

## **PREFACE**

India is highly susceptible to natural disasters, flash floods, cloudbursts, or glacial lake outbursts. India experiences these natural hazards. Floods are the most frequently occurring hazards. The Himalayas are a set of young fold mountains and the tallest mountain range in the world, and this region is mainly affected by these natural disasters. Out of the entire Himalayan range in India, Uttarakhand is the most affected state and most vulnerable to these disasters. Himalayan mountains are a source of significant rivers, which are vulnerable to floods by landslides and glacial lake outbursts.

This dissertation thesis is about the "February 07, 2021 Floods in Rishiganga river". A glacial lake outburst flood is a release of melted water from a moraine – or ice-dam glacial lake. GLOFs often result in catastrophic flooding downstream, with significant geomorphic and socioeconomic impacts. The Rishi Ganga and NTPC Hydroelectricity projects have been washed out in this event. When the event occurred, a large volume of debris and other glacial debris were brought. More than 210 people were killed in this tragic event, and a few are missing. After a section of the Nanda Devi glacier broke off, disaster struck Uttarakhand's Chamoli area on February 07, 2021, in the form of an avalanche and deluge. The Dhauliganga, Rishi Ganga, and Alaknanda Rivers — all intricately interwoven tributaries of the Ganga – flooded unexpectedly in the middle of the day, causing widespread panic and catastrophic devastation in the high mountain districts.

GIS and Remote Sensing play a critical role in risk management and risk assessment in the study of natural hazards, such as mapping, monitoring, evaluation, and modeling, which provide insight into damage assessment and impact in the affected area. We have used geospatial analysis that can give the effect of damage assessment and damage impact with the satellite images and DEM data. In this dissertation thesis, we have used the study area region from the Raunigad glacier to Vishnuprayag town. We have studied using two indices, are Normalized Difference Water Index (NDWI) and Modified Normalized Difference Water Index (MNDWI), to analyze water content and its impact. This study focuses on shedding light on the glacial burst that took place in Rishi Ganga, a river in Chamoli district, by performing NDWI, MNDWI, Supervised classification and Change Detection, and Buffer for future safety and simulation models in the GIS software such as R software, ArcMap, QGIS.