Geofile Online
JANUARY 2006
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COASTAL MANAGEMENT CASE STUDY – THE CUCKMERE (DME)

The English coastline is approximately 3,000 km long, of which nearly two-thirds has artificial defences to protect against coastal erosion or flooding. The shingle ridge at the Cuckmere estuary in East Sussex is one example. Considering the number and size of urban areas and industries around the coast, all contributing to the nation's GDP, it is clear how important the coastal zone is and why coastal defence is necessary. Nearly one million jobs are supported by the coastal economy and tourism is an important activity for regenerating English seaside towns. As coastal settlements have grown due to their economic and aesthetic advantages, more areas are being developed within flood risk zones, with associated costs of repair or mitigation of flood damage (Figure 1).

Figure 1: National flood risk and costs

River and coastal flooding in:	Properties at risk	Average annual damage (£ million)	Flood management costs 2003–04 (£ million)
England and Wales	1,740,000	1,040	439
Scotland	180,000	32 (fluvial only)	14
N. Ireland	45,000	16 (fluvial only)	11
Total (rounded)	1,965,000	1,100	465

Source: Foresight Future Flooding, Appendix 10, DTI April 2004

Figure 2: Cost benefit analysis of managed realignment schemes between Beachy Head and Selsey Bill

		Losses due to coastal erosion (nos. of properties)			At risk of coastal flooding
	Year	2025	2055	2105	2105
Managed realignment	Residential	15	20–30	65–70	Not avail.
	Commercial	1	Not avail.	10	Not avail.
If no money was spent on coastal defence	Residential	16	900	>2,500	19,000
	Commercial	10	180	790	3,700

Source: Beachy Head to Selsey Bill SMP First Review Consultation Draft Jan 2005

Sea defence methods

Traditionally, hard engineering has been used, but today the benefits of adaptive management are being appreciated, in terms of both environment and cost. Adaptive management includes:

- beach nourishment
- managed realignment.

You will be asked to consider the value of these to the Cuckmere area in the DME at the end of this **Geofile**.

Shoreline Management Plans

Every stretch of coast has a Shoreline Management Plan (SMP – Figure 3). SMPs provide

> 'an objective large-scale assessment of the risks to people and the developed, historic and natural environment, resulting from the evolution of the coast. It goes on to present a policy framework that does not tie future generations to costly and unsustainable activities. In the setting of policy it attempts to balance all of the sometimes conflicting interests at the coast in a sustainable manner.'
>
> (Defra, 2004; Figure 6.)

The subsections of coast are defined by sources and sinks of material and cells of sediment movement.

SMPs set out long-term objectives that are:

- technically sustainable
- environmentally acceptable
- economically viable.

SMPs are used to help coastal managers plan into the 22nd century, but because many changes will inevitably occur in this time span, the plans have to be used flexibly and all participants need to agree that SMPs may have to be altered in the light of new circumstances, such as housing development or political and social attitudes. Figure 4 shows how the SMP for the Cuckmere Haven sediment unit has been devised for this century.

East Sussex coastal issues

1. Multiple land use and land ownership

In the coastal zone between Beachy Head and Selsey Bill there is a great natural diversity of chalk cliffs and low-lying plains with important river estuaries, beaches and sand dunes. Much of the coastal strip is agricultural land but there are also important cities and towns, such as Brighton, Newhaven and Shoreham. Tourism is crucial to the regional economy. It is important to integrate and manage competing pressures, made all the more difficult by the multiplicity of ownership and administrative boundaries which do not necessarily match with natural systems. Figure 5 shows the range of land ownership and management responsibilities around Cuckmere Haven.

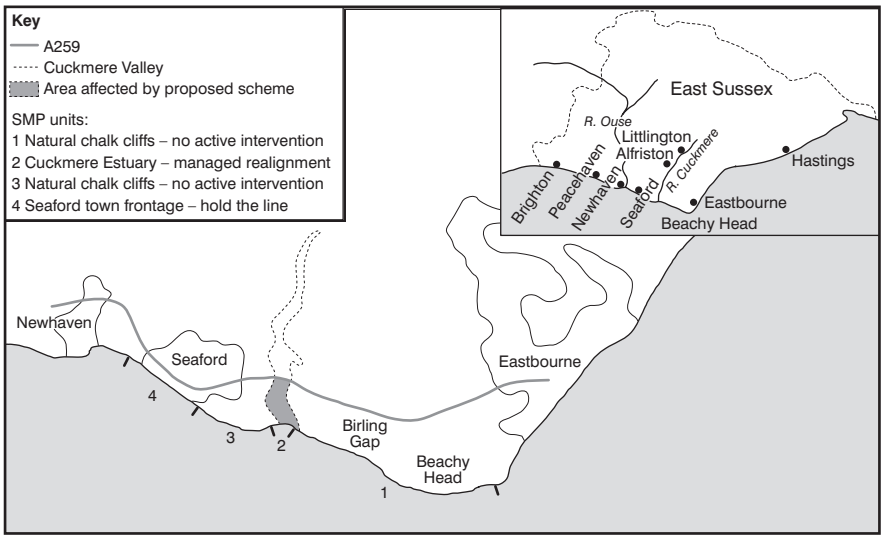
2. Rising sea levels

Sea levels rose rapidly after the last Ice Age and stabilised at about their present levels approximately 5,000 years ago. However, in recent years the rate of rise has accelerated and relative sea level (accounting also for isostatic submergence) is predicted to be 26–86 cm above current levels by 2080 (UKCIP, 2002). This will have the impact not only of the coastline moving inland, but also more energy will deepen the seabed, producing steeper and narrower beaches and making them less effective as natural coastal defences. Another factor of climate change along this coastal stretch is an increased probability of extreme annual flood events, which are predicted to rise from 2% to 33% by 2080.

3. Sediment supply

Shingle beaches are highly dynamic features and have played a vital part in the natural protection of the coastline. Much of the material that forms today's

Figure 3: Location map of Cuckmere Haven and local SMP units



shingle beaches is thought to have originated offshore, deposited by fluvio-glacial rivers during the Ice Age when sea level was 100–120 metres lower and further offshore. This source is now much reduced and so onshore transport is negligible. This, combined with human management to the west restricting replenishment of sediment supplies via cliff falls, means that the beaches are in decline.

4. Saltmarsh and mudflat habitats
The Cuckmere estuary has a tidal effect well inland and so the sheltered conditions are ideal for the formation of saltmarsh and mudflats. The high organic content of the sediments means that they attract vast numbers of birds and a wide range of species. Saltmarsh is a very diverse habitat and plays an important role in coastal flood defence, because it dissipates the wave energy of stormy seas. Saltmarsh is dependent on intertidal mudflats because water picks up fine sediment and deposits it on the marshland behind, therefore allowing the saltmarsh to keep pace with sea level rise. Artificial defences behind saltmarshes are causing coastal 'squeeze', where the habitat cannot naturally move back in pace with rising sea levels and where the seaward edge is eroded by waves.

Saltmarsh can also be lost during construction projects, which by law (EU Habitats Directive) has to be compensated for by creating a similar habitat elsewhere, and the proposed Cuckmere Restoration Project would provide opportunities for new saltmarsh creation. As suitable locations are limited, this legal requirement has the effect of increasing the market value of existing saltmarsh.

Why coastal management of the Cuckmere Estuary must change

As a consequence of the steeper and narrower beaches now being produced, coastal defences if maintained as at present:

Figure 4: 100-year plan for the management of Cuckmere Haven

Time Period	Management Activities	Property, Built Assets & Land Use	Landscape	Nature Conservation	Historic Environment	Amenity & Recreational Use
2005	Defences will be maintained in the immediate term (for possibly the next 5 years), after which they will be allowed to fail. Natural processes will resume.	No loss of property, land or infrastructure behind the existing defences in the immediate term. There is a risk of property loss towards the end of this period.	Change to the character of the river valley, but the Sussex Downs coastal landscape will not change. Some agricultural land loss.	Geological and biological assets maintained through policy of no defences.	Loss of both coastal and inshore heritage sites.	Amenity beach preserved, although the coastal footpath and the fishery will be lost.
2025–2055	Cuckmere Haven will form a free-functioning system.	Loss of property, land (around 150 ha) and infrastructure as the existing defences fail.	Change to the character of the river valley, but the Sussex Downs coastal landscape will not change. Some agricultural land loss	Intertidal habitats encouraged to grow and regenerate.	Loss of both coastal and inshore heritage sites.	Loss of existing beach access.
2055–2105	Cuckmere Haven will form a self-sustaining system.	No other loss of property, land or infrastructure, although a further 5ha of agricultural land could be lost by 2105.	Change to the character of the river valley, but the Sussex Downs coastal landscape will not change. Some agricultural land loss	Intertidal habitats encouraged to grow and regenerate.	Loss of both coastal and inshore heritage sites.	Loss of existing beach access.

Source: Beachy Head to Selsey Bill SMP First Review Consultation Draft Jan 2005

Figure 5: Multiple users and managers around Cuckmere Haven

Environmental designations	Landowners	Managers
• SSSI within the Seaford Head Local Nature Reserve • Heritage Coast • Sussex Downs AONB • Seven Sisters Country Park • (proposed) South Downs National Park	• National Trust • Lewes District Council • East Sussex County Council • Private companies • Private householders	• Environment Agency • National Trust • English Nature/Natural England • South Downs Conservation Board
Key stakeholders in development of SMP		
• Sussex Wildlife Trust • RSPB • National Farmers Union • Railtrack	• South Downs Conservation Board • National Trust • Royal Yachting Association • Brighton Marina Estate Management	• Sussex Sea Fisheries Comm. • English Heritage • Sussex Association of Local Councils

- will have to be much wider so that they are stable against higher waves
- will need foundations to be deeper because the beaches are lower due to less material
- sea walls will need to be higher to prevent overtopping during larger and more frequent storms.

The rate of change in processes may make current types of engineering technically unsustainable and the cost would certainly encourage coastal managers to look for alternative solutions, including relocation. Cost-benefit analyses (Figure 2) of particular stretches of coast and properties will be very important as it has been predicted that during the next 100 years, costs of providing coastal defences will increase to between £6-10 million per kilometre. Taxpayers are likely to demand a greater prioritisation of expenditure, especially if there are proven successful cheaper options such as moving property and activities out of lowlying areas. Clearly this is not feasible for major towns and cities which will continue to need hard defences, but more rural situations will increasingly face questions of relocation as the most sustainable form of coastal management.

The Cuckmere Restoration Project

Because so much of the south-east coast is highly developed, it is not feasible to abandon defences and allow the coast to function naturally – the socio-economic costs would be unacceptable. Existing defences along the Cuckmere estuary are deteriorating and repairing them to meet projected increases in sea level and flood risk will be both too costly (£1.2 million) and unsightly. An opportunity for a long-term reversal to natural processes exists at Cuckmere Haven as it is a rural area with few properties and little infrastructure will be affected. Changes to the valley are summarised in Figure 6.

The original project was not only to allow the coastline to come inland but to restore natural river processes as well. In 1846 the valley was drained for agricultural purposes and the current meanders are not functioning – the main river flows directly along an artificial channel and the meanders are in danger of silting up. The tide does not come upriver as far as it naturally should, due to a shingle barrier built across the estuary in the last century. Removing this barrier would be part of the future project, leading to a restoration of estuarine wetland. Two phases were planned (Figure 7).

Refinement of the Cuckmere Restoration Project

Further monitoring and understanding of the processes operating in the Cuckmere Valley have led the Environment Agency to propose that the whole scheme needs to be implemented in one go, rather than in phases. The reasons for this are:

- More accurate measurements have shown that the volume of water travelling through the flooded (restored) western region will be far greater than originally thought.
- This increase in velocity and discharge of water in the channel would erode the remaining defences of the eastern section well before their planned removal and restoration
- It would not be cost effective to build temporary defences as the long-term objective is for the sustainable restoration of the whole valley.

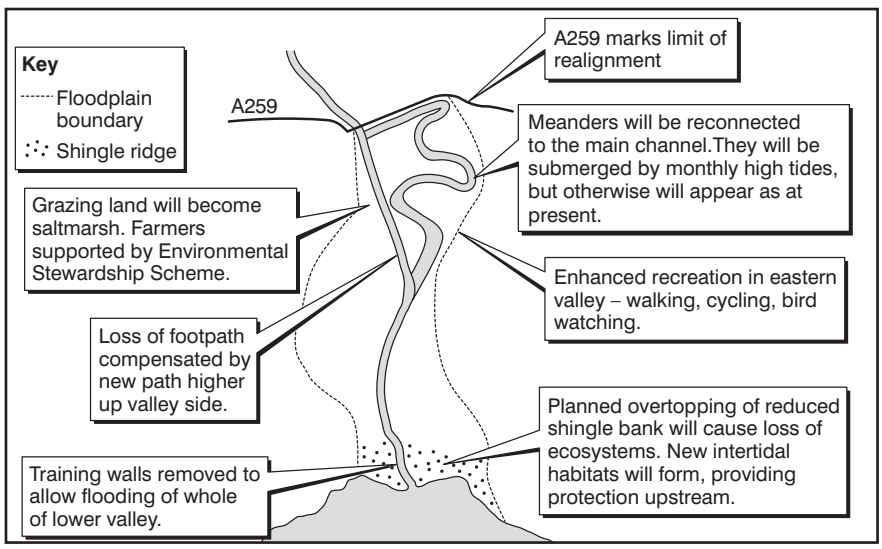
It is feared that increased wave energy will draw beach material up into the fluvial system. Therefore it has been proposed to bring forward work on the eastern side of the valley so as to negate the need for short-term expenditure.

Opposition to the Cuckmere Restoration Project

Local residents and businesses opposed to the Environment Agency's plans have formed a protest group. Their arguments against the proposal are summarised below:

- It will lead to the collapse of the sea wall which protects the Coastguard Cottages, endangering their future.
- There will be many years of mud

Figure 6: Changes in the Cuckmere Valley due to managed realignment



until salt marsh develops and this will only occur at the fringes, leaving vast areas of unattractive mud flats.
- Flood risk could be increased for villages such as Alfriston and Littlington.
- The A259 (main South Coast route) would also be at greater risk of flooding and could be undermined by the meanders.
- Removal of habitat for the many creatures including badgers that inhabit the valley.
- Loss of the beach to the east of the river once the river reverts to its original course next to the Seven Sisters.
- Loss of popular riverside footpaths.

People's reactions to the proposed realignment are varied, as seen in Figure 8.

Figure 7: Proposed managed realignment at Cuckmere Haven

Phase 1

Action
- Breaching of defences in the west.

Consequences
- Flooding of 113 ha of grassland, leading to some agricultural land loss.
- Natural processes will resume.
- Inter-tidal habitats (mudflats and saltmarsh) to develop on the floodplain, which could attract redshanks, ruffs and oystercatchers.
- Character of river valley will alter as types of ecosystems will change, but overall the biodiversity will increase by active conservation practices.
- Coastal landscape remains – recreational beach maintained.
- Loss of coastal footpath and the fishery.

Phase 2

Action
- Eastern floodplain flooded.
- Meanders reconnected to the channel upstream.
- Defences removed at the river mouth.

Consequences
- Natural river system will form a self-sustaining system.
- A saving of £30,000 a year on maintenance.
- Great increase in the ecological status of the area south of the A259, especially inter-tidal habitats.
- Natural tidal scour would manage the shingle, instead of annual dredging costs to keep the estuary open and prevent flooding upstream.
- Loss of property, agricultural land and infrastructure.
- Loss of existing access to beach.

Source: Adapted from Beachy Head to Selsey Bill SMP first review Consultation Draft Jan 2005

Decision Making Exercise

1. Draw an annotated sketch map, based on Figure 6, to show the advantages of the current management system.

2. Using the information in this **Geofile**, the websites suggested, and any other up to date information you can gather, summarise the proposed changes in the coastal defences of the Cuckmere estuary and its immediate surroundings.

3. Produce either an overlay for your sketch map (question 1 above), or draw a second similar sketch map, to highlight the changes that would occur to today's environment in the lower Cuckmere Valley as a result of the proposed coastal management changes.

4. Explain why people hold such strongly opposing views on the issue of managed realignment. Refer in particular to Figure 8.

5. **You decide!** You are a member of the local planning committee for the Cuckmere Valley area and are responsible for deciding whether the proposed changes should go ahead or not. Should the river barrier be removed? Should the coastal defences be altered? Should agricultural land be lost, along with recreational facilities (footpaths, etc.), and the land allowed to revert to wetland?

6. Why do coasts need space? Discuss.

Bibliography

Making Space for Water
www.defra.gov.uk
Beachy Head to Selsey Bill Shoreline Management Plan Consultation Draft Jan 2005.
Foresight Future flooding
www.environment-agency.gov.uk
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Figure 8: Opinions on the managed realignment scheme at Cuckmere Haven.

Nick Williams, *English Nature*	'Sustainable coastline management is essential and managed realignment is the preferred option for conservationists. We see it as inevitable but there is still a debate about where it should be practised. If we stopped repairing uneconomic hard engineering structures we would save taxpayers' money.'
Grace Francis, *resident*	'We deserve to be fully protected – no-one warned us when we bought the house this would happen. I don't know for how long we will be able to stay in this property.'
John Bennett, *Environment Agency*	'The coastline is dynamic and sustainable management requires us to work with natural processes. Current and future rates of sea level rise will increase the cost of coastal defence.'
Jenny Turner, *marine officer, Hampshire and Isle of Wight Wildlife Trust*	'The best option is to allow natural processes to operate along the coastline, without trying to permanently fix it by using hard engineering.'
David Pearce, *resident and retired*	'This is an iconic place, an essential part of Sussex's identity. I oppose this proposal.'
Colin King, *resident*	'Nearly half a million people visit the Cuckmere Valley each year. They marvel at the meandering river and will be disappointed to see mudflats. It is a most beautiful landscape, one which must be preserved for generations to come.'