



Critical raw materials: environmental stakes

Our modern society is increasingly dependent on a range of critical raw materials, contributing to the constant growth in global demand. However, many are not easily available or are only produced in areas that are remote from Europe, sometimes in ecologically sensitive or politically unstable regions where environmental standards are insufficient or even lacking all along the value chain: mining, mineral processing, extractive metallurgy refining...

The extractive nature of mining to recover these materials creates a variety of impacts on the environment before, during and after mining operations. It can produce adverse effects on water, air and soil quality, wildlife and can have severe health effects on local populations, partly due to the amounts of chemicals used in processing and because the processing waste often contains toxic metals and gases.

As an example, the Chinese Society of Rare Earths estimated that for every ton of rare earth oxide it produces in Baotou, the largest rare earth industrial base in China, up to 12 000m³ of waste gas containing dust concentrates, sulphur dioxide, hydrochloric acid and sulphuric acid, and about 2000 tons of mine tailings are generated. Tailings are the ground materials left over once the valuable materials have been removed from the ore. In northern China, these tailings contain traces of radioactive thorium.

Mineral processing and extractive metallurgy also produce wastes that contain traces of toxic elements as well as traces of critical raw materials not valorised today because of the low economic interest to implement further separation processes. These wastes are stored close to the production plants or sometimes reused in public works as sublayer for roads in substitution of nobler materials, although potentially source of pollution (by heavy metals in particular, or other pollutants).

The recycling of these wastes can allow for a more sustainable use of valuable raw materials in times of rising prices and scarcity, and may be one of the solutions to these severe environmental impacts and to Europe's dependence on foreign resources.

Europe is one of the largest consumers of critical raw materials and the amounts of waste from final products containing these materials are increasing. These valuable resources should be returned to the industrial cycle through what is called "secondary mining" or "urban mining". By recycling processed materials, urban mining makes waste re-usable and thus increases supply. It is also considered more environmentally-friendly as it does not lead to land destruction nor does it produce high CO² emissions. Although recycling alone cannot fully meet the demand it is an important additional source that can reduce Europe's dependency by supplying the European market with secondary raw materials.

The challenge today lies in building know-how in rare earth processing and recycling to widen the technical competencies of enterprises and scientific institutions in Europe.