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Demand-side strategies key for mitigating material impacts of energy transitions

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As fossil fuels are phased out in favour of renewable energy, electric cars and other low-carbon technologies, the future clean energy system is likely to require less overall mining than the current fossil-fuelled system. However, material extraction and waste flows, new infrastructure development, land-use change, and the provision of new types of goods and services associated with decarbonization will produce social and environmental pressures at localized to regional scales. Demand-side solutions can achieve the important outcome of reducing both the scale of the climate challenge and material resource requirements. Interdisciplinary systems modelling and analysis are needed to identify opportunities and trade-offs for demand-led mitigation strategies that explicitly consider planetary boundaries associated with Earth's material resources.

Continuing fossil fuel development and consideration of currently implemented policies implies that climate targets will be missed by a wide margin[1]. However, many technologies required to effectively address climate change are already available in the market. There are emerging signs that some societies can rally enough political support and practical action to slow climate change. Peak coal may have arrived[2]. Renewable energy technologies are diffusing exponentially as costs decrease[3], are outcompeting fossil fuels and are integrating into increasingly digitalized networks[4]. Energy end-use technologies enabling low-carbon electrification of mobility and heating services—such as batteries for electric vehicles (EVs) and heat pumps for housing—are becoming ever cheaper and expanding rapidly[5]. If these trends continue and are coupled with policies for tackling GHG emissions from land use and agriculture, the goal of limiting global warming to below 2 °C may remain within reach (disinvesting from fossil fuels is, however, the harder part, given the power of fossil fuels in energy markets and the geopolitical implications associated with phase-out[6]). Large-scale deployment of carbon dioxide removal (CDR) technologies—such as direct air carbon capture and storage—may even offer the opportunity to reverse temperature increases further in the future.

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