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Methodology For Estimation Of Earthquake-Induced Landslide Probability And Result Evalution

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This study analyzed landslides induced by the 1999 Chi-Chi, Taiwan earthquake at a test site in Central Taiwan, called Kuohsing, and landslide spatial probability maps for the test site were made. Landslides induced by the earthquake were extracted from SPOT imageries, Landslide potential factors, which include slope, slope aspect, terrain roughness, total curvature and slope height were derived from a 40m resolution DEM. Lithology and structural data were obtained from a 1 to 50 thousand scaled geological map. Earthquake strong-motion data were used to calculate Arias intensity and others. The state-of-the-art methods, which include two multivariate approach ąV discriminant analysis and logistic regression, an artificial neural network approach, and the Newmarkąęs method, were used in the analyses. In the discriminant analysis, the output discriminant scores are used to develop landslide susceptibility index (LSI). In the logistic regression, an output probability is used as a LSI directly. In the artificial neural network approach, a fuzzy set concept for landslide and non-landslide was incorporated into the analysis so that the network can output a continuous spectrum for landslide and non-landslide membership, and a defuzzifier was used to obtain a nonfuzzy value for LSI. In the Newmarkąęs method, the output value is a Newmark displacement (Dn). All LSIs and Dns are compared with the landslide inventory and then calculate the landslide ratio or probability of failure for each LSI or Dn interval. These were used to develop the probability of failure functions against LSIs or Dn. Landslide probability maps were then drawn by using the probability of failure functions. All the four methods obtain good result in predicting landslides. Four landslide probability maps show similar probability level and distribution pattern. Among the four methods, discriminant analysis and logistic regression are both stable and good in predicting landslides. The artificial neural network method is good also, but it revealed

over-trained phenomenon at the hilly terrain in the test area. The performance of the Newmarkąęs method is not so good as the other methods.