



6 Aviation Road  
Private Bag 13297  
Windhoek, Namibia  
Tel: +264-61-284 8267  
Fax: +264-61-284 249144

Email: [info@mme.gov.na](mailto:info@mme.gov.na)  
Web: [www.mme.gov.na](http://www.mme.gov.na)

Earth Data Namibia  
[www.mme.gov.na/edn/](http://www.mme.gov.na/edn/)

Mining Cadastre  
[maps.landfolio.com/Namibia/](http://maps.landfolio.com/Namibia/)

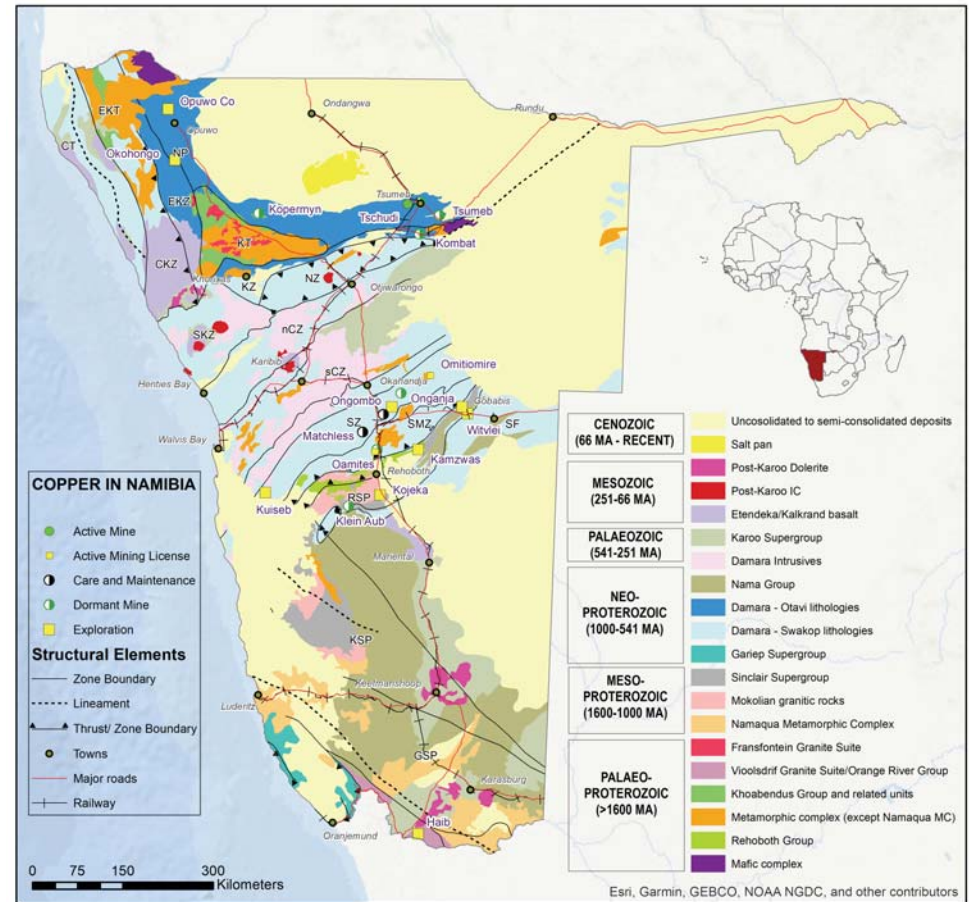


GEOLOGICAL SURVEY OF NAMIBIA

# NAMIBIA'S COPPER POTENTIAL

## Commodity & Host Geology

Copper is by far the most abundant mineral commodity in Namibia. Archaeological evidence suggests that Namibian copper deposits have been exploited for many centuries by locals and thereafter, on a large scale during the colonial era and post-independence. Several major copper mines were in operation in the past, but today the Tschudi mine is the only major copper mine in operation.



Major copper deposits in Namibia are hosted within the Otavi Mountain Land, Damara Belt, Kalahari Copperbelt and to lesser extent in the Namaqua Metamorphic Complex and the Kaoko Belt. The Otavi Mountain Land is the most important base metal mineral province in the country, featuring significant copper production both in the past and at present from the Tsumeb, Kombat, and Tschudi mines.

## Current Exploration

Several major copper mines that were in operation in the past include Tsumeb, Kombat, Khusib Springs and Klein Aub mines, as well as two mines currently under care and maintenance, namely the Otjihase and Matchless mines. Between 1908 and 1992, 1.6 million tons of copper metal has been produced in Namibia. The Tschudi copper mine has been in production since 2015 and is the only major operating copper mine at present.

Figure 1. Five-year copper production figures in tonnes (t) (Namibia)

Commodity	2014	2015	2016	2017	2018
Cu Cathode	22004.0	10526.8	16391	15466.147	7992
Cu Concentrate	5248.0	19717.00	2075	1532	0
Cu Metal Contained	2377.0	3351.10	261.76	68	0

## Existing Projects

Project	Deposit type	Host geology	Ore minerals	Status	Resources and Reserves
Okohongo Cu-Ag	Sediment-hosted stratiform Cu-(Ag)	Ombombo Subgroup (interbedded phyllitic siltstone and dolomite)	Copper carbonates/silicates/oxides, minor chalcocite and bornite	Exploration	NI 43-101 inferred resource (INV Metals Inc, 03.2011): 8.70 Mt @ 1.24% Cu & 19.73 g/t Ag (0.5% Cu cut-off grade) total mineral inventory: 11.69 Mt @ 1.01% Cu & 15.85 g/t Ag
Opuwo Cobalt (Co-Cu-Zn)	Sediment-hosted stratiform Co-Cu-Zn	Ombombo Subgroup (calcareous mudstone and siltstone)	Chalcopyrite, linnaeite, sphalerite, pyrite/pyrrhotite	Exploration Positive scoping study, pre-feasibility study in progress	JORC-compliant maiden resource (Celsius Resources, 11.2018): 112.4 Mt @ 0.11% Co, 0.42% Cu & 0.41% Zn (0.06% Co cut-off grade & 126, 100 t contained Co) indicated: 72.0 Mt at 0.11% Co, 0.42% Cu and 0.41% Zn inferred: 40.5 Mt at 0.12% Co, 0.41% Cu and 0.46% Zn

Kopermyn Cu Mine	Stratabound epigenetic Cu	Nabis Formation and Ombombo Subgroup (siliciclastics and carbonates)	Pyrite, chalcopyrite, bornite, covellite, chalcocite, copper carbonates and oxides	Dormant mine	Tentative ore reserve (1967): 150, 000 t at 2% Cu and 10 g/t Ag and 4000 t at 6.3% Cu in waste dumps.
Kunene Copper Project (Cu-Co-Zn-V-Mn)	Sediment-hosted stratiform Cu-Co/SEDEX/epigenetic	Ombombo Subgroup (siltstone, phyllite and carbonates)	Chalcopyrite, malachite, cattierite, cobaltite, linnaeite	Exploration	-
(DOF Ext., EPL3825, EPL4347, Malachite Mt., Okanihova, Olulilwa, Steilrand & Western)				Recent drill results (12.2018): 0.183% Cu over 199 m (Hole OKRC001)	
				1481 m DD and 4283 m RC drilling (03.2019)	
Haib Cu-Mo-Au	Porphyry Cu-Mo-Au	Namaqua Metamorphic Complex (quartz-feldspar porphyry and feldspar porphyry)	Chalcopyrite, bornite, chalcocite, covellite, molybdenite, copper carbonates	Exploration	43-101 resource <sup>1</sup> measured and indicated: 456.9 Mt @ 0.31% Cu. Inferred: 342.4 Mt @ 0.29% Cu (0.25% Cu Cut-off grade) (Mo and Au resources excluded)

Existing Projects: Table 1 of 5

## Value Addition in Namibia

Dundee Precious Metals, located in the northern town of Tsumeb, owns and operates an arsenic-compatible concentrate processing facility that accommodates copper ores from South America and Europe and exports its blister copper product via the Walvis Bay port. Its by-product, sulphuric acid is used in the uranium and copper mining industries in Namibia.

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Tschudi Cu-(Ag) Mine	Sediment-hosted stratiform Cu-(Ag)	Mulden Group (arkosic sandstone)	pyrite, chalcopyrite, bornite, chalcocite, covellite, malachite	Active mine Operations to be suspended by end of February 2020	Resources & Reserves (30.06.2017) <sup>2</sup> total reserves & resources: 52.0 Mt @ 0.785% Cu, 0.339 g/t Ag total reserves: 15.6 Mt @ 0.890% Cu total resources exclusive of reserves: 36.4 Mt @ 0.737% Cu, 0.485 g/t Ag total measured & indicated exclusive of reserves: 14.6 Mt @ 0.086% Cu, 0.747 g/t Ag total inferred: 21.8 Mt @ 0.634% Cu, 0.310 g/t Ag
Dordabis Cu	Sediment-hosted stratabound Cu-Ag	Nauzerus Group (calcareous siltstone/ phyllite and limestone)	chalcocite, native copper	Exploration	Resources (02.02.2012) <sup>2</sup> total resource: 1.38 Mt @1.055% Cu total measured & indicated: 762, 600 t @1.140% Cu total inferred: 617,600 t @ 0.950% Cu
Witvlei Cu-Ag	Sediment-hosted Stratabound Cu-Ag	Tsumis Group (calcareous argillites)	Chalcocite, covellite, chalcopyrite and bornite	Exploration	Resources (02.02.2012) <sup>2</sup> total resources: 4.99 Mt @ 1.241% Cu, 0.07 g/t Ag total measured & indicated: 2.63 Mt @ 1.36% Cu, 0.07 g/t Ag Inferred: 2.37 Mt @ 1.11%Cu, 0.006 g/t Ag
Kuiseb (Hope deposit, Anomaly West, Luigi deposit, Vendome deposit, Gorob deposit, Anomaly West deposit, Anomaly East and Anomaly Far East) Cu-Au	VMS (Besshi-type)	Swakop Group (quartz-mica schists and magnetite quartzite)	Pyrite, pyrrhotite, chalcopyrite, sphalerite, cubanite and molybdenite	Exploration	Resources (31.12.2009) <sup>2</sup> total resources: 3.60 Mt @ 2.499% Cu, 0.62 g/t Au total measured & indicated: 1.81 Mt @ 2.40% Cu, 0.59 g/t Au inferred: 1.79 Mt @ 2.60% Cu, 0.65 g/t Au

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Kombat Cu-Pb Mine	MVT	Otavi Group (carbonates)	Bornite, galena, sphalerite, chalcocite, tennantite, chalcopyrite, malachite, azurite, arsenates, cerussite, chrysocola, cuprite and native copper	Dormant mine	Resources & Reserves (30.04.2018) <sup>2</sup> total reserves & resources: 7.81 Mt @ 2.504% Cu, 1.071% Pb, 17.172 g/t Ag total reserves: 770, 000 t @ 1.30% Cu, 0.470% Pb, 4.33 g/t Ag total resources exclusive of reserves: 7.04 Mt @ 2.636% Cu, 1.137% Pb, 18.577 g/t of Ag total measured & indicated exclusive of reserves: 5.511 Mt @ 3.050% Cu, 0.720% Pb, 2.88 g/t Ag total inferred: 5.511 Mt @ 3.05% Cu, 1.25% Pb, 22.93 g/t Ag
Ongombo Cu-Ag-Au	VMS (Bessthi-type)	Swakop Group (amphibolite and magnetite quartzite)	Chalcopyrite, bornite, galena and marcasite	Exploration	Resources (08.10.2012) <sup>2</sup> total resources: 10.46 Mt @ 1.585% Cu, 8.358 g/t Ag, 0.32 g/t Au total measured & indicated: 6.71 Mt @ 1.52% Cu, 8.0 g/t Ag, 0.320 g/t Au inferred: 3.75 Mt @ 1.70% Cu, 9.0 g/t Ag, 0.320 g/t Au
Khusib Springs Cu-Zn-Pb-Ag Mine	MVT	Otavi Group (carbonates)	Azurite, malachite and some chalcocite and tennantite.	Dormant mine	Total mined resource (05.14.2012) <sup>2</sup> 500, 000 t @10% Cu, 1.8% Pb, 584 g/t Ag
Otjihase Mine	VMS (Bessthi-type)	Swakop Group (mica schist)	chalcopyrite and pyrrhotite.	Care & maintenance	Total resources (31.03.2018) <sup>2</sup> 4.4 Mt @ 2.27% Cu

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Matchless Mine	VMS (Bessthi-type)	Swakop Group (mica and amphibolite schist and quartzite)	Chalcopyrite, pyrrhotite, cuprite, chrysocolla, native copper, bornite, covellite, chalcocite and malachite	Care & maintenance	Total resources (10.2018) <sup>2</sup> 1.34 Mt @ 2.4% Cu
Klein Aub Cu Mine	Sediment-hosted stratabound Cu	Tsumis Group (argillites)	Chalcocite, djurleite, digenite, bornite, chalcopyrite, covellite, cuprite, native copper and malachite	Dormant mine	Total resources 6.0 Mt @ 1.5% Cu
Kojeka Cu-Ag	Sediment-hosted copper type deposit	Tsumis Group (argillites)	Bornite and chalcopyrite, with minor chalcocite, pyrite, malachite and chrysocolla, with lesser native copper.	Exploration	Total resources 6.5 Mt @ 1.3% Cu, 12 g/t Ag
Oamites Cu-Ag Mine	Sediment-hosted stratabound Cu-Ag	Tsumis Group (conglomerate and arkosic quartzite)	Chalcopyrite, bornite, pyrite and chalcocite	Dormant mine	Total resources <sup>3</sup> 6.1 Mt @ 1.33% Cu, 12 g/t Ag
Kamzwas Cu	Sediment-hosted stratabound Cu-Ag	Nosib and Hakos Groups ()	Malachite, bornite, chrysocolla, chalcopyrite, chalcocite,	Active mining license	Resources <sup>4</sup> : Orebody 1: 17 Mt @ 1.35% Cu Orebody 2: 42 Mt @ 2.40% Cu Orebody 3 (sulphide): 16 Mt @ 3.2% Cu

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Tsumeb Pb-Cu-Zn-(Ge) Mine	MVT	Otavi Group (carbonates)	The main hypogene ore minerals include galena, tennantite, chalcopryrite, sphalerite, enargite, bornite, chalcocite, reni�rite, germanite and briartite.	Dormant mine	Total resources 29 Mt @ 15%Pb, 5% Cu,0.93%Zn,150 g/t Ag
Onganja Cu Mine	Hydrothermal (sheeted vein quartz complex)	Swakop Group (quartz-plagioclase-biotite schist)	Pyrite, chalcopryrite, chalcocite, molybdenite and native gold	Dormant mine	Total resources: 300,000 t @ 2% Cu
Omitiomire Cu	Shear-zone hosted	Ekuja Basement Dome (mafic schist and amphibolite)	chalcocite, digenite, chalcopryrite and bornite	Active mining license	Total resources: 136 Mt at 0.53% Cu (at a cut-off grade of 0.25% Cu)
Malachite Pan Cu-Ag	Sediment-hosted stratabounded Cu-Ag	Tsumis Group (calcareous argillites)	Chalcocite, chalcopryrite, bornite, digenite, native copper, covellite, malachite, chrysocolla, pyrite, hematite	Exploration	Maiden resource (2012): Indicated: 2.63 Mt @ 1.36% Cu, 7.47 g/t Ag Inferred: 2.37 Mt @ 1.11% Cu, 6.19 g/t Ag