

Debris Flow Susceptibility Mapping and Exposure Assessment in Uttarakhand State, India

Rajitha Sachinthaka⁽¹⁾, Kavinda Gunasekara⁽²⁾, Lakmal Deshapriya⁽²⁾, Kuo CHieh Chao⁽¹⁾

¹ Geotechnical and Earth Resources Engineering

² Geoinformatics Center

Asian Institute of Technology (AIT), PO Box 04, Klong Luang, Pathumthani, Thailand

Email: rajitha.subhasinghe@ait.ac.th; kavinda@ait.ac.th; lakmal@ait.ac.th; geoffchao@ait.ac.th

Abstract: Landslide is one of the major natural hazards in the state of Uttarakhand, India which causes infrastructure and fatality damages. Various studies have been used to study landslide phenomena at a regional scale but limited studies on debris flow modeling in the state. This paper presents the potential debris flow susceptible areas and its potential damage to infrastructures. Freely available, a debris flow modeling tool, Flow-R model was used in this study at regional scale. The Flow-R model is capable of delineation of source area, however a recent landslide susceptibility study at state level used to improve the debris flow initiation locations and developed the potential scenarios. The model can be executed with limited data availability and uses improved spreading and directional algorithms based on energy loss functions. Hydrologically corrected digital elevation model used for the model to map the debris flow propagation more accurately.

Most landslide prone districts of the state were selected from the previous study and modelled for debris flow propagation. A Comparison of landslide exposure assessment has been conducted with and without using Flow-R model. Two scenarios, extreme and rare events debris flow modeling approaches used for the next level comparison spatially and validated with landslide inventory database. New susceptibility zones which has potential for landslides can be added to the existing risk map to improve accuracy. Further, an accessibility map can be developed is a possible with using debris flow models which has been generated by the Flow-R model to reduce the response time when a landslide occurred.

Keywords: Landslide, Susceptibility, Debris flow, Flow-R Uttarakhand