

# Coastline Management



*Photo: Environment Agency*



## The Suffolk Coast and Heaths

*- An Area of Outstanding Natural Beauty*

# Coastline Management

## Vulnerable Coastline

The coastline is very valuable for both economic and social reasons, but it is a varying environment, that naturally evolves through coastal erosion, accretion and flooding processes.

Since Roman times, people living on the coast have been reclaiming marginal coastal land to use for agriculture. The advent of seaside resorts increased the demand for development space along our coasts, and this demand continues to grow. Such development and change has up to now been accompanied by an expectation that the investment will be protected by coastal defences that have tried to resist natural processes. On the east coast of England, longshore drift and other processes that cause erosion and flooding have been happening for centuries. For example, over the past 400 years the coast at Dunwich has been eroding at an average rate of one metre per year. These natural processes are being exacerbated by the impact of climate change and sea level rise that continue to alter the coast and estuaries.

Along Suffolk's coast you can see cliff faces that have slumped, erosion of beaches, the loss of coastal land and flooding. It has therefore become essential to have coastal management plans to protect natural and man-made features, as well as human life.

There are two main aims to coastal management plans:

- To provide defence against water inundation
- To provide protection against coastal erosion.

Some forms of coastal defence are natural formations, some are man-made, and they can be combined. They fall into two broad groups: 'soft' and 'hard' defences.

## Soft defences

### *Salt marshes*

Salt marshes are the most natural of sea defences, dissipating wave energy, and significantly reducing the power of waves to erode. Where they extend in front of a man-made hard defence, they protect the vulnerable base from erosion. Drainage patterns develop on the marshes, and plants that colonise the marsh act as a buffer to waves and tidal currents, encouraging deposition of further sediment.



*Salt Marshes* ①

### *Shingle ridges*

A feature of the Suffolk coast, these ridges are natural high embankments of shingle, protecting areas behind the shoreline from the sea. They are porous and salt water will intrude behind the defence. Strong seas will move the ridges about and change their shape. Where they are relied upon as a defence and cannot naturally change position, the ridges require a significant amount of maintenance. The practicality of restoring damaged (re-profiling) shingle ridges depends on sufficient material being locally available or being 'shipped in'.



*Shingle ridge* ⑤

### *Beach nourishment*

High beach levels can be effective in defending the coastline. The larger the beach, the more wave energy is absorbed. However, due to the nature of sand, it can also be easily eroded. The beaches can be reinforced with quantities of sand that are dredged from the



*Foreshore recharge* ②

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seabed and pumped onto the beach. This is often done in the spring after the winter storms and before the tourist season starts. In a strongly eroding environment it may be necessary to undertake nourishment on an annual basis.

**Other natural defences include** – mudflats and sand flats (bare areas un-colonised by plants and therefore less effective at trapping more sediment) and sand dunes on the shore.

## Hard defences

### *Sea walls*

These are usually built from steel or concrete and protect against storm waves by reflecting wave energy. They are very expensive and are normally only found in towns or harbours where there are lots of properties or special assets to protect. Storm waves can be very powerful, and defences do get damaged. A wide beach or salt marsh in front of a sea wall will absorb some of the wave energy and make the walls more effective.

### *Groynes*

Wooden walls built out over the beach at right angles to the land. They primarily stop material moving along the coast by long shore drift. This helps to slow the erosion process by building up the beach level on one side of the groyne.

### *Rock armour*

Large rocks placed on beaches to break up waves, making them less powerful, stopping them from damaging sea defences behind. The local soft rocks of the Suffolk coast are not suitable for this purpose, so rock armour is imported from distant sources, such as Norway.

### *Offshore breakwaters*

These are artificial reefs normally made of large rocks bundled together parallel to the shore but some way out to sea. The reefs reduce the power of the waves reaching the shore, enabling a wider beach to develop behind, and lessening the wave impact on the shore.

### *Revetments*

Structures close to or in contact with the land behind, designed to absorb more than reflect wave energy and to protect the cliff base from wave action. Most revetments are not completely solid, but allow water to pass and, in losing some of its energy, deposit materials rather than erode. They may be of timber or block work with a steel framework containing concrete or rock material.

### *Gabions*

These are wire mesh baskets containing rocks, packed together to create a defence. Their flexible structure means they absorb wave energy well and they are permeable to the water. They are relatively inexpensive, but not especially long-lived since the mesh can break down and allow the filling to escape.



*Mudflats* ③



*Sea wall* ④



*Groynes* ④



*Rock armour* ④



*Concrete block revetment* ④



*Gabions* ④

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## Who is responsible for coastal management?

This is a complex subject with many bodies having some responsibility. Put simply, low lying land that is at risk of flooding from the sea is the responsibility of the Environment Agency, and higher land that might be eroded is the responsibility of the local authority. Individual landowners also have some rights and responsibilities. However, virtually all work needs some form of permission – either from government agencies or the local authority. Coast defence work is very expensive and little goes ahead without grant aid from the government's Department for Environment, Food and Rural Affairs (Defra). With limited funds, they operate a priority score system that determines which schemes provide the greatest value for money, therefore some schemes can be severely delayed or may not go ahead at all.

## What guides coastal management?

The main process for getting agreement about dealing with flood risk on the coast is through the production of Shoreline Management Plans. These relate to sections, or cells, of the coast: units that have similar processes affecting them. The Suffolk coast mainly falls within Cell 3c from Lowestoft Ness to Harwich. All the East Anglian estuaries have estuarine strategies in various stages of development that look at the options for flood risk management. They will also relate to the Shoreline Management Plan.

The Government's guidance for these strategic planning documents is to look at the short, medium and long term approaches (looking up to 100 years in advance) so that any proposed schemes are sustainable and cost effective bearing in mind predicted sea level change. Following the general guidance, specific plans and projects tackle issues on parts of the coast and seeking to gain all the relevant permissions.

Flood risk is generally measured in terms of protection for events that statistically occur every so many years. A simple level of protection would be to stop flooding/erosion from an event that might occur once every 10 years (a 1 in 10 year event). Most flood protection schemes are ideally planned for a 1 in 200 year event protection. The conditions that produce such a flood event might occur more frequently than predicted – they could occur tomorrow, or not for many hundreds of years, but it is a common baseline.

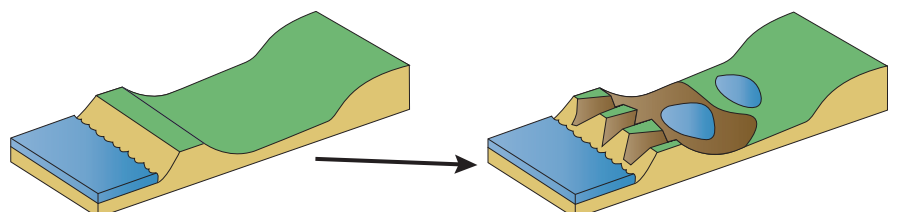
## What are the main options for Coastal Management?

When considering what can be done to manage a dynamic coastline, the range of general options is limited to the following.

### 1 – *No active intervention*

Stopping all maintenance, repair and renewal work. Over time the defences are likely to fail, and slowly the coastline would return to its naturally balanced form. A similar long term effect would come from just limited intervention even if the predictability of the changes might be improved. However, this option has significant drawbacks:

- Land and property (some of it of historic importance) will be lost to the sea and there is no form of compensation to the individuals involved.
- The uncertainty as to when or where defences will be breached creates significant impacts on individuals and communities involved.

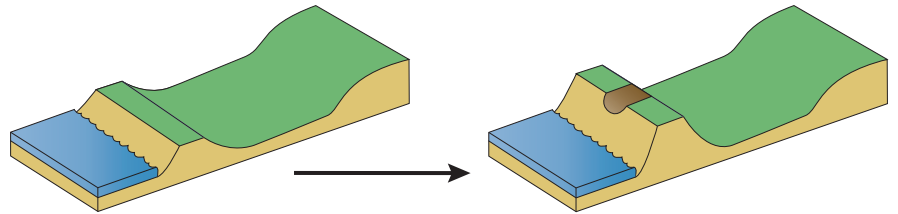


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## 2 – Hold the line of current defences

Existing defences would continue to be maintained but because of the increasing sea levels and storminess, this is likely to mean the defences will need to be improved

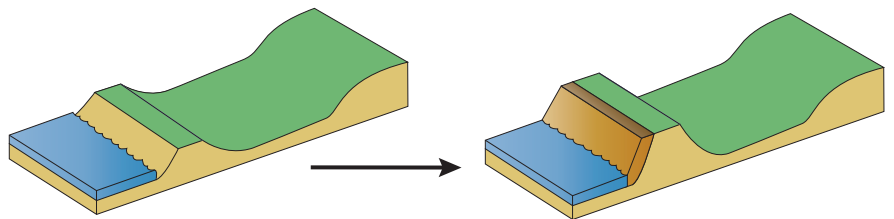
over time if they are to provide the same level of protection. On the Suffolk coast, this may mean raising the level of walls, extending their length, or strengthening. Improving the defences is particularly difficult on the estuarine sea walls as often they are only clay and earth banks with no real foundations. They have been added to in small steps over decades or centuries and are now reaching their limits of stability. Many will sink and slump if more material is piled on top and machinery may be too heavy for the ground conditions.



Defences act as a firm line, so areas of salt marsh which form and are maintained at specific heights above tide levels can't retreat up the shore as sea level rises. This leads to erosion from the front edge of the salt marsh and therefore a loss of habitat and its contribution towards protecting hard defences diminishes.

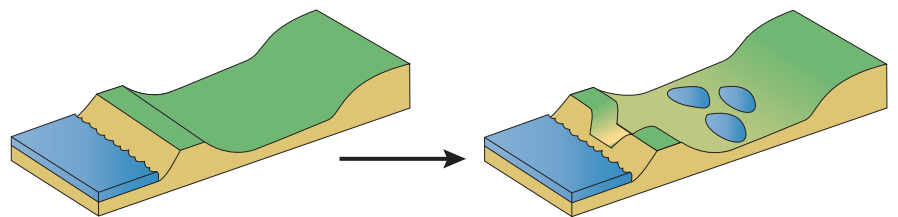
## 3 – Advance the defences

Building new flood defences in front of existing flood defences. An example would be putting in a barrier of some sort (perhaps lock gates) across an estuary meaning the upstream defences do not get a battering from the sea. Whilst technically possible the pressures from existing erosion and predicted sea level rise makes this unlikely option for the Suffolk coastline.



## 4 - Coastal realignment

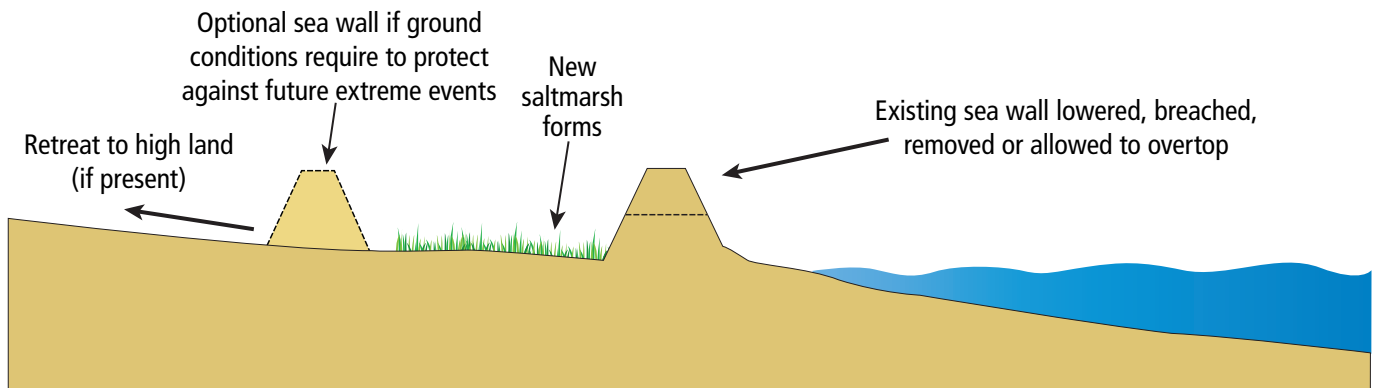
Realignment involves the partial or complete removal of a stretch of flood defence to either use higher land as the stopping point or create a new sea defence further inland. This not only relieves pressure from the sea on other defences but can also allow salt marshes or saline wetland to develop on land previously protected by the original sea wall. This helps to dissipate wave energy and create new habitat.



Schemes can be designed to bring other recreational and social benefits as well as the wildlife and defensive benefits. Highly successful examples of large schemes can be seen for example at Wallasea Island (Essex) and on several sites on the Humber. A smaller scale but equally successful example can be seen at Trimley Marshes on the Orwell. These schemes are only appropriate in specific locations and conditions, but allow a planned approach to designing a new coast line.

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## Coastal realignment



## Innovation in defence

There is growing interest in finding new ways to deal with the threat from sea that are cheaper or less intrusive. One example of innovation can be seen at a small scale at Dunwich.

An experimental beach stabilisation project designed to reduce the severe cliff erosion is being carried out in a joint partnership between Suffolk District Council, Dunwich Parish Meeting and the Environment Agency. A series of sand and shingle humps have been created along the beach at right angles to the shore, with the intention of reducing beach erosion. Completed in Spring 2007, this trial will be monitored to assess its effects.

## Integrated Coastal Zone Management (ICZM)

One way to tackle the complex challenges of the coastal zone is to take a more integrated approach. ICZM looks at flood risk as just one component of the overall management of the coast. In that way projects can develop that will not only bring improved flood risk management but perhaps also bring wildlife, recreational, social and economic benefits. The change to the coast or estuary is not seen as a 'loss' but brings positive gains – perhaps by using a realignment scheme to create new moorings, fish nursery areas, footpaths and habitat improvements from which wildlife and people can benefit.

New community discussion and decision making processes need to evolve to tackle these complex projects. The coastline, lying between land and sea, has many different legislation and decision making processes that will have to be brought together, along with experience and expertise from a wide range of disciplines. But it is likely to prove an important way forward for the coast.

Photo credits:

- ① Malcolm Farrow
- ② Simon Hooton
- ③ Bill Parker
- ④ Environment Agency
- ⑤ Fran Crowe



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