Changing local and global impacts of critical minerals supply for the clean energy transition

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ABSTRACT

The transition to clean energy is occurring rapidly in various localities, if inconsistently on a broader scale. This transition will influence many aspects of society, but it is apparent that it will involve a switch from supply chains focused on fossil fuels to supply chains focused around renewable, nuclear and energy storage technologies, with a greater requirement for metals. While the influence of this transition is still gradual, due largely to the small starting share of clean energy technologies within the energy mix, it is foreseeable that step changes may occur in the future. The impact of shutting down large power stations on their supporting communities has already been seen in some cases, and the energy transition may shift this further up the supply chain. This paper will present the preliminary evaluation of environmental and social impacts of such transitions. The basis data includes the original environmental impact assessments (EIAs) and national pollutant inventory (NPI) data for existing operations. The impacts will be evaluated on the basis of their effect on social equity (considered broadly to include the environmental and health impacts of pollutants) at the local, national and global level. Finally, the results of evaluation for various supply chains will be integrated to examine future scenarios for energy with their critical mineral requirements. Feedback loops from environmental and social impacts to the criticality of minerals will also be considered. It is anticipated that the potential environmental impacts could cause a preference for alternative materials using some of the existing criticality frameworks. Moreover, most existing incorporation of environmental impacts in criticality has been via life cycle assessment, and largely using global impact factors. In this study we seek to incorporate localised factors, which can give a more realistic reflection of the environmental performance.