

Landscape Systems – Coastal landscapes

Coastal landscapes activities

The geology of the coast has a major impact on the rate of coastal recession. An understanding of rock types, their structure and the stratigraphy of the coastline will help develop a good awareness of why coastal processes are operating in an area. If you haven't studied rock types before, this is a good introductory video:

<https://www.youtube.com/watch?v=EGK1KkLjdQY>

or check out BBC Bitesize: <https://www.bbc.co.uk/bitesize/guides/z8jcfrd/revision/2>



Go to [zzed.uk/10760](https://www.zzed.uk/10760)

1. Complete the table below.

Rock type	Formation	Description of structure / characteristics (porosity)	Examples
Sedimentary			
Igneous			
Metamorphic			

2. Study the table below, which shows rock erosion rates.

Rock type	Average erosion rates
Granite	0.1–0.1 cm/year
Marble and slate	0.45–1 cm/year
Limestone	1–2 cm/year
Chalk	1–100 cm/year
Sandstone	10–100 cm/year
Boulder clay	100–1,000 cm/year

a. What does this tell you about how the speed of erosion varies around the country?

.....

.....

b. What do you think a stretch of coastline would look like if it had an area of limestone next to an area of clay?

.....

.....

3. How are rocks structured? Fill in the gaps below (**words at the bottom**).

Rocks can be massive (_____ with no _____), stratified (_____), folded or _____ .

Between each _____ particle, there are _____ spaces. Their size and _____ affect how much _____ is absorbed.

Faults are _____ in the rock caused by past _____ movements.

Folds are _____ in the rock formed by _____ movements that have not been _____ enough to cause the rock layers to _____ .

Joints are _____, natural, _____ cracks found in many rocks.

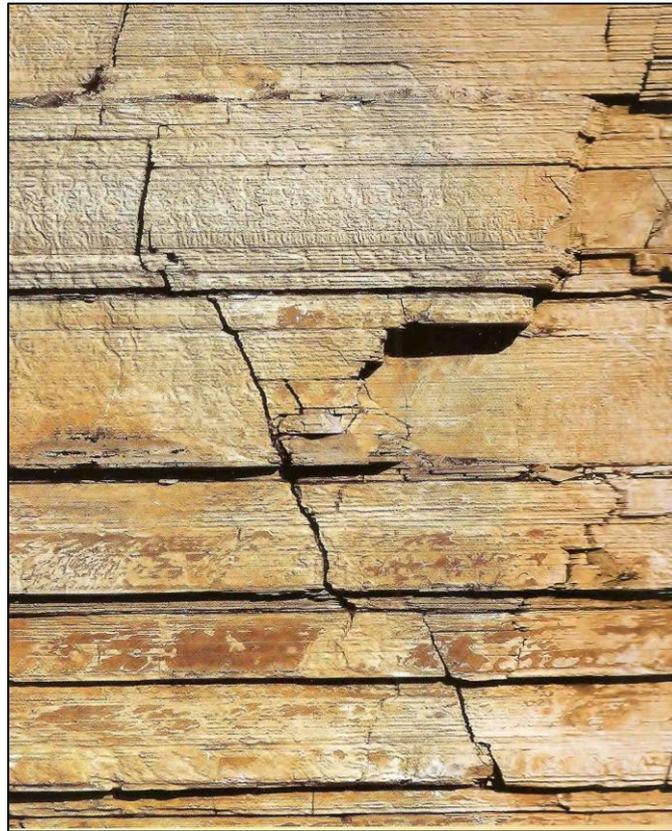
Bedding planes are _____ cracks formed when layers of rock _____ .

Faults, bedding planes and joints allow _____ to pass easily through the rock.

Some of these words can be used more than once in the passage above:

meet	tectonic	alignment	mineral	compact
bends	faulted	vertical	pore	small
break	horizontal	breaks	layers	strong
water				

4. On the diagram below, label a joint and a bedding plane.



5. The table below shows average monthly wave height for the Shetland Islands, Scotland in metres.

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean wave height (m)	4.36	3.83	3.8	2.57	1.88	1.67	1.52	1.7	2.53	3.01	3.41	3.94

- a. Calculate the mean annual wave height using the data above (don't forget to show your working out).

- b. What is the median wave height for the Shetland Islands?

.....

- c. What is the range of wave heights in the Shetland Islands?

.....

- d. Calculate the standard deviation for the wave height data of the Shetland Islands (don't forget to show your working out, and give your answer to two decimal places). *Need some help? Watch this video:* <https://www.youtube.com/watch?v=WVx3MYd-Q9w>



Go to [zzed.uk/10760](https://www.zzed.uk/10760)

6. Study the image below and answer the questions in the surrounding boxes.

How are these landforms linked?

How and why might this landscape change over time?

What landforms can you see in the picture?
Annotate the picture too.



What evidence is there about the structure of the rock? Add arrows to go with your explanation.

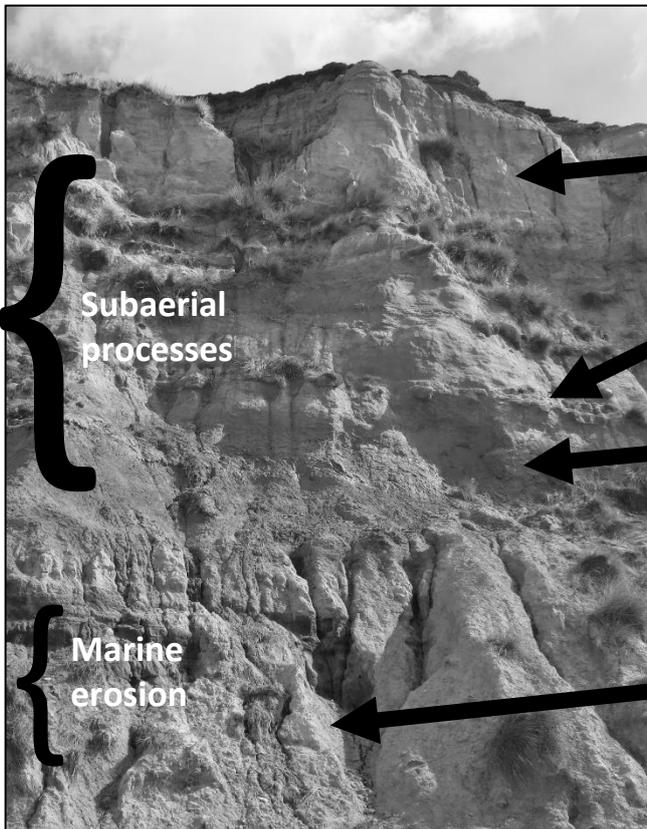
How have these landforms been created? Include: weathering, erosion, transportation and deposition.

7. There are lots of features and processes you should be aware of from GCSE. Complete this key term mix and match to help refresh your memory of them.

Term	Definition
Constructive wave	This process works on loose sediment already eroded from a cliff. Sediment collides and breaks apart. Sediment gets smaller and more rounded.
Destructive wave	Flat, low-lying land adjacent to a coast. The land gradually slopes towards the sea across an area of deposited sediment, with sand dunes and mudflats being the most common examples. There is quite a blurred boundary between land and sea.
Biological weathering	Processes that occur on the cliff face rather than at the cliff foot.
Chemical weathering	Man-made structures built to stop or interrupt coastal processes and prevent flooding; for example, groynes and sea walls.
Mechanical/physical weathering	Coasts where the geology alternates between strata of hard and soft rock at right angles to the sea. It has alternating headlands and bays.
Hydraulic action	A more sustainable/natural way of managing the coastline in order to reduce erosion, such as dune stabilisation.
Attrition	A coastline where bands of different types of rock run parallel to the sea.
Abrasion	A stronger backwash than swash occurs when waves are more powerful and leads to the removal of the beach.
Solution	Air trapped in cracks and fissures is compressed by the force of the waves crashing against the cliff face. When the wave retreats, pressure is released explosively (cavitation). This can widen cracks and dislodge blocks from the cliff face.
Longshore drift	The breakdown of rocks and landforms due to the actions of plants and animals.
Concordant coast	The movement of rocks/sediment downslope due to gravity. Weathering processes can help this happen.
Discordant coast	The breakdown of rocks due to changes in temperature (causing rocks to expand and contract) or changes in pressure.
Tides	Sediment is picked up by the waves and thrown at the cliff. This grinds/scrapes against the cliff like sandpaper, wearing it down. Perhaps the most effective wave erosion process.
Fetch	The breakdown of rocks due to chemical reactions, e.g. carbonation.
Coastal plain	Carbonate rocks react with weak acids in rainwater and seawater. This slowly dissolves them.
Mass movement	A stronger swash than backwash causes sediment to be deposited and the beach to build up.
Subaerial processes	The alternating rise and fall of the sea at the coastline due to the gravitational force of the moon and the rotational pull of the Earth.
Hard engineering	The downdrift movement of sediment along the coast in a zigzag pattern caused by the swash travelling up the beach in the direction of the prevailing wind, the backwash returning perpendicular to the sea due to gravity.

9. Stretch and challenge task:

Study the labelled image below of Hengistbury Head. Add annotations to show how these cliffs are likely to be affected by subaerial and marine processes (consider permeability and resistance to erosion).



Warren Hill Sands – bands of yellow and white sand

Upper Hengistbury Beds – greenish, sandy clays with large ironstone ‘doggers’

Lower Hengistbury Beds – olive green, sandy clays

Boscombe Sands