

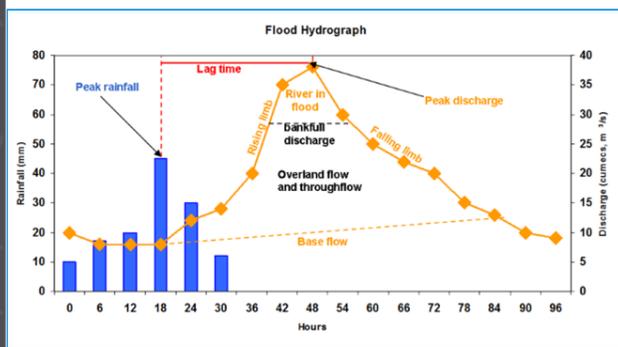
Theme 2: CHANGING ENVIRONMENTS

Key Idea 2.2: Shaping the landscape - River management

CAUSES OF FLOODING

PHYSICAL	HUMAN ACTIVITIES
<p>Geology: Impermeable rocks (e.g. clay/granite/slate through which water cannot permeate) increases rates of overland flow to the river which increases flood risk.</p>	<p>Urbanisation: Tarmac and highly efficient drainage from newer buildings increases rates of overland flow to the river and increases flood risk.</p>
<p>Vegetation: poor coverage decreases storage (in stems and roots) and interception which increases rate of flow to ground surface and overland flow which increases flood risk.</p>	<p>Changes to ecosystems: deforestation decreases storage (in stems and roots) and interception. Increases rates of flow to ground surface and overland flow which increases flood risk.</p>
<p>Climate patterns: prolonged precipitation causes saturation of ground, increases rates of overland flow causes seasonal flooding.</p>	<p>Extreme weather (linked to climate change): chance of infiltration decreases, ground quickly saturated, increases rates of overland flow which causes flash flooding.</p>

FLOOD HYDROGRAPH



Shows how a river's **discharge** changes in response to precipitation.

Calculate lag time:
Predict how the shape of the discharge curve would change with:

- Dam construction
- Afforestation.

SOCIAL AND ECONOMIC CONSEQUENCES OF FLOODING

My named flood event:

FLOODS EFFECT DIFFERENT GROUPS OF PEOPLE IN BOTH POSITIVE AND NEGATIVE WAYS.

NAMED STAKEHOLDER	POSITIVE IMPACTS	NEGATIVE IMPACTS
Local residents		
Business owners/ developers		
Town/city councils		
National government		

DRAINAGE BASIN MANAGEMENT

PLANNERS (WITH THE ENVIRONMENT AGENCY) MUST TRY TO FIND SUSTAINABLE SCHEMES OF MANAGING THE DRAINAGE BASINS. THIS INVOLVES COST-BENEFIT ANALYSES BEING CARRIED OUT (IF COSTS < BENEFITS THE SCHEME IS MORE LIKELY TO GO AHEAD). THIS IS OFTEN CONTROVERSIAL AS STAKEHOLDERS HAVE DIFFERENT VIEWS AND ATTITUDES

STRATEGY (HARD = H or SOFT = S)	BENEFITS	COSTS
<p>Dam construction (H): Walls built across rivers holds water back forming a reservoir.</p>	<p>Store and regulate flow. Can create recreational opportunities, fresh water source and hydroelectric power generated.</p>	<p>Very expensive, floods large land areas, damaging habitat and displacing people. Trap sediment which reduces fertility downstream.</p>
<p>River engineering (H): Flood walls, earth embankments, dredging, channel straightening.</p> 	<p>The size and height of the walls reassures stakeholders. Deep piling prevents seepage and walls can be 'dressed' with local brick/stone to blend in with surroundings. Encourage 'through-flow' away from high value land.</p>	<p>Very expensive (including maintenance). Not all stakeholders benefit. Can restrict access to areas. Often encourages 'flow-through' and makes flooding (and erosion) worse downstream for residents/businesses. Embankments can fail. Dredging causes habitat damage.</p> 
<p>Temporary flood barriers (H/S): Only used when required.</p>	<p>Temporary nature means cost is lower than engineering there is not a permanent eye-saw. Access is only restricted during flood events.</p>	<p>High value land could flood if not erected in time. Local stakeholders do not feel protected.</p>
<p>Temporary flood barriers (H/S): Only used when required.</p>	<p>Relatively cheap and effectively protects high value land. Effects of floods are minimised. Green spaces allow infiltration and groundwater storage, reducing lag time.</p>	<p>Sports clubs have fixtures cancelled and prevents access to green spaces. Restricts industrial/urban development exacerbating housing shortage.</p>
<p>Land use zoning (S): Land uses with low economic value, such as car parks and playing fields are not protected but used to store flood water.</p>	<p>Low-cost, environmentally sustainable. Increase interception and ground storage, reducing overlap flow, increasing lag time. Provides habitat and reduces soil erosion.</p>	<p>Requires a lot of space and reduces land available for farming or alternative development.</p>
<p>Afforestation (S): Tree planting</p>	<p>Cheap and gives people time to evacuate and protect homes/businesses. Sand bags can be put in place which offers some flood protection.</p>	<p>Warnings only effective if people take action. Not all stakeholders have access to mobile phones and social media.</p>
<p>Improved prediction and flood risk warnings (S): Flood warnings issued by Environment Agency so people can plan and prepare for flooding.</p>		