

Coastal Flood Risk Assessment in England

Urban settlements in the UK have recently sustained several large-scale losses through the impact of extreme weather events. High losses were incurred in April 1998, as a result of widespread flooding along inland rivers in central England, and between October 2000 and February 2001, when some places in England and Wales experienced one of the worst river flood disasters in centuries. In both cases, the flooding caused major disruptions to thousands of homeowners and businesses. Damage estimates by the Association of British Insurers for the 2000/2001 floods were on the order of £1 billion.

Assets located near coasts and estuaries are increasingly at risk due to a rise in global mean sea level. Increasing flood risk along coastal eastern England results from increased development, a lack of maintenance of flood defences - a report by the National Audit Office recently rated 43% of flood defence structures in England to be in fair, poor or very poor condition - and the interaction of rising sea levels with storm surge events. Such storm surges have been extremely damaging in the past. The North Sea surge of 31 January to 1 February 1953 damaged 24,500 houses and resulted in more than 300 deaths along the east coast. It is estimated that insured losses as a result of a major coastal flood in England today could be in excess of £10 billion.

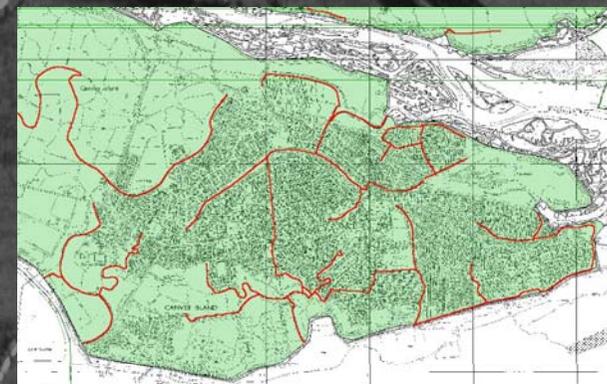
The establishment of a long-term flood management strategy requires a sound understanding of the potential impacts of a storm surge and, in particular, the flood depths and velocities that are likely to be experienced inland for a range of defence failure scenarios. Integrated flood models, based on the combination of a 3-D storm surge model and a 2-D inundation model, are developed for two case study sites, Canvey Island and Kingston-upon-Hull, in order to investigate the potential consequences of a major sea defence breach on residential areas.



Flooded house in Malton, North Yorkshire, on 8 November 2000.



Recent riverside redevelopment in Kingston-upon-Hull, Yorkshire.



Areas at risk from coastal flooding at Canvey Island, Essex.

At the same time, potential damage to residential buildings is explored through a detailed analysis of residence vulnerability. Current methods of damage estimation use coarse building classifications based on data that do not correlate satisfactorily with the features of buildings contributing most to vulnerability. Using historical accounts, case studies, field surveys and insurance loss data, an innovative system of building classification is developed in order to identify key potential weaknesses for each type of housing. The water depths and velocities predicted by the flood inundation model are used to calculate rates of floodwater infiltration as well as the failure of brickwork and windows.

Based on the findings of this comprehensive research approach, appropriate innovative risk management strategies are considered. The research is of particular interest to the insurance industry, although many other potential applications exist, including disaster planning and management, coastal vulnerability assessment and decision support for integrated coastal zone management.



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