

Chapter 12

GEOGRAPHIC INFORMATION SYSTEM-BASED ROCKFALL SUSCEPTIBILITY ANALYSIS OF TURKEY'S BURDUR PROVINCE

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Introduction

Landslides and rockfalls are the most common natural disasters during the mass movement of rock. After earthquakes and floods, mass rock movements form the third-ranked natural disaster that occurred between 1900 and 2014 in Turkey. Rockfalls are common in steep, mountainous areas and can be described as rock blocks that vary in size from a few dm³ to 10,000 dm³, which become separated from a slope by sliding, toppling or falling (Varnes, 1978; Dussauge-Peissere et al., 2002; Aksoy & Ercanoğlu, 2006; Larcher et al., 2012). According to the inventory of Mineral Research and Exploration Institute (MTA), from 1965 to the present, 23 rockfall events occurred in the Burdur province, with seven of them occurring in Bucak county, four in Çavdır county, four in Yeşilova county and three in the Burdur city center. The quality and quantity of rockfall inventory data, gathered from these events, increased the confidence of rockfall hazard assessment (Hutchinson, 2006).

Many influences affect rockfall events, including geologic, geomorphologic, tectonic, topographic and meteorological factors, along with human activity (Larcher et al., 2012). According to the Earthquake Research Department in Ankara, Burdur is situated inside a first-degree earthquake zone; therefore, vibrations increase rockfall susceptibility all around the province. Due to this dynamic, forecasting the rockfall runout distance and distribution locations, which are under the risk of rockfall, are always difficult, ongoing tasks.

The best techniques to gather information in relation to rockfall events on a regional scale are to use a simulation model to determine the locations most prone to this kind of hazard (Seijmonsbergen & Dorren, 2003). The priorities and benefits of regional scale analysis include cost effectiveness, deployment over vast areas, no requirements for a large amount input data and reliable results (Piacentini & Soldati, 2008; Larcher et al., 2012).

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According to the map, within the Burdur province, 3.8 km of the roads intersected with rockfall susceptibility zones.

Conclusion

This study was performed within the province of Burdur with the aim of estimating rockfall prone areas, to preserve settlements and infrastructure on a regional scale. The threshold slope angle for rockfall events was determined to be 43° and above. Therefore, 11.9 km² of the Burdur province was found to lie within rockfall source areas. The CONEFALL program was an appropriate alternative program to execute timely research of rockfall propagation on a large, or regional, scale. The program was beneficial in providing initial estimations, but it could not be used alone without consideration and field observations, due to many factors, such as geomorphology, lithology and the fracture zones of the rocks. In this study, the CONEFALL program was integrated with ArcGIS software to identify rockfall propagation zones. In this study's analysis, cone slope angles of 32°, 35°, and 38° were used, and areas marked as low, medium, or high susceptibility zones. The analysis found that 29.2 km² fell within a high rockfall susceptibility zone. The Yuva, Kayaaltı and Ballık settlements, and 3.8 km of the roads, intersected with high rockfall susceptibility zones. According to this study's results, the rockfalls consisted primarily of carbonate and clastic rocks. The data provided by this rockfall susceptibility map created a good source for decision makers, planners and engineers when organizing their field work and can support decision making for any kind of development work.

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