

COASTAL PROCESSES

The shape of Chichester Harbour is always changing. Processes such as erosion, transportation, deposition and flooding are all natural processes impacting on the shape of the harbour.

The ways in which humans have used the Harbour over time (**see *Harbour History***) and intervened to protect areas of the coastline, have also influenced the shape of the landscape that we see today.

RISING SEA LEVELS

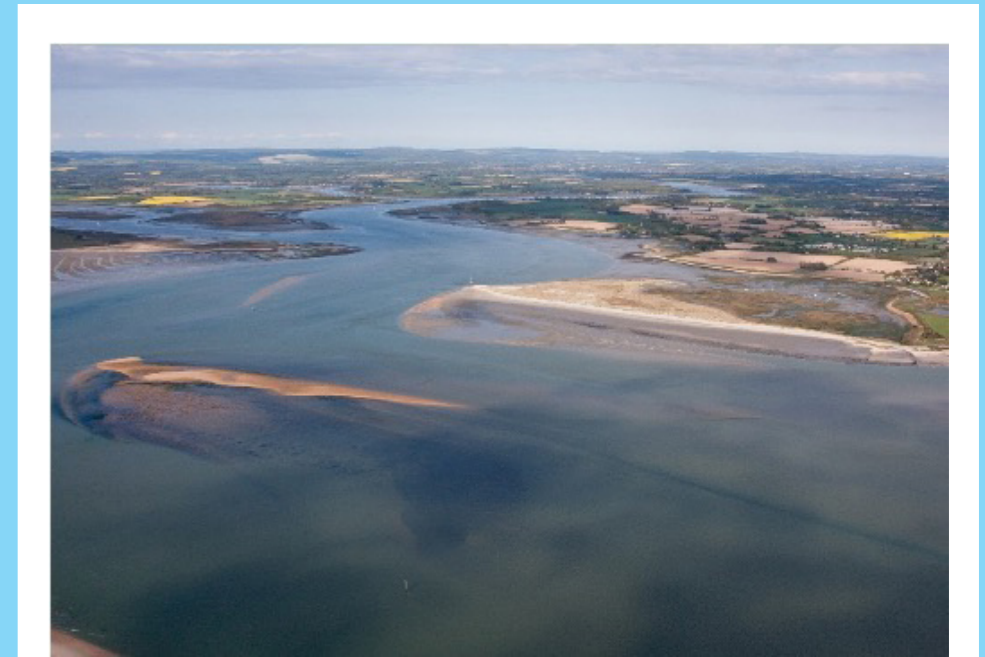
As a consequence of increasing global temperatures, sea levels are rising as glaciers and ice sheets melt, and warming sea water expands, increasing the volume of the world's oceans. Recent research using satellite measurements shows that the rate of global sea level rise is increasing, up from 1.8 mm/year to 3.2mm/year. It is predicted that this rate will continue to increase. The south coast of England has also been gradually sinking since the end of the last ice age. This is because the enormous weight of ice that covered Scotland caused the land to be pressed down whilst the South of England was raised. Since the ice has melted, Scotland has slowly been rising while the south of England has been sinking.

These combined changes make the low lying southern coastal areas of England particularly vulnerable to flooding. It is predicted that by 2100, sea levels could rise by as much as 80cm around parts of the UK coast. The map to the right shows the land around Chichester Harbour that scientists predict will be under water by the end of this century.

POWER OF THE TIDE: WASHING AWAY AND DEPOSITING MATERIAL

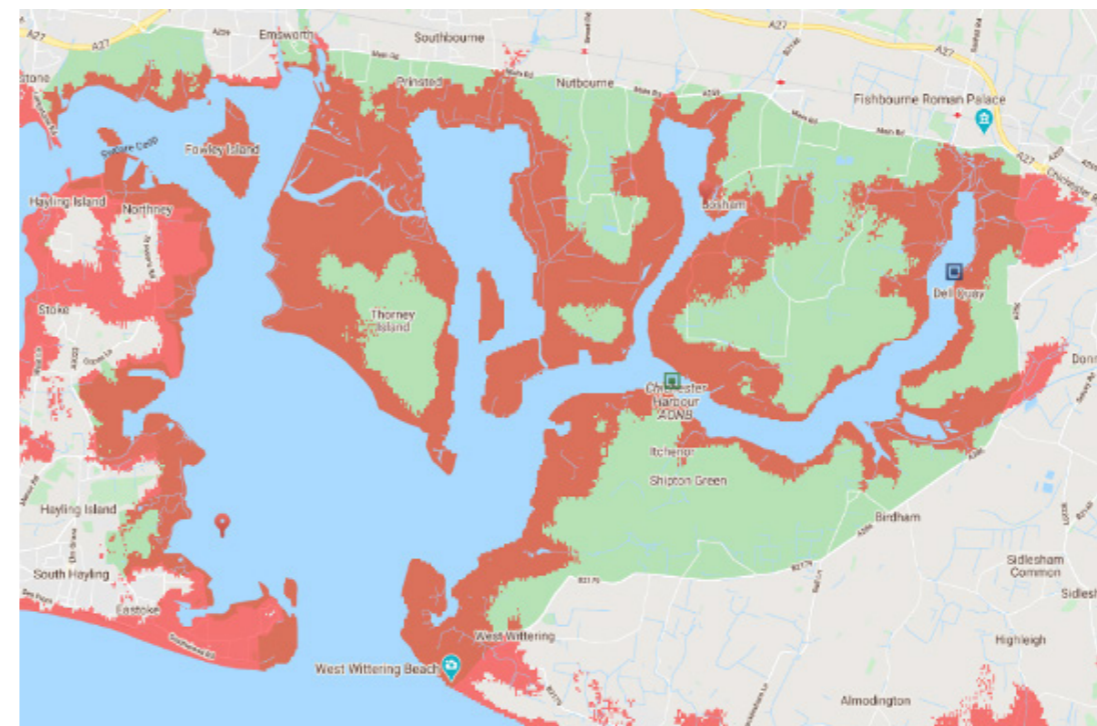
Even without sea level change, the power of the tide coming in twice each day is strong enough to change the coastline. Sand, mud, rocks and pebbles are moved by the sea from one part of the harbour to another.

Longshore drift happens along the open coast, moving sand and stones from East to West in our local area. Channels get silted up and need to be dredged to allow boats to continue to navigate through them.



Chichester Harbour - Matt Simmons

MAP SHOWING PREDICTED WATER LEVEL IN THE YEAR 2100



KEY: = CURRENT WATER BODY IN THE HARBOUR = LAND PREDICTED TO BE BELOW WATER LEVEL BY 2100

Source: www.climatecentral.org

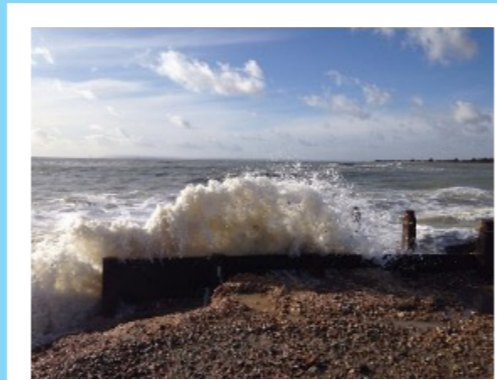


CHICHESTER
HARBOUR
CONSERVANCY

EROSION

Land at the edge of the Harbour is lost by the washing action of the water each time there is a very high tide. When waves hit the shoreline, they wear away the edge of the land. This process is called **erosion**. The type of wave that is responsible for erosion is known as a **destructive wave**. These waves are high, steep waves with a short wavelength (distance between peaks). They are usually created in stormy conditions when the wind is powerful, and the wave has travelled a long distance across the sea. These high energy waves have a weak swash but a strong backwash that removes sand and sediment from the shoreline pulling it back out into the sea.

Erosion is usually a very slow process within the harbour, as the shoreline is protected from the full force of the sea. But over the years the shoreline has moved inland. Most of the land around the Harbour consists of sedimentary rocks such as clays and chalk (*see Harbour Geology*). Sedimentary rocks are soft rock, which means they erode more easily than harder rock.



Destructive wave - Caroline Higbee



Boat travelling at speed causing more wash



Erosion beside Salterns Copse

Many of the boats that use the Harbour could cause erosion by their 'wash' if there was not a speed limit of 8 knots in the Harbour. Imagine throwing a stone into a pond. The stone causes a ripple to spread wider and wider until it reaches the edges of the pond. A moving boat does a very similar thing. If a large boat travels through the water quickly, its wash can cause quite large waves that crash against the shoreline.

Humans and animals can also cause erosion. Some footpaths around the Harbour are used so often that they eventually crumble into the sea. Rabbits make large holes very quickly that can cause sections of shoreline to collapse.



Erosion along a Harbour footpath

TRANSPORTATION & DEPOSITION

The material that is worn away from the edge of the coastline is carried off by the waves and current. This process is called **transportation**. When waves slow down and lose energy, the material is then dropped in other places. This is called **deposition**. Waves that deposit material and help to build up beaches are **constructive waves**. These waves are flat and low in height, with a longer wavelength than destructive waves. They have a strong swash which brings material up the beach and a weak backwash that is not strong enough to remove it.

Although some parts of the Harbour coastline are being eroded away, others are growing in size. Both the northern tip of East Head and Pilsea Island are getting bigger because of deposition.



Pilsea Island - Matt Simmons



Disposing of the dredged sediment

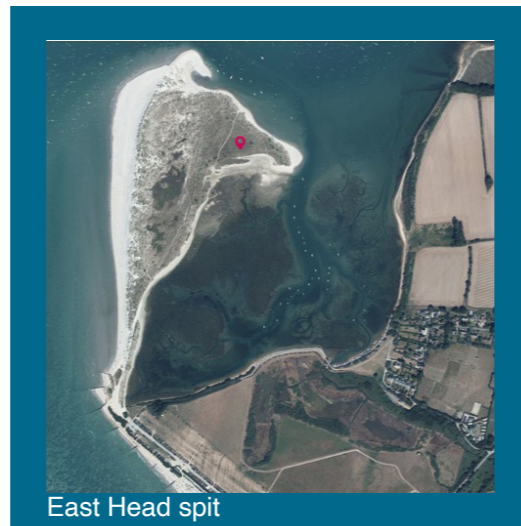
Deposition also affects the deep-water channels in the Harbour as well as access to marinas and boat yards. As sediment builds up in these channels, it makes it more difficult for boats to navigate. Dredging (digging out the mud and moving it away) is used to keep channels deep enough, but it is expensive, affects the seabed and wildlife that lives there and is only a temporary solution as deposition continues. There is also the problem of where to put the material that is dredged up. Both the dredging and the disposal of the dredged material is licenced and regulated by the Marine Management Organisation to help protect marine habitats. The material dredged from the Harbour is currently disposed at a location in the Solent east of the Isle of Wight (Nab Tower Spoil Ground).

LONGSHORE DRIFT

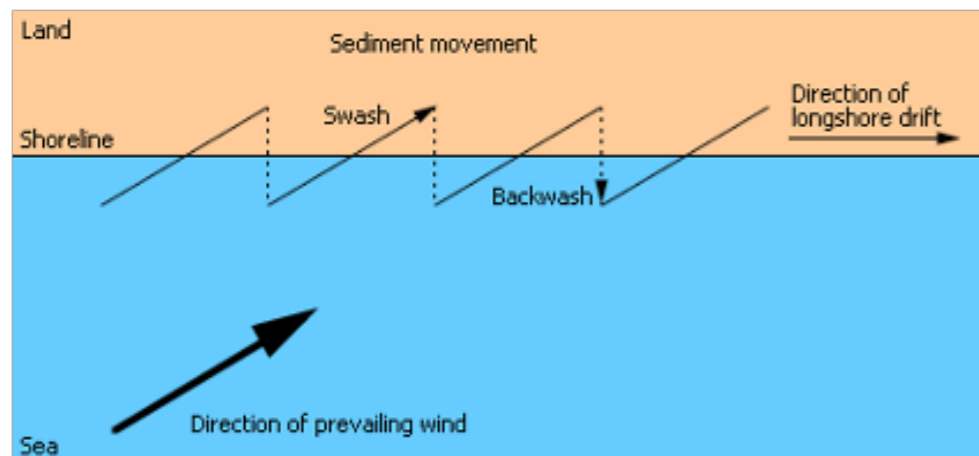
Along West Wittering beach at the entrance of Chichester Harbour, there is evidence of **longshore drift** occurring. Beach material is being moved along the coastline by the waves. For longshore drift to occur the waves need to approach the coast at an angle, usually determined by the direction of the prevailing wind. The swash carries the material up the beach at an angle. The backwash then flows back to the sea, perpendicular to the beach. The process repeats itself along the coast in a zigzag movement, gradually moving the material along the beach.

Interestingly, the dominant direction of longshore drift along West Wittering beach occurs in the opposite direction to the south-westerly prevailing winds. It is thought that this is because the waves in the Solent diffract around the Isle of Wight, causing the waves to hit West Wittering beach from a south-easterly direction.

East Head, a sand and shingle spit at the entrance to Chichester Harbour, has been created by the process of longshore drift along this section of the coastline. It is a **depositional landform**. The area of water behind East Head known as Snow Hill Creek, is very sheltered which has enabled a large area of saltmarsh to establish.



East Head spit

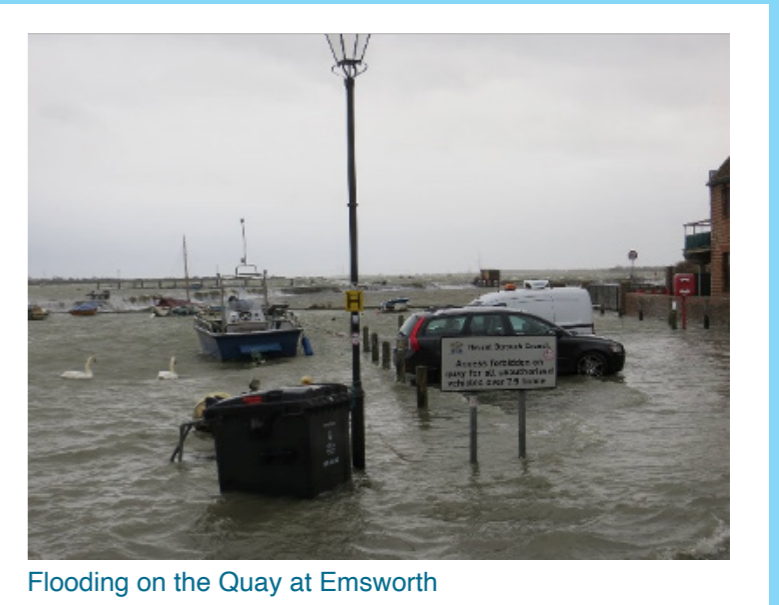


Source: <https://commons.wikimedia.org/>

FLOODING

Global warming has brought more stormy and unsettled weather in the UK together with more turbulent seas. Flooding along the coast occurs during storm surges, which are mainly caused by strong onshore winds, and the higher the tide at the time the more likely flooding will be. A storm surge combined with heavy rainfall, further increases the risk of flooding in low lying areas such as the south coast, as the excess rainfall is unable to drain out to sea.

Flooding and erosion are serious issues as people live and work on the land around the harbour. People want to try and protect their land and property from being washed away. Various sea defences are used around the harbour to try and protect different sections of land (**see Harbour Sea Defences**). Coastal management however is a complex task, it is not possible to protect the entire harbour coastline from flooding or erosion. The needs and views of all the different groups who own, use,



Flooding on the Quay at Emsworth

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