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Mitigating mass movement caused by earthquakes and typhoons: a case study of central Taiwan

Jiun-Chuan Lin
(jclin@ntu.edu.tw)

Typhoons caused huge damages to Taiwan at the average of 3.8 times a year in the last 100 years, according to Central Weather Bureau data. After the Chi-Chi earthquake of 1999 at the magnitude of Richard Scale 7.3, typhoons with huge rainfall would cause huge debris flow and deposits at river channels. As a result of earthquakes, loose debris falls and flows became significant hazards in central Taiwan.

Analysis of rainfall data and data about the sites of slope failure show that damage from natural hazards was enhanced in the last 20 years, as a result of the Chi-Chi earthquake. There are three main types of mass movement in Central Taiwan: landslides, debris flows and gully erosion. Landslides occurred mainly along hill slopes and river channel banks. Many dams, check dams, housing structures and even river channels can be raised to as high as 60 meters as a result of stacking up floating materials of landslides. Debris flows occurred mainly through typhoon periods and activated ancient debris deposition. New gullies were thus developed from deposits loosened and shaken up by earthquakes. Extreme earthquakes and typhoon events occurred frequently in the last 20 years.

This paper analyzes the geological and geomorphologic background for the precarious areas and typhoons in central Taiwan, to make a systematic understanding of mass movement harzards. The mechanism and relations of debris flows and rainfall data in central Taiwan are analyzed. Ways for mitigating mass movement threats are also proposed in this paper.

Keywords: mass movement, earthquakes, typhoons, hazard mitigation, central Ta