Performance and Dynamic: Study on Spatial Evolution of Peripheral Areas of Metropolis in Suzhou

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Abstract. Choosing Suzhou as the research area, taking the administrative area as the unit and starting from the performance and dynamic perspective, this paper analysis spatial evolution characteristics of Suzhou metropolis peripheral area by remote sensing image, constructs spatial performance evaluation system by AHP, and evaluates the spatial performance of the five areas in Suzhou. Combined with the three typical case of Industrial Park, High-tech Zone and Wujiang Region, this paper discuss the mechanism of spatial evolution from the perspective of subject, and sums up three types of spatial evolution and interaction mode of action. The study finds that the types of dynamic have a close relationship with the formation of spatial performance echelon, and reveals the change of performance and dynamic mechanism in the spatial evolution of metropolitan area in Suzhou.

1. Introduction

With the rapid development of urbanization in China, metropolitan area has gradually become the main space carrier of urbanization development in China, which has aroused widespread concern in the academic community [1-3]. Different from sub-urbanization process of foreign metropolises, metropolitan area in China is closer to "urban and regional integration". Metropolitan area in China shows strong characteristics of subjective action [3-4]. "Metropolitan periphery area" is a spatial scope that must be spanned in the initial development of metropolitan area. The periphery of city belongs to the extended area of metropolitan hinterland. This area is affected by the combined action between central city and peripheral sub-centers. The development of city and village (town) is intertwined. By analyzing spatial evolution of the peripheral areas of metropolis and reasonably analyzing the spatial performance and the action process, we can improve the level of spatial governance and effectively improve the quality of the development of urban and rural.

2. Spatial evolution characteristics of peripheral areas of metropolitan areas

Based on the development of metropolitan area in Suzhou, this paper takes the administrative division as the boundary and adopts many kinds of spatial measurement methods to analyze the development of five surrounding areas of the ancient city in Suzhou (Industrial Park, High-tech Zone, Xiangcheng District, Wuzhong District, Wujiang District). And we will analyze structure characteristics, morphological characteristics, scale characteristics and characteristics of direction of spatial evolution in metropolitan area in Suzhou [5-6].

As we can see in figure 1, in the In terms of spatial evolution structure, metropolitan area in Suzhou has experienced a process that is from simple to complex, from scatter distribution to flake...
development and then turn to group development. During this process, urban spatial structure tends to be perfect and reasonable. In terms of spatial evolution, it has experienced the single-core finger-like spreading morphology, the axial-extended morphology of east and west, the windmill-group-expanded morphology and the cross-axis development morphology.

In terms of spatial evolution scale, the overall scale is growing rapidly, and the city is expanding rapidly. The evolution speed is fluctuating, and the space evolution is fierce. The evolution intensity is first increased and then decreased, and the characteristics of the stage are obvious.

As we can see in figure 2, in terms of spatial evolution direction, there are obvious differences in the stages of evolution, and the center of gravity of the city is constantly moving. The spatial evolution develops in all directions, and the distribution of land is in the shape of a cross. At the same time, the third characteristic is that the spatial evolution scale and evolution velocity of each direction are obviously characterized.

3. Spatial performance evaluation of peripheral areas of metropolitan areas
Based on the basic criteria of the composite, all-around process design and the sustainable development, we aim at reflecting "space performance in the peripheral areas of metropolises" objectively and accurately [7]. We have the three-level framework based on "target-system-factors". And we build the spatial performance evaluation system framework just like figure 3, including five system layers, such as "social society, economic system, spatial form, land use, transportation organization and ecological environment", eleven factor layers and twenty-seven indicator layers. Then we use the analytic hierarchy process to construct the four-level hierarchical model just like figure 4 and figure 5, including "target layer (O)-system layer (A)-factor layer (B)-index layer (C)", and combine expert scoring to determine the index weight, and select 2001, 2005, 2010, 2014 for the time node to conduct the research.
Through static horizontal and dynamic vertical comparison, the spatial performance evaluation of five surrounding areas is carried out. As we can see in figure 6, some characteristics of the peripheral areas of the metropolis are found as follows: 1) The main interests are driven by orientation: peripheral areas have the similar advantages, and they are subject obviously to the interests of districts, towns and villages. The resource utilization efficiency is uneven [8]. 2) The spatial evolution path is different: it presents different spatial performances and evolution paths. 3) The planning control force is weak: the construction land has been used out of the control requirements about the end of term in the overall planning seriously, the zoning plan is over-scoped and there are too many violations.

4. Spatial dynamic types in peripheral areas of metropolitan areas
From the perspective of administrative division adjustment and urban planning control, we trace back the picture of spatial evolution of urban area in Suzhou. After the reform, towns in Suzhou have experienced four large-scale administrative division adjustments and multiple urban overall planning. The urban spatial pattern of “Great Suzhou” has gradually formed. After the reform, villages and
towns in Suzhou have experienced many large-scale township merger and removal. As we can see in figure 7, the spatial pattern of small towns has gradually developed from "distributed independence" to "concentrated group", and it forms a unique spatial pattern of towns in Suzhou. After the reform, villages in Suzhou experienced many migrations and withdrawals, and it develops gradually from the traditional "village and agriculture" to "village industry and residence point", "Industrial Park and village industry, community and residence point", and it realizes the transformation about the spatial pattern of "the park and community".

![Figure 7. Adjustment of administrative divisions in the peripheral areas of metropolis in Suzhou](image)

Through the analysis of spatial evolution of suburban metropolitan area, it is found that five outer zones are under the influence of administrative division adjustment and planning control. Their spatial evolution shows different types of active. According to the difference in amount, power, mode and other aspects among the main body of district, town and village, three types of action can be summarized: 1) The new city type dominated by "district". Industrial Park. 2) The "district and town" combination and expansion type: High-tech Zone and Xiangcheng District. 3) The "town and village" hybrid advance type: Wuzhong District and Wujiang District.

From the analysis of three typical spatial evolution types in High-tech Zone, Industrial Park and Wujiang District, the author finds that subjects of three types all include "district, town, and village", and they adopt zoning adjustment, exert planning control, take back management rights and use other ways to strengthen the urban pattern. But due to the differences in motivations and strengths of action, there are different spatial results. Due to abundant start-up capital, Industrial Park is advanced in planning and construction, and its management experience is also advanced. The urban and the surrounding towns and villages gradually merge from independence and form an ideal new city model [9-10]. Due to insufficient start-up funds, High-tech Zone undergoes the frequent adjustment of districts, limited planning and control and so on. For these reasons, High-tech Zone has led to a staggered pattern of urban patterns, a fierce competition for land use and a sharp decline in traditional villages [11]. There are strong economic strength and great resource endowment of towns in Wujiang District, but the district government has limited development resources, and the regional natural basement is complex, and the space constraints are limited [12]. These reasons result in the fragmentation of space, the numerous heterogeneous spaces, the urban-rural contradictions and the urgent need to improve urban and rural social environment.

By combing the active features and differences of the main body, it is found that there are significant differences among the three types of active agents. In general, the two levels of the district and towns dominate the role, and the role of the village level is gradually weakened. The changes in the intensity of its main body show different types of characteristics: Industrial Park from "weak districts and strong towns" to "common progress of district and town", and then it realizes the new city development model led by district. High-tech Zone has developed from "weak districts and strong towns" to "strong districts and weak towns", and thus it realizes the development path of "common progress of districts and towns". Wujiang District has formed from "weak districts and strong towns" to "strong districts and distinctive towns", and then it forms the mixed development path dominated by "common progress of towns and villages" just like figure 8.
5. Spatial governance approaches in peripheral areas of metropolitan areas

1) Integrate the spatial performance needs and establish a unified spatial development framework

We should pay attention to "fairness", change growth mode from "efficiency growth" to "common growth", from incremental growth to stock growth, change development model from "industrial-led" to "production-city integration", and we can improve policy system construction.

2) Improve status of urban and rural planning and improve construction of planning legal system

Multiple departments should coordinate together, establish a unified "legal space platform", construct a planning decision-making mechanism in which multiple entities participate together, and establish a dynamic monitoring mechanism.

3) Coordinate interests of multiple subjects and build an optimal mechanism for interest sharing

It is necessary to integrate regional resource allocation and deepen the development of regional cooperation. We should integrate the development needs of all subjects and build the community of interests of "districts, towns and villages" to promote network-based benefit sharing.

4) Optimize weak indicators of system and coordinate a balanced development of system elements

This approach includes five strategies. Firstly, we should optimize industrial structure and accelerate economic transformation. Secondly, we can delineate the growth boundaries and strengthen land intensive use. Thirdly, we must attach importance to social services and improve public management. Fourthly, we optimize transportation networks and improve the sharing rate of public transport travel. Finally, we should protect the ecological environment and improve the quality of urban life.

6. Conclusion

From the perspective of performance and dynamic research, it can be concluded that the spatial evolution mechanism of metropolitan outlying areas is as follows: Firstly, in the rapid evolution of space in the peripheral areas of metropolises, the performance of each system and each partition is quite different. Secondly, the dynamic type of the partition subject has different effects on the spatial performance, and the degree of each subject effect on the performance is different.

When we review the development of metropolitan areas in China, the peripheral area of metropolis has become a spatial range that must be crossed in the early development of urban region. In the future, we need to pay more attention to the spatial governance of metropolitan areas, establish a unified spatial development framework by integrating space needs, coordinate the interests of multiple subjects so as to promote the balanced development of system elements, and improve the planning and legal system construction to improve the performance of urban and rural planning management and control.

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