Sheffield

Long profile characteristics

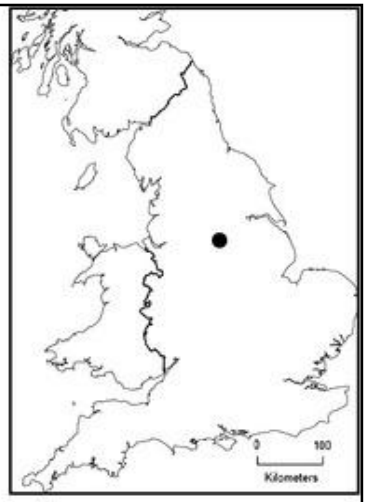
The first two pages of this knowledge organiser outlines how the River Don changes from the source to the mouth and also give reasons for these changes.

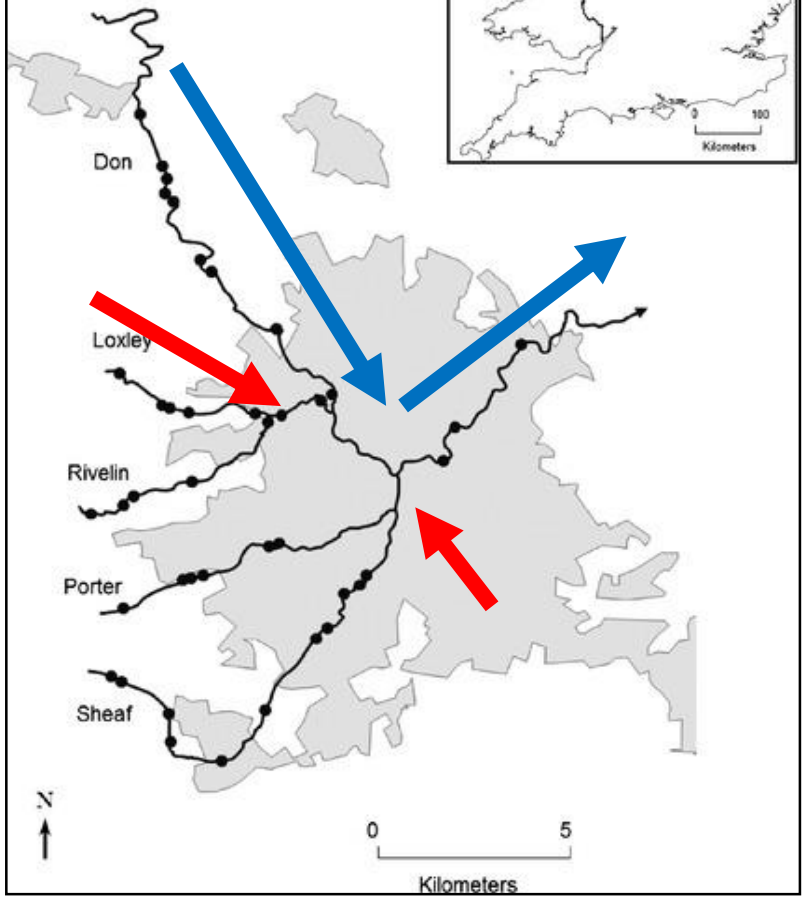
The **upper course** of the River Don that starts in the Pennines made of Carboniferous Limestone

Part of the **middle course** as the River Don runs through the centre of Sheffield

This shows the **lower course** as the River Don travels east towards the River Ouse

The **blue arrows** show the direction of travel for the river





The **red arrows** show two confluences where other smaller rivers (tributaries) join the River Don and therefore increase the rivers discharge

	Upper course	Middle Course	Lower Course
Overview	The river originates in the Pennines - a range of hills / mountains separating the NE and NW of England.	This part flows through South Yorkshire coalfields and then through the city of Sheffield.	As the river flow NE beyond the city of Sheffield out past Doncaster, it becomes wider. The River Don joins the River Ouse, before the River Ouse flows to the Humber.
Channel shape (width, depth)	Narrow and shallow in the Pennines as it weaves through interlocking spurs.	The river becomes wider and deeper due to erosion of sedimentary rocks like mudstone and sandstone.	As the river goes beyond Sheffield's city boundary, the river becomes wider and deeper
Valley profile	V shaped	The river adopts a wider V shape with meanders forming	The closer the river is to the sea, the flatter the landscape becomes and a flood plain is created.
Gradient	Steep	Less steep	Flat
Discharge	Low due to narrow width and shallow depth	The amount of water held by the river Increased as tributaries (smaller rivers) join the main river and so more water is added to the main River Don channel.	The amount of water held by the river is then high, especially with the River Don joining up with the River Ouse.
Velocity	The river flows slowly due to the friction from rough channel sides, where large angular stones slow the flow of water	As the river now has more water and is moving through less resistant rock, the sides and bed of the river are becoming smoother so the velocity of the water Increases	The river is flowing fast now due to the increased volume of water, the erosion of the river bed and bank reducing friction. The wider river also reduces the surface area that the water comes into contact with and reduces drag and friction.
Sediment size and shape	Larger angular stones often from underlying limestone.	Abrasion takes place (stones rubbing together and so more rounded stones are produced, than are smaller.	Materials carried by the river are really fine and carried by suspension or solution

2007 flood Causes, effects and management

Meadowhall shopping centre

Hillsborough football stadium


Sheffield CBD

Physical Causes	Human causes	Effects
• Heavy rain made the ground already saturated at the end on June 2008 • Then 1 months worth of rainfall occurred in 48 hours, 10 days later • 3 rivers flow through Sheffield and due to the accumulation of this water, the River Don broke its banks. • Sheffield is bowl shaped. This means that the steep slopes that surround the city cause lots of surface runoff and can result in shorter lag times.	• Sheffield is built on a floodplain. Due to this urbanisation the concrete and tarmac surfaces create impermeable surfaces. These surfaces resulting in a shorter lag time and flash flooding as water rushes across the surface rather then be absorbed by vegetation. • Drainage systems had been badly maintained by the council and were overwhelmed by the amount of rainfall that fell in such a short space of time.	• Drainage systems overwhelmed. • 2 people died due drowning in floodwater • 1,000 evacuated. • Est. £1 billion worth of damage as flooding caused many businesses and shops to close for months with flood damaged buildings and stock. • Trees to the north of the city collapsed due to saturated soils and landslides, blocking the river channel • Sewage leaked from drains • 13,000 homes without power for 2 days

Management and responses - Consider how effective you think these are? Will they work?

- In 2014, Sheffield Council announced £56million of flood defence plans to include: Flood relief channels for water to drain away from the city, flood plain zoning to stop future buildings being built on floodplains.
- Also structures like embankments (walls alongside the river) are planned to increase river capacity and straightening of the river in places to speed up flow.
- Community members are encourage to raise up sockets, no carpet on the ground floor of buildings and non-return values for pipes to reduce the risk of sewage coming back up pipes and drains.