



Climate Change

1. CLIMATE CHANGE

Climate Change is the long term change in average temperature and rainfall.

Over the past 2.6 million years (a time period known as the **QUATERNARY**) the earth has seen great changes in climate from glacial periods (very cold temperatures where ice has covered large parts of the earth's surface) to interglacial periods (warmer periods where ice has retreated to the poles).



During the last ice age, large parts of the UK were covered by ice (see above map). The last ice age ended around 10,000 years ago with ice retreating towards the poles. We are now in an inter-glacial period.

2. HOW DO WE KNOW THE CLIMATE HAS CHANGED?

We can use various pieces of evidence to see what the climate was like in the past. For example..

Tree Rings (Dendrochronology) – Each year, trees grow a new ring. During warmer years, the rings are thicker. A thin tree ring means poorer growing season—drier and colder.

Ice Core Samples - A long cylinder of ice that has been drilled from a glacier/ice sheet.

Ice builds up in layers each year, trapping gases which can tell us about the atmosphere at that time. This can tell us a bit about the likely temperatures at that time. We have ice cores that date back 800,000 years in Antarctica!

We can also use...

Pollen Analysis and sea bed sediments

More recent evidence of climate changes include photographs, newspapers, changes in timing of bird migrations,

3. NATURAL CAUSES OF CLIMATE CHANGE

- **Volcanic Activity** – volcanic ash can block out/reflect the Sun's rays and cause the Earth to cool down (1991 Mt Pinatubo eruption – Philippines)
- **Solar Output – Sun Spots** – Dark patches emit more solar radiation meaning earth gets more heat energy from the sun and gets warmer.
- **Orbital Variation** – the way the Earth orbits the sun varies over time, which can cause climate change. The earth's orbit changes shape from circular to elliptical.



4. HUMAN CAUSES OF CLIMATE CHANGE

Recent temperature increase is linked to the human activities increasing greenhouse gases in the atmosphere through..

- **Burning Fossil Fuels** – coal, oil, gas – that releases CO₂ (GHG). Used in energy production, factories and transport
- **Farming** – Cattle and rice paddy fields emit methane (GHG) that is 20 times more powerful than CO₂. Methane is also released from landfill (dumping of waste)
- **Deforestation** – chopping down trees means less CO₂ is absorbed and clearing trees by burning also releases CO₂.

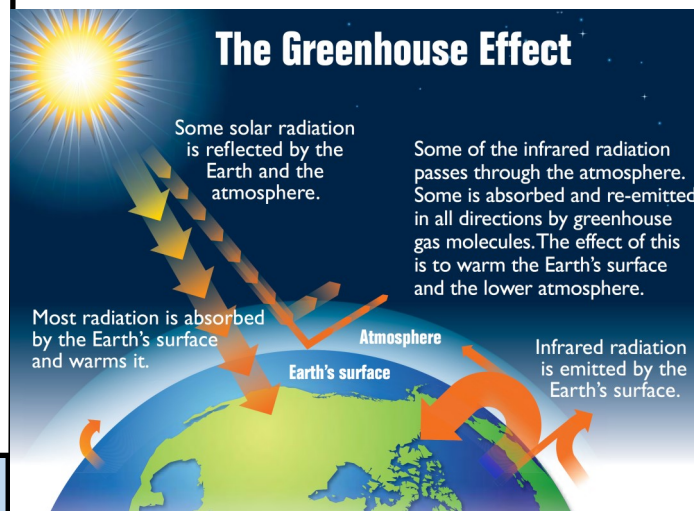


5. THE GREENHOUSE EFFECT / ENHANCED GREENHOUSE EFFECT

The earth's atmosphere contains **greenhouse gases**. These are naturally occurring gases such as **carbon dioxide, methane** and **water vapour**.

These gases let sunlight pass through the atmosphere but they trap heat in preventing it from leaving.

This causes a natural **greenhouse effect** which keeps the earth warm enough for life to exist so it is very important.



The **enhanced greenhouse effect** is where the amount of greenhouse gases in the atmosphere has been increased by human activity.

This means that more solar radiation is trapped and therefore temperatures are getting warmer.





Climate Change continued..

6. THE EFFECTS OF GLOBAL WARMING

The effects of global warming are a real cause for concern and include effects on both people and the environment.

EFFECTS ON PEOPLE	EFFECTS ON THE ENVIRONMENT
Loss of homes due to sea level rise and flooding due to melting ice.	Melting sea ice —loss of habitat for species such as polar bears etc.
More extreme weather e.g. more powerful hurricanes causing devastating impacts on communities	Melting glaciers / ice-sheets cause sea level rise
Increased deaths from heatstroke	Low lying coastal areas flooding due to sea level rise destroying habitats
Reduced crop yields result in malnutrition and	Changing precipitation patterns
People forced to leave their homes (increase migration)	Sea temperatures rising causing coral bleaching and loss of coral reefs.
Water shortages	

IMPACTS FOR THE UK:

- average temperatures rising (hotter summers)
- Increased local flooding / more flash flooding
- more extreme weather
- Increase coastal erosion due to sea level rise
- water shortages in summer
- changes in crops that we can grow and what is available when
- Elderly and young most vulnerable

EXAMPLES OF GLOBAL IMPACTS

- Crop yields in Bangladesh will reduce by 30% leading to very high risk of hunger
- More forest fires e.g. Australia, California etc.
- Melting glaciers in Himalayas—reducing water availability
- Loss of major global habitats—e.g. the Great Barrier Reef—Australia.

7. TACKLING CLIMATE CHANGE

The problems of climate change are getting worse and if we don't act now, we will reach a **tipping point** where large scale, irreversible changes may happen.

There are two things we can do to manage climate change.:

MITIGATION and ADAPTATION

1. MITIGATION

This is about trying to tackle the cause of climate change by reducing greenhouse gas emissions. *Examples include:*

- **Alternative energy** – using renewables instead of fossil fuels.
- **Planting Trees** – Increases the amount of CO₂ absorbed from the atmosphere.
- **Carbon Capture** – Carbon capture and storage – traps, transports and stores CO₂.
- **International agreements** – Agreements that look to monitor and reduce greenhouse gas emissions. Examples are the Rio Earth Summit, Kyoto Summit and the Paris Agreement.

Reducing greenhouse gas emissions does require **international co-operation** with governments across the world working together. This can be difficult to achieve, however.

2. ADAPTATION

This is about things we can do to try and reduce the negative impacts of climate change.

Examples of adaptation include:

- **Sea Defences** in place to protect land from being eroded and also in places to prevent areas from flooding (e.g. Thames Barrier)
- **Water Transfer**—transferring water from areas where there is lots to areas of shortage.
- **Flood Shelters and building houses on stilts**—in low lying areas—e.g. Bangladesh to reduce impact of sea level rise.
- **Planting different crops**—those which can survive in warmer and drier conditions.

IT IS IMPORTANT THAT WE USE BOTH MITIGATION AND ADAPTATION IN TACKLING CLIMATE CHANGE.

WHAT CAN WE DO?

8. REDUCING OUR ECOLOGICAL FOOTPRINT

The **Ecological Footprint** of a place is a measure of how much **land** is needed to provide a place (eg city) with all the **energy, water** and **resources** it needs. This includes how much is needed to absorb its **pollution** and **waste**.

Each of us has our own **carbon footprint** which is the total greenhouse gas emissions caused by the resources we use.

Part of our carbon footprint and an increasing area of concern that we can tackle is our **plastic footprint**, i.e. the amount of plastic we use.

Plastic is a problem in terms of its impact on oceans, ecosystems and health **BUT** it also is a major contributor to greenhouse emissions and therefore climate change.

One of the big problems is **single-use plastics**. These are things that are only used once before being thrown away or recycled.

Climate Change continued..

9. THE PLASTIC PROBLEM

Did you know?

- On a daily basis we litter around 700,000 plastic bottles!
- Each year 5.5. billion plastic bottles are sent to landfill, littered or incinerated!

The impacts of Plastic on the environment?

- **Millions of animals killed every year**—e.g. by strangulation or becoming entangled in plastic waste.
- Many animals stomachs becomes so packed with micro-plastics it reduces the urge to eat and these **animals starve to death.**
- **Chemicals from plastics pass through the food chain**
- **Huge greenhouse gas emissions** involved in the production of plastics and associated products as well as during recycling or burning of plastics.

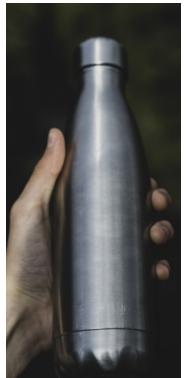
What can we do?

7 EASY HABITS TO REDUCE YOUR PLASTIC WASTE

- Your shopping bag**
Bring your own shopping bag and say no to plastic bags
- Your water bottle**
Bring a refill bottle with you to avoid single-use water bottles
- Your milk carton**
Buy milk cartons without plastic lids
- Your party**
Skip the single-use cups and cutlery and say no to straws and balloons
- Your laundry**
Make sure to fill your washing machine before washing - it will reduce the wear and tear of the fabrics and less plastic fibers will be washed down the drain
- Your everyday products**
Buy large containers of the things you use everyday
- Your visit to the washroom**
Don't throw anything but the 3 P's in the toilet: Pee, Poop, Paper

www.plasticchange.org
#singleusesucks

plastic change



APPLYING YOUR KNOWLEDGE...

- What do we mean by the terms glacial and interglacial?
- What can we use to find out what the climate was like in the past?
- Describe two examples of natural causes of climate change
- Describe how the enhanced greenhouse effect works.
- Outline 3 human activities that contribute to greenhouse gas emissions
- Explain the impacts of climate change on people and the environment.

Now Challenge yourself even further!

- What is the difference between mitigation and adaptation?
- Try and explain why it is difficult to get international co-operation between countries when trying to tackle the climate change problem.

Some ideas for finding out more...

- Explore your ecological footprint using this site <https://www.footprintcalculator.org/>
- Explore your plastic footprint here https://www.carbonfootprint.com/plastic_calculator.html
- Watch this brilliant David Attenborough documentary "Climate Change—The Facts" <https://www.bbc.co.uk/iplayer/episode/m00049b1/>

OTHER RESOURCES

Causes of Climate Change <https://www.bbc.co.uk/bitesize/clips/z7wnvcw>

Human activity and Climate Change <https://www.bbc.co.uk/bitesize/guides/zt6sfg8/revision/2>

A simple guide to climate change <https://www.bbc.co.uk/news/science-environment-24021772>

KS3 Schoology



SCAN ME

Key Term	Definition
Adaptation	Actions taken to readjust to climate change to reduce the negative impacts of changes.
Anthropocene	Current period of time in which human activity has a dominant influence on climate and the environment.
Atmospheric Composition	Chemicals in the earth's atmosphere (including oxygen, carbon dioxide, hydrogen etc.)
Climate Change	A long time change in the earth's climate (an increase or decrease in average temperature)
Climate Cycle	A climate 'pattern' cycling between colder periods (glacials) and warm periods (inter-glacials)
Dendrochronology	Study of tree rings—can be used to infer climate change.
Ecological Footprint	The amount of land and water it takes to support people or a place in terms of the resources consumed and absorption of waste generated.
Enhanced Greenhouse Effect	The increase in greenhouse gases in the atmosphere due to human activities causing more heat to be trapped.
Glacial Period	A period of very cold conditions when ice covers large parts of the earth's surface
Global Warming	An increase in the earth's overall average temperature
Greenhouse Effect	Trapping of sun's energy in the atmosphere due to greenhouse gases such as carbon dioxide and methane.
Ice Age	A period of extreme cold global temperatures
Ice Core	Cylinder of ice drilled from an ice sheet
Interglacial Period	A period of warmer temperature between two glacial periods
Kyoto Protocol	An international treaty setting limits on greenhouse gas emissions (signed in 1997)
Mitigation	Action to reduce greenhouse gas emissions (i.e. tackling the cause of climate change).
Orbital Changes	The path of the earth's orbit around the sun varies over time—which can cause changes in climate
Precipitation	Any form of moisture falling from the atmosphere— including rain, sleet and snow.
Quaternary Period	Period of geological time from 2.6 million years ago to today.
Solar Output	Amount of solar radiation from the sun. When there are sun spots (dark patches on the sun) more radiation is released.

To test yourself Read, Cover, Write, Check OR try this quizlet <https://tinyurl.com/KS3ClimateChange>