

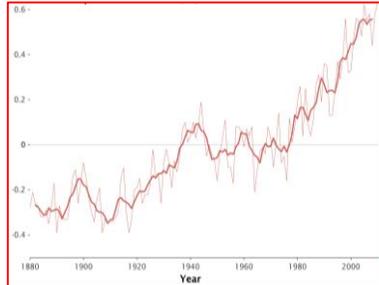
What is Climate Change?

Climate change is a large-scale, long-term shift in the planet's weather patterns or average temperatures. Earth has had tropical climates and ice ages many times in its 4.5 billion years.

Quaternary geological period

The quaternary period is the last 2.6 million years. During this period temperatures have always fluctuated. The cold 'spikes' are the glacial periods, whereas the warm points are the interglacial periods.

Today's temperature is higher than the rest of the period. Despite alternate cold and warm moments within this period, global temperatures have increased above average in the past 100 years. This current trend is what's become known as global warming.

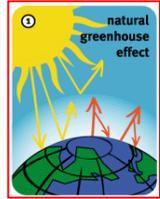


Natural Greenhouse Effect

The Earth is kept warm by a natural process called the Greenhouse Effect. As solar radiation hits the Earth, some is reflected back into space. However, greenhouse gases help trap the sun's radiation. Without this process, the Earth would be too cold to support life as temperature would average as -18°C instead of +15°C.

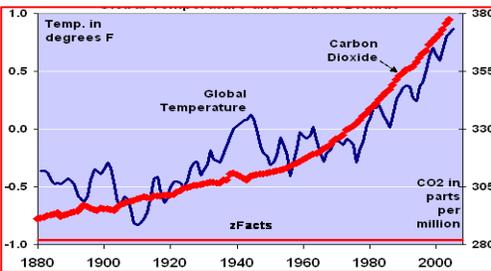
Enhanced Greenhouse Effect

Recently, there has been an increase in humans burning fossil fuels for energy. These fuels (gas, coal and oil) emit extra greenhouse gases. This is making the Earth's atmosphere thicker, therefore trapping more solar radiation but causing less to be reflected. As a result, our Earth is becoming warmer.



Linking CO₂ and Global temperatures

The rate of carbon dioxide and increase in global temperatures is strong. Scientist agree that this increase is caused by human activity.



Evidence for climate change

Earth's temperature has changed over the last 2.6 million years. Scientists know this by collecting a range of evidence that is trapped or stored in the environment around us. In the past 100 years we have become pretty good at recording changes.



Sea Ice positions There has been a decline in the thickness and reach of Arctic sea ice. The amount of ice reduces by 11.5% each decade.

Global temperature data Evidence collected by NASA suggests average global temperatures have increased by more than 0.6°C since 1950.

Ice Cores Ice cores are made up from different layers that each represents a different historical time. By exploring the water molecules of these cores, scientists have calculated fluctuating temperatures of the atmosphere.

Historical records Historical records from ancient cave paintings, diaries and written observations have provided evidence of climate change through personal accounts from the people through them. Can be subjective.

Ice sheets and glaciers Evidence from maps and photos has shown many of the world's glaciers and ice sheets are melting. Eg Columbia Glacier in Alaska has retreated by 16km in the last 30 years.

Sea Level Change Evidence from the IPCC has shown that the average global sea level has risen by 10-20cms in the past 100 years. This is due to the additional water from fresh water ice and

Past Evidence: The Little Ice Age (1300-1870)

The Little Ice Age was a period of cooling that occurred after the Medieval Warm Period in parts of Europe and North America. Impacts included...

1. Price of grain increased and vineyards become unproductive.
2. Sea ice engulfed Iceland and the sea force around parts of the UK. Frost Fairs were held on rivers such as the River Thames.
3. People suffered from the intense cold winters as food stock were limited.

Unit 2: ONW CHANGING CLIMATE

Evidence of natural change

Climate change has occurred in the past without humans being present. This suggests that there are natural reasons for the climate to change.

- MILANKOVICH CYCLES**
1. **Eccentricity:** Changes in the shape of Earth's orbit. Sometimes it is more 'oval' than 'spherical'. In the 21st century it is spherical. Over a period of 100 000 years the orbit slowly changes from circle to oval and back to circle. We notice the effects most during the oval when the northern hemisphere has its summers.
 2. **Obliquity:** Changes in how the Earth tilts on its axis. It takes approx. 40 000 years for the tilt to change from 21.5 to 24.5 degrees. In the 21st century the tilt is 23.5 degrees. Less tilt = cooler summers and milder winters for the UK.
 3. **Precession:** The amount the Earth wobbles on its axis. It takes approx. 23 000 years to wobble from one extreme to the other.

Sun Spots Dark spots on the Sun are called Sun spots. They increase the amount of energy Earth receives from the Sun. Typically there is an 11 year cycle. In the Little Ice Age there were fewer sunspots than in the Medieval warm period!

Volcanic Eruptions Volcanoes release large amounts of dust containing gases. These can block out sunlight and result in cooler global temperatures.

Greenhouse Gases

Most greenhouse gases occur naturally. Some greenhouse gases have greater potential to increase global warming than occurs as different gases trap and absorb different amounts of radiation.

Carbon dioxide Accounts for 60% of the enhanced greenhouse gases. It is produced by burning fossil fuels through producing electricity, industry, cars and deforestation.

Methane Accounts for 15% of the enhanced greenhouse gases. 25x more efficient than Carbon dioxide at trapping radiation. Produced from landfills, rice and farm animals.

Halo-carbons Human made; a tiny proportion of all greenhouse gases. 15000x more efficient at trapping radiation than Carbon dioxide. Produced from air-conditioning, refrigerators and aerosols.

Nitrous Oxide Accounts for 6% of the enhanced greenhouse effect. 250x more efficient than Carbon dioxide. Produced from fertilisers and car exhausts.

Who is responsible?

LDCs Countries in Africa, such as Kenya, emit low levels of carbon dioxide. This is due to these countries not being industrialised or having a population wealthy enough to consume lots of energy.

EDCs Countries such as China and India are increasingly more industrialised and therefore are emitting more carbon dioxide. Growing populations and steadily increasing wealth mean more energy is being consumed.

ACs Countries such as the USA and UK are industrialised with a wealthy population that enjoy lifestyles which required a large consumption of energy.



Not what it seems

Although China is responsible for the highest amount of carbon emission, 1.4 billion people do live there. However, per person, the USA (pop=320 million) actually contributes far more CO₂ emissions.

