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Scholar's Name : Habib Ali Mirdda
Supervisor's Name : Prof. Masood Ahsan Siddiqui and Dr. Bhoop Singh
Department : Geography
Title : "Landslide Hazard Zonation and Risk Assessment: A Case Study of Lower Mandakini Catchment (Uttarakhand)"

ABSTRACT

Landslide is one of the major natural hazards. In terms of losses, it comes after earthquake, flood and cyclone. In most cases, landslide is associated with other triggering factors like heavy rainfall or earthquake. From the Emergency Disaster Database (2016), more than fifty thousand people died and ten million people affected by landslides around the world in the last century. The increasing trend of landslides and their impact on society and economy has generated wider interest among scientific community. There is a growing trend of landslide hazard research all over the world so that the adverse impacts of landslide on society can be minimized.

In order to reduce the damages caused by landslide, it is necessary to establish better preparedness. Thus sufficient amount of fund must be allocated for landslide research, early warning and management of landslide disaster. During the last few decades, landslide researches have grown significantly worldwide. But still there are gaps and various difficulties in landslide research. Accurate prediction of landslide occurrence is still not possible as it is an abrupt process. Indirect precautions may be given through landslide susceptibility and hazard mapping. Even proper early warning system is not possible to develop in countries like India where there is scarcity of data and

unavailability of scientific instruments. But after 2004 tsunami, the government of India is showing interest in disaster research, early warning and evacuation planning.

In this study, eleven landslide causative factors are considered for susceptibility analysis. These are slope, aspect, curvature, lithology, lineament proximity, drainage proximity, land use and land cover, soil texture, soil thickness, road proximity, and rainfall. Three different landslide susceptible models viz. Frequency Ratio, AHP and Logistic Regression are applied to check the effectiveness in the study area. Landslide susceptible maps are prepared using these methods and their accuracy is evaluated by Receiver Operating Characteristics (ROC) curve and Seed Cell Area Index (SCAI) method.

In the present study, a household based risk analysis has been done. Different indicators that are influencing the vulnerability of the area are identified and total of 313 households are surveyed. Weight to each indicator is given subjectively following the past literature and normalized using min-max method. The result shows that above 60% households come under high and very high vulnerable classes whereas only 5.43% households come under low vulnerable classes. R-index is calculated to verify the vulnerability result with reality. The result shows a consistent R-index as the values reflect the positive correlation of classified vulnerable households and damaged households in 2013 disaster. Among the different villages, households in Thapla, Budoli are most vulnerable whereas households in Sumari and Falati are less Vulnerable.

Key Words: Landslide susceptibility, Frequency Ratio, Analytical Hierarchy Process, Area Under Curve, Seed Cell Area Index, Element of Risk, Vulnerability.