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"Integration of Detailed Household Characteristics Data with Critical Infrastructure & Its Implementation to Post-hazard Resilience Modelling."

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Extreme natural events have revealed both the vulnerability and slow recovery of communities. The damage to physical infrastructure can lead to significant societal impact and highlights the importance of physical networks since they support population well-being. An important step in assessing the reliability and resilience of a community is gaining proper understanding and model of the complicated ways that physical and social systems depend on each other. This paper addresses how to link population data with inventories that are related to critical infrastructure data which is used to model recovery after a hazard.

Findings

This paper uses the city of Seaside, Oregon, which is known as a seismic hazard, to show the interdependency between physical and social infrastructure, specifically its drinkable water network and human response. The analysis of the paper connects the loss of functionality with the inability of a network to follow requested flow of goods and services. The model used for movements of the population due to disruption finds that a household living in a single-family structure with no loss in property value had a 23-28% probability of dislocation, depending on the demographics of their neighborhood. A household living in a multifamily structure with no damage had a 33-40% probability of dislocation. The study also finds that households in structures with damage had a 24-89% probability of dislocation, depending on the severity of the damage, structure type and neighborhood characteristics.

Implications

The absence of necessary goods and services for a long time can cause more dislocation, which shows how physical and social infrastructure are dependent on each other. The steps used in the paper can be used to update the initial demand for critical infrastructure, such as water distribution, electric power and transportation network. This paper presents a possible repeatable pattern for information shared between social science and engineering researchers, creating combined models for community resilience. The models are designed to respond to natural and human-created hazards and predict both the effects and time for initial recovery, which helps put complicated systems into motion.