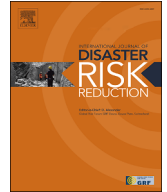




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A GIS-Based emergency response and management support framework for Earthquake crisis: A case study of Antakya and Kahramanmaras earthquake in Turkey

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ABSTRACT

Earthquakes can cause significant damage, including loss of lives, collapsed buildings, and blocked roads. However, the severity and frequency of earthquakes cannot be accurately predicted. To mitigate these effects, successful disaster management, particularly in improving post-earthquake road network connectivity, is crucial. Therefore, this study presents a novel satellite imagery-based approach for identifying post-earthquake road blockage and to assess its impact on urban infrastructure and emergency response management. This study utilised real-world pre- and post-earthquake satellite images of the earthquake that struck Turkey on February 6, 2023 using ArcGIS Pro. The results demonstrated that in the scenario when people in affected areas (incidents) tried to escape to emergency gathering zones, out of the initial 126 incident locations in Antakya, 101 of them experienced alterations in the selected routes after the earthquake. In Kahramanmaras, out of 35 incidents, 28 experienced changes in the selected routes. In the case of emergency vehicles (firefighting, medical aid, etc.) traveling to affected areas, some emergency vehicles were assigned a great number of incidents, whereas some vehicles had no incidents assigned to them. The findings of this study suggest that the developed framework can identify road blockage and inefficiencies in an emergency response framework with high accuracy. Therefore, the approach presented in this paper can be implemented to develop a practical geographic information system (GIS) based model to enhance the emergency response management for potential future earthquakes. Thereby, this study can facilitate the level of resilience of urban environments to withstand and adapt to future crises.

1. Introduction

Earthquakes are major natural disasters that can cause widespread damage and disruption to urban systems. In addition to resulting in losses in terms of people, property, and money, earthquakes also halt the advancement of society and economy. The earthquake that struck Turkey on February 6, 2023, is a recent example of the devastation an earthquake may inflict [1]. To this day, there has been negligible progress in either preventing earthquakes or accurately predicting their occurrence. However, efficient disaster management may significantly lessen the detrimental after-event effects of earthquakes [2]. Road blockage is one of an earthquake's most

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