

COASTAL MANAGEMENT WITHIN CHICHESTER HARBOUR

Coastal Management is the human intervention in response to both natural and human activities that threaten the coastal environment e.g. erosion, flooding, over development and pollution. Coastal Management aims to protect homes, businesses, and the natural environment because these threats can have severe social, economic and environmental impacts.

To manage a coastal landscape effectively, it is important to understand the coastal environment, the physical processes that impact on the coastline, possess knowledge of the local geology and the human use of the coastal landscape.

The Coastal Management of Chichester Harbour is an example of how complex this can be.

INTRODUCTION TO THE HARBOUR

Chichester Harbour is the largest natural estuary in the south east of England. It covers an area of 29 square miles, has 53 miles of shoreline, extensive saltmarshes and mudflats and is surrounded by farmland, villages, private residences, and woodland.

It was designated an Area of Outstanding Natural Beauty (AONB) in 1964, to recognise the national importance of its landscape. 43% of the AONB is fully submerged at high tide.

The Harbour provides a wealth of habitats for wildlife, in particular migratory and overwintering birds, for which it has the highest national and international levels of protection. 51% of the AONB is designated as Sites of Special Scientific Interest (SSSI).

The Harbour is also a very popular location for boating and is one of the largest recreational sailing harbours in the country. The sailing industry is an important part of the local economy.



Farmland



Village



Chichester Harbour



Woodland

COASTAL PROCESS IN THE HARBOUR

The shoreline of Chichester Harbour is dynamic. It is a constantly changing environment driven by marine coastal processes and weathering. Most of the Harbour is sheltered from the main force of the waves from the Solent, but erosion still occurs and can be unpredictable. There is clear evidence of erosion occurring along parts of the unprotected coastline in the Harbour, such as alongside Salterns Copse.

Tides, currents, and waves constantly transport sediment along the coastline and within the Harbour channels. As the water slows down, sediment is deposited, and depositional landforms develop. East Head and the 'Winner' sand bar at the entrance to the Harbour, together with Pilsea Island in the Thorney channel, are all examples of depositional landforms. Navigation can be restricted by the deposition of sediment in the deep-water channels.

(See Coastal Processes)

Rising sea levels generated by both eustatic and isostatic changes threaten the land around the Harbour. The impact of global warming and the gradual sinking of the south coast of England has led to predictions of 80-100cm increase in sea level by the end of this century. Flooding events around the Harbour are increasing, especially when a Spring high tide is combined with a storm surge. Both quays at Dell Quay and Emsworth have flooded during winter months and the use of flood barriers to protect buildings and property is becoming more prevalent.

Erosion besides Salterns Copse



Floodgate at Dell Quay



HARBOUR GEOLOGY

An awareness of the Geology of the Harbour helps to understand how coastal processes impact on its coastline. The rocks around the Harbour were formed from material deposited by rivers, the sea or wind millions of years ago. This type of rock is known as sedimentary rock. The type and hardness of the rock alters how erosional processes effect the coastline. Most of the rocks within the Harbour are either chalk or clay formations. These are soft rocks which are more vulnerable to erosion.

(see Harbour Geology)



Flooded quay at Emsworth



CHICHESTER
HARBOUR
CONSERVANCY

DISTINCTIVE LANDSCAPE AROUND THE HARBOUR

The geology combined with coastal processes have led to the formation of distinctive landscapes around the Harbour. For example:



Mudflats and saltmarsh have formed in the sheltered channels within the Harbour.

West Wittering has a wide sand and pebble beach with a large tidal range.

Rob Wiggins



These distinctive landscapes are also important because they are often endangered ecosystems that should be protected.



East Head is a sand and shingle spit located at the entrance to the Harbour.

Sand dunes have become established upon East Head.

Rob Wiggins



WHY DOES THE HARBOUR COASTLINE NEED TO BE MANAGED?

With increasing sea levels and greater threats of erosion and flooding, landowners wish to protect their land and property along the Harbour coastline, whether it be a private home, a business, farmland, or protected conservation area.

Within the Harbour, there are 5,069 dwellings. A total of 455 businesses, which are important employers within the area. 54% of the land around the Harbour is used for farming. Most of this land is highly fertile, making it very valuable for arable cropping and cereal growing. 51% of the AONB is designated SSSI sites indicating the importance and value for habitats and wildlife in these locations. There are 56.5 miles of Public Rights of Way which are enjoyed by thousands of visitors every year for exercise and well-being.

The land around the Harbour is therefore important to many people and increasing erosion and flooding could cause numerous social, economic, and environmental problems.

HOW IS THE HARBOUR COASTLINE CURRENTLY MANAGED?

Coastal Management is a complex task. The needs and views of all the different groups of people (stakeholders) who own, use, and have responsibility for coastal environments must be taken into consideration. There is rarely one correct answer for the numerous issues that arise as the shoreline keeps shifting. Managing the Harbour coastline requires co-operation amongst all the different stakeholders and this holistic approach is a prime example of Integrated Coastal Zone Management (ICZM). All elements of the Harbour are taken into consideration when determining a coastal management strategy; the land, the water, affected businesses, residents, recreational users and conservation areas. Local, regional and national levels of authority all have an input.

The Harbour Coastline is part of the North Solent Shoreline Management Plan produced in 2010. A Shoreline Management Plan (SMP) is a high-level, non-statutory, policy document setting out a framework for future management of the coastline and coastal defences. It promotes sustainable coastal management policies into the 22nd century for future generations to continue.

The North Solent SMP covers 386km of coastline between Selsey Bill and Hurst Spit and includes Chichester, Langstone and Portsmouth Harbours, Southampton Water and the tidal extent of the main rivers.

Under this SMP, the Chichester Harbour coastline is divided into 19 units and each unit has a recommended coastal management approach to cover the next 100 years. **(See: North Solent Shoreline Management Plan Summary Booklet).**

The main options are:

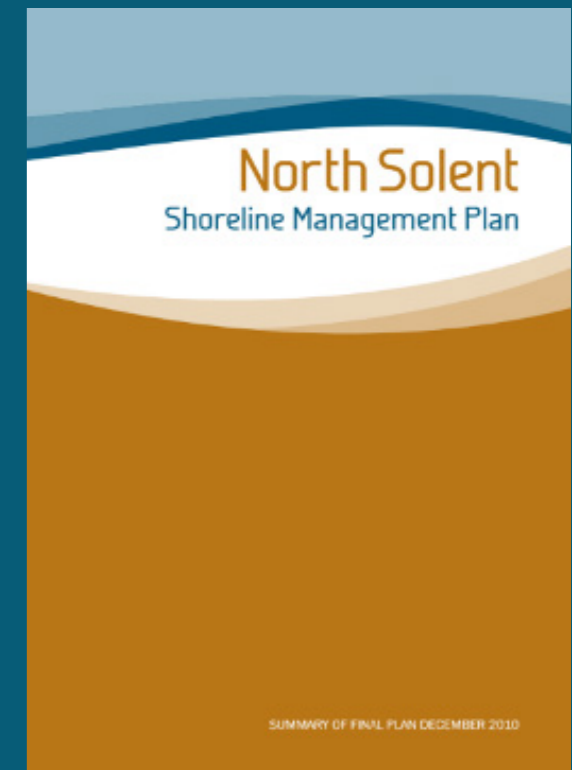
- Hold the Line (HTL): Maintain or upgrade the level of protection provided by existing coastal defences.
- Advance the Line (ATL): Build new defences seaward of the existing defence line.
- Managed Realignment (MR): Allowing the shoreline to move backwards or forwards, with management to control or limit movement.
- Adaptive Management (AM): A flexible strategy, working with natural processes but guiding the changes along the coastline as necessary to protect key areas.
- No Active Intervention (NAI): a decision not to invest in providing or maintaining any defences.

The recommended approach for much of the Harbour is 'Hold the Line' although funding may not be available to support this in all units. For the coastline along East Head and West Wittering 'Adaptive Management' has been agreed (see East Head: Coastal Management). Managed Re-alignment is a technique that is also used along some parts of the coastline and is extremely important to the AONB as it can encourage the evolution of new areas of saltmarsh. The reasons for this are explained further below in the section 'Coastal Squeeze'.

The construction of a new sea defence or the repair or removal of an existing sea defence within the Harbour, is tightly regulated by several policies and is not a straightforward process. The local planning authority, Marine Management Organisation, Environment Agency, Natural England and Chichester Harbour Conservancy all need to approve any construction activity before works can take place. These organisations assess the impact of any sea defence engineering works, including the risk of flooding or erosion along other parts of the coastline, potential harm to wildlife and conservation areas, and any interference to navigation or rights of way within the Harbour area.

Currently, of the 53 miles of shoreline, 38 miles are protected by a variety of hard sea defences.

The remaining shoreline is either natural and undefended, or soft engineering defences are employed.



HARD ENGINEERING DEFENCES

The hard defences used to protect the coastline within the Harbour include concrete walls, gabions, rock armour, revetments, timber planks and groynes. All of these have been constructed to reduce erosion and the risk of the land behind flooding.



Solid wall protecting property at Bosham



Rock armour protecting Chichester Yacht Club



Groynes at West Wittering Beach - Rob Wiggins



Concrete revetment at Nore Barn woods

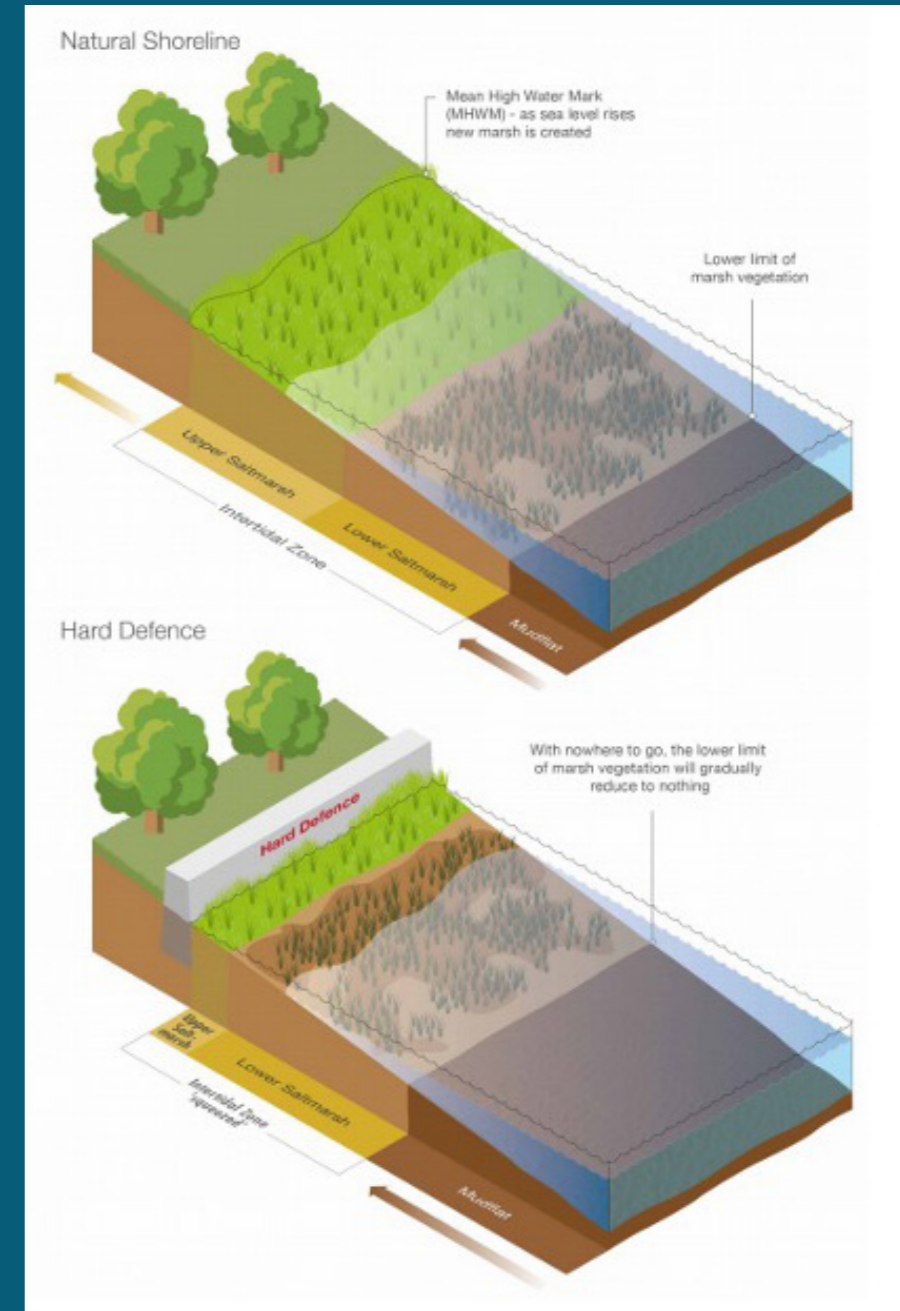


Gabions protecting farmland

All hard sea defences are in a fixed position and are inflexible. They are designed to resist the sea and 'hold the line' of the existing coastline. This is important if valuable land, property, and businesses need to be protected. However, hard sea defences come with disadvantages. Structures such as a solid concrete wall can intensify erosion by reflecting breaking waves and increasing the scouring effect of the returning water. Furthermore, structures like these will need to be continuously raised and strengthened as the sea level rises, which is unsustainable for the future.

COASTAL SQUEEZE

The use of hard sea defences within the Harbour can also result in the loss of valuable saltmarsh habitat through a process known as 'coastal squeeze'. As sea levels rise, existing saltmarsh is becoming submerged under water for longer periods of time resulting in unfavourable growing conditions for the saltmarsh plants. Under natural conditions, the saltmarsh would adjust by gradually moving landwards to maintain its position in the tidal height range and optimum growing conditions. However, the presence of fixed hard sea defences prevents it from doing this. The plants are unable to cope with increased submersion, higher salinity levels and other toxic effects and are consequently destroyed, resulting in the loss of saltmarsh habitat.



SOFT ENGINEERING DEFENCES

The use of 'soft' sea defence techniques is more flexible and has less of a negative impact on the natural environment. They generally work with nature to help manage the coastline in a more sustainable way. Managed Re-alignment is a soft approach currently used within the Harbour. It allows controlled change in the shape of the Harbour's shoreline. One example is a small site at Thornham point, on the northeast shore of the Thorney peninsula;

another is at west Chidham and involves a much larger site covering 3.6 hectares. Both are deliberate breaches of the coastline where the sea has been allowed to break through and flood the land behind. At Chidham, sea defence walls have been built further inland so that the new shoreline continues to have protection. In both cases, the existing line of the shoreline has been maintained



Managed Re-alignment at Chidham Point

either side of the breach and continued access has been managed using bridges. Overtime, new intertidal mudflat and saltmarsh has successfully established, helping to relax the problem of 'coastal squeeze' which is beneficial to the AONB.

The Conservancy support further use of Managed Re-alignment to increase saltmarsh habitat and to help ease the pressure on other parts of the Harbour coastline. However, it does require a sympathetic attitude from landowners who are able to embrace such a scheme upon their land.

Another soft sea defence used within the Harbour is beach nourishment. This technique is used as part of the Adaptive Management approach on East Head. **(see *East Head: Coastal Management*)**



THE FUTURE

Coastal management needs to be sustainable. This means that strategies should be affordable, consider the needs of the environment, protect property as much as possible with minimal impact on livelihoods.

Hard sea defences tend to be expensive and disrupt natural processes, whereas soft engineering techniques are cheaper and work with the natural environment, often creating important habitats.

Moving forwards, management of the Harbour coastline needs to be a careful balance between protecting valuable assets against rising sea levels and increased erosion rates, whilst also caring for the natural landscape and conservation areas.

Chichester Harbour Conservancy provides clear guidelines for landowners within the Harbour based on the North Solent SMP and the Conservancy's management objectives on choosing an appropriate shoreline defence. The options vary widely around the Harbour and depend on the local circumstances. Refer to the 'Sustainable Shorelines General Guidance' booklet produced by The Conservancy for detailed explanation of these options.

The coastline is a dynamic environment and changes can often be unpredictable. Consequently, future management strategies will need to be flexible and adaptable to cope with these changes.

REFERENCES

The North Solent Management Plan
www.northsolentsmp.co.uk

Sustainable Shorelines - General Guidelines produced by Chichester Harbour Conservancy
https://www.conservancy.co.uk/assets/files/cms_item/135/d-Sustainable_Shorelines_First_Edition-T6Q1c9qWFb.pdf

Chichester Harbour – A Reference Guide produced by Chichester Harbour Conservancy