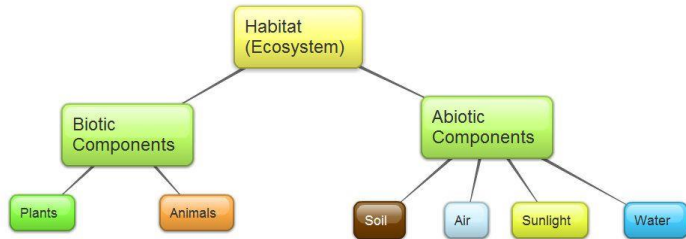


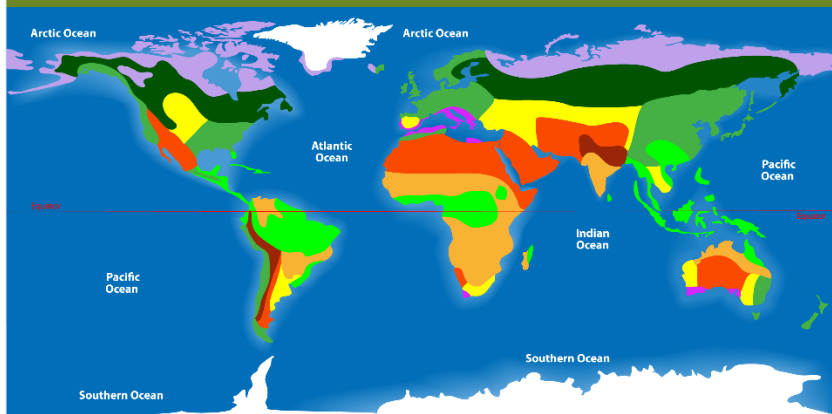
1. What is a desert?

- **Desert** – an ecosystem that receives less than 250mm precipitation (rainfall, snow, sleet)
- **Ecosystem** - made up of two parts, **biotic/living things** (plants animals and bacteria) and their **abiotic/non-living** surroundings (air, water, soil and climate).



- **Biome** - a biome is a large scale ecosystem. The Earth has many different biomes, with each one containing many different living plants and animals that have adapted to the environment.

The main biomes in the world



Ice sheet and polar desert	Mixed and deciduous forest	Savanna
Tundra	Tropical rainforest	Desert
Taiga	Steppe	Mediterranean vegetation
Montane (alpine tundra and montane forest)		

internet geography

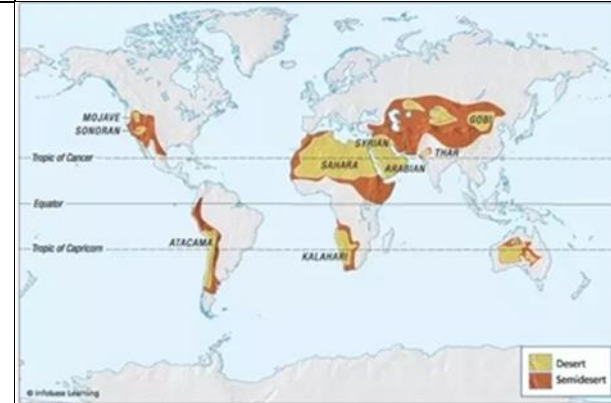
2. Where are cold deserts located?



- I can see cold deserts are located near the **poles** in both the northern and southern hemisphere.
- I can see cold deserts are found in **bands** in the far north and south of the Earth's surface.
- I can see cold deserts lie north of the **Arctic Circle** and south of the **Antarctic circle**.
- I can see **Antarctica** is the largest area of cold desert.
- I can see cold deserts are found on the **edges of North America, Europe and Asia**.



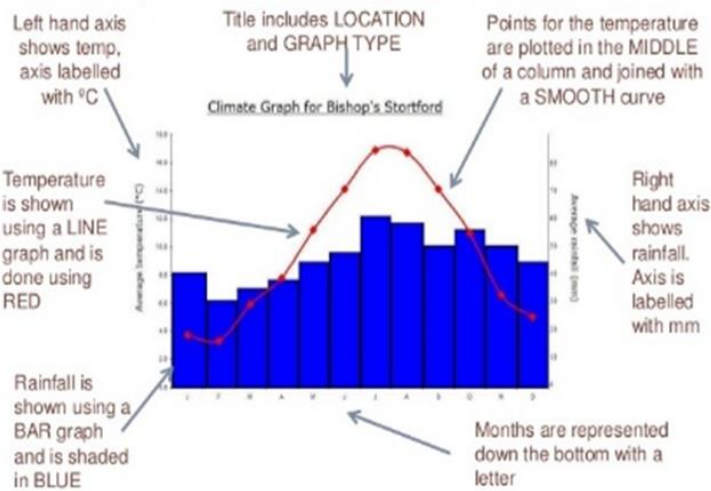
3. Where are hot deserts located?



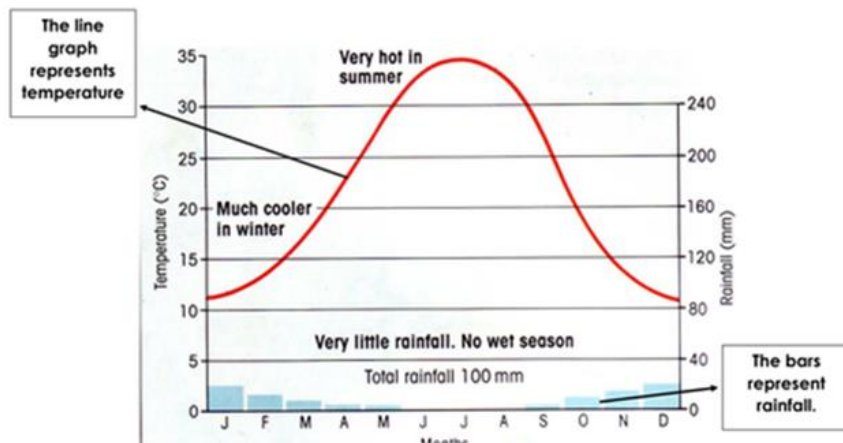
- I can see hot deserts are located **between 15° and 30°** north and south of the equator.
- I can see hot deserts are usually located near the **centre of continents**, away from the coast.
- I can see hot deserts are located in the **middle latitudes**.
- I can see the largest hot desert, the **Sahara**, is located in **northern Africa**.
- I can see other examples of hot deserts include the **Kalahari** in southern Africa, the **Atacama** in South America, the **Gobi** in Central Asia and the **Arabian** in the Middle East.



4. What is the climate like in hot deserts?



- Summer day time temperatures can **exceed 40°C**. However, at **night** the temperature can **drop below 0°C**.
- The climate is **very dry** with **less than 250 mm of rainfall a year**.
- Hot deserts have **two distinct seasons: summer**, when the temperature ranges between 35-40°C, and **winter**, when the temperature ranges between 20-30°C

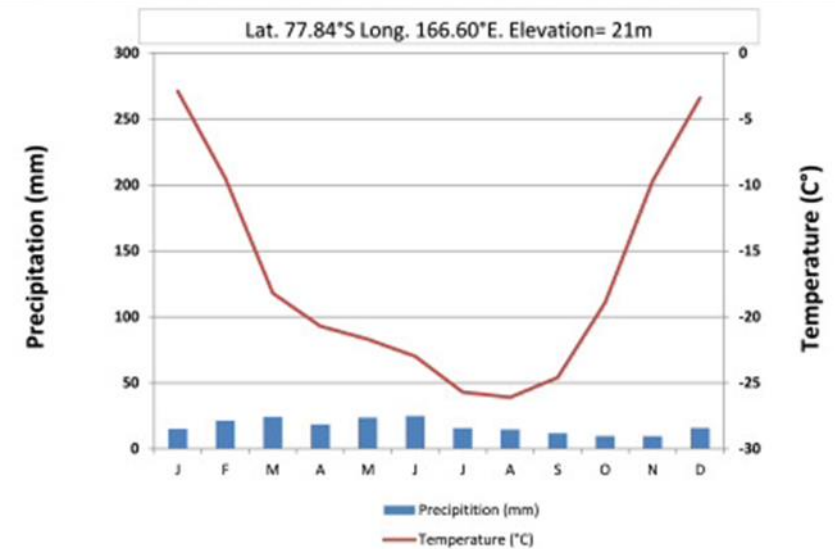


This is a climate graph. A climate graph uses a left AND a right axis because it is a bar chart and a line graph. The **bars** are shaded blue for **precipitation**. The **line** graph is red for temperature.

- A climate graph shows average temperatures and precipitation over a year

5. What is the climate like in cold deserts?

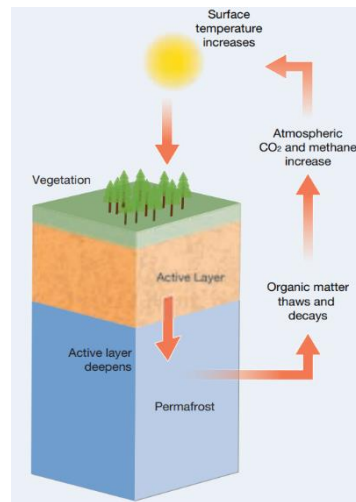
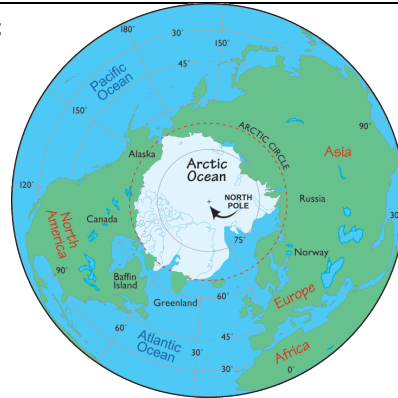
Climate Graph McMurdo Station, Antarctica



- **Temperatures** in cold deserts are **low all year round**
- **Precipitation** in cold deserts is **low all year round**
- **Antarctica** has the coldest land temperature recorded on the Earth of **-89.2°C**.
- The **average annual temperature** in Antarctica is around **-50°C**.
- **Precipitation** in Antarctica is mainly **snow**. In **coastal regions** about 200 mm can fall each year. In **mountainous regions** and on the East Antarctica plateau the amount is **less than 50 mm**.
- There are also **strong winds**, with recordings of up to 200 mph being made.
- In the **Arctic** the temperature typically **varies from approximately 3°C to -28°C**.
- The **wettest months** are between **June and September**.
- The **highest temperatures** are between **June and September**.
- The **coldest temperatures** are between **November and April**.

6. What are the features of the Arctic ecosystem?

- The **Arctic is the area within the Arctic Circle**, a line of latitude about 66.5° north of the equator. Within this circle are the **Arctic ocean basin** and the northern parts of **Scandinavia, Russia, Canada, Greenland**, and the U.S. state of **Alaska**.
- The Arctic is **almost entirely covered by water**, much of it frozen. Some frozen features, such as glaciers and icebergs, are frozen freshwater.
- Some parts of the ocean's surface remain frozen all or most of the year. This frozen seawater is called **sea ice**.
- **Permafrost** - a layer of subsoil, or the layer of subsoil directly under the surface that is **permanently** frozen. In other words, the ground is permanently frozen. Nothing is able to penetrate the permafrost.
- **Climate** – strong, cold winds, a small amount of precipitation (rain, snow, sleet and hail), low levels of sunlight, low temperatures



Pools of Water in the Tundra

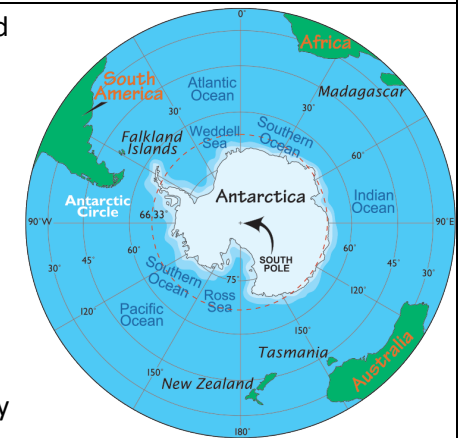
- During the summer, even though the summer days are very short, the water gets through the top layer of soil, but isn't able to get through the permafrost.
- This forms pools of water on the surface of the permafrost.

Biotic parts of the Arctic ecosystem include:

- **Plants** – low growing heaths and mosses able to withstand the climate
- **Animals** – Polar Bears, falcons, insects and fish

7. What are the features of the Antarctic ecosystem?

- Antarctica is the highest, whitest, driest, coldest and windiest **continent** on Earth.
- It is located within the **Antarctic Circle** approximately 66.5° south of the equator.
- Antarctica is not owned by anybody and has no permanent residents although between 1000 and 4000 scientists work there for throughout the year.
- Antarctica has marine ecosystems and terrestrial (land-based) ecosystems.
- **Terrestrial life** is limited to the very small.
- There are no trees or shrubs, so vegetation is mainly mosses, lichens and algae.
- Mites and microscopic organisms like nematodes and bacteria live in the soil.



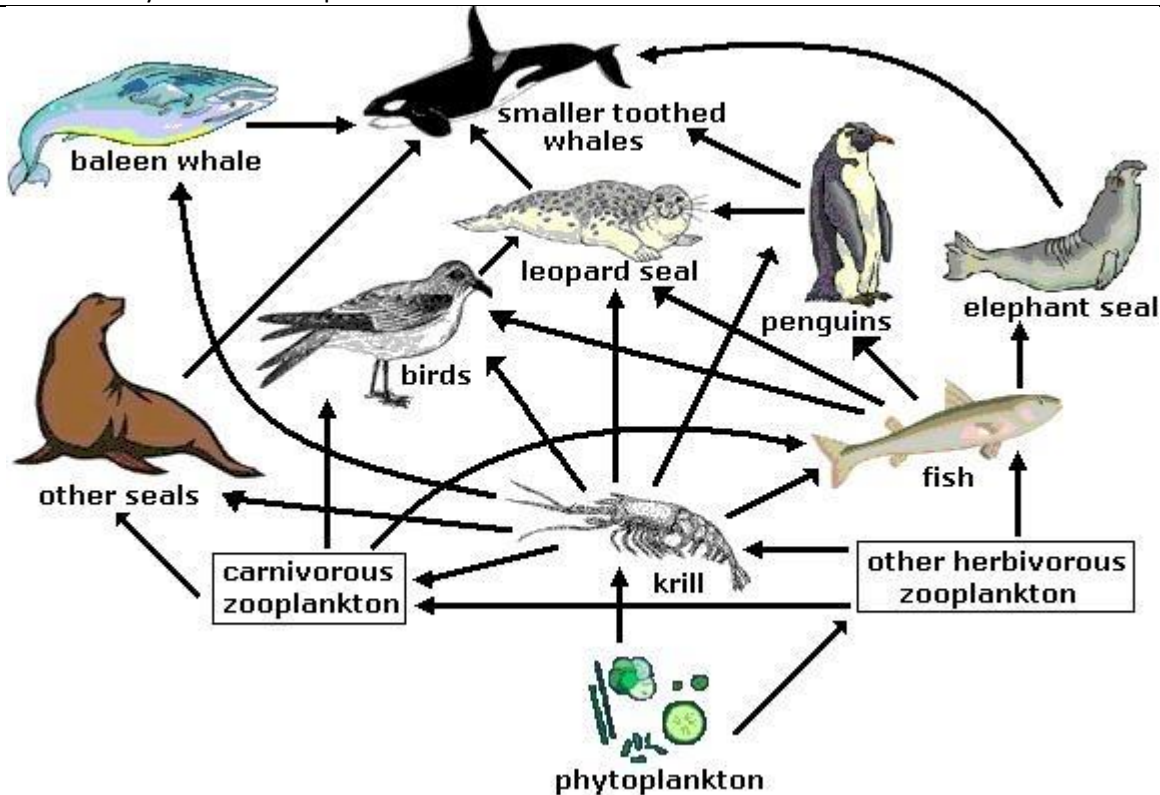
Marine ecosystem

- Antarctic seas are extremely productive because phytoplankton grows abundantly during the extended daylight of summer and feeds huge populations of krill.
- Krill, shrimp-like crustaceans, are a key animal in this ecosystem, as food for top predators: whales, penguins, and seals.

Abiotic parts of the Antarctic ecosystem include:

- **Ice** - Antarctica is covered in ice because of its extremely cold weather. The Antarctic ice sheet covers 98% of Antarctica.
- **Ocean** - most animals in Antarctica live in the ocean. Temperature of the surface of the ocean is near its freezing point. In winter the surface would be covered by ice or snow.
- **Climate** - temperatures are 50° below zero for peak conditions, six months with sunlight and six months without. Less than half an inch of rainfall which is needed to keep the sea ice over 1.6 kilometers thick.
- **Biotic** parts of the Antarctic ecosystem include:
 - **Plants** – vegetation at Antarctica is limited to around 350 species of mostly **lichens, mosses, and algae**.
 - **Animals** - various **sea birds, seals, and penguins** are often seen in Antarctica such as the Emperor Penguin, Adelle Penguin, **Orcas, Humpback whales, Weddell seals and Leopard seals**.

8. Why are krill so important to the Antarctic food chain?



- The **Antarctic Food Web** is relatively simple compared to ecosystems in other parts of the world. There are **fewer different species**, but **greater numbers of individuals** of each. The second most numerous large mammal in the world (after man) is the crab-eater seal.
- A **key part of the Antarctic food web** are **krill** small shrimp-like crustaceans that the **great majority of Antarctic animals, seal, whales, penguins and other birds, fish etc. feed upon.**
- If the number of krill was reduced then the number of all the animals which rely on krill for food would be **decreased** as would lose a source of food. This could reduce their numbers.
- The number of **phytoplankton would increase** as there would be fewer consumers eating them.

9. What key words do I need to know?

- **Food chain** – a food chain shows the different species of an organism in an ecosystem, and what eats what.
- It shows how plants and animals get their energy.
- A food chain always starts with a **producer**, an organism that makes food.
- This is usually a green plant, because plants can make their own food by **photosynthesis**.
- A food chain ends with a **consumer**, an animal that eats a plant or another animal.
- **The arrows in food chains show the way in which energy is moving. They do not show what eats what.**
- **Food web** - a food web is all of the food chains in an ecosystem.
- **Environment** - all the conditions that surround a living organism.
- **Habitat** - the place where an organism lives.
- **Population** - all the members of a single species that live in a habitat.
- **Community** - all the populations of different organisms that live together in a habitat.
- **Ecosystem** - a community and the habitat in which organisms live.
- **Producer** – organisms that use photosynthesis to capture energy from sunlight, water and carbon dioxide to create carbohydrates.
- **Consumer** – creature that eats herbivores and/or plant matter.
- **Decomposer** - an organism such as a bacterium or fungus, that breaks down dead tissue, which is then recycled to the environment.



10. Where is Siberia?

- Siberia is a vast region of Russia, located East of the Ural Mountains.
- Siberia covers over $\frac{3}{4}$ of Russia.
- Around 144.5 million people live in Russia but only 33.7 million live in Siberia. This means that Siberia is very **sparsely populated**.
- The largest city in Siberia is Novosibirsk with a population of 1.6 million.
- Siberia has a very varied climate due to its immense size. However, it typically has short summers and long, brutally cold winters. The average temperature in Siberia is just 0.5°C.
- The coldest temperature ever recorded in Siberia was -71.2°C making Siberia the coldest permanently inhabited place on Earth.
- The Siberian tundra is largely made up of permafrost – soil, rock or sediment that remains frozen year-round.



11. Who are The Nenets People and how do they survive in Siberia?

- The Nenets are an indigenous tribe that live in Siberia.
- They farm reindeer which they use for transportation, food and clothing.
- Every year The Nenets people migrate over 800 miles, crossing frozen rivers and lakes, with their gigantic reindeer herds from their summer pastures in the North to winter pastures south of the Arctic Circle.
- They live a simple and traditional way of life where they make use of and live off of the land.
- They under threat from climate change and resource extraction. They must change their migration routes to go around areas where gas and oil are being extracted. They must also find a way around rivers and lakes which no longer freeze due to climate change.
- The rising temperatures also affect the tundra’s vegetation – the reindeer’s only source of food.



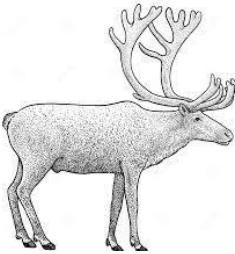



12. How does Siberia benefit from tourism?

- Siberia is a popular tourist destination
- The 5772-mile-long Trans-Siberian Railway connects Moscow in the West to Vladivostok in Russia’s far-East.
- Tourism brings many economic and social opportunities to Siberia.
- Tourism provides jobs to many Siberians and the money spent by tourists helps the Siberian economy to grow.



13. What threats does Siberia face?

- Siberia is rich in natural resources such as coal, oil, natural gas, diamonds, iron ore, and gold
- Mining creates jobs and income for people in Siberia
- Mining creates taxes for the Russian government
- Resource extraction contributes to climate change
- Rising global temperatures may melt the Siberian permafrost. Permafrost contains methane, a greenhouse gas.
- When permafrost melts it releases the trapped methane into the atmosphere, further adding to climate change.
- The Nenets people have had to change their migration routes to go around rivers and lakes that no longer freeze in the winter. Their reindeer also have less and less vegetation to eat each year.
- Climate change, resource extraction and melting permafrost also threatens the Siberian tourism industry. Were the natural beauty of Siberia to be spoiled it is likely that far less tourists would visit.

<p>14. How have animals adapted to live in Siberia?</p> <p>Caribou:</p> <ul style="list-style-type: none"> • Warm, thick coat to keep them warm and to protect them from insect attacks in the summer. • Large, fur-covered hooves to distribute their weight on the snow and ice and to increase grip. • Compact, stocky body to avoid losing heat. • Specially adapted to eat and digest lichen – a common fungus found in the tundra.  <p>Polar bear adaptations:</p> <ul style="list-style-type: none"> • <i>Translucent</i> fur that allows sunlight to reach their black skin below to warm them. • A white appearance that acts as camouflage to allow the polar bear to hunt its prey more effectively. • Thick layers of fat and fur to keep the polar bear warm. • Large paws to distribute their weight on the snow and ice and to increase grip. 	<p>15. Where is The Sahel?</p> <ul style="list-style-type: none"> • The Sahel is a region in Africa. It is located South of Sahara Desert and runs in a from West to East. • The Sahel runs through of the world’s least developed countries such as Mauritania, Mali, Niger, Sudan and Eritrea. • The climate of The Sahel is arid. It is typically hot, dry somewhat windy. It is similar not quite as extreme as, the Sahara Desert located just North of it. • The Sahel covers an area of around 3 million km². It has a population of around 100 million and is experiencing rapid population growth.  <p>North the band some Chad, semi-and to, but</p>
<p>16. What is desertification?</p> <ul style="list-style-type: none"> • Desertification is the process whereby fertile land turns into hot, dry desert as a result of deforestation, drought or climate change. (Fertile land = land where you can grow crops). • Desertification can also be caused by human factors. • The rising population of The Sahel means that the land is farmed more intensively which removes nutrients from the soil and removes the natural vegetation which helps to defend against desertification. Animals also eat this vegetation, and many cut it down to use for firewood. • This means that the Sahara Desert is slowly creeping South into The Sahel, turning it into a dry and barren land where nothing can grow and it is almost impossible to farm. 	<p>17. What are the impacts of desertification?</p> <p>Social:</p> <ul style="list-style-type: none"> • People are forced to migrate, with many people - young men in particular, leaving to work in cities and towns. This puts pressure on already limited urban resources. • Disputes occur over land between herdsmen and farmers. • Food shortages lead to malnutrition and famine, eg. in Ethiopia. • This also results in increased migration to refugee camps. <p>Environmental:</p> <ul style="list-style-type: none"> • As vegetation is removed the roots are no longer able to bind the soil together and the soil becomes vulnerable to wind erosion. • The fertile topsoil is easily blown away. • The land becomes infertile, turning to desert. • Soil quality is also greatly reduced making it very difficult to grow crops. <p>Economic:</p> <ul style="list-style-type: none"> • As the land becomes unproductive, farm income falls. • This leads to widespread poverty and an increased reliance on overseas aid.

<p>18. What are the responses to desertification? The Great Green Wall</p> <p>The Great Green Wall:</p> <ul style="list-style-type: none"> • A 4,000-mile-long line of acacia trees has been planted across The Sahel to hold back desertification. • Acacia trees are hardy and can grow in low quality, dry soil. • They nourish and strengthen the soil, allowing crops to be planted again and preventing the soil from being washed away. • They act as a barrier to the wind offering further protection. • This method is a use of appropriate technology as it is affordable, sustainable and highly effective. 	<p>19 What are the responses to desertification? Stone Lines</p> <p>Stone lines:</p> <ul style="list-style-type: none"> • Long lines of natural stone trap what little rainfall The Sahel receives as well as the nutrients within it which nourishes the soil and makes it easier to grow crops. • They also help to stop the soil washing away as the rainwater and soil are trapped behind the stone lines, nourishing and protecting the soil. • Stone lines are also appropriate technology as the method is simple, cheap, highly sustainable and requires little skill.
<p>20 How have animals adapted to live in hot deserts?</p> <p>Camel adaptations</p> <ul style="list-style-type: none"> • Wide feet - Spreads weight and helps it walk upon the sand. • Eyelids - 2 layers to stop sand blowing in eyes. • Fat stored in hump - Stores food and fat to help it go longer between meals. • Fur on back- Keeps heat out during the day and keeps heat in at night. • Long intestines / stomach - Allows it to absorb as much water as possible from its food. • Long legs - Help them to walk long distances to water holes across the hot sand. <div data-bbox="273 882 880 1262" data-label="Image"> <p>How have camels adapted to life in deserts?</p> <ul style="list-style-type: none"> Thick fur & underwool – warmth at night & insulation against sun in day Fat Stored in humps – energy reserve Two rows of eyelashes– protects against sand & sun Concentrated urine to retain as much water as possible Nostrils can be closed to keep out sand Broad, flat leathery pads on hooves to spread out weight on sand Thick leathery patches on knees to protect when resting on hot sand Long, strong legs – carry heavy loads & body further away from sand </div>	<p>21 How have plants adapted to live in hot deserts?</p> <ul style="list-style-type: none"> • Plants in deserts are called Xerophytes. • They are round in shape to store water, have no leaves (spikes to protect themselves) and so they do not lose moisture due to the small surface area of their spikes. • They have long roots to get to any water available deep down in the ground. <div data-bbox="1368 798 1895 1204" data-label="Image"> <ul style="list-style-type: none"> Small surface area minimises evaporation Spines instead of leaves Stems that can store water Widespread root system </div>