
Mapping the Vulnerability to Potential Toxic Substance Releases from Industrial Facilities under Emergency Situations: A Case Study of Galveston, Texas

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Abstract

This research investigates the spatial variations of vulnerability to toxic substance releases under possible emergency outbreaks in Galveston County, Texas. By identifying the potential risk and measuring the extent of possible impact, we provide useful information for the local government and the public to develop more effective evacuation strategies. Assuming that toxic substance releases occur during a worst-case scenario, we determine the vulnerability based on a combination of five factors at the census block level: (1) population density; (2) the percentage of people under 5 years old and above 65; (3) distance between residence and hazardous sites; (4) road network capacity; (5) density of hazardous sites. We employ the Areal Locations of Hazardous Atmospheres (ALOHA) dispersion model to define the impact areas. We calculate an index for each of the five factors. We weigh the indices equally and generate the overall vulnerability index. Results are visualized in a GIS environment.

Keywords

vulnerability, evacuation, toxic release, worst-case scenario, GIS
