THE DUSTON SCHOOL 11-19

Knowledge Organiser World Studies

KS4 Geography
Topic 4: River processes and pressures

Name:

Class Teacher:

Big Question	Task	Due Date
BQ3	Page 10 – exam style questions	
BQ4	Page 14 – retrieval quiz	
All	Revision task	

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Exam structure & Case Studies

Paper 1: Global Geographical Issues (37.5%)

- ❑ Topic 1: Hazardous Earth
- ❑ Topic 2: Development dynamics
- ❑ Topic 3: Challenges of an urbanising world

Written examination: 1 hour and 30 minutes, 94 marks.

Answer all questions

Paper 2: UK Geographical Issues (37.5%)

- ❑ Topic 4: The UK's evolving physical landscape
- ❑ Topic 5: The UK's evolving human landscape
- ❑ Topic 6: Geographical investigations

Written examination: 1 hour and 30 minutes, 94 marks.

Answer all questions in Topic 4 and 5

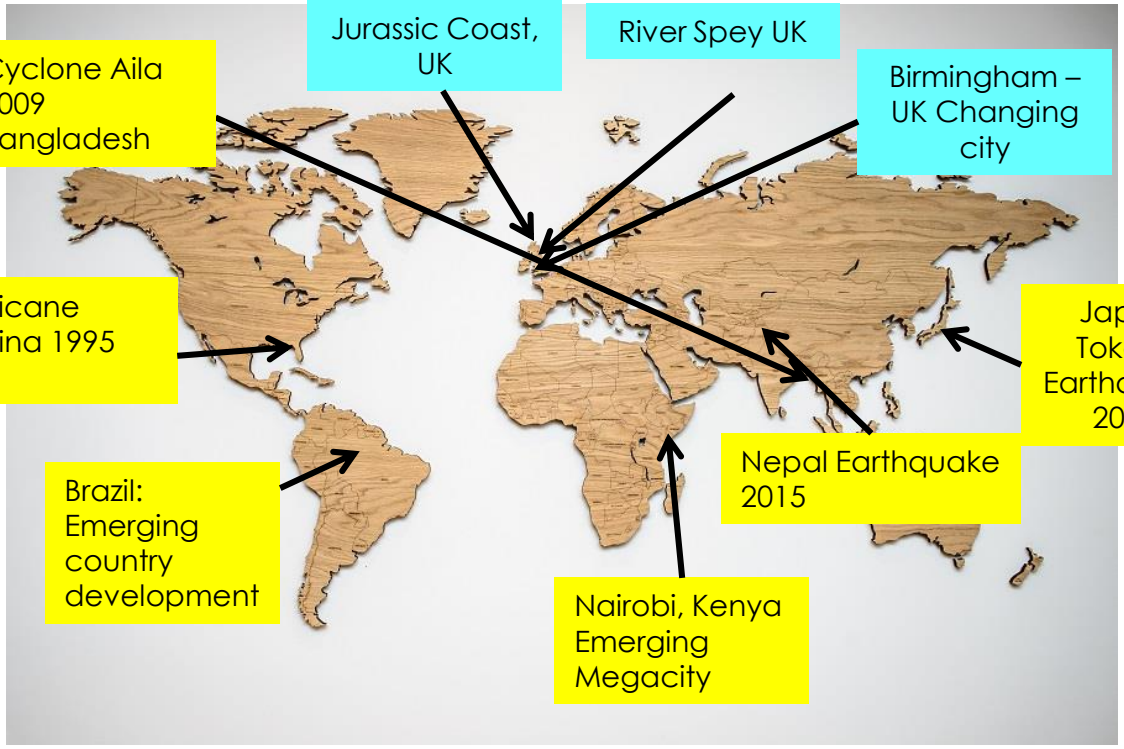
Topic 6: Answer Q 8 & Q10

Paper 3: People and Environment Issues – Making Geographical Decisions (25%)

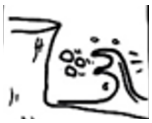
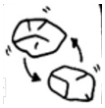
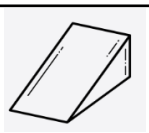
- ❑ Topic 7: People and the biosphere
- ❑ Topic 8: Forests under threat
- ❑ Topic 9: Consuming energy resources

Written examination, 1 hour and 30 minutes, 64 marks.

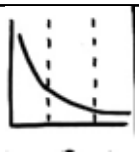
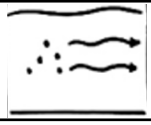
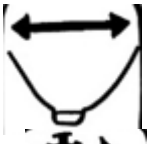
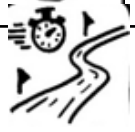
Answer all questions



GLOSSARY

Key term	Icon	Definition
Abrasion		Material carried by the river is thrown against the river bed and banks.
Alluvium		Name for fine sediments deposited in the lower course of a river.
Antecedent conditions		Conditions in drainage basin in the period before a rainfall event such as saturated ground from previous rainfall.
Attrition		The knocking together of pebbles, making them gradually smaller and smoother.
Confluence		The place where two rivers meet.
Discharge		The amount of water flowing in a river, made up of its volume and speed, and measured in cubic metres per second (cumecs).
Drainage basin (shape)		The area of land drained by a river and its tributaries.
Erosion		The action of water wearing away rocks. There are four key erosion processes – hydraulic action, abrasion, solution and attrition.
Floodplain		The flat land on the valley floor each side of a river channel, which sometimes floods.
Flood risk		Places at risk from flooding owing to changes in weather patterns caused by climate change, rising sea levels and storm surges.
Gradient		The steepness/angle of a slope.
Hydrograph		A graph showing rainfall and river discharge over a specific period of time.

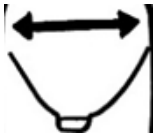
GLOSSARY

Key term	Icon	Definition
Hydraulic action		The pressure of the water being pushed against the riverbanks. It includes the compression of air into cracks as the water splashes against the riverbanks.
Long profile		A slice through the river from source to mouth that shows changes in height of the river's course.
Mouth		Where the river ends, either when it joins another river or meets the sea.
Saltation		A hopping movement of pebbles along the seabed.
Solution		The dissolving of rocks such as limestone and chalk.
Traction		Heavy particles rolled along the riverbed.
Valley profile or Cross profile		A slide across a river showing the changes in height across the valley.
Velocity		The speed at which a river flows; river velocity is often measured in metres per second.

BQ1: How do river landscapes differ as it moves from source to mouth?

Width – Becomes wider as the river moves downstream due to **lateral erosion** in the middle course.

Depth – Becomes deeper as the river moves downstream due to **vertical erosion** and increased **discharge** from tributaries.

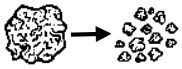


Valley profile – V shaped in the upper course as the river has the potential to erode downwards (vertical erosion), as it is way above sea level.

Gradient – Gradient decreases as the river moves downstream as the river has begun to erode sideways via lateral erosion.

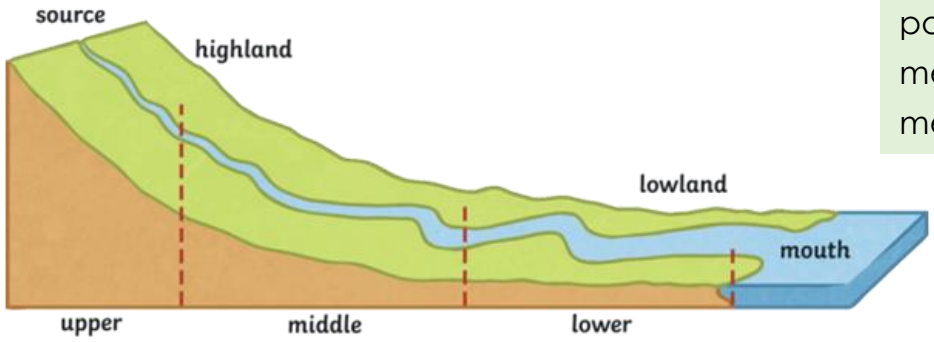
Discharge – Increases as the river moves downstream as width and depth increase and velocity increases

Velocity – Increases as the river moves downstream as more **tributaries** join the main river. Also less water is in contact with the bed and banks as it is deeper and wider.



Sediment size – Decreases as the river moves downstream

Discharge is the amount of water passing a specific point at a given time, measured in cubic metres per second.



Lesson 2 BIG Question: How do river processes create river landforms in the upper course?

Erosional Processes

When rivers have high energy levels, they will erode the landscape through which they flow.

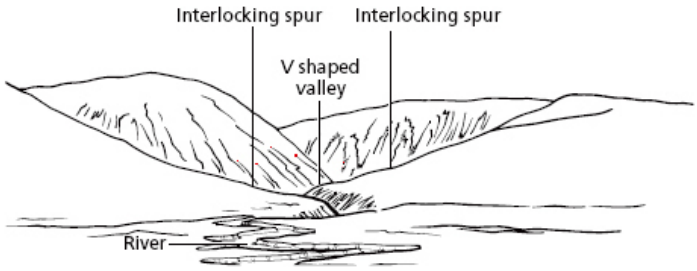
Rivers erode their beds and banks in three main ways:

- **Abrasion: When the river's load hits off the bed and banks eroding them**. This is the most effective form of river erosion and occurs when the river uses its load to erode the bed and banks by scraping and scouring. It is particularly effective at times of higher discharge when the river has enough energy to transport larger particles.
- **Hydraulic action: When the water is forced into cracks in the bed and banks.** On the outside bends of meanders, for instance, the currents push water into cracks, causing pressure that leads to erosion. Hydraulic action is more effective in rapids and waterfalls.
- **Solution: Dissolving of soluble materials by weak acids in the water.** This is a chemical reaction rather than a physical process so is not dependent on the energy levels in the river. It is most effective in rocks containing carbonates, such as limestone.

The river uses these processes to erode in two different **directions**:

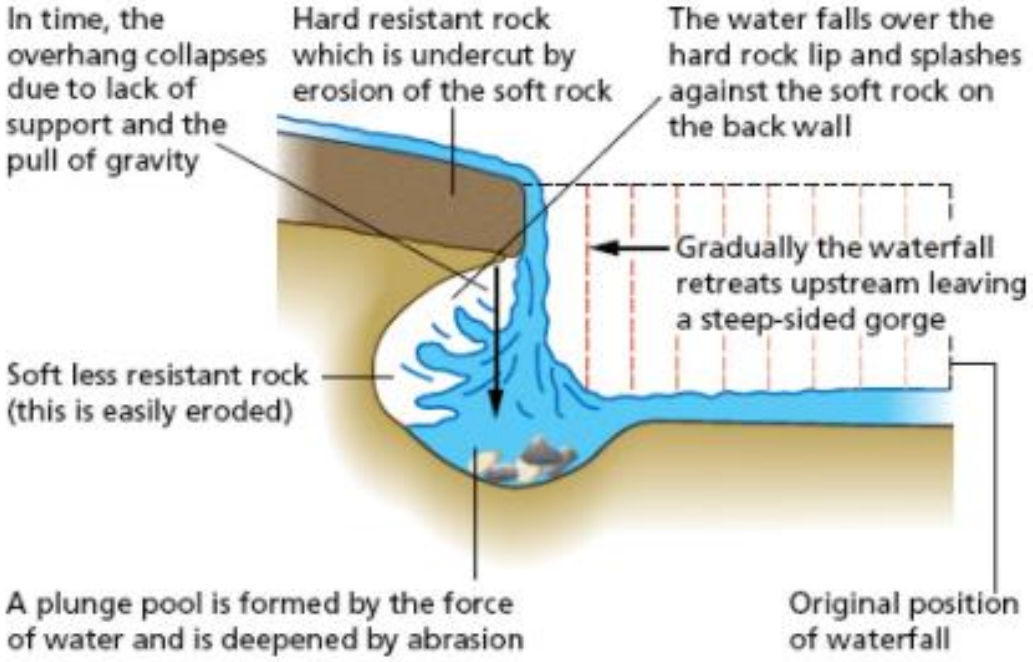
- **Vertical erosion** as the erosion processes wear away the bed, the river cuts down deeper and deeper into the land, forming valleys.
- **Lateral erosion** as the erosion processes wear away the banks, the river will get wider.

Lesson 2 BIG Question: How do river processes create river landforms in the upper course?



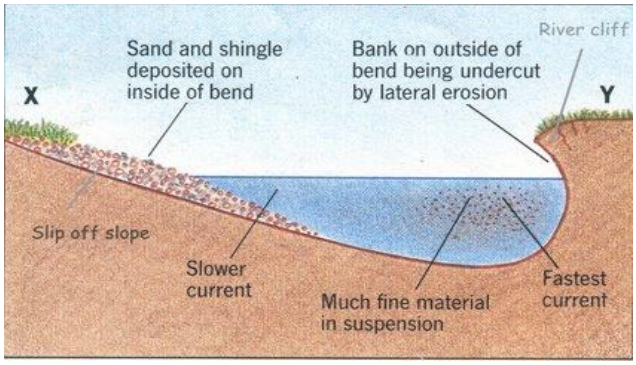
1. The river in the upper course is shallow and a lot of the water is in contact with its bed and banks.
2. There is a lot of friction.
3. The main process occurring in this area is erosion.
4. The gradient is usually steep, the river erodes downwards forming a V shaped valley.
5. The river is forced to wind its way between interlocking spurs of more resistant rock because it does not have the power to go through them.

Waterfalls and gorges



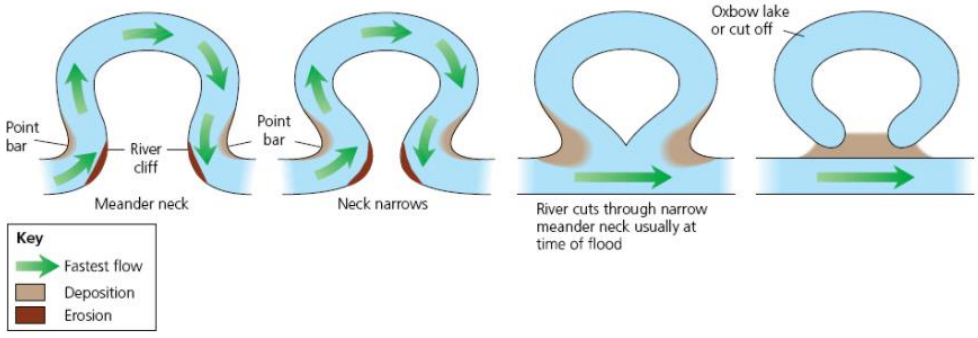
BQ3: How do river processes create river landforms in the middle & lower course?

Meanders



1. The outside of a meander has the deepest water so the greatest erosion creating a **river cliff.**
2. The water is moving fastest on the outside because of the lack of friction with the bed and banks.
3. The outside bank is eroded using abrasion forming a river cliff.
4. On the inside of the end the water is slower and shallower creating deposition.
5. The river is forced to drop material creating a **slip-off slope**

Ox-bow lakes



1. The neck of the meander narrows due to lateral erosion on the opposite sides of the meander
2. During high flow (floods) the meander/swan neck is broken through.
3. The river then takes the shorter route through the old meander neck.
4. Deposition occurs on the edges of the new river channel cutting off the old meander
5. The old meander now forms an ox-bow lake separated from the main river.

Homework 1

Name one process of river erosion. (1)

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Explain one reason why high discharge is likely to increase erosion. (2)

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Explain how both the processes of erosion and deposition create river meanders. You may use a diagram to help your answer.

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Explain two differences between upper course and lower course river landscapes.

1……

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2……

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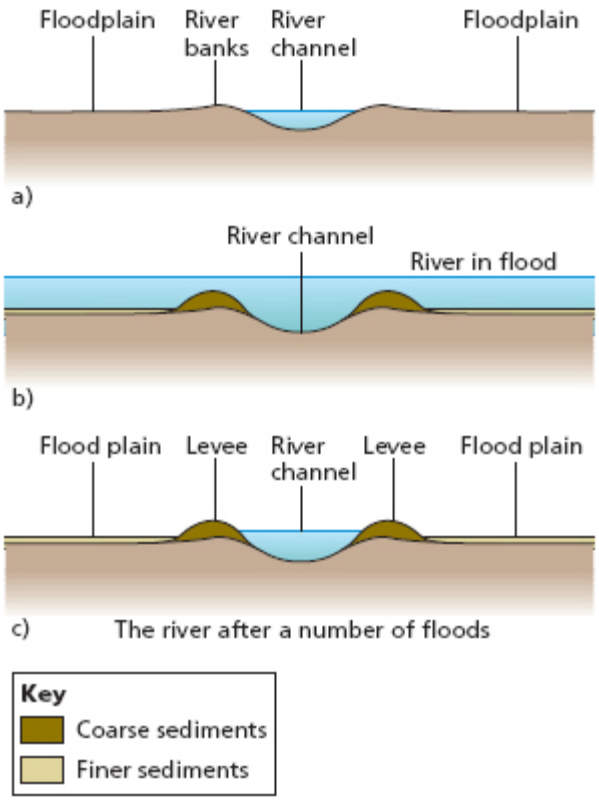
BQ3: How do river processes create river landforms in the middle & lower course?

Floodplain



1. During a flood, water containing large amounts of alluvium (river silt) empties onto the valley floor.
2. The water soaks away leaving the deposited sediment
3. Over time repeated flooding forms thick alluvial which is fertile and good for farming.
4. The flood plains widen as meanders migrate across the flood plain eroding the valley sides by lateral erosion.

Levee

1. During a flood, water containing large amounts of alluvium (river silt) empties onto the valley floor.
2. As it moves away from the channel it is shallower and friction increases.
3. The river has less energy so must drop the load it is carrying.
4. It drops the largest material close to the river channel and this builds up over a number of floods to create a levee.

BQ4: What factors influence flood hydrographs?

Physical causes of flooding

Intense rainfall - During periods of heavy rainfall, the soil and rocks quickly become saturated. As infiltration is reduced, water flows over the surface and into the river at a faster rate.

Duration of rainfall - Long periods of rainfall cause the soil to become saturated and prevent further infiltration of rainwater, leading to increased surface run off.

Snowmelt - In some places a lot of snow falls during the winter months. When the temperatures rise above zero in the spring, all the snow that has built up melts, releasing large volumes of meltwater.

Geology - Different rock types in the catchment can affect flooding. Permeable rocks such as chalk allow water to soak in, so reducing surface run off. Impermeable rocks such as clay do not allow water to pass through them, so rainwater will run off the surface and straight into the river channel.

Relief - Water reaches the river channel much faster where slopes are steeper. Increasing surface runoff.

Human causes of flooding

Urbanisation

- In towns and cities, rainwater will not infiltrate the hard, impermeable surfaces of concrete and tarmac. This causes the water to run off immediately into drains and river channels.

- If settlements are built on a floodplain the drains allow water to move to the channel more quickly, making flooding more likely.

Industry

- Quarrying – the sides of gorges may be quarried for limestone for building materials. This increases the slopes of the gorge.

Deforestation

- Vegetation collects, stores, and uses water from rainfall: this is called interception. Plant roots also encourage water to pass into soil and rock, so vegetation reduces runoff: if it is removed, more water can reach the river channel more quikly.

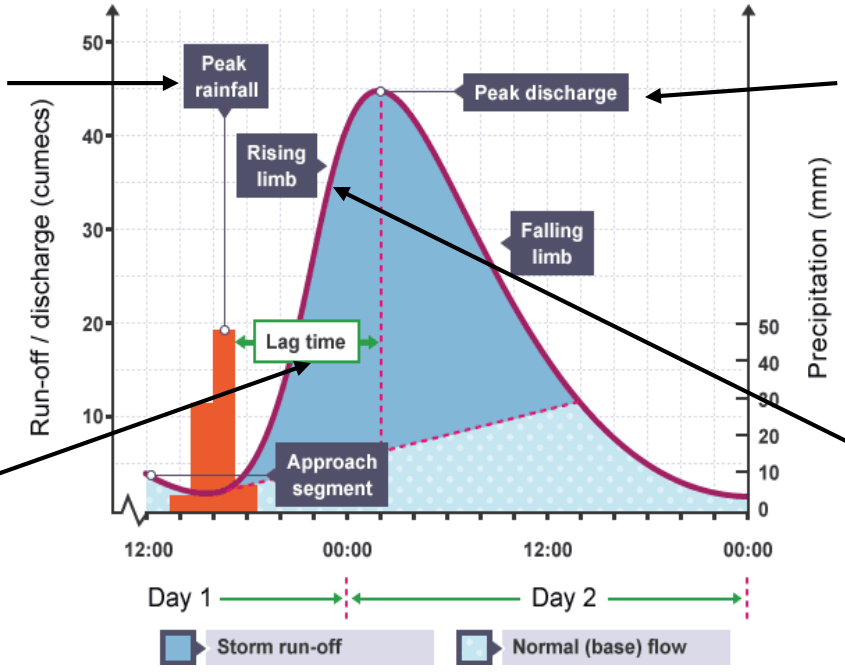
Dams

- Dams may burst: which causes excess water in river channels and flooding of large areas.

BQ4: What factors influence flood hydrographs?

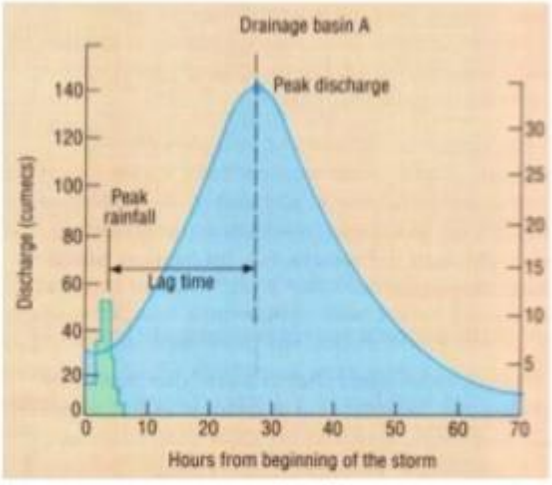
Peak rainfall
The hour of greatest rainfall during a storm

Lag time
The period of time between peak rainfall and peak discharge



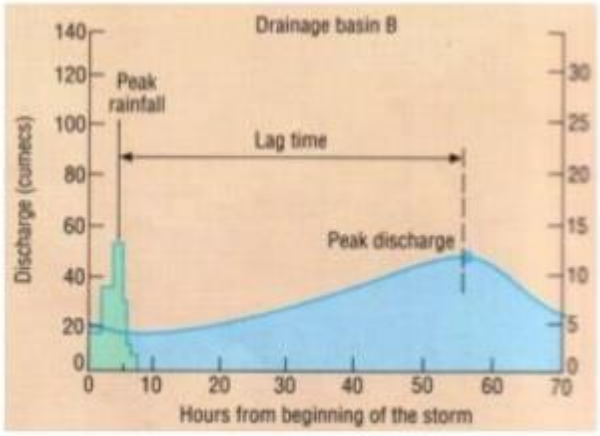
Peak discharge
The time of maximum discharge by the river

Rising limb
The period of rising river discharge following a period of rainfall



Flashy Hydrography

- Steep slopes so rapid run-off
- Impermeable rocks encouraging rapid overland flow
- Heavy or prolonged rainfall
- Saturated or frozen soils
- Deforestation encourages rapid transfer of water to rivers
- Urbanisation encouraging rapid overland flow



Steady Hydrography

- Gentle slopes slow down water transfer
- Permeable rocks allow water to soak into rocks where transfer is slow
- Drizzle
- Deep, dry soils able to absorb water
- Afforestation resulting in water being intercepted and evaporated.

Homework 2

Try to answer all of these key knowledge questions. Then check your answers using the answer page. These are some of the questions that will be in the knowledge quizzes and the mid and end of unit tests.

Questions in *italics* **are from older work.**

Key knowledge question	**Your answer**
What volcano type is at a constructive plate boundary?	
Outline two features of a shield volcano (2)	
Outline two hazards of a composite volcano? (2)	
Which type of lava has a high silica content?	
What is a hotspot?	
Define the term FDI.	
Define the term - Neo colonialism	
Name one social investment	
How does being landlocked make trade difficult?	
Give two characteristics and an example of igneous rocks.	
Describe the distribution of igneous rocks in the UK.	
Name the four erosional processes	
Name the four transportation processes	
Define the term discharge	

BQ5: What physical and human factors led to the flooding of the River Spey?

Gradient	❑ The middle course has a **shallow gradient** so some of the features are more similar to what you might normally find in the lower section of a river. ❑ In the **lower course, the steeper slope** and faster velocity means that sediment size is different. The river is also able to carry larger pebbles all the way to the mouth, this creates braided river channels
Geology	❑ The catchment area of the River Spey is mostly formed of very **hard crystalline rock and granite**. These are very resistant to erosion and that's what keeps the river steep. ❑ There is very little soil and vegetation in the upper catchment area of the river meaning that rainfall is not absorbed by the soil and instead creates **high amounts of surface run-off**. ❑ **The tributaries** of the River Spey have little capacity to hold much water so run-off tends to flow straight into the River Spey.
Climate	❑ North-east Scotland has a **wet and mild climate** and is prone to snow during the winter months. In the winter and spring, this high amount of rainfall and the snowmelts tend to cause **spates in the river**. ❑ During the summer, however, the spates are often caused by summer storms that bring heavy downpours.
Farming	❑ Farming in the catchment area has stripped areas of land of natural vegetation. This means **less rainwater is soaked** up by the land, potentially making the impacts of flooding worse.
Hydroelectric dams	❑ Water from the upper course is diverted to make hydroelectric power for neighbouring regions in Scotland. A dam has formed a small reservoir which allows water to be diverted. This affects the amount of water that is in the river system.
Urbanisation	❑ Around 23,000 people lives in the catchment area of the River Spey. Although this is relatively few people, any settlement can cause the river to flood due to increased numbers **of impermeable surfaces**, such as concrete. ❑ On the whole **human activity has a low impact** on the river system. The frequent flooding of the River Spey seems to have more impact on the human activities than the other way round.

BQ6: How can we reduce the risk of flooding?

Hard engineering - controlling flooding risk through manmade structures that work against natural processes.

Method		Advantages	Disadvantages
Flood walls – artificial barriers designed to raise the height of the river banks to hold more water		✓ Raise the height of the river bank to where the river might not burst ✓ Can be built into the design of an area and become invisible.	× Can prevent access to the river for leisure or economic purposes
Embankments High banks built on or near riverbanks		✓ River channel has an increased capacity for carrying water, reducing the flood risk.	× Can lead to more serious flooding if the embankment fails × Look artificial and unattractive.
Flood barriers Floodgates built near the river mouth to prevent a storm surge or spring tide		✓ Eliminates pressure from floodwaters that would cause structural damage to the home or other structures in the protected area	× May fail or be overtopped by large floods × May be expensive depending on height, length, availability of materials, and other factors

Soft engineering - managing floodwater by working with natural processes. This approach aims to create space for floodwater in the landscape, which also reduces the risk of flooding in other areas.

Flood plain retention Strategies to maintain and restore the river's original flood plain		✓ River landscapes are left relatively unchanged ✓ Very cheap as no defences need to be built	× Flooding takes the land out of action regularly which can anger people who use it for recreation.
River restoration Using a variety of strategies to restore the river's original course		✓ This looks natural, is attractive and can attract wildlife. Can allow the floodplain to become more fertile.	× Can't protect against big floods and may have to coincide with zoning

Homework 3

Complete the SENCA revision work as outlined on class charts

https://app.senecalearning.com/

Question 1: Impacts of tectonic hazards

4 Analyse Figure 2a and Figure 2b which have information about major flood events in England and Wales between 1920 and 2019.

Figure 2a shows the number of major flood events in each twenty-year period since 1920.

Figure 2b provides information about the five largest flood events as measured by the number of properties flooded and the number of deaths.

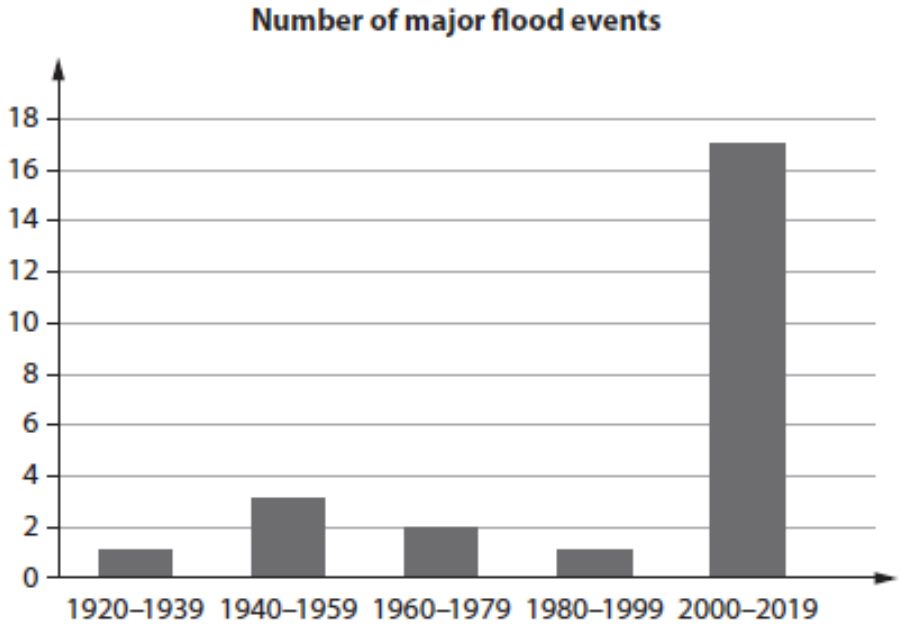


Figure 2a

Date	Cause of flooding	Location	Properties flooded	Deaths
1928	Tides, heavy rainfall and snow melt	London and Thames valley	40,000	14
1953	Tides and storm surge	East coast from Lincolnshire to Essex	24,000	307
2007	Heavy rainfall, river flooding	Midlands, Northern and South-east England	55,000	13
2013	Heavy rainfall, coastal storm surge	South-east England	11,000	0
2016	Winter storm (Desmond)	Northern England and Wales	21,000	0

Figure 2b

Assess the physical and human reasons for the changes in flood events in the past 100 years.

You must use evidence from Figure 2a and Figure 2b in your answer.

(8)

A physical reason as to why there have been changes in flood events could be due to more intense rainfall as a result of climate change. This is because ~~the~~ climate change is causing shifts in the global weather patterns, and as figure 2a shows, in the most recent ~~section~~ years of 2000 - 2019, the number of flood events has increased to 17, whereas previous years peaked at 3. This shows rivers may be recieving too much run off ~~as the ground~~ so their discharge is much higher ^ due to accumulation causing the rivers to overflow more easily. as the grand is saturated from antecedent rainfall

A human reason as to why the changes in flood events has increased could be due to urbanisation ~~as~~ ie: This is because ~~this causes land~~ humans build on land with concrete, making the grand impermeable, so rivers recieve more surface run off. Urbanisation is rapidly increasing, hence why in 2000-2019, the number of floods increased so dramatically to 17. However, humans ~~many~~ also have became better at managing the impacts of floods socially, as figure 2b shows the number of deaths in the 2 most recent events on is 0, and the number of homes flooded has decreased, eg from 55,000 in 2007 event to 11,000. Although these floods may have been different intensities, this could be decrease could also be due to humans becoming better at responding and preparing for flood events - for example

managing ~~coastal~~ flooding using hard or soft engineering which would lower flood impacts.

In conclusion, I think both human and physical ~~factors~~ play a major role in the increase of events however decrease of ~~a~~ social impacts, however human factors have contributed ~~of~~ the most at reducing deaths. ~~and floods~~

(Total for Question 4 = 8 marks)

Question 4 – 8 marks

ResultsPlus
Examiner Comments

This is a very strong response. The candidate has brought their understanding from their work in both coastal and fluvial environments to help them deconstruct the information in the resources. They weave the AO4 with the AO3 very effectively and do an excellent job in reflecting on the complexities of the processes,

KEY KNOWLEDGE QUESTIONS

Key knowledge question	Answer
What volcano type is at a constructive plate boundary?	Shield volcano
Outline two features of a shield volcano (2)	Gently sloping/ basic lava/ non-violent/ wide base
Outline two hazards of a composite volcano? (2)	Pyroclastic flows/ ash/ volcanic bombs
Which type of lava has a high silica content?	Acid (Granitic) lava
What is a hotspot?	Spot where superheated rock (not magma) rises very slowly through the mantle, in a plume.
Define the term FDI.	Foreign direct investment - Overseas investment of capital by transnational companies.
Define the term - Neo colonialism	The dominance of poor countries by rich countries, not by direct political control, but by economic power and cultural influence.
Name one social investment	Countries that have prioritised investments in education and health care generally develop faster.
How does being landlocked make trade difficult?	Landlocked and mountainous areas develop more slowly than coastal nations because trade is more difficult.
Give two characteristics and an example of igneous rocks.	Formed from cooling magma, interlocking crystals make them highly resistant to erosion. Examples – granite and basalt
Describe the distribution of igneous rocks in the UK.	Western UK. Cornwall, N. Wales. NW England. Scottish Highlands and N. Ireland.
Name the four erosional processes	Hydraulic action, abrasion, attrition, solution
Name the four transportation processes	Traction, saltation, suspension, solution
Define the term discharge	The volume of water that passes through a particular point in a river