

Physical Flood Vulnerability of Residential Properties in Coastal, Eastern England

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Summary

This study demonstrates that significant improvements could and should be made in the manner in which society manages its risk to natural disasters. The focus is on managing the physical vulnerability of residences (houses and flats) to flood disasters in coastal, eastern England. To complement the extensive knowledge of damage from slow-rise flood depth, this study examines the lateral pressure from flood depth differential between the inside and outside of a residence and flood velocity.

To determine the impacts on residences in coastal, eastern England, Canvey Island on the Thames Estuary and Kingston-upon-Hull on the Humber Estuary were selected as case study sites. Field surveys determined characteristics of the physical vulnerability of residences in these locations to floods. A first-order analysis indicated the failure modes of most prominent concern to be analysed in detail:

- The rate of rise of flood water inside a residence, to establish that pressure differentials could damage the residence.
- Analysis of glass failure, focused on large, low units in doors.
- Analysis of wall failure, focused on cavity walls of unreinforced masonry.

The observations and calculations were applied to developing a new form of vulnerability profiling: two-dimensional “vulnerability matrices” with flood depth differential along one axis, flood velocity along the other axis, and the matrix cells displaying a damage outcome.

The vulnerability matrices were used to illustrate possible disaster management tools. The “loss equivalent percentage” method of describing quantitative risk was presented for simulated storm surge scenarios on Canvey Island. Qualitative decision-making tools and analysis strategies for residence flood vulnerability management were also discussed.

The results apply specifically to modern residences in England because those were the residences observed in the field surveys. The techniques and methods nevertheless could be used for similar analyses for other locations, other residence types, and other disasters. This study provides new knowledge and methods which contribute to understanding, describing, and managing society’s risk to natural disasters.

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