Relationship Analysis of Debris Flow-inducing Factors in Typhoon Morakot Affected Area By Using Data Mining Techniques

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Typhoon Morakot lashed Taiwan during Aug. 7 to 9, 2009. It dumped heavy rainfall in southern Taiwan, especially around the Central Mountain Range in Pingtung, Chia-Yi, and Kaohsiung County. In view of this, Comprehensive field investigation was carried out by government and private organizations after Typhoon Morakot, useful information of debris flow was gathered. Besides, after Typhoon Morakot, the debris flow-inducing factors become more challenging in Taiwan, many aspects had to be considered.

The scope of this study was mainly discussed in debris flow-inducing factors in serious damaged areas which including Nantou, Chia-Yi, Tainan, Kaohsiung, Pingtung, Taitung County. Totally 218 torrents were included. Field investigation data and disaster records of Typhoon Morakot were utilized to analyze debris flow-inducing factors in three aspects: terrain, rainfall and sediment source. First, by using Principle Component Analysis(PCA) and Pearson Product Moment Correlation Analysis(CA) to select significant factors, 101 factors were reduced to the most important 18. Then through descriptive statistics and scatter diagram were selected to discuss the correlation among "Average slope gradient of watershed", "Landslide rate along the stream within 50m buffer zone" as well as the "rainfall intensity during Typhoon Morakot". The above charts were used to summarize the range of factor value which tend to occur phenomenon of debris flow in Typhoon Morakot.

Besides, Random Forest Algorithm (RF) was utilized to research the relationship toward multi-variables. The significant factors which tend to affect the debris flow-inducing factor were "effective accumulated rainfall", "hourly rainfall", "landslide rate along the stream within 50m buffer zone", "average elevation value of effective watershed area higher than 10 degree", sequentially. By the results, the most significant factor is the rainfall factor during Typhoon Morakot. The results can be utilized in improving debris flow hazard management in the future.