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REGULATION AND OPTIMIZATION OF URBAN PASSENGER TRANSPORT SYSTEM FOR LOW-CARBON DEVELOPMENT: A CASE STUDY OF HEFEI, CHINA

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Abstract

Against the backdrop of accelerating global urbanization and the pressing challenge of reducing transport sector carbon emissions, this study develops an integrated System Dynamics and Multi-Objective Programming (SD-MOP) framework for the low-carbon structural optimization of urban passenger transport systems, with an empirical application to Hefei, China. The methodology synergistically couples dynamic simulation with quantitative optimization to identify critical regulatory levers and derive optimal policy schemes. The principal findings demonstrate that: (1) Structural reconfiguration—achieving a 40% metro share and widespread adoption of new energy vehicles (80.1% for private cars, 100% for taxis and buses)—yields substantial synergistic benefits. (2) Implementation of the optimized regime results in a 63.58% reduction in carbon emissions, a 72.08% decrease in passenger travel costs, and a 72.83% decline in resource occupancy costs by 2030, relative to the baseline trajectory. (3) The research substantiates the SD-MOP framework as a robust decision-support tool for sustainable transport policy formulation, providing a transferable paradigm for low-carbon urban mobility planning.

Key words: low-carbon structural optimization, SD-MOP, sustainable transport, urban passenger transport

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