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From Data to Policy: Leveraging Beneficiation Research to Inform Mineral Processing

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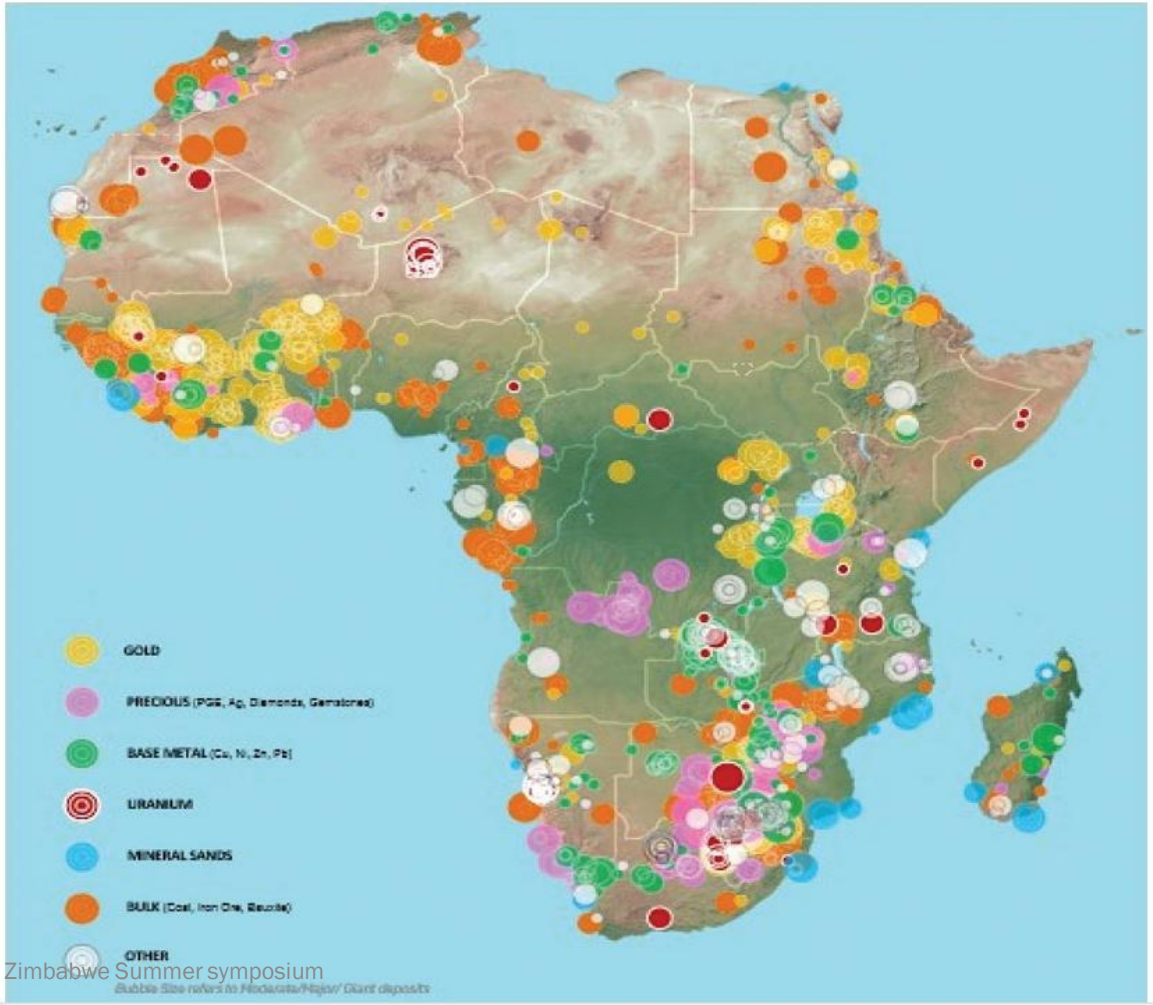
Setting the Scene – Africa's Paradox of Plenty

- Africa holds over 30% of global mineral reserves.
- Over **80%** of minerals exported raw, losing value.
- Limited on-shore processing and policy alignment hinder growth.
- Missed opportunities: technology, jobs, and local industry.

Source: MinEx Consulting's estimates)



Mineral Wealth and Underutilization in Sub-Saharan Africa

Vast Mineral Endowment

Sub-Saharan Africa has abundant mineral resources that remain largely unprocessed for local value addition.

Challenges in Value Addition

Limited on-shore processing results in exporting raw ores, missing industrial growth and job opportunities.

Strategic Development Efforts

Projects should aim to integrate science and policy to develop beneficiation infrastructure and reforms.

Need to Bridge Science & Policy

- Objective: Integrate geological data with policy frameworks.
- Lead: Research Institutions | Partners: Geosurveys, Industry, Communities.
- Goal: Use research to guide infrastructure and legislative planning.

[Insert Visual: Flowchart of science-to-policy linkage]

Closing the Data-Policy Gap:

How Data Can Strengthen the Mines and Minerals Bill

Indequaate representation of Artisanal and Small-Scale Miners — ISSUE

Comprehensive ASM mapping and production data inform differentiated licensing and support policies

- Socio-economic profiling data formalize and support ASM operations arther than criminalizing them

Ambiguous Mine classification — DATA SOLU

Geological, tonnage, and production data defining clear thresholds for smail.-med., and large scale mines

- Spatial and minerological data support zone-based categorization alignd with resource endowment

Flacal ambiguity (Taxation, Royaltles, and Revenue-Sharring) — OUTCOME

Establish production and export databases with real--time tracking of mineral output and trada

- Use data analyties to model royaity structures and fiscalimpacts

Weak Environmental and Social Safeguards — OUTCOME

Environmental baseline databases for mining sones

- Water, soil, and air quality
- recospatial data integration for tracking rehabilitation progress

Evidence-based policies that fomalizab and support ASM operations rather than criminalizing them

Poor Coordination in Governance and Law Enforcement — OUTCOME

Creation a shared national mineral data platform linking Mines, EMA. Labout. and Local Government databases

- GIS-enabled compliance tracking systems to detect illegal operations and safety violations

Enhanced inter-agency coordination and accountability through shared datats

Policy Formulation — OUTCOME

Outputs from projects like SBPM feed structured data into legisiative reform processes →

Pazsidve groumded in

- integrating Pilot plant performance data, socio-economic impact studies, and stakeholder feedback

Closing the Data–Policy Gap: How Data Can Strengthen the Mines and Minerals Amendment Bill

Inadequate Representation of Artisanal & Small-Scale Miners (ASM)

- • Data Solution: Mapping and production data; socio-economic profiling.
  • Outcome: Evidence-based formalization and support policies.

Ambiguous Mine Classification

- • Data Solution: Geological, tonnage, and production data to define thresholds.
  • Outcome: Clear, equitable mine category definitions.

Weak Environmental & Social Safeguards

- • Data Solution: Baseline databases and environmental monitoring.
  • Outcome: Transparent, data-backed environmental oversight.

Poor Governance & Law Enforcement Coordination

- • Data Solution: Shared national mineral data platform linking agencies.
  • Outcome: Improved accountability and coordinated regulation.

Closing the Data–Policy Gap: How Data Can Strengthen the Mines and Minerals Amendment Bill

Fiscal Ambiguity (Taxation & Royalties)

- • Data Solution: Real-time export/production databases; fiscal modelling.
  • Outcome: Transparent and adaptive fiscal regimes.

Critical Minerals Declaration

- • Data Solution: National mineral inventory with transparent criteria.
  • Outcome: Predictable and data-supported mineral classification.

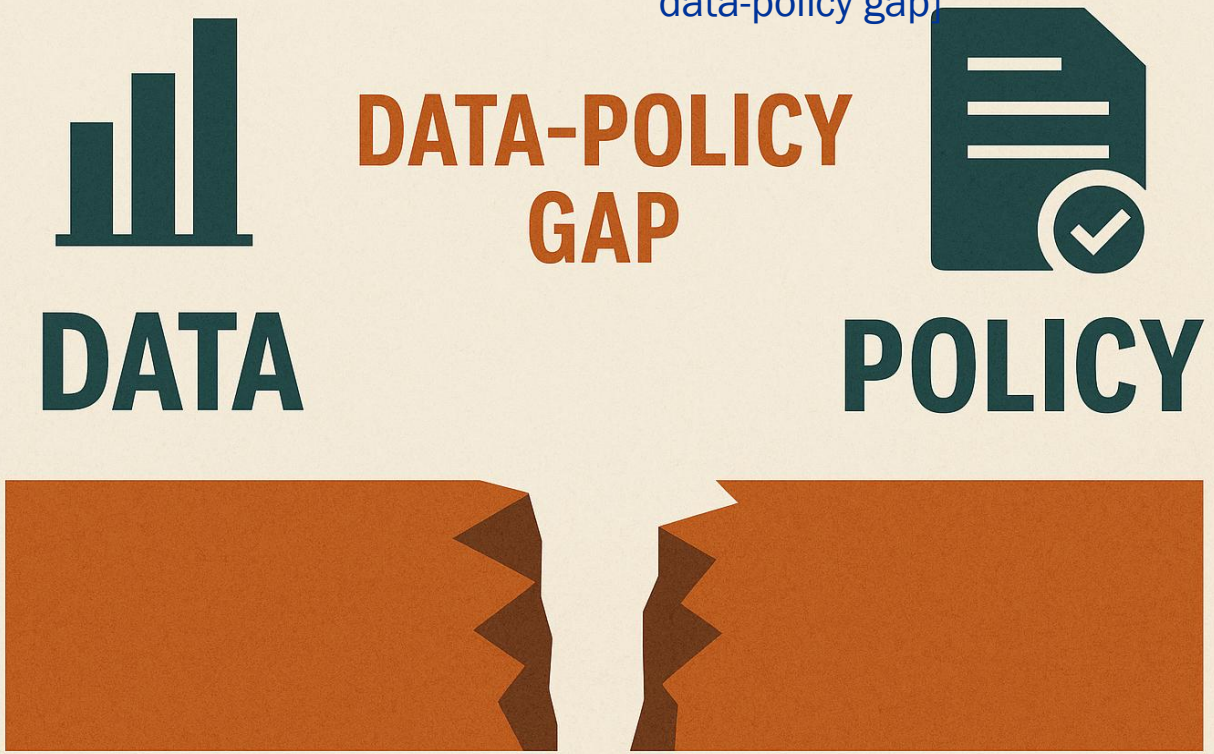
Policy Formulation & Implementation

- • Data Solution: Integrate geological outputs, pilot data, and stakeholder feedback.
  • Outcome: Policy grounded in measurable scientific evidence.

Data to Policy – The Missing Link

- Scientific data is underutilized in legal frameworks.
- Draft Mines and Minerals Bill lacks beneficiation clauses.
- EIAs overlook plant-level impacts (tailings, reagents, contamination).

[Insert Visual: Infographic showing data-policy gap]



Bridging Science and Policy

- Objective: Integrate geological data with policy frameworks.
- Lead: Research Institutions | Partners: Geosurveys, Industry, Communities.
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Barriers to Beneficiation in Zimbabwe's Mining Legislation

Legislative Gaps in Beneficiation

Zimbabwe's draft bill lacks clear mandates for on-shore mineral processing and beneficiation-linked licensing conditions.

Environmental Assessment Shortcomings

Impact assessments inadequately address risks like tailings, reagent use, and water contamination from processing plants.

Investment and Policy Challenges

Legislation not supported by data may discourage beneficiation investment and promote extraction.

Goals and Scope of the SBPM

Project Objective

The SBPM initiative integrates geological data with policy to support mineral processing infrastructure in Sub-Saharan Africa.

Addressing Bottlenecks

The project tackles legislative gaps, unstructured data, and weak stakeholder engagement hindering beneficiation.

Structured Outputs

SBPM produces stakeholder reports, policy briefs, and pilot plant metrics to enable evidence-based policymaking.

Sustainable Industrial Transformation

The initiative promotes socially inclusive, environmentally responsible beneficiation pathways for sustainable development.

The Magondi Belt SBPM Project Example

- Field areas: Makonde & Gokwe North Districts.
- Key sites: KB Mine, Muni 1 & 2, Barrati, Copper Queen.
- Observed minerals: malachite, chalcopyrite, galena, gold, sphalerite, iron oxides.
- Supergene enrichment and complex ore textures
  - Should therefore inform beneficiation protocols.

Mineralogy in the Magondi Belt-?? What metallurgical protocols

Polymetallic Mineralisation

The Magondi Belt contains diverse minerals like malachite, gold, silver, and chalcopyrite indicating rich polymetallic deposits.

Significant Mining Sites

Key sites such as KB Mine, Muni, Barrati, and Copper Queen show supergene enrichment and complex ore textures.

Advanced Processing Techniques

Selective flotation, hydrometallurgical leaching, and integrated flowsheets are needed for tailored beneficiation.

Sustainable Mineral Development

Developing site-specific processing protocols is crucial for maximizing value and sustainable mining practices.

Geochemical and Mineralogical Characterisation

- ICP and XRD analyses reveal complex sulphide–oxide assemblages.
- ??? Beneficiation
- Economic Cu–Pb–Zn–Au potential supports targetted beneficiation circuits.
- SBPM Outputs for Evidence-Based Reform
  - Deliverables: geological datasets, pilot plant metrics, policy briefs.
  - Stakeholder reports guide ministry and regulator engagement.
  - SBPM promotes co-creation of beneficiation pathways

Positioning Geological Research as a Driver of Transformation

Geological Research Empowerment

Geological research is essential in driving industrial transformation by informing policy and mining practices.

Data-Driven Policy Reform

Embedding geological data into mining legislation supports mineral value addition and sustainable development.

Towards Data-Driven Beneficiation Policy

- Isnt it time we see
  - Establishment of a Beneficiation Fund supported by geological data.
  - Site-specific feasibility studies consideing the variability of our ores.

Conclusion

- Geology must inform law, investment, and infrastructure planning.
- SBPM is endeavoring to show that data-driven policy can unlock Africa's mineral wealth.
- "Mineral wealth without data and policy is potential without purpose." — Maideyi Meck