

Construction and optimization of ecological security pattern based on ecosystem services in Wuhan metropolitan area

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Abstract: **【Objective】** Rapid urbanization has affected the stability of ecosystem, seriously threatening regional ecological security. The construction of ecological security pattern can improve the integrity of landscape, providing an effective way to alleviate the conflict between economic development and ecological security. Most previous studies on regional ecological security pattern have only focused on the identification of ecological security pattern in a single year, ignoring the importance of various ecological elements in ESP and their changes in time scale. Based on ecosystem services, we constructed a regional ESP framework to identify and optimize the ESP of Wuhan metropolitan area in 2000, 2010, and 2020. **【Method】** The entropy weight method and landscape connectivity analysis were used to determine the ecological sources. The ecological resistance surface was constructed by considering land use, terrain factors and NLI. The ecological corridors, pinch points and barriers were identified based on circuit theory. Then the Centrality Mapper and gravity model were used to identify the importance of ecological sources and ecological corridors to the optimize the ESP. **【Result】** (1) the ecological sources, ecological corridors, pinch points and barriers in the study area had obvious spatial aggregation, mainly distributed in the eastern and southern, and gradually extended to the northern in the past 20 years. (2) from 2000 to 2020, the number of ecological sources and ecological corridors at different grades decreased first and then increased, and the changes in the area of ecological pinch points and barrier also followed this trend. (3) we finally obtained the optimized ESP in the three periods, among which the ESP in 2020 includes 9 primary ecological sources, 21 secondary ecological sources, 48 tertiary ecological sources, 141 primary ecological corridors, 37 secondary ecological corridors, as well as barriers with an area of 170.46km² and pinch points with an area of 197.42km². **【Conclusion】** This research framework extends the time scale of ESP construction, more directly shows the spatio-temporal changes of ESP, providing the theoretical basis and reference for regional sustainable development and landscape pattern optimization in the process of urbanization.

Key words: Ecological security pattern; Ecosystem services; Circuit theory; Gravity model; Wuhan metropolitan area