OCR A-LEVEL GEOGRAPHY

Key facts at your fingertips

David Redfern

HODDER EDUCATION
LEARN MORE

Contents

1 Coastal landscapes

1.1 Coastal systems

You need to know

- coastal landscapes can be viewed as systems
- how coastal landscape systems are influenced by a range of physical factors
- the main sources of sediment in a coastal system

Systems

Coastal landscapes act as natural open **systems**, with inputs, processes and outputs (Table 1).

Key term

System Any set of interrelated components that are connected together to form a working unit or unified whole.

Table 1 Features of a coastal system

Inputs	**Marine:** energy from waves; tides and sea currents; salt spray **Geological:** rock type, rock structure; products of weathering **Atmospheric:** wind energy; precipitation; temperature; sea level change **Human activity:** land use; coastal protection
Weathering/erosional processes	**Weathering:** physical; chemical; biological **Erosion:** hydraulic action; wave quarrying; abrasion; attrition **Mass movement:** landslides; rockfalls; mudflows; rotational slips; soil creep
Erosional components	**Erosional landforms and landscapes:** cliffs; headlands and bays; wave-cut platforms; geos; caves, arches and stacks
Transport processes (flows)	**Water transport:** longshore drift; onshore and offshore movement; traction; saltation; suspension **Wind transport:** surface creep; saltation
Depositional components (stores)	**Depositional landforms and landscapes:** beaches; spits; tombolos; bars and barrier beaches; sand dunes; salt marshes
Outputs	Energy; onshore sediment; marine sediment

Feedback

Energy and material flow (transfer) through the coastal system, often involving feedback mechanisms.

Key term

Positive feedback Where a change causes a further, or snowball, effect that continues or even accelerates the original change.

An example of **positive feedback**:

- sea walls prevent flooding, but they also limit cliff erosion
- this restricts the release of sediment into the coastal system

- this sediment might otherwise have been re-deposited and helped protect the coastline

An example of **negative feedback**:

- sediment is eroded from a beach during a storm, and is then deposited offshore to form a bar
- waves break before reaching the beach, dissipating their energy and therefore reducing erosion of the beach
- normal wave conditions re-work offshore deposits back to the beach

Sediment cells and budgets

Sediment cells:

- **DEFRA** has identified eleven major sediment cells for England and Wales, which form the basic units for coastal management
- each cell is separated by headlands or stretches of open water
- most cells are divided into sub-cells
- sediment cell theory is a key component of Shoreline Management Plans, which decide on future strategies of coastal management (see page XXX)

Sediment budgets:

- see Figure 1

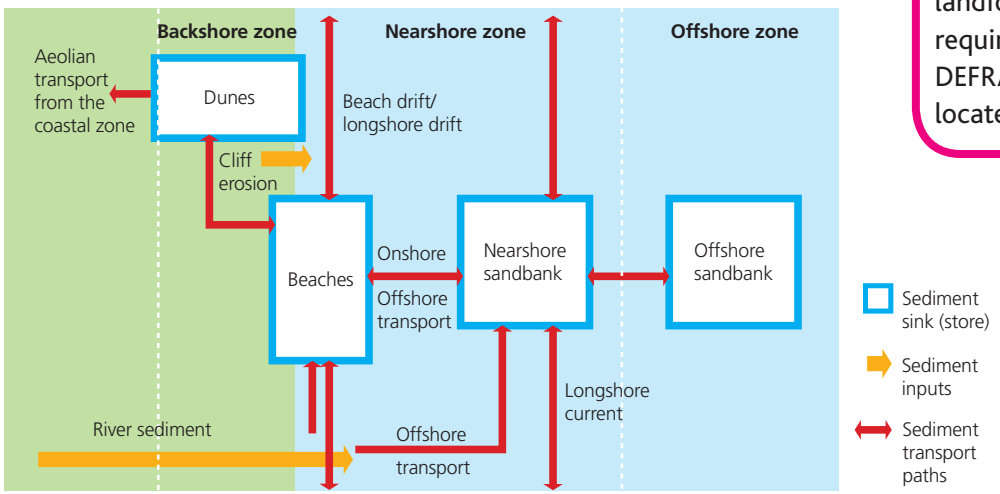

Figure 1 Coastal sediment budgets

Physical factors

Wind and waves

Key points:

- waves are caused by the wind blowing over the surface of the sea
- as wind drags over the water surface, friction causes a disturbance and forms waves
- waves at sea follow an orbital movement — objects on the water do not travel forward

Key terms

Negative feedback Acts to lessen the effect of the original change and ultimately to reverse it.

Sediment (or littoral) cell A length of coastline and its associated near-shore area, within which the movement of coarse sediment (sand and shingle) is largely self-contained.

DEFRA The Department for Environment, Food and Rural Affairs.

Exam tip

The UK case study of a coastal landscape in Section 1.2 Coastal landforms (page XXX) will require you to know which DEFRA cell, or sub-cell, it is located in.

Key term

Sediment budget The relationship between accretion and erosion, which can be used to predict the changing shape of a coastline over time.

- when a wave reaches shallow water, the movement of the base of the wave is slowed by friction with the sea bed
- the wave spills forward as a breaker, moving objects forward with it in the **swash**
- it then draws back to the sea as **backwash**

Wave energy is controlled by:
- the force of the wind and its direction
- the duration of the wind
- the **fetch** — the longer the fetch, the more energy waves possess

There are three types of breaking wave:
- spilling — waves breaking on to gently sloping beaches; water flows gently forward as the wave breaks
- plunging — steep waves breaking on to steep beaches; water falls vertically downwards
- surging — low-angle waves breaking on to steep beaches; the wave slides forward

Constructive waves:
- build beaches
- are the product of distant weather systems
- have longer wavelengths, lower height and are less frequent (6–8 per minute)
- swash is greater than backwash so they add to beach materials, giving rise to a gently sloping beach
- the upper part of such a beach is marked by a series of small ridges called **berms** (see Figure 4 on page XXX)

Destructive waves:
- have a shorter wavelength, a greater height and are more frequent (10–14 per minute)
- backwash is greater than the swash so that sediment is dragged offshore
- create a steeper beach profile initially, though over time the beach will flatten as material is drawn backwards
- form shingle ridges at the back of a beach (storm beaches — Figure 4), created by local storms

Key terms

Swash The landward flow of water up a beach.

Backwash The seaward flow of water down a beach.

Fetch The distance over which the wind has blown to produce waves.

Berm A small ridge at the back of a beach, corresponding to a previous high tide.

Tides The periodic rise and fall in the level of the water in the oceans caused by the gravitational attraction of the moon and sun.

Exam tip

When asked to compare or contrast different types of waves, make sure you make clear comparative statements rather than separate statements.

Tides

Key points:
- **tides** are produced by the gravitational pull of the moon and the sun — as the moon orbits the Earth, high tides follow it

- the moon pulls water towards it and there is a compensatory bulge on the opposite side of the Earth
- at various locations between the two bulges, there is a low tide
- the highest tides occur when the moon and sun are aligned, when the gravitational pull is at its strongest
- this happens twice each lunar month and results in spring tides with a high **tidal range**
- twice a month, the moon and the sun are at right angles to each other and the gravitational pull is therefore at its weakest, producing neap tides with a low range

Tidal ranges:

- are low in enclosed seas — wave action is restricted to a narrow area of land
- are higher in places where the coast is funnelled, such as estuaries

Exam tip

Note that tides only reinforce the action of waves; tidal range is the main factor in coastal processes.

Geology

Key points:

- some rock types (e.g. clay) have a weak **lithology**, with little resistance to erosion, weathering and mass movements
- others (e.g. basalt, granite) are made of dense interlocking crystals and are very resistant
- porous rocks (e.g. chalk) have a **structure** with tiny air spaces that separate the mineral particles, allowing them to absorb and store water
- carboniferous limestone is also permeable because of its many joints

Ocean currents

Key points (Figure 2):

- warm ocean currents transfer heat-energy from low latitudes towards the poles
- cold ocean currents move cold water from polar regions towards the Equator
- an ocean current has limited impact on coastal landscape processes
- the transfer of heat-energy can be significant — it directly affects air temperature and therefore the sub-aerial processes of weathering and mass movement (see page XXX)

Key terms

Tidal range The difference between the water level at high tide and at low tide.

Lithology The physical and chemical composition of rocks.

Structure The properties of individual rock types, such as jointing, bedding and faulting, which affect the permeability of rocks.

Ocean currents Flows of water generated by the Earth's rotation, set in motion by the movement of winds across the water surface.

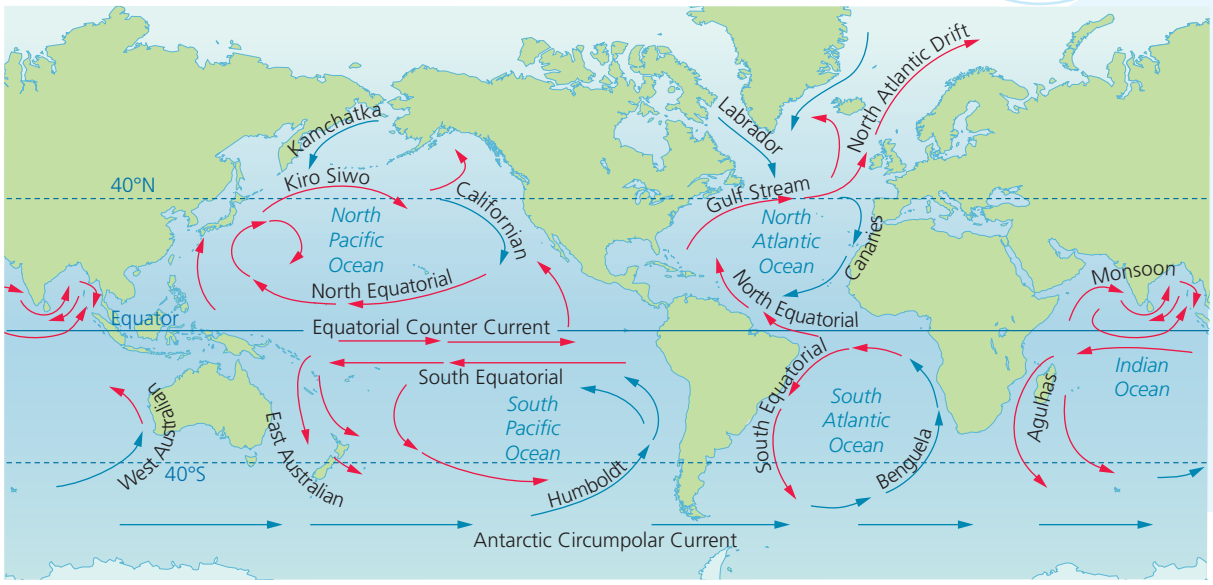

Figure 2 Ocean currents

Sediment sources

The various sources of sediment:

- rivers — material is weathered and eroded inland and deposited in their mouths/estuaries or taken out to sea
- the sea bed — brought from offshore deposits by waves in storms
- erosion of the coastline — especially from weak cliffs made of soft rock
- transported material — blown by wind (aeolian) or moved along a coast (longshore drift)
- human activity — through **beach nourishment**

Key term

Beach nourishment The addition of sand or pebbles to an existing beach to make it higher or wider.

Do you know?

1. Referring to one coastal area you have studied, identify the main stores in that area.
2. Identify one feedback mechanism arising from human activity in a coastal area.
3. What causes a wave to break?
4. Explain why a plan view of an area may be useful when describing the effects of geology on a coastline.