

APPLICATION OF AMREC IN SOUTH AFRICA

A case study on copper projects in the Volcanogenic Massive Sulphide (VMS) System in the Northern Cape Province

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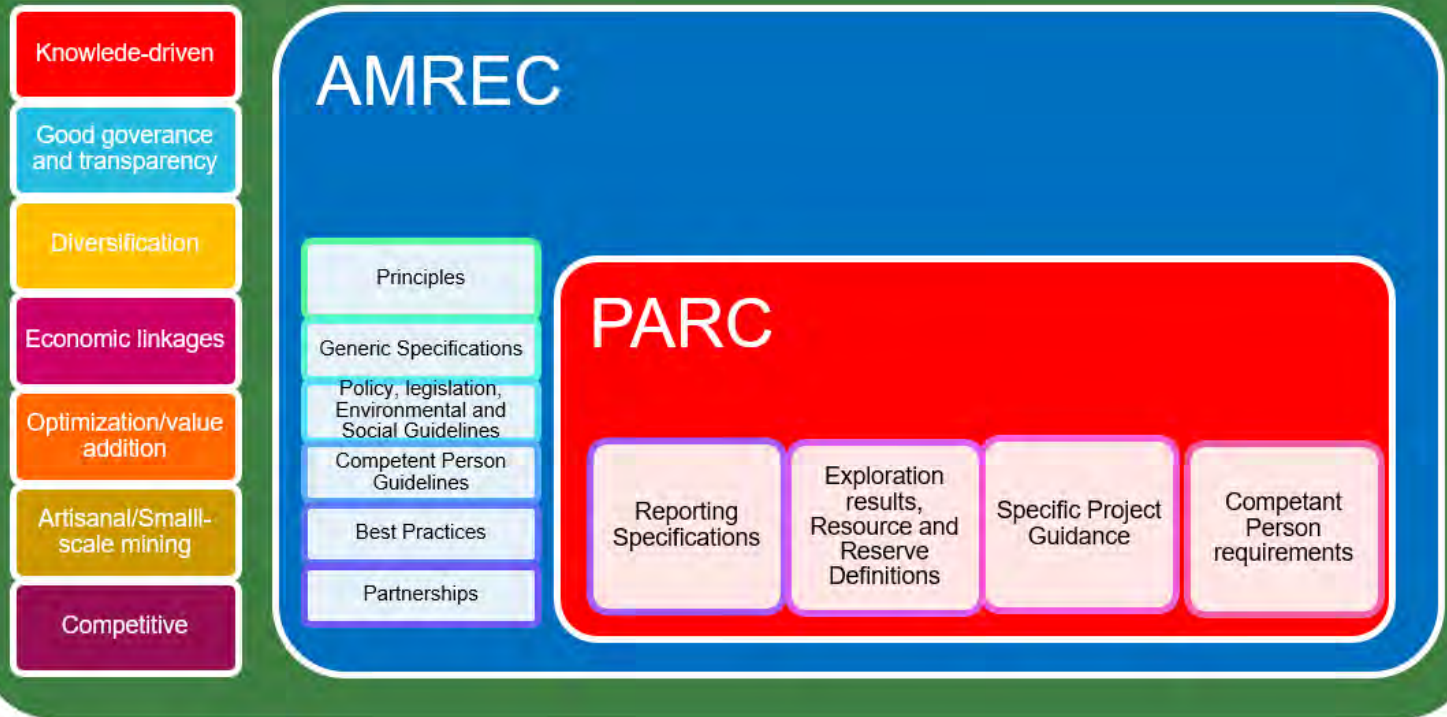
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Introduction

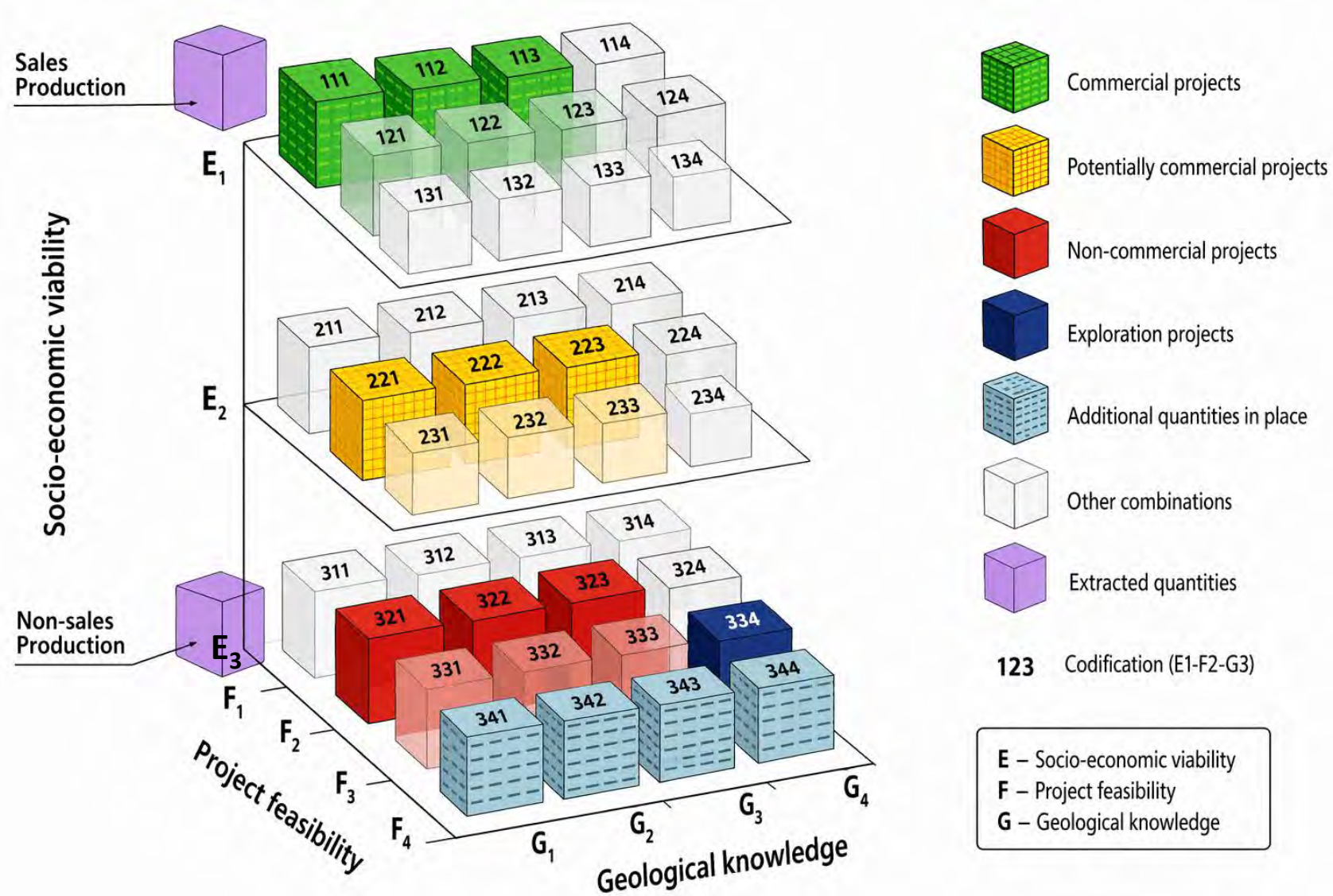
Africa Mining Vision, Agenda 2063 and Global Agenda 2030



AMREC (African continental and national system for comprehensive resource management) is applied and implemented in conjunction with:

- The AMV which provides a holistic framework for the energy and mineral industry to contribute better social, environmental and economic outcomes in Africa.
- Agenda 2063, that calls for a Prosperous Africa, based on inclusive growth and sustainable development
- Global Agenda 2030 for Sustainable Development that urges furthering of prosperity while protecting the planet
- Principles, definitions, generic specifications, sectoral specifications and guidelines of AMREC.

AMREC classification framework



AMREC classification framework

AMREC Classes Defined by Categories and Sub-categories						
	Class		Sub-class	Minimum Categories		
				E	F	G
Estimated Total Quantities in Resource Source	Produced	Sales Production				
		<u>Non Sales Production</u>				
	Known Resource Source	Commercial Projects	On Production	1	1.1	1, 2, 3
			Approved for Development	1	1.2	1, 2, 3
			Justified for Development	1	1.3	1, 2, 3
		Potentially Commercial Projects	Development Pending	2	2.1	1, 2, 3
			Development On Hold	2	2.2	1, 2, 3
		Non-Commercial Projects	Development Unclarified	3.2	2.2	1, 2, 3
			Development Not Viable	3.3	2.3	1, 2, 3
		Additional Quantities in Place		3.3	4	1, 2, 3
	Potential Resource	Exploration Projects	[See Generic Specifications for sub-classes]	3.2	3	4
		Additional Quantities in Place		3.3	4	4

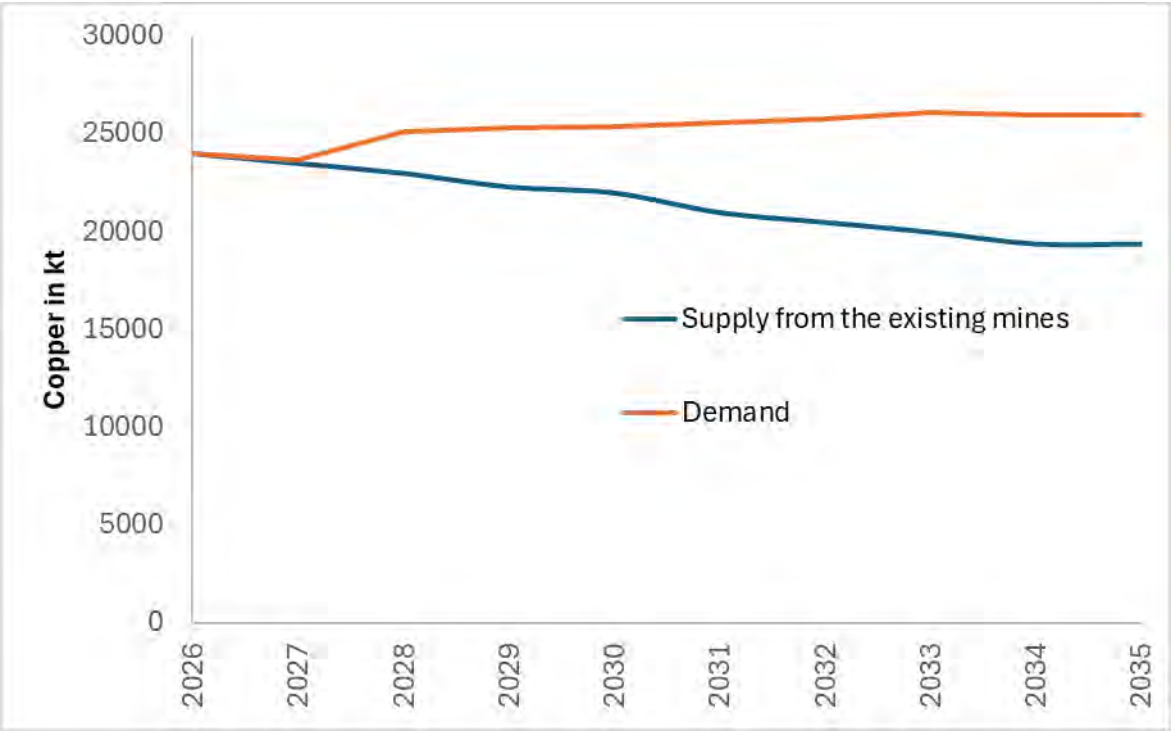
Copper

Every major sector of the global economy uses copper, from new home construction and factories to the automobile industry and power generation, amongst many others.

Copper has the highest conductivity of all non-precious metals and carry more electrical current than other precious metals.

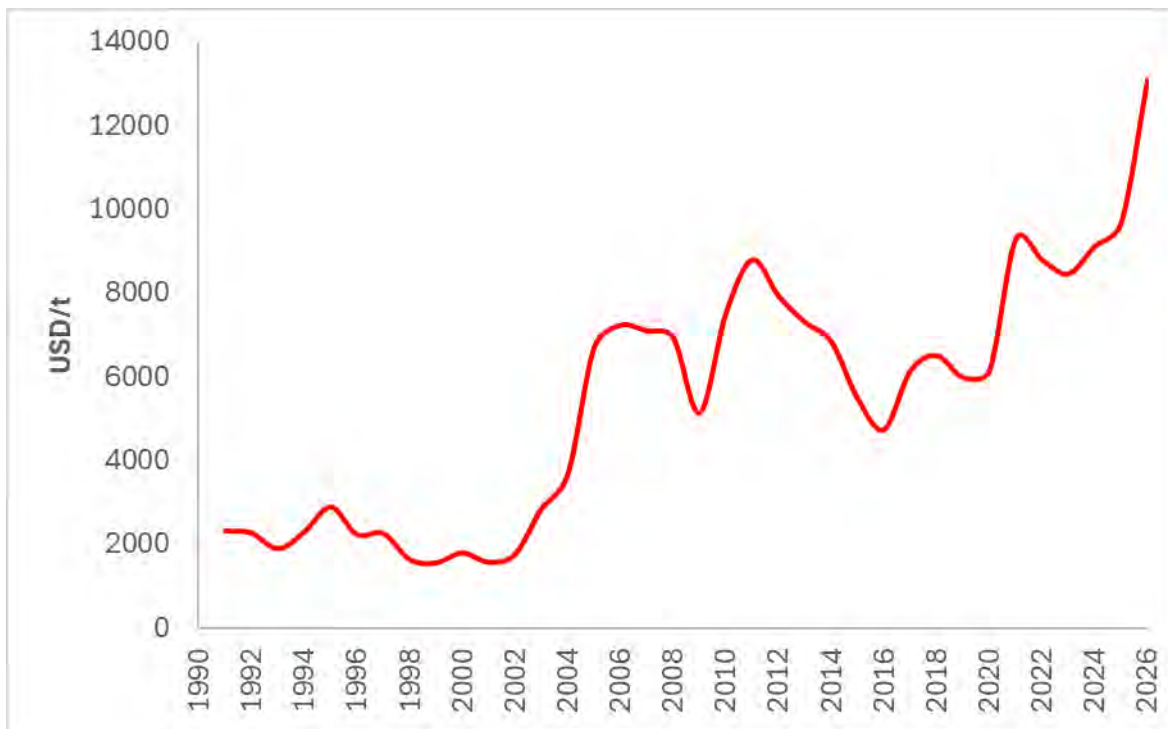
The Cu key characteristics (conductivity, ductility, efficiency, resistant to corrosion, and recyclable) make copper quite an essential metal in renewables, from solar panels and EV batteries to thermal energy and wind turbines.

Global supply and demand for copper



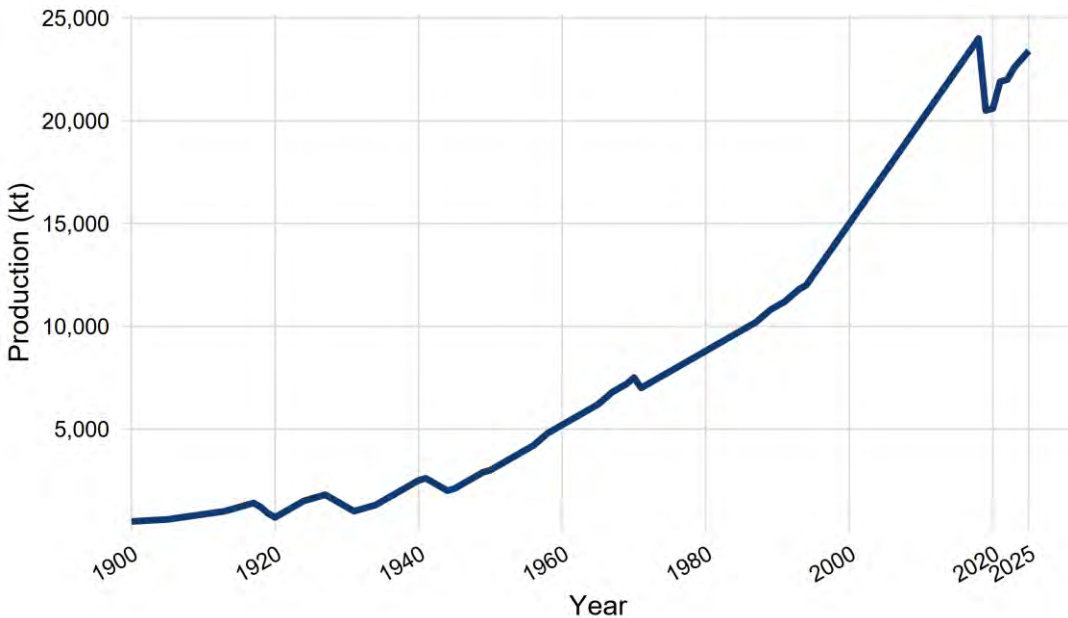
If the current trajectory continues, copper market could face a supply deficit of 30% by 2035

Global copper prices



Copper prices has been on the increasing trend from around 2340 in 1991 to around 13 120 USD/t in 2026

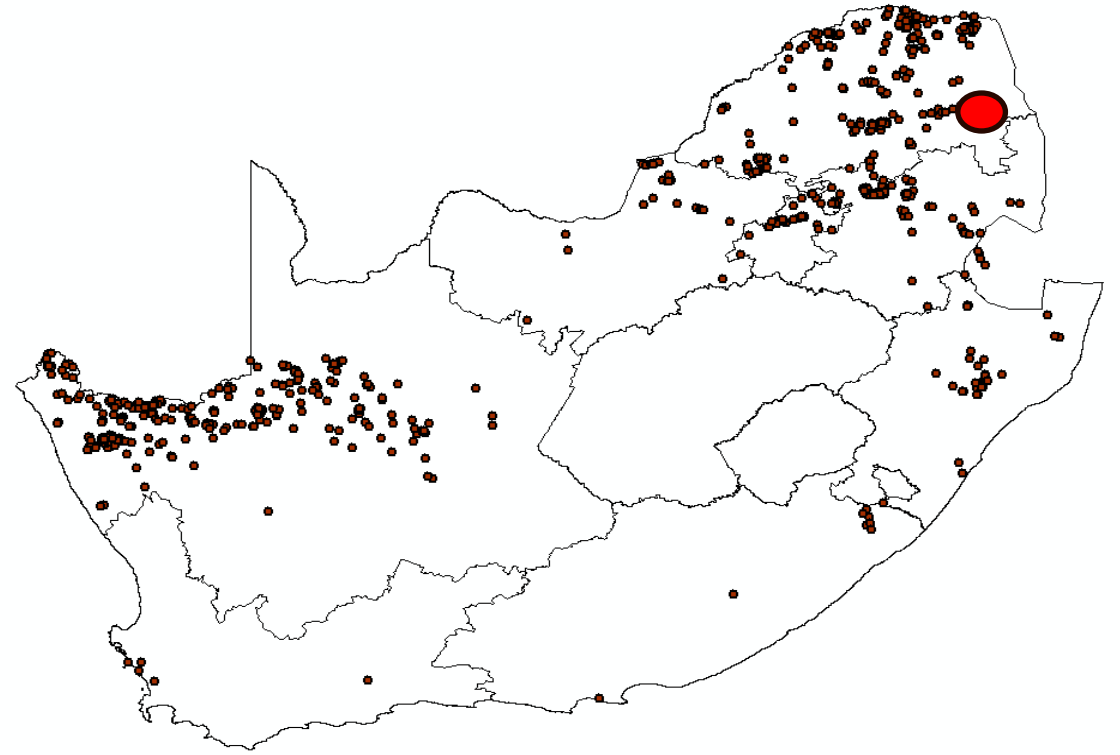
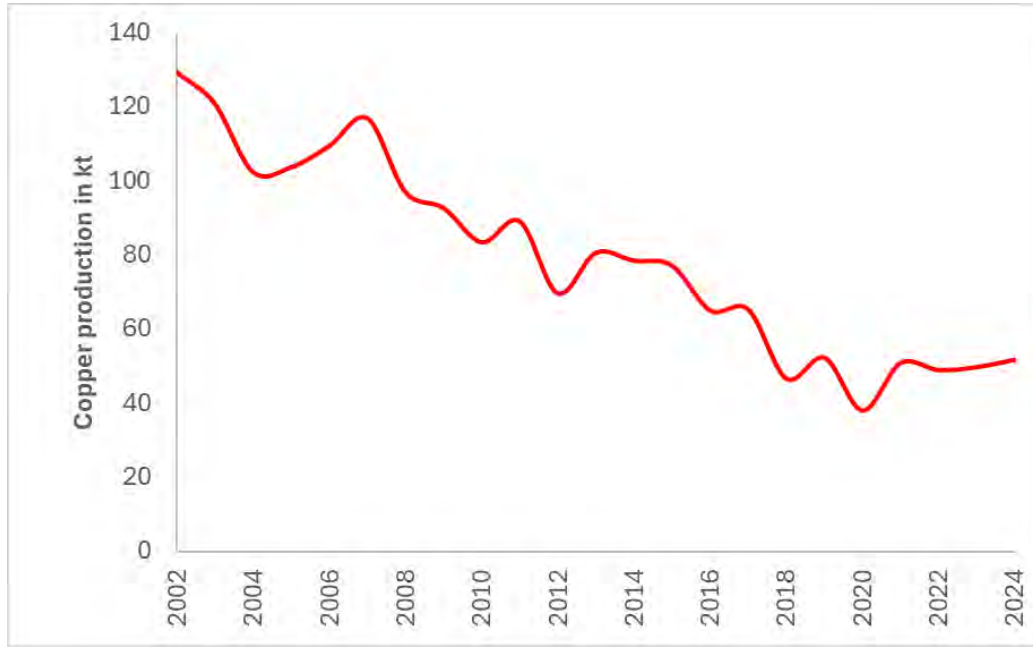
Global copper primary production



Mined copper global production has been increasing since the 1900, from 500 kt in 1900 to over 23 000 kt in 2025.

It is estimated that by 2050, the copper production will be up to 50 000 kt global copper production due to the expected demand increase driven by climate change policies

Copper in South Africa



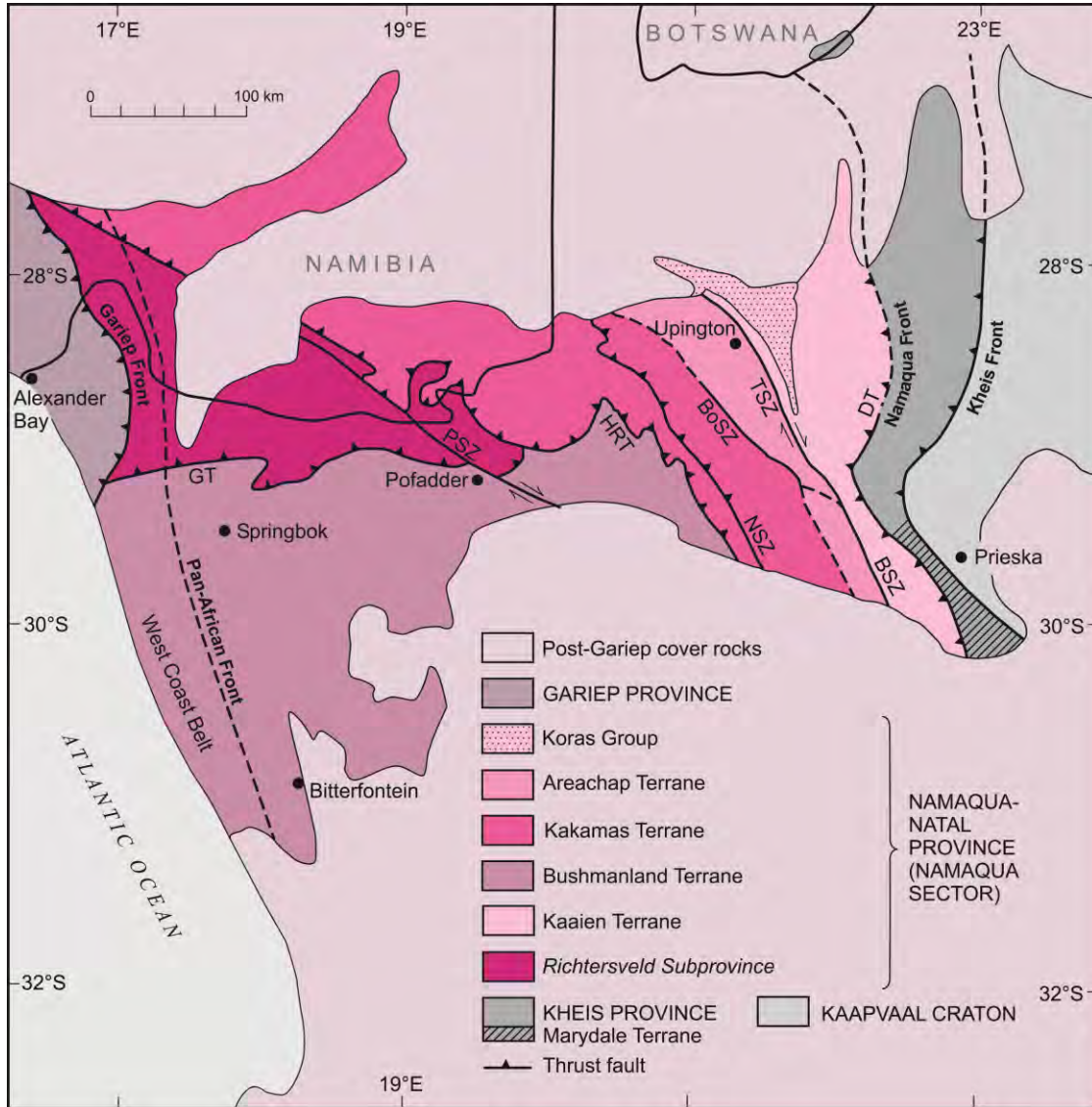
There are numerous copper occurrences in South Africa

Copper production has been declining over the two decades from 130 kt in 2002 to 52kt in 2024

The biggest portion of South African copper production is sourced from the Palabora Copper Mine in the Limpopo Province

Copper production is expected to increase in the near future as exploration projects in the Northern Cape Province are being ramped up

The regional geology of the Namaqualand region

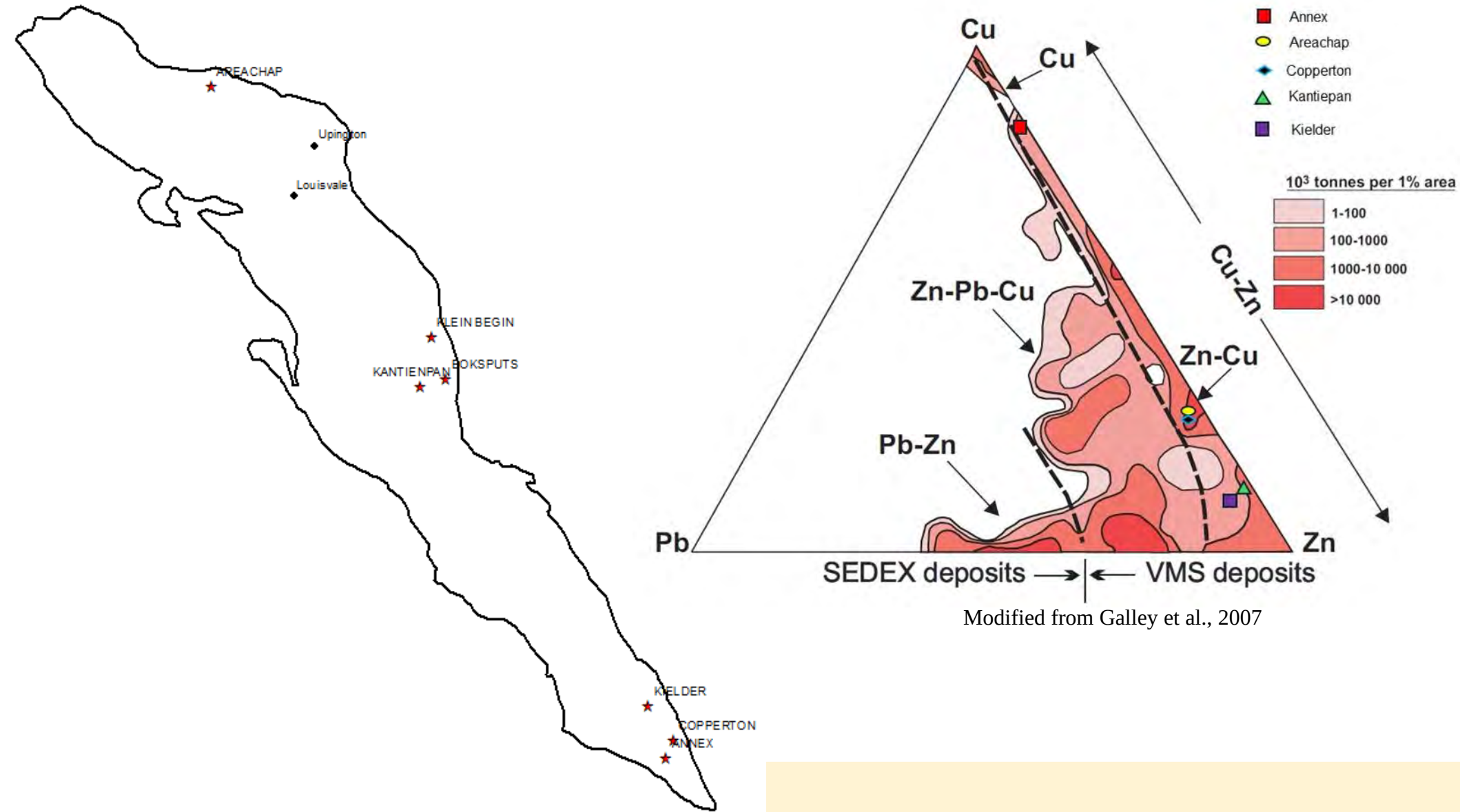


The Namaqua–Natal Province comprises multiple terranes (Areachap, Kakamas, Bushmanland, Kaaiaen) assembled during the Mesoproterozoic Namaqua Orogeny (c. 1.2–1.1 Ga).

The Areachap Terrane consists of metavolcanic–metasedimentary sequences interpreted as a volcanic arc and hosts VMS mineralisation.

These terranes are bounded by major shear zones and thrust fronts (e.g. Boven Rugzeer Shear Zone, Brakbosch Shear Zone, Dabep Thrust, Groothoek Thrust, Hartbees River Thrust, Neusberg Shear Zone, Pofadder Shear Zone, Namaqua Front, Kheis Front), which mark zones of crustal accretion and deformation. To the east, the Kheis Province and Kaapvaal Craton represent older, relatively stable crust.

Major VMS deposits in the Areachap Terrane



Copperton project

- 22 000 m of diamond drilling from 47 drill holes have been drilled
- Mining operations took place between 1972 to 1991

Geology

- The mineralisation is hosted in the deformed gneisses of the Copperton Formation. The bulk of the gneisses are probably metasediments which have undergone at least three phases of deformation and four metamorphic events, reaching granulite grade metamorphism. The orebody has a strike length of 1 600 m and is leached to a depth of about 100 m and outcrops as a well-developed gossan. The main ore minerals are sphalerite, chalcopyrite, pyrrhotite and galena, in association with variable amounts of magnetite, molybdenite, arsenopyrite
- The project has identified probable reserves, and therefore the geological confidence is assigned as G2

Environmental, social and economics

- The environmental impact assessment has been completed and environmental authorisation is completed and approved, the EIA includes: groundwater and surface water impacts, acid mine drainage, biodiversity loss, wetland disturbance, air quality, dust emissions, noise and vibration, waste rock and tailings management, geochemical contamination, heritage resources, visual impacts, closure liabilities, climate-related impacts, amongst others. Financial provision for rehabilitation has been approved which covers annual rehabilitation during mining operations, decommissioning, closure, post-closure monitoring, latent and residual environmental impacts.
- Social and labour plans is completed and approved. This covers local employment commitments, skills development programmes, bursaries and training, procurement from local suppliers, mine community development projects, housing and living conditions for workers, employment equity targets, plans for downscaling and retrenchment management. Community development projects include roads, schools, clinics, water infrastructure, electricity access, agricultural support, enterprise developments.
- The project is economically viable (probable reserve estimated). NPV of 403 million USD, IRR 26%, payback 4.8 years, peak capital 410 million USD.
- Therefore, the social-economic viability is as assigned an E1

Copperton project

Project feasibility

- The project is on development stage, feasibility stage completed. The mining rights has been issued and operations will start in 2027.
- The orebody is divided into upper supergene and deep hypogene.
- For upper supergene, a small low-risk starter plant will be used for processing via bulk flotation processing. The modular plant will have a throughput capacity of 30 tonnes of ore per hour.
- For deep hypogene, a large-scale concentrator plant will be used. SAG and ball mill comminution circuit, differential flotation processing. Modern flotation technology (Jameson cells). The capacity of throughput is 300 tonnes of ore per hour.
- Therefore, the feasibility is assigned an F1.2.
- Overall, the project is therefore considered as a COMMERCIAL PROJECT – APPROVED FOR DEVELOPMENT (E1, F1.2, G2)

Areachap project

- The deposit was mined between 1909 and 1917

Geology

- The ore is hosted in gneisses and schists of the Jannelspan Formation which represents a metamorphosed volcano-sedimentary sequence. The orebody has a strike length of 600 m. A prominent gossan is developed on surface and leaching is developed to depth of 70 m. Pyrite and pyrrhotite are predominant sulphide minerals, while chalcopyrite, sphalerite and galena occur in minor amounts.
- The project is currently being explored for the remaining orebody (that was not mined). The tonnage estimated are still at a low geological confidence (based on historical drill hole intersections), and therefore the geological confidence is assigned as G3

Areachap project

Environment, social and economics

- Basic environmental assessments have been completed and approved. The basic assessment identified potential impacts on soils, groundwater, surface water, biodiversity, heritage resources, air quality, and land use, cumulative impacts, mitigation measures, and rehabilitation measures after prospecting activities cease. Financial provisions for rehabilitation have been submitted.
- Public and stakeholder consultation has been completed, where the landowners, lawful occupiers, interested and affected parties, local communities, municipalities, traditional authorities, were consulted.
- No economic assessment were done to determine the economic viability of the project.
- Therefore, the social-economic viability is as assigned an E3.2

Project feasibility

- The project is on prospecting stage, albeit as an extension of the previously existing mine. The prospecting rights have been issued. Therefore, the feasibility is assigned an F2.2.
- Overall, these projects are therefore considered as NON-COMMERCIAL PROJECT – DEVELOPMENT UNCLARIFIED (E3.2, F2.2, G3)

Kantiepan project

Geology

- The orebody is hosted in Bokspits Formation which consists of biotite gneiss, hornblende gneiss, massive amphibolite and quartzo-feldspathic gneiss. The ore zone is dominated by pyrrhotite and sphalerite with minor amounts of chalcopyrite, pyrite and trace amounts of galena.
- The project is on initial exploration stage. The tonnage estimated are still at a very low geological confidence (based on limited drill hole intersections), and therefore the geological confidence is assigned as G4

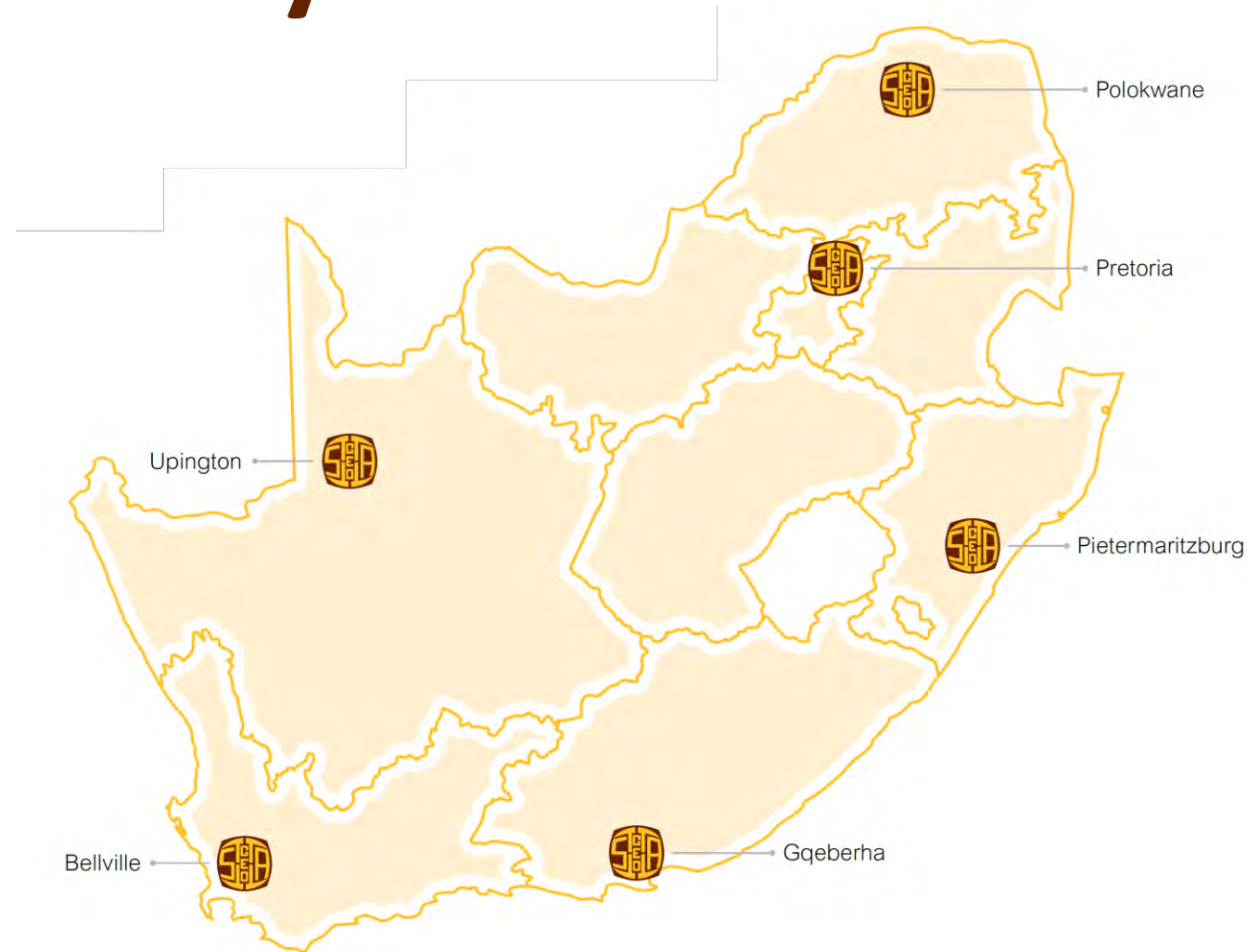
Environmental, social and economics

- Basic environmental assessments have been completed and approved. The basic assessment identified potential impacts on soils, groundwater, surface water, biodiversity, heritage resources, air quality, and land use, cumulative impacts, mitigation measures, and rehabilitation measures after prospecting activities cease. Financial provisions for rehabilitation have been submitted.
- Public and stakeholder consultation has been completed, where the landowners, lawful occupiers, interested and affected parties, local communities, municipalities, traditional authorities, were consulted.
- No economic assessment were done to determine the economic viability of the project.
- Therefore, the social-economic viability is as assigned an E3.2

Project feasibility

- The project is on prospecting stage. The prospecting rights have been issued. Therefore, the feasibility is assigned an F3.
- Overall, these projects are therefore considered as EXPLORATION PROJECTS (E3.2, F3, G4)

Thank you



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