Debris flow hazard mapping considering the effect of mitigation structure – a case study in Taiwan based on numerical simulation

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This study added the dams and retain basin according to their dimensions measured with UAV onto the original 5m-resolution DEM to compare the effect of mitigation structures to debris flow hazard. The original and the modified DEMs were both applied to simulate the consequences by using RAMMS::Debris Flow (RApid Mass Movement Simulation) model.

Hazard map is the best tool to provide the information of debris flow hazard in Taiwan. It has an important role to play in evacuating the residents within the affected zone during typhoon season. For the reason, debris flow hazard maps become a useful tool for local government to execute the evacuation. As the mitigation structure is constructed, the intensity of debris flow hazard reduces.

The Nantou DF190 debris flow potential torrent is located in central Taiwan. In 1996 when Typhoon Herb stroke, 470,000 cubic-meter of debris were washed out and deposited in 91,200 square-meter area (Yu et al., 2006), and the event caused the destruction of 10 residential houses with 2 fatalities. After the event the Soil and Water Conservation Bureau constructed a 100-meter long sabo dam and sediment retain basin with capacity of 60,000 cubic-meters. In order to compare the difference of affected zone before and after the construction of mitigation structures, the study applies RAMMS to simulate the above-mentioned event.

The result shows when large-scale debris flow occurs, most of the sediments still overflow and deposit on the fan with shape similar to the 1996 Typhoon Herb event. However, the intensity has reduced significantly with 50% less in area, several meters less in inundation depth and 50% less in flow velocity approximately. The comparison shows the effect of mitigation structures and could provide valuable information for debris flow hazard mapping.

Key Words: Debris flow, RAMMS, Hazard map, Mitigation, Taiwan