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A Space-Based Model for Evaluating Community Disaster Resilience to Landslide: An Empirical Study in Shenzhen, China

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Numerous studies exploring aspects of community disaster resilience, vulnerability, and adaptive capacity have yielded insights into these concepts and suggested the importance of quantifying them. However, the development of the index for measuring resilience remains a challenge, due to the complexity of resilience assessment which is triggered by several factors including the lack of an agreed-on definition, the difficulties of selection and aggregation of indicators of resilience. To assess the reliability of indicators as proxies to measure disaster resilience at community-levels from an urban planning standpoint, a space-based model, called the evaluating community disaster resilience (ECDR) model, was established by utilizing both K-means clustering and ordinal regression analysis to derive resilience rankings. Two datasets, an observed dataset extracted from the entire natural disturbance process including the disaster risk, the disaster damage and the extent of recovery, and a predicted dataset of social-ecological indicators, were analyzed in K-means clustering analysis and ordinal regression, respectively. The validity of the model is addressed via training and implication in communities in Shenzhen, China, which suffered landslide damage. The results indicate a significantly high correlation between the observed and predicted resilience scores, meaning that the 13 predicted variables can be used to estimate the rankings of community resilience. The coefficient for floor area ratio (FAR) and building density denote that higher degree of FAR with lower building densities are associated with higher scores on the rankings of disaster resilience, which indicates that improvements in open spaces in communities could help to enhance disaster resilience. The result also shows that drainage system construction could increase community resilience to landslides. High population density and high extent of education are also associated with high resilience, whereas great slope is associated with low resilience. Based on these findings, it is evident that compacting development patterns and creating open community spaces can promote community disaster resilience. The model is therefore theoretically sound and can be used to derive resilience indices for other empirical studies at different spatial and temporal scales.