

Risk analysis of a debris flow torrent in Taiwan

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In Taiwan, debris flow hazard had been one of the major natural hazards that resulted with tremendous economic loss and casualties in the past few decades. In recent years, with land development, tourism and other human activity moving into the mountains, more and more elements at risk were exposed to debris flow hazard. This paper proposed a debris flow quantitative risk analysis flow chart, which includes risk identification, hazard analysis and consequence analysis. With aerial photo interpretation, historical data collection and field reconnaissance, the elements at risk such as resident housing, crops, bridges and infrastructures could be mapped out, through analyzing precipitation data and FLO-2D numerical simulation, the possible inundation area, height and flow velocity of debris flow were compiled in GIS format. The vulnerability functions for different elements at risk were proposed by historical records and synthetic approach. Combing the information of elements at risk, hazard magnitude, vulnerability function, the damage calculation and risk calculation then followed. Six return periods (5, 10, 25, 50, 100, and 200) of risk analysis were conducted to calculate the annual average loss for every individual torrent. In the case of Chiayi DF051 potential debris flow torrent, which in 2009 the debris flow events killed 1 resident and destroy several bridges and buildings, the annual average economic loss is 125,000 USD and fatality would be 0.4970457. Through the complete procedure of debris flow risk analysis, the risk of each debris flow torrent could be obtained and be comparable in risk ranking and risk management.