The world's by-product and critical metal resources part I: Uncertainties, current reporting practices, implications and grounds for optimism

Gavin M. Mudd, Simon M. Jowitt, Timothy T. Werner

PII: S0169-1368(16)30066-X
DOI: doi: 10.1016/j.oregeorev.2016.05.001
Reference: OREGEO 1800

To appear in: *Ore Geology Reviews*

Received date: 16 February 2016
Accepted date: 2 May 2016

Please cite this article as: Mudd, Gavin M., Jowitt, Simon M., Werner, Timothy T., The world's by-product and critical metal resources part I: Uncertainties, current reporting practices, implications and grounds for optimism, *Ore Geology Reviews* (2016), doi: 10.1016/j.oregeorev.2016.05.001

The World's By-Product and Critical Metal Resources

Part I: Uncertainties, Current Reporting Practices, Implications and Grounds for Optimism

Gavin M. Mudd[1], Simon M. Jowitt[2], Timothy T. Werner[1]

[1]Environmental Engineering, Monash University, Clayton, VIC, 3800 Australia

[2]School of Earth, Atmosphere and Environment, Monash University, Clayton, VIC, 3800 Australia

Abstract

Many of the metals extracted as by-products and rated as 'critical' are vital to important modern technologies but are seldom reported as extractable commodities by the mining industry. This creates numerous uncertainties and challenges in estimating the global resources of these metals; here we outline the current approaches (or lack thereof) used in resource reporting and identify and discuss the uncertainties surrounding critical co- and by-product reporting in detail. We present a review of ore reserve and mineral resource reporting in the mining industry, including the identification of various methods by which resource accounts have been constructed, a discussion of examples and differences between countries, states and organisations that conduct these assessments, and a discussion of the various ways in which these resource data have been interpreted. This is followed by a series of case studies that document and discuss the reporting of selected critical metals that suggest that the lack of reporting is dominantly as a result of the perceived or actual low monetary value of by-products at the mine site rather than as a result of any lack of these metals, indicating that different types of uncertainties can arise in estimating the global resources of these critical commodities.

This paper also addresses (and continues in parts II and III) the numerous issues and uncertainties identified in this study by outlining approaches and alternative data sources that can be used to develop more comprehensive assessments of critical metal resources from deposit to global levels. The hybrid methodologies proposed in this paper provide reasons for some optimism in that by-product and critical metal resources can still be identified to a reasonable degree of accuracy, and these resources are likely to be sufficient to meet demand for some decades. However, there is still a strong case for improved reporting of by-products and critical metals in mineral deposits to assist in these efforts and to clarify the true global position in terms of the future security of supply of co- and by-product metals, invariably including the critical or e-tech metals.