

## Mapping and Mitigation Strategy for Flash Flood Hazards: A Case Study of Bishoftu City

**Authors :** Berhanu Keno Terfa

**Abstract :** Flash floods are among the most dangerous natural disasters that pose a significant threat to human existence. They occur frequently and can cause extensive damage to homes, infrastructure, and ecosystems while also claiming lives. Although flash floods can happen anywhere in the world, their impact is particularly severe in developing countries due to limited financial resources, inadequate drainage systems, substandard housing options, lack of early warning systems, and insufficient preparedness. To address these challenges, a comprehensive study has been undertaken to analyze and map flood inundation using Geographic Information System (GIS) techniques by considering various factors that contribute to flash flood resilience and developing effective mitigation strategies. Key factors considered in the analysis include slope, drainage density, elevation, Curve Number, rainfall patterns, land-use/cover classes, and soil data. These variables were computed using ArcGIS software platforms, and data from the Sentinel-2 satellite image (with a 10-meter resolution) were utilized for land-use/cover classification. Additionally, slope, elevation, and drainage density data were generated from the 12.5-meter resolution of the ALOS Palsar DEM, while other relevant data were obtained from the Ethiopian Meteorological Institute. By integrating and regularizing the collected data through GIS and employing the analytic hierarchy process (AHP) technique, the study successfully delineated flash flood hazard zones (FFHs) and generated a suitable land map for urban agriculture. The FFH model identified four levels of risk in Bishoftu City: very high (2106.4 ha), high (10464.4 ha), moderate (1444.44 ha), and low (0.52 ha), accounting for 15.02%, 74.7%, 10.1%, and 0.004% of the total area, respectively. The results underscore the vulnerability of many residential areas in Bishoftu City, particularly the central areas that have been previously developed. Accurate spatial representation of flood-prone areas and potential agricultural zones is crucial for designing effective flood mitigation and agricultural production plans. The findings of this study emphasize the importance of flood risk mapping in raising public awareness, demonstrating vulnerability, strengthening financial resilience, protecting the environment, and informing policy decisions. Given the susceptibility of Bishoftu City to flash floods, it is recommended that the municipality prioritize urban agriculture adaptation, proper settlement planning, and drainage network design.

**Keywords :** remote sensing, flash flood hazards, Bishoftu, GIS.

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