Critical raw materials: an economic and technological standpoint

Although Europe's dependence on foreign imports of raw materials poses a serious threat to its economy in terms of supply of certain materials, price volatility and market distortions, great potential opportunities have risen in recent years.

The High Level Steering Group of the EU's European Innovation Partnership (EIP) on Raw Materials released a Strategic Implementation Plan (SIP) in September 2013 describing how Europe can act to ensure a sustainable supply of raw materials and make Europe a world leader in raw materials exploration, extraction, processing, recycling and substitution by 2020.

The SIP outlines detailed actions which EU countries, companies and researchers can apply to foster technological innovation in the raw materials value chain. These include a wide range of initiatives such as new cost-effective exploration concepts and technologies, better recovery and recycling of waste and finding substitutes for critical raw materials. These actions can generate new IP in Europe and allow new types of natural deposits and industrial residues to be mined.

It has been recognised that Europe holds valuable mineral resources in both primary and secondary mines. Sources of such minerals can be found both underground and in our garbage bins and can create new markets that will contribute to the much needed economic growth and job creation.

Concerning primary mines, Europe has been actively mined over many centuries and many easy-to-access mineral deposits are greatly depleted. The major opportunities for accessing raw materials within the EU are in populated areas, in low grade or small complex deposits that may vary in composition over time and contain different sizes of particles from coarse to very fine grains. The challenge in processing these raw materials lays in the evolution and adaptation of existing processing to European constraints.

For secondary mines, there are numerous challenges and the task is even more complex. Processes must be adapted or even specifically designed for the material or the waste to be treated. Before being developed at industrial scale, these processes need to take into account the economic, environmental and societal aspects in Europe and abroad.

According to the SIP, the following technological challenges should be addressed for:

- **More effective exploration:** The objective is to develop new cost-effective exploration technologies providing high quality data including high resolution 3D geo-data down to 150-4000 meters depth, and their interpretation through geo-models in order to facilitate

both finding new mineral deposits on the continent and in the sea-bed, as well as fostering industry investment to mining.

- **Innovative extraction of raw materials:** The objective is to enable extraction of minerals in a socially acceptable, environmentally responsible and economically viable way by developing new technological solutions leading to social acceptance of extraction, which would push Europe to the forefront in extraction technologies.
- **Processing and refining of raw materials:** The objective is to develop new holistic processing concepts with higher technical, economic, energy and environmental performance and flexibility, versatility and modularity for processing of different raw materials from low grade and/or complex feeds.
- **Substitution of raw materials:** Actions include the substitution of heavy rare earth elements (REE) in magnets; and the substitution of Critical raw materials (CRM) in rechargeable batteries, in catalysts, and in photovoltaic materials such as solar cells, which will improve the competitiveness of European industry (notably in energy, chemical and automotive industries).
- **Improving the EU's waste management framework:** The objective is to minimise critical raw materials needed in products, support product life extension and maximise the amount of materials recycled through new design strategies. It will help define a coherent resource-efficient product policy framework, thereby contributing to a sustainable supply of raw materials through resource efficiency and recycling.
- **Optimised waste flows to increase recycling and recovery:** The objective is to boost the quality and quantity of collected waste/end-of-life products and to improve the life-cycle management of products ensuring their high quality treatment and recycling. This would in turn help further develop recycling activities, promote increased access to secondary raw materials and reduce the EU dependency on imports of many of these metals, including critical metals, in the EU.

PROMETIA will mainly address the processing and refining of raw materials challenge in strong connection to the other challenges described above.

More information

About the Strategic Implementation Plan (SIP): https://ec.europa.eu/eip/raw-materials/en/content/about-sip