

For Ordinary Sessions (O-)

Mechanisms of Widening Inequality in Regional Carbon Neutrality Planning: Focusing on Planners' Bounded Rationality

The mismatch between carbon emissions and mitigation responsibility impedes carbon neutrality and sustainable development. This study defines regional carbon inequality as a spatial mismatch between emissions and burdens, where specific regions monopolize economic benefits from emissions while others bear disproportionate mitigation burdens. Such inequality hinders long-term national carbon neutrality by causing resource misallocation, negative externalities, and carbon lock-in. Although regional planners recognize this inequality and attempt to resolve it, they face bounded rationality constraints, including information asymmetry, cognitive limitations, and organizational inertia. Consequently, these decision-making patterns risk solidifying or intensifying carbon inequality rather than resolving it. However, existing studies focus primarily on quantitative emission gaps, neglecting the underlying cognitive and behavioral mechanisms from a bounded rationality perspective. Accordingly, this study empirically analyzes regional carbon inequality and identifies underlying mechanisms using a mixed-methods approach. The analysis covers 229 South Korean municipalities from 2010 to 2023. First, the quantitative phase employs panel stochastic frontier analysis (SFA) to measure carbon emission efficiency. The model incorporates labor, capital, and energy consumption as inputs, with gross regional product and carbon emissions as outputs. Subsequently, Blinder-Oaxaca decomposition identifies the drivers of the carbon intensity gap between the top 20% (high-efficiency) and bottom 20% (low-efficiency) groups. The qualitative phase aims to figure out the mechanisms of widening carbon inequality based on the theory of planners' bounded rationality. To this end, 90 carbon neutrality-related planning documents were selected from the high-efficiency and low-efficiency groups. SFA results indicate an approximate 63% gap in average carbon emission efficiency between the two groups. Blinder-Oaxaca decomposition reveals that the unexplained component accounts for approximately 43% of the carbon intensity gap, suggesting disparities in regional policy levels and planning capabilities. Grounded theory analysis shows that low-efficiency regions adopt satisficing strategies, failing to devise independent solutions to external constraints. Specifically, these regions uncritically imitate high-tech technologies from leading cities without considering local contexts or fill plans with rhetorical declarations lacking concrete implementation measures. In conclusion, regional carbon inequality stems not only from exogenous resource deficits but also from endogenous factors, including planning capacity. Achieving carbon neutrality therefore requires policy support to supplement the insufficient planning capacity of lagging regions.