

The Decoupling Relationship Between Land Use Efficiency and Carbon Emissions in Beijing Ecological Conservation Areas, China

Linlin Cheng and Huizhen Cui (China, PR)

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SUMMARY

In the new development phase, clarifying the relationship between land use efficiency (LUE) and carbon emissions (CE) supports high-quality development and coordinated economic-ecological progress. Based on land use and socio-economic data of Beijing Ecological Conservation Areas (BECA) from 2010 to 2021, this paper analyzes the decoupling relationship between LUE and CE using carbon emission calculation coefficients, DEA model, and Tapio decoupling model. The findings are as follows:

(1) Net CE of the areas showed fluctuating declines, with overall carbon sequestration increasing in 2021. Pinggu and Miyun districts had carbon sink ecological carrying capacity coefficients greater than 1. While Huairou, Mentougou and Yanqing districts had relatively low LUE. (2) During the 12th Five-Year Plan, driven by policies for ecological protection and industrial transformation, the decoupling status showed a sharp fluctuation trend of "strong decoupling-strong negative decoupling-recessive decoupling". During the 13th Five-Year Plan, with the deepening of green development policies, the decoupling relationship evolved toward a moderate and coordinated trend of "weak decoupling – expansive connection". Taken together, this reflects the response law and evolution logic of the relationship between land use efficiency and carbon emissions in BECA shifting from "transformation pains" to "mature development" across different policy stages. Overall, promoting low-carbon development, high technology, and scientific innovation is essential for the region in future.

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