Understanding the Mineral Potential for Critical Elements in New Zealand: The Case for Nickel and Cobalt

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ABSTRACT

Critical elements are defined as those that are crucial to society for economic growth and/or national security, but which are vulnerable to supply disruption and have no practicable substitutions. They are usually in high demand and are often mined as companion or by-product elements making them highly valuable, vulnerable to market volatility and usually expensive. However, as their supplies and/or societal demands change over time, minerals that are currently critical may not be in the future, and those that are not currently, may become critical with time. Critical elements tend to be central to the advanced and clean technology sectors. Nickel and cobalt are two such elements. New Zealand has geologic rock types typically associated with nickel, nickel-copper and potentially cobalt mineralisation elsewhere in the world (e.g. mafic and ultramafic igneous rocks). Despite this, New Zealand remains under-explored with respect to Ni and Ni-Cu deposits, and is completely unexplored with respect to cobalt.

We have used a mineral systems approach to produce a mineral potential model (map) for nickel and cobalt in New Zealand. Data were extracted from geological mapping and geoanalytical databases (e.g. QMAP, Petlab), as well as sourced from various mineral reports and scientific publications. Additionally, new geochemical analyses from hand specimens lodged in the National Petrology Reference Collection were obtained during this study. Mappable criteria were combined using an expert-weighted spatial modelling approach using Geographic Information Systems (GIS) software to generate a nickel and cobalt mineral potential model for New Zealand. The model depicts areas within the Tasman, Nelson, and Marlborough regions at the north end of the South Island associated with the Dun Mountain Ultramafics Group, the Patuki Melange, and the Riwaka and Cobb Igneous Complexes as the regions with the highest potential for nickel and cobalt mineralisation.