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## Evaluating the environmental sensitivity to land degradation: a case study in central Taiwan

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Land degradation is a primary form of global environmental deterioration. Soil erosion and land desertification are common land degradation processes in many regions. In this research, we take the Zhuoshui River basin in central Taiwan as the study area, and investigate the environmental sensitivity of different land use/land cover to land degradation subjected to historical and future climate scenarios. In order to understand the quality of land resources in the study area, we used the evaluating framework of the Mediterranean Desertification and Land Use (MEADALUS) model with revisions according to the localized mountainous characteristics in central Taiwan, and calculated the Environmentally Sensitive Areas Index (ESAI) of the study area. The ESAI is comprised of five indicators, which include climate, soil, vegetation, management, and landslide indicators. For the climate index, observed data from 2001 to 2020 of weather factors were used in the historical scenarios. On the other hand, data of weather factors generated by MIRCOS GCM considering RCP2.6 and RCP8.5 scenarios in near-term and long-term time scales were used for the climate indicator in the future scenarios. The results depict the spatial variation of environmental sensitivity to land degradation in the Zhuoshui River basin using numerical values ranging from 1 to 2, where higher values correspond to more severe degradation. It is evident that the upper reaches of the Zhuoshui River exhibit lower degrees of land degradation due to dense vegetation, higher elevations, and limited human presence. In contrast, the downstream areas show a higher trend of land degradation, with the wet season exhibiting lower degradation trends compared to the dry season. Furthermore, there is a slight upward trend in land degradation since 2015, primarily attributed to climate indicators, as soil and vegetation indicators, as well as anthropogenic management indicators, show no significant changes. The land degradation index shows relatively subtle differences between future scenarios and historical scenarios, with land degradation index variations ranging from -13% to 22%. Negative values in the degradation index differences indicate an improvement in the degree of degradation, while positive differences denote an exacerbation of land degradation. According to the land use distribution in the Zhuoshui River basin, the land degradation trends for forests and national parks show relatively consistent variations between the dry and wet seasons. However, in the middle and lower reaches of the basin, apart from the RCP85 scenario for the long-term period, the other three scenarios exhibit higher differences in land degradation index changes for agricultural and urban areas compared to historical values. The research provides a reference for preventing continued land degradation and conserving terrestrial ecosystems and biodiversity in the study area.

