Hurst Spit to Lymington Flood and Coastal Risk Management (FCRM) Strategy

GCSE Geography education pack - Teacher Notes

Introduction

Hurst Spit is a classic example of a landform of coastal deposition and therefore worthy of study as a case study at GCSE. In the lee of the spit are the extensive Keyhaven mudflats and saltmarshes. Together, these low-lying landforms are very vulnerable to climate change and rising sea levels. This stretch of coastline needs to be managed to address the issues of ageing defences and competing social, economic and environmental demands.

The Hurst Spit to Lymington Flood Coastal and Risk Management (FCRM) Strategy

The Hurst Spit to Lymington Flood Coastal and Risk Management (FCRM) Strategy seeks to identify a sustainable future for the coastal frontage between Hurst Spit and Lymington, in Hampshire with consideration of climate change, habitats, wildlife, recreation, tourism and deteriorating coastal defences.

Strategy Vision

The overall strategy is to create a sustainable future for Hurst Spit to Lymington area for the next 100 years: enabling communities, the environment, wildlife, heritage, recreation, tourism, and business to adapt to climate change and sea level rise. The strategy involves a partnership between different stakeholders, working together in the interests of the local community.

Strategy Objectives

They propose a series of recommendations that:

1. Provide greater resilience to communities, property and infrastructure by managing the risk of flooding and erosion, while providing adaptability to climate change.

2. Protect and enhance the natural environment and wildlife and support natural processes.

3. Promote FCRM solutions in ways that contribute to carbon reduction including solutions with potential to capture and store carbon through habitat creation.

4. Promote FCRM solutions that align with partner authority plans in terms of their social, recreational, commercial and cultural benefits.

5. Develop a plan to implement the Strategy that includes a programme of works over the short /medium term that is achievable and affordable.

Extensive background information can be accessed at: https://www.hurstspit2lymington.co.uk/

Classroom resources

Coasts is a popular option at GCSE. Coastal landforms and coastal management are key topics within this theme. Students are required to make detailed case studies of landforms and management along named stretches of coastline.

There are two sets of resources:

1. ***Coastal landforms of deposition at Hurst Spit and Keyhaven***.

Hurst Spit forms an excellent case study of spit formation. Students can consider the role of longshore drift in the formation of this landform and of its characteristic features. In the shelter of the spit, extensive mudflats and saltmarsh have formed.

The resources include:

- **PowerPoint presentation**. This focuses of the processes and landforms associated with Hurst Spit and the mudflats and saltmarsh at Keyhaven. The engaging presentation makes extensive use of photos, maps and diagrams to reinforce students' understanding of this topic.
- **Student worksheet**. This comprehensive worksheet aims to support students in using the PowerPoint presentation. It provides a variety of activities aimed at engaging students as they learn about this stretch of coastline. The worksheet provides students with some of the images used in the presentation and will help to generate a comprehensive set of notes for revision. The activities use familiar exam command words to reinforce student's understanding and support exam preparation.
- **GIS activities**. The study of geography through Geographic Information System (GIS) is a requirement at GCSE. These activities make use of the excellent Digimap for Schools platform, which is freely available to schools (https://digimapforschools.edina.ac.uk/roam/map/schools) . The interactive activities, which make use of historic maps, tells the story of the development of the mudflats and saltmarsh at Keyhaven.

2. Coastal management at Hurst Spit and Keyhaven.

The stretch of coastline between Hurst Spit and Keyhaven is part of the Hurst Spit to Lymington Flood and Coastal Risk Management (FCRM) Strategy, which seeks to identify a sustainable management plan in the face of climate change.

For several decades, the coastline to the west of Hurst Spit (Christchurch Bay and Milford on Sea) has been protected from coastal erosion by the construction of hard engineering defences, such as sea walls and groynes. These have impacted sediment supply to Hurst Spit, making it more vulnerable to erosion and over-washing. Due to its historical importance, Hurst Castle has previously been protected from the sea by some rock armour. The key question posed by the authorities – and the focus of these resources – is, to what extent should this coastline continue to be protected into the future?

The resources include:

- **PowerPoint presentation**. This engaging presentation, supported by maps, photos and diagrams, tells the story of coastal management at Hurst Spit and Keyhaven. It examines the need for protection and the current, short-term measures of coastal defence. The presentation then considers in more detail some of the medium-term and longer-term options for coastal management, focusing on 'hold the form' and 'managed realignment'.
- **Student worksheet (1)**. This worksheet focuses on the current coastal defences at Hurst Spit and Keyhaven. The focus is very much on engaging students through practical activities, including the use of OS map extracts at different scales and photos.
- **Student worksheet (2)**. This worksheet focuses on the options for the future management of the coast at Hurst Spit and Keyhaven. Students will consider the possible outcomes

associated with the strategies of 'hold the form' and 'managed realignment'. Students are tasked with considering the costs and benefits of both approaches.

Classroom delivery

Each resource would probably involve about 2 hours of study time (lessons + homework). This should be enough time to deliver the PowerPoint presentation and complete the student worksheets. The GIS activity (Resource 1) could be delivered separately to provide useful reinforcement and practice of these skills.

The resources are available as editable files to enable teachers to 'tweak' the materials to suit individual needs and requirements. Teachers may choose to delete some slides or add new ones. The same might apply to the worksheets.

Suggested answers

To support teachers, we have provided some suggested answers. These are intended to act as guidelines to assist teachers in assessing student responses. Some answers are more factual than others (e.g. OS mapwork) but most have a range of appropriate answers.

We have deliberately not suggested a mark scheme due to the variability between exam boards. The student activities are just that – activities to support learning – as opposed to exam-style questions with all the associated assessment complexities. In providing some guidance, we hope that the suggested answers help to save teachers a bit of time!

Resource 1: Coastal landforms of deposition at Hurst Castle and Keyhaven

Student worksheet

Question	Suggested answer
1 a-c	Student labels correctly positioned
d	3189
2a	Looking in a north-westerly direction
b	Sediment is coarse, pebbles/shingle
c	Low tide. The colour variation to the left suggests more moisture than at the top of the ridge. To the right, some mudflats and saltmarsh are exposed.
d	Visitors can enjoy opportunities for walking, nature spotting (e.g. birds), fishing and relaxing on the beach.
3 a-c	Student labels in correct positions
d	Recurved tip
4	Three facts might include: the spit is about 2.5km in length, it extends eastwards from the coast at Milford on Sea; at its tip is Hurst Caste, an historic monument
5 a-b	Student labels correctly positioned
c	Recurved tips are formed at the tip of a spit most commonly by a change in the direction of the waves, which causes the tip to curve back on itself.
6a	Student annotations describing the development and growth of the spit over time. Students should focus on description.
b	Student diagram showing longshore drift. Expect the zig-zag movement of sediment (swash and backwash). Insist on a label showing the actual direction of longshore drift!

GIS activity

Question	Suggested answer
1 a-c	Student activities involving drawing and labelling
d	In the 1890s, the mudflats/saltmarsh appear to have been rather more extensive than they are today (marked by the low tide line). This is particularly clear to the north of the spit's recurved tip.
2 a	2.4km
b	1km
c	2.4km2
3	Student activity involving labelling in the correct positions.
4	Student activity, using labels to pick out deposition Hurst Spit, recurved tips, beach, mudflats, saltmarsh, etc.
5	Student activity, with labels to show change.

Resource 2: Coastal management at Hurst Spit and Keyhaven

Worksheet 1

Question	Suggested answer
1	Hurst Spit is located on the south coast between Bournemouth and Southampton. It extends into the Solent which separates the mainland from the Isle of Wight. It is located to the SE of Milford on Sea.
2a	Hurst Spit has been protected from erosion because it forms a protective barrier for Keyhaven. It also provides access to Hurst Castle and is a popular attraction for visitors.
b	Defences to the west, such as groynes, have trapped sediment moving eastwards by longshore drift. This has reduced the supply of sediment to Hurst Castle making it more vulnerable to erosion. If Hurst Spit becomes a less effective barrier, Keyhaven is at greater risk from flooding.
c	Annotation will probably focus on the groynes.
3a	Student label located correctly
b	Rock armour forces waves to break early. This reduces the wave's energy and helps to protect the coast from erosion.
c	The shingle on the beach is extensive and high and it looks to have been freshly profiled by the machine.
4a	Student label – just behind the zig-zag structures as indicated in the photo
b	Student activity to shade and label correctly
c	Sediment is collecting in-between the groynes suggesting that they are interrupting the transfer of sediment.
5a	Student label correctly positioned
b	The embankment is protecting Keyhaven, the freshwater marshes and the agricultural land from flooding by seawater.
c	The saltmarsh is flat marshy grassland some of which is exposed and other parts under water.
d	Student diagram to show how, as sea levels rise, the area of saltmarsh may become squeezed between the rising sea level and a fixed embankment or seawall.

Worksheet 2

Question	Suggested answer
1a	'Hold the Line' may be the preferred option where the land has a high value and property or infrastructure needs to be protected. Where the benefits outweigh the costs.
b	'Hold the Line' may involve a fixed wall or embankment. As sea levels rise, a saltmarsh may become squeezed (reduced in size) between the sea and the fixed barrier.
c	'Managed realignment' would allow seawater to flood the area previously protected up to the newly constructed embankment. This land, previously public amenity grassland with trees, will become flooded and will naturally transition to a saltmarsh.
d	'Managed realignment' is likely to be more sustainable as the newly formed saltmarsh will act as a natural defence (barrier) to the sea. Maintenance costs will be reduced compared to 'Hold the Form'.
e	Student decision-making. They will need to justify their answer.
2a	

	Short-term	Medium-term	Long-term
Hurst Spit	'Hold the Form' Beach nourishment to maintain the current height and width of the spit	'Rollback – reactive management' Limited maintenance to retain barrier. Allow the spit to become lower and wider.	'Rollback – minimal intervention' Allow the spit to evolve naturally with minimal intervention
Keyhaven	'Managed Realignment' Construction of new embankment inland of the current embankment	Controlled breaching of the existing embankment to allow the sea to flood the land	New, wider saltmarsh develops benefiting wildlife and naturally protecting the coast from flooding

b	For Hurst Spit, short-term intervention aimed at 'Holding the Form' is preferred to maintain vehicular access to the castle and ensure that the spit continues to protect Keyhaven from flooding. Following research and modelling, it may not be necessary to continue with this strategy in the future.
c	Student diagram (using the PowerPoint) to show that in the future the spit is expected to become wider but lower. It is also expected to 'rollback' towards the coast.
d	Student diagram and labels, using the PowerPoint presentation diagram 'Managed realignment with saltmarsh creation'.
3	

	Costs (disadvantages)	Benefits (advantages)
Hurst Spit 'Hold the Form - Maintain'	• Expensive as it involves constant maintenance (Cost £20m) • Shingle needs to be brought in – carbon costs (fuel, etc)	• Retains access for people and vehicles to the spit and to the castle • Continues to provide an effective barrier to protect Keyhaven from flooding
Hurst Spit 'Rollback – Reactive Management' and 'Rollback – Minimal Intervention'	• Spit becomes lower which may increase likelihood of over-washing during storm • As it is allowed to evolve naturally, occasional over-washing may cause flooding of the saltmarsh (affecting habitats) and may threaten Keyhaven (costly)	• More sustainable, allowing the coast to evolve naturally • Cheaper as gradually less maintenance will be required • Broad area of saltmarsh will develop provided natural protection to Keyhaven

Keyhaven 'Managed realignment with saltmarsh creation'	• Some loss of access and need to re-route footpaths • May be changes to ground and surface water levels	• Intertidal habitats (saltmarsh, mudflats) will rollback naturally as sea level rises • Extensive saltmarsh dissipates wave energy, reduces erosion and reduces flood risk.

[This is not an exclusive list – other suggestions are possible]