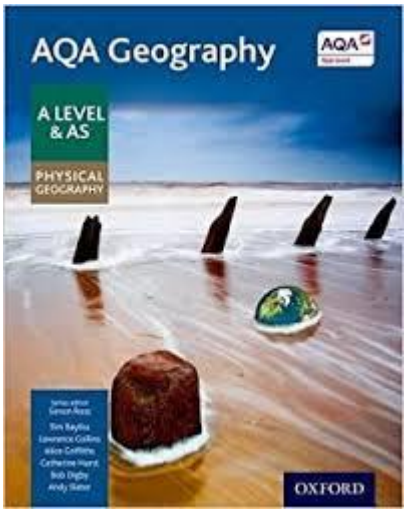
Year 11 → Year 12 Physical Geography Coasts Transition Task

The first physical topic we study starting in September is 'Coastal Systems and Landscapes'. The textbook we will be using has now been loaded onto Kerboodle for you to access. Some of these transition tasks will ask you to use this.

AQA A-Level Physical Textbook



Task 1

Using the Coastal Pages section (Pages 102 -155) or the Glossary section at the back of the AQA A-Level Physical Textbook on Kerboodle, write the meaning of the following words:

Coastal System (page 103)

Open System (page 102)

Input (page 103)

Output (page 103)

Energy Stores (page 103)

Flows/transfers (Definition and example) (page 103)

Closed System (page 363)

Constructive Wave (page 363)

Destructive Wave (page 363)

Dynamic equilibrium (page 363)

Eustatic Change (page 363)

Isostatic Change (page 364)

Low energy environments (page 364)

High energy environments (page 364)

Positive feedback (page 103)

Negative feedback (page 103)

Weathering (page 365)

Sediment cell (page 103)

Task 2

Use the AQA A-Level Geography Physical textbook on Kerboodle.

Look at the table (Figure 3) on page 103 and then draw figure 1 and add 10 – 15 labels of coastal examples from figure 3 and colour code if they are inputs, outputs, energy stores or flows.

Task 3

Context: Large case studies in the Coastal topic can be cleverly used for many different types of examination questions, so it is important to do less of them but in more detail.

Case study – Happisburgh, Norfolk

This is an eroding village that had sea defences which were not maintained. It is a famous example and there is lots of information on the internet and Youtube(Search Happisburgh coastal erosion) documenting this. Below are some useful links:

https://www.bgs.ac.uk/landslides/happisburgh.html

https://www.internetgeography.net/topics/happisburgh-case-study/

https://zigzageducation.co.uk/support/geography/5842

https://www.pri.org/stories/2018-4-05/british-villages-crumbles-sea-family-holds-home-cant-be-saved

Produce a comprehensive A3 case study on Happisburgh using the following headings:

- Happisburgh Location/Population
- Images of Erosion over the years
- Why it is now being eroded more
- How rock types in Happisburgh have contributed to weathering and erosion
- Why is it not defended now
- Opinions of
  - -Homeowner
  - -Businesses
  - -Farmers
  - -Tourists
- What the plan is for the future
- What the village is famous for
- What has been lost over the years
- What defences were once used
- At least 3 other images

Task 4

Coastal management in Norfolk

Erosion has always been a major problem along much of the Norfolk coast, although in the extreme south of the county, near to Yarmouth, flooding is the major danger (as experienced in the North Sea floods of 1953, Figure 18.32). The present-day SMP must aim to strike the seemingly impossible balance between protecting the coastline at a viable cost and trying to minimise the disruption of natural processes. Indeed the coast of East Anglia, of which Norfolk is a part, is in the centre of the controversy as to whether people and their property should be protected at all costs or whether nature should be allowed to take its course. This controversy is likely to intensify as climate change causes sea-level to rise, tides become higher and storms more frequent and severe (Figure 18.20).

Coastal erosion at Happisburgh

Happisburgh is one example of a settlement at the centre of the controversy. At present it has a population of 1400 living in about 600 houses. The village has a fourteenth-century stone church, several listed buildings and a landmark red-and-white striped lighthouse (Figure 18.22). Although it is now a coastal village, it was once located inland, being separated from the sea by Whimpell, a settlement that has long since been lost to the sea. Records for Happisburgh show that between 1600 and 1850 erosion by the sea resulted in the coastline retreating by over 250 metres. Attempts were then made to prevent further loss and these seem to have at least slowed down the rate of retreat. However, a lack of maintenance has led to the defences falling into disrepair and erosion to accelerate. The soft cliffs, varying in height between 6 and 10 metres, have retreated by 100 metres in the ten years since 1998 (compare Figures 18.22 and 18.23). This retreat is resulting in the loss of at least one property per year and considerable amounts of good agricultural land. The inhabitants of Happisburgh, naturally, want new sea defences built to protect their property despite the enormous costs that this would involve.

Figure 18.22
Happisburgh 1998

Figure 18.23
Happisburgh February 2009

Coastal defences at Sea Palling

Much of the north Norfolk coastline from Cromer southwards is protected by expensive sea defences. At Sea Palling the beach is backed by sand dunes which, in earlier times, helped to provide a natural defence.

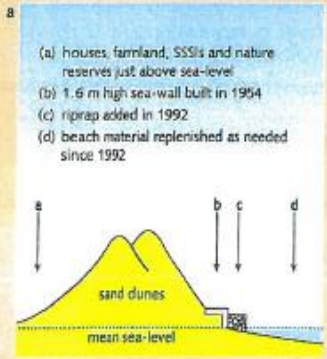


Figure 18.24
Sea defences at Sea Palling:
(a) 1952–92
(b) Since 1995

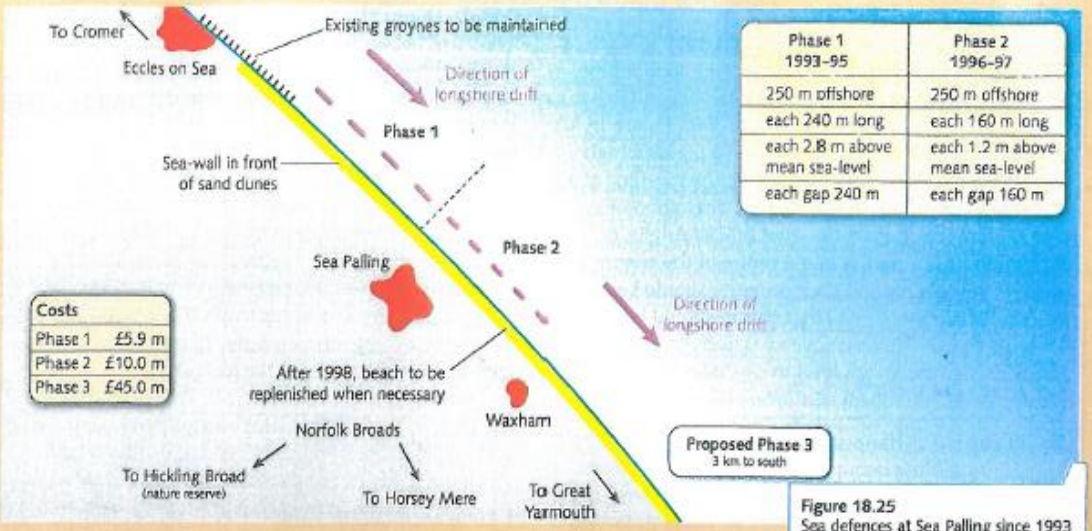


Figure 18.25
Sea defences at Sea Palling since 1993

Inland from these dunes are 6000 ha of land used for settlement, farming and (this being part of the Norfolk Broads) tourism and wildlife. The 1953 storm surge (Case Study 18A) broke through the coastal defences, flooding large areas and, at Sea Palling itself, washing away houses and drowning seven people. Following the 1953 flood, a sea-wall was built in front of the sand dunes and there was some replenishment of beach material (Figure 18.24a). During the next 40 years the beach became increasingly narrow. This was due to material being transported southwards by longshore drift at times of northerly and easterly gales which, presumably due to the onset of climate change, seem to be increasing in both frequency and intensity. In 1991, following several severe winter storms, riprap was placed against the sea-wall as a temporary measure and in 1992 a beach management strategy was introduced. The aims of this strategy were that it should:

- have as little effect as possible on adjacent coastal areas
- have minimal environmental impact
- be cost-effective.

The strategy was implemented by placing 150 000 tonnes of rock in front of the sea-wall, replenishing the beach with nearly 1.5 million cubic metres of sand and – the major part – constructing four offshore reefs. The reefs were designed to protect the beach by reducing wave energy while at the same time allowing some longshore drift so as not to deplete the supply of sand to beaches further along the coast (Figure 18.25).

Almost immediately after their completion in 1995, a previously unpredicted problem arose: that of sand accumulating in the sheltered areas behind the reefs. This meant that the reefs became joined to the mainland (Figure 18.24b), which in turn interrupted longshore drift. To try to overcome this problem, the next five reefs were made:

- shorter – to reduce the area of shelter behind them
- lower – to allow more overtopping by waves
- closer together – to prevent erosion in the gaps between them.

A further five reefs are planned 3 km to the south but, as Figure 18.25 shows, the estimated cost has shot up in comparison with that of earlier reefs.

Proposed 'managed retreat'

Controversial plans to flood parts of Norfolk became known in 2008. If accepted, this proposal would mean that, for the first time, Britain is admitting defeat in the battle to maintain all of its coastal defences. Many experts believe that it would be far less expensive and a more practical option to 'realign the coast' in a 'managed retreat'. This would involve (Figure 18.26):

- building a new sea-wall further back from the present coastline, as this would cost only a fraction of that of trying to maintain the existing defences
- breaching the existing defences to allow the predicted higher tides and storm waves to flood an area between the existing defences and the proposed new sea-wall, which in time would develop into a salt marsh that would act as a buffer, reducing the strength of the waves (Figure 18.27 shows the first scheme of this kind in Britain).

In response to the proposal, Defra said that it was 'committed to the sustainable protection of people and property in Norfolk and elsewhere'.

If the scheme went ahead, it would mean allowing the sea, over a period of time, to breach 25 km of the Norfolk coastline between Eccles on Sea and Winterton-on-Sea (Figure 18.28).

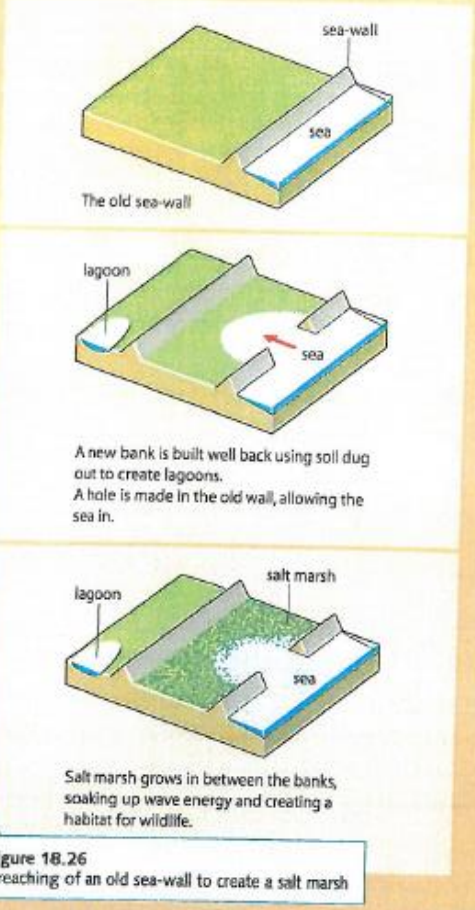


Figure 18.26
Breaching of an old sea-wall to create a salt marsh

This would lead to the creation of an area of saltwater lake and salt marsh covering 65 km². Within 50 years this lake could eliminate the four coastal villages of Eccles on Sea, Sea Palling, Waxham and Horsey and two further inland, at Hickling and Potter Heigham. The result would be the loss of some 600 houses, many hectares of good-quality farmland and five of the freshwater lakes that currently

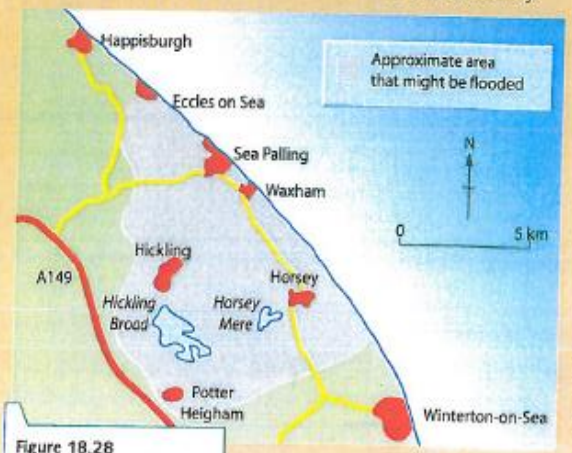


Figure 18.28
Proposed area of flooding on the North Norfolk coast

Figure 18.27
Tollesbury managed realignment in Essex

form part of the Norfolk Broads National Park. Of these lakes, Hickling Broad is a well-known tourist area and Horsey Mere has rare fauna and flora. Naturally a proposal such as this is likely to provoke strong opposition.

Opponents to the scheme claim that:

- it would mean in the short term making homes unsaleable and in the long term the relocation of hundreds of families, and having to pay them compensation
- a millennium of history would vanish under the waves and with it villages like Hickling, mentioned in the Domesday Book, and Sea Palling, which the sea failed to destroy in the 1953 flood
- the loss of valuable farmland and five freshwater wildlife habitats
- a loss of jobs in agriculture and tourism.

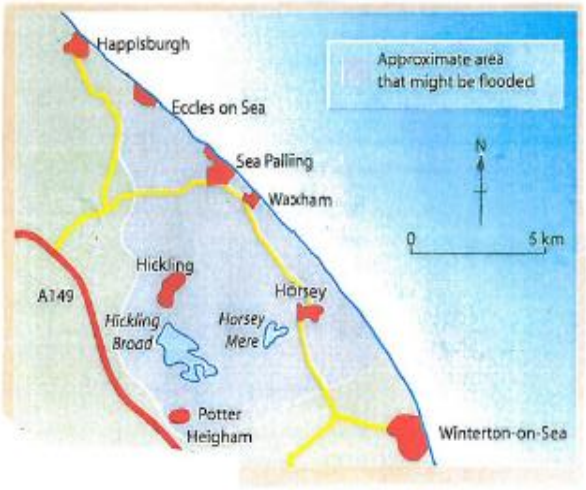
Proposers suggest that:

- the plan is economically more sustainable; to restore and maintain the existing sea-wall could cost £5000 a metre, whereas an inland retreat with a resulting buffer zone to dissipate the power of the waves might only be £500 a metre
- the salt marsh could prove ideal grazing for cattle and, at times of a storm surge (page 310), an area for storing excess seawater
- the salt marsh would provide a welcome haven for coastal wildlife when little of Britain's salt-marsh ecosystem remains, and more of what does is being lost each year.

No final decision has been made, but while the outcome might have a major effect on people living in this part of Norfolk, it is likely to have wider repercussions on many more living in similar environments who are at risk from the sea elsewhere in Britain.

Homework – Contrasting Coastlines (Coastal Management Norfolk)

1. What evidence is there that this coastline has been at risk of flooding in the past?



2 Read page 307

A. Describe the village of Happisburgh
B. What is the coastal problem at Happisburgh?
C. Why is this coastline at risk?
D. How rapidly is coastal erosion occurring?
E. What are the consequences of erosion here?

3. According to page 308

Why is the coastline at Sea Palling different?

A. Make a copy of sketch a page 307 to show what the coastline looks like in cross section at Sea Palling
B. What happened to Sea Palling in 1953?
C. What had to be done in 1991 and why?
D. What were the aims of the 1992 management strategy and what did it include?
E. Was the scheme successful? How did they attempt to solve the problem?
F. Copy figure 18.25 into your notes to show the scheme used from 1993.

4. Using pages 308 & 309

A. Explain what has been happening at Winterton-on- Sea since 2008? Give details of the scheme
B. Sketch figure 18.26 to show how this managed retreat will be achieved.
C. Give 4 disadvantages of the proposal and 3 advantages.