Coastal Process and Flooding
Long term cliff erosion modelling

FRMRC2 has produced:
- Climate change impact on near-shore wave climate and long-shore sediment transport off East Anglia with associated cliff erosion

Intended readership:
- Environment Agency
- Local authorities
- Consultants
- Coastal groups

Where to find more information:
http://ukclimateprojections.defra.gov.uk/

Summary

Assessment of shoreline response to climatic change is an important issue for coastal management.

To prevent cliff recession, managers can design coastal structures. However, the impact of such protection can lead to the reduction of sediment supply to neighbouring regions necessary to maintain beach volume and prevent flooding inland.

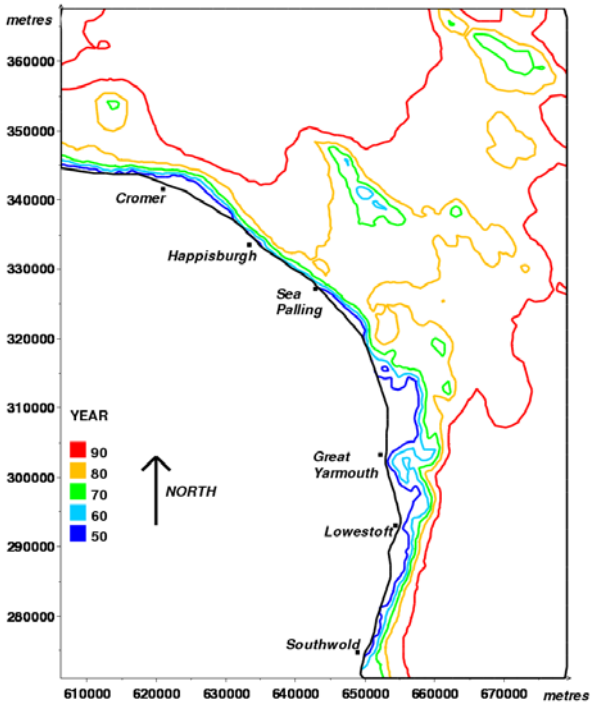
The long-term stability of Norfolk coastline has been studied through numerical modelling. This methodology involves the coupling of state-of-the-art hydro-informatics systems to represent physical processes responsible for shoreline morphodynamics.

The study site is a 7,000 km^2 area located off East Anglia, UK, within the Southern North Sea. The coastline is mainly formed of soft cliffs and sand dunes. The offshore area is characterised by the presence of large-scale tidal sand banks. The complex pattern of tidal sand banks is taken into account since they act as dissipaters for offshore wave energy propagating towards the shore.

An integrated framework of numerical models was created to downscale future wave and surge scenarios from global climate

EPSRC Grant: EP/FP202511/1

models to the outer boundary of our study region. A coastal model is implemented to perform wave propagation in shallow waters. The model takes into account wave energy dissipation due to bottom friction and wave breaking, and also the effect of water depth variations on wave propagation, such as surge, tides and sea level rise. The model which has been validated with existing measurements is then used to transfer offshore wave climate towards the shoreline. Along the coastline, a morphological model driven by near-shore wave and water depth investigates long-term cliff recession through the SCAPE model (Walkden and Hall, 2005).



Changes in the return period of extreme wave heights in case of moderate sea level rise

This framework of models is used to downscale climatic scenarios for the 21st century, and assess the change in wave and surge conditions along the coast of the study area. Impact on long-shore drift, cliff recession and changes in beach volume has been assessed. (Perhaps use this space to highlight how this sort of information might be of use to the Coastal Manager, i.e. understanding the potential impacts of policy options such as hold the line on down drift beach volumes linking to flood risk, increased frequency of beach recharge etc.

Other sources of information

http://www.tyndall.ac.uk/

Walkden, M., Hall, J., 2005: A predictive mesoscale model of the erosion and profile development of soft rock shores. Coastal Engineering. 52. 535-563

Research Team

University of Manchester: Peter Stansby, Nicolas Chini

University of Newcastle: Jim Hall

Royal Haskoning: Mike Walkden

National Oceanography Centre: Kevin Horsburgh, Chris Wilson, Judith Wolf

CETMEF: Gerard Goasgue

FRMRC is an interdisciplinary research consortium made up of partners from universities, government bodies and practitioners supported by:

- Engineering and Physical Sciences Research Council
- Department of Environment, Food and Rural Affairs/Environment Agency Joint Research Programme
- United Kingdom Water Industry Research
- Office of Public Works Dublin
- Northern Ireland Rivers Agency

Data were provided by the Environment Agency and the Ordnance Survey.