

HOT AREAS: THE SAHARA DESERT

LINKS TO NATIONAL CURRICULUM

Science

- Identify that most living things live in habitats to which they are suited and describe how different habitats provide for the basic needs of different kinds of animals and plants, and how they depend on each other (*Year 2, Living things and their habitats*).
- Identify and name a variety of plants and animals in their habitats (*Year 2, Living things and their habitats*).
- Recognise that environments can change and that this can sometimes pose dangers to living things (*Year 4, Living things and their habitats*).

Geography

- Identify.....the location of hot and cold areas of the world in relation to the Equator and the North and South Poles (*Key stage 1*).
- Identify the position and significance of latitude, longitude, Equator, Northern Hemisphere, Southern Hemisphere, the Tropics of Cancer and Capricorn, Arctic and Antarctic Circle (*Key stage 2*).
- Develop contextual knowledge of the location of globally significant places - both terrestrial and marine - including their defining physical and human characteristics..... (*Key stage 3*).
- Extend their locational knowledge and deepen their spatial awareness of the world's countries.....focusing on their environmental regions, including polar and hot deserts..... (*Key stage 3*).
- Understand how human and physical processes interact to influence, and change landscapes, environments and the climate (*Key stage 3*).

KEY LEARNING OBJECTIVES

1. Where are the hot and cold areas and why?
2. What is it like in the Sahara Desert?
3. How are animals in the Sahara adapted to their environment?
4. How are humans affecting the Sahara region?

Note to Teachers

- These teaching notes run alongside a Powerpoint presentation and all slides are referred to in the notes.
- The notes are designed to provide key information and suggested activities to help teachers deliver the topic, whilst the presentation is full of effective images that will bring the topic to life for students in the classroom.
- Can be adapted to suit different ages of students by adding/deleting slides on the presentation and/or varying the level of detail used from the teacher notes.

HOT AREAS: KEY WORDS GLOSSARY

Equator - an imaginary line around the Earth. Everywhere on the Equator is equally distant from the North Pole and the South Pole.

Northern Hemisphere - the half of Earth that is north of the equator.

Southern Hemisphere - the half of the Earth that is south of the equator.

North Pole - the most northern point of the earth.

South Pole - the most southern point of the Earth.

Arctic Circle - a special line of latitude that forms a circle around the North Pole (approximately 66.5 degrees north of the Equator). Anything north of this imaginary circle is in the Arctic.

Antarctic Circle - a special line of latitude (approximately 66.5 degrees south of the Equator). Anything south of this imaginary circle is in Antarctica.

Polar Regions - the regions of the Earth surrounding the North and South Poles.

Weather - the daily state of the atmosphere in any given place (in regard to heat or cold, wetness or dryness, calm or storm, clearness or cloudiness).

Climate - the average of the weather conditions in an area over a long period of time (usually 30 years).

Desert - a dry land with few plants and little rainfall. There are both hot and cold deserts.

Precipitation - water that falls to the earth as hail, mist, rain, sleet, or snow.

Condensation - the process of changing from a gas into a liquid (by cooling).

Evaporation - the process of changing from a liquid to a gas (by heating).

Transpiration - the process by which plants give off water vapour through openings in their leaves

Evapotranspiration - loss of water from the soil both by evaporation and by transpiration from the plants growing there.

Arid - very dry, having less precipitation than is needed to support most trees or woody plants. If land has an arid climate it is usually a desert.

Semiarid - partially arid and characterized by light rainfall.

Hyper arid - extremely arid.

Sand dunes - hills made of sand. They can reach over 500 feet tall in the Sahara.

Ergs (sand seas) - large areas covered with sand dunes.

Hamada - hard and barren rocky plateaus.

Oasis - any area in a desert that has a supply of freshwater and where plants can therefore grow.

Wadi - the bed or valley of a stream that is usually dry except during the rainy season and that often forms an oasis.

Dust devil - a small area of rapidly spinning wind (whirlwind) that contains sand or dust.

Desertification - when land gradually changes into desert.

The Sahel - a belt of semi-arid tropical savanna around the Niger River valley.

Savanna - land in warm regions (e.g. Africa) that is covered with grass and only a few shrubs and trees.

Nomadic - having no permanent home but moving from place to place usually in search of food or to graze livestock.

Sedentary - living in one place instead of moving to different places.

Irrigation - the artificial supply of water to agricultural land.

Adaptation - the process of change by which an organism or species becomes better suited to its environment.

Succulent - a plant with fleshy, thick tissues adapted to water storage.

Climate Change - changes in the Earth's weather patterns.

Global warming - a raising of average global temperatures that is thought to be a result of increased levels of certain gases e.g. carbon dioxide and methane in the atmosphere.

Greenhouse effect - when warmth from the sun is trapped in the Earth's atmosphere by a layer of gases (such as carbon dioxide), leading to the warming of the Earth's surface and the air above it.

Greenhouse gas - any of various gaseous compounds (such as carbon dioxide) that contribute to the greenhouse effect.

Drought - a long period of time during which there is very little or no rain.

Soil Erosion - the wearing or washing away of soil due to factors such as water and wind.

Endangered species - any type of plant or animal that is in danger of disappearing forever.

Extinct species - occurs when there are no more individuals of that species alive anywhere in the world - the species has died out.

1. WHERE ARE THE HOT AND COLD AREAS?

SUGGESTED STARTER ACTIVITIES

1. Hotter and Colder Experiences (Slide 4)

Ask the students if they have visited a part of the world where it was much hotter or colder than it is in the UK. Locate these areas on a world map and share their experiences of what it was like to be in a hotter or colder place. Or you could use the contrasting photos on slide 4 to prompt discussion about the differences between hot and cold places.

2. Labelling the World Map (Slide 5)

You could use the map on this slide or ask the students to look at a world map in an atlas to complete this task. It is also useful to show the children a globe and point out the lines that go around it. On a map, they don't look like circles as the map is flat, but when they look at a round globe they will see that they are circles that go the whole way around the Earth.

On an outline of a world map (page 8) help them label the following:

- The UK
- Lines of latitude and longitude
- Equator
- Tropic of Cancer
- Tropic of Capricorn
- Arctic Circle
- Antarctic Circle
- Northern Hemisphere
- Southern Hemisphere
- North Pole
- South Pole
- Arctic
- Antarctica

Shade the following (and include a key):

- A country/region that is very hot (shade in red)
- A country/region that is very cold (shade in blue)

Able students could shade more hot and cold areas.

TEACHER INPUT

Slide 5: Using their labelled and shaded maps (or using the map on the slide) , ask the students if they notice anything about where the hot and cold parts of the world are. Hopefully they will notice that hot countries are near the **Equator** and cold countries are near the **Poles** (prompt if necessary).

Slide 6: The **Equator** is an imaginary line around the Earth. Can they name the continents that the Equator 'runs through'? Temperatures on the Equator are very high.

Slide 7: The **North Pole** is the most northern point of the Earth and the **South Pole** is the most southern point. Temperatures are very low at both.

Slide 8: Ask whether anyone can explain why closeness to the Equator or Poles affects how hot or cold the **climate** is? At the **Equator**, the sun stays almost directly overhead everyday. This means the sun's rays come in at a steep angle so they are concentrated over that area and temperatures are always high. At the **Poles**, the sun's rays strike the Earth at a very low angle, so they are spread out over a greater area and temperatures are icy cold. Also, ice makes these regions even colder by reflecting the sun's light and heat back into space.

What is a Desert?

Slide 9: A desert is any large region that gets very little rain each year. Average annual precipitation ranges from almost zero to 400mm. Some authorities claim true deserts have less than 250mm and those with 250-400mm are semi-deserts.

For a detailed YPTE fact sheet on deserts, please see here:

<http://ypte.org.uk/factsheets/desert-regions/what-is-a-desert>

There are hot and cold deserts:

Hot deserts - mostly found in the sub-tropics. They are very hot (but usually cold at night) and dry, with limited plant life. The Sahara is the largest and hottest hot desert in the world.

Cold deserts - areas covered in ice and snow that occur in temperate areas at higher latitudes than hot deserts e.g. the Patagonian Desert in South America and the Gobi Desert in Asia. Cold deserts can also be found close to the Poles - which is why they can also be known as '**polar deserts**'. Antarctica is the world's largest cold desert.

Where Are Hot Deserts Located and Why? (More advanced, KS3)

Slide 10: Most hot deserts are found between 15-30° north and south of the **Equator**. On the map, they are the yellow areas.

Slide 11: So what causes hot deserts to form where they do?

- At the Equator, warm, moist air rises. It cools, condenses and forms rain.
- The air then moves north and south until it gets to about 30° north and south of the Equator, where it sinks.
- The air that is sinking is dry, so no condensation can form and there is no rain. This is known as the **Hadley cell**.

SUGGESTED ACTIVITIES

Crossword Puzzle (see page 9)

This checks understanding of key terms covered in this section.

Annotated Diagram

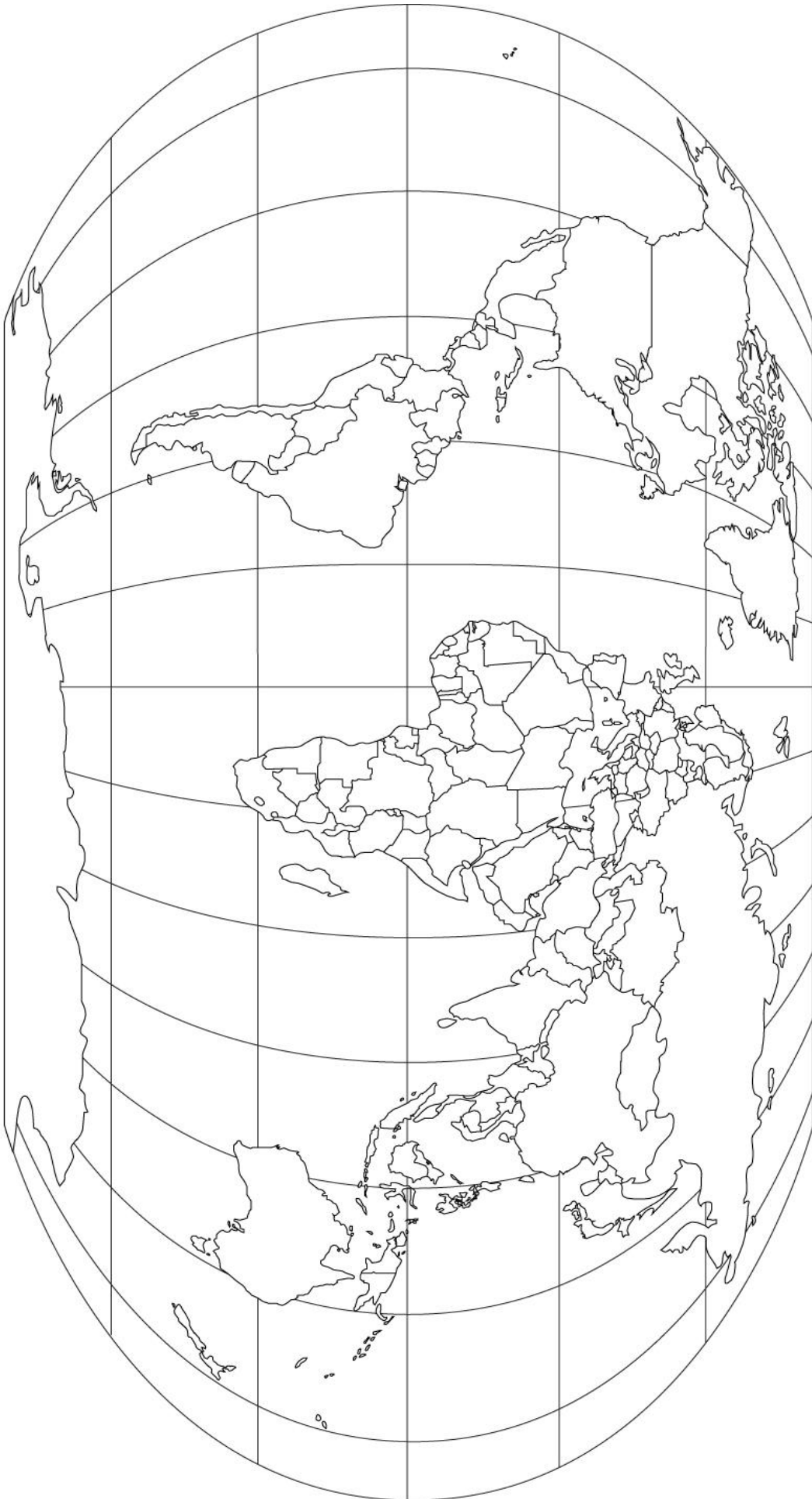
Draw a diagram showing why places near the Equator are hot and places near the Poles are cold. Annotate your diagram clearly.

Hot Deserts of the World

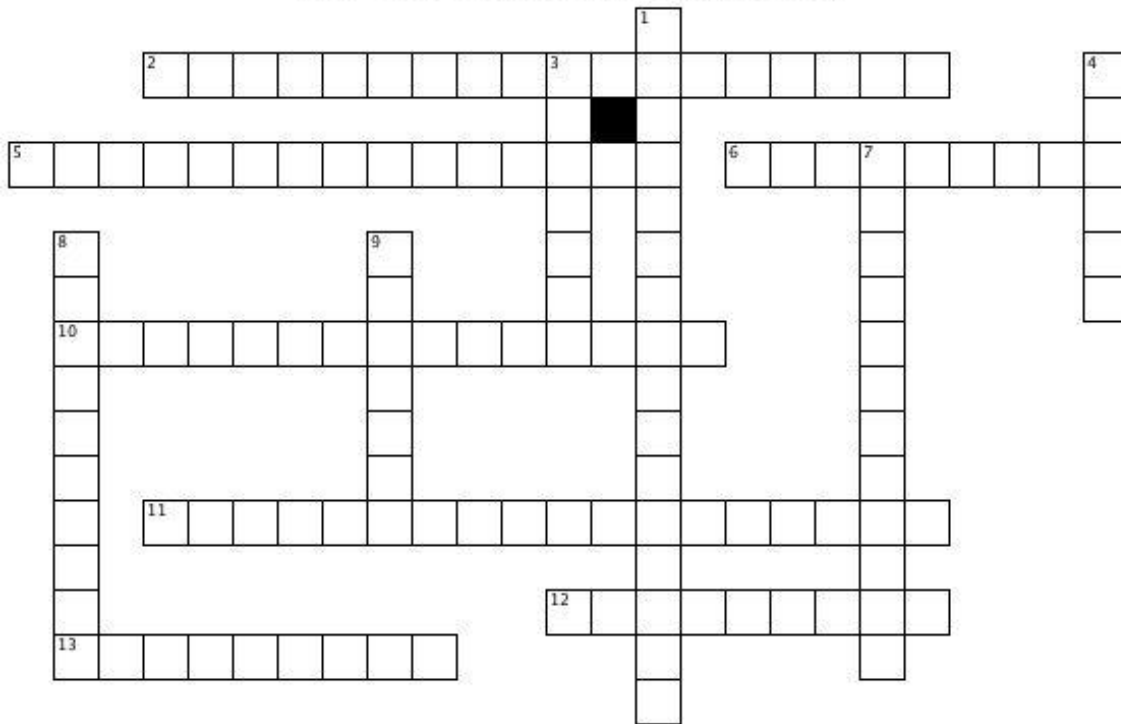
Research the hot deserts of the world e.g. the Sahara Desert, Arabian Desert, Kalahari Desert and Great Victoria Desert. Shade and label them on an outline world map (page 8).

Extra Challenge

Explain why most hot deserts are found between 15-30° north and south of the Equator. You could use a labelled diagram to help you do this.



Hot and Cold Areas: Key Words



Across

2. What do we call the bottom half of the Earth?
5. What do we call the imaginary lines that circle the Earth in an east-west direction (parallel to the Equator)?
6. What do we call the cold region around the South Pole?
10. What do we call the imaginary circle around the Earth that is 66.5 degrees south of the Equator?
11. What do we call the top half of the Earth?
12. What do we call the most southern point of the Earth?
13. What do we call the most northern point of the Earth?

Down

1. What do we call the imaginary lines that run from the top of the Earth to the bottom?
3. What do we call the imaginary line around the middle of the Earth?
4. What do we call the cold region around the North Pole?
7. What do we call the special line of latitude that forms a circle around the North Pole?
8. What is the word we use to describe how a body part, feature or behaviour helps a living thing survive better in its environment?
9. What is the word we use to describe the usual weather conditions in a particular place?

2. WHAT IS IT LIKE IN THE SAHARA?

SUGGESTED STARTER ACTIVITY

Desert Perceptions

Ask students about their image of a desert and discuss their ideas:

- What words would they use to describe a desert?
- What would it feel like to be in a desert?
- What plants and animals would they see?
- Who would they meet there?

Feeling Hot Hot Hot!

Ask students what it feels like to be very hot. What can happen to your body when you get very hot or don't have enough to drink? What would you wear and what would you take with you if you were going to spend a day and night in the desert?

TEACHER NOTES

The Largest Hot Desert

Sahara is an Arabic word which means '*the greatest desert*'. The Sahara is the largest **hot desert** on Earth. It is the third largest desert overall, after Antarctica and the Arctic, which are **cold deserts**. Other major hot deserts include the Arabian Desert in the Middle East and the Kalahari Desert in Africa.

Location and Size

Slide 13: The Sahara Desert is huge! It covers an area of over 3.6 million square miles - that's 8% of the world's land area and 31% of Africa. If the Sahara were a country it would be the 5th largest in the world (only slightly smaller than the United States).

The Sahara covers much of North Africa from the Atlantic Ocean to the Red Sea. North is the Mediterranean Sea and south is the **Sahel** region that sits between the desert and the African **savanna**. The Sahara Desert covers large sections of 11 different countries - Egypt, Libya, Tunisia, Algeria, Morocco, Western Sahara, Mauritania, Mali, Niger, Chad and Sudan.

History

Slides 14-15: The Sahara hasn't always been **arid**. It is thought that between 5,000 to 11,000 years ago it was a lush region with green vegetation, abundant

wildlife and many bodies of water in the area - known as the African Humid Period. But it began to dry up around 4,000 years ago. Scientists think this was due to a gradual change in the tilt of the Earth's orbit.

Rock paintings and engravings from the time were found by explorers in the mid 1800s. These images included animals that were hunted or were in their surrounding area including hippos, rhinos, elephants, giraffes and large antelopes that roamed a once-lush Sahara. Many of those animals no longer exist in the Sahara due to changes in climate.

Landscape

Slides 16-17: Many people have an image of the Sahara as being a vast sea of sand dunes (ergs). But in fact, only fifteen percent of the Sahara consists of sand "seas"; the rest is a mixture of hammada (barren rocky plateaus), coarse gravel, two mountain chains in the central regions (with the highest point being 11,204 feet [3,417 m] at the peak of Emi Koussi in Chad), low lands, depressions (the lowest point being 436 feet [133 m] below sea level at the Qattara depression in western Egypt), oases, and transition zones.

Slide 18: There are only 2 permanent rivers in the Sahara - the Nile and the Niger. Apart from these, rivers and streams are irregular or seasonal.

Slide 19: Underground rivers from the Atlas Mountains help create nearly 80,000 square miles of **oases**. They can provide habitat for animals and even humans if the area is big enough.

Slide 20: There are a number of mountains and mountain ranges rising from the Sahara Desert. The highest point at 3,445 m above sea level is the volcano Emi Koussi in the Tibesti Mountains in Chad.

Climate

The Sahara Desert has one of the world's most severe climates - almost no rainfall, powerful warm winds and wide temperature ranges:

1. Temperature

Slides 21-22: The Sahara is the hottest large area on Earth and the hottest place on Earth in some areas during the summer. Average temperatures during the summer months are between 100.4°F and 114.8°F. In some areas the temperature can exceed 120°F for several days in a row - that's very hot indeed! But the temperature can drop rapidly at night, sometimes to below freezing.

This is because there are no clouds or plant life to keep the heat in, so it begins to cool as soon as the sun goes down.

2. Rain

Slide 23: It rarely rains in the Sahara. Half of the Sahara receives less than an inch of rain per year and the rest receives up to 4 inches. Some regions can go years without seeing a drop of rain. But when the infrequent rains come, they are often torrential.

3. Wind

Slide 24: The Sahara's north-easterly winds can reach hurricane level and often give rise to **sandstorms** and '**dust devils**' (small whirlwinds that make spinning columns of sand).

People

Slide 25: Long before recorded history, the Sahara was more widely occupied. Stone artifacts, fossils, and rock art have been found widely scattered through regions that are now far too dry for people to live in. Some powerful civilisations have formed in the Sahara e.g. the ancient Egyptians.

Slide 26: Today only around 2.5 million people live in the Sahara - this is because the lack of water, high daytime temperatures and sometimes freezing conditions at night make it an extremely dangerous and difficult place for humans to live. But wherever meagre vegetation can support grazing animals or reliable water sources occur, there are scattered clusters of people.

Slide 27: **Sedentary** farming is limited to the **oases**, where irrigation allows limited cultivation of fruit trees, cereals and vegetables. Cultivation is in small 'gardens' and relies on a great amount of manual labour.

Slide 28: Most of the people who live in the Sahara are **nomads** who do not settle in one area but constantly move around. They tend flocks of goats, sheep, and camels and live in tents so they can move easily as soon as the grass is eaten in one place and find new areas to graze their livestock. This nomadic lifestyle is an **adaptation** to the environment - by moving frequently, they avoid exhausting an area of resources.

Slide 29: There are a number of **nomadic** groups living in the Sahara, such as the Bedouin who settled in the region over a thousand years ago. Bedouin means 'desert traveller'. Whilst some Bedouins have abandoned their nomadic and tribal traditions for a modern urban lifestyle, many have kept the traditional Bedouin culture.

Slide 30: The Bedouin people have learned to live in the harsh desert environment. Their tents are built to allow air to circulate within them, keeping them cool. Animal hair is used to insulate them, to keep the tent cool during the day and warmer at night.

Plants

Slide 31: The centre of the Sahara is **hyperarid**, with sparse vegetation. But the northern and southern margins of the desert, along with the highlands, have areas of sparse grassland and desert shrub. Trees and taller shrubs are found in **wadis**, where moisture collects. Plants that grow in the Sahara have to be able to adapt to the unreliable precipitation and excessive heat. Although the environment of the Sahara is very harsh and challenging, it is home to nearly 1,200 species of grasses, shrubs, trees and plants.

Animals

Slide 32: For such a vast area, the number of species living in the Sahara is very low. This is because animals that live in this environment need to be specially adapted to the extremely dry conditions. They have to be able to cope with very little water, as well as the big variation in temperature between day and night (diurnal range).

SUGGESTED ACTIVITIES

Climate of the Sahara (Link to Numeracy)

Research the climate of the Sahara. You could use this link:

<https://en.climate-data.org/location/1000296/>

Can you find the average temperature and rainfall for each month of the year?

Plot graphs to show your results - a bar graph for rainfall and a line graph for

temperature. Can you answer these questions:

- Which is the **driest** month in the Sahara?
- Which is the **hottest** month in the Sahara?
- What is the **maximum temperature** reached in the Sahara?

Extension task: Research data and plot graphs showing the average temperature and rainfall amounts for each month of the year in the UK. Write a paragraph comparing the climate in the Sahara with our own.

How People Have Adapted To The Sahara

Choose a tribe that live in the Sahara (e.g. Bedouin, Berber, Touareg, Toubou). Research how they have adapted their lives to survive in the harsh environment.

Try to address the following:

- How many of this tribe live in the Sahara?
- Why is life difficult in the Sahara?
- How have they adapted to the harsh environment - include how they get water and food, what they wear and how they build their shelters.

Tourist Leaflet

Think about why people might want to visit the Sahara Desert e.g. the unique landscape, wildlife and cultures. Imagine you work for a tour operator that organises tours of the Sahara Desert. Produce a leaflet that will encourage people to visit, giving them an idea of what they will see and learn. Make sure you include some good photographs to capture imaginations.

Creative Task

Write a short story, song or poem about the Sahara Desert, celebrating the landscape, ancient cultures and amazing wildlife of this unique region.

3. HOW ARE PLANTS AND ANIMALS IN THE SAHARA ADAPTED TO THE DESERT ENVIRONMENT?

SUGGESTED STARTER ACTIVITY

Starting Knowledge Mind Map

Ask students what plants they think grow in the Sahara and which animals live there. Why would it be difficult for many plants and animals to survive there? Recap the meaning of **adaptation** - do they have any ideas about how plants and animals are adapted to survive in the Sahara? Record ideas on the board.

TEACHER NOTES

Sahara Plants

Slides 34-35: Plants that live in the Sahara have to be able to collect and store water, as well as reduce water loss. Near **wadis** and **oases**, plants such as date palms, tamarisks and red acacia put down long roots to reach water. In the more arid areas, the seeds of flowering plants sprout quickly after a rain, putting down shallow roots and producing seeds in a matter of days, before the soil dries out.

Cactus

Slides 36-37: Cacti are **succulents** and have many special adaptations that enable them to grow in very arid conditions such as the Sahara Desert e.g. storing water in their stems and leaves.

Sahara Animals

Despite the harsh conditions, an incredible array of animal species live in the Sahara Desert, including 70 mammalian species, 100 reptile species, 90 avian species, together with several species of spiders, scorpions and other smaller forms of life. The wildlife is concentrated mainly along the less severe northern and southern margins and near desert water sources.

These animals are very well adapted to survive in the Sahara, where they must cope with extremes of temperature and lack of water. They do so in various ways:

- Many of the animals avoid the heat of the desert by simply staying out of it as much as they can.

- Since water is so scarce, most desert animals get their water from the food they eat - succulent plants, seeds, or the blood and body tissues of their prey.
- Some desert animals prevent water leaving their bodies by living in **burrows** which do not get too hot or too cold and have more damp air inside. These animals stay in their burrows during the hot days and emerge at night to feed.
- Some animals have bodies specially designed to save water.

Mammals

Among the mammal species that live in the Sahara are the gerbil, jerboa, Cape hare, desert hedgehog, dorcas gazelle, addax antelope and fennec fox. Here we look at just a few:

Camel

Slides 38-39: Camels are probably the animal most often associated with the Sahara. They were introduced to the desert around 200 A.D. and used to transport people and goods across the desert. There are three surviving species of camel today - the dromedary (or one humped) camel lives in the Sahara. Their advantages over the horses they replaced include their soft feet that are aligned so that they can move quickly and easily through sand. A common misconception the students may have is that camels store water in their humps - it is actually fat that they store there.

For a fact sheet on camels, please see here:

<http://ypte.org.uk/factsheets/camel/the-arabian-camel#section>

Addax Antelope (White antelope)

Slide 40: This is one of the most beautiful antelopes in the world, but sadly they are rarely sighted in the Sahara now due to unregulated hunting. It is adapted to the arid environment of the Sahara in a number of ways:

- Can sustain themselves without water for indefinite periods
- Instead of drinking water, they suck moisture from desert grasses and bushes.
- Oversized hooves make it adept at moving through loose sand.

Fennec Fox

Slide 41: The Fennec Fox is a small canid which is native to the Sahara. It is the smallest of the canines, but has the largest ears in proportion to its body size. Its nocturnal lifestyle helps it deal with the extreme heat of the desert environment and it has a number of physical adaptations that help as well.

For a fact sheet on the fennec fox, please see here:

<http://ypte.org.uk/factsheets/fox-fennec/overview>

Dorcas Gazelle (ariel gazelle)

Slide 42: The dorcas gazelle will drink water when it is available, but can go without drinking for its entire lifetime, as it can get all of the moisture it needs from the plants in its diet. They are able to withstand high temperatures, but when it is very hot, they are active mainly from dusk to dawn.

Jerboa

Slides 43-44: This tiny kangaroo-like creature is a hopping desert rodent and well designed to survive the extremes of life in the desert. The jerboa doesn't have to drink water as it is able to extract enough fluid from the food it eats. For a jerboa factsheet see: <http://ypte.org.uk/factsheets/jerboas/overview>

Reptiles

Monitor Lizard

Slide 45: The desert-thriving species of monitor lizard has perfected the art of survival in the Sahara Desert. During the middle of the day, they mainly stay in their burrows and only come to the desert surface to search for food.

Horned Desert Viper (Saharan horned viper)

Slide 46: This is one of the deadliest creatures in the Sahara Desert. During hot days, it often buries itself in the sand with its nostrils exposed; it uses this same skill whenever it wants to catch its prey.

SUGGESTED ACTIVITIES

Plant Adaptation

Choose a plant that grows in the Sahara. Find out how it is adapted to survive lack of water and extremes of temperature.

Animal Fact File

Choose an animal that lives in the Sahara Desert. Produce an illustrated fact file including the following information;

- What it looks like (include a photo or drawing)
- How it is adapted to the extreme heat and arid conditions in the Sahara
- What it eats and its predators
- Whether it is endangered and if so, why?

Sahara Food Chains

Who eats who in the Sahara Desert? Carry out some research and try to draw some simple food chains for the Sahara Desert.

4. HOW ARE HUMANS AFFECTING THE SAHARA REGION?

TEACHER NOTES

Introduction

Humans are having a number of impacts on the Sahara region. Some scientists fear we risk losing unique landscapes, ancient cultures and amazing species of animal. Many of the desert plants and animal have unique adaptations and a genetic makeup that could hold the key to our survival - contributing to new crops and animals that are capable of coping with a warming world.

1. Expansion of the Sahara into the Sahel (more advanced)

Slide 48: The **Sahel** is a **semi-arid** region of western and north-central Africa, just to the south of the Sahara. It forms a transitional zone between the arid Sahara Desert to the north and the more fertile lands to the south. The Sahel's climate is similar to, but less extreme than, the climate of the Sahara desert. Rainfall is low with most of the rain usually falling during a few months, while the other months can remain absolutely dry.

Slides 49-50: A number of countries lie in the Sahel and some are now suffering from severe **desertification** e.g. Sudan, Chad, Senegal and Burkina Faso. **Desertification** is the process that sees a relatively dry area of land become increasingly **arid** and unproductive. The Sahel, once a fertile area, is now at risk of becoming desert. Healthy land is being destroyed, threatening the lives of millions of people.

Causes of Desertification

The causes are complex and often interrelated - a combination of over-farming and global warming:

1. Over cultivating the land (slide 51)

Some **nomadic** groups have become more **sedentary** and are settling in one area. This means the land is continually used for growing crops and has no time to recover. As a result all the nutrients in the soil are used up and the ground turns to dust.

2. Overgrazing the land (slide 52)

If people stay in one area the animals eat all the vegetation and bare soil is left, which is then open to **erosion** by wind and rain.

3. Deforestation (Slide 53)

Cutting down trees for fuel and shelter also leaves the soil exposed to **erosion**.

4. Population increase (Slide 54)

The Sahel's population growth rate is among the world's highest. The population at the moment is around 135 million people and experts predict that it might increase from to 330 million by 2050 and close to 670 million in 2100. More people living in the region means more demand for food and wood, increasing all of the above problems.

5. Climate change (Slide 55-56)

Global warming is brought about by an increase in **greenhouse gas** levels in the atmosphere. Humans are increasing the amount of greenhouse gas in the atmosphere by activities such as burning fossil fuels and cutting down trees. This is contributing to a change in the Earth's atmosphere that is causing it to heat up.

You will find lots of resources here covering global warming and climate change in detail:

<http://ypte.org.uk/factsheets/climate-change/climate-change>

<http://ypte.org.uk/factsheets/climate-change-and-animals/introduction>

<http://ypte.org.uk/downloads/conservation-education-29-climate-change-update>

When global temperatures rise, the changes in climate are not expected to be uniform across the Earth. But existing drylands such as the Sahel are probably most at risk of climate change.

The effect of global climate change on desertification in the Sahel is very complex and not yet sufficiently understood. Many scientists believe it is resulting in increased rates of desertification due to lower rainfall and higher temperatures causing higher **evapotranspiration** and the drying up of water resources. However, some scientists claim that an increase in global temperature could trigger more frequent heavy rainfall and result in the Sahel becoming greener.

Effects of Desertification

Slides 57-59: Desertification has far reaching consequences for those that live in the Sahel region. Poor soil means crops fail, which can lead to famine and danger of starvation. Large areas of the Sahel are no longer able to support

people and by 2020, it is estimated that 60 million people will have migrated to North Africa or Europe because of desertification.

Solutions to Desertification

Recent evidence suggests that there are some areas where the process of desertification has slowed down. But areas on the edge of the Sahara are very fragile and need careful management. There are a number of ways in which they can be protected:

- Reduce grazing - this means plants have the chance to grow again
- Plant trees - this provides shelter from the wind and reduces erosion
- Mulching - this involves adding layers of leaves or straw to the ground, reducing evaporation and adding nutrients to the soil
- Terracing/contour ploughing (**Slide 60**) - this means soil is not washed down the slopes when it rains
- Growing drought resistant plants - vegetation cover protects the soil
- The Great Green Wall (**Slide 61**) - an African-led project which aims to grow an 8,000km "wall" of drought-resistant trees and plants along the edges of the Sahara. This will create a barrier to halt desertification. To find out more about this incredible project, see here:

<http://www.greatgreenwall.org>

For information on the global problem of desertification, please see this fact sheet:

<https://ypte.org.uk/factsheets/desertification/desertification>

2. Tourism

Slide 62: The Sahara holds great appeal to adventurous visitors. There are many opportunities such as exploring the unique landscape, seeing exotic wildlife, taking part in hiking and camel treks and visiting historical sites.

Slide 63: However, visitors are having negative impacts on the sensitive desert ecosystem. One of the main threats is the use of off-road vehicles - when used irresponsibly they can cause irreparable damage to the land and harm vegetation. Animals such as sand vipers, which hide so well in the sand, can become victims. Discarded waste products are another risk. It is essential that tour operators and visitors practice responsible tourism to protect this vulnerable and unique environment.

3. Hunting

Slide 64: Over the past 100 years there has been intense hunting across the Sahara. The populations of all large mammals adapted to desert conditions have been greatly reduced by hunting for food, and also through hunting for sport

and recreation. The addax antelope is now critically threatened with **extinction**, mainly due to intense over-hunting, and most of the other desert-adapted antelopes that may still occur in the region are **endangered**. The extreme environment of the Sahara makes conservation efforts very challenging. But there are now organisation such as the *Sahara Conservation Fund* that are working to conserve the wildlife and habitats of the Sahara.

SUGGESTED ACTIVITY

Newspaper Article on Desertification in the Sahel

Write an article for a children's newspaper that addresses the following:

- Where the Sahel is (include a map)
- Why the region is suffering from desertification
- How desertification is affecting the people that live in the Sahel
- What can be done to slow the rate of desertification and the risk of food shortages. Your suggestions should include things that people can do locally (change farming methods etc) and ways in which those further away from the Sahel can help (e.g. helping to reduce global warming).

We value your feedback!

Let us know what you thought of this lesson plan by completing this Google Form <https://forms.gle/cGAwi9AWXfSZgrYa9>. Thank you!