

ZNOTES.ORG

UPDATED TO 2017-19 SYLLABUS

CAIE IGCSE GEOGRAPHY (0460)

SUMMARIZED NOTES ON THE SYLLABUS

1. Population and Settlement

1.1. Population Dynamics

- **Keywords:**
 - **Under-population:** when country has declined too much that it can't support its economic system
 - **Overpopulation:** too much population of an area: overcrowding, depletion of resources
 - **Birth rate:** average number of live births in a year for every 1000 people
 - **Death rate:** average number of deaths for every 1000 people
 - **Natural increase of a country:** Birth rate minus death rate
- **Reasons for population explosion:**
 - Improved medical care – vaccinations, hospitals, doctors, new drugs and scientific inventions
 - Improved sanitation and water supply
 - Improvements in food production (quality & quantity)
 - Improved transport – moving food, doctors etc.
 - Decrease in child mortality
- **Problems of overpopulation and underpopulation:**

Overpopulation	Underpopulation
Unemployment	Shortage of workers
Pressure on healthcare and education	Less people paying taxes
Shortage of housing	Schools, hospitals & services close down due to lack of customers
Traffic congestion	Less innovation/development
Inflation (excess demand)	Hard to defend country
Shortage of food and water	Have to attract migrants
Noise, air & water pollution	
Diseases spread quicker	

- **Reasons for contrasting rates of natural population change:**
 - Population size is related to the amount of resources available e.g. water, wood and minerals
 - **Carrying Capacity:** number of people the environment can support without there being negative effects to the population
 - **Optimum Population:** amount of people that a region/country can ecologically support, usually less than carrying capacity
 - **Population Density:** number of people living in a given area (km²)
 - **Population Distribution:** how a population is spread out around a country or an area
- **Factors that contribute to population size:**
 - **Migration:** movement of people (or animals) from one country or region to another
 - **Birth rates**
 - **Death rates**

- **Fertility rate:** The average number of children a female is expected to have in their lifetime
- **High death rates in LEDCs:**
 - Poor health care/few hospitals/doctors/nurses/clinics
 - Poor sanitation/hygiene/lack of toilets/dirty places
 - Poor access to safe/clean water/water borne diseases
 - Limited food supplies/malnutrition/starvation
 - HIV/AIDS
 - Natural disasters/drought/flood
 - Lack of vaccinations/medicines/cannot cure diseases
 - Lack of education about healthy lifestyles e.g. smoking/diet
 - Lack of provision for elderly e.g. pensions/old people's homes
- **Low birth rates in MEDCs:**
 - Availability of contraception/family planning/abortions
 - Educated in contraception/family planning
 - Can afford contraception/family planning/abortions
 - Traditionally small families
 - Expense of bringing up children (high standard of living)
 - Many women have careers/women are educated
- **Origin and impact of HIV/AIDS:**
 - HIV-1 – arose in Central Africa
 - HIV-2 – arose in West Africa
 - HIV mostly occurs in women
 - When women give birth, they infect the child as well resulting in low death rate for infants
 - Death rate of mothers results in a higher orphan generation
 - Due to the countries being poor, there is a lack of state welfare, resulting in poverty and lack of education
- **Population policies:**
 - Some countries have population policies to either decrease or increase their population

Decrease population:

- **China's One Child Policy**
 - Started in 1979
 - Country's fertility rate was 5.7
 - Would be fined up to 3000 if a family had a second child

Can have second child only if....	Evaluation
First child died in 2008 earthquake	Fertility rate dropped from 5.7 in 1960 to 1.5 in 2010
First child has disability	High dependency ratio - lack of working population to support old dependents
Living in rural area	Narrowing gender imbalance
Multiple births (twins, triplets etc), gets to keep all children	Forced abortions often happened

Increase population:

- **Germany's Pro Natal population policy**
 - Fertility rate 1.38 in 2012

- Youth unable to support ageing population

Encourage by...	Evaluation
Free education	Not very effective
More immigration	Fertility rate 1.54 in 2021
Paid maternity leave	Rewards are given but no punishment
Paid parental leave	
No tax for families who have more than one child	

1.2. Migration

- **Keywords:**
 - **Migration:** Movement of people from one place to another
 - **Immigrants:** People who arrives at a country to live there permanently
 - **Emigrants:** People who leaves the country to live in another country permanently
 - **Net migration:** Number of immigrants minus number of emigrants
- **Types of migration:**
 - **Internal migration:** When people move to a different place within the country
Eg - California, US to Texas, US
 - **International migration:** When people move from a country to another; involving the crossing of a country's border
Eg - Malaysia to Korea
 - **Temporary migration:** When people stay in an area for a limited amount of time
Eg: Seasonal migrants
 - **Permanent migration:** When people move and never return home
 - **Involuntary (forced) migration:** When people are forced to move

Refugees: A person who has been forced to leave their home and their country, may be due to a natural disaster, war, religious or political persecution

Persecution: When someone is attacked for what they believe in e.g. their religion or political belief

Asylum Seekers: Someone seeking refuge (residency) in a foreign country because their life is in danger in their home country

- **Voluntary migration:** When people choose to move

Employment: People may move to another country in search of better jobs and better pay, or for new business opportunities

Education: Young adults from developing countries typically choose to move away from their home country to study abroad for a better future

Healthcare: Elderly and medically challenged individuals may opt to travel and then stay for access to better medical facilities

- **Reasons for population migration:**
 - **Push factors:** Reasons for people to move away from their home country

- **Pull factors:** Factors that attract migrants to their destination

Push factors	Pull factors
Unemployment	More job opportunities
War	Better salary
Pollution and congestion	Better schools and hospitals
Bad weather	Peaceful and safe
High crime rates	Friends and family may already live there
Poor education and healthcare	Citizenship
Poor housing	Higher standard of living
Famine	Closer to relatives

- **Impacts of Migration:**

COUNTRY OF ORIGIN

Home country for migrants; country they were living in before moving

Advantages	Disadvantages
Less pressure on healthcare	Labour force reduced - reduced output
Decline in birth rate	Brain drain: more skillful/educated labour leave country - fewer innovations
Migrants bring back new skills	Division of families
Money is sent back (remittances)	Left with elderly population - less income
Creates more job opportunities: reduces unemployment	
Less pressure on education	
Increased quality of education and healthcare	
Decrease traffic congestion and air pollution - less cars	

COUNTRY OF DESTINATION

Where migrants are moving to

Advantages	Disadvantages
Overcomes labour shortage	Competition for jobs
Dirty unskilled jobs done	More pressure on healthcare and education
Brings expertise to country: Japanese moves to Australia to set up Japanese restaurant - authentic	Traffic congestion - air and noise pollution
Skilled migrants bring innovations	Less religious amenities for immigrants
Cultural diversity	
Will work long hours for low salary	

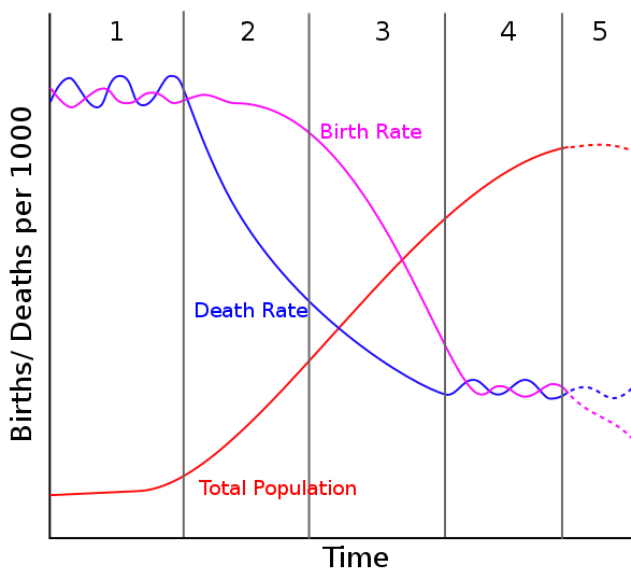
MIGRANTS THEMSELVES

Advantages	Disadvantages
More job opportunities	Culture shock
Better salary & access to wider variety of good	Racism
Better access to education & healthcare	Language barriers
Safer & peaceful; can start a family	Different culture may be difficult to integrate
Higher pay	Separated from friends and family
Higher standard of living	Higher cost of living
Send remittances to family back home	Not used to weather conditions
	Visa
	Difficulty in finding houses to stay

1.3. Population Structure

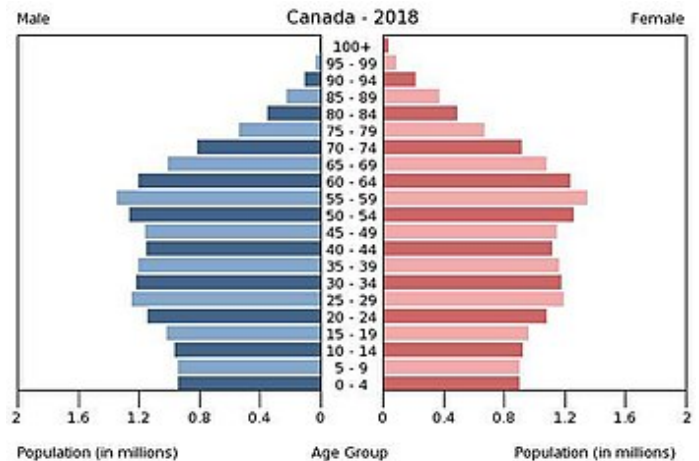
- Keywords:**
 - Ageing population:** Old dependents (people above 60 years old)
 - Dependent population:** People who don't work; retired and young children

The Demographic Transition Model:



- Stage 1:** high birth rates; high death rates; short life expectancy; less dependency (since there are few old people and children must work anyway)
- Stage 2:** high birth rates; fall in death rates; slightly longer life expectancy; more dependency due to more elderly
- Stage 3:** declining birth rate; declining death rate; longer life expectancy; more dependency
- Stage 4:** low birth rate; low death rate; highest dependency ratio; longest life expectancy
- Stage 5:** When proportion of old dependents is increasing
 - Occurs because life expectancy increases, but also because birth rates start to fall
 - typically happens in very developed countries

- Population Pyramid:** a type of graph that shows the age and sex structure of the country



- Problems of having too many Old Dependents:**
 - More pensions to be paid
 - More pressure on public transportation: many old dependents do not drive
 - More pressure on healthcare
 - Not enough labour force
 - Difficult to evacuate old dependents during natural disasters
- Why do LEDCs have more young dependents than MEDCs?**
 - LEDCs cannot afford contraception
 - LEDCs have no education on family planning/contraception
 - Children wanted as labour in LEDCs
 - Cost of living higher in MEDCs
- Implications of Young Dependents:**

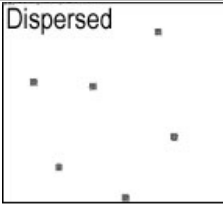
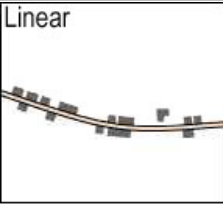
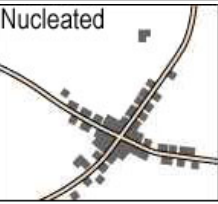
Too few	Too Many
Closure of child related services; fewer jobs	Child care needed so parents can work
Less consumers and taxpayers in the future	Taxes for public schools from government
An increase in the age of the population	Increased dependency ratio
Birth rates fall below minimum because the population declines	Creation of teaching and nursing jobs
Less labour in future	Pressure on healthcare and education

1.4. Population Density & Distribution

- Keywords:**
 - Population density:** number of people per unit of area (typically per kilometer square)
 - Sparsely populated:** an area with low population density
 - Densely populated:** an area with high population density
- Factors influencing:**

	Sparse Population	Dense Population
Physical Factors	Mountainous areas - inaccessible	Flat relief - easier to build
	Extreme climates	Favourable climates
	High risk of flooding	Rivers - easy access and trading
	Infertile soil	Fertile land for crops
	Locations with frequent natural disasters	No or few natural disasters
		Availability of natural resources for industry and manufacturing
Economic factors	No economic opportunities	Many job opportunities
	No infrastructure	Good infrastructures
	No transport routes	Many transport routes to travel easily
Social factors	High crime rates	Low crime rates
Political factors	Government corruption	Reliable and stable government
	Poor public services such as healthcare and education	Good public services
	Civil war	

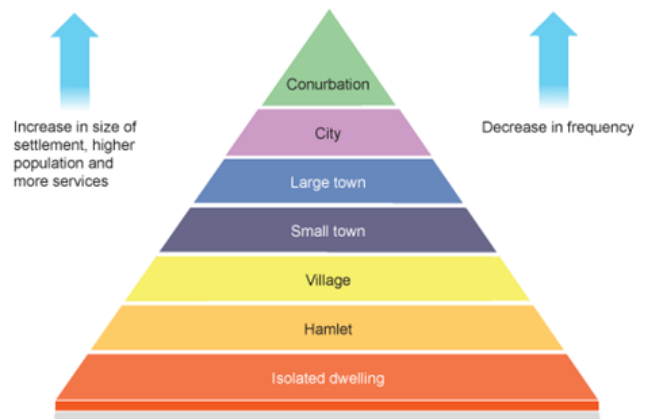
1.5. Settlements & Service Provision

Dispersed	Linear	Nucleated
		
An isolated, building or a group of two or three buildings, separated from the next by 2 or 3 km.	Buildings are strung along a line of communication, for example a main road, a river valley, or canal	Buildings are grouped together, initially for defence, or a common resource.

- **Site:** describes the physical nature of where a settlement is located – the actual piece of land
- **Situation:** describes settlement in relation to other settlements and physical features around it – this determines whether the situation will grow into a large city or remain a small town or village
- **Factors influencing settlements:**
 - Wet point site: this has a good water supply
 - Dry point site: this has less risk of flooding
 - Building material: availability of stone, wood, clay etc.
 - Defensive site: in a river meander or on a hill with steep sided and commanding views
 - Fuel supply: for heating and cooking
 - Food supplies: land suitable for farming

- Nodal points: where routes converge
- Bridging point: river shallow enough to build a bridge
- Aspect: settlements often on sunny side of a valley
- Shelter: from cold prevailing winds and rain

• Hierarchy of settlements:



- Determining order of importance:
 - The population size
 - The range and number of services
 - The sphere of influence
- **Sphere of Influence:** The distance or area people travel from to access a service.
- **Services:** Facilities that are offered to people e.g. supermarket. Services have a threshold population, which helps explain why bigger settlements have more services.
- **Range:** This usually refers to the number of different services e.g.

a school, a post office, etc.

- **Threshold Population:** The minimum amount of people required for a service to be offered and remain open.
- **High Order Goods (Comparison):** Goods that people buy less frequently. They tend to be more expensive and people will normally compare quality and price before purchasing e.g. a car
- **Low Order Goods (Convenience):** Goods that people buy every day. They don't usually cost much money and people would not normally travel far to buy them e.g. bread and milk
- **Functions of settlements:**
 - **Rural Areas:** tend to have a lot less functions than urban areas. The main purpose of settlements in rural areas is normally agriculture & low-order services. This is because rural areas have less people, poorer transport, poorer communication, less technology, & the land is better used for other purposes.
 - **Urban Areas:** tend to have a lot more functions ranging from shopping functions, to educational functions, to transport functions, to administrative functions and residential functions; more middle and high order services.
 - **Urban Sprawl:** The spread or growth of an urban area into the rural-urban fringe; provides mostly middle – order services

1.6. Urban Settlements

- Urban settlements tend to have several land uses

The Central Business District

- The CBD:
 - Centre point of the city and has highest land prices
 - Most accessible point in the city
 - High-rise buildings and skyscrapers
- Functions: retail, entertainment, financial services, and other professional services
- Land uses:
 - Leisure and recreation - may include open land
 - Residential - High/multi-story buildings.
 - Transport - road and rail networks, train stations and airports
 - Business and commerce - offices, shops, and banks
 - Industry - factories, warehouses, and small production centers
- The CBD is in the centre because it is:
 - A central location for road/railways to converge
 - The most accessible location for workers
 - Accessible to most people for shops and businesses
- Problems that CBD face: congestion, pollution, and lack of space

Residential Areas

- Old inner-city area:
 - Typically found next to CBD
 - Has mainly terraced houses in a grid like pattern
- Suburbia:
 - Urban sprawl and owning cars led to construction of well-planned and spacious houses
 - Larger than inner city terraces & most have a garden
 - Typically, detached or semidetached
 - Roads are arranged in cul-de-sacs and wide avenues
 - Land prices cheaper than in CBD and inner city
 - Demand can make some areas expensive
- Outer-city estate:
 - Located on the fringes of cities with varied housing
 - People relocated here when inner city was being redeveloped
- Rural-urban fringe:
 - This is found at the edge of a town or city
 - Mixture of land uses e.g. housing, golf courses, allotments, businesses, parks and airports.

Industrial Areas

- Factories were built:
 - As close as possible to the CBD but with enough space
 - Next to canals and railways to transport materials
 - Next to rivers for cooling, power source or waste disposal
 - Next to land where lots of workers could live

Urban Growth in Urban Areas

- Urban Growth/Sprawl:** rapid urbanisation, due to building in the rural-urban fringe and land reclamation

- Problems of urban growth in urban areas:

For People	For Environment
Overcrowded	Loss of vegetation
Unable to obtain jobs/low pay	Loss of habitats
Pressure on schools/hospitals	Impacts on food chains
Increased crime rates	Pollution of rivers
Difficulties of waste/litter	Death of fish/other species
Traffic congestion	Pollution of ground water
Noise pollution	Air/atmospheric pollution
Lack of sanitation	Rivers dry up
Poor quality of life	
Food shortage	

1.7. Urbanisation

Urban Growth in Rural Areas

- Many rural areas seek & experience rapid urban growth for several reasons:
 - Better transport links e.g. road, rail, river
 - Better trading prospects
 - Nearby natural resources e.g. fuel
 - Better job prospects
 - Better schools and hospitals
 - Better supply of electricity, gas and water
 - Varied entertainment

Rural-Urban Migration

- Movement of people from countryside towards cities
- Rural-urban migration is main cause of urbanisation
- It is caused by several push & pull factors:

Push factors from rural area	Pull factors from urban areas
No/poorly paid jobs	More jobs
Mechanisation of farming	Good schools/healthcare
Agricultural products have low prices	Good transport/comms
Poor schools/healthcare	Reliable supply of resources
Lack of entertainment	Better entertainment
Poor housing quality	Better quality & quantity of houses
Drought/famine	
Shortage of resources	
Poor transport/comms.	

Reducing negative impacts of urbanisation

- Greenbelts:** area of land around urban areas that is protected from development
- Greenfield Sites:** sites that are barred from being built on by government policies

Advantages	Disadvantages
Land never used – not polluted	Conflicts with other land users

Advantages	Disadvantages
Often near rural-urban fringe so good transport links	The government now protects many sites
Less congestion	Public protests for building on greenfield site
Room to expand	

- **Brownfield Sites:** increasing building on brownfield sites allows less pressure to be put on rural areas

Advantages	Disadvantages
Often cheap to buy	Site polluted – expensive to clean
Near the CBD	No room to expand
Closer to transport routes	May not be in desirable shape or location

- **Urban Wedges:** urban growth allowed to take place in wedges ensuring some green areas protected throughout city
- **Housing density:** increasing housing density means less land will be destroyed

Characteristics of Squatter Settlements

- **Squatter settlement:** a rural residential area which has developed without legal claims or permission to build on the land
- Extremely high home density
- Extremely high population density
- Houses built from mud for walls, iron for roofs
- No electricity
- No running water or sewage
- Diseases spread easily
- Strong smell of human waste
- No infrastructure or privacy

2. The Natural Environment

2.1. Earthquakes and Volcanoes

Earthquakes

A series of vibrations or movements in the earth's crust

- **How earthquakes happen:**
 - Tension released from inside crust
 - Plates get stuck
 - Pressure builds up
 - Pressure released

Features of earthquakes	Effects of earthquakes
Focus: point of earthquake	Large number of deaths
Epicenter: point directly above the focus, on the ground	Fires breaking out
Seismic waves	Water pipes burst
Shaking ground	Water contamination, diseases

Features of earthquakes	Effects of earthquakes
Subduction zone: occurs at destructive margin, one plate goes under the other	Corpses: human & animal
	Accessibility difficult
	Building damaged/destroyed
	Tsunami can follow
	Reconstruction costs

- **Reduce impacts of earthquakes:**

Prediction	Preparation
Measure earth tremors, pressure, and release of gas	Build earthquake-proof buildings
Use maps and facts to find pattern in time/location	Train emergency services
Unusual animal behaviour	Set up warning system
Seismometer	Create evacuation plan
Richter scale	Emergency food supply
	Prepare earthquake kit

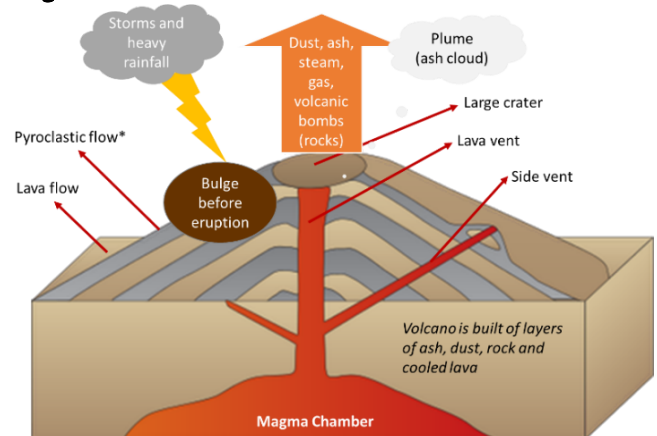
- **Earthquake proof buildings:**

- Automated weights on roof to reduce movement
- Rubber shock-absorbers between foundations
- Foundation sunk deep into bedrock avoiding clay
- Automatic shutters come down over the windows
- Interlocking steel frames which can sway during earth movements

Volcanoes

A vent in the earth's surface where magma, gas or ash escapes onto the earth's surface or into the atmosphere

- **Diagram of volcano:**



- **How do volcanoes form?**

- Magma rises through cracks of the Earth's crust
- Pressure builds up (inside Earth)
- Pressure released → plate movement
- Magma explodes to surface causing eruption
- Lava cools and forms new crust
- Over time, rock builds up and volcano formed

Impacts/hazard of volcanoes	Why do people live near volcanoes?
Pyroclastic flows	Fertile soil for crops

Impacts/hazard of volcanoes	Why do people live near volcanoes?
Lava flow	Tourism (tour guides, restaurants)
Ash clouds	Scientific research
Landslides	Mining
Deaths	Geothermal energy
Agriculture affected	
Lahars	

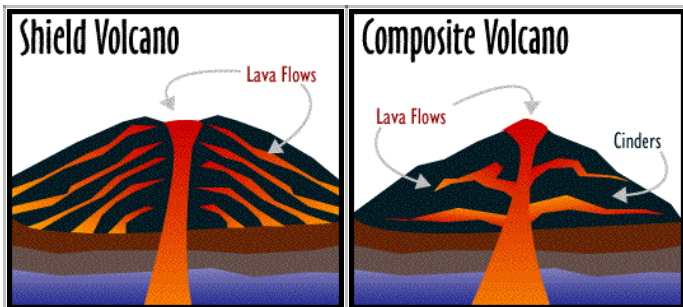
Causes of eruptions:

- At constructive margin: plates move away from each other; magma rises to fill the gap;
- At destructive margin: oceanic crust melts from friction and heat from mantle; newly formed magma is lighter so it rises to surface

Stages of volcanoes:

- Active:** has erupted recently
- Dormant:** has not erupted recently but may in future
- Extinct:** unlikely to ever erupt again; no magma inside

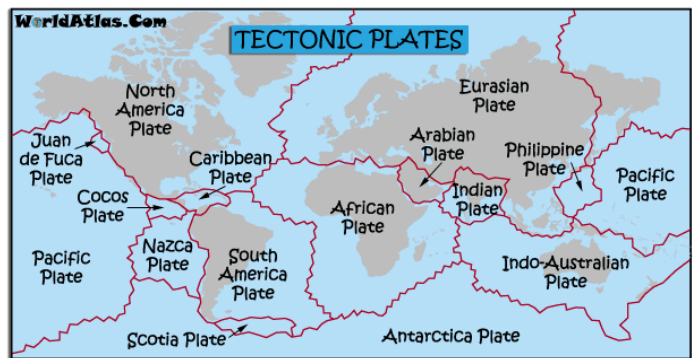
Types of volcanoes:



Low viscosity (runny lava) - basaltic lava	Viscous (thick) - andesitic lava
Low in height, gentle sloping sides with wide base	High in height, steep sided volcanic cones
Low silica content (covers long distance)	High silica content (covers short distance)
Frequent eruptions but low in magnitude	Infrequent but high magnitude
High temperature	Low temperature
Low gas content	High gas content
Little build up pressure	Enormous build up pressure

Distribution of Earthquakes and Volcanoes

- Where earthquakes occur and volcanoes form is governed by plate tectonics
- Oceanic crust:** younger, heavier, can sink and is constantly being destroyed and replaced
- Continental crust:** older, lighter, cannot sink and is permanent
- Plate movement is caused by convection currents in the mantle



Earthquakes:

- Encircle the whole of the Pacific Ocean
- Extend down entire length of the mid-Atlantic Ocean
- Stretch across southern Europe and Asia

Volcanoes:

- Encircle the whole of the Pacific Ocean (known as the Ring of Fire)
- Extend down entire length of the mid-Atlantic Ocean
- Some in southern Europe, the Caribbean & east Africa

Plate Boundaries

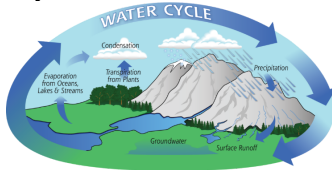
Diagram	Description
<p>COLLISION PLATE BOUNDARY</p> <p>Continental Crust</p> <p>Fold Mountains produced by upthrust on collision</p>	<p>Collision: occur when two continental plates move towards each other.</p> <p>Example: Indo-Australian and the Eurasian Plate</p>
<p>CONSTRUCTIVE / DIVERGENT BOUNDARY</p> <p>Oceanic Crust</p> <p>Lithosphere</p> <p>Asthenosphere</p> <p>Mid-Oceanic Ridge</p>	<p>Constructive: occur when two plates move away from each other.</p> <p>Example: North American and Eurasian Plate</p>
<p>CONSERVATIVE PLATE BOUNDARY</p> <p>Lithosphere</p> <p>Asthenosphere</p>	<p>Conservative: occur when two plates slide past each other.</p> <p>Example: North American Plate and the Pacific Plate</p>
<p>DESTRUCTIVE / CONVERGENT BOUNDARY</p> <p>Oceanic Crust</p> <p>Continental Crust</p> <p>Lithosphere</p> <p>Asthenosphere</p> <p>Subduction Zone</p>	<p>Destructive: occur when oceanic plate is subducted by a continental plate.</p>

Diagram	Description
	Example: pacific plate and the Eurasian plate

Plate boundary	Volcanoes	Earthquakes	Fold mountains
Constructive	Gentle	Gentle	No
Destructive	Violent	Violent	Yes
Collision	None	Violent	Yes
Conservative	None	Violent	No

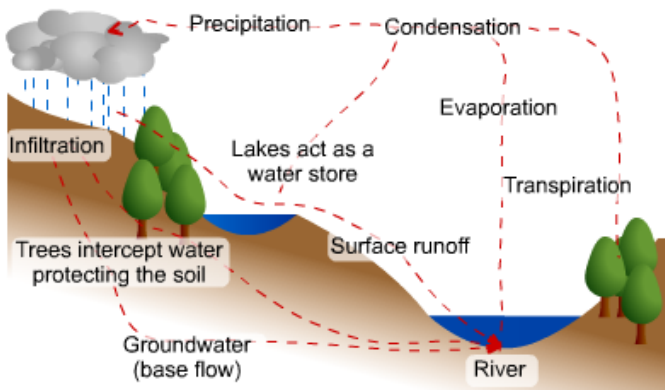
2.2. Rivers

The Hydrological Cycle



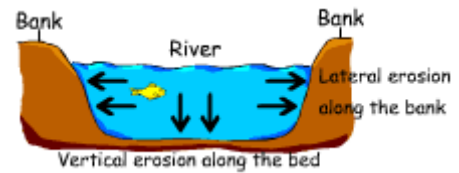
- **Drainage basin:** the area of land drained by a river
- **Watershed:** the edge of highland surrounding a drainage basin, marking the boundary between two drainage basins
- **Source:** the beginning or start of a river
- **Confluence:** the point at which two rivers or streams join
- **Tributary:** a stream/smaller river which joins a larger stream or river
- **Mouth:** point where river comes to end, usually when entering sea

River Processes



- Drainage basins act as a system with:
 - Inputs: precipitation
 - Transfers: infiltration, percolation, surface runoff, throughflow & groundwater flow
 - Stores: interception, surface storage, soil moisture storage & groundwater storage
 - Outputs: evaporation & transpiration or evapotranspiration

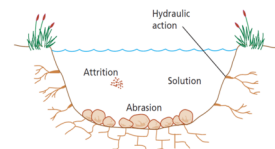
Characteristics of rivers



- **Bed:** The bottom of the river channel
- **Bank:** The sides of the river channel
 - A river has two banks
- **Width:** The distance between the two banks of a river
- **Depth:** The distance from the water surface to the bed of a river
- **Speed of flow:** how fast the water in a river is moving; different speeds arise at different parts of the river
- **Wetted perimeter:** length of bed and banks in contact with river
- **Channel:** The route course (between bed and banks) that a river flows. The flow of the river is often described as channel flow.
- **Thalweg:** The fastest part of the river, always near the middle of the river channel, where there is least friction

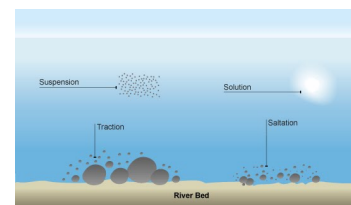
Erosion

- **Attrition:** large particles such as boulders collide and break into smaller pieces; occurs at higher part of river
- **Hydraulic action:** the sheer force of the river dislodges particles from its banks and bed
- **Abrasion:** smaller particles rub against the river banks and bed like sand-paper; occurs at low part of river
- **Solution:** acid in rivers dissolve rocks; occurs at any part of river



Transportation

- **Traction:** rolling stones along the bed
- **Saltation:** small particles bounce along bed in a leapfrog motion
- **Suspension:** silt and clay-sized are carried within the water flow
- **Solution:** minerals dissolve in the water

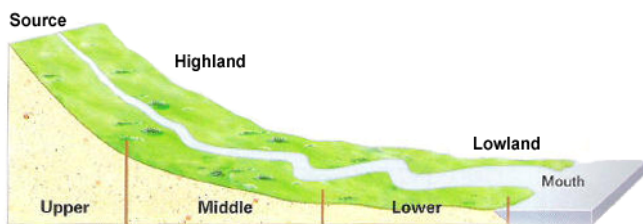


Deposition



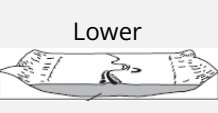
- When a river lacks the energy to carry its load; it begins depositing the heaviest particles
- Happens when there is less water or where the current slows down
- Large boulders are deposited at the top, and very small particles are deposited at the end, resulting in sorting

River Profiles

Long profile:



Cross profile:

Course	Long Profile	Cross Profile
Upper 	Steeply sloping towards the lower sections of the river	Steep sided v-shaped valley, thin river channel, deep in places
Middle 	Shallow slopes towards the mouth of the river	V-shaped valley remains with a wider valley floor, river begins to meander, channel is wider & deeper
Lower 	Almost at sea level, gently sloping to its mouth	Wide, shallow valley, with large flood plains & meanders; channel is wide deep & smooth sided

FLOODS

Causes of flooding:

- No vegetation
- Deforestation
- Urbanisation
- Poor drainage
- Steep slopes
- Rock type (impermeable rocks does not absorb water)
- Wet soil (over saturation)

Impacts	Why do people live near rivers?
People can be killed	Water supply (drinking, washing)
Homes destroyed	Fishing industry
Spread of water borne diseases	Transportation for trading
Shortage of clean water and food	Tourism
Infrastructure damaged	Fertile soil
Businesses destroyed	Powerplants (dams)
	Sports/recreation

Flood Management Techniques

Dams:

- Built across a river to control the amount of discharge
- Water is held back by the dam in a reservoir
- Released in a controlled way to control flooding
- Is expensive to build, can affect farmers & cause erosion downstream

Afforestation:

- Trees planted near to the river
- Greater interception of rainwater
- Lower river discharge
- Relatively low-cost option, enhances environmental quality of the drainage basin

River engineering:

- Channel widened/deepened to carry more water
- Channel straightened so water travels faster
- Course altered to divert floodwater away from homes
- Alterations may lead to a greater risk of flooding downstream, as the water is carried there faster

Managed flooding:

Allow river to flood naturally in places, to prevent flooding in other areas

Planning:

- Authorities & government introduce policies to control urban development near/on floodplain reducing risk of flooding & damage to property
- Enforcing regulations may be difficult in LEDCs

2.3. Coasts

- Coasts are formed by the sea and wind working together in 3 key tasks: erosion, transportation and deposition

Coastal Opportunities	Coastal Threats
Sports/recreation	Hurricanes
Groundwater recharge	Coastal storms
Habitat for fish	Tsunamis
Transport (shipping goods)	Landslides
Tourism	Flooding
Job opportunities	Coastal erosion

Coastal Management

Hard Engineering:

Name	Located at	Advantages	Disadvantages
Sea wall	Coastlines/foot of cliffs	Reduce erosion and prevents flooding; Curved structure breaks waves	Very expensive and big, requires constant maintenance
Groynes	In front of area facing coastal erosion	Increases distance between waves and coasts → Waves lose energy → Reduces impacts of waves	Certain sections of coast may be more exposed to erosion

Name	Located at	Advantages	Disadvantages
Gabions	Base of cliff	Reduces impact of waves on cliff, prevents cliff from being undercut; cheap	Not as effective as other coastal defences
Revetments	Slanted barrier against waves at base of cliff	Absorbs energy of waves, prevents cliffs from being eroded; Rippled surfaces helps dissipate wave energy; No need much maintenance	Expensive
Rip-raps	Rocks and stones put against base of cliff	Absorbs wave energy, protects cliffs behind	Visual pollution, susceptible to being moved by the sea
Breakwaters	Near coasts	Effective, breaks incoming water	Visual pollution, easily destroyed
Tidal barriers	Side of coasts	Prevents storm surges, very effective	Expensive

Soft Engineering:

Name	Description	Advantages	Disadvantages
Beach nourishment	Sand/shingle added to the beach	Increases distance between waves and cliffs → Waves lose energy → Less erosive power	Effectiveness is uncertain
Land management	Protect and rebuild dunes	Good barrier against coastal flooding and erosion	Tourism affected as dunes marked out of bounds to general public
Marshland		Break up waves and reduce speed and power of waves → Limits area which waves can reach → Prevents flooding	Effectiveness is uncertain

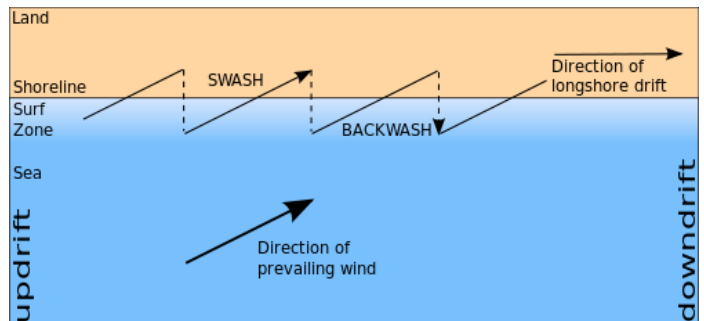
Name	Description	Advantages	Disadvantages
Beach stabilisation	Planting dead trees in sand to stabilise	Widen beach and reduces wave energy, lowers profile of beach	Effectiveness is uncertain

Erosion at Coasts

- **Corrasion:** large waves hurl beach material at the cliff
- **Corrosion:** salts and acids slowly dissolve a cliff
- **Attrition:** waves cause stones to collide and disintegrate
- **Hydraulic action:** force of waves compresses air in cliffs

Transportation – Longshore Drift

- Waves approach coast at an angle
- Swash moves up the beach at an angle
- Backwash drains straight back down the beach
- Gradually moving material along beach in zig-zag motion



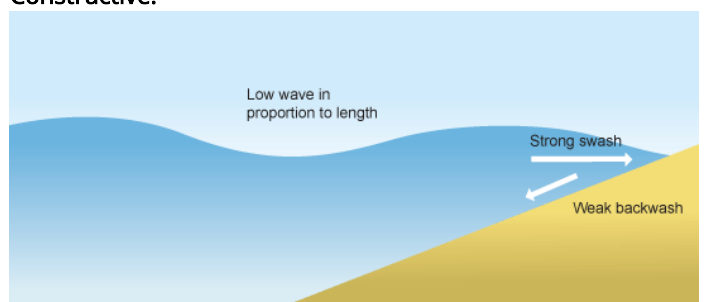
Deposition

- **Components of a wave:**
 - **Swash:** when a wave breaks & washes up the beach
 - **Backwash:** when the water drains back into the sea

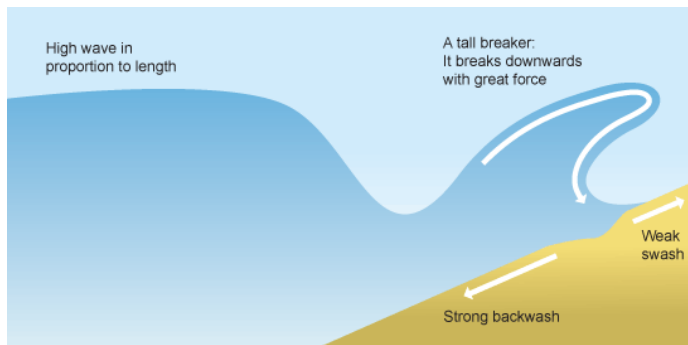
TYPES OF WAVES

Constructive	Destructive
Low wave height	High wave height
Beach gradient is gentle	Beach gradient is steep
Spill forward gently	Plunge forward
Creates a strong swash	Swash is weak
Water drains through beach material	Rotation of water causes a strong backwash
Backwash is weak	Erodes beaches
Deposits material	
Builds up beaches	

Constructive:

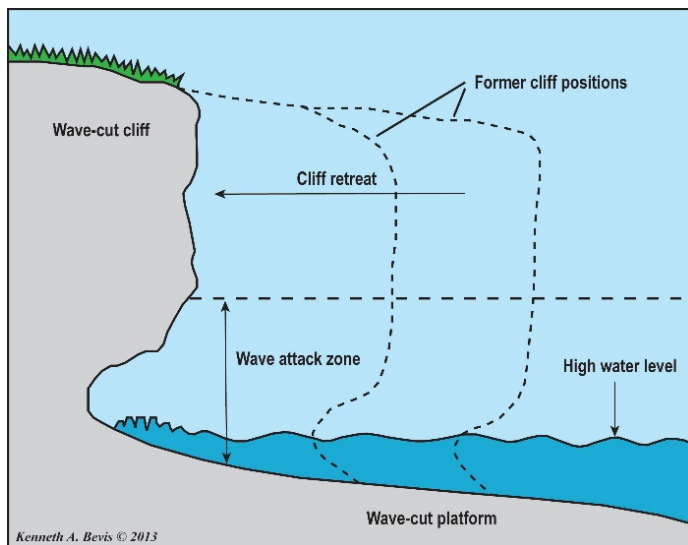


Destructive:



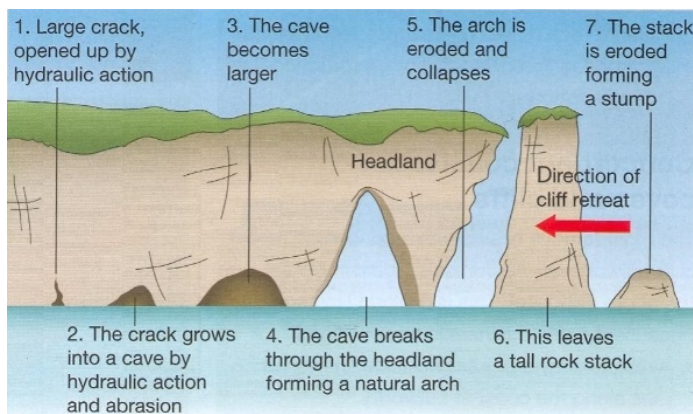
Cliffs & Wave-cut platforms

- Wave erosion is concentrated at the foot of the cliff
- A wave-cut notch is formed
- Cliff is undercut & collapses
- Repeated collapse causes retreat of the cliff



Caves, Arches & Stacks

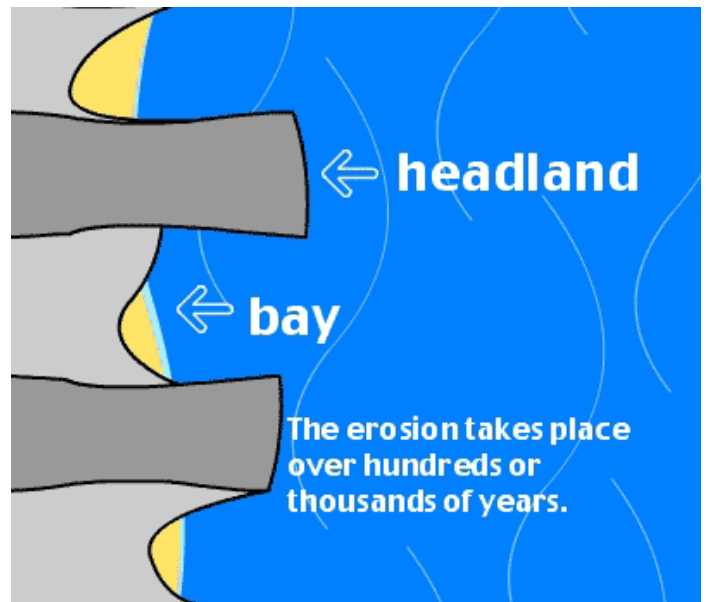
- A band of weaker rock extends through a headland
- Erosion produces caves on both sides of headland
- More erosion produces an arch through the headland
- Eventually the roof is weak & collapses forming a stack



Beaches

- In bays, the waves diverge outwards
- The wave energy is dissipated creating a low energy environment hence deposition to form beaches

Bays and Headlands



- Bays are formed due to softer rock getting eroded easily
- Headlands are usually formed since they are made of resistant rock and so is eroded more difficultly

Spits

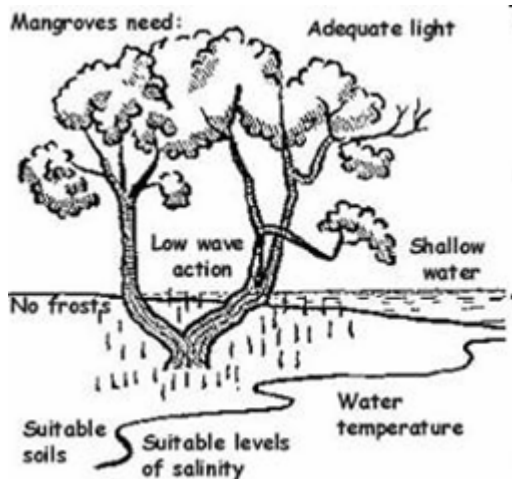
- Spits form when the coastline changes direction
- Longshore drift carries material in same direction
- Sand & shingle is built up to form a spit
- End of spit curves due to wave refraction or wind

Sand Dunes

- Sand dunes form behind wide sandy beaches
- Onshore winds pick up the dry sand from above the high-water mark & carry it landward by saltation
- If they encounter an obstacle the wind loses energy & deposits sand in the lee of the obstacle
- Eventually a dune is formed
- Plants grow on it which stabilizes it & traps more sand

Mangrove Swamps

- Mangrove swamps are trees and shrubs that grow in saline coastal habitats in the tropics and subtropics
- Provide a habitat and protection for many fish & other sea animals, especially when young
- They slow water flow encouraging any sediment to be deposited, keeping sea water clear
- Protect the coast from erosion, storm surges, hurricanes, and tsunamis
- They are a source of food and material
- Conditions required for formation of mangrove swamps:



Coral Reef

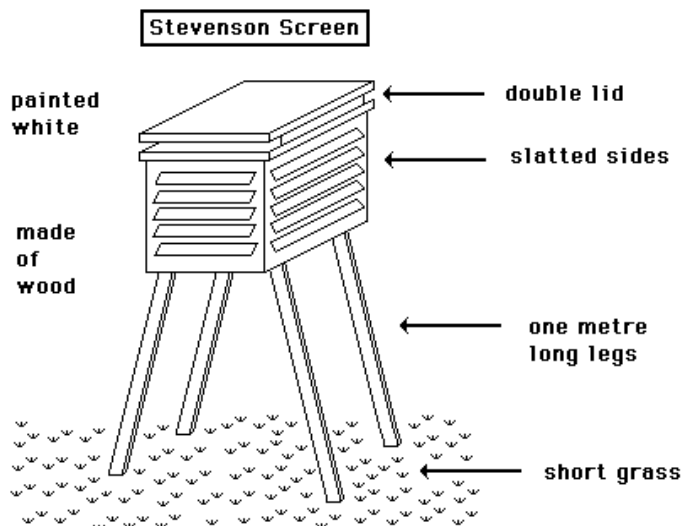
- Coral reefs support a great diversity of life
- Built from the limestone remains of coral skeletons & coralline algae
- **Conditions required for growth of coral reef:**
 - Warm water/seas; temperatures 20 - 30C
 - Shallow water; not more than 60 meters deep
 - Water free from sediment/clear/availability of light
 - Plentiful supply of oxygen in water/unpolluted
 - Plentiful supply of plankton
 - Lack of strong current

2.4. Weather

- **Weather:**
 - The mix of events that occur in our atmosphere, including changes in temp., rainfall and humidity
 - Can vary from day to day and from place to place

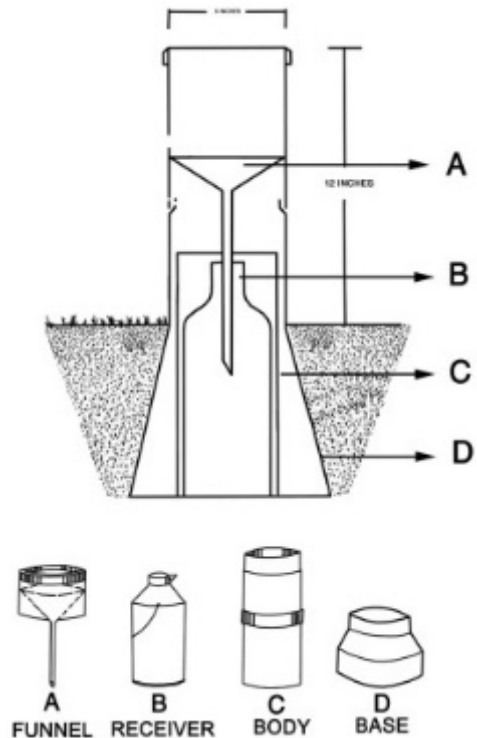
Protip: important to know features of the Stevenson's screen
Stevenson's Screen: contains the thermometers

- Painted white to reflect sun with double lid for insulation
- Slatted sides to let the air circulate, but slanted downwards to prevent light getting in
- Legs 1m long to prevent heating from ground
- On short grass for same amount of reflection



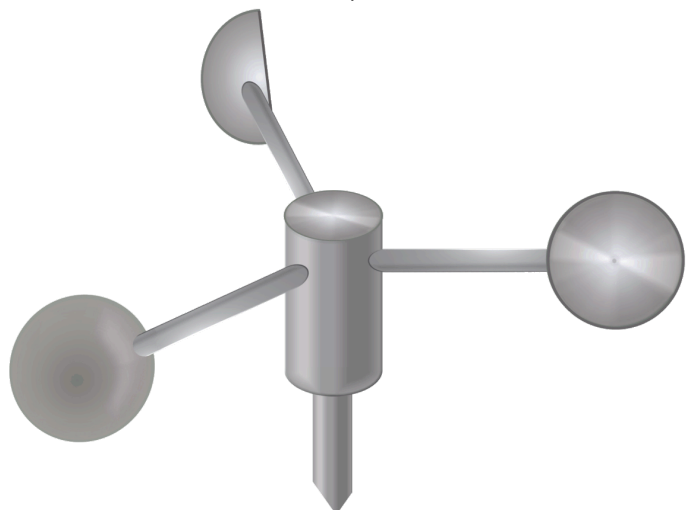
Protip: important to know how weather instruments look like and brief knowledge of how to use

Rain Gauge: has a fixed diameter so that they collect the same amount of water & so comparisons can be made



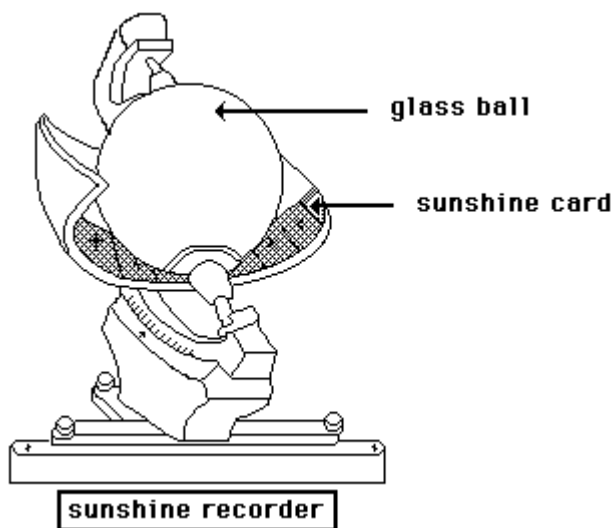
- Made of a hollow cylinder (C) containing:
 - Funnel (A) to collect the water.
 - Container to collect water which may be graduated
 - Emptied once every 24hrs
 - Rain is measured in millimetres.
 - Sunk into ground, but not level so splashes or surface water can't get in

Anemometer: Measures wind speed



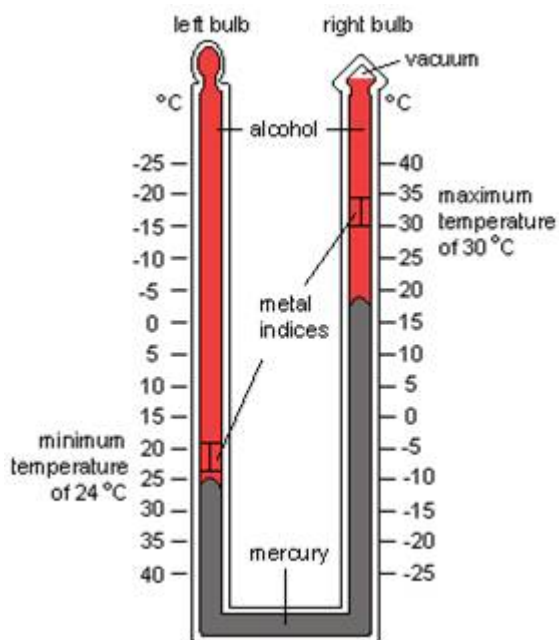
- Three light rotating cups (mounted on a high pole) are blown around by the wind the revolutions are counted & converted into m/s, km/h or knots

Sunshine Recorder (Heliograph): records the amount of sunshine at a given location



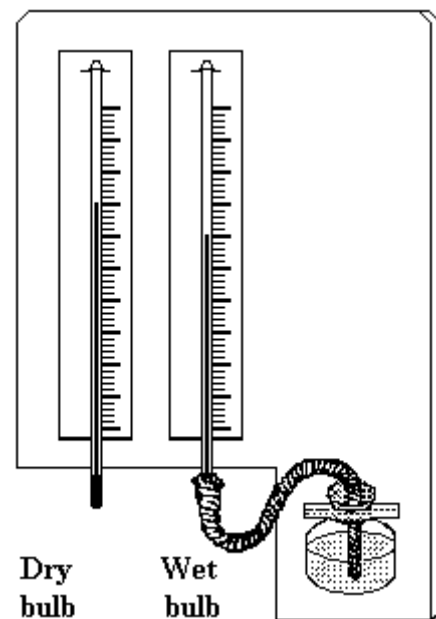
- Burns a timeline
- Traces sun shine not the hours of daylight
- The glass ball focusses the light
- This burns a line onto the card

Max-min thermometer: Records max. & min. temp. over 24hr period



- Max thermometer contains mercury & min contains alcohol
- As temp. rises, mercury expands & pushes up a metal index and when it cools, mercury contracts and index is left in place at highest temp
- As temp. falls, alcohol contracts & pulls metal index with it; but as alcohol expands, it flows past index, leaving it at lowest temp
- Both indexes read from bottom once every 24hrs

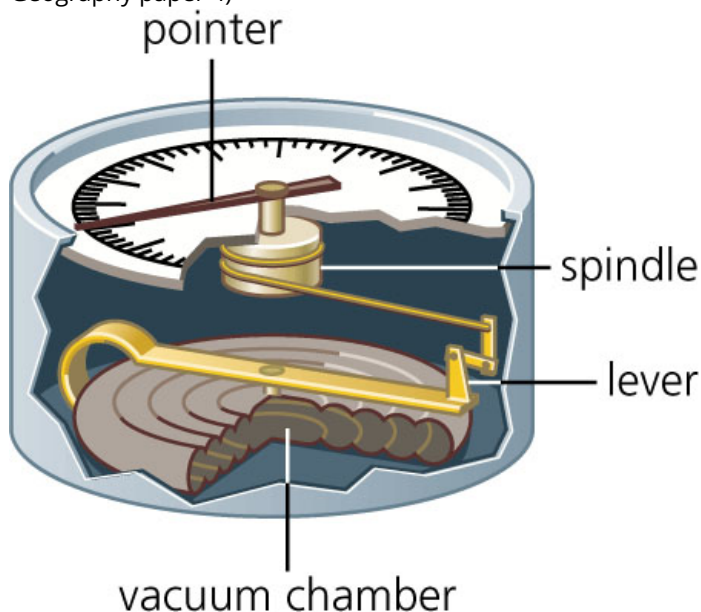
Wet & dry bulb thermometer (hygrometer): Used to calculate humidity of air



- Dry bulb is a normal mercury thermometer and it measures actual air temperature
- Wet bulb is same but bulb is covered with a fine cloth which is connected to a reservoir of water.
- Water evaporates from the cloth & cools temperature so it reads a few degrees lower than air temp.
- Both wet & dry bulb temperatures read

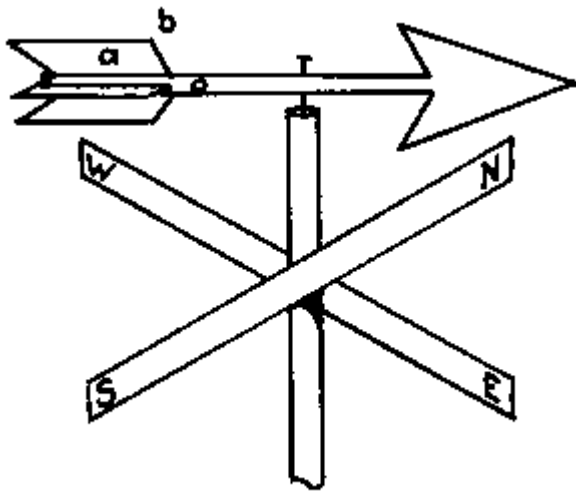
Barometer: Measures air pressure

****Protip****Unit used: mb/millibars (was asked in 2021 Geography paper 4)



- An aneroid barometer has a vacuum chamber
- As air pressure rises & falls, the chamber contracts & expands
- Levers conduct this movement to a spindle which moves pointer on the dial which records the air pressure in mmHg

Wind vane: Records wind direction



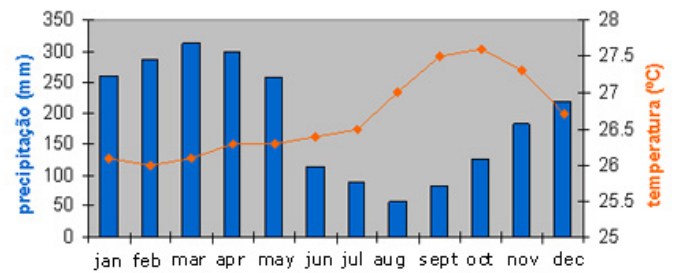
- The fletching is blown by the wind so that the arrow head points into the wind.
- Mounted on a high places (rooftops)
- Make sure no trees are blocking

2.5. Climate & Natural Vegetation

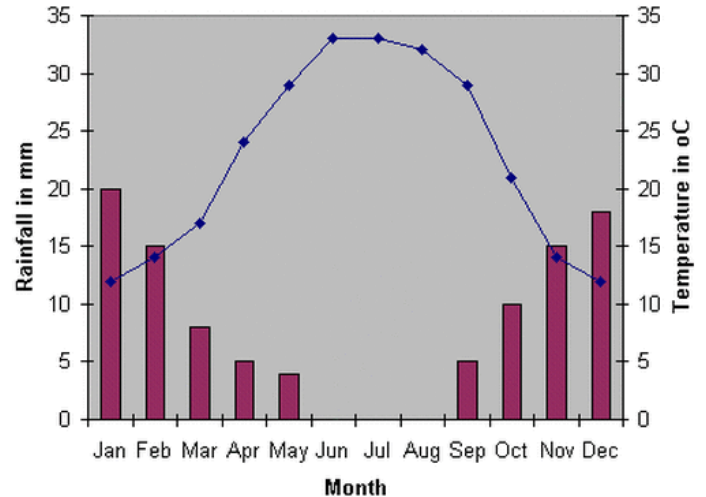
- **Weather**
 - Describes condition of atmosphere eg sunny, hot, windy
- **Climate**
 - This is the average conditions over a longer period of time, usually a few years

	Equatorial	Hot Desert
Location	Close to the equator	Between 5° and 30° north and south of the equator
Mean temp. of hottest month	≈25°C	≈30°C
Mean temp. of coldest month	≈25°C	>18°C
Annual temp. range	<5°C	<5°C
Rainfall amount	>200mm	<250mm
Rainfall distribution	Same throughout year	Irregular
Wind	Low	Strong
Cloud	Heavy	Almost none
Humidity	High	Low
Pressure	Low	High

Equatorial Climate Graph



Hot Desert Climate Graph



Factors Influencing Climate Characteristics:

- **Latitude:** closer to the equator = higher temperature
- **Distance from the sea:** coastal area = warmer winters and cooler summers
- **Prevailing winds:** seasonal difference in heating between land and sea affects temperature of prevailing wind. Warm prevailing wind = rise in temperature
- **Ocean currents:** warm currents raise winter temperatures in coastal areas; cold currents cool them down in summer
- **Altitude:** higher altitude = lower temperature (1° per 100m)

Tropical Rainforest Ecosystem

Distribution:



Vegetation & Adaptation:

- **Emergent:** tall trees up to 50m, few lower branches, grows above others to get full sunlight
- **Canopy:** trees 20-40m forming a continuous canopy, few lower branches, makes up 50% of vegetation
- **Shrub:** low shrubs & saplings, plants that adapt because they are extremely close to the forest floor

- **Lianas:** use large trees as support to reach sunlight
- **Fan Palms:** wide leaved plants that capture as much sunlight & rainfall as possible
- **Humus Layer:** decaying biological matter; rainforest soil fertility is dependent on this
- **Buttress Roots:** very long roots that support tall trees & suck up maximum amount of nutrients in poor soil
- **Drip tip leaves:** leaves that let rainfall travel over them & drip to the ground, causing less damage by excess water

Wildlife & Adaptation:

- Home to many mammals
 - Tigers in SE Asia
 - Jaguars in Central & South America
 - Leopards in Africa
 - Sloths
 - Primates
 - Lemurs
- Home to birds, amphibians, reptiles & insects too
- Animals adapt in differently to survive e.g. camouflage

Climate:

- Are close to the equator so they have very similar climates all year around
- Temp. is constant between 25-30°C
- Rainfall all year around, monthly amounts vary slightly
- Days start of warm & then temp. and humidity build up
- Hot air rises causing low pressure

Hot Desert Ecosystem

Distribution:



Vegetation & Animal Adaptations:

Vegetation	Animal
Seeds remain dormant	Camel have humps to store water
Waxy leaves to reduce transpiration	Foxes have big ears to reduce heat
Thorns to protect from predators	Shelter in underground to avoid heat
Long roots to search for water	Only comes out at night to hunt
Thick stem to store water	
Light colours to reflect sunlight	

Climate:

- Deserts are extremely dry (arid) places

- Have less than 250mm of rainfall per year
- Air is dry because:
 - Most of the moisture has precipitated over equator
 - Air travelling to desert travels over land, not the sea
- No moisture leads to very few clouds, exposing them to high levels of incoming radiation from the sun
- Causes day-time temps. to be very high
- Lack of cloud cover allows outgoing radiation to escape
- Causes night-time temps to be low
- **Annual temperature** range is very low
- **Daily temperature** range is very high

Deforestation of Tropical Rainforests

- **Causes:**
 - Population growth
 - Economic growth
 - Mining
 - Road building
 - Agriculture
 - Urbanisation
 - Exploitation of land by TNCs
- **Effects:**

Local environment	Global environment	People
Loss of vegetation	Melting ice	Death of local tribes people
Causes floods	Global warming/increase temperatures	More carbon dioxide
Threatens species with extinction	Rising sea levels	Less oxygen
Loss of habitat	Changes in climate patterns eg drought	Reduction of materials available to build buildings
Reduction of food supply	Loss of species such as polar bears	
Soil erosion		
Food chain disrupted		

3. Economic Development

3.1. Development

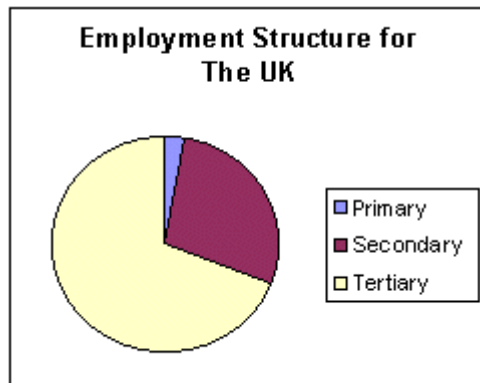
- **Main Indicators**
 - **Birth Rate:** number of births in a year per 1000 of total population
 - **Death Rate:** number of deaths in a year per 1000 of total population
 - **Gross National Product (GNP):** total value of goods and services produced annually
 - **GNP per Capita:** wealth of a country averaged per person
 - **Infant Mortality:** average number of deaths of infants under 1, per 1000 live births per year
 - **Life expectancy:** the average age people live to

- **Human Development Index (HDI):** measures and compares international development
- **Adult literacy rate:** the percentage of adults that can read and write
- **Sectors of the industry:**

	Primary	Secondary	Tertiary	Quaternary
Definition	Collecting natural resources	Manufacturing goods	Provides services to people	High tech and research based jobs
Examples	farming, fishing, mining	carpenters, food production, car manufacturers	lawyers, teachers	medical researchers, scientists, computer design

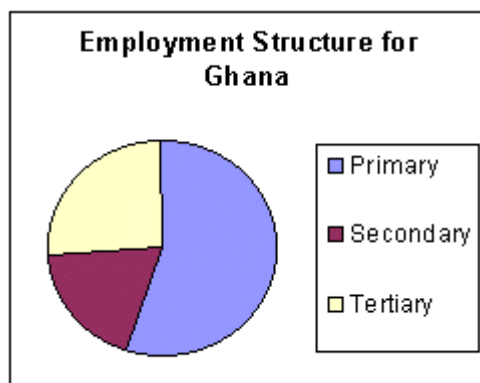
- Comparing nations:

An MEDC e.g. UK



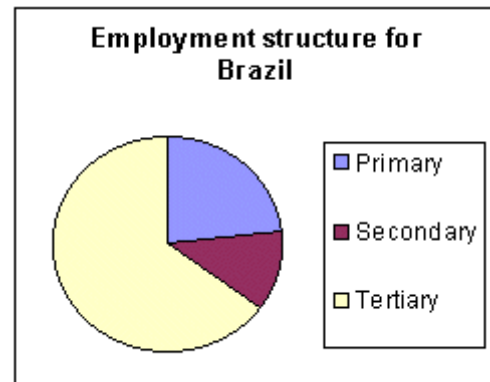
- Low proportion in primary sector:
 - Mechanizations of jobs in primary
 - Primary resources exhausted
 - Resources are now imported
- Numbers falling in secondary sector:
 - Mechanization - as machines are taking over jobs in factories
- Tertiary sector is main growth area:
 - Most work in hospitals, schools, offices & financial services
 - Greater demand for leisure services as people have more free time and become wealthier
 - More jobs become available in the tertiary sector

An LEDC e.g. Ghana



- Majority in primary sector:
 - Lack of machinery available in farming, forestry and mining
 - Farming very important because most eat what they grow
- Few in secondary sector:
 - Lack of factories because machinery is too expensive
 - MNCS manufacture instead
- Tertiary may be larger than secondary:
 - Most informal work is in the tertiary sector
 - Growth of jobs in tourism

An NIC e.g. Brazil



- While Brazil's economic base is developing, there are still a large number of people employed in primary industries such as farming.
- There are a large proportion of people employed in tertiary industries.
- One reason may be growth of Brazil as a tourist destination.
- Also, there have been significant improvements in the provision of health care, education and transport

Globalisation

- Process in which the world is becoming increasingly interconnected
- **Causes of globalisation:**
 - Improvements in transportation
 - Freedom of trade
 - Improvements of communications
 - Labour availability and skills
- **Impacts of globalisation:**

Positive	Negative
Provides jobs and skills	Local businesses may close down
Culture diversity	Countries may lose control of important decisions
Wider choice of goods and services for locals	Usually operates in richer countries
Governments of different countries can work together to tackle global issues	

TNCs (Transnational Corporation)

- Companies that operate in more than 1 country

Advantages	Disadvantages
Create job opportunities	Working conditions may be harsh
Improved education and skills	Damage to environment - factories create air pollution
Increased economy	Profits going overseas
Invest in infrastructures, healthcare or education	Natural resources being over exploited
	Higher position jobs awarded to foreigners instead of locals

3.2. Food Production

Agricultural Systems

Human Inputs	Physical Inputs	Process	Outputs
<i>Things that are built or made by humans and added on to a farm</i>	<i>Natural things that are found on a farm or added to a farm</i>	<i>The events that take place on a farm to turn inputs into outputs</i>	<i>Things that are produced on a farm that are often sold</i>
Labor/rent	Soil	Rearing	Profits
Machinery	Precipitation	Shearing	Meat products
Building	Temp.	Ploughing	Wool
Animal feed	Length of Season	Fertilizing	Milk
Fertilizers	Alluvium	Weeding	Waste
Pesticide	Floods	Irrigating	Crops
Market demand	Relief	Cultivating	Pollution
Government controls	Drainage	Harvesting	Erosion
Seeds		Slaughtering	
		Planting	

Food Shortages & Famine

- When demand for food exceeds supply of food leading to undernourishment
- Prolonged undernourishment can damage people's health and eventually lead to starvation

Human Causes	Physical Causes
Increasing population; supply cannot keep up with demand	Too hot or cool temperatures can kill crops and animals.
Overgrazing reduces integrity of soil and can cause topsoil erosion and soil degradation.	Shortage of rainfall kills most crops or require irrigation
Overcultivating causes soil degradation, using up and not giving nutrients recovery time	Too much rainfall can flood & kill crops or wash away topsoil reducing soils fertility leading to low yield

Human Causes	Physical Causes
Deforestation of woodland, damages integrity of soil as well as its source of nutrients.	Natural disasters can destroy large areas of agricultural land and kill or injure farmers.
Farming and industrial pollution can both degrade land and reduce crop yields	If soil is infertile because the bedrock contains few minerals it can be hard to cultivate land and lead to low yields.
Corruption of government	

- Effects:**
 - Hunger
 - Susceptible to infectious diseases
 - Impair physical and mental development
 - Reduce labour productivity
- Measures to increase output:**

GM Crops and Farming

- Genetically modified crops are crops that have their genes altered to improve quality and/or quantity

Advantages	Disadvantages
Uniform in shape – easy to transport/appeal consumers	Natural species may die
Growing season shorter	Taste often not as good
Drought resistant – less water	Lead to development of super weeds – stronger than GM
Higher yields	No one knows long term effect on humans

Monoculture

- Growing of only one type of crop
- Cash crops:** crops grown in large plantations for selling and making a profit

Advantages	Disadvantages
Become more efficient	If demand falls, no profit
Profitable	Less variety
Can have high yields	Bad season, no profit
Easily controllable	Labor becomes deskilled
Low training required	Only source of income

Green Revolution

- The introduction of modern western style farming techniques in LEDCs during the late 1960's and 1970's.
- High Yield Varieties:**
 - Developed to try and end food shortages by increasing yields.
 - Were first developed by cross pollinating different varieties
 - This is now being done through genetic modification

Successes	Failures
-----------	----------

Successes	Failures
Hiv did increase food production and made countries more self-sufficient	Required fertilisers & pesticides polluted water
Food prices began to fall making; affordable for poor	The HYV were more prone to disease and drought
Shorter growing season, more crops could be grown	More water had to be diverted to growing crops
The yields were more reliable	Many poorer farmers couldn't afford to buy expensive HYV
Different crops were grown adding variety to local diet	Mechanisation led to unemployment
There were surpluses so crops could be traded commercially	Many natural varieties lost
Farmers became wealthier	Countries & farmers became dependent on foreigners

3.3. Industry

- **Input:** resources, can be physical e.g. ore or human e.g. labour
- **Processes:** turning raw materials into usable things e.g. steelmaking; turning usable things into other things e.g. assembling cars
- **Outputs:** product + profit or loss + waste materials
- **Types of Industry:**
 - **Manufacturing:** produces goods that are physically used by consumers e.g. toys
 - **Processing:** turns raw materials into other materials used in manufacturing e.g. metal production
 - **Assembly:** using materials and a design scheme to put together a finished product e.g. electronics
 - **Hi-Tech:** specialised industries that mostly do research but often have small sections dedicated to each of the 3 normal types of industry

Factors influencing location of an Industry

Physical	Human
Power/energy: industry should be near source of raw materials	Labour: quantity/quality
Natural routes: river valleys/flat land is good for transport	Markets: size & location
Site/land: availability/price	Transport: cost increases when items are bulky, fragile, perishable
	Government policies
	Leisure facilities
	Capital

3.4. Tourism

- **Tourism:** the occupation of providing information, accommodation, transportation and other services to

tourists

Growth of Tourism

- **Greater affluence:** higher salary + holiday with pay
- **Greater mobility:** increased cars + more aircraft
- **Improved accessibility & transport facilities:**
 - Better roads
 - Larger airports, online reservation, package holidays
- **More leisure time:**
 - Longer vacations
 - Shorter working hours; people work from home
 - More elderly
- **Changing lifestyles:** changing fashions, earlier retirement
- **Increase in recreational activities**
- **Advertising holiday destinations:** TV + Internet

Factors that Change Tourist Patterns

- **Transport & accessibility:** access to various means of transportation e.g. trains, cars, planes, ships
- **Scenery:** landscape & visual appearance of places
- **Weather:** climate is important e.g. cold place for ski trip
- **Accommodation:** quality/price of hotels, camps, resorts
- **Amenities:** variety of recreational, historical, leisure facilities & sites offered

TOURISM

Advantages	Disadvantages
To create job opportunities	More congestion
Money can be used for development	Damage to landscape
Attract foreign investment (TNCs)	Noise/air pollution
Cultural exchange	Shortage of supplies
Improve health care and education	Inflation affecting locals
Roads built or improve	Seasonal unemployment
Airports improve	Social/cultural problems
Electricity/water supply improve	Racism may happen between locals and tourists

Managing Tourism

- **Ecotourism:** holidays that involve eco-related activities & are sustainable e.g. hiking, bird-watching, horse riding
- **Sustainable tourism:** tourist activities that are socially, environmentally & economically sustainable
- **How?**
 - Built National Parks with entrance fees → Money raised can be spent on conservation/improvement of parks
 - Ban hunting/fishing
 - Fence prohibited or protected areas
 - Put up signs such as "no littering"
 - Impose fines on littering or breaking any rules
 - Vehicles prohibited in certain areas
 - Create paths for people to walk on

3.5. Energy

- **Non-renewable resources:**
 - Are finite
 - Fossil fuels were produced by photosynthesis
 - Takes millions of years for them to form
 - Examples: coal, oil, gas
- Fossil fuels used mainly by MEDCs
- Uranium for nuclear energy
- Fuel-wood is a non-commercial source of energy in MEDCs but important in LEDCs

	Advantages	Disadvantages
Coal	Lasts 300yrs, now become more efficient, needed to make coke	Cost of production high, produces lot of GH gases, dangerous, open cast = visual pollution, costly to transport, acid rain
Oil	More efficient than coal, easier to transport, diversity of uses, petro-chemicals	Lasts only 50-70yrs, oil spills, releases greenhouse gases, prices fluctuate, refineries use lot of space, acid rain
Gas	Cleanest of fossil fuels, cheaper than oil, easy to distribute	Releases methane, explosive, prices fluctuate, acid rain, greenhouse gases.

- **Renewable resources:**
 - Are continuous
 - Are, by definition, sustainable
- **Types:**
 - Geothermal
 - Wind
 - Solar
 - Bio fuel
 - Hydroelectric
 - Tidal
 - Wave

ADVANTAGES	DISADVANTAGES
Reduce dependence upon fossil fuels	Difficult to produce required energy quantity
Alleviate the world's energy crisis	Energy produced much less than fossil fuels
Development of alternative energy	Unreliable supply of constant energy
No pollution	Some countries lack the conditions for these
Source lasts forever	Cost of technology high compared to fossil fuel

NUCLEAR POWER

Benefits	Drawbacks
Technology for nuclear power exists	Risk of nuclear accidents

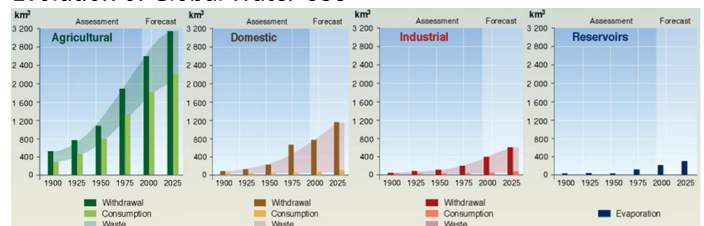
Benefits	Drawbacks
Plenty of radioactive supply as fuel	Risk of nuclear plants as terrorist targets
Very low amounts of greenhouse gases made	Nuclear technology can be used to make WMDs
Reduces dependency on fossil fuel countries	Risky to transport material & expensive
Nuclear waste stored safely underground	Risk of nuclear radiation related to cancer
Electric supply altered easily based on demand	Uranium mining dangerous and polluting
	Remains radioactive for long time & expensive

3.6. Water

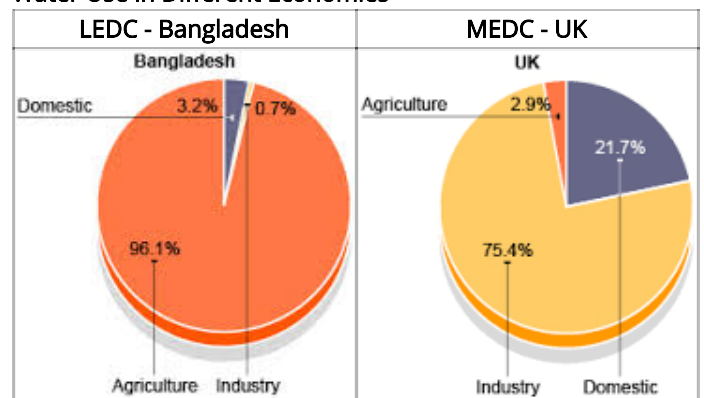
Uses of Water

- **Agriculture:** to water plants
- **Industrial:**
 - Heated to make steam to turn turbines
 - Cooling down reactors
- **Domestic:**
 - Household e.g. cooking, cleaning, drinking
 - Recreational e.g. swimming, sports
- **Environmental:** preserving water in a dam

Evolution of Global Water Use



Water Use in Different Economies



Methods of Water Supply

- **Dams:** barrier placed across a river made from concrete
- **Reservoirs:** artificial lake that develops behind a dam
- **Wells:** a shaft sunk into the ground to obtain water
- **Desalination:**
 - **Thermal:** evaporation of water to remove salt
 - **Reverse Osmosis:** forces water through semi-permeable membrane to remove salt
- **Sewage Treatment:**

- Removal of contaminants from waste water & household sewage
- Requires physical, chemical & biological processes to remove all the contaminants and make safe

Causes of Water Shortages

- **Population Growth:** increased pressure on water sources as world's population grows
- **Pollution:** water sources are being polluted by industries
- **Demand:** as development increases globally so does amount of water needed
- **Sewage:** lack of proper sewage treatment means that waste is often pumped directly into water sources
- **Climate Change:** global warming may be releasing freshwater from glaciers & ice shelves, but much of it is running directly into oceans; inaccessible
- **Political:** water sources are often shared; some people control large percentages of the shared resource, leading to shortages for others
- **Mismanagement:** water is used inappropriately causing water shortages

Impact of Water Shortages

- **Drought:** below average supply of water over a prolonged period
- **Famine:** crops fail/livestock die due to water shortage
- Conflict arise when sharing a limited supply of water
- People may be forced to relocate due to famine/drought
- Stagnant dirty water = increased risk of diseases
- Eutrophication due to run-off
- Dirty water/eutrophication causes loss of biodiversity
- **Eutrophication:**
 - Run-off from farms containing fertiliser causes excess growth of algae in water
 - Water does not oxygenate properly/receive light
 - Causes plants & animals to suffocate & die

Solutions to Water Shortages

- **Desalination:** governments should invest more in desalination plants
- **Sewage Treatment:** governments should enforce better policies regarding disposal and reuse of waste water
- **Conservation:**
 - Half flush toilets & showering instead of bathing
 - Watering the garden at dusk to prevent evaporation
 - Collecting rainwater to use on garden
 - Using appropriate plants for the climate
 - Using drip irrigation rather than sprinklers
- **Water Charities:**
 - Building wells to access groundwater
 - Building toilets to reduce sewage & pollution
 - Teaching appropriate farming techniques
 - Low cost schemes to filter and clean water
- **Irrigation Projects:** use irrigation systems to redistribute water & water the land

3.7. Environmental Risks of Economic Development

- **Soil erosion:**
 - Occurs in farms, where rainforest is cleared – soil is washed away by rain because no tree roots to retain it
 - In the Amazon rainforest, eroded soil goes into rivers & pollutes drinking water
- **Global warming:**
 - Occurs due to too much greenhouse gases
- **Greenhouse effect:**
 - When infrared radiation passes through atmosphere, & some is absorbed and re-emitted in all directions by greenhouse gas molecules
 - This warms the surface & lower atmosphere
- **Effects:**
 - Melting poles = rising sea levels = increase in storms
 - Change in the distribution of precipitation
 - Plants and wildlife might not have time to adjust
 - Lower crop yields in Africa, Asia & Latin America
 - More people at risk from insect/water-borne diseases
- **Greenhouses gases are:**
 - CO₂ from burning fossil fuels or wood
 - Methane from decomposing organic matter & waste
 - CFCs from aerosols, air conditioners, & refrigerators
 - Nitrogen Oxides from car exhausts & power stations
- **Air pollution:**
 - Carbon monoxide: incomplete combustion of carbon-containing substances causes oxygen starvation
 - Sulphur dioxide: combustion of fossil fuels causes respiratory problems and acid rain
 - Nitrogen oxides: N₂ & O₂ from air combine due to heat (furnace/engine); same effect as sulphur dioxide
 - Lead oxide: burning leaded petrol; damages nervous system
- **Water Pollution:**
 - Chemicals in fertilizers cause eutrophication
 - Oil spilling into the sea
 - Acid rain; destroys lakes and kills animals/plants
 - Health hazards for humans
 - Damages limestone buildings and sculptures
 - Fewer crops can be grown on an acidic field
- **Noise pollution:**
 - Vehicles
 - Machinery in industries and farms
 - Noisy humans
- **Visual pollution:**
 - all man-made things are ugly compared to unspoiled nature
- **Desertification:**
 - Overgrazing
 - Soil erosion
 - Global climate getting warmer - gets drier due to less rain
 - Deforestation - less roots of trees to hold soil together
- **Sustainable development:** Economic development without destroying natural resources
- **Management:**
 - Population policies
 - Sustainable tourism
 - Use of renewable energy
 - Afforestation
- **Resource conservation:** Meeting needs of present without affecting needs for the future

- **Ways of conservation:**

- 3 Rs: reduce, reuse, recycle
- Renewable energy
- Use energy efficient products

- Restrict the use of resource
- Use more public transport
- Government can raise tax on petrol prices

CAIE IGCSE GEOGRAPHY (0460)

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