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European countries are highly dependent on imports because of scarcity of domestic natural reserves for many materials. Such feature as net-importer makes Europe vulnerable to potential supply risk and raw material shortages. For this reason, the European Commission (EC) has identified a list of critical raw materials that includes many materials universally recognized as critical such as, for instance, rare earth elements and specialty metals.

Copper is not deemed critical by the EC, but the region has modest copper ores and depends strongly on imports of copper forms from other countries. In addition, the decrease of ore grade and the expected mine production peak, should the global copper demand keep growing at current rates, could result in further limitations to access essential materials for the European copper industry. Recycling of secondary copper sources, in particular scrap and obsolete products at end-of-life (also known as old scrap), can help to reduce Europe's reliance on primary sources and to enable the community to move towards a circular economy.

Material flow analysis is applied to characterize the anthropogenic copper cycle in the EU-28 from 1960 to 2014. A top down approach is followed to quantify the contemporary size of the in-use stock as difference between the amount of copper that entered the use phase and the old scrap generated. The results show that (i) Europe has a well-established industry network in the copper cycle; (ii) copper recycling has better performance than global averages but it is still far from perfect recycling; (iii) the size of the copper in-use stock is around 180-210 kg copper/per capita, i.e., about two times the magnitude of primary copper reserves in the region; (iv) about half of secondary copper collected for recycling has been exported from Europe mainly to Asian countries, and (v) at the same time, secondary copper production capacity has been reduced due to the closure of several European smelters in the past years. The outcomes demonstrate limits to the closure of copper flows in the region and highlight significant potentials for improvements.

Historic results for copper demand will be used as basis to estimate the future demand of the metal in the region according to four scenarios (i.e., UNEP's-GEO-4 scenarios). Then, life cycle inventory data will be applied to estimate the environmental benefits related to copper recycling under the circumstances that (i) current end-of-life recycling of major copper end-use applications remain constant in the future, and (ii) a near-perfect recycling of secondary copper flows is achieved in the European community.

We comment on the implications of the results for Europe and provide prospective to the copper industry and policy actors. This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Sklodowska-Curie grant agreement No. 704633.