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松鶴地區土石流災害之風險評估

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摘　　要　爲瞭解土石流潛勢溪流周圍災害風險分佈的情形，本研究建立一套土石流災害風險評估模式，利用危害度、易致災性以及受災率三者的乘積，來計算風險值。首先，針對不同重現期距之降雨事件，利用 FLO-2D 軟體分別進行模擬，將淹沒區域劃定爲紅色、黃色危險區。再根據被淹沒的風險元素（element at risk）型式，運用代表實際損失值與風險元素本身價值平均比例之損害因數（damage factor），來評量不同風險元素在紅色、黃色危險區之危害度。第二，將淹沒區域之圖層套疊至土地利用圖層，獲得易致災性之分佈情形。數化土地利用圖層時便直接分類爲房屋、農耕用地、林業用地、道路、橋樑及無直接損失等六種風險元素型式。並針對不同風險元素給予其當地政府所公告的價值，來進行易致災性之定量分析。第三，利用層級分析法（AHP）建立層級結構，所設定之社區承受度由「居民個人抵抗災害能力」與「社區抵抗災害資源」兩部分所組成。如此，由居民問卷、社區檢核表所得到的分數與各項目之權重來計算社區承受度，再轉換爲受災率。最後，將危害度、易致災性及受災率三者相乘，以計算風險值並繪製風險地圖。本研究並藉由松鶴地區工程構造物設置前後來說明土石流風險評估之方法與結果，此降低之總風險值可視爲工程構造物之部分效益。

關鍵詞：風險評估、危害評估、易致災性、承受能力、風險地圖。

Risk Assessment of Debris Flow Disaster in Songhe Village

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ABSTRACT　To understand the distribution of risk around potential debris flow torrents, this study established a model for assessing the risk of debris flow disaster. The risk level of this study was calculated by multiplying hazard grade, the value of vulnerability and the normalized index of capacity. First, using Flo-2D software to simulate the submerged areas under different sized rainfall events with 10 and 150 year return period respectively, the areas which are endangered by debris flow could be classified into two hazard rating zones, that is, a red and yellow zone. The different groups of elements at risk have distinct susceptibility factors, which represent the ratio of actual loss to total value of an element, in the two zones. The hazard grade of each element equals corresponds to the susceptibility factor. Second, we used land-use layer covering the layer of submerged areas to get the distribution of vulnerability. The original elements were reclassified into six groups, that is, house,

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farming land, forest land, road, bridge and no-direct-loss. For each kind of element, the value of vulnerability represents the price bulletining from the local authorities. Thirdly, the Analytic Hierarchy Process (AHP) was used to establish the framework and evaluate the resilient capacity of the village, which includes the ability of residents to resist natural hazard and the resources of the village for preventing disasters. Therefore, the total score of capacity could be evaluated with the weightings and then be transformed into a normalizing index. Finally, by multiplying three terms mentioned above, the risk level could be computed and the risk map could be obtained. Taking Songhe village before and after installation of mitigation measures as an example, the difference in the total risk could be treated as a part of the benefit of the mitigation measures.

Key Words: risk assessment, hazard assessment, vulnerability, capacity, risk map.