World Academy of Science, Engineering and Technology
International Journal of Mathematical and Computational Sciences
Vol:14, No:12, 2020

Coupled Analysis for Hazard Modelling of Debris Flow Due to Extreme Rainfall

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Abstract : Korean peninsula receives about two third of the annual rainfall during summer season. The extreme rainfall pattern due to typhoon and heavy rainfall results in severe mountain disasters among which 55% of them are debris flows, a major natural hazard especially when occurring around major settlement areas. The basic mechanism underlined for this kind of failure is the unsaturated shallow slope failure by reduction of matric suction due to infiltration of water and liquefaction of the failed mass due to generation of positive pore water pressure leading to abrupt loss of strength and commencement of flow. However only an empirical model cannot simulate this complex mechanism. Hence, we have employed an empirical-physical based approach for hazard analysis of debris flow using TRIGRS, a debris flow initiation criteria and DAN3D in mountain Woonmyun, South Korea. Debris flow initiation criteria is required to discern the potential landslides which can transform into debris flow. DAN-3D, being a new model, does not have the calibrated values of rheology parameters for Korean conditions. Thus, in our analysis we have used the recent 2011 debris flow event in mountain Woonmyun san for calibration of both TRIGRS model and DAN-3D, thereafter identifying and predicting the debris flow initiation points, path, run out velocity, and area of spreading for future extreme rainfall based scenarios.

Keywords : debris flow, DAN-3D, extreme rainfall, hazard analysis
Conference Title : ICSRD 2020 : International Conference on Scientific Research and Development
Conference Location : Chicago, United States
Conference Dates : December 12-13, 2020