

GCSE Case Study:

COASTAL MANAGEMENT AT DAWLISH WARREN

making space for sand

Department for Environment Food & Rural Affairs

Environment Agency

Flood and Coastal Resilience Innovation Programme

Part of the Resilience Innovation Fund

CORNWALL COUNCIL
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geography southwest

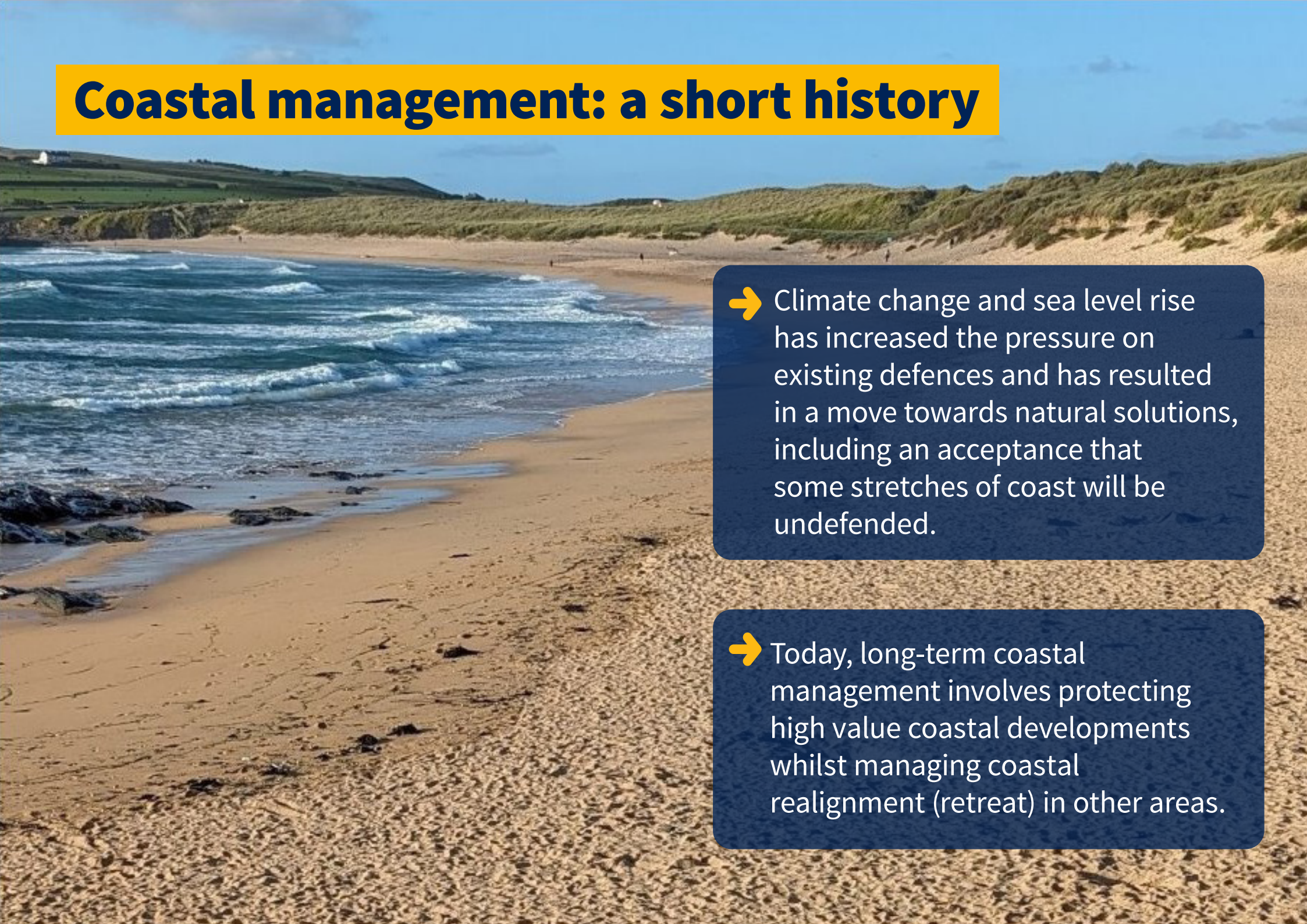
SOUTH WEST COASTAL MONITORING



Coastal management: a short history

- Sustainable coastal management aims to balance economic, social and environmental demands at the coast.
- Traditionally, it has involved strategies to ‘defend’ or ‘protect’ the coast from erosion and flooding. These strategies included constructing sea walls or lining the coast with rock armour.

Coastal management: a short history



- Climate change and sea level rise has increased the pressure on existing defences and has resulted in a move towards natural solutions, including an acceptance that some stretches of coast will be undefended.

- Today, long-term coastal management involves protecting high value coastal developments whilst managing coastal realignment (retreat) in other areas.

Coastal management: a short history

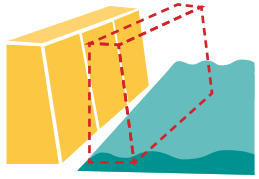
There are four approaches to coastal management:



Hold the Line – to maintain or upgrade existing defences to retain the coastline at its current position



Advance the Line – build new defences to move the coastline seaward



Managed Realignment – controlled realignment (retreat or advance) in balance with natural coastal processes

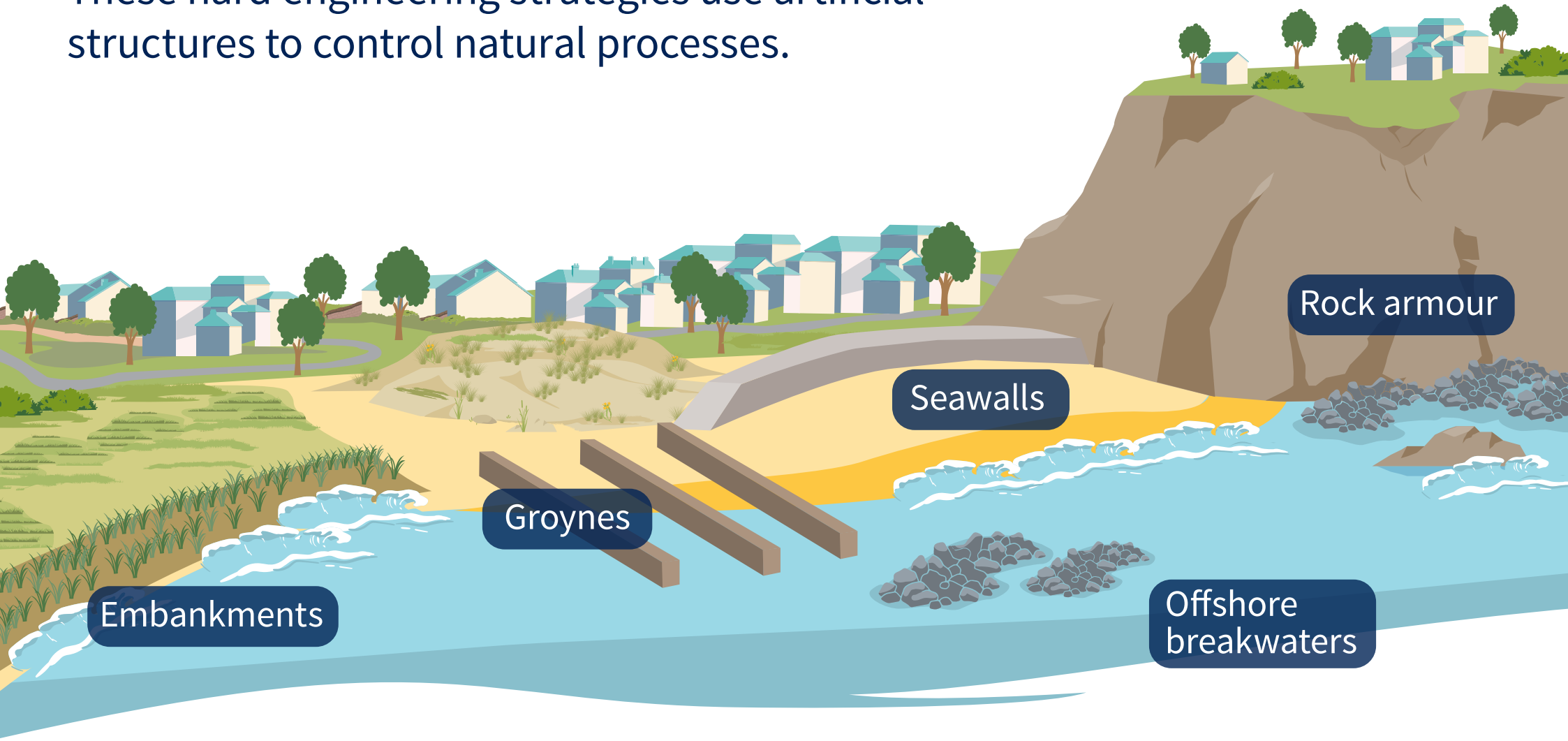


No Active Intervention – leaving the coast to develop naturally



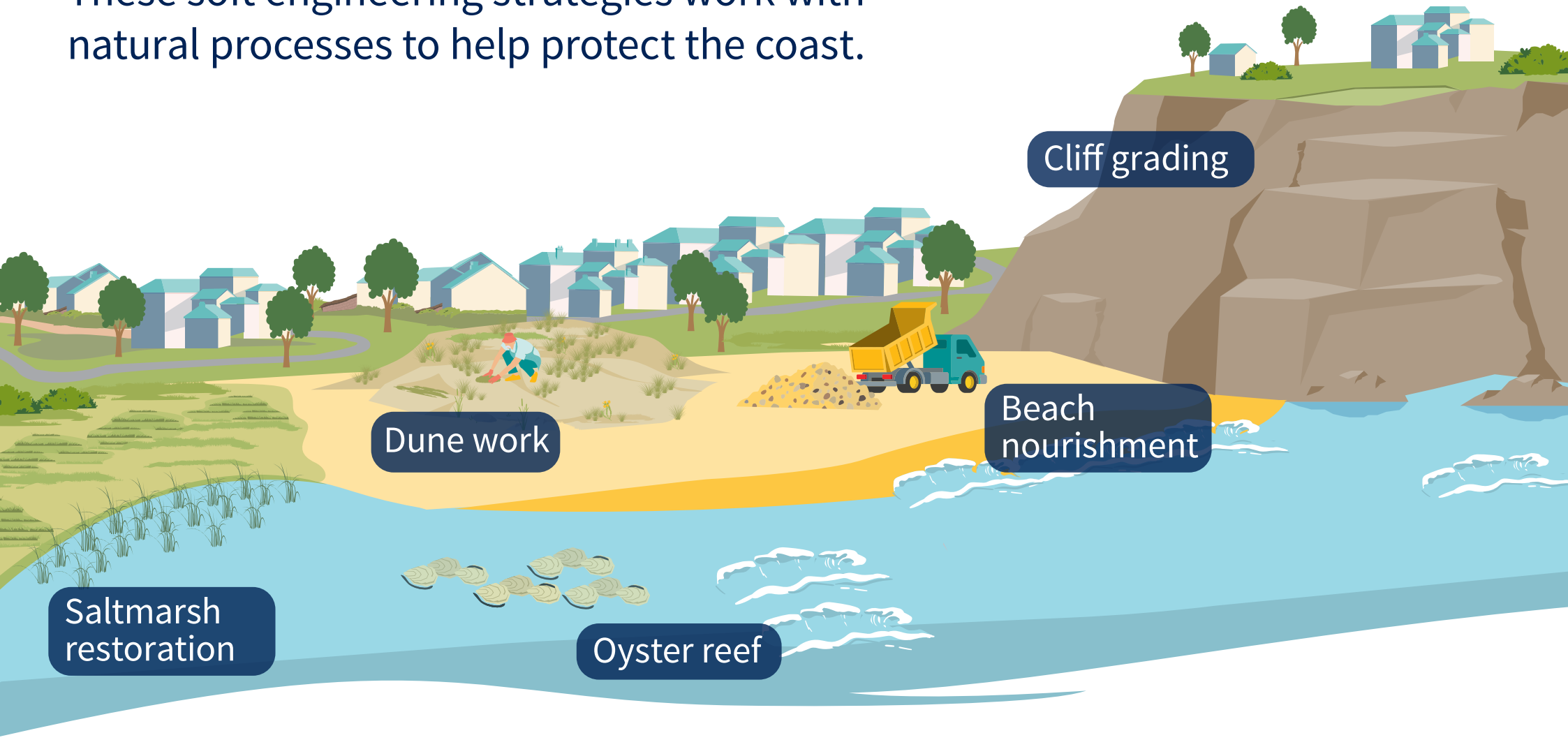
Controlling natural processes (Hard Engineering)

These hard engineering strategies use artificial structures to control natural processes.



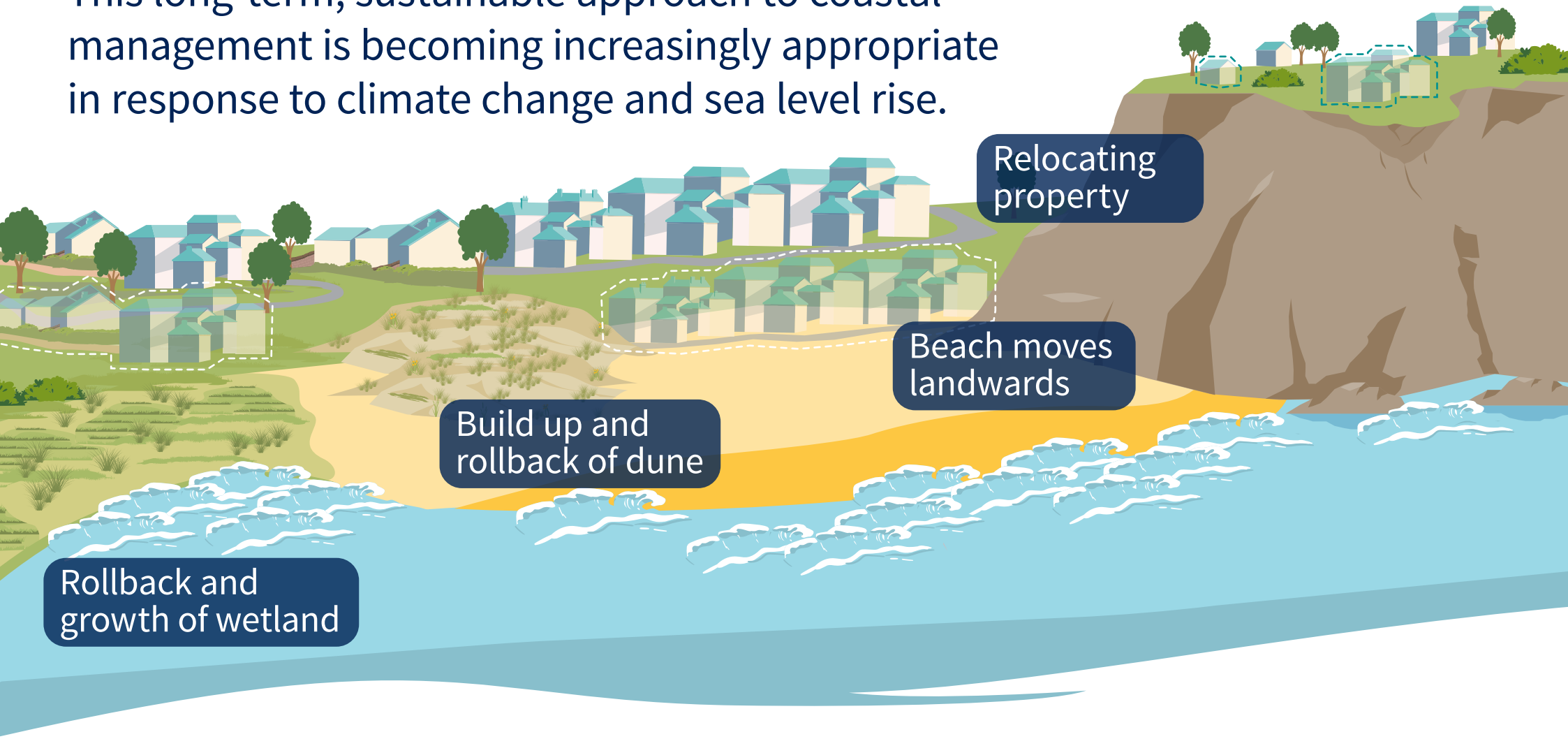
Working with natural processes (Soft Engineering)

These soft engineering strategies work with natural processes to help protect the coast.



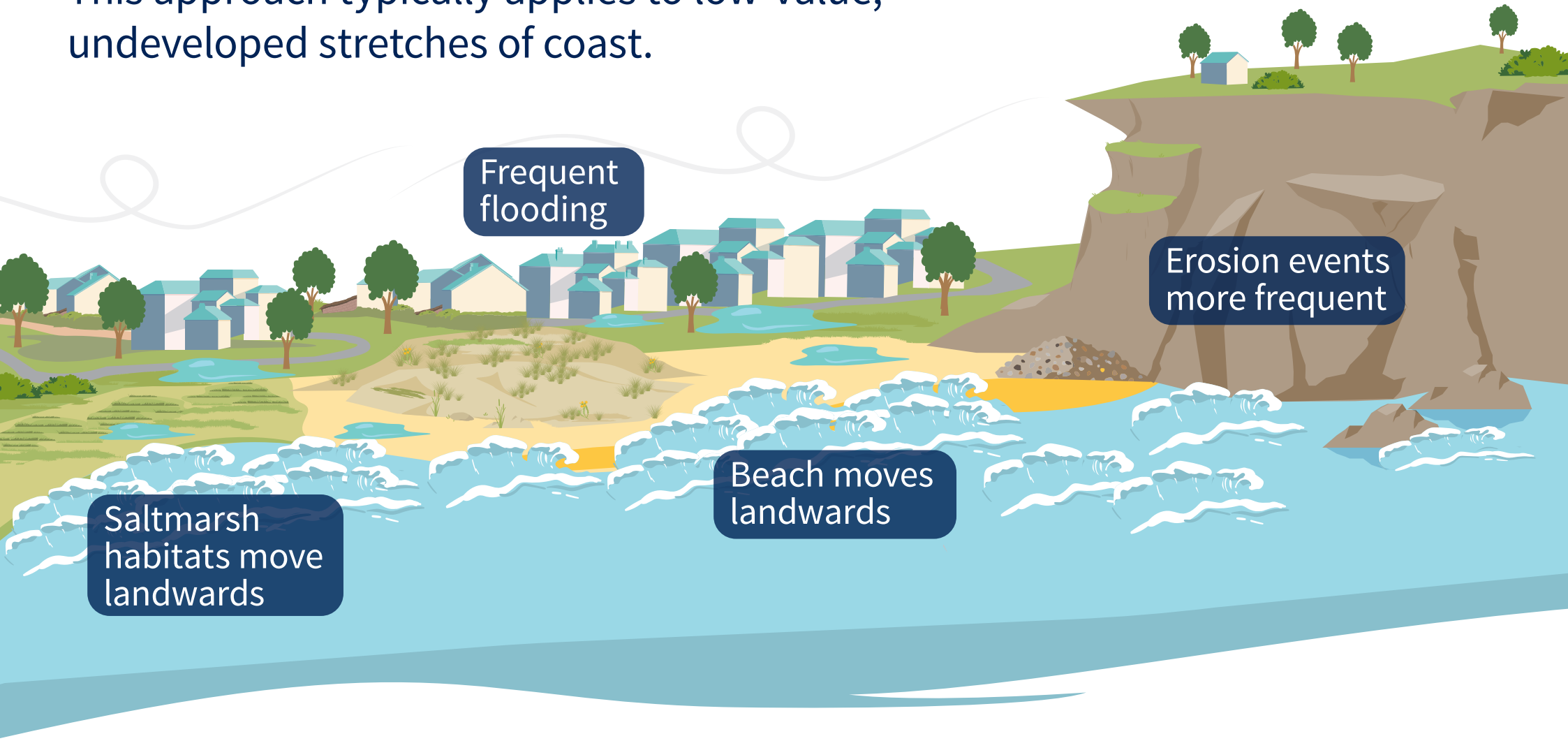
Managed Realignment

This long-term, sustainable approach to coastal management is becoming increasingly appropriate in response to climate change and sea level rise.



No Active Intervention

This approach typically applies to low-value, undeveloped stretches of coast.



Coastal management at Dawlish Warren

Dawlish is a small coastal resort located 15km south of Exeter, Devon.



Coastal management at Dawlish Warren



It is located on the western side of the River Exe estuary. The spit at Dawlish Warren extends north-eastwards into the mouth of the river.

Dawlish Warren spit

- Dawlish Warren is a sand spit that has formed at the mouth of the River Exe estuary.
- Longshore drift has transported sediment from west to east, extending the spit into the mouth of the river.



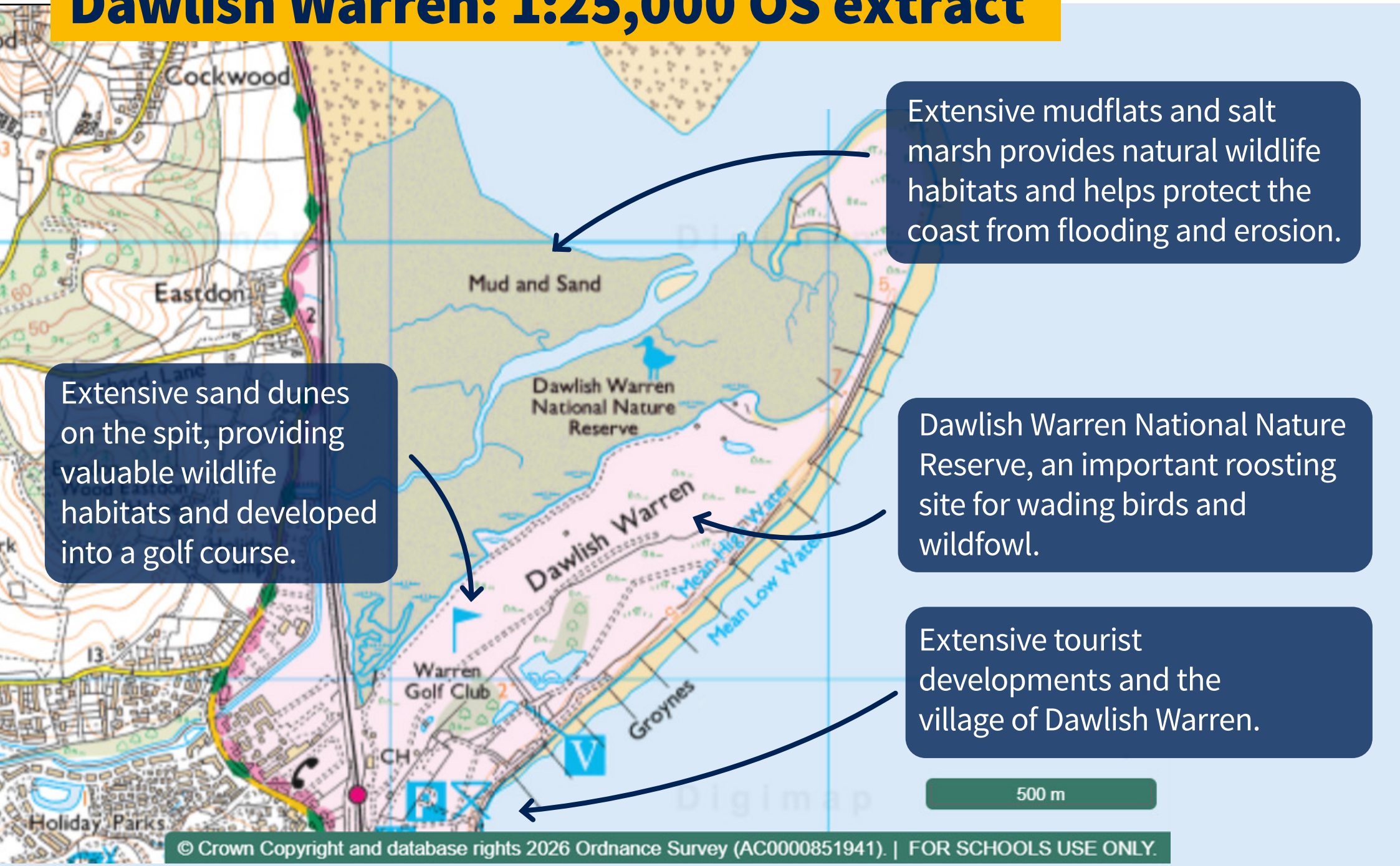


Dawlish Warren Spit

- An extensive area of mudflats and salt marsh has developed in the sheltered leeward side of the spit.
- The spit helps to protect the estuary from erosion and flooding.



Dawlish Warren: 1:25,000 OS extract



Extensive mudflats and salt marsh provides natural wildlife habitats and helps protect the coast from flooding and erosion.

Extensive sand dunes on the spit, providing valuable wildlife habitats and developed into a golf course.

Dawlish Warren National Nature Reserve, an important roosting site for wading birds and wildfowl.

Extensive tourist developments and the village of Dawlish Warren.

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Why is Dawlish Warren spit under threat?

- The coastal defences to the west have reduced the supply of sediment to the spit.
- Erosion of the spit has resulted in its width being reduced from about 250m to 50m over the last 250 years.
- Much of the eroded sand from the spit has been transferred and deposited across the estuary at Exmouth.



Why does Dawlish Warren need to be protected?



Dawlish Salt Marsh © N Chadwick

Dawlish Warren protects low-lying agricultural land, marshland, settlements and the mainline railway from erosion and flooding.

With its holiday parks, golf course and resort attractions, Dawlish Warren is an important tourist attraction. It supports many local businesses.



Why does Dawlish Warren need to be protected?

- Dawlish Warren, with its extensive area of sand dunes, is an important habitat for birds, such as the black-tailed godwit. It supports over 600 species of plants.





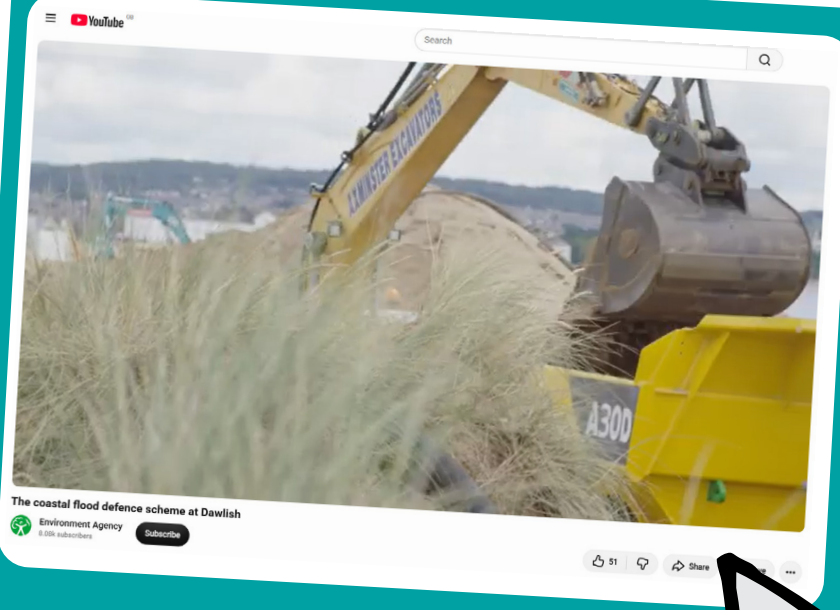




Beach Management Scheme (2017)

In 2017, the Environment Agency and Teignbridge District Council completed a £12m scheme to protect the spit and enhance the amenity value of the beach.

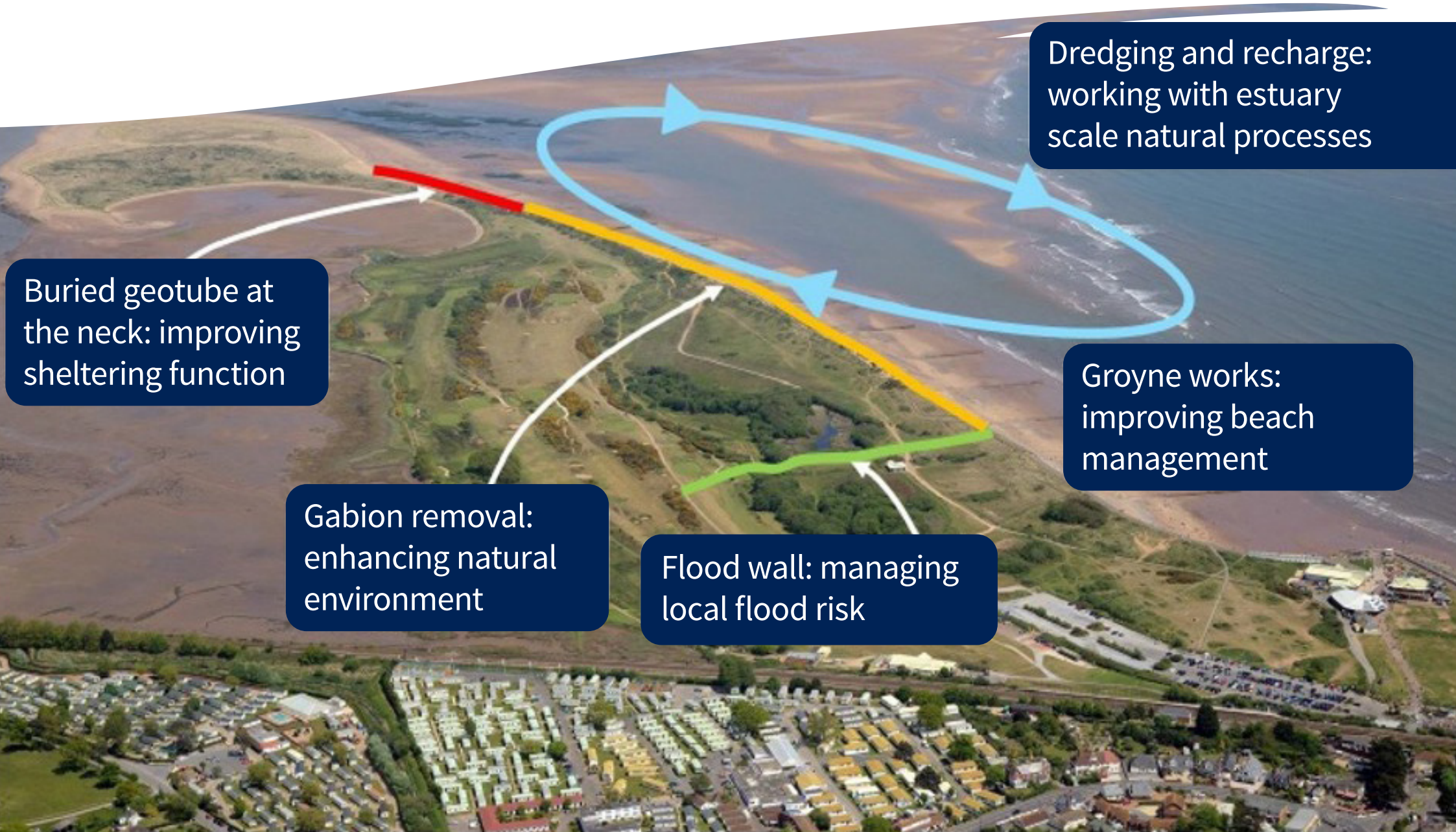
- Timber groynes were replaced or modified
- Construction of a new revetment between groynes 2 and 3
- At the ‘neck’ of the spit - where it narrows before the recurved tip - the burial of 450m long ‘geotube’ filled with sand to provide extra protection during storms.
- Offshore dredging and beach nourishment pumped over 250,000 cubic metres of sand onto the beach
- Removal of gabions to enable sand dunes to develop naturally

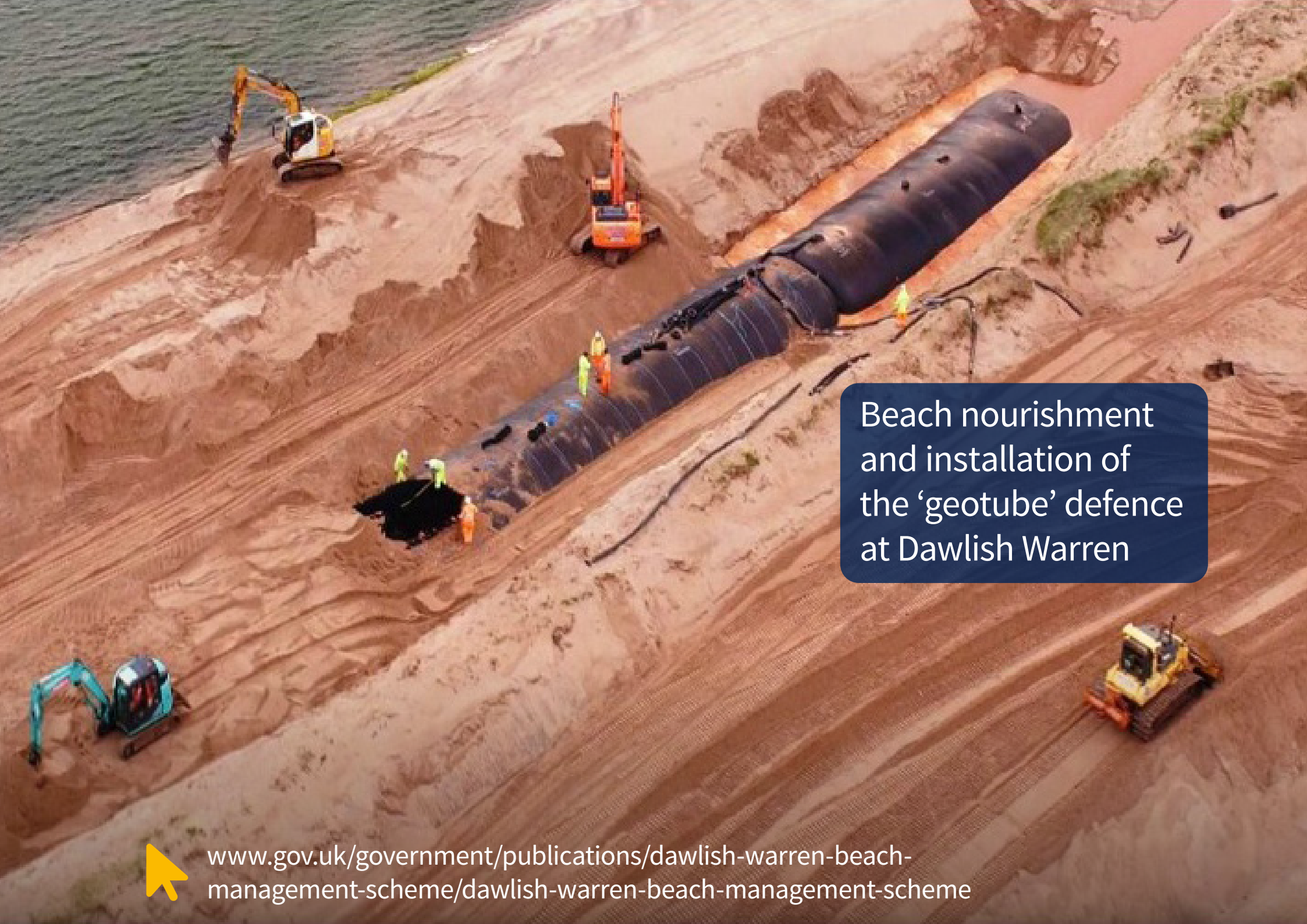


See YouTube video

https://www.youtube.com/watch?v=mvBkGHKwRgo&t=14s

Summary of management scheme (2017)





Beach nourishment and installation of the ‘geotube’ defence at Dawlish Warren

www.gov.uk/government/publications/dawlish-warren-beach-management-scheme/dawlish-warren-beach-management-scheme

Improved groynes, new revetment and beach nourishment at Dawlish Warren (2017)



www.gov.uk/government/publications/dawlish-warren-beach-management-scheme/dawlish-warren-beach-management-scheme

Has the management scheme been successful?



In 2023, a post-scheme review was published

- The spit will continue to lower over time, increasing the risk of flooding both locally and across the estuary.
- The main revetment and flood wall are, and will continue to be, effective in providing a good standard of protection.
- Further beach nourishment is not planned.



Has the management scheme been successful?

- Geotube and groynes are implemented but unsustainable in the longer term and will be removed by 2049 to allow natural processes to operate.
- The Geotube has become exposed and will be ‘patch repaired’.
- Remnant gabions and groynes should be removed to allow natural processes to operate.



Shoreline Management Plan (2005-2105)



Cockwood to the Warren
(Hold the Line) – maintaining current defences (sea walls and embankments) to protect the mainline railway, holiday camp, settlements, roads and sites of environmental importance.

Dawlish Warren spit
(No Active Intervention) – selective maintenance in the short-term, but in the longer-term the spit will be allowed to evolve naturally.

Dawlish Warren
(Hold the Line) – sea walls, revetments and rock armour will protect the mainline railway, amenity land, tourist developments and housing .

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Dawlish Warren: the future?

In the long-term, Dawlish Warren is under threat:

- Climate change threatens an increase in frequency and intensity of storms. Breaching, erosion and inland flooding may occur threatening settlements along the Exe estuary.
- Sea level rise will result in erosion of the beach, roll-back of sand dunes, reduction of wildlife habitats, and an increased risk of flooding.



Dawlish Warren: the future?

- The lack of sand input from the west (due to coastal defences trapping the sand) will starve the spit reducing its height and width.
- Some scientists consider that, if left to evolve naturally, the spit may disappear completely by the end of the century!



Dawlish Warren: past, present and future







REFERENCES

https://www.gov.uk/government/publications/dawlish-warren-beach-management-scheme/dawlish-warren-beach-management-scheme

https://devongeography.wordpress.com/2023/09/16/a-walk-around-the-warren-part-two-dawlish-warren-spit-wave-action/

https://www.youtube.com/watch?v=mvBkGHKwRgo&t=14s

