

How do humans use rivers?

Mineral Extraction – Taking out valuable minerals or other natural materials from the rivers.
Over \$3 billion globally is thought to come from mineral extraction in rivers.

Tourism – Rivers that attract tourists bring in more money for local areas. This money can then be given to locals so that they can afford more food and services.

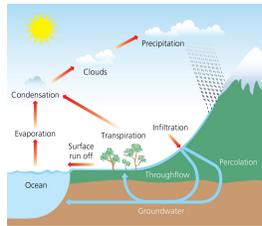
Food – Global demand for fresh fish for humans to eat is 143.8 million tonnes per year

Dam – A barrier constructed to hold back water and raise its level, forming a reservoir used to generate electricity or as a water supply.
There are around 50 000 large dams in the world, 168 of which are located in the UK.

Ports – Accessible water to navigable water where ships load or unload.
In 2017 470 million tonnes of goods passed through UK ports.

Drainage Basin:

Infiltration – Water soaks into the soil from the ground
Throughflow – Water runs through the soil
Surface run off – Water that runs over the surface of the land
Groundwater flow - Water that is saturated down into the rock
Percolation – water passing through



2015 York Floods

Causes of the flood:

- Record levels of rainfall (December 2015 storm Desmond occurred)
- Changes of land use in drainage basin as peat had been removed which meant more surface run off
- Two tributaries into the River Ouse.
- Urbanisation – York has grown as a city.

Responses:

- £45 million investment provided to York by the government to upgrade flood defences and install embankments, flood walls and temporary flood gates.
- Installation of pumps to pump 30% more water out the local area at a cost of £17 million
- An increase in education for local people as to what to do in a storm.

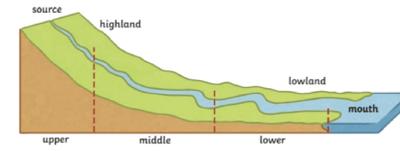
At the public consultation in York, locals expressed an opinion that protection of farmland seemed to be more important than the city and by building higher walls, it would spoil the look of the city for tourists.

Effects:

- 250 people evacuated
- 18000 properties flooded
- Shops shut before Christmas
- Insurance company increased staff
- Sewage leaked into surrounding fields
- Bridges collapsed



How does a river change from source to mouth?



| | Upper Course | Middle Course | Lower Course |
|-----------------|--------------------------------|-------------------------------------|--------------------------------|
| Gradient | Steep gradient | more gentle gradient | Flat gradient |
| Velocity | Low velocity | Faster velocity | Fastest velocity |
| Features | Waterfalls, gorges, and rapids | Meanders, Ox bow lakes, floodplains | Floodplains, deltas, estuaries |
| Channel | Narrow and shallow channel | Wider and deeper channel | Widest and deepest channel |

Long profile - shows how the gradient of the land changes as the river travels downstream.

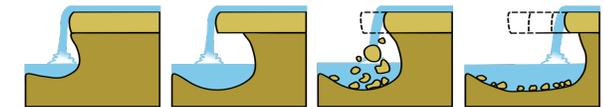
Cross profile - shows the cross-section of the river and the river valley.

Upper Course of a River

Near the source, the river flows over a steep gradient but has limited energy. The river erodes vertically, producing **V-shaped valleys**, **interlocking spurs**, and **waterfalls**.

Waterfall formation:

- River flows over layers of more resistant and less resistant rock
- Hydraulic action and abrasion causes a plunge pool in the less resistant rock
- The more resistant rock is undercut, leaving the rock unsupported
- The overhanging rock collapses and the waterfall retreats upstream, forming a gorge.



Middle Course of a River

The river now flows over a more gentle gradient, but has more energy (more water flowing, more quickly). The river erodes **laterally**, creating a **u-shaped valley**, **meanders**, and **ox bow lakes**.

Formation of a meander and ox-bow lake:

- The fastest flowing water erodes the outer bank forming a **river cliff**; slower water causes deposition on the inner bank, forming a **slip off slope**.
- Further erosion causes the two outside bends to move towards each other, **narrowing the neck of the meander**.
- Erosion eventually cuts through the neck of the meander, and the fastest flow is redirected.
- Deposition separates the old meander loop from the new main channel, forming an **ox-bow lake**.



Physical and Human Causes of Flooding.

Physical: Prolonged/heavy rainfall

This causes the soil to become saturated, stopping infiltration and causing surface runoff which increase peak discharge.



Physical: Geology

Impermeable rocks prevent infiltration, causing surface runoff which decrease lag time.



Human: Deforestation

Clearing trees reduces interception and evapotranspiration, increasing peak discharge.



Human: Urbanisation

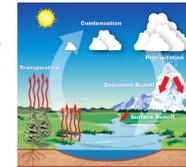
Tarmac and concrete are impermeable, preventing infiltration and causing surface runoff.



RIVERS – YEAR 8

Water Cycle

Energy from the Sun heats the surface of the Earth. Water is **evaporated** from oceans, rivers, lakes, etc. The warm, moist air rises because it is less **dense**. **Condensation** occurs and clouds form. **Precipitation** occurs as water droplets get bigger and heavier.



Processes

Transportation - The movement of sediment along the coast

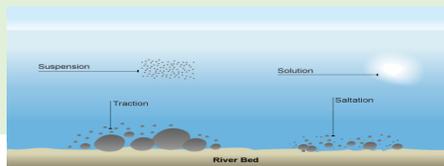
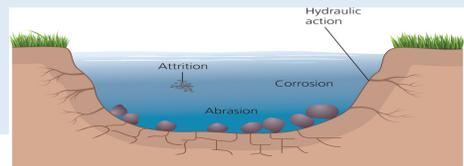
- Traction** - large material is rolled along the sea floor.
- Saltation** - beach material is bounced along the sea floor.
- Suspension** - beach material is suspended and carried by the waves.
- Solution** - material is dissolved and carried by the water.

Erosion - The breakdown of sediment into smaller fragments

- Hydraulic Action** – The force of water into cracks helps to break it up.
- Abrasion** – Waves fling sand and pebbles against the rock. These wear away like sandpaper.
- Attrition** - Chunks of rock get knocked together and worn into smaller bits
- Solution** – Water dissolves the soluble material from the rock.

Deposition - When water loose energy it leave behind the smaller pieces.

- The energy of a river decreases, leading to deposition if:
- the gradient of the river or the volume of water decreases
 - the water slows down on the inside of a bend in the river
 - the river channel becomes shallower
 - the river enters a lake or the sea.



Flood management schemes

Soft Engineering (natural processes)

Afforestation – plant trees in the upper course to increase interception to lengthen lag time, and increase evapotranspiration to reduce discharge.



The Environment Agency (EA) is a government body and has responsibility for the management of the risk of flooding from main rivers, reservoirs, estuaries and the sea, as well as making people aware of flood risk and advising them how they can protect themselves

Hard Engineering (building structures)

Embankments– increase the height of the river banks to increase channel capacity.

Temporary gate– Free standing frames that can be installed prior to a flood and removed when the water levels have dropped.

Permanent flood walls– These defences remain fully in place and are built into the natural surroundings. During a flood the gates would be closed to prevent water from entering.



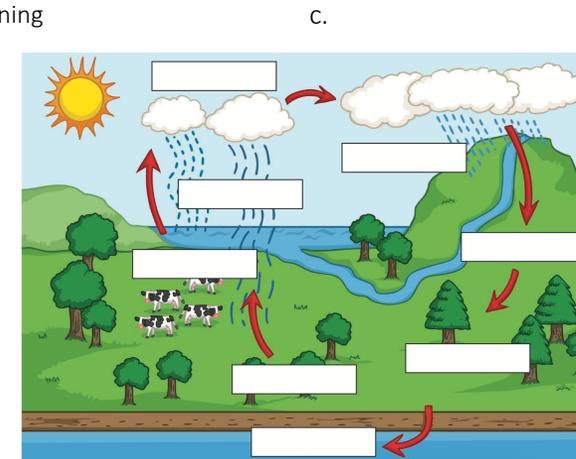
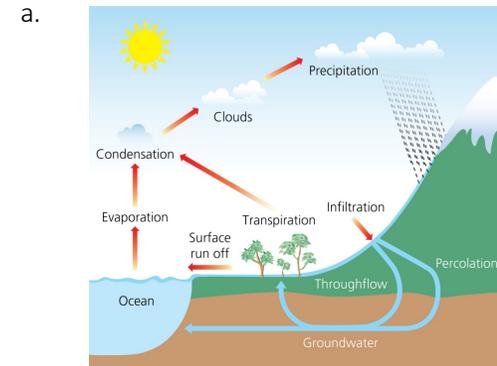
Key words:

- Condensation** – Conversion of water vapour or gas into a liquid
- Cross profile** – A slice taken across a river showing how wide and deep it is
- Drainage basin** – The area of land that is drained by a river and its tributaries
- Erosion** – The breakdown of sediment into smaller fragments
- Flood plain** – Low-lying land either side of a river which regularly floods
- Groundwater flow** – Water flowing very slowly through rocks deep underground.
- Hard engineering** – Using artificial structures to stop a river from flooding
- Hydrologist** – People who solve water-related problems such as finding new sources of water or managing floods
- Infiltration** – Water soaking into the soil
- Intercepted** – Water caught by leaves
- Interlocking Spurs** – Hillsides that a river flows between
- Lateral erosion** – When a river erodes horizontally
- Mouth** – the end of a river where it meets the sea
- Plunge pool** – A deep part of a river eroded by a waterfall
- Precipitation** – Moisture falling from clouds as rain, snow or hail
- River cliff** – A steep bank on the outside of a river
- Saturated** – holding as much water as can be absorbed
- Sediment** – Rocks or stones found in the river
- Soft engineering** – Using natural methods to stop a river from flooding.
- Source** – the point at which the river starts to flow
- Surface run off** – Water flowing quickly over the surface into rivers
- Throughflow** – Water flowing more slowly through the soil to the river.
- Transportation** – Water carrying sediment down a river
- V-shape valley** – A valley created by vertical erosion with steep sides near the source of the river
- Vertical Erosion** – When the river cuts down
- Watershed** – Area where water drains into a certain river

Revision Tasks:

- Make a mindmap/ poster/ revision cards/notes/ presentation/ song/ answer the following questions.

1. Define deposition.
2. Define precipitation.
3. State two ways rivers are used by humans.
4. Name a flood case study.
5. Give three reasons why deposition happens.
6. State the causes of flooding in a case study you have studied.
7. Using figure a, annotate the processes in a drainage basin.
8. Name the two types of engineering involved in flood management.
9. Name a landform of deposition.
10. Draw and name the four types of erosion.
11. Give two factors that influence deposition from happening.
12. Draw an annotated diagram of a waterfall.
13. Describe a method of soft engineering.
14. Compare the physical causes and human causes of flooding.
15. Explain how the river changes from source to mouth.
16. Using figure b, explain the effects of a flood you have studied.
17. Explain how tourism allows people to use rivers.
18. Evaluate the responses of a flood you have studied.
19. Justify the use of a temporary flood gate to protect towns from flooding.
20. Using figure c, annotate the water cycle and explain the processes.



Command Words:

- Analyse** - Take apart an idea, concept or statement and criticise it.
- Assess** - Come to a conclusion about the overall value or significance of something; discuss its positive and negative aspects to show balance.
- Compare** - Identify similarities and differences.
- Define** - State the meaning of an idea or concept.
- Describe** - Set out the main characteristics of something; DON'T EXPLAIN.
- Discuss** - Set out both sides of an argument (for and against) and come to a conclusion; there should be some evidence of balance.
- Evaluate** - Make a judgement about the effectiveness of something; discuss its strengths and weaknesses and come to a conclusion about its overall success or importance.
- Explain** - Give reasons why something happens.
- Give** - Produce an answer from recall.
- Justify** - Support an idea or argument with evidence; for the outcome chosen, the positives must outweigh the negatives.
- State** = name