

Carbon Emission Calculation, Eco-efficiency Evaluation and Green Transformation Path of Lithium Industry in Jiangxi Province Under the "Dual Carbon" Goals

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Abstract

Lithium is a critical energy metal underpinning the development of new energy vehicles and energy storage industries, and its low-carbon green production is directly tied to the carbon footprint of the entire new energy industrial chain. Taking Jiangxi's lithium industry as the research object, this paper adopts the IPCC carbon emission accounting method to calculate carbon emission intensities by production segment, applies the Super-SBM model to evaluate the eco-efficiency of the lithium industry, and identifies the core influencing factors of eco-efficiency via the Tobit regression model. The results show that: (1) The total carbon emissions of Jiangxi's lithium industry are rising rapidly, with the smelting segment accounting for over 60% of total energy consumption and constituting the primary source of carbon emissions; (2) The overall eco-efficiency of Jiangxi's lithium industry remains at a moderately low level, while the mineral resource exploitation segment records the lowest eco-efficiency, with technological maturity and energy mix acting as core constraints on eco-efficiency improvement; (3) Energy consumption in conventional pyrometallurgical smelting is 1.5 times that of hydrometallurgical smelting, coal accounts for more than 50% of total energy use, and the carbon emission intensity exceeds the advanced industrial benchmark; (4) Open-pit mining dominates the resource exploitation segment, posing arduous ecological restoration challenges. On this basis, this study establishes a four-in-one green transition framework featuring "resource recycling – technological empowerment – industrial chain coordination – policy guidance", and proposes implementation approaches including green mine renovation, cultivation of low-carbon benchmark enterprises, construction of low-carbon industrial parks, and cross-regional coordinated development, providing decision-making references for the low-carbon green transformation of Jiangxi's lithium industry.

Keywords

Dual Carbon Goals, Jiangxi Lithium Industry, Carbon Emission Accounting, Eco-efficiency, Green Transition