



Geography Year 10

Blended Learning Booklet

Y10-5 Hot Deserts

Name:

Form:

Aim to complete one lesson each week. Write down the **title and LI** for each lesson and then complete the tasks which are **highlighted**.

The Knowledge Organiser on page 3 has all the key information and vocabulary to help you with this unit.

Upload all work onto ClassCharts for feedback.





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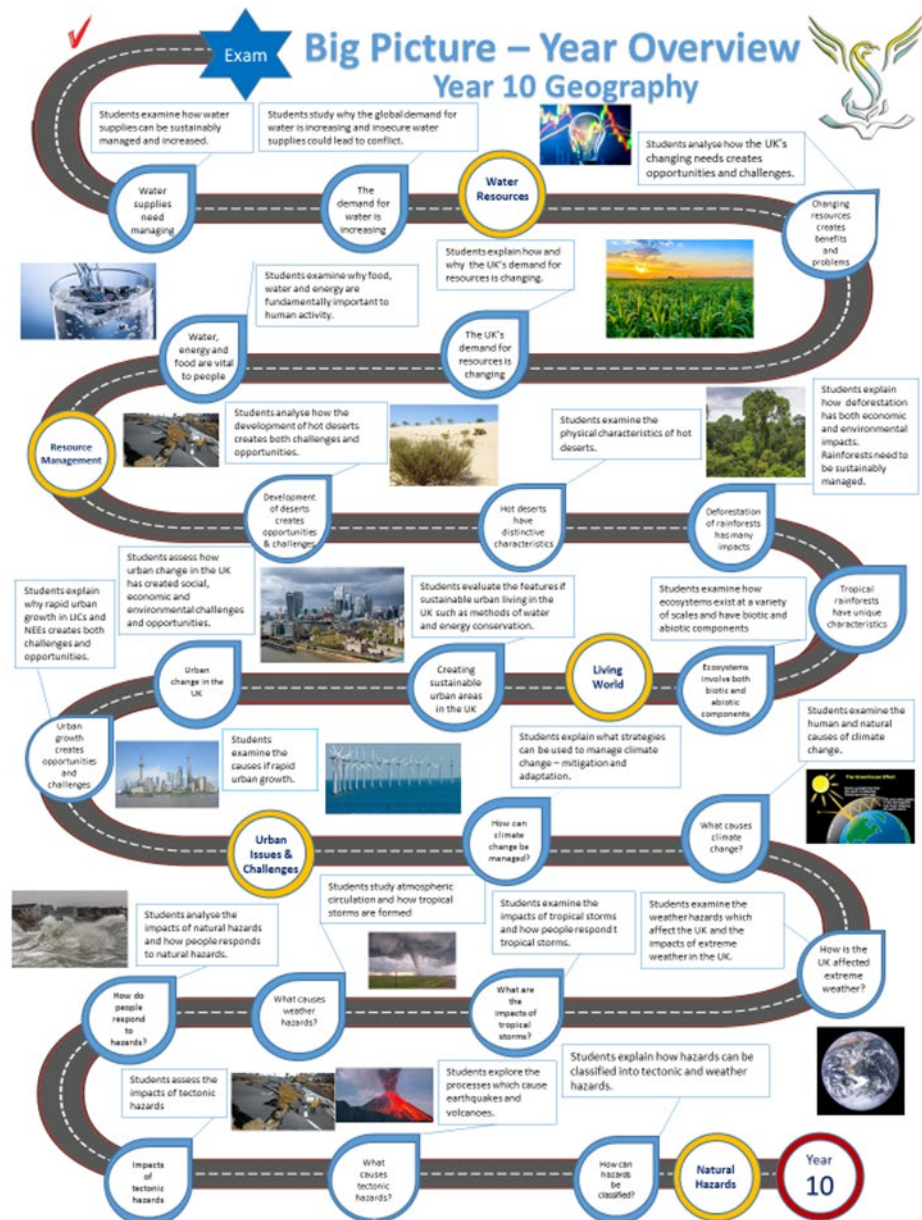
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KO 1: Introducing Hot Deserts

Hot deserts are an important ecosystem where plants and animals have adaptations to the harsh conditions. They cover roughly 33% of the Earth's land surface. Deserts typically have less than 250mm or 25cm of precipitation (rain, sleet, snow or hail) each year. Hot deserts provide opportunities for economic development, but also cause challenges such as desertification. The largest area of hot deserts is the Sahara Desert in north Africa.

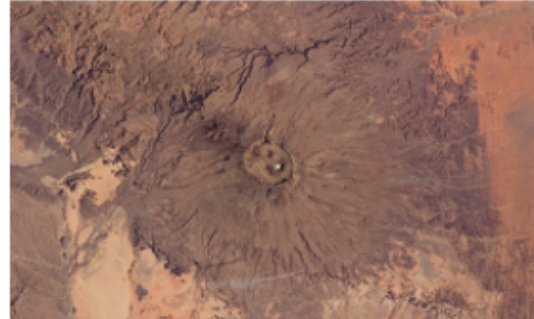
Many people think all deserts are covered in sand dunes, but sand dunes cover only 15% of deserts!



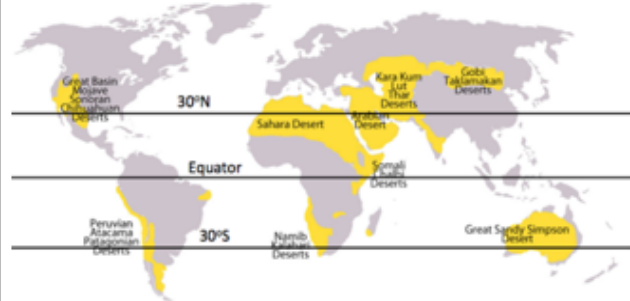
Hot deserts have an extreme climate and challenging environment. There is very little biodiversity in hot deserts because of the harsh climate. Few species are specialised enough to survive there. Plants and animals which do survive there have adapted to difficult conditions. The biotic or living components and the abiotic or non-living components of the hot desert rely on one another - a change in one will lead to a change in the other.

Volcanoes in the Sahara?

One surprising fact about the Sahara desert is that it has lots of dormant volcanoes and has vast areas covered by old lava flows. The satellite image below shows the 11,000 foot high volcano called Emi Koussi which is located in northern Chad.



The map below shows the location of the world's deserts:



Environmental conditions in deserts

Desert climates

- The climate is very **hot**. 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.

Desert soils

- Desert soils are thin, sandy, rocky and generally grey in colour.
- Desert soils are very dry. When it does rain, they soak up the water very quickly.
- The surface of the soil may appear crusty. This is due to the lack of rainfall. As it is so hot water is drawn up to the surface of the soil by evaporation. As the water evaporates, salts are left behind on the surface of the soil.

Questions on desert environments

- Q1) How much precipitation (rain, snow, sleet or hail stones) do desert areas receive each year?
- Q2) What % of the Earth's surface is covered by deserts?
- Q3) Does the Sahara Desert have volcanoes?
- Q4) What % of hot deserts are covered by sand dunes?
- Q5) Do hot deserts have high or low levels of biodiversity?
- Q6) Describe the climate and soils found in a hot desert.
- Q7) Do hot deserts have different temperatures in summer and winter?
- Q8) Explain in detail how plants adapt to the climate and soils found in hot deserts.
- Q9) What are succulents?

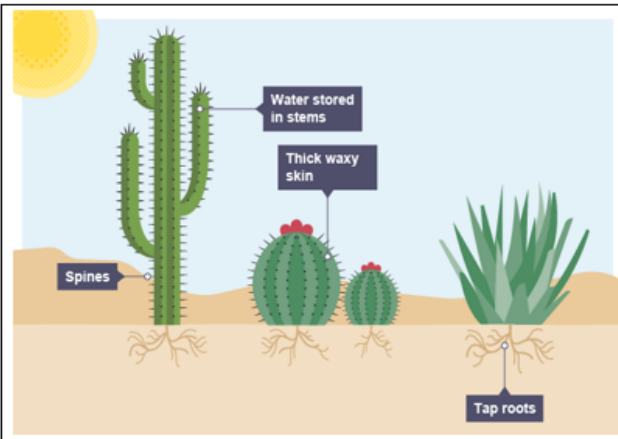
EXTENSION

- Q10) How do you think people use desert areas? What would be the challenges for people living in a desert?

How do plants adapt to survive in deserts?

Plants with adaptations which allow them to live in hot and dry conditions are called **xerophytic**. The following adaptations allow plants to survive in the hot desert environment:

- **Small leaves** - these ensure that less water is lost from the plant by transpiration because the leaf has a smaller surface area.
- **Tap roots** - these are long roots (7-10 metres long) that reach deep under the ground to access water supplies. The tap roots are much longer and bigger than the plant which is visible at the surface.
- **Spines** - some plants have spines instead of leaves e.g. **cactuses**. Spines lose less water than leaves so are very efficient in a hot climate. Spines also prevent animals from eating the plant.
- **Waxy skin** - some leaves have a thick, waxy skin on their surface. This reduces water loss by transpiration.
- **Water storage** - some plants, known as **succulents**, store water in their stems, leaves, roots or even fruits. Plants which store water in their leaves and stems also have a **thick waxy skin** so that they lose less water by transpiration.





KO 2: People and Hot Deserts

Do people live in deserts?

Yes! In fact, **1 billion people live in or near the world's deserts**. Many cities are found in deserts, good examples include the cities **Las Vegas** and **Phoenix** in the USA and the city of **Dubai** in the United Arab Emirates.

Phoenix and Las Vegas are the **fastest growing cities in the USA** and Dubai's population has grown massively in the last 30 years. People are attracted to the hot climate and long hours of sunlight. All three cities offer new, high quality housing, well paid jobs, opportunities for shopping and lots of entertainment. Las Vegas and Dubai are also major centres for **tourism**.

Many people think deserts have very few people, but Dubai in the United Arab Emirates is a desert city:



Case study of a hot desert - the Thar Desert, Rajasthan, India

The **Thar Desert** is located in **northwest India**. It is one of the major hot deserts of the world with the highest population density. Many people living in this desert are subsistence farmers but with increasing development opportunities, the human population is also growing. Due to population pressures this environment is increasingly under threat.



People use the Thar Desert in a variety of ways

Mining - the Thar Desert has valuable **reserves of minerals** underground such as feldspar, phosphate, gypsum and kaolin. These minerals are used to produce cement and fertilisers. They are very valuable. **Limestone** is used for building and producing cement, and **marble** is used in construction.

Energy generation - energy is produced in the Thar Desert using **solar panels**. And the open spaces mean **Wind energy** is also used to generate electricity.

Farming - irrigation in the Thar Desert has made commercial arable farming viable. Producing crops such as **wheat** and **cotton** has created many jobs and generated income for the local economy.

Tourism - the **Thar Desert National Park** attracts many visitors who want to see some of the animals found there. **Tourism is an important source of income and creates many jobs for local people**. The multiplier effect of tourism creates many development opportunities.

Desertification

The presence of people in deserts areas can cause severe environmental problems if we do not manage desert areas correctly. One major problem is the process of **desertification** or the growth of deserts.

Desertification is the process of land turning into desert as the quality of the soil declines over time. **The main causes of desertification include:**

Population growth - the population in some desert areas is increasing. In places where there are developments in mining and tourism, people are attracted by jobs. An increased population is putting greater pressure on the environment for resources such as wood and water.

Removal of wood - in developing countries, people use wood for cooking. As the population in desert areas increases, there is a greater need for fuel wood. When the land is cleared of trees, the roots of the trees no longer hold the soil together, so it is more vulnerable to soil erosion.

Overgrazing - an increasing population results in larger desert areas being farmed. Sheep, cattle and goats are overgrazing the vegetation. This leaves the soil exposed to erosion.

Soil erosion - this is made worse by overgrazing and the removal of wood. Population growth is the primary cause of soil erosion.

Climate change - the global climate is getting warmer. In desert regions conditions are not only getting warmer but drier too. On average there is less rain now in desert regions than there was 50 years ago.



Questions on people and deserts

- Q1) How many people live near or in deserts?
- Q2) Name 3 famous desert cities.
- Q3) Why do people want to live in desert cities – what do they offer?
- Q4) Where is the Thar Desert located?
- Q5) Describe 4 ways people use the Thar Desert.
- Q6) What is desertification?
- Q7) What causes desertification?
- Q8) Explain how desertification can be prevented.

How can desertification be reduced and reversed?

Desertification can be reduced by adopting the following strategies:

- 1) **Planting more trees** - the roots of trees hold the soil together and help to reduce soil erosion from wind and rain.
- 2) **Changes to farming** - reducing the number of grazing animals they have and growing more crops instead. Growing crops in this way can improve the quality of the soil as it is held together by plant roots and protected from erosion.
- 3) **Water management** - water can be stored in earth dams in the wet season and used to irrigate crops during the dry season. This is an example of using appropriate technology to manage water supplies in the desert environment.



Lesson One: What are the unique physical characteristics of hot deserts?

- **LI: To examine the unique physical characteristics of hot deserts**

Read through the KO 'Introducing hot deserts'. Using the information, answer the following questions.

Q. Where are the hot deserts of the world located?

Q. What are conditions in hot deserts like?

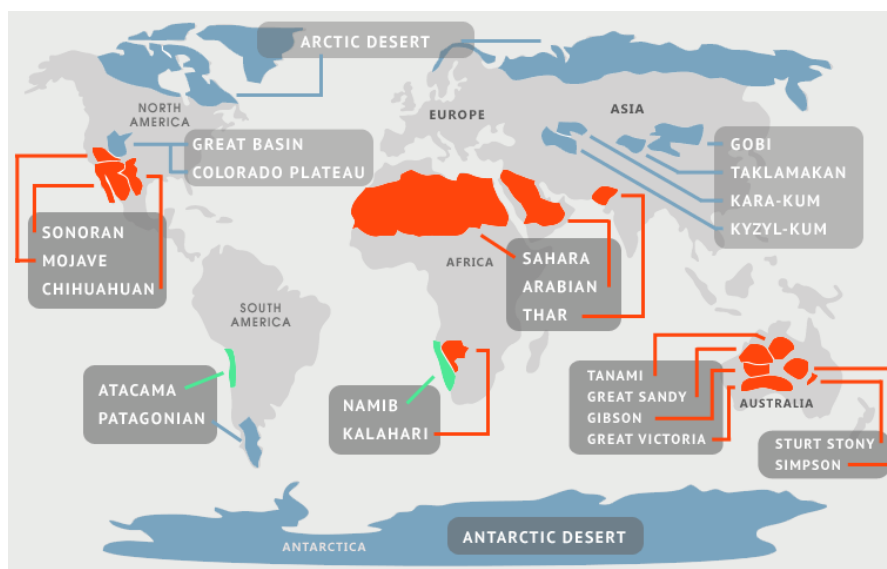
RECALL: What are biotic and abiotic factors?

Read the DART below, and answer the questions at the end.

Comparing hot and cold deserts

Hot and cold are the two main ways of classifying the deserts based on the temperature. An obvious difference between the hot and cold deserts could be identified in terms of temperature, yet there are many other physical and interesting biological characteristics about these ecosystems.

The distribution of hot and cold deserts is shown on the map below:



Hot Deserts

With extreme temperatures present in both day and night, hot deserts are dry. However, these deserts are utterly hot during daytime but extremely cold at night. The usual temperatures reach 43° – 49° Celsius in daytime while it goes down towards -18° Celsius at night. The annual rainfall does not usually exceed 250 millimetres.

Hot deserts can be found in almost all the continents; Sahara and Kalahari in Africa, Arabian Desert in Middle East, Great Victoria Desert in Australia, Gobi Desert in Asia, and Great Basin Desert in North America are some of the largest and amongst the most known deserts.

Hot deserts are surprisingly varied landscapes some are very mountainous and rocky, others are covered by sand dunes:



Stewards Academy



There is not much soil in hot deserts, where it does exist it is mainly loose, coarse, or gravelly. Most of the time fine dust and sand particles are blown away by the wind. The biological diversity in hot deserts is low. Cactus species, small shrubs, and very few trees with short shoots are the typical vegetation in these deserts. Water conservation techniques such as thick leaves and spines can be observed in the vegetation.

Most of the animals have adapted to live under soil or in burrows such as kangaroo rats, reptiles, and spiders. Insects inhabit trees and flowers while carnivorous birds hover around the sky looking for prey animals. Plants weather the hot daytime, but animals wait until it becomes cool enough to forage.

Cold Deserts

Cold deserts are almost lifeless regions with snowing winters during most of the time of year. Out of all the deserts in the world, the Antarctic and Arctic deserts are two of the largest in land area covering more than 27,000,000 square kilometres together.

Antarctica is the largest and coldest of the cold deserts:



The winter lasts for nine months with an average temperature ranging around -20 to -40° Celsius, yet it could go as down as -70° Celsius or even colder. During the three months of summer, the mean temperature lies around 12° Celsius. Precipitation takes place in two ways, raining and snowing.

The annual rainfall does not exceed 250 millimetres, and most of the raining takes place in the summer. Since the sun does not strike hard on cold deserts, the evaporation is not as much as in hot deserts. The soil is almost covered in snow, yet its texture is silty but heavy. Polar bear, flatfish, caribou, arctic fox, arctic hare, and penguin are the well-known cold desert animals. Grasses and shrubs are the main forms of vegetation in this ecosystem.



What are the main differences between Hot and Cold Deserts?

- Both places are dry, but temperatures vary in the two as the names suggest, hot and cold.
- Hot deserts are found in many tropical places of the world while cold deserts are found towards the Polar Regions or on mountains.
- Precipitation is low in both biomes, but evaporation is much higher in the hot desert than in the cold desert.
- Cold deserts experience long winters and short summers, but there are no seasonal effects taking place in hot deserts.
- Hot deserts feature the presence of reptiles and amphibians but not in cold deserts.

Questions:

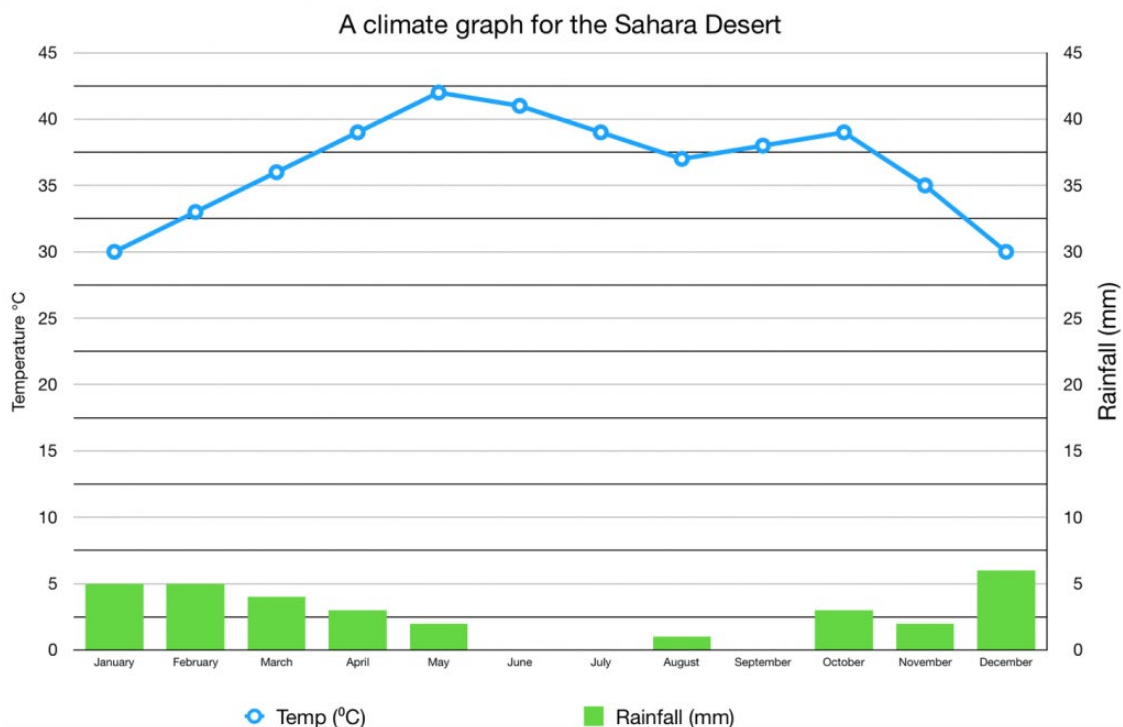
- Q1) What is the main difference between hot and cold deserts?
- Q2) Describe the climate of a hot desert.
- Q3) Describe the levels of biodiversity found in hot deserts.
- Q4) How does the climate of a cold desert compare to the climate of a hot desert?
- Q5) Explain the main differences between hot and cold deserts

Lesson Two: What is the climate of biodiversity of deserts like?

- **LI: To explain the unique climate and animal biodiversity of hot deserts**

Analyse the climate graph and answer the questions.

The annual climate of the Sahara Desert





- 1) What two months have the lowest average temperature?
- 2) What is the peak average temperature?
- 3) What is the difference between the highest and lowest temperatures?
- 4) What are the three driest months?
- 5) What is the amount of rainfall during October?
- 6) Which months have the highest amount of rainfall?
- 7) How many months have rainfall exceeding 40mm?
- 8) What is the amount of rainfall in January?
- 9) What is the temperature in June and July?
- 10) Does the Sahara have any months without rainfall?
- 11) What is the temperature range in the Sahara Desert?
- 12) Is the hottest month also one of the wettest?
- 13) What are the 3 wettest months?
- 14) Does the Sahara Desert have a wet season?
- 15) Is the Sahara Desert always hot?
- 16) Does the temperature vary through between summer and winter?

Extension questions:

Q17) Describe the climate (temperature and rainfall) of the Sahara Desert between January and December.

Q18) Compare and contrast the temperature and rainfall patterns of the UK and the Sahara Desert.

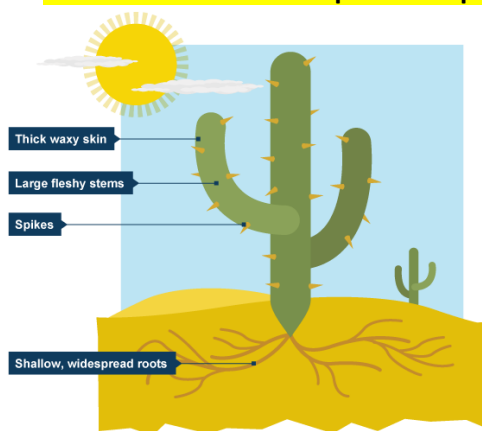
Watch the following video, which explains some animal adaptations in the desert:

<https://www.youtube.com/watch?v=Lx-p9i3TSpk>

Q. What are some of the main animal adaptations in the desert?

Lesson Three: How do plants adapt to hot deserts?

• LI: To examine how plants adapt to the climate of a hot desert



- thick, waxy skin to reduce loss of water and to reflect heat
- large, fleshy stems to store water
- thorns and thin, spiky or glossy leaves to reduce water loss
- spikes protect cacti from animals wishing to use stored water
- deep roots to tap groundwater
- long shallow roots which spread over a wide area
- plants lie dormant for years until rain falls

Read the above information and answer the following question in your own words.

Q. How have plants adapted to living in hot desert environments?



Then **read the DART** about how to improve greening in the desert. **Answer the questions.**

'Desert Greening' and desert farming



Deserts could be the future for global farming and transforming them into green spaces using new technology. Deserts have been used for growing crops for many years.

Huge 'crops circles' are common in the deserts of the USA, but they need colossal amounts of water for the crops to grow. **Watering crops is called IRRIGATION.** In poorer desert countries like Chad in Africa, 80% of their water is used to water crops.

There is also an increasing demand for food as the global population grows, but one scientist has come up with an innovation that could turn those deserts green again.

Liquid clay

Norwegian scientist Kristian Morten Olesen has patented a process to mix tiny particles of clay with water and bind them to sand particles to improve desert soil - he has been working on Liquid Nano-Clay (LNC) since 2005.

He says: "The treatment gives sand particles a clay coating which completely changes their physical properties and allows them to bind with water. We just mix natural clay in water with desert sand. This creates a good, fertile, 50cm deep layer which crops can grow in".

Normal sand particles are very loose, which means that they cannot hold water easily. But when you add Liquid Nano-Clay to the sand it binds those sand particles together. **This means the new soil can hold water for longer, allowing more crops to grow, but only using half the water.**

United Arab Emirates trial

In the UAE, local farmer Faisal Mohammed Al Shimmari agreed to host a trial of Liquid Nano-Clay in December 2017, and two areas were planted with a selection of crops: tomatoes, aubergines and okra.

"I am amazed to see the success of LNC," says Faisal. "It just saved consumption of water by more than 50%, it means now I can double the green cover with the same water."

He says that the untreated area used almost 137 cubic metres of water for irrigation and the one treated with LNC used just 81 cubic metres. "I can double the farming area using the same amount of water I was using before," says Faisal.



Questions:

- 1) Why could deserts be the future for farming?
- 2) How much water is used to grow crops in poor desert countries like Chad?
- 3) Why does the world need to grow more food?
- 4) Explain how Liquid Nano-Clay helps to create good soil in a desert.
- 5) How much water does Liquid Nano-Clay use compare to normal irrigation?
- 6) How has Liquid Nano-Clay help farmers in the United Arab Emirates?

Lesson Four: Why do people live in desert regions?

- LI: To examine how people use desert regions and the Sahara Desert

Read through KO: 'People and Hot Deserts' at the beginning of this booklet, then answer the questions on the KO.

RESEARCH: What would living or travelling in a desert be like without modern technology?

What would the most essential resources for all desert cities?

Lesson Five: Why are desert cities in HICs expanding?

- LI: To examine why desert cities in HICs are expanding.

Watch the following video; <https://www.youtube.com/watch?v=EctE3dEAwEY>

Q. Why did Dubai get so rich?

Q. What are some of the disadvantages of Dubai's growth?

Dubai – a desert dream?



Dubai's spectacular skyline from above shows the high-rise modernity of the city today.

Dubai has been revealed as one of the fastest-growing cities in the world, claiming a population boom of over 500% in recent decades. Here's how a small fishing village on the edge of the desert became the most populous city in the United Arab Emirates (UAE) and one of the fastest growing in the world.

The port city that grew from the desert

100 years ago, Dubai was a small fishing village that first began to grow thanks to its proximity to Iran, evolving into an important trade route to the Persian Gulf. Other areas in the United Arab Emirates were expanding from the profits of vast oil field reserves found underground, but it wasn't until a chance



discovery of offshore oil in 1966 that fortunes began to change for Dubai, too. However, the money from oil is reducing every year as the stocks of oil run out.

Dubai's ongoing success

The last 30 years have seen the population of Dubai grow to 2,785,000. That is a remarkable growth of 569%. To secure future success, Dubai started a massive building boom to attract tourists and business people from all over the world.

Dubai has worked hard to become a top tourist attraction and it attracts tourists from around the world who are drawn to the golden, sandy beaches, luxury hotels and spectacular attractions. These include the world's largest indoor ski centre, the world's largest shopping centre, the world's tallest building (the Burj Khalifa) and many others. Dubai built colossal structures to draw people to it including the huge artificial 'Palm islands' and the 'World Islands'.

Dubai is also a global business hub, with many companies locating offices here due to low taxes, easy planning laws and no restrictions of foreign ownership. Thanks to its warm climate and easy accessibility from Europe, Dubai is a luxury tourist destination popular year-round.

The darker side of Dubai's growth

Despite Dubai's success, there is a darker side. Many of the workers who have built the modern city of Dubai are from India and other poorer parts of Asia. They work very long hours, are very poorly paid by Dubai's standards and live in appalling conditions. Construction companies in Dubai have been accused of exploiting these workers and using 'modern day slavery' to build the very attractions which have made modern Dubai.

Questions

- 1) What was Dubai like 100 years ago? Why did it grow in the 1960s?
- 2) Why has Dubai grown so quickly in the last 30 years?
- 3) Why are tourists attracted to Dubai? What has been built to attract tourists?
- 4) Why are businesses attracted to Dubai?

EXTENSION TASK - Is it fair that Dubai has been accused of using modern day slavery? Are foreign workers exploited by construction companies in the UAE? What are the ethical considerations of using cheap foreign labour?

Lesson six: What is desertification?

- **LI: To examine the causes and impacts of desertification**

Read the DART on the next page, then answer questions 1, 2 and 3 in the Activities box.



KEY LEARNING

- ▶ The role of population growth and human factors in desertification
- ▶ Desertification in Darfur

Human causes of desertification

In addition to natural pressures, desertification occurs when fragile land in desert fringe areas is overexploited by humans. Physical and human causes of desertification are often interlinked with one another (Figure 7.25).

What role do population growth and human factors play in desertification?

Population growth in desert fringe areas, as in other places, has two components:

- Population growth remains very high in the poorest parts of the Sahel, for reasons linked with poverty, such as lack of education. There were just 30 million people living in the Sahel in 1950. Today, the figure is closer to half a billion. By 2050, it is expected to reach one billion. Most of this growth is caused by the high number of children being born, and people living longer than they did in the past (Figure 7.26).
- Migration brings even greater population pressure. Drought and desertification in one region will displace people to another fragile environment. Desertification occurs there too, as the number of people increases, so the problem gets spread from place to place. In addition to 'climate change refugees', millions of people have been forced to move into desert fringe areas by armed conflicts in the Sahel region.

Figure 7.27 shows the human causes of desertification that follow on from population growth.

Why has desertification become a problem in Darfur?

You may have heard of Sudan's Darfur region, where 250,000 people have been killed and around three million made homeless by conflict since 2003. Previously, the environment was already under pressure:

- One year out of every five brings drought, crop failure and livestock loss to Sudan.
- The Sahel's ability to produce food has not kept pace with its growing population (Figure 7.26).

The environment has played a major role in creating conflict. In 2003, nomadic cattle herders and settled farmers began to fight over water supplies and land. Herders were deliberately prevented from reaching water sources by farmers, which led to **overgrazing**. Once the vegetation was gone, their cattle died. In revenge, some herders chased farmers from their villages, and cut down their crops and trees.

Country	Population (millions)	Fertility rate (children per woman)	Pop. growth (%) per year	Pop. density (people per sq km)
Burkina Faso	17.9	5.9	3.1	65
Chad	13.3	6.6	3.3	10
Eritrea	6.5	4.7	2.6	56
Gambia	1.9	5.6	3.1	169
Guinea-Bissau	1.7	5.0	2.5	48
Mali	15.9	6.1	2.9	13
Mauritania	4.0	4.1	2.6	4
Niger	18.2	7.6	3.9	14
Senegal	13.9	5.3	3.2	71
Sudan	38.8	5.2	2.5	21

▲ Figure 7.26 Population data for Sahel nations, 2013



▲ Figure 7.25 The causes of desertification

Millions of people fled their land and homes. They were housed in refugee camps, with help from the UN. But refugee camps create new environmental stress wherever they are located and cause desertification to spread (Figure 7.29). When people finally return home, further desertification is expected. One charity estimates that each returning family will need 30–40 trees to rebuild their houses and fences. The desert fringes of Sudan do not have enough trees left to support this.

Figure 7.28 Human causes of desertification in populated areas

Population	1973	2003
Type of land use	13 million	6.5 million
Bush and shrub	23.8	17.5
Rain-fed agriculture	22.7	34.4
Wooded grassland	11.8	7.1
Closed forest (natural)	10.7	7.9
Grazing/pastures	9.0	6.8

▲ Figure 7.27 Population and land use trends in Darfur prior to conflict

Overcultivation	Overcropping land can exhaust soils' fertility. Part of the problem is due to small-scale subsistence agriculture. As health has improved over time, more of the children born into farming families are surviving infancy. More crops are planted and some squatters have been drained dry. Commercial farming makes this situation worse. European companies are using large areas of fragile land in Ghana to grow water-hungry cash crops such as jatropha (which is used to make vegetable oil).
Overgrazing	If too many goats and cattle are grazed for too long on one site, all the vegetation is eaten and may be unable to regrow. Nomadic groups used to wander freely, following the rain wherever it fell. They would leave land before all the vegetation was gone, giving it a chance to recover. Now they cannot, due to new political boundaries, or because large companies have bought up the land rights in a region. Civil war and political instability also force herders to stay too long in places.
Soil erosion	Overcultivation and overgrazing both result in soil erosion. If vegetation has been eaten by cattle or killed by drought, the exposed topsoil becomes baked hard by sunlight. When it finally arrives, intense rain washes over the soil rather than soaking into the ground. As it flows, it carries the topsoil away. Once the soil has eroded, it becomes impossible for the vegetation to grow back.



▲ Figure 7.29 Refugee camps greatly increase the population density of some fragile desert fringes

Geographical skills

Describing data sets

Figure 7.26 is a large and complex table. Imagine a question that asks you to describe the variations shown in the table. You could:

- For each column, say if it varies a lot or a little.
- Identify the maximum and minimum value in each case (you might even want to subtract the two to find the range of data i.e. if the maximum value is unusually high, point this out (see Sudan)).
- Finally, look for patterns horizontally as well as vertically: is there a country which is highest- or lowest-scoring in most categories?

Activities

- 1 How are the problems of overgrazing and soil erosion linked?
- 2 Explain how a combination of physical and human factors leads to desertification taking place in some parts of the world.
- 3 Look at Figure 7.27.
 - a) Describe how the population and environment in Darfur changed between 1973 and 2003.
 - b) Explain how the population change you have described may have led to two environmental changes.



Answer the following 9-mark question.

Explain the causes and impacts of desertification in a region you have studied. (9 marks)

Attainment band:	Year 9 Unit 2 – ‘Causes and impacts of desertification’ 9-mark question	
	Knowledge and Understanding	Skills
Yellow Plus (8 to 9 marks)	- Student can clearly evaluate the causes of desertification in a specific region - Student can clearly evaluate the impacts of desertification in a specific region - Student can reach substantiated conclusions about the issues created by desertification in a named area	- Effectively use figures to answer geographical questions and draw geographical conclusions - Independently use maps to locate places and identify key features - SPaG is always correct
Yellow (6 to 7 marks)	- Student can evaluate the causes of desertification in a specific region - Student can evaluate the impacts of desertification in a specific region - Student can reach clear conclusions about the issues created by desertification in a named area	- Shows an ability to use figures to answer geographical questions and draw geographical conclusions - Confidently use maps to locate places and identify key features - SPaG is generally correct
Blue (4 to 5 marks)	- Student can discuss the causes of desertification in a named area - Student can discuss the impacts of desertification in a specific region - Student can reach conclusions about the issues created by desertification in a named area	- Identify useful geographic information from figures - Use maps to locate places and identify some key features - SPaG contains a few key word errors
Green (2 to 3 marks)	- Student can describe some of the causes of desertification - Student can describe some of the impacts of desertification - Student can reach some conclusions about the issues created by desertification	- Describe what figures are showing and link them to the topic of cold environments - Use maps to locate places - SPaG contains frequent errors, particularly of key words
White (0 to 1 marks)	- Student recognises some of the causes of desertification - Student recognises some of the impacts of desertification - Student can reach some very basic conclusions about the issues created by desertification	- Describe basic facts about what figures are showing - Use maps to locate places with support - SPaG contains lots of errors, particularly of key words



Lesson seven: How can we prevent desertification?

- **LI: To examine the solutions to prevent desertification**

Read the DART below and answer questions 1, 2 and 3 in the blue activities box.

KEY LEARNING

- How better land management can help combat desertification
- How planting trees can help
- How appropriate technology can help

Tackling desertification

How can better land management help combat desertification?

The majority of the 50 million people who live in the Sahel region suffer from poverty. Niger is losing 250,000 hectares of farmland every year through desertification. Millet crops have failed and sand dunes are advancing. Women in some villages now walk as far as 25 kilometres a day to fetch water for their families. But a range of land management measures can help to preserve soil quality and water supplies, such as:

- tree-planting schemes to bind and protect the soil
- planting grass on slopes to help stabilise the topsoil
- building small rock dams to trap rainwater in gullies
- collecting rainwater on roofs by designing a flat roof with a surrounding lip
- building terraces (flattened sections with a retaining wall) on farmed slopes.

One successful strategy, introduced in the Sahel countries of Mali and Burkina Faso, is the construction of low stone walls called **bunds** (Figure 7.30). The stones are planted in lines parallel to the slope gradient. They help to prevent soil erosion, and slow down the flow of rainwater over the baked ground. When water pools behind a bund instead of running fast over the land, it has time to soak into the ground.

How can planting trees help to stop desertification?

Tree roots help to stabilise soil, while their decomposing leaf litter adds valuable nutrients (see Section 5.1). This makes the planting of trees a practical way to tackle desertification. The African Union's proposed 'Green Wall' is a plan to plant a wall of trees across the entire Sahel region, running from the Atlantic Ocean in the west, all the way to the Indian Ocean in the east (Figure 7.31). It will be decades before the Green Wall reaches maturity, but it offers hope for sustainable development among communities. In addition to making the physical environment more secure, the project will also generate work for desperately poor communities in all the Sahel countries. Finally, it will help bring about political co-operation in the region. This might reduce conflict, and the number of refugee camps, which, unfortunately, contribute to desertification. However, climate change projections suggest increased aridity may threaten the survival of the trees in the long term.

How can appropriate technology be used to change the way people cook?

Removing trees for firewood is one of the most damaging human activities in desert fringe areas like the Sahel. For millions of years, people have been using wood as a cooking fuel. Yet population growth in the Sahel has meant that wood is a vanishing resource. When trees are cut down in large numbers, the resulting soil erosion effectively prohibits any future regrowth. This is unsustainable land management, but people in rural areas have no access to gas or electricity infrastructure. Recently, however, an alternative way of cooking has begun to be adopted, using **appropriate technology** called efficient stoves. One example is the **Toyola stove** in Ghana, and another is the **Upesi stove** in Kenya. The stove designs are being distributed to rural desert fringe communities by charities like Practical Action and the Global Alliance for Clean Cookstoves. The key to their success is that the stoves can be made locally using more available materials like clay, and much smaller amounts of wood and charcoal.

Some stove designs also incorporate a thermocouple, which generates sufficient electricity from the heat to charge a mobile phone – which growing numbers of Sahel farmers own. In turn, mobile phone access is helping farmers to gain access to weather forecasts, which can help them prepare for drought or rain.

Another important energy development for desert fringe areas is the move towards solar power (see page 52). As well as providing energy for cooking and other needs, earnings from solar power could provide Sahel nations with money to tackle desertification even more effectively. Hot deserts and their fringe places may eventually be seen as the world's most resource-rich places.

Activities

- 1 Study Figure 7.30. (a) Describe the characteristics of a bund. (b) Explain how bunds can help tackle the problem of desertification. It would be helpful to think carefully about what information you use to answer the two parts of this question. The command words 'describe' and 'explain' have different meanings and require you to use your knowledge of bunds selectively.
- 2 Study Figure 7.31. What kind of problems could be encountered by the African Union as it tries to carry out the Great Green Wall project (think of physical and human challenges)? Can you suggest any possible solutions for the problems that may develop?
- 3 a) Explain what is meant by the problems that may develop? b) To what extent can the use of appropriate technology help to tackle the problem of vegetation removal in desert fringe areas?
- 4 Some people have criticised the steps being taken to tackle the problem of desertification as 'too little, too late'. Discuss why the process of desertification, once it has begun, can become an irreversible problem.

Figure 7.30 How bunds work

Figure 7.31 The proposed Great Green Wall, with a total distance of 7,775 km and a total area of 116 million hectares.

Figure 7.32 This Ghanaian woman is cooking on a stove that uses far less fuel than a traditional fire