Coastal Settlements at Risk: A Study of England's East Coast

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INTRODUCTION

A number of large-scale losses have recently been sustained in the UK through the impact of extreme weather events on human settlements. The largest risk to the low-lying East Coast is flooding resulting from the combination of storm surge and high tide. This risk combines with other risks, such as windstorm damage, coastal erosion, ground settlement, river flooding and cold weather damage.

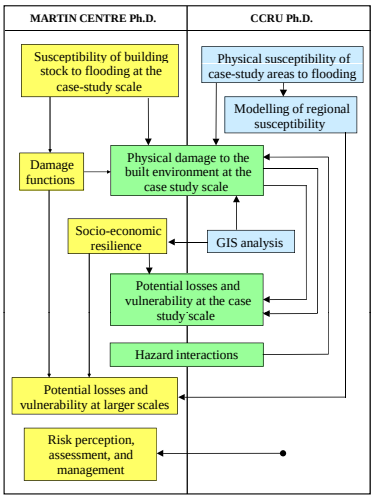
PROJECT OBJECTIVES

This study aims to make a significant contribution to the understanding of risks to the built environment from natural hazards by:

- **Identifying the key features of residential building stock vulnerability.**
- **Defining flood risk in relation to the local flood climate and environmental vulnerability.**
- **Investigating a range of flood scenarios using a 3-dimensional hydrodynamic model.**
- **Studying the interaction between shoreline management and building stock vulnerability.**
- **Considering innovative risk management strategies.**

RESEARCH FRAMEWORK

The research will be conducted through a collaboration between the Martin Centre for Architectural and Urban Studies, Department of Architecture and the Cambridge Coastal Research Unit, Department of Geography. The project is staffed by a Ph.D. student in each department and is guided by a post-doctoral research associate. The study is interdisciplinary and aims to provide a link between the scientific research community and the insurance industry.



CASE STUDY SITES

Three case study sites were chosen, based on the geographical and hydrodynamic environment and building stock characteristics:

- Kingston-upon-Hull, Humberside
- Great Yarmouth, Norfolk
- Canvey Island, Essex

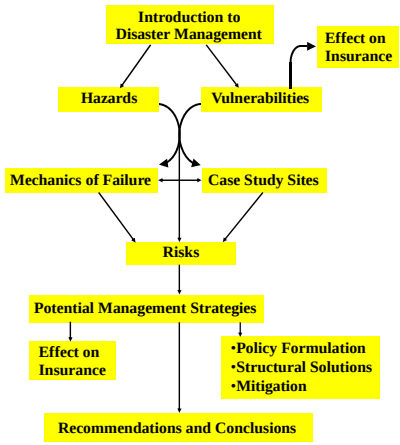
Kingston-upon-Hull

Great Yarmouth

Canvey Island

BUILDING STOCK VULNERABILITY

At the centre of the estimation of risk will be a detailed examination of the building stock in the areas at risk through sample surveys and vulnerability analyses. The study seeks to identify those features of the building stock which govern the vulnerability to each of the main hazards and to determine a form of classification or zoning which can be used to identify risks more precisely.



HYDRODYNAMIC MODELLING

A fully three-dimensional hydrodynamic model will be used to investigate the physical susceptibility of each case study site to flooding resulting from the combined effects of:

- Astronomical tide
- Storm surge
- Wind-wave processes
- Non-linear interactions
- The physical environment of the coastal zone.

The model will be capable of representing both the generation of a flood wave and its propagation inland. Flood scenarios will be developed for a wide range of meteorological events, for which return periods will be defined, and potential losses to the built environment will be assessed through combined geospatial analyses of flood wave parameters and associated residential vulnerabilities.

EXPECTED OUTCOMES

- Integrated strategy for modelling the physical susceptibility of coastal settlements to storm surge flooding and related hazards.
- Development of a coupled surge and inundation model at the case study scale.
- Modelling of the dynamics of storm surge flooding in contrast to the conventional determination of the flood footprint for a range of potential water levels.
- Development of new approaches to conceptualising and modelling flood-induced building failure.
- Estimation of residential losses at the case study scale through combined modelling and building stock surveys.
- Determination of composite losses from hazard interactions.

BENEFITS FOR INSURERS

- Better pricing of risks.
- Better understanding of mitigation options.