

<h1>River Landscapes</h1>			Key river features			How to defend against river flooding					
			Interlocking spurs	In the upper course there is more vertical erosion. The river cuts down into the valley. If there are areas of hard rock which are harder to erode, the river will bend around it. This creates interlocking spurs of land which link together like the teeth of a zip.		Evaluation of	A man-made reservoir.				
Fluvial processes			Waterfalls and gorges	<p>A waterfall is a sudden drop along the river course. It forms when there are horizontal bands of resistant rock (hard rock) positioned over exposed, less resistant rock (soft rock).</p> <ol style="list-style-type: none"> <li>The soft rock is eroded quicker than the hard rock and this creates a step.</li> <li>As erosion continues, the hard rock is undercut forming an overhang.</li> <li>Abrasion and hydraulic action erode to create a plunge pool.</li> <li>Over time this gets bigger, increasing the size of the overhang until the hard rock is no longer supported and it collapses.</li> <li>This process continues and the waterfall retreats upstream.</li> <li>A steep-sided valley is left where the waterfall once was. This is called a gorge.</li> </ol>		Dams and reservoirs	<p>The dam traps water, which builds up behind it, forming a reservoir. Water can be released in a controlled way.</p> <p>Advantages Can be used to produce electricity by passing the water through a turbine within the dam. Reservoirs can attract tourists.</p> <p>Disadvantages Very expensive. Dams trap sediment which means the reservoir can hold less water. Habitats are flooded often leading to rotting vegetation. This releases methane which is a greenhouse gas. Settlements are lost leading to the displacement of people. In developing countries locals are not always consulted and have little say in where they are relocated.</p>				
Erosion	<p>Hydraulic action - This is the sheer power of the water as it smashes against the river banks. Air becomes trapped in the cracks of the river bank and bed, and causes the rock to break apart.</p> <p>Abrasion - When pebbles grind along the river bank and bed in a sand-papering effect.</p> <p>Attrition - When rocks that the river is carrying knock against each other. They break apart to become smaller and more rounded.</p> <p>Solution - When the water dissolves certain types of rocks, eg limestone</p>		Meanders	<p>As the river makes its way to the middle course, it gains more water and therefore more energy. Lateral erosion starts to widen the river. When the river flows over flatter land they develop large bends called meanders.</p> <p>As a river goes around a bend, most of the water is pushed towards the outside. This causes increased speed and therefore increased erosion (through hydraulic action and abrasion). The lateral erosion on the outside bend causes undercutting of the bank to form a river cliff. Water on the inner bend is slower, causing the water to slow down and deposit the eroded material, creating a gentle slope of sand and shingle. The build-up of deposited sediment is known as a slip-off slope (or sometimes river beach).</p>		- You should know each defence and be able to evaluate them. Stretch evaluate with reference to SEE.					
Transportation	<p>Traction - large, heavy pebbles are rolled along the river bed. This is most common near the source of a river, as here the load is larger.</p> <p>Saltation - pebbles are bounced along the river bed, most commonly near the source.</p> <p>Suspension - lighter sediment is suspended (carried) within the water, most commonly near the mouth of the river.</p> <p>Solution - the transport of dissolved chemicals. This varies along the river depending on the presence of soluble rocks.</p>		Ox-bow lakes	<p>Due to erosion on the outside of a bend and deposition on the inside, the shape of a meander will change over a period of time. Erosion narrows the neck of the land within the meander and as the process continues, the meanders move closer together. When there is a very high discharge (usually during a flood), the river cuts across the neck, taking a new, straighter and shorter route. Deposition will occur to cut off the original meander, leaving a horseshoe-shaped oxbow lake.</p>		Other hard techniques	<p>Channelisation, straightening, flood relief channels, embankments.</p> <p>Case study – Jubilee River Flood Relief channel. Revise</p>				
Deposition – material is dropped	<p>Factors leading to deposition: shallow water at the end of the river's journey, at the river's mouth when the volume of the water decreases</p>		floodplains	<p>A floodplain is an area of land which is covered in water when a river bursts its banks.</p> <p>Floodplains form due to both erosion and deposition. Erosion removes any interlocking spurs, creating a wide, flat area on either side of the river. During a flood, material being carried by the river is deposited (as the river loses its speed and energy to transport material). Over time, the height of the floodplain increases as material is deposited on either side of the river.</p> <p>Floodplains are often agricultural land, as the area is very fertile because it's made up of alluvium (deposited silt from a river flood). The floodplain is often a wide, flat area caused by meanders shifting along the valley.</p>		Evaluation of floodplain zoning	<p>Floodplain zoning</p> <p>Allowing only certain land uses on the floodplain reduces the risk of flooding to houses and important buildings.</p> <p>Advantages More expensive buildings and land uses are further away from the river, so have a reduced flood risk. Less damage is caused, leading to fewer insurance claims.</p> <p>Disadvantages Not always possible to change existing land uses. Planners have to decide what type of flood to plan for.</p>				
How do the characteristics of a river change?			Causes of flooding			Levee	<p>Levees occur in the lower course of a river when there is an increase in the volume of water flowing downstream and flooding occurs.</p> <p>Sediment that has been eroded further upstream is transported downstream.</p> <p>When the river floods, the sediment spreads out across the floodplain.</p> <p>When a flood occurs, the river loses energy. The largest material is deposited first on the sides of the river banks and smaller material further away.</p> <p>After many floods, the sediment builds up to increase the height of the river banks, meaning that the channel can carry more water (a greater discharge) and flooding is less likely to occur in the future.</p>		Other soft	Flood warnings, and afforestation projects	
Up per course	<p>Upper course - in the upper course, where the river starts, there is often an upland area. Rivers are narrow and shallow. The river's load is large in the upper course, as it hasn't been broken down by erosion yet. Vertical erosion is the dominant process of erosion – caused by hydraulic action and abrasion. Features – V-shape valleys, waterfalls, gorges, rapids, interlocking spurs.</p>		Physical factors	<p>Prolonged rainfall - if it rains for a long time, the land around a river can become saturated (it's holding as much water or moisture as can be absorbed). If there is more rainfall it cannot be soaked up, so it runs along the surface - this is known as surface run-off.</p> <p>Heavy rainfall - if there is heavy rainfall there is less chance of it being soaked up by the soil (infiltration) so it runs off into the river. The faster the water reaches the river, the more likely it will flood.</p> <p>Relief - a steep valley is more likely to flood than a flatter valley because the rainfall will run off into the river more quickly.</p> <p>Geology - permeable rocks allow water to pass through pores and cracks, whereas impermeable rocks do not. If a valley is made up of impermeable rocks, there is a higher chance of flooding as there is an increase in surface run-off.</p>							
Middle	<p>River becomes wider and deeper as more tributaries (smaller rivers) join main river. Land not as steep, small floodplains. Features typical are meanders, slip-off slopes, river cliffs, ox-bow lakes. More lateral erosion (sideways)</p>		Human factors	<p>Urbanisation, deforestation,</p>							
Lower course	<p>The widest and deepest area – large flat flood plain on either side of river. Shallow gradient. Here you will find levees (build up of sediment either side of the river aka embankments).</p>										

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Erosion	
Transportation	
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		Human factors	

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Interlocking spurs	
Waterfalls and gorges	
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floodplains	
Levee	

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Evaluation of	
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