

Mineral Exploration, Opportunities & Development Projects Showcase, Zimbabwe



African Exploration & Technology
Showcase, Johannesburg, South
Africa



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Talk format

1. Introduction to Zimbabwe geology and its mineral resources endowment.
2. Zimbabwe space in strategic elements: high-tech & green energy revolution.
3. Overview of selected mineral resources in Zimbabwe.
4. Gold, PGMs-Cr, lithium & hydrocarbons: deposit examples.
5. Exploration finds and opportunities in Zimbabwe.
6. Conclusions.

Introduction

- 60 % of Zimbabwe comprises granitoid-greenstone terrain, which constitutes the Zimbabwe Craton (ZC).
- The ZC was assembled over 1 billion years, from ca. 3.8-2.6 Ga.
- The ZC has a wide diversity of mineral resources spanning Archaean to Phanerozoic eras.
- Formation of Paleoarchaean-Mesoarchaean granitoid basement and cover greenstone belts is good for diamonds, gold and Ni-Co mineralization.
- Craton-scale deformation & associated metamorphism provided channel ways for gold precipitation & emplacement of granitic lithium pegmatites.
- Cover rocks (sedimentary rocks) include the Proterozoic Magondi belt and Umkondo Supergroup.
- About one third, western part of the country has a thick Phanerozoic cover (mostly sandstone), with no clear idea of underlying geology.
- The country is largely under-explored & can greatly benefit from more exploration investment.
- This presentation showcases, the country's geology, mineral endowment, finds and exploration opportunities.

Geology of the Zimbabwe Craton

60% of Zimbabwe's land surface is Archaean terrain.

Current geometry of GBs: deformation

Competency contrasts between GBs & granitoids: more shearing in GBs relative to granitoids.

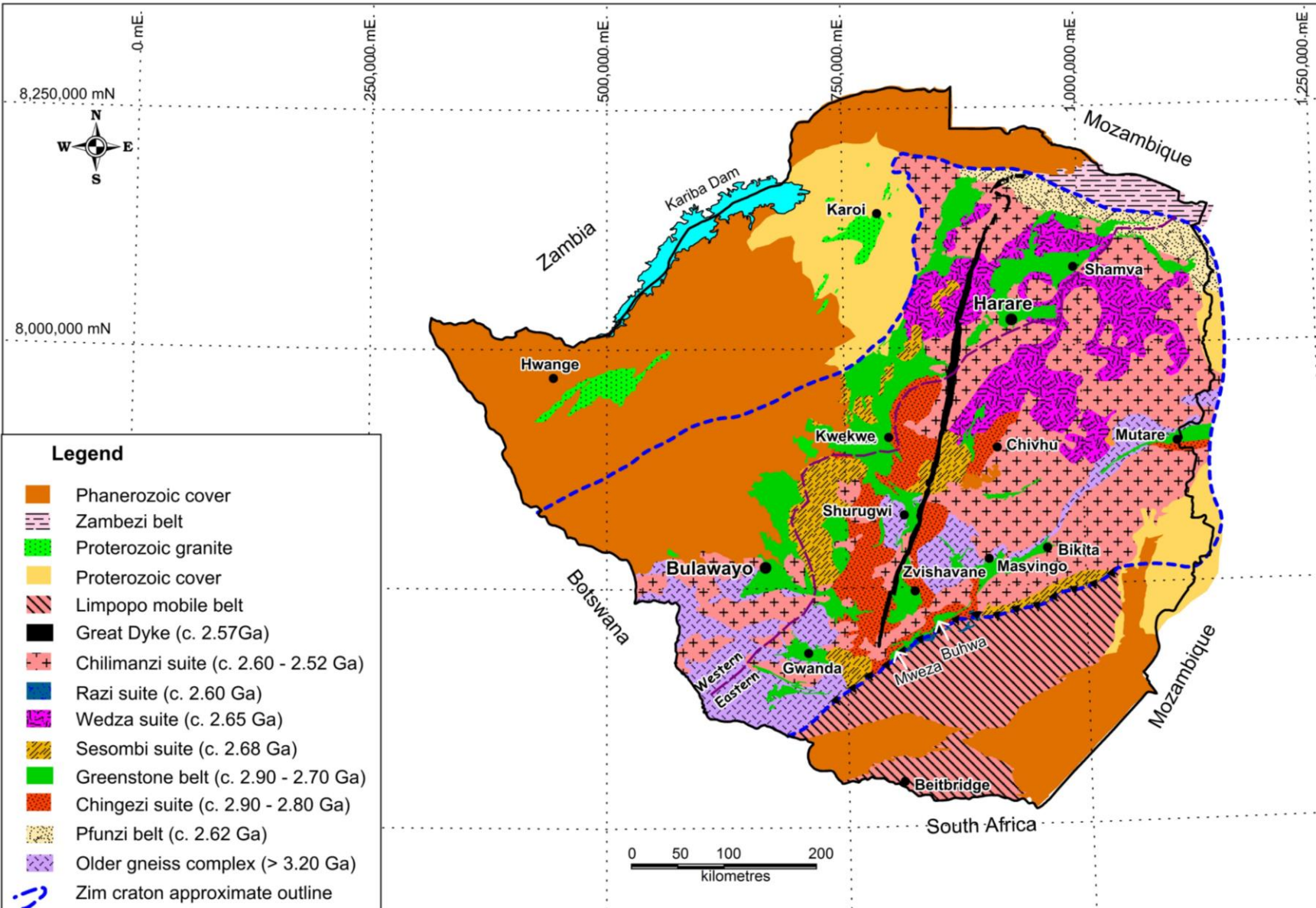
Craton-wide terrane accretion: oblique east-over-west thrusting & recumbent folding (Jelsma & Dirks, 2002).

Off-the dome movements: shearing of GBs enveloping the granitoids e.g., Chinamora batholith, enveloped by Harare-Shamva belt.

Deformation & associated metamorphism: necessary precursor process (conduits) for (a) hydrothermal system for Au mineralization & (b) LCT pegmatites intrusion.

Younger granites: cratonisation: reflect an extensive, crustal-scale melting event

Craton cracks: deep crustal discontinuities: intrusion of the Great Dyke, post-cratonisation.



(Hofmann and Chagondah, 2018)

Zimbabwe is endowed with some key elements used in an electric vehicle

Key minerals in an electric vehicle

Lithium-ion batteries harness the properties of various minerals to power electric vehicles. The cells in the average lithium-ion battery with a 60-kilowatt-hour (kwh) capacity contain about 185kg* of minerals.

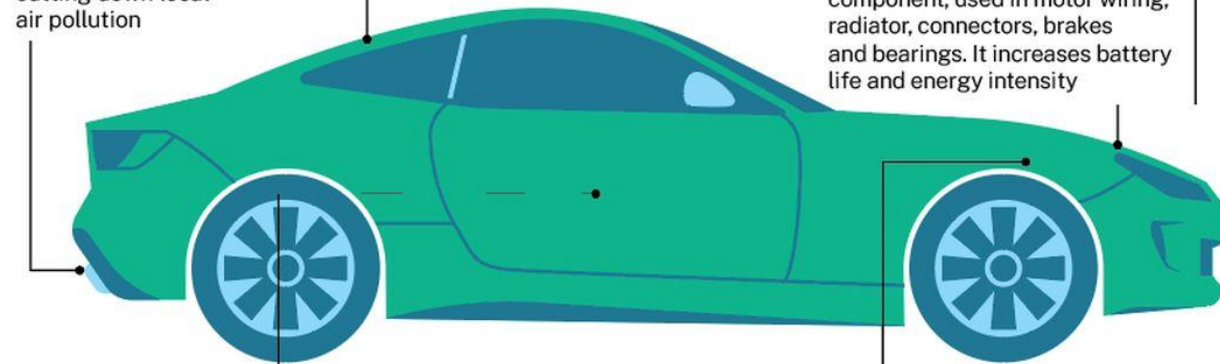
*Based on the battery compositions on the 2020 market

- Li Lithium
- Co Cobalt
- Ni Nickel
- Al Aluminium
- Mg Magnesium

Rich metal-oxide batteries emit no tailpipe pollutants, cutting down local air pollution

A reduction in the weight of a car can improve fuel economy. A vehicle's chassis made from lightweight materials magnesium or aluminium alloys can reduce its weight up to 50%

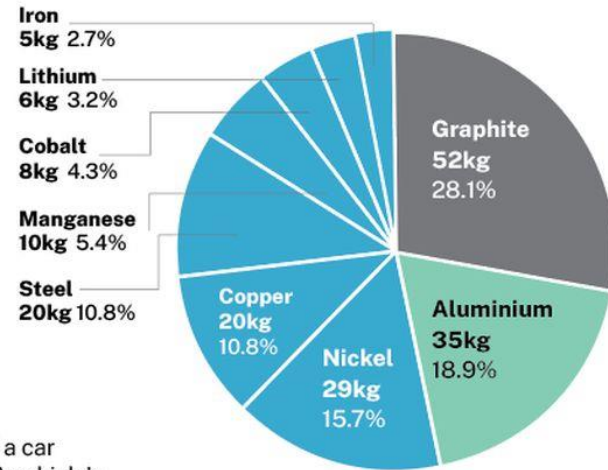
Cu Copper
An expensive but essential component, used in motor wiring, radiator, connectors, brakes and bearings. It increases battery life and energy intensity



- Fe Iron
- Mn Manganese
- Mo Molybdenum
- V Vanadium

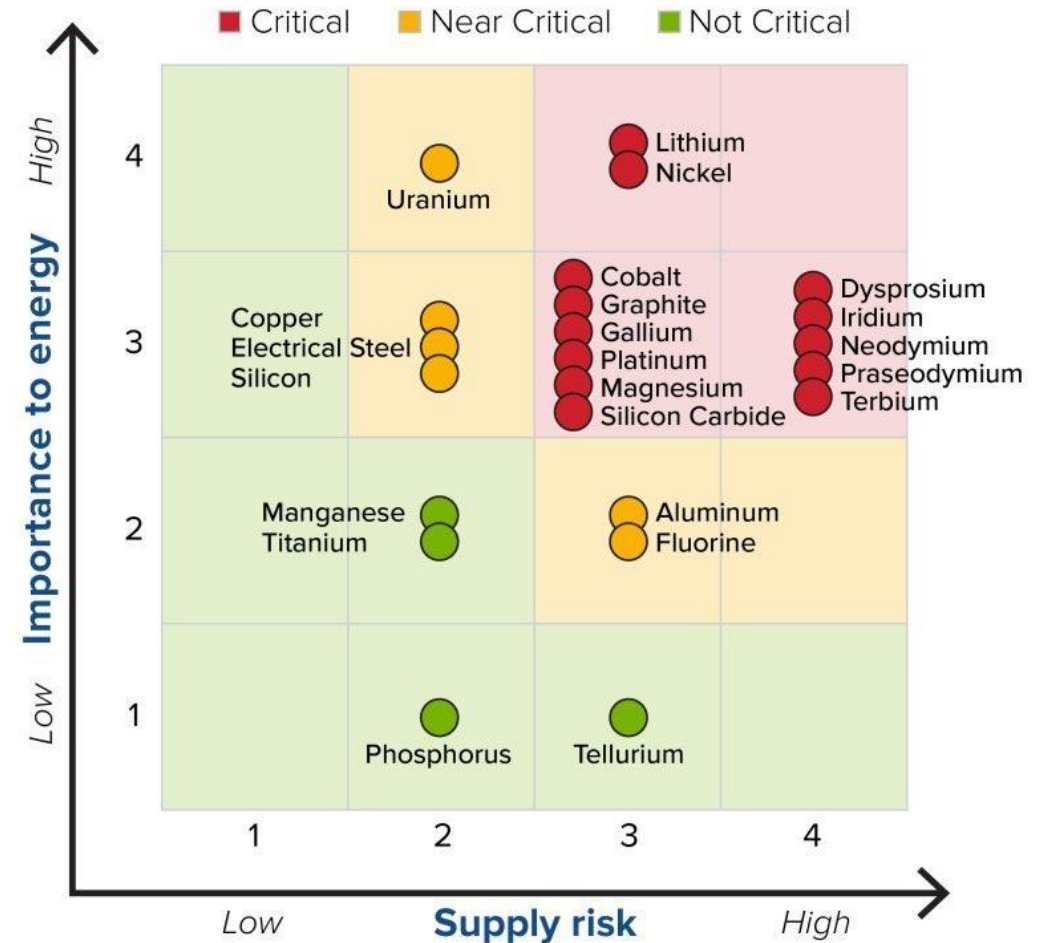
- Dy Dysprosium
- Nd Neodymium

Rare earth metals are used in the motors and generators, making EVs 3-4 times more efficient than combustion engines



Critical elements: US Department of Energy

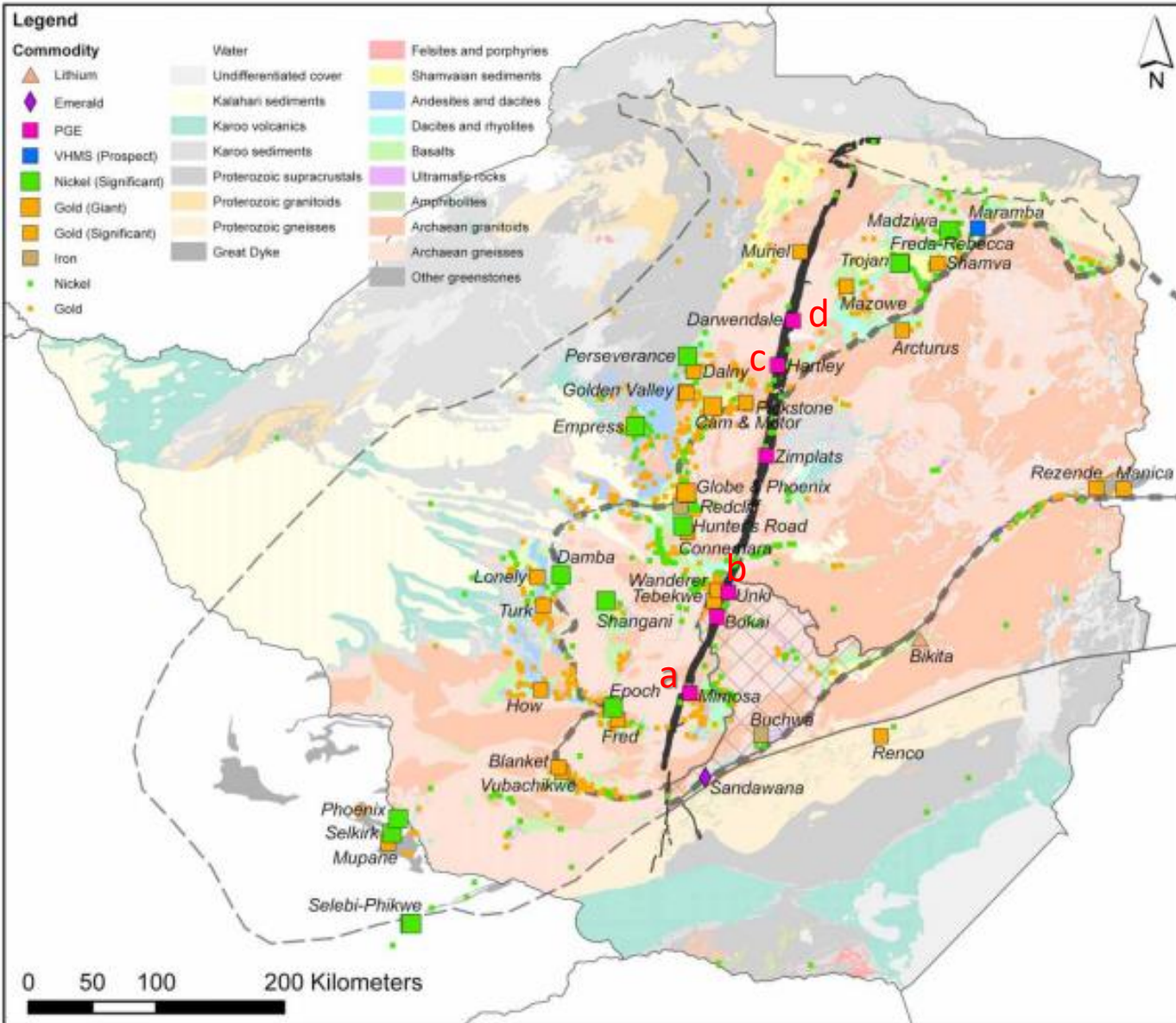
MEDIUM TERM 2025-2035



<https://www.energy.gov/cmm>

Overview of selected mineral resources in the ZC

(Jelsma et al., 2021)



ZC: wide diversity of world-class mineral resources:

Eastern succession GBs: rift-related:

Gwanda, Makaha, Shurugwi, Odzi & Belingwe belts.

Western succession GBs: subduction-accretion system:

Harare-Shamva, Chinhoyi, Midlands & Bulawayo belts.

Ni deposits: associated with komatiites & komatiitic basalts (e.g., Trojan, Madziwa, Shangani, Empress, Epoch, Hunters road & Selebi-Phikwe)

Li & gem deposits: occur in granitic pegmatites spatially associated with Neoproterozoic & Proterozoic granite suites.

Diamonds: Kimberlites: > 200 kimberlites are known.

Murowa & Sese pipes:

intrusive into c. 3.5 Ga TTG basement.

Alluvial: Chiadzwa & Chimanimani paleo-placer gravels.

Source unknown?

The Great Dyke, c. 2575 Ma: 3-11 km x 550 km long. one of the world's largest mafic-ultramafic layered igneous complexes. Endowed in PGMs & credits such as Au-Ag & chrome ore.

Developed: 4 isolated trumpet-shaped magma sub-chambers:

a. Wedza – Mimosa Mining (Implats & Sibanye Stillwater)

b. Selukwe – Unki (Anglo-American)

c. Hartley – Zimplats (Amplats) & Karo (Tharisa Pvt Ltd)

d. Darwendale – Great Dyke Investments (VI Holdings)

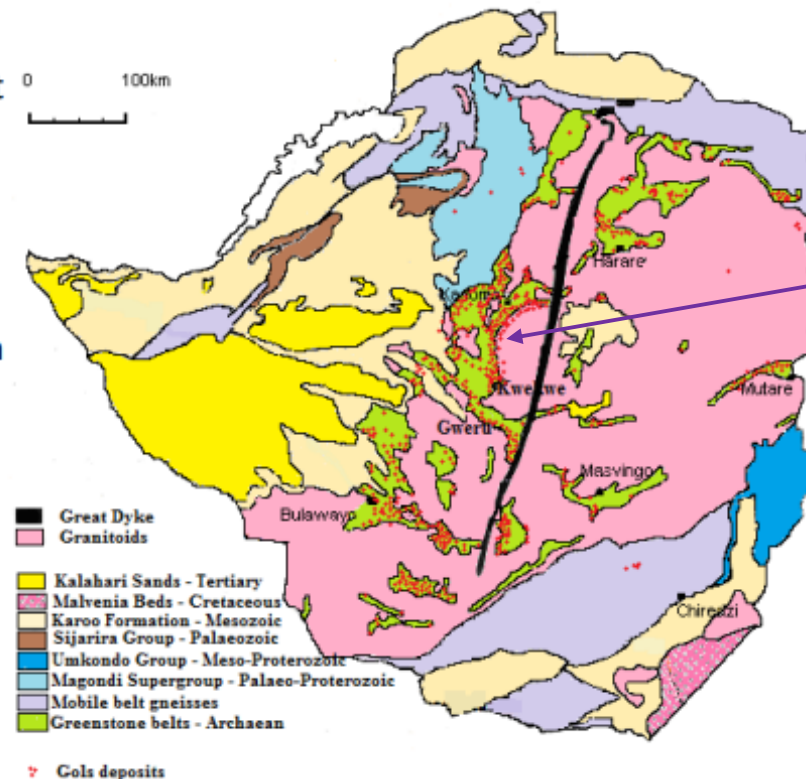
Gold mineralization in Zimbabwe

Gold Mineralization is structurally controlled (Campbell & Pitfield, 1994).

Brittle-ductile shear zones: quartz-carbonate veins and stringers.

Gold: most productive in the world at 6kg Au /km² compared to 1kg / km² in other parts of the world.

- >6 000 prospects recorded.
- Systematic mining ceased in the 1930's at most deposits
- >30 deposits produced >10t gold each
- >900 deposits produced >100kg each
- Highest production recorded 28.84t (1918)
- >90% deposits occur associated with Archaean greenstone belts and surrounding granitoids
 - Richest greenstone belts in the world
- Gold in the LMB
 - Renco-Ngundu area
- Gold in the Piriwiri –
 - D-Troop area
- Umkondo - a new gold province
 - Tarka Forest
- By-product e.g. Great Dyke
- Alluvial gold e.g. Mutare, Mazowe, Angwa, Umzingwane rivers
- Gold in dumps - >260t Au locked up in tailings (Solens Consultants, 2002)



Largest concentration of occurrences/deposits are in the Midlands GB.

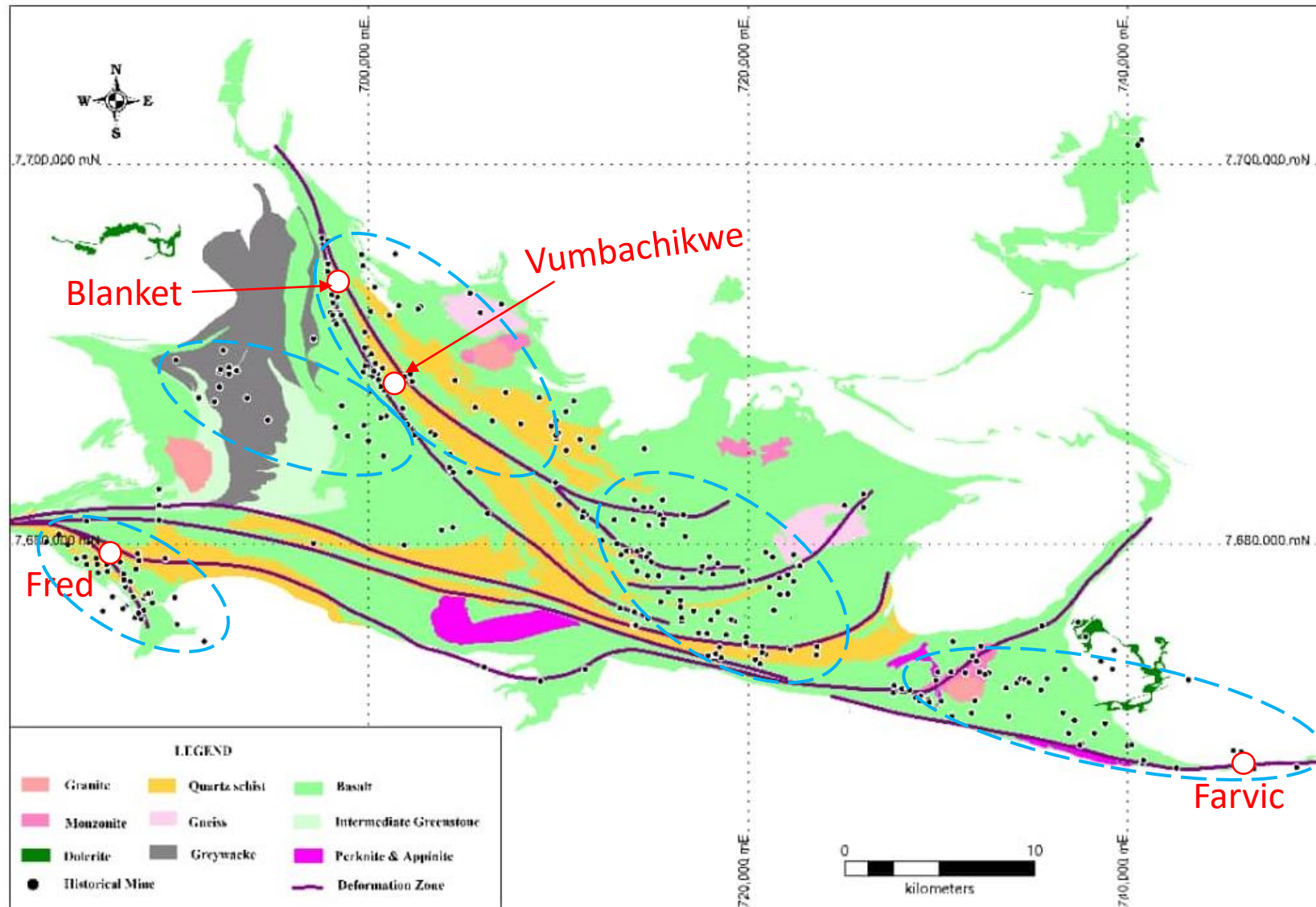


Zimbabwe's formal gold miners by 2022 output:

- Freda Rebecca: 2,070kg from 2,920 in 2021
- Dallaglio (Eureka/Pickstone): 1,961kg (2021: 976kg)
- Blanket Mine: 2,289kg (2021: 1,912kg)
- Rio Zim (Renco, Cam&Motor): 929kg (2021: 1,122kg)

Sabi gold mine (> 5 tonnes of Au)

Distribution of Au mineralization in the Gwanda GB: e.g., eastern succession



(Fuchter, 1990)

Largely sheared metabasalt...chlorite schist

Au mineralization is structurally-controlled along higher order shear zones, which splay off the main NW trending, South Gwanda Shear Zone

One of the most productive GBs in Zim.

At least 5 Au mineralization clusters/camps.

Caledonia: Blanket Mine

Largest deposit, c. 80 000 oz per yr.

Development: new shaft completed in 2020

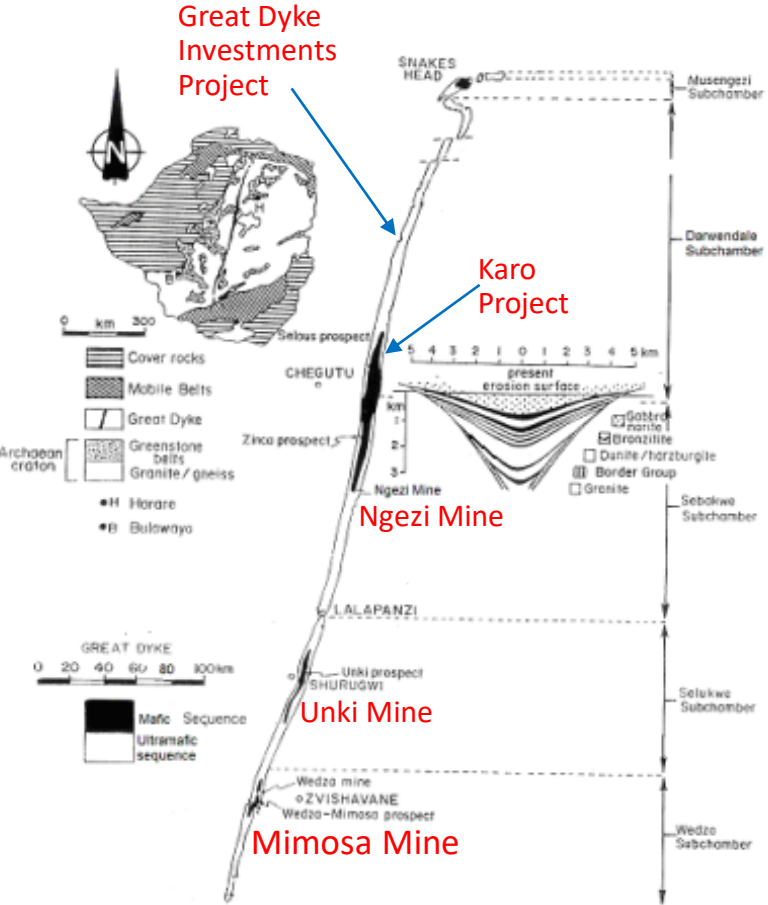
Vumbachikwe, neighbor to Blanket Mine

... 2nd largest in Gwanda belt.

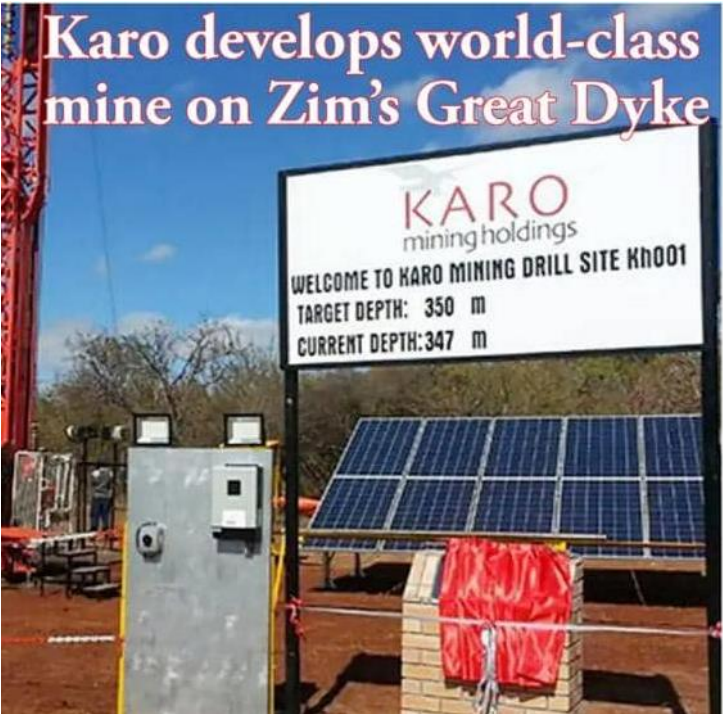
Au mineralization at GB-granitoid contact e.g., Farvic Mine.

Vumbachikwe-Blanket at ca. 800 m depth vs 1 200 km at Chakari Mine.

Platinum Group Metals



- Second largest resources in the world in the Main Sulphide Zone
 - Where the stratigraphy is capped by gabbro/norite
- Grade and thickness of ore body persist over large areas.
- Large resources locked up in oxidized parts of the MSZ
- Lower Sulphide Zone not investigated in detail.
- Potential outside the Great Dyke not investigated
 - Mhangura, Empress, other layered complexes??

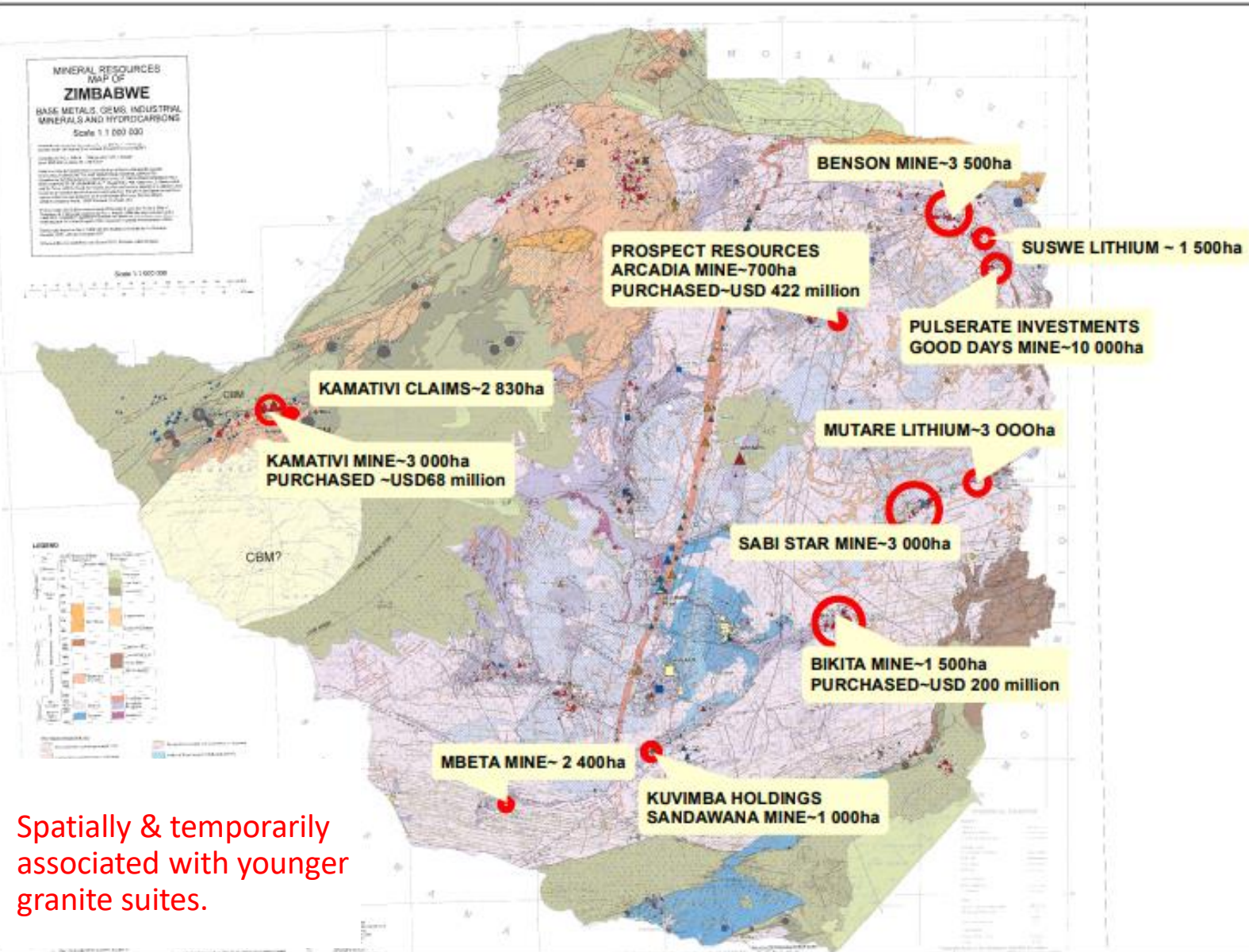


(Notes from Mugumbate: Geological Society of Zimbabwe symposium 2019)

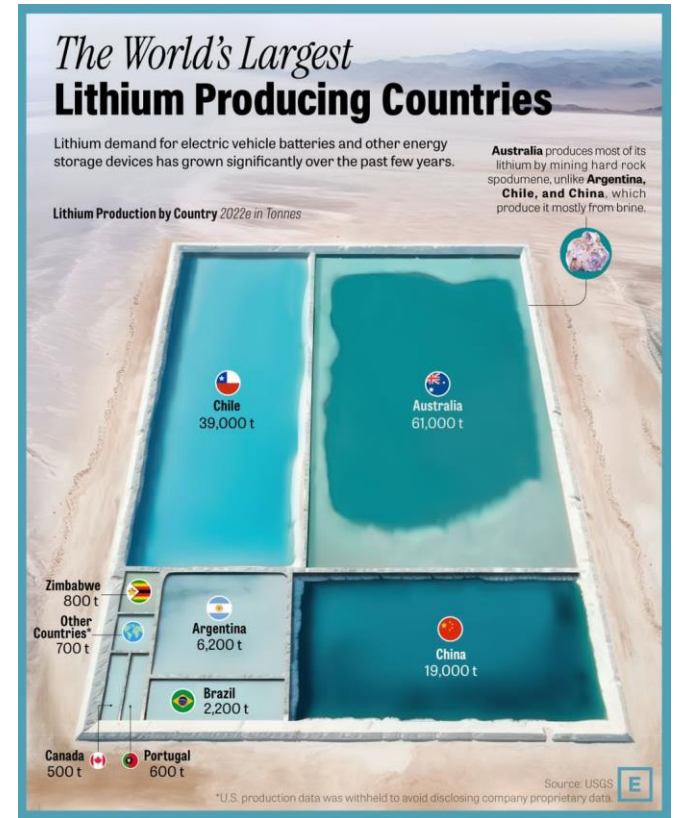
Prendergast and Wilson, 1989

Chromite
 One of the richest chromite resources in the world.
 Hosted in 11 narrow but persistent seams on the Great Dyke.
 Alluvial & eluvial deposits spatially associated with the Great Dyke.

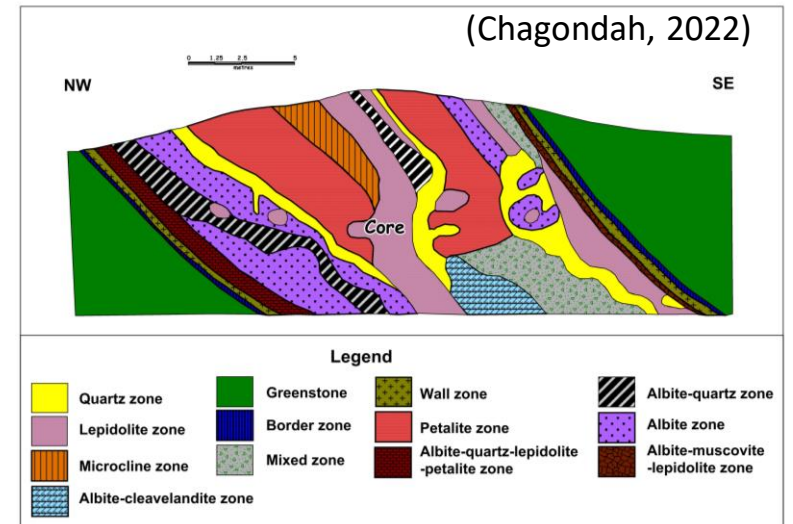
Distribution of lithium deposits, with selected investments deals



Spatially & temporarily associated with younger granite suites.

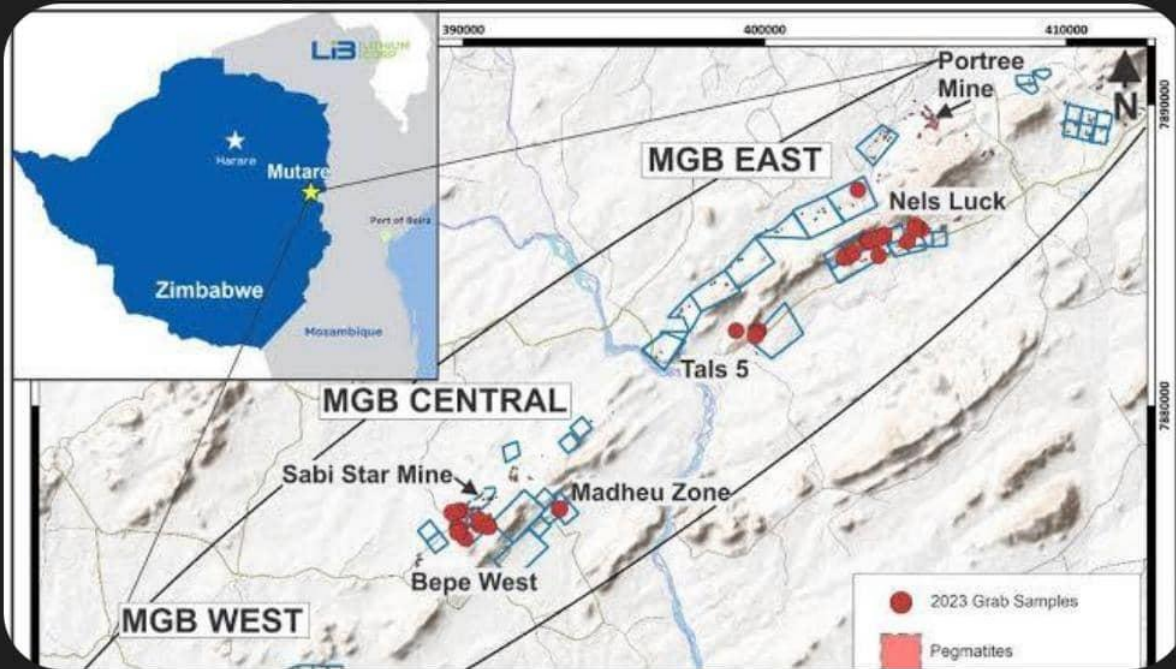


LCT pegmatite zonation: Victor's Pegmatite, Bikita.



Lithium Projects.....cont.

Mutare Lithium Project: Li3 Lithium Corp:
2022-2023



Li3 Lithium Corp uncovers 1.2
km mineralized pegmatite body
at the Mutare Lithium Project in Zi...

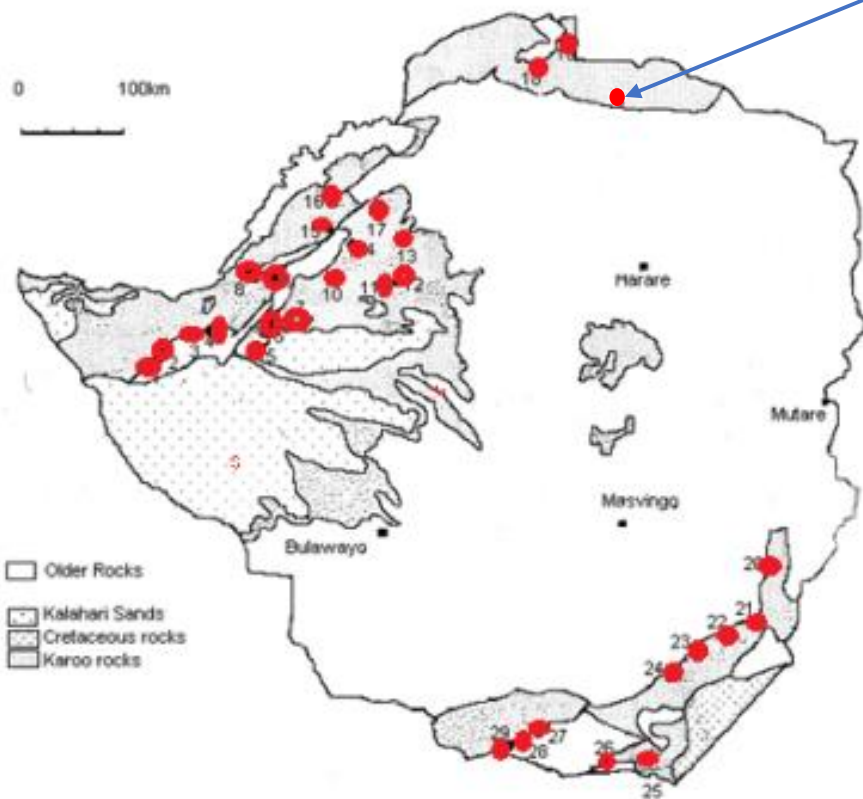
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Kuvimba Mining House's Sandawana
lithium project in Mberengwa area has a
projected resource deposit of 200 million
tonnes, effectively making it the biggest
lithium operation in Africa.

**Kuvimba to sink US\$250m
into beneficiation plant**

Hydrocarbon: Cabora Bassa Project, Zimbabwe

Zambezi Basin, Muzarabani



Red dots are associated with CBM:
Lupane- gas resources.

ASX Announcement

ASX: IVZ
OTCQB: IVCTF



INVICTUS
ENERGY LIMITED

**Total Depth reached with
additional zones of strong gas
shows and fluorescence**

30 October 2023

HIGHLIGHTS

- Strong gas shows and fluorescence encountered in multiple additional Lower Angwa reservoirs to Total Depth
- Gross hydrocarbon charge interval across Upper and Lower Angwa in excess of 1,000m
- Total Depth called at 3,718m
- Wireline logging program commenced to evaluate multiple zones of interest

Invictus Energy Limited ("Invictus" or "the Company") is pleased to provide an update of drilling the Mukuyu-2 well at its 80% owned and operated Cabora Bassa Project in Zimbabwe.

Exploration finds and opportunities in Zimbabwe

Investment opportunities are huge in gray areas

What is under Phanerozoic cover?
Expose to modern high resolution exploration techniques.

Mwami mica field: could quickly turn into a Li field (similarly to Bikita Tin Field...now Li field?).
Mwani: known occurrences of Be, Ta, W & Sn

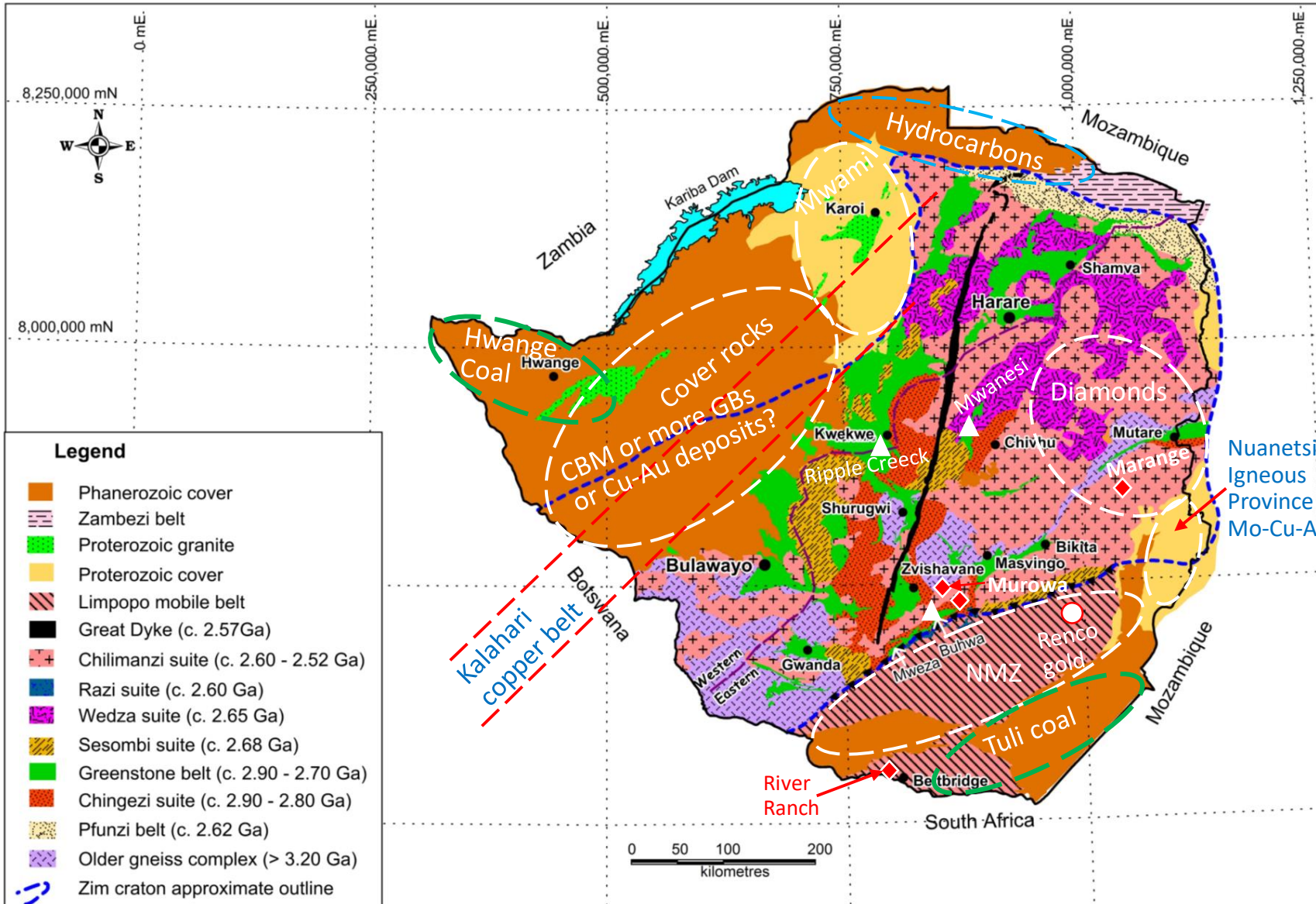
Hydrocarbons: Cabora Bassa basin Project.
Invictus Energy (ASX listed company),
drilling MUKUYU 2, ca. 3800 m.
Elevated gas & hydrocarbon shows.

Diamonds: ZCDC; Source of stones?
Umkondo Supergroup (sediments): Cu, Au & diamonds.
Where are the kimberlite pipes? Kimberlites into ancient Sebakwe proto-craton prospective.

The NMZ: granulite terrain.
Lower crustal section of the ZC.
Any potential for 'deep rooted' deposits?
Active artisanal miners Au workings. Could these be tips of the iceberg?
How many Rencos are hiding?

Hwange & Tuli coal fields:
Coal Bed Methane.
Potential to extract much-sought REEs in the coal?

Kalahari Copper Belt (NE) of Botswana.... possibly links with the Proterozoic (Magondi) Alaska-Mhangura Cu-Au in Zim?
Sanyati & Copper Queen Mines along this corridor.



Conclusions

- Zimbabwe has a wide diversity of mineral resources and is host to world-class deposits in some commodities.
- Commodity examples: Au, PGMs, Cr, Cu-Ni-Co, diamonds, rare-metals (Li, Cs, Ta, Sn) & industrial minerals (vermiculite, phosphorous, clay) and perhaps hydrocarbons?
- Current PGMs & chrome mining is around the 4 sub-magma chambers: there is potential in-between the feeder vents.
- Since 2000, there has been a substantial decrease in exploration investments across the country.
- Only the PGM industry received modest exploration funding.
- Exploration investment needed across all commodities to test unknown and mostly deep-seated deposits.
- Granting of EPO will see exploration increase at regional scales.
- Integrated and modern exploration techniques should be employed for more finds.

Acknowledgements

