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Dynamic Land Use Change and Sustainable Urban Development in a Third-tier City within Yangtze Delta

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Abstract

The main purpose of this study is to explore the relationship between dynamic land use change and sustainable urban development in a typical third-tier city within Yangtze Delta. This study also attempts to provide suggestions in terms of land use cover change (LUCC) and land use intensity change (LUIC) for governments and planners to achieve better land use performance and more rational urban development. Spatial and regression analyses show LUCC rather than LUIC affects urban sustainability. Thus, implications for future city construction were proposed.

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Keywords: Land use cover change; Land use intensity change; Sustainable urban development; Third-tier city.

1. Introduction

Cities and land use are dynamic not only because the ceaseless landscape can mirror the underlying economic and sociocultural transformations of a city[1] but also because land use changes (LUCs) in turn have profound influences on urban development. In China, developments or transitions in many cities rely heavily on land developments. Thus, land urbanization is considered a significant impetus by governments to accelerate urbanization or modernization. However, inappropriate land utilization causes several issues, such as habitat encroachment, biodiversity loss, soil degradation, food security threat, and an increase in poverty, inequity, and

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other social problems. LUCs that result from developments in a city can be identified by land use cover change (LUCC) or/and by land use intensity change (LUIC). LUCC focuses more on the process where a parcel of land loses its original type because of natural phenomena and human-related activities, whereas LUIC, which is the reverse of land expansion, implies the alteration commonly steered by compelling desires. The pursuit of high intensity is mainly meant to capture the yield gap created by different amounts of input from the agricultural, economic, or social aspect and/or its corresponding output differences measured by land area or time duration. LUIC may not bring about LUCC, but could result in ecological changes within the same type of land use cover[2]. Therefore, no relationship between more inputs and ascending production exists because reducing only the demands for land size cannot ensure fewer occurrences of negative socioeconomic and ecological effects at the same time.

Sustainable urban development (SUD) is vital to cities in eastern China, where large bottlenecks restrain long-term aspirations despite immediate economic prosperity. Rapidly growing coastal cities in the Pearl River Delta and Yangtze Delta and large cities in interior districts are always the focus of research, whereas urban change is nonstationary over space and LUCs in various places have distinct characteristics[3]. In fact, the relatively small inland cities need more attention to better identify pivotal development attributes and to help planners and governments avoid anticipated issues. Thus, this study aimed to investigate the relationship between the dynamics of LUC and SUD because changes in the quantity and quality of land use may create competitions and conflicts directly and indirectly through urban development.

2. Literature review

2.1. Land use cover change

Studies detecting and monitoring natural resources have four mainstreams, namely, detecting if a change has occurred, identifying the nature of the change, measuring the areal extent of the change, and assessing the spatial pattern of the change. Remote sensing (RS) is the most reliable and effective instrument for data gathering and quantitative analysis of temporal impacts. RS in combination with the geographic information system is more functional and appealing because it enhances classification accuracy and surveys the spatial structure of LUCCs by using adjuvant data, visual interpretation, and expert knowledge. Monitoring determines the time and location of LUCC occurrence, and knowledge of the underlying human and biophysical drivers that cause changes is important. The existing literature has proposed three types of main drivers, namely, economic development, environmental inducement, and social inducement. Rapid industrialization, urbanization, population growth, and economic reforms were argued to be major social and economic contributors to LUC in the case of Kunshan[4]. Cultural, political, technological, and natural driving forces were also important[5] as LUC mirrored location behavior and preferences[6], which further manifest that psychology and behavior are easily influenced by culture and politics.

2.2. Land use intensity change

Despite no consensus in connotation, the overall definition of urban land use intensity (LUI) depends on space scales and stresses on comprehensive benefits of land use and the structure of a city. However, in the middle and microscopic views, intensification of urban land utilization aims to yield outputs. Previous studies on evaluations of LUI in the macro scope have attracted the most concerns. Meanwhile, limited attention has been focused on a relatively narrow range of LUI. Development zones and industrial lands are major research areas of evaluation at the intermediate scale, whereas residential lands, commercial lands, and micro level remain the focus of least interests. Many factors attributed to LUI can be evaluated using various methodologies. The multiplicity of objectives and factors affecting LUI make multifactor synthetic evaluation the most widely accepted method for evaluation. The assessment results of multifactor synthetic evaluation can be easily expressed by a framework constituted of indicators and corresponding weightings. Many scholars have introduced a vast array of indicators, namely, indicators that restrict LUI, such as environmental contamination index and urban greenery coverage; indicators that reflect intensive use levels, such as input intensity and utilization intensity; land use efficiency indicators, such as land economic outputs; and land intensive use trend and sustainability indicators. Landscape-level indicators, such as plot ratio, economic output, and environmental index at least at smaller spatial scales, were also introduced. Macro indicators cover urban spatial layout, utilization intensity, output efficiency, and land sustainability, whereas