



A Preliminary Study of Building Vulnerability to Debris Flow Hazard in Taiwan

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In Taiwan debris flow quantitative risk analysis could be divided into 3 parts, hazard, exposure and vulnerability. One of the most important exposures is residential buildings in the mountainous area, thus the vulnerability of different types of buildings is vital for debris flow risk analysis. This study aims to develop a vulnerability function for different building material through information from field observations in Typhoon Morakot disaster area.

Numerous debris flow induced by Typhoon Morakot in Aug. 2009, the outflow of a mixture of abundant gravel, sand and water, some serious damage was occurred especially in Southern Taiwan. Through field investigations, the debris flow inundation height and loss ratio of each building were obtained.

While discussing debris flow hazard in Alps region, Fuchs (2008) defined vulnerability as the degree of loss for an element at risk as a consequence of a debris flow event; this study discusses the vulnerability of building from two aspects: building structure and contents of building.

The structure part of building vulnerability is related to its building material, three types of building materials were considered in this study, concrete, brick, and wooden. The building loss database was established through recoding building materials, inundation height and evaluating the loss ratio in Typhoon Morakot disaster area. By statistical analysis, each type of building material is corresponding to a respective vulnerability function which is a third order polynomial function corresponding to different inundation height.

The contents of building include furnishing and interior finishing, the cost and height could be estimated by market survey and field investigations. This study assumes that the loss occurred when the inundation height reaches the height of furnishing and interior finishing; a third order polynomial function of contents with different inundation height could be established as well.

The unit cost of different type material building was acquired from Taiwan Architects Association. And from statistic data of the Directorate General of Budget, Accounting and Statistics, the cost of content was assumed to be 10,000 USD per building for all types, thus the vulnerability functions of building materials and contents were able to be combined to form one overall vulnerability function, with different types of building materials.

For example, the loss ratios are 25%, 50% and 100% with the corresponding inundation height of 1.7 m, 2.5 m and 3.5 m for concrete buildings. With the utilization of building vulnerability available and inundation height from simulation result, the overall economic loss of building could be estimated.

Key Words: Risk, Debris flow, Morakot, Vulnerability