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Unravelling Manganese Mineralization Through Intergration of Remote Sensing and Geophysical Techniques in Mansa Area of Luapula Province of Zambia

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Recent interest in manganese occurrences in Zambia's Luapula and Central provinces and the resurgence of manganese mining indicates the potential for the region to be considered a Tier 1 manganese mining district, akin to the Central African Copperbelt as the understanding of geology in the area increases. Manganese is classified as a critical mineral defined by the European Union (risk list, 2023) due to its pivotal role in green energy components. This also aligns with Zambia's strategy to diversify mineral portfolios and boost the nation's GDP. Historical data from the Rhodesian Selection Trust and Anglo-American Corporation (1992-2000) regarding mineral occurrences in Zambia is the earliest mention of manganese deposits in Zambia. Using remote sensing and airborne geophysics the study aims to identify manganese mineralisation by locating regional and local faults which are controls of mineralisation. Analysis of geoscientific and remote sensing data will try and identify surface and subsurface manganese anomalies associated with preferential rock formations. Manganese mineralisation is hosted within Mesoproterozoic metasediments of the Muva Supergroup of the Irumide belt and Bangweulu block. Manganese deposits are observed to form in deformed supracrustal rocks, including pelites and sandstones, with manganese occurring as veins, nodules, and pockets within fracture zones. Faulting and fracturing serve as fluid pathways for manganese-bearing hydrothermal fluids. Economic deposits, with reserves up to 40 Mt, have been identified in Chipili district, Luapula province, and areas such as Kabwe through to Nakonde exhibit significant manganese potential, due to the extensive coverage of the Irumide belt in Central and Northern Zambia. This study aims to identify lineaments or faults that would function as sites for manganese deposition, informing exploration and extraction strategies in the study area. It also contributes to increased geoscientific knowledge and socioeconomic development in the associated communities.