Geological Society of Zimbabwe

Summer Symposium

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Start	**End**	**Topic**	**Speaker**
07:45	08:30	**Registration**	
08:30	08:50	Welcome	Caston Musa- Geological Society Chair
08:50	09:30	Official Opening	Forbes Mugumbate - Director - Zimbabwe Geological Survey
09:30	10:00	From Data to Policy: Leveraging Beneficiation Research to Inform Mineral Processing Infrastructure Development in Sub-Saharan Africa	Maideyi Meck
10:00	10:20	**Tea**	
10:20	10:40	African Minerals and Energy Resources Classification and Management System, Pan African Reporting Code (AMREC PARC) and its relevance to the African mining industry	Fred Ndoro
10:40	11:10	The geological architecture of Southern Africa	Tony Martin
11:10	11:40	A review of the geology and exploration challenges for lenticular chrome deposits in the Zimbabwe Craton and Northern Marginal Zone	Godfrey Chagonda
11:40	12:05	Diamond potential of the lithospheric mantle beneath the Limpopo mobile belt (southern Zimbabwe) based on geochemistry of mantle garnets.	Evgeny Nikolenko
12:05	12:25	British Geological Survey collaborations in Zimbabwe 2025/26: National geological map GIS and Harare groundwater database	John Stevenson & Bentje Brauns
12:25	12:45	Promoting Large-Scale Mineral Exploration in Zimbabwe	Hillary Gumbo
12:45	14:00	**Lunch**	
14:00	14:20	Kimberlite origin and emplacement - kimberlitic & alluvial diamond exploration in Southern Africa	Tapiwa Mtetwa
14:20	14:45	An Overview Of Resource Drilling And Mine Development At Mogalakwena	James Winch
14:45	15:05	Practical uses of AI for Zimbabwe	Steve Duma
15:05	15:25	**Tea**	
15:25	15:45	GIS & Remote Sensing applications in mineral exploration - How we can use them in Zimbabwean	George Kwenda
15:45	16:05	Core Principles and Best Practices for Geological Databases	Johannah Nhiwatiwa
16:05	16:25	Mineral Resource Modelling and Grade Estimation	Arimon Ngilazi
16:25	16:45	Summary	Tony Martin

From Data to Policy: Leveraging Beneficiation Research to Inform Mineral Processing Infrastructure Development in Sub-Saharan Africa

Maideyi Meck, Nanny Mabwe and Liane Mugariri

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Sub-Saharan Africa's mineral wealth remains largely underutilized due to limited on-shore processing capacity and policy misalignment. Despite abundant geological potential, many countries continue to export raw ores, forfeiting opportunities for industrial growth, employment creation, and technological advancement. The Sustainable Beneficiation of Polymetallic Minerals (SBPM) project, led by the University of Zimbabwe, seeks to address this challenge by integrating geological data with policy frameworks to support the development of mineral processing infrastructure. This paper presents early findings from the Magondi Belt and explores how structured data can inform legislative reform, licensing regimes, and environmental oversight to promote beneficiation across the region.

Initial fieldwork conducted in Makonde District and Gokwe North has revealed structurally controlled polymetallic mineralisation. Different zones host a diverse suite of minerals, including malachite, azurite, chalcopyrite, gold, galena, sphalerite, silver, and iron oxides. Sites such as KB Mine, Muni 1 and 2, Barrati, and Copper Queen exhibit supergene enrichment and complex ore textures, indicating the need for advanced beneficiation circuits. These may include selective flotation, hydrometallurgical leaching, and integrated flowsheets tailored to the mineralogical profile of each deposit. The reconnaissance confirms the polymetallic potential of the Magondi Belt which is indicated in most literature and underscores the urgency of developing site-specific processing protocols.

However, translating these scientific insights into policy remains a critical bottleneck. A review of Zimbabwe's draft Mines and Minerals Bill reveals several gaps that hinder site specific beneficiation. Notably, the bill lacks a clear legal definition or mandate for on-shore processing. Strategic minerals licensing does not require beneficiation-linked conditions, and environmental impact assessments fail to adequately address the risks associated with processing plants such as tailings management, reagent use, and water contamination. If data and research are availed it would be possible to improve the legislation. In the absence of data, the "use-it-or-lose-it" clause, while intended to prevent speculative tenure, may inadvertently incentivize extraction over value addition. Furthermore, ownership thresholds for foreign and local investors are not aligned with the capital requirements of beneficiation infrastructure, potentially deterring investment.

To address these challenges, the SBPM project is gathering data that can be used in the future policy reforms. The SBPM initiative is producing structured outputs to support evidence-based policymaking. These include stakeholder feedback reports, policy briefs, midline and endline reviews, and pilot plant performance metrics. These deliverables are designed to engage ministries, regulators, and industry actors in co-creating beneficiation pathways that are technically sound, socially inclusive, and environmentally responsible.

In conclusion, geological research must be positioned as a driver of industrial transformation. The SBPM project demonstrates how geological data can inform policy instruments that promote mineral value addition. By embedding scientific outputs into mining law and infrastructure planning, Zimbabwe and the broader Sub-Saharan region—can transition from raw ore dependency to regional processing hubs. This shift is essential for achieving Africa's green industrialisation agenda and ensuring that mineral wealth translates into sustainable development.

Drawing from its reconnaissance findings and stakeholder consultations, the SBPM project recommends a data based targeted suite of policy reforms to unlock Zimbabwe's beneficiation potential. To attract the requisite capital and expertise, government should establish a dedicated beneficiation fund that prioritize geological/mineralogical data to support the development of sustainable mineral processing capacity.

African Minerals and Energy Resources Classification and Management System, Pan African Reporting Code (AMREC PARC) and its relevance to the African mining industry

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I. Introduction
Welcome and introduction to the presentation on AMREC PARC and its relevance to the African mining industry
Overview of the African Mining Vision (AMV) and its objectives

II. African Mining Vision
The AMV aims to promote sustainable and transparent management of Africa's mineral resources
Key principles: transparency, accountability, and good governance

III. Need for Unified African Stock Exchanges
Benefits of a unified African stock exchange: increased liquidity, improved transparency, and enhanced investor confidence
Potential for pan-African stock exchange to facilitate cross-border listings and trading

IV. Need for an African Reporting Standard
Importance of a standardized reporting framework for mineral resources and reserves
Benefits of AMREC PARC: transparency, consistency, and comparability

V. AMREC PARC vs. Other Reporting Standards
Comparison with other reporting standards (e.g., CRIRSCO, PRMS)
Unique features of AMREC PARC: focus on African context, transparency, and accountability

VI. Training on AMREC PARC
Importance of training for practising geologists on AMREC PARC
Benefits: improved reporting, increased transparency, and enhanced credibility

VII. Inclusion of AMREC PARC in Academic Curricula

Importance of incorporating AMREC PARC in geology and mining-related academic programs
Benefits: future professionals will be equipped with knowledge of the standard, enhancing industry's adoption and compliance

VIII. Adoption of AMREC PARC by African Stock Exchanges
Potential for VFEX, ZSE, and other African stock exchanges to adopt AMREC PARC
Benefits: increased transparency, improved investor confidence, and enhanced credibility

IX. Endorsement by GSZ
Request for the Geological Society of Zimbabwe (GSZ) to endorse AMREC PARC as the way forward for the African mining industry
Benefits: GSZ's endorsement will promote adoption and implementation of AMREC PARC across the industry

X. Conclusion
Recap of key points and benefits of AMREC PARC
Call to action: adoption, implementation, and promotion of AMREC PARC in the African mining industry.

The Geological Architecture of Southern Africa

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The geological events that formed the continental crust of the southern part of African span almost the whole of earth history from the Archean Granite Greenstone terranes (< 3.7 Ga) to the Pleistocene Kalahari Group (<65 Ma present).

The Archaean cratons include the Kaapvaal, Zimbabwe and Congo Cratons with three Palaeoproterozoic Shield areas or Blocks (Angolan, Bangweulu and Rehoboth), which are surrounded by orogenic belts of three different ages each reflecting the break-up and amalgamation of supercontinents. Overlying the basement rocks are a number of intracratonic sedimentary basins and igneous intrusions, ranging from the Archaean to present. These will be described in varying degrees of detail.

A review of the geology and exploration challenges for lenticular chrome deposits in the Zimbabwe Craton and Northern Marginal Zone

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The southern and south-central parts of Zimbabwe are endowed with Archean (3.5-2.74 Ga) lenticular chromite deposits hosted in layered komatiitic ultramafic sill complexes distributed both in the greenschist to amphibolite facies Zimbabwe Craton (ZC) and the granulite-grade Northern Marginal Zone (NMZ) (Rollinson, 1997; Prendergast, 2008). The ultramafic sills hosted chromite deposits are the subject of this presentation and they pre-date the intrusion of the ca. 2.57 Ga Great Dyke and its associated chromite mineralization. The lenticular deposits have been worked intermittently since 1900s and have contributed significantly to the country's economy. The deposits are hosted in serpentinized dunite and occur as discontinuous lenticular to pipe-like bodies of variable sizes (up to few tens of metres in width & strike) and exhibit different ore grades (Stowe, 1968; Rollinson, 1997; Prendergast, 2008). The lenticular deposits in the ZC occur in the Tokwe Segment associated with Sebakwian remnant greenstone belts (e.g., Hornet, Valley), Shurugwi Ultramafic complex (e.g., Railway Block & Selukwe Peak mines) and Mashava Ultramafic Suite (e.g., Prince Mine) (Prendergast, 2008). The NMZ deposits are situated in Mberengwa, and they include Inyala, Rhonda & Mlimo mines hosted in layered intrusion enveloped within granulite facies gneisses.

Both in the ZC and NMZ, the ultramafic sills and associated chromites experienced several episodes of regional tectonism including folding, shearing, faulting and thrusting. The deformation rolled-up, duplicated, stretched and off-set the once continuous main chromite ore horizons formed by magmatic differentiation from olivine-orthopyroxene-pyroxenite-chromite komatiitic magma (Stowe, 1968; Rollinson, 1997). Alteration is envisaged to post-date deformation, and it manifests as carbonatization and silicification (Stowe, 1968). Magnetite is introduced during serpentinization and talc-carbonate alteration of host rocks (Prendergast, 2008).

Exploration challenges for the chromite deposits arises from their relatively small size, lenticular and discontinuous nature, comparative physical and chemical properties of the chrome and its host rocks which render it difficult to contrast the ore bodies through convectional geophysical exploration techniques such as gravity and magnetic surveys. Complex tectonism resulted in duplication and displacement of the main ore horizons, and this presents a gig-saw puzzle to the exploration geologist. Exploration successes documented in Shurugwi (e.g., Peak Mines) were achieved through systematic core drilling campaigns, with chromite deposits discovered to be spatially associated with magnesium-rich (> 32 % MgO) domains (Cotterill, 1959).

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Diamond potential of the lithospheric mantle beneath the Limpopo Mobile Belt (southern Zimbabwe) based on the geochemistry of mantle garnets

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Alrosa (Zimbabwe) company conducted an exploration program to search for new kimberlites on their licenses in the south of the country (Matabeleland South) during the period 2020 to 2024. Exploration was carried out using the traditional mineralogical method, resulting in the discovery of three new non-productive kimberlite bodies of vein morphology. In parallel, a re-evaluation of some previously discovered (JK-01, Triangle-11, 12) kimberlites was carried out. The studied kimberlites are located within the Central Zone of the ancient (early Archean) Limpopo mobile belt, which separates the Kaapvaal and Zimbabwean cratons, and represents a complex structure composed of a tectonically displaced allochthon, which has no connection with the lithospheric mantle (De Wit and Hart, 1993). According to published data, the lithospheric mantle beneath this belt is completely analogous to that beneath the Kaapvaal craton, i.e., represented by a depleted, relatively cold lithosphere composed of low-temperature garnet peridotites (Kopylova et al., 1997).

Mantle garnets classification shows an unusual ratio for diamond-bearing kimberlites between genetic groups of the garnets, namely - abnormally high contents of diamond-bearing harzburgite-dunite paragenesis garnets - 45.5% and 48.4% in the kimberlites Triangle-11 and JK-01 respectively (Sobolev et al. 1973). Mineralogical criteria for diamond potential of kimberlites (Sobolev et al, 1973) indicate a high potential for mentioned kimberlites. However, bulk sampling of these kimberlites revealed a rather low diamond content, or even their complete absence.

Studies of mantle garnets' REE and trace element composition from the kimberlites JK-01, Triangle-11, and Triangle-12 made it possible to analyze geochemical indicators of metasomatic processes in the lithospheric mantle of this region. According to the classification (Agashev et al. 2018), the predominant harzburgite garnets from the studied kimberlites were affected by carbonated fluid metasomatism. Their comparison with the REE composition of garnet inclusions in diamonds from diamond-bearing kimberlites showed that the capture of inclusions in these diamonds occurred at a quite mature stage of the metasomatism process of the lithospheric mantle. The garnet inclusions in diamonds exhibit peaks in REE distribution at either Pr-Nd-Sm (harzburgitic garnets) or Nd-Sm (lherzolitic garnets) (Stachel et al., 2022), thereby fixing the stage of diamond nucleation and the capture of inclusions. However, the harzburgite garnets from the kimberlites JK-01, Triangle-11, Triangle-12 reflect an earlier stage of the metasomatic process, which is reflected in the shape of their REE distribution that peaks at Ce-Nd and very low contents of medium and heavy REE in the range from Gd to Tm.

As is known, stable conditions with a continuous supply of metasomatic agents containing carbon are necessary for diamond growth. The new data on the rare element composition of mantle garnets from the kimberlites Triangle-11, Triangle-12, and JK-01 indicate that metasomatism of the lithospheric mantle in this area ceased at an early stage, due to a reduction in fluid flow, and consequently, supply of carbon necessary for diamond crystallization. Therefore, the process of diamond growth in the lithospheric mantle beneath the kimberlites Triangle-11, Triangle-12, and JK-01 stopped at an early stage.

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British Geological Survey collaborations in Zimbabwe 2025/26: National geological map GIS and Harare groundwater database

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British Geological Survey staff are visiting Harare in October and November 2025 as part of two collaborations that will run until March 2026. This presentation described the projects in two parts.

In the first, BGS Informatics staff and Survey geologists are working with the Zimbabwe Geological Survey to prepare an updated version of the 1:1M national geological map. This is primarily an exercise in Geographic Information Systems (GIS) and will not involve any new mapping or fieldwork.

Digital data from both the 1977 Geological and 2010 Tectonic maps have been converted to modern data formats suitable for use in open source QGIS, and a database of rock units is being created. Training will be given to ZGS staff. The aim is to create a new geological map (as a true GIS, as opposed to georeferenced vector drawings) that ZGS staff are in a position to incrementally update.

This talk will present our aims and progress so far, then solicit feedback and advice from Society members.

The second part of the presentation highlights a collaborative initiative between BGS Hydrogeology, Geology, and Informatics teams, working alongside local stakeholders and partners. The project is funded by the UK Foreign, Commonwealth & Development Office (FCDO).

This project aims to collate, analyse, and synthesise data critical for informed groundwater management. It also focuses on developing a robust data infrastructure and delivering training to support the effective use of these datasets. The resulting resource—referred to as a Groundwater Assessment Tool—is designed to support decision-making around sustainable groundwater use.

The talk will showcase an example of the types of data BGS, in partnership with local collaborators and stakeholders, envisions integrating into this tool.

Promoting Large-Scale Mineral Exploration in Zimbabwe

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Overview

The Geological Society of Zimbabwe (GSZ) has established a Subcommittee on Large-Scale Exploration to advocate for a modernised and competitive exploration framework in Zimbabwe. The initiative seeks to promote investment in systematic, large-scale mineral exploration to unlock the country's considerable geological potential and attract global risk capital.

Why Large-Scale Exploration Matters

- Zimbabwe hosts world-class mineral resources yet lags behind in systematic exploration.
- The Exclusive Prospecting Order (EPO) system historically delivered major discoveries.
- Since the early 2000s, suspension of EPO issuance halted new large-scale discoveries, causing skills migration and increased informal mining.

Engagement

The GSZ has engaged with major stakeholders, including the Ministry of Mines, Chamber of Mines, ZIDA, Zimbabwe Miners Federation, ZanuPF and Parliamentary Committees, advocating for:

- Predictable and transparent regulatory frameworks.
- Modernised mining cadastre and open geoscience data.
- Clear national minerals policy defining the role of government, landowners, and investors.

Key Challenges

- Lack of recent national geoscience data (last geological map: 1977).
- Suspension of EPOs and policy uncertainty discouraging foreign investment.

Benefits of EPO System

- Attracts high-risk capital and foreign direct investment (FDI).
- Generates new geological data and employment.
- Supports downstream industries and fiscal revenues.
- Each EPO could yield >US$1 million in FDI even without success and potential +1Moz gold discoveries.

Recommendations

- Reinstate and streamline EPO issuance.
- Create certainty for investors by keeping government discretion to a minimum.
- Introduce an online cadastre and open-access data portal.
- Invest in new national geoscience datasets (aeromagnetic, radiometric, and mapping programs).
- Foster collaboration between large-scale and small-scale miners

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Conclusion

Zimbabwe can revitalise its mining industry by:

- Creating a clear minerals policy.
- Modernising its legislative and cadastral systems.
- Making exploration data accessible and transparent.
- Competing regionally for global exploration investment.

If implemented, these reforms could restore Zimbabwe's position as a leading exploration destination—targeting long-term gold production levels comparable to major producers such as Australia.

Kimberlite Origin and Emplacement – Kimberlite and Alluvial Diamonds Exploration in Southern Africa

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A kimberlite is a mantle derived ultramafic rock with a fine to medium grained texture and a distinctive dull grey-green to bluish colour. It is rich in magnesium and iron. Kimberlites often have a porous or vesicular texture due to the release of volatiles during eruption. Kimberlites are rich in volatiles like carbon dioxide, water, methane and halogen species such as chlorine and fluorine. Diamondiferous kimberlites occur on Archaean cratons. There are two types of kimberlites, Group I and Group II.

Kimberlites originate deep within the mantle (150-250 km or more) and travel to the surface at speeds of tens of kilometres per hour where they explode into small volcanoes.

A typical kimberlite profile is a carrot shaped body consisting of a root zone or hypabyssal kimberlite, a diatreme zone in the middle and a crater at the surface. Kimberlites can also occur as dykes and sills. The major rock types in kimberlite are dunites, harzburgites, wherlites, lherzolites and eclogites, all in a fine grained groundmass consisting mainly of olivine, phlogopite, monticellite, spinel, perovskite and apatite amongst other minerals.

Kimberlite exploration involves sampling for pathfinder minerals like garnets, ilmenites, spinel, olivine and chrome diopside. In flat terrain, soil deflation sampling at a kilometre grid is ideal whilst in well drained areas stream sediment sampling is the method of choice. The samples are processed to recover pathfinder minerals. If pathfinder minerals are identified follow-up sampling is done to locate the kimberlite. The chemistry of the pathfinder minerals provide valuable insights into the origin, emplacement and diamond potential of a kimberlite. Airborne geophysics methods like magnetics can be used to locate kimberlites under cover like in the Kalahari dessert.

For alluvial deposits trap-sites on rivers that drain diamondiferous kimberlites are targeted. Trap-sites are normally areas where river flow is interfered with and the flow speed is reduced resulting in deposition of its load. Trap-sites can be river bends, potholes or where a river enters the sea like Chiyadzwa in Marange or an ocean like the west coast of Southern Africa where the Orange River enters the Atlantic Ocean.

An Overview of Resource Drilling and Mine Development at Mogalakwena Platinum Mine 2008- 2018

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Mogalakwena Platinum Mine is a high tonnage low-grade open cast operation exploiting the PGE-rich Platreef developed in the northern limb of the Bushveld Complex. A large volume of diamond core drilling is completed annually for resource upgrade purposes in support of mine planning and pit expansion. Whilst still delivering to schedule and plan, the resource development and upgrade programme is executed in a dynamic near-mine environment, which necessitates operational and logistical flexibility, and extensive interdisciplinary collaboration. The sustained delivery of the programme has underpinned the development of Mogalakwena into a Tier 1 mining operation, which now makes a significant contribution to the Valterra portfolio, and provides the business with substantial open cast optionality in a changing platinum mining sector. The progression of the resource upgrade programme over the 10 year period 2008- 2018 will be reviewed, highlighting the significant role that geoscientific information has played in adding value to the business.

Courtesy of Valterra Platinum.

Practical uses of AI for Zimbabwe

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Artificial Intelligence (AI) can be defined as the ability to simulate human intelligence in machines. AI can perform tasks such as technical reasoning, problem-solving, and learning which give decision-making power. While the many mines in Zimbabwe were built on a foundation of geological understanding matched with standard mining engineering practices, data collection and data analysis has not evolved to take advantage of this new technology. In this age, to stand still is to fall behind as now, the formalised operations are losing the competition for investment versus the low cost and quick returns of artisanal operations. In order to harness the full potential of the mineral wealth in the country, a working system of mining the data can be used to rebuild confidence in local skills to upgrade deposits for commercial mining using AI tools. The story of declining grades, higher costs should not deter growth because AI has moved from experimental innovation to a practical necessity available to all miners and many investments are already delivering tangible results, though few examples have been published in Zimbabwe and Africa.

The whole value chain from discovery to final smelt can now be simulated by creating a "Digital Twin" of operation capturing the geology block model to the processing plant then simulate scenarios and optimize the project.

For exploration, Rio Tinto has used advanced data analysis to reduce discovery rates by up to 30% and improve success rates. A good mining example is Obuasi Mine which used cognitive technology to analyse1.5 million samples and reinterpret subtle anomalies to create new targets and justify reopening the mine on a $500M redevelopment project coupled with machine automation. Their aspiration is to produce 350koz per year for the next 10 years. At the core of this is deployment of a UG fleet with IoT capability following the successes seen at Kroondal mine. This is the same fleet working at Zimbabwe's Mupani Mine which benefits from predictive maintenance of operating TMM with telemetry.

Zimbabwe can utilise AI to resuscitate old operations and exploit the lower grades following these examples and leveraging on existing technology.

GIS & Remote Sensing Applications In Mineral Exploration - How We Can Use Them In Zimbabwean Context

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Remote sensing (RS) and geographic information systems (GIS) serve pivotal roles in mineral exploration, acting as vital data sources and integration methodologies, respectively. Remote sensing data are increasingly accessible, often available at no cost and through commercial channels. Satellite imagery facilitates the identification of prospective ore-bearing provinces. Geological maps, alongside geochemical and geophysical data, can be synthesized with remote sensing data—such as alteration zones and regional structures—to delineate potential mineralisation targets for concentrated exploration efforts.

The Zimbabwe Geological Survey, as the principal repository of geoscientific data, boasts an extensive archive of historical exploration records in both analogue and digital formats. These datasets are invaluable for both greenfields and brownfields exploration projects. Upon digitization, these data can be integrated with remote sensing information to generate targets and select areas prior to initiating exploration activities by private enterprises. The Midlands Goldfield project stands out as a seminal study elucidating gold mineralisation within the Zimbabwean Archaean terrane. Regional shear zones were delineated through the application of Landsat imagery in the 1990s.

In contemporary times, enhanced satellite data and advanced image processing indices are now accessible for application within the Zimbabwean geological context. Notably, the majority of geological maps housed in the ZGS archives were produced over half a century ago. Remote sensing has the potential to refine geological detail and interpretation through the deployment of RS and GIS tools. New mapping initiatives utilizing archived and remote sensing data will expedite the updating and coverage of unmapped areas at significantly reduced costs compared to traditional methodologies, which relied on aerial photographs (currently unavailable) and extensive fieldwork.

The reinterpretation of geological data is a critical factor in the discovery of new deposits, and this may represent an area where new discoveries have become infrequent within the country today. The surge in consultancy firms should harness RS and GIS technologies to delineate targets that can be proposed to prospective junior exploration companies, whether local or international. Furthermore, the mapping of artisanal mining operations can be efficiently accomplished using appropriately processed satellite imagery, covering district-scale areas.

GIS data analysis and integration using data driven and empirical models are one of the most important applications of GIS in mineral prospectivity mapping. Available historical geochemical data from regional and EPO surveys in the ZGS archives and aeromagnetic data available in digital (CIDA) and ore deposit models are readily available resources that can be accessed at low cost.

Core Principles and Best Practices for Geological Databases

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The goal of this presentation is to discuss the fundamental qualities and best practices required to build and maintain an authentic geological databases. It discusses the critical importance of accuracy, consistency, completeness, verifiability, security, scalability, and integration. It also places emphasis on the importance of compliance with industry standards such as JORC, SAMREC, NI 43-101.

Furthermore, the presentation addresses the importance of standardised protocols for data collection, validation, storage, and retrieval. These principles serve as the foundation for the integrity and functionality of a geological database to aid resource modelling & estimation and decision making.

Mineral Resource Modelling and Grade Estimation

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In Zimbabwe, starting approximately in the last ten year of 20^{th} century , software developments has led to the current status where the use of computer based techniques for both mineral resource modelling and grade estimation is now a normal part of the toolkit. Nonetheless, the use software has emphasised the need for, rather than than replacement of, the fundamentals traditional skills (geology ,structure and mineralisation). It makes sense therefore when a minimum period of 5 years working (hands on) on a particular style of mineralisation is important to ensure credible models and grade estimates. The presentation is designed to promote the merging of the strength of the speed of software with mineral resource knowledge for accurate, credible outcomes. With great power comes great responsibility.,

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