

## **Incorporation of New Technologies for Sustainable and Economical Mining Solutions**

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### **Abstract**

The availability of secure supplies of raw minerals is a global concern which has been constantly growing over the past years. To reach the sustainable development goals defined by the United Nations, addressing global poverty, inequality, climate or environmental degradation, consumption of the majority of the raw materials is steadily growing. The European Union defined a list of critical raw materials, which are of growing economic importance but bear a high risk of supply shortage. As a response to these global trends, new strategies are needed contrasting the economic feasibility of recycling methods – today, recycling rates of less than 1% are reached for many of those critical raw minerals – to investing in innovative technologies.

Newly developed methods as contact-free analyses systems, which are, for example, based on hyperspectral cameras, can improve the selection of materials and thereby increase the mining efficiency while reducing the environmental damage. This technique has been successfully evaluated for a potential use for the separation of anhydrite or gypsum to customize the direction of mining the quarry without time-intensive laboratory analyses. Another strategy includes the efficiency enhancement of existing infrastructure as petroleum-producing wells in the oil and gas industry. For example, the global demand of lithium is steadily increasing being used for electric storage solutions. Production waters from oil and gas wells can contain lithium concentrations of more than 70 mg/l, which is sufficient for lithium recovery as has been recently shown in North America by companies as MGX Minerals. In Germany, future studies should focus on the applicability of such systems, testing the geochemistry of produced oil wastewater and calculating the profitability of such extraction techniques which will depend on the volume of the brine and the mineral concentration.