Theme 2 – The natural environment

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2.1 Plate tectonics

Plate boundary - where plates meet
Tectonic plate - section of earth's crust

Earth structure

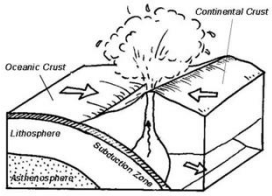
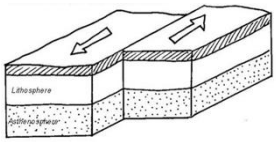
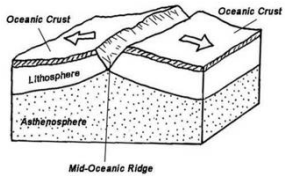
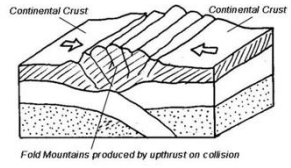
- **Crust** - thin, rocky
- **Mantle** - molten rock
  - upper: lithosphere, lower: asthenosphere
- **Outer core** - liquid nickel & iron
- **Inner core** - solid nickel & iron

Crust - 7 large plates & 12 smaller plates

- **Oceanic crust** - thin, dense, young
- **Continental crust** - thick light, old

Plate tectonics (movement of plates)

Suggest where new oceanic plate is formed - at mid-ocean ridge
Suggest how new oceanic plate is formed - magma rises to surface, cools down & solidifies
Suggest why oceanic plate moves - Convection currents cause circular movement of magma within mantle, which causes plates to move

Destructive 	• Oceanic plate subducted under continental plate • Eg Indo-Australian & Eurasian plate
Conservative 	• 2 plates slide past each other • Eg North American & Caribbean plate
Constructive 	• 2 plates move away from each other • Eg North American & Eurasian plate
Collision 	• 2 continental plates move towards each other • Eg Indo-Australian and Eurasian Plate • Continental plates same dense, crumple upwards • Form folded mountains (eg Himalayas)

Earthquake

Focus - point underground where earthquake starts
Epicentre - point on surface directly above focus
Seismic waves - wave which travels within earth
Magnitude - amount of energy released

Describe relationship between earthquakes & plate boundaries

- On plate boundaries
- Some away from boundaries

Hazards

- Buildings collapse, fire

Cause

1. Plates collide / a plate subducts under another plate
2. Plates get stuck
3. Fault line formed
4. Pressure builds up due to fraction
5. Pressure too big, plates jerk apart
6. Pressure released
7. Seismic waves within earth in all directions, cause ground shaking
8. Plates move to new positions
9. Aftershock occurs

Measurement (Richter scale)

- measures magnitude of earthquakes
- Scale 0-12

Opportunities

- Employment in tourist industry eg tourist guides
- Fertile soils → high crop yield
- Extract raw materials eg gold
- Family & friends live in the areas
- Can't afford to move
- Confident in protection methods

Preparation

- Build earthquake-proof buildings
- Train emergency services
- Set up warning system
- Create evacuation routes
- Practice earthquake drills

Earthquake proof buildings

- Rubber shock-absorbers between foundations
- Deeper foundations
- Shatterproof glass
- Pyramid shape
- Open areas for evacuation

Extinct volcano - will not erupt again

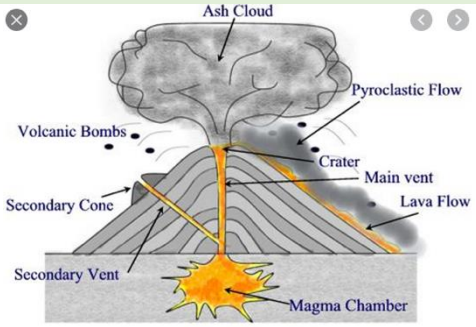
Variation in deaths - some area more densely populated, better prepared, time of day

Case study - Haitian earthquake

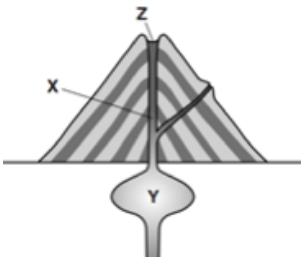
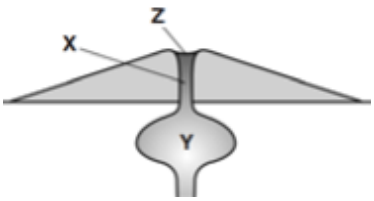
Where?	West of capital Port-au-Prince (1million ppl)
When?	Jan 2010
Magnitude	7 (high)

Focus	10km deep (shallow)
Cause	• North American & Caribbean plate (conservation) • Plate stuck for 200 years
Hazards	• Ground shaking 50s • Aftershock magnitude 6
Impacts	• 230000ppl killed, 300000ppl injured • 50% of buildings in Port-au-Prince damaged • Eg gov buildings (Presidential Palace) • 1.5 million ppl displaced • Loss of electricity / communications • Roads damaged • Disrupt businesses (cost $14 billion) • Loss of jobs

Volcano



Types

Stratovolcano	Shield volcano
	
• Steep sides • Narrow base • Alternative layers of ash & lava • Small crater • More explosive	• Gentle sides • Wide base • Made of lava • Large crater • Less explosive

Causes

Destructive	Constructive
1. Plates move towards each other & converge due to convection current 2. Oceanic plate is denser & subducts under continental plate 3. Plate sinks into hot mantle & melt → form magma 4. Build up of manga increases pressure 5. Magma forced upward through cracks in crust 6. Lava cools down & form new crust	1. Plate move apart due to convection current 2. Gap created 3. Magma rises to reach surface

Opportunities - geothermal power, hot springs, (same as earthquakes)

Hazards

- Lava flows - flow down volcano sides
- Lahars - **mudflows** - destroy roads and settlements, people evaluate
- Ash cloud - ash around volcano - suffocation / gases - poisoned
- Pyroclastic flow - ash + lava + poisonous gas flow down volcano sides rapidly - killed by force / burning
- Volcanic bombs - killed by force
- Lateral blast - killed by force
- Post-eruption famine

Why it's important to give warnings when volcano erupt (3)

- Ppl live nearby
- Danger to life
- Need to evacuate
- Road blocked
- Explosive eruption towards town

Why volcano change shape before erupt?

- Pressure builds-up /magma/gas movement

Why volcano extinct? No magma supply coz far away from rising magma

Case study - Mount Sinabung, Indonesia

Where?	Northern Sumatra
When?	• Main eruption in Feb 2014 • Still show signs of being active
Cause	• Indo-Australian subducted under Eurasian plate (destructive)
Impacts	• 16ppl died • 14000ppl evacuated to temporary camps • Crop damaged → loss £50000+ • Ash caused air pollution • Houses collapsed coz of heavy ash • Ash & pyroclastic material poisoned Sumatra's wildlife
Opportunities	• Fertile soil & higher altitude → coffee (main source of income)

2.2 River

Hydrological characteristics

- **Drainage basin** - area of land where water flows into river
- **Watershed** - line which divides one river basin from another
- **Source** - start of river
- **Tributary** - small river which flows into main river
- **Confluence** - where tributary joins main river
- **Mouth** - end of river where it meets sea/lake

Water cycle

- **Evaporation**, **Condensation**, **Precipitation**
- **Interception** - precipitation caught by the vegetation
- Transpiration - water from vegetation transferred back to atmosphere
- **Overland flow (surface runoff)** - water flowing over ground surface
- **Throughflow** - sideways movement of water through soil towards river
- **Groundwater flow** - sideways movement of water through permeable rock towards river
- **Infiltration** - downward movement of water into soil

- **Percolation** - downward movement of water through permeable rock

River characteristics

- **Long profile** - gradient change source → mouth
- **Cross profile** - shape across valley
- **Cross section** - shape across river channel
- **River discharge** - amount of water flowing, width × death × velocity
- **Load** - material which river is carrying
  - boulders → cobbles → pebbles → gravels → sand → slit → clay (sequential deposition)

Course	Valley	River	Landforms
Upper 	• Narrow • V-shaped • Steep sided	• Narrow & shallow • Steep gradient • Load large & angular • Low velocity & discharge • Vertical erosion - downward erosion of river bed	• V-shaped valleys • Interlocking spurs • Waterfalls • Potholes • Rapids
Middle 		• Lateral erosion - sideway erosion of river bank	• Small meanders • Flood plains
Lower 	• Wide • Less V-shaped • Gentle sided	• Wide & deep • Gentle gradient • Load small & rounded • High velocity & discharge • Lateral erosion	• Meanders • Flood plains & levees • Deltas • Oxbow lakes

River process

Erosion

- **Hydraulic action** - force of water compress air in cracks in rocks & wear away loose materials
- **Abrasion** - load carried by river collide & wear away bed & banks
- **Solution** - acid in water reacts & dissolves carbonation rocks & carried away in solution eg limestone, chalk
- **Attrition** - load carried by river collide with each other, become smaller & smoother

Transportation

- **Traction** - large materials rolled along bed
- **Saltation** - lighter materials being picked up by water & bounced along bed
- **Suspension** - smallest & lightest materials carried along water
- **Solution** - dissolved materials carried along water in solution

Why deposition occurs? Low velocity, not enough energy to carry loads

Landforms

V-shaped valleys

Formation

1. River erode vertically into its bed by hydraulic action & abrasion
2. Deepens & widens valley, steepens valley sides

Waterfalls

Features - Overhang hard rock, vertical drop, white water, rocky, plunge pool

Formation

1. Horizontal layer of hard rock (eg granite) on top of layer of soft rock (eg sandstone)
2. Water falls down → form plunge pool below waterfall
3. Soft rock is eroded quicker → undercutting beneath hard rock
4. Unsupported hard rock collapses into plunge pool
5. Process repeats itself

6. Waterfall retreats upstream → form gorge & leaves steep-sided valley

Potholes

Formation

1. Stone trapped in water currents
2. Erode small holes in bed
3. Stones trapped in holes
4. Water swirl them around in hole
5. Erode & make holes larger & deeper

Meanders

- Move downstream coz high velocity erode outer bend

Formation

1. Water turns around obstructions eg stones → faster & slower water movement
2. Outer bend - high velocity & energy for lateral erosion → forms river cliff
3. Inner bend - low velocity & energy → deposition, forms point bar on slip off slope

Flood plain & levees

Formation

1. River erodes valley sides → form wide, flat valley
2. When flood, water shallower → ↑ friction ↓ velocity
3. River loses energy & deposits load → form flood plain & alluvium
4. Heavier load deposit first on banks → form levees
5. Lighter load deposit further away → build up levees
6. Process repeats → build up flood plain & levees

Deltas

Features

- Distributaries
- Formed by 2+rivers
- **Shape -** Arcuate / bird's foot

Formation

1. When river enters sea → deposition
2. Salt water causes **flocculation** (when river meets sea, salt cause clay particles stick together & become heavier → deposit)
3. Deposited loads builds up in layers → form deltas
4. River splits into many small channels (distributaries)

Oxbow lakes

Formation

1. Faster flow on outer bends of meander
2. Erosion on outer bends
3. Neck of meander narrows
4. Eventually due to erosion / flood, river cut through neck, water flows straight across
5. Deposition seal former meander → form oxbow lake
6. Overtime, stagnant water in oxbow lake dry up → form meander scar

Hazard – Flooding

Cause	Prevention
• Soil & rock saturated / Water not fast enough to infiltrate • Too much water runs off to river • Channel fills & overflows	• Afforestation - ↑ interception • Dredging - deepen channel → hold more water • Build artificial levees - (same) • Dams - store water, control river discharge

Case Study - River Ganges & deltas in Bangladesh

- Major floods happen from June to Sept

Physical causes	Human causes
• Many large rivers eg Ganges flow through Bangladesh with high discharge • Low lying land • Snowmelt from Himalayas & heavy monsoon rains in Summer	• Deforestation • Urbanization • Poor flood defense - artificial levees collapse when high discharge • Global warming - Snowmelt from Himalayas
Impact (in 2007)	**Reduce impact**
• Over 1100 ppl died • House damaged - 10 million ppl displaced/homeless • 2/3 of land flooded • 2 million acres of agricultural land damaged • $300 million crop damaged • Contaminated drinking water - diseases eg cholera	• Flood Action Plan set up in 1989 • Built 350km of artificial levees • Built 7 dams • Negotiation between gov of Bangladesh & Nepal • → ↓ deforestation ↑ afforestation • Dredging • Warnings, evacuation plan

Opportunities

- **Flat land** - easier to build settlements
- **Agriculture** - water used to irrigate crops
  - deposited alluvium → fertile soil
  - high crop yield, stable food supply
- **Water supply** - agricultural, domestic & industrial use
- **Trade** - river used for transportation of goods → encourage trading
- **Fish / shrimp** - source of protein

2.3 Coasts

Features

- **Wave length** - distance between top of waves
- **Wave period** - no. of waves per min
- **Beach profile** - angle of slope of beach

Processes of erosion

- **Hydraulic action** - force of waves trap & compress air in cracks in rock & wear away loose materials
- **Abrasion** - loads carried by waves collide & wear away cliffs
- **Corrosion** - acid in water reacts and dissolves carbonation rocks & carries away in solution
- **Attrition** - load carried by waves collide with each other, become smaller and smoother
- **Marine erosion** - wearing away of cliffs by waves

Types of waves

Destructive waves	Constructive waves
• Large, high wave height, short wave length & high frequency • Swash weaker than backwash • More sediment removed from beach than transported in • Erodes beach • Steep beach profile	• Small, low wave height, long wave length & • low frequency • Swash is stronger than backwash • More sediment transported onto the beach than removed • Beach is being built up • Gentle beach profile

What causes a wave to break at the coast?

1. Wave approaches coast in same direction as wind is blowing
2. Sea floor becomes shallower
3. Wave base slows down coz of friction with sea floor
4. Wave becomes higher and top of the wave breaks eventually
5. Water flowing up the beach in the same direction as wind is blowing (**swash**)
6. Gravity causes water to flow back down the beach to the sea (**backwash**)

Landforms

Bays and Headlands

Formation

1. Alternate bands of hard and soft rock along coasts
2. These rocks erode at different speeds (**differential erosion**)
3. The softer rock e.g. clay erode faster & form the bays.
4. The harder rock e.g. chalk erode slower & form the headlands.

Explain how differences in rock type can lead to formation of bays and headlands. (2)

- Different in resistance (hard & soft rock), differential erosion, discordant coastline

Cliff and wave-cut platform

Characteristics	**Cliff** - Hard rock, steep, high, jagged, vegetation covered near top **Wave-cut platform** - Hard rock, gentle sloping, contains joints, located at base of cliff
Formation	1. Bottom of the cliff is eroded by hydraulic action & abrasion by waves 2. Cliff is undercut, making a **wave cut notch** 3. Cliff above is unsupported & eventually collapse 4. Cliff will retreat backwards 5. Material on beach will be broken up by attrition & removed by the waves 6. Process repeat itself, causes cliff to retreat & leaves gentle slope of rock called **wave-cut platform**

Caves, arches, stacks and stumps

Characteristics	**Stack** - Rocky, hard, tall, narrower base, wider top, surrounded by sea, layers of rock **Arch** - Rocky, steep slopes, joints, shape of bridge, jagged
Formation	1. When waves crash against the rocks, a line of weakness in the rock eg crack is eroded 2. Line of weakness enlarges, form a **cave** 3. Cave is eroded through the headland to the other side, form an **arch** 4. Roof of the arch weakened by erosion and collapse leaving an isolated rock in the sea called a **stack** 5. Over time the stack will be eroded by the sea and become smaller to form a **stump**

Longshore drift

1. Waves flow in the direction of the wind
2. Swash deposits sediment on the beach at an angle in the direction of the wave
3. Backwash returns at right angle due to gravity
4. Beach material gradually move along the beach in a zig-zag motion

Landforms made from longshore drift

Spit

Characteristics	Long and narrow, made of sand or shingle, one end attached to the coastline & other end open water
Formation	1. Sediment carried by longshore drift… (explanation)

	2. At a bend or break in the coastline, longshore drift continues to transport the material & deposit material in open water → form **spit** 3. Change in wind direction cause longshore drift to change the direction of sediment movement → form **hooked end** 4. Area behind spit is sheltered from waves & wind, deposition occurred. Deposited material colonized by vegetation eg halophytes. Their roots trap more sediment → form **salt marsh** behind spit.

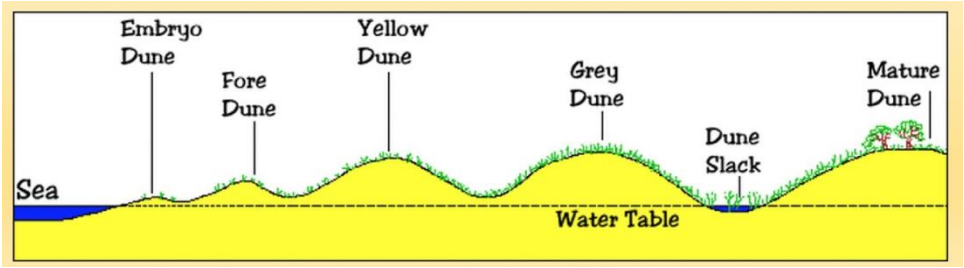
Bars

Characteristics	Long and narrow, both ends attached to the coasts, water behind bar (lagoon)
Formation	1. Spit grow across river mouth till reaches the other side of land 2. Water behind bar becomes trapped, form lagoon 3. Eventually, sediment fill up lagoon.

Tombolo

Characteristics	Long and narrow, one end attached to coast/island
Formation	Spit grows from coast to an offshore island

Sand dunes

Conditions required (SWOP)	• **Sand** - large supply of sand • **Wind** - strong onshore wind to dry out and transport sand • **Obstacles** - eg seaweed on beach trap sand • **Plants** - halophytes eg marram grass colonize dunes • **Flat land**
Formation	1. Sand dries out 2. Onshore wind pick up sand from beaches particularly at low tide 3. Sand deposited around obstruction 4. Sand builds up over time → form **dunes** 5. Halophytes eg marram grass colonizes dunes 

Beach

Formation	1. Powerful swash moves material up beach by constructive waves 2. Weak backwash doesn't have energy to remove material 3. Beach material builds up over time 4. Larger material carried further up beach 5. Longshore drift 6. Gentle slope reduces speed, causes sedimentation 7. Deposition in sheltered bays

How the beach material changes along the transect from the sea to the cliff?

- Sand near the sea
- More shingle in the middle section

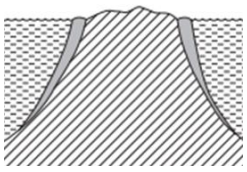
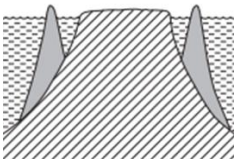
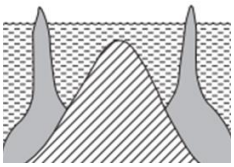
- Lots of large pebbles near the cliff

Coral reefs

- Created by many polyps (tiny animals that live in colonies, eat zooplankton & get energy from photosynthesis for algae - gives corals colors)
- Produce $CaCO_3$ to form solid structure for protection
- Provide protection & food source, creates biodiverse marine ecosystem

Characteristics	Conditions required
• Plants • lots of variety of species eg fishes & turtles • colourful	• Warm water, + 20°C • Shallow water, no more than 60 m deep • Clear water / plentiful supply of oxygen & light • Plentiful supply of plankton • Calm seas • High PH

Types of coral reefs

Fringing reef	Barrier reef	Atoll reef
		
• grows in shallow water around coast • attached to coast • forms narrow reef parallel to coastline	• offshore • separated from coast by lagoon • wider, older, larger than fringing reef	• roughly circular surrounding a deep central lagoon • form around submerged volcanic islands coz convection current • polyps build coral structure upwards → maintain light condition for photosynthesis

Opportunities

- **Fishing industry** - contain many fishes - seafood / commercial fishing
- **Tourist industry** - biodiverse, beautiful scenery attract tourists scuba diving, creates job opportunities
- **Coastal defence** - protect coastlines from tsunamis by absorbing wave energy

Threats (eg coral bleaching)

- **Climate change** - polyps die when sea temp ↑
- **Sea water pollution** eg oil spills - polyps die
- **↑ pH of sea water** coz acid rain & air pollution
- **↑ sedimentation** coz river deposits more loads to sea - ↓ light & oxygen levels
- **Disease** - viruses infect & kill polyps

Mangrove swaps

Characteristics

- Salt tolerant
- Evergreen trees
- Salt filtering
- Grow between high & low water mark

Conditions required

- Warm temperature, 24°C
- High annual rainfall, +1200mm
- Sheltered coastal area - low wave energy
- Wide gentle slope with large tidal range

Opportunities

- **Fishing industry** - contain many fishes - seafood / commercial fishing
- **Coastal defence** - protect coastlines from tsunamis by absorbing wave energy
- **Breeding ground for marine life** - coral reefs depend on mangroves to breed, important in ecosystem
- **Filters pollution** – clean sea water, protect coral reefs from pollution

Threats

- Destroyed for land for agriculture eg prawn farms
- Over-logging for woods

Coastal impacts

- **Coastal erosion** - cause properties to collapse / damaged eg loss of farmland
- **Natural disasters** eg coastal flooding, storms, tsunami → damage port installations
- **Danger to ppl** from collapsing cliffs
- Cost of protection measures
- Unable to sell properties

Management of coastal impact

- **Hard engineering methods**

Types	Description	Adv	Dis
Groynes 	Barriers built at right angles to the beach to trap sediment and prevent longshore drift	• Cheap • Prevent longshore drift	• Cause erosion on downdrift side • May rot away • Doesn't protect cliff
Sea walls 	Large-scale concrete curved walls built along base of cliff	• Long-lasting • Reflect wave energy • High protection	• High production & maintenance costs • Destroy habitats eg nesting sites for sea birds • Waves reflecting off wall can scour beach
Offshore breakwaters 	Built out into the sea, enable waves to break on breakwaters	• Cheap • Tires don't have to be dumped elsewhere	• Disrupt local ecology • Technically difficult to install • Visually unattractive
Revetments 	Barriers built mid-way up the beach and parallel to the sea	• Cheap • Easy to build	• Needs regular replacement • Weak - doesn't protect against storms • Short life span
Gabions 	Large boulders placed in cages	• Installed quickly • Fairly effective	• Expensive • Visually unattractive • Small scale
Rock armour 	Giant boulders placed at base of cliffs	• Effective	• Expensive • Visually unattractive • Small scale

- **Soft engineering methods**

Types	Description	Adv	Dis
Beach nourishment	• Adding sand to the beach to replace eroded sand	• Looks natural	• Short life span
Planting vegetation	• Planting of mangroves • Vegetation on slopes	• Looks natural	• Not effective

Case study - Criccieth, West Wales coast

Basic info	**Formation** • Granite & basalt forms headlands of Criccieth castle & Black Rock • Boulder clay eroded faster to form Criccieth Bay
Opportunities	• **Tourism** - attractive coastline eg wide sandy beach & Black Rock caves • **Job opportunities** eg restaurants • **Easy access** eg Cambrian Railway • **Fishing** - small scale, mostly recreational • **Agriculture** - surrounding land used for postal farming
Hazards	• Glacial deposits eg Boulder clay - retreat 1m every 10 years • Exposed to 4000km fetch from Brazil, prevailing wind: SW • Strong waves erode weak rocks • Raising sea level • Threats to businesses, residental areas & farmland
Management	**West of Wales Shoreline Management Plan** • Encourage provision of adequate flood warning systems & coastal defences measures • Discourage development in areas at risk from flooding / coastal erosion **Coastal defence measures** • **Breakwater** - on western side, made of concrete, protect lifeboat station, £500,000 • **Rip-rap** - made of boulders, protect cliff • **Victorian / recurved sea wall** - made of granite, protect open space • **2 Groynes** - stop longshore-drift, £90000 for 2

2.4 Weather

Define weather (1)

- Short term atmospheric conditions, including temp, rainfall & humidity
- Can vary from day to day / place to place

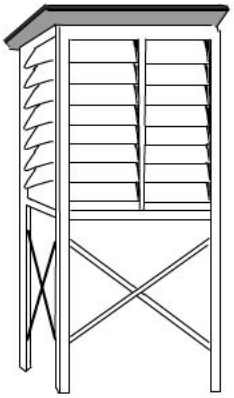
Weather instruments

Stevenson Screen

Characteristics

Contains:

- Max-min thermometer
- Wet & dry bulb thermometer
- Barometer



Explain why the thermometers are kept in a Stevenson Screen (4)

- Not affected by direct sunlight & wind
- Measure condition of air not ground
- Not sheltered or shaded by trees/buildings
- Avoid damage

- Painted white - reflect solar radiation to prevent false temp readings
- Slatted sides / vents - allow air circulation
- Made of wood - avoid absorbing too much solar radiation
- Double layer wooden roof - protect against solar radiation & conduction, air space maintains constant temp
- 1.25m above ground level - instruments not affected by heat from ground
- Door opens to N/S in northern/southern hemisphere - avoid sun's rays

Site

- In open area to avoid heat from building / shelter
- On grass to avoid heat absorption from concrete
- In a protected area to prevent damage from ppl / animals
- On flat land
- Door face away from direct sunlight

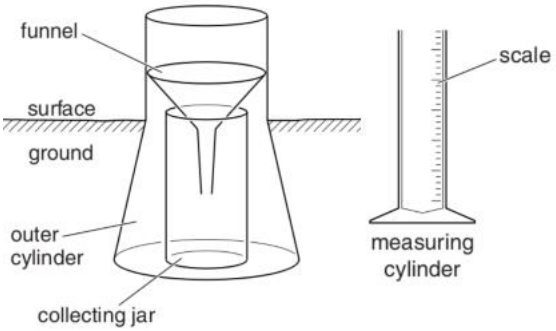
Rain gauge

What it measures

- Amount of precipitation

Site

- In open area to avoid heat from building / shelter
- On flat land
- Partly buried in the ground - stop it spilling



Describe the ground surface where rain gauge is located (1)

- Flat land of grass / short vegetation

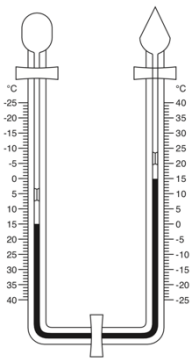
How features help to measure rainfall accurately (3)

- Sharp rim - measure from precise area
- Enclosed collecting vessel - prevent evaporation
- Deep funnel - prevent rain splashing out
- Partly buried in the ground - stop it spilling
- 30cm above surface - avoid surface water entering into it

How to use

1. Rainfall collected through funnel into container
2. Pour water into measuring cylinder
3. Take measurement from measuring cylinder in mm

4. Read at eye level
5. Pour water away before reuse
6. Take measurements every 24 hours



Maximum - minimum thermometer (Six's thermometer)

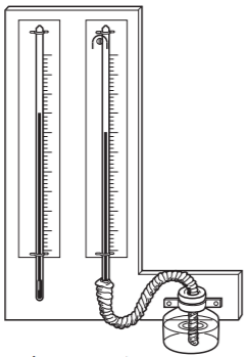
What it measures

- Highest & lowest temp

How to use

1. Read min & max temp off the bottom of indices at eye level
2. Rest indices with magnet
3. Check every 24 hours

Wet-and-dry bulb thermometer (hygrometer)



What it measures

- Relative humidity

Characteristics

Explain why 2 thermometers show different temp in a wet & dry thermometer. (4)

(If temp ↑, dry bulb ↑)

- Dry bulb exposed to air giving the air temp
- Wet bulb
- Bulb linked to container of water & wrapped in muslin
- Keep bulb continuously moist
- Heat lost in moisture

If wet & dry bulb same reading - humidity is 100% (air is saturated)

Which temp reading decreases when there's a low humidity & why?

- Wet bulb coz as humidity is low, more evaporation takes place while latent heat is used which reduces the temp of air and bulb, so temp on wet lower than dry bulb.

Depression of wet bulb - dry bulb - wet bulb

How to use

1. Read both temperatures
2. Use relative humidity table
3. Subtract wet from dry bulb
4. Read off figure at intersection of dry & wet bulb depression figures

Sunshine recorder

What it measures

- Hours of sunshine

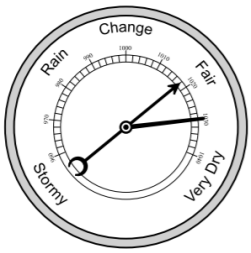
Site

- Placed south facing in northern hemisphere
- Put in open area

How to use

1. A sunshine recorder is a glass sphere with a piece of card located behind it which is marked in minutes and hours.
2. The glass sphere focuses sun's rays onto the piece of card.
3. As the sun's rays pass through the glass, it burns a line in the card paper. The marks on the paper indicate at which hour this happened
4. As the position of the sun changes, the burn line will extend across the card.
5. At the end of each day, measure the length of the burnt line which shows the hours of sunlight.
6. Replace the card paper each day.

Barometer



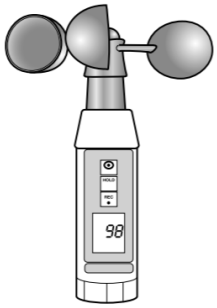
What it measures

Atmospheric pressure

How to use

1. Index pointer shows previous recorded value
2. Pointer moves on dial when pressure changes
3. Read value on dial
4. Find difference between index pointer & arrow in mb (milibar)

Anemometer



What it measures

Wind speed

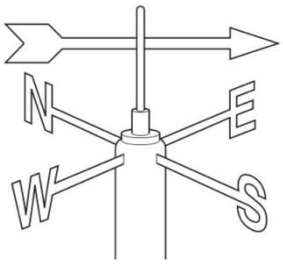
Site

- On the roof
- High up above trees/buildings
- Wind won't be blocked or sheltered

How to use

1. Cups which catch wind & rotate
2. Record electronic display screen in km per hr
3. Observe at set times

Wind vane



What it measures

Wind direction

Site

- On the roof
- High up above trees/buildings
- Wind won't be blocked or sheltered

How to use

1. Arrow with compass points around
2. Observe direction arrow is pointing
3. Arrow points to direction wind is blowing from
4. Observe at set times

Explain why there's a fence around weather station (1)

- Keep ppl / animals away

Explain why weather station is sited on grass not concrete (1)

- To prevent splash back from concrete
- To prevent increased heat from concrete

To what extent do you think the weather station is located in a good position? (4)

- Not covered by buildings
- On grass
- Open area - readings aren't affected by shelter
- Not many ppl living close by
- Flat land
- (Dis) trees on one side - causes shade

Paper 2

Describe influence of cloud cover on temp (2)

- More cloud higher maximum temp
- More cloud higher minimum temp
- More cloud smaller range

Define mb (units of pressure)

- milibars

Paper 4

Give 3 advantages of using digital instruments (3)

- Sensitive
- Easy to read
- Precise
- Less chance of making mistake in reading

Suggest two ways that students could check temperature measurements were correct. (2)

- Use another thermometer
- Compare readings with other students
- Take more readings and compare

Suggest two ways to improve reliability of their investigation. (2)

- Take temp readings at more sites on the day / at more times in the day / on different days

Why is it important to collect data at the same time each day? (1)

- For comparison

Suggest two ways in which secondary data is more reliable than primary data collected by students. (2)

- Professional ppl - less error
- Measurements done with advanced instruments

Suggest why they decided to use six rain gauges at each location. (2)

- More results
- Avoid student error
- Calculate mean

Suggest reasons for the difference in temperatures between built-up and rural areas (4)

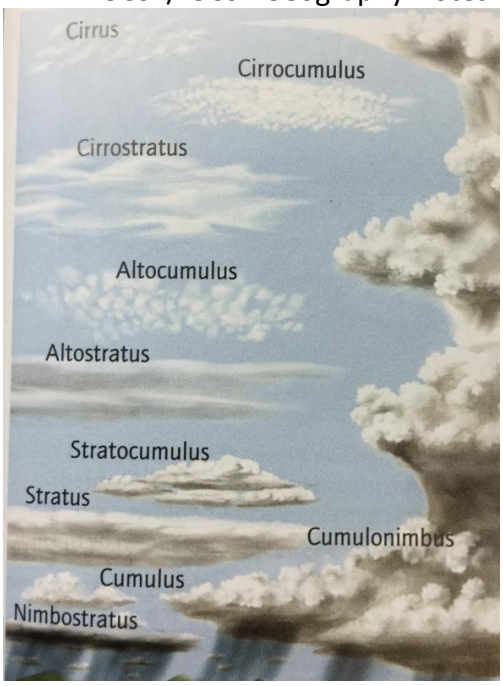
- In built-up area
- Concrete absorb radiate heat
- Air conditioning control temp
- In rural area
- Vegetation gives more shade
- More humidity in woodland
- Fluffy / flat bottomed / low
- Thick / thin
- Dark / grey / white
- Not much cloud

How data collected & recorded at digital weather station

- No need to visit station
- Signals & results are sent to a receiver in a building eg a computer

Clouds

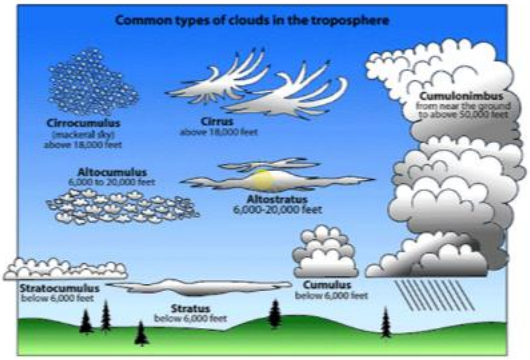
Describe cloud type and cover



Characteristics of clouds

Cloud types:

Cumulus: flat bases & heaped / lumpy tops/ like cotton wool. White. Fair weather.
Nimbus: raincloud
Cumulonimbus: heaped rainclouds linked with thunderstorms & heavy rain
Stratus: layers
Stratocumulus: layer and heaped low level clouds
Nimbostratus: Heavy layer of cloud which is dark. Brings continuous rain/drizzle
Cirrus: high altitude, thin like locks of hair. Made of ice crystals. Fair weather
Alto: high



Cumulonimbus clouds	• Tall, cauliflower & wide top, grey, flat & low base, thunder
Cumulus	• Like cotton wool, dense, domed tops
Cirrus	• High altitude, thin, wispy
Stratus	• Layer, uniform

Explain how clouds are formed (3)

- Overhead sun causes large amounts of evaporation & transpiration
- Air cools as it rises to upper atmosphere
- Lots of condensation occur
- Cumulus & cumulonimbus clouds form

Paper 4

Describe how students measure the amount of cloud cover and type. (4)

- Look at clouds
- Estimate how much sky is covered
- Measured in oktas
- Identify type of cloud from chart

Explain how and why an increase in amount of cloud cover might affect daytime temp (2)

- Reduce temp
- Clouds block sun's ray

2.5 Climate and natural vegetation

Tropical rainforest

What is the temp & rainfall of Equatorial climate (2)

- High temp all year / low temp range
- High annual rainfall
- No seasons

Explain why equatorial climates have low temp range. (3)

- Low temp range: small difference between highest & lowest
- Near equator
- Overhead sun with solar radiation concentrated over a small area is constant
- (Diurnal) Cloud cover trap heat at night

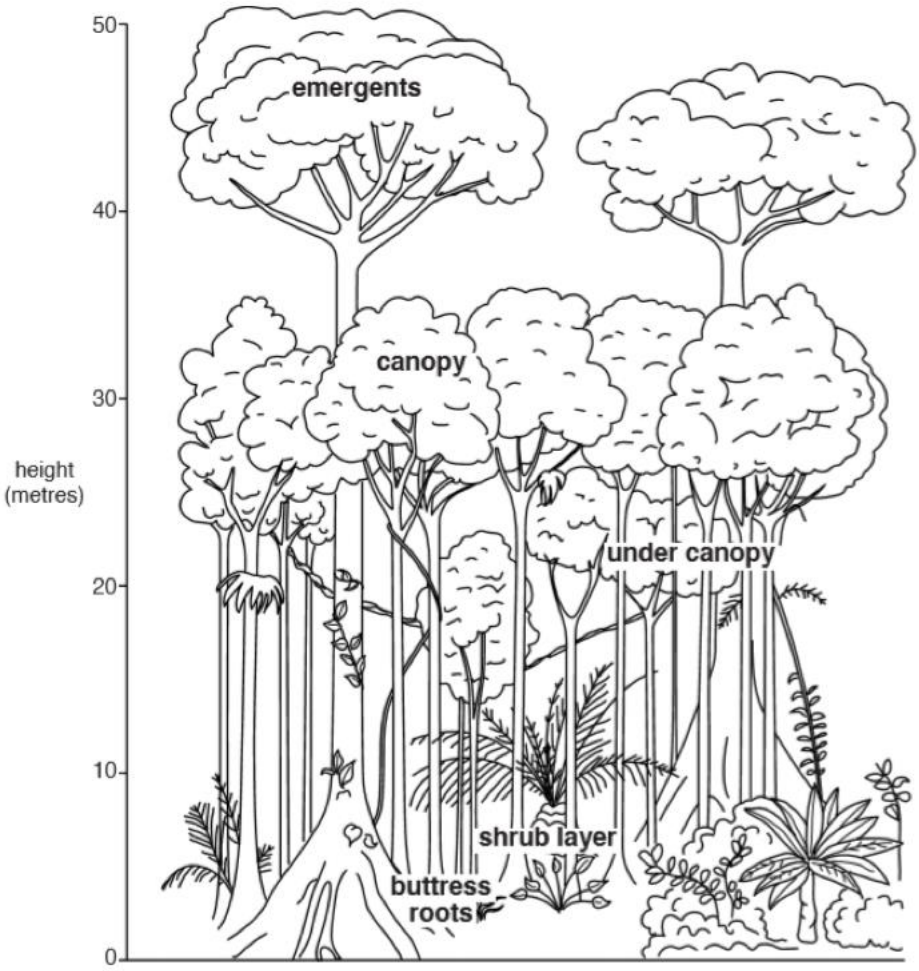
Explain why equatorial climates have large amounts of rainfall. (4)

Convectional rainfall

- Overhead sun cause large amounts of evaporation & transpiration
- Lead to high humidity
- Air cools as it rises to upper atmosphere
- Lots of condensation occur
- Cumulus & cumulonimbus clouds form
- Air mass cannot hold any more water
- Heavy rain occurs
- Repeated each day

Explain why some places have an equatorial climate. (4)

- Near Equator
- Overhead sun
- Convectional rainfall
- Low pressure (coz air is hot & rises)
- Large amounts of evaporation & transpiration



Explain relationship between climate & natural vegetation in TRF. (5)

- Lots of vegetation & rapid growth, evergreen coz high temp & constant rainfall all year, continuous growing season
- Tall (eg emergent trees) reach for sun
- Drip tip leaves - shed water
- Large leaves - absorb more sunlight
- Buttress roots (in emergent) - support tree & prevent it from falling over

Explain why there are many different types of plants & animals in TRF. (4)

- High rainfall, temp
- No seasons
- Optimum growing condition
- Variety of habitats for different species
- Large supplies of food
- Rapid nutrient cycling
- Little human disturbance

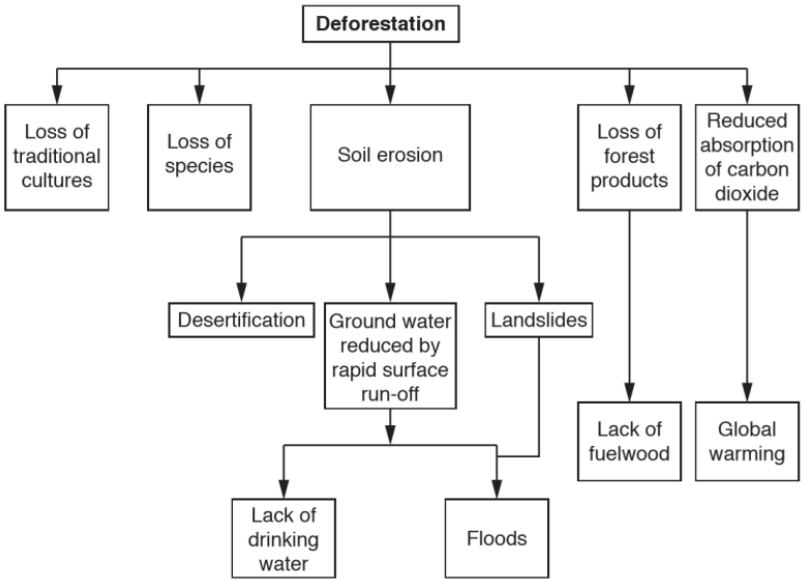
Explain how nutrients are cycled in TRF ecosystem. (3)

- Leaves fall to ground
- Decomposed by bacteria rapidly in hot & wet climate to form humus
- Humus mixed with soil & provides nutrients
- Nutrients absorb by plants

Deforestation

Give 3 reasons why deforestation has occurred. (3)

- Timer (make paper / logging)
- Agriculture / cattle ranching to meet demand
- Urban development (settlements, roads, dams)
- Mining



Explain how deforestation affects TRF ecosystem. (5)

- **Destruction of vegetation**
- Loss of habitats - loss of food sources - disrupt food chain - threat species extinction
- **Leads to soil infertile & erosion**
- Soil exposed by removal of trees
- Roots of plants no longer hold soil in place
- When rains, ↓ interception, large amounts of surface run off remove soil
- Reduce nutrient cycle
- ↓ decomposition from plants, ↓ humus bind soil, ↓ nutrients returned to soils

Explain how deforestation leads to flooding of local rivers in areas of TRF. (5)

- ↓ interception by vegetation
- Rain falls directly on to ground
- No trees roots absorb water
- Soil soon becomes saturated
- Surface of soil becomes impermeable
- Large surface run off occur
- Soil erosion occurs coz soil isn't held by roots & washed into rivers
- River channel fills & overflow

Explain why protecting rainforest from deforestation is important for local natural environment & for ppl who live in rainforest. (5)

- Prevent extinction of species, loss of habitat, soil erosion, desertification, flooding
- Maintain biodiversity
- Not destroy valuable medicines
- Attract tourists

Explain why tropical rainforest is important globally. (5)

- Create O_2 & reduce CO_2
- Reduce global warming, flooding risk
- Source of medicine & raw materials

Explain why it's difficult for LEDCs to reduce rate of deforestation. (3)

- Source of income

- Lack of gov legislation
- Exploitation by MNCs

Explain how tropical rainforests could be used sustainably. (4)

- Restrict logging
- Selective logging
- Afforestation
- Rubber tapping - latex collected used to make rubbery goods eg balls
- Education - ppl understand value of TRF
- Ecotourism - encourages tourism that creates jobs for local while ensuring money earned is used to protect TRF

Deserts

Define desert

- Area with annual precipitation < 250mm

Describe the climate of hot desert. (3)

- The annual precipitation is < 250mm
- High annual temp range
- Hot in summer (30-40°C)
- Cold in winter (15-20°C)
- Large diurnal temp range
- Low humidity

Explain why temp in tropical deserts vary during the year. (2)

- Angle of sun changes
- Overhead sun (Sept - March)

Suggest reasons why temp are high in Dec & January. (3)

- Near Tropic of Capricorn
- Overhead sun
- Inland location
- Small amount of cloud over

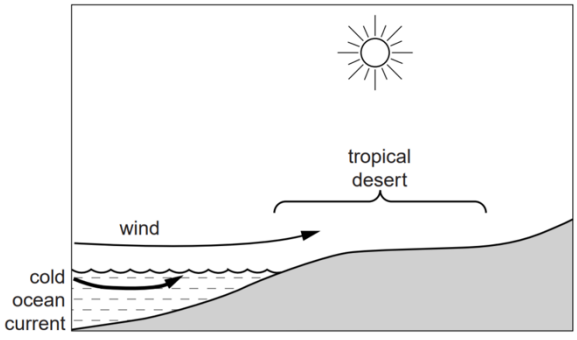
Explain why deserts have high diurnal range of temperature. (3)

- High daytime but cold night temp
- Lack of clouds allow high insolation during day & allows heat to escape at night
- Inland so no moderating influence of sea

Ocean currents

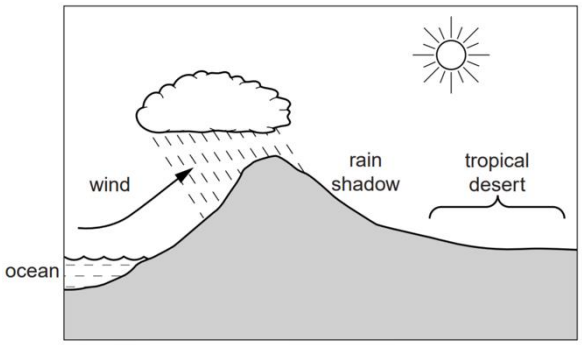
Explain how ocean currents result in formation of tropical deserts. (4)

- Winds blow across a cold ocean current
- Cold temp prevent air hold moisture
- Air cools above ocean and condensation occur at sea
- No rain falls along coast coz air mass warms up and decreases relative humidity, resulting in lack of clouds
- Dry air mass when reaches land



Rain shadow

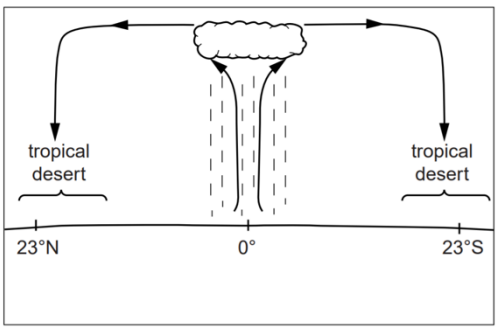
Explain why some tropical deserts are located in areas of rain shadow. (4)



- Prevailing wind blow from across land
- Air contains water vapour rises on windward side of mountain range
- Air cools
- Water vapour condenses & form clouds
- Precipitation on mountains
- Cool air sinks & warm up at leeward side
- No condensation takes place coz no moisture in air by the time it reaches desert

Hadley cell

Explain why many tropical deserts are located in areas close to Equator. (4)



- Air rises at Equator coz overhead sun
- Air cools as it rises
- High altitude air spends to north/south from Equator
- Cool air sinks & create high pressure at surface
- Air heats as it descends - so no condensation

Explain why desert doesn't receive much rainfall. (5)

- Close to Tropic of Capricorn
- (Ocean current, rain shadow, Hadley cell)

Explain why wind direction & distance from sea are important influences on desert climates. (4)

- Deserts are inland - so wind are dry by the time they reach them
- Trade winds blow over large areas of land before reaching desert - less moisture in air

Explain how plants & wildlife are able to survive in hot desert. (5)

Plants eg Joshua trees

- Low precipitation results in spares vegetation
- Waxy, narrow leaves - reduce transpiration
- Thorns - protect from predators
- Deep tap / wide shallow roots - access water supplies
- Light colours - reflect sunlight
- Thick stems - store water
- Plants remain dormant when no rain

Animals eg Gila monster

- Shelter in underground burrows - avoid heat
- Only come out to hunt at night - avoid heat
- Camouflage - protect from predators
- Fat accumulated for nutrition in tail - survive during hibernation
- Urinary bladder store water - prevent dehydration

Both TRF & TD

Explain how latitude & atmospheric pressure influence characteristics of equatorial & hot desert climates. (3)

- Both equatorial & desert is hot & doesn't have seasons coz low latitude & overhead sun at all times
- Equatorial - High rainfall coz low pressure & rising air
- Desert - low rainfall coz high pressure & falling air

Desertification

Define desertification (1)

- Process of land turning into desert as quality of soil declines over time

Explain how desertification occurs. (5)

- Less rainfall / long period without rain
- **Overcultivation**
- Less humus to bind soil
- Soil erosion
- **Overgrazing**
- Pop growth - larger desert area being farmed
- Herders have more animals stay in an area for longer, soil becomes compacted, restrict plant growth & root development
- **Removal of water from underground for industry**
- Leads to death of vegetation
- **Deforestation**
- Less roots to bind soil
- Soil erosion
- **Global warming**
- Droughts & less precipitation occur more often
- Over-exploited land can't recover

Ecosystem

Describe ways in which natural vegetation, soil & wildlife are dependent on each other. (3)

- Vegetation needs soil for growth
- Primary producers eat & get energy from plants
- Predators eat & get energy from animals
- Nutrients returned to soil from rotting vegetation / animals excretion

Clouds

Describe the processes which result in large amounts of cloud forming in areas of Equatorial climate (5)

1. Heating
2. Evaporation
3. Transpiration
4. Water vapour rises
5. Cooling
6. Condensation
7. Saturation
8. Convection

Explain why there are usually more clouds in areas with an equatorial climate than in areas with a hot desert climate. (5)

- More convectional rainfall at Equator
- Low pressure at Equator but higher at deserts
- Large amounts of evaporation & transpiration at Equator but less at deserts
- Deserts more distant from water bodies
- Winds to deserts are more likely to have blown over large areas of land

Explain why more clouds forms in tropical rainforest areas than in tropical deserts. (5)

- High humidity, pressure / more evaporation, vegetation, transpiration, condensation in TRF
- Air rises in TRP / sinks in desert

Explain why very few clouds form in tropical deserts. (5)

- Distance from oceans

- Winds blow over large areas of land
- Winds don't blow from sea hence no source of moisture
- Low humidity
- Lack of evapouration
- Sparse vegetation
- Lack of transpiration
- High air pressure
- Descending air

Case studies

Tropical rainforest - Ecuadoran rainforest, Ecuador, South America

Basic info	• Location - Amazon rainforest in eastern Ecuador • Average annual temp - 25°C • Annual temp range - 1°C • Average annual rainfall - 3411mm
Ecosystem	• One of most biodiverse places in world • 1350 species of animals eg jaguars • 2700 species of plants eg mahogany • Local tribes - indigenous ppl
Why deforestation has taken place?	• Mahogany to make furniture • Agriculture (palm oil) / cattle ranching (beef farming) - pop growth • Urban development (settlements, roads, dams) • Mining - clear forest to access resources eg gold in Amazon Basin • Dams - large area flooded to create dams
Impacts of deforestation	• Destruction of vegetation • Reduce biodiversity • Soil infertile & erosion • Flooding • Global warming • Conflict with local tribes (indigenous ppl) - depend for shelter & food to sustain way of life

Tropical deserts - Mojave desert, south west USA

Basic info	• Max monthly temp - 28°C in July • Min monthly temp - 8°C in Jan • Annual temp range - 20°C • Average annual rainfall - 160mm
Human activities	• Military bases - train soldiers / test large-scale weapons secretly • Roads - provide access for military bases & tourists • Cattle ranching • Tourism - 4 national parks, travel around by off road vehicles • Energy production - use solar panels coz reliable sunshine • Largest solar farm (200,000 mirrors) produce energy for 150,000 homes
Impacts	• Pop growth put pressure on limited water resources • Water extracted from underground faster than being replaced by rainfall • Cause underground water supplies to dry up • Disrupt food chains due to overgrazing by cattle ranching • Underground water polluted by mining operation

	• Off road vehicles damage vegetation & compact desert soils which leads to greater surface run off & soil erosion