Disaster Risk Analysis Using Geographical Information Systems: A Case Study of Ferhat Pasha Mosque in Çatalca

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SUMMARY

Cultural heritage represents the tangible (historic buildings, urban fabrics, archaeological sites) and intangible (language, traditions, rituals) values that reflect the identity, culture, and history of societies. However, this heritage faces the threat of destruction due to wars, disasters, urbanization, and environmental pressures, prompting international organizations such as UNESCO, ICOMOS, ICCROM, IUCN, and ICOM, along with local stakeholders, to take collective action for its protection.

Istanbul is a metropolis with a high risk of exposure to disasters such as earthquakes, floods, and landslides due to its geographical location and geological characteristics (İBB, 2020). The subject of this study, the Ferhat Pasha Mosque, is a work of Mimar Sinan located in the Ferhatpaşa District of Çatalca. The mosque, featuring a single dome and a double portico in the last congregation area, preserves the classical architectural character of the 16th century (Kuran, 1975; Kuran, 1986; Çelebi, 1994; Akçıl Harmankaya, 2017).

This study aims to assess the disaster risks of the Ferhat Pasha Mosque and its surroundings using GIS-based methods, applying the Weighted Overlay technique to produce spatial risk maps. Conducted at the neighborhood scale, it fills a gap in the literature—where most studies focus on basin, provincial, or district levels—by providing an original contribution to GIS-based disaster risk analysis.

In this study, eight environmental parameters (slope, elevation, aspect, soil capability, distance to fault lines, hydrological and meteorological structure, and land use) were analyzed using ArcGIS, with weight values assigned based on expert opinions to produce risk maps. This method is applicable to other cultural heritage sites with similar risk

profiles.

Eight spatial parameters were evaluated in the disaster risk analysis conducted in Ferhatpaşa District. The results show that 72% of the area is classified as medium-risk, 28% as low-risk, and only a small portion as high-risk. The Ferhat Pasha Mosque, located on a northeast-facing slope within the medium-risk zone, is surrounded by alluvial soils and pasture areas, which increase the potential for flood and erosion hazards.

This GIS-based disaster risk analysis for the Ferhatpaşa District reveals that protecting cultural heritage structures requires considering not only their physical characteristics but also environmental and spatial factors. The findings highlight increased disaster risk in low-lying, impermeable, and hydrologically sensitive areas, emphasizing the need for attention to secondary earthquake-related hazards due to local ground conditions.

Accordingly, the study recommends prioritizing surface runoff control, reducing impermeable areas, improving drainage systems, implementing non-structural measures in high-slope and weak-ground zones, preserving material and structural integrity during restoration, and ensuring coordinated monitoring and management among relevant institutions.