

Edexcel A- River Landscapes



GEOGRAPHY

Mass movement is the downhill movement of material under the influence of gravity. The two types of mass movement are listed below.

- **Sliding** – Rock and weathered material moves down a slope owing to gravity.
- **Slumping** – A river erodes the bottom of a valley slope, making it steeper. The material above then slides downwards, particularly if saturated.

Weathering is the wearing away in situ of the river valley sides. The three types of weathering are listed below.

- **Chemical** – Rocks reacting with slightly acidic water (acid rain) such as limestone.
- **Biological** – burrowing animals and tree roots widening cracks.
- **Mechanical** – Freeze-thaw action – water freezes in cracks, expands and causes the rock to break apart.

Rivers **erode** and shape landscapes. The four types of erosion are listed below.

- **Abrasion** – Material carried by the river rubs against the bed and banks wearing them away.
- **Hydraulic action** – The force of the water on the bed and banks removes material.
- **Attrition** – The load carried by the river rubs together and break into smaller pieces, becoming smoother in the process.
- **Solution** – Some rock minerals dissolve in river water.

The physical effects of flooding include soil erosion and loss of wildlife habitats. The **human effects** include loss of life, economic damage/financial loss, damage to property, loss of jobs and disruption to farming and transport.

Hard engineering involves building structures as a defence against flooding.

- **Dams and reservoirs** are barriers constructed to hold back water. They store large volumes of water until it is needed and can be used to generate hydro-electric power. However, they are expensive, and sediment can build up in reservoirs.
- **Channelisation** straightens and/or widens the river channel allowing water to flow more quickly from the area at flood risk. However, water moves more quickly

Soft engineering uses natural processes to protect against river flooding.

- **Floodplain zoning** prevents development in areas most at risk to flooding. This reduces the number of homes at risks and allows infiltration to take place.
- **Washlands** are areas adjacent to rivers that are deliberately flooded in order to avoid flooding of residential areas and important farmland.

In the **upper course**, rivers erode vertically. This forms three distinct landforms.

- **Interlocking spurs** – At its source, a river has limited energy and naturally flows around ridges of more resistant rock.
- **Waterfalls** – Form where there is a layer of more resistant rock overlying a less resistant rock. The less resistant rock is eroded by hydraulic action and is undercut. The overhang eventually collapses to leave a waterfall.
- **Gorges** – Over time, the continued undercutting and collapsing means that the waterfall retreats, forming a gorge.

The UK has experienced some **extreme weather** in recent years. The factors listed below can increase the risk of flooding.

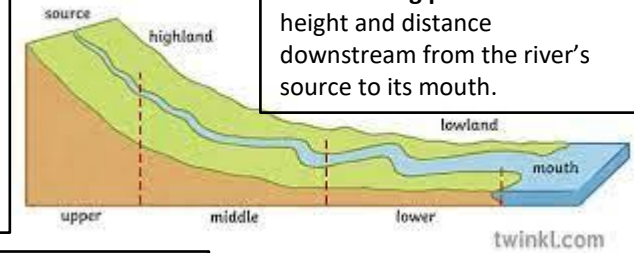
- **Frequency of storms** – Greater periods of heavy, intense rainfall causing rivers to overflow.
- **Periods of hot, dry weather** – Hardens the soil surface, meaning rain cannot soak in. This increases the surface runoff and river discharge. The list below outlines the impact of climate on rivers.
- **Discharges will be greater in wetter climates.** Hotter temperatures mean greater evaporation, so less discharge.
- **The erosion rate will be higher** with greater discharge.
- **The transport rate will be greater** when the energy of the water is greater.
- **The weathering of rocks will be greater** where temperatures range from just above to just below freezing (freeze-thaw weathering).

Transportation is the way in which the river carries eroded material. The four main types of transportation are listed below.

- **Traction** – Large boulders are rolled along the riverbed.
- **Saltation** – Smaller pebbles are bounced along the riverbed.
- **Suspension** – Finer sediment is carried along in the flow.
- **Solution** – Some minerals (such as chalk) are dissolved in the water and carried along. This material can be deposited onto a floodplain during a flood.

Physical causes of flooding can include the factors listed below.

- **Rainfall intensity** – Large amounts of rainfall reduces soil infiltration.
- **Geology** – Impermeable rocks means water cannot percolate from above.
- **Snowmelt** – During spring, snow melts adding more water to a river.
- **Drainage basin** – Steep-sided valleys carry water into a river system quicker.



In the **middle course**, a river erodes laterally as the velocity increases. This causes the channel to become wider and deeper. The river starts to bend, which is called a **meander**. On the outer bend of a meander, where the velocity is greater, erosion forms a river cliff. On the inside of a meander, the velocity is slower due to increased friction, and sediment is deposited. This forms a point bar (made up of sand, silt and pebbles). **Ox-bow lakes** form as the neck of a meander narrows and eventually erodes through. The water now takes the quickest route, and deposition cuts off the old meander leaving behind an ox-bow lake.

Human causes of flooding include:

- **Urbanisation** – more impermeable surfaces
- **Deforestation** – less interception and greater surface run off.

Depositional processes in the **lower course** produces two distinctive landforms, listed below.

- A **floodplain** is shaped by meanders and lateral erosion. During floods the river deposits sediment, forming the floodplain.
- The deposition during flooding continues until eventually **embankments** are created at the side of the river, forming **levees**.

Human activities lead to changes in river landscapes. These include: **Urbanisation, Agriculture, Deforestation** and **Industry**.

Case Study: The River Dee flows south-east from its source in Snowdonia, Wales. Human factors causing change:

- **Channelisation** has improved navigation but has increased velocity and discharge.
- A series of **reservoirs** have been constructed.
- **Embankments** have been built up along the middle course to protect agricultural land and property. Physical factors causing change
- As the river meanders, floods and deposits sediment, **it has changed course over time**.
- **Rising sea levels** could replace freshwater marsh landscapes.
- In the Dee Estuary, rising sea levels could destroy the landscape and habitats.