

Geochemical mapping of Mg in agricultural soil of Europe for assessing the potential of critical elements

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By the 2017 the European Commission identified 26 critical raw materials including elements like Sb, Nb, Ge and Mg. Magnesium is the eighth most abundant element in the Earth's upper continental crust and is essential for all organisms as a key plant nutrient and for photosynthesis in plants. Additionally, magnesium is used in a variety of industrial sectors, such as transport, consumer electronics, steel industry, , pharmaceutical and agricultural chemical production and in medical implants. The worldwide primary magnesium production in 2016 was around 878 Kt, and 85% of global demand was supplied by China. Worldwide demand is expected to increase in the next decade. In particular, the development of Research & Development technologies could significantly affect the long-term demand for magnesium.

Here we investigate a geochemical behavior of Mg in agricultural soil (Ap-horizon, 0–20 cm) collected in 33 European countries (. The survey area includes a diverse groups of soil parent materials, a wide range of climatic zones, and landscapes. The chemical composition of soil reflects largely the primary mineralogy of the source bedrock, superimposed effects of pre- and post-depositional chemical weathering controlled by element mobility and formation of secondary phases such as clays. The geochemical distribution of Mg in agricultural soil at the continental scale provides important knowledge about its mobility and residence in soil and can be considered as a starting tool for identifying potential areas for more focused mineral exploration surveys.