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IMPACT OF URBANIZATION ON CARBON BALANCE CAPACITY: COUPLING DEGREE AND OBSTACLE ANALYSIS

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Abstract

This study examines Dalian's urban carbon balance and energy-related emissions over a decade of rapid urbanization (2011-2020). By employing emergy theory, the study refines the energy carbon emission factor and develops a comprehensive urbanization index system. Utilizing Granger testing and Stata causality analysis, the research uncovers the dynamic relationship between carbon balance capacity (CBC) and the Comprehensive Urbanization Indicator (CUI). Coupling and obstacle degree models further analyze this relationship, identifying critical obstacles. The results reveal a rise in carbon sinks and energy-related emissions, though the expansion of carbon sinks lags behind, leading to a decreased CBC. Despite this, urbanization continues to progress, with a strong coupling between CBC and CUI, indicating balanced urban growth. Key obstacles identified include gas usage, the proportion of built-up areas, per capita green space, green coverage rate in built-up areas, and the ratio of industrial electricity consumption. The study's findings offer valuable insights and recommendations for promoting sustainable urbanization in Dalian.

Key words: carbon balance capacity, carbon emissions, coupling degree, obstacle degree, urbanization

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