

# Assessment of Imja Glacier Lake outburst Flood (GLOF) Risk in Dudh Koshi River Basin using Remote Sensing Techniques

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## ABSTRACT

Glacier lakes are common phenomena in the Himalaya region of Nepal. Glacier lake outburst floods have repeatedly caused the death tolls and severe damage to downstream infrastructures. In Himalayas, a vital uncertainty about the glacier lake hazard potential still exists, thereby the effects of accelerating rates of glacier retreat and expansion of Glacier Lake could be the wake of recent global warming and resulting climatic changes. The paper, first describes the general different-level approach upon which the study is based. Then, in the methodological part, applicable remote sensing techniques, geographic information system (GIS) and statistical methods are presented. Observed data of lake area, volume, and depth having similar lake characteristics reported in the different literature are used to develop empirical equations by using statistical methods. The values of  $r^2$  (coefficient of determination) - obtained are very high ( $r^2=0.939$  for depth – area relationship and  $r^2= 0.990$  for volume – area relationship). The comparison of the empirical expression clearly indicated that there is more than 90% variation in the dependent variable, lake volume, as explained by the linear regressions in both cases. Area of Imja glacier lake for different years are determined from the available satellite imagery and volume of the Imja glacier lake are estimated using the expression:  $V = 0.094A^{1.453}$ . developed from linear regression analysis of the observed data. Similarly, mean depth can be estimated by using the expression:  $D = 0.94A^{0.452}$ .

After the preparation of maps and data, a scheme of decision criteria for the evaluation of hazard potential of Imja glacier lake is established. A list of decision criteria is a documented set of factors that are used to examine and compare for evaluating the hazard potential of a glacier lake. The empirical scores are given in terms of hazard magnitude for hazard rating. Analysis of Imja glacier lake based on the empirical scoring system clearly indicated that GLOF risk of the possible outburst from Imja glacier lake is **MODERATE**. A systematic application of remote sensing based methods for glacier lake outburst flood risk assessment is applicable and thus recommended.

*Keywords: Glacier lake outburst, remote sensing, risk assessment, hazard potential, empirical parameters, climate change*

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