

Climate change and sea level rise



Sea level rise

Global sea levels rise and fall throughout time on an irregular basis in response to changes to the environment, which results in either an emergence (regression) or submergence of the coastline (transgression).

Changes in global sea level rise today have been attributed largely in response to changes in the world's climate due to global warming, resulting in the phenomena becoming a major concern both globally and nationally.

However it should be understood that global sea level rise is not only attributed to the changing sea levels but also to vertical changes of the land brought about by geological processes that occur locally (isostatic adjustment).

Currently at a regional level, East Anglia is faced with a sea level rise of 4.5mm/yr and an isostatic adjustment (sinking of the land) of 1.5mm/yr, giving what is called a relative sea level rise of 6mm/yr, for the East Anglian coast.

This problem in East Anglia has arisen in response to events that occurred during and after the last ice age (which ended between 10,000 and 15,000 years ago), where large ice sheets covered much of central and northern Britain. The huge weight of this ice pressed the land downwards as it advanced across the country. Once the ice began to retreat, the weight of the ice was removed causing the land in Scotland and Northern England, once covered in ice, to rise again. The land in Southern England however began to sink into the sea, this process is still continuing in both areas of the country today.

Climate change

There is growing scientific agreement (Intergovernmental Panel on Climate Change) that human activities are having an impact on the World's climate. The main cause is the release of Greenhouse gases (GHG's) such as methane and carbon dioxide, which help warm the atmosphere. Global warming causes three main effects on our planet, which are and will continue to bring about changes to the environment in which we live.

• Melting of glaciers and ice caps

One effect that climate change has is to warm up places that were very cold. The ice at the North and South Poles is starting to melt more quickly. As the ice melts, freshwater is released into the oceans and adds to the volume of water.

• Increased storminess & wave activity

Climate change effects the weather. This may mean more stormy weather resulting in increased wave activity. Waves form at sea when the wind blows over the water. The energy in the wind is passed onto the wave and the wave moves in the direction that the wind is blowing. As the wave reaches the shore it will break against whatever is in its path. This could be a beach, a salt marsh, mud flat, cliff or a sea wall, for example. The energy that is in the wave is then transferred to the shore.

Waves can be extremely powerful and can cause a lot of damage. The damage is called erosion and when we have big storms and powerful waves a lot of the coast can be eroded very quickly. Waves cause serious damage to flood defences and if large enough can over-top them causing flooding behind defence walls.



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• Thermal expansion

This is the process by which sea level rise occurs as a result of oceans warming up and expanding in response to increases in global temperature. If you imagine a kettle boiling, it is a very similar process, but on a much larger scale. As water is heated up the heat causes all the molecules of the water to move faster. As they whizz about they bump into each other and take up more space. In the sea the water is nowhere near boiling, however imagine how much water there is in the oceans and seas. A very small increase in temperature will cause a slight increase in 'expansion' so the sea level will rise a little, similar to bread in the oven!

Taking into account the three main effects of climate change, The UK Climate Impacts Programme predicts,

- Increases in sea level around our coasts.
- Weather patterns will change to wetter winters and increased storm strengths.
- This will increase wave height and frequency.

In summary the effects of climate change will mean a change in the weather that we experience and the environment that we live in.

Coastal squeeze

Saltmarsh and mudflats are both important habitats for wildlife, which are rapidly eroding in response to a process called coastal squeeze.

Coastal squeeze occurs as the saltmarsh and mud flats become trapped between the sea walls and the rising sea. The seawall prevents these habitats moving upwards and landwards within the changing tidal frame and so become reduced in their extent.

The creation of saltmarsh is very important from a flood defence point of view as saltmarsh significantly reduces wave energy.

The reduction of wave energy is important as waves are extremely erosive and are responsible for damage to sea defences, scouring of beaches and overtopping of sea walls. By reducing wave energy, the saltmarshes allow for smaller defences further inland.

This reduces the cost of construction and hence reduces the cost to the tax payer. It also creates important amenity areas for the public and wildlife havens for animals and plants thus helping us to meet legal targets set by the EU Habitats Directive regarding the replacement of intertidal habitat.



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