Research on the Matching of Supply and Demand for Ecosystem Services at the Quantitative and Spatial Levels: A Case Study in the Hexi Region, China

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Abstract

To achieve the best management of the ecosystem and sustainable socioeconomic development, it is crucial to clarify the matching relationship between the supply and demand of ecosystem services (ESs). Therefore, four types of ESs were chosen for the Hexi region in this study: food supply, carbon sequestration, water yield, windbreak and sand fixation. This study evaluated the supply-demand and matching relationships between various ecosystem services tapping into the InVEST model, the supply-demand ratio of ecosystem services, and the four-quadrant model. It also analyzed the supply-demand ratio of comprehensive ecosystem services and their cold and hot spots. The findings suggest that (1) the overall ESs supply showed an increasing trend, with a spatial pattern of "high in the southeast and low in the northwest". The demand for food supply and carbon sequestration services has been increasing annually, while the demand for water production and wind and sand prevention services has been declining. The demand space is characterized by a layout similar to the distribution of population, production and living areas, and ecologically vulnerable areas; (2) From the perspective of quantity matching, with the exception of windbreak and sand fixation services which are in short supply, all others are in a state of oversupply. Regrading spatial matching, all ESs are primarily dominated by low-low spatial matching zones, with large areas concentrated in the northwest desert region; (3) The supply-demand ratio of overall ESs shows a fluctuating upward trend. The proportion of cold spots and sub-cold spots, which are mainly concentrated in the northwest region, accounts for more than 50%, while that of hot spots and sub-hot spots is relatively small and mainly appears in the Qilian Mountains of the southern region and a few oasis areas.

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