

Research on the Evolution Characteristics and Driving Mechanisms of Land Use Patterns in the Changsha-Zhuzhou-Xiangtan (CZT) Metropolitan Area

Abstract: In recent years, the conflict between ensuring food security, maintaining ecological functions, and promoting industrial upgrading has become increasingly prominent in the Changsha-Zhuzhou-Xiangtan (CZT) metropolitan area. Based on land-use data from 2015 to 2023, this study utilizes spatial analysis of land-use transitions and Geographical Detectors to analyze the evolution of land-use patterns in terms of structure, quantity, and spatial morphology, while exploring the underlying driving mechanisms. The results indicate that: (1) The overall land-use structure of the CZT metropolitan area maintains a fundamental pattern of "ecological dominance, agricultural foundation, and rapid expansion of construction land." (2) Ecological and agricultural spaces remain dominant, forming the essential base for regional ecological security and food production, while the proportion of construction land continues to rise driven by urbanization. (3) Land use exhibits a typical "two-decrease, three-increase, one-stable" pattern: cropland and forest land have overall declined; construction land, water bodies, and unused land have grown steadily; and grassland has remained largely stable. (4) The expansion trajectory of construction land has evolved from early "point-like growth" to "block-like clustering," gradually forming a "belt-like continuous" structure centered on main transportation axes and the boundary areas of the three cities, with land elements continuously converging toward the metropolitan core and axial zones. (5) The evolutionary dynamics consist of external pushes from national strategies and policy systems, internal pulls from market mechanisms, industrial clusters, and population mobility, as well as the constraints and guidance provided by ecological red lines, "Green Heart" management, and spatial structural evolution.

Keywords: Changsha-Zhuzhou-Xiangtan (CZT) metropolitan area; land use; pattern evolution; driving mechanisms