NUMERICAL SIMULATION AND GIS BASED ANALYSIS FOR DEBRIS FLOW MODELING A CASE STUDY FROM BADULLA DISTRICT, SRI LANKA

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Debris flows are enriched with masses from landslides or masses from past events which saturated with enough rain water or any other channel flow and move rapidly down the slope under the force of gravity. These fast moving and toppling of rock fragments, pebbles, and fine materials destruct the vegetation cover as well as numerous life losses in high lands over the past decades. Though several studies have been carried out to identify possible hazardous areas and there are not sophisticated numerical methods for identifying vulnerable areas of landslide induced debris flows. Therefore, the present case study was carried out to apply the numerical simulation to predict vulnerable area of landslide induced debris flow event more accurately.

The recently occurred landslide induced debris flow in Meeriyabedda area, Kotabakma Grama Niladhari Division, Haldumulla Divisional Secretariat Division within Badulla District with an area of 1.46 km^2 was selected as the study area.

First, debris flow events and theories behind them were studied. Then for the numerical simulation, used Debris-2D program which is a two-dimensional debris flow simulation. This program has been applied to many field cases in Taiwan and Korea and testified and compatible with field evidences. Topography of relevant area, simulation range, mass information, material parameter and output setups are main inputs for the GUI of the program and these information were gathered during field investigations. Surfer software is applied for mapping the simulated results. Then, using Windows Movie Maker combined all maps frame by frame, obtained the animation of debris flow for more clear demonstration. Three locations of the field evidence were used for the validation of the simulation results.

Whole simulation process acquires 149 seconds and there is 8 % of error with respect to final deposition range. The result is validated reasonable and accurate. The simulated boundary of debris flow affected area and the measured one deviated with 52.74 m in maximum, and the path of the debris flow is almost similar to the field condition. The total error is less than 21% considering the affected area with reference to filed measurements. However, even with some minor errors, the motion of debris flow in the simulation clearly reflects the real field condition, and the simulation successfully predicts this event.

In summary, this Debris-2D is convinced to be a practical tool for the hazard assessment of debris flows as well as for the vulnerability analysis of physical and economical losses in the near future.