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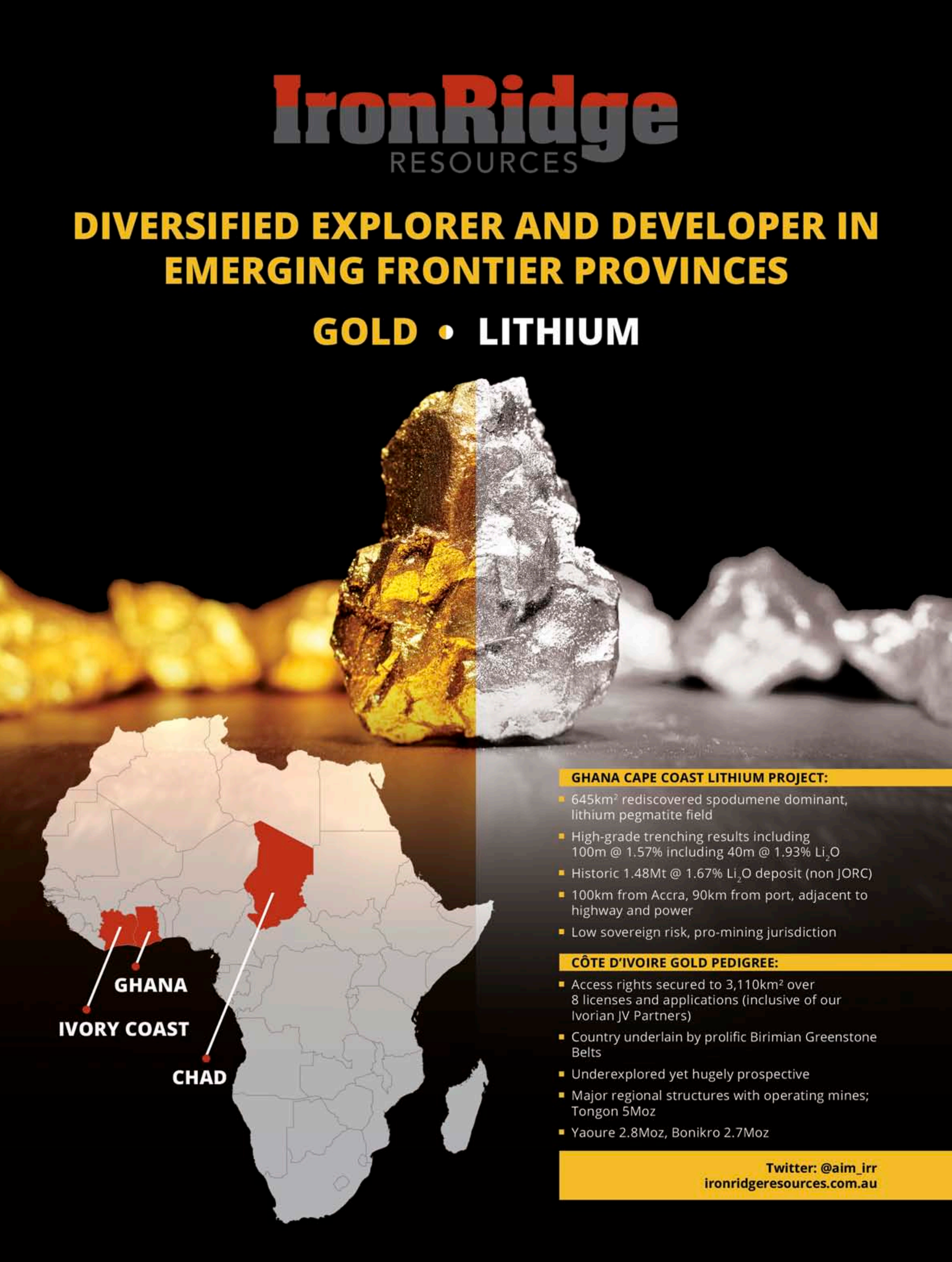
MACIG
THE OFFICIAL MINING IN AFRICA COUNTRY INVESTMENT GUIDE

West Africa
2018-2019

MACIG 2019
PRE-RELEASE
EDITION



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CÔTE D'IVOIRE GOLD PEDIGREE:
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Country underlain by prolific Birimian Greenstone Belts
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Dear Readers,

West Africa's rich mineral resource potential makes the region an attractive proposition for investors from across the globe. Significant gold discoveries have shone a spotlight on countries sharing the Birimian Greenstone Belts and, while mature mining countries like Ghana and Mali continue to lead the way in gold production, others are gaining ground as investors turn their attention to less-explored areas. While gold remains the focus for mining investment into West Africa, recognition of the region's more diverse resource potential coupled with government efforts to mitigate risks associated with such heavy ties to just one commodity, has led to a number of successful and promising projects in resources such as iron, lithium, copper and manganese.

In order to properly assess West Africa's investment prospects, the West Africa Pre-re- lease for the Mining in Africa Country Investment Guide (MACIG) 2019, the official publication for Investing in African Mining Indaba™, seeks to highlight some of these opportunities while presenting a balanced picture of the enabling environment.As with any jurisdiction, each country is not without its challenges, and investment risks must be properly weighed against potential return. The final publication of MACIG 2019 will be launched at the African Mining Indaba in Cape Town, February 2019.

We have spent four months conducting on-the-ground research, living between Senegal, Burkina Faso, Ghana and Côte d'Ivoire to investigate and present the latest trends in the industry. This pre-release includes our initial findings from interviews conducted with key players across the sector in West Africa, from producers and juniors to service and equipment providers. Ghana's mature mining sector stands in stark contrast to a country like Senegal, whose mining industry is relatively nascent. While underexplored geographies hold greater potential for large discoveries, more developed mining countries have the advantage of a proven track record of projects being brought to production and a more developed local service sector. The introduction of more attractive mining codes and investment incentives seem to correlate directly with greenfield investment, of which Côte d'Ivoire is a shining example.

As well as highlighting opportunities, we also seek to elucidate risks and potential challenges. Histories of political unrest have deterred some investors over the years, but the impacts of increased stability on investor confidence are immediately apparent in countries like Côte d'Ivoire and Burkina Faso. Security remains a concern in the region, however, and profiles can change rapidly.

We invite you to explore this valuable resource to help inform your investment decisions in West Africa; a mining region of great potential and offering high returns when approached with the right strategy.

Merci Beaucoup! Enjoy the read!

***Catherine Howe**, Project Director and Journalist*
***Lina Jafari**, Project Coordinator*

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This research has been conducted by Catherine Howe, Lina Jafari, Lindsay Davis and Carl-Johan Karlsson.

Edited by Mungo Smith
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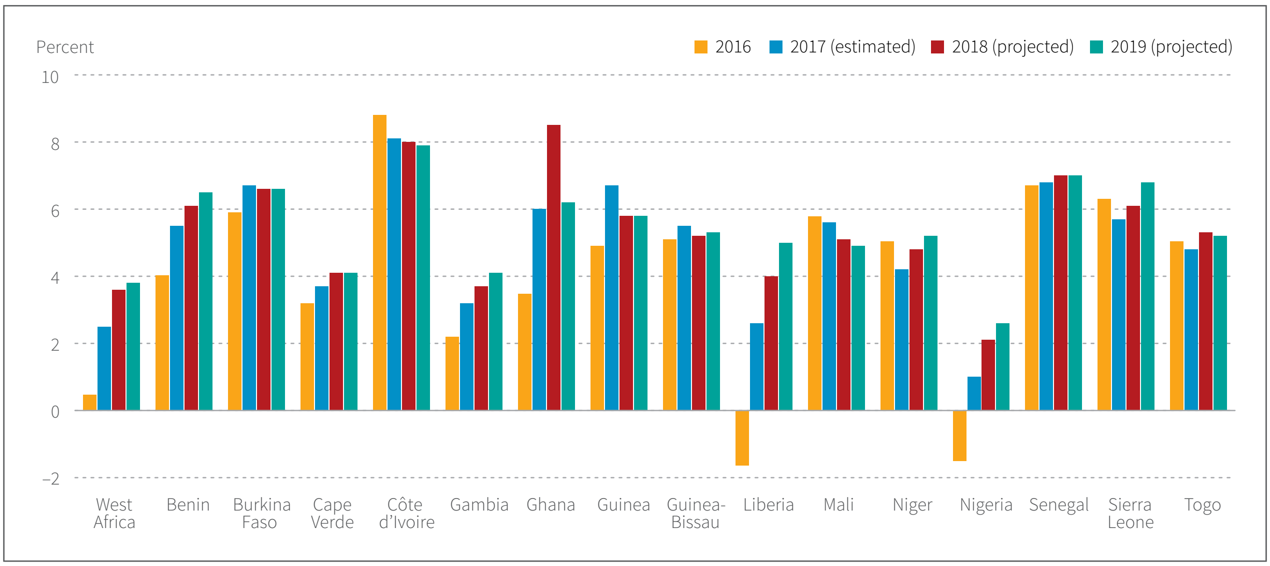
West Africa in Numbers

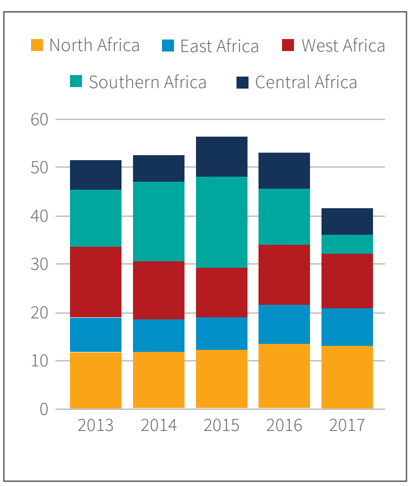
Burkina Faso, Côte d'Ivoire, Senegal, Guinea-Bissau, Mali, Niger, Benin and Togo are members of the West African Economic and Monetary Union. Accounting for more than 40% of the currency union's GDP, Côte d'Ivoire is WAEMU's largest economy. Senegal contributes about 15%, followed by Mali, Burkina Faso and Benin, which each contributed about 10%.

Real GDP growth rate, 2016–19



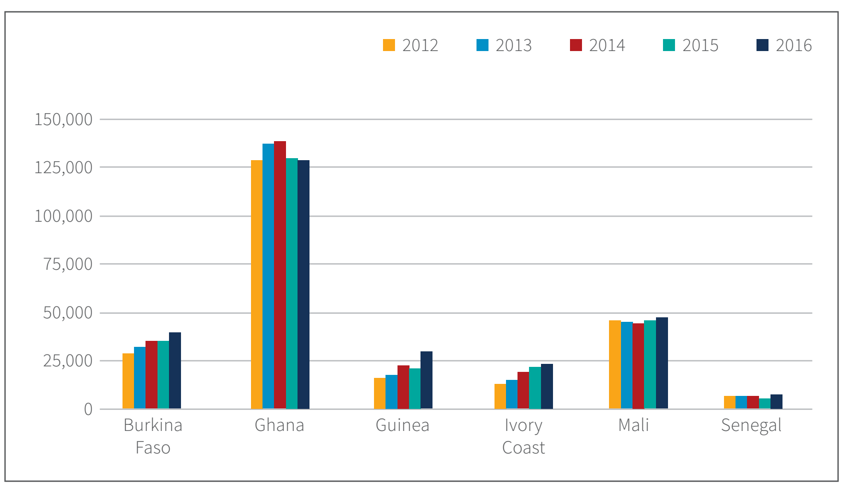
Source: AfDB statistics

Foreign Direct Investment (FDI)



Source: UNCTAD

Gold Production



Source: British Geological Survey

Prospective Lands: West Africa's Mining Potential

Spotlights on Côte d'Ivoire, Senegal, Burkina Faso and Ghana

Long recognized for its geological potential, West Africa continues to edge into center focus from the peripheral vision of many investors. Within the region, investment dynamics continue to shift, with several rising stars gaining momentum alongside the more established mining countries. Perceived attractiveness largely comes down to geological potential, economics and perceived risk. Due to the shifting perception of attractiveness, investor attention is shifting away from the historic producers to less-explored countries with greater potential for big discoveries. Larger companies are continuing to increase their land positions and acquire properties across the region, and a number of projects have found success. The most notable deal, however, is the announced Barrick Gold and Randgold merger – a share-for-share deal valued at US$6.5 billion, which will see the formation of a new company, new Barrick. Subject to approvals, this entity would be an industry leader in gold and listed on both the New York and Toronto exchanges.

While each country is characterized by its own policies and operating environment, the common vein among many attractive mining investment destinations in West Africa is their shared position along the Birimian Greenstone Belt. This geological formation underpins Ghana, Côte d'Ivoire, Guinea, Mali and Burkina Faso; a major source of gold, with approximately 52 million ounces of gold resources discovered to date. Geologically, Côte d'Ivoire is considered the most prospective country by many because, covering about 35% of the belt, it is home to the most significant portion.

In West Africa, Ghana has led the way in gold mining and still holds first place in

"While world gold production is expected to decline in the coming years, West Africa continues to be one of the fastest growing regions for gold production in the world. There are few regions with this much activity. West Africa produces half of the continent's gold and is closing in on North America production levels. This remarkable progress over the past 25 years is due to the mining-friendly governments and prospective, underexplored geology in the region. There have been about a dozen projects built over the last five years and, with one exception, they are coming in on time and on budget. They are bitesize but profitable."

Richard Young, CEO, Teranga Gold

the region for gold production – second on the continent only to South Africa. Ghana produced 101.7 tons of gold in 2017 versus South Africa's 139.9 tons. Among the country's producers are Newmont, Gold Fields, Kinross and AngloGold Ashanti. However, the country's high tax burden has stalled many exploration projects and deterred new investors, leading to a lack of greenfield exploration. The country's skew towards large companies with underground mines and brownfield exploration focus goes hand-in-hand with a mining code that favors companies with larger investment power.

Also a center for gold production, Mali's 2017 figures came to 49.6 tons. Major investors supporting Mali's position amongst the continent's top gold performers include AngloGold Ashanti, Resolute Mining and IAMGOLD. Output last year was also boosted by the initiation of production at B2Gold's Fekola project. Meanwhile, Burkina Faso has stolen fourth place on the continent, overtaking Tanzania, with 45.5 tons of production in 2017 and 2018 set to be a record year with a projection of 55 tons.

After geological potential, investment incentives and stability play a significant role in attracting investment, as demonstrated in Côte d'Ivoire. However, just as international investors seek solid ground, governments continue to find their footing when it comes to balancing investment incentives with ensuring economic benefit to their respective countries, several tipping the scales towards the latter. Countries with increasingly stable economic and political environments are garnering most investor attention, whilst security risks and uncertainty in others are causing companies to delicately tread the line as they enter "wait-and-see" mode.

ATTRACTING EXPLORATION

After a slump in activity, exploration is on the rise again worldwide, with an increase in spending of about 15% in 2017 versus the previous year, according to S&P Global Market Intelligence. Accounting for more than 70% of this year-on-year increase, gold led the way, followed by base metals. In West Africa, gold's share of exploration

"Côte d'Ivoire is currently the most attractive country for exploration and mining investment, but Guinea and Senegal have also entered the race and are looking like good competitors. Mali and Burkina Faso have always been attractive countries from a geological perspective, but their attractiveness to foreign investors has been reduced due to the security risks which continue to increase."

Beau Nicholls, CEO,
Sahara Natural Resources

"Global investors have choices. The gold game in West Africa has become quite competitive now, especially in Côte d'Ivoire, as a new address for people to explore. Burkina Faso and Mali are big competitors, and even Guinea is starting to get involved."

Jeff Quartermine, CEO,
Perseus Mining

spending sat at 61% in 2017, up from 51% in 2016. However, investor appetite is still a long way off the highs of six or seven years ago. “Most of the lower investment appetite for gold and gold stocks is simply that the value of gold has fallen from US$1,800 in 2011/2012 to just US$1,200 today,” commented Douglas MacQuarrie, CEO at Ghana-focused junior Asante Gold Corporation. “The junior gold market is highly leveraged to the gold price and, while investment leverage is great when the underlying asset is increasing, the converse is painful. The stock charts say its a great time to pick up your favorite gold shares cheap, but be prepared to hold them for an extended time.”

The impacts of reduced activity have been felt across the value chain, with service companies tied to the sector also suffering a great deal. “The last four years have been tough for all companies involved in exploration, particularly service companies, but we are optimistic about the future,” commented Simon Meadows Smith, managing director at SEMS Exploration Services, a Ghana-based full-service provider to the mining industry. “For the first time since 2013, we can plan with confidence due to the return of the junior explorers to West Africa. We have witnessed a couple of IPOs this year where companies have raised US$4 million to US$6 million on the ASX for early-stage mineral exploration projects in West Africa, which would have been extremely difficult just 12 or 18 months ago. We are confident that this trend will continue for a while. On the back of this upward trend, we are now back in a position where we can expand our field of operation and we are looking to grow the company again.”

Optimistic that this strong growth trajectory will continue, SEMS is keen to focus more attention on Guinea and Côte d’Ivoire and is hoping to replicate its West Africa service offering in the Central African region.

Nevertheless, since investment dollars are in tighter supply than they once were, governments are recognizing the importance of competitiveness beyond the naturally-occurring resources held within their lands. Whilst investors may

Oumar Toguyeni

Regional VP West Africa, IAMGOLD

"I must say that our competitive edge is that we know how to build lasting relationships with key stakeholders and we know how to operate efficiently in this region."

Could you provide a brief overview of the importance of West Africa to IAMGOLD?

We are present in Burkina Faso, Mali and Senegal, and recently acquired exploration rights in Guinea. About 50% of our production comes from West Africa, with Essakane, one of our flagship operations, still playing a major role. We are currently looking at a brownfield expansion at Essakane with a heap leaching project currently under study, which will take the site from a production of over 400,000 oz/y to close to 500,000 oz/y. In Mali we still hope to bring the Sadiola sulfide project into production and in Senegal we are currently doing a feasibility study on the Boto gold project.

How is Essakane performing, and what is the timeline of the heap leaching project?

Essakane has performed extremely well: in 2017 we had record attributable production of 389,000 oz, (432,000 oz total production) beating our previous record in 2016. In 2018, we are targeting the same level with mining production coming from the Essakane main pit and two satellite deposits at Falagountou; Falagountou West came into production in 2015, and mining is starting at Falagountou East in 2018, bringing oxide and transition material to the plant. The heap leaching project is progressing well and the pre-feasibility study will be completed by June 2018; it has the potential to increase Essakane production by up to 20% and extend the mine life by two to five years.

In terms of exploration, we are actively exploring around the mine at prospects such as Gossey in order to prove resources that can be fed to the plant. Essakane sits in a very prospective area and we have a large land package that can be further explored.

How is the mining environment in Burkina Faso?

As in most countries in the region, we have a mining investment agreement, or Basic Convention for Essakane with the government which has stabilized our legal, customs and fiscal terms and this has given us more predictability. We have been operating now since 2010 without any major interruptions because of the excellent relationships with local communities, NGOs and the government. I must say that our competitive edge is that we know how to build lasting relationships with key stakeholders and we know how to operate efficiently in this region.

Could you tell us more about your CSR initiatives?

Our philosophy is that if you want to operate somewhere, you need to bring something positive and sustainable to the host community. Our strategy has been to better integrate our mines in the communities and countries where we operate. I can tell you about two of our two major projects. Back in 2011, we signed an agreement with Plan Canada, Plan Burkina and the government of Canada to jointly fund a CAD 7.5 Million project for non-formal technical and vocational training programs in two regions of the country for youth ages 13 to 18 who did not finish school so they can transition to the job market or become entrepreneurs.

Secondly, we have the Water Triangle project in northern Burkina, which, when completed, will be a game changer in terms of potable water access for the population of this drought-stricken region. The Canadian government, the One Drop Foundation and IAMGOLD have teamed up with an execution agency (Cowater Sogema) to provide potable water to over 60,000 people. We provided CAD $2.3 million, an amount matched by the One Drop Foundation, and the Canadian government provided CAD $14 million for the project's implementation.

What are the next steps for IAMGOLD in West Africa?

We look forward to the results of the Pre-feasibility study on the Essakane heap leaching project, with a decision to be made this year. We still hope to reach an investment agreement on legal, fiscal, custom and energy clauses with the Malian government for the Sadiola sulfide project in order to finally unlock the next life of this world class mine. We are also excited about the Boto gold project, where we plan to apply for a mining concession at the end of this year.

turn to countries with a proven track record of successful discoveries, focusing on the same geological trends, after some time the general perception is that the potential for big discoveries is much lower. In more mature mining countries, as seen in Ghana, juniors begin to pursue smaller ounce numbers, playing to their strengths in exploration and taking advantage of leaner cost structures, and on discovery are often quickly taken over by large companies with greater capability and experience in development and production. Nevertheless, while the juniors may pursue smaller ounce numbers, there is a limit. "In this part of the world, we believe that we need close to 1.5 million ounces of inferred resource before it is worthwhile to look at more advanced studies," underlined Don Dudek, CEO at Savary Gold Corporation, which is focused on two properties in Burkina Faso in a joint-venture agreement with Sarama Resources. "The theory is that a 1.5 million ounce-inferred pit-constrained resource could translate to around a million-ounce reserve which could support mining production of approximately 100,000 ounces over 10 years."

It is the relatively underexplored countries that are attracting more greenfield exploration activity as investors set their sights on larger returns. Côte d'Ivoire in particular is experiencing a boom in its mining industry, seemingly out of the woods regarding the political instability that had deterred investors in previous years.

Burkina Faso, similarly, is widely regarded as a country with great geological potential. Within West Africa, the landlocked Francophone country was the biggest focus for exploration activity in 2017. For Burkina Faso, however, security risks are a big hurdle in the attraction of investment and several recent incidents are likely to have shaken investor confidence.

A more recent entry into the investor spotlight is Senegal. Although the country is not new to mining; operating its first phosphate mine since the late 1940s, it has so far not experienced much of the limelight on West Africa's mining stage.

OTHER GOLDEN OPPORTUNITIES

Although gold has historically been West Africa's most sought-after and most heavily-exploited resource, market volatility has driven a diversification of interest, both from investors and governments alike.

From the government perspective, having an economy so tied to one commodity is a huge risk. Investors, seeking high returns and stability, will follow opportunities with minimal perceived risk and gold is currently somewhat out of favor with the junior investor community. Battery metals, on the other hand, are receiving a great deal of attention due to projected demand in end-use segments. There has been notable attention on resources such as cobalt and lithium, for example, although share prices are not necessarily reflective of current interest. "Although many lithium companies have dropped significantly in market capitalization, there is a clear disconnect between share prices and the deals that are actually being hunted down in the marketplace," noted Vincent Mascolo, CEO at IronRidge Resources, an AIM-listed exploration company with advanced lithium projects in Ghana, amongst a portfolio of gold, bauxite, titanium and iron ore projects in West Africa and Australia. "There is a lot of activity and everyone is talking about electric vehicles. However, IronRidge is a bit different as we focus on the stored energy space. Many countries in Africa lack electrification which is due to transmission costs rather than the source of the generation. The technological development in solar panels and stored energy, combined with LED lighting, has made it much more efficient and it will have a great impact on Africa. We have started a Lights of Africa initiative in Chad for this purpose."

Underscoring the likely trajectory of the market, Darryl Butcher, project manager at Mali-focused Birimian Limited, commented: "My outlook for the lithium market is very positive, but it is important to understand the market consensus. I believe Lithium will go through a period of oversupply between 2019 to 2021, followed by a period of sustained undersupply, based on the assumption that the electric vehicle market expands as expected. While the outlook for other metals involved in the battery design is less certain, lithium will be involved in most batteries regardless. The consensus is that the next step will likely be a solid-state lithium battery that will not involve other metals such as cobalt."

Other alternative energy resources also have high demand projections. Uranium, for example, while yet to recover from the impact of the Fukushima disaster, is broadly considered to have a positive outlook. "Uranium has always been a challenging commodity, but there are currently approximately 450 reactors in the world with many more being built," highlighted Stephen Roman, president and CEO at Global Atomic Corporation, which is developing a high-grade uranium project in Niger. "The Americans have the largest reactor fleet, but soon the Chinese will match them, followed closely by India. Nuclear provides a very clean and efficient base-load power… People must understand that new reactors are much safer than they were in the past. Some designs cannot melt down given the new technology and cooling systems… There is a powerful effort by many to shut down nuclear, but common sense has to prevail. Countries need to fulfill their power requirements. China will have 150 to 180 reactors in the next 20 years; every few months they turn on a new one."

"Niger is now becoming a solid hub in West Africa, with French and American military bases located there. It is a strategic area that needs to maintain good security to ensure investors can enter and operate in the country. Global Atomic has also benefited from the rapid turn-around times in terms of permitting. In Canada, permitting a new uranium mine would take a minimum of 10 years, in Niger it takes 4-6 months."

Stephen Roman, CEO, Global Atomic Corporation

While uranium producers are certainly going through a difficult period, the market outlook is considered positive and, with significant capacity having come offline due to oversupply, juniors should be well positioned to capture demand increases by the time they move through to production.

ENABLING FRAMEWORK

After geological potential, the tax regime is one of the most highly-considered fac-

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tors when assessing the economic viability of a project. Governments are often at odds with companies over the balance between incentives for the company to operate and economic return for the country of operation. Because the viability of a mining project relies on its economics, a stringent tax regime can quickly render the development of a mine unfeasible. Equally, juniors are less likely to enter a country where they are expected to pay high taxes before making a return themselves.

On the other hand, negative public perception, a source of pressure on the government to secure greater economic return from companies, is often a result of a lack of apparent increase in local and national development and wealth. While in some instances this is due to an inefficiency in reinvestment of funds received through royalties and other taxes, the perception generally leads to efforts on the government's part to tax more heavily for greater economic benefit. "There appears to be a large gap in the understanding of mineral economics between mining companies and governments," commented Jeff Quartermaine, CEO and managing director at Perseus Mining, which operates the Sissingué mine in Côte d'Ivoire and the Edikan mine in Ghana and will soon move into construction of its third mine, Yaouré, also in Côte d'Ivoire. "Everybody is under pressure to find funds and when governments approach traditional lenders, like the World Bank or OECD, the advice they seem to receive is to extract more value from the country's existing resources. There seems to be a belief amongst some politicians, not shared I should say by the companies, that the mining industry is not sufficiently contributing to their host countries' economic welfare."

Meanwhile, the industry perspective emphasizes indirect economic benefit, including local employment, and urges consideration for "hidden" taxes such as import duties on equipment and VAT. In countries where exploration activity is not accompanied by tax breaks, juniors are at a disadvantage and investors may be deterred altogether. On the flip side, governments that try to revise tax systems once companies have entered are also at risk of dispute. On the topic of the recent uptick in arbitration cases, Mouhamed Kébé, managing partner at the Senegalese law firm Geni & Kébé, commented: "One of the reasons is that more African countries have new mining regulations and taxes. In many cases, these reforms have impacted existing mining contracts. We are developing more programs in arbitration, and there is a provision under the OHADA system. The OHADA Arbitration Act applies to 17 countries and the Common Court of Justice and Arbitration in Abidjan is seen more and more as the major arbitration center in Africa."

Investors will tend to stay away from countries with track records of unstable tax regimes or attempts to renegotiate contracts. "Governments must stop thinking of mining companies as having massive war chests, particularly in African countries that are heavily reliant on the junior segment," asserted Daniel Major, CEO at GoviEx. "Juniors have generally only had enough money to do what they need to do. Many governments have the misperception that these companies have cash to spare, when in fact they work very hard to get what they have and it goes straight into the ground. One aspect that appeals to us in Niger in particular is that the tax code is bound to the mining code. It is in the law. The law also binds both parties, so it is equally beneficial to companies. West Africa's integrated OHADA law system is also extremely useful."
As enabling frameworks stabilize in developing mining jurisdictions, investors will gain more confidence that what they see now is what they will be getting over the long-term.

SECURITY

Security can be a major challenge in Africa and, as has been seen in many countries, security profiles can change rapidly with unexpected incidents or, at a broader level, with a change in political regime. Countries that have become more attractive in this regard include Côte d'Ivoire and Guinea, while investors are proceeding with greater trepidation in countries like Burkina Faso, Niger and Mali. "It is worth noting that there are many established smuggling routes in West Africa, of which one branch goes through Burkina Faso and up through Agadez, Niger," highlighted Philip Whitehead, regional security manager for West Africa at MS Risk, a British company with a strong presence in security and risk assessment and management in West Africa. "A lot of the violence we are seeing is a mixture of straightforward Islamic fundamentalism and violence surrounding the trafficking of drugs, people and consumer goods in one direction and weapons in the other direction."

Due to the often-vast expanses of uninhabited land and lack of surveillance capability, it is impossible for governments and companies alike to keep abreast of unrest in certain areas and activity at the borders in real-time. Since mining operations tend to be in remote locations, keeping track of potential security threats can therefore be extremely difficult. At the mine sites themselves, companies often have to take major precautions to mitigate security risks, but the underlying problem goes unsolved. MS Risk is trying to address this challenge through its intelligence-gathering efforts, a great deal of which have been translated into the company's mobile phone application, D-Risk. The app allows companies to view the region, with the option to filter by country, with pinpoints for any incident overlaid onto google maps. Companies are able to search their area and also interrogate it and view trends.

In Mali, it was the recent election that caused discomfort in the investor community amid accusations of electoral fraud and anticipation of potential public unrest. The environment does, however, seem to remain settled for now.

LOCAL EXPERTISE, INTERNATIONAL STANDARDS

When available, international mining and exploration companies look to local service providers, as long as they can compete at the same standards as the international alternatives. Whilst cost is certainly a factor, companies will generally not compromise on quality. "High quality products are the preferred choice in the region, and although the importance of quality may have decreased slightly during the downturn in favor of lower cost products, it has generally been the predominant aspect over pricing," commented Martin van Gemert, managing director at Mincon West Africa, which primarily supplies DTH products to West Africa and has its local base in Senegal. "Whilst price can be a consideration, our customers generally recognize that higher quality means increased longevity and efficiency, leading to overall cost savings. Therefore, while the initial CAPEX investment may be higher, cost per meter will be lower."

Mincon is currently looking for distributors that can comply with the company's standards.

Training has become a major preoccupation for many companies, particularly as new technologies come into play. The major drivers for innovation are safety and efficiency, and many new technologies seek to simplify processes and reduce potential for human error. "We are also seeing a lot of technical development with machinery; automation for example, that is making our drill rigs safer and helps reduce human error," commented Vincent Gonthier, director of development at Forage FTE Drilling. "Interestingly, these new technologies are entering West Africa at the same time they are arriving in North America and Europe since many companies and distributors are doing business globally now."

Local content guidelines are outlined by most governments, but when it comes to service providers, many companies are finding benefit in contracting locally.

The overarching trends in the service segment pivot on complete turn-key solutions and reactivity. Many service providers are expanding their capabilities, if they have not already done so, to become a "one-stop-shop" for their clients, responding to the long-standing preference of companies at the end of the supply chain to work with fewer suppliers. In terms of reactivity, fast response times are key in maintaining competitiveness. For many international companies, this means building out warehouse capacity and holding greater inventory in country. Many other companies are responding to demand for fast responses through greater proximity to the client, whether by setting up bases in the main mining regions or at the mine sites themselves.

Equally important are the new technologies coming into play to increase safety and drive efficiency. Automation is being increasingly implemented across different settings primarily driven by these two factors. Predictive maintenance is also gaining momentum to maximize operational output. "Downtime is key in mining operations," stated Andrew Sarsons, mining director at Burkina Equipements, part of the JA Delmas network of Caterpillar dealers. "A lot of methods used by mines today were not in place 20 years ago. Today the focus is more around driving productivity and efficiency while being cost effective… If a machine goes down and we do not have the part in our inventory, that machine could stand for three weeks. The mining philosophy is "repair before failure". We work with our customers more and more on planning engine or component change-outs before they fail. With scheduled downtime, we can work with our customers and plan effectively to ensure production targets are achieved."

Echoing the drive for greater efficiency with new equipment, Boart Longyear's West Africa division manager, John Madigan, elaborated: "Safety is number one for Boart Longyear. In the near future, we are looking at hands-free handling to take away the risk of injuries and we are using new mechanisms such as our Roller Latch Overshot. We are also using our In Vehicle Monitoring System (IVMS) in every vehicle in West Africa, with a centralized user interface to track any vehicle from our headquarters. They all carry panic alarms, and also send out alarm signals if a driver is speeding, which has reduced safety incidents. We are also implementing lasers in locking systems, so the rotation stops if the laser is crossed."

POWER GENERATION

Also tying in heavily to the economics of projects is power, which accounts for a significant portion of the cost structure of gold extraction in particular. However, while investment seems to be flowing, projects are still hitting road bumps when it comes to transmission. Andrew Herscowitz, coordinator at Power Africa, an arm of the United States Agency for International Development (USAID), stated: "Some of the biggest challenges for projects when they reach the point of bankability is the purchaser or off-taker. A recent study indicated that only 2 of 37 utilities in sub-Saharan Africa were actually financially solvent…The question is not whether there is enough deal flow across the continent – they are pretty much on par with anticipated demand for power in most countries. The power will simply not reach industry or the local population if we cannot improve the financial viability of utilities, build out the distribution network and set up transmission lines."
Power Africa is therefore working on strengthening the enabling environment across Africa to increase the success rate of strong projects with good financial backing.

Renewable energy sources are considered the future for power generation across the continent and have a place in the mining sector too. However, for now, mines will generally require a hybrid solution with the occasional exception of light-load operations. "For most mines, heavy fuel and gas-powered plants are still the priority consideration," outlined Erik Pretorius, LBU manager – process industries at ABB. "Renewables are a consideration for light-load operations but are unlikely to become an isolated power supply source for the foreseeable future.

"New systems are being put in place to control import of goods and equipment in many countries of West Africa, ultimately to modernize and bring more transparency to the network. This transition is not without the usual pain but it is coming along slowly. In general, companies operating in the region for a while are used to these challenges, and we try to mitigate them by increasing inventory levels, for example."

Vincent Gonthier, Director – Development, Forage FTE Drilling

"The problem is that the planned power plants will simply not be able to deliver electricity to industry or the local population if we cannot improve the financial viability of utilities, build out the distribution network and set up transmission lines…. Transmission lines are important both domestically and regionally because it does not make sense for a country to develop its own power at 25 or 30 cents/kWh if it could pay a minimal amount and import from a neighboring country at eight or ten cents. As we look at different countries and deal flow, we are trying to figure out how countries could do a better job of trading power, which will bring down the cost and in turn benefit industry."

Andrew Herscowitz, Coordinator, Power Africa, United States Agency for International Development

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- Infrastructure
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- Waste management
- Ground maintenance
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- Inventory control
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- Local procurement of material, equipment
- Delivery by air, road and sea
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- Site and location analyses
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RA INTERNATIONAL

"There has been real progress in power generation, particularly renewables. New sources of power are becoming available and are better understood. SRK is increasingly focused on understanding how to trade off the advantages and disadvantages of various approaches. Public Private Partnership is certainly an option but each situation is unique and the final approach will depend on the location of the mine, not only the country but proximity to communities, rivers for hydropower, coal and the general infrastructure and regulatory environment."

Andrew van Zyl, Partner and Principal Consultant, SRK Consulting

Rather, they can be used as a complementary energy source. Where ABB is particularly strong is in the establishment and management of micro-grids and building in a renewable power source."

Nevertheless, as confidence grows and commodities continue along a positive trajectory, mining companies will take a longer-term view to return on investment, shedding a more favorable light on the significant upfront capital required to develop on-site renewable energy capacity. IAMGOLD's recently-inaugurated solar facility at its Essakane mine in Burkina Faso is a prime example and is synchronized with Wärtsilä's 55 MW oil-driven power plant. The 15 MW hybrid PV plant will reduce CO2 output by about 18,500 tons and save around six million liters of fuel per year. These kinds of results tie in well with the increasing emphasis on sustainability driven by most mining companies.

LOCAL ENGAGEMENT; ECONOMIC BENEFIT

Community engagement has become an increasingly integral part of mining operations and, with the right type of practices, explorers and miners could potentially constitute a reckonable force in driving economic development outside of the country's main cities. Through local employment, training and development of locally-driven industries such as agriculture, the potential indirect economic impact is huge, and companies across the mining value chain are increasingly incorporating local content and finding mutual benefit.

Since mining operations are finite, developing sustainable local activity is crucial in supporting long-term economic development across the continent. In Ghana, locally-owned Atlantic Catering and Logistics is incorporating local agricultural activity into its supply to mine sites. "We are very keen on developing the local communities and have policies in place to support that," pronounced Maud Lindsay-Garmat, the company's CEO. "When we move to remote locations, we try to identify local farmers and bring them up to speed and train them to ensure they are employing good practices. If not, we guide them and let them know which products we need so that they can concentrate their farming efforts where there is high demand. For the products that are not available in the local communities, we transport them to the regions at regular intervals."

Mining companies are also increasingly understanding the importance of building on local competencies and contributing to communities in a meaningful way. Providing a school may seem worthwhile, but without a trained teacher the benefit of the investment will be lost. Over time, training and employing a local workforce will also provide opportunities for local companies. There are many instances now whereby a previous employee at a major mining company or service provider branched out to open his own business. Similarly, local companies working with international players are able to learn best practice, benefit from knowledge transfer and raise themselves to an internationally competitive level. It is important for governments to support the development of local companies to international standards, rather than simply impose and enforce local content laws when it comes to service providers. If the local companies can operate to the same level as the international ones, they are naturally competitive and often have other advantages such as a simplified in-country supply chain and greater in-country focus.

The potential for the mining industry to drive development across West Africa is huge if managed sustainably and, as such, it will remain a priority for most governments in the region. Previous deterrents, such as economic and political instability, which are anathema to growth and investment, are becoming less of a concern in many countries across the continent.

Local transformation is one of the greatest opportunities going forward, and currently where the greatest potential value is lost for many West African countries. Most of what is produced locally is exported before much value addition occurs.

"The mining industry is one of the main drivers of Africa's economic development. Providing energy requires mineral resources. Feeding Africa requires fertilisers, which are produced from the extractives sector. Addressing the challange of low employment can only be possible with industrialisation, which relies on minerals among other resources. The African population is growing very fast, and will require processed products. This is necessary, first, to satisfy local markets before exports. This will improve the quality of life for the people of Africa using their natural resources."

Fred Kabanda, Division Manager, Extractives, The African Natural Resources Center (ANRC), African Development Bank

In more mature mining countries such as Ghana, there are some plans afoot to develop downstream activity in country, including a planned refinery at the site of the Precious Minerals Marketing Corporation in the next few years.

Other companies are focusing on expanding their own capabilities to become a center for value addition in the region. For example, Labosol-AGTS, a Senegalese company affiliated with the Apave Group, is planning to develop its capabilities in sample analysis to service the region, rather than companies sending their mineral samples to countries such as South Africa, Australia and Canada, as is currently the case. In Ghana, SGS has a similar idea to develop its in-country metallurgy capabilities for the same reason.

Long filled with promise and recognized geological potential, investors are recognizing West Africa's potential as a destination for mining investment. The growing focus is on less-explored countries such as Côte d'Ivoire and Burkina Faso, particularly as success stories continue to unfold. Planned infrastructure development, a newfound political stability and government receptiveness to the sector suggest that the favorable business environment for mining will be sustained well into the future.

Brendan Clarke

Manager, Africa, CSA Global

"By hiring the very best people and focusing on the transfer of knowledge from our experts to local project teams we can make a very real difference."

As a leading geological mining and management consulting company, can you provide an overview of your services and how you differentiate yourselves from competitors?

Our services centre around expertise in geosciences, resource optimisation, engineering studies, exploration, data management, mine planning, operational and corporate support. The CSA Global clientele spans the entire industry; from early-stage junior explorers to mining companies with mature producing assets. As a result, we are active across the whole mining value chain. The quality of our people is a key differentiator – ultimately we are a human capital business. Coupled with an extremely well-integrated business (across services and geographies), this allows us to deliver industry-leading services globally. In Africa, we have worked in over 30 African countries (25 of them in the 2017/18 financial year alone) and are particularly proud of our West African record, where we currently provide services to most of the top gold miners, in the region.

CSA Global has an extensive track record operating in challenging environments. What would you describe as the most significant obstacle to operating successfully in remote locations?

Social licence to operate (SLO) is possibly an overused term but the ability to operate efficiently in Africa, as in many parts of the world, is governed by the care and respect and integration provided to local communities. This is particularly true in West Africa where the population density can be high, ethnically and culturally diverse and there is an established artisanal mining culture in many of the communities. Success for a mining venture really does need to be measured on the impact to the triple bottom line.

CSR is therefore becoming an increasingly integral part of the mining industry. How is CSA Global incorporating this into its business model?

Unlike mining companies and explorers, our tenure on the ground on projects tends to be limited to a specific piece of work – we generally don't have the longevity on a specific site that the project owners do. By hiring the very best people and focusing on the transfer of knowledge from our experts to local project teams we can make a very real difference. For me, African success will be when we have numerous locally-owned, managed and run mines that are competing with the best in the world.

There is a lot of buzz around battery minerals at the moment. What is your outlook on the future of battery minerals in Africa?

Energy production and storage is a global priority for numerous reasons and electric vehicles and batteries are a key part of this. Since late 2015, we have seen a massive increase in interest for battery and technology metals e.g. graphite, lithium, cobalt, nickel, etc. Many companies have invested heavily in the development of assets, but with price volatility I think only the truly differentiated projects will be successful. Also, with the ongoing rapid technological advances in this sector it is difficult to predict which technologies will prevail. Cobalt is a very important battery metal but very few mines produce the metal as a primary product. I believe we will see increased exploration in places away from current centres of production e.g. those with historical cobalt occurrences like Uganda and Cameroon as these are vastly under-explored in comparison to more mature environments like Ghana and Burkina Faso.

What trends in innovation and tech have you observed taking root in Africa?

Parts of Africa have gone from a complete absence of fixed land telecommunication to be covered with 4G cellphone networks that are better than in some developed nations. As living standards improve and the demand for connectedness increases, so will the demand for all minerals. For CSA Global, possibly the most perceptible difference is the application of technology in operations which allow remote monitoring of the many different aspects of exploration and mining. The availability of real-time data from machinery and personnel combined with improved computing power allows for predictive analysis and better decision making.

West Africa Outlook

"For West Africa in particular, now is the perfect time to invest, especially in Francophone countries, which have developed somewhat later than elsewhere. These countries are relatively under-explored, with high grade, easily operable mines, political stability and strong currency compared to neighboring countries. The West African CFA franc is linked to the Euro and guaranteed by the French government, so it will not fluctuate unexpectedly; financing rates are low, at about half of those in Ghana, for example."

Joel Cavaille, CEO, JA Delmas

"There is a group of investors that will always understand Africa better than the rest, but we have not yet seen a fundamental shift; however, what we have seen in a few African countries is expressions of interest in mining debt. There is not really much of a project finance market anymore – it got totalized in 2008 when the big African iron ore projects went down and took the banks out with them. Nowadays, banks are less interested in finance mining debt, meaning no debt market for juniors. Investors should note that the money market in Africa is workable, with export credit-backed debt lending – the difference in Africa is the sovereign risk protection. Clearly, it depends on the country."

Daniel Major, CEO, GoviEx

"Right now there is a growing confidence in investment in West Africa with the juniors, and most of them are looking towards Burkina Faso, Côte d'Ivoire and Ghana. We have seen some changes in the last six months with a few IPOs on the ASX based on West African exploration projects, which is very encouraging for us. We have started to rebuild our junior explorer client base. Guinea is another country where there is great potential and we expect to see increased levels of exploration investment in commodities such as bauxite and gold over the next few years."

Simon Meadows Smith, Managing Director, SEMS Exploration Services

"The biggest challenge with regard to investment is getting retail investors to understand West Africa, and in particular Burkina Faso. Investors often have a very elementary idea of the region and I believe if they had more knowledge of the operations in the region, they would see the opportunities. The gold market has been through many cycles, but a company coming to market with a compliant resource is still able to find success."

Alex Klenman, CEO, Nexus Gold

Côte d'Ivoire

Gaining independence from France in 1960, Côte d'Ivoire is today the world's largest exporter of cocoa and considered one of the most prosperous African states. The introduction of a new mining code in 2016, reflecting the government's focus on the sector as a driver for economic growth, has sparked an increase of interest among international investors.

Population: 24,184,810

Land area: 318,003 km^2

Official Language: French

Chief of State: President Alassane Dramane OUATTARA (since 4 December 2010)

GDP (PPP): $96.92 billion

Growth Rate: 1.84%

GDP per Capita (PPP): $3,900

Economic Sector Breakdown: agriculture: 17.4%, industry: 28.8%, services: 53.8%

Industry: foodstuffs, beverages; wood products, oil refining, gold mining, truck and bus assembly, textiles, fertilizer, building materials, electricity

Exports: $11.08 billion; cocoa, coffee, timber, petroleum, cotton, bananas, pineapples, palm oil, fish

Imports: $8.789 billion; fuel, capital equipment, foodstuffs

Major Trading Partners:

Exports: Netherlands 11.8%, US 7.9%, France 6.4%, Belgium 6.4%, Germany 5.8%, Burkina Faso 4.5%,

Imports: Nigeria 15%, France 13.4%, China 11.3%, US 4.3%

Inflation rate (Consumer price): 0.8%

Source: CIA Factbook

Fraser Institute Investment Attractiveness Index Ranking:

2015: 42/109 → 2016: 17/104 → 2017: 78/91

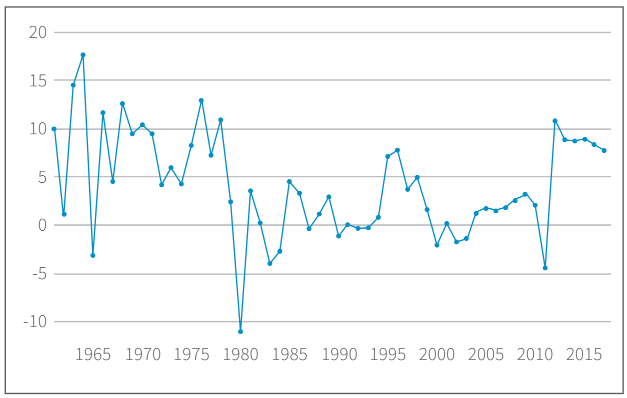
The Global Competitiveness Index Ranking:

99/137 (previous 91/140)

Ease of Doing Business Ranking:

139/190 (World Bank Group)

GDP (annual %)



Source: The World Bank

Gold Production (kg):

2011: 11,009
2012: 11,054
2013: 12,713
2014: 17,318
2015: 20,245

2014-2015

16.9% ↑

Source: British Geological Survey

Diamond production (cts):

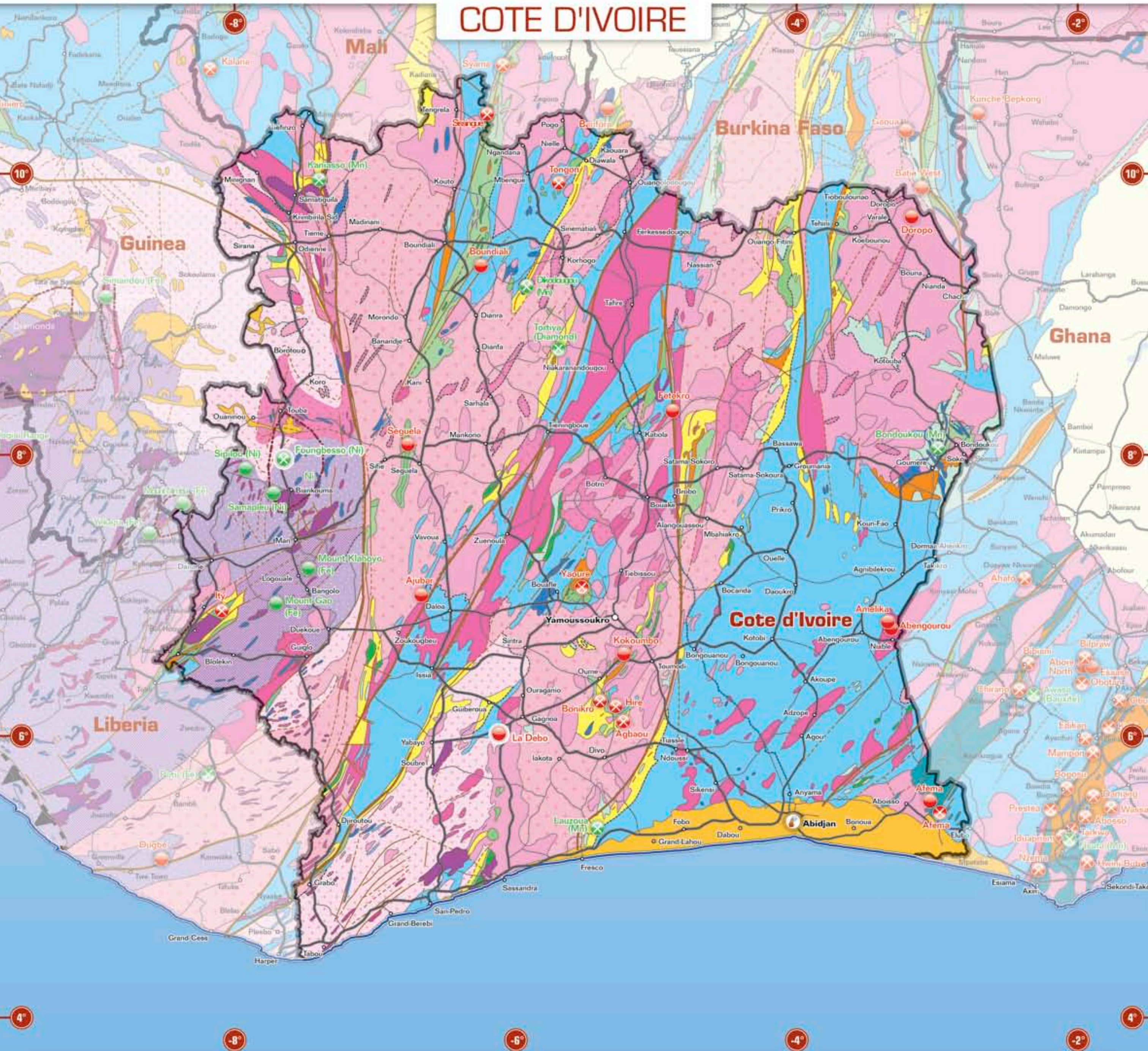
2015-2016

2014: 1,074
2015: 14,924
2016: 20,235

35.5% ↑

Source: British Geological Survey

COTE D'IVOIRE



Your feet on the ground in Africa

NORTH

0 50 100 150 KILOMETERS

- Geological boundary certain
- Fault certain
- Thrusts
- Geological boundary inferred
- Fault inferred

GOLD MINES

- Existing
- Closed
- Gold resources/ projects

OTHER MINERALS

- Existing mines
- Closed mines
- Projects
- Mineral fields
- Country Borders
- Roads
- Seaside
- Minor roads
- Railway
- Sems Offices

POST-EBURNEAN ANOROGENIC DOMAINS

- Basic-ultrabasic complexes (Freetown, Guinea)
- Cretaceous to Recent
- Upper Proterozoic to Paleozoic

EBURNEAN OROGENIC DOMAIN

LOWER PROTEROZOIC TERRANES [2.4 - 1.6 Ga.]

Plutonic rocks

- Basic-ultrabasic complexes
- Leucogranite
- Undifferentiated granitoids

Volcanic and fluviodeltaic formations

Lithostructural assemblages (D2 and D3 deformation phases)

- Fluviodeltaic: sandstone, conglomerate, argillite (Tarkwaian)
- Plutonic-volcanic assemblage: minor volcanic rocks
- Undifferentiated volcanics, volcanosedimentary rocks
- Komatiitic to tholeiitic basalts
- Rhyodacitic to rhyolitic volcanic rocks, chert (b), graphitic horizons
- Andesitic volcanic rocks, chert (b), graphitic horizons
- Basic volcanic rocks, chert (b), Mn levels (c)

Flysch-type formations with minor volcanic rocks - Lithostructural assemblage (D1 to D3 deformation phases)

- Carbonates felsic volcanic rocks
- Felsic volcanoclastic rocks, dykes; chert (b), manganese levels (c)
- Flysch-type : sandstone to argillite (graphitic, conglomeratic levels)

Horizon Markers (B2, B1)

- Tourmaline-bearing sandstone and conglomerate
- Chert and quartzite levels
- Manganses-rich levels: quartzite, gondite, phyllite

ARCHEAN AND/OR PROTEROZOIC GRANITIC GNEISS COMPLEXES DEFORMED BY THE EBURNEAN OROGENESIS

- Granitic, migmatitic and undifferentiated gneiss
- Granitic, migmatitic and undifferentiated gneiss
- Granite, gneiss, and migmatitic gneiss complexes

PRE-EBURNEAN OROGENIC DOMAIN

ARCHEAN - LEONIAN [3.5 - 2.9 GA.] / LIBERIAN [2.9 - 2.5 GA.]

Plutonic rocks

- Undifferentiated plutonic rocks (Leonian to Late-Liberian)

Greenstone belts and ironstone formations

- Ironstone formation (meta-sedimentary, meta-basic rocks associated)
- Basic and ultrabasic formations

Gneissic complexes

- Migmatitic and undifferentiated gneisses
- Granulitic gneiss "basement"

GEOLOGICAL DATA FROM BRGM - LAT/LONG WGS84

Map drafted by Kwaku Owusu-Ansah

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SEMS EXPLORATION

THE AFRICAN GEOLOGICAL CONSULTANCY GROUP

Ibrahima Danso

President, Groupement Professionnel des Miniers de Côte d'Ivoire

"While economic development has previously focused on the agriculture sector, there is a current push from the government that has placed the mining sector as the main driver."

What role has the Groupement Professionnel des Miniers de Côte d'Ivoire (GPMCI) played in the development of the mining industry in Côte d'Ivoire?

GPMCI is the minerals industry association that represents the collective interests of companies involved in mining exploration and production. The association was founded in 2008, so it has been representing the interests of the industry for over a decade with significant achievements so far, including the successful negotiation of the 2014 mining code reform with the government.

The mining industry is in its infancy in Côte d'Ivoire and, with the arrival of the newly appointed government, we are here to ensure the smooth development of the mining industry. While economic development has previously focused on the agriculture sector, there is a current push from the government that has placed the mining sector as the main driver.

What were some of the major changes heralded by the mining code implemented in 2014 that have contributed to an increase in investment?

The 2014 Mining Code set a goal to develop the most attractive mining code in West Africa. The government's extensive consultation with the sector resulted in a well-balanced mining code that provides fiscal stability and ensures profitability of the sector as well as ensuring the needs of the communities affected by mining are taken into consideration through financial provisions for the development of these communities. For example, the code contained a provision of 0.5% of the turnover of operating mines to be invested into community development. Holding time for exploration permits was also increased from nine to twelve years.

Côte d'Ivoire is a stable and business-friendly country with a sustainable debt level, low inflation and a stable currency. Among the key aspects for development are the credibility of the government, a well-developed, educated workforce and well-developed infrastructure.

As the sector develops, what challenges have arisen that must be ironed out?

The industry has attracted a lot of international attention, but the most important message given to government is not to make adjustments for greater benefit of the country. For example, the government recently intended to change the income tax exemption for operating mines from five years to one year. This amendment was not recommended by GPMCI and was thus suspended by government. Only once the industry has matured can such amendments be considered.

Illegal artisanal mining is also a big challenge. The government is trying to control the situation but the plan is still a work-in-progress. One idea is to allocate areas for illegal artisanal mining while ensuring they are properly equipped and licensed. This will reduce environmental impact and risks to health and safety of the participating individuals.

How developed is Côte d'Ivoire's local services segment and how could it be better supported?

Understandably, the current local service capacity is low due to the infancy of the sector. There is great potential to develop local services as the industry grows thanks mainly to the quality of the infrastructure, workforce and the mining code. Local SMEs are crucial and we are committing to developing these sectors by providing opportunities by upskilling and training, particularly with regard to safety. We have to ensure that these companies are raised to an internationally-competitive level rather than simply enforcing local content requirements for international companies. Government and international companies need to work together to provide adequate training facilities.

What are the focus areas for GPMCI in continuing to support the mining industry?

The mining industry is finite, and our main objective is to develop the capacity of local communities and to promote an investment-conducive environment for all businesses, not only those in mining. We would also like to avoid mistakes made by other African countries in the development of their mining sectors, particularly regarding the nationalization of resources. Another priority for us is to control illegal mining, which we see as the single biggest threat to the mining sector. In many countries, we see a lot of talk about illegal mining, but in Côte d'Ivoire we are taking action and making progress.

Côte d'Ivoire's Mining Sector

Making Strides

Although not new on the radar for investors, Côte d'Ivoire's mining sector has seen a pronounced uptick in the last couple of years. While the country's geological potential has been recognized for some time, other factors have curbed the sectors growth, including political instability and the more widely-impactful unfavorable gold prices. Now, however, Côte d'Ivoire's political scenario has seemingly stabilized and the mining sector has been pinpointed as a key economic driver. If the sector's growth is properly sustained, this focus on mining will bring great value to the country's economy, which experienced a setback in 2017 with a 35% drop in cocoa prices. For now, cocoa remains the key source of export earnings in the country's agriculturally-driven economy. In order to spearhead growth and attract investment into mining exploration as the necessary first step to a flourishing sector, the government introduced a new mining code in 2014 and the results speak for themselves.

"The 2014 Mining Code set a goal to develop the most attractive mining code in West Africa," highlighted Ibrahim Danso, president at the Groupement Professionnel des Miniers de Côte d'Ivoire (GPMCI), the national minerals industry association representing companies involved in mining exploration and production. "The current mining code has brought huge benefits if we look at production levels. From 2014 to 2018, manganese production doubled from 300,000 tons to 600,000 tons and nickel production grew from zero to 800,000 tons per year. Gold mining grew from 630,000 ounces per year to 900,000 ounces per year – an increase of 40%. Currently, the mining industry accounts for 2% of Côte d'Ivoire's GDP growth but the goal is for contribution to GDP to hit 10% in the next five years. In addition, we expect to see the development of one new mine per year in the country for the next ten years."

Among the country's producers are Randgold, Endeavour Mining and Perseus Mining. Perseus is Côte d'Ivoire's most recent success story, pouring its first gold at the Sissingué gold mine in January 2018. This is the company's second gold mine after the Edikan mine in Ghana, from which it has produced about 200,000 ounces of gold per year since 2012. Perseus is also hoping to begin construction of its third mine, Yaouré, in late 2018 or early 2019. "We completed the feasibility stage last year and have now completed approximately 50% to 60% of the front-end engineering and design," commented Jeff Quartermaine, Perseus' CEO. "We believe the government in Côte d'Ivoire will grant the exploitation license fairly shortly; my understanding is that all of our applications have been reviewed and approved by the Minerals Commission and the proposal is on its way to the Inter-Ministerial Committee for approval prior to being signed by the President. At the moment, we are also implementing our financing plan. We will not need to go back to the equity market as on current projections we can comfortably finance the project through internally generated cash and an amount of bank debt.

"In Côte d'Ivoire, we see significantly more reverse circulation drilling, which is cheaper and less complex and therefore better suited to the relatively-underexplored geology. As AMC is more drilling-focused, we have more opportunity to test new products in more mature markets that require more complex drilling, such as Ghana."

Mark Goosen, AMC Area Manager Western Africa, AMC Drilling Optimisation

We estimate that Yaouré will cost around US$260 million to build. As soon as the exploitation license is issued, our intent is to finish the compensation of farmers and land owners and begin early works around the site such as roads and fencing."

A longer-established producer is Endeavour Mining, most recently achieving commercial production at its Agbaou gold mine in January 2014, which produced 177,191 ounces in 2017. Meanwhile, the Ity mine has the longest operating history of any gold mine in Côte d'Ivoire, with first modern gold production reported in 1991. In over 25 years of operation, Ity has produced more than 1.2 million ounces of gold, and produced 59,026 ounces in 2017. Following completion of Endeavour's US$412-million construction project at Ity, mine life is expected to extend by 14 years, and production is expected to rise to approximately 204,000 ounces annually for the first ten years, at a low AISC of $549/oz.

Further north and in proximity to both Mali's and Burkina Faso's borders, Randgold's Tongon mine comprises two open pit operations and produced 288,680 oz of gold in 2017, a 9.7% increase year on year, driven by an 11.6% improvement in tons processed, a small improvement in recovery and a slightly higher head grade. Whilst the strategy following Randgold's merger with Barrick Gold is unclear as yet, the company is one of Côte d'Ivoire's prominent producers for the time being.

"When we first looked at Côte d'Ivoire, numerous factors contributed to our decision to invest in the country over others in the region. Firstly, it was clear to us that the government was very supportive of exploration and the mining sector in general. This has been demonstrated by the fact that there have been five gold mines developed in the last ten years. Secondly, the new mining code that was put into place in 2014 is fair and workable for mining companies operating in the country. Lastly, the infrastructure in the country in conducive to the development of mining operations and exploration."

Justin Tremain, Managing Director, Exore Resources

Other strong gold producers exploring the country that are yet to develop a mine include Newcrest, Centamin and Teranga Gold. Shining a spotlight on the diversity of Côte d'Ivoire's resource potential is IronRidge Resources. While IronRidge also has gold exploration projects underway, the ASX-listed company is also pursuing lithium.

GROWING PAINS

While Côte d'Ivoire's government has positioned itself as very receptive to mining activity and put forward an attractive mining code to encourage investment, it is natural that challenges must be addressed as the industry grows and greenfield exploration projects move through to construction and operation. Notably, however, it is the permitting process itself that is causing the biggest headaches for the juniors. Delays make it difficult to plan budgets and run the risk of companies allocating funds elsewhere in the meantime.

Côte d'Ivoire will continue to take center stage as the brightest opportunity for new mining investment in West Africa as long as the country remains stable. With many examples to learn from in the region, Côte d'Ivoire holds high potential for developing its mining industry sustainably and with maximum economic impact, both direct and indirect.

Senegal

As a member of the Mali Federation, Senegal gained independence from France in 1960, after which the union quickly dissolved. Senegal's capital, Dakar, is the continent's western-most city, situated on the Cap-Vert peninsula. Senegal's key export industries include phosphate mining, agricultural products and commercial fishing, and it remains one of the most stable democracies in Africa.

Population: 14,668,522

Land area: 192,530 km^2

Official Language: French

Chief of State: President Macky SALL (since 2 April 2012)

GDP (PPP): $43.24 billion

Growth Rate: 7.2%

GDP per Capita (PPP): $2,700

Economic Sector Breakdown: agriculture: 16.9%, industry: 24.3%, services: 58.8%

Industry: agricultural and fish processing, phosphate mining, fertilizer production, petroleum refining, zircon, and gold mining, construction materials, ship construction and repair

Exports: $2.546 billion (2017 est.); fish, groundnuts (peanuts), petroleum products, phosphates, cotton

Imports: $5.227 billion (2017 est.); food and beverages, capital goods, fuels

Major Trading Partners:

Exports: Mali 14.8%, Switzerland 11.4%, India 6%, Cote d'Ivoire 5.3%, UAE 5.1%, Gambia, The 4.2%, Spain 4.1%

Imports - France 16.3%, China 10.4%, Nigeria 8%, India 7.2%, Netherlands 4.8%, Spain 4.2%

Inflation rate (Consumer price): 1.4%

Source: CIA Factbook

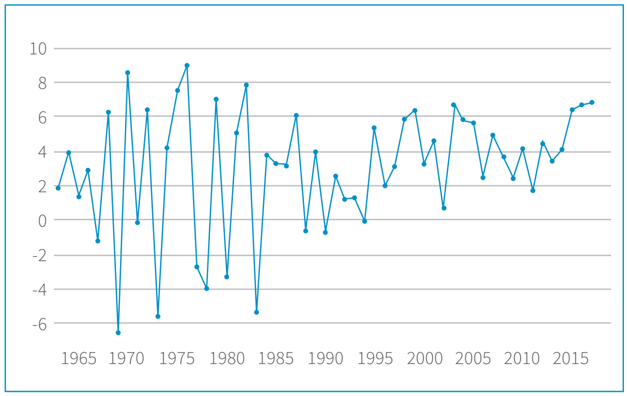
The Global Competitiveness Index Ranking:

106/137 (previous 113/140)

Ease of Doing Business Ranking:

140/190 (World Bank Group)

GDP (annual %)



Source: The World Bank

Gold Production (kg):

2012: 6,666
2013: 6,445
2014: 6,588
2015: 5,670
2016: 6,741

2015-2016

18.8%

Source: British Geological Survey

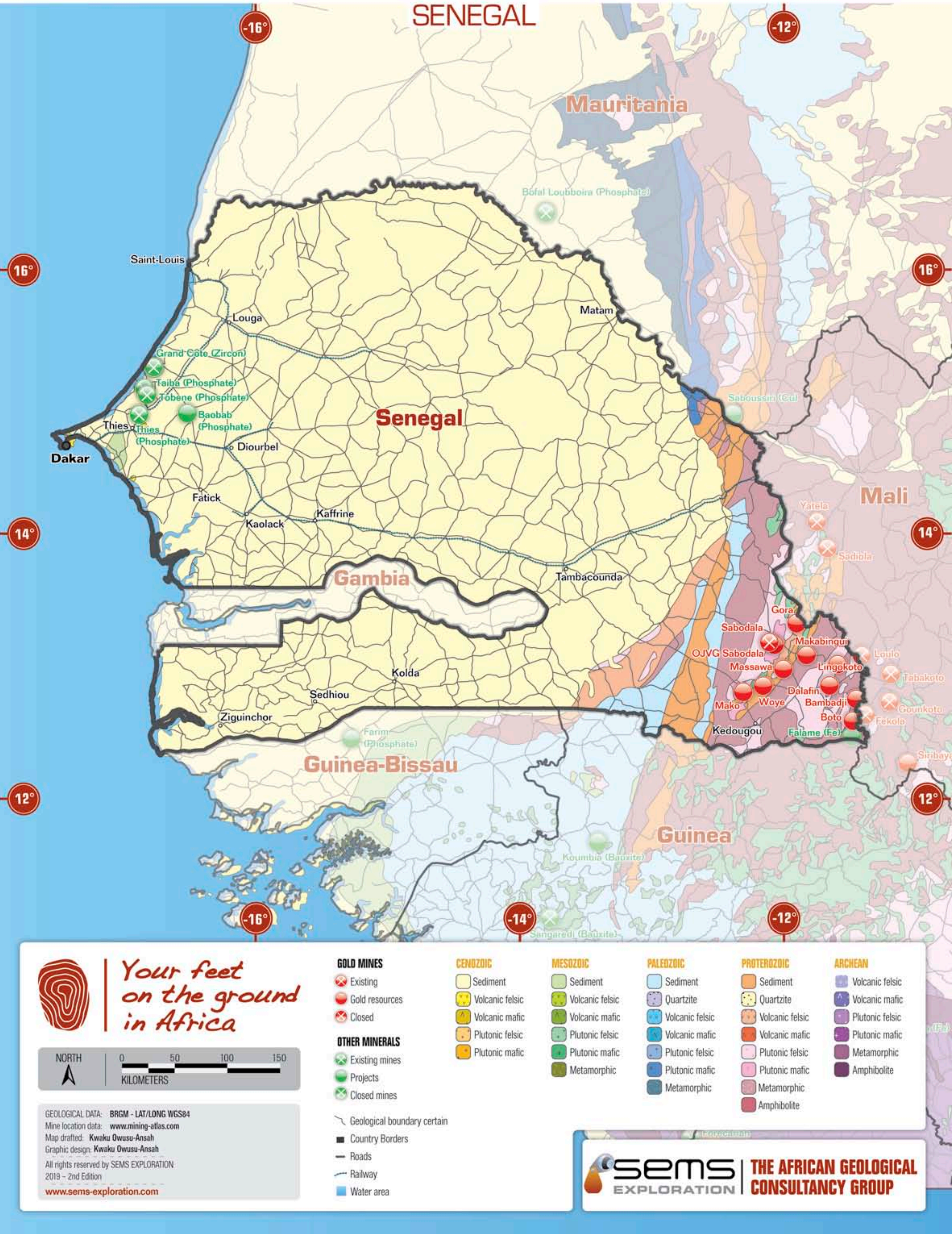
Diamond Production (cts):

2012: 670
2013: 850
2014: 1,150
2015: 540
2016: 500

2015-2016

-7.4%

Source: British Geological Survey


SENEGAL
-16°
-12°
-14°
16°
14°
12°
Mauritania
Senegal
Mali
Gambia
Guinea-Bissau
Guinea
Saint-Louis
Louga
Matam
Thies
Dakar
Diourbel
Fatick
Kaolack
Kaffrine
Tambacounda
Kolda
Sedhiou
Ziguinchor
Kedougou
Grand Cote (Zircon)
Taiba (Phosphate)
Tobene (Phosphate)
Baobab (Phosphate)
Thies (Phosphate)
Bofal Loubboira (Phosphate)
Saboussiri (Cu)
Farim (Phosphate)
Koumbia (Bauxite)
Sangaredi (Bauxite)
Yatela
Sadiola
Gora
Sabodala
Makabingui
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Loulo
Tabakoto
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GOLD MINES
Existing
Gold resources
Closed
OTHER MINERALS
Existing mines
Projects
Closed mines
Geological boundary certain
Country Borders
Roads
Railway
Water area
CENOZOIC
Sediment
Volcanic felsic
Volcanic mafic
Plutonic felsic
Plutonic mafic
MESOZOIC
Sediment
Volcanic felsic
Volcanic mafic
Plutonic felsic
Plutonic mafic
Metamorphic
PALEOZOIC
Sediment
Quartzite
Volcanic felsic
Volcanic mafic
Plutonic felsic
Plutonic mafic
Metamorphic
PROTEROZOIC
Sediment
Quartzite
Volcanic felsic
Volcanic mafic
Plutonic felsic
Plutonic mafic
Metamorphic
Amphibolite
ARCHEAN
Volcanic felsic
Volcanic mafic
Plutonic felsic
Plutonic mafic
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Ousmane Cisse

Director of Geology & Mining, Ministry of Mines, Senegal

"Important research efforts are taking place in regions that have been under-explored until now, particularly in the phosphate fields in the central part of the sedimentary basin, and lithium and manganese in the eastern Senegal area."

Mining is not a new industry in Senegal, but activity has certainly been picking up recently. How has the sector developed over the years since the first phosphate mines?

Senegal has a rich and varied mineral potential. Until 2008, mineral production was mainly phosphate - locally processed into phosphoric acid and derived products, cements, produced from limestone and clay, attapulgite (absorbent clays) and salts. However, the sustained mining promotion efforts subsequently deployed, including the adoption of an incentivizing legislative and regulatory framework, have helped to attract a significant investment flow both in exploration and exploitation of gold, iron, zircon and cement. This has encouraged a boom in the sector and, since 2009, new mineral resources have been progressively developed. The exploitation of the heavy mineral sand deposits of the Grande Côte from 2014 ranks Senegal among the world's producers, with 8% of production and 25% of the European market. The Matam phosphate lime project also started its production activities in the second half of 2014 with a full expected annual production of around 1.2 million tons of phosphate rock from 2018. In addition to the known deposits, important research efforts are taking place in regions that have been under-explored until now, particularly in the phosphate fields in the central part of the sedimentary basin, and lithium and manganese in the eastern Senegal area. Several mining projects are also under development.

Senegal recently updated its Mining Code for the first time since 2003. What were the major changes and the motivation behind them?

The new mining code has been designed to improve the mineral sector's governance, attractiveness, accountability, safety and environmental protection. Implemented in March 2017, the new code gives incentives, multiple benefits to investors and improvements that could streamline administrative procedures for permitting. Like elsewhere in Africa, for the granting of mining licenses, priority is given to the applicant that offers the best conditions and guarantees for the government. To avoid any inconsistencies and ambiguities in fiscal provisions, tax provisions under the former mining code were transferred to the General Tax Code in 2012. The new code introduces many important changes to royalties and taxes calculations and even the option to enter a production sharing agreement, a concept more frequently found in the oil and gas sector.

In what ways is the Government encouraging and supporting the development of local companies to service the mining industry in Senegal?

The mining hub for specialized services, logistics and training in the field, means a significant increase in the participation of local investors and entrepreneurs at all levels of the value chain. Mining companies may always freely choose their suppliers, sub-contractors and service providers as well as their partners. However, mining operators and their suppliers and subcontractors shall use, whenever possible, services and material originating from Senegal, provided these services and products are available at competitive conditions regarding their price, quality, warranties and time delivery.

What importance does the Government place on the mining sector as a contributor to Senegal's economic development and how will it support the industry going forward?

Senegal intends to sustainably exploit its mineral potential and promote the emergence of a dynamic and competitive mining industry where local companies play a significant role in the value chain. By developing the mining sector, the government intends not only to increase the contribution of the sector to the national economy, but also to make it a lever for local development. To become a real catalyst, the mining sector will have to increase and diversify its production. Growth will be supported by the intensification of the development of strategic sub-sectors, including phosphates, gold and heavy mineral sands - zircon, iron, ilmenite. It will also require a substantial increase in research to improve knowledge of the geological and mining potential and thus attract new investment. Potential areas for development will be identified and promoted to potential investors. An increased contribution of the mining sector to economic growth also means the emergence of a mineral resource processing industry. The phosphates sector is particularly promising in this respect and could, among other things, enable the creation of a phosphate-fertilizer sector that would support the development of the agricultural sector.

Senegal's Emerging Potential

Previously overshadowed; now coming into its own

Sharing borders with Mauritania, Mali, Guinea, Guinea Bissau and Gambia, Senegal is situated on Africa's western coastline, home to Africa's most westerly point – the Cap-Vert Peninsula. As well as direct land access to six neighboring countries, the port in the country's capital, Dakar, makes Senegal one of the gateways to land-locked West Africa. Senegal has, however, experienced a difficult period economically. The country is now implementing its Plan for an Emerging Senegal (PES), launched in 2014, which is marked out in a five-year Priority Action Plan (PAP) of strategic pillars and sectorial objectives. The aim of the PES was to increase annual GDP growth to an average of 7.1% from 2014 to 2018 and reduce the account deficit to less than 6% of GDP, also keeping inflation below 3%. Within the plan, agriculture, mining and tourism were identified as key sectors for development, supported by almost 30 planned infrastructure projects.

Whilst not receiving the same level of recognition as many of its neighboring countries as a mining jurisdiction in the past, Senegal is no stranger to the sector. Société Sénégalaise des Phosphates de Thies has been present in Senegal since 1948, for example, originally a joint venture between the State of Senegal and a French group, and since bought by the Tolsa Group approximately two decades ago.

In terms of gold potential, Senegal holds almost double Mali's portion of the Birimian Greenstone Belts in the south-east portion of the country. As well as gold, the country is home to high-quality iron ore deposits.

Senegal's first and premier gold producer is Teranga Gold. The TSX-listed company's Sabodala mine has been in operation since 2009, with its regional land package situated on the Birimian Greenstone Belt. When Teranga completed its IPO in 2010, Sabodala was producing just over 100,000 ounces per year (oz/y) and had a reserve base of 1.4 million ounces. Following an acquisition of an adjacent property and expanding mill capacity, Sabodala has been producing more than 200,000 oz/y since 2012, with increased reserves of 2.7 million ounces. Sabodala had record production of 233,000 oz/y gold in 2017, generating free cash flow of US$40 million. The expectation is for the mine to produce more than one million ounces and generate approximately US$250 million in free cash flow over the next five years. In terms of exploration, Teranga's 2018 program focused on Burkina Faso and Côte d'Ivoire.

In close proximity to the Sabodala mine, Toro Gold's Mako mine has become Senegal's second gold producer, commencing production in January 2018 following an 18-month development period. "At the start of construction, we were looking at a million-ounce reserve and an average grade of 2.25 grams per ton, plus a life of mine stripping ratio of a little over 5:1," highlighted Martin Horgan, Toro Gold's CEO. "It is a single open pit operation, flowing into a standard CIL processing plant. While the million-ounce reserve and eight-year mine life are on the lower end of the spectrum, it is a very straightforward project technically, with a good open pit grade and moderate strip ratio, meaning strong cash flow. We are now actively drilling both beneath and around the mineralization in the hope of extending the open pit and potentially going underground. More recently, we are also looking at the 25km to 30km vicinity of the mill to see if we can identify satellite targets."

IAMGOLD, which also has a presence in Burkina Faso, Mali and Guinea, has also recognized the country's potential, entering the market in the early 1990s. It is now carrying out a feasibility study on its Boto gold project.

Meanwhile, Mineral Deposits Limited (MDL) entered the market in 2004, when it was granted a permit by the Senegalese Government for mining exploration and development. The Australian company joined forces with the French company Eramet in 2011 to create TiZir Ltd – a 50:50 joint venture, under which Grande Côte Operations (GCO) was born. Since Eramet has recently acquired TiZir, it now holds 90% of shares in GCO. According to Senegal's Ministry of Mines, the exploitation of the heavy mineral deposits of the Grande Côte from 2014 ranks Senegal among the world's leading mineral sands producers, with 8% of production and 25% of the European market.

"Senegal has been producing phosphate since the late 1950s and has been producing gold since 2009. We are also producing heavy minerals, such as Zircon and Titanium. The government's Plan for an Emerging Senegal (PES) has identified mining as one of the six drivers for the economy, and there are incentives in place to support mine profitability. Successful projects will also encourage further investment and growth."

Aziz Sy, President, The Mining Chamber of Senegal

The economic impact of the mining industry, both direct and indirect, is very much recognized by the government. The Sabodala mine, for example, employs approximately 1,100 people, of which close to 95% are Senegalese, with over half from local and regional communities. Nevertheless, Senegal's mining industry is disproportionately small when compared to its geological potential. The government's drive towards the development of the sector coupled with the recently-updated mining code should go some way in increasing investor confidence.

AN ATTRACTIVE INVESTMENT DESTINATION?

Senegal does seemingly tick many of the boxes considered by investors when assessing an opportunity: underexplored but proven geological potential, newly updated mining regulations and both economic and political stability. As a member of the West African Economic and Monetary Union (WAEMU), Senegal also shares a common currency with the other members – the CFA franc, which is pegged to the euro and therefore a relatively stable currency.

Senegal's 2017 Mining Code remains competitive in the region, despite revisions in favor of economic benefit. "In 2003, the regime's focus was very much on attracting investors," noted Maname Fall, associate director at SOJUFISC, a Senegalese law firm. "The new regime, which came into power in 2012, believed that this mining code was not very advantageous to Senegal's people and to the state. They therefore increased the taxes and the royalty amounts from 3% to 5%. There is also a provision in the new code whereby a company will operate according to the tax regime under their original agreement, and this will not be altered if changes are made to the general tax code."

Explaining the changes in the context of West Africa's mining jurisdictions, Cheikh Tidiane Wade, senior legal counsel at Houda Law Firm, outlined: "Senegal's mining reform of 2017 followed

Martin Horgan

CEO, Toro Gold

"This landmark was achieved ahead of schedule, under budget, and most importantly with a very good safety record. With this milestone, we have become Senegal's second gold producer.

Toro Gold is currently focused on projects in Senegal, Côte d'Ivoire and Guinea, with its Mako mine in Senegal entering into production in early 2018. Could you update us on Toro Gold's activity and its strategy to date?

Toro Gold is a West Africa-focused production, development and exploration group, established in 2009 following the global financial crisis. Equity was scarce, mining and exploration company valuations were at historically low levels, but rather than treating the period as one of distress, we treated it as one of opportunity. We put together a portfolio of exploration projects using very little cash and at one point had 12 exploration projects across six countries, including joint ventures. While many companies aim to identify deposits with early-stage potential and pass them on to groups that will take on the construction risk, we have always been clear that we are keen to take projects all the way through to production.

Within the portfolio was a joint venture with a local Senegalese group with a permit in relative proximity to the Sabodala mine. There was no existing work done but the area looked geologically interesting. In 2010/2011, we discovered what is now the Mako mine. We then moved rapidly through the different stages of scoping and prefeasibility studies, leading us to submit a feasibility and environmental and social impact assessment (ESIA) in late 2015, with a mining license then issued to us in July 2016. We commenced construction in August 2016 and, following an 18-month development period, began producing gold in January 2018. This landmark was achieved ahead of schedule, under budget, and most importantly with a very good safety record. With this milestone, we have become Senegal's second gold producer.

How has the Mako mine performed so far in 2018?

From January 2018, our team oversaw a very positive first three months of production, meeting our expectations in terms of ounces and cost. In the subsequent three months, up to the end of June, we have continued that strong performance. We expect to stay on target in terms of ounces produced within the forecasted cost parameters. All in all, we have had a very successful construction period and have navigated the risk around commissioning well, with no significant issues moving into production.

What has the exploration progress been like at Toro Gold's other assets?

In 2015, despite focusing on our Mako mine project, we saw similar market constraints to five years prior, which prompted us to expand into Côte d'Ivoire, where we formed a joint venture partnership with an Australian group called Predictive Discovery. We are now beginning to see some interesting traction in Côte d'Ivoire. We have also just moved into Guinea Conakry with three early-stage exploration projects – the country has great mineral potential and, with the new mining minster and a reinvigorated administration, we see higher investor confidence again.

How receptive has Senegal's government been to Toro Gold's project, and how positive is the country's general perception of mining?

The current President is the former mining minister and a geologist by training, so recognizes the value of the sector in the development of Senegal's economy. In terms of engagement with the administration in Senegal, mining companies are effectively pushing on an open door. A good example is the ministerial committee we were able to create, which allowed us to liaise on finance, customs, security and environment through a single forum and coordinate across the various government administration units.

Since we are working in a relatively underdeveloped mining region, local engagement has been a priority from the earliest stages of the project. Today, about 60% of our workforce comes from the Kedougou region and about 89% is Senegalese. Of the remaining 11%, about half are from the surrounding West Africa region. As only the second gold producer in the country, we have found a few challenges in sourcing talent with the depth of mining expertise that may be found in other more mature mining jurisdictions such as Mali and Ghana.

What are the priorities for Toro Gold over the next 12 to 18 months?

Adding additional mine life at Mako is a clear focus for us both within the current lease and externally. We will also continue to aggressively push our exploration activity in Côte d'Ivoire and Guinea and move our portfolio along, and keep an eye out for new opportunities. Finding and securing a somewhat later-stage project is also of interest to us.

the reforms seen in other West Africa countries, such as Mali in 2012 and Guinea in 2011. While some companies operating in Senegal objected at first, the new mining code was generally received quite well. However, the civil society indicated that the mining code was still skewed towards companies rather than benefitting the Senegalese people as much as it should."

The general sentiment around Senegal's mining environment is very positive and, considering investors tend to follow geological potential, the country is in a good position to capture the attention of juniors as well as the larger companies. "Wherever someone drills in the Birimian belt, they find gold," commented Alex Mackenzie, CEO at Bassari Resources. "My prediction is that Senegal will follow Mali, which holds one third of the Birimian belt versus Senegal's two thirds. This gold belt is likely to become one of the biggest gold belts in the world."

Bassari Resources is focused on its Makabingui project, also on the Birimian Greenstone Belt. "The big plus under Senegal's Mining Code is that companies get all their exploration costs back from production," highlighted Mackenzie. "We are now focusing on getting this mine into production, so that we can use the cash flow from Makubingui to fund further exploration, rather than issuing more shares and diluting the company further."

The company expects to move into production in the first quarter of 2019. Outlining the resource, Mackenzie commented: "There is a resource of around one million ounces at an average grade of 2.6 g/mt, and within that resource, we have about 200,000 ounces of reserves with an average grade of 5.7 g/mt. Significantly, we have used the fire assay method for gold analysis, which uses only a 50 gram sample. Because of all the nuggets in the coarse nature of our deposit we are optimistic that if we assayed using the leach well method which better picks up nuggety gold by using a 2 kg sample, our reported gold grade will in fact be much higher."

The company, listed on the ASX, has high expectations for the project. "I believe we can turn Bassari into another Randgold and bring its capitalization up to AUS$500 million to one billion," Mackenzie stated, also commenting that, having drilled 8km south of Makabingui, there is "gold all the way". "This should not be too difficult, because once we enter production we will bring in about US$100 million. Once drilling has been completed, these reserves will also increase in size. The production cost is about US$680 per ounce, while the gold price is about US$1200 per ounce. For a small company, this is a significant margin."

Senegal is also notable for its limestone reserves, placing the country in a strong position to take advantage of the region's planned infrastructure development and increasing cement demand. Dangote Cement is Africa's leading cement producer and has its headquarters in Nigeria, beginning operation in Senegal in 2015 and with plant capacity of 1.5 million tons per annum. In total, the company has capacity of around 40 mil-

"Unlike most traditional mines, our environmental footprint is minimal as we rehabilitate the mining area immediately after mineral extraction and we are not using chemicals. GCO contributes to the sustainable development of the communities, bringing infrastructure, access to water, education, healthcare, agriculture and local business support. Last year, for example, 300 people living in the mining area were relocated into a brand new village we built, providing electricity through solar technology, schools and easy access to water. From our point of view, we feel that the Government of Senegal has a real intention to develop the country and make it attractive for the mining sector."

Francois Godin,
CEO, Grande Côte Operations

lion mt/y with production operations in 14 countries, which is projected to grow to 60 million mt/y in the near future. "Senegal is a significant region for cement production with large overcapacity across its three cement factories – about 200% of national consumption – primarily due to the country's large limestone reserves," commented Luk Haelterman, country manager at Dangote Cement Senegal. "In other West African countries, limestone reserves are limited. Côte d'Ivoire, for example, has a large number of cement mills but no limestone quarry available – this means that clinker must be imported, which results in a higher cement production cost."

While low transport costs and local availability of raw materials are strong advantages for Senegal, the domestic price of cement is also one of the lowest in Africa. Because of this, the three cement operations have an international focus. Equally, the capacity greatly exceeds national demand. "Senegal has a production capacity of 8 million mt/y," stated Haelterman. "However, market demand is below 4 million mt/y. Purchasing power is very low, yet large projects only account for 10% of our business. Adding capacity is therefore not economical, so it is unlikely that new companies will enter this market."

Increasing capacity in Burkina Faso particularly is expected to increase competition and impact Senegalese suppliers due to its proximity to major export markets such as Mali, with which both countries share a border.

SOURCING LOCALLY

A lack of skilled personnel and local service providers is a common and natural challenge for a country in the early stages of developing a particular sector. Whilst gaps in the market are certainly problematic for companies looking to invest in a relatively under-developed industry, they also create pockets of opportunity. Inevitably, these opportunities will first be taken by international companies, which will enter new countries according to demand or with a particular client.

In some cases, services can be sourced close by from more mature mining countries in the region. In others, as is the case with mineral analysis, companies must look further afield. "Many African countries send their mineral samples to Australia, Canada and South Africa for analysis," commented Abdourahmane Diop, CEO at LABOSOL-AGTS, which focuses on the provision of geotechnical and typography services. "We want to supply this service locally to enable mining companies throughout West Africa to send their samples to us in Senegal rather than having to bring them out of Africa. We have a lot of opportunity as a private company in Senegal's mining industry…"

While LABOSOL-AGTS is a Senegalese company, it is affiliated with the French group Apave. Acquisition of local companies is an attractive way for international providers to get a foot in the door. Such is the case with similarly-focused SENELABO, which was acquired by France-headquartered Geotec. "In Senegal, SENELABO has locally developed techniques that were not previously available and provided by geotechnical companies," said Jean Christopher, general manager at Geotec. "Due to the expertise of Geotec, we have been able to develop the cable coring technique, which was not previously present in Senegal, enabling us to broaden our offering to the mining sector. We have also innovated in the development of drilling techniques, which requires personnel training and investment in materials. The new coring techniques we have introduced in Senegal took us a few years to deploy and sell. We are now the only local Senegalese company that offers this coring technique."

SENELABO's objectives are to sell its services internationally and export its expertise to other countries in the region, focusing initially on Francophone countries. Indeed, Senegal's geographic position and port access make the country a convenient hub for companies to export services to the rest of the region.

Many service companies are increasingly viewing Senegal as a promising central hub for their West Africa services. As well as logistical advantages, such as the port access, there may be other benefits with the export of some services. "In countries such as Mali and Guinea, it is common for embargoes to be placed on explosives, meaning international companies cannot export explosives to these countries," highlighted Rokhaya Mbaye, managing director at Mineex, a Senegalese supplier of explosives to the mining and construction industries. "However, it is still possible to export to these countries from Senegal, since there is an understanding between the governments that allows us to have permits. This makes Senegal a very important country in the West Africa region, and there are no other local companies providing explosives. We therefore expect to see a lot of growth throughout West Africa."

"We have seen many international companies making an effort to develop local people, some of whom then go on to establish their own business. There are also a number of local companies being acquired by international companies, which then bring in their own expertise. What we see now is more of a "Senegalization" of companies, rather than only Senegalese national companies."

Francois Cherpion, General Manager, Société Sénégalaise des Phosphates de Thies

Originally founded in 2011 to fill the dearth of Senegalese capabilities in this area, Mineex prides itself on competing at international standards. In 2017, Mineex integrated its operations with the French group EPC to gain access to more advanced technology.

Another way in which countries may be able to bolster their service segments is through the transfer of expertise from a related industry. OMA Group, originating from Togo, found its strength in providing logistics services to the oil and gas industry, with a presence in Benin, Ghana, Côte d'Ivoire and Nigeria, acting as a Hapag Lloyd agent. After opening its OMA Logistics Senegal office in Dakar in December 2015, the local branch quickly realized the potential of the country's growing mining sector. "There are many processes in both mining and onshore oil and gas that are the same, or at least very similar," stated Vincent Bayiha Kodock, country manager at OMA Logistics Senegal. "We see providing services to the mining sector as a natural extension of what we already do today in the oil & gas sector, not only in Senegal, but across West Africa. Through the development of intimate customer relationships both locally, as well as internationally through our overseas network, we can quickly identify exactly what customers need and expect from us, and where we can bring added-value to mine operators in Senegal."

Where possible, mining companies tend to work with local service providers, as long as they are competitive and meet their standards. "We do work with local service providers and are always open to developing new relationships with Senegalese companies," said Francois Cherpion, SSPT's general manager. "However, we have to achieve optimum standards and make

"Mine development is largely linked to production cost and product processing. Energy is the most prominent factor. Being able to produce energy at a low cost will greatly benefit mines and act as a catalyst for faster mine development. As well as the traditional mines, cement plants also need a high quality of energy and we are looking at solutions with gas."

Mamadou Faye, Managing Director, Petrosen

sure our partners are fully legal, so we cannot endorse informal services that do not contribute to the official GDP of the country."

Further development is needed before Senegal's service providers are ready to support the mining sector without international input, but the promising emergence and growth of local companies in mining services is indicative of future strengths in this area.

LOGISTICS AND INFRASTRUCTURE

Despite Senegal's port advantage, there remain many challenges with the country's logistical infrastructure, amplified in the mining sector by the remoteness of projects from the more developed city centers. "There are many improvements to be made to develop the infrastructure in Senegal; most urgently, the rail system needs to be refurbished and brought back to life if we want Senegal to become competitive on the international markets," noted Assane Diouf, country manager at Damco, the supply chain arm of A.P. Moller-Maersk Group's transport and logistics division. "We anticipate this happening soon, as the African Development Bank and some international banks are investing heavily in African infrastructure. Additional development of ports in Senegal is also necessary. Today, the port in Dakar is too congested and the surrounding infrastructure is lacking; there are no rail options and there is an incredibly high demand for trucks, which leads to congestion on the roads, plus inflated truck prices."

Senegal is also garnering more attention for its oil and gas potential, and the government is currently reforming its petroleum code. However, there are some concerns regarding discussions over taking tax provisions out of the code and adding them to the general tax code, which could potentially hurt some of the mining companies. "On the one hand, the government wants to gain maximum return from production, but on the other it also wants to reduce other taxes to give benefits to companies as well," commented Mamadou Faye, managing director at Petrosen, the implementing body for the country's petroleum policy. "We now have a profit-sharing system, society taxes and some advantages in production. There are many political sensitivities in petroleum and the public perception is often very negative. In actual fact, oil companies have made important investments and a great deal of return – just an evaluation of the discoveries requires more than US$1 billion of investment and, if this leads to development, we are looking at around US$4.5 billion of investment."

Petrosen has 46% ownership of Senegal's only refinery, and is pushing the government to support the construction of a second refinery for the processing of various qualities of crude oil and sale of the refined products into the region. "In addition, in the longer term, we could coordinate with producers in other African countries to transport their oil to our refinery in order for treatment followed by worldwide export," added Faye.

As well as the projected economic benefits for Senegal, there is an obvious positive knock-on effect for the mining sector. Lower-cost energy production will be a significant catalyst for mine development and contribute to more attractive economics considering the prominence of energy within most mines' cost structures. Most notable is the development of the Greater Tortue Complex, a gas project led by BP and Kosmos Energy in conjunction with a signed agreement between Mauritania and Senegal to split production on the cross-border offshore field. The area of focus is estimated to hold more than 25 trillion cubic feet of gas, and first gas is expected in 2021.

Just as companies established in this segment may venture across to mining, mining service companies are also keeping an eye out for opportunities to diversify their client base. Such is the case with local parts and equipment provider Afrique Mine et Industrie (AMI) SA. "We want to grow the oil & gas side of the business because at the moment, the ratio is very much in favor of mining, which accounts for about 75% of business," explained Abdou Mbackle Lo, AMISA's general manger. "Since the industry is volatile, this business model is not always favorable. We want to balance and stabilize our income so we are not affected as much by the cyclical nature of either industry. When Senegal and Mauritania begin exploiting their oil & gas potential, we want this ratio to sit more at 50:50."

Particularly in line with government guidelines towards local content, there is high demand for local service providers operating at international standards. By offering a more cost-effective and logistically-convenient service without compromising on quality, local companies are in a strong position to capture market share. Reputation needs time to build but, with the right mechanisms and mentality in place, international experience alone will not hold up against strong local presence and expertise. In recognition, international players are seeking the best of both with their acquisitions of local companies and investments into warehousing and logistical infrastructure to hold inventory domestically and ensure rapid response times with clients.

"There is of course the initial capital investment in the equipment, but the real value for us comes when the mine begins operation – the training of the operators, for example, and then the maintenance. Some customers may choose to carry out their own maintenance, but it is increasingly common for companies to subcontract their fleet maintenance entirely. This means long-term business for us over the life of the machine. On average, about 40% of our revenue comes from our customers' capital investment, about 50% from parts and services, and about 10% from newer services such as rental. In rental scenarios, we provide not just the machine and its maintenance, but also the financing."

Samuel Modicom, Country Manager, Saudequip

Senegal's Mining Outlook

"There is huge potential in West Africa, and some very large deposits. Randgold's Loulo Mine is 14 million ounces, as is IAMGOLD's Sadiala mine. Whilst our Makabingui resource is one million ounces, we have also drilled 8km south and there is gold all the way. Konkoutou could even be bigger. Wherever someone drills in the Birimian belt, they find gold. My prediction is that Senegal will follow Mali, which holds one third of the Birimian belt versus Senegal's two thirds. This gold belt is likely to become one of the biggest gold belts in the world."

Alex Mackenzie,
CEO, Bassari Resources

"Whilst the government will generally not offer financial contributions to companies developing infrastructure, as far as rules and regulations are concerned, the government is generally supportive. "

Vincent Bayiha Kodock, Country Manager, OMA Logistics Senegal

"The current President is the former mining minister and a geologist by training, so recognizes the value of the sector in the development of Senegal's economy. In terms of engagement with the administration in Senegal, mining companies are effectively pushing on an open door. We have found that there is a supportive environment across the government."

Martin Horgan,
CEO, Toro Gold

"Senegal has a favorable position, not only in terms of its new Mining Code but also because of the country's stability in finance and politics. There are some modifications to the tax code but these do not impact investments into Senegal. Very few investors are complaining about changes in their financial contracts."

Mouhamed Kébé,
Managing Partner,
Geni & Kébé

Photo courtesy of GCO

Burkina Faso

Since gaining independence from France in 1960, Burkina Faso's political instability has been a major deterrent for investors until recently. Still ranked one of the poorest countries in the world, Burkina Faso's government has focused its efforts on developing its mining sector to diversify its agriculture-driven economy as the major catalyst for development.

Population: 20,107,509

Land area: 273,800 km^2

Official Language: French

Chief of State: President Roch Marc Christian KABORE (since 29 December 2015)

GDP (PPP): $35.78 billion

Growth Rate: 6.4%

GDP per Capita (PPP): $1,900

Economic sector breakdown: agriculture: 31.9%, industry: 22%, services: 46.1% (2017 est.)

Industry: cotton lint, beverages, agricultural processing, soap, cigarettes, textiles, gold

Exports: Exports: $2.797 billion (2017 est.), gold, cotton, livestock

Imports: $2.923 billion (2017 est.); capital goods, foodstuffs, petroleum

Major Trading Partners:

Exports - Switzerland 44.9%, India 15.6%, South Africa 11.3%, Cote d'Ivoire 4.9% (2017)

Imports - China 13.2%, Cote d'Ivoire 9.5%, US 8.2%, Thailand 8.1%, France 6.5%, Ghana 4.4%, Togo 4.4%

Inflation rate (Consumer price): 1.4% (2017 est.)

Source: CIA Factbook

Fraser Institute Investment Attractiveness Index Ranking:

2015: 29/109 → 2016: 48/104 → 2017: 68/91

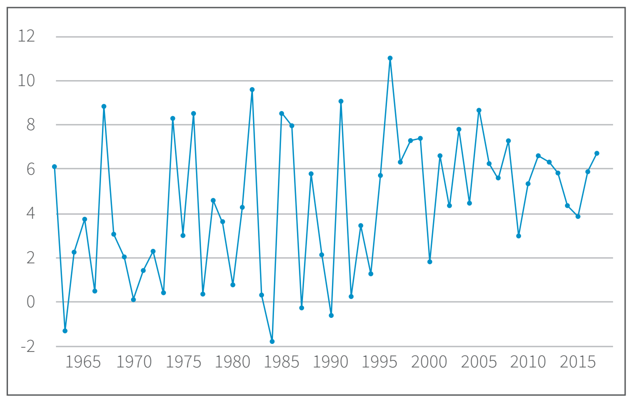
The Global Competitiveness Index Ranking:

95/137 (previous 140/140)

Ease of Doing Business Ranking:

148/190 (World Bank Group)

GDP (annual %)



Source: The World Bank

Gold Production (kg):

2012: 29,877
2013: 32,944
2014: 36,320
2015: 36,540
2016: 39,000

2015-2016

9.3% ↑

Source: British Geological Survey

Silver Production (kg):

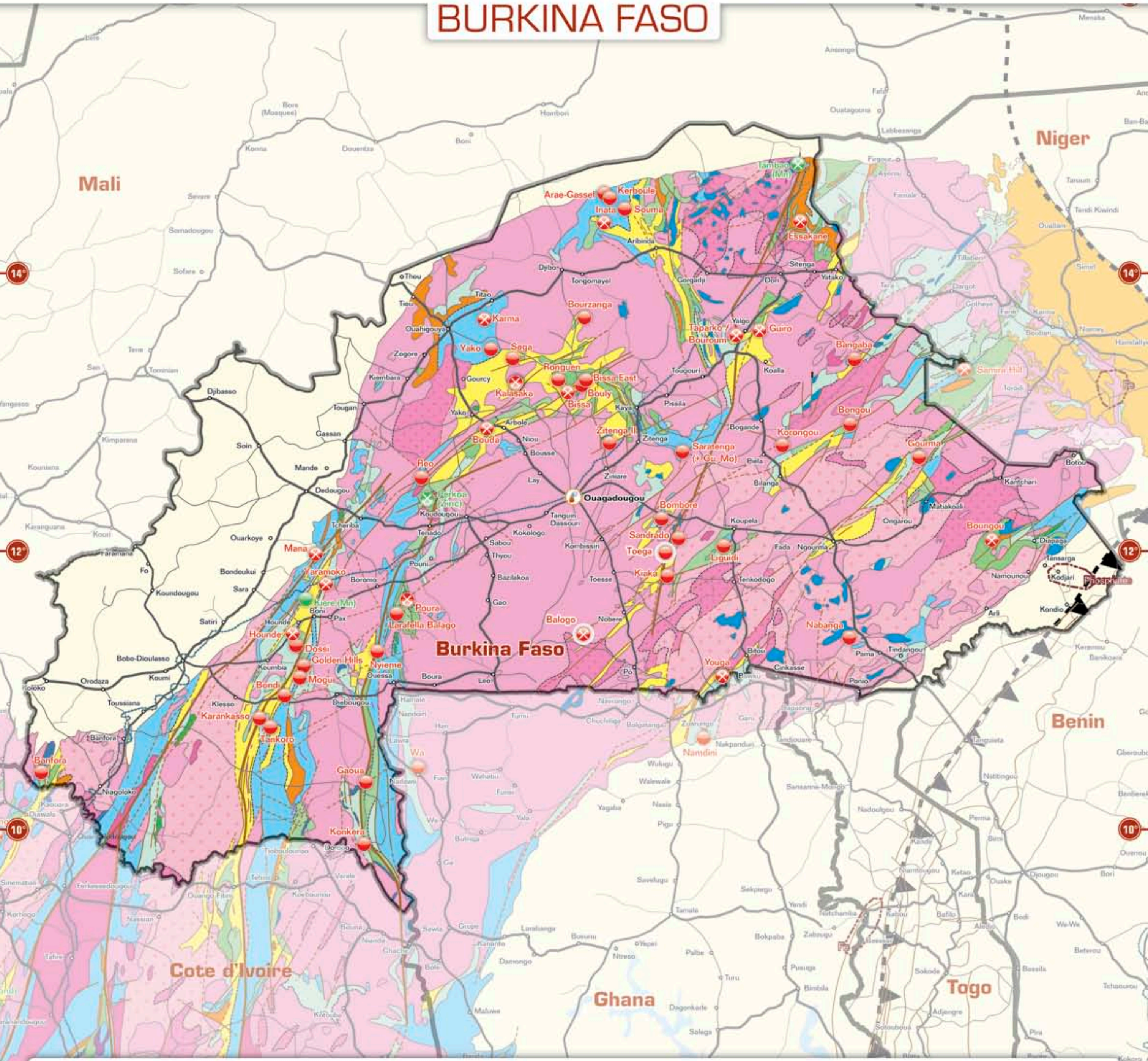
2012: -
2013: 31,436
2014: 25,520
2015: 29,000
2016: 30,843

2015-2016

6.3% ↑

Source: British Geological Survey

BURKINA FASO



Your feet on the ground in Africa

NORTH

0 50 100 150

KILOMETERS

Geological boundary certain

Geological boundary inferred

Fault certain

Fault inferred

Thrusts

GOLD MINES

Existing

Closed

Gold resources/ projects

OTHER MINERALS

Existing mines

Closed mines

Projects

Mineral fields

Country Borders

Seaside

Roads

Minor roads

Railway

Sems Offices

POST-EBURNEAN ANOROGENIC DOMAINS

- Basic-ultrabasic complexes (Freetown, Guinea)
- Cretaceous to Recent
- Upper Proterozoic to Paleozoic

EBURNEAN OROGENIC DOMAIN

LOWER PROTEROZOIC TERRANES [2.4 - 1.6 Ga.]

Plutonic rocks

- Basic-ultrabasic complexes
- Leucogranite
- Undifferentiated granitoids

Volcanic and fluviodeltaic formations

Lithostructural assemblages (D2 and D3 deformation phases)

- Fluviodeltaic: sandstone, conglomerate, argillite (Tarkwaian)
- Plutonic-volcanic assemblage: minor volcanic rocks
- Undifferentiated volcanics, volcanosedimentary rocks
- Komatiitic to tholeiitic basalts
- Rhyodacitic to rhyolitic volcanic rocks, chert (b), graphitic horizons
- Andesitic volcanic rocks, chert (b), graphitic horizons
- Basic volcanic rocks, chert (b), Mn levels (c)

Flysch-type formations with minor volcanic rocks - Lithostructural assemblage (D1 to D3 deformation phases)

- Carbonates felsic volcanic rocks
- Felsic volcanoclastic rocks, dykes; chert (b), manganese levels (c)
- Flysch-type : sandstone to argillite (graphitic, conglomeratic levels)

Horizon Markers (B2, B1)

- Tourmaline-bearing sandstone and conglomerate
- Chert and quartzite levels
- Manganses-rich levels: quartzite, gondite, phyllite

ARCHEAN AND/OR PROTEROZOIC GRANITIC GNEISS COMPLEXES DEFORMED BY THE EBURNEAN OROGENESIS

- Granitic, migmatitic and undifferentiated gneiss
- Granitic, migmatitic and undifferentiated gneiss
- Granite, gneiss, and migmatitic gneiss complexes

PRE-EBURNEAN OROGENIC DOMAIN

ARCHEAN - LEONIAN [3.5 - 2.9 GA.] / LIBERIAN [2.9 - 2.5 GA.]

Plutonic rocks

- Undifferentiated plutonic rocks (Leonian to Late-Liberian)

Greenstone belts and ironstone formations

- Ironstone formation (meta-sedimentary, meta-basic rocks associated)
- Basic and ultrabasic formations

Gneissic complexes

- Migmatitic and undifferentiated gneisses
- Granulitic gneiss "basement"

GEOLOGICAL DATA FROM BRGM - LAT/LONG WGS84

Map drafted by Kwaku Owusu-Ansah

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Burkina's Golden Promise

A case of high risk, high reward?

Nestled in West Africa between neighbors including Mali, Côte d'Ivoire, Ghana and Niger, Burkina Faso one of the region's few completely landlocked countries. The country's economy has been primarily driven by agriculture over the years, but the relatively recent shift in focus towards natural resources has already had an impact. GDP grew by 6.42% in 2017, versus 5.9% in 2016 and only 3.9% the year before. This growth is very much in line with the growth seen in the extractive industries, which accounted for only 4.5% of GDP in 2009, increasing to 7.9% in 2015, 8.3% in 2016 and 11.4% in 2017. "Now, we see that the mining sector and other related industries contribute around 11% of Burkina Faso's GDP," commented Tidiane Barry, president of Burkina Faso's Chamber of Mines, which was established in 2011 to support the industry's growth. "This is expected to grow in the coming years. The mining industry is also the main driver for foreign direct investment into Burkina Faso, so the sector is also important in this respect."

The country currently has 12 mines in operation and a further two in construction. Neighboring countries such as Ghana, Mali and now Côte d'Ivoire are familiar names in the mining investment community, and it seems that Burkina Faso's geological potential is also receiving greater attention. In fact, the country accounts for roughly 22% of West Africa's greenstone belt exposure. In line with this geological potential, the country is expecting record gold production in 2018 and has overtaken Tanzania to become the continent's third-largest gold producer after South Africa and Ghana. The country's gold production status is perhaps surprising considering its first gold mine was Nordgold's Taparko, which poured first gold only in late 2007. Fast-forward 10 years to 2017, when Burkina Faso achieved 46.5 tons of gold production. This figure is against 38.53 tons in 2016 – an increase of over 18%. 27 tons of raw gold have been poured in the first half of 2018.

This significant growth is driven primarily by two factors, the first being the stability of gold prices and the second the new capacity coming online. Most significantly, Endeavour's Houndé mine had its first gold pour in October 2017 and announced commercial production within a month. The mine has an expected average annual production of 235,000 ounces at an all-in sustaining cost of US$610/oz over its first four years.

A recent entrant to Burkina Faso is MNG, which acquired Burkina Mining Company in 2016 and Avesoro shortly thereafter, thus gaining control of the Youga and Balogo gold mines. With MNG's involvement, Avesoro added 160,000 ounces to the reserve at Youga, which had previously been set for closure, and brought the mine to production in less than four months. The combined

"Burkina is attractive based on its geological potential and mining-friendly environment. It is underexplored but is clearly fertile given recent discoveries such as B2Gold's, West African Resources' and Roxgold's. The government wants foreign investment, as do local communities. The fact that we went from discovery to production in five years shows just that."

John Dorward,
President and CEO,
Roxgold

Oumarou Idani

Minister of Mines and Quarries, Burkina Faso

"Research and exploration is ongoing for the development of other mineral resources such as copper and nickel."

Burkina Faso has experienced steady GDP growth over the last few years, with the mining industry being a main driver. Could you share the Government's economic growth strategy and the importance of the mining sector?

The government's ambition is to make the mining sector an important lever for sustainable socio-economic development in Burkina Faso by 2026. Achieving this ambition requires effective implementation of reforms in collaboration with other actors in the sector and in accordance with the following guiding principles: state ownership of mineral resources, integration of mines with the rest of the world, partnership, good governance, preservation of the environment, community development and mainstreaming of themes such as gender, environment, human rights and health. To this end, the strategy of our department focuses on two orientations – to create, on the one hand, favorable conditions for research and the rational and sustainable exploitation of mineral resources and, on the other hand, to increase the benefits of exploitation of mineral substances for sustainable development in Burkina Faso.

A substantial amount of gold is extracted annually by artisanal miners. What efforts has the government made to organize the sector and mitigate challenges?

The mining industry has indeed undergone significant development with an explosion in the number of artisanal mining sites and gold panning sites. To date, more than 600 gold washing sites are listed and more than one million people support themselves through this activity.

The artisanal mining of gold has become the second largest occupation of rural populations after agriculture. Despite some advantages, this trend is accompanied by negative environmental, economic and social effects. The Ministry of Mines and Quarries has put the issue of mining craftsmanship at the center of its concerns.

Although Burkina Faso is mostly known for its gold potential, the country has other resources to offer. Is there now an effort to diversify the sector?

The diversification of exploitable minerals in Burkina Faso is a challenge for the department. A fall in the gold price would be a risk to the macroeconomic stability of our country. In order to address this great challenge, we have set three main lines of activity which are planned over the 2016 to 2025 period. The first is the development of the research of strategic and energy substances; the second is the monitoring and control of mining activities and infrastructure; the third is the promotion of careers in exploitation. The realization of these axes will increase the number of mineral substances exploited.

Research and exploration is ongoing for the development of other mineral resources such as copper and nickel. Quarry substance deposits have also been identified, including more than 500 granite sites, more than 500 clay sites, at least 56 feldspar sites, at least 45 kaolin sites, 22 laterite sites, more than 20 dolomitic limestone sites, one phosphate site and 12 sandstone sites. Interesting sites of precious stones have also been noted.

What are the priorities for the Government to ensure continued investment and development of Burkina Faso's mining sector?

The government's priorities to ensure investment and continuous development of Burkina Faso's mining sector are included in the National Plan for Economic and Social Development (PNDES), where the sector is expected to meet the following objectives: Increase the share of extractive industries in GDP from 7.9% in 2015 to 10.2% in 2020; increase the proportion of local purchases in the food consumption of mining industries from less than 14% in 2015 to 25% in 2020; increase the average amount of local investments made by the mining industry from CFAF 2 billion in 2015 to CFAF 5 billion in 2020; increase the number of direct and indirect jobs created by the mining sector from less than 10,000 in 2015 to 20,000 in 2020.

In addition to its objectives, the Head of State has made commitments to the members of the government and mines to set up a mechanism for monitoring mining operations, to implement a gold mining economic recovery strategy, conduct a production assessment for importing and operating equipment, establish a national geological and mining data bank, and promote industrial quarrying to increase the supply of construction materials.

life of Youga and Balogo takes the company up to 2026. Avesoro expects 120,000 of gold production from the Youga Mine in 2018. The combined measured and indicated mineral resource is 16 million tons, with 924,000 ounces of gold at an average grade of 1.73g/mt and combined proven and probably mineral reserves of 11.2 million mt with 660,000 ounces of gold with an average grade of 1.84g/mt.

SEMAFO's Boungou mine also had its first gold pour in June 2018. The company expects the new mine to double production capacity by 2019 in conjunction with its Mana mine, bringing SEMAFO's gold production up to over 400,000 oz/y. If all goes to plan, this will make SEMAFO the second-biggest gold producer in the country after IAMGOLD.

IAMGOLD is Burkina Faso's premier gold producer. The Essakane mine is one of IAMGOLD's flagship operations and had record attributable production in 2017 of 389,000 oz. IAMGOLD recently began mining at Falagountou East, the second satellite deposit at Falagountou of which the first, Falagountou West, came into production in 2015. The company is also looking at Essakane with a heap leaching project currently under study. "The heap leaching project is progressing well and the pre-feasibility study will be completed by June 2018; it has the potential to increase Essakane production by up to 20% and extend the mine life by two to five years," highlighted Oumar Toguyeni, IAMGOLD's regional vice president for West Africa.

Teranga Gold is also aiming for its first gold pour at its Wahgnion mine in 2019, whilst B2Gold's Kiaka project is expected to have a huge impact, with measured mineral resource estimates of 27.3 million mt at 1.09 g/mt gold for 953,000 ounces, indicated mineral resource estimates of 96.8 million tmt at 0.96 g/mt gold for 2.99 million ounces and inferred mineral resource estimates of 27.3 million mt at 0.93 g/mt for 815,000 ounces. Wahgnion, acquired by Teranga with the acquisition of Gryphon Minerals in 2016, is expected to produce between 120,000 to 150,000 ounces over a mine life of 12 or 13 years with all-in sustaining costs per ounce of about US$850.

Roxgold's flagship asset, the Yaramoko mine, has been in production since May 2016 following a greenfield discovery in 2011 and capital investment of US$106 million. The mine life is 10 years and, in 2017, Yaramoko processed an average head grade of 15.3g/t gold. "Production has also been very strong and in 2017 we produced 127,000 oz gold, significantly above our initial guidance of between 105,000 and 115,000 oz," highlighted Roxgold's CEO, John Dorward. "Our cash operating cost was US$438 per oz, which is extremely low. We have made a significant repayment on our debt, paying nearly US$30 million of our project finance, and built up to US$63 million of cash in the bank at the end of 2017. From having US$75 million of debt in May of 2016, we are now net cash positive. Yaramoko is one of the highest-grade gold mines in the world, with measured and indicated grades of over 17g/mt and so far, we have been delivering over 15g/mt. About 70% of the gold is recovered in our gravity circuit and the balance comes out in our leaching circuit. It is a very clean metallurgical system with low sulfides, and nothing refractory about it with high overall recoveries of 99%. Ground conditions have also been good."

With an exploration budget of US$9 million in 2018, Roxgold has been focusing on new discoveries, with a program involving 63,000 meters of drilling, focused on the Houndé belt.

Also performing well is Nordgold's Bissa-Bouly mine. Bissa was launched in 2013, and expanded in September 2016 with the launch of a heap leach operation at the nearby Bouly deposit. Bouly's average annual production is expected to be approximately 120,000 oz over a mine life of 10 years.

As well as gold, the Perkoa zinc mine, a joint venture between Glencore Xsrata and Blackthorn Resources, has been in operation since 2013, and there is also potential for resources such as manganese and other base metals.

Elie Justin Ouedraogo

General Manager, SEMAFO

"Our focus remains on Burkina Faso, although we recently acquired and are carrying out early exploration on some permits in Côte d'Ivoire."

SEMAFO is a long-standing player in Burkina Faso's mining sector, with its first gold pour at the Mana mine in 2008. How has SEMAFO developed in the country?

SEMAFO played a large part in the revival of the country's mining sector. SEMAFO's founder first came to Burkina Faso for an NGO program in 1993 when the mining sector was undeveloped – there was only artisanal mining activity. In 1995, SEMAFO was born from the union of two small exploration companies and went on to obtain permits throughout West Africa. The company's West African focus has proved strategic. Through our development of several projects, we have acquired a good understanding of the geology since many countries have similar mineralization. The cultural aspect is also important and, since Québec and many West African countries are francophone, there are fewer barriers.

SEMAFO's development activities began in Guinea in 2001 when we developed the Kiniero gold mine. We also developed and built the Samira Hill mine in Niger from 2003 to 2004. In 2006, we began building the Mana mine in the south of Burkina Faso, approximately 300 km from Ouagadougou. Although the first pour was carried out in March 2008, the mine is still operational 10 years later and is almost wholly owned by SEMAFO – according to Burkina Faso's mining code, every mine is at least 10% government-owned. Mana is the mine that helped build SEMAFO's reputation as a gold producer.

Could you elaborate on the developments at Boungou and Siou?

Following our positive experience with Mana, we decided to augment our portfolio in 2015 with an acquisition involving the Boungou project, which we bought for US$150 million from a small exploration company. As the project was just at the scoping study phase, we brought it to feasibility study level in 2016. The latter yielded positive results for the company and its shareholders, showing an average life-of-mine head grade of 4.15 g/mt Au at a gold recovery of 93%. In six months, we had obtained a mining permit and started building the Boungou mine, with first poured gold 18 months later in June 2018.

The construction process went very smoothly since we had kept the same operations team that had developed and run the Mana mine, plus we had already forged a strong relationship with the government. We expect Boungou to double our production capacity by 2019, bringing us up to over 400,000 ounces per year and making us the second-biggest gold producer in the country.

In what ways does SEMAFO support local communities through initiatives such as the SEMAFO Foundation?

SEMAFO is determined to foster strong partnerships with its host countries as reflected by its corporate motto: international expertise and human advocacy. An important fact to consider is that mining activities have limited time frames – development therefore must be sustainable or the local community will be left impoverished when the mine closes. This is the main remit of SEMAFO Foundation, which receives up to 2% of the net profit from SEMAFO's mining activity.

Over its nine years of operation, the Foundation has invested about CFA 4.5 billion (US$8 million) into areas such as education, agriculture, solar energy, healthcare and community infrastructure. As part of its approach, SEMAFO Foundation visits the communities directly and finds ways to complement and strengthen existing activities and to develop skills aligned with its vision and needs analysis. At Mana, we saw that women were already producing shea butter, so we decided to support and develop the activity. Today, the soap factory at Mana positively impacts about 10,000 people through sales of its produce locally, to the mine site and to Canada. Even when the mine closes, soap production can continue. And, as sesame was already extensively grown in the community, we supported the local producers in this domain too – with impressive returns after one year. Now, we are also developing beekeeping and honey-producing capacity, and we support a chicken co-op and vegetable gardens in supplying the mines.

What are the priorities for SEMAFO going forward?

Our focus remains on Burkina Faso, although we recently acquired and are carrying out early exploration on some permits in Côte d'Ivoire.

Burkina Faso's Investment Proposition

Weighing up Risk

Beyond initial attraction based on geological potential, investment tends to follow the path of least resistance. The tax system and mining code are important factors to consider and changes to either can be highly impactful, even if it is just the perception of added barriers by comparison to a previous state of affairs. "Côte d'Ivoire and Mali will likely see some influx of investment because they have very attractive mining codes," commented Barry, president of the Chamber of Mines. "Burkina Faso adopted a new mining code in 2015 and the reality is that the new code is less attractive than the previous one, so this is a challenge. The challenges are mainly around taxation – the previous code had more incentives for investors, which have now largely been retracted. Nevertheless, the government has always been open to dialogue with the mining companies to ensure that the mining code does not negatively impact a project that was already underway."

For any country, dialogue is key in finding a balance, but the perception of several companies it that the conversation has been somewhat one-sided of late. "In the last two to three years, several factors have changed that have affected us," commented Johan Labuschagne, general manager at Nordgold. "The water tax, for example, created a lot of uncertainty and decreased the competitiveness of the operating environment versus countries such as Ghana and Mali. The rate is too high. We have also recently heard about the new fuel prices, which include a 38% increase in HFO, the prime driver for power generation. The final number is not yet confirmed. The moment the cost goes up, extending the life of the mine becomes more challenging and it is more difficult to invest in exploration. It is a very short-sighted approach to pursue returns from the industry in this way – an understanding of the nature of the business is required to keep the balance. Equally, even though the 1% local development tax is intended for development of the surrounding region, it rarely gets invested there. It is then up to the mining company if they choose to invest additional resources to develop the community. It would be preferable to us to be in control of the flow of investment into the area in which we are operating, and we are likely to see much better returns and influence on community development."

"There is a willingness to preserve the stability of the framework and steps are being taken to mitigate any negative impacts of the new mining code. Burkina Faso has a lot of potential but must remain competitive to continue attracting investment from foreign players. In the new mining code, the emphasis on local development is a positive aspect and is conducive to the competitiveness of the industry, since local development creates an environment of stability, peace and a better social condition in the region."

Tidiane Barry,
President,
Chamber of Mines,
Burkina Faso

Johan Labuschagne and Christian Ouedraogo

General Manager and Deputy General Manager, Nordgold

How has Nordgold's focus on West Africa developed, and where does the region sit in the company's overall strategy?

JL: Nordgold's entry into West Africa started with the Taparko mine in Burkina Faso in 2005, which was followed by Bissa being taken on, developed and established and the further expansion at Bouly. There has been a lot of knowledge sharing between the Russian mines and West African mines to bring them up to international standards. This includes elements such as automation and underground methods and generally implementing best practices.

Bissa-Bouly is the biggest gold producer in Nordgold's stable at the moment, but the Gross project in Russia is set to become the company's biggest gold producer once it reaches full capacity. Russian gold producers also tend to be very low cost. Bissa is now coming into maturity in its sixth year of production, so it is becoming more challenging to keep the cost profile low – the high grades are depleted, so it is now necessary to pursue lower grades at greater expense. The challenge for us is to continuously explore and extend the mine life to get the best return on investment. Exploration is absolutely critical at this stage.

What is performance like at Taparko as well as Bissa and Bouly?

Both mines have healthy net cash flow. Bouly has done extremely well, being new, although we have begun to feel some pressure on our net cash now that we have started paying taxes. The key is to keep on investing. We increased exploration spending from about US$4 million a few years ago to US$6 million this year and next year probably about US$8 million.

As one of the country's leading gold producers, what benefit has Nordgold brought to Burkina Faso besides direct economic impact?

At Bissa-Bouly, we directly employ about 1,200 people, and roughly 800 contractors, so 2,000 in total. At Taparko, we employ about 1,000 people in total. The flow-on effect just from the salaries paid is highly significant. The difference in wealth is clearly visible in the towns that have been impacted by mining. Burkina Faso is fairly young by mining industry standards, but over time the economic benefit will be seen. We need the government to look at more mature mining industries that have seen successful investment and understand how to drive the sector's success.

How does Nordgold approach local workforce training and working with local service providers?

CO: During the Bouly construction, we spent US$40 million, 30% of which was spent locally. However, there are not many local providers with the capability to supply and service big mining equipment. In terms of local development, we have built a dam and organized some local agricultural activity around it, from which we supply the mine site. We buy produce like potatoes and onions and we have now built an abattoir. We are always sure to meet with the local community and form a committee and initiate training programs to develop skills to open the door for more opportunities. We also build schools in the area and offer programs. Because agricultural activity is seasonal, there is a time each year when the supply runs out, so we maintain availability and also subsidize the food.

JL: One of the challenges with local employment is the education level, particularly as mining becomes increasingly digital and trucks include computer monitors, and so on. This requires a certain understanding – generally the required skill level on the mines is becoming higher and higher. Employing locally is extremely important, but in some cases the skill level is not there to be able to operate efficiently. This comes back to a need for the government to invest in schooling.

What are the objectives for Nordgold in the coming months?

Exploration is extremely important and we are focused on expanding our existing resource base.

Whilst Burkina Faso's mining code is still competitive within the region, there will always be a readjustment period when changes are made. It is common for governments to make policy revisions as a sector develops to maximize economic return, often followed by further adjustments if new investments taper off. "It is difficult to take a completely objective stance on the mining code," commented Emmanuel Yonli, lawyer at SCPA KAM & Some. "From each perspective – either that of the country or of the investors – it will always be the case that the code could be more attractive. With time, a balance will hopefully be reached. In fact, there are currently some revisions being made because there are still complaints about the changes that were made in 2015. In the previous mining code, mining companies were subject to a tax of 15%. This has now been adjusted to the standard rate, which is 27%."

Other pronounced challenges are security and infrastructure. Because the country is landlocked, there is a heavy reliance on imports through neighboring countries, driving costs higher and impacting lead times. "At customs, lead times are long and taxes are already high – up to 48% on imports," noted Grant Palmer, country director at Geotech Drilling Africa.

Planned infrastructure projects should go some way in alleviating some of the challenges experienced by companies needing to shift products across the border. Notably, the Tema Port-Ouagadougou railway project, which would connect Ghana's port to Burkina Faso's capital, is currently open for tender.

SOURCING LOCALLY

Because of the logistical challenges, it would make sense for companies to work with local manufacturers, but the segment remains underdeveloped. Part of the challenge is that, as with any sector, it takes time to develop a skilled workforce. "The biggest demand is in the area of maintenance – people qualified to fix equipment, either in plant or production engines," said Dina Yanogo, managing director at Exterhum Africa, a Ouagadougou-based company dealing with management and supply of personnel, with a focus on industrial sectors such as mining. "We also see high demand in the areas of geology, metallurgy and administration. Since most of the mining companies know us, we receive a lot of CVs and we use our intern database plus independent research through websites and social media; this large pool helps us to source the right people."

Exterhum also provides rental services for mining transport vehicles and plans to expand its capacity in this area.

These challenges lead to a dearth of local companies operating at the required standards to make them a viable alternative to the experienced international service providers. "It is three times more difficult to capture market share as a local provider because there are many international companies offering similar services with greater experience and larger capacity," commented Yanogo. "Investors come to us because they want to promote local providers; however, we still need to develop this field and we have to be ready to take on additional business."

International companies are therefore building their own in-country inventory, or working with trusted distributors and dealers. "Although we can generally get the parts from Europe quite quickly, the process of clearing those parts through customs can be quite cumbersome," explained Andrew Sarson, mining director at Burkina Equipements, part of the JA Delmas network of Caterpillar distributors. "There is definitely improvement needed in the process. In Europe, if a piece of equipment fails and the dealer does not have the required part, it can still be delivered the next day. As a dealer in Burkina Faso, we therefore hold a lot more inventory because of those inefficiencies in the system. Today, we plan six to nine months ahead with our clients. Even countries with the advantage of a sea port have many challenges – strikes, for example, can often mean huge delays on lead times for containers, and sometimes the dealer has to react and has no other alternative but to fly parts in by airfreight at additional expense to the dealer."

Similarly focused on simplifying the supply chain and reducing lead times is Socoghaf, a supplier of mining tools and a distributor for Hardox in Burkina Faso. "Our ability to hold large stocks improves reliability of supply and shipping in bulk reduces logistics costs," highlighted Socoghaf's CEO, Ghossoul Charbel. "We are also doing more and more maintenance on behalf of SSAB, which is more cost effective because we have the local workforce in place to support this activity. Planning is very important for mines and disruptions to timelines and unscheduled downtime can be very detrimental. Price is not the primary factor – reliability of supply and quality are generally more important."

The infrastructure within the country is also underdeveloped and power generation is particularly challenging. In a sector like mining, where power is both essential to operations and a significant part of the cost structure, the necessity of building power capacity increases the required investment, impacting the economics of the project.

MITIGATING SECURITY RISK

One of Burkina Faso's biggest challenges is security, highlighted by several incidents over recent months. These security risks are also particularly difficult to address. Not only is there a lack of coverage across the country and at its borders to monitor activity and control unrest, but appropriate precautions can be a huge expense, particularly for the juniors that dominate the greenfield exploration segment. "There are some very large companies in this part of the world, but the majority are juniors and very small," said Philip Whitehead, regional security manager for West Africa at MS Risk. "First of all, they do not have the resources for a security manager, so they often delegate to their HSE manager – it is not a subject they know a lot about and there are failings as a result. Equally, many of these small companies are owner-managed and are more concerned with getting gold out of the ground than the associated risk. There is often no process of quantifying the security risk to which they are exposing themselves."

Patrick Downey

CEO, Orezone Gold Corporation

"Burkina Faso's newly-implemented mining code and permitting process seem to be working fairly well."

Orezone Gold Corporation has a long history in Burkina Faso, going back to the development of Essakane. What changes in strategy has Orezone undergone to date?

Orezone Resources was responsible for the exploration and early stage development of Essakane. The company was acquired by IAMGOLD in 2009 with Orezone Gold ("Orezone") being a spin-out from this transaction. Orezone currently owns a 90%-interest in the Bomboré project, a multi-million ounce gold deposit centrally located in Burkina Faso. A previous feasibility study was completed in 2015 envisioning a hybrid heap leach/carbon-in-leach (CIL) gold recovery process which was complicated and expensive to build.

Realizing that the project could be simplified by focusing on the near surface oxide material, the new strategy became to free dig mine the oxide ore and then to process this ore through a single-stage grind and CIL circuit. Supported by a new recently completed independent feasibility study, the simplified strategy has reduced the initial estimated construction capital by approximately US$100 million as well as improving future operating costs when the mine goes into production.

Orezone is about to start the relocation of the villages that are within the project footprint. We are fully permitted and ready to start construction on the process plant, water supply systems and tailings dam by the second quarter of 2019. The aim is to be producing gold by late 2020.

Although Burkina Faso has great geological potential, its mining industry is relatively young. Is there a good availability of services providers and skilled workers in Burkina Faso?

With 11 mines built over the last 10 years, there is a strong local skillset in mine construction and operation. Orezone's current project is focused on oxide and free digging. The simplicity of the project allows for the mining contractors to be local. If the project entailed drilling, blasting and bigger fleets, we would likely have to use international mining contractors with greater expertise and capabilities. There are companies within Burkina Faso that are willing to enter the mining industry and take on big projects, but it all comes down to their capability of handling these big projects. Local contractors are building their capabilities but we are not yet at that point where we can see 100% local construction but the progress in recent years has been impressive.

What work has Orezone done towards development of the local community?

Orezone has always had a strong focus on developing the local communities surrounding our projects and this starts right from the exploration stage. We believe that corporate social responsibility starts as soon as a company sets foot on a property as the surrounding communities are the ones that are most affected. We want to make sure that we do everything possible so the local populations participate and enjoy long-term benefits from our project and this becomes a focus of discussion and meetings with local communities and municipalities at a very early stage.

We have set up several produce gardens for the community and we have an agro-economist working with them to help make the garden a sustainable business and to teach the business aspects of marketing and re-investment. We have worked with several NGO groups in installing and maintain ground water wells and we have also focused on other key areas such as health and education.The nearby river is seasonal; and as part of the mine construction, Orezone will be constructinga permanent water storage facility which will remain in place with all infrastructure for the community's use after mining ceases. Setting up long-term relationships with the community will positively transform the economy of the area. Orezone wants to leave a positive and permanent legacy in the areas that we operate in.

What is Orezone's vision in Burkina Faso for the next three to five years?

We are very excited to begin the first phase of our project, which we see as a long-term investment. Burkina Faso's newly-implemented mining code and permitting process seem to be working well. Security is a big challenge but the government and Chamber of Mines are aware and supportive where possible. We want to build a base in Burkina Faso and possibly expand into other West African countries in the future.

MS Risk has positioned itself as a "virtual security manager", able to assess physical risk and plan to mitigate that risk and allocate personnel to monitor a project for a company at regular interviews over a certain period of time. On the prospect of addressing the broader issue, Whitehead commented: "To some extent, governments try to get involved and protect the industry, but their approach is very inefficient. The typical scenario is generally disappointing from a mining company's point of view. Mining companies are generally told they need to meet certain security requirements and support a number of gendarmes, for example, through a salary, accommodation, logistics and so on. However, what they actually get is poorly-trained security personnel with no understanding of industrial site security."

MS Risk is therefore working with governments in West Africa on industrial training packages and intelligence gathering to create a more comprehensive understanding of activity around the country that could potentially be a security risk.

BUILDING POWER CAPACITY

Power is often a challenge for mining companies due to the remoteness of their mine sites and even more so in countries with a power deficit. Burkina Faso has a significant disadvantage when it comes to power generation, but there are some ongoing initiatives which primarily focus on renewable energy projects, particularly solar. "There is a clear policy in place to drive a mixed energy portfolio, which includes the installation of a large solar power plant to create an autonomous energy source," outlined Adama Ouedraogo, CEO at Satel, a service company operating in telecommunications and energy. "The government is also seeking to help small companies and households shift to solar energy to decrease consumption of fuel, which can then free up availability for mine production. Within the new energy policy, there is also a focus on strengthening interconnections with Côte d'Ivoire, Ghana and Nigeria. There is also an intent to build a conventional 100MW plant in the east of Ouagadougou and another 30MW solar plant."

Burkina Faso's government is certainly aware of the need to improve the country's power generation and transmission, but the strategy seems in large part to rely on the private sector. IAMGOLD has taken the lead with its 10MW solar plant at Essakane, and SEMAFO is swiftly following suit with its 15MW plant currently under construction. "The envisaged energy transition is to increase the share of renewable energy in the energy mix," explained Oumarou Idani, Minister of Mines and Quarries. "This is why we encourage mining companies to develop initiatives to create endogenous production units, preferably in renewable energies and especially solar energy – a very available or even unlimited resource in Burkina Faso. One example is the hybrid power station set up at the Essakane mine, which was inaugurated on March 16, 2018. The message is to encourage mines and solar energy developers to invest in renewable energies to ensure the productivity of the extractive industries, while also ensuring electricity supply to the local populations."

Burkina Faso's mining industry boasts a number of success stories, demonstrating the country's functionality as an investment destination. Whilst the country certainly has its challenges, Burkina Faso remains an attractive destination by virtue of its promising geology and, due to its relatively underexplored terrain, its potential for big discoveries at high grades.

"The success of Burkina Faso's mining industry is largely dependent on the gold price; over the last couple of years it has been quite stable. Prior to that, the gold price was quite volatile so we saw a bit of a slump. Today, we see much more investor confidence and we are currently working on securing new business opportunities with three potential greenfield projects."

Andrew Sarson, Mining Director, Burkina Equipements

Burkina Faso's Mining Outlook


Photo courtesy of Forage FTE Drilling

"Because Burkina Faso does not have many water sources, hydropower generation is unfeasible. This is why the country is dependent on power from Ghana and Côte d'Ivoire. Otherwise, electricity is generated by fuel. Demand continues to increase every year by about 10% to 12%, so there is a lot of focus on investment and building capacity. Many companies are now looking at solar power for generation of electricity. The other point regarding power issues is the cost – the cost of power in Burkina Faso is one of the highest in the world."

Essam Daoud, CEO, CIM IVOIRE, CIM Metal Group

"Big mining companies sometimes have issues trusting local companies, particularly when they operate internationally. It is three times more difficult to capture market share as a local provider because there are many international companies offering similar services with greater experience and larger capacity. Investors come to us because they want to promote local providers; however, we still need to develop this field and we have to be ready to take on additional business."

Dina Yanogo, Managing Director, Exterhum Africa

"In this part of the world, companies need close to 1.5 million ounces of inferred resource before it is worthwhile to look at more advanced studies. Open pit would usually translate to around a million-ounce reserve which would give around 100,000 ounces over 10 years. At this moment, we are well funded and we have pretty good support. However, as an exploration company, all we do is spend money. There is a lot of interest in the project as a whole and we have a number of shareholders that will support us in the future. "

Don Dudek, CEO, Savary Gold Corporation

Ghana

Ghana, known as the Gold Coast before gaining its independence from Britain in 1957, is situated on the coast of the Gulf of Guinea. While gold production remains a key component of the country's GDP and still contributes over 90% of total mineral exports, there is now a focus on diversification of resource extraction as existing gold plays mature.

Population: 27,499,924

Land area: 227,533 km^2

Official Language: English

Chief of State: President Nana Addo Dankwa AKUFO-ADDO (since 7 January 2017

GDP (PPP): $133.7 billion

Growth Rate: 8.4%

GDP per Capita (PPP): $4,700

Economic sector breakdown: agriculture: 18.3%, industry: 24.5%, services: 57.2%

Industry: mining, lumbering, light manufacturing, aluminum smelting, food processing, cement, small commercial ship building, petroleum

Exports: $13.75 billion; oil, gold, cocoa, timber, tuna, bauxite, aluminum, manganese ore, diamonds

Imports: $12.68 billion; capital equipment, refined petroleum, foodstuffs

Major Trading Partners:

Exports - India 23.8%, UAE 13.4%, China 10.8%, Switzerland 10.1%, Vietnam 5.2%, Burkina Faso 4%

Imports - China 16.8%, US 8%, UK 6.2%, Belgium 5.9%, India 4.1%

Inflation rate (Consumer price): 12.4%

Source: CIA Factbook

Fraser Institute Investment Attractiveness Index Ranking:

2015: 31/109 → 2016: 22/104 → 2017: 22/91

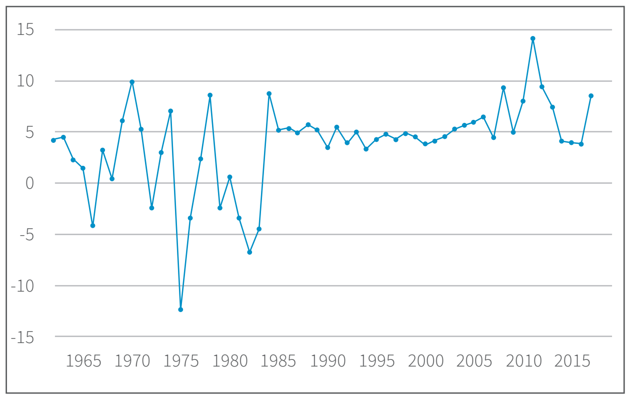
The Global Competitiveness Index Ranking:

111/137 (previous ??/140)

Ease of Doing Business Ranking:

120/190 (World Bank Group)

GDP (annual %)



Source: The World Bank

Gold Production (kg):

2012: 128,600
2013: 137,800
2014: 137,900
2015: 130,100
2016: 129,000

2015-2016

-0.8%

Source: British Geological Survey

Diamond Production (cts):

2012: 215,118
2013: 159,074
2014: 241,235
2015: 174,136
2016: 141,530

2015-2016

-18.7%

Source: British Geological Survey

GHANA

Your feet on the ground in Africa

NORTH

0 50 100 150

KILOMETERS

Geological boundary certain
Geological boundary inferred
Fault certain
Fault inferred
Thrusts

GOLD MINES
Existing
Closed
Gold resources

OTHER MINERALS
Existing mines
Closed mines
Projects
Mineral fields

Country Borders
Seaside
Roads
Minor roads
Railway
Sems Offices

POST-EBURNEAN ANOROGENIC DOMAINS
- Basic-ultrabasic complexes (Freetown, Guinea)
- Cretaceous to Recent
- Upper Proterozoic to Paleozoic

EBURNEAN OROGENIC DOMAIN

LOWER PROTEROZOIC TERRANES [2.4 - 1.6 Ga.]

Plutonic rocks
- Basic-ultrabasic complexes
- Leucogranite
- Undifferentiated granitoids

Volcanic and fluviodeltaic formations
Lithostructural assemblages (D2 and D3 deformation phases)
- Fluviodeltaic: sandstone, conglomerate, argillite (Tarkwaian)
- Plutonic-volcanic assemblage: minor volcanic rocks
- Undifferentiated volcanics, volcanosedimentary rocks
- Komatiitic to tholeiitic basalts
- Rhyodacitic to rhyolitic volcanic rocks, chert (b), graphitic horizons
- Andesitic volcanic rocks, chert (b), graphitic horizons
- Basic volcanic rocks, chert (b), Mn levels (c)

Flysch-type formations with minor volcanic rocks - Lithostructural assemblage (D1 to D3 deformation phases)
- Carbonates felsic volcanic rocks
- Felsic volcanoclastic rocks, dykes; chert (b), manganese levels (c)
- Flysch-type : sandstone to argillite (graphitic, conglomeratic levels)

Horizon Markers (B2, B1)
- Tourmaline-bearing sandstone and conglomerate
- Chert and quartzite levels
- Manganses-rich levels: quartzite, gondite, phyllite

ARCHEAN AND/OR PROTEROZOIC GRANITIC GNEISS COMPLEXES DEFORMED BY THE EBURNEAN OROGENESIS
- Granitic, migmatitic and undifferentiated gneiss
- Granitic, migmatitic and undifferentiated gneiss
- Granite, gneiss, and migmatitic gneiss complexes

PRE-EBURNEAN OROGENIC DOMAIN

ARCHEAN - LEONIAN [3.5 - 2.9 GA.] / LIBERIAN [2.9 - 2.5 GA.]

Plutonic rocks
- Undifferentiated plutonic rocks (Leonian to Late-Liberian)

Greenstone belts and ironstone formations
- Ironstone formation (meta-sedimentary, meta-basic rocks associated)
- Basic and ultrabasic formations

Gneissic complexes
- Migmatitic and undifferentiated gneisses
- Granulitic gneiss "basement"

Geological data: BRGM - LAT/LONG WGS84
Mine location data : www.mining-atlas.com
Map drafted: Kwaku Owusu-Ansah
Graphic design: www.arcildesign.com

Ghana's Mining Industry

Breathing Life into a Maturing Sector

Ghana is king when it comes to West Africa's gold mining industry – second only to South Africa in terms of gold production on the continent, and many companies have found great success in the country's share of the Birimian Greenstone Belts. As the mining industry has matured, the landscape has become dominated by large players such as Gold Fields, Newmont, Kinross and AngloGold Ashanti.

Gold Fields, which has seven operating mines in Australia, Ghana, Peru and South Africa, entered Ghana 25 years ago. As a result of a number of acquisitions over the years, the company holds a 90% attributable portion of the Mineral Resources and Mineral Reserves for Tarkwa and Damang, with the remaining 10% held by the Ghanaian Government as a free-carried interest. In 2018, Gold Fields bought a 50% stake in Asanko Gold Ghana, further cementing its strong hold on the country's gold resources. Total attributable annual gold-equivalent production for the company is approximately 2.2 million ounces.

Measured by production, AngloGold Ashanti is the third-largest gold mining company in the world, with 14 mines and 3 exploration projects across Africa, Australasia and the Americas. AngloGold Ashanti has two wholly-owned and managed operations in Ghana's Ashanti and Western Regions. In the latter, the Iduapriem mine is an open-pit mine with a CIP plant and gravity circuit. Located in the Ashanti region, the Obuasi gold mine has been primarily an underground operation and has been on care and maintenance. However, the first gold pour from the redeveloped mine is expected in the third quarter of 2019.

Kinross's Chirano mine, approximately 100km southwest of Kumasi in the Western Region of Ghana, made the transition to a pure underground mine in 2017 and produced 246,027 Au eq. oz. that year. Meanwhile, Newmont's Ahafo operation commenced commercial production in 2006, with Akyem following suit seven years later.

These mine owners and operators are now focused on reducing footprints or moving into underground or through-

Sulemanu Koney

President,
Ghana Chamber of Mines

"We see a lot of brownfield expansion and rebuilding of mines, but it would be beneficial to see an increase in greenfield investment in Ghana."

What role has the Chamber of Mines played in the development of Ghana's mining industry?

The Ghana Chamber of Mines has been the bulwark of the mining industry and the fulcrum around which the private sector and government address policy initiatives. On the one hand, we help to shape policies and address the industry's challenges and, on the other, we provide a platform for engagement with the government.

Our structure is similar to that of the Minerals Council of Southern Africa – we have a technical committee looking at innovation and technology and a dedicated health and safety team. Additionally, we have put together a joint committee made up of HR, legal and technical people all of whom work together for the betterment of the community. There is also a governing body including members of the executive community, consisting of about 10 people.

How is the mining industry taking shape in Ghana in terms of investment and potential diversification and growth?

Over the years, we have seen an increase in exploration at existing mine sites rather than new investment. We see a lot of brownfield expansion and rebuilding of mines, but it would be beneficial to see an increase in greenfield investment in Ghana. We have spoken to government officials about the need for the country to attract more investment. Because of the high levels of resource exploitation and challenges in the fiscal regime, Ghana's attractiveness is waning in comparison to neighboring countries and it is important for the country to reposition itself. It is important for us to now raise the visibility of Ghana's other mineral resources, such as manganese, bauxite, aluminium and iron, plus diamonds on a small scale. At the moment, about 97% of mineral extraction is gold, so there is vast opportunity to diversify the country's mineral basket.

Investors consider a number of factors and a more flexible fiscal regime would be viewed favorably. In Ghana's Mining Code, Act 703 dictates that terms are frozen for 15 years within a stability agreement, but a company investing a minimum of US$500 million has the opportunity to negotiate benefits above what is currently outlined. The large companies therefore have an upper hand and the smaller companies and juniors are at a disadvantage. Equally, the government should remove the VAT on exploration and other services, such as drilling and laboratory services.

What incentives are in place for mining companies, and how could the framework be improved?

Due to the maturity of Ghana's mining sector, we have a policy environment that is generally favorable and has been developed through a great deal of dialogue between the industry and government. This is not the case in newer mining industries. In addition, there is a larger local talent pool than in many neighboring countries with a basic understanding of the sector, including a number of good engineers, geologists and other technical people.

Of royalties paid, only a small percentage seems to be reinvested at the local district in which the mining company operates. How is this distribution being managed?

Until recently, only 4.9% of royalties paid by mining companies were reinvested locally around the site of operation. Through advocacy, we secured the Mining Development Fund Act in 2016, which outlines a clear governance framework around the management of fund distribution from royalties. It has a national architecture coupled with a local committee, and dictates that funds will be used ultimately for the development of the host community under the label of the New Development Fund (NDF). The national board will act in line with the local communities to oversee distribution of funds.

What will the objectives for the Chamber of Mines be over the next 12 to 18 months?

We want to encourage higher levels of engagement and education so the mining industry is properly understood by all stakeholders. Advocacy will remain a priority for us and we will continue to aggregate views and present common challenges to the government. We also plan to present a memorandum to the government regarding the heavy taxes.

put operations, with a greater emphasis on recovery and brownfield exploration to extend mine life. “Most of the work in Ghana is brownfield exploration, around the 800m to 1000m mark,” commented Jon Madigan, West Africa division manager at Boart Longyear. “There is some exciting work coming up in deeper directional drilling to hit tighter targets. We will see the construction of shaft mines rather than open pits. Our biggest focus at the moment is building our directional drilling experience and showcasing ourselves as a company with capabilities in deep-hole and directional drilling. We are also looking to expand our RC offering in Ghana since demand is increasing again after a slow period.”

As companies move underground and pursue lower grades, cost efficiency becomes increasingly important. To cater to this need, Boart Longyear is using a “mother and daughter” approach in its directional drilling; drilling a mother hole and branching off at 500m so the top 500m to 600m of drilling can be saved.

“In Ghana, most of the mines have gone into underground operations to find high-grade ore which requires complex and sophisticated mining methods and more complex technologies unlike countries like Burkina Faso, which has untapped resources and does not need such complex equipment to extract minerals yet.”

Enoch Kusi-Yeboah, General Manager, Metso Minerals Ghana

In gold, it is primarily the larger companies that are driving exploration and there is relatively little greenfield exploration underway. Rather than capturing business with new market entrants, the opportunities for service providers in Ghana are more aligned with the changing requirements of existing players as they seek to extend mine life and expand operations. “In Ghana, most of the mines have gone into underground operations to find high-grade ore which requires complex and sophisticated mining methods unlike countries like Burkina Faso, which has untapped resources and does not need such complex equipment to extract minerals yet,” said Enoch Kusi-Yeboah, general manager at Metso Minerals Ghana. “Business is always dynamic, and the mining industry of five to seven years ago has metamorphosed into something very different; customer demands are mostly linked to resource prices. The development of new technologies and it’s implementation op-

Adriano Sobreiro

General Manager, Chirano, Kinross Gold Corporation

"The marked improvement in unit cost as well as the positive results from a refocused exploration program have had a considerable effect on our mine life outlook and also positively affected the morale of our employees."

Could you introduce Kinross' West Africa operations within the context of the company's global strategy?

Kinross has operated two mines in West Africa since 2010: Chirano in Ghana and Tasiast in Mauritania. Chirano is located in the Western Region of Ghana, approximately 100 kilometres southwest of Kumasi, Ghana's second largest city. Chirano Gold Mine Ltd (CGML) is an underground mine, operated by Kinross with a 10% carried interest by the government of Ghana. Chirano's focused on three underground deposits: Akwaaba, Paboase and Akoti. Tasiast, an open-pit operation, is located in northwestern Mauritania, approximately 300 kilometres north of the capital Nouakchott. Chirano and Tasiast contribute significantly to the success of Kinross. In 2017, Chirano produced 246,027 Au eq. oz., with approximately 1,400 staff, 98% of which are Ghanaian. Together, the West Africa Region produced 464,664 Au eq. oz., representing 17% of Kinross' production in 2017.

Chirano made the transition to an underground operation in 2008. How is the mine performing?

In 2017, we ceased all open pit operations at Chirano and soon after, the mine became profitable. Although the mine faced operational challenges, the team exemplified professionalism and their efforts resulted in consistent improvement in safety performance, gold production and cost reduction. The marked improvement in unit cost as well as the positive results from a refocused exploration program have had a considerable effect on our mine life outlook and also positively affected the morale of our employees.

With the mine life expected to end in 2020, what further exploration efforts are being made?

Our strategy is to grow Chirano organically through the optimization of existing reserves while establishing drill platforms in the lower parts of the three existing underground mines to drill deeper into the Chirano orebody, which we believe is still open at depth. We believe that continuing on this path and getting our cost structure right can provide an opportunity to extend Chirano beyond 2020.

As a mature mining industry, Ghana is currently characterized by well-established mining companies focused on underground operations and brownfield exploration. How do you expect the industry to perform over time?

The mining industry in Ghana is expected to grow significantly over the coming years as mining companies explore and expand production. The probable reserves of most mines are on a regular basis increasing due to scaled up exploration activity and the availability of trained expertise from the nation's tertiary institutions. The industry is also attracting significant foreign investment, the latest being a US$127 million dollar investment into Golden Star Resources by La Mancha Holding, a Luxembourg-incorporated private gold investment company.

The government is working on streamlining the operation of small-scale miners in Ghana and this will hopefully contribute significantly to the growth of the industry and reduce the environmental degradation associated with their activities.

Could you outline Kinross' CSR strategy and highlights to date?

Wherever it operates, Kinross strives to be a responsible mining operator and a reliable development partner to its host countries and the local communities. To achieve this goal, this means responsibly managing our impacts while leveraging economic opportunity to generate sustainable long-term benefits in close collaboration with our local stakeholders. From 2011 to 2017, Kinross contributed significantly to the development of the Ghanaian economy with nearly US$1.8 billion spent in country: almost US$400 million to the national economy through taxes and royalties paid to the government; US$257 million through wages and salaries paid to employees, 98% of whom are Ghanaian; nearly US$1.2 billion through procurement of goods and services with local companies. In 2017, 73% of all procurement was done in-country.

Chirano provides strong support for programs in health and education, and in 2017, more than 212,000 beneficiaries in communities surrounding the mine were reached. Since 2011, the Company has spent more than US$12 million on local programs. Our communities have benefited from major infrastructure projects. We have built nine schools, nine computer centers, 40 boreholes and four water facilities to provide potable water for local people. Five health clinics have also been established.

We also understand that a major issue in Ghana is youth unemployment. With a focus on long-term benefits for local young people, Chirano has sponsored training for nearly 300 youth.

"Ghana is one of the easiest West African countries to work in. Many of the issues we face in other countries we do not face here. There is also a much larger available workforce than in most neighboring countries, although there is very high demand – Ghanaians are working all over West Africa at the moment. One challenge is work permitting, but we have addressed this through rigorous training. Out of a team of 180, we have only three expats. We have a warehouse in Ghana where we hold an inventory, and everything else comes from South Africa."

Jon Madigan, West Africa Division Manager, Boart Longyear

tions are dependent on the economic viability – good return on investment depends on finding the right tools for the task at hand."

While investors are certainly drawn to countries with proven geological potential, exploited land also means waning attractiveness as the potential for big discoveries is reduced. While Ghana has proven itself to be a strong mining jurisdiction with a relatively stable political and security environment, the geological risk has increased. Many investors are looking instead to less explored countries.

Nevertheless, the rebound in global commodity prices has restored some investor confidence and there are several instances of both new and old explorers striking gold in Ghana's southern region and also in the less explored north where new gold as well as lithium deposits have been discovered. "Not surprisingly, our mining sector has contributed strongly to Ghana's overall provisional growth in GDP with the mining-quarrying subsector recording the highest year-on-year quarterly GDP growth rate in the Q1 2018 this year," said Hon. Barbara Oteng-Gyasi, Ghana's Deputy Minister for Lands and Natural Resources, during the 2018 Africa Down Under mining conference in Perth. However, increased production in oil, gas and agriculture is progressively overhauling mining as the pillar of Ghana's economic development strategy – allowing the government to put tighter restrictions on mining companies – and Ghana faces stiff competition from younger West-African players like Côte d'Ivoire, Burkina Faso and Mali. As follows, the long-term competitiveness of Ghana's mining industry will rely heavily on continued uptake in exploration activity.

Emblematic of the mining sector's convalescence is the recent success of Azumah Resources, which received exploration results from the Kunche deposit at its Wa gold project in northern Ghana in May this year. One drill hole returned impressive intercepts at the 1.5km strike orebody comprising an interval of 44m at 5.37g/mt gold from 99m. This includes two high-grade zones of 1m at 144g/mt gold and 20m at 10.27g/mt gold. Further breakthroughs followed as Azumah's joint venture partner Ibaera Capital provided 'proof of concept' of a possible feeder zone that could lead to a deepening of the existing shallow pit design and for an underground mining option to be scoped.

"Ultimately, Dr. Jon Hronsky and the Ibaera team were successful in confirming exactly what we all had hoped for – that our deposits, particularly our main deposit at Kunche, have a strong depth component. These results have really proved a 'game-changer' for the Wa gold project," stated managing director Ste-

"There is still some mystery in Ghana as there could be substantial deposits undercover – much of southern Ghana is covered with rainforest, for example. However, exploration plays become mature, leading to a predominance of mining companies rather than exploration companies. A small organization can also afford to pursue a smaller deposit. Larger companies are looking for five million ounces and above, but we would go for an economic half a million. As techniques get better, exploration companies become better at looking. This is why exploration will not completely die in Ghana."

Kevin Downing, CEO,
Star Goldfields

ven Stone, who will provide an Ore Reserve and Interim Project Update by the end of 2018 with a development decision scheduled for Q3 2019, after the release of a full feasibility study.

New explorers are increasingly heading northward as old players enjoy continued success in the region, and recent findings indicate the possibility of a whole new gold mining district in the country. Cardinal Resources – celebrating its 30th anniversary operating in the region this year – will be publishing PFS for its flagship Damdini project located in upper east region of north Ghana by Q3, 2018. The company has also struck gold at Ndongo, just 20km away from Namdini. The highest grading of 59.2 g/mt gold was within a 9-meter intersection of 23.3 g/mt from 60m.

In addition to its auspicious greenfields, the northern regions of Ghana are conducive to sustainable energy generation – making it a convenient area for companies exploring the potential for renewable power facilities. "We have incorporated solar into our project because it is well suited; the northern regions of Ghana have on average more sunlight than the south," commented Cardinal's CEO Archie Koimtsidis. "In finding a partner to develop our solar capacity, the question is around who we will partner up with and making sure the deal benefits both parties in the long run."

While gold persists as the centerpiece of Ghana's mining space, the government has made efforts to diversify its portfolio to undermine over-dependency on a single commodity. "At the moment, about 97% of mineral extraction is gold, so there is vast opportunity to diversify the country's mineral basket," highlighted Sulemanu Koney, president at Ghana's Chamber of Mines.

Other historical metals in Ghana include bauxite, diamonds and manganese; the government's move towards diversifications will broaden the focus to include base and clay metals, granites, solar salt and, most recently, lithium. The country joined the world's producers of lithium after an agreement with IronRidge Resources to carry on with exploration in Ghana's southern region. Recent drill results show intersections over 100 meters ranging from 1.2% to 1.35% oxide. The company has also rediscovered an historical lithium resource, Egyasimanku Hill, which was drilled up in the 1970s. "We believe this will be a world-class project partly due to its proximity to infrastructure," said CEO Vincent Mascolo. "Our site is 90km from the capital of Accra, less than a 100km from the port of Takoradi and we have sealed roads to 1km of the site."

As the government continues to carry out nationwide mineral exploration exercises, lithium deposits have so far been discovered in the Volta, Western and Ashanti region of Ghana. Ramped up exploration is part of a broader government initiative to attract more investors, which most importantly includes the introduction of new and more beneficial legislation for areas like licensing, support services and health and safety.

REMOVING BARRIERS

While success stories continue to be woven, several juniors are facing challenges due to a lack of exploration incentives. The mining code has been written and shaped with the large companies that have long been the stalwarts of the sector in mind. This is underlined by the provision in the mining code that companies investing over US$500 million have negotiation rights over taxes and royalties, whilst companies with smaller investments do not. "In Ghana's Mining Code, Act 703 dictates that terms are frozen for 15 years within a stability agreement, but a company investing a minimum of US$500 million has the opportunity to negotiate benefits above what is currently outlined," noted Koney. "The large companies therefore have an upper hand and the smaller companies and juniors are at a disadvantage. Equally, the government should remove the VAT on exploration and other services, such as drilling and laboratory services."

As with any mining code, a balance is crucial but not always easily achieved. "The Government is generally in a relatively weak negotiating position compared to companies," commented George Kwatia, Ghana and West Africa mining leader at PwC. "Equally, since Ghana does not have sunset clauses in its agreements with mining companies, it becomes very difficult to get the company reviewed. There are companies in Ghana with warranties dating back to the 1940s – even if the companies themselves have moved on, the warranty is linked to the concession even after the assets are sold. Therefore, there are still companies relying on agreements that have been signed 60 years ago with no clause for termination. Ghana's government wants to move forward from old regulations and previous mistakes, but the mining companies are not making it easy as they want the best for themselves. It has become a challenge for the government to shift to a place where mining regulations are mutually beneficial for both the country and the mining industry. This results in a reluctance from the government to enter into new agreements that favor the investor."

While there is certainly work to be done to capture more investment into greenfield exploration, Ghana holds many advantages having enjoyed a peaceful transition of power during its last election, and continuing to uphold its reputation as one of Africa's stable democracies. In addition, Ghana's well-established mining tradition presents a clear advantage over adolescent competitors that often lack in both overarching industrial framework as well as in-country competence. "There are several educational institutions generating very skilled Ghanaian professionals, including mining staff," noted Jeff Quartermaine, CEO of Perseus Mining. The company has one of the biggest gold mines in the country, with 650km^2 of tenements centered on the Ashanti Gold Belt some 25km to 65km from the 60-million-ounce Obuasi gold deposit.

"Ghana is at an advantage compared to some other countries in the region due to availability of resources like water and power. For example, it is typically not necessary to have big start-up water volumes. Recent projects in Burkina Faso and Sierra Leone needed to have a full year's worth of water storage before the mines could open. Similarly with power, although the Ghana power grid is limited and larger companies tend to supplement capacity with on-site power generation, having access to a reasonably developed grid provides greater opportunity for smaller-scale mines."

Jeffrey Coffin, Regional Manager - West Africa, Knight Piésold

David Johnson

Vice President – Stakeholder Relations, Gold Fields Ghana

"Politically, Ghana has proven to be one of the most stable countries within the region. In terms of the fiscal environment, some other countries in the region have relatively softer fiscal regimes as they are focused on attracting investment."

Can you give a brief overview of Gold Fields's activity in Africa, with a focus on Ghana?

Gold Fields is headquartered in Johannesburg, South Africa, where we have one operating mine, the South Deep gold mine. Apart from our South African operations, we also have a presence in Ghana with two operating mines, Tarkwa and Damang. The Tarkwa gold mine is our largest operation, as well as being the largest operating mine in Ghana in terms of production. The company also recently bought a 45% stake in Asanko Gold Ghana.

Gold Fields recently invested in Damang to extend mine life to 2025. Could you outline the strategy and timeline?

Gold Fields is currently doing a significant amount of waste stripping with the aim of exposing deep lying ore. We are cutting back on one of our existing pits, which will allow us to go deeper and reach the ore lying deep within – this will extend the life of mine by about eight years.

Tarkwa has recently implemented a contractor mining option. What were the reasons behind this decision?

The Tarkwa mine is quite mature, which means that we now have to go deeper to reach the ore. As we move deeper into the pits, the cost of mining escalates, because we have to deal with harder rocks, higher cost of reagents, longer haul distances etc. We had to make a business decision on how to spend the resources that we have, and it was decided that it would be more prudent to spend these resources more intensively on exploration to extend the life of mine, and bring in a contractor with newer fleet that can operate more efficiently and cheaper.

How are both mines, Tarkwa and Damang, performing currently?

Both of Gold Fields' operations are doing very well. We have investment plans for the Damang mine and we are ahead of scheduled activities. Tarkwa, being a mature mine, comes with its own challenges but it we are still producing over 500,000 oz/y, which is a strong performance.

What is your perspective on Ghana as a mining jurisdiction compared to other countries within the region?

Politically, Ghana has proven to be one of the most stable countries within the region. In terms of the fiscal environment, some other countries in the region have relatively softer fiscal regimes as they are focused on attracting investment. Ghana still has a very decent fiscal environment to operate in, and it is for this reason that Gold Fields has decided to focus on this country. We entered into a development agreement with government of Ghana, which provides fiscal certainty and predictability, in return for our investment in the operations. Our confidence is evidenced by the the fact that we have made an investment into another mine in Ghana, Asanko Gold Ghana.

What is Gold Fields' strategy for local development?

Local development can be considered from two perspectives – local content development and community development and employment. We are the first mining company in Ghana to set up a foundation – the Gold Fields Ghana Foundation - that is 100% dedicated to the development of our host communities. For every ounce of gold that is produced, US$1 is donated to the Foundation and we also channel an additional 1.5% of our profits, before tax, to the Foundation. The five pillars that drive our local development are education, health, water, sanitation and infrastructure. To date, Gold Fields has invested over US$47 million into social development programs.

With local content development, we are focused on local procurement and have received recognition for our Procurement and Supply Chain (Mining) programme. 90% of our procurement for the Tarkwa operation was from within Ghana and from the surrounding communities.

What are Gold Fields' priorities moving forward?

We have a strong focus on our US$1.4 billion reinvestment into the Damang mine. We will also be focusing on our 45% stake in Asanko Gold Ghana, which will allow us to expand our operations. We continue to look for opportunities, but our main focus will be on developing our existing operations and assets in Ghana.

LOCAL ENGAGEMENT AND DEVELOPMENT

Although the maturity of Ghana's mining sector would imply a more tested and therefore more efficient process for local development, there are still a number of challenges to iron out. There has been a recent effort to increase reinvestment into local communities, with an additional 4% of investment by government on top of the 4.95% of company revenue.
Perhaps most importantly, the royalty distribution was in need of attention to avoid the scenario of taxes paid by mining companies for the purpose of local development not properly trickling down to the mining region. "Until recently, only 4.9% of royalties paid by mining companies were reinvested locally around the site of operation," emphasized Koney. "Through advocacy, we secured the Mining Development Fund Act in 2016, which outlines a clear governance framework around the management of fund distribution from royalties. It has a national architecture coupled with a local committee, and dictates that funds will be used ultimately for the development of the host community under the label of the New Development Fund (NDF). The national board will act in line with the local communities to oversee distribution of funds."

The preferred approach of the Chamber of Mines would be for the two investments to be added together and distributed by one development committee. This would enforce accountability and ensure the funds are being used judiciously.

LOCAL CONTENT: ADDING VALUE

Due to Ghana's position as a hub for mining activity in West Africa, the country is an obvious candidate to lead the way in development of local capabilities to serve the rest of the region. Many local companies that have grown with the industry and raised themselves up to international standards are now competitive service suppliers within the region.Operating from a more local base gives an immediate advantage, particularly when it comes to holding stock or enabling greater reactivity. Equally, knowledge of the local environment can grant a big advantage, particularly from a regulatory and logistics perspective. For example, logistics companies with longstanding experience of the local infrastructure and relationships with customs and regulatory bodies are well poised to support mining operations efficiently.

As well as providing a more local service to neighboring countries, the potential for greater in-country value addition is also huge. Due to Ghana's geographic position and solid service foundation, there is a large opportunity to develop downstream activity to benefit the entire region. For example, Ghana's Precious Minerals Marketing Corporation (PMMC), which assesses the grades and grants certificates for all gold leaving the country, plans to build a refinery at its site in Accra.

One challenge that still lies ahead of the Ghanaian government is the taming of unruly mining territory. Illegal mining has taken a considerable environmental, human and economic toll on the country over the last years, robbing the economy of US$2.3bn in 2016. According to the government, artisanal gold production sits at about 30% of total volumes. If the issue persists, it could constitute a deterrent to investors as other options emerge in the region. Illegal mining, or galamsey, is likely to persevere as an issue for the foreseeable future, especially following the gov-

"There are great infrastructural issues within Ghana, which pose a challenge to logistics. In the pre-independence period, the colonial government constructed roads which led to resource bases. The road and rail networks in the country are all linked to mines. Since independence, there has been little follow-through on policies and infrastructure development has come to a standstill. However, it is these challenges that create the need for regional logistics companies."

Henry Tabi,
Managing Director,
Barbex

ernment's recent decision to lift a ban on small-scale mining. The ban was instated in 2017 and, in the ensuing period up to early 2018, the illegal-mining task force carried out some 1,200 arrests. However, following persistent pressure from legitimate small-scale miners, in May 2018 the government announced its plans on lifting the ban. The Ghana National Association of Small Scale Miners had also repeatedly called on government to reconsider the ban, pointing to the US$551m of lost profit during the period of interrupted operations. In recent years, galamsey has transformed from an artisanal, rudimentary way of putting food on the table, to operations with capital machinery incorporating businessmen, associations, and politicians. The lifting of the ban is likely to hamper efforts to sufficiently delineate illegal mining and practitioners will be able to take advantage of the blurred line between illicit and legitimate artisanal mining to avoid prosecution.

With an estimated 200,000 illegal miners operating in Ghana, there is also great potential for ethnic tensions between the Chinese workers in Ghana and the local population, between law enforcement and local communities and between farmers and artisanal miners. In the absence of a robust framework surrounding illegal mining, farmers will continue to fall prey to galamsey which, by extension, will pose a serious threat to Ghana's food security. Mining companies that have paid for large concessions are also affected by illegal miners encroaching on their territories.

"Moving forward, SGS would like to encourage the development of metallurgy activities in Ghana, adding to our portfolio of services as part of our minerals division. Currently, metallurgical lab testing is undertaken only at the Tarkwa Mines University without commercial options available with most clients sending the metallurgical testing to South Africa, Australia or Canada. Ghana does have good local expertise in this science and SGS will consider commercial options if demand is sustainable. This is also the case for advanced geochemistry with work outsourced offshore currently. Of course this is a medium to long term plan as Ghana has to grow local depth and expertise over the coming years."

Mark Davidson, Managing Director – Ghana, Liberia & Sierra Leone, SGS

If properly regulated and developed, however, this market segment does present opportunities for local development and economic growth. With the right support, some small-scale miners may even grow to fill the gap in the mid-scale juniors space.

As one of the region's more mature mining jurisdictions, Ghana is a country from which others can learn as they gain momentum. Ghana's mining industry has seen a great deal of success, but the competitiveness of the region's leading gold producer may wane as juniors pursue less-explored terrain in countries with greater incentives to invest in greenfield projects. Rather than placing an emphasis on attracting a continuous flow of new investment, Ghana has instead adapted its operating environment according to the producers providing greatest economic benefit in the present. However, with a renewed emphasis on diversification of Ghana's resource exploitation and some promising projects in the pipeline, the mining sector will continue to be key in the country's economic development, and investors will find peace of mind in its longstanding stability and proven track record of successful projects.

Ghana's Mining Outlook

"The long tradition of mining in Ghana definitely creates an advantage to us as they understand the mining sector. In Ghana particularly, mining is the a major source of revenue and the governance is willing to develop these industries in order to increase revenue and create more jobs. If you go into more modernized jurisdictions you need to drill deeper and you need to look harder. In Africa overall, there is potential for easier opportunities and also much larger opportunities, which is why we focus on Africa."

Vincent Mascolo,
CEO, IronRidge

"What the new government has done so well is to ensure that all departments involved in the extractive industry in the country are communicating. What could be improved, and is being considered at the moment, is automation and other technical aspects in back office functions which will be important to increasing efficiency."

Archie Koimtsidis,
CEO/MD —
Cardinal Resources

Photo courtesy of Iron Ridge

Local Expertise, International Standards

Local and international service companies can derive value from mutual cooperation.

The overarching trends in the service segment pivot on complete turn-key solutions and reactivity. Many service providers are expanding their capabilities, if they have not already done so, to become a "one-stop-shop" for their clients, responding to the longstanding preference of companies at the end of the supply chain to work with fewer suppliers. When available, international mining and exploration companies look to local service providers, as long as they can compete at the same standards as the international alternatives. Many companies are responding to demand for fast responses through greater proximity to the client, whether by setting up bases in the main mining regions or at the mine sites themselves. For many international suppliers, these demands will mean working with local distributors rather than necessarily setting up shop in country themselves. Across the continent, a large number of local distributors hold consignment stock for international suppliers and carry out aftersales services on their behalf. Holding stock domestically is key, particularly with the added delay of lead times at customs on top of shipping. Particularly well known is the JA Delmas network of Caterpillar distributors, which came into being in Senegal 160 years ago. Today, JA Delmas' agreement with Caterpillar includes 11 countries around Senegal and consists of 2,300 employees located in Africa.

Demonstrative of how important the services that go along with equipment supply are is the emphasis placed on aftersales by these suppliers and their distributors. "There is of course the initial capital investment in the equipment, but the real value for us comes when the mine begins operation – the training of the operators, for example, and then the maintenance," commented Samuel Modicom, the country manager of Saudequip, JA Delmas' Senegal operation. "Some customers may choose to carry out their own maintenance, but it is increasingly common for companies to subcontract their fleet maintenance entirely. This means long-term business for us over the life of the machine. On average, about 40% of our revenue comes from our customers' capital investment, about 50% from parts and services, and about 10% from newer services such as rental."

"New systems are being put in place to control import of goods and equipment in many countries of West Africa, ultimately to modernize and bring more transparency to the network. This transition is not without the usual pain but it is coming along slowly. In general, companies operating in the region for a while are used to these challenges and we try to mitigate them by increasing inventory levels, for example."

Vincent Gonthier, Director – Development, Forage FTE Drilling

JA Delmas is currently looking to add complementary products to its Caterpillar-focused offering, for which it has partnerships in the pipeline for drilling and crushing equipment as part of a drive to provide a full line of products and services to mine sites.

The major drivers for product development and innovation are safety and efficiency. "We are seeing a lot of technical development with machinery; automation for example, is making our drill rigs safer and helps reduce human error," commented Vincent Gonthier, director of development at Forage FTE Drilling. "Interestingly, these new technologies are entering West Africa at the same time they are arriving in North America and Europe, since many companies and distributors are doing business globally now."

Remote control at sites and autonomous vehicles are at the forefront of these technologies. As well as higher productivity, the reduction of human error is highly beneficial, particularly where skill and training may pose a challenge. "Within the mining industry, driverless vehicles will become increasingly popular," commented Fredrik Morsing, managing director at Scania West Africa. "A driver can be a resource but is often an obstacle due to the significant amount of training required. Autonomous vehicles will be more reliable through reduction of the "human factor"."

When it comes to the implementation of new technologies, however, it is important for companies to consider the resources at hand, the project requirements and the potential impact of these technologies on the workforce. "Mining companies need to take into account what the best fit for their project will be," emphasized Edwin Obiri, CEO at DRA Global. "There is an international pressure for efficiency and optimization through technology. It is possible to 100% mechanize a mine, but the socio-economic impact needs to be considered. Job creation remains important, and there is a need to retain value and develop skills locally."

Training has become a major preoccupation for many companies, even without factoring in the introduction of new technologies. Particularly in countries with less-developed mining sectors, sourcing skills can be very challenging. "An interesting characteristic of Africa is that the skillsets are totally different in neighboring countries, which is a factor to be considered when taking training into account," highlighted Grant Palmer, country director for Geotech Drilling Africa in Burkina Faso. "Standards are also often different across borders. The training we offer at Geotech is always ongoing and the company's standards are higher than most, even in North America and Europe."

With differing skillsets to contend with and often building on no prior experience, manpower alone will not lead to efficient execution. "While labor in West Africa was once considered low cost and therefore an advantage, it is now apparent that in most instances the need for more people to work the same job has negated this attraction," underscored Beau Nicholls, CEO at Sahara Natural Resources, which offers specialized services across the mining life cycle in areas including surveying, geotechnical, hydrogeology, operational improvement and consulting, with a

focus on West Africa. "We are constantly training our people so we can work efficiently and delivery a high-quality international service. The few expats we have are West African expats moving around the region to transfer their knowledge and expertise as we establish activities in new countries."

Long-term benefits of knowledge transfer include the opportunity for local employees to benefit from training and go on to set up their own businesses. Particularly in countries with more mature mining industries, there are many cases of local companies growing out of expertise gained at international entities.

While local content guidelines are outlined by most governments, when it comes to service providers, there is still a need to operate at international standards. Cost is certainly a factor, but mining companies will generally not compromise on the quality of their suppliers' products and services. "High quality products are the preferred choice in the region and, although the importance of quality may have decreased slightly during the downturn in favor of lower cost products, it has generally been the predominant aspect over pricing," commented Martin van Gemert, managing director at Mincon West Africa, which primarily supplies DTH products to West Africa and has its local base in Senegal. "Whilst price can be a consideration, our customers generally recognize that higher quality means increased longevity and efficiency, leading to overall cost savings. Therefore, while the initial CAPEX investment may be higher, cost per meter will be lower."

Mincon is currently looking for distributors that can comply with the company's standards.

Successful local providers are those that grow to be internationally competitive, thereby offering a worthwhile value proposition to potential clients beyond compliance with local content guidelines. In Ghana, for example, Atlantic Catering & Logistics' CEO and founder drew on 15 years of past experience in the industry to establish a highly competitive local provider working to international best practices. "From the outset, our systems met international standards regarding quality and across all aspects that industries look out for," said Atlantic's CEO, Maud Lindsay-Garmat. "Over the last four years, we have acquired many customers, not just local companies but also multinational ones, and today we have a staff of 55, which is also growing by the day. We also have another project in the pipeline which, should all go according to plan, would increase our labor base by about 200%."

Atlantic Catering & Logistics is now on the lookout for partnerships to grow the business. "Our message to the mining community is to trust local brands – we are a 100% Ghanaian company and exercise the same standards of operation as the international companies," stressed Lindsay-Garmat. "Only working with local companies and individuals can truly grow the local communities. Whilst many multinationals repatriate funds back to their country of origin, we keep them in the country and seek to develop a strong local value chain so we can continue to supply the right products at the right price."

Indeed, there is great economic benefit to be derived through local companies partnering with international ones, learning to implement and operate according to international best practices, driving their competitiveness. These companies then have the opportunity to serve the rest of the region from a more local base, taking advantage of simplified supply chains and a deep understanding of the cultural and business environment.

However, organic growth and market penetration can be a challenge for local companies. Lack of local financing solutions is a major constraint, particularly felt by those without investment power from overseas to expand capacity and penetrate new markets. "Acquiring equipment can be a problem – funding investments can be a challenge since banks want a guarantee and often take some time to react," commented Adama Ouedraogo, CEO at Satel, a Burkinabé company focusing on conventional energy and telecommunications infrastructure. "It would be highly beneficial if the government could make provisions for local service providers to build their capacity more easily."

While there are some feasible financing options emerging, there is still a long way to go. Scania, which provides vehicles and solutions to the mining industry and established a base in Ghana four years ago, is seeking to ease its customers' financial burden. "We see ourselves as a partner to the mining industry, not just a vehicle manufacturer and supplier," emphasized

"The mining industry in West Africa has taken a serious toll on the environment and companies are now doing what they can to reduce the impact of these operations. Mincon is endeavoring to manufacture environmentally-friendly tools, and we are now looking at long-term projects for proper recycling of disposed tools, such as the discarded rock drilling tools. We are also involved in an international project for the development of what we call the Green Hammer, a DTH hammer currently being tested in Australia. Once launched, this will be a big game changer for the industry, as it will enable the use of smaller machines with lower emissions, therefore polluting less and achieving the same goal at a lower cost due to higher efficiency."

Martin van Gemert, Managing Director, Mincon West Africa

Morsing. "We provide solutions for in-fleet management, as well as in-house financing for our customers. Finding financing locally can be very expensive; we provide financing at a very competitive rate. Roughly 90% of our customers take advantage of these financing solutions, and we find that our credit losses are very low."

There are many local companies operating successfully in West Africa, but many more face hurdles and market entry barriers. Through support from both governments and the private sector, there is great potential for sustainable growth of the local services segment across the region, but a degree of facilitation is required to allow companies to build capacity and flourish.

ADAPTING SOLUTIONS

International companies often have the upper hand when it comes to market penetration and winning new contracts – they tend to have stronger investment power to expand capacity, and their brands tend to resonate more with the head offices and procurement personnel of the international mining companies. However, a need remains to adapt to the local environment. Satel, for example, is adding




value through local input into imported technologies. "We largely import technology but tend to tailor solutions for a particular application," explained Ouedraogo. "With solar technology, for example, there is a necessity to adapt the solution to the climate since we do not have the same wind magnitude as other geographies. If we import materials from other countries and fix them here without adapting them to the local environment, the structure will fall after one season. We therefore often build our own solar plant foundations, using our local expertise to complement an existing solution and optimizing it for our clients' purposes."

Even for internationally-recognized brands, getting a foot in the door at mining companies can be a challenge where preferences are already set. Referencing Nissan's strategy to increase its market share in West Africa, Imad Ghorayeb, regional mining director, summarized: "Although Nissan works with some of the major mining companies, there is a historical preference for Toyota, partly driven by the decision-making power for many of these companies sitting in South Africa, which can be difficult to overhaul."

Working hard to ensure their equipment and vehicles are fit for purpose, many brands suffer from the impact of imported products that are not properly adapted to the market. "The vehicles in Africa require higher severity ratings than in other locations – we operate at the highest severity rating of 56 compared to a rating of 30 even in Dubai," stated Ghorayeb. "The conditions in Africa require "tropicalized vehicles" which are adapted to the specific geographical environment. They are adapted to the heat, humidity and rough terrains – extremely important considering the poor road infrastructure, particularly in the more remote locations where the mines sites are. It is also important to adapt the vehicle engines to the diesel available in the region. An imported vehicle may not be able to handle the available fuel and the engine could quickly be ruined. Importing vehicles and equipment from other parts of the world can have an extremely negative impact for the brands. A model imported from another country and sold in Africa might be cheaper, but it has not been adapted to African conditions and will likely not last long."

Reputation is key for all service providers looking to build their mining business and, as such, quality is paramount across products and associated services. Because of the opportunity for long-term business growth and often lower entry barriers, many service providers are positioning themselves as partners earlier in the exploration stages.

REDUCING DOWNTIME

Predictive maintenance through monitoring and analytics is also gaining momentum to maximize operational output. "With a big data and analytics solution, the company can predict and prevent problems by applying predictive analytics to a vast volume and variety of near-real-time and historical production variables," noted Babacar Kane, general manager at IBM. "It can detect and alert facility managers on impending machine malfunctions, allowing them to change production conditions or implement preventive maintenance to avoid machine failure. The solution can also determine the root cause of quality issues, helping the company manage conditions to avoid costly product defects."

The next step is to utilize advanced analytics within prescriptive maintenance systems, which not only make the recommendations but also act on them. In this way, technology can play a major role in increasing productivity by reducing downtime. "Downtime is key in mining operations," stated Andrew Sarsons, mining director at Burkina Equipements, the Burkina Faso arm of the JA Delmas network. "A lot of methods used by mines today were not in place 20 years ago. Today the focus is more around driving productivity and efficiency while being cost effective… If a machine goes down and we do not have the part in our inventory, that machine could stand for three weeks. The mining philosophy is "repair before failure". We work with our customers more and more on planning engine or component change-outs before they fail. With scheduled downtime, we can work with our customers and plan effectively to ensure production targets are achieved."

JA Delmas is now investing in technology to better monitor performance, which will relay any default to enable repairs to be managed proactively before major damage is done to the machine. 2,000 machines are already connected, and the figure is expected to increase to 3,000 by the end of 2018.

Echoing the importance of proximity to the customer and rapid responses, Etienne Lefevre, general manager at DEM Ghana, outlined the measures taken by the company: "DEM has dedicated service technicians on site to reduce downtimes for customers. We also carry out regular site visits to follow up with our customers and do maintenance work. When required, our experienced service engineers can travel to remote locations to perform fast troubleshooting and fault diagnosis. Our modern equipment and specialized tools allow us to quickly restore machines to full capacity. Our mobile teams have been trained to minimize downtime to let our customers reach their objectives of productivity. DEM is able to fully assist and support local companies which do not have significant experience within the mining industry."

DEM Ghana has been in operation since 2013 and is the official dealer for Hitachi, John Deere and Wirtgen Group within the country. Although initially focused more on construction, today approximately 80% of business is within the mining industry. Some of DEM's priorities are to establish branches in different mining regions to be closer to customers and establish on-site facilities to deliver the highest level of support possible.

Successful suppliers to the mining industry will continue to be those offering high quality products and services. With time and a supportive attitude to development of local companies, the playing field will be evened out so national and international companies alike can compete side by side and derive value from mutually-beneficial partnerships.

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