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The impact of population change on social-ecological systems' vulnerability: A case of the Qinling-Daba Mountains of Southern Shaanxi in China

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摘要： Human activities have exacerbated the contradiction between ecosystem functionality and social-economic growth. Understanding and managing social-ecological systems' changes under the dual drivers of intensive human activities and rapid global environmental changes are crucial for achieving coordinated and sustainable development. While the vulnerability framework provides a new perspective for human-environment relationship studies, limited research has focused on the impact mechanisms of population change on social-ecological systems' vulnerability (SESV). Therefore, this study selects the Qinling-Daba Mountains of Southern Shaanxi in China (QMSSC), one of the areas with the most prominent human-environment contradictions in China, as a case study. Using the Vulnerability Scoping Diagram (VSD) assessment framework and the Spatially Explicit Resilience-Vulnerability (SERV) model, we divide SESV into three dimensions: exposure, sensitivity, and adaptive capacity. We select indicators, calculate weights, and quantitatively assess the spatiotemporal distribution characteristics, evolution trends, and spatial correlation features of SESV in the QMSSC from 2000 to 2020. Furthermore, we reveal the impact mechanisms of population change on SESV. The results indicate that the impact of population outflow on SESV depends on the spatiotemporal distribution of SESV. Gender ratio is closely related to the four elements of SESV. The proportion of elderly population affects SESV through adaptive capacity. In other words, population change often indirectly drives SESV by affecting different dimensions or elements of SESV. This necessitates policymakers to deploy population strategies across dimensions and elements. This study aims to provide reference for population development policies and spatial governance directions in globally underdeveloped mountainous regions through a typical case analysis of China's mountainous areas.

关键词： Social-ecological systems, vulnerability, population change, Qinling-Daba Mountains of Southern Shaanxi in China