



**British
Geological Survey**

NATURAL ENVIRONMENT RESEARCH COUNCIL



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Coastal erosion under changing climates

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Ghana coast



Outline

- A natural process - but a societal problem
- A global issue - but which requires regional management
- Coastal erosion will escalate with climate change
- Unsustainability of present coastal management policy

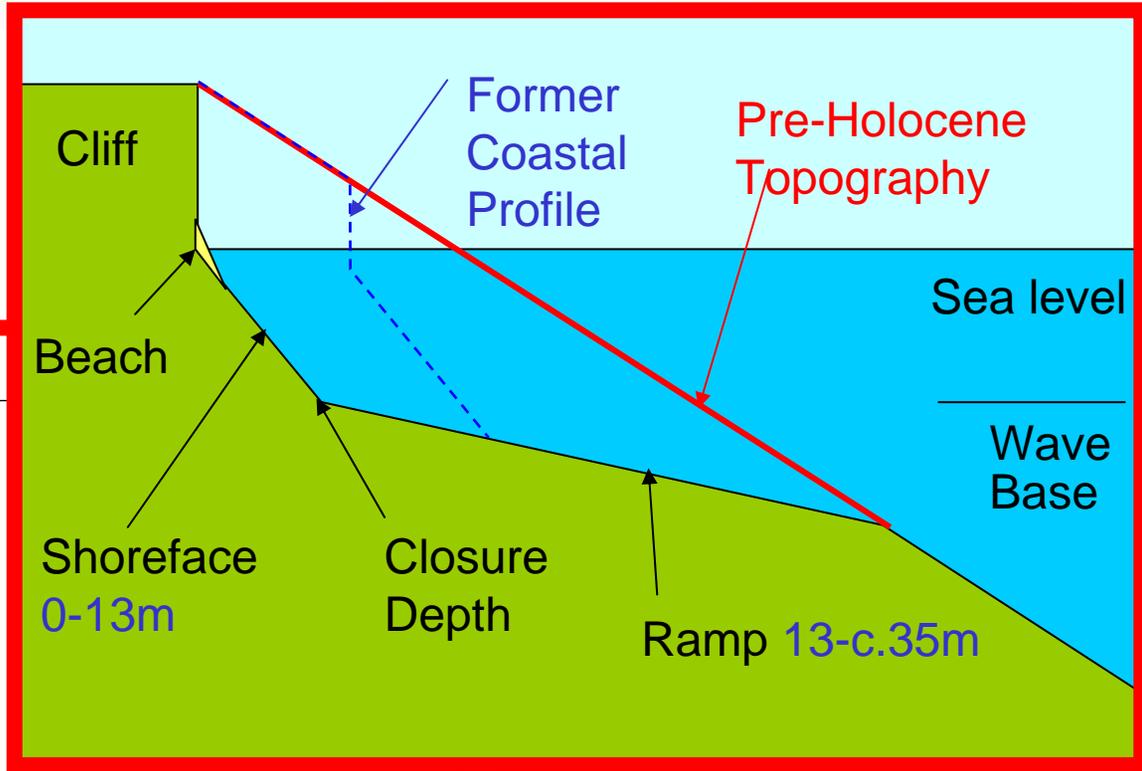
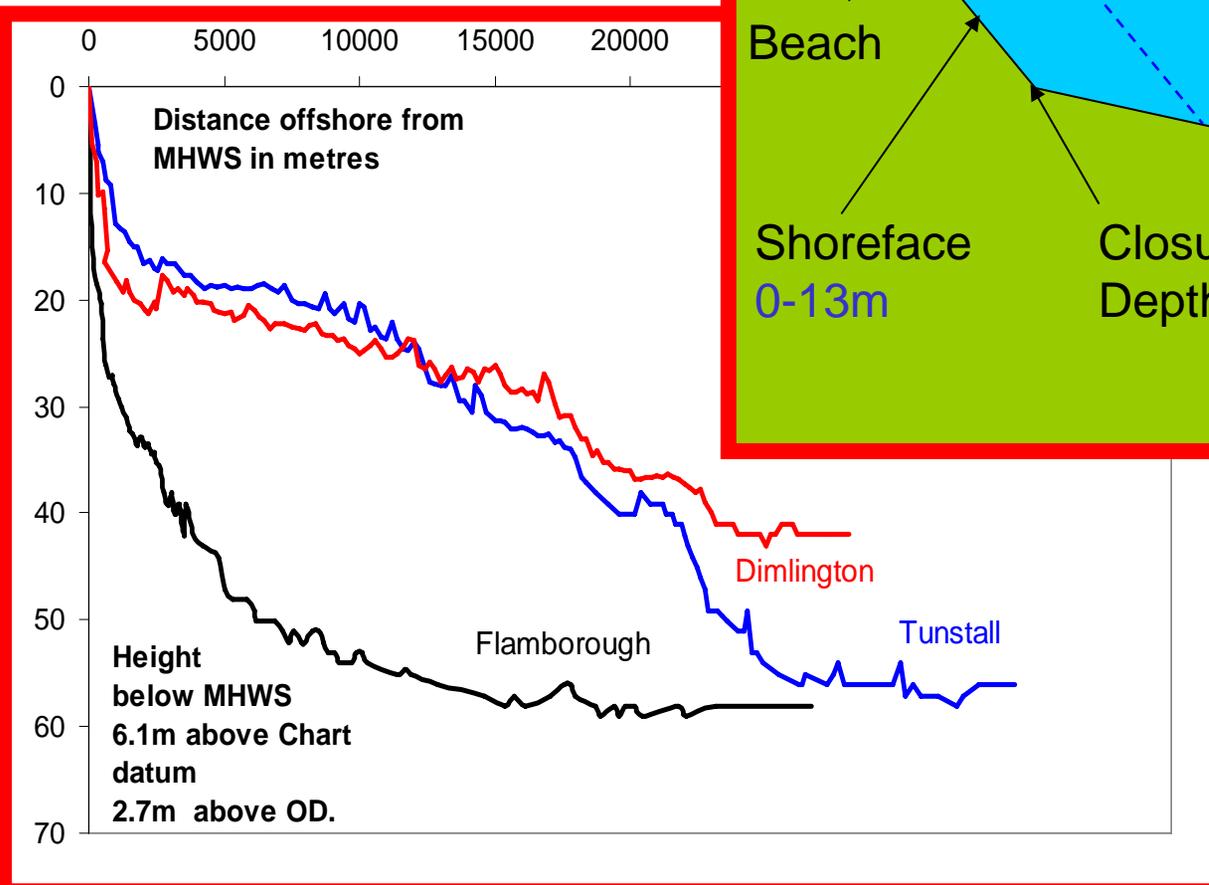
To inform better decision-making:

- *How can we improve our scientific advice?*
- *What science is needed to develop policy?*





Historical Erosion



About a third of UK coasts eroding by $>0.1\text{m/yr}$ – even when 60% of these are defended.



FOCUS

Crumbling away

Is dredging the villain in the drama of Britain's eroding coasts?

Fred Pearce

EIGHTY years ago this winter, tides destroyed the coastal village of Halsanda in south Devon. The few remains are today a mecca for ghoulish geographers—in this case from the building of the nearby Devonport dockyard—can expose a coastline to violent erosion.

On the other side of the country today, the residents of Norfolk villages such as Salthouse, Hemsby and Happisburgh fear this winter their homes could join Halsanda.

The Guardian Wednesday October 14 1998

Rising sea 'threatens 500,000 homes'

Paul Brown
Environment Correspondent

government is to scale its attempts to stop its falling into the sea, ditching resources from ding sea walls to create natural defences like beaches and salt stacks.

Cunningham, agricultural minister, has decided

The Guardian Friday December 21 1999

Village on edge of oblivion

Salthouse, a fishing community in Norfolk, faces the toughest battle in its long history, against the might of the sea. Luke Harding reports

BORGE Cooke, who has lived in Salthouse for 77 years, peers

community and guarantee its long term future, residents are demanding a sea defence wall. But the Environment Agency — the government for

Exclusive: Study shows sea levels will rise by up to 20cm over 50 years

Gone with the wind (and sea)

Stephen McClarence visits the changing face of the Yorkshire coast, where time and tide wait for no tourist

ENVIRONMENT FUNDS SWITCHED TO MARSHES AND BEACHES

Natural defences to be used against sea erosion

Virginia Parker
Sara Merrill

Cunningham's review has concluded that most attention must be paid to protecting urban areas and environmental areas of international importance — such as wetland bird habitats.

In other rural areas the sea will be allowed to break through to flood agricultural land, resources would then be allocated to manage the advance of the sea.

The study — part of the comprehensive

shp, coastal paths are to be closed. In 1994, Holbeck hotel in Scarborough into the North Sea.

Elliot Morley, the agriculture minister responsible for coastal defences, gave a suggestion that more money would be made available to tackle the problem, but methods of dealing with the sea were changing.

"In the past, defence often consisted of concrete sea walls, but experience has shown

Farmer loses home of 25 years to the sea and demolition men

A WOMAN who has fought to stop the sea claiming her home of 25 years

What I hastened when sea defences were put in place for north in Mappleton in 1993. "I am not King Canute cannot hold the sea back. She and her uncle, who farm 20 acres of land, were up at dawn to salvage the and wood from their home before the demolition team moved in. They have moved to a caravan near by and will still tend to their donkey ponies, goats and cows.





Erosion & Climate Change

- Increase in sea level will cause:
 - Greater exposure of coasts to wave energy
 - Shorewards shift in erosional system
- Storms more intense
 - Regionally more frequent
- Corals and other living systems stressed

With climate change the rates and extent of coastal erosion will increase markedly



ICZM management implications

- Costs of coastal defence will greatly increase accordingly
- Highly unlikely that we will be able to sustain existing coastal defence policies
- Global move to use of adopt more cost-effective 'natural' soft coastal defence systems
 - Will raise big questions about which parts of the coast to proactively defend
 - Will afford benefits for coastal flood protection



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HARD
rock coast

Coastal types

SOFT
sediment coast



North-western UK

Localised dynamics

Local management

Less costly defence

South-eastern UK

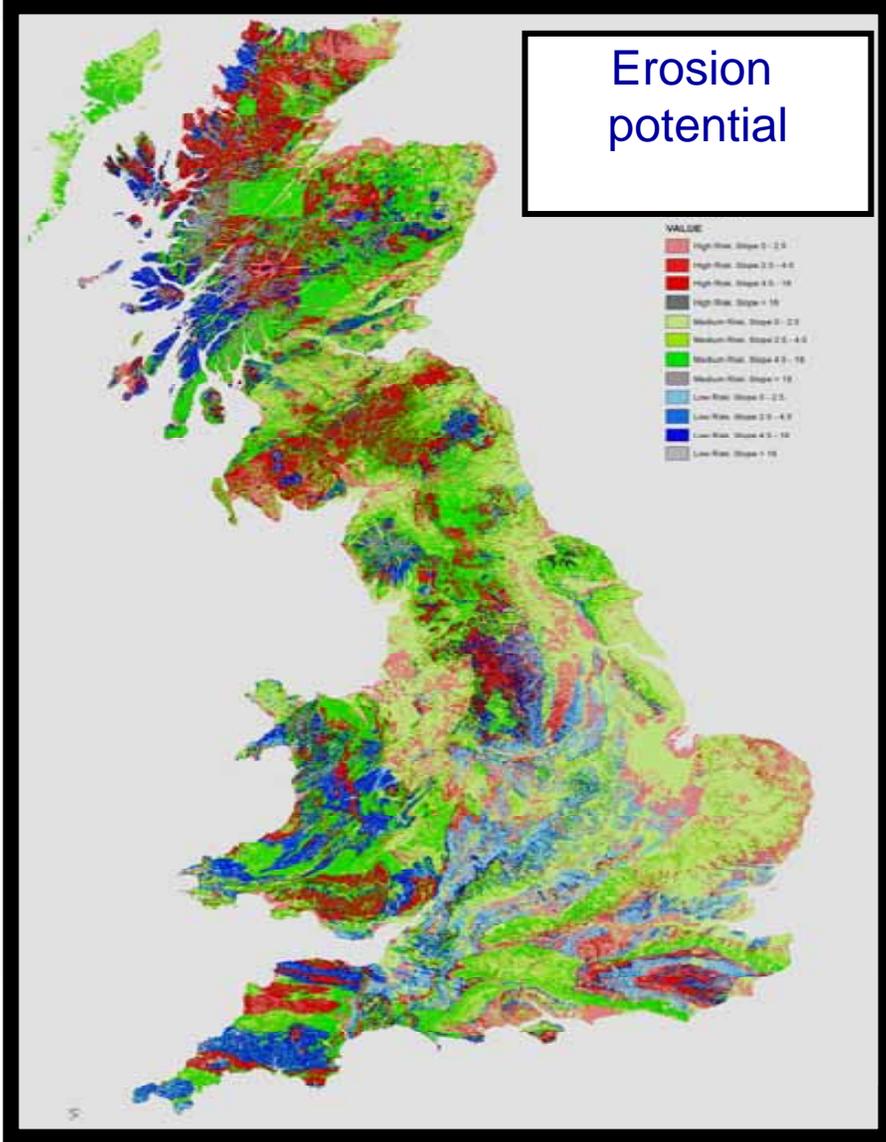
System-scale dynamics

Management - wide impacts

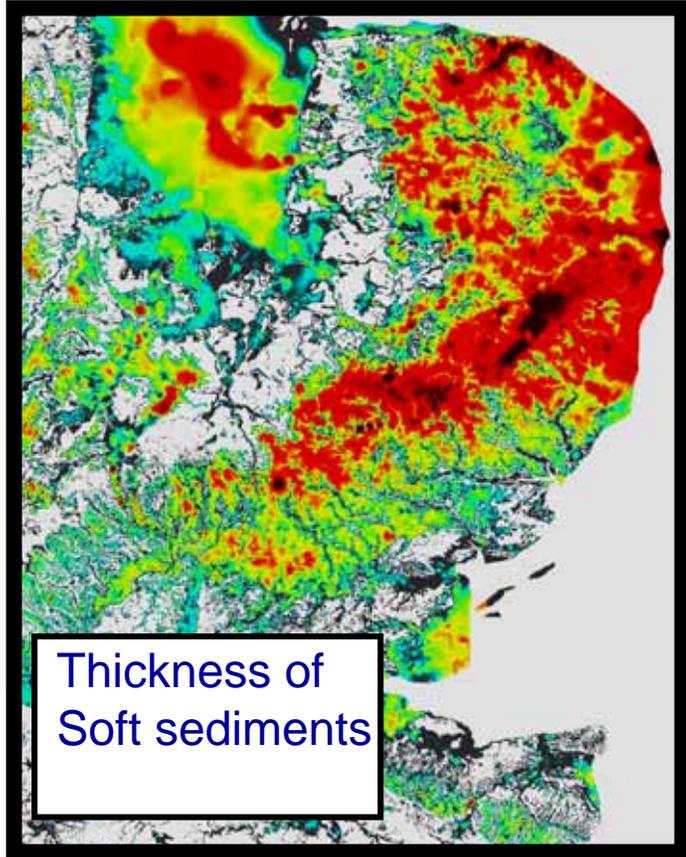
Engineered defence costly



Erosion potential



Focus on management of soft coasts

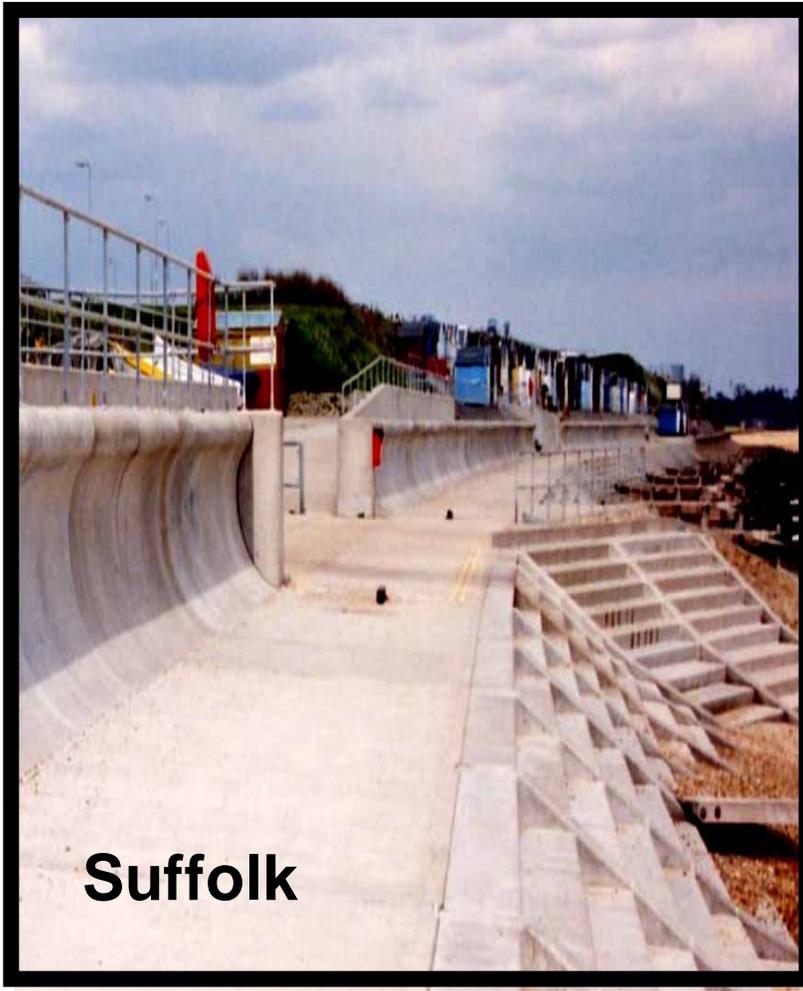


Thickness of Soft sediments

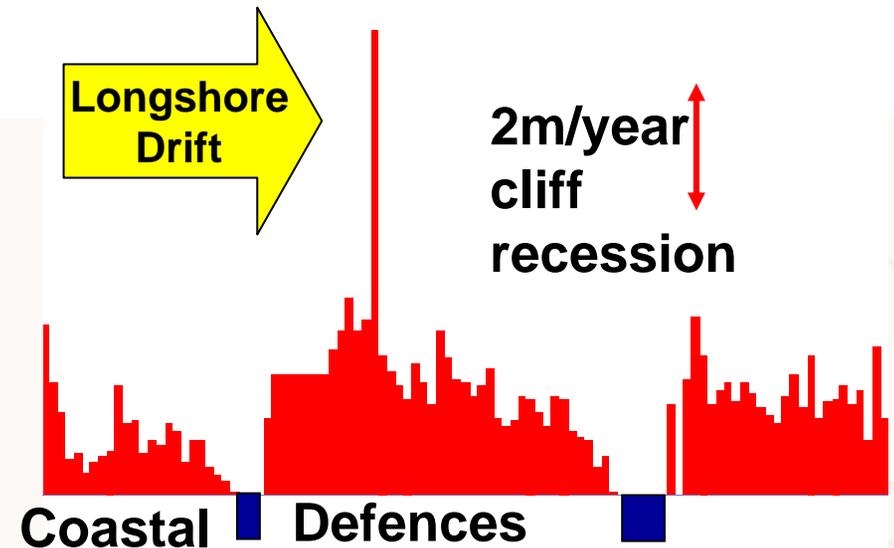


Hard defences

- Hard defences in one area accentuate erosion in others



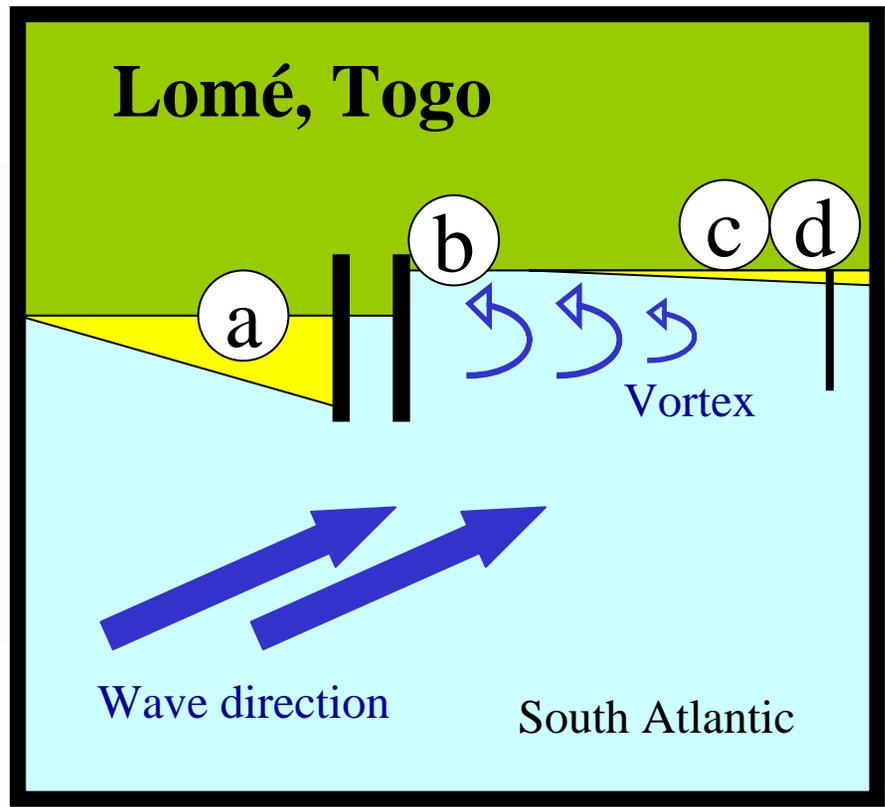
Suffolk



Enhanced coastal erosion rates downdrift of coastal defences, Yorkshire coast



Port structures





- Need for systems-scale management
- Which coastal infrastructure should be defended?
- Integration of process-social- and economic-models
- Need strong science to policy interface

Science to Policy



Lagos, Nigeria





Policy questions

- What are the real costs of hard defences?
- Should society pay to protect a few individuals?
- What infrastructure should be protected?
- How do we value coastal assets?
- Should we be placing a burden on future generations?
- How should we engage decision-makers?
- How do we demonstrate cost-benefit-analysis?

Role of scientists to provide costed-advice about options



Improving Scientific Advice

1: *Integrated physical, social and economic modelling*

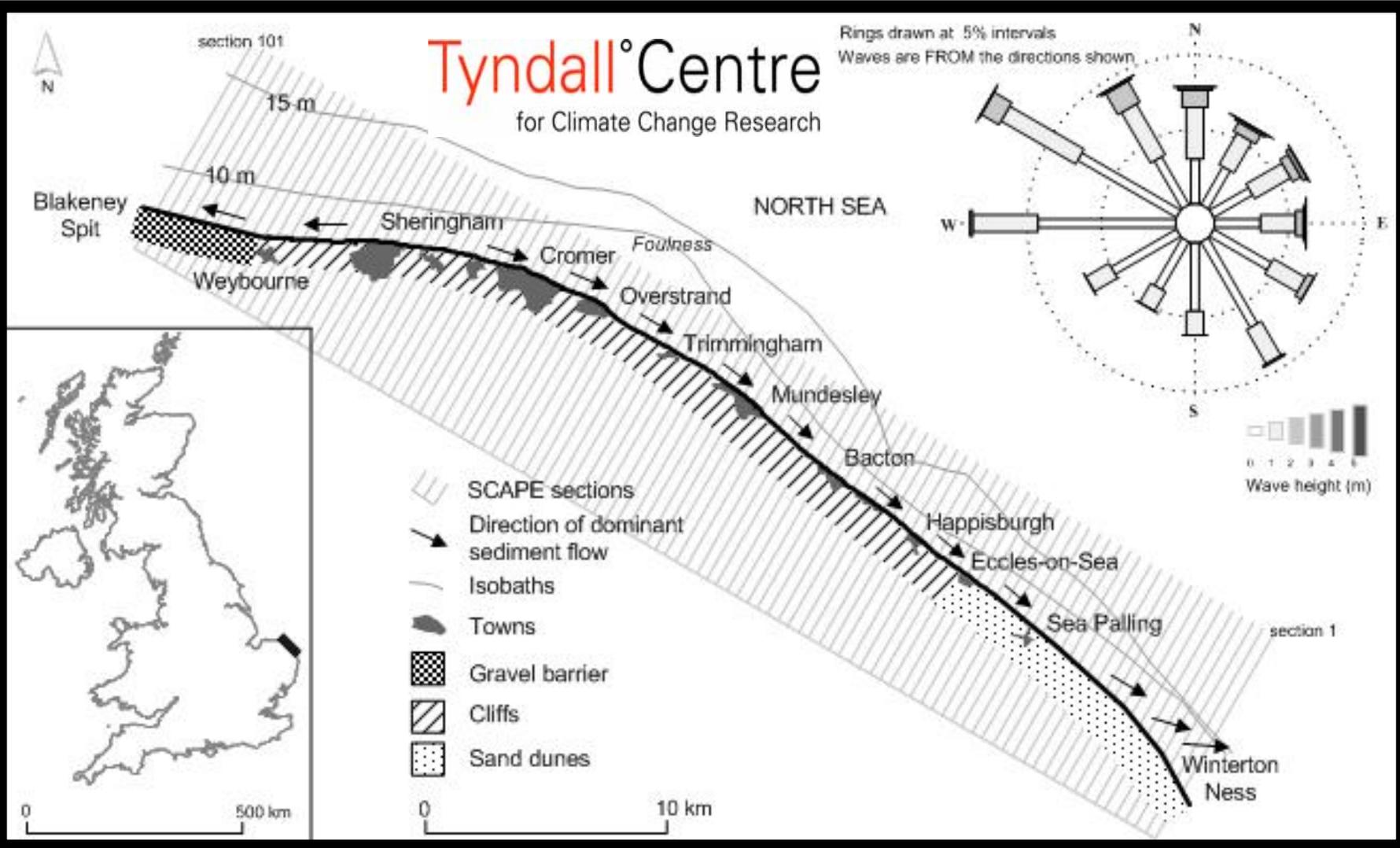


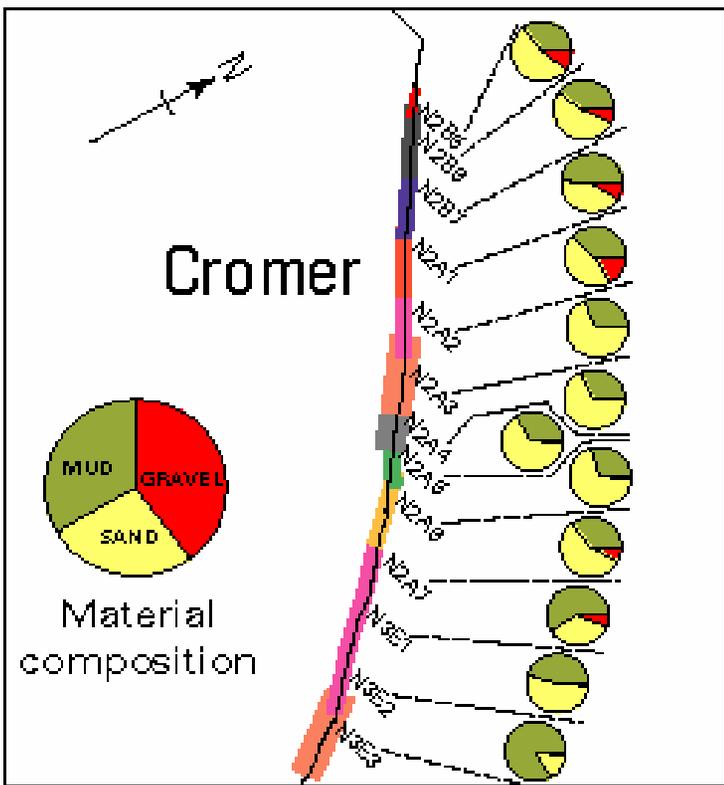
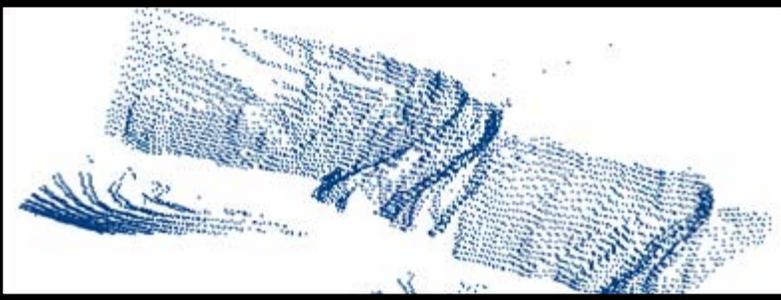
Thames Estuary

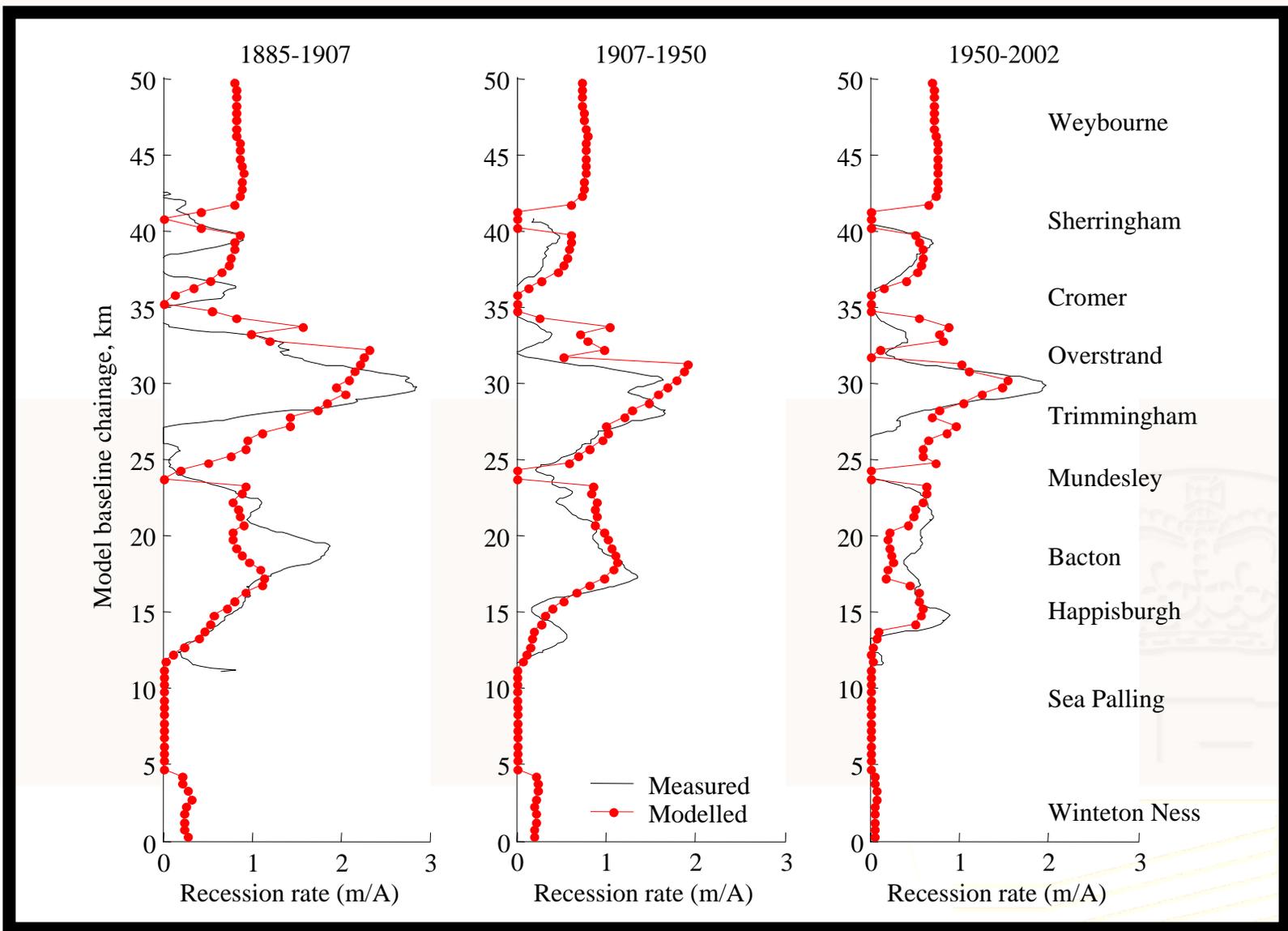


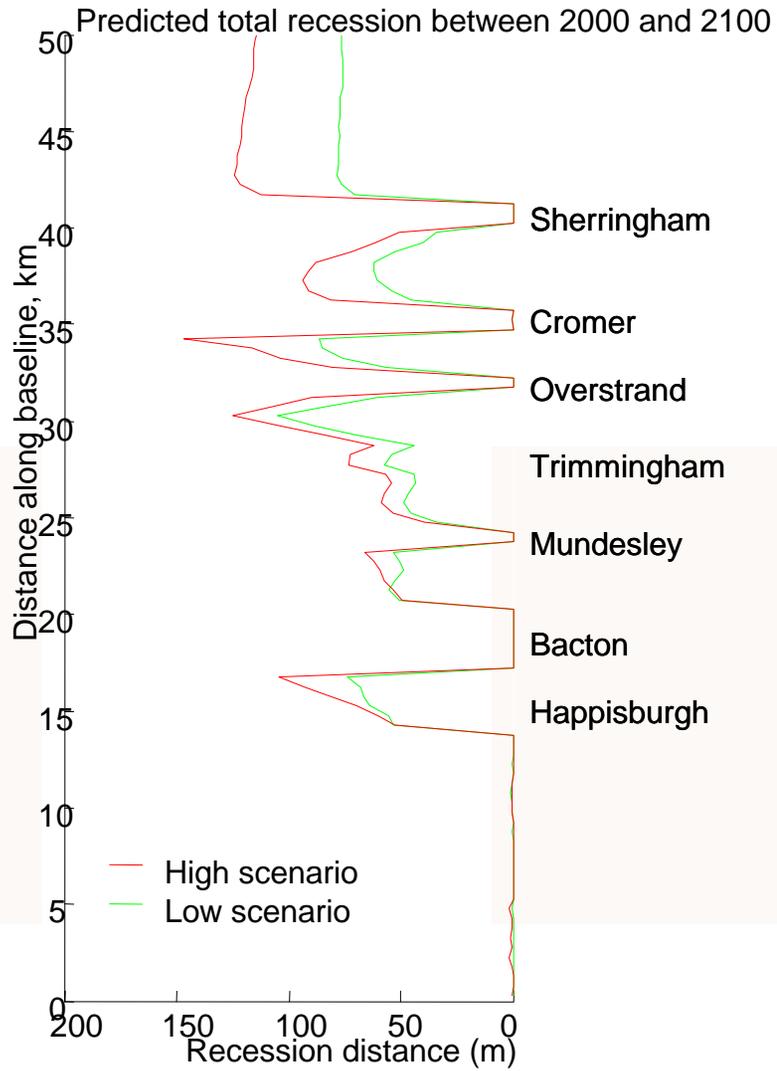
Tyndall Centre for Climate Change Research

Rings drawn at 5% intervals
Waves are FROM the directions shown







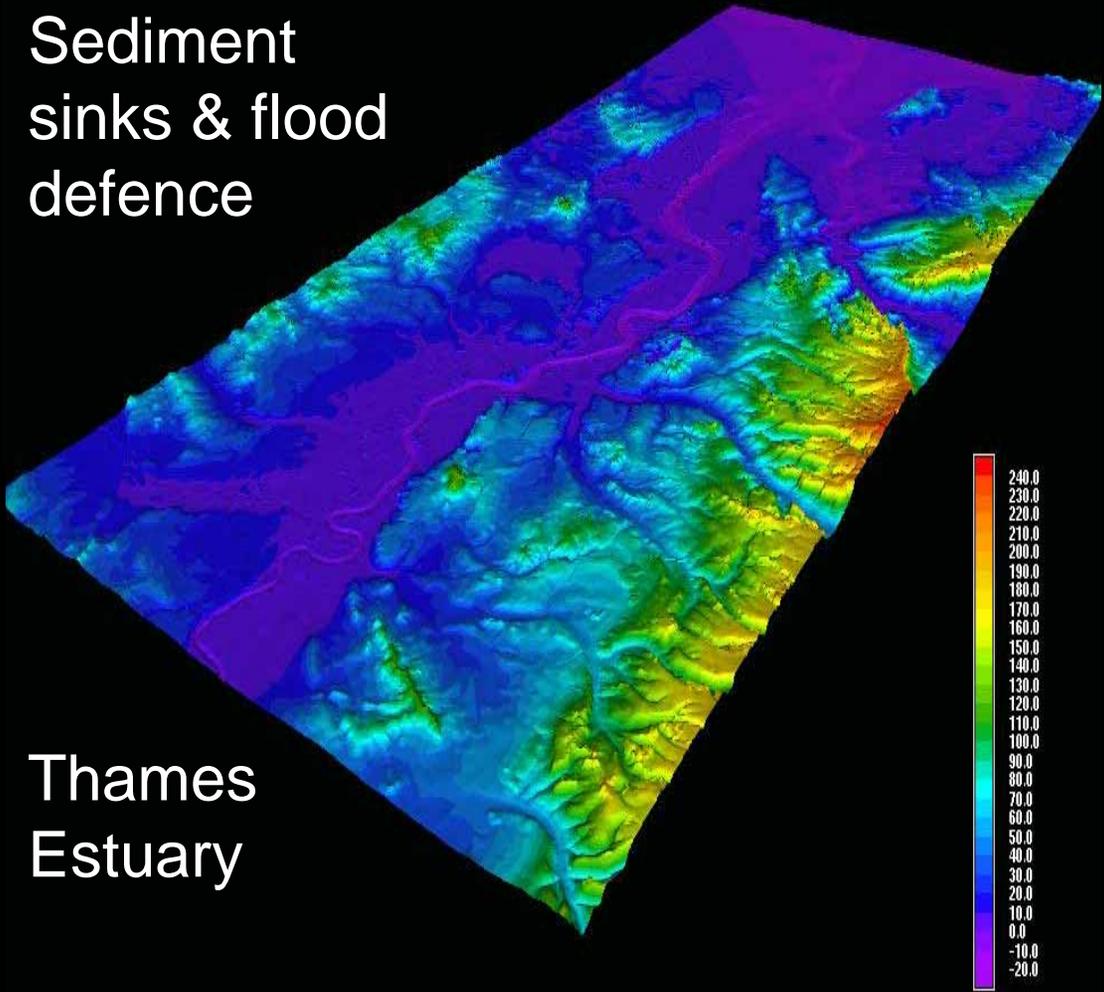




Sediment
sinks & flood
defence



Thames
Estuary



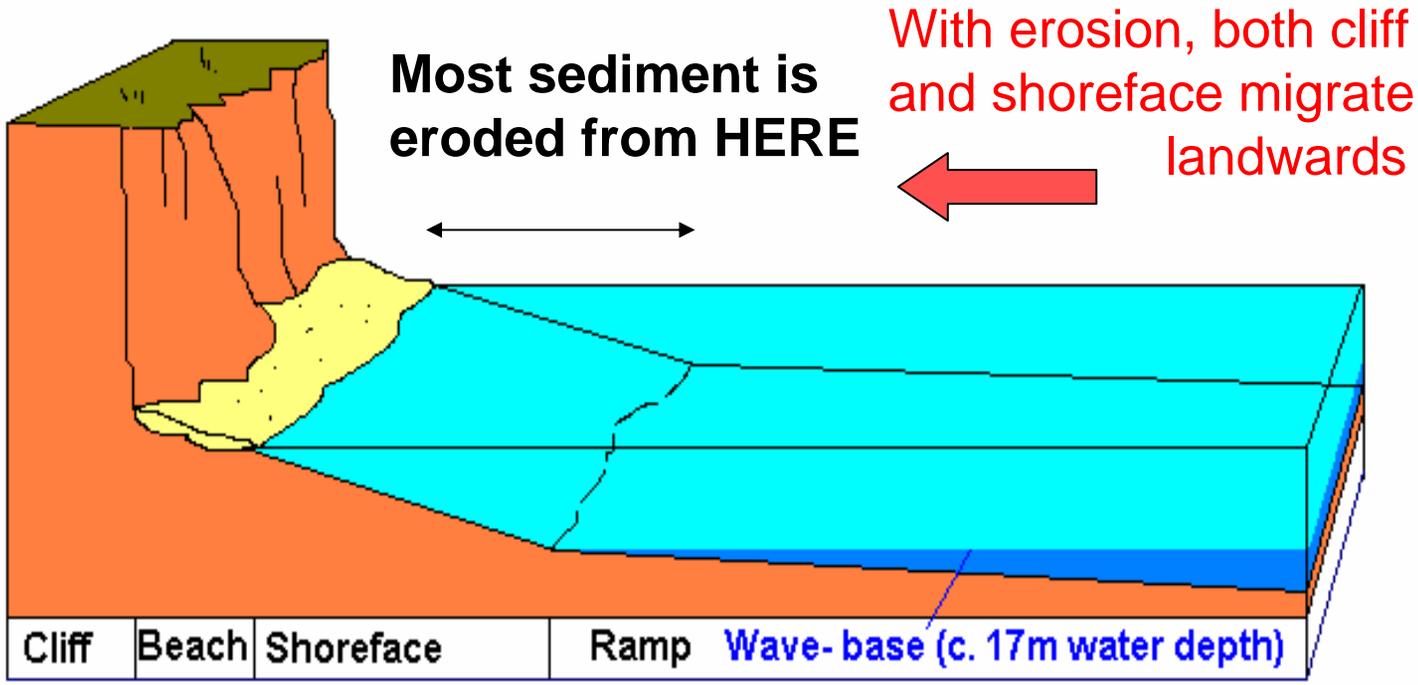


Improving Scientific Advice

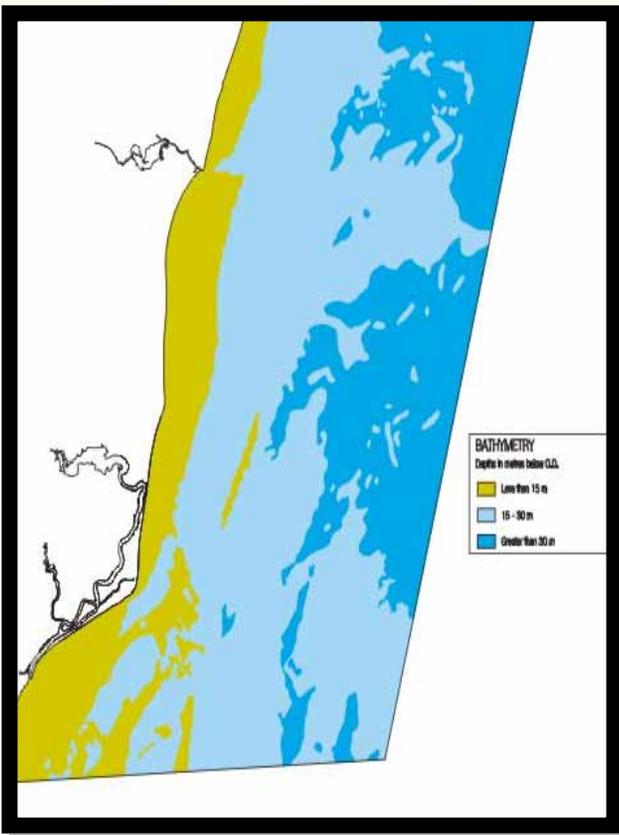
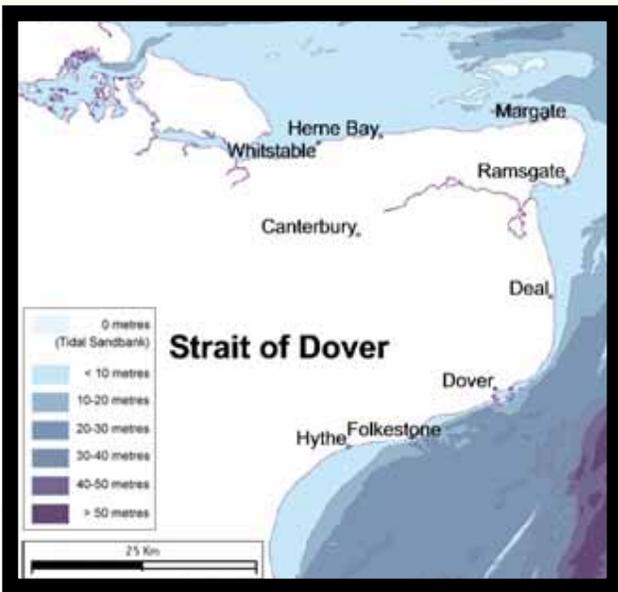
2: *Improved modelling of sediment transport in storms*



Yorkshire coast



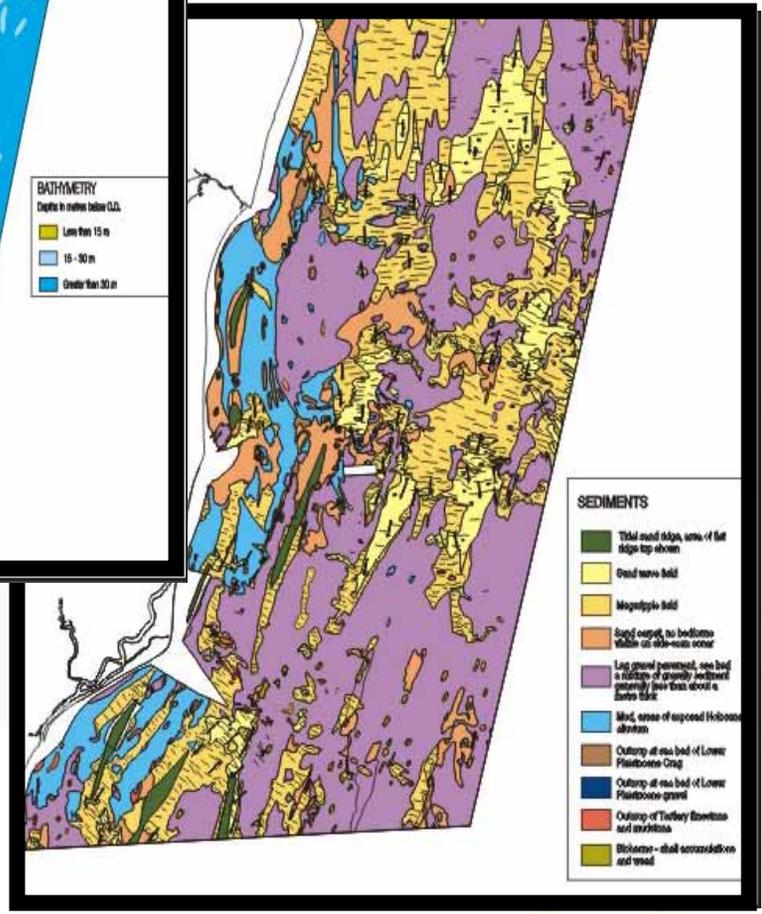
Most sediment is supplied, not from rivers, or cliffs, but erosion of the SHOREFACE, where wave-action scours the sea bed



Sea-bed sediment distributions

Offshore Sediment Supply

Bathymetry, Suffolk





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Questions ?



Suffolk coast