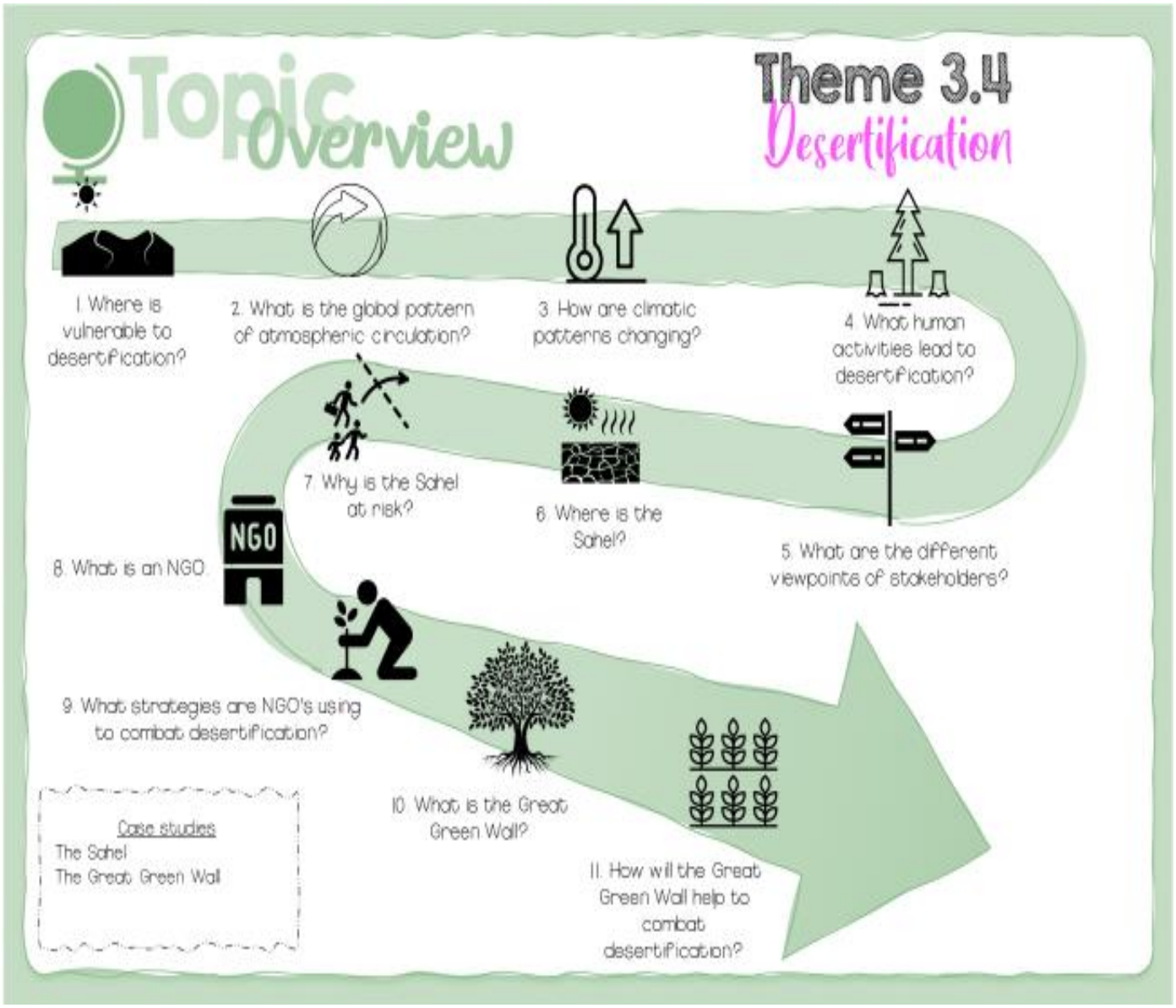
GCSE Geography

Desertification

Name: _____

Group: _____



Example Exam Questions

Explain why human activity can increase the process of desertification. (4)
Explain the strategies used to reduce the spread of desertification (8)
Suggest how desertification may make the daily lives of people more challenging (3)
Explain why planting trees and shrubs may help prevent desertification (3)

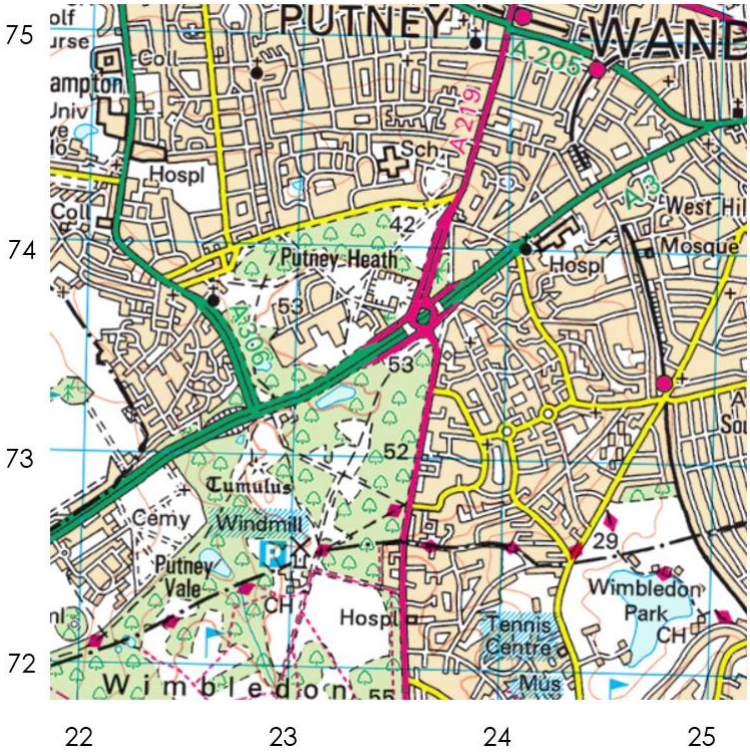
Theme 3: Environmental Systems

Key Ided 3.4 Desertification

Keyword	Definition
Agro-Forestry	A type of farming in which a mixture of crops, shrubs, fruit trees and nut trees are grown.
Commercial Farming	Farming for profit.
Convection Cell	Cells of air which are responsible for the blowing of wind.
Desertification	The process of fertile land becoming desert.
Drip Irrigation	Crop irrigation which involves the controlled delivery of water directly to individual plants.
Drought-Tolerant Crops	Plant that can survive with below average rainfall.
Evapotranspiration	Evaporation and plant transpiration from the land, soil and plants.
Global Atmospheric Circulation	Large-scale circulation of the atmosphere
Great Green Wall	A wall of trees being planted across Africa from Senegal to Djibouti to help prevent desertification
Magic Stones	Circles of stones placed on the ground to hold water on the soil.
Monoculture	A type of agriculture in which only one crop is grown.
Non-Governmental Organisation	An organisation which is not part of the government but provides important resources.
Over-cultivation	Cultivation of the land that has degraded the soil.
Over-grazing	Excessive grazing which causes damage to grassland.
Seasonal Rainfall	When rainfall is at a particular time of the year e.g. wet season.
Stakeholders	A person with an interest or concern in something.
Subsistence Farming	Farming to produce enough food and materials for the benefit of the farmer and their family.
Sustainable	Actions that meet the needs of the present without reducing the ability of future generations to meet their needs.
The Sahel	The area of land directly below the Sahara Desert which is vulnerable to desertification.
Vulnerable	Something which is likely to be damaged or disrupted.

Lesson 1: What is Desertification?

LO: to understand why desertification is taking place across the Savannah ecosystem.



Do Now:

What can be found at:
226 738
248 734
231 725
248 722
224 728

1. What type of forest can be seen on the map?

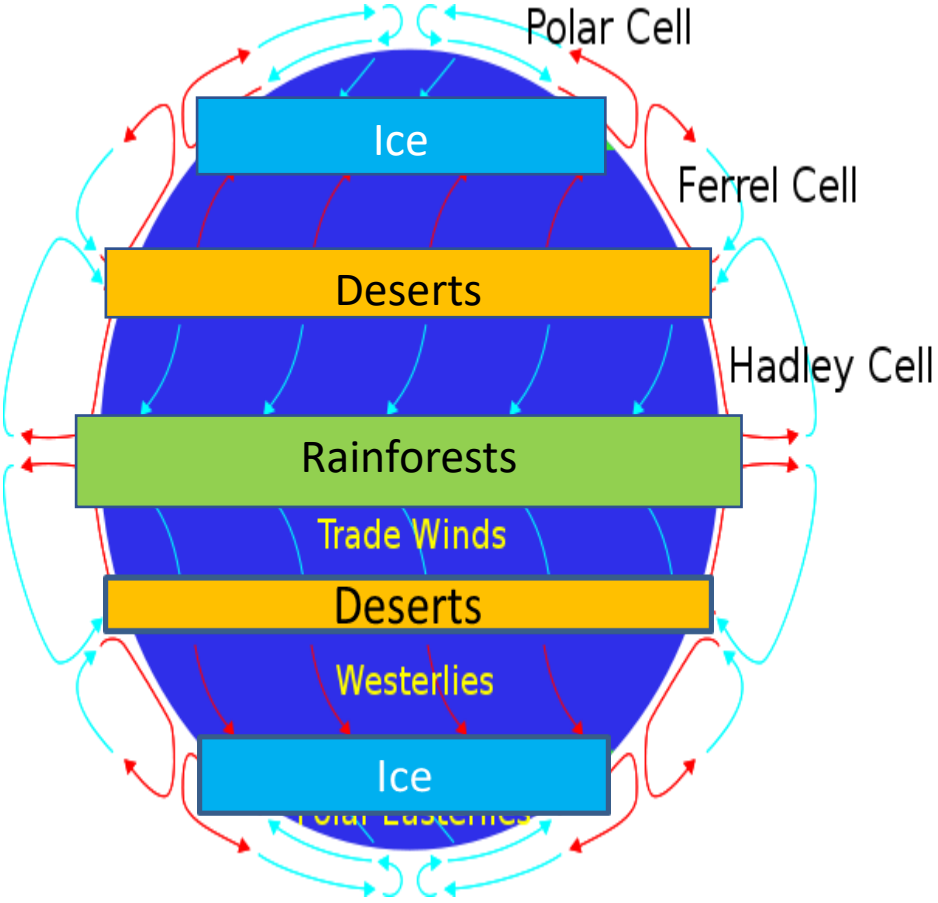
2. Is this a rural or an urban area? What evidence do you have?

3. What different religious buildings can you see on the map?

Match the key words with the definitions.

Desertification		To graze (grassland) so heavily that the vegetation is damaged and the ground becomes liable to erosion.
Over-Grazing		Very likely / more likely to be damaged or exposed.
Vulnerable		The process by which fertile land becomes desert, typically as a result of drought, deforestation, or inappropriate agriculture.

Why are deserts found in certain areas of the world?



Complete the cloze exercise

<u>The Global Pattern of Atmospheric Circulation</u>

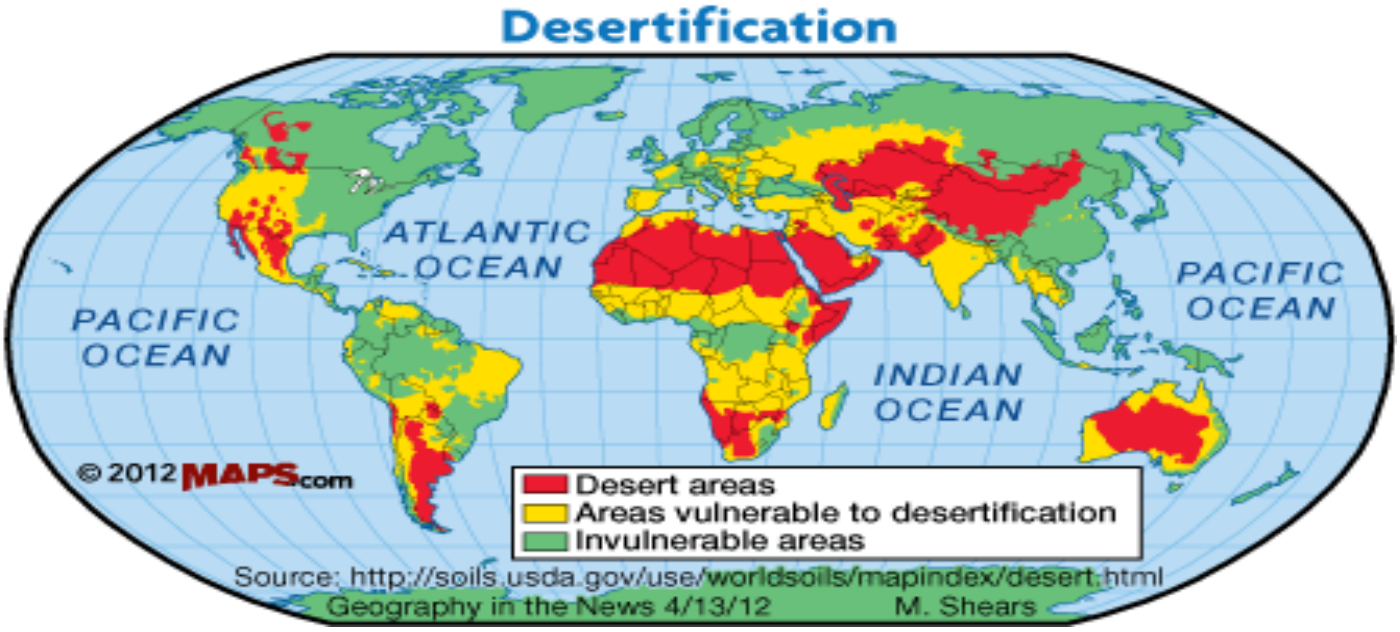
This is where _____ air rises over the _____and sinks over the tropics forming a _____ cell. There is no evaporation, which means there will be no _____ therefore there won't be any rain.

At about _____ North and South of the equator air pushes down on the earth's surface to create two belts of _____ pressure near the sub tropics.

As the air _____ it gets warmer and _____. These dry winds help to dry out the land.

The _____ air also stops _____ from forming.

Missing words					
High	Sinks	Clouds	30°	Warm	Equator
Drier	Sinking	Clouds	Convection		



Describe which areas of the world are vulnerable to desertification (3)

Have you included:

- Continents and countries
- Clear reference to the map
- At least 3 key points

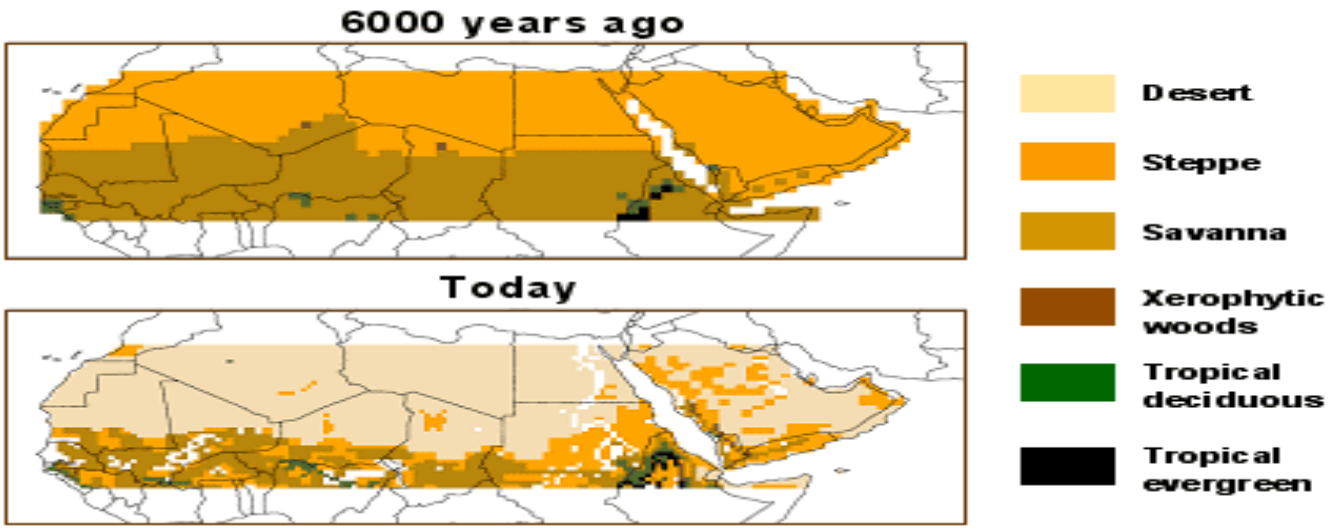
Take a photo of this answer and submit it on Teams

Which areas are most a risk? Give a named example

Why are some areas vulnerable and how does this change over time?

Watch this clip and answer the questions. Write down any vocabulary that you are unsure of
https://www.youtube.com/watch?time_continue=26&v=w9RxnuBiFbg

1. How long does it take for 2.5cm of soil to form?	
2. How much land is threatened by desertification?	
3. What damage does ploughing do to the soil?	
4. What strips the soil of its cover?	
5. How much land is lost each year?	
6. What places does desertification affect?	
7. How many countries are affected overall?	
8. How much grain could be produced from that land that has been lost?	
9. What is one solution to this problem?	
10. What is the Great Green Wall?	
11. Where does the Great Green Wall stretch from and to?	
NEW VOCABULARY	

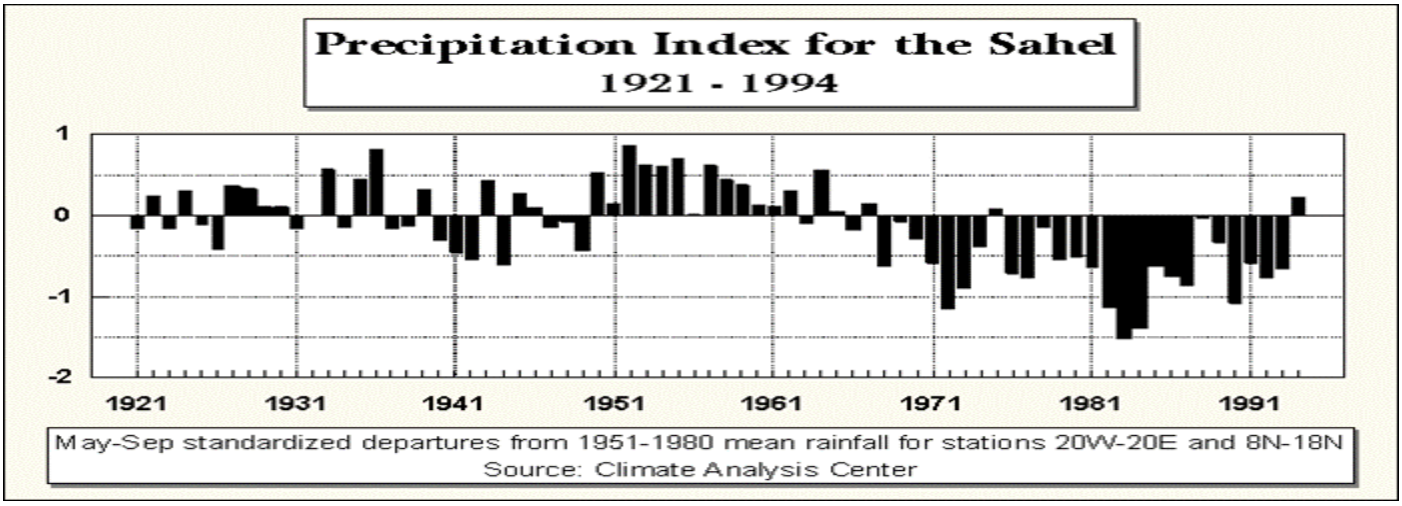


Describe the changes to the Sahara Desert over time (3)

Have you included:

- At least 3 points
- Clear evidence from the maps
- Differences between the ecosystems in the two maps

<u>What has happened to the amount of rainfall over time?</u>



Describe what this graph shows.

Which processes cause desertification?

Complete the table. Read the information on the next page and what you have learnt so far this lesson to help you to complete each column. Identify whether they are human or physical causes.

Climate change and drought	Variations in seasonal rainfall and evapotranspiration rates	High pressure systems
Removal of vegetation and deforestation	Over-grazing	Intensive farming

Unpredictable patterns of rainfall

Regions that have low rainfall totals each year are at most risk from desertification. The **Sahel** region of Africa is one such region. The Sahel has a long dry season of nine months, followed by a wet season of rainfall for three months. The total amount of rainfall over these three months is similar to the total amount of rainfall in Cambridge in a year. However, these wet seasons have become unpredictable, with short periods of heavy rainfall running off the land and failing to soak down into the soil where it is needed to recharge the stores of water in the ground.

What physical processes cause desertification?

Desertification occurs in regions of hot semi-arid grassland (savanna). The trees are scattered. They do not form a continuous canopy like that of a tropical rainforest. However, the trees, shrubs and grasses all protect the soil from erosion. In regions where the trees and shrubs have been cut down or burnt, the process of desertification has been rapid. Therefore, it seems that the process of desertification is caused, at least in part, by poor management of the land:

- Vegetation is an important regulator of the water cycle. In more heavily forested areas as much as 80 per cent of rainfall is recycled back into the atmosphere by a combination of evaporation and transpiration from the leaves. Slash and burn of savanna trees and bushes to make space for farming significantly reduces evapotranspiration and so eventually leads to reduced rainfall totals. This in turn leads to a reduction in water for people who rely on rivers for water supply.
- The removal of vegetation means that leaf litter can no longer fall into the soil. The nutrient cycle is broken and shrubs no longer replace nutrients or help to maintain a healthy soil structure by adding organic material to the soil.
- The destruction of the tree canopy exposes the soil to rain splash erosion. During heavy rainfall the water flows over the surface of the ground in sheets, eroding all the organic material from the upper layers of the soil. On steeper slopes the power of the water picks up and carries soil particles and smaller rocks. It uses these to erode downwards into the soil in a process known as **gulley erosion**.

Poor land management

We have seen that desertification occurs when the natural shrubs and grasses of the ecosystem are damaged or removed. This problem can be caused by poor land management such as:

- over-grazing by sheep and cattle or the collection of firewood for cooking. This means there is less vegetation to protect the soil from direct sunlight. The soil becomes drier so the risk of soil erosion increases. With less moisture in the soil, there is less evaporation. This means that there is even less rainfall locally. This is an example of a **micro-climate** where areas with less vegetation experience a local climate that is hotter and drier.

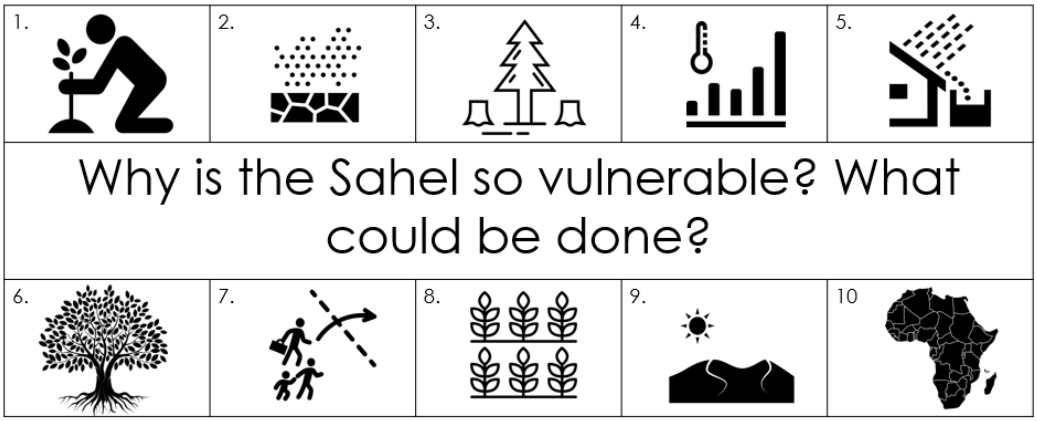
Farming in the semi-arid grasslands of Africa is a mixture of arable (crop growing) and pastoral farming (animal grazing). Farmers keep goats and cattle for both their milk and their meat. Crops are grown using a traditional bush fallow system. Scrub vegetation is removed by slashing and burning. Crops such as maize, root crops and vegetables are grown for between one and three years.

A change in global climate has caused more drought than normal. This damages animal's habitats and the soil in many areas. This also leads to famine in the long term as crops die. Disease is prevalent due to poor water quality.

Lesson 2: To what extent does human activity contribute to the problem of desertification?

LO: To understand how humans can have a significant impact on their surroundings and to be able to describe how different stakeholders may have different viewpoints in the Sahel.

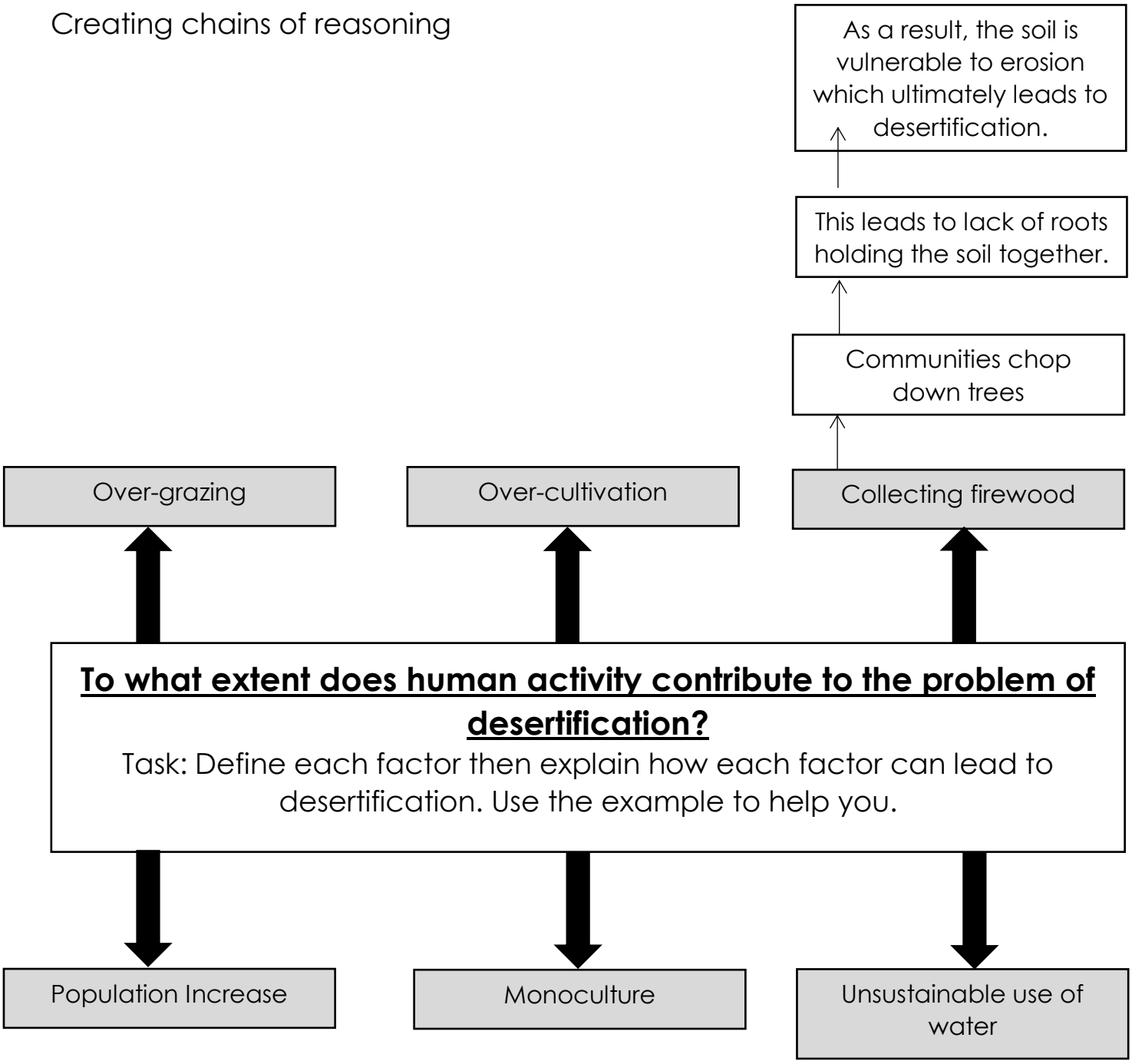
Do Now:



Recap: What are these causes of desertification?

What causes desertification?
So what? Why?
1. Overgrazing
2. Over-cultivation
3. Collecting firewood
4.Population increase
5. Monoculture
6. Unsustainable use of water

Creating chains of reasoning



What are the different viewpoints, values and attitudes of stakeholders in the affected areas?

A stakeholder is someone who has an interest or is involved in an area or activity.

Complete the table below How would each stakeholder feel about desertification? Why? How might their attitudes differ?

Stakeholder	What is their viewpoint on desertification?	What do they value?	What is their attitude to looking after the land?
Subsistence Farmers			They need their land to remain healthy so that they can feed their families. However, they may not have the right equipment or knowledge to look after the land properly.
Local Government			

Commercial Farmers			

Common Assessment Question (AO2)

Suggest how humans can impact on a semi-arid environment you have studied (6)

Plan your answer in the box below. Consider the following:

- How many paragraphs should you write?
- What should you include? How many impacts?
- Which case study are you going to use?

Paragraph 1: Which environment have you studied? Introduce your case study and state how humans are having an impact.

Paragraph 2: Explain one impact with chains of reasoning

Paragraph 3: Explain a second impact with chains of reasoning

Now write your answer below.

Lesson 3: How can environments vulnerable to desertification be managed?

LO: To be able to describe and explain the management strategies in place in the Sahel to combat desertification.

Describe the location of the Sahel

Continent

Latitude

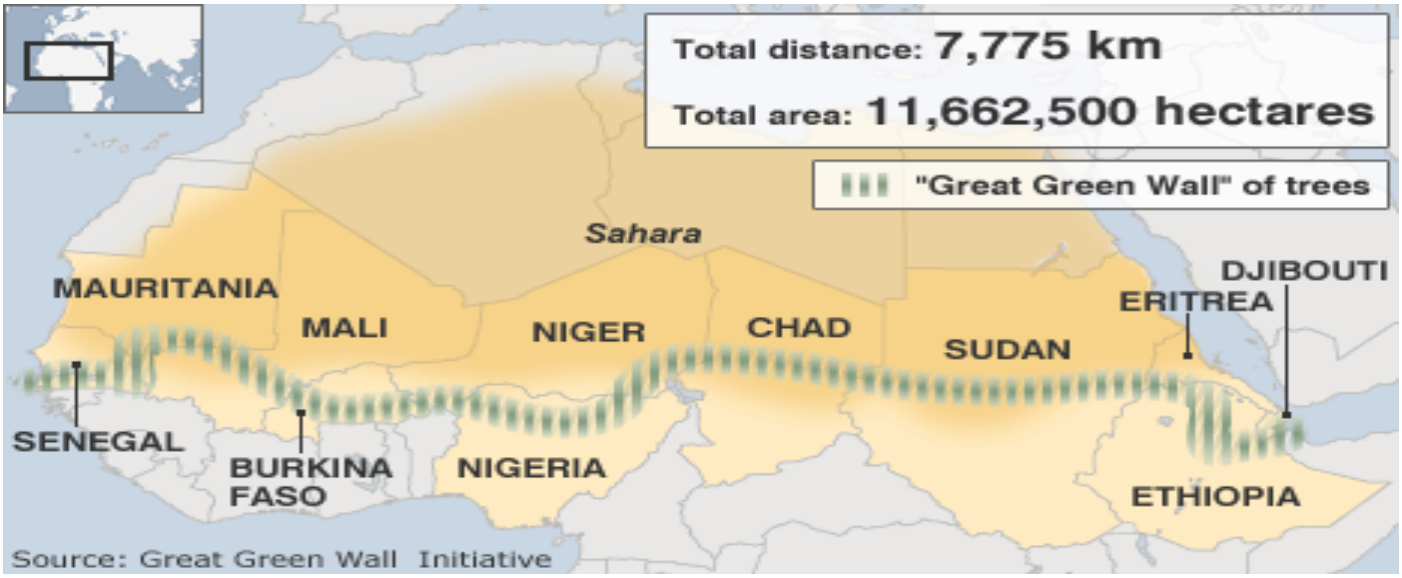
Oceans/Seas

Countries Nearby

Compass Direction

What is an NGO? Give examples?

What are the dimensions for the Great Green Wall?



https://www.youtube.com/watch?v=hfgPm4sV0uA

What is the Great Green Wall?

Read the information about the Great Green Wall on the next pages and use it to answer the questions to help you to build a case study.

Read the text carefully to ensure that you pick out the right information. Write it into your own words.

The Great Green Wall (GGW) of Africa

The Great Green Wall is one example of an initiative where countries are working in partnership with one another. Eleven countries signed an agreement in 2010 to begin planting this 'wall'. The plan is to plant a 15 km-wide strip of land with trees and shrubs across the width of Africa. It is hoped that this wall of vegetation will help prevent further soil erosion from the Sahel and improve incomes.

The plan is to encourage local communities to plant a mixture of native trees. These will include fruit and nut trees. Small fields between the trees can be planted with food and cash crops – a type of farming called **agro-forestry** because it combines farming and forestry.

▲ **Figure 17** Fields of millet growing between native shrubs and trees in Zinder, Niger.

Reduce soil erosion during the rainy season	Diversity farm incomes by growing fruit trees
Improve soil fertility by using leaves as a mulch	Increase the ability of communities to cope with climate change
Increase the amount of fodder (plant food) for livestock	Trees will provide shade for crops and increase their yield
Reduce the amount of time women spend collecting firewood	Grow medicinal plants
Increase biodiversity	

▲ **Figure 19** Benefits of the Great Green Wall.

How successful is the GGW?

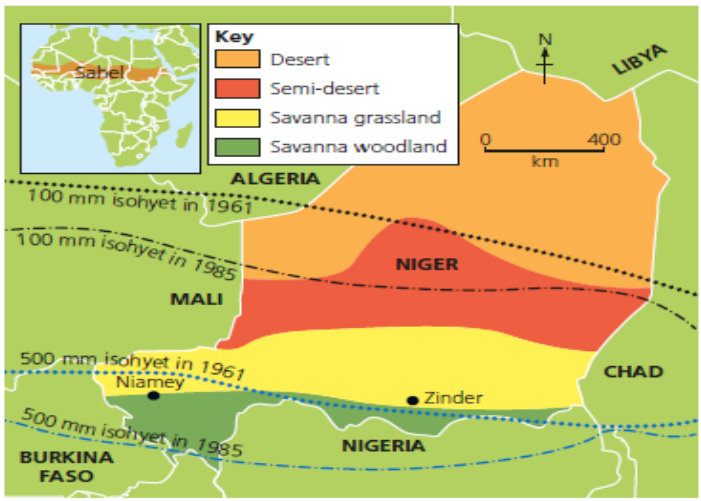
Huge progress has been made by Niger. But Niger had a head start. It began its tree-planting programme 25 years before the 2010 international agreement was signed. Five million hectares of land in the Zinder region of Niger have been planted with trees since the mid-1980s. Senegal has also made good progress. Eleven million trees have been planted across 27,000 hectares of land. The Senegal Government wants local communities to develop ecotourism in the newly planted areas to take advantage of the larger number of bird species that live in these new forests.

The Food and Agriculture Organization (FAO) of the United Nations claims that tree-planting in these two countries has been a success:

- crop yields have increased
- livestock is better fed
- the trees are providing medicines and firewood.

Progress has been slow in the other nine countries who signed the agreement. This may be because some local communities do not feel as though they have been involved in the decision-making process and they feel suspicious. This is an example of a 'top-down development' and some communities are disappointed because they have not been consulted. They cannot imagine how their own community might benefit.

▲ **Figure 20** The Project Eden Research station in Niger. Project Eden is a Swedish NGO. It funds research into plants that will grow in semi-desert conditions without the use of fertilisers or irrigation.

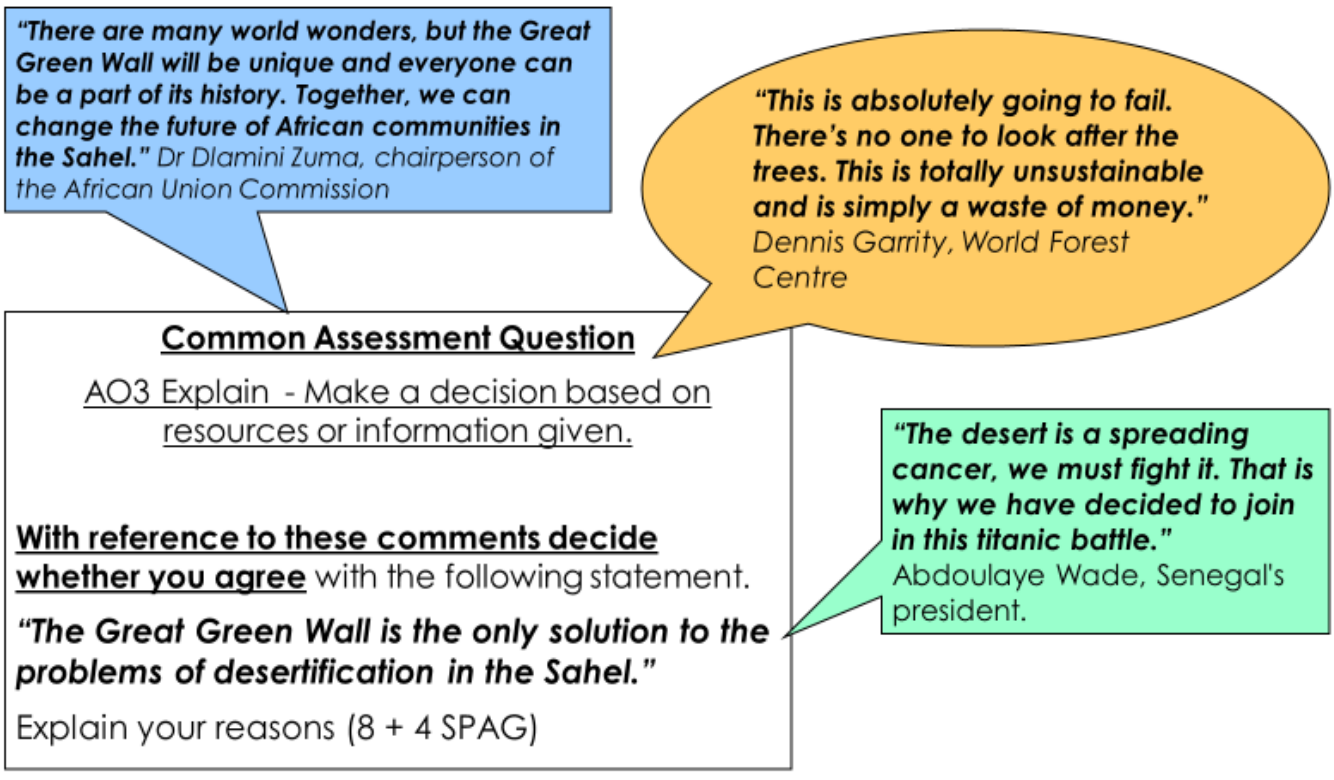


▲ **Figure 21** Ecosystems and the location of the Great Green Wall in Niger.

The Great Green Wall Project (GGW): A Sustainable Development Project

1	In which continent is the Great Green Wall being planted?	
2	How many countries signed the agreement?	
3	In what year was the agreement signed?	
4	How wide will it be?	
5	What is agro-forestry?	
6	What is the plan?	
7	What are they hoping to achieve by planting the wall?	
8	Give 3 benefits of planting the wall.	
9	Which country has made huge progress in their planting of the wall?	
10	How have they made such significant progress?	
11	How many million acres of trees have been planted in the Zinder Region?	
12	What progress have Senegal made?	
13	What does the Senegal government want to do?	

14	Who is the FAO and what do they claim?	
15	Who is Project Eden and what do they do?	
16	Why has progress been slow in the other countries?	
17	How could the Great Green Wall benefit communities?	



Suggested Structure:

An **introduction** to the issue of desertification and the Sahel as well as the possible solution of the Great Green Wall.
Agree – any arguments which agree with the statement (including the 3 quotes given)
Disagree – arguments against the statement
Conclusion - your opinion and reasons.

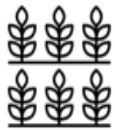
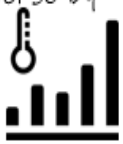
Tips for success…

1. Use wider geographical knowledge e.g. bunds, drip irrigation
2. Key terms, e.g. sustainable, semi-arid, NGO, stakeholder
3. Chains of reasoning
4. Structure (SPaG!)

Write your answer below. Remember to make use of the quotes and to write in the appropriate structure..

Take 10
The Sahel

Case study knowledge is important. Learn these 10 facts and apply them to your 6 and 8 mark questions.

The Sahel is south of the Sahara Desert and stretches from Senegal to Djibouti. 	It is vulnerable to desertification. 
The Sahel frequently suffers from drought. 	Deforestation, over-grazing and over-cultivation are helping to cause desertification. 
Subsistence farmers struggle to grow crops and therefore are often forced to migrate. 	Over-grazing strips the land of vegetation and over-cultivation takes all the nutrients. 
Desertification is made worse by climate change and population pressure. 	The Great Green Wall has been planted to reverse the effects of desertification. 
The canopy of the trees provide shade and the roots hold the soil together. 	Terracing slopes, bunds and rainwater harvesting are also used to halt desertification. 

Model Answers

Lesson 1

Describe which areas of the world are vulnerable to desertification (3)

6 of the 7 continents contain regions which are vulnerable to desertification. In Africa the Sahel region is vulnerable to desertification as well as countries such as Angola, Zambia and Mozambique.
In the majority of locations, regions vulnerable to desertification neighbour regions which are already desert, exceptions to this include Brazil, Bangladesh and Spain.

Describe the changes to the Sahara Desert over time (3)

The Sahara has changed significantly in the last 6000 years. The desert has spread, and now areas which were previously steppe and Savanna are now desert. The Savanna has decreased in size and is now only found in the south of the Sahara. This means that there is evidence of desertification as the desert has spread and now countries such as Egypt and Libya are mostly desert.

Lesson 2

Suggest how humans can impact on a semi-arid environment you have studied (6)

A semi-arid environment that has been impacted by human activity is the Sahel in Northern Africa. Human activity such as commercial farming and collecting firewood has caused significant damage to the environment.

Commercial farming often results in monoculture, this means that one plant type is farmed and therefore the soil loses nutrients. Over time this loss of nutrients leads to the soil becoming infertile. When plants can no longer grow in the soil it is left bare, this can lead to soil erosion as the wind will blow away any soil which has not been anchored b plant roots. This leads to desertification. The Sahel is already a fragile environment – the poor land management has contributed to the spread of the Sahara Desert.

A second human impact is collecting firewood. In the Sahel firewood is often collected, however when communities cut down trees they reduce shade for other plants and therefore the ground can very quickly dry out. As the soil

becomes drier the risk of soil erosion increases as it can be easily be blown away by the wind. When trees are removed completely for firewood this leads to a lack of roots anchoring the soil, therefore the Sahel becomes more vulnerable to desertification.

Lesson 3

With reference to these comments decide whether you agree with the following statement: "The Great Green Wall is the only solution to the problems of desertification in the Sahel." (8+4)

The Sahel is in Northern Africa and it is one of the most 'at risk' regions of desertification. Desertification is the process of fertile land becoming desert. The Sahel is particularly vulnerable as it is already very dry it is also heavily cultivated by both commercial and subsistence farmers. One possible solution is the planting of the Great Green Wall – a forest which stretches from Senegal to Djibouti with the aim of preventing the further spread of the Sahara Desert.
Those in favour of the Great Green Wall include Dr Zuma, they believe that it will change the future of African communities in the Sahel. To some extent this is true. If the planting of the Great Green Wall is successful it could provide many opportunities such as an income from planting fruit trees, an increase in crop yields for families and the ability for women to spend less time collecting firewood and therefore being able to work or participate in education. Furthermore, the Great Green Wall will improve the overall fertility of the soil, increase biodiversity and reduce soil erosion. The Great Green Wall has a variety of benefits and could be at the forefront of preventing the spread of the desert – this opinion is also shared by Abdoulaye Wade, Senegal's President.

On the other hand, there are many downsides to the planting of the Great Green Wall. Firstly 11 countries need to work tirelessly together in order to plant 7775km of trees -this would be very difficult to organise, and could potentially cost a lot of money – some countries may feel it unfair or may not have the funds or equipment to successfully plant and grow their share of trees. Dennis Garrity states that "There is no one to look after the trees. This is totally unsustainable". It would be very difficult to achieve cohesion between all 11 countries to successfully plant their share and without the right equipment or access to water the project is unsustainable. There are other strategies which could be successful, for example NGOs such as Project Eden who are researching into plants which grow well in normal semi-arid conditions without the need for fertiliser. Planting these could also help to

stop the spread of the deserts as they would need little human intervention in order to thrive.

In conclusion I believe that there is more than one solution to the problems of desertification in the Sahel, a number of strategies need to be used to help prevent the spread of the Sahara Desert, as each country will have its own issues and their access to water, equipment and plants may differ. Only applying one solution leads to a single point of failure and therefore it could easily fail. Applying a range of solutions such as the Great Green Wall, education and the work of NGOs the problems of desertification in the Sahel could be minimised.