Geophysical Research Abstracts,
Vol. 11, EGU2009-4278, 2009
EGU General Assembly 2009

Correlation of Catchment Sedimentation and Landslides in Ta-Chia River Influenced by the 1999 Taiwan Chi-Chi Earthquake

K.-J. Shou (1), L.-Y. Fei (2), J.-F. Lee (2), C.-Y. Wei (2), S.-T. Huang (1), and Y.-C. Lin (1)

(1) National Chung-Hsing University, Dept. of Civil Engineering, Taichung, Province Of China Taiwan (kjshou@dragon.nchu.edu.tw), (2) Central Geological Survey, MOEA, Province Of China Taiwan (feily@moeacgs.gov.tw)

It is generally accepted that the high frequency of landslide in Taiwan area is strongly affected by its geomorphology and geology background. The geomaterials in Taiwan are highly fractured due to the tectonic activity of collision of Phillipine sea plate and Eurosian plate. The hilly Western Foothill is highly prone to landslides, especially during typhoon season in the summer. The 1999 Chi-Chi earthquake (MW=7.6) resulted in tremendous amount of landslides along the Ta-Chia River catchment of central Taiwan, with 1.5 million m^3 of earth driven from broken slopes (DGH, 2000). The impact of this earthquake not only makes the geomaterial more fractured but also changes the river morphology in the Western Foothill area.

The main purpose of this study is to investigate the correlation of catchment sedimentation and landslides before and after the 1999 Chi-Chi earthquake. The Ta-Chia River is a major river in central Taiwan, with 120km in length, 1200km^2 in drainage area, and elevation from 3600m to 360m. Beside the flow discharge and sediment discharge, the hydropower facilities also play important roles in the sedimentation process, especially in the catchment segment between Ku-Kuan Dam and Te-Chi Dam. This study divides the Ta-Chia River catch to three segments, above Te-Chi Dam (I), Ku-Kuan Dam to Te-Chi Dam (II), and below Ku-Kuan Dam down to Shih-Kang Dam (III). Analyses were performed for each catch segment with discussions. The study comprises two major parts, i.e., catchment sedimentation and correlation with landslides. The former part includes field, satellite image and DTM calculation results, and the later part includes analysis on the correlation between the landslides and catchment sedimentation. Three typhoon events, i.e., Herb (1996), Toroji (2001), and Mindulle(2004) are adopted for this study.

Our findings indicate, comparing with typhoon Herb, 40% more sediments in catchment segment II and 22% less sediments in catchment segment III were generated by Toroji. The results also reveal sedimentation trend in segment I and incision trend in segment III, however, there are still tremendous amount of sediments in segment II. For the landslides in those three catchment segments, comparing with typhoon Herb, 247% more reactivated landslides and 318% more new landslides in segment I, 66 times more reactivated landslides and 43% more new landslides in segment II, 209% more reactivated landslides and 59% less new landslides in segment III were generated by Toroji. The results show strong correlation between the catch sedimentation and landslides. However, the impacts of Chi-Chi earthquake on different catchment segments are different. The landslides are more prone to reactivation in the segment II, more prone to new generation in the segment I, and less prone to new generation in the segment III. The Ta-Chia River catchment is an appropriate area to test the seismic effect of the 1999 Chi-Chi earthquake, and this case study could provide experiences of the sustained landslide investigation and sediment estimation to regard as the reference of catchment management. It also provides information to assess hazard risk and the future benefit of reconstruction.