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Introduction

Inflation woes and African mining

The African mining sector never seemed to swim in the same waters as the rest of the global industry, never fully riding the high waves, nor floundering in a low tide of the kind we see today. Inflation hit differently in Africa, in terms of equity valuations, project CAPEX and OPEX, as well as the ability to raise finance.

Regardless of what happens on the outside, African players must deal with other issues from within the continent, including security concerns, power blackouts, poor infrastructure, and unstable governance, in a mix specific to each individual country. Handling these challenges has, at best, bulked up the African industry's resilience against global shocks. But it certainly has not insulated it from them.

Inflation, caused by excess liquidity and a spike in energy prices, has been the main culprit of the current economic malaise. To stop the economy from overheating, the Fed increased interest rates sharply, causing markets to tumble – the S&P 500 contracted by 24% in the first nine months of 2022. Fears of a synchronized global recession have started to mount as real GDP growth is flattening out below 2% in both the US and Europe. Africa is expected to grow above the global average at 3.7% this year, but inflation, both imported and domestically instigated, is the highest in the world at 13.7%.

As the dollar strengthened to its highest level in two decades, reaching parity with the euro, investors rushed to the greenback, causing a contraction in metal prices, since most commodities are priced in US$. S&P GSC Industrial Metals is down by 19.9% year-to-date (YTD), while the benchmark for precious metals, S&P GSCI Precious Metals, is down 8.52% YTD. According to Reuters, nickel and palladium were the only metals whose price appreciated in 2022, while platinum, gold, silver, zinc, lead, copper, aluminum, and tin lost value.

The African mining industry is incredibly diverse, not lacking any of the important metals and minerals mined globally. Gold is mostly found in the Birimian Greenstone Belt in West Africa, the Atlas region of Morocco, and the Arabian-Nubian Shields of Egypt; Copper is heavily mined from the Copperbelt in the DRC and Zambia, but also in Limpopo, South Africa, a province also known for PGMs; Diamonds are famously found in Botswana, Angola and South Africa; while iron ore is in abundance in Guinea and the North Cape region of South Africa. Uranium in the Mersoï Basin in Niger, bauxite in Guinea, graphite in the Cabo Delgado region of Mozambique, and lithium projects developed all around the DRC, Ghana, Zimbabwe, Mali, and Namibia. According to Africa Mining IQ, the continent counts 735 gold projects, 178 in coal, 109 uranium, 150 diamond, 108 platinum, and 89 in iron ore.

Impact on CAPEX and OPEX lines

In an environment of heightened inflation, African miners and juniors still benefit from lower discovery and operating costs, with many expenses incurred in local currencies and most ore bodies found close to surface and amenable to cheaper mining methods. So far, both miners and juniors have managed well the rise in fuel, wage, and equipment costs. Fuel represents circa 30% of costs for B2Gold, the mid-tier operating the Fekola gold mine in Mali. The company expects a 24% increase in the cost per ounce produced this year on account of inflationary pressures but also operational-related factors: "Overall, higher fuel prices than budgeted are expected in the second half of 2022, but since we beat budget so significantly in the first half of 2022, we still expect our cash operating costs and AISC to come in within original guidance ranges," said B2Gold's president and CEO, Clive Johnson.

But, at a gold price at over US$1,600/oz, and average all-in-sustaining-costs (ASIC) under US$1,000, the gold industry continues to enjoy a high margin that buffers inflated overheads. Mining other metals requires more careful algorithms to make operations profitable. Trigon Metals, a Canadian junior operating in Namibia, brought the historical Kombat copper mine into early production in December 2021, preparing for commercial production this year. But as the price of copper lost much of the value accrued during the pandemic, Trigon was forced to pause mining: "The dramatic fluctuations in the copper price from US$4.5/lb to around US$3/lb put us in a money-losing position; moreover, recent drilling results showed there was an opportunity to find higher grade ore at surface that was not part of the original mine plan," said Jed Richardson, Trigon's CEO.

Trigon initially fast-tracked production to take advantage of the unusually high copper prices, but even at relatively high copper prices against a 10-years trend, inflationary pressures throw the operation into a negative margin. An adjustment is taking place. Higher operational expenses demand proportionally higher commodity prices to make projects viable. The uranium price, for instance, currently trading at US$53/lb (double compared to pre-pandemic levels), is still far from allowing new projects to come onstream: "Some developers used to say US$65/lb was the incentive price to start production, but the cost curve is higher now. The current price is not enough to cover costs for most projects," said Murray Hill, the CEO of Elevate Uranium, a junior developing the Koppies uranium project, also in Namibia.

CAPEX is more viciously affected. Capital expenditure for brownfield and greenfield projects is revised upwards as energy, labor and equipment costs snowball. TSX-listed Fortuna Silver Mines had to review the construction budget for its Séguéla gold mine in Ivory Coast, now over 80% completed, from US$145 at the beginning of 2021, to US$173 this year. But the most vulnerable to higher CAPEX updates will be developers that have not yet secured financing for their projects. "There's no question that cost escalation will be testing project economics. Projects at pre-feasibility or definitive feasibility are more decisively exposed to cost pressures. For these, inflation could influence the verdict of investors and developers to move forward," said Peter De Leo, managing director of EPCM player, Lycopodium.

"Overcoming all the barriers imposed by the pandemic, Catoca managed to safeguard our workers, meet our fiscal and financial commitments, and continue our social investments. In FY21, we generated profits of US$270 million."

Benedito Paulo Manuel,
Managing Director,
Catoca

Both equity and debt financing are tighter. Stunted metal prices and the flee of investors from commodity stocks have already created contractions in the share price of most players. If we look at some of the biggest operators in the continent, Ivanhoe Mines' share price retraced by 10.99% YTD, yet its five-years performance reveals a 188% appreciation, accumulated especially in the last two years. Even market favorites like the stock of Barrick Gold lost 19.04% this year, the current price also marking a return to pre-pandemic levels. The downcast trend, though rather corrective than regressive, tells speculators that returns already exploded in 2021.

Risk calculations

While downward-sloping prices keep CEOs awake at night across all time zones, companies with African assets have developed a thicker skin for tough market conditions through constantly having to prove project excellence to make up for high jurisdictional risks. In an environment where private and public financiers judge projects more diligently, the industry's logic is to minimize the risks within their control. Juniors, particularly, feeling the turn in the market, are eager to start making cash and lower their dependence on external funding. Tantalex, a DRC explorer with a large lithium exploration permit called the Pegmatite Corridor, has found an opportunity in a lower-capital project with a short development timeframe: For US$10 million, Tantalex bought a small plant at TiTan, an alluvial tin and tantalum project that can be brought into commercial production in early 2023. For four years, TiTan will produce 1,400 t/d of tin concentrate and 22 t/d of tantalum concentrate annually.

Many other examples of juniors launching into shorter lead-time projects point to a widespread trend. In South Africa, Orion Minerals has diverted from its original development plan for the Prieska copper-zinc project: Rather than directly developing a 2.4 million t/y copper operation, Orion will start by mining the historic Crown pillar of the mine, which holds 1 million t of ore, to bring into production a small operation of 100,000 t/m.

This model is particularly favorable for gold projects, the strong price boding quick paybacks. In just nine months, TRX Gold, an explorer in Tanzania, managed to put an oxide plant into production. The costs were recouped in under three months. The Buckreef gold project, a JV with the State Mining Corporation of Tanzania (STAMICO), is a 2 million ounce indicated + inferred gold resource graded at 1.8 g/t Au. TRX decided to start with the easy-to-mine 10% oxide resource, while it develops the remaining 90% sulfide deposit.

The key ingredient for the success of such strategies is a low CAPEX requirement. High grades also help. Akobo Minerals, one of only two gold juniors in Ethiopia, made a small discovery with rarely seen average grades of 22.7 g/t Au in the resource estimate. The project, called Segele, is a petite resource containing 52,410 oz of inferred gold, and it will be brought into production in March 2023 with only US$10 million pre-production capital. The cash generated will fund exploration for a secondary, larger deposit called Joru. For a junior operating in a country of little visibility for gold investors, starting a small-scale operation to self-fund was a necessary way forward.

However, this model is not suitable to all operations. Rushing into becoming a money-making rather than a money-eating organization can result in an ill-thought design and poor resource management at a later stage, warned Nick Tatalias, managing director of South African EPC company MET-C Engineering: "The worldwide sense of economic and political uncertainty engenders impatience, as companies want to make sure they capitalise on rising commodity prices now. Companies impatiently skip steps, jumping from scoping studies directly into DFS, or, from PFS directly into execution. Stage-skipping yields projects with unresolved issues and capital costs typically increasing, even blowing out, reducing investment in the mining sector, because of a reputation of being poorly run." ■

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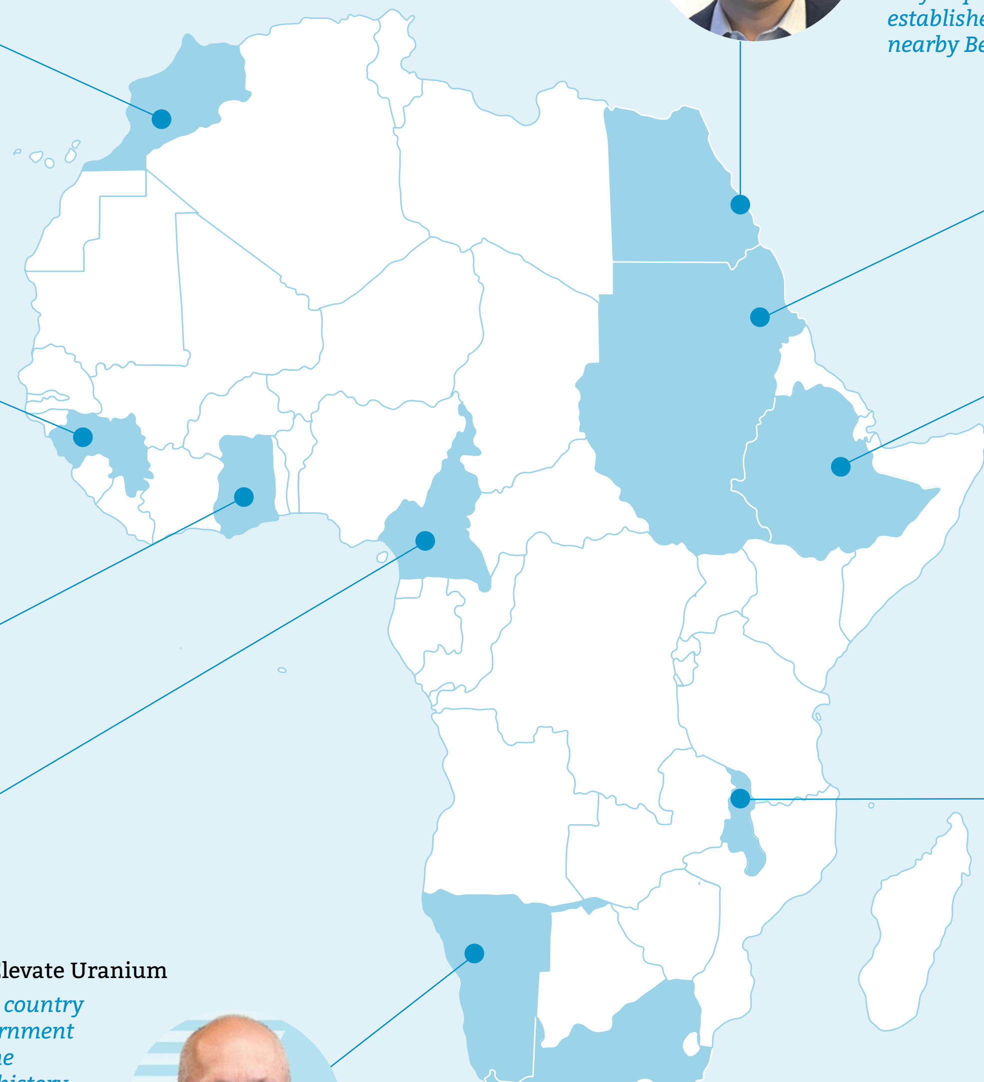
Juniors from around Africa on exploring in their jurisdictions



MOROCCO

Jed Richardson, CEO, Trigon Metals

"Our early drilling in the Anti-Atlas region of Morocco yielded positive results. I believe this is a region that will continue to attract more attention. Morocco remains widely underexplored. As the world's largest phosphate producer, the country is not new to mining, but I think the focus on phosphate has meant that other opportunities have gone unnoticed. I expect this to change."

GUINEA

Craig Mackay, Managing Director, Golden Rim Resources

"Guinea does actually have a rich history in gold mining. World-class miners like AngloGold Ashanti have been in the country for more than 20 years. What discouraged juniors from coming to Guinea was the previous Mining Act, which proscribed high taxes and a sizeable government free-carried interest above other West African peers. But new legislation brings the tax framework in line with other countries in the region, giving Guinea's rich geology a chance at being better valorized."

GHANA

Luke Alexander, President and CEO, Newcore Gold

"Ghana has been referred to as the 'Gold Coast' because of its over 1,000 years-history of gold mining. To me, Ghana epitomizes great geological potential combined with jurisdictional excellence. With an annual production of over 5 million oz Au, Ghana is the largest gold producer in Africa and the sixth largest in the world, behind countries with a much larger landmass like China, Canada, Australia and the US. The fact that the world's top gold producers chose to invest in Ghana out of all other places in the world says it all."

CAMEROON

Jean-Sébastien Boutet,
CEO, Canyon Resources

"Cameroon has the rail and port infrastructure to support the growth of the bauxite export industry. The Minim Martap project is located very close to the existing railway line, but there is a need for improvement in order to run bigger and faster trains. Some work will need to be done at the Port of Douala where the rail line terminates in order to facilitate the offloading and transfer onto barges."

NAMIBIA

Murray Hill, CEO, Elevate Uranium

"Namibia is a great country to operate, the government is supportive and the country has a long history of mining. The Rössing uranium mine has been continuously operating since 1976. New projects are likely to be developed in a shorter timeframe than other countries thanks to the existing history and culture of uranium mining. Namibia is the world's fourth largest uranium producer globally and it has some of the largest uranium assets."

EGYPT

Tonno Vahk, Interim CEO, Aton Resources

"Overall, conducting business in Egypt is easier than in many other African countries. The absence of vegetation and inhabitants in the Concession is very advantageous to exploration, drilling and mining. We also have a year-round field season, excellent infrastructure, with our main project sites only two hours drive from two international airports on modern highways, and very importantly a close and long-established relationship with the nearby Bedouin communities."

SUDAN

Jeff Quartermaine, CEO, Perseus Mining

"Sudan had a vibrant oil industry for many years, which encouraged a reasonable level of industrial development. When South Sudan seceded from Sudan, it was left with few producing oil assets, but the infrastructure and supporting services industry remained."

ETHIOPIA

Jørgen Evjen, CEO, Akobo Minerals

"Without a history of colonization, Ethiopia is very different from other African countries, and it has built a solid bureaucracy over the years. Despite all the country has to offer, it has not managed to put itself on the map of international investors. One of the biggest limitations for foreign investors is around expatriating investment dollars. Akobo Minerals signed the first mining agreement to ever give a mining company the rights to expatriate profits. By becoming the first new gold producing company in the last 20 years, we will pave the way for other players."

MALAWI

Asimwe Kabunga, Chairman, Lindian Resources

"We believe Kangankunde represents a unique opportunity to prove up and develop a rare earths project of potentially global significance. We're excited to get started, working together effectively with all stakeholders to build Kangankunde into a leading Malawian resources project. At the same time, we view the project as an opportunity to create value for all stakeholders and play a key role in the emergence of Malawi as a globally recognized mining jurisdiction."

SOUTH AFRICA

Jurie Wessels, Exec. Chairman, Vanadium Resources

"Investors are worried about bureaucracy, red tape, electricity supply and political rhetoric. While there is some validity to these concerns, a lot of them are perception-based and therefore unwarranted. South Africa doesn't have the challenges that some of our fellow Africans in the North face, but because we are experiencing challenges from an elevated base of having been the decades-long economic powerhouse of Africa, we are perceived to be a more challenging environment."

West Africa

Redrawing the borders of a maturing jurisdiction

If West Africa was a country, it would be the second-largest gold producer in the world, after China. As it stands, five countries in the region must share that title collectively, while another 10 countries benefit from the wider reputation of the region's geology as they individually seek the attention of investors. Geologically, there are no borders. The Birimian greenstone belt transverses the region without discriminating between the political and operational contexts of each nation, but investors cannot afford that freedom. Security challenges, political instability, and the lack of proper infrastructure have dictated the course of investments more than geology could.

The world's largest gold producers have been operating in Ghana for decades, while in the last 10 years, large mines were brought to life in Mali, Burkina Faso, and most recently, Guinea and Ivory Coast. The world's number one gold company, Newmont, is currently investing between US$750 and US$850 million in the Ahafo North gold project on the Sefwi Volcanic Belt in Ghana. Newmont is already operating the 643,000 oz/y Ahafo South mine since 2006, together with the 422,000 oz/y Akyem mine since 2013. Barrick, the second largest gold producer after Newmont, also operates two mines in West Africa; the Loulo-Gounkoto complex in Western Mali and the Tongon mine in Ivory Coast. Gold Fields, AngloGold, Endeavour, B2Gold, and Kinross are also here, while some mid-tiers and emerging mid-tiers were made in West Africa. Among these we name Perseus, Resolute, Orezone, West African Resources, Asante Gold and Tietto Minerals.

"West Africa is one of the world's most attractive and prospective mining jurisdictions, the second-largest global gold-producing region and the leading region for global gold discoveries."

**Sébastien de Montessus,
President & CEO,
Endeavour Mining**

Along with these household names, new entrants have made their way to West Africa in recent years. Fortuna Silver Mines, a Toronto-listed mining company with a market capitalization exceeding C$1 billion, had three mines in operation in Argentina, Mexico, and Peru, before acquiring its fourth one in Burkina Faso with the takeover of Roxgold. Today, Fortuna is primarily focused on completing the construction of its fifth mine, the Séguéla gold mine in Ivory Coast. With Séguéla entering production in 2023, Fortuna's portfolio will balance between Latin America and West Africa. Jorge Ganoza, Fortuna's CEO, considers the region one of the most prolific in the world, especially when considering its size: "The combined size of Ghana, Burkina Faso, Ivory Coast, Mali, and Guinea equate to the size of Texas, yet this comparatively small region of West Africa produces more gold than any but one of the top five gold producers in the world (China, Australia, Russia, the US, and Canada)."

The long-term presence of majors has been the most consequential factor in the maturation of the gold-rich jurisdictions, particularly Ghana, which has the longest history of mining, but also Burkina Faso and Mali, whose economies have strongly relied on the extractive industries in the past decade. This maturity, most evident in Ghana, is characterized by clear and stable mining regulations, solid relationships with governments and local stakeholders, a well-developed infrastructure and a robust services sector. In recent years, large corporations have also launched comprehensive ESG programs, characteristic of tier-one jurisdictions. Just last year, Endeavour Mining, the region's biggest gold producer, rolled out the "Endeavour Foundation", running projects like "One village without malaria" in Burkina Faso, where the producer has its biggest footprint.

The presence of majors has also paved the way for juniors. A change is happening though: The countries that were most favorable for explorers 10 years ago are becoming more challenging, whereas jurisdictions that were no-goes in the past, are opening up. The reasons differ for each jurisdiction. In Ghana, the biggest entry barrier is the lack of available exploration land left up for grabs.

Even in less-busy jurisdictions, large companies control the exploration landscape: Endeavour Mining holds a dominant land position across West Africa with 17,000 km^2 of exploration land on the Houndé and Ity belts. The company wants to discover between 15 to 20 million oz Au by 2026 and has already drilled 250,000 m by mid-2022. Canadian senior miner B2Gold has also set aside a company record of US$75 million for its 2022 exploration budget. Most of these dollars will be spent in Mali, where its flagship Fekola mine is located.

But the main reason why swathes of West Africa have remained broadly underexplored is instability, both political and military. Today, it is in Mali and Burkina Faso where recent military coups and growing insurgent activity dishearten investors, but in the past, Guinea and Ivory Coast were inoperable. The tables have turned, and many juniors are leaving Burkina Faso for Ivorian and Guinean prospects. For example, Australian explorer Golden Rim Resources has put on hold its 2 million oz Kouri gold project in Burkina Faso, shifting its focus to a smaller gold discovery in Guinea. Once again, the presence of at least one producer in a newly opened country, such as AngloGold Ashanti in Guinea, is a critical advantage for juniors who can tap into already worked-out mining and exploration legal frameworks; it is also useful to show investors examples of large mines built and ran successfully by a respected major.

"Over the past 10 years, the law in Senegal has changed quite significantly, and with each change, the authorities have tried to yield more and more benefits from the extractive industries to rebalance the interests between investors and the population."

**Maname Fall,
Tax and Legal Partner,
Sojufisc**

Juniors are also drawing geological parallels between their greenfield exploration targets and nearby or geologically linear existent mines: Newcore Gold is drilling on the same gold belt of Newmont's prestigious Ahafo in Ghana; Golden Rim is validating its Kada deposit as an analog to the AngloGold's Siguiri mine on the Siguiri belt in Guinea. TSXV-listed Diamond Fields Resources, on the other hand, sees geological similarities between its gold deposit in Burkina Faso and the Yaouré mine across the border, in Ivory Coast. Overwritten by geological potential, and underwritten by a workable operational environment, borders disappear, while individual mineral belts – Ahafo, Siguiri, Ity, Houndé, Boromo, Bibiani, Mako, and others, which cross one or more countries, gain a reputation of their own.

Ghana, signs of aging

Main producers and upcoming producers:

Newmont, Kinross, Gold Fields, AngloGold Ashanti, Perseus Mining, Resolute Mining, Asante Gold, Shandong Gold, Chifeng Jilong Gold

Main juniors:

Newcore Gold, X-Tra Gold, Ibaera Capital, Galiano Gold, Pelangio Exploration, Atlantic Lithium

Ghana has been setting the tone for the entire region when it comes to regulation. In the last year, the focus of the government has been to also improve compliance, both regulatory and tax. The introduction of a waiver on penalties for businesses that have defaulted has been extended to the end of 2022, giving companies the chance for a clean slate on their unpaid duties. Richard Ansong, partner at PwC Ghana, told GBR that the country is also evaluating a proposal to settle tax disputes outside of the court system, which would speed up such cases. Moreover, the country introduced a VAT penalty for unregistered importers, while the Ghanaian Revenue Authority has onboarded taxpayers to an electronic invoicing reporting regime (E-VAT).

These nuanced measures are a sign of regulatory sophistication and will have a light, though important, impact on the industry. More immediately felt was the enactment of a 3% withholding tax on artisanal miners, later revised to 1.5%. This new tax is thought to have played a bigpart in the reduction of Ghana's total gold output, which fell by almost 30% in 2021. By some estimates, gold mined by artisanal miners every year in Ghana is almost equal to that produced by registered gold miners, though the numbers are hard to verify. Officially, informal miners account for only 20% of total gold production. Kiki Gyan, regional managing director at testing and certification company SGS, thinks the behind-the-scenes numbers are probably higher: "The lower production figure is explained both by the government shutting down many illegal operations by depriving them of equipment, but also by the fact that a lot of artisanal activity has moved to the black market and is not captured in official reports," he said.

Lower mining outputs came at a bad time for the Ghanaian economy, which has been fighting a plunging currency (Cedi) and one of the highest inflation rates of the continent, at over 28%. Kofi Frempong-Kore, partner at KPMG Ghana, said all fiscal and economic targets were missed this year: "Inflationary pressures, like double the price of fuel, and food shortages are far from abating. The government is working around the clock to bring the economy back on track and boost national revenues while reining in public spending," he explained.

To avoid running a higher debt, the Ghanaian government reached out to the IMF for a US$3 billion bailout, which commentators see as a positive, proactive move, and most agree it has a strong chance to be approved. "The government is hopeful a deal can be reached with the IMF by the end of 2022. The central bank of Ghana has also begun an initiative to purchase 10,000oz of gold annually from mining companies locally to shore up the country's reserves," said Richard Ansong, Partner at PwC Ghana.

Meanwhile, investments in the mining industry have mostly come from China. Last year, state-owned Shandong Gold completed the acquisition of Cardinal Resources and its Namdini gold project, while most recently, Shanghai-listed Chifeng Jilong Gold Mining acquired Golden Star Resources, the owner of the Wassa gold mine. Brownfield acquisitions were principally headed by Asante Gold, a Canadian explorer and developer that last year bought the Bibiani gold mine from Resolute Mining, and this year the Chirano gold mine from its former operator, Kinross.

In greenfield exploration, another Canadian junior, Newcore Gold, has made significant progress following its recently completed 90,000 RC and DD drilling campaign at the Enchi gold project. For the first time, the explorer dug bellow 125 m vertical depth, making multiple high-grade sulfide discoveries: "At Nyam we believe we have been able to identify two high-grade shoots that plunge to depth with multiple intercepts of +5 gram material between 150 m to 300 m below surface. As part of our updated resource estimate in Q4 2022, we hope to be able to define a small underground resource," said Luke Alexander, Newcore's President and CEO.

Underground exploration is unusual in West Africa, but gradually becoming more common in Ghana, where about half of the current mines are underground.

"Ivory Coast has always been seen as a potential gold producer, and things are really starting to happen for the country, with the advancement of multiple mines."

Bernard Kaninda,
Regional Director Africa,
Maxam

Ivory Coast, the buzz of new mines

Main producers and upcoming producers:

Barrick Gold, Perseus Mining, Fortuna Silver Mines, Endeavour Mining, IAMGOLD, Centamin

Main juniors:

Tietto Minerals, Mako Gold, Awale Resources, Montage Gold, Sama Resources

More mines are currently being built in Ivory Coast than anywhere else in West Afri ca. These investments are enough to lay the grounds for a positive outlook for Ivory Coast, which is growing at a high 6% rate this year, while the country remains politically stable and safe, despite some military pressures mounting at the northern border with Mali and Burkina Faso.

Barrick, one of the biggest majors in the country, is actively exploring near-mine permits to extend the life of its Tongon gold mine, set to produce between 170,000 to 200,000 oz Au this year. This is one of Barrick's smaller operations. Also producing around 200,000 oz/y, the Yaouré gold mine operated by Australian mid-tier Perseus Mining came into commercial production in 2021. Yaouré has an exceptionally low AISC of just US$734/oz and has become the company's powerhouse, as CEO Jeff Quartermaine called it, accounting for up to 60% of the company's total gold output.

Three new gold mines will follow in the next two years. The first mine expected to pour first gold by the end of this year is the Abujar gold project, a greenfield project developed by Tietto Minerals. Abujar holds a mineral resource of 3.35 million oz and can produce over 200,000 oz annually at an average AISC of US$804/oz. Already 70% complete, next in line will be the Séguéla gold mine of Fortuna Silver Mines, targeting first gold by mid-2023. In the first six years, Séguéla should deliver 133,000 oz/y, with an AISC over LOM (life of mine) projected at US$832.

The latest news came from Endeavour Mining, the operator of 250,000 oz/y Ity mine in Ivory Coast. Endeavour recently announced a final investment decision for the construction of the Lafigué gold project. Construction began late this year and the mine will become operational by the end of 2024. Very similar to all the other projects enumerated above, the DFS for Lafigué contemplates a similar capacity of 200,000 oz/y, at a low AISC of US$831/oz. In a public release, Endeavour said the deposit was discovered with just US$31 million spent in exploration, which brings the discovery cost to just US$12/oz. These successes speak of the opportunity to find rich deposits that can be easily converted into mines, not only by majors, but by small explorers too.

Burkina Faso, a victim of bad news

Main producers and upcoming producers:

Endeavour Mining, Fortuna Silver Mines, IAMGOLD, Trevali, Nordgold, Centamin, Orezone, West African Resources

Main juniors:

Diamond Fields Resources, Sarama Resources, Tajiri Resources

As more players flock to Ivory Coast, juniors, miners and their supporting service providers flee Burkina Faso. At least three companies have paused operations due to the worsening security situation. Russian miner Nordgold shut down its Taparko mine, calling force majeure. Avesoro Resources has also suspended operations at the Youga gold mine, while local Néré Mining ceased activity at the Karma mine, which it bought early this year from Endeavour. In June this year, Karma was attacked by unidentified assailants, resulting in two casualties. Six others died in a gun attack on a convoy coming from the Boungou mine, operated by Endeavour.

Juniors are also taking a step back on operations, at least for now. Golden Rim Resources and Arrow Minerals, both explorers with gold projects in the country, have paused their activity, focusing on projects in other jurisdictions. WSP Golder, one of the largest engineering and design service companies, withdrew from the country. To make matters worse, a flood at the Perkoa zinc mine, which resulted in the death of eight people trapped underground, forced Trevali, its operator, to close the mine.

Adama Soro, the president of the Chamber of Mines in Burkina Faso, is concerned about these events. Besides the tragic loss of life, the economy is shaken by lower revenue streams, with gold output down by 8% in the first half of 2022 (H1) compared to H1 2021. The political situation is also frail after the country suffered two military coups this year. This, together with widespread poverty, foment further violence: "The origins of the conflict are not inherent to Burkina Faso, as violence spilled out from Mali and continues to ferment across the Northern Sahel. This makes it difficult for any individual country to contain the spread of violence on its own, especially since Burkina Faso does not benefit from any international forces to help fight the insurgents. We need a regional approach to change the course of events," said Soro.

"Mining is a frontier business, we need high tolerance for challenging environments. In spite of volatile changes in government and immature political processes, the continued support for responsible mining in the jurisdiction is notable."

Jorge Ganoza, President and CEO, Fortuna Silver Mines

Nevertheless, Burkina Faso is home to some of the best and biggest deposits in West Africa. Endeavour Mining has four mines in the country, making it the biggest producer not just in Burkina Faso but in the whole region. IAMGOLD's biggest mine, Essakane, is also in Burkina Faso, while West African Resources has recently started its 400,000 oz/y Sanbrado mine. Orezone also announced in September first gold at its Bomboré mine, expected to produce 178,000 oz/y for over 13 years.

Early exploration companies are also seizing opportunities in the country. This year, Diamond Fields Resources, a Canadian junior, acquired TSXV-listed Moydow Holdings and its portfolio of gold projects in Burkina Faso and Mali. The focus will fall on the Cascades deposit on the Banfora gold belt in the south of the country. John McGloin, the CEO, thinks that juniors must approach security differently than producers: "The village system and tribal hierarchies are very well-structured, but recent developments mean there is no room for complacency. I strongly believe that directors and management that live outside of the country should walk in the steps of the people on the ground, which is why we spend time on the ground regularly," he said. ■

Southern Africa

South Africa, the rainbow country sitting in the dark

Main operators:

- **Gold:** Harmony, Gold Fields, AngloGold, Sinbanye StillWater
- **Coal:** Exxaro, Jindal, Glencore
- **Vanadium:** Bushveld Minerals, Vanadium Resources
- **Diamonds:** De Beers, Petra Diamonds
- **Manganese:** South32
- **Platinum:** Impala, Sibanye StillWater
- **Zinc:** Vedanta Zinc
- **Copper:** HBIS, Anglo American, Orion Minerals

"Exploration in South Africa was historically conducted by large, well-resourced mining houses – but this role has now been left to junior companies. Unfortunately, South Africa is currently ill-equipped to support and nurture the smaller exploration and mining companies."

Andrew van Zyl, Director and Principal Consultant, SRK Consulting

"Rainbow Nation" is the nickname popularized by Nelson Mandela in his first month in office to describe multiculturalism in post-apartheid South Africa, but the rainbow metaphor is also becoming of the country's mineral richness, a colorful mix of gold, diamonds, platinum, coal, vanadium, zinc, manganese, copper, chrome and titanium. Unfortunately, over the past year, South Africa has experienced severe and more frequent power blackouts that have shadowed the industry's growth. Even though the South African mining industry reached a remarkable milestone in 2021 as the mineral output value reached 1 trillion Rands (R) for the first time, according to the Minerals Council, the sector has incurred multiple losses, caused by domestic hurdles – power, transport infrastructure constraints, and a wage strike.

80% of South Africa's power comes from coal. This June, the country reached its worst-ever stage of load shedding, measured as level six out of eight, which translates to several hours of power cuts every day. The national utilities company, Eskom, has allowed for 6,000 megawatts (MW) to be cut to avoid the collapse of the national grid, following multiple breakdowns at the outdated and reportedly mismanaged power facilities. The other big concern is the inability of Transnet, the public freight-rail operator, to handle the volume of coal and other bulk exports. In 2021, Transnet saw over 1,000 km of cable stolen. The rise in copper prices has incentivized vandalism of public infrastructure in the last few years. Furthermore, zama zamas (illegal miners) cost the industry about 7 billion Rands (R) a year, reports The Economist. On top of these losses, coal, chrome, iron ore, and manganese exporters were unable to move R65.3 billion worth of goods after a 12-day labor strike at Transnet hindered exports. Transnet resumed work once a 6% wage increase was agreed upon, but backlog disruptions will run into 2023.

For the mining industry, the inconsistency of electricity remains the biggest concern: "South Africa has been starved of sustainable power, and while the government has not let the power cuts from Eskom impact the industry, we fear that it could degenerate and trickle down to mining operations like ours," commented Debratna Nag, the CEO of Jindal, one of the main anthracite coal producers in the country.

As one of the largest polluters in the world, accountable for 13% of GHG globally, South Africa is hard-pressed to transition from coal to renewable power. In the next 30 years, the country will have to spend US$250 billion to build wind and solar plants. In the aftermath of COP26 climate talks, South Africa secured US$8.5 billion from the UK, US, Germany, France and the EU to finance this transition.

The government also reacted to another mounting pressure coming from within and outside the country. In a landmark deci-

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sion, President Ramaphosa extended the licensing threshold for private projects from 1 MW to 100 MW. The electricity reform is a real game changer for miners, but also for private power suppliers. Rob Hounsome, Africa regional managing director at SLR Consulting, a global environmental and advisory services company, commented on its significance: "The reduction of certain redtape for private power producers is bound to have a profound effect on the economy. Creating opportunities for the private sector in the renewable energy space is crucially important for the development of the economy, and we're seeing a lot of mining and renewable energy clients benefiting from being able to self-generate renewable energy."

Orion Minerals, one of the largest holders of mineral rights in South Africa with over 6,000 km^2 of land, can already see how the availability of renewable energy is changing the economics of its project. In the original bankable feasibility study (BFS) for the Prieska copper-zinc project, Orion used a standard Eskom energy rate at 119 cents/KW/hour, but the updated BFS relies on renewables that come at a third of the cost of grid (35-45 cents/KW/hour): "The market is moving thrillingly fast and new doors are opening, which also means the input parameters for developing new mines need to be reviewed. Suddenly, mines like Prieska, which were already on a path to carbon neutrality, could even potentially become a net carbon sequestrator making them attractive targets for financiers looking to offset carbon credits," said Errol Smart, the CEO of Orion.

"The entire energy scene is changing: It will no longer be a case of Eskom buying up power as the sole client, but consumers directly engaging independent power producers. On the back of this, the hydrogen economy is poised to blossom."

Errol Smart,
CEO,
Orion Minerals

The further liberalization of the power sector will also impact renewable power suppliers. For Ja Solar, a manufacturer of solar power panels, South Africa is the biggest market in the continent. General manager Hadyr Koumakpai thinks mining will become one of the most important segments for the business: "Mining is a heavy energy consumer, with demands on the megawatt scale. At the same time, however, a sometimes-stiff mentality hinders the wider adoption of solar solutions. Naturally, people are resistant to change, but we see companies increasingly more concerned with reducing their operational costs by leveraging a hybrid energy supply," he said.

Namibia, stokes in the wheels

Main operators:

- **Gold:** B2Gold, Osino Resources, Deep South Resources, Antler Gold
- **Lithium:** Lepidico, AfriTin
- **Tin:** AfriTin
- **Zinc:** Trevali Mining, Vedanta Zinc International
- **Uranium:** Elevate Uranium, Forsys, Orano, Langer-Heinrich Uranium, Swakop Uranium, Madison Metals
- **Iron ore:** Lodestone Namibia
- **Diamonds and gems:** DeBeers (Namdeb Diamond Corporation), Sperrgebiet Diamond Mining, Sakawe Mining Corporation
- **Copper:** Dundee Precious Metals, Trigon Metals

South Africa's northern neighbor, Namibia, shares the geological heterogeneity of the Rainbow Nation, offering a spectacularly diverse endowment of gold, base metals, battery metals, uranium and diamonds. However, the country has only managed to differentiate itself as a major producer of uranium, where it is the continent's leading producer on account of the Rössing uranium mine, one of the largest open-pit mines in the world. Rössing is owned by the China National Uranium Corporation after Rio Tinto sold its majority stake in the asset three years ago.

Out of the 25 mines identified by the country's Chamber of Mines, nine are under care and maintenance. One of these is the Skorpion zinc mine of Vedanta Zinc International, a subsidiary of the large Indian group Vedanta Resources. The plant, on care and maintenance since 2020, could double its current capacity from 150,000 t/y to 300,000 t/y with a R6.5 billion investment that would create up to 1,500 jobs, according to the operator. Vedanta had plans to convert the refinery at Skorpion so that it can cater to both oxide and sulfide ore types, but these plans fell through: "High energy prices have derailed this plan. Unfortunately, the refinery is not economically feasible at the current energy prices. Namibia imports power from South Africa, which also runs a deficit and deals with problematic load shedding," said Pushpender Singla, executive director and CFO at Vedanta Zinc International.

One of the most awaited investments in the African zinc industry, Trevali's expansion project at the flagship Rosh Pinah mine, is also on hold. The Rosh Pinah 2.0 (RP2.0) expansion, which would add 86% more volume into the mill and extend the life of mine beyond 2032, was brought to a halt after a court order forced Trevali to suspend trading on the TSX to face inquiries related to a flooding incident at another site in Burkina Faso.

On the copper front, the reopening of the historic Kombat mine also reached a temporary stalemate. Trigon Metals reopened the mine, but subsequently went back to drilling and studying higher-grade opportunities from the open pit, not included in the original mine plan. Trigon will be publishing an updated resource at the beginning of 2023 to incorporate resources from the open pit, and wants to start production from the underground in 2024.

Another copper project, the Haib copper deposit, was abruptly stalled when the Namibian government removed the license from Deep South Resources, its operator. The deposit had been in the hands of multiple operators since the 1950s when it was first discovered, but none of the prospectors managed to prove positive economics for the large resource. Pierre Léveillé, president & CEO of Deep South Resources, is confident the decision will be revoked by the end of this year: "The Ministry renewed the claims over all these years without seeing the results it hoped for. Deep South Resources is the first company in 55 years to demonstrate that the project could be viable and can have a positive economic impact. We showed it was possible to extract the metal at a very low OPEX and CAPEX," he said.

The gold, battery metals, and uranium sectors saw fewer obstacles. The main gold producer in the country, B2Gold, is going ahead with the underground expansion of the Wolfshag mine, which has an annual guidance between 165,000 and 176,000 oz Au for 2022. ASX-listed Lepidico is fully-permitted and shovel-ready to start construction once it has secured financing for its Karibib lithium project. Production should commence in 2025. Coming ahead of Lepidico, AfriTin is looking to start lithium production from its Uis tin mine next year. Another Australian explorer, Elevate Uranium, has managed to identify over 20 million pounds (lb) of uranium resource estimate since acquiring the Koppies tenement in the Namib desert three years ago. After raising A$11.5 million at the end of 2021, the explorer intensified exploration efforts: "We are now spending more than ever on an aggressive drilling campaign. We have two drill rigs in operation, the first one focused on expanding Koppies and the other one at our Capri project," CEO Murray Hill said.

Botswana, the "Switzerland of Africa"

Main operators:

- **Diamonds:** Lucara Diamond, Gem Diamonds, De Beers
- **Manganese:** Giyani Metals
- **Copper:** Koemacau Copper Mining
- **Uranium, Nickel and Cobalt:** A-Cap Energy

"Botswana was built on diamond mining. Since beginning our activity in the country almost a decade ago, we have matured our sustainability agenda and are committed to leaving a lasting positive impact in the country."

Eira Thomas,
CEO,
Lucara Diamond

It is an Eurocentric habit to compare African countries to a Western reference, but it was with noble intentions that Botswana earned the nickname of "the Switzerland of Africa" thanks to its stability and prosperity. These qualities Botswana shows exemplarily in an African context. Indeed, Botswana is the second most democratic country in the continent and 30st in the world, according to the 2021 Democracy Index by the Economist Intelligence Unit. This sparsely populated country with only 2.3 million people in a territory as big as France's – if we can allow for another European reference - has one of the largest GDP per capita in Africa, and a GDP growth curve that has been moving in rhythm with the demand for diamonds, of which it is the biggest global producer by value.

The dependency on diamonds resulted in fluctuations so steep that, in 2020 when the global diamond sector went dormant, Botswana's economy dropped to -8.7% GDP, whereas in 2021 it jumped up to 11.4% under more buoyant conditions. Despite these trepidations, Botswana achieved a high GDP growth average of 4.5% between 1995 and 2022.

Diamond mining is a staple of the economy. De Beers, in partnership with the government of Botswana under Debswana, has four mines in production, of which Jwaneng is the world's richest by value. Other international players, like Canadian-based Lucara Diamond and UK-based Gem Diamonds, have major operations in the country. At the Karowe mine, Lucara Diamond is investing US$547 million into an underground expansion that will be ready in 2026. This will be the country's first underground mine. Eira Thomas, Lucara's CEO, told GBR why diamond mining is at home in Botswana: "Botswana was built on diamond mining. Diamonds were discovered not long after Botswana gained independence more than 50 years ago, and the mining of diamonds was central to the country's growth and industrialization – infrastructure, schools, and hospitals were funded from mining revenues. The mining act was modelled after the Canadian one. 99% of Lucara's employees are Batswana, including our top management."

These qualities that recommend Botswana as "Africa for beginners" have also attracted interest in mining for other materials. These could help the country escape the volatile nature of diamond valuations.

Last year, privately owned copper and silver mining company, Koemacau, completed construction of the first copper and silver mine in the country, drawing attention to the Batswana share of the Kalahari Copper Belt, which stretches to Namibia. The underground Koemacau mine produced first concentrate in 2021, and is set to produce 60,000 t copper and 2 million oz silver concentrates per year for 22 years.

Unlike diamonds, whose value oscillates with the health of the global economy and the appetite for luxurious items, copper and other metals tie into the future-facing energy transition. A-Cap Energy, an Australian company, is exploring opportunities for uranium, cobalt and nickel in the country. The Letlhakane uranium project is set to be one of the top 10 largest undeveloped uranium resources. The company is also drilling the cobalt and nickel Wilconi project, hoping to tap into the battery market.

A more advanced battery metals project is Giyani Metals' K.Hill high-purity manganese sulfate. The developer published an updated PEA focusing on battery-grade materials. Giyani is well-funded with C$17 million in the bank to complete the FS and a demo plant. ■

Central Africa

The DRC and the road to regulatory cohesion

Main operators:

- **Copper and Cobalt:** Ivanhoe Mines, Zijin Mining, Glencore, Eurasian Resources Group, Chemaf, MMG, CMOC
- **Gold:** Barrick Gold, AngloGold Ashanti, Amani Gold, Loncor Gold
- **Lithium, Tin, and Tantalum:** AVZ Minerals, Alphamin, Tantalex Lithium Resources

An upbeat mood shines over the mining industry in the Democratic Republic of the Congo (DRC). The economy has carried the momentum of 2021 into 2022, with GDP growth declining only by 0.1% from the 6.2% registered last year. Foreign direct investment grew by 14% in 2021, according to UN body UNCTAD. Most investments went to the mineral sector.

But the main reason for celebration is the monumental increase in copper production; the DRC climbed from the fourth to the third biggest copper producer in the world in 2021, after Chile and Peru, with an output of 1.8 million t in 2021 versus 1.3 million t the year before. Next year, the DRC is expected to hit the 2 million t mark for the first time. In 10 years, it can reach 3 million t copper, overtaking the current total output of Peru. These giant leaps are almost singlehandedly driven by expansions at the Kamoa-Kakula copper complex, set to become the third-largest copper mining operation in the world by 2024.

What is striking about the DRC is that its dozen or so mines overtake in size and grade most other resources in the world. A handful of mines operated by Glencore, Eurasian Resources Group (ERG), and a few other players supply 70% of the world's cobalt. In gold, DRC's only mine - the Kibali gold mine of Barrick and AngloGold Ashanti - is bigger than any other in Africa, producing 812,000 oz at a head grade of 3.62 g/t Au in 2021.

Nevertheless, the DRC is routinely placed at the bottom of the list for investment attractiveness according to the Fraser Institute and other indexes. Poor governance and chaotic regulations are to blame. Though the trend has been to strengthen the existing legislative frameworks to encourage better mining standards and increased compliance, questionable policies and unclear actions befog any progress. For example, a new law requires all labs in the country to be ISO accredited. So far, all sounds right, but, Jack de Longueville, CEO of Robinson International Group, explained: "What we find problematic are side-line opportunistic requirements asking, for instance, to obtain the ISO accreditation from a Congolese company, which is an unjustified way of making extra money. There are also more and more government agencies all asking for independent audits and taxes."

Forward and backward moving regulations are confusing to the industry. Just a year ago, the government passed a decree which granted Enterprise Générale du Cobalt, a state-owned entity, monopoly over the artisanal cobalt mined in the country, but this year, Minister of Mines Antoinette N'Samba Klambayi is looking to cancel this decree. The state-owned mining company,

"One of our greatest accomplishments was discovering and constructing the Kamoa-Kakula Mining Complex, poised to become the third-largest copper mining operation in the world."

Marna Cloete,
President, Ivanhoe Mines

Gécamines, has also been at the center of multiple scandals. The Congolese ombudsman, the Inspectorate General of Finance (IGF), found significant irregularities in the management of Gécamines as part of an audit. More than US$400 million could not be traced in the books of the organization.

Private operators have also run into trouble with regulators in the past year. The operator of the copper-cobalt Tenke Fungurume mine, China Molybdenum, is the subject of a government-led investigation claiming that the miners understated the level of reserves to reduce payable royalties to Gécamines. China Molybdenum denies the accusation. MMG, the operator of Kinsevere copper mine, is to launch an international arbitration case against Gécamines after government armed forces occupied two concessions close to its Kinsevere copper mine, unlawfully, in September 2022, the plaintiff claims.

In the spin of all this, the biggest investors in the country are making efforts to prove that mining can be done sustainably, ethically and transparently in the DRC.

Zambia welcomes investors with open arms, but is it too late?

Main operators:

- **Copper and Cobalt:** Barrick, Glencore, First Quantum, Arc Minerals, Moxico Resources
- **Gold:** Zambia Gold, Deep South Resources

Zambia used to be biggest copper producer in the continent, but it traded places with its Copperbelt neighbor, the DRC, in 2013. The gap between the two grew wider and wider, as the DRC added about another 1 million t/y in this past decade, while Zambia only added a mere 130,000 t/y. 2013 was also a turning point for FDI in the country, which slipped downhill and never recovered. According to the World Bank, FDI in Zambia was at US$2.1 billion in 2013, the highest in the last five decades. Today, it crushed at negative 0.2% (-US$172,752), according to the latest data. Public debt, a mere 24% of GDP in 2014, exploded to 141% in 2020.

This period of economic decline coincided with the erosion of democracy and the accumulation of a pile of debt under the rule of former President Edgar Lungu. Finally, after new elections in 2021, President Hakainde Hichilema (HH as he is familiarly called) came to power with an ambitious vision and a series of structural and fiscal reforms to restore growth, promising "a new dawn for Zambia's mining sector" in his keynote speech at the Mining Indaba conference in Cape Town.

Post-election, market confidence grew considerably, the national currency, Kwacha, enjoyed a sharp appreciation in the months following, and the first massive capital investments in mining did not fail to appear. Canadian-listed First Quantum Minerals, the biggest operator in the country, announced an expansion worth US$1.35 billion at its Kansanshi mine. AngloAmerican made the first investment in 20 years in the country. The country is also attracting more explorers. Deep South Resources, a junior with a flagship project in Namibia, has recently acquired three exploration licenses: Chililabombwe, Luanshya West, and Mpongwe. ■

"The regulatory environment is evolving positively in Zambia where the change in government is generating a lot of optimism and also remodelling the relationship between the state and the mining industry."

John Martin, VP of Southern Africa, Kal Tire's Mining Tire Group

East Africa

Untrodden jurisdictions

Main operators:

- **Ethiopia:** Akobo Minerals, East Africa Metals
- **Sudan:** Perseus Mining, Managem
- **Tanzania:** Barrick Gold, Shanta Gold, Winshear Gold, Petra Diamond, TRX Gold, Peak Rare Earths, Kebanga Nickel, Volt Resources, Black Rock Mining, Orecorp, Resource Mining Corporation
- **Kenya:** Porini Gems, Shanta Gold, Base Resources
- **Mozambique:** Jindal, Kenmare, Syrah Resources, Gem Fields
- **Madagascar:** Rio Tinto, Ambatovy
- **Malawi:** Lindian Resources, Lotus Resources, Paladin Africa, Mkango Resources, Mawei Mining, Sovereign Metals

East Africa remains the least mined region in Sub-Saharan Africa. Summarizing the specific circumstances of each jurisdiction would result in oversimplification and error by omission. It suffices to say that, in countries with a brief or non-existent history of mining, regulations are improperly defined, local services difficult to come by, and the infrastructure available, dependent on where the project is situated, can make or break the prospects of a new mine. Conflict and terrorism, most bloody in the northern regions of Mozambique and the Tigray region of Ethiopia, but also political unrest, recent in Sudan, are also weighed against geological opportunity.

Mineral and non-mineral resources abound under the soils of each of the mentioned jurisdictions, with Ethiopia, Sudan, and Tanzania standing out for gold, Kenya for its gemstones, gold, titanium, and iron ore, while Mozambique holds some of the largest untapped coal deposits in the world and Madagascar has large deposits of nickel, cobalt, and ilmenite, mostly undeveloped. Perhaps it is the provocation of these dormant resources, in the context of higher commodity prices, that is attracting multiple mining and exploration companies to these jurisdictions. Most remainy largely untrodden, with the notable exception of Tanzania.

Tanzania

Barrick's acquisition of Tanzanian-focused Acacia Mining for US$1.2 billion in 2019 was the most catalytic for the country's mineral sector. Acacia had been stranded in a long tax dispute with the government, which Barrick paid US$300 million to settle. Today, Barrick's two large Tanzanian mines, Bulyanhulu and North Mara, are on a path to reaching a combined production of half a million oz/y, the mark of a tier-one deposit. Winshear Gold has also been locked in a five-year dispute with the Tanzanian government over its SMP gold project. Now more focused on its Peruvian assets, Winshear launched an arbitration case against the government in 2020. Shanta Gold is another active player in the Tanzanian gold industry, with a small mine in operation since 2012 and a second mine expected to come into production in Q1 2023.

"If I could name one challenge of operating in Madagascar, it would be the protection of the environment. I look at the immense scrutiny we receive as a positive thing because it keeps us on the edge in our efforts to do our best thing for the environment and the communities around us."

David Alexandre, Managing Director QMM (Rio Tinto QIT Madagascar Minerals)

GBR spoke to Charles Rwechungura, managing partner at the Tanzanian law firm CRB Africa Legal, to better understand the country's regulatory landscape: "2021 came with a massive change in the fiscal regime that reversed a period of about five tense years where regulations had been chocking the mining business. During this difficult time, the government was often hostile to mining companies and investors, taking arbitrary taxation against many players. Tax collection used to be chaotic and very hard on mining, but the tax system today is much more conducive to business. Tanzania's investment climate is more open than ever, and we see a healthy dialogue between the authorities and the private sector. The current regime is pro-mining and is doing its best to clean the country's image and bring back investors. I think they are managing to do this at a satisfying pace," he said.

Among the most challenging policies in Tanzania were strict local content rules requiring miners to only work with 100% Tanzanian legal companies, even where the scale and complexity of a transaction was overwhelming for local players. Lawyers were seen with suspicion and classified as targets in money laundering operations, while banks had to report payments over US$50,000 to the Central Bank, which would start an investigation. "Suspicion and unease ran high," said Rwechungura. "This has changed now. People go about selling and buying properties, the tax authorities no longer infringe, and the government has relaxed policies so that money can circulate freely," he reassured.

BHP placed a vote of confidence on the credibility of change in Tanzania after recently announcing a US$50 million investment in the Kabanga nickel project, with a further US$50 million to follow, subject to conditions. This marks the re-entry of the major not only to the country but in the continent. The Kabanga project is developed in partnership with the Tanzanian government, which retains a 16% share.

Sudan

Another pioneering mid-tier producer, with three mines in operation in West Africa, Perseus Mining acquired all the shares of Orca Gold, where it already held a minor interest, coming into possession of the Block 14 gold project in Northern Sudan. Block 14 is expected to produce over 200,000 oz/y for 13.5 years. Perseus is the first publicly listed producer in the country and augurs well for the reputation of Sudan. Sudan is believed to be the third largest gold producer of the continent, but the exact data is hard to come by. The country's main mine, Hassai gold mine, is owned by two private entities, La Mancha Resources and Ariab Mining company, while artisanal miners contribute substantially to the total gold output. 90 tons of Sudanese gold reach global markets every year.

Ethiopia

Oslo-listed Akobo Minerals adventured to a remote area close to the Akobo River in Ethiopia and found a small but incredibly rich gold deposit. What it did not find was suitable infrastructure: "Close to the South Sudanese border, this extremely remote area was never mined before and lacked all basic infrastructure. Setting up the logistics and getting in supplies was incredibly difficult, but we carried on with trenching, soil sampling and RC drilling to build our geological model. In 2019, we did our first core drilling and struck a bonanza-grade gold deposit unlike anything else seen before, with high grades at an average of 22.7 g/t Au in the resource estimate, and 40.6 g/t in Indicated resources," said Jørgen Evjen, CEO at Akobo Minerals.

The area around Akobo's site has been occupied by over 40,000 alluvial miners who destroyed the biodiversity. Akobo launched a "tree nursery" to try to restore the natural ecosystem.

Madagascar

Rio Tinto is one of the only – and largest – operators in Madagascar. David Alexandre, managing director of Rio Tinto QIT Madagascar Minerals (QMM), told GBR that the protection of the environment is the biggest challenge the ilmenite producer faces in the country. Beginning operations in 1998, Rio Tinto made the first big investment in the private sector, laying down the regulatory foundations for mining in the country. US$350 million of its US$1 billion investment went on building public infrastructure. The major is now investing assiduously in renewables, which will make QMM the first carbon-neutral mine of Rio Tinto by 2023. "Ever since we started in the 1980s, our key concern was to minimize the impact on the environment. So far, we have managed to conserve 2,000 ha of forests, and we are also investing in water treatment facilities to improve the quality of the water released from the site – we have a whole department with global experts exclusively dedicated to this aspect," said Alexandre. ■

Inflation, logistics and security cause disruptions across the supply chain

"While the strong demand for mineral commodities is positive, it has led to logistics pressures, particularly on truck availability. There are not enough trucks to transport the mining materials from Zambia and the DRC to port destinations. Also we notice that export vessels for the Africa-Asia route are also running short, driven by a strong mineral demand from Asia."

Dolores Biamou,
Mining Director Africa, Bolloré Logistics

"We are most impacted in terms of wage inflation and the rise of input commodities like steel and explosives, which account for a fairly large part of the costs of a project. That said, inflation impacts our business less than it does mining operations because we are able to pass on the higher costs to some extent by adapting our fees to market conditions."

Mike da Costa,
CEO of Global Mining, Murray and Roberts (M&R)

"Downstream, the price of ammonia has increased significantly, driving up the price of explosives. This affects the entire global blasting industry, almost without exception. Given the global challenges, ammonium nitrate can no longer be treated as a commodity, and Dyno Nobel has the technologies available to increase the efficiency of blasting, reduce costs and limit the environmental impact associated with wastage."

Nigel Convey,
Senior Vice President (SVP) EMEA, Titanobel

"Two of our biggest challenges are energy and raw material cost increases, both of which affect the manufacturing costs for products at our factories in Europe. To combat this, we're continuously improving our products to reduce costs for customers operations, as well as providing on-site technical expertise to drive further optimisations."

Martin van Gemert,
Regional Vice President,
Africa, Mincon Group

"Security is a chief concern to us. We always give our customers the choice to make an informed decision based on the risk assessments we conduct. Internally, we have regular sessions to prepare our teams, together with experienced managers that monitor developments on the ground daily. We offer customers security insurance, the choice of the best suppliers and escort services. Nothing is left to chance."

Samad Osman,
COO, OMA Group

"I continue to believe that the DRC is an amazing country, so very rich in resources and possibilities. To be successful in this country, it is crucial that new companies analyze very well the situation on the ground and preferably have good contact in the country. MCSC is happy to be part of the transformation that the DRC is undergoing and keep the firm conviction that mining can be done respectfully."

Cécile Amory,
President, MCSC (Mining Contracting Services Congo)

Precious Metals

Gold vies for investors' attention against the USD

Main countries:

- **Gold:** Ghana, South Africa, Mali, Burkina Faso, Guinea, Sudan, Tanzania, Ivory Coast
- **PGMs:** South Africa (biggest in the world)

Gold is one of the first currencies used by ancient civilizations, but in modern times, it is the "anti-money" quality of gold that has been most appreciated, because no matter what happens with fiat currencies, the stock market, or other financial assets, gold preserves an intrinsic value as a tangible, quantifiable, permanent commodity. At the same time, its value is also arbitrary and highly speculative and a creature of market forces. Over the past two years, gold has honored its role as a hedge against uncertainty and crisis, going above the US$2,000/oz mark at the height of the pandemic and after Russia's invasion of Ukraine. Since then, it came down to around US$1,600/oz, a healthy price for the gold mining industry. Neither the price of gold nor the demand-supply balance trouble the industry as much as the twin pressures of frail investment sentiment and inflation, both linked to the USD.

The fundamentals are on the side of the gold mining sector. Gold supply, especially that which comes in premium deposits (large, open-cast, easy-to-mine) is shrinking. According to a report by the New York Times newspaper, the amount of above-ground gold only increases by 1.5% every year, while below-ground reserves are decreasing by 5%. The banning of Russian gold has also deprived the global supply of about 330 t of gold this year, about 10% of the total 3,500 t. Africa is emerging as one of the last places that could deliver top-tier deposits, as vast swathes of the continent remain underexplored. According to the World Gold Council, South Africa, Ghana, Mali, Burkina Faso, Sudan, the DRC, Guinea, and Tanzania were the biggest producers of the continent in 2021. Over the last decade, the most ounces of gold worldwide were discovered in West Africa. While Ghana already holds some of the biggest mines in the continent, the gold veins crossing Mauritania, Mali, Senegal, Ivory Coast, Burkina Faso, Guinea, Liberia, Nigeria and Cameroon have seen little exploration by comparison.

About half of gold demand comes from jewelry, industrial and medical applications. This utilitarian part of demand has been stable, retail gold demand in particular picking up in Q3 of this year driven by Diwali celebrations in urban India, according to the World Gold Council. The other half of gold demand, that part which concerns gold as "anti-money" and which is driven by investors, has declined by 47% year-on-year in Q3, according to the same source. The weaker investor sentiment for gold assets, including gold mining stocks, is a negative reaction to a stronger dollar and higher interest rates. The dollar surged 15% this year as measured by the US dollar index (DXY), competing with gold as a safe-haven investment. Higher bond yields as a result of rising interest rates have also become attractive to investors, to the detriment of gold, which saw the fifth consecutive month of ETF outflows in September.

Nevertheless, gold returns outperformed most asset classes and the stock markets this year. Moreover, for non-US investors, gold did well in both nominal and real terms. Year-to-date gold returns declined 5% in USD, but in Euro, Japanese Yen and GBP, they grew by 7.5%, 14.7%, and 10.6% respectively in nominal terms, according to the World Gold Council. "We've seen the gold price sliding in USD, but the price

"Liquid assets are sold down irrespective of whether they have stores of wealth like gold might, and more investors are returning to cash, especially seeing a strong US dollar."

**Andrew Grove,
CEO,
Chesser Resources**

in Euros, GBP, or Canadian dollars is still close to all-time highs. (Also), if we compare gold to other main indices like the S&P 500 or the NASDAQ, which are down by more than 20% year-on-year, gold strongly outperformed these, coming down by only 4%," said Luke Alexander, president and CEO of Canadian junior explorer Newcore Gold.

To discuss the gold price is to discuss the USD. Based on the gold return arbitration model proposed by the World Gold Council, a fall in the USD would have an almost immediate numeraire effect on gold; just a 1% fall in USD resulting in a 0.88% rise in gold prices. But leaving aside the short-term, unpredictable dynamics for the USD, the macro-economic context remains characterized by uncertainty, a higher USD exporting further inflation into the global economy, while the Russian-Ukraine conflict continues to cast a deep, dark shadow on geopolitics, gas, and other commodity supplies. For more than five decades, gold returns have had a negative correlation with stock market returns, owning gold being seen as a hedge against market volatility, especially as gold has a low correlation with most asset classes. During recessions, crises, bear markets, and a volatile stock market, gold did well, and there is no reason to believe that it would be different this time.

African gold projects showcase competitive economics amid inflation and weak sentiment

"The way I see it, the market looks terrible. Many resource companies suffered deep plunges in their share price in the past few months due to the uncertainty that prevails in the gold market, even though the price of gold has only dropped by about US$100 in the last month," said Craig Mackay, managing director of junior explorer Golden Rim Resources, which has recently raised US$4 million to fund a 5,000 m drilling campaign at its Kada project in Guinea.

"In times like these, it all comes down to the quality of the asset and the ability to prove that quality," said Mackay, voicing a popular belief.

Like Golden Rim, many African gold juniors have seen strong depreciations in their share prices and struggle to win the attention of equity investors, while debt has become more expensive and riskier. David Awram, Co-founder and Senior Executive VP of royalty and streaming company Sandstorm Gold Royalties, one of the largest in the industry, told GBR that some banks tend to take a conservative view on financing projects in what are considered high-risk jurisdictions in Africa: "I struggle to identify what some call 'tier-one' jurisdictions. To me, every jurisdiction has risks, be it taxation, stability, or permitting lead time. Rather than focusing on one particular tier-one country or one risk type, we prefer to invest in a high-quality project," Awram said.

The African gold sector might just have some of the best project economics out there, according to Awram. We do not need to look far to find such projects. Gold producers like Persues, a top 30 TSX performer over the last three years, produced half a million oz of gold at a margin of US$732/oz in the last year. For its Yaouré mine, which it brought into commercial production, the margin exceeds US$1000/oz at current market prices. This places Perseus towards the bottom of the cost curve and at the top of the cash flow yield curve relative to peers in North America and Australia.

Orezone, West African Resources, Tietto Minerals, Fortuna Silver Mines, Endeavour and others are bringing forward projects mostly on time and on budget. Those juniors at an earlier exploration stage are also demonstrating positive metallurgical recoveries, low AISCs, large deposits, or a combination of these factors that render their projects attractive, and most importantly under the current market, de-risked. For its 781,000 oz at 1.6 g/t grade maiden resource estimate, Chesser Resources showed the ounces found are economic, amenable to a low-cost, low-risk CIL gold extraction at a 2 million t/y rate producing at an AISC of US$820/oz, conformant with what is seen in the region.

Low operational costs, resulting from easy metallurgy, high grades, and access to cheap power are surely important to showcase, but most investors will first look at pre-production costs. CAPEX has been revised upwards over the past year. Juniors that are nearing the FS stage will have to account for larger CAPEX numbers, whereas those with a completed DFS may need to further review these numbers to capture inflation. Pasofino Gold, a junior developing the Dugbe gold project in Liberia, has just filed its FS report for a capital cost of US$435 million, with a post-tax NPV at 5% of USD$524 million. Its executives think the capital requirement is a conservative take and it will likely come down, and that they put out defensible numbers rather than aspirational ones.

"We took an engineering-driven approach to the FS. The numbers are real; they reflect the inflationary pressures of the current environment, and they are the kind of numbers that a constructor could run with, while some of our competition out there will put out unbuildable figures. The market always looks at any CAPEX with caution, and in this environment, it is no different. It's up to us to show the market the upside potential we have at Dugbe, not just in terms of identifying more gold, but also cost savings," said its CEO, Daniel Limpitlaw.

"Africa could very well be the destination with the most economic and best-performing assets in the next 10–20 years. This is where we have been increasing our investments more than anywhere else in the world."

David Awram,
Co-founder,
Sandstorm Gold Royalties

The last couple of years have made the gold mining industry more impatient and risk-driven, eager to shoot out news releases every other week, but the current market asks them to pace down, demonstrate more conservatism and be careful with their spending. Producers have significantly expanded their exploration budgets in 2021, by as much as 100% in Endeavour's case. Meanwhile, most juniors raised money last year, which should finance their activities into mid-2023 or later, depending on how they stretch their budgets. In this market, juniors are expected to refocus on cheaper exploration.

John McGloin, the CEO of Diamonds Field Resources, a junior with projects in Burkina Faso, explains the change in industry sentiment: "In a cycle of growth, the market can afford to dream more, but when reality hits, it turns to empiricism. This is a challenge for explorers. At Diamond Fields Resources, we know that to achieve success we need to discover more ounces of high-grade and good metallurgical recovery."

Diamond Fields acquired Moydow Holdings, taking over its now flagship Cascades gold project in Burkina Faso, as well as two other licenses in Mali and Nigeria. Cascades offered the advantage of already having about 65,000 m of RC and DDD drilling on it done by previous operators, so Diamond Fields verified this historical drilling through a 4,000 m infill drill program, identifying 264,000 oz at 1.5 g/t Au indicated and 371,000 oz at 1.65 g/t Au inferred resources. This translated into a discovery cost of less than US$5/oz. Like other juniors we spoke to, Diamond Fields raised money internally, being majority-owned by managers and directors.

The current market does not exclude bold M&A, especially when the return opportunity outweighs the risks. Perseus acquired Orca Gold in 2021, taking over Block 14 gold project in Sudan. This came as a surprising move for some, as Sudan has no other large mining company besides Managem: "With the acquisition, Perseus put at risk about 9 to 10% of our company. In return, we doubled our ore reserve inventory, added a 15-year mine life project to our portfolio, and, very importantly, we secured a first-mover advantage in one of the most underexplored and apparently well-endowed mineral precincts in the world," said Jeff Quartermaine, CEO of Perseus. ■

Base Metals

Rocky short-term fundamentals don't deter African players

Main countries:

- **Copper:** The DRC, Zambia, (also) Morocco, South Africa, Eritrea
- **Zinc:** South Africa, (also) Namibia, Eritrea
- **Bauxite:** Guinea (biggest in the world), (also) Sierra Leone, Ghana, Mozambique
- **Tin:** The DRC, Namibia

The production of base metals in Africa is concentrated in three key regions: The Congolese and Zambian Copperbelt, as the second largest copper producer in the world after Chile; Guinea, by far the world's leader in bauxite; and *the* Northern Cape province of South Africa, as the main zinc source for the continent and with rich copper resources. More marginally, tin is mined in the DRC and Namibia.

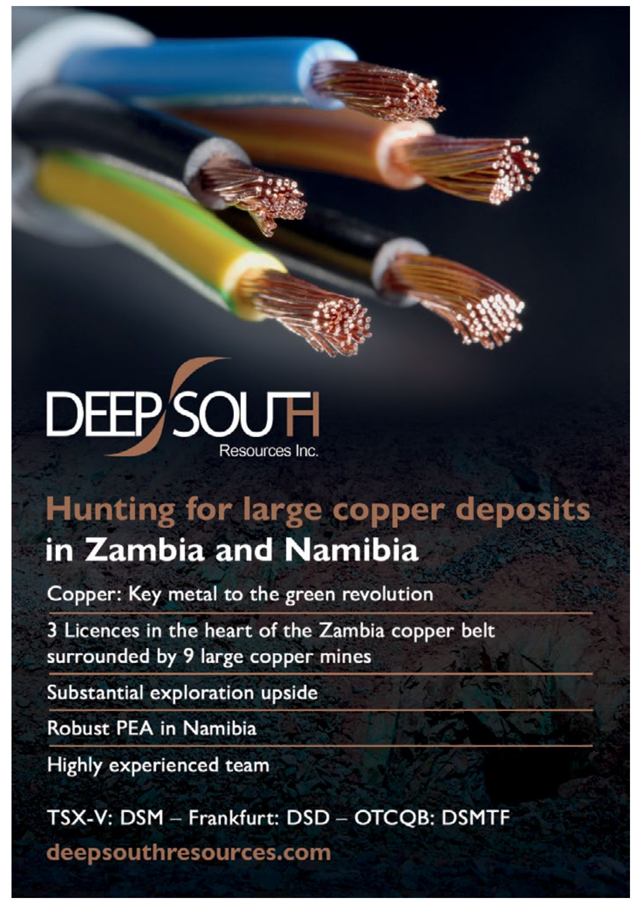
Distinguishing themselves with projects of superior size and quality, these regions have been the key receivers of big investments over the past few years. Following the multi-billion-dollar investment by Ivanhoe Mining, the Kamoa-Kakula copper project in the DRC is set to become the third largest copper mine in the world by 2024. With an investment of R7 billion (about US$413 million), the largest undeveloped zinc resource is being developed by Vedanta Zinc International in South Africa. The Gamsberg zinc project will double production to 500,000 t/y by 2024.

Investments have also started to spill outside of these well-tested formulas that associate the DRC with copper or Guinea with bauxite, targeting brownfield projects mostly. Ivanhoe diversified from its main commodity (copper) to zinc, after signing an agreement with DRC state-owned Gécamines to restart production at the Kipushi zinc mine, which had been in operation between 1924 and 1993. Ivanhoe thinks it can expedite the mine to commercial production in just two years by leveraging the infrastructure in place. With average grades of 36.4% for the first five years of production, Kipushi is easily the world's highest-grade zinc deposit.

While Ivanhoe adds more zinc mining on the DRC map, the continent's biggest gold producer, Barrick, is also looking at more copper projects in the Copperbelt, where it operates the Kibali gold mine in the DRC and the Lumwana copper mine in Zambia. Its CEO Mark Bristow alluded to an untested theory that the Copperbelt might extend into other countries, potentially to the southwest of the Congo into Angola. At the opposite end at the northeast border of Congo, Uganda began the hunt for an investor to take over the Kilembe copper mine, the biggest in the country, which ran between 1952 and 1982. Kilembe was put on care and maintenance due to depressed copper prices.

In the last two years, base metals went through dramatic episodes of record or near-record declines and rebounds. Copper, the most used base metal, saw its steepest drop during the pandemic in 2020. Two years later, the price of copper reached its highest point ever, climaxing at US$5.02/lb in March 2022. Also in March, aluminum and zinc prices traded at their second-highest levels in history. All three metals retreated since, but copper seems to have found a floor just below US$7,000/t, which is much higher than its five-year trend, but the outlook forward is filled with mixed signals.

Copper is sensitive to negative economic activity shocks, which a report by the World Bank found to contribute 74% to the variance in the copper price. Pessimistic demand expectations, recession fears, and softening demand from China are therefore expected to further weaken prices in the following quarters. In the short-term, supply risks radiating from Latin America, but also inflation-driven or pandemic-driven disruptions could also push the price higher, though capacity additions, including those in the DRC, will again fiddle with the price. In the long-term, however, the growth in demand for metal-intensive renewables required in the energy transition poise copper, as well as aluminum and zinc, for strong growth. The International Energy Agency says the building of solar photovoltaic plants, wind farms, and EVs require more critical minerals than fossil fuel infrastructure. According to the IEA, an electric car consumes six times more minerals than a traditional car, whereas an offshore wind plant uses 16 times more minerals compared to a corresponding gas-fired plant.



Copper is seen as a winner of electrification, but the problem with this positive assumption is the time gap between now and then (or the time for renewables to replace fossil fuels). At present, most copper demand comes from industrial applications like the construction sector, and China, which accounts for more than half of copper consumption. The *now* is characterized by a declining – some would even say collapsing - real estate Chinese market, together with other macro headwinds. For now, renewables are a small part of the demand for copper and other base metals. In 10 years time, however, between 7.6 to 11.3 million tons of new mine capacity will be required to fill the copper supply gap, according to Wood Mackenzie. *Then*, prices will surely rise.

So are these long-term price assumptions enough to incentivize mining projects when soaring inflation and feeble sentiment make the discovery and development of new mines so difficult? According to EY, the US$6,726/t average copper price in the last six years has been below the so-called incentive price, calculated by the audit firm to range between US$7,000 and US$8,000 for new project developments. Experts think copper will stay above US$7,000/t through 2024.

Smaller players must think strategically to survive market volatility. In the quest to find capital, base metal junior developers are resorting to selling the precious by-products of their projects where these are available. Trigon Metals, a junior operating in Namibia and Morocco, announced in July this year a silver streaming agreement with Sprott Streaming worth at least US$25 million. In South Africa, junior developer Orion Minerals has also secured a streaming finance arrangement with Triple Flag Precious Metals for an upfront investment of C$87 million. In exchange, Orion committed a portion of its gold and silver byproduct for the life of mine of its flagship Prieska copper project. Aside from precious metals, Orion has also eyed opportunities in a nickel component at its other project, Okiep, which it acquired last year. The Okiep copper mine is a former Newmont and Gold Fields operation and was closed down when copper prices dropped. Okiep is said to hold more than 50 million t of copper ore, but what attracted Orion to the asset is the mineralization style, which creates optionality for nickel and platinum components. "For the first time in the mine's history, we drilled for this style of mineralisation and made a nickel discovery. Moving forward, we will be focusing on the nickel potential as well as the copper mineralization. Our strategy for Okiep is to get a small mine running and generating cash as early as possible," said Errol Smart, Orion's CEO.

While finding viable financing options in the short term, developers of base metal projects are also engaging in long-term thinking, positioning their projects in a way that they couple themselves to the energy transition. Orion, for instance, sees a future in the high-value metals space, where highly refined micro-powders of nickel, lithium, phosphor, and cobalt, often found in conjunction with copper ore projects, sell for a premium. "Neglected, orphan ore bodies, whose development had been sub-economic, could get a completely new lease of life," Smart said.

The opportunity to sell into a premium, greener market is common for other ores. The owner of the recently acquired Simandou North project in Guinea, junior explorer Arrow Minerals, also wants to use the high-grade iron resource found at its project to tap into the electric furnaces market. Traditional smelters are powered by coal, but a new market of electrically powered furnaces create an opportunity to make "green" steel with a much lower CO2 footprint. ■

"If we draw a historical comparison, the base for the zinc price is already above US$3,000. Even at US$2,700, it would be good to run an operation. We believe in zinc and its role in galvanizing industrialization worldwide."

Pushpender Singla, Executive Director and CFO, Vedanta Zinc International

Battery Metals

The African rush to lithium

Main countries:

- **Cobalt:** the DRC (biggest in the world)
- **Tantalum:** the DRC (biggest in the world); (Other) Rwanda, Nigeria
- **Lithium:** Zimbabwe, the DRC, Ghana, Mali, Namibia
- **Nickel:** South Africa, Madagascar, Ivory Coast, Zimbabwe, Namibia
- **Vanadium:** South Africa
- **Manganese:** South Africa (biggest in the world), Gabon, Ghana

"Lithium demand is only growing stronger. Structurally, the market is well-placed for more investments, but macroeconomically, it is less clear."

Hadley Natus, Chairman, Tantalex Lithium Resources Corp

Africa's contribution to the EV revolution has so far been mostly reduced to the controversy of DRC's cobalt, the world's biggest, most coveted, but also most contested cobalt resource, due to its links to child labor and illicit trading. While the mining industry in the Congo fights to prove good practices and detangle its operations from the prejudice surrounding the blue metal, a paradigm that will be discussed elsewhere in the MACIG 2023 book, lithium is causing a stir in the African mining space: "In my 20 years of experience, I have never seen such a crazy rush for a metal," said Anthony Viljoen, the CEO of AfriTin Mining, a tin producer in Namibia.

AfriTin was spun out of Bushveld Minerals, one of the largest vanadium producers in South Africa, back in 2017. For the past five years, AfriTin has mined tin from the Uis mine in Namibia, but for the first time, it is looking to adapt its production circuit to also extract the lithium that currently reports as waste at its operation. AfriTin is not the only miner that has been throwing away lithium in Africa. The continent contains lithium pegmatite deposits which are

"There is a real disconnect between lead times in upstream mining and processing and the downstream. Lead times for new mining operations tend to be 6 to 10 years, compared with 18 months to 2 years to build a new cathode or battery plant."

Joe Walsh,
Managing Director,
Lepidico

"Rather than throwing the lithium away as we have been doing to date, we are now looking to extract it as a by-product to the extent that we become a lithium mine with a tin by-product."

Anthony Richard Viljoen,
CEO,
AfriTin Mining

typically bound up in a range of ore minerals, including pollucite (mined for caesium), columbite-tantalite (tantalum), and cassiterite (tin). Indeed, the only lithium-producing mine in Africa is Bikita, a former tin mine discovered more than 100 years ago in Tanzania. However, Bikita produces petalite concentrate sold for glass and ceramics, even though it does contain spodumene pegmatites, the most important ore used in lithium batteries.

Lithium prices more than tripled over the last year. In China, lithium carbonate prices touched a new record in October this year, trading at an all-time high of US$74,475/t. Despite a looming economic depression, demand for EVs is expected to grow sixfold by 2030, according to Bernstein Research. Bloomberg reports that EV cars may represent 40% of all cars by 2030. Today, 10% of all cars on the road contain batteries. The supply shortage for lithium, but also cobalt, nickel, tantalum and vanadium, is a reality for the battery value chain, including the mining industry. The value deal of critical minerals transactions grew by 159% since 2019, according to a recent report by PwC, which expects further M&A in this space. Because of the typically small and niche size of such deposits, these transactions are more likely to involve mid-tiers and juniors rather than major mining companies.

Except for the Bikita mine in Zimbabwe, Africa has no other active lithium mines, but multiple projects in development are racing to change that. Also in Zimbabwe, Prospect Resources has been developing the Arcadia lithium mine, which it recently sold in 2022 to Zhejiang Huayou Cobalt. Other greenfield projects are being developed in Mali, namely the fully funded Goulamina project developed by Leo Lithium as part of a JV with Jiangxi Ganfeng Lithium, which is due to start production in 2024, and the Bougouni project by Kodal Minerals, which is yet to be funded. Ghana also has a promising lithium project with Ewoyaa, of Atlantic Lithium, also funded through to production. Atlantic Lithium has recently submitted a mining application.

The DRC has the largest lithium pegmatite corridors. Tantalex Lithium Resources is developing a greenfield exploration project called the Southwest Pegmatite Corridor: "We have done geochemical work together with a 100 km^2 high-res aeromagnetic survey, and we are plan- ning roughly 20,000 m combined RC and DD drilling. The drilling program has started and we are hopeful for positive results by the end of Q4 2022," said Natus Hadley, the chaiman and founder of Tantalex."

But the projects closest to production are brownfield mines where tin had been mined in the past, whereas the lithium product has been disregarded. Today, the lithium content is reason enough to restart these historic mines. Owned by AVZ Minerals and two local companies, the Manono project in the DRC contains one of the world's largest LCT (lithium, caesium, tantalum) resources. Manono had been mined in the past for tin, but AVZ released a compelling DFS in 2020 reporting a resource of 401 million t at 1/65% Li2O spodumene, which would give the lithium operation a production life of almost 30 years. Tantalex also has a license on the historic tailings of Manono and is preparing to put out a mineral resource estimate by the end of this year.

Moving down the map to Namibia, another close-to-market lithium mine is preparing to enter production. Rather than mining tailings, AfriTin Mining is updating the production circuit at the historic Uis tin mine to separate the lithium and the tantalum from tin, creating in effect three revenue streams, with lithium concentrate possibly becoming the primary output. Currently, Uis crushes the three elements together, lithium reporting as waste. But the modular expansion of the current circuit will allow AfriTin to segregate and commercialize lithium concentrate, while a magnetic separator will identify the tantalum. Because the mine is already in production, AfriTin is ahead of the market, ready to begin lithium production by Q2 of next year. "There has never really been a better time to be in a metal," said AfriTin's CEO, Anthony Viljoen. "China is lightyears ahead, with the biggest conversion capacity to turn lithium concentrate into batteries and they are getting their hands on as many lithium projects as possible. The West is waking up to the fact that the whole car manufacturing industrial complex is at risk of being outsourced to China."

Viljoen is pointing to a recurring concern. China dominates both upstream and downstream of the EV market, and not only for lithium-ion batteries, but also for vanadium redox flow batteries, a growing alternative. After China, Russia is the second largest vanadium producer globally. The growing appetite for vanadium in China, together with pressures on the supply of Russian vanadium, are making room for a geopolitically neutral supplier like South Africa, reckons Jurie Wessels, chairman of Vanadium Resources, the developer of the Steelpoortdrift vanadium project in South Africa. Vanadium Resources has recently published a DFS showing the project could produce 12,000 t/y of vanadium pentoxide (or vanadium flake). Though mostly used in the steel industry, the main growth driver for the vanadium flake will be the battery market, according to Wessels: "With close to 180 years of life potential, Steelpoortdrift is such a compellingly large and financially robust project that there is no reason why it should not become the next major producing vanadium mine in the world," he said.

Other developers are exclusively focusing on extracting battery-grade materials. In Botswana, Giyani Metals is targeting high-purity manganese sulfate at its K.Hill project. By skipping the production of metal as an intermediary step and going straight from ore to sulfate, Giyani can save both costs and CO2, becoming competitive against China. China dominates 95% of the high-purity manganese sulphate industries, used in different types of cathodes for lithium-ion batteries. Only a few other non-Chinese companies are developing the technology at a commercial scale, and only four listed companies are currently advancing manganese sulfate projects: "The high-purity manganese sulfate has not traditionally been a big market. But now, with the enormous demand coming from the EV industry, suddenly these minority markets like nickel sulfate, cobalt sulfate, lithium hydroxide and lithium carbonate are exploding. The high purity sulfate market is expected to run into a deficit of close to one million tons by 2035. With China's tight grip on this market, and the tidal wave of demand, sulfate supply is imbalanced and there is a clear need for new players to come in and help OEMs diversify their supply chains," said George Donne, VP business development at Giyani Metals.

The African mining industry has the perfect opportunity to participate in higher-end value chains instead of exporting raw materials. Whereas most African lithium projects are planning to produce hard-rock lithium concentrate and export it to third-party convertors, at the Karibib lithium project in Namibia Lepidico is devising a vertically integrated business model to convert its lithium concentrate into lithium hydroxide and lithium carbonate at a chemical plant in Abu Dhabi. "Being vertically integrated means we can participate in revenue strength through the cycle, whether the pendulum swings in favor of concentrates or in favor of chemicals," said Joe Walsh, the managing director of Lepidico.

Lepidico entered a binding offtake agreement with multi-billion European company Traxys to sell all of its lithium hydroxide monohydrate for the first seven years of operation. The 35,000 tons of African product will feed the EV supply chain. ■

ESG drives a new generation of demand

"The difference in this cycle is the central theme of sustainability and ESG that accompanies capital investment. Those companies driving investment in SADC are approaching their projects in an increasingly responsible manner. As a specialist in premium blasting solutions, BME is well placed to work with mines to grow production in efficient and sustainable ways."

Nishen Hariparsad, General Manager (Technology, Innovation, Global Product Management Marketing), BME

"Around the world the use of cyanide is becoming more strongly regulated to minimize the harm it can cause when it is discharged into the environment. The industry is pressured to reduce cyanide content and treat the effluent water that contains cyanide, which is quite expensive. We offer two solutions to this problem: Our oxide and sulfide collectors and our cyanide replacement product."

Justine Stubbs-Hult,
Co-Founder and Group CEO, Axis House

"There is no miner or junior that is not considering hybridizing existing or new power stations by adding more renewables into the mix, but there are, of course, challenges. We need to work with the intermittency of renewable power sources and add backup sources to stabilize supply when there is no sun or when big clouds shadow the PV station. For this reason, gas is becoming more popular."

Cédric Fernandez,
Managing Director, Africa Power Services

"African governments are becoming more aware of the need to create a fair balance of interests between the state and investors; within this trend, amendments in mining legislation have tended to incentivise investors while also ensuring equitable benefits to the local population. Another trend is that local populations demand better transparency not just from their governments, but also from corporations."

Mouhamed Kebe,
Managing Partner, Geni & Kebe

"Lubricants are the engine of every equipment and, as the world shift towards renewables, so will Dutylex. In this sense, I cannot think of a better example than Petro Canada products, where all the oils are 99.9% purified and almost biodegradable. While the shift from fossil fuels to renewables is becoming the new normal in Europe and America, Africa is slowly catching up."

Peter Alexander Quarm,
CEO, Dutylex

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Senior Project Director & Journalist: Lorena Stancu
Project Director & Coordinator: Germaine Aboud
Coordinator: Marta Armengod
Executive Editor: Mungo Smith
Graphic Design & Artworks: Özgür Ergüney, Kaori Asato
Operations Director: Miguel Pérez-Solero
General Manager: Alfonso Tejerina
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If you wish to be interviewed for the report, please contact Lorena Stancu (lstancu@gbreports.com) or Germaine Aboud (gaboud@gbreports.com)

www.gbreports.com