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Mining in Africa Country Investment Guide

MACIG 2024

Pre-Release Edition

Introduction

Unearthing geopolitical rivalry, economic challenges and the retention of value

For more than a century, the extractive sector has been instrumental in Africa's economic development. With the role the continent is poised to play in the green energy transition, governments will continue to depend on the industry to boost national economies. According to Vanessa Ushie, acting director of the African Natural Resources Management and Investment Centre, African Development Bank (ADB) Group: "Africa's extractive resources are expected to contribute more than US$30 billion annually to government revenue by 2040."

The African mining sector is at a critical juncture. The extraordinary demand for the continent's resources is currently balanced by the global landscape of price volatility and uncertainty. The latter keeps deterring investor appetite in projects sitting in nations with little political stability and affected by infrastructure, energy, and security woes. Such challenges have continued to reflect across many African nations in 2023. Africa has a crucial role to play considering the energy transition and global appetite for commodities across the periodic table. Simply, the world hungers for African minerals. As these opposing forces continue to unfold, the fate of the African mining sector teeters on the precipice of either a generational opportunity or missed potential.

Capturing value from the new scramble for Africa

Africa has long been a theatre of competition among the global powers. The legacy of colonialism has given way to new forms of rivalry in the post-colonial era, and the 21st century has witnessed the resurgence of Africa as a battleground for influence and resource control. China, with its insatiable appetite for raw materials to fuel its rapid economic growth, has emerged as the dominant player in African mining. Through extensive investments and infrastructure development, China has forged partnerships with various African nations to secure access to minerals including copper, cobalt and coal (it controls about 80% of Co/Cu production in the DRC). Yet, Western companies remain active, particularly with renewable energy projects (more than 71 currently developed in the continent), leading to record investment in the continent. According to UNCTAD, in 2021 FDI to Africa reached US$83 billion, up from US$39 billion in 2020. The largest holders of foreign assets in Africa remain the old colonial powers, led by UK (US$65 billion) and France (US$60 billion), with the US and China accounting for US$48 and US$43 billion respectively.

In his opening speech at the Battery Metals Forum in Kinshasa in September 2023, Paul Kabuswe, Minister of Mines and Minerals of Zambia, highlighted the main dilemma for African leaders: How to balance attracting foreign investment and retaining value locally. For too long the continent has been pillaged and stripped of its resources, so that today, Africans are determined to build local value-creation models and benefit more fully from their coun-

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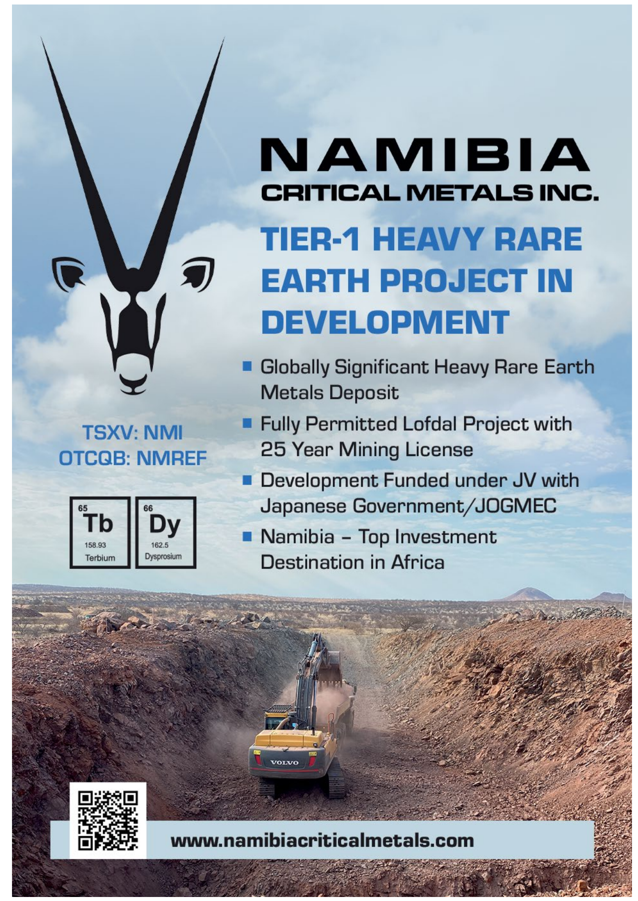


tries' natural resources. With exceptional geology, progressively competent industrial skills, and more established frameworks of governance, African mining jurisdictions are increasingly negotiating from a position of strength, as both West and East scramble for the ingredients to fuel the green energy transition.

Currently, only 3% of the total value created by the battery metals industry in the DRC remains with local communities. For Africa to shift from an exporter of raw materials to a value-added manufacturing hub, the continent will need a predictable business environment, competitive incentives, investment in infrastructure and human capital, and access to finance. Demonstrating political intent, in 2022 the DRC and Zambia signed a cooperation agreement to "facilitate the development of an integrated value chain for the production of electric vehicle (EV) batteries in the DRC and Zambia."

Governments across Africa are concluding deals and presenting policy initiatives to develop refining, processing, and other value-adding capabilities for their mineral resources. In that regard, 2023 saw several incentives, including offtake agreements for battery and EV products, and the establishment of Special Economic Zones.

Long-lasting inflation and commodity rollercoasters

Recent months have witnessed a rollercoaster ride in commodity prices. Lithium prices dropped by two-thirds in H1 2023 after reaching an all-time high in late 2022, and cobalt prices tumbled

"Zambia and the DRC are home to 80% of the minerals required for the production of electric vehicle batteries, and the countries have signed a cooperation agreement to facilitate the development of the electric battery value chain."

Marie-Chantal Kaninda, President, Glencore DRC

by over 30% in 2023, with surging surpluses emerging from the DRC. Gold has also been subject to wide price swings due to geopolitical tensions, economic uncertainties and shifts in global monetary policies. Copper has experienced price surges and declines in response to supply and demand disruptions.

Commodity price volatility is compounded by the impact of inflation, and despite decreasing, the latter has not spared Africa's leading economies. Ghana faces a projected 45% inflation rate in 2023, providing a good reminder that the continent is struggling with rising prices that erode the real value of its currencies and disrupt economic stability.

"The mining sector is the main driver of the Congolese economy. We want a circular economy that develops its human resources by training them in the use of the new technologies. We want to add value to our mining products by processing minerals locally."

Antoinette N'Samba Kalambayi, Minister of Mines, Government of the DRC

Ongoing developments across various resource sectors

Africa has a generational opportunity to benefit from the scramble for battery metals thanks to its diversity across the period table. The continent contains most of the world's cobalt and manganese, is home to the prospective Copperbelt, Niger might reshape the uranium scene, Malawi, Namibia, and Uganda's rare earths projects keep strengthening, while lithium projects in the DRC's Manono area are ramping up.

In 2023, many African jurisdictions saw new mines coming online, deals being made and developers moving towards production. The biggest stories this year came out of Ghana, with the JV between Gold Fields and AngloGold Ashanti to combine Tarkwa and Iduapriem, effectively creating the continent's largest gold mine, and on the Copperbelt, where Ivanhoe Mines' Kamoa-Kakula complex is poised to become one of the largest copper-producing operations in the world.

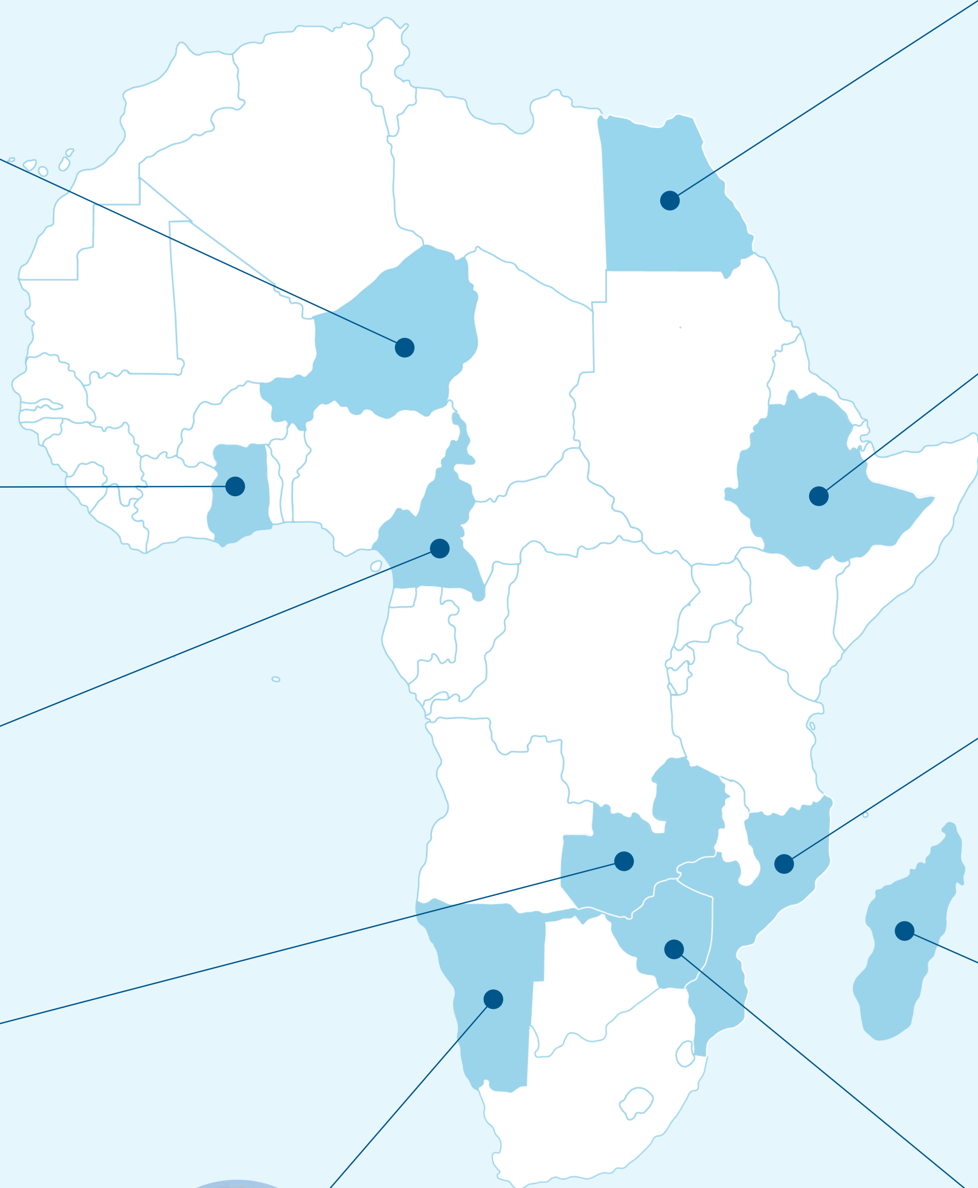
In Africa, ESG is understood as a key factor in attracting investment and maintaining a social license to operate. Moreover, effective tailings management has gained prominence, and miners in Africa are now investing in safer, more sustainable processes.

In conclusion, mining in Africa is a multifaceted and ever-evolving landscape, influenced by the scramble for resources between Eastern and Western powers, economic challenges posed by commodity prices and inflation, and the pursuit of value addition through beneficiation. This report will explore these themes and provide a comprehensive analysis of the major mining jurisdictions in Africa, offering insights into the challenges and opportunities that lie ahead.

To ensure that the continent can fully harness this potential, the sector must be acutely aware of both the risks and facilitators in play. Importantly, broadening the economic benefits of mining throughout the continent, and securing community engagement will be pivotal factors for achieving success. Simultaneously, the industry must address the growing calls for supply chain transparency and sustainability.

Through insights gathered on the ground across North, West, Central, and South Africa, the following pages provide an analysis of a continent where mining jurisdictions are at different levels of development, but where growth ambitions are unapologetically stated. ■

Explorers in Africa's insights on their jurisdictions



NIGER

"Goviex Uranium completed the final feasibility study on our Madaouela project in Niger in September 2022, which led us into project debt financing conversations with commercial banks, export credit agencies and development finance institutions. Currently, we are trying to understand the changing political situation in Niger and how the government agencies want to deal with this change."

Daniel Major, CEO, Goviex Uranium

GHANA

"There are only a few development-stage gold projects as advanced as our Enchi gold project in Ghana. This places Newcore in a strategic position given that Ghana is the biggest producer of gold on the continent. One of the big advantages of operating here is the ability to expedite the timeline of a project from exploration to development and then ultimately toward a construction decision."

Luke Alexander, President & CEO, Newcore Gold

CAMEROON

"A significant milestone for Oriole Resources has been the completion of a maiden resource assessment on our Bibemi project. Over the past couple of years, Cameroon's mining sector has seen significant advancements, largely driven by the completion of the World Bank-funded PRECASEM program, which involved an investment of around US$30 million in loans to Cameroon."

Tim Livesey, CEO, Oriole Resources

ZAMBIA

"At Luanshya West, the next step will be to do a geophysical survey with some infill sampling on some of the anomalies followed by a 3,000 m reverse circulation drilling program down to 150 m. I believe Zambia will certainly play an important role in feeding the needs of the growing copper market in the future."

Pierre Léveillé, President and CEO, Deep South Resources

NAMIBIA

"Uranium projects in Namibia offer multiple advantages. Infrastructure in the Swakopmund area, where our project is situated, is remarkable. There are tarred roads leading to within 4 km of our site. The power grid is established and is notably eco-friendly due to the high ratio of hydropower. Namibia boasts a long history of uranium exports through its port facility."

Gavin Chamberlain, COO, Bannerman Energy

EGYPT

"Egypt's abundant gold endowment is indisputable, with a rich history of gold mining spanning over 6,000 years since the era of the Pharaohs. The Arabian Nubian Shield, traversing Egypt, Saudi Arabia and five other countries, presents a remarkable opportunity due to its extensive untapped potential and the prevailing market conditions of rising commodity prices and heightened mineral demand."

Mostafa Talaat, CEO, Ankh Resources

ETHIOPIA

"Not many explorers would be willing to invest in Ethiopia without a producer that could take over down the line, and producers, in their turn, need a well-defined regulatory environment. The lead time from greenfield exploration to production can be up to 15 years, with many projects failing long before production, so Ethiopia must set the stage for future investors."

Jørgen Evjen, CEO, Akobo Minerals

MOZAMBIQUE

"Mozambique has great mining legislation and systems in place to encourage mining. People can obtain mining licenses at a relatively early stage in the project's life, which helps in de-risking it. One challenge is that Mozambique is a very bureaucratic country, and some processes can drag on for a significant time."

Cédric Simonet, CEO, Altona Rare Earths

MADAGASCAR

"In January 2018, we made our debut on the Australian Securities Exchange (ASX). At that time, our primary assets were the Maniry graphite project and Ianapera, both early-stage exploration sites situated in the southern region of Madagascar, approximately 60 km apart. Madagascar is one of the poorest countries globally, and we are operating in one of its most impoverished regions."

Tom Revy, Managing Director, Evion Group

ZIMBABWE

"The skills available in Zimbabwe are outstanding. The Zulu mine does not employ any ex-pats and every single person, from the general manager of the mine down to the lowest operator, is a Zimbabwean, indicative of the skills available. The tenement structure in Zimbabwe is also reasonable and should give comfort to investors."

George Roach, CEO, Premier African Minerals

West Africa

Golden opportunities amidst regional perils

Will more countries be added to West Africa's long list of those succumbing to military coups in the coming months? The July coup in Niger was the sixth in the region in less than three years. The Sahel region, notably Burkina Faso and Niger, continues to grapple with endogenous destabilization that has raised the risk profile for mining, causing mine closures and halting exploration expenditure. Yet, in a troubled region, some countries stand out as a haven for investors and operators. Côte d'Ivoire, Ghana, and Senegal have seen their economies unharmed by conflicts.

West Africa is known for its outcropping resources, and in recent years has produced around 380 t/y, which, if the region were considered as one country, would make it the third largest producer of gold in the world. In 2022, Ghana dethroned South Africa as the continent's top gold producer.

Investment appetite for gold is currently strong as evidenced by several recent major developments including AngloGold Ashanti and Gold Fields' decision to join forces to build Africa's biggest gold mine; a fusion of the Iduapriem and Tarkwa mines in Ghana that will lead to a production of 900,000 oz/y. Meanwhile, Newmont's Ahafo (Ghana), Barrick's Lolo-Gounkoto (Mali), and B2Gold's Fekola (Mali) all delivered more than 600,000 oz/y for 2022, and are on track to deliver on their production targets in 2023, showcasing the strength of the producers in the region. Looking ahead, with the gold price teasing US$2,000/oz for the better part of the year, producers have capex to deploy towards strengthening their operations, and developers have a healthy glow.

Resource optimization means consolidation on the West African scene

Amidst global geopolitical and economic upheaval, investors in the mining industry are facing a challenging terrain characterized by unstable and unpredictable commodity markets. This situation is exacerbated by a widespread shortage of raw materials, persistent disruptions in supply chains, and rising energy and input expenses. This presents an auspicious moment for resource companies to consider investments in projects, and in West Africa these investments have taken the form of capital commitments and M&A, without signs of slowing down.

Recent developments in the West African mining industry have shown a trend of smaller and mid-tier companies seeking strategic partnerships and asset-sharing arrangements to adapt to the evolving market dynamics. Oriole Resources CEO Tim Livesey explained: "The partnership between West African Resources and Orezone in Burkina Faso is emblematic of the smaller and mid-tier companies' strategy. By joining forces for power supply, they are aiming to enhance operational efficiency and reduce costs in a challenging business environment."

The need to increase resources saw larger firms in Africa acquiring smaller, quality assets in 2023, and with the strong disconnect felt between intrinsic and market value, this consolidation trend will likely persist. Phil Russo, CEO of Toubani Resources, which is developing West Africa's next gold mine in Mali at the oxide-dominant Kobada gold project, shared: "There is a discernible trend of consolidation in the West African gold industry. There is a wide disconnect, perhaps the widest in a long time."

In that sense, the region is already witnessing opportunistic takeover offers. In October, the proposal by a unit of China's Zhaojin Mining Industry for the shares of Australian miner Tietto Minerals – timely announced after the improvements at the Abujar Mine in Cote d'Ivoire – highlights the astute stance larger groups continue to take in offers undervaluing companies.

Majors are also making significant moves to reshape their portfolios, as seen with IAMGOLD's decision to divest its West African exploration and development assets to Managem. Following the acquisition of Roxgold in 2021, a newcomer is Fortuna Silver's Séguéla mine, successfully commissioned in H1 2023. Finally, West African producer Asante Gold acquired the open pit Bibiani mine from Resolute in 2021 and poured first gold in the same year. "The acquisition gave us an opportunity to control 53 km along the Bibiani and Chirano shear zones. This is a prospective trend that has produced over 8 million oz throughout its history" explained Dave Anthony, Asante's CEO.

High speed, low (capital) intensity

The West African mining scene has dramatically changed in the past decade. Roughly 20 mines have been built since 2010 in West Africa, taking an average of only 1.7 years to complete, placing the region as a top destination for rapid execution. Perseus Mining managing director and CEO, Jeff Quartermaine, who developed two mines (Edikan and Sissingué) in Côte d'Ivoire over the past five years, recalled: "The first time I stepped out of the airport in Abidjan back in 2011, I saw buildings dotted with bullet holes and scorched by flame. Since the end of the war in 2011, the country has evolved tremendously, experiencing one of the fastest sustained economic growth rates in Sub-Saharan Africa and becoming one of the most attractive investment destinations in Africa."

Another reason keeping players enthusiastic about the region is the relatively low cost per ounce to produce gold. Indeed, costs in West Africa are generally considered lower than elsewhere. One of the region's heavyweights, Endeavour, discovered 11.5 million oz/Au in the past five years, at a discovery cost of less than $25/oz for indicated resources. Across operations in Côte d'Ivoire, Senegal and Burkina Faso, Endeavour achieved an all-in-sustaining cost guidance of below $930/oz in 2023. "The region offers some of the lowest capital intensity globally," commented Quartermaine. ■

"West Africa became the world's leading gold-producing region, and top for discoveries for the past decade. The region has the quickest timelines from discovery to production, thus offering attractive returns on investment."

Sébastien de Montessus,
President and CEO,
Endeavour
Mining

Côte d'Ivoire: A beacon of stability amidst West African unpredictability

A decade after the revision of its mining code in 2014, the mining industry is well and truly booming in Côte d'Ivoire. In the past five years, the country saw more mines being built than any of its West African neighbors and boasts a competitive advantage envied by all in the region: Political stability. Surfing on high gold prices, new mines coming online, and experience from the world's greatest international operators – the Australian Perseus, the Canadians Barrick, Endeavour and Fortuna, and the British Centamin – the government now wants to grow the share of mining to up to 6% (currently at 3%) of the country's GDP by 2025. To do so, the government aims to diversify its mining industry beyond gold, particularly as it holds economic deposits of nickel, lithium, cobalt and rare earths. In September 2023, the government granted two new lithium exploration licenses.

Côte d'Ivoire contains a prospective part of the Birimian Greenstone Belt, a mineral-rich belt of sedimentary volcanic rock stretching from Senegal to Ghana, with gold deposits expected to be the largest in the world. Nestor Houssou, executive GM of geosciences specialists Georec, is currently carrying out exploration work for several mining companies in Côte d'Ivoire, including Kenorland Minerals Africa, CAREM, and Global Mineraie, and said: "The country holds the largest share of the West African Birimian (35%) and is crossed by shear zones bearing gold occurrences in the neighboring countries. In legal terms, the country has had attractive mining legislation since 2014, which has led to a rush of mining companies to Côte d'Ivoire."

Côte d'Ivoire boasts strong infrastructure that will facilitate any upcoming operations. Vamoussa Fofana, managing director of Imperium Services, which provides catering services to Fortuna's Séguéla mine among others, said: "We have a much better road network than other West African countries. The improvement of the last 10 years can be felt; almost all the accesses to the sites we serve are paved. Logistically, the setting is ideal."

"We will remain active looking for growth opportunities in West Africa, with a focus on Côte d'Ivoire and Senegal. Few other places in the world exhibit the rich mineral endowment and production growth as West Africa does."

Jorge Ganoza,
President and CEO,
Fortuna Silver Mines

Gold production and gold panning

Ivorian gold production reached 48 t in 2022, a 14% increase compared with 2021; only five years ago, the country's gold production stood at 24,4 t/y.

The world's top cocoa producer is aiming to develop its long-neglected mining sector to bolster its revenue. Gold output has been climbing steadily for several years and is expected to reach 50 tonnes this year with the start of production from Fortuna's Séguéla Mine and Tietto (who in October received an off-market take-off proposal from Zhaojin) 's Abujar mine according to the Ministry of Mines, Petrol and Energy. With another operation likely to come online in 2024, production is expected to reach 55 tonnes.

To sustain such momentum, development projects are seamlessly turning into mines, thanks to agile operators and a good operating environment. Tietto Minerals' Abujar mine, for example, came into production in 2023 and was built in under 12 months. Having poured its first gold in January, Abujar is expected to produce 260,000 oz/y in 2023, and is forecasted to produce 1.2 million oz of gold over its planned 11-year lifespan. Perseus Mining's Edikan and Sissingué mines are further examples of exceptionally fast mine development whilst remaining within budget.

Greenfield discoveries are continually taking place in the country. In October, Canadian giant Endeavour published the partial results of its extensive 180,000 m drilling program at the Assafou deposit at its Tanda-Iguela gold exploration project. The improved mineral resource estimate for Tanda-Iguela, followed by technical studies in 2024, should put the company on track to develop its third gold mine in Côte d'Ivoire in the coming months. Fortuna Silver also made a significant discovery with the Sunbird deposit at the Séguéla mine.

One challenge the country must address is illegal mining. Kouamé Klemet-N'Guessan, partner at KSK Avocats, an Ivorian law firm, detailed the issue: "Illegal mining activity constitutes a big security problem. This activity is criminal. People who engage in gold panning escape mining regulations and will therefore pollute groundwater and other sources."

Those comments were seconded by Vamoussa Fofana, Managing Director, Imperium Services, who services several mines in the country: "We are facing a scourge: Clandestine gold panning. We need a much more physical presence of the state."

Beyond gold, Côte d'Ivoire ranks among the top global manganese producers, and Mako Gold announced the discovery of a significant deposit at Korhogo in August. The country is also witnessing an increase in lithium exploration permits in Issia, Agboville, and other regions. The future thus appears bright and diversified for the country, as long as it manages to maintain what its neighbors so jealously envy: Its steadiness. ■

"Airborne and ground-based geophysical surveys have been used for a long time, but the real change has come with the use of drones. We use drones to cover large areas as well as zones impacted by illegal activity."

N'guessan Nestor Houssou,
Managing Director, Georec

Ghana: If you want to find an elephant, go to an elephant country

The Ghanaian economy heavily relies on the mining sector, which not only draws in over 50% of foreign direct investment (FDI) but also contributes to more than a third of the country's export revenues.

Ghana is once again the number one spot for gold production in Africa, wrestling a crown it lost to South Africa in 2021. The country overtook the southern nation with 3.7 million ounces produced in 2022 (a 32% increase YoY), notably driven by the output of both large and small-scale sectors. A lowering of the withholding tax rate on unprocessed gold by small-scale miners, the consolidation of existing mines, and the fusion of two giants ensured Ghana's return to the top spot. The effort is remarkable, particularly given the fact that Ghana has one of the highest inflation rates in Africa, above 40% in 2023. But with the yellow metal representing close to 50% of the value of national exports, retaining the first spot was paramount for the Ghanaian economy. Land and Natural Resources Minister Samuel Jinapor attributed the performance to the revival of AngloGold's new crown jewel, the Obuasi mine, which was overrun by an army of illegal miners a few years ago, and also first gold poured at Asante's Bibiani gold mine in 2022. Obuasi increased production by 132% in 2022 to 250,000 oz/y, while the Bibiani mine yielded an output of more than 52,000 oz for 2022.

The country also saw one of the biggest transactions in the African gold mining space in 2023, when, ironically, two South Africans, Gold Fields and AngloGold Ashanti, put pen to paper to form a JV with their respective assets Tarkwa and Iduapriem. Expected to produce 600,000 oz/y over an estimated LOM of 18 years, they created a giant direly needed by a Ghanaian economy struggling to catch its breath. Gold Fields' Interim CEO Martin Preece elaborated: "With this merger, we certainly see a significant extension of mine life, as well as a huge upside in terms of getting the combined mine's all-in-sustaining costs under US$1,000/oz. This puts a good margin into the asset and is a win-win situation for all. Ghana is an excellent place for mining, and we hope that this joint venture will endorse the long-term future of the country as a stable and pre-eminent mining jurisdiction."

"Ghana has some of the largest deposits in the world. I personally do not think that it is the unexplored areas that will deliver elephant discoveries, but those that are known for gold. In Ghana, the story is just starting to be written."

**Dave Anthony,
CEO,
Asante Gold**

Despite Ghana counting numerous gold heavyweights, explorers are but a handful in the country. According to Sulemanu Koney, director of the Ghana Chamber of Mines: "There has been acknowledgment from the government that some fiscal policies need to change to attract more investment into the country, and support mechanisms need to be put in place that encourage greenfield exploration."

Nevertheless, Newcore Gold is actively exploring Ghana and updated the MRE for its Enchi project in March 2023, showcasing a robust heap-leach (HL) project with an after-tax NVP of US$302 million at a gold price of US$1,850/oz and an IRR of approximately 42%. President and CEO Luke Alexander said: "Newcore is the most advanced explorer in Ghana, with other gold projects in-country either owned by a larger entity or producing at a small scale."

Gold will likely remain the star in Ghana, the birthplace of the largest mines in Africa. However, the 2023 green minerals and tax incentives to benefit greenfield exploration suggest that future-facing commodities will be a growing part of the story. With Atlantic Lithium's Ewoyaa poised to be the country's first lithium mine, and the country's ambition to be the leading African producer of bauxite, diverse minerals are now driving greenfield work, and the next generation of Ghanian mines will not necessarily be focused on gold. ■

Burkina Faso: Geology remains the (only) ally

Gold is Burkina Faso's leading export. A dozen operating mines contribute to over a fifth of the country's GDP. But recent years have been marked by growing threats from jihadist groups in a country that is only partially controlled by the state. Prolonged instability means capital has not rushed to the country's mineral reserves. In 2022, six mines closed due to the cost of protecting workers and infrastructures, with more than 30 casualties recorded since 2019.

To put such risks and the costs associated into context, it is standard for gold producers who have operations both in Côte d'Ivoire and Burkina Faso to employ more personnel dedicated to protecting sites in the latter country than all staff combined at their Ivorian operations. Beyond insecurity, a factor harming foreign investments is political instability. With three presidents and as many prime ministers and mining ministers in less than two years, this unwelcomed political waltz is not to the taste of foreign investors. Lucid about the situation, the president of the Burkina Chamber of Mines, Adama Soro, expanded: "The political and security challenges we have encountered have been significant. Over the past two years, Burkina Faso has seen multiple leadership changes. These frequent changes have sometimes jeopardized previous progress and led to alterations in the regulatory framework."

Security challenges are forcing majors to make drastic decisions regarding their assets. To reduce its exposure in the country – and in light of expansion plans at higher quality assets in Senegal and Cote d'Ivoire – Endeavour Mining divested 90% stakes in its Boungou and Wahgnion mines in July. The firm faced several jihadist attacks in the past three years.

Finding allies to unlock synergies is paramount in such a challenging environment. Orezone's Bomboré mine poured its first gold in 2022, and in 2023 signed a MOU with the neighboring West African Resources to join forces in areas of grid power, renewable energy, and optimizing security costs. Such agreements are likely to become standard in the Sahel, where mid-tier operators are strategically aligned on deal-making approaches to unlock value, keep opex low, and bolster security stances.

For juniors, finding opportunities in the country is a perilous endeavor. Looking to establish a new mining district in Burkina Faso, Sarama Resources completed a large chunk of the upcoming PEA for the multi-million-ounce Sanutura gold project in August 2023, located 60 km south of Endeavour's Houndé mine. With good geology and land position, further regional consolidation in the Houndé Belt is to be expected following the trend noticed across West African gold players, though this will depend on the political and security situation.

There is room for hope, although juniors and operators will have to rely (or depend) on the involvement of the military junta. The latter through increased security measures around mining sites – intends to regain positive momentum in gold production (which dipped to 57 t in 2022 from 66 t in 2021). The country is host to some of the most prospective gold deposits in Africa, and recent large transactions have shown that deal-making is possible. Burkina Faso has a consistent record of opening an average of 1.2 new mines annually since 2010. The country's economic lifeline will likely come through new mines coming online (like Bomboré), strengthening across renowned gold belts, and more exploitation licenses being handed out, like Nordgold's Yimiougou operation in December 2022. Towards the return of a positive mining cycle in 2024? ■

"Burkina Faso remains a highly attractive investment destination in the mining sector. Despite recent challenges, we encourage foreign mining firms to recognize the potential of our country, where the mining industry has a strong foothold."

**Adama Soro,
President,
Chamber
of Mines of
Burkina**

East Africa

Spotlight on growing jurisdictions

Despite East African countries' linguistic, cultural and political differences, one finds a common denominator in the commodity they are most intent on developing to bolster their economies: Gold. While the famous Birimian Greenstone Belt of West Africa deals with insurgency and declining gold production mostly on account of scheduled mine closures in Ghana, a new geological structure is stealing the attention in the East: The Arabian Nubian Shield (ANS), which covers North and East African territories in Egypt, Ethiopia, Eritrea and Sudan. Except for Tanzania, mining is a nascent industry in the region, yet an increasing presence of juniors and majors, along with substantial foreign investments in the region during 2023 (particularly in rare earths projects) show that East African jurisdictions have a part to play on the African mining scene.

Gold in Ethiopia, Sudan and Kenya

From Western Kenya near Lake Victoria to the Akobo River in Ethiopia, all the way to Nile State in Sudan, gold mining has the potential to reshape the economies of these reconstructing East African states.

"The Ugandan Government has been extremely supportive of our Project – they are a willing partner who is invested in building capacity and understands the role mining can play in developing jobs and revenue for the country."

Tim Harrison,
Managing Director,
Ionic Rare Earths

Ethiopia

A staggering level of violence has plagued Ethiopia since the Tigray conflict erupted in 2020. In November 2022, representatives from Ethiopia's federal government and the Tigray People's Liberation Front (TPLF) signed a cessation of hostility agreement, ending a conflict that devastated the country. As Ethiopia heals, it will be intent on leveraging its natural resources to rebuild its economy. According to the Extractive Industries Transparency Initiative (EITI), Ethiopia boasts around 200 tons of gold. Along the Akobo River, Akobo Minerals's Segele and Joru gold deposits hold promises for the country. Akobo recently completed 20,000 m of drilling at Segele and identified what looks like a quartz vein system with swarm waves stretching over a large area at Gindibil. To unlock this potential, CEO Jørgen Evjen said: "For the Ethiopian economy to blossom, it will need to review macroeconomic and fiscal issues," adding: "We need changes on the regulatory side for the industry to open."

Sudan

As the Sudanese army and the paramilitary Rapid Support Forces (RSF) fight for Khartoum, peace efforts led by a union of East African states have stalled. For the few mining operators in the country, safety and patience are on the agenda. Having acquired the Meyas Sand project in May 2022, Perseus Mining CEO Jeff Quartermaine tends on the side of caution: "We are not comfortable about taking an investment decision to develop the project with the conflict still raging without an end in sight in other parts of the country. Logistically, the port remains open; however, the investment climate is not where we require it to be for such a decision."

Kenya

Like all emerging jurisdictions, Kenya has barriers to entry to navigate, such as environmental protection measures, restrictions on foreign investment, and social issues that include conflict over resource control. That did not deter Marula Mining, a battery-metals developer, from tapping into the Kenyan market, by being the first mining firm listed on the Nairobi Securities Exchange. Jason Brewer, CEO, explained: "Our portfolio will change dramatically in the next six months. Right now, we are busy finalizing agreements for a copper-graphite project in Kenya."

Activated carbon producer Panthera has a production facility in Mombasa, from which it assists gold mining firms in the region. Al Eadie, CEO and co-founder, expanded: "Kenya's geographical position will allow us to easily expand into other regions in Africa, such as Tanzania and eventually West Africa, where there are much larger mining industries we can support."

Rare Earths in Uganda, Mozambique and Malawi

Africa is home to numerous rare earth deposits, particularly in the East. For now, its potential is largely untapped and the continent remains at the level of great potential. But several projects in the pipeline are the promise of a growing African importance in global value chains.

Uganda

The new Mining and Minerals Act of 2022 has been well-received. Intentions to improve mining administration and business processes should benefit the country's growing rare earths industry. With a clear path toward a license, Ionic Rare Earths is moving towards the production of Mixed Rare Earth Carbonate (MREC) later in 2023 at Makuutu and wants the project to play a key role in developing a magnet and heavy rare earth supply outside of China. MD Tim Harrison stated: "Secondary sourced material is starting to escalate high on the agenda for European end users, and the aim is for 15% of strategic materials to come from recycling by 2030. This opens up the supply chain for the development of the larger primary supply that will come from Makuutu once an alternative supply chain has matured."

The downstream demand from Europe will be a driver for East African rare earth projects. Ionic Rare Earths' subsidiary, Ionic Technologies, built a permanent magnet recycling demonstration plant in Belfast to process end-of-life magnets into separated, high-purity magnet rare earth oxides (REOs). Beyond Ionic's deal with Ford, Rainbow Rare Earths (which operates the Gakara RE project in Burundi) signed a supply agreement with a UK-based alloy manufacturer.

Mozambique

Promising stories are unfolding in the Mozambican RE space. Altona Rare Earths published a JORC exploration target in 2022 that demonstrated the project's potential to become a significant REE supplier in Africa, with the high-grade zones of the deposit totaling 6.5 million t at 2.47% TREO to 11.5 million t at 2.41% TREO. CEO Cédric Simonet detailed: "People can obtain mining licenses at a relatively early stage in the project's life, which helps in de-risking it."

The Chamber of Mines of Mozambique is working with the government to draft legislation that will help de-bottleneck the industry (there are almost as many pending license applications as existing ones: 2,700 in the country). Geert Klok, the Chamber's chairman, said: "We must make sure we have the right environment to support industrialization. Local companies will require access to affordable financing."

Malawi

Holding over 30 million t of rare earth minerals, Malawi's place on the mining map keeps growing. Leading the charge iis Africa's 'Rare Earths King,' Lindian Resources' Kangankunde project. Having completed the Phase 1 drilling program of over 10,000 m and with Phase 2 underway, Asimwe Kabunga, Lindian's chairman, detailed: "Kangankunde is a standout example of a project in Africa that has the potential to play a central role in global rare earths supply. That may also act as a catalyst for further investment in Malawi."

Canadian Mkango Resources is developing the Songwe Hills REE project with mineral resources of 18.1 million t. ■

Critical minerals rush makes for bullish service providers

"Over the past year, ERM saw significant growth, fueled by the global demand for critical minerals. We have been involved in multiple advisory projects driven by the GISTM with a growing focus on mine closure and waste management."

Sifiso Siwela,
Africa Manager – ERM Sustainable Mining Services (Previously CSA Global)

"We are witnessing a significant shift towards diversified commodities, particularly in the context of the green transition and the heightened demand for minerals like lithium, cobalt and graphite."

Lourens de Koning,
COO, Fraser Alexander

"The allure of strategic minerals has led many junior gold exploration companies in West Africa to diversify their project portfolios. Consequently, a considerable portion of our recent work has revolved around assisting junior exploration companies in their efforts to explore lithium assets."

Simon Meadows Smith,
Managing Director, SEMS Exploration

"Orica is looking at certain commodities that we think will start growing fast in the next year – the future-facing commodities such as lithium, nickel and cobalt due to the cleaner energy transition. We are seeing great growth in the mining industry in West Africa, and we hope to continue supporting this."

Victor Morales Baeza,
VP EMEA Mining, Orica

"There is an increased focus on ESG in the mining industry and Veolia is developing the technologies and solutions to support the industry in its ecological transformation. As investors focus on ESG, companies are encouraged to implement sustainable solutions."

Adrien Cerino,
Managing Director, Veolia Ghana

"The green energy transition has changed the game. There is an incredible rush in the DRC, even if it's dominated by China. The US is making a comeback, and that could reshuffle the deck here."

Cécile Amory,
President, MCSC

"With increased demands for critical minerals, Africa's great geological endowment, and the substantial capital being injected into mining in the continent, I am bullish on the demand we will see for our solutions from the mining industry."

Peter Quarm,
CEO, Dutylex

Central Africa

Leading the charge for a local battery metals value chain

Central African states were the first to embody Africa's new vision regarding the development of a battery metals strategy at the regional level. First pinned in 2022, the repercussions of the cooperation agreement between the DRC and Zambia to create "Special Economic Zones for the production of Battery Electric Vehicles" have started to materialize in 2023. Afreximbank and the United Nations Economic Commission for Africa facilitated the establishment of an Operating Company, in consortium with investors (both public and private) from the DRC, Zambia and elsewhere. At the Battery Metals Forum in Kinshasa in September 2023, attended by Ministers and Ambassadors from the US, Europe and African states, a pre-feasibility study for the establishment of the economic zones was presented.

Sharing the most prospective Copperbelt in the world – and competing for the number one copper producer spot in Africa – the Congolese and Zambian governments have stated their intentions to negotiate from a position of strength when it comes to their countries' critical minerals. Driven by the growing demand for copper and resting on assets like Konkola Copper Mines (Zambia) and Kamoa-Kakula (DRC), both ministers of mines of the DRC and Zambia delivered GBR with a similar message: The desire to sign win-win partnerships. The formula to move to a local value creation model must be affordable for capital, utilize good technology, able to attract strong partnerships and deliver competitive value addition.

Despite a long-lasting conflict in the northeast of the DRC, the country, and Zambia, offer clear pathways for foreign investors. Both countries have amended their policy frameworks in the past four years, offering stability and predictability for capital flow. Most importantly, in comparison with their Western African peers, elections do not constitute a trigger for political upheaval or mayhem. Looking ahead, the green energy transition will not happen without both countries' minerals, mostly copper, but also lithium and cobalt. For the DRC and Zambia, success will be measured on the ground. From Katanga to Ndola, those win-win partnerships will have to translate into an improvement of the life quality of local communities that sit at the bottom of the battery value chain and struggle to capture its value. ■

DRC: Rocky roads but huge upsides

The mining sector remains the main growth driver in the DRC, counting for close to 12% of total GDP in 2022, according to World Bank data. Spearheading the industry is copper, and the DRC keeps producing more of the red metal. The country produced 2.36 million t of copper in 2022, according to the Central Bank of Congo. This represents another YoY increase, particularly due to the expansion of Ivanhoe's Kamua-Kakula complex and China's CMOC boosting copper output. The DRC is closing in on Peru to become the second biggest copper producer in the world, while the country is also the world's largest cobalt producer, accounting for 73% of global output in 2022. Considering those impressive figures, one wonders why the DRC was ranked (again) in the bottom 10 mining jurisdictions for investment attractiveness. The answer is deeper than numbers: Poor governance, failure to capture value, and poor law enforcement keep plaguing the industry.

Turning challenges into opportunities

The first challenge to address is that of electricity. Despite a huge 100,000 MW potential hydroelectric power from the Grand Inga Dam projects, the country keeps importing electricity. The DRC hosts one of the biggest rivers in the world, which offers the opportunity for hydropower generation, but the lack of incentives and heavily bureaucratized processes are deterring funding. Gabriel Tshitende, managing director of Elephant Trade, said: "Congolese billionaires do not want to invest in energy projects because the procedures take years. Bureaucracy is an obstacle."

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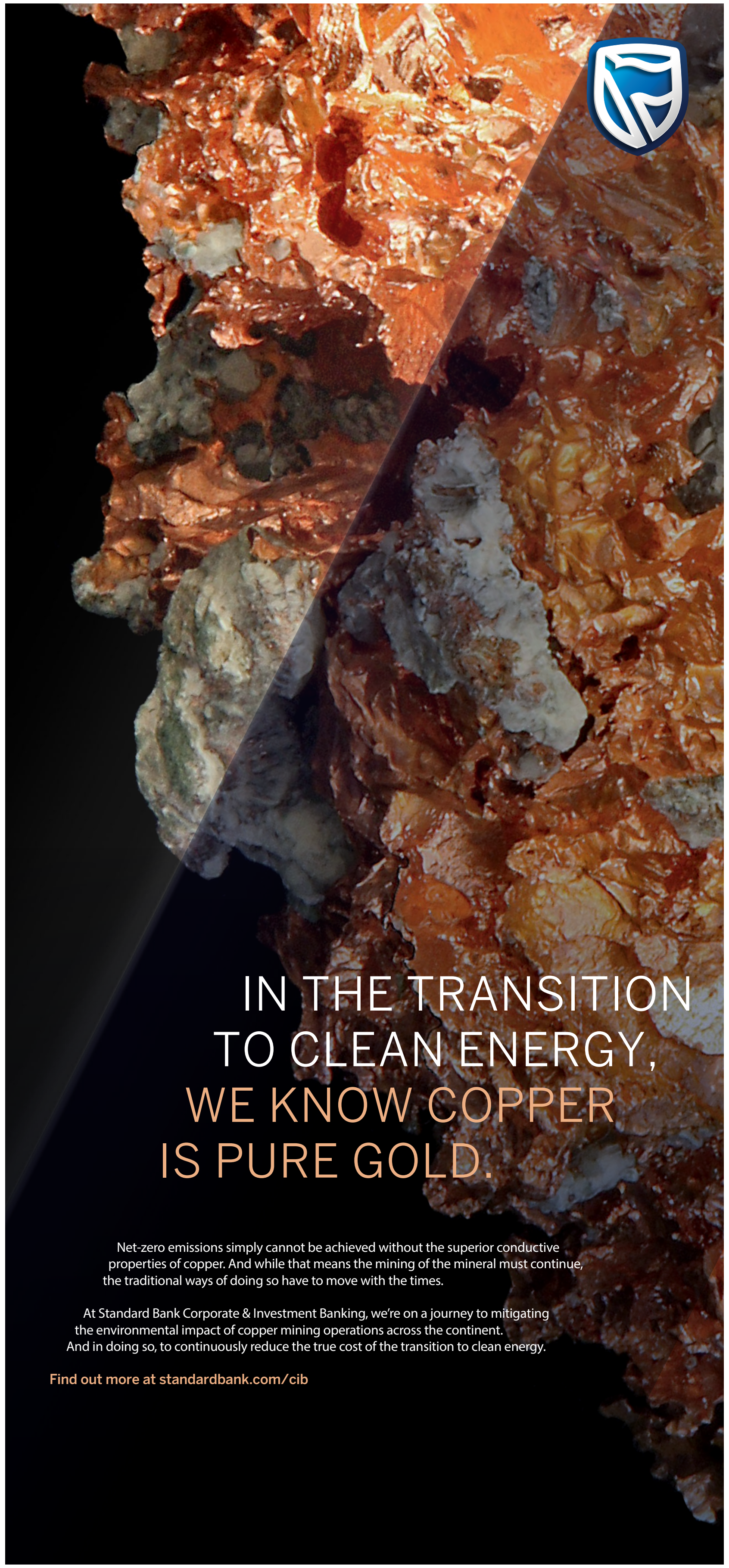
- RURAL WOMEN SUPPORT PROGRAM
- ENTREPRENEURSHIP PROMOTION PROGRAM
- DISTRIBUTION OF TEACHING MATERIAL



As private investment stall, institutional investors look to the State to address the energy challenge. Standard Bank DRC's new CEO, Marie-Gabrielle Opese, said: "The country has great hydropower potential. It is a matter of being willing to set up required stable power supply infrastructures and to give the private sector the means to process minerals and being deliberate in terms of actions."

To address power supply shortages, Glencore invested more than US$450 million to refurbish two turbines at the 1,424 MW Inga 2 hydropower plant.

Making the law a strength

The absence of regulatory cohesion remains problematic for investors in the DRC. In 2018, the DRC amended its Mining Code to provide more clarity for investors, as the threat of having a license revoked under unclear circumstances was not bearable. Patrick Bondonga helped draft the first Mining Code over two decades ago. The co-founder of OVK Lawfirm now sees the regulatory framework as a strength: "Our legal framework is an asset to attracting foreign investment. It is designed to obtain mining rights with clear principles, priorities, transparency and objectivity."

Growing production from the country's main copper operators –Ivanhoe Mines, Zijin Mining, Glencore, Eurasian Resources Group, Chemaf, MMG, and CMOC – led to strong demand for the services segment in 2023. With such demand came clear governmental ambitions to give local businesses priority over foreign companies. In Kolwezi and Lubumbashi, for instance, competition for operators' contracts is fierce. The law that reserves the subcontracting market for companies majority-owned by Congolese suffers from the practice of 'name-lending'. Reflecting on the situation, Adry Nzonzimbu, managing director of Minequip, shared: "In traditional subcontracting, the Congolese can assert themselves and take the lion's share. We have the expertise, the financial capacity, and the will."

Gabriel Tshitende (who is also the president of the National Club of Subcontractors) added that Congolese success in the field will require a shift in the entrepreneurial mindset: "Subcontracting is entrepreneurship: You need resources, a structure and expertise. We have compatriots who open businesses without knowing what to do with them." ■

Mapping mining operations and investment opportunities in the DRC

"The DRC has one of the largest lithium reserves in the world, is the largest cobalt producer in the world, and the largest copper producer in Africa. It is important now for the DRC government and investors to sit together, move towards a green economy."

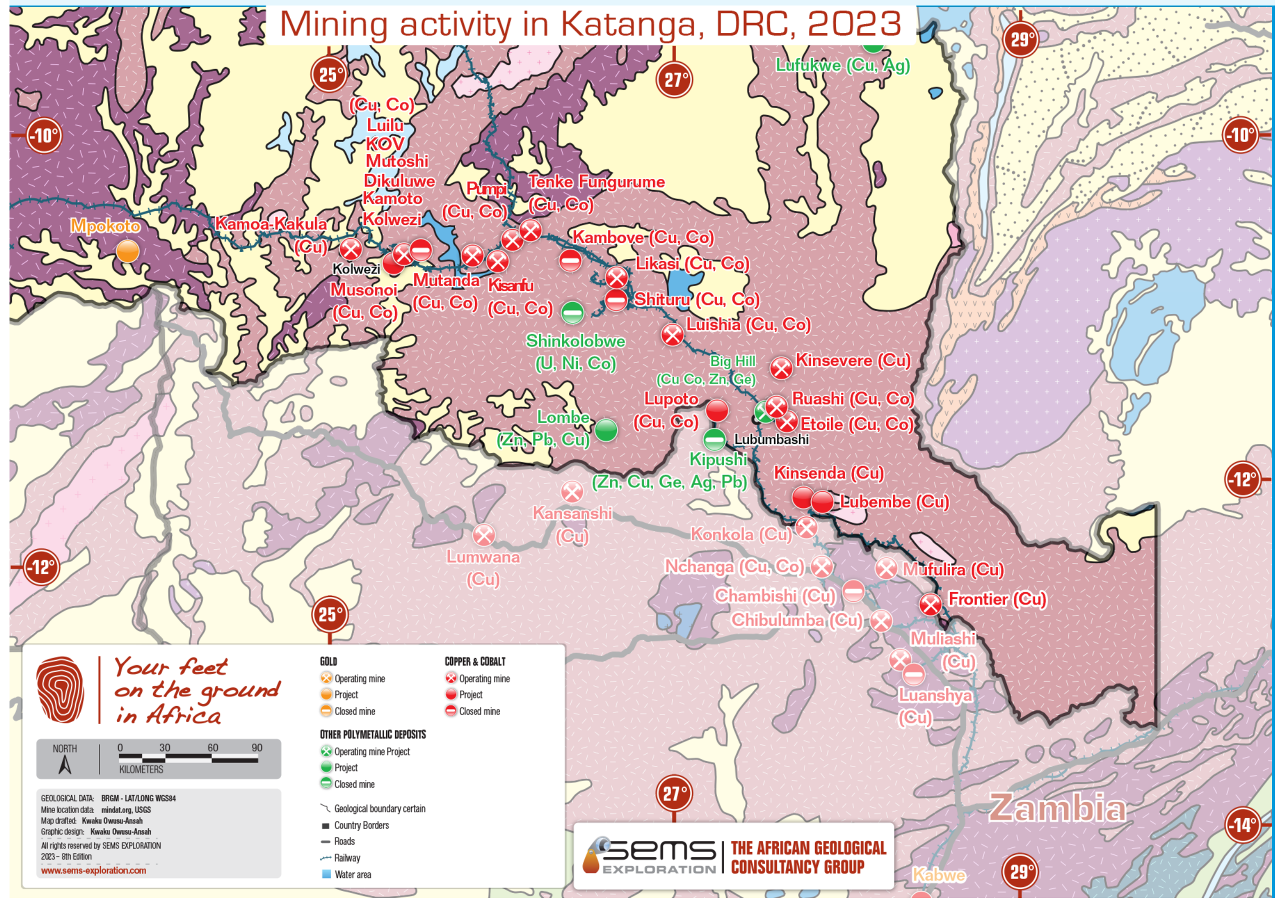
Marie-Gabrielle Opese, CEO, Standard Bank DRC

"The country is experiencing a real boom. There is a lot of opportunity; the bank has grown from US$2.6 billion to US$4 billion in assets in two years, and you don't see that kind of growth everywhere. The challenges are marketing real investment opportunities in the DRC."

Célestin Mukeba Muntuabu, Managing Director, EquityBCDC

"With a population of over 100 million, the domestic market is vast. In recent years, the DRC has made progress in the development of transport, telecommunications, and energy infrastructures, which facilitates investment and trade in the mining sector."

Alassane Sorgo, General Manager, Ecobank DRC



Zambia: Ambitions beyond wishful thinking

Zambia boasts some of the planet's most valuable copper reserves, ranking as the world's seventh-largest copper producer. Yet, the country's production of the red metal has been constantly falling since a peak in December 2013 (close to 998 metric tonnes). Copper alone accounts for more than 70 percent of the nation's foreign export revenues, while the country also hosts exploitable deposits of cobalt, nickel, and manganese. The lion's share of copper production in the country is split between First Quantum Minerals, Barrick Gold, and Glencore, together producing over 75% of the country's copper.

Zambia is still on the road to recovering from an all-time high in foreign direct investment in the country a decade ago, when the country attracted over US$1.8 billion in FDI. After negative values in 2021, UNCTAD reported FDI rose to US$116 million in 2022, particularly due to mining and renewable energy projects. Peace, security, market potential, strong infrastructure and political stability were the main factors that influenced decisions to invest and re-invest in Zambia.

There is one throne that Zambia eyes: Reclaiming the spot of African leader in copper production. Grappling with debt, the government aims for a copper production of over 3 million t/y in the next 10 years. Yet, there are some discrepancies on the line. A report from the Ministry of Finance and Planning forecasts that copper output will decrease by 10% next year from the 760,000 t mined in 2023 (a 14-year low), and the Ministry of Mines and Mineral Development axed its strategy around the opening of 17 new mines and increasing productivity by 200% by 2026.

Since taking office, Paul Kabuswe, Zambia's new Minister of Mines and Mineral Development, has set about getting the industry "out of court" (one cannot mine in court, and Konkola Copper Mines, Glencore and First Quantum all faced legal issues). After sitting all actors at the negotiation table, Minister Kabuswe stated his ambitions: "Our key priority is to continue implementing reforms that enhance the competitiveness and sustainability of the mining sector. We will focus on ensuring a stable and transparent regulatory environment."

"Our ambition is to position Zambia as a significant player in the battery vehicle value chain. With our substantial reserves of copper, cobalt and lithium, we aim to develop a sustainable supply chain, from mining to processing, that supports the growing EV industry."

**Paul Kabuswe,
Minister of Mines and Mineral Development, Government of Zambia**

The government's ambitions are having positive repercussions for explorers on the ground. Beyond copper, the country is host to Goviex Uranium's Muntanga project, of which the feasibility study is scheduled in 2024. CEO Daniel Major said: "A great advantage of Zambia is that there is talent and skills in the country, and you can find appropriate candidates for jobs. The Zambian government is supportive of mining as they want to expand the country's copper industry."

Looking ahead, forging strategic partnerships with foreign forces will be key to putting Zambia back on the mining growth path. The top asset-holding country in Africa, the UK, understood this well, as highlighted by James Cleverly's visit to Zambia via Moxico's Mimbula mine (the first by a British Foreign Secretary to Zambia in over 30 years). This followed the announcement of a £3 billion public-private investment package in Zambia's mining, minerals, and renewable energy sectors to "support green growth" in the country. ■

Southern Africa

Poor conditions despite the richest crust

The economies of Botswana, Namibia and South Africa all rely heavily on mining, which remains a central part of the socio-economic development of Southern Africa.

Southern Africa is home to the world's richest mineral deposits. South Africa alone is estimated to have non-energy minerals worth upwards of US$2.4 trillion, Lesotho hosts some of the most valuable diamonds on earth, and Zimbabwe is home to over 4,000 gold deposits. Yet, the region is among those with the highest levels of inequality in the world. A two-hour drive from Sandton to Pilanesberg Park will open one's eye to the reality of the "rainbow nation" beyond the flashy skyscrapers of Johannesburg. Indeed, Southern Africa represents the difficulties of catalyzing mining wealth into shared prosperity. Countries in the region have their differences, but to keep attracting investments, a few challenges stand out: Addressing the quality of the governance, maximizing revenue collection to improve wealth distribution, and building a regional strategy to help reduce energy, infrastructure and market access constraints.

South Africa: Adapting to survive

South Africa remains a leading powerhouse of the African mining scene. In 2022, the industry employed 475,000 people according to the MCSA (Minerals Council of South Africa) and contributed over R493 billion to the country's GDP. Despite headwinds felt across the continent, the industry remained a trillion-rand industry for the second year in a row (when measured in production value).

The largest contributor to the industry, Platinum Group Metals (PGMs) saw a 15% production decrease in 2022. Loadshedding by Eskom is a main factor explaining the output falling, although changing trends in vehicle demand and environmental legislation promise a better outlook for 2024. Characterized by deep underground mining (with Mnopeng and Driefontein having a vertical depth of almost 1,219 m), South Africa's gold sector remained the third contributor to the country's revenue from minerals, behind PGMs and coal. Yet, the country, which was the world's top gold producer until the mid-2000s, sees its output continuously slumping, with 110 t produced in 2022 (against 189 t in 2010, according to Statista). Five firms – Harmony Gold, AngloGold Ashanti, Gold Fields, Sibanye Stillwater and Northam – continue to account for over 50% of total production in the country. Affected by rail and port capacity constraints, iron ore (66 million t/y) and manganese (19 million t/y) were also on the decline.

Beyond those figures, the short-term challenges – fluctuating commodity prices, crippling power cuts (at the alarming rate of at least two hours a day in Johannesburg), rail network constraints, and a tumbling rand – have managed to hide South Africa's bigger problem; Its mineral reserves are shrinking. Should the predictions of the latest PwC South Africa Mine Report be accurate, the country

Mining's Contribution to the South African Economy (2022)

Direct GDP contribution
R493.8bn
(2021: R475.0bn)

Minerals exports
R877.6bn
(2021: R855.7bn)

PAYE by mining employees**
R27.1bn
(2021: R26.2bn)

Royalties paid**
R14.2bn
(2021: R11.8bn)

% contribution to GDP
7.53%
(2021: 7.56%)

Employment
475,561
(2021: 458,954)

VAT (net outflows)**
R28.9bn
(2021: R34.7bn)

Transfer duties paid**
R8m
(2021: R12m)

** Fiscal Year
Source: Minerals Council of South Africa

would have no more than 50 years of gold, platinum, iron ore and coal mining left.

Record performance and shareholder returns seen post-pandemic have now regressed. Infrastructure constraints, energy challenges and lower productivity have led to lower profits and margins for operators. The country now sits among the bottom 10 of the Fraser Institute's Index for investment attractiveness, the worst it has performed since 2009. Thankfully, the country can count on its exceptional mineral diversity to meet current challenges, leveraging critical minerals for decarbonization efforts.

That mineral wealth, particularly in the field of "future-facing commodities" and uranium, has the potential to revitalize a struggling South African mining industry. Ralf Hennecke, managing director of BME, a bulk mining explosive and blasting technology supplier who operates at several mine sites, particularly in Northern Cape, saw promising signs in 2023:"In South Africa, our customers are demonstrating positive growth. In the Southern African Development Community there is something of a revitalization in mining, with added opportunities emerging in battery minerals and uranium."

Energy security remains the key concern in South Africa. Eskom, the South African giant with clay feet that provides 90% of the country's electricity, recently braced the Rainbow Nation for another winter in the dark. The National Energy Crisis Committee (NECOM) attempts to stabilize the performance of the electricity-generating coal fleet, but years of corruption and neglect are still being felt. Logistical infrastructure has also suffered, and the deterioration of

"There is a lot of frustration coming from unfulfilled promises in South Africa, such as an effective mining cadastre (still lacking today). At the same time, South Africa is the world's biggest producer of platinum, chrome and manganese, and an extremely prospective jurisdiction."

Errol Smart,
CEO, Orion Minerals

Transnet, the state-owned logistics company that manages Transnet Freight Rail, has also significantly affected the mining industry.

As many businesses and households are today being run on generators or solar and battery systems, the energy crisis will remain at the top of the agenda in the coming months at least. Indeed, the MCSA reports that mining operations were running 20-30% under capacity due to the electricity constraint. Having lobbied to streamline reforms regarding energy processes, Mzila Mthenjane, CEO, MCSA, explained: "Energy security is paramount in this context because electricity is the lifeblood of industrialization. We cannot simply talk about beneficiation without addressing the fundamental need for reliable and affordable energy sources."

In a country overwhelmingly powered by coal, supply challenges have led to a need to diversify and an acceleration of investments in renewable and off-grid solutions. Seriti, Exxaro and Anglo-American all invested in such projects. Hadyr Koumakpai, GM Africa of Ja Solar, a manufacturer of photovoltaic panels, said: "South Africa has been at the forefront of embracing new technologies and transitioning away from fossil fuels. Challenges like power cuts highlight the urgent need for reliable and sustainable energy solutions."

Jonathan Debasc, managing director flexible generation Africa at Engie, shared: "The most important thing for our clients in South Africa is reliable power, and if it can be green, it is a great benefit as it then contributes to their decarbonization targets."

The sleeping giant's unparalleled potential

Coal is vital in South Africa. The seventh largest producer in the world has appreciated that fact and is now looking to invest in new technologies to capture emissions and leverage capital gained from coal to then invest in critical minerals. As European sanctions on Russian coal persist, South African coal exports to the European Union surged by +677% in Jan-Dec 2022 to 15.8 million t from just 2 million t in 2021. Sandton-based Menar has several coal mines in its portfolio, along with coal development assets. Vuslat Bayoglu, managing director, said: "It is difficult to put a timeline on coal, but given the incapacity of renewables to provide baseload, I believe South Africa will continue using coal until resources are depleted."

Systemic problems, such as crime, corruption and poor governance, constitute foundational challenges for South African miners. Another is bureaucracy. There are over 5,000 permits currently awaiting government approval for exploration and mining activities. Should these be approved within the next six to 18 months, SA


Image courtesy of Orion Minerals

could witness a substantial influx of capital into the sector. "Considering the multiplier effect, mining can generate economic opportunities between eight and 10 times its initial investment", said the Minerals Council of South Africa's CEO Mzila Mthenjane.

The maturity of South Africa's mining industry makes it an ideal playground for testing out new technologies. South Africa has been a pioneer in fuel cells, and in 2022, Engie and Anglo American inaugurated the Rhyno project at Mogalakwena platinum mine. The world's largest hydrogen-powered mining haulage truck, capable of carrying a payload of 290 t, demonstrated the country's capability of being a leader in decarbonization initiatives at mine sites. "South Africa is moving towards greater automation in mining operations, aligning with global trends. However, the successful implementation of autonomous systems necessitates dependable and low-latency networks, such as 5G or private LTE," shared Gabino De Diego, BD manager at Torsa Global, a Spanish technology manufacturing firm that opened its first African office in SA in 2023.

In conclusion, despite slipping mining profits, currency fluctuations, load shedding and logistical problems in exporting minerals because of deteriorating infrastructure, there are many signs of hope ahead for the "Rainbow Nation". Leaders of Africa's most advanced economy will most likely be intent on refocusing some of their efforts towards "future-facing" commodities like copper, lithium and manganese the South African soil is endowed with. The country can also count on – perhaps – its most bankable resource:

"Eskom is struggling at the moment, but have realized that, as an original equipment supplier, we are capable of being their partner and helping them out of their current difficulties."

Christian Gerhard,
Managing Director,
Loesche

Its workforce. Its world-famous engineers continue to lead the development of many mining projects across the continent, and those skills will be key to reshape the industry. As put by Vuslat Bayoglu, managing director of Menar, which has got its own training academy – "South Africa has a rich mineral endowment, as well as good infrastructure in terms of roads, rail, power, banking, and judicial system, and, importantly, a very talented workforce: Everywhere you go in West, Central, or East Africa, you will find highly educated South African engineers." ■

Namibia: Juniors' playground, and a gateway to the Southern African market

"Namibia's strategic location with regards to the global markets is fundamental, our ports and infrastructure development are crucial assets."

André Snyman, Managing Director, Walvis Bay Salt Holdings

Namibia's mining industry saw double-digit (21.6%) growth in 2022, and all indicators have shown progress: mining's share in GDP contribution, turnover, and royalties paid all rose significantly in the past months. As eight of Namibia's 26 mines remain in care and maintenance, the main reason behind this fruitful period was the inauguration of Debmarine's US$7 billion Benguela Gem vessel in March, the major contributor to the 45% increase in diamond production. But there are many other reasons for Namibia to be excited as foreign investors leverage both the country's geological potential and its strategic position as an entry to other Southern African jurisdictions.

In a vast and sparsely habited country (824,292 km2 with 2.5 million inhabitants), where many deposits are yet to be found, exploration opportunities are numerous. Osino Resources made a greenfield discovery at its Eureka gold project in August and is hoping to create a new gold district in an area virgin of previous exploration and with no known deposits. Developing the Tier-1 heavy rare earths Lodfal project in the North-West, Namibia Critical Metals (NCM)is an essential player in the exploration scene, and its CEO Darrin Campbell recognized: "Namibia is a huge country with an extremely small population, making it perfect for exploration."

With NCM spearheading the movement, rare earths players in Namibia are looking at adding value to their proposition by creating a rare earth separation plant within the country. Understanding that most rare earths deposits are relatively small, NCM, E-Tech Resource, and Ondoto formed the Rare Earth Alliance Namibia (REAN), a JV to conduct a feasibility study on a rare earth separation unit to handle the throughput of their projects locally, rather than having those sent to China. This unique deal amongst juniors who are actively competing for the same pool of capital highlights a growing trend of mining firms wearing the cap of downstream processors to navigate today's capital markets.

After a two-year legal hiatus, Deep South Resources' HaibCopper License EPL 3140 was renewed by the Ministry of Mines and Energy in July 2023, so that in October Deep South resumed drilling at Haib, aiming to complete a 5,000 m diamond drilling program towards a new resource estimate. Pierre Léveillé, CEO, expanded on the operating environment: "Namibia has always been one of the best countries in Africa for junior mining companies to do business in as the country is welcoming to mining, the legal environment is well organized and the rule of law prevails."

With the longest-running Uranium mine – Rossing – still in production, the fourth-largest uranium producing country in the world will likely see its output growing in the coming years, as firms like Elevate Uranium and Bannerman Energy see their flagship assets move into development. Bannerman completed a DFS for its Etango-8 project and is currently working toward securing project financing and off-take agreements. Elevate Uranium holds the largest land position for nuclear fuels in Namibia and is advancing its Koppies project. CEO Murray Hill said: "Namibia stands out as the only country in the world with a dedicated Uranium Association. Overall, the combination of a supportive government, robust infrastructure, and a knowledgeable local workforce makes Namibia an excellent jurisdiction for uranium mining."

Beyond its hydrogen potential - Namibia signed the largest hydrogen deal in sub-Saharan Africa to date, worth US$10 billion - in the short term, operators in the country will continue to leverage the country's solar and grid potential. The largest gold producer in Namibia, B2Gold, saw both environmental and costrelated benefits from this: "In addition to the 6 MW solar power plant commissioned in 2018, the connection of the Otjikoto mine to the NamPower Grid in late 2022 will reduce operating costs and GHG emissions," explained Clive Johnson, its president. ■

Expert Opinion Article

First GISTM deadline reflects progress and prospects

Vis Reddy, *Chairman, SRK Consulting (SA) & Regional Coordinator (Africa), SRK Global*

John Stiff, *Director and Principal Engineering Geologist, SRK Consulting*

The first deadline for tighter standards in the tailings field was reached in August 2023, reflecting much progress and many lessons learned.

Launched in August 2020, the Global Industry Standard on Tailings Management (GISTM) set a three-year deadline for tailings storage facilities (TSFs) for sites with the two highest potential consequences for failure. The standards demand a heightened level of due diligence, and required specialists in tailings design, monitoring and management to both deepen and broaden skills and capabilities in this field of engineering.

The learning curve precipitated by the new GISTM standards has affected not just consulting engineers and their clients, but also government regulators and third-party operators managing tailings facilities. This has led to improvements in best practices and, importantly, to higher minimum standards that are more broadly applied.

Recent TSF failures have led to many additional studies to understand inherent geotechnical risks, and the training of more engineers and scientists to service the sector will be paramount. The failures that led to the GISTM were a wake-up call for the sector and prompted a renewed focus on developing our understanding of all facets of design, operation and monitoring.

The GISTM is aiming to increase confidence in tailings storage facilities, by ascribing to a higher level of investigation and understanding – which has driven developments over the last three years. Among the areas receiving most attention has been the record-keeping and analysis of reports and studies to ensure that the life cycle development tracks the design intent of each tailings dam.

This more detailed focus allows any changes since the original design report to be re-assessed in relation to the TSF stability. Facilities can have perfectly good designs, but there are often deviations during the construction and operation – which could prove to be fundamental to the safe operation and closure of tailings dams. It is therefore vital to keep better record of each site's development, so that it is clear that they are being maintained and operated in accordance with the design intent.

Performance monitoring – through enabling technology – is playing a growing role in continuously tracking a TSF's vital signs. Instead of waiting for monthly or quarterly inspections, monitoring can now be conducted in real time, delivering critical information through a dashboard to inform both operators and accountable executives and enable timely interventions to avert potential failures.

It is crucial to keep up the momentum of advancements being made; many companies are making good progress while others are still lagging. The processes that GISTM has initiated is an important opportunity to reduce operational risk by better understanding those risks, and finding sustainable solutions. ■

Image courtesy of Fortuna Silver Mines

Focus on tailings management

Towards more regulation

A year after the Jagersfontein tailings dam collapse, miners keep moving toward the implementation of the Global Industry Standard on Tailings Management (GISTM). The International Council on Mining and Metals (ICMM) members were handed robust roadmaps, the first deadline being August 2023, when all tailings storage facilities (TSFs) with "extreme" or "very high" potential consequences were ordered to comply with the Standard. All TSFs will have to do so by 2025.

For tailings management, risk mitigation remains a major challenge, and equipment providers have noticed the increased scrutiny on African miners' mitigation measures and environmental approaches. "Demand in the tailings segment is driven by ESG and mining houses' sustainability efforts. We see that both tailings management and hydrometallurgy solutions will be a big area of interest for customers in Africa moving forward," detailed Metso's VP minerals in Africa, Charles Ntsele.

Technology and innovation are key drivers of safety improvement in the tailings space. Recognizing this, Fraser Alexander established a team dedicated on mechanized dry-stacking filter plants for tailings management. A few years back, the firm developed its Digital Tailings Risk Management System, as it saw the opportunity to manage tailings through digitalization. It is also a leader in the art of unlocking value from existing waste. Lourens de Koning, COO, explained: "We continuously explore innovative methods to extract added value from historical tailings. This strategy has already proven successful in the gold industry and is gaining traction in the platinum sector."

Extracting resources from mine wastes contributes to the long-term sustainability of a mining operation. Waste, previously seen as an environmental burden, today helps offset closure issues and costs while allowing continued wealth generation.

South African consultancy and engineering firms, like Fraser Alexander or SRK Consulting, help miners re-think mining waste in accordance with ICMM standards. For operators seeking to improve their ESG standards through recycling while creating new economic value, those circular economy aspirations are enticing.

Digitalization efforts, technologies to recover mineral residue, and holistic circular economy approaches also remind the adage learned during chemistry lessons that nothing is lost, nothing is created, everything is transformed. ■

Technology adoption in Africa's most mature mining jurisdictions

"The mining industry has historically been conservative and liked to be the first to be third when implementing new technologies. Mining operators are risk averse as they cannot afford any downtime, and therefore technologies must be de-risked before they will consider adoption."

Richard Doyle,
Managing Director,
JUWI

"The Polytechnic Faculty of the University of Lubumbashi was the first to produce civil engineers to support the Congolese mining and metallurgical industry. Universities need to be in constant contact with industry to meet expectations. Academic-industry collaboration is vital to the future success of the Congolese mining industry."

Jean-Marie Kanda,
Dean, Polytechnic Faculty,
University of Lubumbashi

"Our innovation efforts are driven by three key imperatives: To increase production by drilling more meters per hour, help our customers cut costs (by using less fuel), and reduce the carbon emissions at their operations. While supporting our customers with their Scope 3 emissions, Mincon is focused on reducing our Scope 1 emissions."

Martin van Gemert,
Regional VP (Africa),
Mincon

"Technology adoption goes hand in hand with jurisdiction maturity and I believe that over the next five years, underground electric equipment will be more normalized in the most advanced jurisdictions of Africa. Having tier-one mining houses implementing our BEV technology will probably give its adoption rate great momentum."

Johan Strydom,
Managing Director,
Normet Africa

"In the case of gold extraction, activated carbon is used in a carbon-in-leach (CIL) process, where the gold ore is extracted into the activated carbon. Using activated carbon is much more efficient and sustainable compared to more polluting methods traditionally used for gold extraction."

Al Eadie,
CEO & Co-founder,
Panthera Activated Carbon

Gold

Risk-taking and de-risking

Africa has always been seen as the epitome of high risk, high reward; a continent with resources as copious as the troubles incurred to extract them. In this year's Fraser Institute ranking of the best mining jurisdictions, only one African country (Botswana) makes the top 10; by contrast, in the bottom 10 only one country (China) is not African. This year, we find African gold miners taking more risks than before, compelled by the high gold price opportunity, while also doing more de-risking work to engage a more risk-savvy - not to call it risk-averse – investment climate.

The risk-reward mentality is becoming more pronounced at the two extremes as an adaptation to both global and local dynamics. At the global level, we note unusual asymmetry between a very attractive gold price (which touched a height of US$2,000/oz earlier this year, not far from its all-time high), but that is not necessarily being followed by a strong investment appetite, not in the equity markets at least, which have been the traditional financing vehicle for juniors. At the local level, the opportunity to find gold in Africa is increasingly more tempting. Africa produced 864.2 t of gold in 2022, according to data from the World Gold Council. This is more than double that of China, the biggest pro-

"The factors that drive the popularity of gold remain strong and every time there is a financial shock, people keep turning to gold."

Jeff Quartermaine, Managing Director and CEO, Perseus Mining

ducer, with 375 t. Since 2010, gold production in the continent has risen by almost 60%, writes Brookings, while globally it has only grown by 26%. If the fact that Africa holds 40% of the world's gold is not compelling enough, the bonus of a high gold price and profitable returns is stirring a lot of interest.

Much of this interest is concentrated on West Africa, the world's top generator of gold discoveries in the last decade. However, declining reserves in the main gold jurisdiction, Ghana, together with instability in the Sahel, where the rest of the bulk production comes from, have also sent investors looking for new prospects further out in the continent, including in previously unexplored or deemed unsafe areas. Out there, they come across an even bigger opportunities, and bigger risks.

Africa's shifting gold geographies

Every mining jurisdiction in the world comes with its challenges, from long permitting times in Canada, to land access in Australia or sensitive community relations in Latin America. Africa's main challenge is political instability. Ongoing conflicts have prevented exploration and mining in certain countries, and violence and other troubles have "preserved" many of Africa's resources untouched.

A greater number of juniors are working now in under-explored West African countries like Liberia, Cameroon and Sierra Leone. Karl Smithson, the CEO of Hamak Gold, an early-stage explorer in Liberia, attributes the shift to countries not historically considered for gold mining to the mitigation of political and country risks over the years. "I have always held the view that politics and challenges improve over time, but geology always remains the same," he told GBR.

In Liberia, Hamak Gold joins London-listed producer Hummingbird Resources which owns the Dugbe gold project, with a 2.76 million oz gold mineral reserve estimate (MRE). Liberia has been a relatively stable democracy since 2013, though it is still scarred by the Civil War that officially ended 20 years ago. So is its neighbour, Sierra Leone, a country whose "blood diamonds" continue to stain its reputation today. But gold mining could provide immense opportunities for the country: The development of the Baomahun gold project could create up to 2,500 direct and indirect jobs during the construction phase, and thus become the second largest employer in the country, informed the Africa Finance Corporation (AFC), one of the key financial institutions in the continent, which is putting US$175 million into the project. Developed by private company FG Gold, the 5.81 million oz Baomahun is one of the largest gold projects under development in the continent. Probably, Sierra Leone holds others like it.

A notable example of how a country can, post-war, transform from underexplored to a gold producer in record time, is Côte d'Ivoire. Five years ago, Côte d'Ivoire was still an emerging jurisdiction that took the fancy of adventurous explorers. But those explorers were rewarded with consistent discoveries, of of which many have become mines.

Though Côte d'Ivoire has been prioritized mostly for its low-cost, close-to-surface gold potential, some older-established players in the country are now assessing the potential of underground too. Perseus Mining, the Australian mid-tier producer with three active mines in its portfolio, has proven the feasibility of an underground operation at its Ivorian Yaouré mine. This would mark Perseus' first foray underground, but also the first underground development in Côte d'Ivoire.

The Arabian Nubian Shield (ANS) wins over new players

Recently, very high grades, large deposits and a turn in policy are coaxing both majors and juniors to the Arabian Nubian Shield (ANS). Egypt, after introducing a new mining code in 2020, has awarded licenses to a range of new entrants; for instance, Ankh Resources obtained the Dara concession, not far from Barrick's license in the Eastern Desert.

The main attraction to the ANS is purely geological. In Ethiopia, Akobo Minerals found a small bonanza-style deposit with a headline-making average grade of 22.7 g/t Au, as published in the MRE, and with 40.6 g/t Au in the indicated part. Its developers say this is only comparable to Kirkland's Lake's Fosterville mine in Australia, which is considered the highest-grade gold mine globally.

But, as with any mining jurisdiction, ANS countries also come with their set of challenges and opportunities. Logistics can be either unbelievably easier or unimaginably harder. On the security front, parts of the region are also very unpredictable. This year, Ethiopia signed a peace deal with Tigrayan forces, which is hoped to mark the beginning of the end of the conflict. However, Jørgen Evjen, the CEO of Akobo Minerals, expects it will take a few more years before northern Ethiopia becomes operable. In neighbouring Sudan, conflict broke out in April this year between the Sudanese Armed Forces (SAF) and the paramilitary Rapid Support Forces (RSF), with thousands killed to date. Though far from the conflict area, Perseus' recently acquired Meyas Sand gold project, formerly known as Block 14 under previous operator Orca Gold, is currently on hold.

In gold-rich Africa, balancing risk with opportunity is a lot about the right timing, as one can observe in the recent history of the main gold-producing countries. Rapid political and economic change, together with quick exploration-to-mining timeframes, could see the map of gold producing countries drastically changed in the next 10 years, depending on how current and new players respond to risks.

Consolidation

Though African miners and explorers share many common challenges, including jurisdictional risk, a poorer investment sentiment, or ESG risks, there are two aspects they experience fundamentally differently: One is financing, which is almost always a sore issue for explorers. The other is the decline in reserves, which is a big issue for producers, but an opportunity for juniors.

Producers can respond to this threat by doing more brownfield and greenfield exploration, moving further underground where there is a case for it, or acquiring new projects. In recent years, and with the backing of a strong gold price, the sector has showed more love to brownfield projects. In a recent example, Barrick, which operates one of the top 10 largest gold mines in the world in Mali (the Loulo-Gounkoto complex), recently rebooted its Tanzanian Bulyanhulu mine, put on care and maintenance in 2019.

However, an even better way of deriving more value from existing projects is by consolidating across multiple assets. This has taken many forms this year: In Ghana, two leading mines operated by two majors (Gold Fields and AngloGold Ashanti) are to come together, a union long expected in the industry: "Earlier in 2023, we announced the intention to form a joint venture between the Tarkwa gold mine and AngloGold Ashanti's (AGA) neighbouring Iduapriem gold mine to potentially create Africa's largest gold mine. With this merger, we certainly see a significant extension of mine life, as well as a huge upside in terms of getting the combined mine's AISC under US$1,000/z," Martin Preece, interim CEO at Gold Fields, told GBR.

The two companies are in negotiations with the government and hope to conclude the transaction soon.

Also in Ghana, Asante Gold is on a path to transform into a mid-tier producer after acquiring two mines, Chirano from Kinross and Bibiani from Resolute Mining. With the Bibiani sulfide plant brought into production, Asante should produce over 500,000 oz/y from 2025 onwards from the two mines: "The Chirano lease is immediately contiguous to Bibiani's. The acquisition gave us an opportunity to control 53 km along the Bibiani and Chirano shear zones. This is an extraordinarily prospective trend that has produced over 8 million oz throughout its history. Since completing the acquisition at Chirano last August, we have been able to establish a life of mine of more than 10 years, just like we did at Bibiani," said its CEO, Dave Anthony.

Other examples of neighbours coming together can also be seen in Burkina Faso, with its two newest mines, Bomboré operated by Orezone and Sanbrado of West African Resources (WAF), located 14 km one from another, seeking synergies in a new MoU.

"For any foreign investor to commit a large amount of capital, there needs to be legal and fiscal stability in the country, with predictability for the investor, and a transparent process that provides an adequate level of investor confidence."

**Clive Johnson,
President and CEO,
B2Gold**

Traditional producer-buys-junior acquisitions are also expected to increase. Just as it brought to life its newest mine in Côte d'Ivoire, Fortuna Silver Mines acquired advanced explorer Chesser Resources, adding to its portfolio the Diamba Sud gold project in Senegal, which has an MRE and scoping study completed last year. Fitch Ratings suggests deal-making in 2023 is on track to be the highest in a decade, on the back of high profits accumulated in 2021-2022. This trend appears likely to continue heading into 2024, with the offer from a Chinese-group for Tietto Minerals confirming the lively deal-making scene in the region. This should give explorers and developers a good audience to showcase their projects to. ■

Copper

The Race for Africa's Copperbelt(s)

There have been many high-profile visitors to Africa lately. Early in the year, Pope Francis delivered a speech in front of huge crowds in Kinshasa, lamenting the exploitation of Africa's resources: "Africa is not a mine to be stripped," he said. A few months later, US Vice President Kamala Harris was touring Ghana, Zambia and Tanzania, pledging more investments in Africa's future, including in the development of minerals. Europe has also increased its outreach to Africa. The European Commission's leader, Ursula von der Leyen, told attendees at the Africa Climate Summit this September that Europe wants to partner with Africa to close the clean energy investment gap: "We are not only interested in extracting resources, but to partner with you to create local value chains."

Africa is no stranger to the scramble for its minerals by foreigners. Most African mines belong to Chinese, Australian, European and Canadian companies, while the rest are owned by South Africans. However, the urgency and scale of the energy transition, which will require massive amounts of copper, cobalt, nickel, lithium, graphite, rare earths, and other so-called critical raw materials, directs a flurry of renewed interest to the place that has it all. Africa holds 30% of the world's minerals, yet many of these remain undiscovered and unmined.

That said, Africa's copper has been noticed in recent years. The DRC jostles with Peru to be the second-largest copper producer. As copper demand is projected to reach a record 50 million t/y by 2035, from the current 25 million t/y, the looming supply shortage is a major concern. This anxiety is doubled by another one - China's dominance. China has an outsized influence in materials processing with 68% of the world's nickel refining capacity, 40% of copper, 59% of lithium, and 73% of cobalt, according to a report by Brookings.

For the past few decades, Africa's largest investor has been China. Between 60 and 80% of the mining production flow out of Africa has been financed by Chinese capital, reported Dentons Mining Law. But troubles at home, caused by Covid and a slowing economy, have reduced the total Chinese FDI to Africa from almost US$5 billion in 2021 to US$1.8 billion in 2022, according to Statista figures. This creates a gap that Europe and the US could exploit, though it is difficult to see how they could fill it.

This year's prominent visitors did not come to Africa empty-handed. Half of the EU's new foreign US$322 billion investment plan, known as Global Gateway, is directed to Africa as part of the mission to close the gap in the energy transition. The EU is looking to finalize a partnership with the DRC and Zambia to boost local industries and secure critical materials for the green transition, something that the US has already done, having signed a trilateral MoU with the two Copperbelt countries to develop an integrated regional EV value chain.

Commenting on these developments, Marie-Chantal Kaninda, president of Glencore DRC, said: "Zambia and the DRC are home to 80% of the minerals required for the production of electric vehicle batteries, and the countries have signed a cooperation agreement to facilitate the development of the electric battery value chain. Being a major producer in the DRC, Glencore also has a role to play, ensuring that we contribute to the green transition by producing responsibly."

However, these partnerships are still a long way from meeting Africa's multi-billion dollar investment needs to realise the green energy transition. Standard Bank calculated that US$700 billion is required in the next decade, money that is not available in the local banks. Asked whether the world (not just China) is becoming more attuned to opportunities in Africa, Osam Iyahen, senior director of natural resources at the Africa Finance Corporation (AFC) told GBR: "We see a remarkable amount of interest in the African mining space, especially from the Americas. It is no coincidence Kamala Harris visited Zambia and Tanzania. Likewise, Asian countries have always shown a lot of interest and a higher tolerance for risk in Africa. I see more and more interest and potentially a higher capital inflow in the mining sector."

The return of majors to the African mining space confirms that trend. Almost 10 years since exiting the continent, BHP has recently acquired a minority stake in the Kabanga nickel project in Tanzania. While Chinese firms have broad control over copper and cobalt mining projects, Africa's exploration sector remains Western-driven. 80% of exploration expenditure comes from Canada, Australia, the UK and South Africa, according to the European Council of Foreign Relations. The US is also joining that list. Last year, California-based explorer KoBold Metals

"Congolese billionaires do not want to invest in energy production because the procedures take years. Bureaucracy is an obstacle. Logistics too: to get from Lubumbashi to Kinshasa, a flight that normally takes two hours, I had to go via Nairobi!"

Gabriel Tshitende, General Manager, Elephant Trade

allocated US$150 million to develop the Mingomba copper mine in Zambia.

Western investors seek to counter China's dominance by promising better ESG standards. In its turn, China has been a bedrock for investment in the continent, and it can levy strong financial and technical capacity, a higher risk tolerance, as well as long-term relationships with African governments and various economic actors. African nations are not ready to ditch China, nor to trust America. Instead of choosing sides or becoming a new arena for a contest between the US and China, Africa must leverage the increased competitiveness, strike better deals for minerals, and ensure that this race for critical minerals translates into growth for its economies and populations.

"The market has been tremendously buoyant over the last year, marked by the significant increase in production at the Kamoa-Kakula copper mine in the DRC, which entered its second phase of production late last year. This had an immense impact on cargo demand."

Amaury Luyckx, CEO, Polytra Group

The diversity of interests in Africa's copper can be observed in the latest race for the acquisition of Botswana's Khoemacau copper and silver mine, which is one of the continents' largest copper deposits. Valued at US$1.5 to US$2 billion, Khoemacau has attracted Chinese bidders like Zijin Mining and MMG, which already own assets in the DRC, but also Johannesburg-listed Impala Platinum, Exxaro Resources, and Sibanye Stillwater, as well Australian companies South32 and Sandfire Resources. The last two have now dropped out. In Zambia, an investor from the United Arab Emirates (UAE) has also made an acquisition proposal for Mopani copper mines, which the government bought from Glencore in 2021 and has put up for sale. The Arab investor is competing with household names like Zijing, which brings in the capital and expertise, and Sibanye, which has experience in reviving some of South Africa's oldest gold and platinum mines. A final decision is expected by the end of this year.

Whereas Khoemacau indicates international competition, a logistics project called the Lobito Corridor shows how international collaboration can be the solution to drive real change.

Demand creates supply (and logistics issues)

Ample literature supports how the world has routinely underestimated Africa. But one image helps to visualize some misconceptions about how we think of Africa: The world map itself. The Mercator map projection distorts the relative size of the countries furthest to the Equator, stretching them bigger than their true size. Africa is, actually, much bigger relative to other places than one can gauge on the map. Within its landmass, Africa can fit the US, China, India, Japan, Mexico, and many European nations combined, calculated the Visual Capitalist.

At a purely practical level, this realization helps one to correct how to estimate distances across the continent and start understanding the logistics challenge. At an interpretative level, this mis-sized view is also a metaphor for limiting misperceptions: "When American investors think of mining in Africa, they still think of cobalt, Congo and child labor," reported British newspaper The Economist.

Continuing with the subject of size, the Kamoa-Kakula copper mine in the DRC, on a path to become the third largest copper mine in the world, has a mineralization of 28 km x 23 km, twice the size of Malta. The project, a JV between Ivanhoe Mines, Zijin Mining and the government of the Congo, plans to complete Phase 3 expansion in 2024. This will boost annual production to 650,000 t/y. Additional supply is expected to drive the copper market into a surplus next year, according to The International Copper Study Group (ICSG). But, long-term, the market is headed towards a structural deficit, forecasters agree. Bloomberg thinks a shortfall of around 5.4 million t/y by 2027 – this is about eight Kamoa-Kakula's production in 2024 - may push the price up by 20% to US$9,800/t.

"If the current trend of global mining output continues - with dwindling supply of copper, declining grades, limited future mining opportunities, and insufficient investment, we will be faced with a substantial (copper) deficit."

Marna Cloete, President, Ivanhoe Mines

The economic dogma that demand creates its own supply is applicable today across Africa's two major belts: the well-known Copperbelt, covering the DRC and Zambia and home to the continent's flagship Kamoa-Kakula Complex, and the emerging Kalahari Belt, crossing Botswana and Namibia. In the Copperbelt, the DRC has stolen the show in recent years, progressing fast into a top three global copper producer, but Zambia is determined to catch up.

Zambia is currently producing 850,000 t/y of copper, the sector having been derailed by political issues under the former government.

Recently, Zambia agreed to return control of Konkola copper mines to Vedanta Resources, ending a dispute that had lingered since 2019, when the authorities seized the project. Vedanta is committed to invest over US$1.2 billion in the asset. Other important works on the Copperbelt are Barrick's Lumwana Super Pit expansion in Zambia, with a potential to add 240,000 t/y of copper production, and Eurasian Resources Group (ERG)'s US$800 million plan to revamp the Comide copper and cobalt mine in the DRC, by building a hydrometallurgical plant and conducting a large exploration program and mine development.

On the Kalahari belt in Namibia, Canadian explorer Deep South Resources had the license for its Haib copper project renewed, following a legal battle started in 2021. Haib is a large tonnage, low-grade copper deposit with nearly 1 billion t of ore at 0.31% copper. Deep South holds three other licenses in Zambia (Luanshya West, Chililabombwe and Mpongwe).

In South Africa, another mine is preparing to add product into the market. Orion Minerals is advancing its flagship Prieska copper-zinc project, having drawn financing from three different sources: South Africa's Industrial Development Corporation (IDC), streaming and royalty company Triple Flag Precious Metals, and cornerstone investor Clover Alloys Group (among other equity investors).

Increased copper activity is exposing logistics challenges, especially in landlocked Central Africa. The relative logistics-related cost of mining in Africa is believed to be at 250% of the world average, found Policy Center for the New South (PCNS). A welcome sign is the development of the Lobito Corridor, a railway that connects Congo and Zambia to Angola's Lobito port, as an alternative to the more distanced port of Durban in South Africa, and other less frequented ports like Beira in Mozambique, or Walvis Bay in Namibia. The Benguela railway had been broadly abandoned and needed the coming together of three leaders - João Lourenço in Angola in 2017, Félix Tshisekedi in Congo in 2019 and Hakainde Hichilema in Zambia in 2021- to be revamped. Now, the EU and the US have confirmed a commitment to support the three governments in developing the 1,290 km corridor, with an unconfirmed US$250 million in financing from the United States Development Finance Corporation (DFC) and talks to even expand the corridor to the Tanzanian coast. Following these developments, Ivanhoe Mines announced Lobito as the preferred exit point for its cargo.

There are also positive developments in terms of road infrastructure: An US$850 million road project connecting copper-cobalt mines in the DRC through Zambia to Dar es Salaam port in Tanzania will help cut 241 km from the existing journey. The road will be built by GED Africa, a company backed by a Hungarian construction firm.

Overall, addressing logistical challenges will be key for Africa's leading red-metal-producing jurisdictions, as the copper race heats up in Africa. ■

Battery Metals

How could Africa become more integrated?

Transportation, and specifically the burning of fuel to move people and goods, together with the fossil-dependent energy production system, are the largest contributors to global emissions, and therefore the biggest impediments to reducing global warming under 1.5 Celsius. This global target is already touted as impossible by some scientists, but we can leave aside those thorny debates for now and focus on the solutions: The potential GHG savings from using electric vehicles (EVs) are 90% based on a life cycle assessment by ICAMME published in Science Direct. EV or hybrid cars have become a popular option among consumers, with one in 20 cars sold in the world being electric-powered, according to the International Energy Agency (IEA). This is expected to grow to 1 in 3 cars by 2030, says the same source. The explosive growth, galvanized by car producers in accord with regulators, creates unprecedented demand for materials like lithium, nickel, manganese, cobalt, and graphite to feed the complex heart of the EV car – its battery.

In addition to that, investments in battery energy storage systems (BESS) to back up renewables are expected to hit a record

"We have seen a significant increase in interest about our technology and our ability to process third party concentrates. Having a larger phase two plant would see Lepidico developing the world's first global market for lithium mica concentrates outside of China."

Joe Walsh, Managing Director, Lepidico

in 2023, reaching US$35 billion, says the IEA. These systems again require ample amounts of battery materials.

This is a story as old as time: The world needs more mining, and Africa, as it did with the traditional popular metals like gold and copper, comes to the rescue. Africa holds 47% of cobalt reserves, 21% of graphite, 85% of manganese, 5% of nickel, and 4% of lithium, as published by the Centre for Strategic and International Studies. Many believe that those figures, especially in lithium, could be even higher. Furthermore, very little is known about the deposits of many rare earths like neodymium, used in NdFeB magnets, which lie within the great continent.

What is different about this new demand-driven cycle is that it attaches mining, an industry that still lives in the public imagination as primitive, dirty, dangerous, environmentally harmful, or children drenched in mud scraping for gold, all for the sake of insensitive magnates, to the new economy shaped by the green transition. For years, the focus on bad news sucked the oxygen out of positive ones. For instance, a TV campaign run by the Australian Mining Council in 2015 promoting coal received intense backlash. Due to these experiences, the mining industry has learned to go about its business while keeping a low profile outside of specialist circles.

Even though mining is already integral to modern life, the industry is finally seeing more recognition in mainstream media as the "inevitable solution to net zero", as BBC, the world's largest broadcaster put it. With this, the industry has the opportunity to finally show itself as it is, how it has changed, and how it is changing, as the extraction of battery materials creates a new generation of miners that are more technology, ESG, and partnerships-driven.

For Africa, in particular, this turn is significant. Africa is not well-known for its "green" metals. This is because no one looked at these resources before, suggests Jason Brewer, the CEO of Marula Mining, a miner and developer of lithium, graphite and rare earths projects across South Africa, Zambia and Tanzania: "There is an abundance of battery metals in the continent that just have not been the focus of attention but, as soon as explorers start looking into them, they will find them. Those hunting for the best and biggest assets will find them in Africa."

The scale and extent of the continents' mineral base are poorly understood. At the last Mining Indaba conference in Cape Town,

geophysical data company Xcalibur Multiphysics signed a partnership with Africa Finance Corporation (AFC) to conduct large-scale geophysical mapping of natural capital projects, prioritizing critical raw materials for the energy transition.

The Cathode

With LFP (lithium-iron-phosphate) cathode batteries continuing to dominate the battery sector, lithium prices had a very strong run in the last two years. After hitting all-time highs at the end of last year, lithium carbonate and hydroxide prices started to fall in 2023, a correction that was expected, and, in some ways, even welcome. Lithium stocks remain robust yet volatile,, with demand poised to outpace supply in the coming years. When that happens is uncertain, with various sources indicating different timelines. Fitch Solutions says supply will enter a deficit in 2025. EV sales will reach 13.3 million this year but will jump to 30 million by 2030, says S&P Global.

"Forecasts from various agencies point to a structural deficit for the next five to six years in the lithium market. In the desperate scramble to secure feedstock for conversation facilities, significant premiums are being paid. This will continue unless substitutes are found, and there is already interest in sodium batteries emerging as alternatives for lithium-ion," said Keith Muller, the newly appointed CEO of Atlantic Lithium, which is developing one of the most advanced lithium projects in Ghana.

Muller believes it will be healthy for the lithium market to stabilize so that alternatives do not become more attractive. "As an industry, we must work together, aligning converters and investors, to bring lithium molecules – be it spodumene, petalite, lepidolite and brines - into the market. If we don't plug this gap, there is a risk of substitution," he said.

Africa has a dozen or so lithium projects at various stages of development across Central, West, and Southern Africa, which give the continent a diverse and attractive pipeline moving forward. In West Africa, Atlantic Lithium has published the DFS for the Ewoyaa project, the country's sole lithium deposit, defining 3.6 million t spodumene concentrate production over a 12-year

"We can see that the landscape is changing in Africa and many other jurisdictions globally, and that's being driven by a clear consensus in the market that demand for quality rare earths is going to accelerate over the next decade."

Asimwe Kabunga, Chairman, Lindian Resources

LOM. In Mali, two projects, Bougani lithium developed by Kodal Minerals, and Goulamina lithium developed by Leo Lithium, are currently underway. While Kodal is unfazed by the new mining code instituted in the country, Leo Lithium went on a voluntary trading halt in relation to the application of the new mining law, without giving away more information on the suspension.

In Central Africa the former Manono tin mine on the Kibaran belt in the DRC has given birth to two company-making projects: the Manono project, developed by ASX-listed company AVZ Minerals, and the Manono Tailings project, developed by Canadian Tantalex Lithium Resources.

Southern Africa sees the most activity with the largest number of projects concentrated in Zimbabwe: The Bikita lithium mine of Sinomine Resource Group, the Arcadia lithium project of Zhejiang Huayou Cobalt, and the Zulu mine of Premier African Minerals, among the largest. Namibia also hosts multiple projects under development. Most are brownfield. These include the tantalite and petalite deposit of Karibib, developed by Australian company Lepidico, and the Uis mine, where Andrada Mining is extracting lithium concentrate. In South Africa, London-listed Marula Mining has started processing stockpiles at the Blasberg lithium mine and, fully funded, is preparing to move into the hard rock operation.

The focus of many of these developers has been to speed up to early production, taking advantage of the high lithium prices.

Many have adopted Lego-like processing facilities that allow them to process easily available concentrates. For example, Atlantic Lithium opted for a DMS (Dense Media Separation) processing plant, so that it could start production and generate revenue before financing the construction of the main DMS plant. "Generating cash flow from an initial production phase also helps us close our funding requirement, while fast-tracking production allows us to capitalize on the high lithium prices while they last," said Keith Muller, the CEO.

Beyond demonstrating the viability of extracting and processing lithium, some companies are also looking at the next step. Over in Namibia, Lepidico is building a "proof of commercialization" chemical conversion plant in Abu Dhabi where it will convert lithium mica concentrate into lithium hydroxide. In its five-year growth strategy, Lepidico is looking to connect the upstream from the Namibian mine (Karibib) to the downstream in UAE, with a view to "get to free cash generation as quickly as possible, and, in doing so, demonstrate the commercial viability of our process technologies," as Joe Walsh, managing director at Lepidico told us.

"We know that the mineral concentrator in Namibia readily lends itself to expansion, and we are already expanding our resource base in the Karibib region to support that expansion. For this additional mineral inventory, we are already looking at a phase two chemical plant where we currently have two concepts. The first is a sister plant to the one that we are building in Abu Dhabi at a similar scale of approximately 5,000 t/y of lithium hydroxide output; or a larger plant that has a capacity of up to 20,000 t/y. Realistically, to be able to achieve that, we would need to secure other third-party sources of lithium mica concentrates. Over the last year, we have seen a significant increase in third-party interest with unsolicited inquiries about our technology and our ability to process third-party concentrates. Having a larger phase two plant would see Lepidico developing the world's first global market for lithium mica concentrates outside of China," Walsh explained.

Developing companies in the lithium space must think from an early stage about the end-use of the raw materials extracted, something that the mining industry has not traditionally been involved in beyond ensuring economic grade. The new focus on technology, which requires miners to think like chemists, creates additional risks and brings the industry into unfamiliar territory. For that reason, brownfield, ready-to-mine, albeit smaller projects, are becoming more attractive, since they compensate for the risk of early-stage exploration. Marula Mining is a notable example; the company is exclusively focused on identifying projects that can be brought into production in a 9-to-12-month timeframe, as it has done with the Blesberg lithium project. Now, Marula can safely move into the next phase, having started to process spodumene into carbonate from Blesberg at a test facility in Johannesburg. It wants to establish a standalone processing plant with an initial capacity of 2,400 t/y, which can later be boosted to 12,000 t/y. This would produce about 1,200 t/y lithium carbonate.

The lithium, but also graphite and rare earths sectors, are changing the nature of junior companies, who are becoming more entrenched in secondary processing rather than pure exploration. However, that focus may create blind spots in finding those greenfield elephant deposits that require years of traditional exploration work.

The Anode

While the cathode (the positive electrode) of the battery uses lithium, nickel, manganese and cobalt, the anode (the negative electrode), which is the other 50% of the battery, is almost entirely dependent on graphite. Almost every lithium-ion battery chemistry, be this nickel-cobalt-aluminum, nickel-cobalt-manganese, or lithium-cobalt-oxide, requires graphite, which is half of the battery's weight. The rise in EVs and energy storage systems is pushing graphite demand growth by 500% by 2050, estimates Energy Capital and Power.

"We are foreseeing a material deficit soon, primarily around 2026. What is noteworthy is that the anticipated shortage of graphite is likely to manifest more quickly than in other critical commodities like lithium. The price of natural graphite used in batteries could see significant increases, with only a minor impact on the overall cost of lithium-ion batteries," said Tom Revy, managing director of Evion Group, a graphite explorer and developer with projects in Madagascar.

Synthetic graphite, produced from crude oil, makes up about 90% of the market share of the graphite used in batteries, based on data from Verified Market Research. But rising concerns over

40 >>

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"We announced the intention to form a joint venture between the Tarkwa gold mine and AngloGold Ashanti's neighboring Iduapriem gold mine to potentially create Africa's largest gold operation. With this merger, we certainly see a significant extension of mine life, as well as a huge upside in terms of a combined all-in-sustaining cost under US$1,000/oz."

Martin Preece,
Interim CEO,
Gold Fields

"Namibia Critical Metals announced the formation of the Rare Earth Alliance Namibia (REAN). We are investigating the feasibility of building a separation plant to allow the throughput of all three of our projects to separate into individual rare earth metals directly in Namibia."

Darrin Campbell,
CEO, Namibia Critical Metals

"The IPO market in 2023 has not been great. The increase in private equity and venture capital funding has allowed companies to raise capital outside of the public market. Additionally, there has been a consolidation trend among asset managers on the buy side, so smaller companies find it difficult to attract investment from these large asset managers."

Sam Mokorosi,
Head: Origination & Deals,
Johannesburg Stock Exchange (JSE)

"It is no coincidence Kamala Harris visited Zambia and Tanzania, both rich in critical minerals, which indicates the interest from the US to support Africa. Likewise, Asian countries have always shown a lot of interest and a higher tolerance for risk in Africa, with multiple acquisitions of African projects by Chinese entities in recent years."

Osam Iyahen,
Senior Director, Natural Resources, Africa Finance Corporation (AFC)

>> 38

emissions associated with the production of artificial graphite, together with technological developments in the production of natural graphite at high purities, creates room for more growth in the supply of battery-grade natural graphite. This will transform the graphite mining sector, which has historically produced the mineral for industrial uses like steel.

Africa already has a strong footprint in graphite production, supplying 9% of the world's material. However, the production of graphite for battery use is a new game that not every graphite producer can play.

Africa affords both that low-cost environment and remarkably high purities, Madagascar being particularly renown for the highest purity and largest graphite flakes in the world, but also as the second-largest graphite producer after China, though by a large difference. Last year, China produced 850,000 t, while Madagascar produced 170,000 t. But Madagascar jumped from fifth place to second place between 2021 and 2022, thanks to new capacities. More capacity is coming. One of the new mines entering production this year was NextSource's Molo, which announced first production in June. At the first phase, which is fully financed, Next- Source will produce at a nameplate capacity of 17,000 t/y, but it wants to ramp up to 150,000 t/y after a Phase 2 development – this would be the largest mine in the country.

The ability to scale up by almost nine times is down to the modular platform that NextSource has chosen. The mine was built offshore, dismantled, and then shipped and reassembled in Madagascar. The construction in Madagascar took 45 days. The company is among the few to develop a fully integrated ecosystem to supply its Superflake graphite into the battery chain: First, it has secured two off-takers, one with Thyssenkrupp and another with a Japanese anode material supplier that has the expertise to upgrade the material into coated, spheronized purified graphite (CSPG) for battery use. These three processes – spheronization, purification, and coating – are both highly technical and capitalin tensive and are almost entirely controlled by China.

NextSource announced the building of a battery anode facility in Mauritius as part of a JV with its partners. The plant will be modeled after an existing one in China, from where the current Japanese partner sources the material.

Early-stage players are also thinking about developing integrated downstream graphite value chains. Evion Group, which listed on the ASX five years ago, has two graphite projects in the southern region of Madagascar, where it identified feldspar sediments with graphite intrusions. "Our aim has never been limited to mining; we have been committed to downstream processing as well," said Tom Revy, the company's managing director: "This integrated approach, from exploration to downstream processing, has become increasingly crucial in today's market, given its ability to navigate the complexities of capital markets effectively. The minerals in the ground dictate the products we can create, which means we cannot simply change a product's characteristics during downstream processing." ■