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GIS-based landslide hazard predicting system and its real-time test during a typhoon, Zhejiang Province, Southeast China

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Yongjia County (Zhejiang Province) is located in southeast China. This densely populated small area (2675 km^2) has a population of nearly one million. Statistics and previous reports have shown that 62 percent of the study area has experienced various forms of slope instabilities including debris flow and landslides. The geological buildup promotes the occurrence of landslides, since largest part of the area is covered by clayey sandstones, volcanic tuffs and other types of pyroclastic rocks. To assess and visualize landslide hazards a GIS-based system was established. The information layers in the MAPGIS system were generated by using 11397 regular grids, with grid size of 5mm$\times$5mm. At first landslide susceptibility map was compiled by using input parameters such as lithology, structural geology, slope morphology and angle, surface waters and human induced geomorphological changes (linear structures, dams, landfills, etc.). Rainfall data; quantity of rainfall and rainfall intensity were obtained to calculate the Effective Rainfall Model. Past landslide frequency with combination of effective rainfall were used to determine rainfall threshold values and to generate a rainfall threshold map. Information Matter Element Model was adopted to compile the landslide hazard prediction map.

In the landslide hazard susceptibility map, the landslide susceptible zones were outlined and referenced in comparison with stable zones. The map also provides information for sustainable land-use and slope management. A warning threshold of the rainfall levels of different hazard degrees to trigger landslide at different areas were

generated. Thus, by overlaying landslide hazard maps and rainfall threshold maps a warning map was compiled including five-steps of warning levels. Above the third level the population is noticed, while at level five immediate evacuation takes place. During “Yunna” typhoon in August 2004, a real-time warning was realized based on the landslide hazard susceptibility map and the real rainfall information. During this catastrophic event the GIS-based system proved to have been satisfactory in predicting areas of landslides, marking eight critical localities.