

Landscape Pattern Evolution and Optimization Strategy in Wuhan Urban Development Zone, China

Authors : Feng Yue, Fei Dai

Abstract : With the rapid development of urbanization process in China, its environmental protection pressure is severely tested. So, analyzing and optimizing the landscape pattern is an important measure to ease the pressure on the ecological environment. This paper takes Wuhan Urban Development Zone as the research object, and studies its landscape pattern evolution and quantitative optimization strategy. First, remote sensing image data from 1990 to 2015 were interpreted by using Erdas software. Next, the landscape pattern index of landscape level, class level, and patch level was studied based on Fragstats. Then five indicators of ecological environment based on National Environmental Protection Standard of China were selected to evaluate the impact of landscape pattern evolution on the ecological environment. Besides, the cost distance analysis of ArcGIS was applied to simulate wildlife migration thus indirectly measuring the improvement of ecological environment quality. The result shows that the area of land for construction increased 491%. But the bare land, sparse grassland, forest, farmland, water decreased 82%, 47%, 36%, 25% and 11% respectively. They were mainly converted into construction land. On landscape level, the change of landscape index all showed a downward trend. Number of patches (NP), Landscape shape index (LSI), Connection index (CONNECT), Shannon's diversity index (SHDI), Aggregation index (AI) separately decreased by 2778, 25.7, 0.042, 0.6, 29.2%, all of which indicated that the NP, the degree of aggregation and the landscape connectivity declined. On class level, the construction land and forest, CPLAND, TCA, AI and LSI ascended, but the Distribution Statistics Core Area (CORE_AM) decreased. As for farmland, water, sparse grassland, bare land, CPLAND, TCA and DIVISION, the Patch Density (PD) and LSI descended, yet the patch fragmentation and CORE_AM increased. On patch level, patch area, Patch perimeter, Shape index of water, farmland and bare land continued to decline. The three indexes of forest patches increased overall, sparse grassland decreased as a whole, and construction land increased. It is obvious that the urbanization greatly influenced the landscape evolution. Ecological diversity and landscape heterogeneity of ecological patches clearly dropped. The Habitat Quality Index continuously declined by 14%. Therefore, optimization strategy based on greenway network planning is raised for discussion. This paper contributes to the study of landscape pattern evolution in planning and design and to the research on spatial layout of urbanization.

Keywords : landscape pattern, optimization strategy, ArcGIS, Erdas, landscape metrics, landscape architecture

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