

# A REVIEW OF URBAN EXPANSION AND GREEN ECONOMY DEVELOPMENT

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## **Abstract**

Green development, as one of the five new development concepts, is an important way to improve economic quality and solve ecological protection problems. This is also the primary task facing the high-quality development stage in the new era. Cities are of paramount importance in promoting the development of China's green economy. Urbanization, as the mainstream trend of human social development, is an important indicator for measuring the advanced stage of economic and social development, lifestyle, and modernization process of a country or region. It is also an important component of realizing the blueprint for high-quality development. There are few studies that integrate urban expansion and green economic development into the same research framework. Although there are a few studies that explore the relationship between the two, there is a lack of systematic theoretical analysis framework and exploration of the mechanism of their interaction. This article examines the interrelationship between urban expansion and green economy development through existing literature, and finds that the direction in which urban expansion affects regional green economy development is uncertain. Urban expansion not only inhibits the improvement of green economy development, but also promotes it.

**Keywords:** Urbanization; Urban expansion; Green Economy

## **Introduction**

In the context of the new normal, China's economic development mode has gradually shifted from a "speed first" to a "quality first" stage, and high-quality economic development has become a basic requirement for economic development in the new era. However, at the same time, economic development still faces the dilemma of "three overlapping periods", namely the growth rate transition period, the structural adjustment pain period, and the early policy digestion period. Many problems have emerged with the transition to high-quality development, such as factor dependence and historical issues left over from investment driven development models. The problems of unbalanced, insufficient, and uncoordinated development remain prominent. The existence of the above problems has exacerbated the depletion of natural resources and the deterioration of the ecological environment, and the accumulation of resource and environmental problems is difficult to reverse. China's green development strategy aims for sustainable development, with economic quality as the core, ecological environment carrying capacity as the foundation, and "low-carbon, green, and circular" economic activities as the main content and approach, promoting the transformation of economic development from extensive "industrial civilization" to intensive "ecological civilization". The 14th Five Year Plan clearly proposes the implementation of a green development strategy, promoting coordinated development of economic development and environmental protection through four means: green low-carbon, environmental improvement, improvement of ecosystem quality, and efficient utilization of resources. Therefore, promoting the implementation of green development strategy is an important task to break through

resource and environmental constraints, adapt to the new trend of global green development, solve the contradiction between economic construction and ecological environment, achieve the transformation of economic green development, and move towards a new stage of high-quality development.

Cities are of paramount importance in promoting the development of green economy in China. Urbanization, as the mainstream trend of human social development, is an important indicator for measuring the level of economic and social development, lifestyle, and modernization progress of a country or region. It is also an important component of realizing the blueprint for high-quality development. Since the reform and opening up, the scale and speed of China's urbanization construction have always been among the top in the world, and the urban development system has been continuously improved. The continuous promotion of urbanization has effectively solved the problems of imbalanced urban-rural development and low urbanization rate during the period of urban-rural dual structure. Urbanization has expanded domestic market demand, promoted the transfer of surplus rural labor, achieved the transformation of agricultural and rural economic models, and improved residents' living standards. On the other hand, urbanization plays a role in factor aggregation, promotes industrial restructuring, facilitates intensive utilization of funding sources, improves energy efficiency, and stimulates regional development potential. Overall, China's urbanization construction and road design have the characteristic of "capital land population" relay development.

**Table 1** The Development Stage of Urbanization in China

<b>Stage</b>	<b>Time</b>	<b>Characteristic</b>
During the period of urban-rural dual structure	1949-1978	Institutionalized urban-rural division with low urbanization rate
During the period of industrial urbanization	1979-1994	Leading industrialization, lagging urbanization
During the period of land urbanization	1995 - 2013	Integration of Land, Finance, and Finance
New Urbanization Era (Population Urbanization)	2014-Now	Putting people first "and" urban-rural integration "

As the problems caused by unreasonable urban expansion become increasingly prominent, the government and relevant scholars gradually realize the necessity of rational planning for urban construction. In 2021, the State Council further issued the "Opinions on Promoting Green Development in Urban and Rural Construction", introducing the concept of green development into the construction of new urbanization and emphasizing the importance of green urbanization. From this perspective, it is necessary and urgent to study the development of green economy in China's urbanization process, whether it is the key task of optimizing urbanization layout or achieving long-term goals of sustainable economic development. This can provide theoretical reference and guidance for the deep integration of new urbanization and green development concepts, and the construction of a new development pattern.

## Literature Review

### 1. Research on Urban Expansion

At present, urban expansion has attracted widespread attention from the academic community. Domestic and foreign scholars have conducted extensive research on the scale, speed, direction, and methods of urban land expansion, further exploring the characteristics and laws of urban expansion evolution. Urban expansion refers to the objective description and representation of changes in urban scale and development through the growth or expansion of urban built-up areas, urban land, or urban boundaries. It focuses on changes in land elements during regional development, often neglecting the socio-economic activities carried by land. The core characteristics of urban expansion are disorderly land expansion and low population density. Some scholars define urban expansion as the unorganized, disorganized, and inefficient development process in urbanized areas. This definition clearly indicates the use of derogatory emotions to describe the characteristics of urban expansion. Some scholars define urban expansion as the core concept, which refers to the process of adding commercial, industrial, residential, and other urban land that is far away from the city center or attached to urban roads, scattered or contiguous (Hou Yali, 2023)<sup>[1]</sup>. This concept is relatively neutral. It is worth noting that urban expansion can trigger a series of social, economic, and ecological environmental problems, including the loss of agricultural ecological land, increased carbon emissions, and urban heat island effect. However, from the perspective of urban development, the outward expansion of urban land is inevitable and its existence is reasonable.

From the perspective of studying the spatial characteristics of urban expansion, the expansion mode defined by expansion speed cannot highlight the changes in spatial form. Therefore, scholars have introduced landscape ecology theory to reveal the laws of urban expansion from the perspective of spatial form. The method of combining GIS and spatial landscape matrix was used to identify the types of urban expansion in West Bengal, and it was found that filling expansion was the main expansion type, edge expansion was concentrated in the suburbs, and enclave expansion area gradually increased with phased development (Dutta et al., 2020)<sup>[2]</sup>. A simple quantitative method based on plaque perimeter to determine the type of expansion, which can be divided into filling type, edge expansion type, and self-generated length type. The edge expansion type dominates in the Nanjing metropolitan area, with a higher proportion of early spontaneous growth than the filling type. But with the development of urbanization, this trend is gradually weakening. By comparing the spatiotemporal patterns of urbanization in Chongqing and Chengdu, it can be found that during the study period, urban land use significantly increased, with marginal expansion being the main form of expansion (Qu et al., 2020)<sup>[3]</sup>. The spatial distribution of newly added urban land is largely constrained by terrain. By analyzing the dynamic changes of urban expansion in Shenzhen and Guangzhou over the past 40 years, it can be found that both types of expansion are characterized by leapfrog expansion. On the other hand, using the Landscape Expansion Index to quantitatively analyze the process of urban expansion can better describe two or more temporal pattern changes (Ding Dan et al., 2023)<sup>[4]</sup>. Subsequently, this method was widely applied to the study of spatiotemporal characteristics of urban expansion. Some scholars have also improved the extended pattern recognition method based on principles such as common edge, convex shell, and landscape expansion index. By combining the convex shell principle with the common edge measure, the urban expansion pattern is divided into two types of expansion pattern matrices (Chen Jianglong et al., 2023)<sup>[5]</sup>. When the recognition results of the two methods are different, the final expansion mode is determined according to certain rules: convex shell filling expansion, indicating that the newly added construction land is located within the boundary of urban construction land, which is

contradictory to traditional enclave expansion. The landscape evolution feature index based on landscape expansion index identifies the growth and disappearance of patches during the expansion process, and divides the expansion patterns into new patch type, enclave type, edge type, and filling type; Extinguishing plaques, isolated plaques, adjacent plaques, and surrounding plaques (Wang Haijun et al., 2022)<sup>[6]</sup>. The multi-level landscape expansion index creates multi-level equidistant buffer zones, which can measure the continuous urban expansion pattern at multiple time points. According to the distance between multiple layers of buffers, expansion types are divided into six types: fill type, edge type, adjacent type, interval type, separation type, and expansion type. Overall, the current classification of urban expansion patterns and types is mainly based on enclaves, edges, and fillings.

## 2. Research on Green Economy

Economic ecology is the foundation of green economic development, which means protecting and improving the ecological environment while developing the economy. The knowledge economy, as the leading force, provides intellectual support for promoting the transformation of the green economy. The core goal of green economy development is to achieve effective utilization of resources, protection of ecological environment, sustainable economic and social development, and achieve win-win outcomes for all parties (Yang Liping et al., 2011)<sup>[7]</sup>. Green economic growth requires a comprehensive consideration of the relationship between resource conservation, ecological environment improvement, and economic development, while also taking into account the sustainable development of economic benefits and production methods (Long Haiwen, 2024)<sup>[8]</sup>. There is a constrained economic growth model within the scope of ecological environment capacity and resource carrying capacity, and green economic growth emphasizes the sustainability of the ecological environment (Wei Bin, 2024)<sup>[9]</sup>. Based on ecological city planning, the green development of urban economy can be summarized into five key areas: green production, green industry, green governance, green environment, and green society (Hao Guangming, 2021)<sup>[10]</sup>. With the increasingly severe ecological environment, the development of green economy is gradually receiving attention. The United Nations Environment Programme (UNEP) defines green economic development as improving human well-being and social equity while significantly reducing environmental risks and ecological scarcity. The Organization for Economic Cooperation and Development (OECD) defines green economy development as a development model that promotes economic growth while ensuring that natural assets continue to provide the resources and ecological services that our well-being depends on. According to the definition of the International Energy Agency, green economy development is the decoupling of unsustainable resource utilization from the environmental impact of economic growth. The premise of developing a green economy is a virtuous cycle of ecology, which is a sustainable economic development model based on economic and ecological transformation and led by the knowledge economy (Cui Rubo, 2020)<sup>[11]</sup>. The development of green economy refers to the ability of human activities to simultaneously generate environmental and economic benefits, that is, economic activities are conducive to environmental protection, and economic benefits are obtained through environmental protection, thus constructing a circular economy model. Green economic development is a constrained economic growth model within the scope of ecological environment capacity and resource carrying capacity. Developing a green economy emphasizes both green and economic development. The core connotation of green economy development is to achieve a positive interaction between the economy, society, and ecological environment, while striving to reduce energy input and pollutant emissions while balancing economic output (Zhang, 2022)<sup>[12]</sup>.

### **3. Research on the Relationship between Urban Expansion and Green Economy**

#### **3.1 Negative impact of urban expansion on green economy**

The relationship between urban expansion and total factor productivity has been widely discussed, but there is little literature that integrates urban expansion and green total factor productivity into a unified analytical framework to explore their relationship. Green total factor productivity is a type of total factor productivity. Therefore, this section reviews existing research from the perspective of total factor productivity, providing reference for the relationship between urban expansion and green total factor. Firstly, some scholars believe that urban expansion has a negative impact on productivity, and they often examine it from the perspective of urban sprawl. For example, drawing inspiration from the theory of urban agglomerations, data from 357 metropolitan areas in the United States from 1990 to 2001 were used (Farah, 2021) <sup>[13]</sup>. They conducted empirical tests on the relationship between economic performance and urban expansion in metropolitan areas of the United States using OLS and instrumental variable methods. This study found a negative correlation between urban sprawl and urban productivity. A specialized urban sprawl index was constructed using panel data of Chinese cities from 2000 to 2002 and global nighttime light data. Research has found that urban sprawl can inhibit the improvement of total factor productivity. In addition, using urban panel data and DEA method to calculate the total factor productivity of prefecture level cities, the spatial differentiation of the impact of urban expansion on urban total factor productivity is empirically tested. Research has found that urban sprawl suppresses the growth of total factor productivity in cities, and this impact varies spatially (Wang Jia, 2022) <sup>[14]</sup>. Based on the industrial dynamic agglomeration index and spatial Durbin model, the relationship between urban expansion and productivity was explored. Research has shown that urban sprawl suppresses productivity growth by reducing industrial agglomeration levels, with a more pronounced effect from 2000 to 2006 (Hao Liangfeng, 2020) <sup>[15]</sup>. Urban expansion can lead to increased energy consumption, worsening air pollution, reducing urban green spaces, and increasing the burden on ecosystems (Johnson, 2021) <sup>[16]</sup>. The cost of low-density urban expansion is that urban construction encroaches on agricultural and forestry land, leading to a weakened self purification capacity of the ecological environment and a decrease in urban green production efficiency (Borrego et al., 2024) <sup>[17]</sup>.

#### **3.2 Positive impact of urban expansion on green economy**

The existing conclusions regarding the negative impact of urban expansion on productivity still need to be discussed. Firstly, it deviates from the real background. At present, utilizing land expansion for urban construction is still the mainstream trend of urbanization development. International cities such as Tokyo and Shanghai belong to urban continuous zones in spatial form. Secondly, it contradicts existing theories. The research conclusions drawn from extensive experience indicate that the expansion of urban scale helps to improve productivity. Therefore, some scholars believe that urban expansion has a positive impact on productivity. For example, according to Adam Smith's theory of division of labor, the driving force of division of labor on labor productivity is constrained by the market scope. With the expansion of urban scale and market scope, energy utilization efficiency can be improved. We empirically tested the difference between urban expansion and green total factor productivity using panel data from 285 prefecture level and above cities in China from 2004 to 2007. Research has found that moderate urban expansion significantly improves green total factor productivity (Shao Hanhua, 2020) <sup>[18]</sup>. Using panel data from 29 provinces and regions in China from 1996 to 2015, the impact of urban expansion on economic efficiency was analyzed. The research results indicate that at the national level, urban expansion can significantly exert agglomeration and scale effects, driving economic efficiency improvement; From a spatial perspective, the effect of urban expansion on economic efficiency in the western region is relatively vague, while the effect of urban expansion on

improving economic efficiency is more significant in the eastern and central regions (Liu Rongzeng, 2020) <sup>[19]</sup>. The larger the city size, the more prominent the spatial externalities generated by agglomeration economy. Therefore, moderate urban expansion can even improve the economic efficiency of mega cities (Cowperthwaite, 2020) <sup>[20]</sup>.

### **3.3 Curve Effect of Urban Expansion on Green Economy**

Some scholars believe that there is a non-linear or more complex relationship between urban expansion and productivity. Using the statistical data of Chinese cities from 2006 to 2021, analyze the impact path of urban expansion on economic efficiency and explore the role of urban expansion on urban economic efficiency. Research has found that there is an inverted U-shaped relationship between urban land expansion and scale efficiency, while this is not the case in the eastern region (Zhao Ke, 2021) <sup>[21]</sup>. Using data from 286 cities in China from 1997 to 2013 as the research object, it was found that there is uncertainty in the direction of the impact of urban sprawl on urban productivity, which depends on industrial structure and city size (Wei Shouhua, 2020) <sup>[22]</sup>. The interactive relationship between the expansion of provincial construction land and economic growth efficiency in China was dynamically analyzed using a panel VAR model. Research has shown that the expansion of urban construction land can suppress economic growth efficiency in the short term, but the long-term impact is not significant. This article is based on a micro perspective, using data from Chinese manufacturing enterprises as the research object, and systematically analyzes the impact of urban expansion on enterprise production efficiency. The research results indicate that with the continuous promotion of urban expansion, the overall production efficiency of Chinese manufacturing enterprises shows a positive U-shaped trend of first decreasing and then increasing. There are significant differences in the impact of total factor productivity among enterprises of different regions, industries, and even sizes (Shi Jing, 2022) <sup>[23]</sup>.

## **Conclusion**

There is currently no unified conclusion on the impact of urban expansion on the development of green economy. The direction of green economic development in regions affected by urban expansion is uncertain. Urban expansion has both a restraining effect on the improvement of green economic development and a promoting effect on it. Although urban expansion brings a series of ecological and environmental problems, it is an inevitable development stage in the process of urbanization. At the same time, urban expansion can enhance the agglomeration effect and economies of scale of cities, which is conducive to the improvement of green economic efficiency. Studying how urban expansion affects the development of regional green economy from the perspective of dynamic adjustment of economic agglomeration level with spatial expansion is a topic that combines practical significance and academic value.

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