

What is the long profile of a river?

Why does the cross profile of a river change along its course?

Identify 4 processes of fluvial erosion.

Identify 4 processes of fluvial transportation.

Why do rivers deposit sediment?

Explain the formation of a waterfall.

Explain the formation of a flood plain.



Identify the landform in the photograph and explain its formation.

Explain how deforestation increases the risk of flooding.

What is the difference between hard and soft engineering?

Give 3 examples of both hard and soft engineering solutions to flooding.

Give two social, economic and environmental impacts of flooding.





The long profile shows the gradient of a river as it journeys from source to mouth.

The long profile of a river is a way of displaying the channel slope (gradient) of a river along its entire length. Therefore, it shows how a river loses height with increasing distance towards the sea.

In the upper course, the river erodes its bed by hydraulic action and abrasion. As the river flows downstream tributaries increase the volume of water, velocity and its erosive power. This enables it to cut a deeper channel as it flows downstream. Downstream the channel becomes wider as the gradient becomes more gentle leading to less vertical erosion. By the middle course of the river lateral erosion becomes the dominant type of erosion causing the river to become wider.

Abrasion, attrition, hydraulic action and solution.

Traction, saltation, suspension and solution.

Deposition occurs whenever a river loses energy and velocity falls. This can be when:

- a river enters a shallow area (this could be when it floods and comes into contact with the flood plain)
- at the base of a waterfall
- on the inside bend of a meander
- towards its mouth where it meets another body of water.

Waterfalls forms where there are layers of horizontal rock. Hard rock is on top of soft. Where the soft rock is close to the surface under the hard, it is eroded faster by abrasion and hydraulic action and an overhang is created of the cap rock. Over time, this gets bigger and eventually it collapses creating a waterfall. Repeated erosion by material in the plunge pool deepens the waterfall.



Meander - As the river erodes laterally, to the right side then the left side, it forms large bends and loops called meanders. The force of the water erodes the river bank on the outside of the bend where, due to reduced friction, the water flow has most energy. On the inside of the bend, where the river flow is slower, material is deposited, as there is more friction forming a slip-off slope or river beach

Cutting down trees causes increased run-off (water flowing over the surface of the earth). Rainwater reaches rivers faster. Flooding becomes more likely.

Flood plains are formed due to meander migration, where the outside bends erode laterally into the edges of the valley. Their position is also gradually moving downstream. Eventually, a wider valley is cut. Deposition during flooding results in the flood plain being slightly higher.

Hard engineering river management involves building artificial structures which try to control natural processes whereas soft engineering involves taking a more sustainable and natural approach to managing rivers.

**Hard engineering:**

- Dams and reservoirs
  - Embankments
  - Flood defence barriers
  - Channel straightening
- Soft engineering:**
- Flood plain zoning
  - Afforestation
  - River restoration

**Social:**

- damage to property
- injury or loss of life

**Economic:**

- Cost of repairs
- Reduced tourism
- Closure/temp closure of businesses

**Environmental:**

- Loss of habitat
- Loss of wildlife

