

Assessment of trends in cobalt mining and processing in relation to mineralogy

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ABSTRACT

The long-term availability of mineral resources is crucial for sustaining human society, technology and economic activity, a need that is growing to enable the energy transition and this is particularly true for by-product metals. In the special case of cobalt, despite its significance for key technologies supporting the energy transition (batteries, permanent magnets), the decision to mine cobalt alongside nickel or copper depends on the extraction costs and the revenues coming from the main metal, while extracting cobalt as a by-product hinges on the cost of producing a sellable concentrate and its market price. This often results in variable and relatively low recovery rates for cobalt compared to the main commodity. It has long been recognized that ore mineralogy and mineralogical deportment play a key role in defining by-product recoverability. Classical reporting schemes for cobalt resources often fail to capture this information and it is therefore useful to estimate the so-called “recoverable resource” for by-product metals such as cobalt, i.e., the amount of the mineral resources that could, if desired, be extracted and put into use over the near future. In this study, detailed data sets have been compiled on global cobalt production statistics by mine/operation and reported cobalt mineral resources by projects, deposit type, and ore types, as well as cobalt mineralogy and deportment in Finnish deposits. This information allows for a comprehensive assessment of recent trends in cobalt mining in relation to cobalt mineralogy and processing technology. Combining this with cobalt mineral resources and mineralogical information allows for the assessment of recoverable cobalt resources, as well as mineral-based national resource estimates, as illustrated here for Finland. Ultimately this can be used to define roadmaps to support the development of new projects, but also to compare different scenarios for joint downstream refining activities.