Spatial Analysis of Earthquake Damage in Ecologically Sensitive Areas: The Case of Antakya Post-2023 Earthquake

Dr. Alper Çabuk
Department of Architecture, Faculty of Architecture and Design, Eskişehir Technical University, Türkiye

Özgecan Mallı
Department of Remote Sensing and Gepgraphical Information Systems, Institute of Graduate Education, Eski?ehir Technical University, Türkiye

Abstract:

The twin earthquakes that struck southern Türkiye on February 6, 2023, left devastating impacts on Antakya's urban fabric. What set this disaster apart, however, was the visible pattern of destruction aligning closely with ecologically sensitive zones. This study explores the spatial footprint of the earthquake damage in Antakya by employing Geographic Information Systems (GIS) and Remote Sensing (RS) technologies to analyze how environmental fragility, construction timelines, and topographical conditions influenced the severity of damage. High-resolution satellite imagery spanning from 1999 to 2023 was used to trace urban development, while the Normalized Building Difference Index (NBDI) helped detect changes in built-up areas before and after the quake. Findings point to a significant overlap between zones of ecological vulnerability and high structural loss, particularly in areas developed prior to updated building regulations. This suggests that beyond engineering failures, weak integration of ecological planning and topographic awareness into urban growth played a critical role in amplifying disaster risk. The results advocate for a stronger alignment between nature-based planning principles and post-disaster recovery efforts. In this context, GIS and RS tools prove indispensable in identifying risk-prone areas and guiding future resilience strategies for sustainable cities.

Keywords:

Urban Planning, Ecological Planning, Nature Based Solutions, Ecological Planning and Safety, Post-Earthquake Reconstruction, GIS and Remote Sensing in Disaster Analysis, Nature-Based Solutions for Resilient Cities, Ecological Sensitivity and Disaster Risk.