

Mitigating critical mineral misallocations in China's EV battery supply chain: A provincial input-output analysis with recycling and cooperation scenarios

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Extended Abstract

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Abstract Summary

The rapid expansion of electric vehicle (EV) deployment is intensifying pressure on critical minerals such as lithium, nickel, cobalt, and manganese, raising concerns over China's resource security and the resilience of its battery supply chain. This study develops a province-level input-output model covering the entire EV battery industrial chain to track critical mineral flows and quantify resource misallocations under nine combined demand-recycling scenarios. The results reveal pronounced spatial and sectoral mismatches. Western provinces hold about 77% of identified mineral reserves, whereas roughly 72% of battery manufacturing capacity is concentrated in the east, consuming around 470 kt of critical mineral resources. Resource-abundant provinces exhibit factor redundancy and low value-added utilization, processing hubs face underutilized capacity, and eastern demand centers experience persistent supply shortages. Scenario analysis shows that targeted inter-provincial cooperation mechanisms-such as resource-for-technology exchanges and long-term offtake agreements-can reduce misallocation indicators by 20-50%, while strengthening end-of-life battery recycling, particularly for cobalt and nickel, lowers misallocation by 30-35%. These findings provide a quantitative basis for designing coordinated resource-industry layouts, integrating primary and secondary (recycled) supply, and enhancing the resilience and sustainability of China's EV battery supply chain.

Presenting Author Biography

Ms. Binli Wang is a doctoral student at the Management School, Guizhou University, China. Her research interests focus on the sustainability study of critical mineral resources.

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