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Projection of land and ecosystem degradation for preventing risk of natural capital decline in Tibet plateau.

Lu Zhang

Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences, China (luzhang@rcees.ac.cn)

Numerous methodologies are available so far measuring trends of land (LD) and ecosystem degradation (ED) with spatially explicit manner. Yet the delineation of spatial and temporal covariance between LD and ED remains challenging which limited the effectiveness of future conservation decision making for preventing risks of LD and ED simultaneously, especially in cold and drought areas because of high cost of restoration. Here, we produced the spatial networks for managing and restoring LD and ED based on the risk projection of LD and ED in Tibet plateau under human exploitation pressure and climate change. Firstly, we simulated 10 indicators for LD and ED separately by monthly interval from 2000 to 2015 to capture the current trends of LD and ED. Secondly, resilience, resistant, and risk exposure have been assessed to connect the vegetation traits, threaten factors and their reflections. Thirdly, by the exploration of relationship between LD and ED and their impact factors, we projected risks for both of them using 12 scenarios from different climate and land use change combinations identifying the key area of preventing LD and ED spatially. Finally, an effectiveness analysis has been processed ordering results under each scenarios led to the decline of nature capital for providing alternative strategies of regional land and ecosystem management. By our research, we found that LD and ED in Tibetan plateau have similar pattern of dynamic, while ED shows more significant correlation with climate change due to stronger intrinsic resilience in front of stressors. In opposites, once serious land degradation occurs, it is hardly being recovered by increasing of precipitation and temperature. Based on the relationship analysis, we modeled LE and ED risks under various potential scenarios suggesting that at least 100,000km² area needed to human intervention for restoration. These suggested sites covered the worst 60% areas of both LD and ED producing 12.5 billion USD dollars revenue from the maintenance of key regulating ecosystem services.