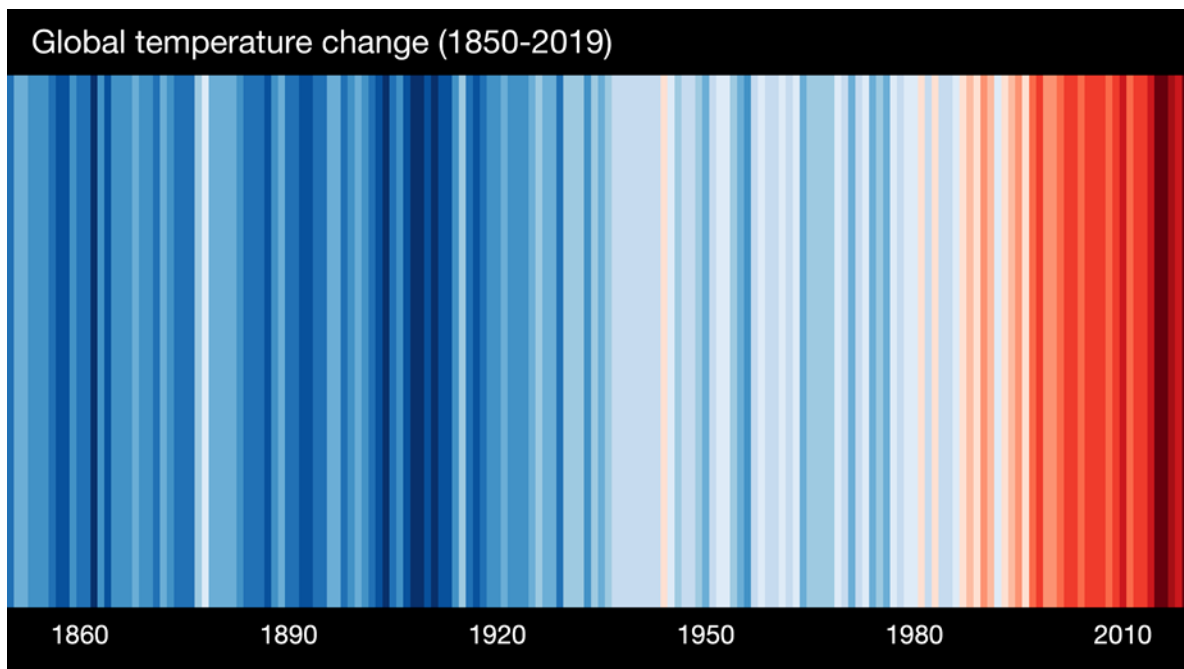


Name: ..... Class: .....

# Year 9 Unit 1:



Is Climate Change an extinction level event?

**UNIT OVERVIEW: Climate Change**
**ENQUIRY: Is Climate Change an extinction level event?**

<b>Unit intention:</b>		
<b>Success criteria</b>	✓	X
<ul style="list-style-type: none"> <li>• I can explain the evidence for climate change</li> <li>• I can assess which causes are most important</li> <li>• I can explain the ecological breakdown</li> <li>• I can describe how Tuvalu is being affected by climate change</li> <li>• I can compare the effectiveness of different strategies</li> <li>• I can explain why people aren't tackling climate change</li> </ul>		
<b>Unit summative and formative assessment details:</b>  EQs throughout, essays and end of unit test		
<b>Home Learning (What and how often):</b> Every lesson – variety of activities		
<b>Topic Sequence</b> <ul style="list-style-type: none"> <li>• Evidence for climate change</li> <li>• Causes of climate change</li> <li>• Impacts of climate change</li> <li>• Tuvalu case study</li> <li>• Mitigation and adaptation</li> <li>• Opinions on climate change</li> </ul>	<b>Recommended reading/ watching:</b> Greta Thunberg – book/ Ted talks David Attenborough – documentaries Extinction Rebellion handbook   <b>Places to visit:</b>	

Professionalism. Inclusion. Pedagogy. Curriculum.  
Be professional. Be inclusive. Be a learner. Be knowledgeable.

### End of unit evaluation

**Success criteria** – Have you met them? Show your evidence in preparation for your assessment.

1.

2.

3.

4.

5.

6.

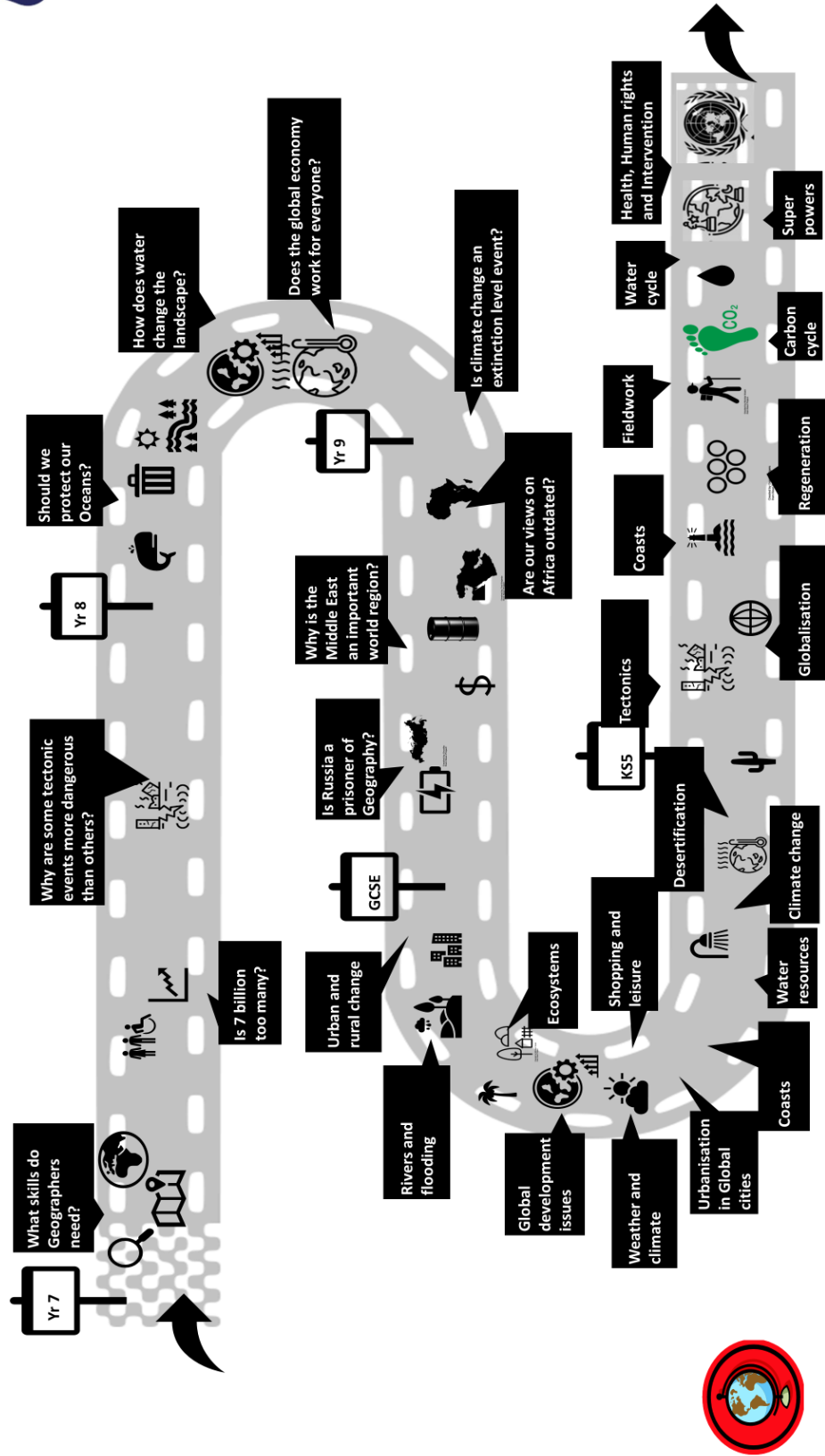
How will you improve your work?

## Student Assessment sheet

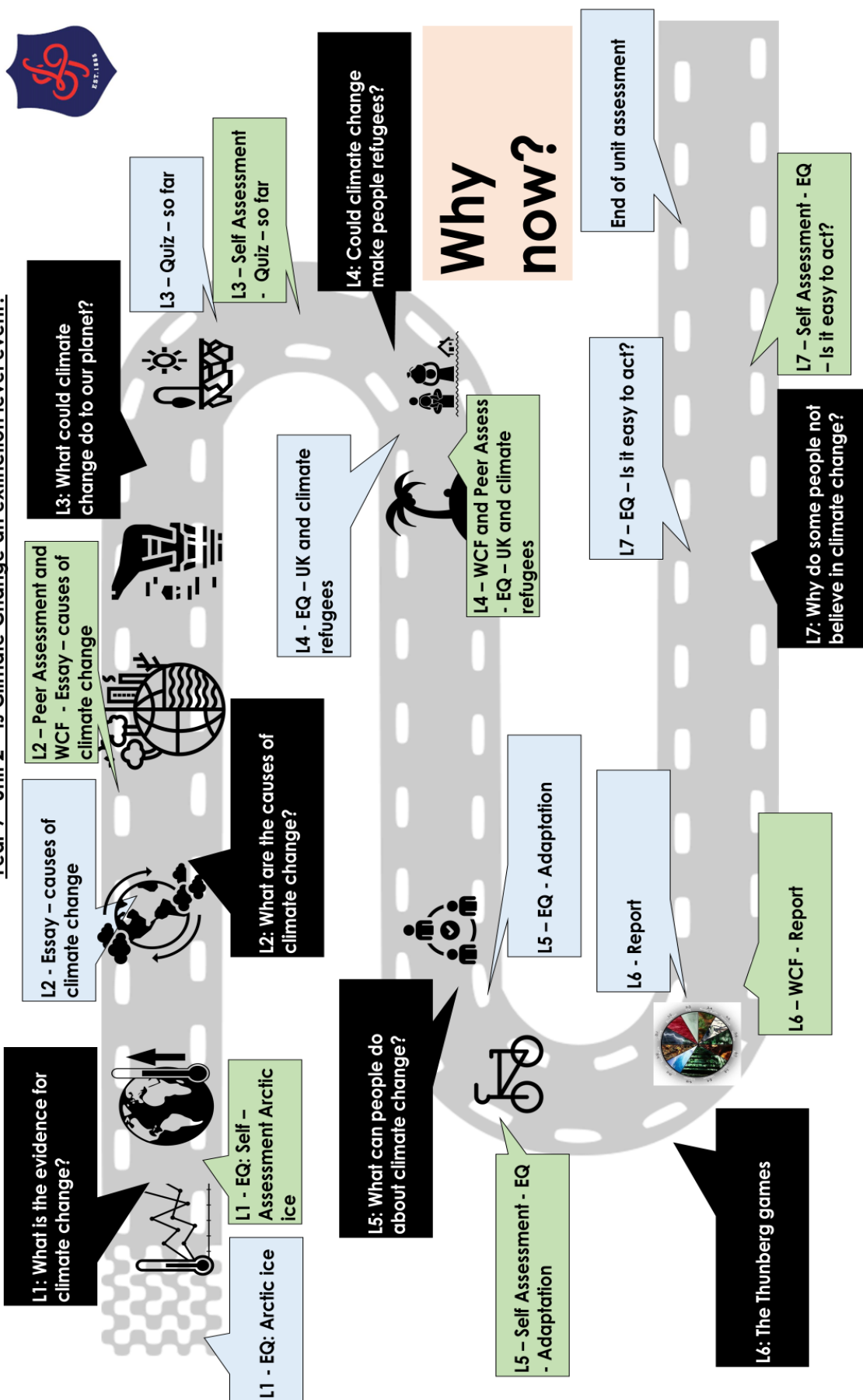
### Year 9 Unit 1

LI	Extending	Mastering	Learning	Assessment	HW Check
<b>To understand the evidence for climate change</b>	I can explain the evidence for climate change	I can describe the evidence for climate change	I can define climate change	EQ	Guided reading
<b>To understand the different causes of climate change</b>	I can assess which causes are most important	I can compare the impact of human and natural factors	I can describe the normal and enhanced Greenhouse effect	EQ	Dual coding  Guided reading
<b>To understand the social, economic and environmental impacts of climate change</b>	I can explain what might happen to the UK	I can explain the ecological breakdown	I can describe the impacts of climate change	Quiz	Guided reading
<b>To explain the impact that climate change can have on individual locations on our planet.</b>	I can explain how climate change will make people into refugees	I can describe how Tuvalu is being affected by climate change	I can describe the location of Tuvalu	EQs	Meanwhile, elsewhere
<b>To understand how individuals, organisations and governments can tackle climate change</b>	I can compare the effectiveness of different strategies	I can relate actions to sustainability	I can define adaptation and mitigation	EQ	Speech
<b>To check our understanding of climate change</b>	I can answer an exam style question	I can solve problems	I can work effectively in a group	EQ	Revision clock
<b>To understand why it is so difficult to deal with climate change</b>	I can explain my own view on climate change	I can explain why people aren't tackling climate change	I can identify different opinions on climate change	EQs	Revise for exam

# Geography at Langdon Park School – Year 9 from 2022



## Year 9- Unit 2 – Is Climate Change an extinction level event?



## Lesson 1: How has our climate changed over time?

### Big Picture

		I think I can..	My teacher thinks I can ...
Learning	I can define climate change		
Mastering	I can describe the evidence for climate change		
Extending	I can explain the evidence for climate change		

### Do it now:

## Can you find?

What can be found at:

491 782  
506 761  
491 760  
503 761  
509 782

What is the map symbol for:

An Embankment  
An A Road  
Marshes



### Starter:

1		5	
2		6	
3		7	
4			

## Video notes

.....

.....

.....

.....

.....

.....

.....

What is climate change?

.....

.....

.....

What is Global warming? Rewrite this definition in your own words.

**Global warming is the gradual increase in the overall temperature of the Earth's atmosphere. Many people believe that this is caused by the Greenhouse Effect – increased levels of CO<sup>2</sup>, CFCs and other pollutants.**

.....

.....

.....

.....

What is global cooling?

.....

.....

.....

The movie Ice Age is set during a glacial period of Earth's history. The dinosaurs lived during an **interglacial** period and we are also living in an interglacial period. During the last **glacial** period, London was very close to the ice sheet covering the Northern half of the UK. Now it rarely goes below freezing in London. This shows how much the climate has **fluctuated** in the past.

Use the paragraph above to try to write definitions to the 3 key words.

.....

.....

.....

.....

.....

.....

.....



The climate during the Quaternary has not been consistent and has seen many changes. The most recent 2.6 million years of Earth's history is known as the Quaternary. Glaciers advance from Polar Regions and then retreat, carving and moulding the land with each growth. Sea levels fall and rise with each period of freezing and thawing. Some mammals get massive, grow furry coats, and then disappear. Humans evolve to their modern form, traipse around the globe, and make a mark on just about every Earth system, including the climate.

At the start of the Quaternary, the continents were just about where they are today, slowing inching here and there as the forces of plate tectonics push and tug them about. But throughout the period, the planet has wobbled on its path around the sun. The slight shifts cause ice ages to come and go. By 800,000 years ago, a pattern had emerged: Ice ages last about 100,000 years followed by warmer periods of 10,000 to 15,000 years each. The last ice age ended about 10,000 years ago. Sea levels rose rapidly, and the continents achieved their present-day shape.

During cold spells, when the temperatures drop, ice sheets spread from the Poles and cover much of North America and Europe, parts of Asia and South America, and all of Antarctica. With so much water locked up as ice, sea levels fall. Some continents become connected, due to the low sea levels, allowing animals and humans to migrate from one landmass to another. During warm spells, the ice melts and retreats, leaving behind new rivers and giant lakes like today's Great Lakes. Plants and animals that sought warmth and comfort toward the Equator return to the higher latitudes, closer to the poles.

Mammals like mammoths, rhinos, bison, and oxen grow massive during ice ages and thrive. About 10,000 years ago, the climate began to warm, and most of these so-called megafauna went extinct. Only a handful of smaller representatives remain, such as Africa's elephants, rhinoceroses, and hippopotamuses. Scientists are uncertain whether the warming climate is to blame for the extinction at the end of the last ice age. At the time, modern humans were rapidly spreading around the globe and some studies link the disappearance of the big mammals with the arrival of humans and their hunting ways. In fact, the Quaternary is often considered the "Age of Humans." *Homo erectus* appeared in Africa at the start of the period. The first modern humans evolved in Africa about 190,000 years ago and moved to Europe and Asia and then on to Australia and the Americas.

Answer the following questions:

1. What is meant by the 'Quaternary Period'?

.....

2. What happens to glaciers with each period of the Quaternary?

.....

3. What happens to the sea with each period?

.....

4. How has the sun affected the temperatures in the quaternary period?

.....

.....

5. When was the last ice age?

.....

6. What happens during cold spells?

.....

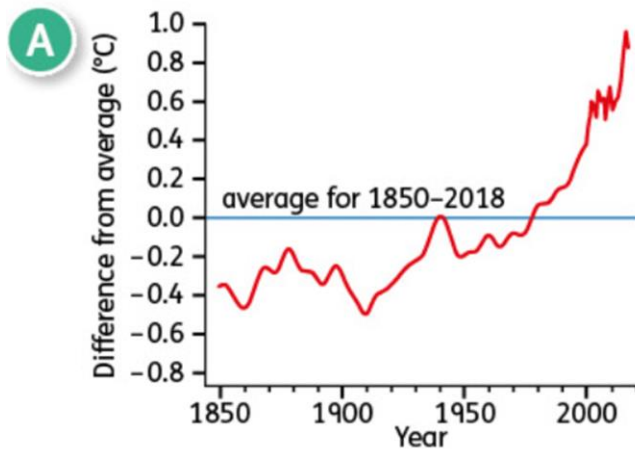
7. What happens during warm spells?

.....

8. Why is Quaternary known as "age of the humans"?

.....

.....



*Changes in global temperatures, 1850–2018*

The **geologic timescale** shows the names of each time period in history, which is then split into **epochs** (smaller time periods).

We are most interested in the **Quaternary** period, in particular the **Holocene** as this is the most recent **time period**, and the one we're in now! It goes from the last 11,500 years ago (the end of the last **glacial**), to the current time.

Summarise the above paragraphs into no more than 20 words. You **MUST** include the words in bold!

.....

.....

.....

Time	When?	What was it like?	What was happening to the earth?
Anthropocene			
Holocene			
Pleistocene			
Tertiary			
Cretaceous and Jurassic			

	Tick the correct answer		
<b>The Quaternary period includes the last:</b>	3.4 million years	5.5. million years	2.6 million years
<b>During this time global temperatures have:</b>	Stayed the same	Fluctuated (up and down)	Increased
<b>Cold periods are known as:</b>	Glacials	Interglacials	Hot spots

<b>Warm periods are known as:</b>	Glacial	Interglacial	Hot spots
<b>Glacials last about:</b>	400,000 years	100,000 years	1 million years
<b>Interglacials last about:</b>	2,000 years	100,000 years	10,000 years
<b>The Earth is currently in a:</b>	Glacial period	Interglacial period	Ice Age

What is proxy data?

.....

.....

.....

Weather recordings	
Ice cores	
Rocks and fossils	
Analysis of pollen and trees	

**Exam question:**

Study the photograph below. Explain how the shrinkage of Arctic sea ice could be evidence of climate change. (4 marks)

.....

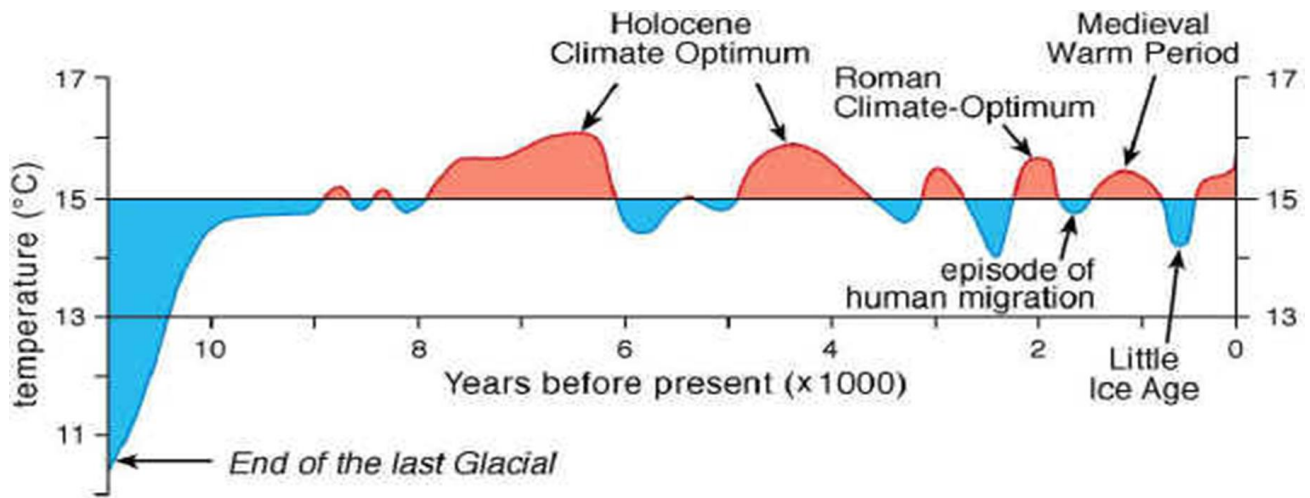
.....

.....

.....

.....

.....



Describe the changes in average global land surface temperatures since 1850. Use figures from graph 2.2. in your answer (3)

.....

.....

.....

.....

.....

.....

.....

.....

Statement:	True/ False
Over the last 100,000 years the earth's climate has generally had a steadily increasing temperature change.	
The last ice age was 950 AD so about 1065 years ago.....	
The last warm period started in the year 1450.	
The last warm period lasted approximately 700 years.	
Between the 450,000 years ago and 400,000 years ago the temperature stayed steady and level	

## Lesson 2: What are the causes of climate change?

### Big Picture

		I think I can ...	My teacher thinks I can ...
Learning	I can describe the normal and enhanced Greenhouse effect		
Mastering	I can compare the impact of human and natural factors		
Extending	I can assess which causes are most important		

### Do now: Complete the key definitions

Keyword	Definition
Evaporation	
Transpiration	
Condensation	
Infiltration	
Precipitation	
Surface run-off	

### Starter:

What does the word cause mean?

.....  
 .....  
 .

What categories can we divide these statements into?

Sea Levels will rise	Interglacial periods
Animals could become extinct	Burning Fossil fuels
Coral reefs will be destroyed	CFCs
An increase in tropical storms	Holes in the ozone layer
Changes in the Earth's orbit	Deforestation
Sun spots	Methane from cows
Meteorites hitting Earth	CO <sup>2</sup> emissions
Volcanic Eruptions	Ice caps melting

Anthropogenic causes - .....  
.....

Natural causes .....  
.....

### **The Greenhouse effect:**

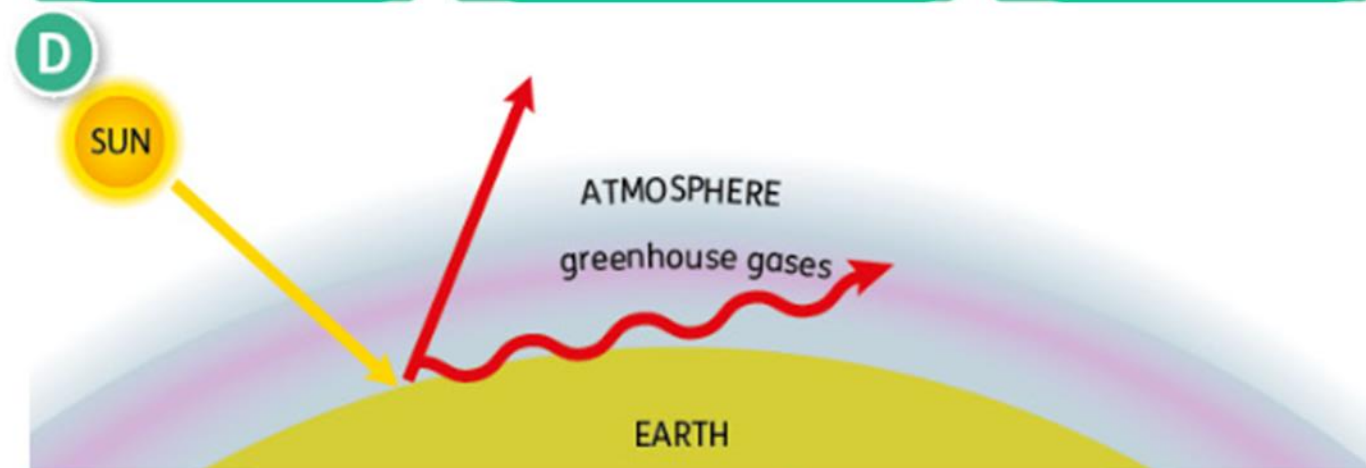
Video notes  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....



1

2

3



4

5

### The greenhouse effect

Some radiation is _____ by the atmosphere.	Some _____ is _____ by the earth.
Some radiation cannot _____ through the atmosphere and is reflected _____ to earth.	Incoming _____ radiation warms the earth.

1 The Earth's atmosphere is made up of gasses like oxygen, carbon dioxide and methane	True	False
2 The atmosphere stops heat from getting through from the sun		
3 Without the greenhouse effect, the Earth's would be about 30°c colder and many people and animals would not be able to live here.		
4. Certain gases allow the sun's energy through into the Earth but then stop the heat from escaping back into space. These gases are called greenhouse gases.		
5. The amount of greenhouse gases in the atmosphere is decreasing		
6. Humans have increased the amount of greenhouse gases by burning fossil fuels such as coal, oil and gas.		
7. Other human activities that have increased the amount of greenhouse gases includes burning forests and aerosol (spray) cans.		
8. The more greenhouse gases there are in the atmosphere the colder the Earth gets		
9. Some of the sun's radiation is reflected off the atmosphere back into space		
10. If humans reduced the amount of fossil fuels they burn then the global temperature would increase		

#### Video notes

.....

.....


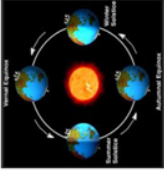
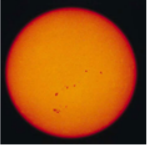

.....

.....

.....

.

## The natural causes of climate change

Long term changes (may last for many centuries)		Short term changes (lasting just a few years)
The orbital theory	The sunspot theory	The eruption theory
		

Theory	Description	Details			Example
<b>Eruption Theory</b>	The changes in the earth's orbit and axis are called Milankovitch Cycles.	Dark spots tell us that the sun is more active than usual and therefore warmer.	The blanket of ash and gas can stop some sunlight reaching the earth's surface.	These are black areas on the surface of the sun.	The eruption of Mount Pinatubo in 1991 reduced global sunlight by 10 % and cooled the earth by 0.5°C.
<b>Sunspot theory</b>	Volcanic eruptions produce ash and sulphur dioxide gas.	It takes 41,000 years for the earth's axis to tilt, straighten up, and tilt again.	It takes 100,000 years for the earth's orbit to change from circular to more of an ellipse.	Some of the sunlight is reflected off the ash and gas back into space. This cools the earth and lowers temperatures.	The Little Ice Age and Medieval Warm Period may have been caused by these changes in activity.
<b>Orbital theory</b>	Sometimes the sun has lot's of dark spots and other times they disappear. These spots are called sunspots.	If the ash and gas rise high enough they can spread round the earth by strong winds.	Lot's of spots mean more solar energy being fired out from the sun towards the earth.	Over 26,000 years the earth's axis 'wobbles' and straighten up, like a spinning top.	Glacial and interglacial (warmer) periods may have been caused by these orbital changes.

## Physical causes of climate change - Quiz

### 1. How long is a Milankovitch cycle?

- a) 41,000 years
- b) 26,000 years
- c) 100,000 years
- d) 78,000 years

### 2. What shape is the earth's orbit usually?

- a) Circular
- b) Elliptical
- c) Regular
- d) Irregular

### 3. What is eccentricity?

- a) Moving from a regular to irregular cycle
- b) Moving from an elliptical to a circular orbit.
- c) The wobble of the earth
- d) A change in the tilt

**4. What is a sun spot?**

- a) An area of the sun that has died
- b) A hotter patch of ground on the Earth.
- c) A dark patch on the sun that appears from time to time
- d) A much hotter area on the sun.

**5. What is precession?**

- a) The natural wobble of the Earth.
- b) An elliptical orbit
- c) A change in the tilt of the Earth
- d) An irregular mechanism

**6. What is the current tilt of the earth's axis?**

- a) 21.5 degrees
- b) 22.5 degrees
- c) 23.5 degrees
- d) 24.5 degrees

**7. How regularly does the earth's tilt vary?**

- a) every 40,000 years
- b) every 41,000 years
- c) every 42,000 years
- d) every 43,000 years

**8. If the sun is closer to the earth in January what would this mean for the northern hemisphere. Select 2 answers.**

- a) Cooler winters
- b) cooler summers
- c) warmer winters
- d) warmer summers

**9. Which eruption in 1991 temporarily offset the greenhouse effect?**

- a) Mount Pinatubo
- b) Mount Tambora
- c) Krakatoa
- d) St Helens

**10. The Mount Tambora eruption reduced the global temperatures by how much?**

- a) 1°C
- b) 5°
- c) 0.4°C
- d) 3°C

Captain America says – 'There is no way climate change wasn't caused by humans. I didn't see any evidence of it before I re-awoke in 2012!'

Write your response

This image shows a full page of white paper with horizontal dotted lines. The lines are evenly spaced and run across the width of the page, providing a guide for handwriting practice. There are no margins, text, or other markings on the page.

## Peer Assessment

Comment .....

.....

.....

.....

Action .....

.....

.....

## Human causes

Explain how humans are enhancing the greenhouse effect. (3)

.....

.....

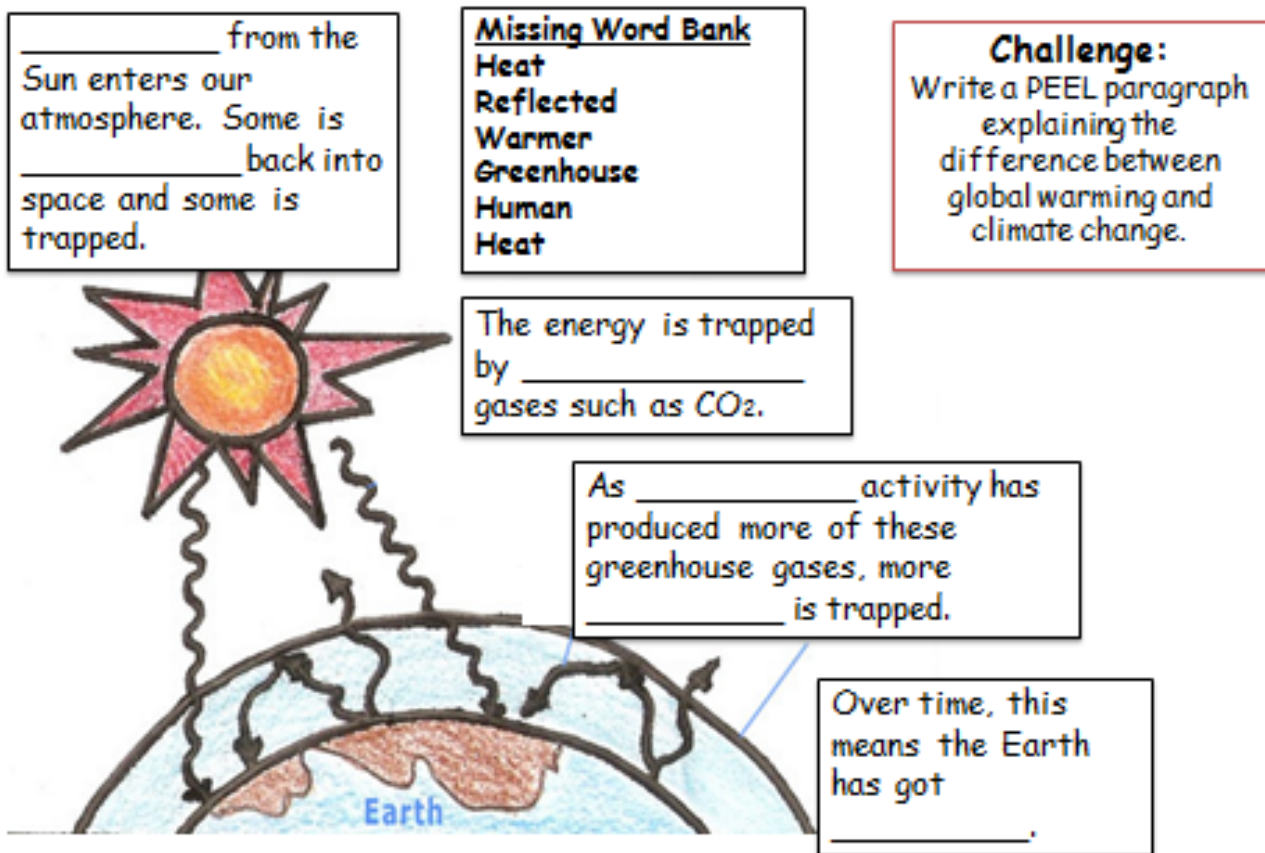
.....

.....

.....

.....

## Enhanced Greenhouse Effect



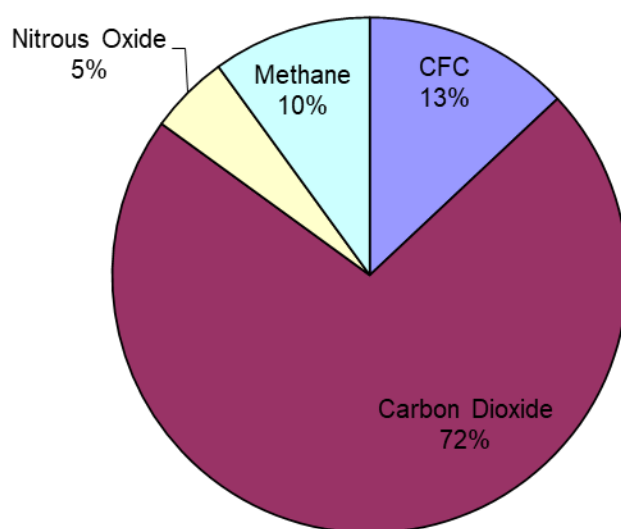
What does the Hockey Stick graph show?

.....

.....

.....

.....



Where is the CO<sub>2</sub> coming from?

.....

.....

.....

Where is the Methane coming from?

.....

.....

.....



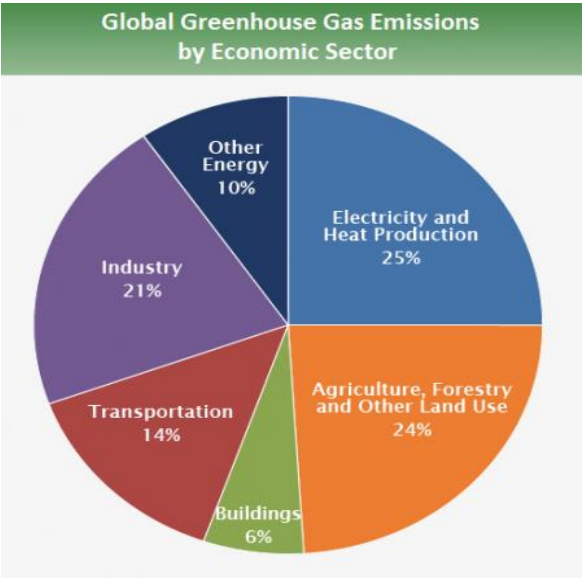
Where is the Nitrous Oxide coming from?

.....

.....

.....

Greenhouse gases by sector



Which sector contributes the most GHGs?

.....

How does the transportation sector use fossil fuels?

.....

How can use of electricity at home sometimes be wasteful?

.....

Describe two ways farming releases greenhouse gases.

.....

Explain the advantages and disadvantages of using fossil fuels.

.....

.....

.....

.....

.....

.....




.....

.....

.....

.....

The human causes of climate change

Fossil Fuels	Agriculture	Deforestation
		

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

[illegible]

Explain how both natural and human factors contribute to climate change. (6 marks)

[illegible]

.....

.....

.....

.....

.....

.....

.....

.....

.....

Stick your homeworks here

### Lesson 3: What could climate change do to our planet?











#### Big Picture

L/M/E		I think I can ...	My teacher thinks I can ...
Learning	I can describe the impacts of climate change		
Mastering	I can explain the ecological breakdown		
Extending	I can explain what might happen to the UK		

#### Do now: Retrieval

Last Lesson	Last year	General Geography knowledge
What is short-term aid?	Name 1 process in the water cycle	What continent is the UK in?
What is long-term aid?	Explain evaporation	How many continents are there in the world?
What is tied aid?	Explain infiltration	Name the 5 Oceans

## Starter: Looking back

1. 	2. 	3. 	4. 	5. 
What are the human and physical causes of climate change?				
6. 	7. 	8. 	9. 	10. 

Watch this Greta Thunberg speech to world leaders at the UN Climate Summit.  
Write down your thoughts on what you think an ecological crisis / breakdown is.

.....

.....

.....

.....

.....

.....

.....

.....

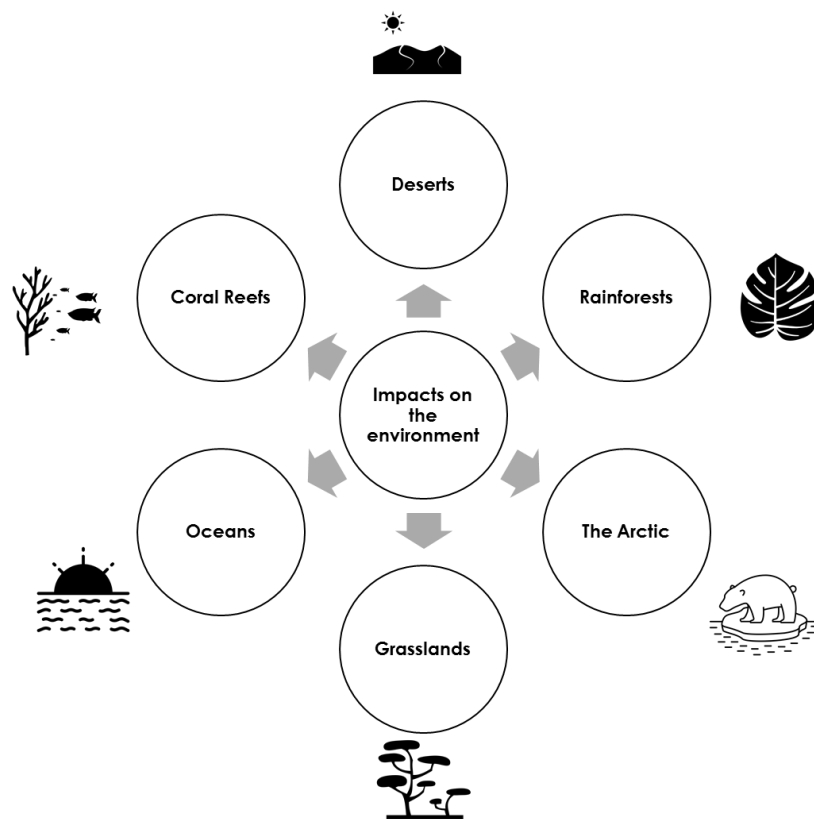
.....

Our planet is \_\_\_\_\_. Global warming is both a \_\_\_\_\_ and man-made process, it is something that has happened on a \_\_\_\_\_ since the existence of our planet however \_\_\_\_\_ are making the process happen more quickly than ever before. Global temperatures are \_\_\_\_\_ and this is leading to changes in our \_\_\_\_\_ which could be irreparable.

Fragile ecosystems such as \_\_\_\_\_ are dying, in turn this is leading to extinction of some marine life. The rise in temperatures is leading to an increase in \_\_\_\_\_ and forest fires and the \_\_\_\_\_ ice caps are not only increasing sea levels they are also failing to provide \_\_\_\_\_ for animals such as polar bears.

An ecological crisis / breakdown is a situation where an ecosystem suffers a \_\_\_\_\_ and possibly permanent reduction in the number of \_\_\_\_\_ that can survive there which could result in mass \_\_\_\_\_.

Changing, food, drastic, cycle, extinction, melting, coral reefs, rising, humans, natural, bushfires, species, ecosystems,





Which ecosystem will be most at risk?

Put the 6 ecosystems into a rank order. At the top will be the ecosystem which is most at threat down to the lowest threat.

This is your opinion.

You must be able to justify your reasons. This is an important skill.

1	
2	
3	
4	
5	
6	

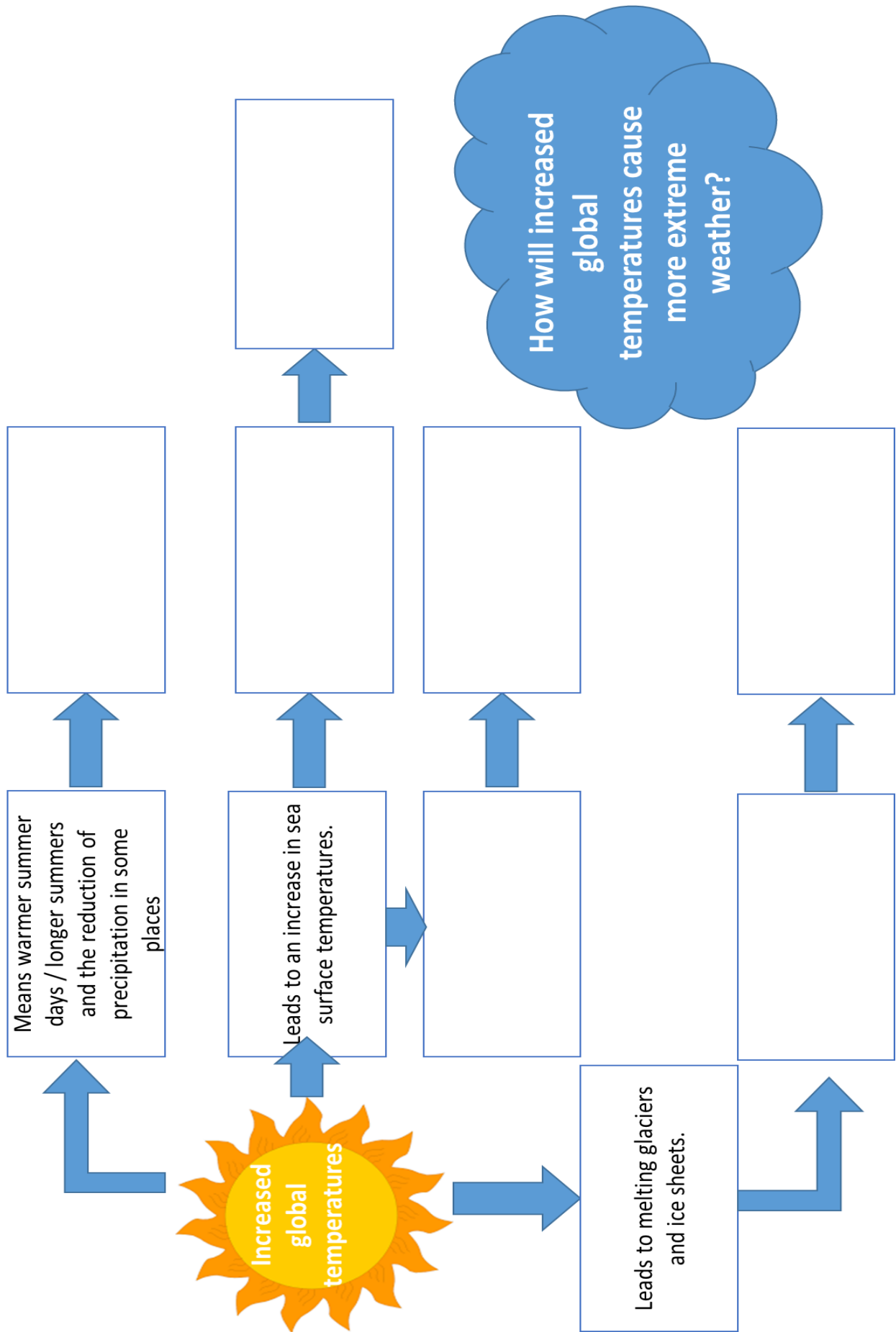
What is extreme weather?

.....

.....

.....

.....



## Major weather events cited in the World Meteorological Organisation study

### CANADA 2005

The warmest summer on record in Canada

### US 2005

Most active hurricane season on record. Hurricane Katrina hits New Orleans causing extensive flooding and killing more than 1,300 people

### BRAZIL 2005

Worst drought in 60 years in Brazil caused by lowest Amazon flow in 30 years

### HORN OF AFRICA 2006

Long-term drought followed by torrential downpours produce worst flooding for 50 years

### EUROPE 2003

Record heatwave in France and other parts of Europe. Some 35,000 people are estimated to have died from heat-related causes

## KEY

-  Heatwaves
-  Severe drought
-  Extreme flooding
-  Hurricanes
-  Tornadoes

Read through the article, then using 2 colours underline or highlight the positive and negative effects to the UK.

**Challenge:** In your books, summarise the positives and negatives as concisely as possible in a short paragraph.

E.g., The positives of climate change to the UK include.... however, there are also negatives, including...

### **Climate change will make UK new holiday destination**

**Britain will become a holiday hotspot in 40 years because of warmer weather, a Government report on climate change has found, but extra flooding will cost billions.**

#### **By Louise Gray, Environment Correspondent**

Southern Europeans tourists may come to the UK to escape increased heat while British holidaymakers will remain here rather than travel to France or Spain, according to a report by the Department for Environment, Food and Rural Affairs.

But the main risk is that global warming will cause flooding that could cost up to £12 billion every year because of heavy rainfall in the winter and rising sea levels, affecting up to 3.6 million people by 2050.

There will also be regular hosepipe bans because of droughts, especially in the South East where there is already a shortage this winter. Hot weather will kill crops, devastate wildlife, and increase risk of diseases.

Heatwaves could kill up to 6,000 more people every summer by the 2050s and businesses will lose up to two days as employees struggle to work in the heat.

However there are also "opportunities" for the UK in reduced energy bills during warmer months, up to 24,000 fewer deaths from the cold in winter and growth in new crops like peaches or sunflowers.

The opening of the Arctic shipping route due to ice melt will make it easier and cheaper to transport goods and some species of fish, like plaice and sole, should become more abundant around the UK.

"Hotter summers and warmer year-round temperatures may make the UK a more attractive for foreign and domestic holiday makers. In particular, the UK could be well placed to attract visitors deterred by the uncomfortably high temperatures in southern Europe projected to result from climate change," read the report.

The Climate Risk Assessment Report sets out the 100 greatest risks for the UK over the next century due to rising temperatures predicted by the Met Office.

Flooding, that currently causes £1.3 billion worth of damage every year, is expected to become a massive problem, costing £12 billion per year not including surface flooding.

The impact will also be felt on health with the number of people killed by floods increasing from 18 today to up to 52 by the 2050s and the number of people affected mentally rising from up to 7,000 to 11,500.

At the same time a lack of water will also be a problem. In the South East and Anglia, where there is already currently a drought, most people will be considered to be living under “water stress” meaning water meters will have to be introduced and there may be restrictions imposed.

Caroline Spelman, the Environment Secretary, pointed out that the floods in 2007 cost £3 billion in England alone.

She warned that failure to prepare for further disasters will cost even more unless preparations are made now.

“This world class research provides the most comprehensive case yet on why we need to take action to adapt the UK and our economy to the impacts of climate change,” she said.

“It shows what life would be like if we stopped our preparations now, and the consequences such a decision would mean for our economic stability.”

Sir Bob Watson, Defra’s chief scientist admitted it was a “mixed bag” for the UK.

Although tens of thousands of people in Britain may be saved by more warm winters there will still be cold snaps.

He also pointed out that other problems will emerge because of the effect of climate change on other parts of the world. For example food prices are expected to go up because of droughts in the main agricultural areas, water shortages could cause more conflict and millions of people will become ‘climate change refugees’.

“If we have a warmer world we should then in principle have the adverse effects of heat stress mortality but at the same time it should be offset by less people dying by winter,” he said.

.....

.....

.....

.....

.....

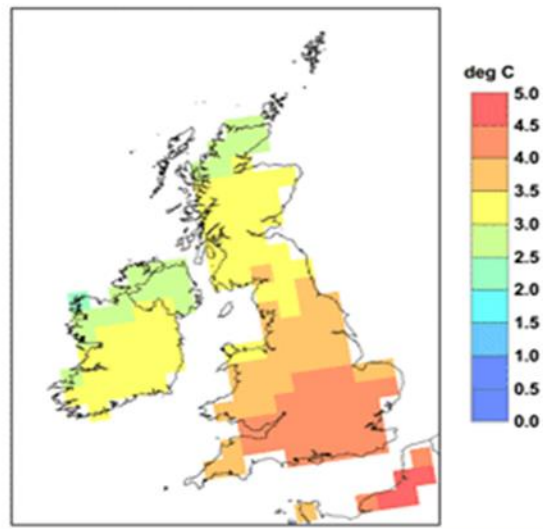
.....

.....

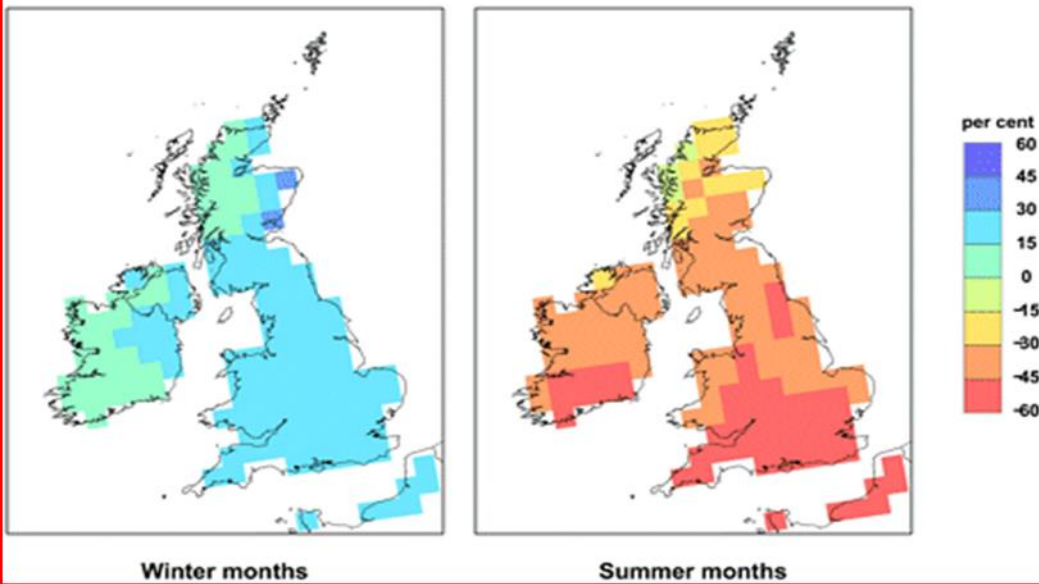
.....

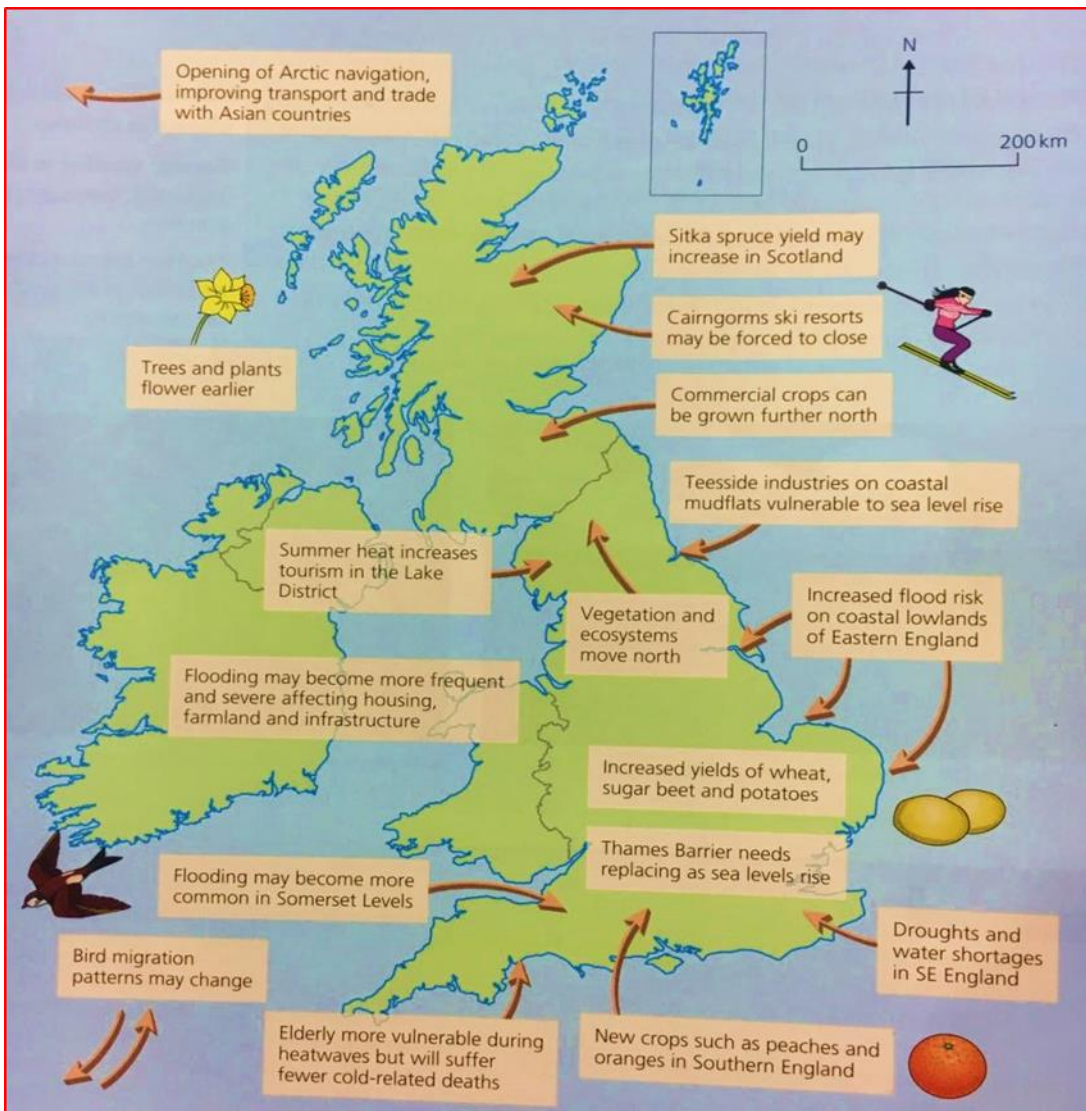
.....

### Change in annual average daily temperature –2080s



### Percent change in precipitation –2080s –High Emissions scenario





What new crops can be grown in a warmer England?

.....

.....

Why might ski resorts be forced to close?

.....

.....

Is the earlier flowering of trees and plants a good or bad thing?

.....

.....

How might the increase in production of wheat and potatoes benefit industry and people?

What will be the impacts on the economy?

.....

.....

.....



Collect a guided reading sheet











Quiz

	My answer	Correction
1		
2		
3		
4		
5		

Case study:

# Take 10

## UK Climate Change

<p>Sea levels could rise, covering low lying areas e.g. East Anglia.</p> 	<p>Scottish ski resorts may have to close to the lack of snow.</p> 
<p>Droughts and flood become more likely as extreme weather increases.</p> 	<p>There will be an increased demand for water in the hotter summers.</p> 
<p>Crops such as oranges, grapes and peaches could be grown in a hotter climate.</p> 	<p>London could be at risk as the Thames Barrier is unlikely to cope with sea level rise.</p> 
<p>In 1997 the UK signed up to the Kyoto Protocol to limit carbon emissions.</p> 	<p>In 2015 the UK signed the Paris Accord to keep global warming below 2°C.</p> 
<p>National strategies: Investment in nuclear/renewables, public transport upgrades, car taxation, etc.</p> 	<p>Local strategies: park and ride, bike hire schemes, congestion charges, car sharing, etc.</p> 



## Lesson 4: Could climate change make people refugees?

### Big Picture

L/M/E		I think I can ...	My teacher thinks I can ...
Learning	I can describe the location of Tuvalu		
Mastering	I can describe how Tuvalu is being affected by climate change		
Extending	I can explain how climate change will make people into refugees		

### Do now: Retrieval

Gross Domestic Product (GDP)
Gross National Product (GNP)
Life expectancy
Infant mortality rate
Literacy rate
Birth rate
Death rate
Human development index (HDI)

GDP plus earnings from foreign investment
The average number of years a person is expected to live in a particular place.
Percentage of people who can read and write.
Deaths per 1000 per year
The total value of all goods and services produced in a country
The number of children who die before the age of one.
Births per 1000 per year
Measures a combination of life expectancy, GDP and literacy rate.

**Starter: What are the impacts of climate change on HICs?**

Literacy Starter  
Find the 10 words in the grid by joining the chopped-up pieces together e.g. Quaternary and write them down.

Extension – define any 3 of the words.

Ter	ane	use effect	ernary
Pleist	tiary	Car	Int
Quat	Meth	erglacial	ene
ocene	bon	greenho	Foss
Holoc	gla	cial	il fuel

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

A climate change refugee is a person who has been forced to move due to the change in the climate. This could be due to sea level rise, drought or an extreme weather event.

### Where in the world might this happen?

Describe the distribution of low elevation coastal zones.

Remember:

Compass directions

Latitude

Oceans

Continents/countries

Use data from the map.

Distribution = pattern

Unsure?

Start by naming parts of the world which are darker green.

.....

.....

.....

.....

.....

.....

.....

.....

.....

- I Identify** - Where do you think this photo was taken?
- D Describe** - What can you see in the photo?
- E Explain** - Why could the child be holding this sign?
- A Apply** - What are the social, economic and environmental effects of the rubbish in the background.
- L Link** - What is the link between sea water and vegetation?



.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Describe the location of Tuvalu.  
Remember to use C.L.O.C.C

.....

.....

.....

.....

.....

.....

## Video notes

How many islands make up Tuvalu?	What is the population of Tuvalu?
What is the average elevation of the islands?	How much is the sea level rising by each year?
What is happening to the resident's land?	Why is the ground not suitable for planting in?
What is happening to the fish numbers?	Why are Tuvaluans becoming reliant on imported goods?
Why is there now more rubbish on Tuvalu?	Why is their land important to them?
How are they trying to deal with the issues that are happening?	Why are they planting mangroves on the islands?

## The issues in Tuvalu

### Water Supply

The islands of Tuvalu have progressively lost their fresh groundwater resources, not only due to sea-level rise, but also because of human pollution. In consequence, Tuvaluans have to rely on rainwater storage to meet their needs. However, the seasons on Tuvalu are getting irregular and difficult to forecast, leading to droughts and water shortage. In order to improve this situation, the adaptation plan recommends improved and increased water collection and water conservation techniques.

The residents of Tuvalu have large containers on their land in order to collect rain water. There have been periods of drought in Tuvalu – therefore collecting rainwater isn't always an option.

Bottled water has been imported, however the plastic bottles need to go somewhere. More plastic waste is being created and this is having a huge environmental impact. There is little/no recycling options available on Tuvalu therefore the rubbish is just piling up. As the islands are regularly flooded the rubbish can be washed out into the oceans, this is also having an adverse impact on the environment, with lots of plastic waste ending up within the coral reefs.

### Food Supply

More food is being imported to the islands as the residents are unable to grow as much as they used to.

The traditional foods, which were once in abundance, are now running out. The staple foods were coconut and fish. Traditional foods include pulaka, taro, bananas, breadfruit, crab, seabirds and pork.

Now that salt water is poisoning the ground it is difficult to find many of the traditional foods. The pigs on the island are also running out of food and the residents are finding it increasingly difficult to keep livestock.

### Agriculture

Due to sea-level rise, the ground of Tuvalu is prone to increasing salinization, threatening the habitats of some plants, such as pulaka and coconut trees. Considering that pulaka traditionally is the staple food in Tuvalu, the adaptation strategy is to introduce salt-tolerant pulaka.

The traditional diet in Tuvalu is based on fish, coconuts and starchy vegetables like breadfruit, pulaka and taro. Fisheries have been depleted in recent years by an increase in water temperatures; erosion has caused the loss of tracts of livable and arable land along the shore, devastating crops and livelihoods.

The soil farther inland has suffered, too, with crop failures attributed to increases in flooding and higher salinity in the groundwater. The United Nations Food and Agriculture Organization has financed an effort to introduce salt-resistant banana plants to the islands, and another involving salt-resistant taro root is in the works.

## Health

The shortage of water has also led to health problems. Where the water has become salty and this has been drunk it has led to high blood pressure issues. This can be extremely dangerous for pregnant women.

As water is at a premium water-borne infections and diseases can spread very quickly. The pathogens that cause these infections/diseases also thrive when there is increased temperatures. There has been an increase in diarrhoeal illness, which can be incredibly dangerous if there is little safe water to drink to replace the fluids lost from the body.

Mosquito (and other biting insects) and tick breeding grounds will have an increasing availability in the next years and decades because of higher tides and tropical cyclones. The increased availability will exacerbate the exposure of the Tuvaluans to water borne diseases and will increase the epidemic potential of the islands.

Due to the amount of imported food the residents of Tuvalu are starting to put on weight. They used to eat a mostly natural diet of fish and vegetables, however now they are eating more processed food and this is directly having an impact on their health.

## Fishing

Climate change heats the ocean water and impacts the corals and consequently the marine fauna. The biodiversity of the ocean and of the atolls will decrease. In order to prevent this irreparable loss of species due to heat, fragile ecosystems have to be protected. The biodiversity of the atoll and particularly in the shallower water in the lagoon, will not be the only affected by the impacts of the rising surface water temperature. The rising temperatures will also considerably reduce the shellfish and available fish resources.

Considering that the Tuvaluans, on average, eat 500 grams of fish per capita every day, a reduction of the resource will have a disastrous impact of the livelihoods and, thus, also on development.

As climate change is heating the atoll's shallow lagoon, the coral – the natural habitat of the reef fishes – is bleaching and dying. On top of this, sewage-water spills are increasingly causing algal blooms in the lagoon, killing the small reef fishes and thereby threatening the lives of larger fishes depending on them.

The subsistence fishermen report that they have a harder time getting the daily fish for their families. According to interviews conducted by the fisheries department, the stories from the fishermen are mostly the same: they have to go further out in the lagoon than before (it is about 14km wide and 18km long), they have to fish longer to get the same amount of fish, and the fish they catch are smaller than they used to be.

Fish is not only a staple food; it is among the few traditional food items in which Tuvaluans are still self-sufficient.





(c) Read the following newspaper article about Bangladesh, which is an LEDC.

**Climate change and Bangladesh**

Adapted from Md Saidur Rahman 2007

Rising sea levels is one of the most important issues humans will have to grapple with in this century. The people who will be affected first live in places with low-lying deltas like Bangladesh.

The increasing intensity of tropical storms and rising sea level are making it impossible for people to live in some parts of the country. Millions of people face the possibility of being among the first climate refugees. A one metre sea level rise would flood more than 15 per cent of Bangladesh, forcing 13 million people to leave their homes.

Explain why climate change is likely to have a greater impact on the lives of people who live in LEDCs, rather than people who live in MEDCs.

Use information from this article and your own knowledge to illustrate your answer.

[6]

Read the article carefully.

Answer the exam question.

You must use BOTH your own knowledge and information from the article. Use information from the Tuvalu case study.

You must EXPLAIN! “It is likely to have a greater impact because...”

You must give at least 3 reasons.

.....  
.....  
.....

## How might climate change impact HICs and LICs differently?



## Tuvalu (LIC)

**“The UK should be housing climate change refugees from countries such as Tuvalu. It is vital that we help other citizens of the world as we have contributed to climate change.”**  
**How far do you agree with this statement? Write your response to this argument, giving reasons. (8)**

This image shows a full page of a document template designed for handwritten notes or essays. It features approximately 30 evenly spaced, thin horizontal grey lines across the entire width of the page. The margins are consistent on all sides, providing ample space for writing. There are no pre-printed questions, headings, or other markings on the page.


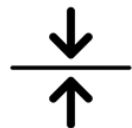




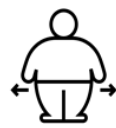



[illegible]

Time to reflect:

Climate change impacts on the environment	Climate change impacts on people

# Take 10 Tuvalu

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

<p>Location: A small atoll of 9 islands in the Pacific Ocean</p> 	<p>They are low lying so susceptible to climate change. The average elevation is 2m</p> 
<p>It is a poor island nation. Residents rely on agriculture.</p> 	<p>Water shortages are common and bottled water is imported.</p> 
<p>As temperatures rise, fish resources are decreasing.</p> 	<p>Salt water is leached into the ground and is poisoning the soil.</p> 
<p>Obesity is increasing as more food is imported. Leading to healthcare issues.</p> 	<p>Livestock is suffering due to the lack of suitable food and the increase in saltwater.</p> 
<p>Salt resistant plants are being introduced as a solution.</p> 	<p>Mass migration may have to occur as sea levels rise.</p> 



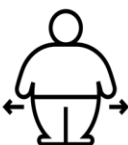



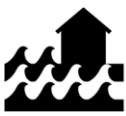







Stick your homework here

## Lesson 5: What can we do about climate change?

### Big Picture

L/M/E		I think I can ...	My teacher thinks I can ...
Learning	I can define adaptation and mitigation		
Mastering	I can relate actions to sustainability		
Extending	I can compare the effectiveness of different strategies		

**Do now: Which case study?**

1. 	2. 	3. 	4. 	5. 	6. 
7. 	What are the impacts of climate change on the UK and Tuvalu? What are the responses?				8. 
9. 	10. 	11. 	12. 	13. 	14. 

## Starter: Retrieval

1. What are the three natural causes of climate change?

The three natural causes of climate change are...

2. What are the four pieces of evidence to support climate change?

The four pieces of evidence to support climate change is rising sea levels by \_\_\_\_\_ in the last 100 years, temperature increase of \_\_\_\_\_ in the last 100 years, Arctic sea ice has thinned by \_\_\_\_% since 19\_\_\_\_ and atmospheric CO<sub>2</sub> is \_\_\_\_% higher than before the industrial \_\_\_\_\_.

3. How does burning fossil fuels cause climate change?

Burning of fossil fuels causes climate by.....

Mitigation is .....

Adaptation is .....

Why is mitigation not the same as adaptation?

.....  
.....  
.....



What is happening in the photos?

.....  
.....  
.....  
.....

What is a carbon footprint?

.....  
.....  
.....  
.....

Complete the quiz and count up your score.

**1. How do you get to school?**

- A. Walk or ride your bike
- B. Motorcycle
- C. Car
- D. Bus or van

**2. What kind of vehicle(s) do your parents drive?**

- A. None (Don't own a vehicle)
- B. Motorcycle only
- C. Car
- D. SUV, van or truck

**3. How often does someone in your family fly in a plane?**

- A. Less than once per month
- B. Once per month
- C. 2 to 4 times per month
- D. Once or more per week

**4. How often does your family eat out or order food at a restaurant?**

- A. Never
- B. Once per month
- C. Once per week
- D. Twice or more per week

**5. What kind of food does your family eat?**

- A. Home grown or raised
- B. Combination of store bought and home grown
- C. Store bought only

**6. How many carbonated drinks (soda or pop) do you drink?**

- A. None
- B. 1 can per day
- C. 2 cans per day
- D. 3 or more cans per day

**7. How often does your family do laundry?**

- A. Once per month
- B. Twice per month
- C. Once per week
- D. Twice or more per week

**8. Do you get newspapers or magazines at home?**

- A. Yes
- B. No

**9. Do you turn the lights off when not needed?**

- A. Yes
- B. No

**10. Do you turn off your computer, video games or other electronics when you're not using them?**

- A. Yes
- B. No

**11. What type of fuel or energy is used to heat your home?**

- A. Wood
- B. Propane
- C. Oil
- D. Natural gas

**12. Does anyone in your home own any of the following items? (Circle all that apply.)**

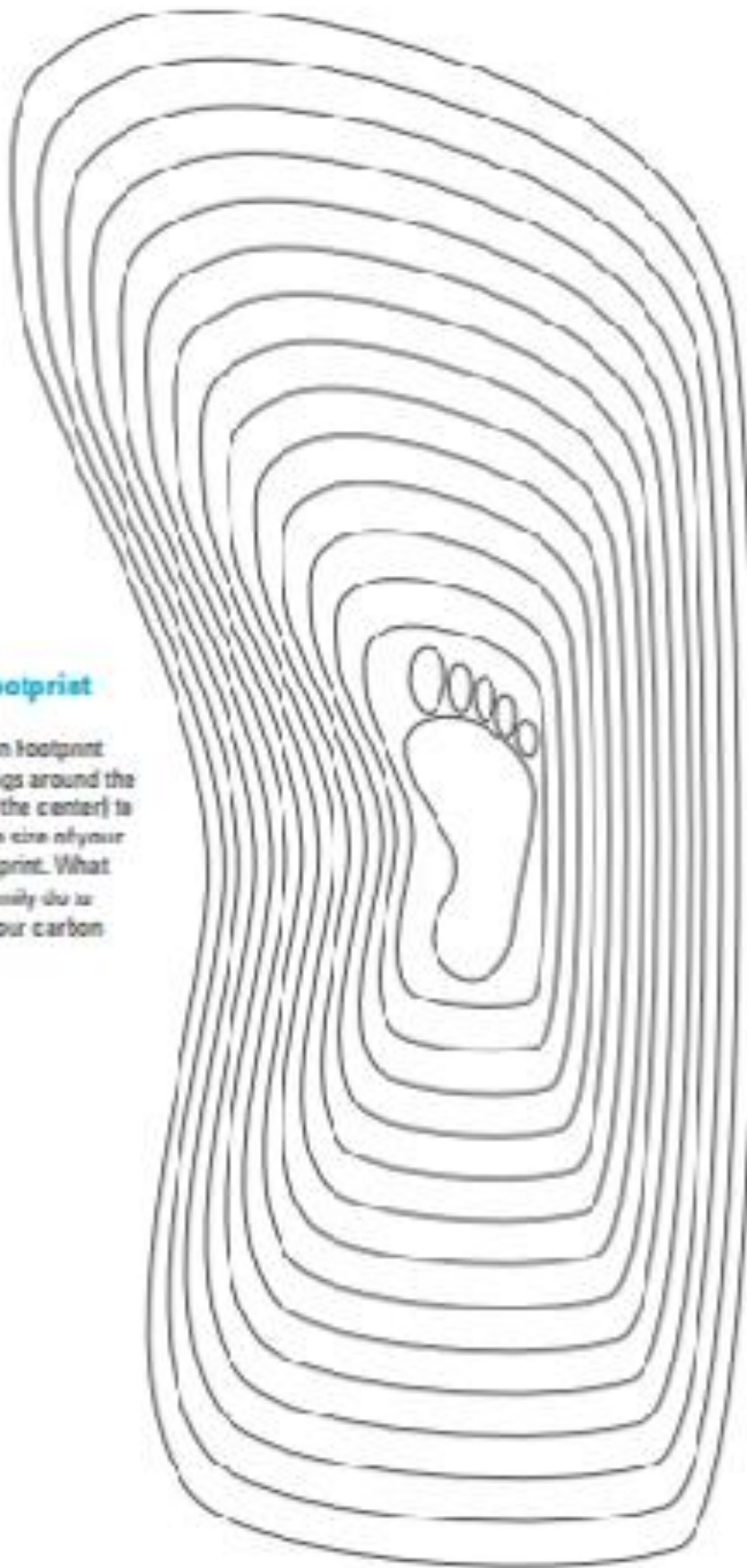
- A. TV
- B. Cell phone
- C. DVD player
- D. Computer
- E. Washing machine
- F. Dishwasher
- G. Refrigerator
- H. Motorcycle, snowmobile, quad
- I. Motorboat

Total score =



### Your Carbon Footprint

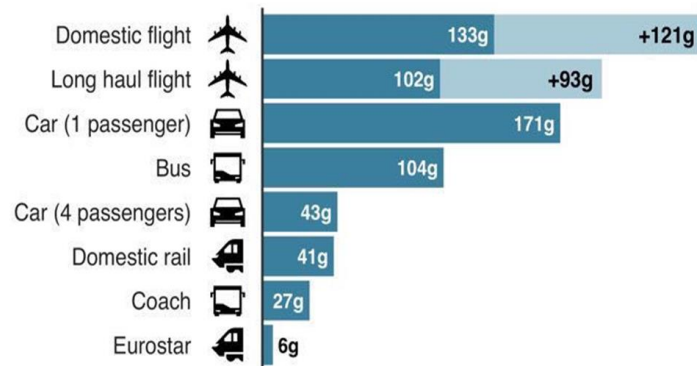
Based on the Carbon Footprint Survey, color the rings around the footprint (start from the center) to estimate the relative size of your family's carbon footprint. What can you and your family do to reduce the size of your carbon footprint?



## Emissions from different modes of transport

Emissions per passenger per km travelled

■ CO2 emissions ■ Secondary effects from high altitude, non-CO2 emissions



Note: Car refers to average diesel car

Source: BEIS/Defra Greenhouse Gas Conversion Factors 2019

BBC

Taking flights and using different types of transport increases our carbon footprint more than most activities. But do we need to stop flying? Greta Thunberg sailed across the Atlantic Ocean to get to the USA – is this an option for most?

What else could be done to reduce carbon emissions from travel?

.....

.....

.....

Using your carbon footprint identify 2 areas where you could reduce your carbon footprint.

.....

.....

.....

Give suggestions on alternatives or adaptations you could make to your life to reduce your footprint

.....

.....

.....

.....

.....

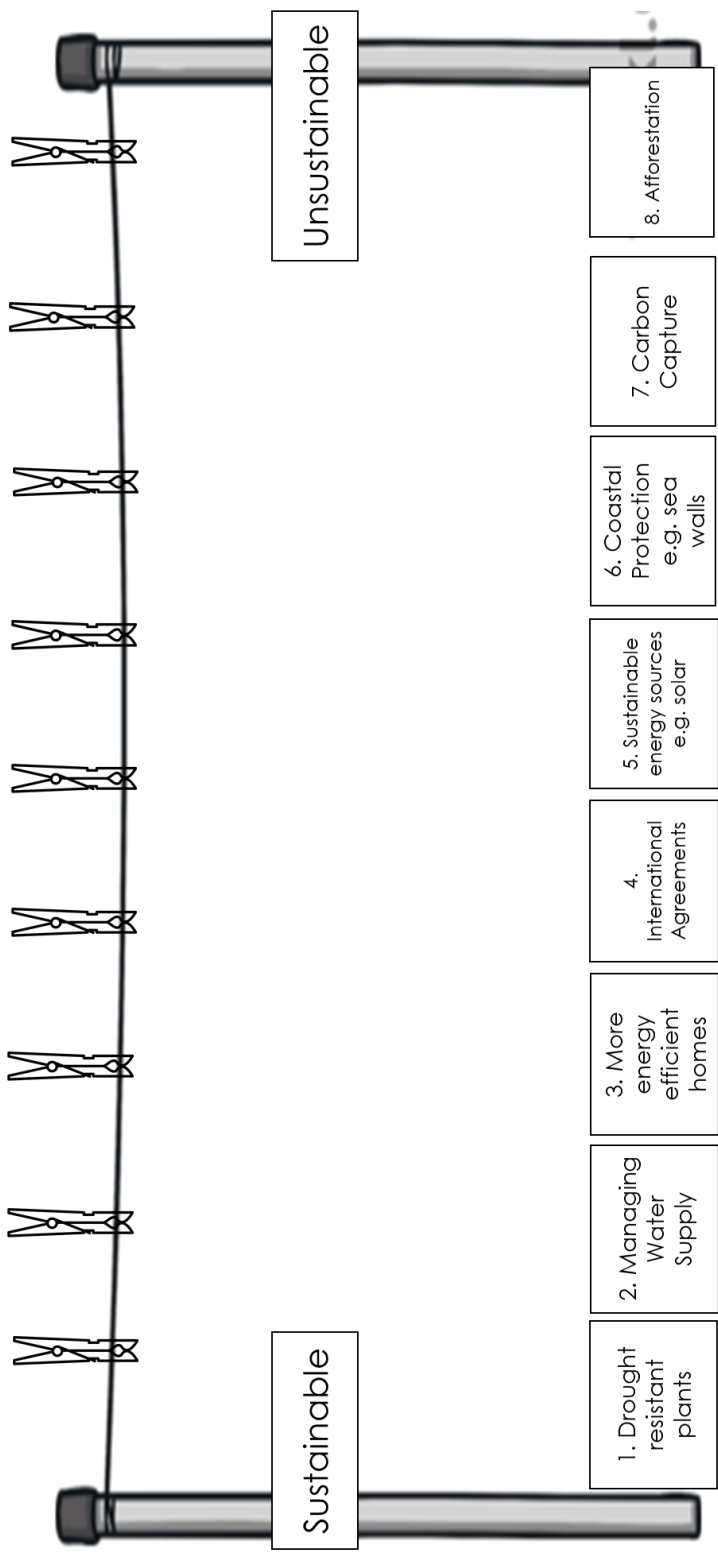
.....

Collect a tree worksheet

## Adaptation or mitigation

Strategy	Description	Advantages	Disadvantages
Reducing demand for water			
Carbon capture and storage			
Using renewable energy sources			
Afforestation			
Drought tolerant crops			
Increasing water supply			
Managing sea level change			
Designing low impact homes			
Eating less meat			

International agreements			
--------------------------	--	--	--



Look at the statements showing ways people are responding to climate change.

You need to decide if each action is a:

Individual action: one person doing something

Local action: response in the local community

National action: action by the UK government

International action: response agreed to by many different countries

Izzy has decided to cycle to school rather than get a ride with her dad.	In 2015, The Paris Agreement to tackle climate change was signed by over 150 countries.	In London, the cycle hire scheme has grown and reduced the number of cars in the city.	London started using the congestion charge to put people off driving in the city.	Lower road tax rates are given to people who drive hybrid cars in the UK
The carbon trading scheme has been somewhat useful in reducing European CO2 emissions.	I went on holiday in Dorset this year rather than fly to Spain.	Mr Smith decided to turn down the heating by 1 degree.	The National Grid pays people for the electricity they produce from their solar panels.	The Kyoto Protocol in 1998 was the first major agreement to fight climate change but the USA didn't sign it.
News houses at Upton conserve water by installing high efficiency fittings and use rainwater harvesting in gardens	The Eco-Schools programme gives incentives for schools across the country to be more environmentally friendly.	New electrical appliances sold in the UK must have an energy efficiency grading on them.	The recycling bins in Essex are larger than the rubbish bins in many councils.	The city of Brighton has exchanged their old buses for hybrid buses which run on biofuel.

**Describe the strengths and weaknesses of adaptation as a way of managing climate change (4)**

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Who are extinction rebellion?

.....

.....

.....

.....

.....

.....

What do we mean by peaceful protest?

.....

.....

.....

.....

Is non-violent direct action effective?

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

### Time to reflect: What would you do?

Put these in order of what you would be most willing to do to reduce climate change.

Turn down the thermostat 1 degree in the winter	
Pay £20,000 to install solar panels on your roof	
Never take another flight again	
Turn off all lights when you leave a room	
Cycle rather than drive for all journeys less than 10 miles	
Eat only food grown locally	
Only fill the kettle with amount of water you need	
Only have 1 child when you start your own family	
Donate £20 per month to Friend of the Earth charity	
Vote for politicians who will protect the environment	

Stick your homework here

## Lesson 6: What do we now know about climate change?

### Big Picture

L/M/E		I think I can ...	My teacher thinks I can ...
Learning	I can work effectively in a group		
Mastering	I can solve problems		
Extending	I can answer an exam style question		

**Collect materials for your group from your teacher**



## Lesson 7: Can we solve uneven development?

### Big Picture

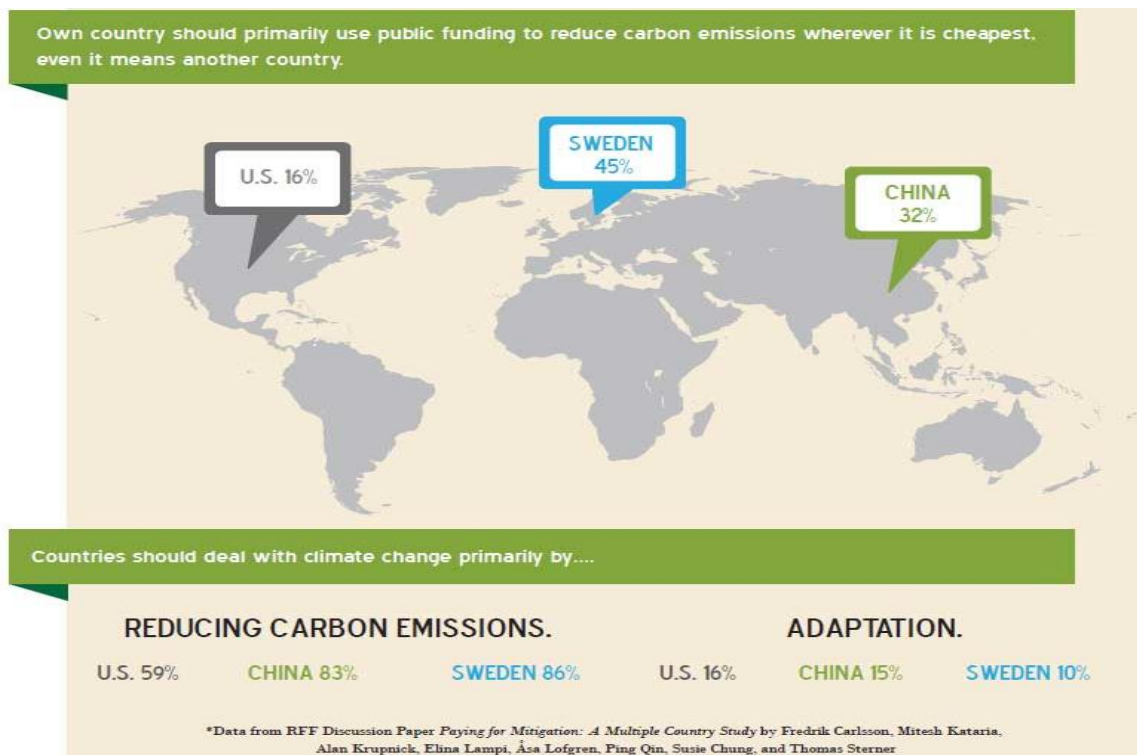
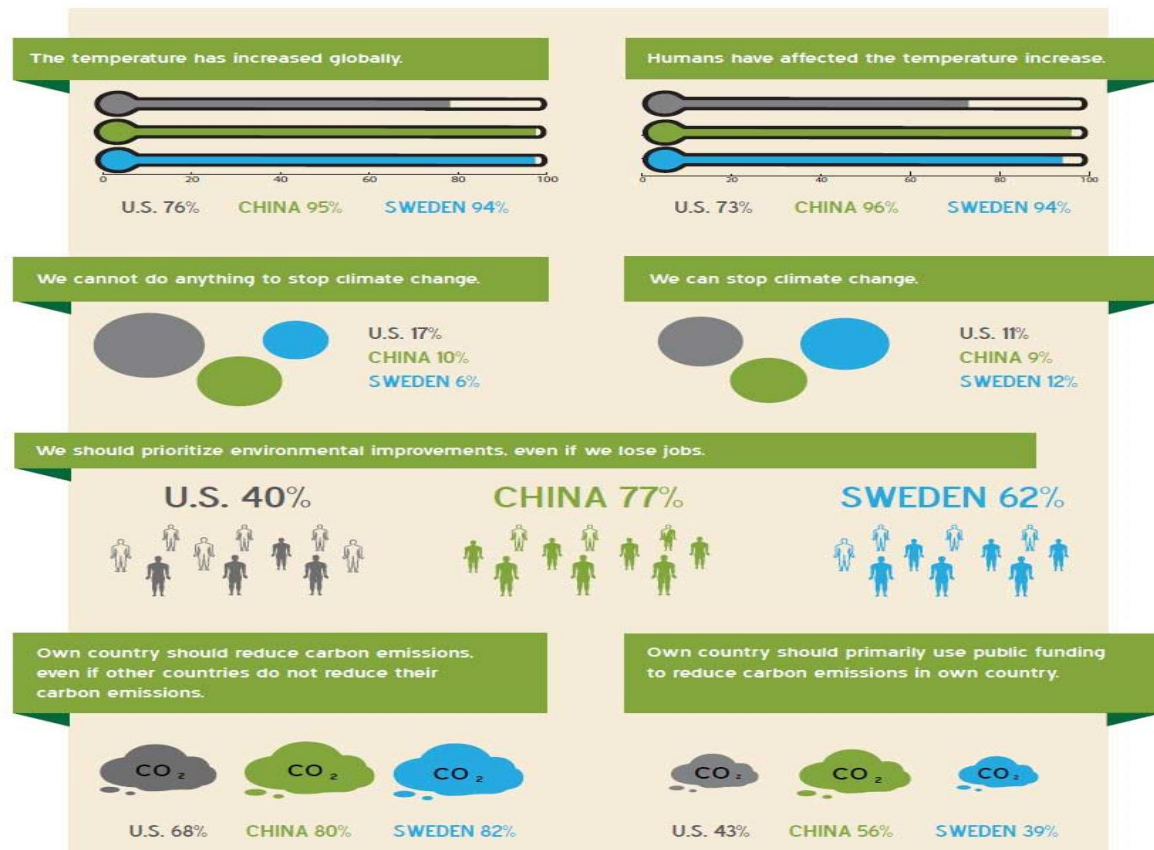
L/M/E		I think I can ...	My teacher thinks I can ...
Learning	I can define different types of aid		
Mastering	I can compare strategies to help development		
Extending	I can evaluate whether trade or aid is better for LICs		

### Do now: Summary

Relate as many emoji's as you can to Climate Change.



## Starter: What does the data say?



.....

.....

.....

.....

.....

.....

Video notes

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

"It's ridiculous; we have bigger problems than Global Warming right now."

"It's called weather!"

"Human action is leading to an increase in average temperature."

"It's getting more worrying if you look at the temperatures now, including 2015-2016 in particular."

"It's a big scam for a lot of people to make a lot of money."

"There will be little change in temperature, it will get a little cooler, and a little warmer... like it always has for millions of years."

"The first few months of 2016 have seen the average temperatures of 1.5 degrees "higher."

"There's a quite shocking acceleration in many of the measures; including surface and ocean temperature etc."

"Clear rise in temperature"

"Global warming being the biggest problem this country is facing right now is insane!"

A horizontal number line with arrows at both ends. It is marked with the numbers 1, 2, 3, 4, and 5 from left to right.

This image shows a full page of white paper with horizontal dotted lines. The lines are evenly spaced and run across the width of the page, providing a guide for handwriting practice. There are no margins, text, or other markings on the page.

## How brain biases prevent climate action

**BBC / Matthew Wilburn King**

**8 March 2019**

### Brain biases

We lack the collective will to address climate change because of the way our brains have evolved over the last two million years.

"Humans are very bad at understanding statistical trends and long-term changes," says political psychologist Conor Seyle, director of research at One Earth Future Foundation, a programme incubator that focuses on fostering peace long-term.

"We have evolved to pay attention to immediate threats. We overestimate threats that are less likely but easier to remember, like terrorism, and underestimate more complex threats, like climate change."

In early phases of human existence, we faced an onslaught of daily challenges to our survival and ability to reproduce – from predators to natural disasters. Too much information can confuse our brains, leading us to inaction or poor choices that can place us in harm's way.

As a result, our brains evolved to filter information rapidly and focus on what is most immediately essential to our survival and reproduction. We also evolved to remember both threats, so that they could be avoided in the future, and opportunities, so we could easily recall where to find sources of food and shelter.

These biological evolutions ensured our capacity to reproduce and survive by saving our brains time and energy when dealing with vast amounts of information. However, these same functions are less useful in our modern reality and cause errors in rational decision-making, known as cognitive biases. "Cognitive biases that ensured our initial survival make it difficult to address complex, long-term challenges that now threaten our existence, like climate change," says Seyle.

Flooding in Sebastopol, California in late February 2019. We've evolved to focus on immediate threats at the expense of longer-term crises (Credit: Getty)

Psychologists have identified more than 150 cognitive biases we all share. Of these, a few are particularly important in explaining why we lack the will to act on climate change.

### Hyperbolic discounting

This is our perception that the present is more important than the future. Throughout most of our evolution it was more advantageous to focus on what might kill us or eat us now, not later. This bias now impedes our ability to take action to address more distant-feeling, slower and complex challenges.

### Our lack of concern for future generations

Evolutionary theory suggests that we care most about just a few generations of family members: our great-grandparents to great-grandchildren. While we may understand what needs to be done to address climate change, it's hard for us to see how the sacrifices required for generations existing beyond this short time span are worth it.

### The bystander effect

We tend to believe that someone else will deal with a crisis. This developed for good reason: if a threatening wild animal is lurking at the edge of our hunter-gatherer group, it's a waste of effort for every single member to spring into action — not to mention could needlessly put more people into danger. In smaller groups, it was usually pretty clearly delineated who would step up for which threats, so this worked. Today, however, this leads us to assume (often wrongly) that our leaders must be doing something about the crisis of climate change. And the larger the group, the stronger this bias becomes.

### The sunk-cost fallacy

We are biased towards staying the course even in the face of negative outcomes. The more we've invested time, energy, or resources into that course, the more likely we are to stick with it – even if it no longer seems optimal. This helps explain, for example, our continued reliance on fossil fuels as a primary source of energy in the face of decades of evidence that we both can and should transition to clean energy and a carbon neutral future.

These cognitive biases evolved for good reason. But they're now hamstringing our ability to respond to what could be the largest crisis humanity has ever created or had to face.

### Evolved for good?

From mental time travel to cooperative social behaviour to our abilities to innovate, teach and learn, all of these evolutionary consequences always have helped us secure our own survival, and they will continue to do so – albeit in the face of a very different threat than we had in our hunter-gatherer days.

We have evolved to be able to stop human-induced climate change. Now we must act.

Dr Matthew Wilburn King is an international consultant and conservationist based in Boulder, Colorado and the president and chairman of the COMMON Foundation.

What does the article tell us?

.....

.....

.....

.....

.....

.....

.....



## What is your opinion on climate change?

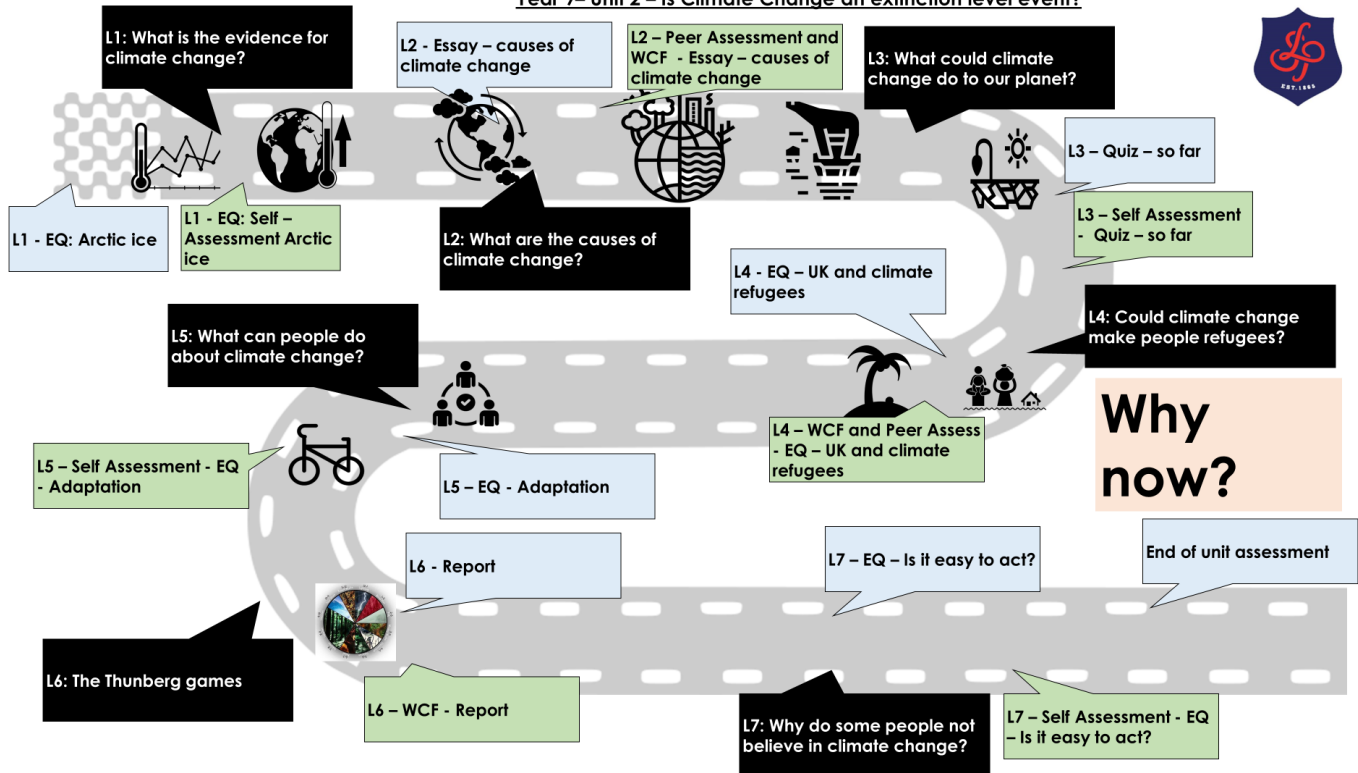




**Time to reflect: What's the main reason for our inaction?**

Scientific uncertainty	
We choose what to ignore	
Ineffective science communication	
You never get to see the whole picture	
We push climate change far away	
Too difficult to solve	

Year 9– Unit 2 – Is Climate Change an extinction level event?



What have you learned about Climate change? Top 3 pieces of information	
Why were you studying this topic? Why is it important?	
Out of the 7 lessons in the journey above, which lesson did you learn the most from?	
What is the 1 key message/ fact that you will remember from this topic?	
When we teach this unit again next year, what else do you think we should teach about? What was missing from this unit?	