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## **Mineral exploration and the challenges for the future supply of minerals**

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Population growth connected with a continuous improvement in the standards of living will cause the demand for minerals to rise during the 21<sup>st</sup> century, despite the forecasts for improvement in the efficiency of the use of mineral products and a steady increase in the rates of recycling. Together with such increase in demand, several other challenges exist for the supply of most minerals products such as declining exploration success, declining grades and increased depths of current mines and more costly and lengthened project development timeframes [1]. As a consequence, mineral exploration will play a key role in guaranteeing the discovery of new mineral deposits for development into new mines or to extend the lives of the existing mines into the next decades.

Mineral exploration is inherently a long-term high-risk activity which requires significant amounts of capital. Most of this capital is private and provided for by major and junior mining companies. After several years of a commodity price boom led by the unprecedented growth in demand driven by China the mining industry now confronts one of its more severe crises. Mining companies are facing financial difficulties which are resulting in investment cuts. In industry downturns, exploration capital is one of the first to be constrained. The current downturn has therefore caused a significant decrease in exploration spending from majors but even more acutely from the junior sector, which is mostly financed through the stock markets of Canada, UK and Australia. Such curtailment is to be felt in years to come, resulting in fewer discoveries. During the recent boom, investments in nonferrous exploration as reported by mining companies reached an all-time high of US\$20.5 billion in 2012, only to decrease to US\$8.7 billion in 2015, a level not seen since 2009 [2].

In the last decade, the discovery rate of some important minerals such as copper has not matched the increase in exploration expenditure and may not be sufficient to compensate the current depletion of deposits and supply for future demand [3]. This can be explained by several factors, including: a) the major traditional mining districts around the world are becoming more mature, requiring exploration to focus deeper or under cover, b) prospective terrains in a large number of countries are basically inaccessible to modern exploration and mining development due to the perceived sovereign risk or the lack of favourable legislative frameworks conducive for exploration and mining, c) several prospective areas lack pre-competitive basic geological data that leverages exploration success, and d) social acceptance from stakeholders and in particular from local communities has become more demanding and paramount for projects to progress.

The mining industry has throughout history been successful in discovering and supplying the minerals necessary for human progress, but not without experiencing the large imbalances of the commodity cycles. The boom stage of the current cycle has been unprecedented by resulting in proportionally fewer discoveries than previous ones, a factor that will be aggravated by the current downturn. Supplying the world with the necessary minerals will require that industry and research groups continue to develop innovative conceptual approaches and exploration techniques to foster the discovery of new deposits. Industry will need to keep adjusting to a more socially demanding context, strive for more sustainable

practices and the early engagement and acceptance of stakeholders. Governments have to work together with industry on frameworks to attract capital for investment and to gain the social acceptance for projects. Mining companies need to invest through the cycles and maintain their skill-base through the downturns in order to preserve their capabilities and secure the long term sustainability of their businesses.

*References:*

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- [2] SNL (2015) Corporate Exploration Strategies
- [3] Schodde R (2012) 34<sup>th</sup> International Geological Congress

