

Degradation or evolution? Assessing ecological security network for a rapid urbanization region in Eastern China

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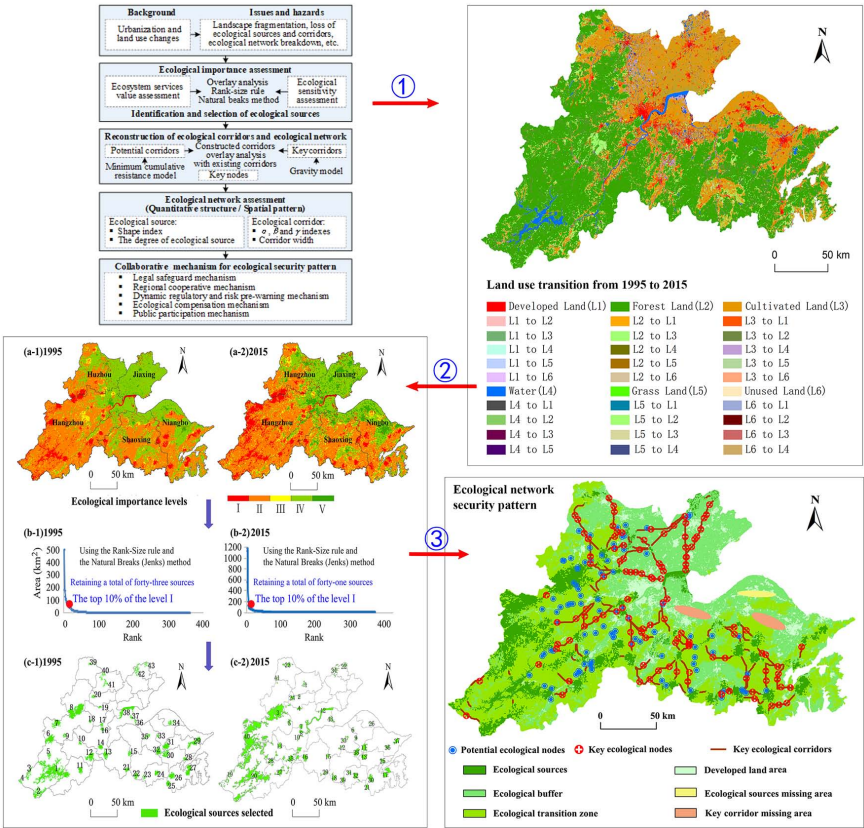
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Abstract

Rapid urbanization leads to fragmentation of large land patches, islandization of ecological landscape, and destruction of ecological security network. As a basic guarantee of life, a sound ecological security network promotes connectivity between ecological sources, improves ecological security patterns, and mitigates the degradation of an ecological system. The objective of this study was to improve a framework for assessing the ecological security network. We demonstrated the application of the proposed framework through a case study of the urban agglomeration around Hangzhou Bay (UAHB), a rapid urbanization region in Eastern China's Zhejiang Province. We improved the identification method of ecological sources by integrating the evaluations of ecosystem services value and ecological sensitivity, while we screened ecological sources by using the rank-size rule and the natural breaks method. Based on the screened ecological sources, the ecological corridors were reconstructed and optimized for the UAHB region. Results from this study showed that the structure and function of the ecological security network were strongly influenced by human activities and urban sprawl. The ecological security network has deteriorated locally in eastern coastal areas of UAHB during the past 20 years with strong spatial variability in ecological security patterns. To maintain a well-protected and sustainable ecological quality, we proposed a set of 5 measures to improve the ecological security pattern and the sustainable development of the ecological system in Eastern China.

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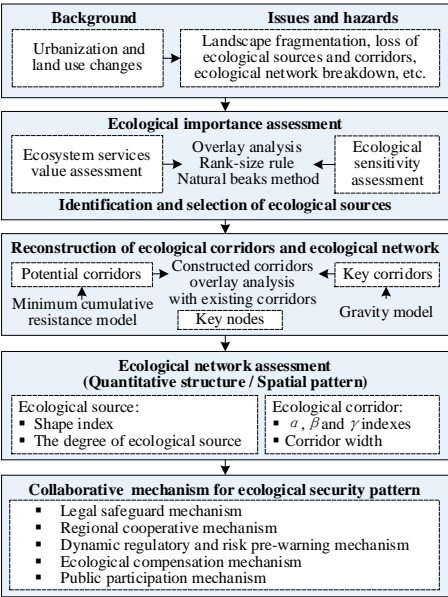


FIGURE 1 The framework and technical flowchart of ecological security network assessment

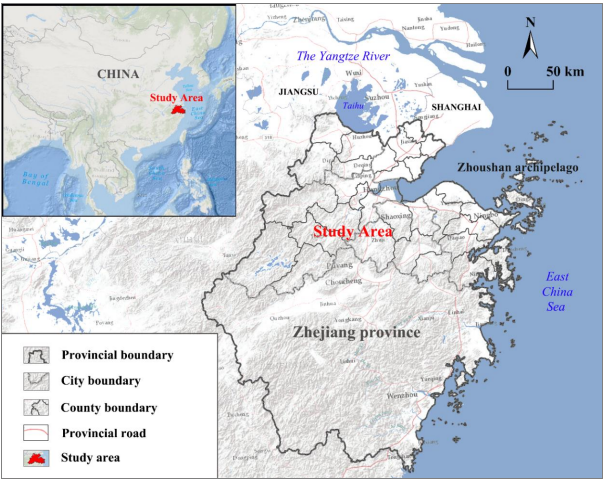


FIGURE 2 The location and scope of the study area

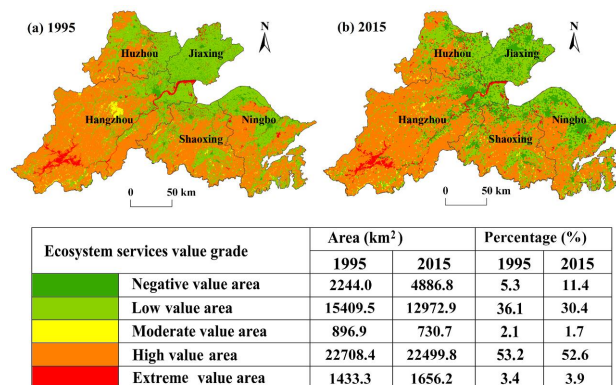


FIGURE 3 Spatial-temporal patterns of ecosystem services value in 1995 and 2015

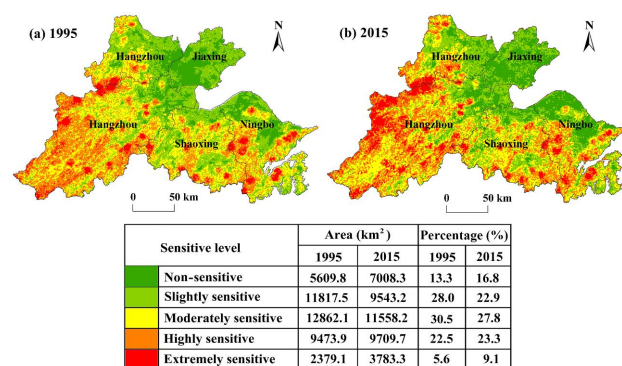


FIGURE 4 Spatial-temporal patterns of ecological sensitivity in 1995 and 2015

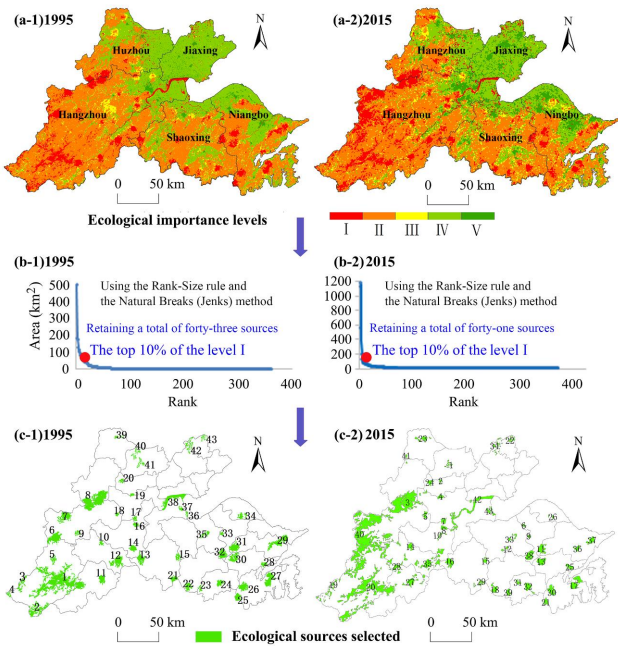


FIGURE 5 Identification of ecological sources in the UAHB in 1995 and 2015

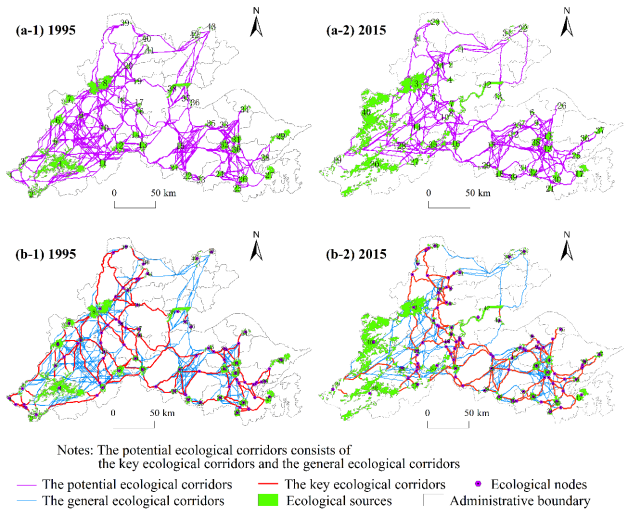


FIGURE 6 Ecological corridors system in the UAHB in 1995 and 2015

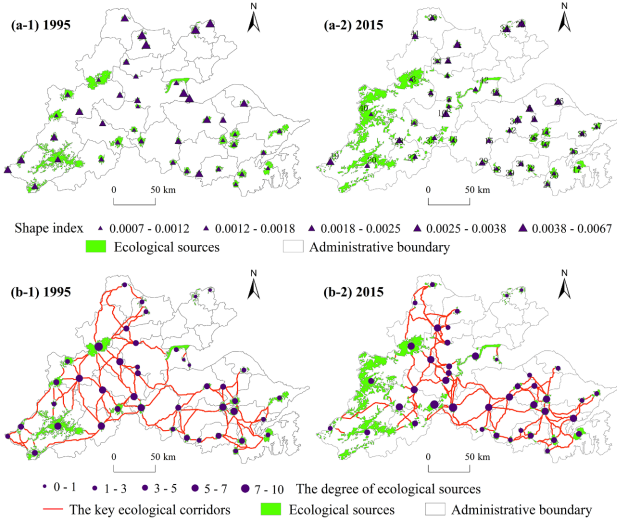


FIGURE 7 Assessment of ecological sources based on shape index and degree of ecological sources

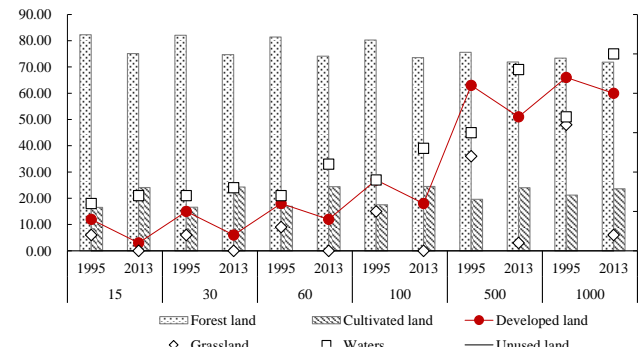


FIGURE 8 Area percentages of land-use types corresponding to ecological corridors with different width (m)

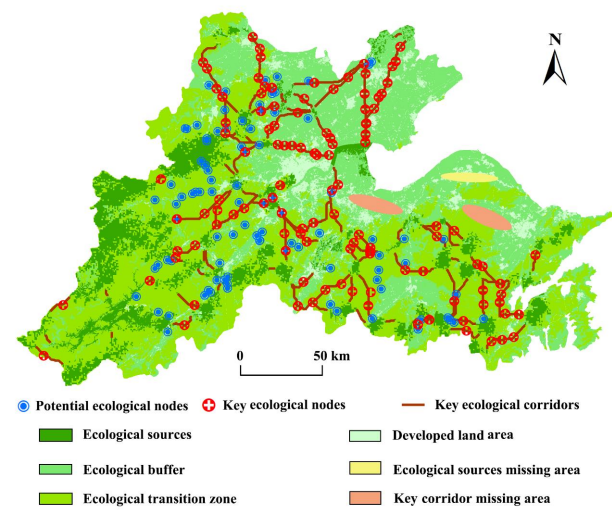


FIGURE 9 Ecological security network and spatial pattern of the study area