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Regional danger assessment of Debris flow and its engineering mitigation practice in Sichuan-Tibet highway

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Luding-Kangding highway cross the eastern edge of Qinghai-Tibet Plateau where belong to the most deep canyon area of plateau and mountains in western Sichuan with high mountain and steep slope. This area belongs to the intersection among Xianshuihe, Longmenshan and Anninghe fault zones which are best known in Sichuan province. In the region, seismic intensity is with high frequency and strength, new tectonic movement is strong, rock is cracked, there are much loose solid materials. Debris flow disaster is well developed under the multiple effects of the earthquake, strong rainfall and human activity which poses a great threat to the local people's life and property security. So this paper chooses Kangding and LuDing as the study area to do the debris flow hazard assessment through the in-depth analysis of development characteristics and formation mechanism of debris flow. Which can provide important evidence for local disaster assessment and early warning forecast. It also has the important scientific significance and practical value to safeguard the people's life and property safety and the security implementation of the national major project.

In this article, occurrence mechanism of debris flow disasters in the study area is explored, factor of evaluation with high impact to debris flow hazards is identified, the database of initial evaluation factors is made by the evaluation unit of basin. The factors with high impact to hazards occurrence are selected by using the stepwise regression method of logistic regression model, at the same time the factors with low impact are eliminated, then the hazard evaluation factor system of debris flow is determined in the study area. Then every factors of evaluation factor system are quantified, and the weights of all evaluation factors are determined by using the analysis of stepwise regression. The debris flows hazard assessment and regionalization of all the whole study area are achieved eventually after establishing the hazard assessment model. In this paper, regional debris flows hazard assessment method with strong universality and reliable evaluation result is presented.

The whole study area is divided into 1674 units by automatically extracting and artificial identification, and then 11 factors are selected as the initial assessment factors of debris flow hazard assessment in the study area. The factors of the evaluation index system are quantified using the method of standardized watershed unit amount ratio. The relationship between debris flow occurrence and each evaluation factor is simulated using logistic regression model. The weights of evaluation factors are determined, and the model of debris flows hazard assessment is established in the study area. Danger assessment result of debris flow was applied in line optimization and engineering disaster reduction of Sichuan-Tibet highway (section of Luding-Kangding).