

Climate change a significant risk to African mining

Climate change is no longer a distant threat; it's a present-day disruptor reshaping industries, economies and ecosystems. In Africa, few sectors are as exposed or as vital as mining. WSP in Africa's Kierra Chetty, Principal Consultant for Climate Change, and Nirvishee Juggath, Director of Water Management, highlight the risks and the need for a shift toward resilience-focused innovation and adaptive measures.



Left: Chetty, Kierra (1), Principal Consultant for Climate Change at WSP. Right: Nirvishee Juggath, Director of Water Management for WSP.

Intensifying droughts, erratic rainfall, and rising temperatures are placing growing pressure on water availability and operational stability. For mining companies, the compounded risks of environmental volatility and resource scarcity demand urgent attention.

"Climate variability has shifted from rare disruptions to an operating baseline, reshaping how the mining sector plans and protects its people. Weather extremes are no longer outliers but a reality that must be engineered into every decision to ensure operational stability and long-term value," says Kierra Chetty, Principal Consultant, Climate Change, WSP in Africa.

For many African countries, mining is not just a sector; it's an economic backbone. In South Africa, for instance, mining contrib-

utes approximately 6% to the national Gross Domestic Product (GDP). Any disruption to operations, such as those triggered by the early onset of the Covid-19 pandemic and lockdown measures, can reverberate across the economy, affecting employment, exports, and fiscal revenue. Recovery from such shocks is often slow and complex, underscoring the sector's critical role in economic resilience.

Unlike sudden disruptions, the risks posed by climate change are largely predictable, yet the risks are intensifying in both frequency and severity. The Lloyd's Register Foundation's Global Safety Evidence Centre reports that mine workers are increasingly on the front lines of this growing threat, facing extreme weather events and rising temperatures that compromise safety and

productivity. The Foundation's World Risk Poll reveals that one in five workers worldwide, 18%, faced harm at work in the past two years, a number that rises to 21% in the mining and quarrying sector. Workplace health and safety conditions are further compounded by operational challenges, especially in water-scarce countries like South Africa, where the ongoing water crisis adds another layer of complexity to mine sustainability and resilience.

"One of the most significant and complex climate-driven challenges facing mining operations across Africa is the need to manage water effectively. Water risk in mining is no longer just about scarcity; it's about volatility. Sudden stormwater surges, prolonged dry spells, and shifting water quality demands require adaptive systems that can capture, store, treat, and reuse water efficiently and safely," says Chetty.

During extended droughts, mines struggle to secure the water needed for core functions such as mineral processing, dust suppression and equipment cooling. This is especially problematic in arid regions where water scarcity is already a concern.

"In a country as water-stressed as South Africa, long-term performance relies on circularity such as protecting catchments, designing for reuse, and treating water as a shared resource to sustain both operations and communities," says Chetty. "Additional rainfall would not resolve mining's water challenges. When high intensity or out-of-season storms do occur, they frequently overwhelm mine infrastructure, flooding pits, tunnels, haul routes and waste areas, disrupting operations and introducing substantial safety hazards."

Managing excess water is a delicate balancing act: mines must determine not only how to remove it, but also where and how to discharge it without breaching environmental regulations or causing downstream harm. Failure to do so can result in contamination, legal consequences and reputational damage.

Compounding these challenges is outdated or insufficient infrastructure, often built in an era when climate volatility was

not a design consideration. Many mining facilities weren't designed to withstand today's extremes, let alone meet evolving regulatory standards.

"This means that infrastructure was not designed for extreme events or even for the current design requirements being stipulated by global standards. Regulatory requirements have also improved over the decades, and design criteria for climate impact must be revised from original design requirements," explains Nirvishee Juggath, the Director of Water Management at WSP in Africa.

"Whether it is underground, open cast or open pit mining, the act of mining has an impact on water resources and water quality, while inflow from rain, runoff, recharge and lateral groundwater ingress is inevitable," adds Juggath.

To stay resilient, mining companies must strike a careful balance, adopting innovations in production and methodologies to improve water efficiency while also developing strategies to capture and store excess water during the wet season for use in the dry season.

"During high rainfall events, water availability is not an aspect of concern for communities and industries, but during the dry season, that's when water quantity

and quality become an issue," says Juggath. "Irresponsible use and management of water do not help the situation."

In many African countries, the relatively low cost of water – particularly in regions where pricing models fail to account for scarcity or environmental stress – can diminish the financial incentive for mining companies to invest in robust water management practices.

Juggath notes that while water stewardship has often been deprioritised in favour of more immediate profitability, this is changing. "As mines are at the forefront of the risks climate change poses, with the inevitable impact on infrastructure and productivity, industries want to better understand how good water management can prevent loss, and mitigation measures they can take."

Juggath encourages mining companies to reassess their risk profiles, operational plans and environmental commitments. This includes reviewing infrastructure against best-practice design standards and conducting design reviews, reliability assessments and risk analyses. "Mining companies should develop a risk-based action plan that identifies vulnerabilities and prioritises upgrades, particularly for critical systems and facilities."

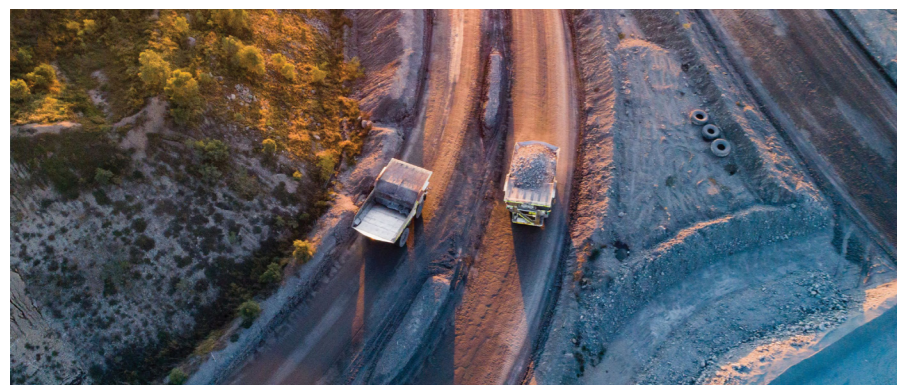
"We are seeing a clear shift across the sector toward resilience-focused innovation and adaptive measures, where renewable and hybrid power systems, advanced process optimisation, real-time monitoring, and closed-loop water solutions are being integrated to reduce dependence on vulnerable resources, strengthen operational continuity, and enhance overall efficiency under increasing climate pressures," says Chetty.

Infrastructure upgrades are also gaining momentum, with emphasis on building resilience into tailings storage facilities, haul roads and processing plants.

"The frequency and severity of climate-related extremes are increasing, but so is our capacity to engineer resilience. By integrating science-based insights, strengthening critical infrastructure, and optimising water and energy systems, mining operations can safeguard performance, protect communities, and reduce vulnerability while adapting effectively in an increasingly volatile climate landscape," concludes Chetty.

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