



Spatiotemporal assessment and trade-offs of multiple ecosystem services based on land use changes in Zengcheng, China



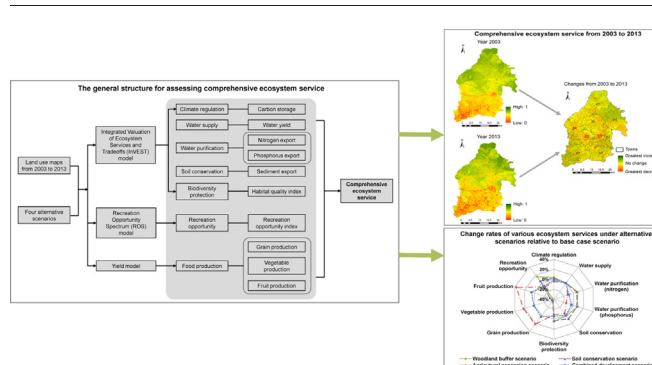
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HIGHLIGHTS

- We put forward the general structure of assessing comprehensive ecosystem service.
- Trade-offs among various ecosystem services was analyzed.
- Four alternative scenarios were designed to identify how to improve the comprehensive ecosystem service.
- More sustainable intensification of agriculture should be adopted to increase the food production.

GRAPHICAL ABSTRACT



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ABSTRACT

Driven by rapid urbanization, land use change has become a significant factor influencing ecosystem services (ESs). To support the decision-making process of city planners and policy makers, assessing the spatiotemporal changes associated with multiple ESs is vital. In this study, we developed a general structure to assess the changes of multiple ESs in Zengcheng, China. A new index also was developed to measure the comprehensive ecosystem service (CES). Trade-offs of various ESs were analyzed by using correlation analysis. We then designed four alternative scenarios to explore the optimal land use strategies to increase the CES value and minimize trade-offs among various ESs. Results demonstrated that rapid expansion of built-up land and traffic land resulted in a decrease of CES in Zengcheng from 2003 to 2013. Although the water supply, water purification, and vegetable and fruit production services increased, the climate regulation, soil conservation, biodiversity protection, recreation opportunity and grain production services decreased during the ten-year period. Government should implement land use policies and ecological engineering measures to improve soil conservation in the northern region; recreation opportunity in the central region; and carbon storage, water purification, biodiversity protection and recreation opportunity in the southern region. Among all alternative scenarios, woodland buffer and soil conservation scenarios exhibit the highest CES values, indicating that policies such as the "Ecological corridor construction" project and the "Grain for Green" project should be implemented. However, a caveat is that these policies improve the ESs at the expense of food production due to significant trade-off relationships. To minimize the trade-offs, a more sustainable intensification of agriculture should be adopted to increase food production without decreasing other ESs or occupying additional land. The land use strategies and ecological engineering measures in this study can provide a reliable reference for sustainable development of other urbanized regions in China.

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