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2022

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ABOUT PUBLICATION

Mining Zimbabwe is the premier source of Zimbabwe Mining News. Our core focus is the Zimbabwe Mining Industry, trends, new technologies being developed and used to improve this crucial sector, as well as new opportunities and investments arising from it. Mining Zimbabwe's sole purpose is growing and empowering the Mining Industry and highlighting all its challenges as well as putting forth expert solutions

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CONTENT

Mining Zimbabwe Magazine | Issue 55

05

Interview:

Kuvimba Mining House
 Chief Executive Officer



INSIDE MINING ZIMBABWE

06 THE CLEAR PERSPECTIVE

08 **Interview:** Mines and Mining Development Minister Winston Chitando

12 RioZim Biox plant breathes new life to Zimbabwe mining industry

14 AANR poised to exploit the Nickel Supply Cliff



16 Interview: Elton Gwatidzo Mine Manager - HOW MINE

18 2021 PROJECTS

26 CALEDONIA focuses on underground development to increase production

28 Widening the Investment Spectrum In the mining sector

32 Bright prospects for Panashe Muguza

36 Casualties in mining drop significantly

38 CHEMICAL SUPPLY to the Mining and Manufacturing sectors in Zimbabwe



40 Mining Cyber Risks and Insurance Solutions

42 Gold Mining, buying/selling and registration in Zimbabwe

46 Gearing towards a sustainable future - Importance of ESG in Mining

48 Investment opportunities in the Zimbabwe Semi-Precious and gemstones industry

52 Minerals and areas of verified deposits in Zimbabwe

36



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INTERVIEW



KUVIMBA MINING HOUSE CEO

Simba Chinyemba

A brief introduction of yourself?

My name is Simba Chinyemba. My current role is CEO for Kuvimba Mining House (Pvt) Ltd. I am an actuary by profession. I enjoy hiking, travelling and seeing the world. Indeed, I have lived in 7 countries now, including Zimbabwe where I am glad to be back. Prior to my current role, I have held various leadership and board roles gained in the United Kingdom, Bermuda, Asia, the Middle East and various African countries.

You are running the country's biggest Mining House what is your working day like?

I would start with a comment on the "running the company" part of your question. As Group CEO of KMH, I really am just the figurehead of a team of leaders including the CFO, Innocent Rukweza and the COO Cobus Bronn. In a different world without titles, we might have seen ourselves as co-CEOs. In addition, most of our mines have their own senior management structure with CEOs who report into the team at group level.

My day is therefore mostly spent discussing matters of strategy and operational progress with the various leaders we have in the business. I also typically engage the different stakeholders we have in the business regularly to ensure that we are still aligned in our common objectives and where necessary, adjust course to ensure alignment.

Which assets (Mines) does Kuvimba currently own?

Kuvimba owns quite a large array of assets either as 100% owner or as a majority shareholder. These are:

- **Freda Rebecca Gold Mine**
- **Bindura Nickel Corporation**
- **Shamva Mining Company**
- **Jena Mines**
- **Elvington Mine**
- **Sandawana Mine**
- **Zimbabwe Alloys Limited**
- **Great Dyke Investments**
- **Homestake Mines**

How much Capex has Kuvimba injected into Mining projects since its inception?

Kuvimba has injected significant funding into the operations, the funding was meant to acquire the assets, and address the mines expansion CAPEX and working capital requirements. The funding was in excess of US\$300 million.

How many people are employed by Kuvimba?

Kuvimba currently employs over 4000 employees across the different mining assets we have.

Are there any CSR programmes you are currently engaged in?

All our major mines have CSR programmes in the communities. There are indeed so many it would be difficult to mention them all for this interview.

Just a few examples we have are: Refurbishing and equipping the schools in the villages, providing accessible medical care to the communities through our clinics. We have also opened Covid testing centres and isolation centres which are made available to the communities around our mines.

Are any new projects slated for this year?

The three major projects that we have going on are :

1. Creating an open-pit mine at Shamva. This will likely be the largest open-pit gold mine in the country both by size and production.
2. Exploration project at Sandawana where initial indications show a large scale lithium resource.
3. The Darwendal Platinum project which is still ongoing and is of course part of our major projects.
4. Resuscitation of the Zimbabwe Alloys mining and ferrochrome production complex.
5. Assisting the Government of Zimbabwe in the turnaround and resuscitation of the Ziscosteel integrated steelmaking complex.

Given the size of Kuvimba, we also have many other exploration and development projects constantly happening at our various mines and assets.

What exploration projects are you currently undertaking?

As I mentioned above, we have exploration projects at nearly every asset we have. This is indeed a standard part of our operating ethos. We also have major exploration projects going on at Sandawana and Freda Rebecca Gold.

Some of our readers expressed disappointment that important projects specifically Bikita minerals and Arcadia lithium went to foreign companies. Is

there no interest in minerals like Lithium for Kuvimba?

KMH has an interest in Lithium. Indeed, we are currently exploring one of our resources where current indications are that we have a very large lithium resource at Sandawana.

As a predominantly Zimbabwean owned company, we obviously wish that most Zimbabweans are able to take part in our economy through both ownership and employment in our massive natural resource sector. As Kuvimba, we do our part in this regard by being both majority owned by the government and also through our listing program which I will outline below. Our timeline is beyond generations and therefore we acknowledge the lack of capital in our country. In that regard, we welcome the interest in Zimbabwe lithium from foreign companies and view it as good for the economic development of our country. When the President said that Zimbabwe is open for business, the practical meaning of that includes that we are open to foreigners investing in our country, especially in the mining sector.

What is the current progress at the Darwendale Platinum mine?

The Darwendale project is still ongoing. The original project was modelled on the possibility of underground mining. After further exploration and analysis common to projects such as this, it is now believed that the orebody may be more amenable to an open-pit project. GDI is thus remodelling the whole Darwendale project in order to take this into account. Further updates will be provided in due course.

Continued on next page



What is the plan of action for the Zisco resuscitation?

The resuscitation of Ziscosteel is a major project. KMH's role is to be the government's partner in the turnaround program. This involves leading the strategy formulation, capital injection and raising efforts and helping the board and management of Ziscosteel make the necessary strategic decisions. The plan involves scaling up the iron ore mining capacity of Ziscosteel, Resuscitating the steelmaking complex and ensuring that the products from Ziscosteel.

How much gold did you produce last year and what are your targets for this year?

Kuvimba produced 115,136 ounces.

The government has been calling for mining houses to list on Victoria Falls Stock Exchange (VFEX) are there plans for you to list?

KMH has heeded this call by the government. In December 2021, we led the movement of Bindura Nickel Corporation from the ZSE to the VFEX. We also have major plans to list at least 2 more major companies within the next 18 months. Given the confidential nature of various regulatory processes involved in listing companies, all I can say for now is watch this space. We will be making necessary announcements at the appropriate times.

Since the fall of Mhangura mine, the country's copper production has been relatively low to the extent that copper was not mentioned as a significant mineral towards the achievement of the US\$12 Billion milestone. Are there any copper projects you are interested in or currently undertaking?

KMH does not currently have a presence in the Copper sector. We however believe that Copper is an important metal in the economy of the future. We are therefore always looking at opportunities and if one presents itself in a manner that aligns with our vision and strategy, we will definitely consider it.

Chamber of Mines has a zero harm mantra, how is Kuvimba working to achieve zero harm at its mines?

The Group continued to enforce its ZERO HARM policy and sought to create a safe working environment by creating a culture that promotes safety, teamwork, and accountability. Our SHE management system ("SHEMS") is based on ISO 14001:2015 and ISO 45001:2018 which continued to blossom and guide the business sustainability. In the financial year under review, the Group's SHE performance continues to be exceptionally better than international and Zimbabwean mining standards. Prior to Kuvimba, one of the mines used to have two fatalities annually, now the Group sustainably achieves ZERO fatalities.

In terms of environmental rehabilitation after mining, what measures are the company currently undertaking to ensure the land can be used for other purposes?

There are various mining regulations in our country including specific requirements on rehabilitation of the environment after mining. As a group, our policy is to comply with all the relevant regulations in all the areas we operate in. Indeed, our motto is Beyond Generations. That in itself means we take very seriously our environmental responsibilities not just today but also for a future that may be beyond our current generation. ENDS//





Interview: Mines and Mining Development Minister **Winston Chitando**

Zimbabwe is one of the richest countries on earth with over 63 discovered and proven Minerals.

By Keith Sungiso

It is a haven for Mining enthusiasts and is home to almost every mineral any Mining die-hards can ever dream of. From gold to platinum, lithium, diamonds you name it we have it all.

Many across the globe have unanswered questions on how they can have a piece of the Zimbabwean cake and Mining Zimbabwe took this opportunity to speak to the country's Mines and Mining Development Minister Hon Winston Chitando to shed light on investing in Zimbabwe.

KS May you give a brief description of the Mineral Resources in Zimbabwe?

WC Zimbabwe has excellent geology, comparable to that of leading mining economies and has unique and highly prospective geological environments:

- Expansive craton with high diamond prospectively;
- Widespread greenstone belts rich in precious metals, precious stones, base metals and industrial minerals;
- The Great Dyke;
- Precambrian sedimentary basins rich in placer gold and diamond deposits
- Karoo basins rich in coal, coal bed methane gas (CBM), natural gas and uranium.
- Metamorphic belts rich in pegmatite minerals such as lithium, tantalite, rare earth elements etc.
- Zimbabwe is host to about 60 minerals whose commercial profitability has been proven at one point or another. The major minerals found in Zimbabwe include Gold, Platinum Group Metals (PGMs), Diamonds, Chrome, Ferrochrome, Nickel, Copper, Iron, Lithium, Coal, Coal Bed Methane (CBM) gas etc. Zimbabwe also has huge potential for Rare Earth Elements (REE) as well as oil and gas.

KS Which are the most sought-after minerals in Zimbabwe?

WC The major minerals are gold, diamond, PGMs, nickel, diamonds, chrome, coal and coal bed methane gas and lithium.

KS Why should investors consider Zimbabwe and why?

Zimbabwe is Open to any Investor regardless of their nationality. There are a number of foreign investors in Zimbabwe including Africans, Americans, Canadians, Europeans, Russians, Indians, Chinese e.tc.

WC Zimbabwe's mining sector presents many competitive opportunities to different needs of diverse investors as a result of:

- The abundance of mineral resources;
- Availability of a highly skilled labour force that is willing to work;
- Attractive Investment Incentives;
- Functional systems:
 - i. Effective and efficient minerals marketing system;
 - ii. Investor-friendly Mines and Minerals Act – currently being amended to
 - iii. make it more competitive;
 - iv. Responsive relevant Government Ministries and institutions;
 - v. Progressive policies e.g. Ease of Doing Business and Rapid Results
 - vi. Initiative (RRI);
 - vii. Availability of good basic infrastructure – power, water, rail and road network.

KS Are foreign Mining Investments in Zimbabwe safe won't there be any taking over of investments because one is foreign e. g the 49/51% ERA?

WC The government exempted the mining sector from complying with equity thresholds of the Indigenisation and Economic Empowerment Act. Investors can now own 100% shareholding in all mining projects across the sector.

KS Are foreign investors allowed to go it alone without being tied to partnerships with locals?

WC Access to prospecting and mining ground may be easily obtained by:

- i. Acquisition of Prospecting license
- ii. Pegging and registration of mining claims
- iii. Purchase/lease/tributing of existing

properties

iv. Entering into joint ventures with existing mining projects both private and public (mainly Zimbabwe Mining Development Corporation).

KS Are there still any foreign investors in Zimbabwe other than Chinese?

WC Zimbabwe is Open to any Investor regardless of their nationality. There are a number of foreign investors in Zimbabwe including Africans, Americans, Canadians, Europeans, Russians, Indians, Chinese e.tc.

KS Is an investor able to take their money out of Zimbabwe?

Yes, the Government can make arrangements with the Investor.

KS There are Media reports of disputes will an investor not wade into one unknowingly?

WC The Government will introduce a computerised Mining Cadastre system for the ease of management of mining titles. The Cadastre system is meant to expedite the process of mining administration and mineral accountability.

KS What's the current time frame from registration to actual mining?

The timeframe is variable depending on the type of Mining Title. In recent years there has been an influx in the application for Mining Titles. The Ministry of Mines and Mining Development is currently undertaking the Backlog Clearance Programme in various Provinces to accelerate the registration of titles.



Minister Chitando overseeing the signing ceremony of a Lithium deal between Prospect Resources and Huayou Cobalt in Harare recently

KS Are there any partnerships government is currently looking for?

WC The government of Zimbabwe participates in mining through its Parastatals including Mining Promotion Corporation (MPC), Zimbabwe Mining Development Company (ZMDC), Zimbabwe Consolidated Diamond Company (ZCDC) and Defold Mine (Pvt) Ltd. These Parastatals seek strategic partnerships to execute Mining Projects efficiently.

KS I need to buy gold from Zimbabwe, how do I get the license?

Gold Buying Licenses are issued by Fidelity Gold Refiners depending on the financial capacity of the Investor.

KS Since your appointment as Mines and Mining Development Minister what have been your achievements?

- Sustained growth of the Mining Sector through the USD 12 Billion Mining Industry Roadmap. The Mining Sector has witnessed significant growth on the back of programmes including increased exploration, resuscitation of closed mines, opening of new mines, expansion of existing mining projects and mineral beneficiation and value addition.

- Zimbabwe was made the Vice Chairman of Kimberly Process Certification Scheme (KPCS) in 2022 and will chair KPCS in 2023.
- In addition, Zimbabwe was nominated as the Vice Chairman for the African Diamond Producers Association (ADPA) in 2022 and will chair ADPA in 2023. The results of the

election are an endorsement of Zimbabwe's engagement and re-engagement drive with all nations of the world.

KS The government set up a 12 Billion dollar (USD) Mining Industry target by 2023. What mechanisms have you put in place to ensure you reach the target and are you on track?

WC The Mining Sector has grown from a benchmark of USD2.7 billion in 2017 when the 2nd Republic started to USD 5.2 billion in 2021. The Mining Sector remains on course towards the achievement of a USD12 Billion Mining Industry by 2023. The USD 12 Billion Mining Industry is anchored on a number of mechanisms including:

- Opening of new mines, resuscitation of closed mines and expansion of existing mines.
- Enhanced Exploration
- Enhanced Investment and Capacity Building
- Promotion of Value Addition and Beneficiation
- Increased Mineral Exports and Foreign Currency Generation
- Increased Capacity Utilization and Employment Creation
- Regular Monitoring and Evaluation of the Mining Sector Projects
- Attracting relevant long-term capital, both domestic and Foreign Direct Investment;
- Continued development of skills and expertise

KS An investor would like to set up value addition facilities in Zimbabwe are there any incentives for such ventures?

Local mineral beneficiation and value addition is quite key to ensure the minerals generate more revenues both for the Government and the investor. It also creates more employment opportunities for the local Zimbabweans. In order to promote and support local beneficiation and value addition, the Government came up with incentives such as:

- Reduction on Tax and Royalty Fee to the Miner
- Rebate of duty on Mining Capital Equipment being imported.

KS Comments to those who relegate Zimbabwe as a bad investment destination?

WC Zimbabwe is open and ready for business to the mutual benefit of our Nation, our communities and the investor. The Zimbabwe Investment and Development Agency (ZIDA) was formed through an Act of Parliament. ZIDA is mandated to promote and facilitate investment into Zimbabwe, including mining. The coming in of the new dispensation has increased investor appetite. In that regard, the mining sector has a number of areas in need of investment including areas of exploration, opening up of new mines, resuscitation of old mines as well as expansion of existing operations. A number of investment projects are at various levels of implementation.



Minister Chitando at the commissioning of the RioZim Biox plant in Kadoma

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RioZim Biox Plant

breathes new life to Zimbabwe mining industry



Diversified resource firm, Rio Zimbabwe, has broken new ground by setting up Africa's biggest biological oxidation plant at its Cam and Motor Mine in Kadoma, a move expected to increase the company's gold production while paving way for other mining companies to attain value from their refractory ores.

By Prince Sunduzani

The plant, which is a first of its kind, is set to revolutionize gold mining in the country as it clears the path for the reopening of old mines and expansion of existing ones.

This monumental plant, which was commissioned last Month by Zimbabwean President Emmerson Mnangagwa is finally

operational after facing serious hurdles, with covid 19 and accessibility to foreign currency.

The President hailed RioZim for its investment in the growth of the country's mining industry through technology-based solutions.

FACTS ABOUT THE RIOZIM BIOX PLANT.

- 1. IT'S THE EIGHTH OPERATING BIOX PLANT IN THE WORLD.**
 - 2. THE BIGGEST IN AFRICA.**
 - 3. THE SECOND BIGGEST IN THE WORLD.**
 - 4. THE ONLY ONE IN ZIMBABWE.**
- New Life for Zimbabwean Mining industry.**

According to Zimbabwe's Ministry of Mines and Mining Development, most of the country's gold ores have an affinity for mercury and cyanide solutions in terms of the way they are processed. However, a significant portion of the country's ores is said to contain certain sulphides such as arsenic antimony and compounds of copper.

Experts, propound that a significant part of the gold in our country is held in refractory sulphides. "refractory" gold ore is an ore that has ultra-fine gold particles disseminated throughout its gold occluded minerals. These ores are naturally resistant to recovery by standard cyanidation and carbon adsorption processes.





RioZim Chairman Saleem Beebejwan

This then means that mines in Zimbabwe have been failing to recover this kind of gold and have been thrown a lifeline.

RioZim Chairman Saleem Beebejwan says "it is destined to transform the mining landscape in our country through technology."

The company's CEO Manit Shar said the company built this plant with Zimbabwe's mining industry in mind. Their goal is to enable Zimbabwean mining companies to be able to access the gold which they previously couldn't.

"We at RioZim are committed to unlocking mining value through investment in technology. In that way, we undertook the challenge to enable Zimbabwe to process refractory gold ore. After considering a lot of options, we finally landed on BIOX short for biological oxidation, which is the most environmentally friendly way to treat such ore today, he said."

The Minister of Mines Winston Chitando said Zimbabwe partnered RioZim to breathe new life into dying mines and pave the way for the reopening of mines that were closed down because of this situation.

Most mines were closed when the Kwekwe Roasting plant, which used to provide a similar facility closed down as there was no other place where they could treat such ores.

He said his ministry realized that it was important to partner with an investor who would be able to provide solutions for the treatment of these refractory ores, not only for their own needs but to establish the technology and be in a position to free up the opportunity for all treatment ores.

"The idea was and is that would then enable a lot of mines which were closed at the time the roasting plant in Kwekwe closed. The roasting plant in Kwekwe used to provide a similar facility for a total treatment of factory ores which as was mentioned earlier on by the chairman of and was explained in there are technologically very difficult and also

capital intensive so a centralized solution or centralized solutions it was important that government partners with an investor who would provide such a solution.

"The success of these plans opens a completely new chapter for the reopening of several closed mines which have refractory deposits. More importantly, it now enables us as government and other holders of mining concessions which have never come into operations to be able to plan and make sure that these can now come into operation," said Minister Chitando.

Increased gold output at Riozim

The new plant will significantly augment Rio Zim's gold production.

The company says the Cam and Motor Mine gold resource was defined with three different ore zone layers namely, the oxide, transitional and sulfide zone.

The top layer oxide has naturally been oxidized over thousands of years and is amenable for gold recovery using the traditional carbon in the leach process.

However, the gold in transitional and sulphide zones at Cam and Motor Mine is locked up in refractory sulphides, at the risk of oversimplification. The gold particle in such ore is surrounded by waste or sulfides and no amount of cyanidation can recover that gold what is needed is to first remove the surrounding waste. Hence the Biox plant.

The company's general manager Mr Akim Mutiti said the mine personnel have been trained in operating the plant as the company targets 140 KGS per month by the end of the year.

He said RioZim will increase its crushing capacity from 1500 tones per day to 2500.

"We are extremely delighted with the

coming in of the Biox plant that will result in increased gold production. Our team on the ground is fully prepared to successfully run the plants after having gone through various training. We are upgrading our crushing and milling capacity from 1500 to 2500 tons per day, this will be fed into the flotation plant to produce up to 130 tons per day of gold concentrate for feeding the Biox plant. The Biox plant has resulted in a massive increase in gold production from an average of 30 kgs per month last year to the 90 kgs per month is current and eventually 140 kgs per month as the year progresses.

How does the Biox Plant work?

According to Riozim General Manager- Group Engineering and Projects Mr Munetsi Machikicho :

After the ore has been milled to size, it is then concentrated in a sulfide flotation process. The concentrates are then fed into a set of tanks called the Biox reactors for the oxidation process. The bacteria used in the process is resident in these reactors and feeds on the compounds of sulfur where the gold is occluded. The degradation of these sulfides results in the exposure of gold particles rendering it amenable for cyanidation. The prerequisites for optimal oxidation are pH, that is to say, bacteria thrive in acid and oxygen so the reactor must be well aerated and temperature-controlled because the reactions are heat generative.

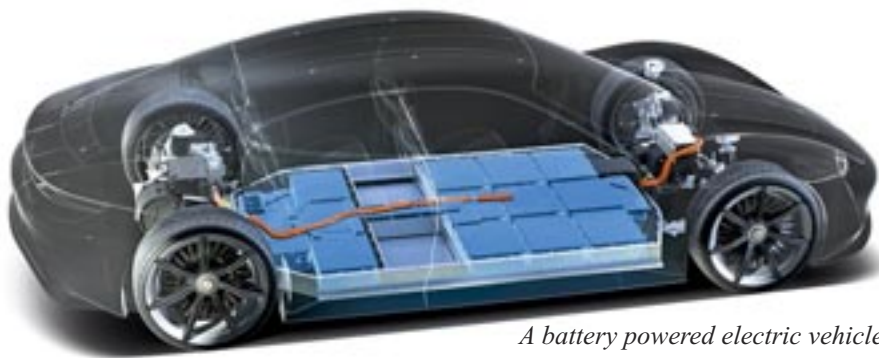
So, the reactors must be cooled all the time. Subsequent to oxidation, the feed is passed on to a set of wash thickeners where the acid, as well as the iron and arsenic in the solution, are removed.

These are called counter-current decantation. The oxidized and washed concentrates are then ready for gold recovery. They are therefore passed down the circuit for conditioning and cyanidation.



Minister Chitando and President Mnangagwa at the commissioning of the plant in Kadoma

AANR poised to exploit the Nickel Supply Cliff



A battery powered electric vehicle

As the stampede for the adoption of Li-ion batteries intensifies, Associated African Nickel Resources Ltd ("AANR") has been growing its mining portfolio in Zimbabwe and Africa at large to satisfy the world's growing demand for Li-Ion Battery technology.

Rudairo Mapuranga

The junior mining company has announced its intention to list on Zimbabwe US\$ Denominated stock exchange, Victoria Falls Stock Exchange (VFEX) thereby attracting significant domestic capital trapped in Zimbabwe pension funds.

Li-Ion Battery technology is an essential component in the electric vehicle industry.

Reports have indicated that the Electric Vehicle rollout promises extraordinary Nickel demand growth, possibly 300-500 percent by 2040. The biggest suppliers of Nickel ore, Indonesia and the Philippines are producing expensive Nickel Oxide deposits that yield toxic waste. AANR Chairperson Ben Mbanga indicated that the company and the Nation are on an expansion drive and are looking to spread their wings across the nickel value chain. This will help the company tap into the ever-growing Li-ion battery in line with the

global shift towards clean energy alternatives.

"AANR is therefore focused on clean Nickel Sulphide deposits in Africa to yield traceable, sustainable EV-Battery Grade Nickel Sulphate and Cobalt Sulphate (99.5% pure). This has seen the company advancing rapidly in exploring nickel and other Li-Ion Battery technology required metals to advance the world's increasing demand for green energy," he said.

Nickel production for AANR remains significant because for small devices and Electric Vehicles, Li-Ion Batteries are unchallenged. Within Li-Ion technology, developments continue to reduce Cobalt requirements in favour of Nickel.

AANR projects in Zimbabwe

AANR intends to Beneficiate its ore in Zimbabwe to EV Battery-Grade Nickel Sulphate + a matching quantum of EV Battery-Grade Cobalt Sulphate – all traced to the source and certified as socially and environmentally responsible. This will likely attract significant price premiums. The following are projects being carried out by AANR in Zimbabwe.

Chaka Project

AANR's Chaka Project incorporates a 19kms strike of the Chakari Belt including the mothballed Perseverance mine (ex Rio) - which closed for safety reasons during the civil war. Historically, float-concentrate from the mine's high-grade sulphide ore was processed at Rio's Empress smelter facility and refinery. The resource may be open at depth and amenable to near-term re-opening. Prospectivity promised by a Thompson model offers a roadmap for discoveries in repetitions targeted along the 19kms strike.

According to the Chaka project's significant investment to date – geophysics,

geochemistry, mapping, Hydrogeological studies, drilling, dewatering etc. The project is arguably in the top 10 global nickel sulphide prospects.

Exploration rollout

Ground-based Electromagnetic Survey - 100x100m TDEM moving transmitter loop; base frequency 1Hz and Average 26Amp pulses. EM targeted at nickeliferous, gossanous outcrop, soil, radiometric, and magnetic anomalies plus off-topographic expressions of bulging serpentinite structures mimicking known ore bodies. Conductors require analysis for differentiation between previously logged graphitic, conductive black shales versus massive sulphides.

Exploration Drilling & Resource Development plans

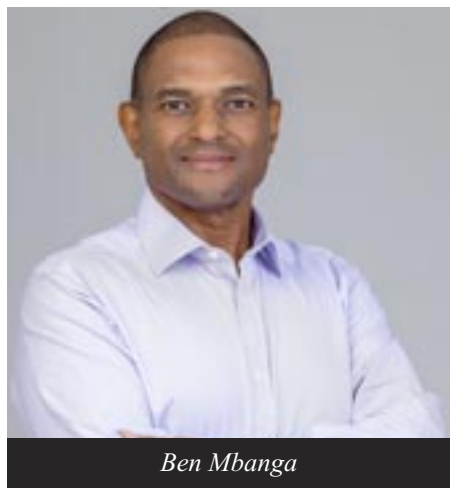
Drill defined anomalies for proof-of-mineralisation; and Massive & disseminated Sulphide bodies were identified to be drilled out to JORC compliance.

Maddy Project

The setting of the Maddy project is within the greater Madziwa Igneous Complex with Brownfield sites and extensive potential for blind ore body discovery based on new geological understanding.

The Maddy project is one of AANR's lead projects with the potential for early production and extensive potential for multiple virgin nickel sulphide bodies. It is a Brownfield with >50,000 tonnes of nickel produced historically.

The float-concentration residues of this history form a 14 million tonne tailings dump. AANR has surveyed & drilled this asset. A JORC compliant Resource of ~25,000 tonnes containing Ni Metal has been declared (mostly in Indicated category). Large parts of the dump are running at 0.2% and over, with early extraction tests showing that much of this is in sulphide particles. Various techniques are being tested to upgrade the dump material to >0.4% Ni whereafter flotation to 5%+ Ni is expected to be achievable. The float-concentration residues of this history form a 14 million tonne tailings dump. AANR has surveyed & drilled this asset. A JORC compliant Resource of ~25,000 tonnes containing Ni Metal has been declared (mostly in Indicated category).



Ben Mbanga

Large parts of the dump are running at 0.2% and over, with early extraction tests showing that much of this is in sulphide particles. Various techniques are being tested to upgrade the dump material to >0.4% Ni whereafter flotation to 5%+ Ni is expected to be achievable.

The Company intends to advance this project to profitable production within 18 months.

During the first quarter of 2022, Maiden JORC Resource Declared 24,923 tonnes of contained nickel metal = ~USD\$1 billion gross in situ metal inventory. A feasibility study has commenced intending to test the economic viability of tailings retreatment – targeting a Reserve and Balance Sheet re-valuation on discounted NPV.

A comprehensive 2015 White Paper authored by Prendergast & Wilson – arguably two of the leading geologists in their field – has essentially revolutionised the Company's view of the Madziwa Igneous Complex and offered (indirectly) a clear roadmap to new deposit discovery. This, therefore, means that Past Geological Survey Bulletins can be largely disregarded.

AANR has conducted extensive geophysical surveys over an area of roughly 10kms x 7 kms (Magnetic survey) to assist in the identification of further anomalous zones with nickel mineralization potential. These

surveys are ongoing and have yielded excellent data prompting more expensive Stage 2 Geophysics. In stage 2, Legacy data & magnetic anomalies highlighted by Stage 1 Geophysics guided a recently completed time-domain electromagnetic survey. A large conductive body was pinpointed. Qualified interpretation leads the Company to believe it represents a massive sulphide, possibly a significant virgin nickel ore body – i.e. a high-value drill target.

Empress Project

The mineralogy and geological setting of Empress Nickel mine are unusual in that it hosts relatively high Gold, Silver, Palladium, Platinum, Rhodium & Rhenium credits in addition to the expected Nickel, Copper, Cobalt. Host minerals, in order of % occurrence, are pyrrhotite, pentlandite, chalcopyrite, pyrite, violarite and chalcocite.

The ratio of Nickel to Copper is also unusual in that it is almost 50/50 @ 14:13. It has become common practice, therefore, to refer to combined base metals ("CM") – i.e. Ni+Cu, when referring to estimated contained metals (i.e. excl Co, Au, PGM's)

Owned and mined by Rio Tinto until 1983, Empress was both open pit & underground, with total reported production of nett 100,000 tonnes of CM (USD\$1.4 billion @ today's pricing). Cobalt and Precious metals went largely unreported.

Rock Stockpiles, slag dumps and float tailings make up some 13 million tonnes lying on the surface – likely bearing some 40,000t CM. Residual underground reserves have been professionally estimated @ 80,000t CM underground excluding lateral extensions which would require exploration & resource definition drilling.

Exploration rollout

Geophysics Surveys around old mine site to detect orebody extensions at depth and nearby; and Targeted magnetic geophysics + geochemistry on surrounding areas, subject to tenure consolidation, to identify targets for EM; and Dewatering followed by limited re-equipping then LIDAR underground survey to map voids/pillars/stopes etc, define residual extractable resource; and Subject to outcomes of above, consider merits of underground EM and drilling for extensions.

Exploration Drilling & Resource Development plans:

Underground: channel sampling + limited drilling of halo; Surface drilling of strong anomalies in lateral extensions; and All above-mineralised zones drilled out to JORC compliance.

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Elton Gwatidzo

MINE MANAGER - HOW MINE

Earlier this year Mining Zimbabwe visited one of Zimbabwe's oldest operating mines, How Mine, for a technical visit with the Association of Mine Managers of Zimbabwe (AMMZ).

Keith Sungiso

The visit saw Mine Managers touring the underground mine sharing technical information and taking notes on how the recently awarded "most improved gold mine" conducted business. I had a sit down with the man running the show Engineer Elton Gwatidzo. It was easy to see why the Engineer was voted President of the AMMZ as the man knew his business.

Here is how the interview went.

KS Tell us a bit about yourself?

EG Elton Gwatidzo is a Mining Engineer who studied at the UZ. He has worked for BIMCO at ZISCO, PanAff-Ayrshire Mine and How Mine. He is married with 3 boys. Holds various mining and management qualifications.

KS How old is Elton Gwatidzo?

EG Elton is 41 years old.

KS What made you choose Mining as a profession?

EG My father is Ex-Wenera so I had an interest in mining interest from a very young age.

KS What's your typical working day like?

EG Early morning daily reports, meetings, news press catch-up and various KPIs tracking.

KS You are running one of the oldest mines in the country, tell us about the history of How Mine?

EG Pegged in 1941 by J. Howe (hence How Mine). The mine Started with open pits and stamp mills for processing. It changed various ownership hands including 1971 when Lohnro took over then Metallon took over in 2002 until today.

KS How many metres below ground level is your deepest shaft and how do you get air circulation down there?

EG The deepest shaft is currently at 33L, 1200m and still sinking further down. Ventilation is supplied through the North shaft and Main Shaft which are intake while exhausting using districts in the old



Gwatidzo with AMMZ members underground at the How Mine technical visit

workings. A negative pressure system is employed.

KS We have seen the new (Level) you are currently working on (opening). Tell us about it?

EG The new mining level being opened is 32L. Shaft sinking is progressing to 36L so as to establish a loading level at 35L which will enable access to ore from 32L. Each mining back is 76m ie from 30L to 32L.

KS Seeing there is lots of Mining in Southern Africa are there any plans for the AMMZ to work with SADC Mine Managers for example and conduct technical visits for information sharing?

EG Post Covid-19, that should be the plan.

KS You have a strong Mining background and as a person who grew up in Mining, is there anything you are doing to help Artisanal and Small-scale Miners around you to conduct proper mining?

EG How Mine has trained Women-In-Mining to obtain Blasting Licenses and basic mining training

KS What policy improvements would you like to see?

EG The main issue is policy inconsistency

KS To ensure the sustainability of the mine, what exploration and capital development projects are you running?

EG The mine is undertaking an aggressive exploration plan for both surface and underground resources at a cost of \$8.2m. The mine is also expanding operations at a cost of \$3m and deepening the 16N7 shaft to extend life at a cost of \$3.6m.

KS In the last five years to current, do you have any upgrades or increases in your mineral reserves?

EG Last five years of exploration have only been to maintain the known resources.





KS What is your production target this year and what measures are in place to achieve these targets?

EG The mine is planning to produce 30koz of gold and over \$5.7m was spent in 2021 to ensure sustained production in terms of capital expenditure.

KS We have seen a mini-town suburb at How Mine, currently how many workers reside in the workers' residential area?

EG Currently 1016 workers reside at the mine



KS Zimbabwe set a 12-billion-dollar mining economy by 2023! Is this achievable?

EG Very possible although the timing is taking a toll. Covid-19 and International instabilities are always affecting the plans.

KS You recently won the most improved

gold producer of the year. What did you do right to achieve improved production?

EG Investing in the business. Investing in new and modern equipment, underground exploration, and underground development. The results were mostly a function of the shaft deepening project commissioned in 2020 at a cost of \$5.3m.

KS What challenges would you say you are facing as Zimbabwean miners?

EG Access to capital, quality of supplies and fair value of revenue.

KS Any words to those who are interested in venturing into Zimbabwe Mining?

EG Zimbabwe is still highly untapped. The vast mineral abundance is still being accessed in shallow operations. There is still huge potential We have witnessed new ventures in Coal, Lithium, Gold, Diamond, Iron Ore and Platinum. More are still opening.

KS Besides Mines and Mining, what's Elton into?

EG Elton is into Golf, farming and some family ventures



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Eureka Gold Mine, Dallaglio Investments (Pvt) Ltd Re-opening, Guruve,



- Eureka Gold Mine has resumed operations after the injection of capital from new investors.
- The reopening programme started in 2018 through a ground breaking ceremony by His Excellency, the President, Cde Dr. E.D Mnangagwa. On October 21 2021, His Excellency, Cde Dr.E.D. Mnangagwa officially commissioned Eureka Gold Mine.
- The project has created employment for 500 employees, with over 300 employees from the local community.
- Resuscitation of Eureka Gold Mine is a success story to the President 's call for investors to invest in the geologically rich nation.

Caledonia Mining Corporation/ Blanket Mine (Shaft Expansion), Gwanda



- Caledonia Mining Corporation completed the construction of the USD 67 Million Central Shaft at Blanket Mine in Gwanda.
- The Central Shaft is expected to boost production to 80 000 oz of gold per year.

Rio Zim Murowa Diamonds Midlands (Expansion Projects), Zvishavane, Midlands

- As at Q3 2021, the expansion was at 78% completion. Commissioning expected in Q2 2022.
- Feasibility Studies for underground mining are in progress.
- The expansion will see Murowa processing 500 000 tonnes per month from 190 000 tonnes per month.

Anjin Investments (Pvt) Ltd Diamond Reopening, Chiadzwa, Manicaland

- His Excellency, Cde E.D Mnangagwa officially reopened Anjin Diamond Mine in August 2020.
- Anjin Diamond Reopening Benefits
 - i. Increase in diamond production to achieve 10 million carats by 2023, peaking at 12 million carats 2025.
 - ii. Employment creation

Shamva Gold Mine Reopening, Shamva

- Shamva Gold Mine Project reopened in April 2020 since closure in January 2019 and currently the mine employs 800 employees.
- Exploration was completed in 2021 with the project set to produce 250 kg of gold per month in addition to the current production of 900 kg per annum (75 kg of gold per month).
- Plant and Mine Construction to commence in February 2022.
- Shamva Gold Mine to build 800 houses, 2 schools and a clinic and contribute to the growth of Shamva town.
- Shamva Gold Mine benefits
 - i. Ore production expected to meet the design capacity of the mine of 30 000 tonnes of gold ore per month.
 - ii. Employment creation of 1000 people directly and indirectly.

RioZim Cam and Motor Mine (Expansion Project) Kadoma,

- The USD17 Million Biox Plant project is nearing completion. The project will be commissioned in Q1 2022.
- The gold production will reach 140 kilograms per month, during the first phase of the project, and will peak at 200 kilograms per month, after Phase 2 is implemented.
- The project has created employment for 100 locals

ZCDC (Expansion Projects), Chiadzwa and Midlands



- ZCDC commissioned a 450tons per hour metallurgical process plant. The mining company is expanding operations from alluvial operations to conglomerate ore processing. ZCDC is the first mining company globally to process conglomerate ore and is using state of the art technology such as X-Ray Transmography technology.
- ZCDC ramped up production which saw them surpass their 2021 target of 2 million carats.
- To date ZCDC has produced 2.3 million carats.

ZCDC/ALROSA J.V (New Mine), Malipati, Matabeleland South

- Following the signing of a joint venture agreement between the Zimbabwe Consolidated Diamond Mining Company (ZCDC) and Russia's ALROSA in 2019 to develop diamond fields in the country, exploration work is now in full swing.
- Work has been done in setting up the exploration camp and assembling a diamond washing plant with a capacity of 1 tonne per hour of ore.

Gemmology Centre, Mutare, Manicaland

- Government's thrust to promote value addition and beneficiation is bearing fruit with a Gemmology Centre being constructed at Fern Valley in Mutare.
- In the quest to achieve targets set under Vision 2030, government is spearheading construction of a Gemmology Centre in Mutare, to promote value addition and beneficiation of the country's precious stones.
- Phase one of Gemmology Centre will be completed by mid-February 2022 and it is 51 percent to completion. The phase 1 comprises of the perimeter fence, security fence, brick wall, gate house. 2 boreholes were drilled in the first phase and installed 2 water tanks.
- Mobilizing of funds for the construction of the cutting and polishing plant is now underway.

Great Dyke Investments (Pvt) Ltd (New Mine), Darwendale

- To date, the first Boxcut of the two is complete and Excavation Work is complete.
- The project employs a total of 360 employees with 70 being GDI employees while 290 are contractors.
- Once fully operational the two mines will produce a total of 3.45 million tonnes of PGM ore per year.

Karo Platinum (Pvt) Ltd (New Mine), Darwendale,



President Mnangagwa Operates a Drill Rig at KARO Mine

- Karo has successfully completed an exploration/ resource delineation exercise and the project is at implementation stage.
- Resettlement of affected individuals is scheduled for Quarter 1 2022.
- The project is expected to mine approximately 14.4 Mtpa of run of mine ore.
- The project has created employment for 100 employees.

Mimosa Mine (Expansion Project), Zvishavane, Midlands

- Mimosa mine has a short life of mine and is investing in the opening of a new portal at North Hill to increase life of mine. This will contribute to the attainment of the critical mass for local beneficiation.
- Mimosa Mine is carrying out various projects to increase process efficiency. A concentrate handling facility to use a bulk loading bunker has been commissioned. The company is also working on process optimization project to improve recovery from the metallurgical plant.
- This will all target increasing revenue and helping the nation attain a USD12 Billion mining economy.

Unki Mine (Pvt) Ltd (Expansion Project) Shurugwi, Midlands



- The concentrator expansion is now complete and steady ramp up is in progress.
- The expansion will result in increased concentrator capacity from 179 000 tonnes per month to 210 000 tonnes per month.

Bravura (Pvt) Ltd (New Mine), Darwendale



- Bravura carried out exploration and feasibility studies in 2021 and plans to go into mine construction in 2022 and production in 2023.
- Bravura has created employment for a total of 40 employees.

ZIMPLATS (Expansion Project), Mhondoro Ngezi



- ZIMPLATS signed a memorandum of understanding with Government of Zimbabwe in 2021 that will see the company invest USD1.8 Billion to expand its operation by the year 2025.
- A key project is The PGM Base Metal Refinery (BMR) plant that will cost an estimated USD 200 million.
- Currently ZIMPLATS is undertaking a bankable feasibility study that is expected to be complete by 2022.
- The construction of the Base Metal Refinery, installation and commissioning of the plant is expected to be complete by 2026.

Todal Mining (New Mine)



- Todal is currently undertaking resource estimation, aeromagnetic survey and drilling.
- Metallurgical testworks on comminution, variability and flotation are expected to be finished by 2022 and a pilot plant to be built by 2023.

Dinson Iron and Steel Company (Pvt) Ltd (Tshingshan), Carbon Steel Plant (New Project)



- The steel plant will produce 1.2 million tons of carbon steel per annum and will generate around USD1.9 billion per annum.
- The investment will create at least 6000 jobs, thousands of downstream activities and a new town of about 30 000 residents.
- The Carbon Steel Plant is now due for commissioning by Quarter 1 2022.

Southern Granite, Chitungwiza & Mashonaland Central



- Southern Granites has 3 Multiwire saws which have 52, 56 and 72 wires and 2 polishing lines. They export approximately 12000 m² per month. Southern Granites adds value to approximately 95% of blocks produced.
- They produce 400-500 cubic metres per month and exports 8 000 square metres to key markets including Europe, Asia and South Africa.

Afrochine Smelting (Pvt) Ltd Selous



- Operationalization of 2 × 12.5 MVA additional Furnaces in addition to 3 Chrome Smelters already operating to produce 600 000 tons per annum of ferrochrome was done in June 2019. The furnaces are ready for commissioning by H.E

Jin An Corporation Chrome Smelters, Gweru, Midlands

The Low Carbon Ferrochrome Furnace is operational with a capacity of 1200 tonnes/ month of Low Carbon Ferrochrome.

- JinAn also produces High Carbon Ferrochrome and ferrosilicon chrome.
- The electrode paste plant is operational with an annual capacity of 5000 tonnes per annum.

Prospect Lithium New Mine, Arcadia

- Prospect Resources and its subsidiary Prospect Lithium Zimbabwe remains focused to bring the Arcadia Lithium project into production.
- Prospect finished the construction of a Pilot Plant which will initially produce bulk samples of 500t of Petalite and 120t of Spodumene concentrates for customer qualification.
- Prospect Resources signed agreements for the sale of 87 percent stake in the Arcadia Lithium Mine to China's Zhejiang Huayou Cobalt Limited.

Grand Sanyuan Copper Resources Zimbabwe (Alaska Mine Re-opening) Makonde



- Phase 1 comprising of installation of the furnace is expected to be completed by end Quarter 1 2022.
- The company has directly employed over 50 locals and the construction and civil works are being done by local contractors which takes the total (direct and indirect) employees to over 100

Yang Sheng Mining, Murehwa

- Yang Sheng Mining (Pvt) Ltd is a granite mining company that commenced operations in 2018 in Zimbabwe.
- Yang Sheng Mining Private Limited is in the process of the construction of a granite cutting and polishing facility that is expected to be completed by February 2022.
- Yang Sheng Mining Private Limited first phase will produce 1950 tonnes of polished slabs per month and 2400 tonnes of granite will be cut every month.
- A total investment of USD10 Million will be required for the first phase and 100 local employees will be recruited.
- The company's expansion plan will involve 5 phases which will create more than 300 local job opportunities.

South Mining (Pvt) Ltd, Hwange

- The expansion project was officially opened by H.E Cde E.D Mhangagwa on the 16th July 2020.
- 2 Coke Oven Battery with a capacity of 12000 tonnes per month each.
- The main local suppliers for raw material are Hwange Colliery, Makomo and Zambezi Gas
- Construction of Phase 2 with an additional 140 000 t capacity has commenced and is expected to be completed by February 2022.
- The combined capacity at the plant will be 280000 tonnes of coke, 2800 tonnes of tar, 2400 tonnes of benzoyl and 40 million m3 of gas as by-products.

Project Benefits

- Local employment
- Exports
- Coke by product at ZIMCHEM
- Gas supply to ZPC

Tutu/Jin An Corporation, Hwange

- Construction of semi coke plant still underway. and mobilization of material resources is on-going.

Zhong Jian Investments (Pvt) Ltd, Hwange

- Current production is 150 000 t/month of thermal coal for ZPC
- 474 locals employed for mining operations
- Commenced construction of a coke battery of 300 000 tonnes /year capacity
- The investment for the coke battery has been budgeted at USD120 Million

Zimbabwe Zhong Xin Coking Company (ZZCC) (Pvt) Ltd, Hwange

- The current coke production is 10 000 t/month and the main product is foundry coke.
- The current stockpile is 18000t of foundry coke which has a market price of USD290/tonne.
- The main market for foundry coke is AcelorMittal in South Africa, Zambia and Congo for processing copper, manganese and cast iron.
- 173 locals employed by the project to date.

GeoAssociates (Pvt) Ltd, Muzarabani Oil and Gas Exploration Project, Muzarabani

- The Seismic survey was successfully carried out in 2021.
- Muzarabani, has secured the necessary casing, wellheads and long lead items for its 2-well oil and gas drilling programme scheduled for May 2022

Dingmao Mining, Mutoko, Mash East

- The company currently has two granite polishing plants and they are planning to erect five more granite polishing plants by October 2022.
- The company's expansion plan would increase the number of locals employed from 200 to 500 workers by end of year 2022.

Lokalise Investments Limited (Western Areas) Western Areas, Matebeleland North



- Current coal production is 75000 tonnes/month
- Lokalise is supplying 50% coal to ZPC and other customers include Triangle, Hippo Valley, farmers and small thermals. Metallurgical coal supplied to Dinson Colliery (Pvt) Ltd
- Coal testing lab and office building to be completed in October 2021
- Rehabilitation of mined out area already taking place as mining is being undertaken

Makomo Resources (Pvt) Ltd, Hwange

- Current Monthly production of 20000 tonnes of coking coal, 8000 tonnes of thermal coal and 8000 tonnes of industrial coal.
- There is scope to ramp up production by 100% to meet the Expansion of ZPC Units 7 and 8 requirements.
- Coal Sales is 73% Production ZPC, 15% for Commercial Market and 3% for Exports.

Project Benefits

- Employment Creation
- Power Generation
- Fiscal contribution - over US\$300m

Zimbabwe Zhong Xin Electrical Energy (ZZEE) (Pvt) Ltd Hwange



- ZZEE finished the construction of the power plant in 2021 and connected to the 80 kV power line.
- 100 locals employed by the project to date.

Project Benefits

- Employment Creation and Power Generation

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BLANKET MINE



CALEDONIA

focuses on underground development to increase production

Victoria Falls Stock Exchange-listed gold-focused miner Caledonia Mining Corporation's strategic focus is to complete the remaining underground development associated with the Central Shaft project, which is expected to increase production, the company CEO Steve Curtis has said.

Rudairo Mapuranga

According to Caledonia's Chief Executive Officer (CEO), the completion of the underground development will also reduce operating costs and increase the flexibility to undertake further exploration and development in depth, thereby safeguarding and enhancing Blanket Mine's long-term future.

"We also believe there is excellent exploration potential in the older shallower areas of the mine and brownfield sites immediately adjacent to the existing Blanket footprint," Curtis said.

Caledonia's Blanket mine reported its biggest gold output during the year ended December 31, 2021, with gross revenue rising by 21 per cent to US\$121 million.

Chief executive officer Steve Curtis said operationally, the review period marked a

turning point for the business, which commissioned the US\$67 million, Central Shaft, during the period.

The project was funded through internal resources.

"Production in the year was 67 476 ounces, which was above the top end of the guidance range and was a new record for annual production," he said.

Curtis said the robust operating performance was supported by good cost control.

Gross profit for the year was US\$54.1 million, 16 per cent higher than 2020.

Cash generated from operations before working capital increased by 17% from US\$42.4 million to US\$49.6 million.

"Now that the central shaft is commissioned, we expect further production increases.

"Guidance for 2022 is a range of 73 000 to 80 000 ounces while from 2023 onwards it is 80 000 ounces — 38% higher than in 2020," Curtis said.

During Q4, Caledonia completed the acquisition of the mining claims at Maligreen in the Zimbabwe midlands which are estimated to host a NI 43-101 compliant inferred mineral resource of approximately 940,000 ounces of gold in 15.6 million tonnes at a grade of 1.88g/t.

"During the year we acquired the mining claims at Maligreen in the Zimbabwe midlands which are estimated to host a NI 43-101 compliant inferred mineral resource of approximately 940,000 ounces of gold in 15.6 million tonnes at a grade of 1.88g/t. Our immediate focus on this asset is to improve the confidence level of the existing resource base and we are currently re-assaying historic drill cores. Thereafter we expect to prepare a feasibility study to commercialise the existing resource before we engage in further exploration of the claims area along strike, at depth and a previously unexplored zone in the claims area.

"Our approach to new projects is highly disciplined: after further evaluation, the Company has decided not to exercise the options to acquire the Connemara North property as it does not meet our investment criteria. During the Year, we also divested non-core assets in the vicinity of Blanket. Caledonia continues to evaluate

further investment opportunities in the Zimbabwe gold sector to transform the Company into a mid-tier, multi-asset Zimbabwe-focussed gold producer." Curtis said.

According to the Caledonia Chief progress on the 12MWac solar plant has resumed following delays arising from the combined effects of COVID-19 and difficulties with the supply chain. The plant is expected to provide approximately 27 per cent of Blanket's total daily electricity demand, improve Blanket's security of electricity supply and reduce its environmental footprint. It is anticipated that the project will be commissioned in June 2022.

"To improve the quality and security of Blanket's electricity supply, minimise our environmental footprint and help create a more sustainable future for our business, Caledonia is constructing the first phase of a 12 MWac solar plant that will provide approximately 27 per cent of the average daily electricity demand at Blanket Mine. This project, which is expected to yield a modest return to shareholders, is expected to be completed in mid-2022." He said.

Curtis went on to say, "Operationally, the last 12 months have marked a turning point for the business. The Central Shaft has been

a huge project costing approximately \$67 million, all funded through internal cash flow and I am delighted that it was commissioned in the first quarter of 2021.

"Production in the Year was 67,476 ounces, which was above the top end of the guidance range and was a new record for annual production. The robust operating performance was supported by good cost control and gross profit for the year was \$54.1 million - 16 per cent higher than 2020. Cash generated from operations before working capital increased by 17 per cent from \$42.4 million to \$49.6 million.

"Now that the Central Shaft is commissioned, we expect further production increases: guidance for 2022 is a range of 73,000 to 80,000 ounces while from 2023 onwards it is 80,000 ounces [3] - 38 per cent higher than in 2020.

"We continued to increase the dividend in 2021. The total dividends paid in 2021 were 50 cents per share - almost 50 per cent higher than in 2020.

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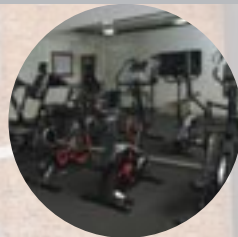
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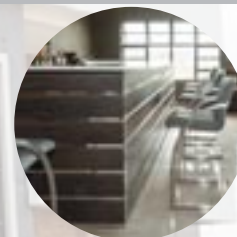
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The accommodation consists of standard twin rooms, standard double rooms and the suite rooms. All rooms are en-suite, spacious and offer DSTV and WIFI. The lodge boasts of a well-manicured garden, secluded and ideal for relaxation to our clients. The spacious garden is also ideal for hosting casual diners, formal and informal meetings, team building for all type organisations and companies, weddings, and celebrations of any type

event. A 15-seater restaurant is located on the ground floor of the lodge, and offers a diverse menu to cater for all ages. The Platinum Restaurant menu has a mix of both local and international cuisine. The Palladium bar, located on the first floor, offers a wide selection of wines, cocktails, mocktails, and other beverages in a relaxed setting where one can enjoy watching sport from the various channel selection available.

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COMFORT AWAY FROM HOME



Eureka Gold mine in Guruve, Zimbabwe

Widening the Investment Spectrum In the mining sector



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While the conversation on investment in the mining sector continues to revolve around the opening and reopening of mines, less attention has been given to the need for investments towards the improvement in mining technologies to reduce mining costs and increase resource revenues.

This is despite technological advancements being substantial in the determination of mining profitability, which in turn, determines the rate of investment into and around the mining sector. Zimbabwe has a wealth of mineral resources, it is, therefore, reasonable to assume that the country would be a leader in the development of mining technologies for the efficient exploitation of its minerals. More reason is given to this assertion by recognition of the robustness of Zimbabwe's educational institutions and the substantiality of its educational policy (Education 5.0) which implores research, development and deployment of novel technologies. Amid discourse over the increase of investment in the mining sector, it is pertinent, therefore, to instigate conversation on how investment may also be directed towards the improvement of methods in Exploration, Mining and Processing in the mineral sector.

Exploration

Exploration for large mineral deposits by technical means began in earnest around the 1950s, with the introduction of

geophysical and geotechnical technologies. Developments in these methods were progressive in the period between the 1950s and 1990s, but there has not been much improvement since. Zimbabwe is yet to discover and quantify vast sums of its mineral resources. This is, in part, the consequence of mineral exploration being somewhat expensive, with no newer and affordable methods having been developed in recent times. As such, the following are areas which may receive attention towards development of new technologies in mineral exploration:

i. Geological Methods

These speak to the underlying physical and chemical processes associated with the formation of metallic and non-metallic ore deposits. The Geological Survey Department in Zimbabwe remains devoid of geological data on the processes of ore formation in the country, and so struggles to update the pre-independence geological bulletins containing maps of the mineralised zones across the country's landscape. Where such information is available, it is historic and found in print or on tapes (eg. Mobil exploration data on the Muzarabani Oil and Gas prospect), which are expensive to convert to digital format. Research needs to be devoted to understanding ore formation processes in Zimbabwe. As a matter of necessity, this would feed into the updating of the country's archaic geological bulletins, which are priceless for time and cost-efficient desktop mineral exploration.

Gathering of extensive geological data to this end requires a joint private sector and Government effort for the pooling of resources.

ii. Geochemical and Geophysical Methods

Geochemical surveys involve the analysis of rocks, water, soil and vegetables for trace amounts of elements that indicate the presence of mineral ore. Development of technologies for laser fluorescence and x-ray fluorescence (XRF) scanning have made it possible to dictate smaller and smaller concentrations of these elements of interest, in real-time. Research and development of such technologies should be incremental in Zimbabwe, where there is still much mineral exploration to be done. Geophysical exploration employs methods such as magnetic survey and remote sensing to identify anomalies beneath the earth's surface. New developments, such as the use of drones, have made it possible to explore more hectareage in less time. The reduction of time has to be dovetailed with a reduction in cost, which necessitates further research. Meanwhile, remote sensing facilities at the Science and Industrial Research and Development Centre, have seldom been deployed for mineral exploration. Funds should be invested towards enhancing remote sensing facility to a Hyperspectral one for sharper imaging appropriate for mineral exploration, and the facility should be opened to public access via website in the same manner that NASA did with the Landsat Satellite Program.

iii. Drilling Methods

Although the drilling of slim holes (for rock chips and core extraction) and wells (in the case of Oil and Gas exploration) is the surest way of ascertaining the presence, quantity and quality of mineral resources, it is easily the largest cost associated with mineral exploration. Avenues of research in this area would be towards miniaturising of drill rigs for manoeuvrability, development of technologies to increase drill rates, technologies to reduce the amount of energy required by rigs, sharper pinpointing of potential mineral locations for the purpose of decreasing the number of drill holes, and adopting technologies from petroleum exploration such as gamma-surveys, which are miniature and can be sunk into the drill hole to analyse rocks in-situ rather than extracting samples and sending them for analysis.

Mining

Types of mining are determined by a combination of the type of deposit, the rock strength, the depth of resource, thickness of the resource, inclination, and the roof and floor strata. These all have a bearing on the mining cost, vis-à-vis the value and quantity of resource available for mining. Narrow veins, steeply inclined deposits and mining at depth present significant challenges, which may explain the abandonment of some mining projects across the country regardless of the continued availability of minerals within them. In Zimbabwe, as more easily mineable deposits continue to deplete, mining technologies, systems and methods are required to continue evolving to keep the business lucrative. The areas in mining requiring investment for improvement are as follows:

i. Mining

Finding the confluence of mining speed and human safety and health is of most importance in the development of mining technologies going forward. To achieve this, there is need to establish technologies to ascertain the rock conditions beyond the mining wall, particularly the relaying of data on shifts in the rock structure post blasting, so as to facilitate rapid extraction of material while ensuring safety. In the same vein, there are significant economic benefits associated with good anticipation in mining. As such, technologies that can sense and visualise the thinning or thickening of the deposit, the loss of deposit, faults and water reservoirs would be priceless for miners. Mindful of the rock stress associated with mining at depth, there is also need for engineering to continue to develop designs that ensure short and long term stability of the mine structures. Lastly, there is a need for the employment of sensors on machinery that

relay the machine's conditions in real-time, avoiding lost time on account of breakdowns and increasing the operational life of equipment.

ii. Cutting and Fragmenting

Technologies for the cutting and fragmenting of rocks have been progressing well for soft rock mining over the years. This is emphasised by the development of the Continuous Miner, which has revolutionised coal mining. Hard rock cutting and fragmenting technologies have not received much attention, however, with the conventional drilling and blasting remaining the method of reduction, from the olden days of dynamite to the modern-day Ammonium Nitrate explosives. Tunnel-boring machines were introduced with some success, but their adoption has been restricted by their high energy requirement and their poor manoeuvrability. In advancing cutting and fragmenting for hard rock mining, there is need to look into the fracture mechanisms of hard rocks. The possible preconditioning of rocks to make them weaker for mechanical cutting is also essential. Blasting designs also stand to be improved, with the possibility of receiving the assistance of computer simulators.

Improving the cutting and fragmenting of rocks would work to cut the costs for downstream communitation.

iii. Materials Handling

Transporting materials from the mining to the processing point is considered one of the weakest components in the mining flowchart. To reduce costs, it is necessary to invest in the use of machinery that can qualify the grade of materials envisaged for mining, in real time, while still on the rock face, so as to maximise on the waste to ore ratio.

"less attention has been given to the need for investments towards the improvement in mining technologies to reduce mining costs and increase resource revenues"



Alfred Chinyere speaking to Mine Managers underground at Shamva Mine, Zimbabwe

Downstream processing, like physical separation and leaching, is also possible while the ore is in transit, particularly on conveyor belts. Loading and hauling often involves the use of diesel thirsty equipment. There is room for the development of new-generation battery technology for such equipment. Similarly, there is also the option of looking into the development of automation and control systems so as to allow for the remote operation of machinery such as excavators and dumpers.

Processing

Mineral processing involves the unit components which size, separate and process minerals for eventual use. It is in this part of the mining flowchart where much stands to be gained from an investment of resources and effort. Every unit process could be improved by technical input, ranging from a better understanding of fundamental principles through research, to the development of new devices and the integration of entire systems. The components of most significance in mineral processing are as follows:

i. Communion

This process involves the blasting and crushing of rock. This is a particularly energy-consuming process, determinant in the economic viability of mining projects. With energy consumption being a major capital and operating cost in mineral beneficiation, comminution (size reduction) accounts for approximately two-thirds of the energy processing costs. Technologies such as High-Pressure Grinding Rolls have been introduced to reduce energy requirements. This has been with some success, as the grinding rolls have been found to also cause microfractures which increase mineral liberation and leaching efficiency. The high set-up costs have impeded their adoption, however. Taking from this lead, energy efficiency in size reduction is where enormous potential lies, and it is where energy and investment must be devoted.

ii. Separation

This is the separation of various minerals from one another, as well as the separation of solids (minerals) from liquid (water). Most separation processes are conducted wet, such as floatation and gravity separation, however, the cost of water has been noted as a concern in some instances. Research is

therefore due on measures to reduce entrained water in disposable solids. Furthermore, said wet processes are designed for dilute pulp with finer solids. Given the effectiveness of floatation and gravity separation, and the economy with which they recover sulphides from metals, there is need to develop improved magnetic and electrostatic separators for the processing of dense pulps, which would therefore increase in the number of applications for these economic technologies.

This is but an effort to agitate conversation around the need to tap into the human resource in Zimbabwe and implore the development of novel intellectual property around mining technologies. Government needs to take the lead and direct specific research objectives for research houses like the Institute of Mining Research, as well as all the universities across the country. This can usher in progressive partnerships with private stakeholders in the mining industry, who stand to benefit from such research, to the greater benefit of the nation. It would be deplorable, given the human and mineral resources in Zimbabwe, for the country to continue to be a technology taker and not a leader.



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Bright prospects for Panashe Muguza

"Some people want it to happen, some wish it would happen, others make it happen."

By Keith Sungiso

The latter distinctly describes twenty-six year old junior Mine planner based at Union Jack Mine in Makonde, Zimbabwe.

Unlike most in his age the young man hosted us from arrival to departure fully engrossed without any disruptive technology disturbances explaining in detail how the mine operated and they have boosted production. Here is how our interview went.

KS May you introduce yourself and your educational background?

PM My name is Panashe Muguza, a Mine Planning Engineer/Mine Planner and a lover of earth science and technology. I was educated at Lomagundi College and moved on to complete two Degrees in Mining Engineering at the University of Johannesburg.

KS Why did you choose mining as a career?

I would admit that mining was an industry I had no idea I would end up in while growing up. I always thought I wanted to be a physiotherapist until I went for a mine visit and was exposed to a whole new world. As a science nerd and curious young mind, I had a deep interest in Geography, Physics and Biology. However, when I went to see what happens on a mine during my post-high school gap year, I had no doubt that mining was what I wanted to study. I got a job as a sales rep which didn't last long and then sold some vegetables from a truck until I applied for admission to UJ

for a bachelor's in Mining Engineering. I had no doubts about my choice and have never regretted it ever since.

KS What is the importance of a mine planner?

PM Mine Planners are a key part of the life cycle of all mining projects. The key performance areas considered are Mine Scheduling, Mine Economics and Evaluation, Feasibility studies, production planning, risk analysis and a whole host of other aspects. Calculating the life of mine (LOM), pay pack periods and key performance indicators are all part of the many responsibilities of the mine planner. It is a very broad-based practice which requires a strategic approach and tact. To navigate the volatile commodity markets and unsteady economic environment, every mine requires a mine planner because failing to plan is planning to fail. The mine planner fuels up the car but the miner drives us to the promised land.

KS Please describe your current role at Union Jack Mine?

PM At Union Jack Mine I work as the Jnr Mine Planning Engineer and Operations Manager. I prepare financial forecasts, production plans, geological surveys, geotechnical risk analysis and engineering management. I report directly to the board of directors/mine owners.

KS How many people are employed at union Jack?

PM Union Jack Mine employs 29 people. 19 Contract workers and 10 permanent employees.

KS You are using heap leaching as your extraction method. May you explain in

detail how it works?

PM Heap leaching involves the use of water, chemical agents, gravitational flow and irrigation techniques to leach gold from the ore into solution.

KS What advantages does leaching have over other methods and why did you choose it?

PM Leaching is a very safe, environmentally friendly and cost-cutting extraction method. Compared to other methods, heap leaching is the safest metallurgical solution because it does not involve any large moving parts and electrical apparatus. It also has no significant noise pollution and dust generation. The water reticulation system ensures that no water is let out into the open environment which could contaminate groundwater resources.

KS Is the leaching method feasible for ASMiners?

PM Heap leaching is definitely a method that Artisanal miners can use to extract gold. It is not as viable as other precious or base metals.

KS Tell us about the gold collection methods you are currently using?

PM We are currently using an elution plant to win the gold. It is a process called electrowinning where the carbon chips from the carbon in solution tanks (CIS) are loaded into a column which feeds a boiler and then eventually directs the contents to an electrolysis cell where the gold is collected and then taken to an acid wash and smelt.





KS How much gold are you producing monthly?

PM We are producing between a range of 10 to 18kg every month.

KS We have seen impressive crushing machinery here at the mine! Tell us about the crushing process?

PM The crushing plant downsizes the mineral ores to increase the surface area of the rock. It uses high voltage motors to power a jaw crusher and a cone crusher after screening takes place.

KS You are currently using the terrace mining method tell us more about this method?

PM Terrace mining is a multi-benched sideways moving method, the entire mine moves over the ore reserve from one end to the other, but not necessarily in a single bench. The number of benches used is a function of the excavation depth and type of machinery used. Typically you have benches of 8 - 15m in height and 1-32 benches in the terrace.

KS Are there any plans to sink shafts and

mine underground?

PM Yes. The plan is to sink a vertical shaft on the reef to achieve a pay as you go development.

KS Are you planning on using more contractors in future?

PM We do plan on working with more contractors however we aim to develop in house skills and become a large scale producer.

KS What are your plans for the growth and development of the mine in terms of production?

PM The plan is to ramp up production by mining less waste and constructing a milling plant. We will train and hire more miners who will lead more mining crews once we go underground.

KS What legislative reform would you recommend for the growth of Junior miners to large scale mining in Zimbabwe?

PM Our legislative framework can start by addressing the issue of mine accidents and

falls of ground. Many lives are lost every week because there are no competent persons who can assess the state of underground/surface workings and compile a risk assessment. It must be legislated that every ASM and Junior mining firm must have a consulting rock/geotechnical engineer who can design and approve mine support systems. The law must also pave the way for a mining charter which can be updated twice every decade by the chamber of mines, a council representing mining houses/companies and members of parliament. The Mines and Minerals act must be updated to facilitate the protection of mining communities, national heritage sites, wildlife and other natural resources.

KS What's your advice on those who are studying mine planning and what would you say will be the biggest challenge they should expect?

PM Those studying Mining Engineering must look forward to long hours of problem-solving, feasibility studies and risk analysis. They must be ready to take on new challenges and adopt modern technologies and ways of problem-solving.



Panashe speaks to a colleague as they prepare to blast



KS How has been the safety record at the Mine?

PM The safety record has been superb. We have had no mine accidents or fatalities since we started.

KS In what ways do you keep pollution to a minimum?

PM To avoid pollution we use a closed-loop for water circulation/ reticulation. We have daily emission and discharge inspections to check if there are any spillages/leakages.

KS Tell me about a successful solution you proposed and was implemented.

PM I proposed the use of fewer but longer drill rods and a mobile heavy duty air compressor for our rock drills. This has increased our output per blast.

KS Many young people like yourself have challenges with moving into mining areas mainly because these are located in deep rural areas away from the usual lifestyle of fast foods, and stable internet amongst others. How do you cope with living and working in this remote area?

PM I understand why the youth would prefer life in the cities/towns however history teaches us that cities were once barren wastelands or dense forests that just needed an upgrade. So I simply work hard to bring the comforts I enjoy to the rural areas. As for fast food I was never a fan and am pretty sure that such a lifestyle and diet will diminish one's health and cognitive abilities.

KS With jobs being difficult to come by in the Mining Industry. What's your advice to Chipo a graduate mine planner who has been seeking employment for years with

no luck?

PM To Chipo I would say "Smooth seas don't make skilful sailors". She must take her time to build her personal brand, network and keep on learning. It is always darkest before dawn but the sun will always rise.

KS Besides Mining what else is Panashe into?

PM I'm into travelling, fishing, boxing, tennis and art.

KS Some may need your expert advice or consultation services how do they get hold of you?

PM They can write to me on panamuguza@gmail.com

ENDS//



Standing proud - Panashe Muguza after taking the Mining Zimbabwe team on a tour of Union Jack Mine

Casualties in mining drop significantly



Chamber of Mines CEO Mr Isaac Kwesu

The protection of workers remains a priority for mining companies as zero harm policies continue to gain traction.

Rudairo Mapuranga

The mining industry in Zimbabwe has taken necessary measures to see through the achievement of the zero-harm mantra.

The country's body, representing Large scale producers, the Chamber of Mines works with Government, labour and Small-Scale Miner organisations to ensure that mining operations cause no harm or injury to those working in mines. This is done by encouraging mines to develop and implement safety, occupational health and environmental systems at their operations.

In this regard, the Chamber of Mines of Zimbabwe works with the Ministry of Mines and Mining Development's Mining Engineering Department which is responsible for the safety and health inspectorate function. It works with the National Social Security Authority (NSSA) which is the lead agency for occupational health and safety in the country. In addition, it works with the Environmental Management Agency (EMA), the national authority on environmental management.

According to the Chamber of Mines CEO Mr Isaac Kwesu, the chamber established a standing committee of Safety, Health and Environment (SHE), whose mandate is to make recommendations to the Executive Committee on SHE issues in the mining industry.

He said through the SHE committee, that the mining sector has seen the number of deaths decreasing significantly.

"Safety, health and environment are key aspects that we must consider when undertaking mining activities and the chamber of mines subscribe to zero harm and have structures in place to ensure that there is zero harm in the mining industry. Through our SHE committee structures of the industry, we have also seen the number of calamities or casualties in mining coming down significantly. Some large mining houses have been recording zero deaths and it is common that if other mining operations learn how others are doing it through existing structures of the mining industry, we can achieve these zero harms," Kwesu said.

For example, Bulawayo Mining Company owned gold producer, How Mine, has employed strategies to improve the safety and health of its workers which has seen it achieving a reduction in injuries from 299 to 12 per year. The company has made great strides in ensuring a safe working environment as a result of an integrated systems approach which has seen them using three different systems some of which were borrowed from the chamber of mines, SHE committee.

Victoria Falls Stock Exchange-listed nickel producer Bindura Nickel Corporation (BNC) has not recorded fatalities at its Trojan Nickel Mine since 2015 an indication that the chamber of Mines SHE committee has been of significance to the reduction of calamities in the mining industry. The company recorded BNC 2.6 million fatality-free shifts last year with Caledonia's Blanket mine also reaching over 2.6 million fatality-free shifts last year.

The Deputy Minister of Mines and Mining Development Dr Polite Kambamura said the government was working with the

mining players to ensure that there was zero harm. He said the Ministry of Mines has been conducting safety awareness campaigns to promote the achievement of zero harm.



Polite Kambamura

"We encourage miners to adhere to set safety standards by safety awareness campaigns being done by the ministry," Kambamura said.

The Parliamentary Portfolio Committee on Mines and Mining Development Chairperson Hon Edmond Mkaratigwa said the parliament was doing all it can to ensure that the safety of workers has been achieved.

"Parliament's position as the representative of the masses in Zimbabwe stands with what protects life as the most sacred aspect and then the body as the first capital of all sources of livelihood for all workers and their families.

"Parliament has therefore voiced against these mining accidents and all unsafe practices at the workplace and surrounding environment. We have raised concerns and when these are being addressed, we are happy and will support if there is any other need for us to unlock when any resisted difficulty but necessary options are to be taken towards achieving that target.

"I also hasten to say, we should deal with safety and zero harm but where zero harm has failed, we should still fail safely and be able to rescue and recover. This is our position that mitigation is fine, prevention is fine and response, rescue and recovery are equally fine. I commend the initiative and we support that," Hon Mkaratigwa said.



Edmond Mkaratigwa



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- COMMODITY POLYMERS



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Mining Cyber Risks and Insurance Solutions

Cyber risks were not major risks for most local mining companies before the Covid pandemic changed the way that operations are conducted. Globally, Cyber related attacks and losses in the mining space have increased over the years from the 2010 combined attack on Rio Tinto Group, BHP Billiton Ltd. and Fortescue Metal to more recently the 2021 Weir attack which has an estimated \$27 million revenue loss.

Post-Covid, the use of digitally integrated systems, the move toward autonomous equipment and use of artificial intelligence improved across all aspects of mining operations but it also increased the cyber risks companies are faced with.

Cyber risks are varied and attackers can be your own employees, third parties exploiting your systems directly or through contractors with access to your systems. Breaches in the cyber arena can be caused by local or international attackers. Although mining entities have invested in monitoring, maintaining and upgrading their IT and digital systems, the fast-paced nature of developments in this space poses a risk that they may be unable to prevent

all cyber-threats.

The main effects of such attacks on mining operations include:

- **Disruption of supply chains**
- **Loss of financial and commercial data**
- **Compromise of employee safety and personal data**
- **Loss of exploration data and resource definition**
- **Loss of access to critical condition monitoring systems**
- **Disruption to autonomous mining operations**
- **Extortion and damage to company reputation.**
- **Disruption to production and subsequently loss of revenue**

Cyber Insurance solutions are available which provide cover for first-party losses (e.g. business interruption, restoration, and crisis communications) and third-party losses, (e.g. data breaches, network interruption, and notification expenses). These Insurance solutions provide cover in areas that traditional insurance policies have gaps or exclusions.

However, because of the unique nature of cyber risks, a one size fits all view does not work. Firstlink emphasises a customised cyber insurance program design for each client cemented by our 360° Risk Management approach. This process would involve investigating and clearly defining the cyber risk exposures existing as these differ according to the type of mining operation. These exposures should also be quantified financially to determine their worst-case scenario impact on client revenues should a loss occur. Preloss and Post Loss scenarios are modelled and we guide the client in developing a cyber risk management framework to complement the insurance being purchased. This results in an optimal program design, with a clear balance between exposures, insurance cover and premiums.

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Tichaona Chihambakwe is the Business Development and Marketing Head for Firstlink Insurance Brokers.

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GOLD

**Mining, buying/selling &
claim registration in Zimbabwe**

Gold mining in Zimbabwe is a major mainstay for millions in the Southern African country.

By Keith Sungiso

There are over 4 000 recorded gold deposits in Zimbabwe of which nearly all of them are located in ancient workings. The country remains under-explored to discover deposits away from these ancient workings. More than 90% of gold deposits in Zimbabwe are associated with greenstone belts which are some of the richest in the world. Other gold deposits occur in the Limpopo Mobile Belt in the south of the country and the Proterozoic Piriwiri rocks in the North-Western part of Zimbabwe.

Top large scale gold producing miners in Zimbabwe

Freda Rebecca

It mines 3,000 tonnes of ore and removes 8,000 banks of overburden on an average every day. The mine poured its first gold in April 1988. Freda is owned by Kuvimba mining house which owns a soon to be biggest gold producer Shamva gold mine.

Blanket Mine

One of Zimbabwe's most successful mines, owned by New York Stock Exchange-listed Caledonia Mining Corporation, run by Steve Curtis the mine is currently carrying out an ambitious expansion drive aimed at producing 80 000 ounces of gold by 2021.

RioZim

Rio Zimbabwe, a diversified miner owns several gold mines which include Renco Mine, Dalny mine and Cam & Motor Mine in Kadoma and many more scattered across the country.

Metallon Corporation

In 2015, gold production was 97,000 ounces and the target was 120,000 ounces in 2016. Across the group, Metallon has a significant resource base with a JORC-compliant 8.3 million ounce resource. Metallon owns the award-winning Bulawayo based How Mine.

Sabi Gold Mine

The mine employs about 450 employees and is currently serviced by one rectangular double compartment shaft

reaching down to 15 metres below 12 level elevation. The Principal mining method is underhand stopping. The mine has the capacity to treat 450 tonnes of ore per day.

Falcon Gold (Falgold)

The company formerly owned Dalny mine in Chakari, Venice Mine in Kadoma and Golden Quarry mine in Shurugwi. Founded in 1991, Falcon Gold Zimbabwe is a subsidiary of the New Dawn Mining Group. New Dawn Mining Corp is involved in the exploration, development, extraction, processing and reclamation of precious metal deposits in Zimbabwe.

It primarily explores for gold, base metals and precious metals. Falcon Gold Zimbabwe Limited also has an operational processing plant and Ancillary infrastructure which supports a central processing plant that treats ore from Pickstone.

Pickstone Peerless

The 584ha Pickstone-Peerless Gold Mine is located 100km southwest of Harare and has historically produced over 400,000oz gold. Pickstone-Peerless has a current JORC Resource of 62 million tonnes grading 1.8 g/t, containing 3.56 million ounces of gold. Included in this Resource is an open-pittable Ore Reserve of 16.6Mt grading at 1.9 g/t for 1.02 million ounces of gold.

Duration Gold Mine

Duration Gold Limited offers gold exploration and production services. The company owns 5 core assets with historic production of 4.6 million oz. It also sells gold at international spot prices. The company was founded in 2006 and is based in Bulawayo, Zimbabwe. Duration Gold Limited operates as a subsidiary of Clarity Enterprises Limited.

One of its flagship gold mines is Vumbachikwe, which is one of

Zimbabwe's oldest gold mines.

Bilboes Holdings

Bilboes Holdings (Private) Limited owns and operates gold mines in Zimbabwe. It engages in mining, exploring, and producing gold. The company was founded in 1989 and is based in Harare, Zimbabwe.

Bilboes own and operates four gold mines namely Isabella, Bubi, When and McCay's 'existing mines' all in the Bubi Greenstone Belt of Zimbabwe. The mines were acquired from Anglo American Corporation Zimbabwe Limited (AMZIM) in 2003 together with most of AMZIM's gold mineral rights in Zimbabwe.

Eureka Gold Mine

Eureka Gold Mine is located about 150km north of Harare.

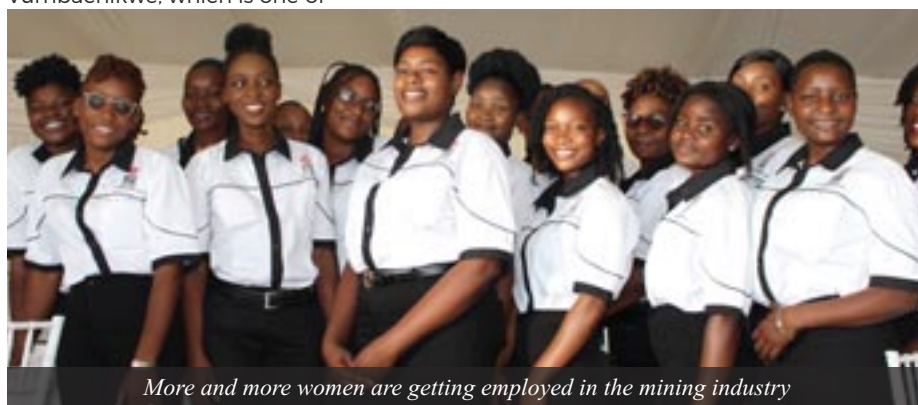
Eureka is a modern gold mine designed to produce up to 70,000oz of gold per annum from an open pit operation. Operations were suspended in 2000 due to high costs and low gold prices. The mine is recommenced production in 2021.

Small-scale gold mining

Artisanal and Small-scale miners currently operating in Zimbabwe are estimated to range from 500 000 to 1 500 000 people.

This group is currently producing over 60% of gold submitted to the country's sole buyer Fidelity Printers and Refiners (FPR).

The major challenges faced by the ASM sector are a lack of financial resources, equipment, expertise, and geological information. Despite these challenges, ASM operations remain crucial as production details recorded at Fidelity Printers and Refiners indicate that the sector has produced more than 60 tonnes (60%) of gold for the period 2017-2020.



More and more women are getting employed in the mining industry



Members of the country's largest mining body, the Zimbabwe Miners Federation (ZMF) at a small-scale mine in Mashonaland West, Zimbabwe

Gold buying in Zimbabwe

Fidelity Gold Refiners formerly Fidelity Printers and Refiners (Pvt) Ltd (FPR) is licensed to buy gold from large scale producers, small scale producers and holders of gold buying permits.

With FPR miners have an option to select the assay method for a particular deposit or the specific gravity method. If the customer opts for the fire assay method, payment will be made after the analysis which is carried out at the Head Office in Harare. Samples obtained after melting are accurately analysed using the internationally recognised fire assay technique. Results obtained are in the region of 1 part per thousand tolerances. However, for the specific gravity method, payment is actioned on the spot. The specific gravity method is used particularly in areas outside Harare.

“Gold is found in every district in Zimbabwe!”

FPR has decentralised its buying activities from Harare to cover the entire country, thereby significantly reducing the security risks associated with transporting gold for the small scale sector. The customer has an option to select the assay method for a particular deposit or the specific gravity method. Gold delivered to the centres is paid for on the spot after carrying out a specific gravity determination of the gold content. However, if the miner opts for the fire assay method, payment will then be

made after the analysis which is carried out at the Head Office in Harare.

Fidelity Gold buying centres



Fidelity gold buying centres are housed in ZB Banks across the country

FPR has decentralised its buying activities from Harare to cover all gold producing regions within the country, thereby significantly reducing the security risks associated with transporting gold over long distances. The company has also appointed Gold Buying agents to conveniently mop gold produced in outlying areas and also from artisanal miners.

The current gold buying centres are: Bulawayo, Gwanda, Kadoma, Mutare, Bindura, Gweru, Kwekwe, Zvishavane, Chinhoyi, Filabusi, Masvingo

Registering for gold mining claims in Zimbabwe

Gold mining is the most popular type of mining conducted in Zimbabwe. It has a flourishing market ready to pay the greenback on demand. Popular gold mining towns include Kadoma, Bindura, Shurugwi, Gwanda, Chegutu, Kwekwe, Zvishavane, Chinhoyi, Shamva, Mutare and many other towns.

Gold is found in every district in Zimbabwe!

The Ministry of Mines and Mining Development (MMMD) is tasked to promote sustainable exploration, mining, processing marketing and management of mineral resources for the benefit of all Zimbabweans. Its key responsibility is to be responsible for the administration of the Mines and Minerals Act (Chapter 21:05) of Zimbabwe.

Mining investment in Zimbabwe

1.1 Foreign Investors are allowed to own 100% shareholding for mining operations in all minerals except for platinum and diamonds which the foreign investor is expected to jointly own with Government on a 51%/49% basis.

1.2 Before starting operations the newly registered company should possess a Zimbabwe Investment and Development Agency (ZIDA) certificate and can then apply for a prospecting license from any Ministry of Mines and Mining Development provincial Offices.

1.3 Any person who is a permanent resident of Zimbabwe and above the age of 18 may take out a prospecting license at any Ministry of Mines and Mining Development provincial offices.

1.4 The Provincial Mining Director acting on behalf of the Permanent Secretary may refuse to issue a prospecting license but shall forthwith be required to report each refusal to the Secretary.

1.5 Each Prospecting License is valid for two years.

1.6 A holder of a Prospecting License automatically acquires the rights of prospecting and pegging mining claims anywhere in Zimbabwe.

1.1 When a Prospecting Licence holder has identified a mineral deposit that he/she is interested in, he/she appoints an agent or an Approved Prospector to peg on his behalf.





1.2 The agent is required to physically peg the area by marking the deposit with a Discovery Peg. He/She should also post Prospecting, Discovery and Registration Notices on the ground. The notices must be posted conspicuously to alert other prospectors.

1.3 Before posting these notices the agent is required to inform/or seek consent from the landowner of his intention to prospect.

NB: Consent is only sought from the landowner if prospecting on a farm less

than 100 hectares, otherwise the prospector is only required to inform the farm/landowner in writing either by registered mail or deliver by hand.

1.4 All areas classified as not open to prospecting and pegging or reserved against prospecting and pegging cannot be pegged, e.g. cultivated lands, dip tanks, Dams, etc.

1.5 Each Prospecting License can peg up to a maximum of 10 claims at 1 Ha each.

1.6 An application for registration must be submitted to the Ministry of Mines and Mining Development offices. The application must have copies of the following attachments:

- (a) **Prospecting license(s).**
- (b) **Prospecting Notice.**
- (c) **Discovery Notice (Base Minerals).**
- (d) **Notification of intention to prospect to the landowner.**
- (e) **A map in triplicate to the scale of 1:25000.**

1.6 If the Provincial Mining Director is satisfied that all pegging procedures have been followed he shall issue a certificate of registration upon payment of the

gazette fee. This allows the holder to start mining operations subject to meeting other obligations like Environment Impact Assessment (EIA).

1.7 Within three months from the date of registration the miner is required to erect permanent beacons on the ground.

1.8 All precious mineral claims are supposed to be continuously worked on in order to obtain renewal of title. Claims have a 12-month tenure after which they shall expire or be renewed.

1.9 Gold and other precious metal claims are inspected by production and capital expenditure.

1.10 Base metal claims can be protected by payment.

1.11 If a mining claim is transferred or sold a Certificate of Registration After Transfer shall be issued by the Ministry of Mines and Mining Development.

1.13 Failure to renew title will result in the forfeiture of a mining claim. Furthermore, loss of title can be through cancellation or abandonment.



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Gearing towards a sustainable future - Importance of ESG in Mining



Zimbabwean mining companies need to up their game on environmental, social and governance (ESG) factors if they are to remain viable and in sync with the global mining industry that is rapidly changing and placing more emphasis on the protection of natural resources and the environment.

Prince Sunduzani.

ESG factors have become increasingly important to investors who now require increased attention on environmental, social and governance-related matters as a prerequisite for mining companies to access capital.

The investment landscape has changed as investors are incorporating ESG criteria into their investment assessments and valuation decisions, and perceive companies with strong sustainability programs as sound and reliable forward.

ESG standards for mining include energy efficiency, emissions reduction and water efficiency, along with improved worker safety and community relations.

Ernst & Young's (EY's) report on Top 10 Business Risks and Opportunities for mining and metals in 2022, reveals environmental and social risks will be the most significant factor for the industry to consider over the next year.

The report surveyed 200 global mining executives that gave their insights into the risks and opportunities for the industry in the year ahead.

EY, in the report, notes that miners that can

demonstrate their contribution to a sustainable future will have a competitive advantage.

The report indicates that investors are now placing importance on ESG when considering investing in the industry.

EY posits that higher ESG ratings can enable access to a larger pool of attractively priced capital.

This presents viability and an existential threat to Mining companies that neglect this important phenomenon.

"As environmental, social and governance (ESG) factors become a bigger priority for investors, shareholders and a broader group of stakeholders, miners are doing more to integrate ESG into corporate strategies, decision-making and stakeholder reporting. Stakeholder pressure over issues such as biodiversity and water management is likely to intensify, requiring miners to progressively plan for mine closures and better manage the water-energy nexus to satisfy expectations," says EY in the report.



According to the United Nation, mining companies are called on to extract with responsibility, produce with less waste, use safer processes, incorporate new

sustainable technologies, promote the improved wellbeing of local communities, curb emissions, and improve environmental stewardship.

SLR, a global leader in environmental and advisory solutions with a focus on helping clients achieve their sustainability goals notes that the ESG agenda emphasizes the issues mentioned below for the mining industry:

Environment: biodiversity, ecosystem services, water management, mine waste/tailings, air, noise, energy, climate change (carbon footprint, greenhouse gas), hazardous substances, mine closure.

Social: human rights, land use, resettlement, vulnerable people, gender, labour practices, worker/community health & safety, security, artisanal miners, mine closure / after use.

Governance: legal compliance, ethics, anti-bribery and corruption (ABC), transparency.

These issues should not be secondary for mining companies. They should be a priority, given the negative impact mining activities have on the environment and people's livelihoods. The ESG is also in line with the sustainable development goals SDGs.

These are some of the reasons why ESG should not be ignored.

The UN says that Mining companies committed to the SDGs will benefit from improved relationships with governments and communities and better access to financial resources; those that fail to engage meaningfully with the SDGs will put their operations at risk in the short and long term.

It's time for Zimbabwean mining houses that lag on ESG to pull up their socks or face extinction.

Also prioritising ESG means that companies can leave a long-lasting legacy rather than open mine pits and degraded environment.

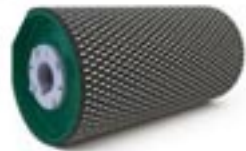
It means they are placing themselves in a position to improve the livelihoods of their host communities who bear the brunt of their mining activities.



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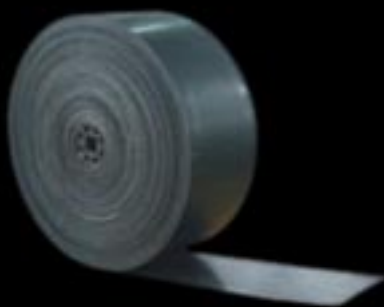
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Investment opportunities in the Zimbabwe Semi Precious and gemstones industry



The Zimbabwean semi-precious stones industry is still an underutilised territory, which provides a lot of investment opportunities in the value chain, from extraction to value addition.

By Prince Sunduzani.

State of Semi-Precious Gemstones industry in Zimbabwe

The country is endowed with many semi-precious minerals that include emerald, quartz, agates, and amethyst among others. These gemstones are largely mined by artisanal and small-scale miners and there is very little information on the cutting and polishing plants in Zimbabwe.

Lyman Mlambo, the Chairman of the Institute of Mining Research at the University of Zimbabwe, propounds that the Resources of semi-precious stones in Zimbabwe are estimated to be vast, with the total value estimated at US\$20 billion.

The country boasts of about 33 different types of semi-precious minerals. The minerals are underexplored, more than other minerals, so the estimated number of types and value could be way below the

actual.

Mlambo notes that possibly Zimbabwe has more than 33 semi-precious stones. The number of resources could be more expansive than is currently estimated.

The fact that neighbouring countries in Africa are noted producers of gemstone points to the potential existence of high geological prospectivity in Zimbabwe.

He says the greatest opportunity that faces the sub-sector in the country is the existence of a big global market which is very lucrative.

With the sub-sector in its nascency in Zimbabwe, there are likely to be opportunities for big finds and lower costs of production as the near-surface semi-precious stones do not require large complicated machinery to mine.

These minerals that easily, mined and are sometimes just collected or kicked in the field the mining of semi-precious stones in Zimbabwe is dominated by artisan now minus.

Investment opportunities

According to Zimbabwe Miners Federation Gemstones and Semi-precious stones secretary Mr Privilege Moyo, investing in the Zimbabwe gemstones industry has guaranteed returns due to several favourable factors as will be explained below.

Extraction

Investment opportunities in Zimbabwe are quite plenty. We are looking at the extractive angle whereby most people are not well-versed with mining. There is a great opportunity of creating synergies with those people who are in the production sector. Also, those who want to bring in machinery for both value addition and extraction.



Privilege Moyo



Alexandrite

Value addition

In Zimbabwe, it is ideal to have value addition of gemstones and semi-precious stones being done locally because we have an abundance of various minerals whereby your sourcing will be very close to your value addition plant. You also have choices of various other minerals which you can blend in with your designs rather than have it done outside where the costs can be prohibitive as it will be very expensive. Having a product being done locally at least you shed off other unnecessary costs of having to carry excess baggage of waste which becomes a very high cost to the end-user.

Education

Also, investors can set up vocational training centres for our people. Developing other techniques, because usually once the extraction process has been done there are other stages which need to be followed for example technology about grading. The

stones have been mined and now the people don't know how to grade them, how to evaluate them and how to handle them so these are some of the opportunities one can venture into. For those who feel they have potential, financial resources and expertise Zimbabwe is the best place to land and you're guaranteed to automatically find somewhere to fit.

WHY INVEST IN GEMSTONES SUBSECTOR.

Impressive Human Capital.

Zimbabwe, compared to other countries, Zimbabwe has got highly educated people, and the language barrier is better than in any other country. In other countries, there is a need for a lot of translation to the person who is supposed to carry out the process, which ends up affecting the quality of the end product. Zimbabwe has very intelligent and hardworking people and we still have the land to do value

addition.

Availability of working spaces (For value addition)

Also looking at the situation in Zimbabwe, we have a lot of factories which have been closed for various reasons, so working areas or factories to set up value addition centres are still plenty, it is only a matter of choice which are you might be interested in. The infrastructure is already there, there is power, and there is water and roads, so automatically it becomes easy for anyone who wants to invest in value addition in Zimbabwe.

Opportunity to shape laws that govern the industry

Since our laws are work in progress, it is also good for those who want to come in and share experiences from wherever they have been to shape the laws to suit whatever the business community wants. We need investors who want to get involved in the industry to come in and share their experiences so that we can redirect our country to enact laws which are in tandem with the environment. It becomes a plus because the Government is willing to listen to whoever wants to do business which makes the environment favourable to those who want to do business.

The country is working on the accelerated growth of the mining sector

Zimbabwe is trudging towards attaining the objectives of Vision 2030 through interventions such as the National Development Strategy 1: 2021-2025 (NDS1). NDS1 is clear on the subject of the under-exploration of the country's minerals.

The country is also targeting, growing the entire mining sector to \$12 billion. As part of its interventions to attain the target, Zimbabwe is targeting low hanging fruits. Gemstones and Semi-Precious stones are such low hanging fruits which have been under-utilized hence, the country is open to investment in this area.

These initiatives present an opportunity for prospective investors to hop onto the train as the country has a high appetite for investment in mining, with the semi-precious, gemstones sector being one of those.



Legendary semi-precious expert Dave Darling with a Rhodocrosite stone



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Minerals and areas of verified deposits in Zimbabwe

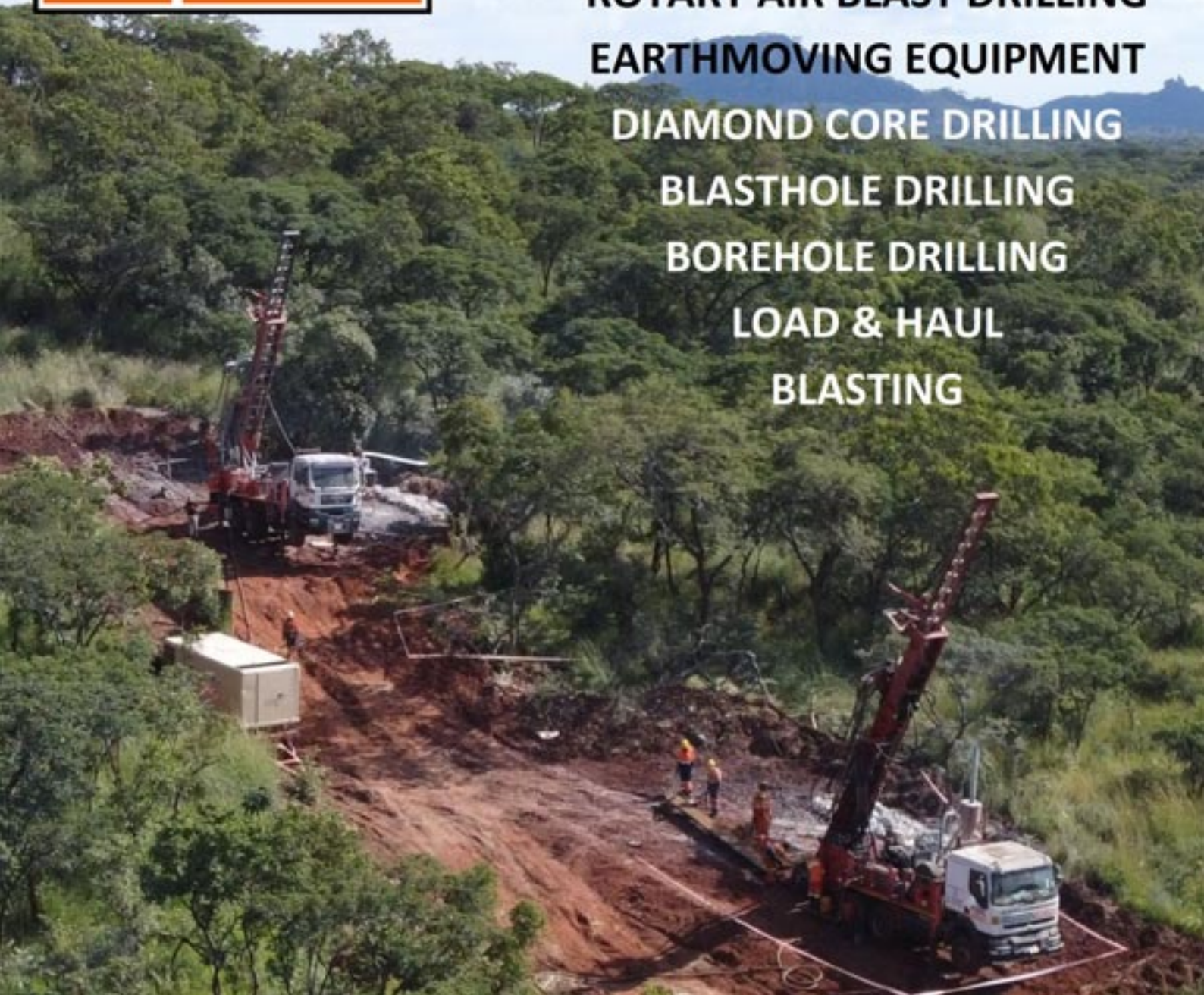
Agate	Nyamandhlovu, Chikomba, Lupane
Aluminum	Mutare, Nyanga, Mwenezi
Amazonite	Nyamandhlovu, Rushinga
Amethyst	Nyamandhlovu, Hurungwe, Hwange, Makonde, Lupan
Antimony	Kwekwe, Bubi, Mberengwa, Kadoma, Shurugwi
Arsenic	Bubi, Shurugwi, Mutare, Gwanda
Asbestos	Masvingo, Gwanda, Matobo, Mberengwa, Insiza, Makonde, Umzingwane
Aventurine	Masvingo, Beitbridge
Barites	Kwekwe, Mwenezi
Beryl	Hurungwe, Kariba, Goromonzi, Harare, Mudzi, Rushinga, Mutoko, Bindura, Marondera, Gutu, Buhera, Bikita, Chegutu, Hwange, Mberengwa, Gweru
Bismuth	Gwanda, Insiza, Goromonzi, Hwange
Cesium	Mudzi, Bikita, Goromonzi
Calcite	Hwange, Bindura, Chiredzi, Mwenezi
Chromium	Mberengwa, Guruve, Makonde, Gweru, Kwekwe, Shurugwi, Chegutu, Kadoma, Gwanda, Insiza, Masvingo, Chirumanzu
Citrine	Marondera, Harare, Goromonzi
Clay	Harare, Bulawayo, Gwanda, Gweru
Coal	Gokwe, Chiredzi, Beitbridge, Mwenezi, Hwange, Lupane, Binga, Kariba, Hurungwe, Bikita
Cobalt	Kwekwe, Insiza, Shamva, Bubi, Bindura
Copper	Makonde, Kadoma, Mutare, Chirumanzu, Chegutu, Kwekwe, Shurugwi, Beitbridge, Gokwe, Bindura, Chipinge, Bikita, Insiza, Makonde, Harare, Bulawayo, Shamva, Chiredzi, Nkayi, Mudzi, Chegutu, Bindura, Kwekwe, Hurungwe, Bubi, Makonde, Bikita, Gwanda, Masvingo.
Cordierite	Hurungwe, Beitbridge, Chimanimani, Rushinga, Makuti
Corundum	Beitbridge, Chiredzi, Shurugwi, Marondera, Mberengwa, Mazowe, Rushinga, Insiza, Goromonzi, Wedza, Makoni
Diamond	Gweru, Bubi, Beitbridge, Binga, Mwenezi, Mutare, Chivi
Diatomite	Hurungwe
Dolomite	Mutare, Beitbridge, Makonde, Mudzi, Masvingo, Rushinga.
Emerald	Gutu, Masvingo, Insiza, Mberengwa, Hurungwe.
Feldspar	Harare, Bikita, Umzingwane, Goromonzi
Fireclay	Hwange, Chiredzi, Kwekwe, Lupane, Nkayi, Kadoma, Kwekwe
Flint clay	Mwenezi, Beitbridge
Fluorite	Hwange, Guruve, Binga
Garnet	Beitbridge, Hurungwe, Mudzi, Guruve, Rushinga, Marondera
Graphite	Hwange, Hurungwe, Kariba, Makonde
Gypsum	Beitbridge
Gold	Every district in Zimbabwe
Iron	Kwekwe, Mberengwa, Harare, Kwekwe, Buhera, Gweru, Charter, Chiredzi, Masvingo, Mazowe, Kadoma.

Minerals and areas of verified deposits in Zimbabwe

Jade	Masvingo
Kaolin	Kwekwe, Mutare, Bubi, Hwange, Kadoma, Mazowe, Harare, Umzingwane, Nkayi, Chegutu
Kainite	Hurungwe, Nyanga, Mudzi, Rushinga
Lead	Mberengwa, Kwekwe, Gokwe, Mutare, Wedza, Hwange
Limestone	Mberengwa, Gwanda, Bindura, Shamva, Mazowe, Kadoma, Umzingwane, Gweru, Chegutu, Chimanimani, Mudzi, Harare, Hurungwe
Lithium	Goromonzi, Mudzi, Buhera, Bikita, Chegutu, Hwange, Harare, Insiza, Rushinga, Mutoko, Mutare, Hwange
Magnetite	Gwanda, Nyanga, Kadoma, Mwenezi, Insiza, Buhera, Mberengwa, Beitbridge, Gweru
Manganese	Kwekwe, Gweru, Makonde, Mberengwa
Mercury	Bubi, Kadoma
Mica	Hurungwe, Rushinga, Kariba, Hwange
Molybdenum	Kwekwe, Insiza, Shurugwi, Makonde, Chipinge, Gweru, Mutare
Mtorolite	Guruve, Mutare
Nickel	Bubi, Makonde, Kwekwe, Insiza, Guruve, Shamva, Shurugwi, Matobo, Chegutu, Bindura, Gweru.
Ochre	Gweru, Kwekwe
Palladium	Kwekwe, Makonde, Shurugwi, Chegutu
Phosphate	Buhera
Platinum	Kwekwe, Makonde, Shurugwi, Chegutu, Centenary
Pyrite	Shurugwi, Gwanda, Mazowe, Kadoma, Bulilimamangwe, Shamva, Hwange.
Salt	Mwenezi
Sapphire	Mudzi
Selenium	Makonde
Silica	Gweru, Kwekwe, Makonde, Chegutu, Gokwe, Harare, Goromonzi
Sillimanite	Hurungwe
Silver	Makoni, Makonde, Kwekwe
Talc	Bubi, Guruve, Insiza, Nyanga, Mutare, Mt Darwin, Mberengwa, Goromonzi, Mutoko, Wedza, Kwekwe, Makoni
Tantalum	Hurungwe, Guruve, Kariba, Mudzi, Mutoko, Shamva, Bindura, Harare, Goromonzi, Murehwa, Mt Darwin, Rushinga, Mazowe, Marondera, Gutu, Masvingo, Buhera, Bikita, Mutare, Hwange, Chivhu, Mberengwa, Chimanimani, Makoni, Insiza
Tin	Hurungwe, Mudzi, Shamva, Bindura, Goromonzi, Harare, Rushinga, Mt Darwin, Nyanga, Gutu, Bikita, Hwange, Masvingo, Mutare
Topaz	Hurungwe, Gweru, Mutare
Tungsten	Hurungwe, Kariba, Shamva, Mazowe, Rushinga, Bindura, Guruve, Mt Darwin, Harare, Mudzi, Goromonzi, Bulawayo, Insiza, Matobo, Gwanda, Umzingwane, Bubi, Buhera, Mberengwa, Kadoma, Bikita, Shurugwi, Mutare, Chipinge, Chegutu, Kwekwe, Chiredzi, Wedza, Gweru, Hwange, Masvingo, Makoni
Vanadium	Mt Darwin, Guruve, Bulawayo
Vermiculite	Buhera, Mudzi
Zinc	Kwekwe, Gokwe, Nyanga



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