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Landslide Hazard Assessment and Monitoring in Chibo Pashyor, Kalimpong, India

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The Indian Himalayan regions has been significantly affected due to the increase in frequency of landslide occurrence. 30% of the worldwide landslide incidents occurs in Himalayan region with 42% of India's landslide region belongs to Darjeeling-Sikkim Himalayas. The damage caused due to landslides is immense causing significant loss of life, property, agriculture land initiating a dire need to formulate strategies in minimizing its impact in areas affected by landslides. Several studies have been carried worldwide on early warning systems considering rainfall history. Although the rainfall criteria is able to successfully predict the probability of landslides on regional scale, it is indeed very difficult to understand the risk associated with certain slopes. The reason being the spatial distribution of rainfall intensity and the forecasting system based only on rainfall do not take in consideration the effect of local soil, geology, hydrology and topography which also varies spatially. An early warning monitoring system is one of the most productive technique to minimize the disasters influenced by slope instability. A reliable and robust system fitted with Microelectromechanical Systems (MEMS) tilt sensor and volumetric water content sensor are installed. The MEMS-based sensor monitors the tilting angle of the instrument which is installed at shallow depths and the variation of tilting angle corresponds to lateral displacement at slope surface. Thus, the amount of tilting angle which exceeds critical value implies slope failure. The main objective is to monitor the tilting angles at various slope sites and formulate a dependable warning system with low probability of false alarms in Chibo Pashyor region in the Indian state of West Bengal. This paper aims to study being taken to build an effective early warning system in Chibo Pashyor. The change in tilt of sensors caused due to rainfall will help in developing an early warning system and also help in calibrating the thresholds calculated using empirical methods. Such system would help in installation of several low-cost sensors over an active slope and help in accurate prediction of future landslide possibilities.