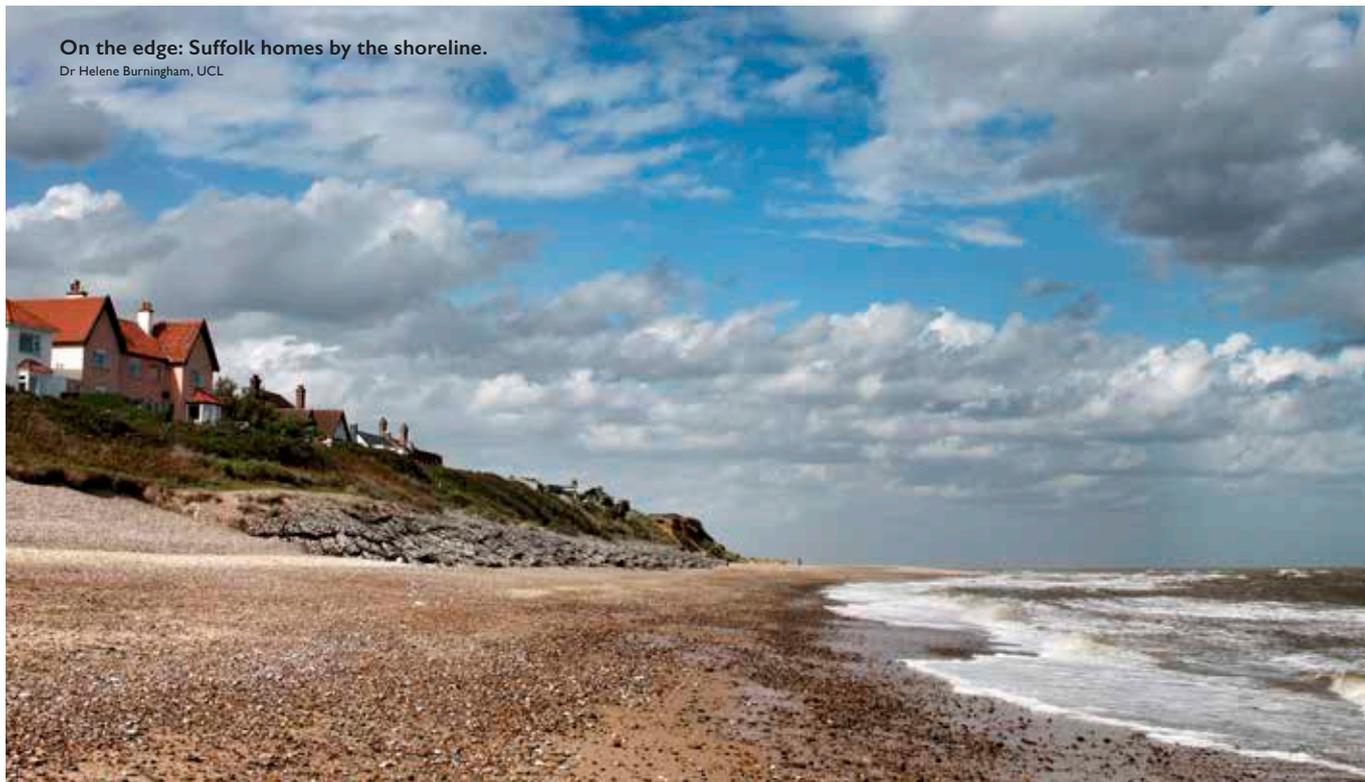**On the edge: Suffolk homes by the shoreline.**
Dr Helene Burningham, UCL

A view on the coast

Frequently linked to an increased threat from flooding, coastal erosion was widespread in the 20th century. Professor Robert Nicholls of the University of Southampton and Professor Jon French of University College London explain how the iCOASST project is helping to reveal what the next hundred years could hold.

Happisburgh was once some distance from the sea, parted from the coast by the parish of Whimpwell, long since eroded away.

istockphoto

Famous for its red-and-white striped lighthouse, Happisburgh sits on the Norfolk coast, a stone's throw from the North Sea. But that wasn't always the case. Only relentless erosion over centuries gave the village its coastal character – leaving the community anxiously wondering what fate may await it. This is equally true of other places around the UK, with coastal erosion expected to accelerate and become even more pervasive due to climate change and rising sea levels.

Erosion is a very real, very immediate hazard for people and property in many coastal areas. As well as causing the coastline to retreat, it means it's more likely that natural and manmade defences will fail during storms, increasing the risk of flooding as the sea makes inroads. The risk of tidal flooding – where high tides are exacerbated by storms – is widespread along open coasts. It's especially an issue in estuaries, which rely partly on interactions between tide, surge and the shape of the land (its morphology) to control extreme surges.

Currently, we can predict erosion and flooding during specific extreme storms with some skill, but as we look further into the future this capacity diminishes. This stems largely from our inability to predict changes in the shape of coasts and estuaries over decades to centuries. It was precisely this knowledge gap that integrating COAstal Sediment SysTems (iCOASST) set out to fill.

istockphoto

Public workshops captured valuable local knowledge that made researchers re-assess.

Shapes to come

The iCOASST consortium is pinpointing the best way of predicting changes to our coasts. This is quite a challenge, not least because erosion of a beach or other natural feature is influenced by its interaction with the features next to it like cliffs, saltmarshes and tidal deltas, while human interventions provide another complicating factor.

Ultimately, iCOASST's aim is to inform long-term decision making in fields such as shoreline management to help protect and reassure coastal communities. Through a suite of co-ordinated iCOASST projects and components, we'll gain an unprecedentedly comprehensive understanding of coastal evolution. One of our ultimate goals is to be able to explore the full effects of climate and sea-level change, and the wide range of coastal management options, with large simulations.

A case of two coastlines

We have tested the iCOASST approach with a pair of real-life case studies at Liverpool Bay and the Suffolk coast. By involving ongoing and close engagement with stakeholders in both locations, we've been able to evaluate not only the realism of our results but also their relevance and usefulness.

Two key ingredients underpinned the case studies: data and engagement. We have benefited hugely from the coastal monitoring data in the public domain that's increasingly becoming available – for example through the Channel Coastal Observatory. All interested stakeholders – including the general public, environmental groups and local authorities – were able to bring valuable knowledge to strengthen iCOASST. Using this input to help structure a problem and formulate an agreed approach proved vastly superior to 'consulting'

stakeholders on findings generated by a process devised solely by 'experts'.

In Suffolk, workshops with stakeholders captured valuable local knowledge that made us re-assess the way that beach sediments are carried along the shore. This actually challenged our previous assumption that sand and gravel were transported southwards more or less continuously. That prompted further analysis that revealed numerous instances of sediment reversing direction. That knowledge is crucial to our ability to forecast the shape of the local coastline in coming decades. And being able to do that is essential for us to be able to devise strategies that can protect coastal communities, businesses and infrastructure.

Initial results from the Liverpool Bay case study underlined the importance of how sediment moves between the open coast and the Ribble Estuary. The simulation found that plans to realign parts of the Ribble coastline to their original shape before the area was reclaimed from the sea could actually cause serious erosion problems if conducted rapidly and on a large scale.

With iCOASST we're equipping the UK to respond to the challenge of coastal erosion through new methods, new models, new insights into what the UK coastline could look like in future and the processes that will shape it. That way we'll be able to respond practically and with much more confidence over the next hundred years and beyond.