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Hazard Mapping of Structurally Controlled Landslide in Southern Leyte, Philippines Using High Resolution Digital Elevation Model

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The 2006 Guinsaugon landslide in St. Bernard, Southern Leyte is the largest known mass movement of soil in the Philippines. It consisted of a 15 million m3 rockslide-debris avalanche from an approximately 700 m high escarpment produced by continuous movement of the Philippine fault at approximately 2.5 cm/year. The landslide was preceded by continuous heavy rainfall totaling 571.2 mm from February 8 to 12, 2006. The catastrophic landslide killed more than 1,000 people and displaced 19,000 residents over its 6,400 km path. To investigate the present-day morphology of the scar and potential failure that may occur, an analysis of a high-resolution digital elevation model (10 m resolution Synthetic Aperture Radar images in 2013) was conducted, leading to the generation of a structurally controlled landslide hazard map of the area. Discontinuity sets that could contribute to any failure mechanism were identified using Coltop 3D software which uses a unique lower Schmidt-Lambert color scheme for any given dip and dip direction. Thus, finding main morpho-structural orientations became easier. Matterocking, a software designed for structural analysis, was used to generate possible planes that could slide due to the identified discontinuity sets. Conefall was then utilized to compute the extent to which the rock mass will run out. The results showed potential instabilities in the scarp area of the 2006 Guinsaguon landslide and in adjacent slopes because of the presence of steep discontinuities that range from 45-60˚. Apart from the 2006 Guinsaugon potential landslides, conefall simulation generated farther rock mass extent in adjacent slopes. In conclusion, there is a high probability of landslides in the municipality of St. Bernard Leyte, where the 2006 Guinsaugon Landslide occurred. Concerned agencies may use maps produced from this study for disaster preparedness and to facilitate long-term recovery planning for hazardous areas.