#HRRC30for30

"Integration of Detailed Household and Housing Unit Characteristic Data with Critical Infrastructure for Post-Hazard Resilience Modelling."

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Extreme natural events have revealed the risk levels of communities and their slow recovery. The assessment of how well infrastructure functions after a disrupting event is a critical step in reliability and resilience analysis. Infrastructure refers to the basic structures and facilities needed for a city and other areas to function. Physical infrastructure includes water and wastewater, electric power, transportation and telecommunication networks. Damage to these structures and facilities can lead to significant impacts on society and brings attention to the importance of physical networks that support the well-being of residents. Since infrastructures are connected, their responses to damaging events should also include and address indirect damage.

Findings

The work from this study offers a possible method for residential structures and networks that supply drinkable water by combining physical and social systems of infrastructure which includes detailed infrastructure data with diverse household traits, such as size, race and tenure status. The method was applied to the city of Seaside, Oregon, subject to seismic hazard, to model the interdependency between physical and social infrastructure, especially the city's human response and network of drinkable water.

This paper presents a general workflow for data that is shared between social science and engineering researchers that generate combined models for community resilience. This combination results in improvements in all data sources and more accurate resilience modelling.

Implications

Research has started to focus on the modeling of hazard impacts on residential housing and infrastructure at an increasingly small scale. Combining detailed housing unit characteristics data with critical infrastructure data provides the benefit of visualizing and exploring differences in predicted probabilities of human response to a hazard at the housing unit level.

Census data, which provides detailed household and housing unit characteristics, can be transformed and allocated to individual buildings. Necessary infrastructure can be mapped to buildings to capture the demand on the system using the data from the Census. The procedure presented in the paper can be adopted to update the initial demand for necessary infrastructure, such as water distribution, electric power and transportation network.