

Storms and rising seas are making floods more frequent and severe. Jon Williams (right) says studying a small stretch of coast will help predict future threats.

Keeping back the sea

— *how to predict floods*



The coast of Crosby, Merseyside.



The UK floods of July 2007 are estimated to have caused £2 billion of damage and led to significant human hardship. Along our coastlines too, rising sea levels and more storms directly increase the risk of coastal flooding and pose a growing challenge to Britain's coastal defences. Making effective use of new approaches to the prediction of what coastal flooding might be like in the future lies at the heart of the CoFEE (Coastal Flooding by Extreme Events) project.

Many scientists now believe that global warming carries with it the possibility of an increase in the frequency and intensity of coastal flooding. This will affect industry, housing, communication, power and transport systems. This is a cause of great concern for citizens, businesses and those charged with coastal management and protection.

Over the coming decades, flood-prone areas are likely to become more densely populated, increasing the impact of flooding worldwide. This means it is important to understand and predict how the coast will evolve and how natural changes to our coastline might increase flood severity.

The CoFEE project uses the Sefton coast of north-west England as a case study. Here the sand dunes that protect the coastline at Formby Point are receding at a rate up to four metres per year. Waves and tidal currents carry the eroded sand north and south, where it accumulates and slowly extends the beaches.

Defensive sea walls protect the urban areas of Southport and Crosby from coastal flooding. Changes to the Sefton coastline attributable to natural processes and to agriculture and industry have been studied for many years, resulting in a

comprehensive data base documenting responses to storms and to the long-term evolution of coastal features.

The approach used in the CoFEE project to foresee and mitigate how the coast will respond to storms and sea-level rise is to build a numerical model to predict tides and waves accurately.

The model calculates tidal levels and waves during past storms that caused coastal flooding. It is now helping us study how rising sea level and very severe storms affect the maximum tidal levels along the Sefton coastline and how these in turn cause coastal erosion and sediment transport.

We then compare the resulting simulations of coastal evolution with known changes along the Sefton coastline, and where necessary make adjustments so that the predictions match the observations as closely as possible. The model can be used to explore future coastal evolution in a range of sea-level and storm scenarios.

In the final part of the study, we will use the model to simulate known overtopping events along coastal defences and real coastal floods. Successful simulation of past events provides credibility to the predictions made for floods still in the future.

The CoFEE project supports a range

of civil protection and flood mitigation strategies. The outputs of the project are being defined in collaboration with the people who will use this information. We are developing a generic format so that the knowledge gained about the Sefton coast can be applied elsewhere to help make informed decisions on how to mitigate, and adapt to, the consequences of environmental change along populated coastlines. ❖

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