
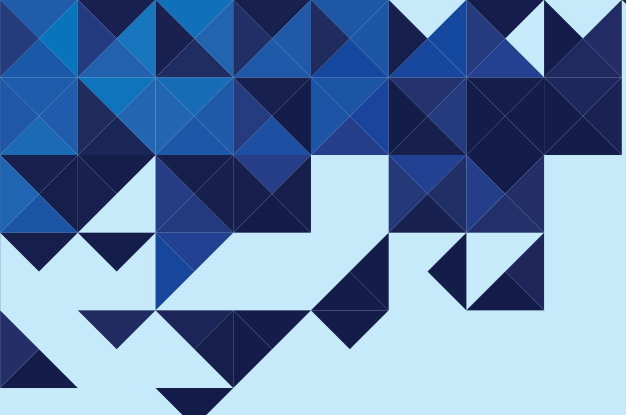




Developing new
innovative technology
and high tech solutions
for sustainable raw
materials supply



The EU faces a number of major societal challenges including availability and supply of critical and essential raw materials from primary and secondary sources and provision of jobs, skills and technological competences. At the same time the need for mineral resources continues to grow because of an increasing global population and a growing middle class. Addressing these challenges requires that the appropriate technologies, processes and products are in place, along with adequate policies to implement and stimulate the required changes. In November 2008 the EU launched the Raw Materials Initiative (RMI) and the Roadmap for a Resource-Efficient Europe to secure reliable and undistorted access to raw materials as being “crucial for the sound functioning of the EU’s economy”.

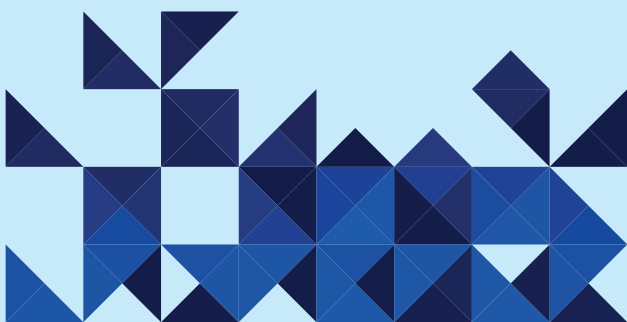
The European Technology Platform on Sustainable Mineral Resources (ETP SMR) strives to answer these challenges. Established in 2005 and officially recognized by the European Commission in September 2008, the ETP SMR unites many stakeholders from the mineral resources industry and research community, covering the whole value chain, and endeavors to involve regulators, consumers and civil society to contribute towards a competitive and sustainable European economy.

The ETP SMR focuses its activities on creating sustainable access to, and supply of, essential and critical raw materials (exploration, mining, smelting, recycling and metallurgical recovery and refining, including the highly innovative enabling technologies and equipment industry) through research and innovation, perfectly in line with the European Innovation Partnership on Raw Materials proposed by EU, based on 3 pillars: fair and sustainable supply of raw materials from international markets; fostering sustainable supply within the EU; and boosting resource efficiency and recycling.



Illuminated crystals. Picture provided courtesy of K+S.

Modern society is increasingly dependent on mineral resources. They differ in their availability, in the way of use, in the cost of production, and in their geographical distribution.

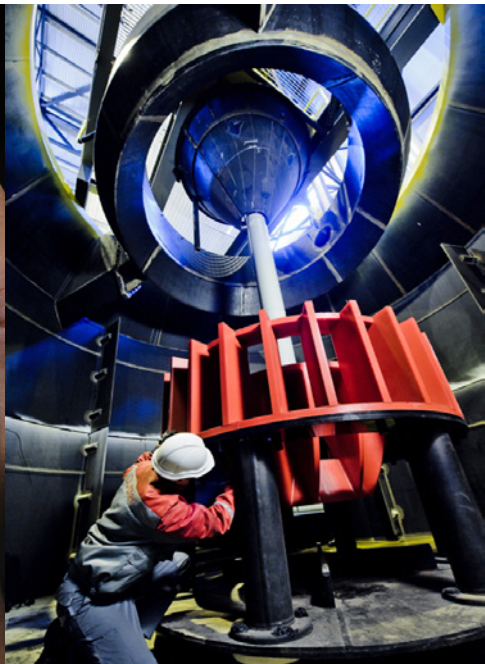




Boliden Harjavalta smelter control room.
Picture provided courtesy of Boliden.



Silver grains. Picture provided courtesy of Boliden.



OTE concentrator used in mineral processing.
Picture provided courtesy of Outotec Oyj.

Context

We do not know what the most important resources will be 100 years from now, but society will still need a wide range of raw materials.

70% of EU manufacturing depends on minerals and particularly metals

Raw materials are essential for the functioning of the economy of industrialized and developed regions like the EU. Sectors such as construction, chemicals, automotive, aerospace and machinery are completely dependent on access to certain raw materials. In this respect, the EU has to secure a reliable and uninterrupted supply of raw materials and achieve a sustainable and efficient management of non-energy raw materials.

Europe is not self-sufficient in the production of essential raw materials for industrial production. For instance European extraction covers only 29% of the demand for concentrates necessary to meet the requirements for production in metallurgical plants, and for several 'critical' minerals the situation is much worse.



Raw Materials at Risk

Antimony, beryllium, cobalt, fluorspar, gallium, germanium, graphite, indium, magnesium, niobium, PGMs, REE, tantalum, tungsten, are all considered to have a relatively high economic importance and supply risk in the EU.

The main characteristics that make them critical for EU are:

- // the import dependence of the EU for all of them (generally more than 70%; in most cases 100%)
- // their use is fundamental in emerging technologies
- // they are produced as byproducts of other main metals treatment or coupled elements
- // their recycling rate is quite low
- // the substitution options are limited.

The increasing demand has significantly raised mineral and metal prices over the last 10 years.

The present situation in the global market of mineral raw materials is characterized by:

- // increasing demand for minerals from both industrial and developing countries,
- // dramatic changes in where minerals are sourced,
- // volatile markets and pricing,
- // increased vulnerabilities in the mineral supply chain.

In this framework, the EU is in a particularly vulnerable position on imports for many raw materials (e.g. EU produced only 3% of the world metal production) which are increasingly affected by growing demand pressure.

Moreover the production of many materials is concentrated in a small number of countries. Supply risks may arise as a result of political-economic instability of the producing countries and export or environmental restrictions imposed by these countries. However, significant opportunities exist for securing material supplies within the EU by:

- // exploring the potential for deep-seated deposits and new deposit types enriched in critical metals
- // streamlining the land permitting process for mining
- // supporting research on extraction, processing and recycling
- // improving resource efficiency and recycling
- // substituting certain high-risk raw materials by others that are not facing similar restrictions and supply limitations.

EU Strategy on Raw Materials

Following the Raw Materials Initiative, on 2 February 2011 the European Commission adopted a strategy document which sets out targeted measures to secure and improve access to raw materials for the EU. This strategy document reinforces the three pillars approach:

- // fair and sustainable supply of raw materials from international markets
- // fostering sustainable supply within the EU
- // boosting resource efficiency and promoting recycling.

To develop this new strategy on raw materials the European Commission, in the frame of the European Innovation Partnership on Raw Materials, proposes concrete targets to be achieved by 2020 at the latest including: up to ten innovative pilot actions (e.g. demonstration plants) for exploration, extraction and processing, collection and recycling; substitutes for at least three key applications of critical and scarce raw materials; enhanced efficiency in material use and in prevention; re-use and recycling of valuable raw materials from waste streams with a specific focus on materials having a potentially negative impact on the environment; a network of research, education and training centres on sustainable mining and materials management; European standardised

statistical instruments for the survey of resources and reserves and 3D geological maps; a dynamic modelling system linking trends in supply and demand and a full lifecycle analysis; and a pro-active strategy of the EU in multi-lateral organisations and in bilateral relations, such as with the US, Japan and Australia in the different areas covered by the Partnership.

Innovation can help increase the supply of raw materials in a number of ways – from new mining methods, through improved product design for recycling to ways in which rare metals can be retrieved from waste. Substitution of materials, as well as finding new ways to make better use of what we already have, also plays an important role here.

The following examples illustrate Europe's potential: It has been estimated that the in situ value of unexploited minerals at a depth of 500-1,500 metres is about € 100 billion. New innovative technologies will help to extract even deeper, in more remote areas and under harsh conditions. Nowadays, each citizen in the EU generates around 17 kg of electrical and electronic equipment waste (WEEE) annually, a figure that is predicted to rise to 24 kg by 2020. New cost-effective and environmentally-sound recycling techniques and best practices on waste collection and treatment offer a possibility to improve the recovery of key raw materials, such as copper, silver, gold, palladium or cobalt.

Innovation in these fields is necessary for Europe to regain a role and presence in the sustainable supply of raw materials and to maintain and improve its competitiveness on the global stage.

A prompt response from ETP SMR

ETP SMR sees the need to increase business and job opportunities while at the same time safeguarding biodiversity and the environment.

The European Technology Platform on Sustainable Mineral Resources (ETP SMR) strongly supports the launch by the EC of a European innovation Partnership (EIP) on Raw Materials for the Modern Society with the aim to “ensure a secure supply and achieve efficient and sustainable management and use of non-energy materials along the entire value chain in Europe”.

The ETP SMR aims to develop innovative technologies and solutions along the entire value chain for cost effective, safe, environmentally and socially sound extraction and supply of raw materials from both primary and secondary sources.

The main objective is to propose specific issues for demonstrating ten innovative pilot actions for raw materials exploration, extraction, processing, and recycling, within the European Innovation Partnership on Raw Materials.

The whole value chain covers raw materials from extraction to marketed products. This life cycle starts with exploration and mining to provide first hand access and bring materials from the geosphere into the technosphere. From then on the basic concept is simple: extract minerals at high rates from the ores, use them as efficiently as possible in the manufacturing process of products, avoid dissipation during the use and End of Life (EoL) phase and minimise losses of metals into wastes and residues during all phases of the life cycle. By doing so, a high proportion of metals can be re-used more than once.

Innovative Technologies and Solutions

Overall Vision and Strategic Ambitions

By 2020, the EU will have secured a sustainable minerals and metals supply base to ensure competitiveness and growth of the EU industry and economy as a whole. Scientific breakthroughs and sustained innovation efforts will have significantly improved access to, production, use and recycling of resources.

By 2050, the EU will have achieved a sustainable basis for the entire life-cycle of minerals and metals in the EU. On the way to make this vision a reality, the ETP SMR formulated strategic ambitions.

Strategic Ambition 1 (exploration and inventory of resources) - By 2020, Europe has a comprehensive overview of available intra-EU geological mineral resource and metal potential (primary resources) and of the mineral resource and metal potential in the "urban mine" (secondary sources). Secondly, we will have developed new, advanced exploration technologies for land and sea-based exploration as well as tools to assess the resource potential in technical infrastructure and products put on the market.

Strategic Ambition 2 (mineral extraction from land and sea bed deposits) - Already today some of the world's smartest, and most energy and resource efficient mines and quarries are operating in Europe. By 2020, Europe will maintain and develop further technological leadership aiming at economically viable and environmentally sound mineral extraction operations, including from greater depth of land and sea deposits.

Strategic Ambition 3 (mineral processing) - By 2020 Europe has identified new ore and concentrates processing technologies that will allow step changes in energy, water and emissions intensity and will allow treating more complex (primary and secondary) mineral resources.

These technologies will pave the way for expanding European business and future advanced jobs.


Strategic Ambition 4 (metallurgy/metals recovery) - Europe should maintain its advanced technology in metals production and should develop further its know-how in order to be able to process even lower grade and/or complex (primary and secondary) materials in the most sustainable way.

Overview of challenges

In the upcoming years and even decades, the main challenges of the mineral raw material supply are, among others:

- // Innovation will be required in terms of technologies, but also in terms of techniques and best practices.
- // New products and applications, new systems and new consumption patterns will have to be developed to maintain a sustainable supply and use of resources in our societies.

Therefore training and education will have to become an essential part in fostering innovations in the raw materials sector as well as in the downstream industries.



Strategic Ambition 5 (recycling) - Europe has already become the leading continent with regard to recycling of base metals and a number of other raw materials. The same needs to be achieved for the recycling of critical and essential raw materials, where significant shortfalls still exist.

To make recycling of raw materials or raw material containing products more efficient, it is necessary to:

- // mobilise End of Life (EoL) products with critical raw materials for proper collection
- // improve overall organisation, logistics and efficiency of recycling chains, focus on interfaces and system approach
- // prevent illegal exports of EoL products containing critical raw materials and increase transparency in flow
- // promote research on system optimisation and recycling of technically challenging products and substances.

In particular, the ambition is therefore to become the leading continent with regard to recycling of both base and critical/technology metals:

- // by 2020, the recycling rates of critical and technology metals exceed 10% in the EU
- // by 2050, the recycling rates of critical and technology metals exceed 25% and an overall 10% increase in the recycling rate is reached for all other metals.

That gives the opportunity to improve the extraction from secondary sources increasing the overall availability of resources for the EU economy.

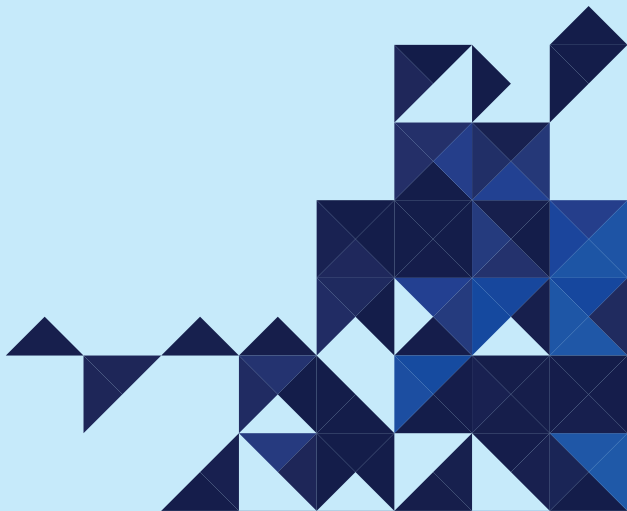
Collaborative efforts by the various institutions and governments in the EU Member States are required to achieve these goals since the interdependencies of industries and mineral raw material supply in the Internal Market are such that only a joint EU effort will have the critical mass to produce the technological leadership and know-how.

The ERA-MIN will provide a starting point. Such innovation will have to foster technology, but also adjust the legal and social framework for innovation and the uptake of the innovative technologies.

- // Competence and capacity building will have to accompany the role out of new technologies and techniques.

Besides innovations in technology, social innovations are also necessary to develop skills and transfer knowledge and understanding within and beyond current practice. Secure access and sustainable use of raw materials also requires capable human resources. This includes awareness raising among young people for the significance of the sector as a cornerstone in the sustainable development of Europe and to attract more students to engage in related fields.

The ETP SMR will support the European Innovation Partnership on Raw Materials in developing a new innovation agenda for the EU's and the Member States' way of dealing with raw materials.





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