“Leasing is already an established practice for traders and refining companies in the precious metals sectors. In an advanced circular economy, a range of mined minerals and/or manufactured metals could be leased to companies by producer countries, with the country of origin retaining ownership.”

-Jack BARRIE, Patrick SCHRÖDER, Tim BENTON

Image Source: Wikimedia Commons. April 13, 2017. Leaving her family for a 10/4 work/rest days far from home in a small town at 200 km from Abidjan, an Ivorian woman in a mining company should be celebrate for her courage and sacrifice to help her family. Miss Ekepe Lydie is an operator at the process plant. Every day, she is in charge of the grade control and the cyanide concentration. Being in contact with chemicals could be dangerous but she knows very well how to respect the safety rules. Photo Credit: Aamlorievi. https://commons.wikimedia.org/wiki/File:Ivorian_Women_in_Mining_Industry%CB%90_the_busy_and_strong_process_operator.jpg

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Achieving a just net zero transition via a circular economy

Achieving a global net zero transition will require the deployment of a range of materially intensive technologies and infrastructure. Many of these, such as electricity grids, solar panels, wind turbines, battery storage systems and electric vehicles, require a wider range of material inputs in comparison to more conventional energy production methods. These range from iron, steel and copper through to lithium, cobalt, gold and rare earth metals.[1] According to the International Energy Agency, to achieve net zero globally by 2050, demand for mineral inputs will increase on average by 600% by 2040 with demand for some (such as cobalt and lithium) increasing by more than 2,000-4,000%, if the linear economy production and consumption approach to energy continues.[2]

Circular material mining practices to meet this surge in demand is predicted to result in significant environmental and social impacts. In terms of environmental impact, minerals such as gold, iron ore and copper are commonly mined within or near forests and other critical ecosystems that play an important role in regulating climate and are home to globally significant biodiversity.[3] Mining activities have been demonstrated to cause significant environmental harm to these ecosystems. As such, rapid scaling up of mining for minerals to produce renewable energy technologies, if done unsustainably, would likely have an adverse impact on climate and biodiversity goals. Mining for minerals such as cobalt and nickel, which are essential for electric vehicles, also has high social risks. Since 2010, 304 human rights abuse allegations against 115 different mining companies have been recorded globally. No doubt, many more cases go unreported.[4]

An increase in mining of minerals is essential to supply sufficient materials at the pace and scale necessary to meet the global net zero target. Yet, the associated environmental and social impacts of extraction, processing, consumption, and waste disposal do not typically feature in net zero strategies.

There is significant potential to achieve net zero in a less material-intensive and environmentally harmful ways by applying circular economy principles to achieve energy and material demand reduction.

Achieving circular net zero transition

A circular economy aims to decouple economic activity from environmental impact through designing out waste and pollution. Circular design encompasses everything, from the micro-level of material choices and product design, as well as redesigning business models and value chains, all the way to the systems level. This systems approach allows for slowing, narrowing, and looping of material flows and the regeneration of natural ecosystems. The overall objective is to enable decoupling, where circularity directly reduces the demand for virgin materials needed to achieve net zero.

Examples of circular solutions for net zero include designing renewable technologies to be more durable and more easily repaired, remanufactured, and recycled to recapture critical valuable materials and circle them back into the economy. This reduces the demand for virgin materials. For example, wind turbines can be fitted with real time monitoring of components to ensure they are maintained and repaired timely, to maximize their lifetime. Furthermore, 85-90% of the total mass of a wind turbine can already be recycled into new wind turbines.[5]

Circular solutions are particularly valuable in changing consumption patterns in energy intensive sectors and areas of the economy where limited energy efficiency improvements can be made. The built environment is one such area. Designing neighborhoods to be much denser significantly reduces the material and energy footprint. Buildings that are multi-functional, energy efficient and easy to deconstruct – and therefore easy to for materials to be reused – means that the energy demand throughout the entire lifecycle of buildings can be dramatically reduced.

Mobility is a second area in which circular solutions can dramatically reduce energy and material demand. Examples of circular mobility solutions include shifting to a sharing economy model where mobility is offered as service through rental models or through active travel, such as cycling. Both are more materially and energy efficient. The reuse and refurbishment of electric vehicle batteries as energy storage devices in homes, offices, and factories, thereby displacing new batteries, is another example.

A recent study conducted by the Centre for Research into Energy Demand Solutions (CREDS) suggests that if the UK implemented widespread energy demand reduction measures, it could more than halve its energy demand by 20503.

Simultaneously, as we begin to reduce our consumption of energy and products through circularity, we need to continue to mitigate the adverse economic and social impacts our - unavoidable - extraction of minerals will have on low-and-middle income CRM producing countries.

The concept and political agenda of a 'just transition' has gained significant traction in national and international debates on climate change and energy transitions, but this needs to be extended to the circular economy.[6]

To that end, new approaches to ensuring equitable material ownership needs to be explored. For example, new models of leasing mineral and materials could be explored. Leasing is already an established practice for traders and refining companies in the precious metals (e.g. gold, silver, platinum group) sectors. In an advanced circular economy, one at a level required for achieving net zero, a range of mined minerals and/or manufactured metals could be leased, rather than sold, to companies by producer countries, with the country of origin retaining ownership. The idea is that the resource, in whichever form, is leased for a certain period of time and then 'returned'. It would also provide high incentives for recycling and improving designs of high-tech equipment, electronics, and batteries to ensure easier recovery of CRMs.

Realizing the goal of net zero should not come at the expense of creating other environmental and social impacts. Embedding the circular economy within net zero strategies is critical to reducing our overall demand for energy and materials. We need to keep our eyes on the overarching goal: ensuring our consumption of natural resources fits within all the planetary boundaries and not just climate.

Case Study: Anglo American's Future Smart Mining ™
https://www.angloamerican.com/futuresmart/futuresmart-mining

Key highlights:
Intelligent Mine: integrating IoT sensors, UAV drones and other SMART connectivity devices into mining operations to capture big data for predictive analytics and AI that drives self-learning operations.

Concentrated Mining: improving mining efficiency by reducing the ratio of metal to ore and minimizing environmental footprints as well as energy consumption, operating, and capital costs.
Water-less Mine: on-site closed loop water recycling and drier tailings
Modern Mine: robotic drilling equipment to reduce blast mining while increasing the recovery of low-grade ores and complex minerology.
Sustainable Mining Plan: planning for and catalyzing sustainable development in host communities to ensure economic viability far beyond the life of the mine.
These principles have already been embraced by the African Circular Economy Alliance with the goal of improving mining practices while integrating artisanal and small-scale mining operations.
https://www.kas.de/documents/282730/0/ACEA_Report.pdf/

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