

# <sup>1+1</sup> GCSE Geography knowledge organisers



Paper 1	1	Natural hazards
	2	Living world
	3	Coasts
	4	Rivers

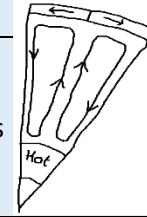
Paper 2	1	Urban
	2	Economic world
	3	Resources
	5	Water

Paper 3	Maths skills (On all papers)	
	Graphs	
	Maps	
	Fieldwork	


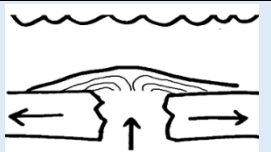
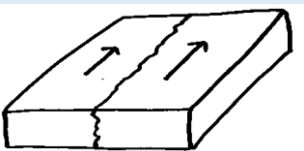
1. Natural hazards	
Term	Definition
Natural hazard	A natural event that threatens people or has the potential to cause damage, destruction and death. <i>Eg.</i> earthquakes
Tectonic hazards	Caused by movement of the tectonic plates (volcanoes and EQs).
Atmospheric hazards	Created in the atmosphere (tropical storms, drought, tornadoes).
Hazard risk	The probability or chance that a natural hazard may take place.
Earthquake	A sudden or violent movement within the Earth's crust followed by a series of smaller shocks.
Volcanoes	An opening in the Earth's crust from which lava, ash and gases erupt.
Factors increasing hazard risk	
Vulnerability	Higher population densities (floodplains). More people living in dangerous areas.
Capacity to cope	Poverty means people can't afford protection/planning e.g. can't evacuate.
Nature of the NH	More warning for TS than earthquakes. Higher the magnitude = higher risk.

3. Distribution of tectonic hazards	
Plate margin	The margin or boundary between two tectonic plates.
Tectonic plate	A rigid segment of the Earth's crust which can float across mantle.
Hazard	Distribution
Volcanoes	At destructive + constructive margins. Ring of Fire around edge of the Pacific. Some aren't on margins. (Hotspots)
Earthquakes	Mostly on plate margins. (All margins) Along w. coast North + South America. Some caused by fracking and mining.

2. Plate tectonic theory		
Theory	Explanation	
Convection currents	Occur in the mantle. The heating and cooling of magma in the mantle makes currents which can move tectonic plates.	
Slab pull	Oceanic plate subducting into the mantle pulls the rest of the plate with it.	
Ridge push	The weight of the plate at ocean ridges makes the plates move due to gravity.	
Structure of the earth		
Crust	The crust is made up of 7 large tectonic plates and several smaller ones.	
	Oceanic crust	Thin 5- 10km. More dense. Can be made and destroyed.
	Continental crust	Thick 30 – 50km. Less dense. Older, never destroyed.
Mantle	Semi molten rock moves slowly. Convection currents occur here.	
Outer core	Liquid. Iron and nickel.	
Inner core	Solid. 5500°C.	



5. Key terms	
Key term	Definition
Primary effects	The initial impact of a natural hazard on people and property. Caused directly by the event.
Secondary effects	The after effects that occur as indirect impacts of natural events, sometimes on a longer timescale.
Immediate responses	The reaction of people as the disaster happens and in the immediate aftermath.
Long term responses	Later reactions that occur in the weeks, months and years after the event.

4. Plate margins	
Include processes and ensure correct sequence.	
<p><b>Destructive margins</b></p> <p>Composite volcanoes. Earthquakes.</p> 	<ol style="list-style-type: none"> <li><b>Convection currents</b> move two plates towards each other.</li> <li>The oceanic plate is denser and so <b>subducts</b> under the less dense continental plate.</li> <li>Due to <b>friction</b>, earthquakes can happen. Heat in the mantle, the oceanic plate melts into liquid magma forming a magma chamber.</li> <li><b>Pressure</b> builds up. Magma is eventually released.</li> <li>An explosive eruption forms a <b>composite volcano</b>.</li> </ol>
<p><b>Constructive margins</b></p> <p>Shield volcanoes. Earthquakes.</p> 	<ol style="list-style-type: none"> <li><b>Convection currents</b> move two plates away from each other.</li> <li>Magma from the mantle rises through the gap.</li> <li>As plates move apart friction occurs leading to earthquakes.</li> <li>The lava is very runny so travels a long distance before cooling.</li> <li>Over many eruptions, a <b>shield volcano</b> is formed.</li> </ol>
<p><b>Conservative margins</b></p> <p>Earthquakes.</p> 	<ol style="list-style-type: none"> <li><b>Convection currents</b> move</li> <li><b>Friction</b> builds up causing <b>tension</b>.</li> <li>Eventually the tension will be released as waves of energy which is an <b>earthquake</b>.</li> </ol> <p>There are no volcanoes at this margin.</p>

6. Tectonic hazards vary between contrasting levels of wealth			
	LIC \$730	HIC \$40,000	Explanation
Earthquake	Nepal 2015	New Zealand 2016	
Primary effects	<ul style="list-style-type: none"> <li>‡ 9,000 died. 22,000 injured.</li> <li>‡ Thousands of water tanks destroyed.</li> <li>‡ 800,000 homes destroyed.</li> <li>💰 US\$5 billion in damages.</li> </ul>	<ul style="list-style-type: none"> <li>‡ 2 died. 50 injured.</li> <li>‡ Water/power damaged.</li> <li>💰 US\$8.5 billion in damages.</li> <li>💰 400km road/rail destroyed</li> </ul>	New Zealand's buildings are EQ proof. In Nepal building quality is poor, responses ineffective.
Secondary effects	<ul style="list-style-type: none"> <li>🏠 Landslides cut off rural communities.</li> <li>💰 Tourism decreased by 1/3.</li> <li>‡ 4mill homeless, no water.</li> <li>🏠 Avalanches on Everest (19%)</li> </ul>	<ul style="list-style-type: none"> <li>💰 200 homeless from Waiiau.</li> <li>🏠 100,000 landslides, flooded Clarence River.</li> </ul>	Damage costs were higher in New Zealand as more expensive infrastructure.
Immediate responses	<ul style="list-style-type: none"> <li>👉 India- search/rescue 15mins</li> <li>👉 Shelter- 500,000 tents in the Kathmandu tent city</li> <li>👉 Operation blessing sent aid to rural areas (took 9 days).</li> </ul>	<ul style="list-style-type: none"> <li>👉 200 evacuated in 24 hours.</li> <li>👉 Power restored in 24 hrs.</li> <li>👉 Tsunami warning issued.</li> </ul>	Not adequate in Nepal, relied on aid. NZ had plans in place- rapid and efficient.
Long term responses	<ul style="list-style-type: none"> <li>🕒 Asian development bank gave US\$200 million</li> <li>🕒 Government promised \$2,000 to rebuild homes, not received.</li> </ul>	<ul style="list-style-type: none"> <li>🕒 \$5.3 million earthquake proof water pipe.</li> <li>🕒 Road/rail repaired in 2yrs.</li> </ul>	In Nepal these were slow and are still ongoing. Very fast in New Zealand as more money.

7. Why do people continue to live in areas at risk from tectonic hazards?	
Factor	Explanation
Geothermal energy.	Due to geothermal energy producing cheap and renewable electricity, electricity prices are 1/3 cheaper in Iceland.
Tourism	Tourist attractions such as the geothermal heated Blue Lagoon in Iceland has led to over 1 million tourists visiting the country each year.
Minerals	Rich minerals such as sulphur are found in volcanic craters such as Kawah Ijen in Indonesia. Miners receive \$6 per day extra compared with coffee farmers.
Fertile soil.	As volcanic material breaks down minerals are released into the soil creating fertile soil. This has led to Indonesia exporting \$872 million worth of coffee per year.

### 8. Management can reduce the risks from tectonic hazards

	Planning	Prediction	Protection
Definition	Actions taken to enable communities to respond to, and recover from, natural disasters.	Attempts to forecast when and where a natural hazard will strike, based on current knowledge.	Actions taken before a hazard strikes to reduce its impact.
Earthquake examples	Similar for both. Practice drills – EQ – drop cover hold under table.	Can't reliably be done for EQs. But we can suggest areas that will be vulnerable.	EQ proof buildings i.e. Steel frames
Volcanoes examples	Volcano – breath through wet cloth.	Tiltmetres monitor volcano deformation as this happens as	Areas around volcano not built on e.g. Vanuatu.

### 9. Global atmospheric circulation

Factor	Explanation
Global atmospheric circulation	Worldwide system of winds, which transport heat from the equator to the poles.
Key information	<p>Wind is large scale movement of air from HIGH to LOW pressure.</p> <p>This is caused by differences in temperature at the Equator and the poles.</p> <p>The circulation is divided into loops called CELLS.</p> <p>Low pressure = Rising air = Rain. High pressure = Sinking air = Clear skies.</p>
	<p>At the poles, cool air sinks creating high pressure. (&lt;250mm rainfall).</p> <p>At 60°N air rises between the Ferrel and Polar cell creating an area of low pressure. The UK gets lots of low pressure weather blown in from the Atlantic.</p> <p>At 30°N air sinks between the Ferrel/Hadley cell creating high pressure (deserts &lt;250mm rain).</p> <p>On the equator air rises as the sun's heat is most concentrated. This creates a low pressure area with high rainfall. (Rainforests &gt;2000mm of rain).</p> <p>Surface winds blow towards the equator (trade winds). Direct hurricanes to west.</p> <p>Here winds blow towards the poles and are called Westerlies. (From the west).</p> <p>The winds curve due to the spin of the earth (Coriolis effect).</p>

### 10. Weather hazards in the UK

Hazard	Example
Extreme weather	A weather event that is significantly different from the average pattern and is especially severe or unseasonal.
Strong winds	Damage property / disrupt transport. 2018 Storm Ali killed 2 people.
Heavy rain	Can cause flooding, costing millions. Cokermouth 2009 314 mm in 24 hrs.
Snow	Injury, death, travel disruption. March 2018 Beast from East. 50 cm.
Drought	Crop failure, rules to conserve water. April 10-March 12 only 75% of rain.
Heatwaves	Pollution builds up- breathing problems. Death. BUT tourism benefits. 2018.
Weather	Day to day changes in atmosphere.
Climate	Average weather in an area.

### 12. An example of a recent extreme weather event in the UK

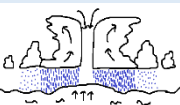
Name	Cokermouth floods 2009.
Causes	314 mm of rain in 24 hours. Ground saturated (more surface runoff).
Impacts	<p>1,300 homes flooded</p> <p>3,057 businesses affected</p> <p>Cost of damage to each household was £28,000</p> <p>Total damage was £100 million</p> <p>Farmland was flooded and became oversaturated.</p> <p>Floodwater contaminated with oil.</p> <p>1 person died</p>
Management strategies	<p><b>Immediate responses</b></p> <p>Government gave £1 million.</p> <p>Cumbria Flood Recovery Fund £1 mill.</p> <p>'Visit Cumbria' website provided information for locals.</p> <p><b>Long term responses</b></p> <p>£4.4 mill management scheme.</p> <p>H 120m self-raising barrier.</p> <p>S Flood action group, 2000 trees planted.</p>

This is also our rivers case study.

### 11. Evidence that weather is becoming more extreme...

Our weather is naturally variable BUT extreme events are becoming more common and severe.

Hazard	Example
Temperature	10 warmest yrs all occurred since 1990 2018 joint hottest summer on record. Dec 2010 coldest month for 100 years.
Rainfall	More rainfall records broken between 2010 - 2014 than in any other decade. Dec 2015 wettest month on record.

13. Tropical storms	
Hurricanes, cyclones, typhoons. An area of low pressure with winds moving in a spiral around the calm central point called the eye of the storm. Winds are powerful and rainfall is heavy.	
Factor	Explanation
Global distribution	5° – 30° north and south of equator (sea temp warm, wind shear low). More in the northern hemisphere. Move towards the west.
Relationship with ACM	Trade winds (from high to low pressure) send tropical storms to west.
Structure	Circular, can be 100s of km wide. Eye- calm in centre (air ↓, LOW). Eyewall- strong winds, torrential rain. Edges- Wind speed falls, rain reduces.
	
How will climate change affect them?	
Distribution	Increase to higher latitudes (warmer sea temperatures).
Frequency	Number could increase. (Longer season)
Intensity	Stronger? More evaporation.


14. Formation of tropical storms	
Include processes and ensure correct sequence.	
Conditions	5-30° latitude. Ocean depth > 60m deep. Sea temperature > 27°C. Form summer and autumn.
<ol style="list-style-type: none"> <li>Sun heats the ocean (27°C) &gt; <b>rapid evaporation</b>.</li> <li><b>Condensation</b> occurs quickly leading to a large amount of cloud forming (<b>tropical depression</b>).</li> <li>Due to the earth's rotation, this cloud mass starts to spin. An eye is formed in the centre.</li> <li>Due to rising air, a <b>low pressure</b> area forms below. Air rushes into this creating high wind speeds. (&gt;74mph = <b>tropical storm</b>)</li> <li>The low pressure results in the ocean being uplifted forming a <b>storm surge</b>.</li> </ol>	

15. How can we reduce the impacts?	
Strategy	Explanation
Prediction / monitoring	Satellites and aircraft to monitor storms. Computer models calculate the predicted track. Allows warnings so people can evacuate or protect their home.
Planning	New developments avoid high risk areas Emergency services train and prepare. Plan evacuation routes. Reduces the injuries and deaths.
Protection	Building design- reinforced concrete, stilts to reduce flood risk. Flood defences along rivers and coasts. Reduces the number of buildings destroyed so fewer injuries and deaths.

16. Tropical storms affect people and environments.		
	Generic	Typhoon Haiyan 2013 Philippines
Primary effects	Direct results of strong winds, high rainfall, storm surges. Flooding, buildings destroyed, death.	<ul style="list-style-type: none"> <li>‡ 6,300 deaths. (Most drowned in storm surge.)</li> <li>‡ 500,000 houses destroyed.</li> <li>‡ 90% of Tacloban city destroyed.</li> <li>‡ 30,000 fishing boats destroyed.</li> <li>‡ Damage cost US\$12 billion</li> </ul>
Secondary effects	Homelessness > lead to poor health. Lack of sanitation > diseases (cholera) Food shortages, price increase.	<ul style="list-style-type: none"> <li>‡ 4.5 million homeless.</li> <li>‡ 1.1 million tonnes of crops destroyed (rice).</li> <li>‡ 6 million people lost their jobs.</li> <li>‡ Landslides in rural areas.</li> </ul>
Immediate responses	Evacuate before the storm. Rescue those affected. Provide food, water, blankets. Aid workers arrive from abroad. Recover dead bodies (prevent disease).	<ul style="list-style-type: none"> <li>➤ Over 1200 evacuation shelters set up.</li> <li>➤ Philippines Red Cross delivered basic food aid.</li> <li>➤ HMS Illustrious delivered 100 tonnes of rice on 7 helicopters (took 15 days)</li> <li>➤ 800,000 evacuated (warnings given 2 days early).</li> </ul>
Long term responses	Repair homes and infrastructure. Promote economic recovery.	<ul style="list-style-type: none"> <li>➤ Oxfam donated thousands of fishing boats.</li> <li>➤ Save the Children trained people as carpenters and rebuilt 900,000 homes.</li> <li>➤ No build zones set up</li> </ul>

### 17. Climate change key terms

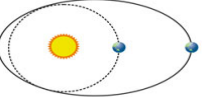
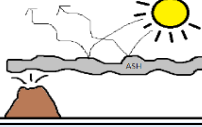
Key term	Definition
Climate change	A change in the global climate from the expected. This can be due to natural or human causes.
Global warming	Gradual increase in the temperature of the earth's atmosphere generally attributed to the greenhouse effect.
Quaternary period	The period of geological time from about 2.6 million years ago to today
Glacial periods	Colder periods of time.
Interglacials	Warmer periods of time.
Greenhouse gases	Water vapour, carbon dioxide, methane, nitrous oxide, ozone, CFCs
Enhanced greenhouse effect	The greenhouse effect is a <b>natural process</b> that warms the Earth so humans can survive. However, humans have added <b>extra</b> GHGs to the atmosphere trapping too much heat making the climate hotter.



### 18. Evidence for climate change

Key term	Definition
Pollen analysis	Pollen is preserved in peat bogs, we can date the peat and the type of pollen suggests the climate conditions.
Photos	Comparing photos from the 1800's with today show glaciers have shrunk.
Ice cores	Ice cores are extracted by drilling. Analysis of trapped gases tell us the climatic conditions of the past.
Tree rings	Thinner rings indicate colder climates. They can tell us changes in temperature for about 10,000 years.
Temperature records	Records using thermometers show us temperature variations around the globe, but only since the 1850's.

### 19. Causes of climate change

Natural factors	Orbital changes	Changes in the pathway of the Earth around the Sun over 96,000 years from circular to elliptical. During the circular rotation the earth is closer to the sun and so the climate is warmer.	
	Volcanic activity	Large volcanic eruptions emit ash/gases into the atmosphere. These reflect the sun's radiation back out to space and reduces temperature on Earth for short periods of time (volcanic winters).	
	Sunspots	The sun's output of energy changes on a 11-year cycle. When solar output increases the Earth experiences warmer climates.	
Human causes	Use of fossil fuels	CO <sub>2</sub> is released into the atmosphere when fossil fuels are burnt. This occurs with cars, factories and to make electricity.	
	Agriculture	Farming of livestock produces lots of methane and we now eat more meat. Rice farming also releases methane and is a core food in many cultures.	
	Deforestation	Plants remove CO <sub>2</sub> from the atmosphere and convert it to organic matter using photosynthesis. When we cut down trees we stop them absorbing more CO <sub>2</sub> . If trees are burnt for fuel or to clear land for farming they release CO <sub>2</sub> into the atmosphere.	

### 20. Effects of climate change

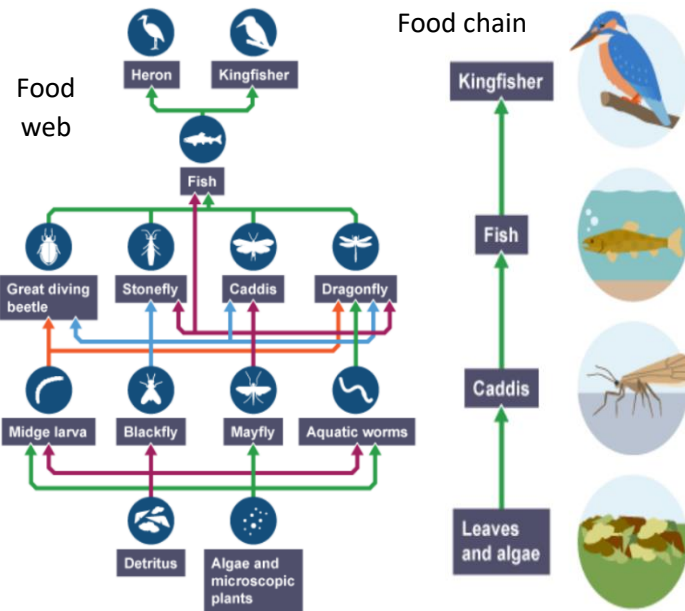
On people	<ul style="list-style-type: none"> <li>- Death rate has increased (some due to heat, some due to cold)</li> <li>- Migration vital from low lying areas</li> <li>- Water stress increases (political tension)</li> <li>- Lower crop yields (malnutrition)</li> <li>- High damage costs from more storms</li> <li>+ Higher temperatures bring an economic boost to some areas (hotter = more tourism, countries at high latitude- farms grow more)</li> </ul>
Environment	<ul style="list-style-type: none"> <li>- Glaciers shrink, ice caps melt</li> <li>- Sea levels rise. 82cm by 2100.</li> <li>- Coastal erosion increases</li> <li>- Coral reefs suffer bleaching</li> <li>- Biodiversity may decrease</li> <li>- More extreme weather events (storms, fires)</li> </ul>
<p>Poor countries tend to suffer the most as they do not have the money to adapt effectively to climate change. Often located in more vulnerable areas.</p>	

**21. Managing climate change**

	Strategy	Explanation	Evaluation
<b>Mitigation</b>	Action taken to reduce or eliminate the long term risk to human life and property from natural hazards and climate change.		
	International agreements	COP 26 40 countries agreed to stop using coal by 2040	+ Global reduction of CO <sub>2</sub> - Only 40 / 195 countries signed the agreement.
	Planting trees	The Great Green Wall – 11 million trees in Senegal. This increases the amount of carbon dioxide that is absorbed from the atmosphere through photosynthesis.	+ Also has other environmental benefits. - Takes a long time for trees to grow
	Alternative energy production	Replace fossil fuels with renewable energy e.g. Solar panels on roof at Gunwharf.	+ Reduces CO <sub>2</sub> emissions. - Expensive, needs large investment.
	Carbon capture and storage	New technology which captures CO <sub>2</sub> from power stations burning fossil fuels and transports it to places it can be stored safely underground.	+ Reduces CO <sub>2</sub> - Expensive technology
<b>Adaptation</b>	Actions taken to adjust to natural events such as climate change, to reduce potential damage, limit the impacts, take advantage of the opportunities, or cope with the consequences.		
	Changes in agricultural systems	Fish farms in Tuvalu to prevent fish migration -> constant food supply -> less chance of famine.	
	Managing water supply	- EU funded water tanks have been installed in Tuvalu to store rainfall -> water crops in dry seasons -> less chance of famine.	
	Reducing risk from rising sea levels	- Tuvalu planting 1,00 mangrove trees on the beach -> Roots hold sand in place -> prevents coastal erosion.	

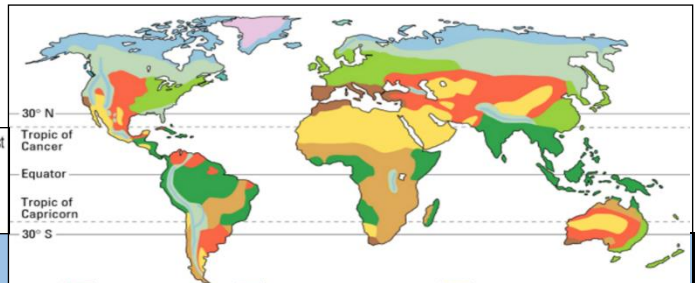
### 1. What is an ecosystem?

Term	Definition
Ecosystem	A community of plants and animals ( <b>biotic</b> ) that interact with each other and their physical environment - <b>abiotic</b>
Biotic	Living elements eg plants, animals.
Abiotic	Non-living elements eg soil, climate.
Food web	A complex hierarchy of plants and animals relying on each other for food. Made of many food chains.
Food chain	The connection between different organisms that rely on one another as their food source. Single flow of energy
Producer	An organism or plant that is able to absorb energy from the sun through photosynthesis.
Consumer	Organisms that eat other organisms. Primary consumers - grasshoppers. Secondary consumers eat herbivores.
Decomposer	An organism that breaks down organic material and recycles nutrients to the soil. E.g. bacteria and fungi.



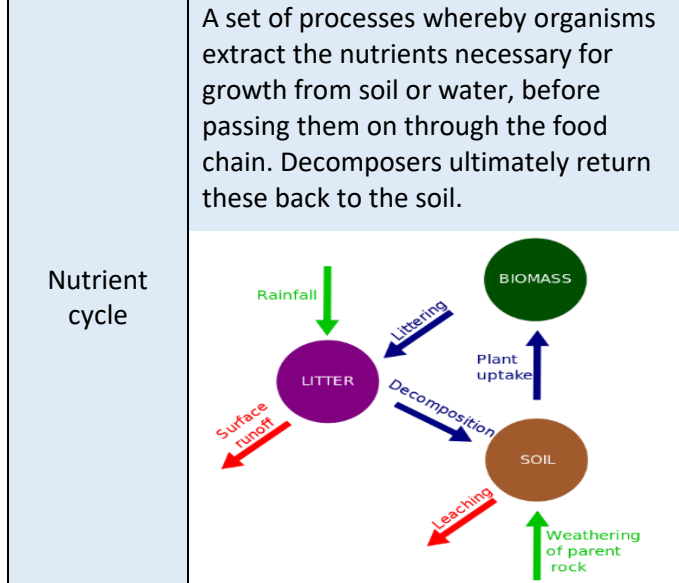
### 2. EG of a small-scale ecosystem


Name	Fresh water lagoon, Slapton Lay
What?	Consists of pond bottom, mid water, surface, pond margin, above surface.
Inter-relationships	Margin provides shelter for insects. Pond surface allows fish to prey on insects like dragonflies. Decomposers live on the pond bottom.
Balance between components	Introduction of more fish means the kingfishers thrive, but the number of caddis decrease due to more predators. Fertilisers from fields draining into the pond may cause eutrophication. Increases algae but depletes oxygen.



### 3. Large scale natural ecosystems

Biome	A plant and animal community covering a large area of the Earth's surface. Global ecosystems.	
Name	Distribution	Characteristics
Polar	At the poles. High latitudes.	Very cold and dry all year round (<250mm). 99 per cent of it is covered by ice. Very little vegetation, dark for several months a year. Low biodiversity.
Tundra	60°N, along Arctic Circle.	Winters very cold, summers brief, little rainfall. Treeless, mosses and low shrubs. Layer of permanently frozen ground called permafrost.
Temperate deciduous	Mainly found along the mid latitudes.	Deciduous means trees lose their leaves in the winter. Found in areas with 4 seasons. Summers warm, winters mild, rainfall all year round.
Mediterranean	40° – 45°N.	Hot and dry summer with mild winters. Vegetation includes olive and fruit trees. California and some parts of Australia too.
Desert	Between 15° - 35°. Along the Tropics.	High average temperature and very low precipitation (<250mm). Very hot during the day but cold at night. Vegetation is sparse. Sandy soils.
Savanna	Between 15° – 30°. Between TRF + sav.	Grass land with a relatively dry climate. It has wet and dry seasons. Large herds of animals graze alongside predators such as lions.
Tropical rainforests	Along the equator, between the Tropics	High temperatures and heavy rainfall (>2000mm) due to it being in a low pressure area. High biodiversity as it has ideal conditions for plants to grow.



4. Rainforest characteristics	
Characteristic	Description
Climate	Consistent all year. No seasons. Very wet. > 2,000 mm per year. Very warm. Average temp. 28°C.
Soil	Latosol (red as rich in iron). Infertile (heavy rain leaches nutrients). Some nutrients on surface. (Decomposition)
Structure (4 layers)	Emergents. Upper canopy. Lower canopy. Shrub layer. 
Biodiversity	Very high, but at risk due to deforestation. >50% of all the species in the world.
Plants	Evergreen as continual growing season. Tall trees. Dense canopy blocks light.
Nutrient cycling	This is very rapid due to the hot and humid conditions.

7. Sustainable management	
Strategy	Explanation
Rate of deforestation	Varies across the world. Decreasing in Brazil. Increasing in Indonesia.
Selective logging and replanting	Only SOME high value trees like mahogany or older trees are cut -> encourages growth of smaller trees.
Conservation	Nature reserves are set up where economic activity is restricted -> 5 years in prison if deforested.
Education	Educating locals on the values and how to make money sustainably -> people boycott (40 companies in 2021) -> stop deforestation.
Ecotourism	Environmentally friendly (small scale, employs locals, educates tourists). Brazil makes \$370 m a year -> stop deforestation.
International hardwood agreements	To prevent illegal logging and promote sustainably sourced timber. E.g. FSC.
Debt reduction	Debt cancelled with the aim that the extra money is spent on conservation. US cancelled Brazil's \$21m debt.

8. Tropical rainforest case study	
Name	The Amazon, Brazil.

Causes of deforestation	
The cutting down and removal of forest	
Farming	Subsistence- Grow just enough food for their family. Small scale and sustainable. Commercial- cattle ranching, Brazil is largest exporter of beef.
Logging	Cutting down trees to sell. E.G. Mahogany .
Road building	Roads constructed for access to mines... E.g. Trans-Amazonian Highway
Mineral extraction	Removal of resources from the earth. Iron Ore, Carajas Mine 30,000 jobs.
Energy development	Building dams = forest being flooded. Belo Monte dam, third largest dam in world.
Settlement	New settlements form i.e. Manaus 2m people.
Population growth	Population in Amazon has increased by 30% 2000-2015.

5. Adaptations to tropical rainforests			
	Name	Description	Explanation
Plants	Drip tips	Waxy leaves shaped like a funnel.	Encourages runoff to reduce water damage and rotting.
	Lianas	Woody creepers rooted to the ground which wind around trees.	By using trees as a ladder to climb, they can get to the sunlight and nutrients.
	Buttress roots	Large roots at the bottom of trees which stand above the surface.	Help support tall trees and overcome shallow soil. They also increase the surface area to help the O <sub>2</sub> / CO <sub>2</sub> exchange.
Animals	Spider Monkey	Prehensile tail.	Can swing from tail > access food in the canopy.
	Sloth	Slow and nocturnal. Strong claws	Conserves energy as they only eat leaves. Allow sloth to grip to branches in canopy.
	Macau Parrot	Strong beak	Crack nuts to eat.

Impacts of deforestation	
Soil erosion	No canopy = exposed soil. Roots no longer hold the soil together. Heavy rain washes the soil away.
Economic development	Provides jobs which leads to more tax. \$7bn beef sold > Tax > improve infrastructure. Profit from selling iron ore, HEP...
Climate change	Trees absorb CO <sub>2</sub> during photosynthesis. Deforestation reduce CO <sub>2</sub> storage increasing the greenhouse effect.

6. Value of tropical rainforests	
To people	To the environment
25% of all medicines. Resources to sell like wood, nuts, rubber. Indigenous tribes.	>50% of all plants and animals. High biodiversity. Trees absorb carbon (< climate change) 20% of world's fresh water and 28% of world's oxygen.

9. Hot desert characteristics	
Characteristic	Description
Climate	Very little rain. < 250 mm per year. Infrequent; may only rain once every couple of years. Extreme temp. 45°C in day, cold nights
Soil	Shallow and sandy. Lack of rain/plant material means its dry Salinisation is a problem (high evaporation)
Bio-diversity	Low. A further risk from climate change. Highest near water sources.
Plants	Very sparse due to lack of rain. Short life cycle, some appearing only with rain. Many are succulents.
Nutrient cycling	Slow due to a lack of moisture and vegetation. Means infertile soils.
Interdependence	Animals spread seeds through dung. Sparse vegetation limits no. animals. People are putting extra stress on the ecosystem, eg draining water supplies.

12. Causes of desertification		
The process by which land becomes drier and degraded.		
Cause		Explanation
Human causes	Population pressure	Population in Sahel has seen population exceed 100m. This is leading to more...
	Removal of fuel wood	Some people still use wood for cooking so cut trees down for fuel Tree roots are vital for holding the soil together so without them more soil erosion occurs.
	Over-grazing	Too many cattle reduce vegetation so nutrients aren't returned to the soil. They also compact the soil.
	Over-cultivation	Crops remove nutrients but does not replenish them so over time soil degrades.
Physical	Climate change	Temperature has increased. Made rain unreliable. Dry soil erodes easily. Worsen by human activity.
	Soil erosion	Bare soil is exposed to wind and rain and so erodes. Made worse by human activity.

13. Strategies to reduce desertification	
Strategy	Explanation
Water and soil management	Bunds (Burkina Faso) prevent soil washing down hills
	Irrigation takes water from rivers to water crops (but causes salinisation)
Tree planting	Trees roots hold soil together, provide shade, add moisture to soil. Great Green Wall 11 m trees Senegal.
Use of appropriate technology	Toyola stove, cheap stove, uses less firewood – prevents deforestation.

11. Hot desert case study	
Name	Thar Desert, India and Pakistan.
Background	Most densely populated desert. 80 people per km <sup>2</sup> .


Development opportunities	
Mineral extraction	Limestone > exported for cement Can be sold for profit and provide jobs.
Energy	Solar power at Bhaleri (10hrs of sunshine a day) > Sold for profit > Tax.
Farming	Indira Gandhi Canal now allows irrigation > 2 harvests a year > double income.
Tourism	Growing industry. Jobs (guides), profit. Annual Desert Festival 500,000 tourists.

10. Adaptations to hot deserts			
	Name	Description	Explanation
Plants	Succulents Eg cacti	Large, fleshy stems. Thick, waxy stems.	To store water during times of reduced rainfall (< 250mm / yr). To reduce water loss (transpiration).
	Tap roots	Long roots (7-10m)	To reach very deep water supplies.
	Dormant seeds	Germinate with rain. Short growth cycle.	As rain is unreliable, seeds germinate when it rains so they survive. They grow, flower, release seeds in weeks- species doesn't die out.
Animals	Camel	Wide feet. Long eye lashes.	Spreads the camel's weight so it's easier to walk on the sand. To keep sand out of their eyes.
	Desert Jerboa	Nocturnal	Bury underground during the day to escape the high temperatures.
	Bat eared fox	Large ears.	Provides a large surface area to maximise heat loss.
	Peringuey's adder	Slide sideways.	Reduces contact with the hot ground.

Challenges for development	
Extreme temperatures	Temperature reaches 53°C in July. Working outside is hard. Crops struggle
Water supply	Rainfall is low. 100 – 240mm/year. Shortages frequent due to demand. Impacts farming and industry. Indira Gandhi Canal now helping.
Inaccessibility	Traditional forms of transport like camels in the inner desert. Tarmac melts, sand covers rds; affects trade.



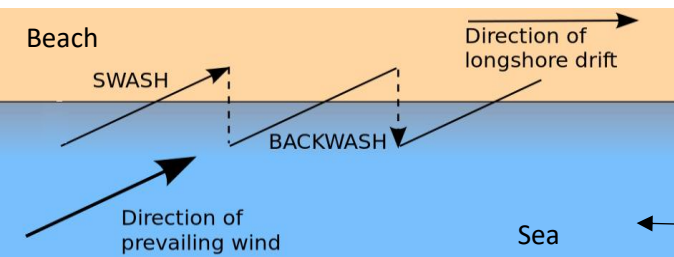
### 1. The UK's diverse landscapes

Term	Definition
Relief	Shape of the land.
Upland areas	Land over 200m. Highlands. Steep.
Lowland areas	Land below 100m. Flat or rolling hills

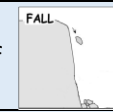
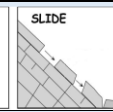
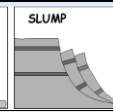


### 2. Waves

Term	Definition
Swash	Movement of the water UP the beach in the direction of the prevailing wind.
Backwash	Movement of water DOWN the beach at right angles (90°) due to gravity.
Constructive waves	Build up the beach. Strong swash. Weak backwash. Low height, long wave length. Low frequency.
Destructive waves	Erode the coast. Weak swash. Strong backwash. Tall height, short wave length. High frequency.

### 3. Processes

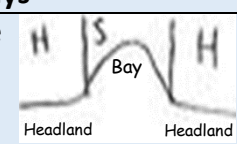
Sub-aerial processes (above the sea)	
Weathering	
Wearing away of rocks in situ. Material not removed.	
Mechanical weathering	The breaking down of rock without changing its composition. Freeze thaw.
Chemical weathering	The breaking down of rock caused by chemicals. (e.g. weak acid rain).
Mass movement	
The downhill movement of material under the force of gravity.	
FALL	
SLIDE	
SLUMP	
Rockfall	Free fall of rocks under force of gravity.
Sliding	Material collapsing in a straight line.
Slumping	Downward rotation of sections of cliff along a slip plane. Worse when saturated.

### Marine processes

Erosion	
The wearing away and removal of material by a moving force such as a breaking wave.	
Hydraulic power	The sheer force of the water compressing air into cracks causes bits to break off.
Abrasion	Sediment scraping against the cliff (like sandpaper) removing small pieces.
Attrition	The 'smashing' of sediment against each other to become more rounded.
Solution	Chemical erosion caused by the dissolving of rocks by sea water.
Deposition	
Dropping of material	Occurs when there is a loss of energy. e.g.. Sheltered bays, when the wind drops.
Transportation	
Longshore drift	Zig zag movement of sediment along the coastline.


### 4. Erosional landforms

#### Headlands and bays

Step 1	Discordant coastlines have alternating bands of more resistant (chalk) and less resistant rock (clay). 
Step 2	The less resistant rock is <b>eroded</b> faster through <b>abrasion</b> , creating bays.
Step 3	The more resistant rock <b>erodes</b> slower and is left jutting out to sea forming a headland.

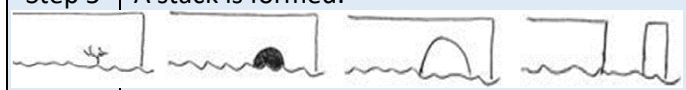
#### Wave cut platforms

Step 1	Waves <b>erode</b> cliff base between high+ low tide
Step 2	<b>Abrasion</b> creates a wave cut notch which enlarges over time.
Step 3	The rock above the notch is unsupported so will collapse due to <b>gravity (mass movement)</b> .
Step 4	Cliff <b>retreats</b> , leaving a wave cut platform (the un-eroded original cliff left behind).



#### Cave, arch, stack

Step 1	<b>Hydraulic power</b> enlarges cracks in headland
Step 2	Over time they turn into a cave.
Step 3	Back of cave is deepened by <b>abrasion</b> until it <b>erodes</b> through the headland > arch.
Step 4	<b>Weathering</b> and <b>erosion</b> wear away at the arch until it eventually collapses (gravity).
Step 5	A stack is formed.



#### Example of a UK coastline. Dorset coastline.

Headlands and bays	Swanage Bay, Durlston Head
Wave cut platform	Kimmeridge
Arch	Durdle Door
Stack	Old Harry

### 5. Depositional landforms

#### Beaches Swanage

Step 1	Beaches form when <b>deposition</b> occurs.
Step 2	There needs to be a source of sediment nearby like soft cliffs.
Step 3	Constructive waves <b>deposit</b> material in sheltered areas like bays.

#### Sand dunes Studland

Step 1	Wind blows sand up the beach ( <b>saltation</b> ).
Step 2	Obstacles such as seaweed cause the wind speed to decrease resulting in <b>deposition</b> .
Step 3	Over time sand dunes build up and are colonised by marram grass.
Step 4	This vegetation stabilises the sand dunes.

#### Spits Hurst spit

Step 1	Longshore drift transports sediment along the coast in the direction of the prevailing wind ( <b>swash</b> and <b>backwash</b> ).
Step 2	Where the coastline changes direction...
Step 3	Sediment is <b>deposited</b> in calm weather out to sea.
Step 4	Can form a recurved tip and a salt marsh behind the spit where it is sheltered.



#### Bar – same as above 1-3

Step 1	When a spit joins two headlands.
Step 2	A lagoon forms behind the bar.



### 6. Coastal management

#### Hard engineering

Man made structures built to control the sea. Reduces flooding and erosion.

Strategy	Explanation	Costs	Benefits
Sea walls	A hard wall made out of concrete that reflects waves back out to sea	Expensive (£5000 per/m). Life span 75 years.	Prevents erosion / flooding. Often protects tourist resorts.
Rock armour	Boulders piled up along the coast. These erode rather than the coast.	Boulders can be moved by waves and need replacing.	Gaps allow water through, reducing wave energy. Cheap
Gabions	Wire cages filled with rocks at the base of cliffs. Absorb wave energy.	Ugly to look at. £100 per/m Metal corrodes over time.	Cheap and easy to build. Reduce erosion.
Groynes	Wooden fences at right angles to the coast, preventing sand moving by longshore drift = wider beach.	Starve beaches further along the coast = more erosion there. Life span only 25 years	Stops longshore drift removing beaches. Fairly cheap.

#### Soft engineering

Schemes set up using a natural approach to managing the coast.

Strategy	Explanation	Costs	Benefits
Beach nourishment	Sand and shingle from elsewhere is added to beaches. Wider beaches stop erosion and flooding	Needs redoing every 5 years. Sand has to be brought from elsewhere. Expensive.	Blends with existing beach. Larger beaches = tourists.
Reprofiling	Sediment is redistributed from the lower part to the upper part of the beach. Increases gradient.	Only works if wave energy is low. Needs to be redone lots.	Cheap and simple. Reduces energy of the waves.
Dune regeneration	Creating or restoring sand dunes by nourishment or planting marram grass to stabilise the sand	Protects only a small area. Areas zoned off from public which is unpopular.	Sand dunes create a barrier between the sea and land. Stabilisation is cheap.

Managed retreat  
Coastal realignment

Remove current defences, allow sea to flood the land behind. Over time land becomes a marshland.

Land is lost = conflict (farmers) Salt water can negatively impact existing ecosystems.

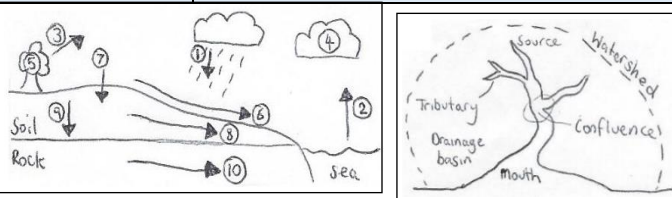
Cheap and easy. Doesn't need maintenance. New habitats created.

### 7. An example of a coastal management scheme

What?	Reasons for management	Positive	Negative
Christchurch Bay. Highcliffe groynes. Aim: Prevent erosion of cliff.	Coastline would erode at 2 metres per year. Protect valuable housing at Highcliffe.	Groynes prevent LSD -> 60m wide beach at Highcliffe -> natural barrier -> no erosion of cliff.	Naish Farm beach starved of sediment, only 11m wide -> erosion happens at 2m per year -> Caravan park at risk of closing.

### 1. The water cycle

Term	Definition
Precipitation <sup>1</sup>	Moisture falling from the atmosphere as rain, snow, sleet, hail.
Evaporation <sup>2</sup>	The process of water changing from a liquid into a gas (water vapour).
Transpiration <sup>3</sup>	Evaporation from plant leaves.
Condensation <sup>4</sup>	Process by which water vapour in the air changes into liquid water (clouds).
Interception <sup>5</sup>	Water stored on the leaves of plants.
Surface run off <sup>6</sup>	Water travelling over the surface of the land (increases when soil is saturated). →
Infiltration <sup>7</sup>	Water soaking into the soil. ↓
Through flow <sup>8</sup>	Water flowing sideways through soil →
Percolation <sup>9</sup>	Water passing vertically through the soil and rock. ↓
Groundwater flow <sup>10</sup>	Water flowing sideways through rock below the water table. →
Saturated	Holding as much water as can be held.

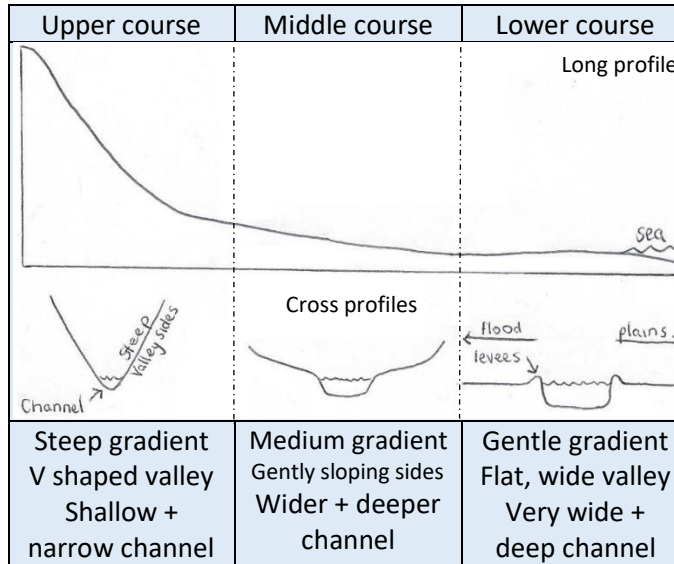


### 2. Parts of rivers

Term	Definition
Source	The start of a river.
Mouth	The end of a river where it joins the sea.
Drainage basin	The area of land drained by a river.
Watershed	The high land that separates one drainage basin from another.
Tributary	A smaller river, which joins a larger river.
Confluence	The point where two rivers meet.
Valley	Area of lower land between surrounding hills. Has a river channel at the base.
Channel	Part where the river water is.

### 3. How does a river change?

Long profile	Shows changes in the gradient of the river from its source to its mouth.
Cross profile	It is a cross section (slice) across the river showing the shape of the valley.



### 5. What causes flooding?

Physical factors	Prolonged rainfall	Saturates the soil so no further water can infiltrate.
	Heavy rainfall	Water arrives too quickly to infiltrate > more surface runoff.
	Relief	Steep land means water reaches the river channel faster.
	Geology	Rocks like granite are impermeable
Human factors	Urbanisation	More impermeable surfaces = more surface run off. Drains get water to river quickly > discharge.
	Deforestation	Trees intercept rainfall and soak up water. Cutting trees down means more water entering river.
	Agriculture	In winter, a lack of crops means more water enters river channel.

### 4. Fluvial processes

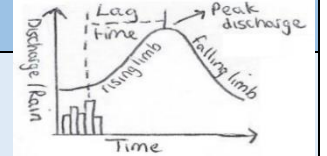
Erosion	
The wearing away and removal of material by a moving force such as a breaking wave.	
Vertical erosion ↓	In the upper course, rivers erode downwards deepening the river channel
Lateral erosion ← →	In the middle course, rivers erode sideways (abrasion on the outside of a meander) widening the river valley.
Hydraulic action	The sheer force of the river against the banks can cause air to be trapped in cracks causing it to weaken and erode.
Abrasion	Sediment carried by the river wears away the riverbed (like sandpaper).
Attrition	The 'smashing' of sediment against each other to become more rounded.
Solution	Chemical erosion caused by the dissolving of rocks by sea water.

Transportation	
Traction	Large, heavy pebbles roll along the bed.
Saltation	Pebbles are bounced along the bed.
Suspension	Lighter sediment is carried by the water.
Solution	Some material is dissolved within water.

Deposition	
Dropping of material	Occurs when there is a loss of energy. E.g. Discharge /velocity ↓, at the mouth

### 6. Hydrographs

A graph that plots river discharge after a storm. It also displays rainfall.	
Discharge	Volume of water flowing per sec. Cumecs
Peak discharge	Highest discharge.
Lag time	Delay between peak rainfall + discharge. Shorter the lag time, worse the flood risk.
Rising limb	Increase in river discharge as rainfall flows into the river (can be steep/gentle).
Falling limb	Decrease in river discharge.

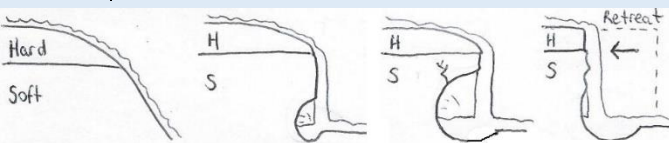


### 7. Erosional landforms

These occur in the **upper course** of the river.


#### Waterfalls and gorges

Char.	A drop in the river that water flows over
Step 1	Forms when a band of hard rock sits on top of a band of soft rock.
Step 2	<b>Hydraulic action</b> will <b>erode</b> the soft rock at the base of the drop creating a plunge pool. This gets larger undercutting the hard rock.
Step 3	Eventually due to <b>gravity</b> the unsupported hard rock (overhang) will collapse ( <b>mass movement</b> ).
Step 4	<b>Abrasion</b> speeds up the erosion of the plunge pool.
Step 5	The waterfall <b>retreats</b> upstream.
Step 6	A steep sided gorge is left behind.



#### Interlocking spurs

Char.	Hillsides that overlap. The river winds around them.
Step 1	<b>Vertical erosion</b> takes place, creating steep sided, V shaped valleys.
Step 2	The river is not powerful in the upper course, so it winds around areas of hard rock.
Step 3	Creating hillsides that overlap.




### 8. Erosion + depositional landforms

These occur in the **middle course** of the river.

#### Meanders and ox bow lakes

Char.	A meander is a bend in the river. An ox bow lake is a semi-circular lake detached from the river.
Step 1	<b>Erosion</b> (mainly <b>hydraulic action</b> ) happens on the outside of the river bend as velocity here is faster. This creates a river cliff.
Step 2	<b>Deposition</b> occurs on the inside of the bend (velocity slower) creating a slip off slope.
Step 3	The meander <b>migrates</b> over time ( <b>lateral erosion</b> ) creating a narrow neck.
Step 4	When the river floods, the water breaks through the narrow neck.
Step 5	The bend is cut off forming an ox bow lake.



### 10. Example of UK river

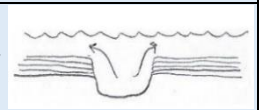
Name	River Tees, NE England.
Where?	Source in Pennines. Mouth on North Sea.
Upper course	V shaped valleys in Pennine Hills. Gorge at Low Force. High Force waterfall (20m drop + gorge) Hard whinstone on top of soft limestone.
Middle	Many meanders. <i>e.g.</i> , Sockburn.
Lower course	Wide mudflat estuary into North Sea. Flood plains and levees south of Darlington

### 9. Depositional landforms

These occur in the **lower course** of the river.

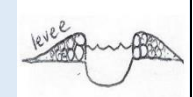
#### Flood plains

Char.	Wide, flat areas of land each side of a river. They flood. Fertile soil.
Step 1	Meanders widen the valley floor through <b>lateral erosion</b> .
Step 2	After heavy rain a river may burst its banks, and the velocity slows due to <b>friction</b> .
Step 3	<b>Depositing</b> its <b>suspended load</b> .
Step 4	Layers of alluvium build up over many floods




#### Levees

Char.	Natural embankments along the edges of a river channel. Taller on the side of the river.
Step 1	When a river bursts its banks the water's velocity slows due to <b>friction</b> .
Step 2	The heaviest material is <b>deposited</b> first, but lighter material is carried further.
Step 3	This creates raised embankments along the side of the river called levees.
Step 4	These build up each time the river floods.



#### Estuaries

Char.	Tidal landforms where the river meets the sea. Often mudflats or salt marshes.
Step 1	Water from the river collides with the sea coming up the river mouth at high tide.
Step 2	Velocity slows so sediment is <b>deposited</b> .
Step 3	At low tide, mud flats are exposed.



**11. River management**

<b>Hard engineering</b>			
Man-made structures built to control the flow of rivers and reduce flooding.			
<b>Strategy</b>	<b>Explanation</b>	<b>Costs</b>	<b>Benefits</b>
Dams and reservoirs	Dams are barriers built across the river. A reservoir (artificial lake) forms behind. Controls river flow.	Very expensive to build. Floods settlements when created.	Can be used to produce hydroelectricity. Prevent flooding downstream.
Channel Straightening	Meanders are removed. Artificial channels make river straighter. Increases velocity.	May cause more flooding and erosion down stream.	Faster velocity means water leaves the area quickly reducing flood risk.
Embankments	Raised walls built along river banks (man-made levees). Increases capacity of the river.	Quite expensive. Risk of severe flooding if flood water higher or they break.	Floods less frequent as river can hold more water.
Flood relief channels	Channels built to divert water around built up areas, or to divert excess water which would flood.	Increased discharge where it re-joins the river so flooding may occur there.	Removes excess water from the river channel to reduce flooding.

<b>Soft engineering</b>			
Schemes set up using knowledge of a river and its processes to reduce the effects of flooding.			
<b>Strategy</b>	<b>Explanation</b>	<b>Costs</b>	<b>Benefits</b>
Flood warning and preparation	Environment Agency warnings. Buildings modified to reduce damage. Residents can add sand bags to their doors prior to floods	Some don't get the warning. Modifications are expensive. Doesn't stop floods but reduces the damage.	People have time to protect their properties or evacuate. Reduces the impacts, fewer insurance claims.
Flood plain zoning	Restrictions prevent building on parts of the flood plain likely to flood.	Not always possible to change existing land uses. Expansion of towns limited.	Flood risk reduced as less impermeable surfaces. Impacts reduced.
Tree planting	Creating or restoring sand dunes by nourishment or planting marram grass to stabilise the sand.	Less land is available for farming.	Discharge and flood risk are reduced because trees intercept the rainfall.
River restoration	Making the river more natural so the floodplain floods naturally.	Local flood risk can increase.	Little maintenance is needed. Creates habitats.

**12. EG of management scheme**

Where?	Cockermouth
Why was the scheme needed?	Large floods November 2009. Confluence of River Cocker/Derwent. Rivers hadn't been dredged.
Management strategy	H 120m self raising flood barrier. H Glass panel flood walls (9). S 2000 trees planted. S Flood action group. 62% of the population agreed to text warnings. S Rivers dredged regularly.
Issues	‡ Rubby Banks Road did not flood in 2015. ‡ Maintain character of town. 💰 Scheme cost £4.4 million pounds. Toy shop on Main Street still flooded in 2015.

**1. Global pattern of urban change**

The world's population is growing rapidly; currently 50% of us live in urban areas.

Urbanisation	An increasing percentage of a country's population living in towns and cities.
HICs	Very slow rate of urbanisation. Already have high urban populations. Urbanisation happened earlier (during the industrial revolution).
NEEs	Fast rate of urbanisation due to industrialisation. Urban population is increasing rapidly.
LICs	Fast rate of urbanisation. Urban population is low as many still work in farming.

**2. Factors affecting urbanisation**

Rural-Urban migration	The movement of people from a rural area (countryside) to an urban area (towns and cities).
Push factors	Negative factors that make people leave an area <i>e.g.</i> drought, famine, war, few services.
Pull factors	Positive factors that attract people to an area <i>e.g.</i> better access to services, better paid jobs, access to electricity.
Natural Increase	When the birth rate is higher than death rate; the population grows. High in NEE cities as migrants are often young and health care is improving.

**3. Megacities**

Megacity	A city of more than 10 million people living there.
How many?	There are now 34. Rapidly increasing.
Where?	Most are in Africa and Asia.






**17. Key terms**

Social deprivation	The extent an individual or an area lacks services, decent housing, adequate income and employment.
Dereliction	Abandoned buildings and wasteland.
Urban Greening	Process of increasing and preserving open space in urban areas <i>i.e.</i> parks.
Urban sprawl	Unplanned growth of urban areas into surrounding rural areas.
Integrated Transport System	Different forms of transport are linked together to make it easy to transfer from one to another.
Brownfield	Land that has been used, abandoned and now awaits reuse; they are often found in urban areas.
Greenfield	A plot of land, often in rural areas or on the edges of urban areas that has not been built on before.
Commuter settlements	A place where people live but travel elsewhere for work <i>e.g.</i> Wickham → Portsmouth.

**18. Sustainable urban living**

Sustainable urban living	Where people living, now, have the things they need, without reducing the ability of people in future to meet their needs.
Water conservation	Portsmouth Water offer subsidised water butts.
Energy conservation	Solar panels in Gunwharf to power car park.
Waste recycling	Gunwharf sends zero waste to landfill and recycles 75%
Creating green space	74 trees and 400m of flowerbed along Southampton Road.

**19. Urban transport strategies used to reduce traffic congestion**

Problems with congestion	  air pollution (global warming).  Late for work, deliveries delayed.   accidents, stress, asthma. In Portsmouth, 200 people die as a result of air pollution each year.
The Hard Interchange	Public transport hub (train, bus, coach, ferry) > less cars on road.
20 cycle lanes in Portsmouth	Safe space for people to ride = less cars on the road = less CO2 emissions.
Park and ride	Car parks on the outskirts of a town, with buses into the city centre.
Congestion charge	Charge for entering the city centre at peak times.
Bus lanes	Stop buses being held in traffic.

4. Location and importance of Lagos	
Location	Lagos is located on the south coast of Nigeria, close to the Benin border.
Regional	Markets for local traders.
National	80% of Nigeria's industry, 30% of GDP.
International	Home to many TNCs e.g., Microsoft. Important port, international airport.

5. Causes of urban growth in Lagos	
Rural to urban migration	More than 275,000 migrants arrive in Lagos every year. 1,200 migrants arrive each day.
Natural increase	High birth rate of 35.2 per 1000/year. Migrants are young so have children. Life expectancy increased to 54.

6. Opportunities created by urban growth in Lagos	
Social	<ul style="list-style-type: none"> <li>Better access to services (health care, water treatment).</li> <li>256 public health centres.</li> <li>68% have a secondary education. 90% attend primary.</li> <li>Electricity (Lagos uses 40% of Nigeria's).</li> </ul>
Economic	<ul style="list-style-type: none"> <li>Jobs available (construction- Eko Atlantic).</li> <li>Wages 4x higher than in rural areas.</li> <li>Thriving film/music industry- Nollywood 2<sup>nd</sup> largest film industry, \$3 billion in 2018</li> </ul>
Urban industrial areas EKO Atlantic	Groups of industries located together. <ul style="list-style-type: none"> <li>Provide 150,000 jobs &gt; Wages increase &gt; Tax</li> <li>Increases exports + tax to government.</li> <li>Attracts other businesses (<b>positive multiplier effect</b>).</li> </ul>

7 + 8. Challenges created by urban growth in Lagos	
Managing urban growth	66% live in squatter settlements like Makoko (100,000 people). <b>Squatter settlements</b> are areas of poor-quality housing (often illegal), lacking in basic services <i>i.e.</i> sewage and water. 3 km to communal water points. Up to 15 households can share 1 toilet.
Providing clean water	Only 40% of the city is connected to the state water supply > dirty water = cholera > lower life expectancy.
Providing sanitation	Squatter settlements do not have access to sewers > contaminate water > cholera
Providing energy	Not enough power for all... Neighbourhoods have to take turns for a few hours at a time. In Makoko, some illegally tap electricity which is dangerous > risk injury > cannot work.
Providing access to services	Makoko has just 1 school > informal job > low pay Unregistered healthcare centres > lack of medication > low life expectancy.
Reducing unemployment	Not enough formal jobs. 60% work in the informal economy > risk of getting sick > no sick pay. <i>E.g.</i> People scavenge in the Olusosun rubbish dump.
Crime	High crime rates in squatter settlements. Gangs like 'Area boys' > people feel unsafe > do not set up businesses.

Managing environmental issues		
	Challenge	How is it being managed?
Waste disposal	Produces 9,000 tonnes of rubbish each day. Only 40% of rubbish is collected > attracts rats > spread disease.	Recycling banks added to each estate.
Air and water pollution	10,000 illegal industries = waste disposal and emissions are not controlled. Squatter settlements have no sanitation. Pollution levels are 5x higher than recommended limit > breathing problems.	Lagos has banned the import of mini generators Communities encouraged to share one larger generator. \$2.5 million new water treatment plants.
Traffic congestion	Bad traffic congestion- poor public transport 2 hours commute called the 'Go Slow' > CO2 emissions > breathing problems.	Bus Rapid Transit network. Built to cope with 200,000 people daily.

9. Example- How urban planning improves the quality of life for urban poor		
What?	How does it improve QoL?	Was it successful?
Makoko Floating School Built in 2013 Educated 100 of the poorest children in Makoko	<ul style="list-style-type: none"> <li>🏫 Provides education for children, improving job prospects.</li> <li>👷 Built by unskilled locals (gained new skills)</li> <li>☀️ Solar panels on the roof.</li> </ul>	<ul style="list-style-type: none"> <li>✓ Increased quality of life.</li> <li>✗ Collapsed after a storm in 2016.</li> <li>✗ Didn't cater for enough children.</li> </ul>

### 10. Distribution of population and major cities in the UK

Population	66 million. Distribution is very uneven. 82% live in urban areas. Upland areas are sparsely populated.
Cities	Most in lowland areas and on coasts. London is the biggest city and the capital. It has 10% of the population. Cities reflect our industrial past (near raw materials e.g. Leeds near coal). Counter-urbanisation is a recent trend.

### 11. Location and importance of Portsmouth

Location	South of the UK
Importance within the UK	Home of the Royal Navy.
Importance to wider world	70% of bananas imported from Ecuador. Many TNCs located there (AirBus, BAE)

### 12. Impacts of migration on the growth and character of the city

National migration	25,000 students each year.
International migration	Now, international migration accounts for half of its growth. 50 countries.
Impact on character	National – student bars Albert Road. International – Multicultural food North End.

### 13. Urban change in Portsmouth

- Population is growing rapidly.
- Population is more ethnically diverse.
- Deindustrialisation loss of 20,000 jobs.
- Focus on tertiary sector – ‘The great waterfront city’

### 14. Opportunities created by urban change

Cultural mix	London Road restaurants Indian, Turkish, Chinese > greater choice > QOL improve as experience more culture.
Recreation and entertainment	Gunwharf Quays 90 shops and 30 restaurants > Days out for families > improve QOL. 150,000 visit Victorious > spend money > boost economy.
Employment	12,000 jobs in tourism e.g Dockyard / Gunwharf > higher disposable income > Improve QOL. Tourists spend £600m > tax > improve schools.
Integrated transport system	The hard Interchange (Bus, coach, train) > less cars on road > lower CO2 emissions > Improve air quality.
Urban greening	74 trees and 400 metres of flower beds on Southampton Road > absorb CO2 > improve air quality.

### 16. An example of an urban regeneration project

Example	Why did it need regeneration?	What are the main features?	Successful?
Gunwharf Quays	<ul style="list-style-type: none"> <li>• De-industrialisation, loss of 20,000 jobs in Dockyard.</li> <li>• Brownfield site- HMS Vernon, run-down and ugly.</li> </ul>	<ul style="list-style-type: none"> <li>• 90 shops and 30 restaurants.</li> <li>• Spinnaker Tower.</li> <li>• Solar panels on the roof.</li> </ul>	<ul style="list-style-type: none"> <li>✓ 2,500 new jobs</li> <li>✓ Attracts 6m tourists.</li> <li>✓ Redeveloped brownfield site</li> <li>✗ Less shoppers in Commercial Road.</li> <li>✗ Increase traffic congestion.</li> </ul>

### 15. Challenges created by urban change

Urban deprivation	Some areas face social deprivation. 52% of children in Charles Dickens are in income deprivation. Problems of crime, drug use, low quality housing, lack of transport.
Inequality in housing	Charles Dickens 3,900 rented. Drayton and Farlington 95% homeowners.
Inequality in education	Charles Dickens – 32% leave school with no qualifications. Drayton and Farlington – 17% leave school with no qualifications.
Inequality in health	Charles Dickens- Life expectancy 75 years. Drayton and Farlington- 83 years.
Employment	Charles Dickens unemployed 6% Drayton and Farlington 0.8%
Dereliction	Industrial buildings derelict (inner-city). Stokes Croft (many squatters).
Building on brown and greenfield	Harbour Place, 337 homes in Drayton > destroy habitat. Gunwharf built on HMS Vernon > V expensive to clear.
Waste disposal	100,000 tonnes of waste per year, only two recycling stations > landfill
Urban sprawl	Harbour place 337 homes > greenfield site. loss of habitat. 7% affordable housing.

### 1. What is development?

Term	Definition
Development	The progress of a country in terms of economic growth, the use of technology and human welfare.
Uneven development	Development takes place at different rates in different places.
Development gap	The difference in standards of living and wellbeing between the world's richest and poorest countries.
Quality of life	General wellbeing (includes health, happiness, social belonging...)
Standard of living	Level of wealth and material goods available to people. \$
Economic development	Progress in an economy. New technology can lead to a move from agriculture to industry.

#### Ways to classify the world

LIC	Low income countries. GNI per capita of under \$1,045. (Poor) e.g. Haiti.
NEE	Newly Emerging Economies. Countries that have begun to experience high rates of economic development, with rapid industrialisation. e.g. Nigeria
HIC	High Income Countries. GNI per capita of over \$12,746. (Rich) e.g. UK.
Brandt line	An outdated line from the 1980's that split the world into rich north and poor south.

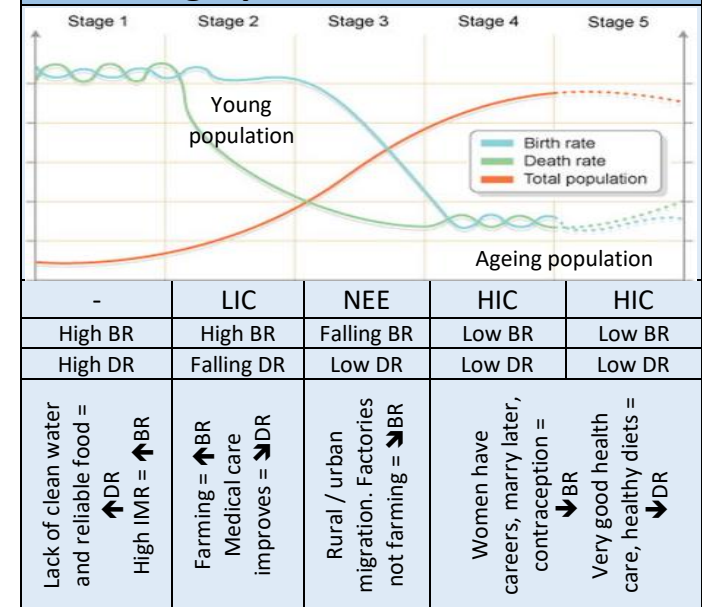
### 5. Consequences of uneven development

Disparities in wealth	Most developed countries > most wealth Africa owns just 1% of global wealth.
Disparities in health	Health care in LICs poor = ↓ life expect UK LE is 81 years. Nigeria LE is 52 years
International migration	Poor try to migrate to HICs. Mexico into USA. Syrians into Europe. Economic migration also occurs.

### 2. Measuring development

Term	Cat.	Definition
Arrows show how the indicator changes with development.		
GNI per capita	⬆️ ➔	Gross National Income per person. Total income divided by the size of the population. - Doesn't show inequality within a country. It's just an average.
Birth rate	⬇️ ➔	The number of babies born in a year per 1000 of the population. +Reliable- infers female equality.
Death rate	⬇️ ➔	The number of people that die in a year per 1000 of the population. - Less reliable. HICs now have an ageing population- > DR
Infant mortality rate	⬇️ ➔	The average number of deaths of infants under the age of 1, per 1000 live births per year.
Life expectancy	⬆️ ➔	The average number of years a person might be expected to live. - Less reliable for a LIC due to IMR making it look lower
People per doctor	⬆️ ➔	The number of people who depend on a single doctor for their health care needs
Literacy rate	⬆️ ➔	The percentage of people who have basic reading / writing skills.
Access to safe water	⬆️ ➔	The percentage of people who have access to water that does not carry a health risk such as cholera
HDI	⬆️ ⬆️ ➔	Human Development Index. A combined measure that includes GNI per capita, life expectancy and adult literacy rate. Out of 1. + Best indicator as it includes ⬆️ and ⬆️ data. Removes anomalies
Generic limitations		Data can be out of date or unreliable. Inequalities exist within countries.

### 3. Demographic Transition Model



### 4. Causes of uneven development

Cat	Factor	Explanation
Physical	Natural disasters	Government has to spend money rebuilding rather than education. eg Haiti has had EQs and TS
	Land-locked	No coastline. This hindered trade keeping the GNI low. E.g. Nepal.
	Extreme climates	If it's too hot or cold agriculture is difficult. E.g. Thar Desert
Economic	Debt	A country's money will go to repaying debt rather than education.
	Selling primary products	These are low value goods so the government has restricted income to invest in health care.
Historical	Colonialism	European countries controlled much of Africa and Asia. After regaining power they were poor and civil wars often occurred. eg Nigeria- UK colony
	War	Money spent on arms. E.g. Sudan

6. Strategies to reduce uneven development		FAT MIDII
Strategy	Explanation	Evaluation
Fairtrade	When producers in LICs are guaranteed a fair price for the goods they produce ie cocoa, coffee. The better price improves income, aids community projects and protects the environment.	+ Improves quality of life - Poorest can't afford certification
Aid	When a country or non-governmental organisation donates resources or money to another country to improve people's lives. Short term emergency aid or long-term aid. Nigeria- NETS4Life.	+ Improves quality of life - Aid may be tied - Corruption of aid
Tourism	Visitors spend money in a country and infrastructure is improved.	- Can be unreliable
Microfinance loans	Very small loans which are given to people in the LICs to help them start a small business. Often to women.	+ Makes women more equal - Can lead to debt
Investment	Countries or TNCs can invest in a country. Might include the development of infrastructure, building dams or industry. Shell.	+ Triggers multiplier effect - Economic leakage can occur
Debt relief	36/39 of the poorest countries have had their debt cancelled if they could guarantee no corruption and they agreed to spend the money on education/ reducing poverty. Nigeria's cancelled 2005.	+ Improves quality of life - They may go into debt again - Corrupt governments...
Intermediate technology	Sustainable technology that is appropriate to the needs, skills, knowledge and wealth of local people. Small scale projects.	+ Affordable - Small scale
Industrial development	Developing the secondary sector. This brings jobs, higher income and infrastructure improvements.	+ Triggers multiplier effect - Environmental damage

7. Tourism to reduce uneven development	
Jamaica	LIC. GNI per capita of US\$5,670. Visit for all year sunshine, Reggae culture, beaches.
Advantages	+ \$2 billion each year. + 34% GDP. + 200,000 jobs.
Dis-advantages	- Locals are poorly paid. - Economic leakage – profit goes to travel companies e.g. Tui - Tourist resorts often in north of the country.
Summary	Has been successful but it is unreliable. Need to find a more sustainable method for the long run.

8. Introduction to Nigeria	
Located just north of the equator, in west Africa.	
Importance of Nigeria	
Global importance	<ul style="list-style-type: none"> <li>🇳🇬 NEE in 2014 &gt; 21<sup>st</sup> largest economy.</li> <li>✌️ 5<sup>th</sup> largest contributor to UN peace keeping.</li> <li>Supplies 2.7% of global oil.</li> </ul>
Local importance	<ul style="list-style-type: none"> <li>📈 Fastest growing economy in Africa. 🌐</li> <li>In 2014 they had the highest GDP.</li> </ul>
Nigeria's context	
Political	Ⓜ️ Boko Haram have killed 17,000 people since 2002.
Environment	○ Rainforest- south > savanna- north.
Social	<ul style="list-style-type: none"> <li>👥 500 ethnic groups</li> <li>📖 Literacy 61%, life expectancy 52 years</li> </ul>
Cultural	🎬 Nollywood (2 <sup>nd</sup> largest film industry).

9. Nigeria's changing industrial structure	
Term	Definition
Industrial structure	The relative proportion of the workforce employed in different sectors of the economy (p, s, t, q).
Primary sector	Jobs that extract/collect natural resources. ↓ Decreasing due to mechanisation and industrialisation. This started rural to urban migration.
Secondary sector	Jobs making things. ↑ Increasing (industrialisation).
Tertiary	Jobs that provide a service. ↑ Increasing as people start to have more disposable income.
How does manufacturing stimulate economic development?	
<ul style="list-style-type: none"> <li>• Factories provide jobs &gt; people have more disposable income &gt; home market enlarges.</li> <li>• Companies pay tax &gt; government invests in infrastructure like roads &gt; attracts more companies to invest. <b>Positive multiplier effect.</b></li> </ul>	

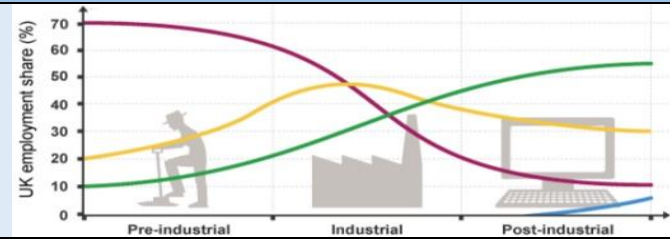
10. Transnational corporations	
Term	Definition
Transnational Corporation	Companies that operate in more than one country. (40 TNCs in Nigeria)
Host country	Country the TNC places its factories.
Footloose	Industries not tied to a certain location
Shell in Nigeria	
Advantages	<ul style="list-style-type: none"> <li>+ 65,000 formal jobs =&gt; disposable income.</li> <li>+ 2018 paid \$1.2 billion tax.</li> </ul>
Dis-advantages	- Oil spills have released 1.5 million tonnes of oil into Niger Delta.
Summary	National economic benefits vs local environmental costs in Niger Delta

12. Impacts of economic development	
Impact on the environment	<ul style="list-style-type: none"> <li>🌲 80% forests destroyed.</li> <li>🛢️ 1.5 million tonnes of oil spilt in Niger Delta.</li> <li>🌫️ Go slows = air pollution.</li> <li>🐼 Loss of species (Niger Delta Red Colobus).</li> </ul>
Impact on quality of life	<ul style="list-style-type: none"> <li>👴 Life expectancy ↑ from 46-52 years</li> <li>💰 GDP per capita has increased from \$2,700 - \$5,200.</li> <li>🎓 Years in school have increased from 6.7 to 10.</li> <li>⚖️ BUT inequality has widened due to oil wealth and corruption.</li> </ul>

19. Place of the UK in the wider world		UK Economic and political links	
Trade	UK trades globally. Exports are worth £250 billion. Strong links with USA, Europe, Asia.	European Union	Partnership of 28 countries. The largest single market in the world. 50% of our trade. 40% of immigrants to UK came from EU. Voted to leave in 2016. The UK left 31.1.2020.
Culture	UK culture exported worldwide. Shaun the Sheep in 170 countries.		
Transport	Channel tunnel links UK/France. Heathrow major airport hub.		
Electronic communication	Most trans-Atlantic cables go through the UK. Many IT firms.	Commonwealth	Association of 53 independent states. Aims to improve wellbeing of members. Commonwealth games every 4 years.

11. Nigeria's changing relationships	
Term	Definition
Political relationships	<ul style="list-style-type: none"> <li>- Gained independence (UK in 1960).</li> <li>- Member of British Commonwealth.</li> </ul>
Trading relationships	<ul style="list-style-type: none"> <li>- Member of OPEC (oil).</li> <li>- Member of ECOWAS (Western Africa trading group).</li> <li>- Has strong links with China and USA.</li> </ul>
International aid in Nigeria	
Term	Definition
International aid	Money, goods and services given to help the QoL of <b>another</b> country.
Emergency aid	Usually follows a natural disaster or war. e.g. Food, water, shelter.
Developmental aid	Long term support by charities or governments to improve QoL. E.g. infrastructure, education, clean water
Aid in Nigeria	
What?	UK trained 1 million farmers in 2017. UK gave £435 million between 2018-2020.
Water aid – Bauchi State	Water pumps installed in Bauchi State. Previously 30% with no water. ✓ Children can now go to school
Problems with aid	<ul style="list-style-type: none"> <li>- Sometimes it isn't sustainable.</li> <li>- Corruption.</li> <li>- Can be tied (strings attached).</li> </ul>

### 13. Economic change in the UK



Primary	↘ due to mechanisation.
Secondary	↗ due to industrial revolution then ↘ due to de-industrialisation.
Tertiary	↗ due to wealth (↗ disposable income)
Quaternary	High-tech jobs including research and IT. ↗ due to government policies and the increase in technology.

#### Why has our economy changed?

De-industrialisation	The decline of a country's traditional manufacturing industry due to exhaustion of raw materials, loss of markets and competition from NEEs.
Government policies	A plan decided by a government to manage issues in a country.
Globalisation	The process which has created a more connected world; with increases in the movement of goods/people worldwide

### 14. Post industrial economy

Tertiary and quaternary sector employed 81% in 2011.	
IT	Employs over 60,000 people.
Services	Retail is the largest sector. Employs 4.4mill
Finance	London is the world's leading centre. HSBC
Research	Government invested £30bill in 2013.
Science parks	Groups of high tech industries and those doing scientific research. Located near universities (for graduates, share facilities).
Business parks	Purpose built areas of offices and warehouses (on edge of cities as less congestion, cheaper, good transport links).

### 15. Environmental impact of industry

Air and water pollution. Soil degradation.	
Releases CO <sub>2</sub> increasing the rate of global warming.	
Transport of materials is by road ↗ air pollution.	
<b>Example of modern industry being environmentally sustainable</b>	
Torr Quarry	Limestone Quarry, Somerset.
2km from train station	Less traffic congestion > Lower CO <sub>2</sub> emissions,
Vertical quarrying.	Dig deep not laterally > reduces destruction of habitat.
Restore 2 wildlife lakes.	Creates habitat > Biodiversity increases.

### 16. Changes in the rural landscape

Population decline	South Lake District – decline 4.3% (away from cities, limited opportunities).
Social changes	↓ ↑ aging population 56% pop over 50 = care issues. ↓ Less children > schools shut.
Economic changes	📉 Shops close e.g. Sports Direct, Barrow 📈 ↑ tourists but infrastructure not there. 📉 Less economically active = less tax.
Population growth	North Somerset – pop increased by 7.8% (near large cities, people can commute).
Social changes	↓ Increased pressure on schools. ↓ Increased waiting times in GP surgeries. ↓ People commute to Bristol = > congestion. ↓ Young people are costed out.
Economic changes	📈 ↑ house prices increased by 6.7%. 📈 Wages higher than national average.

### 17. Improvements in infrastructure

Road	Upgrading 'Smart motorways' M4. Variable speeds, reducing accidents, extra lanes. 2014 Road investment strategy £15 bill. New construction jobs, boost economy. -ve increased congestion no safe place to stop.
Rail	Crossrail in London. Puts extra 1.5 million within 45 mins commute of capital city. HS2 to reduce journey times. London to Manchester in 1 hr 8 minutes. -ve not being built to Manchester.
Port	Felixstowe Port Doubles capacity to over 6,000 ships a year. 96% of UK imports/exports through ports. -ve Destroys habitat of curlew birds.
Airports	Heathrow expansion. 3 <sup>rd</sup> runway 70,000 flights per year. -ve increased traffic on M25 (52,500 cars p/yr).

### 18. North-South divide

Causes	Decline of heavy industry in North (coal) Investment in finance and service industry in the South Investment in infrastructure in South
Impacts in north	Higher unemployment / lower wages (40%) Poor health, lower life expectancy (10 yrs) Poor education. There are SOME exceptions

#### Strategies attempting to resolve regional differences

Devolving more powers	Give more power to local councils and Welsh and Scottish governments. Plan best how to use their money.
Northern Powerhouse	A plan to attract investment to north. £70 million spent on Northern Schools.
Enterprise Zones	55 EZs to encourage businesses to set up in areas of high unemployment. Reduce taxes, simple planning rules, superfast broadband to the area. Sheffield Enterprise Zone – McLaren Factory created 16,000 jobs.

1. What are resources?	
Term	Definition
Resource	A stock or supply of something that has a value or a purpose (food, energy, water).
Resource management	Control and monitoring of resources so they don't become depleted or exhausted.
Significance for well being	
Resources are key to human wellbeing. Their social and economic benefits increase standard of living.	
Food	More than 1 billion are malnourished (this ↑ chance of diseases). Calories provide energy which are vital for people (work, school).
Water	Needed for drinking, cooking and washing. Walking long distances to collect water can stop people working /going to school. Dirty water kills (diseases like cholera).
Energy	Allows industry to develop, creating jobs and making countries richer. Vital for transport. Without it, people burn wood/kerosene to heat homes (takes longer, damages environment)
Resources inequality	
Distribution <b>Uneven</b>	Some countries don't have energy reserves or have unsuitable climates to grow food.
Dependent on <b>wealth</b>	Countries without have to import them or find technological solutions. (Expensive)
Consumption	Greatest in <b>HICs</b> (> money, expect higher living standard). Rapidly increasing in <b>NEEs</b> . Low in <b>LICs</b> . Can't afford to exploit resources or import them.

2. Food in the UK	
Demand	Increasing... rising population, demand for greater choice, more disposable income.
Importing 40% food	Expensive in the UK due to poor harvests. Greater demand for exotic foods. Labour cheaper in LICs. Unsuitable climate for growing some food. We want seasonal foods all year round.
Problems with importing food...	
Carbon footprint	A measure of the greenhouse gases produced. If we transport goods from abroad the carbon footprint is larger.
Food miles	The distance covered supplying food to the consumer. The smaller the better.
Current food trends in the UK...	
Agri-business	Large scale, industrial farming aimed to maximise the amount of food produced. Lyndford house farm 570 hectares of fertile soil.
Organic produce	Food grown without the use of chemicals. Higher labours costs can make it expensive. Riverfood organic farm.
Eat local	Buy from local farms = lower food miles.

3. Energy in the UK	
Demand	We consume LESS energy even though there are more people because of industry decline and energy efficient products like light bulbs.
Energy mix	The different energy resources used by a country. Renewable + non-renewable.
How is it changing?	Renewables are increasing. 1970 – 91% came from coal and oil. 2014 – 19% came from renewable. 50% came from coal and oil.
Reduced domestic supplies coal, gas, oil	North Sea oil + gas reserves running out. We still have coal reserves but all coal fired power stations will close by 2025. By 2020 we will need to import 75%.
Issues with energy exploitation	<p>Economic</p> <ul style="list-style-type: none"> <li>💰 Extraction is expensive.</li> <li>💰 Money needed to research alternatives</li> <li>💰 UK has to pay to import energy.</li> </ul> <p>Environmental</p> <ul style="list-style-type: none"> <li>🏠 Fracking can cause mini earthquakes.</li> <li>🏠 Burning fossil fuels release CO<sub>2</sub>.</li> <li>🏠 Oil spills can leak toxic chemicals.</li> </ul>

4. Water in the UK			
Demand	Demand is increasing (70% since 1985). Higher pop. > more houses > more water intensive appliances.	Areas of deficit	South east. High population = high demand but low rainfall.
Water quality	Water quality improving. But pollution present from fertilisers, oil spills, vehicle pollutants.	Areas of surplus	North + west. High rainfall but low population.
Managing pollution	Stricter regulations on fertilisers, filtering water for sediment, purifying water (chlorine).	Water transfer	From areas of surplus to areas of deficit. eg Mid Wales (surplus) to Birmingham. BUT expensive, affects wildlife, social conflict.

5. Water overview	
Water Security	Water security means having a reliable, uninterrupted and affordable water supply.
Affected by:	<ul style="list-style-type: none"> <li>• Supplies available</li> <li>• Climate</li> <li>• Size of population</li> <li>• Amount used by each person</li> </ul>
Water surplus	This occurs when a country has more water than is required by their population.
Countries with surplus	Water – UK, France, Canada
Water deficit	Having too little water to meet the needs of the people and industry.
Countries with deficit	Politically unstable: Kenya (LIC). Few resources: UAE (HIC).
High consumption	Wealthy countries (HICs) tend to have higher water consumption due to car domestic and industrial use.
Low consumption	Poorer countries (LICs) tend to have lower water consumption due to lifestyle and lack of access.

9. Sustainable resource future	
Carbon footprint	The amount of greenhouse gases an individual produces.
Strategies for conserving energy	
Sustainable design	Insulate walls, south facing homes Automatic lights, solar panels on roofs.
Demand reduction	Improve public transport. Encourage energy conservation.
Technology to increase efficiency	Hybrid cars. Power stations become more efficient. Energy efficient appliances.

6. Factors affecting water	
Reasons for increasing consumption	
Rising population	Global pop growing 80 million each year = more people need more water
Economic development	Rapidly increasing in NEEs. Water used in manufacturing / households.
Agriculture	Water needed to irrigate crops for large population.
Factors affecting supply	
Physical factors	Climate – NE China has low rainfall. Geology – NE China has permeable rock.
Economic factors	Poverty – You have to pay to access water. In some places people who are too poor to afford it may have to find other sources.
Over-abstraction	This is when more water is removed from a water source than is naturally replaced (by rain feeding stores).
Pollution	This is a significant problem in some places where industrial waste can be dumped straight into rivers by companies.
Limited infrastructure.	Rapid urban growth means sewage and water pipes may not be built quickly enough. This can lead to sewage getting into water sources and contaminating supplies.

10. Example of a local scheme	
Where?	Kenya Rural villages – only rains twice a year.
What?	Utooni Development organisation 1,500 sand dams. 1metre high dams built along river – trap water and sand, water infiltrates beneath sand and cannot evaporate. SUSTAINABLE.
Evaluation	<ul style="list-style-type: none"> <li>+ No longer travel for water.</li> <li>+ Irrigate crops.</li> <li>+ Used local labour and materials.</li> <li>- Stops water for villages downstream.</li> </ul>

7. Impacts of water insecurity	
Diseases e.g. Cholera.	Water insecurity means more people will be forced to drink from polluted or unclean water sources. This means that they are at risk of diseases like cholera and typhoid which means that people could die.
Food production	Water insecurity means that less water is available for irrigation. This means that crops are more likely to be destroyed and therefore food stores in countries will decrease, causing starvation.
Industrial output	Water insecurity means that factories have a less secure supply of water. This means that the factories are less productive which means that the economy of the country will shrink because there is less trade occurring.
Potential for conflict	Water insecurity means that more pressure is put on shared water sources. This means that countries are more likely to disagree over access to water which means that there could be conflict and perhaps war in the future.

8. Strategies to increase supply	
Dams and reservoirs	Large barriers are built to hold back water and create a large store (a reservoir) for when water is needed.
Diverting supplies	A man-made river is created re-directing some water from an river and making it flow to areas with poor water availability.
Water transfer	Miles of pipes and canals are created to move water from an area of surplus to an area of deficit.
Desalination	Salt is removed from sea water, creating fresh water.

11. Example of a large scale scheme	
Where?	China – water transfer from south to north.
What?	Dams and canals built to transfer wate from the south to the north.
Evaluation	<ul style="list-style-type: none"> <li>+ water for 100 million people.</li> <li>+ Irrigate crops = food for north.</li> <li>+ Use water in manufacturing.</li> <li>- \$62 billion.</li> <li>- 435,000 forced to leave homes as Danjiangkou dam flooded homes.</li> <li>- Could lead to water insecurity in south.</li> </ul>

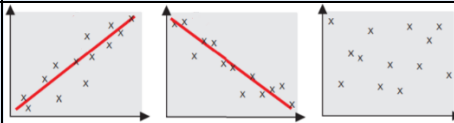
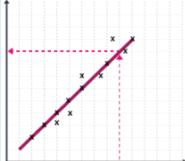
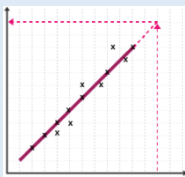
### 1. Measures of central tendency

Key term	Definition	Example: 9 3 5 4 7 3 8
Mean	Total of items ÷ number of items.	$(9+3+5+4+7+3+8 = 39) \div 7 = 5.57$
Median	Middle value (when they are in order). Or position can be calculated using $(n+1) \div 2$	3 3 4 5 7 8 9 = 5 $(7+1) \div 2 = 4^{\text{th}}$ position
Mode	Most common.	3 (appears twice) There can be several modes.
Modal class	Most common class.	-
Range	Difference between the highest and lowest value.	Highest 9 – lowest 3 = 6
Upper quartile	Value $\frac{3}{4}$ of the way through ordered data (smallest to largest). Position = $\frac{3(n+1)}{4}$	3 3 4 5 7 8 9 = 8 Position = $\frac{3(7+1)}{4} = 6$
Lower quartile	Value $\frac{1}{4}$ of the way through ordered data (smallest to largest). Position = $\frac{(n+1)}{4}$	3 3 4 5 7 8 9 = 3 Position = $\frac{(7+1)}{4} = 3$
Interquartile range	The difference between the upper and lower quartile.	Upper quartile 8 – lower quartile 3 = IQR 5

### 2. Percentages

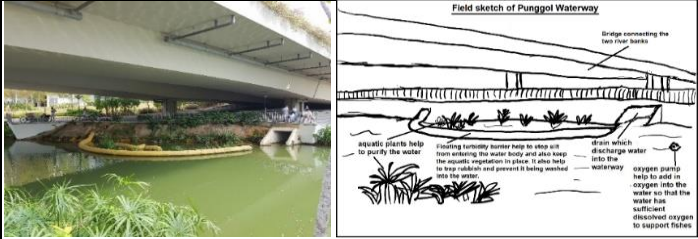
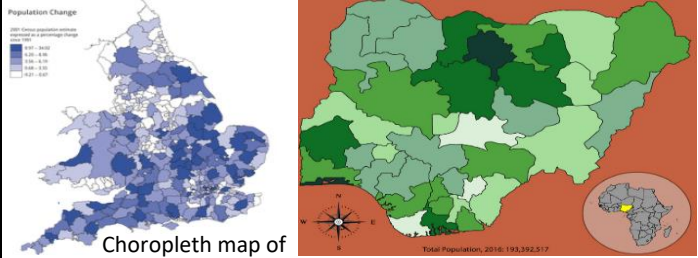
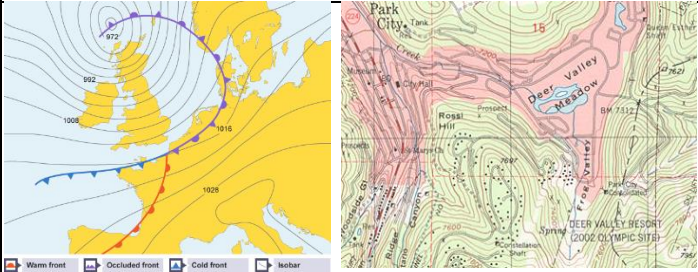
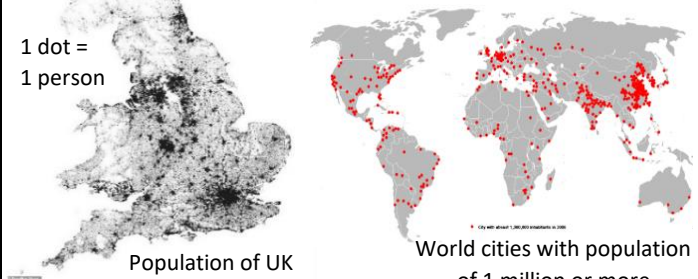
Strategy	Description	Example
Percentage	To give the amount (X) as a percentage of a sample (Y): $X \div Y \times 100$	45 out of 50 people travel by car... $45 \div 50 \times 100 = 90\%$
Percentage increase	To calculate the percentage something has increased by. 1. Work out the difference between the two numbers (the increase). 2. Divide the increase by the original number. 3. Multiply the answer by 100%.	Population in 2020 = 65mill. Population in 2000 = 52 mill. 1. $65m - 52m = 13m$ 2. $13m \div 52m = 0.25$ 3. $0.25 \times 100 = 25\% \text{ increase}$
Percentage decrease	To calculate the percentage something has decreased by. 1. Work out the difference between the two numbers (the decrease). 2. Divide the decrease by the original number. 3. Multiply the answer by 100%.	Cars in 2020 = 40 Cars in 2000 = 70 1. $70 - 40 = 30$ 2. $30 \div 70 = 0.43$ 3. $0.43 \times 100 = 43\% \text{ decrease}$
Use of percentiles	Percentiles are used to indicate the value below which a given percentage of observations fall. For example, the 80 <sup>th</sup> percentile is the value below which 80% of the observations occur and above which 20% of the observations occur.	

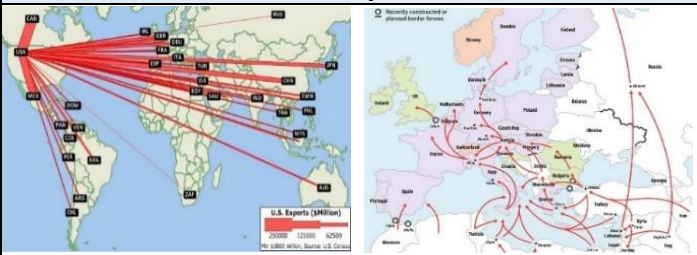
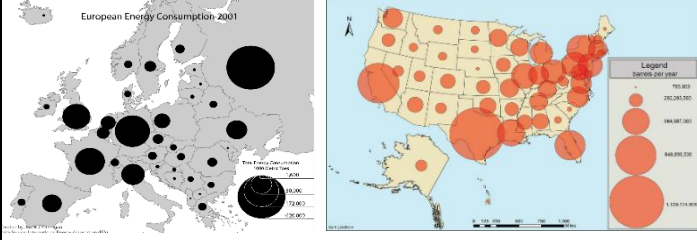
### 3. Relationships in bivariate data

Strategy	Description
Bivariate data	Data for two variables that may be related. e.g. GNI per capita + life expectancy.
Graphed on...	Scattergraphs.
Lines of best fit	Either a completely straight line or a smooth curve, which shows the trend between the two variables. Try to ensure an equal number of points each side of the line.
Correlation	 <p>Positive      Negative      None</p> <p>The closer the crosses to the line of best fit the stronger the correlation.</p>
Interpolate	Estimating an unknown value from within the data set. 
Extrapolate	Estimate an unknown value that is outside the data set. Makes the data more uncertain. 

Graphical skills				
Name	Picture	Description	Example use	Evaluation
Line graph		Shows how variables change over time. Time is plotted on the x axis.	For continuous data <i>e.g.</i> the number of vehicles (buses, cars and motorbikes) that travel to an area over the day.	<ul style="list-style-type: none"> <li>+ Can show multiple variables on one graph.</li> <li>+ Able to estimate (interpolate) data using the trend of the line.</li> <li>+ Easy to spot anomalies.</li> <li>- Data points can cluster making it difficult to draw the line.</li> <li>- Must be accurately plotted to ensure it is useful.</li> </ul>
Bar graph		Each bar is the same width but of varying heights, depending on the figure being plotted. Bars are drawn equal distance apart (normally with a gap between each bar).	For data which fits into discrete categories <i>e.g.</i> the number of different types of car, plants or pets.	<ul style="list-style-type: none"> <li>+ Simple to draw and read.</li> <li>+ Easy to make comparisons of quantities between categories.</li> <li>- Only shows one variable against another.</li> <li>- Difficult to find fractions or percentages without further analysis.</li> </ul>
Pie chart		Shows the quantity of something by dividing a circle into different parts (slices).	For data which fits into discrete categories <i>e.g.</i> the number of people working in different employment sectors.	<ul style="list-style-type: none"> <li>+ Visually effective at showing how a total quantity is divided up.</li> <li>+ Easy to make comparisons between categories.</li> <li>- Hard to accurately interpret percentages unless written on the pie chart.</li> <li>- Small quantities are difficult to represent with narrow slices.</li> </ul>
Pictogram		Shows the quantity of something by using appropriate symbols/pictures that are drawn to scale.	For data which fits into discrete categories <i>e.g.</i> the world population in different years shown with picture(s) of people to represent the quantity.	<ul style="list-style-type: none"> <li>+ Visually effective at showing quantities.</li> <li>+ Easy to read and identify overall trends.</li> <li>- Difficult to accurately interpret data from symbols/pictures.</li> </ul>
Histogram		Shows the frequency of something by using bars of different heights. Bars are touching. X axis shows continuous scale.	For continuous data <i>e.g.</i> the amount of rainfall across a continuous timescale of 24 hours.	<ul style="list-style-type: none"> <li>+ Visually effective at showing how frequency changes.</li> <li>+ Easy to spot anomalies.</li> <li>- Inappropriate intervals on x axis can distort data representation.</li> </ul>

Graphical skills				
Name	Picture	Description	Example use	Evaluation
Divided bar chart		<p>Each bar is the same width, but the bars are individually subdivided to show how the total quantity is divided up. Bars are drawn equal distance apart.</p>	<p>For discrete groups of data e.g. the number of people working in different employment sectors in different years.</p>	<ul style="list-style-type: none"> <li>+ Visually effective at showing how a total quantity is divided up.</li> <li>+ Summarises large sets of data, allowing comparison.</li> <li>- Can be difficult to identify trends.</li> </ul>
Scatter graph		<p>Shows whether there is a relationship between two sets of data. The pattern of the data points describes the relationship or correlation.</p> <p>Where data points are plotted close to the line of best fit the correlation is said to be strong.</p>	<p>For data for which you want to identify if there is a relationship between e.g. plotting life expectancy against GNI per capita.</p>	<ul style="list-style-type: none"> <li>+ Line of best fit can be drawn to show correlation, effectively showing a relationship.</li> <li>+ Can easily spot anomalies where there is a strong correlation.</li> <li>- A correlation may be chance.</li> <li>- If there are too few data points it can be difficult to identify whether there is a correlation.</li> </ul>
Population pyramid		<p>A type of histogram in which the length of the bars is determined by the number of people in a population in that age group.</p>	<p>To show the structure of a population by identifying the number of males and females in age categories.</p>	<ul style="list-style-type: none"> <li>+ Visually effective at showing which age group has the greatest quantity of people in.</li> <li>+ Can be used to approximate a country's birth and death rate.</li> <li>- Detail can be lost if large age intervals are used.</li> </ul>
Dispersion graph		<p>Shows the range of a set of data and how the data tends to group together or disperse. The values are plotted on a vertical axis to show the spread.</p>	<p>To show the range of pebble sizes at different locations on a beach.</p>	<ul style="list-style-type: none"> <li>+ Visual representation of the range of a data set.</li> <li>+ Can be used to determine central tendency.</li> <li>- Difficult to plot if the range is small and data points plot close together.</li> </ul>
Climate graph		<p>A climate graph shows the average precipitation for each month in a year with a bar graph (blue) and the average temperature each with a line graph (red).</p>		
Hydrographs				<p>A hydrograph shows the amount of precipitation over a continuous timescale on a histogram. It also shows the river discharge as a line graph.</p>

Graphical skills			
Map type	Example	Description	Evaluation
Photos and sketch maps	 <p>Photo of Underpass</p> <p>Sketch of Underpass</p>	<p>Photos give real world data on a location, are easy to interpret and are cheap and easy to produce.</p> <p>Field Sketches allow the artist to pick important geographical data relevant to their enquiry.</p> <p>Photos can include aerial and satellite.</p>	<ul style="list-style-type: none"> <li>+ Shows human and physical features of location (land use, vegetation etc).</li> <li>+ Photos are easy to produce and keep. Very visual.</li> <li>- Sketch maps may not be of good quality and miss vital information.</li> <li>- Photos only show a single moment in time.</li> </ul>
Choropleth map	 <p>Choropleth map of population change.</p> <p>Population density in Nigeria.</p>	<p>Uses colours or shades to show data.</p> <p>Used for population density, age or income.</p>	<ul style="list-style-type: none"> <li>+ Very easy to identify spatial patterns and trends.</li> <li>+ Very visual use of data over large areas.</li> <li>- Unable to differentiate within a certain location. Assumes that all area has the same data.</li> <li>- Suggests abrupt changes in data between areas.</li> </ul>
Isoline map	 <p>Synoptic chart of the UK</p> <p>Contour lines</p>	<p>Isolines can be on a map, graph or image. They connect locations of the same value.</p> <p>Most commonly seen as contour lines.</p> <p>Air pressure on weather maps.</p>	<ul style="list-style-type: none"> <li>+ Useful for showing gradual changes.</li> <li>+ Lines show locations of the same value.</li> <li>- Can be confusing where gradient change is extremely close together, or very far apart.</li> <li>- Requires a lot of data to be effective.</li> </ul>
Dot maps	 <p>Population of UK</p> <p>World cities with population of 1 million or more</p>	<p>Dot maps are dots of a fixed size that are used to represent a data set.</p> <p>For example, one dot could be equal to one individual or one million for population size and distribution.</p>	<ul style="list-style-type: none"> <li>+ Easy to identify spatial patterns.</li> <li>+ Great visual tool for large amounts of data.</li> <li>- Clustering of dots makes it impossible to read data.</li> <li>- Areas may appear blank due to value being used per dot – false sense of emptiness.</li> </ul>

Graphical skills			
Map type	Example	Description	Evaluation
Desire lines and Flow line maps	 <p>Desire lines showing US exports. Flow line- Immigration movement.</p>	<p><b>Desire lines:</b> Shows movement with a straight line. ie goods, trade, people. Line length can show distance.</p> <p><b>Flow lines:</b> Have arrows and show the specific direction of movement (curved lines). Width of the line can show quantity.</p>	<ul style="list-style-type: none"> <li>+ Shows general movement direction (A to B).</li> <li>+ Line width can be proportional to value and size.</li> <li>+ Easy to understand. General trends are obvious.</li> <li>- Distance is not always accurate, may not show specific end point, only a country.</li> <li>- Can get difficult to read if there are too many lines.</li> <li>- DESIRE Don't show journey details. (Just start + end)</li> <li>- FLOW Can be difficult to read if lines cross.</li> </ul>
Proportional symbols	 <p>EU Energy Consumption 2015 Population of USA states in 2018</p>	<p>Maps that use symbols drawn in proportion to the size of the data. Any symbol can be used but circles are most common.</p> <p>Used for: energy consumption, cars owned, forest fires per state.</p>	<ul style="list-style-type: none"> <li>+ Useful for comparing data.</li> <li>+ Easy to read as symbols are proportional.</li> <li>• Symbol may obscure location or mean less accurate positioning on maps.</li> <li>• Difficult to calculate actual value.</li> </ul>

1. Stages in a fieldwork enquiry		
Stage	Example	
1	Question / Hypothesis	Is there housing inequality in Portsmouth.
2	Data collection	Environmental Quality Survey. House prices.
3	Data presentation	Bar chart
4	Data analysis	Range of EQS score was 13. Range in house prices was 1.7 million.
5	Conclusion	There is housing inequality.
6	Evaluation	I need to visit sites multiple times of day.

4. Risk assessment		
This is where you consider what could cause people harm while completing fieldwork and think about how to reduce the likelihood of this happening.		
Coasts fieldwork	Drowning	Face the sea. Stay 5m from the water.
	Sun stroke	Check the forecast. Take suntan lotion and a hat.
Human fieldwork	Getting lost	Arrange a meeting spot. Carry a map.
	Traffic accident	Always cross at a crossing. Concentrate- no distractions.

1. Stages in a fieldwork enquiry		
Stage	Example	
1	Question / Hypothesis	Do the groynes at west wittering stop LSD?
2	Data collection	Groyne drop height of every 3 <sup>rd</sup> groyne. Analysed photo – beach wider on E side on 3/5 groynes.
3	Data presentation	Bar chart to show drop with groynes draw on.
4	Data analysis	Mean drop E 33cm W 51CM – groynes stop LSD Range in house prices was 1.7 million.
5	Conclusion	Groynes stop LSD
6	Evaluation	Use digital tape measure to improve accuracy.

2. Possible enquiries	
Coasts	Does hard engineering restrict longshore drift?
Rivers	Velocity increases with distance downstream.
Urban	Regeneration has created social and economic opportunities in Boscombe.

6. Types of data		
Key term	Definition	Examples
Primary data	Data that is collected first hand.	Measuring drop height of groynes.
Secondary data	Data that has been previously collected by someone else.	Google Earth to measure width of beach.
Quantitative data	Numerical data.	River depths.
Qualitative data	Non-numerical, opinion based data.	Questionnaire data / field sketches.

7. Sampling		
Why sample?	To save time. To avoid bias.	
Sample size	Number of data sets collected. Larger sample sizes make data more representative. (Reliable)	
Strategy	Description	Example
Random sampling	Collect data using a random number generator.	Picking up stones from a riverbed using a random number generator.
Systematic sampling-physical	Collect data at specific intervals.	Sampling every 3 <sup>rd</sup> groyne.
Stratified sampling – Human	Collect data from different groups of a population to ensure fair representation. (Deliberately introducing bias.)	Surveying 3 residential locations and 3 town centre locations.

3. Suitable location?	
Distance	Can you get there and back in a day?
Access	Is the site public access? Can you get there?
Sampling opps.	Will it be busy enough to get a reliable sample size? Enough locations to survey?

5. Key terms	
Key term	Description
Data collection methods	How will you collect the data? e.g. questionnaire, river depths.
Data presentation	How will you present your data? e.g. bar graph, flow arrow map...
Accuracy	How close to the true value? (Is it correct to the nearest mm?)
Reliability	The extent to which an investigation produced consistent results. (If you do it again, would you get the same results?)
Validity	How suitable were your methods for answering the question it was intended to?
Limitations	Problems with what you did.
Anomalies	A result that is unusual or does not follow the trend of the other data.
Evaluation	How can you improve your enquiry?

8. Conclusion and evaluation	
Improve your methods	Is there better equipment you could have used? Should you have used a different sampling method?
Increase the reliability	Increase your sample size. Collect data at different times of the day or days of the week.
Increase the accuracy	Use digital fieldwork equipment. Take measurements 3 times and take an average.
Future studies?	Go at a different time of day / year? Add additional methods?