 year .
Process Equipment	8 Months	1 year	10%	13%	Increase in **energy and freight costs** coupled with various regional government's policy for industrialization and supply chain diversification has led to a relative increase in price with longer lead times
Mechanicals	7 months	9 months	12%	16%	Sustained demand in irrigation, **agriculture and mining activities** has created a supply deficit for pumps, blowers and fans amongst other mechanical components. **Manufacturing capacity** remains constrained as price continue to increase and lead time remain fairly constant
Electrical	6 months	1 year	8%	15%	**Increased raw material costs (copper), energy and freight** has heavily impacted this category, with price increase over double digits across all sub-categories
Instrumentation and automation	5 months	1 year	5%	10%	Shortages of **microchips** in the industry is affecting key instrumentation and electronics components for PLC's and automation systems. This has led to doubling of both lead times and price increases this year.
Mining Mobile Equipment	9 months	8 months	11%	15%	The increase in price is mainly driven by the demand **for electric and autonomous mining** systems. The increase in **raw material (green minerals) and electronic components** has negatively affected pricing this year.

Exhibit 16: Supply chain categories lead times and prices increases.

To maximize value from capital spend, organizations are implementing a three-dimensional approach:

- Adopt a portfolio approach to maximize value by shifting from project-level cost optimization toward portfolio-wide integration and business value delivery.
- Empower the owner's team project team to be more effective by leveraging digital tools, increasing collaboration with business and project partners, and increased use of market insights.
- Use capital projects to improve operational performance by setting high performance and safety standards, entrenching new sustainability practices, and integrating digital ways of working.

Players are transitioning from cost-scrubbing to value-creation in capital project delivery. These transitions include a shift from traditional cost-saving initiatives to a holistic approach that takes into account net present value, additional revenue streams, cost savings and project structuring; a shift from a siloed decision-making approach at each project stage gate to dynamic business improvement decision-making initiatives; a shift from ad-hoc project optimization to systematic value driver review of opportunities; and lastly, a shift from the use of owner's capital-project team to optimize projects to wider involvement of internal and external experts for outside-in perspectives when identifying and developing project improvement opportunities.

To empower owners' teams and alleviate resource constraints when delivering capital projects, mining companies can leverage insights, technology, and organizational capability to proactively respond to market dynamics and global supply chain disruptions. This means a closer and earlier collaboration with experts both in and outside of the business, embracing digital technology, and leveraging insights from current market intelligence platforms and historical projects data.

Finally, capital projects execution should be used as an opportunity to align the company's target operating model by embedding operational strategy across the capital project value chain as follows:

- ***Operational strategy***. Evaluate and select the correct strategic direction for the new operation by selecting the right organizational architype, planning to build new capabilities, establishing an asset management strategy, and incorporating the role of digital and analytics to achieve best-in-class business cases.
- ***Operational readiness planning***. Prepare for execution by ensuring the budget and resources are in alignment with the strategy.
- ***Execution.*** Define ways of working and embed them within new operations. This includes developing standard operating procedures (SOPs) and KPIs aligned with the operational strategy and required performance levels, as well as setting a strong performance culture to ensure production targets are met or exceeded.

HATCH

About Hatch

Whatever our clients envision, our teams can design and build. With over six decades of business and technical experience in the mining, energy, and infrastructure sectors, we know your business and understand that your challenges are changing rapidly. We respond quickly with solutions that are smarter, more efficient, and innovative. We draw upon our 10,000 staff with experience in over 150 countries to challenge the status quo and create positive change for our clients, our employees, and the communities we serve.

hatch.com