

DAWLISH: COASTAL PROCESSES, HAZARDS AND MANAGEMENT



<https://www.networkrail.co.uk/running-the-railway/our-routes/western/south-west-rail-resilience-programme/dawlish-sea-wall/>

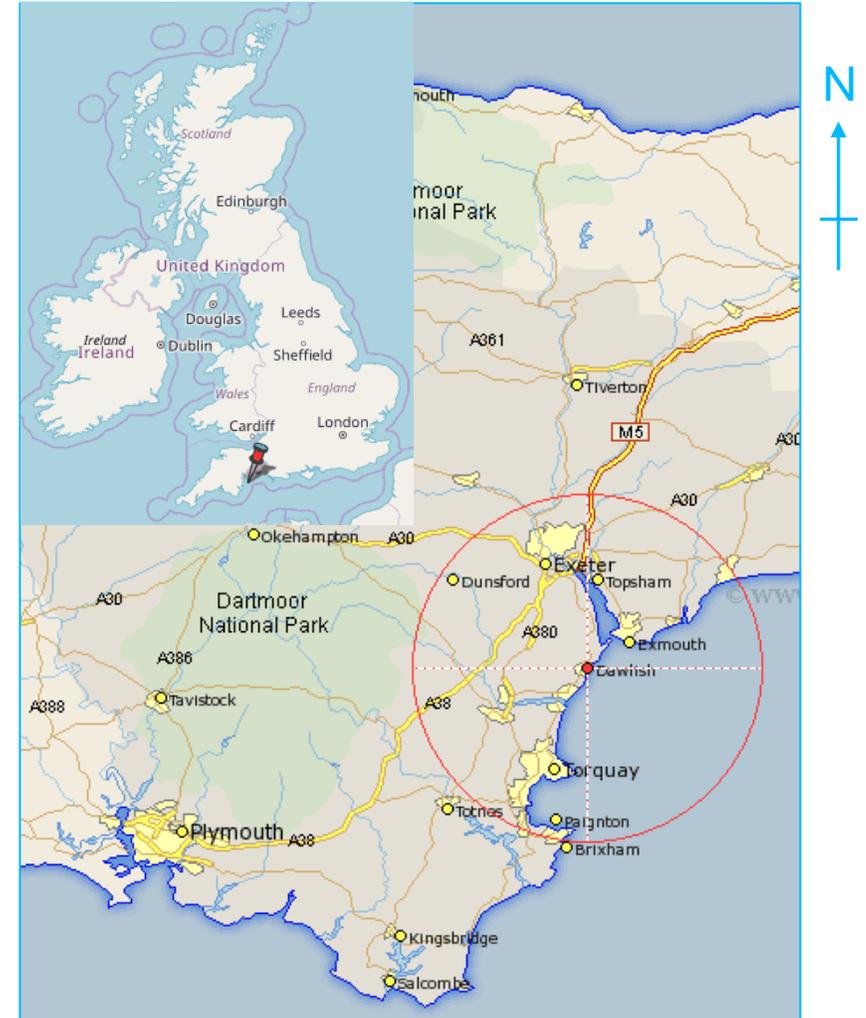
Credit: Network Rail

WHERE IS DAWLISH?

- Dawlish is a small town on the south Devon coast about 20km south of Exeter.
- The town has a population of about 15,000.
- Dawlish and neighbouring Dawlish Warren are popular tourist destinations – Dawlish has nearly 500,000 day visits per year and Dawlish Warren about 800,000 visitors per year.

Drone footage of the Dawlish coast:
https://youtu.be/kdq_pPVekjk or click the icon

[View the
Dawlish
coastline](https://youtu.be/kdq_pPVekjk)



https://www.freecountrymaps.com/map/towns/great_britain/21764119/
<https://www.itraveluk.co.uk/maps/england/8776/devon/dawlish.html>

MAINLINE RAILWAY TO THE SOUTH-WEST

The mainline railway from Exeter to Penzance runs alongside the coast at Dawlish. It was opened in 1846.



Source: National Oceanography Centre, 2020



Source: Digimap for Schools

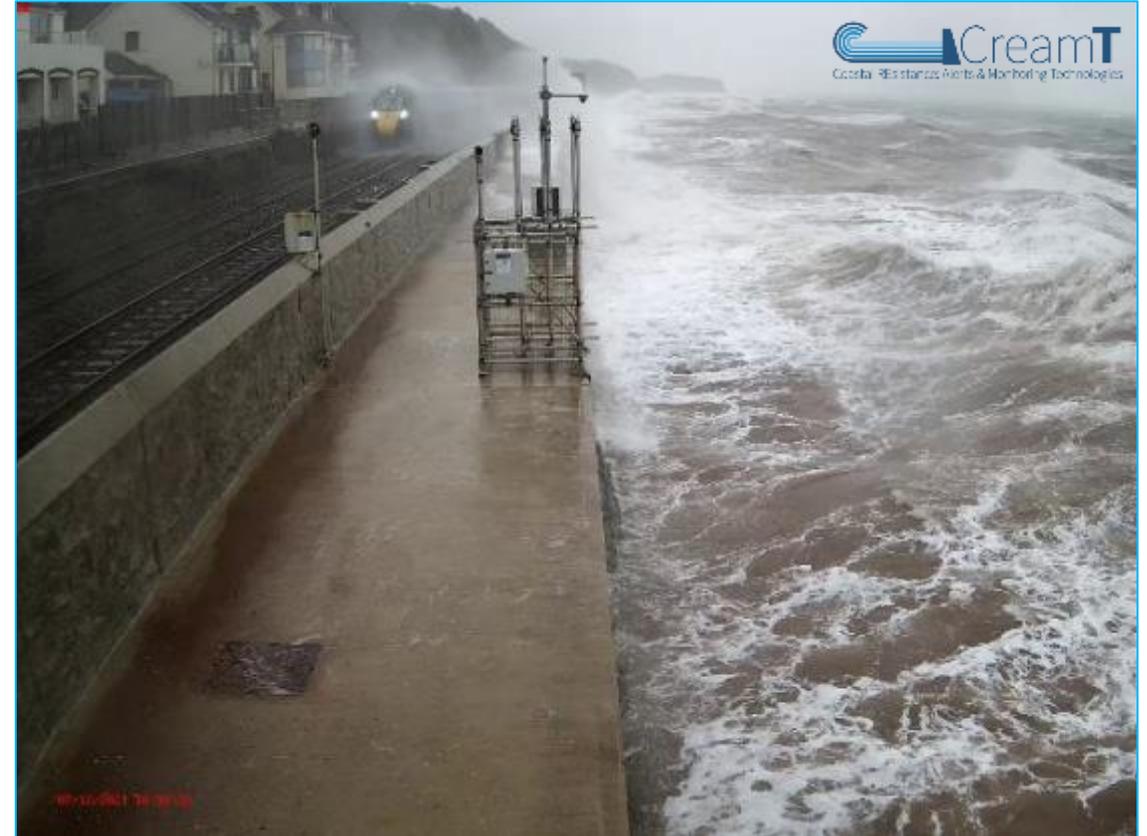
WINTER STORMS AND THE RAILWAY

- The railway infrastructure at Dawlish is vulnerable to the effect of high seas during winter storms
- Trains can be cancelled or delayed impacting the economy of the south-west.
- Tracks and signalling can be affected by flooding and coastal erosion.
- The cliffs alongside the railway are prone to rockfalls and landslips particularly after heavy rain.

Footage of Storm Barra (December 2021):

<https://youtu.be/ysoCnHo7u0k> or click the icon

[Watch Storm Barra](https://youtu.be/ysoCnHo7u0k)



Source: University of Plymouth's camera watching the National Oceanography Centre's wave overtopping measurement system (Wirewall), part of a research project, 2021

STORM PETRA: 5 FEBRUARY 2014

- On 5 February 2014, Storm Petra whipped up powerful waves along the south coast of Devon.
- The existing sea wall defences at Dawlish were breached and the railway lines were left dangling in mid-air.
- Cornwall and much of Devon were cut off for 8 weeks while the sea wall was repaired and the railway restored.
- The cost to the economy was substantial.
- Research (Dawson et al., 2016) indicates disruption due to Sea Level Rise could increase by up to 1200% in the coming decades.
- Maintaining a reliable rail service could cost billions of pounds.

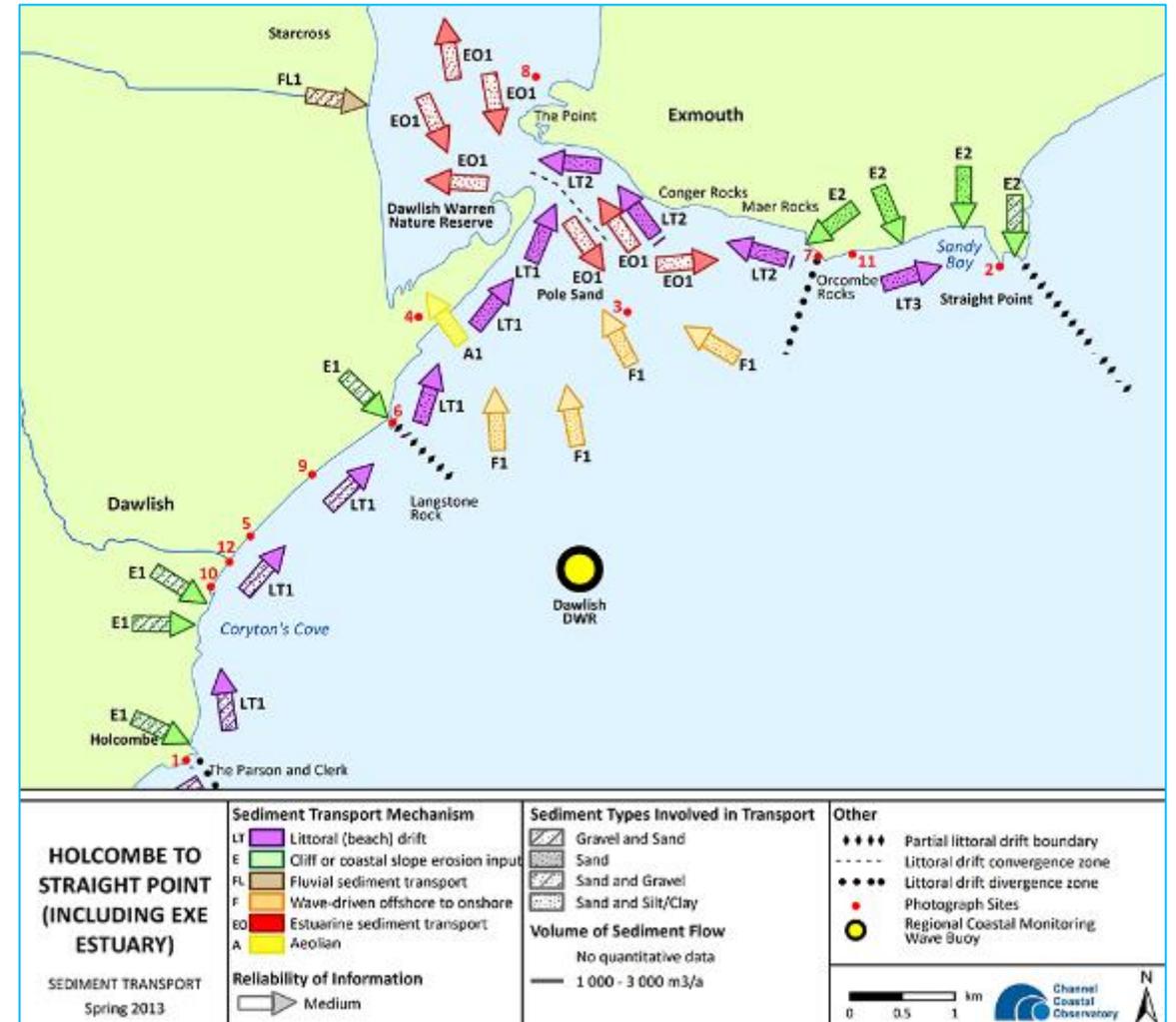


Credit: Network Rail
<https://www.bbc.co.uk/news/uk-england-devon-55939197>

Dawson et al. (2016) Sea-level rise impacts on transport infrastructure: The notorious case of the coastal railway line at Dawlish, England. In *Journal of Transport Geography*, <https://doi.org/10.1016/j.jtrangeo.2015.11.009>

COASTAL PROCESSES AT DAWLISH: THE SEDIMENT CELL

- The map shows sediment transport along the coast – this is called the sediment cell.
- Locate Dawlish and notice that sediment is being transported along the coast from south-west to north-east.
- Notice how longshore drift and wind action (aeolian) has resulted in the formation of a spit at Dawlish Warren.
- Cliff erosion south of Dawlish is an input of sediment into the sediment cell.



Source: New Forest District Council (2017). Update of the SCOPAC Sediment Transport Study, <https://www.scopac.org.uk/sts/ho-sp.html>

COASTAL PROCESSES AT DAWLISH

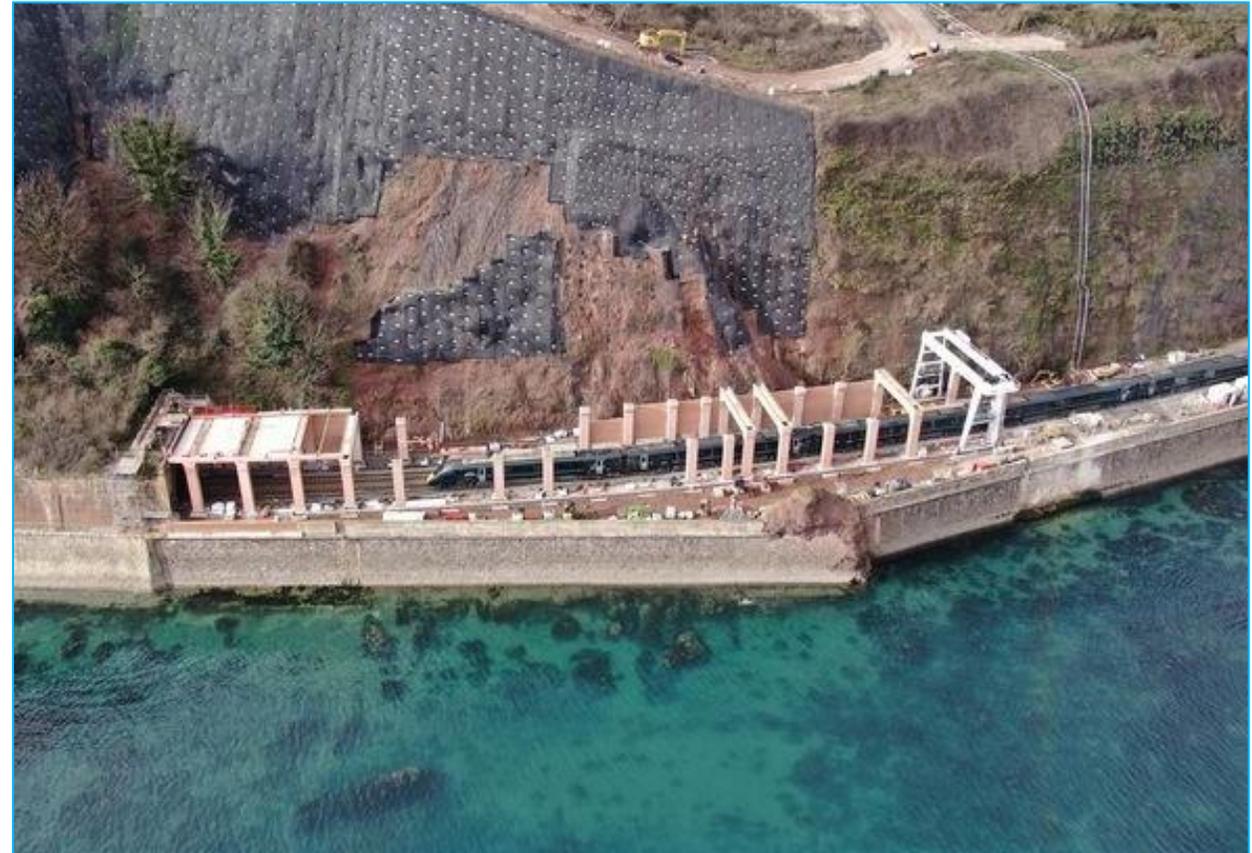
- Longshore (littoral) drift transports sediment northwards often starving the beach at Dawlish (bottom of photo). This exposes the sea wall making it vulnerable to erosion.
- During storms, the erosion of sediment increases vulnerability to flooding and erosion. Notice that the groynes, constructed to interrupt longshore drift, have become dilapidated.
- The steep sandstone cliffs to the left of the railway pose the threat of rockfalls and landslips, examples of mass movement (the downward movement of soil/rock under the influence of gravity).



Source: New Forest District Council (2017). Update of the SCOPAC Sediment Transport Study, <https://www.scopac.org.uk/sts/ho-sp-photos.html#exe-5-8>

NATURAL HAZARDS AT DAWLISH: LANDSLIDES

- Landslides and rockfalls are common along this stretch of coast.
- The photo shows work being carried out in 2023 to extend the rockfall shelter at Parson's Tunnel near Dawlish. The open shelter has a wall adjacent to the cliff to prevent rocks rolling onto the tracks.
- It will be covered by a cushioning material to absorb the impact of any rockfalls as well as promoting vegetation growth.
- Notice that mesh and soil nails have been used to help stabilise the cliffs.



<https://www.devonlive.com/news/devon-news/dawlish-railway-line-vital-new-8120142>
Credit: South West Rail Resilience, Network Rail

NATURAL HAZARDS AT DAWLISH: FLOODING

- The railway track is subject to flooding from both heavy rainfall (surface water) and overtopping by the sea.

For example, see BBC news items <https://www.bbc.co.uk/news/av/uk-england-30013201>

- In 2021, Storm Barra pounded the south Devon coast with winds of 70-80mph. Huge waves crashed over the seafront causing severe disruption to train services.

[Click to Watch Storm Barra video](#)

- The lower photo shows flooding at Cowley Bridge. In 2012 this location flooded following a period of heavy rain.

See BBC news items <https://www.bbc.co.uk/news/uk-england-devon-30487872>



Credit: Coast Cams, <https://www.youtube.com/watch?v=n8HktqrBvoY>



Credit: Network Rail, <https://www.networkrailmediacentre.co.uk/news/proposed-solution-to-flooding-at-cowley-and-stafford-bridges-in-exeter>

DAWLISH SHORELINE MANAGEMENT PLAN (SMP)

- In England and Wales, a shoreline management plan (SMP) outlines strategies for managing flood and erosion risks for a stretch of coastline.
- A SMP identifies the most sustainable policy over three timescales – present-day (0-20 years), medium-term (20-50 years) and long-term (50-100 years).
- There are four management options: Hold the Line, Advance the Line, Managed Realignment and No Active Intervention.
- For the stretch of coast between Holcombe and Dawlish Warren, the strategy is **Hold the Line**. This aims to protect the railway line and coastal property by keeping the coastline at its current position.



Source: [Managing flood and coastal erosion risk for the Exe Estuary, May 2014, Environment Agency](#)

DAWLISH: HOLD THE LINE

The aerial photo shows the existing coastal defences at Dawlish which aim to Hold the Line. They include:

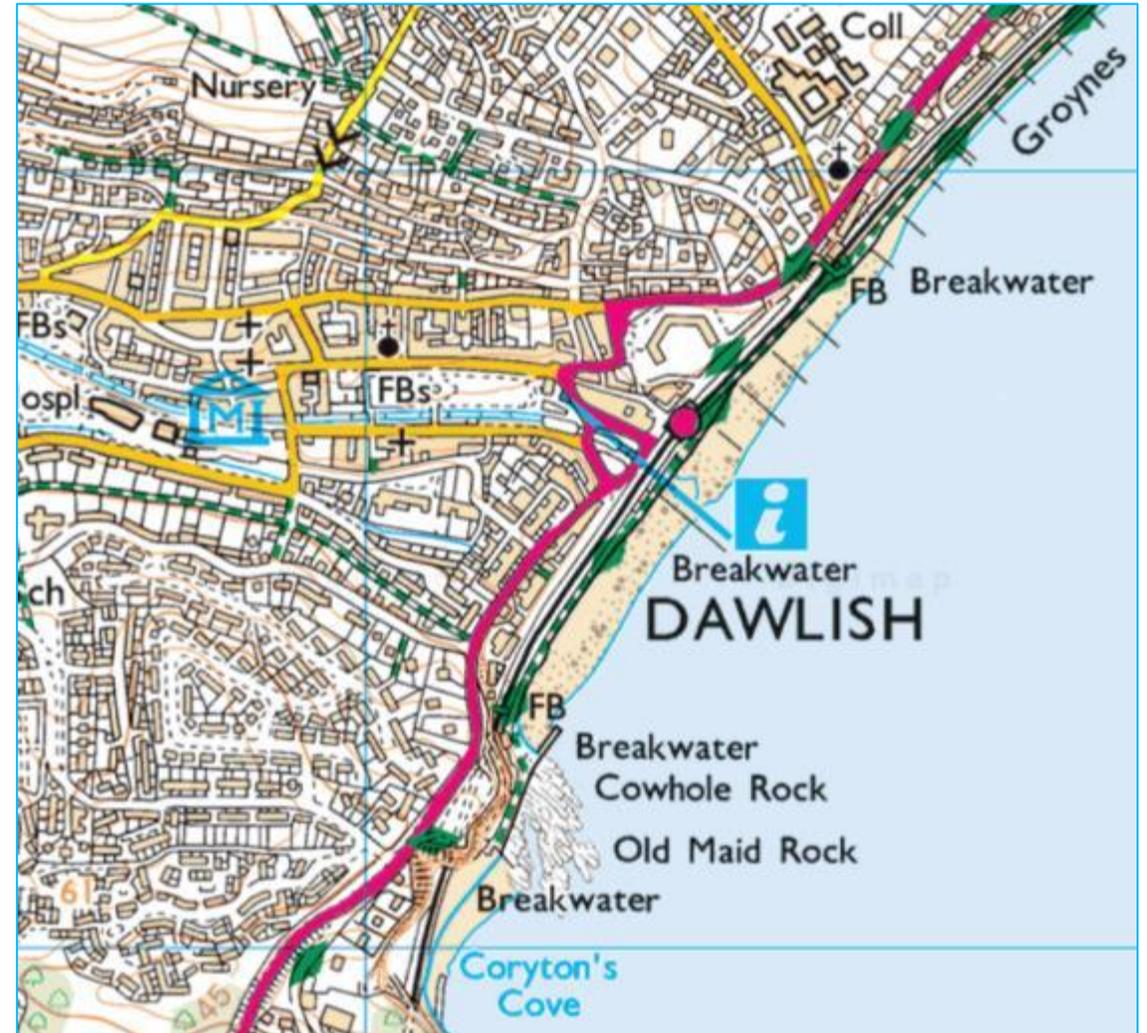
- Sea wall, first constructed in the 1840s as part of the railway construction, which aims to prevent waves reaching the coast
- Breakwater at Dawlish and wooden groynes, also constructed in the 1840s, to interrupt longshore drift and encourage the accumulation of a protective beach.



Source: University of Plymouth's drone part of a research project, 2021

DAWLISH 1:25,000 OS MAP

- The OS map extract shows the railway line which is raised on top of the sea wall. Notice the breakwaters and groynes intended to interrupt longshore drift .
- The beach is only exposed at low tide. At high tide, the sea reaches the base of the sea wall.
- In the absence of a protective beach, the sea wall has been breached on many occasions.



Source: [Digimap for Schools](#)

COASTAL MANAGEMENT AT DAWLISH

- The original sea wall had no wave-reflecting curve resulting in frequent overtopping by waves.
- Following the impacts of Storm Petra (2014) and predictions that, with sea level rise, the existing sea wall would continue to be starved of protective beach sediment, the decision was made to construct a new sea wall.
- The scheme, planned and developed by Network Rail's South West Rail Resilience Programme, will cost an estimated £80m. It is designed to protect the railway for 100 years.



<https://www.bbc.co.uk/news/uk-england-devon-64770572>
Credit: Network Rail

**Look @ the South West
Rail Resilience Programme**

View video footage from the SW Resilience Programme:

<https://www.networkrail.co.uk/running-the-railway/our-routes/western/south-west-rail-resilience-programme/dawlish-sea-wall/> or click the icon

NEW SEA WALL AT DAWLISH

- There are two sections of sea wall (360m and 415m) connected by a new link bridge (see top photo).
- The sea walls are constructed of concrete wall panels with curved wave returns at the top. This should reduce overtopping by waves.
- Construction work began in 2019 and the first section of sea wall (photo) along Marine Parade to the west of Dawlish station was completed in 2020.
- The scheme is due to be completed in mid-2023.

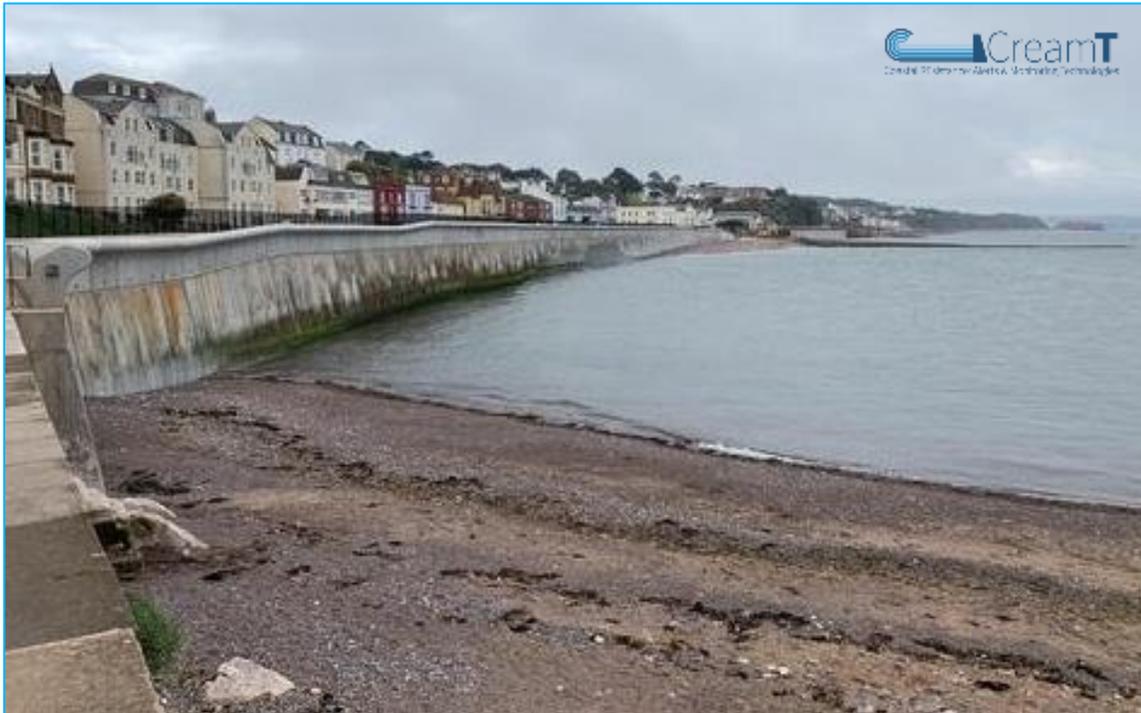


<https://www.bbc.co.uk/news/uk-england-devon-60246052>

Both images - source: Network Rail

NEW SEA WALL AT DAWLISH

The sketch on the right shows the constructional details of the sea wall and gives an indication of its dimensions.



Source: National Network of Regional Coastal Monitoring Programmes of England CoastSnap gallery, https://coastalmonitoring.org/gallery/grid/coastsnap_imagery/dawlish/



Source: Network Rail, <https://www.networkrail.co.uk/running-the-railway/our-routes/western/south-west-rail-resilience-programme/dawlish-sea-wall-section-two/>