Security of supply in Europe

Christine Blackmore and Dr Wolfgang Reimer analyse the importance of a secure supply chain in the mining and mineral processing industry.

Within the European Union, a number of initiatives have been implemented to ensure that the mining and mineral processing industry remains an active contributor to regional industrial growth. Additionally, there is now a strong political will throughout the EU to ensure that a secure supply of its indigenous commodities is available and can strengthen the European Commission’s (EC) position to negotiate trade and supply chains. The EU economy needs an adequate and sustainable supply of minerals and metals to feed into industry and to further become a hub for future technological developments and manufacturing. Currently, a large proportion of minerals and metals are sourced from outside of the EU, posing a significant risk to these ambitions.

In recent years, the demand for many raw materials and minerals has escalated, mainly driven by economic growth in developing economies and the requirements of new and green technologies.

Raw materials have, therefore, become a strategic pawn in global policies – often resulting in artificially manipulated shortages or the creation of cartels. Consumer behaviour and the development of new technologies created a different demand for raw materials than in the past. However, there is increased bureaucratic growth and the participation of civil society such as a social licence to operate), which often extends during the process of extracting other metals.

Critical metals are increasingly used in new and green technologies – an industrial sector the EU sees as a cornerstone for a sustainable competitive pillar in EU re-industrialisation. They are considered to have a relatively high risk of supply interruption in the short term. With the aforementioned socio-economic conditions, substitution and longer end of life recycling rates are being regarded as a short-term response. In the long term, a change in product design and manufacturing, such as based on the Internet of Things, may facilitate to bridge shortages in import and time gaps in developing new mines and recycling technologies.

Metallurgy is key

Against all odds, metallurgy is one of the key factors in enabling an efficient and effective circular economy. However, the EU has faced a dramatic loss in metallurgical knowledge and smelter capacity. Closings a smelter is a comparatively short process compared to setting up a new one. Europe has lost substantial know-how in processing and processing facilities during the extensive mine closures since the mid 20th century.

Is concern justified?

Europe has undergone a dramatic de-industrialisation and loss of capacity and know-how in many of the upstream sectors of raw materials. Many more traditional patterns of supply and demand have changed and the EC has become increasingly concerned about the security of supply of the mineral raw materials needed to sustain economic growth and competitiveness.

This includes the critical raw materials (CRMs). The impact of CRMs varies, and includes:

- Political-economic stability of the producing countries.
- The concentration of production and processing capacity within a few countries – country concentration.
- The extent to which the potential for substitution by other materials is limited.
- The recycling rate.
- The nature of environmental regulation.
- Concentration of production and processing capacity in a few companies – corporate concentration.
- Mining governance.
- Ore grades and complex mineralogy requiring innovative processing solutions.
- By-product dynamics.
- Land use competition.
- Price volatility.

In general, the geology of the EU is complex. This diversity has the potential to host a wide range of mineral deposit types.

As opposed to historic times, these mineral occurrences are not directly linked to the industrial development of their areas of origin. The 21st century of global manufacturing and trade is no longer a matter of regional industrial developments based on local mineral deposits, in terms of quantity and selectivity. In the context of the increasing complexity of material design and manufacturing at global scale, bottlenecks may arise from a single critical raw material, even if it is not required in large quantities. Minor metals have a key function in the technical progress. The high import dependence of these CRMs is the Achilles heel of the EU economy.

Consequently, the EU has developed a list of 27 CRMs all dominated by production from outside the EU28, but many of which could be sourced within.

Over the past 50 years, the extractive industries sector has succeeded in meeting global demand, and the calculated lifetime of reserves and resources has continually been extended. However, given the commercially sensitive nature of information regarding reserves, both at the company and country level, there is little information in the public domain on the quantity and distribution of reserves that could attract potential investors, either within the EU28 or, for that matter, any of the competitor regions to the EU.

An EU 2013 criticality assessment was recently reviewed and now comprises 27 CRMs. Coking coal was reassessed as non critical, but remains on the list for now.

Criticality and security of supply:

The latest policies regard it as more important to have the ability to access the mineral resources in the ground and to be able to extract them in a sustainable, circular economy, as many critical metals are also distinct in that they are recovered only during the process of extracting other metals.

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The past years have shown much progress in the social licence to operate and to make mining, processing and metallurgy more environmentally friendly. Furthermore, minerals strategies at regional and national level have focused on sustainable raw material politics. What is left open is to enable EU members to valorise their mineral wealth with the development of new exploration, mining, processing and refining technologies.

It has become apparent that a well-proven resource base might be a potential tool in raw material politics. The restoration of skills and expertise in the different segments of the raw materials value chain seems to be the order of the day. The EU, therefore, started granting ambitious research and innovation, as well as coordinated support actions within the latest research framework programme (Horizon 2020), flanked by complementary actions at member state level.

Economically, it is clear that instead of spending billions to build one big plant, smaller modular plants can be scaled up quickly, with the lifespan influenced by the next step up in technology.

**The FAME project**

In this context, the EU R&I project FAME (Flexible And Modular Economic processing) addresses the issues by validating a number of important ore types most present in the European ore deposit geology – greisen, skarn and pegmatites. These ore types are mineralogically complex and have variable metal grades, but are of great strategic significance in relation to the overall resource balance of the EU.

FAME targets the production of critical elements as well as their by-products from the three ore types validated at six reference sites across Europe. The key objectives of the FAME project are:

- To increase the competitiveness of European mining enterprises (especially SMEs).
- To develop flexible and mobile technologies customised to promising European mineral deposit types, compliant with environmental and legislative constraints.
- To validate the technologies developed and to demonstrate their capabilities in operational environments and different ore deposits.
- To stimulate private engagement and investment in the European mining sector.

FAME is being implemented by 18 research institutions, mainly from industry, from eight European countries, and is following a holistic approach to optimise the extraction of these kinds of target ores using flexible and mobile technologies.

Research is being carried out specifically on pre-concentration such as fragmentation and grinding, magnetic separation and introducing microbiological approaches to free critical elements from the host rock.

A new flotation cell and tests on improvements on flotation reagents are part of the chemical processing research. Now in its third year, FAME approaches the exploitation of the research results at selected deposit sites as part of distinct mining projects and is developing a pilot plant in conjunction with mine owners and developers.

The new EC policy for smart specialisation and industrial growth has recognised raw materials as a substantial societal challenge. This paradigm change resulted in a renaissance of mining at the lower end of the scale and requires support from policy makers and also further legislative measures to attract investment.

In response, research can pave the way towards better commercialisation of European deposits, to raise competitiveness of EU mine developments and consequently to strengthen the position of Europe in the global raw materials economy. Despite the increasing influence of civil society in mining and operation of refining facilities, many R&D results prove the feasibility of an environmental friendly and socio-economic prosperous raw materials economy.

*Christine Blackmore is an Associate Director at Wardell Armstrong and the IOM3 Mining Technology Board Chairman.

Dr Wolfgang Reimer is the Project Manager of FAME and Managing Director at Geokompetenzzentrum Freiberg.*