

The effects of climate change

In early December 2015 scientists and politicians from around the world agreed measures to tackle global warming and the changing world climate at a groundbreaking conference in Paris

In 2013, the ice melted sufficiently for a cargo ship to sail through the northwest passage for the first time. The route is now open in summer.

Polar bears rely on the Arctic ice, which they use to catch seals as they come to the surface for air. Without the ice, bears are unable to catch their main food source.

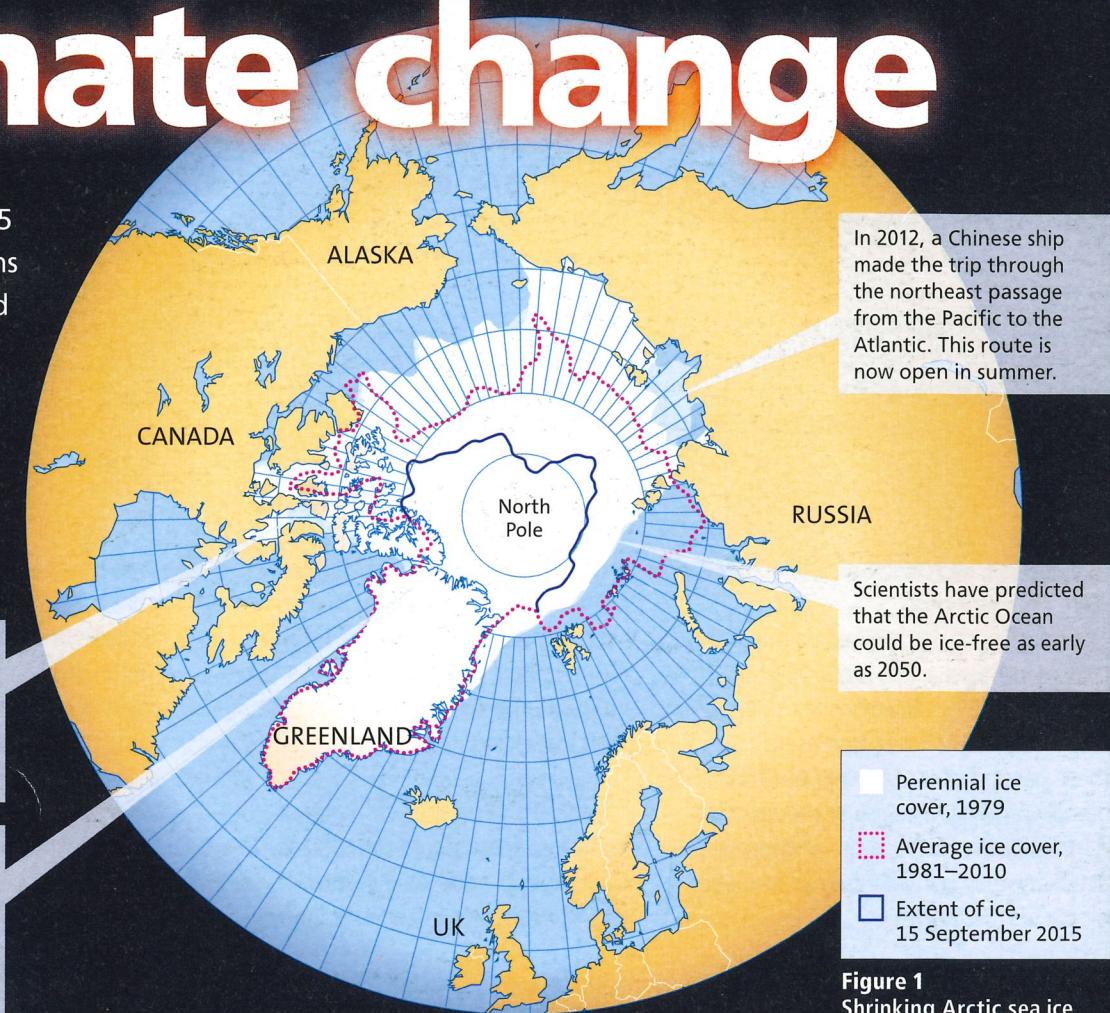


Figure 1
Shrinking Arctic sea ice

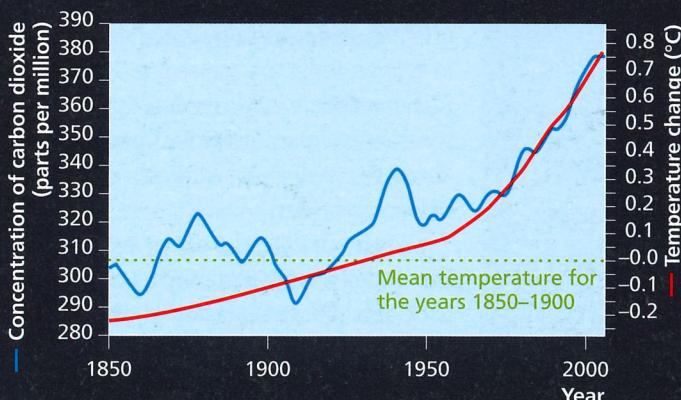


Figure 2 Global temperature and atmospheric concentration of carbon dioxide since 1850

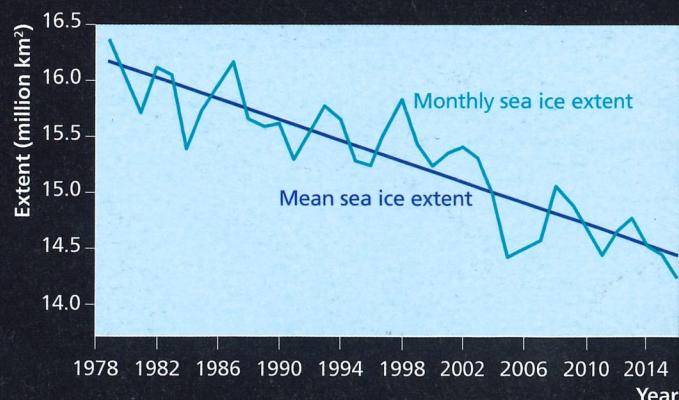


Figure 3 Monthly Arctic sea ice extent since February 1979

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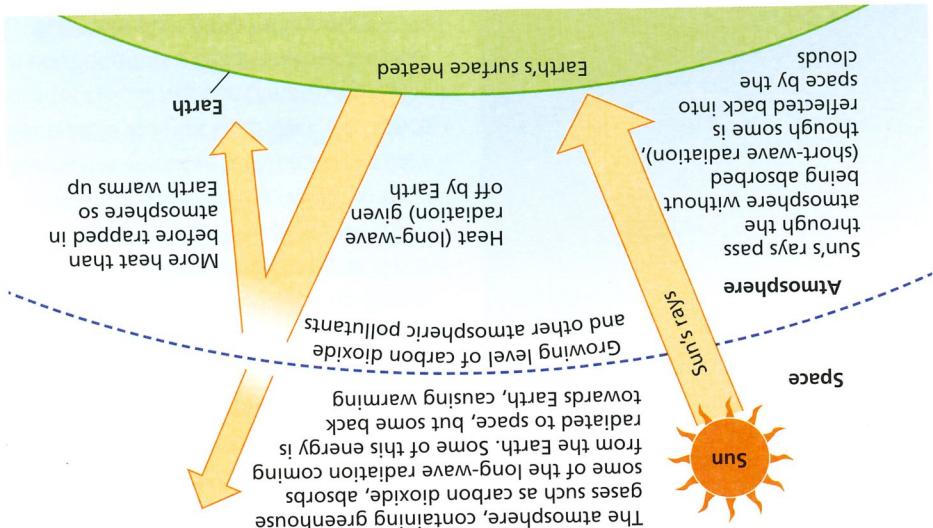
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Figure 1 The greenhouse effect

Scientists have noticed that since the 1850s global temperatures have been rising. The rise has been put at between 0.6°C and 0.75°C (see Figure 1). Although there had been fluctuations in global temperature before this rise, in global temperature before this rise, it is believed that this increase is due to the activities of an ever-increasing human population.

Global warming

Scientists have noted for decades — due to the fact that temperatures are changing in global climate — which around the world finally agreed that in achieving this target. Governments provide support to the least developed countries in the fight against climate change. This was the latest historic turning point in the fight against global climate change. This was the latest climate conference held in Paris marked an agreement among the majority of countries to limit global warming and its effects on the world's climate.

In early December 2015, the International Climate Conference achieved universal agreement on the aim of keeping global warming below 2°C, and for the largest and wealthiest countries to agree to limit global warming and its effects on the world's climate.

International agreement in 2015

Much headlines about melting ice in the Arctic and Antarctic caused rising sea levels and island flooding, famine brought about by lack of rainfall on desert margins and frequent dramatic storms and weather events, our changing climate is rarely out of the news.

This is in the news consider an issue that is now firmly established on the international political agenda and on GCSE specifications. Climate change is a major concern for scientists and environmentalists.

Climate change

Seawater temperatures are rising steadily if they exceed 27°C, coral bleaches and dies

in the news



Adelie penguin colonies are declining.
As Antarctic sea ice retreats, they are deprived of feeding platforms from which to hunt krill, their main food

worryingly the pace of the rise seems to be accelerating (see the back page) and scientists have noted that this acceleration has coincided with the Industrial Revolution which has taken place worldwide during the last 150 or so years.

The greenhouse effect

Research has concluded that this temperature rise is due to a build-up of gases in the atmosphere, causing what has become known as the 'enhanced greenhouse effect' (see Figure 1). Heat — or more accurately, radiation — from the sun is the only major source warming the Earth. Radiation from the sun passes through the Earth's atmosphere and is absorbed at the surface by land or sea. This heats the land or sea, which in turn warms the air above it. A proportion of this heat is then radiated back into space. This process drives our climate and if it is in equilibrium our climate remains stable.

Scientists during the last century have realised that some of the returning

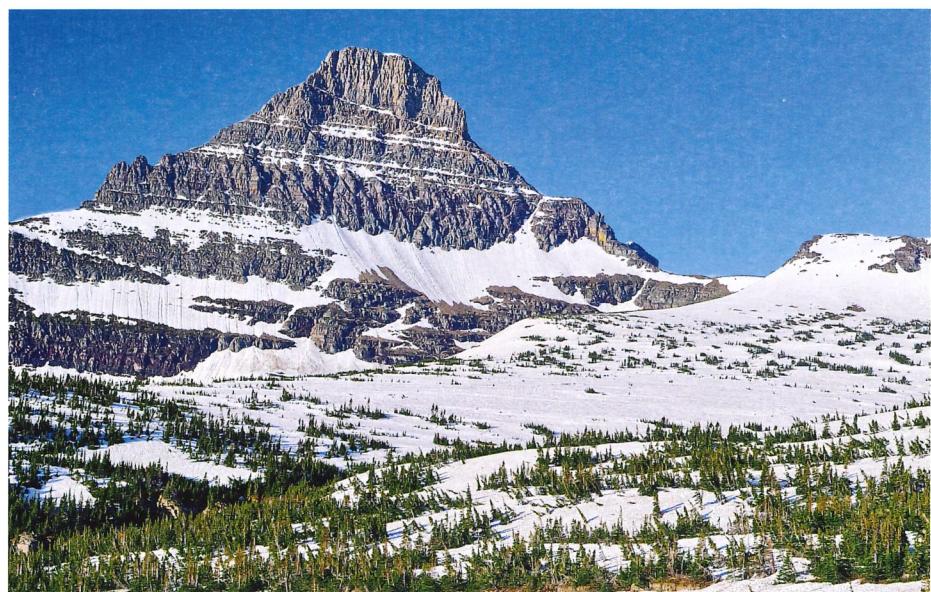
radiation is trapped and re-emitted, which is essential to keeping the Earth warm. This increases the warming effect causing temperatures at the surface to rise. The layer of greenhouse gases which is trapping the returning radiation is increasing due to a build-up of gases in the atmosphere, rather like the way a greenhouse traps heat. The gases are

known as 'greenhouse' gases because of their effect in causing temperatures to rise.

Greenhouse gases

In the last 150 years, since the start of the Industrial Revolution, the amount of greenhouse gases in the atmosphere has increased.

The Glacier National Park in Montana was established in 1910, at which time it had 150 glaciers. Now there are 30, and these are 70% of their original size



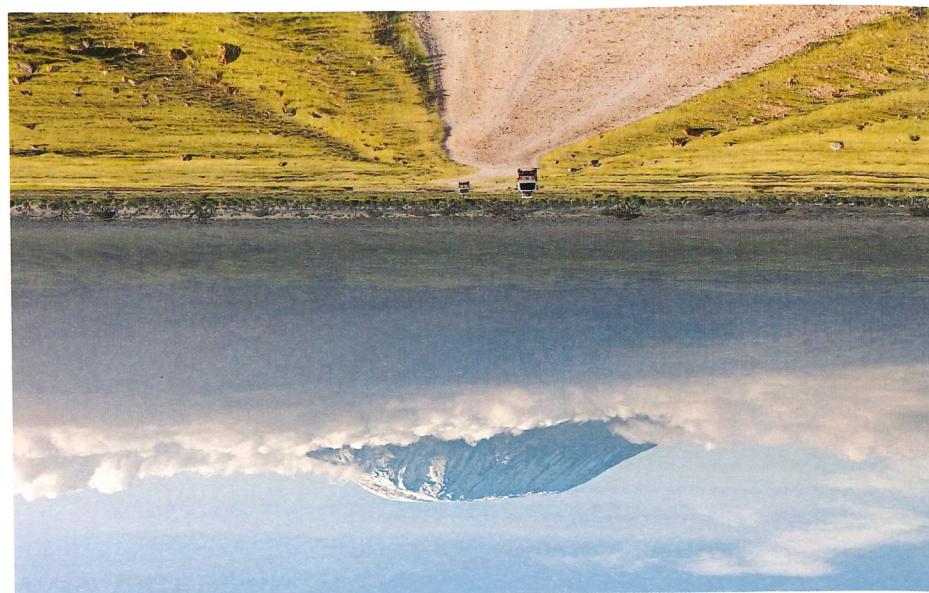
Melting sea ice

One of the most dramatic changes concerns ice sheets and glaciers. Glaciers around the world are shrinking. The world's major ice sheets are melting (see back page). Arctic sea north of Russia during the summer ice is thawing and in the last 20 years ships have been able to sail round the north of North America. The Antarctic ice sheet between eastern Asia and Europe and months, shortening the distance between North America. The Antarctic ice sheet appears to be getting thinner.

Melting ice can have catastrophic effects as the melt-water reaches the oceans causing sea levels to rise. The effect is made worse by water expanding above sea level — are at great risk of flooding and extreme weather events can lead to flooding and the destruction of entire crops.

Climatic change and extreme weather being submerged.

Where the highest point is 3 metres above the highest point in some island nations such as the Maldives — in volume as temperatures rise. Some effect is made worse by water expanding causing sea levels to rise. The effects as the melt-water reaches the oceans causing sea levels to rise. The melting ice can have catastrophic effects as the melt-water reaches the oceans causing sea levels to rise. The effect is made worse by water expanding above sea level — are at great risk of flooding and extreme weather events can lead to flooding and the destruction of entire crops.



Mt Kilimanjaro's white cap may soon disappear as temperatures rise with global warming

Abnormal weather events

Rainfall is increasing in some areas. This is particularly noticeable in the northern mid-latitudes. For instance in the UK, rainfall is increasing in some areas. This is part of a general increase in temperature has been increasing. About 11,000 years ago, over the last 150 years the average temperature has increased by about 1°C since the last ice age is what is meant by climate change. After a stable period since the last ice age patterns and average temperatures. This long-term change in the world's weather is what is meant by climate change. After a stable period since the last ice age patterns and average temperatures. This long-term change in the world's weather is causing a large-scale, global warming is causing a large-scale, melting ice.

flowing earlier for the same reason. By rising temperatures, and plants are response to earlier spring weather caused patterns. Birds are nesting earlier in the changes are affecting natural more prevalent. The changes are desert regions, drought appears to be of the world, especially on the borders such as prolonged rainfall. In some areas an increase in extreme weather events, winter rainfall is rising. There seems to be summer rainfall is decreasing while

put down to natural causes. Changes are so unusual it cannot all be part of a natural cycle but the present have suggested that the changes are emissions from human activity. Some minor compared with the amount of suspended dust particles, but this is warming. Volcanoes emit large amounts natural causes can affect global

Natural causes of global warming

Carbon dioxide in the atmosphere, is contributing to increased agriculture, is logging for timber or clearance for redaction in the area of tropical forest. The amount present in the atmosphere is due to burning fossil fuels. Carbon dioxide in the atmosphere has increased by 40% in the last 150 years. Carbon dioxide is released mainly through burning fossil fuels in power stations to produce energy for homes and factories, and also by cars.

Global temperatures. These gases that is the main reason for these gases have grown tenfold in the last 150 years, due to industrial activity. Scientists are now concerned that it is the increase of greenhouse gases in the atmosphere that is causing global warming. The rise in the amount of greenhouse gases in the atmosphere is almost exactly parallel to the rise in mean global warming.

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The effects

Chlorofluorocarbons (CFCs) — synthetic industrial chemicals. Due to their adverse effect on the ozone layer, CFCs are mostly banned from refrigerators and aerosols, where they were once common.

■ Methane — produced by the bacterial breakdown of organic matter without oxygen in swamps, paddy fields and waste dumps.

■ Nitrous oxide — a powerful greenhouse gas which is released from the breakdown of artificial fertilisers and through burning fossil fuels. ■ Greenhouse gas which is released from the breakdown of organic matter without oxygen in swamps, paddy fields and waste dumps.

■ Carbon dioxide — the greatest contributor, it spends a long time in the atmosphere, which increases its impact. The amount in the atmosphere has increased by 40% in the last 150 years. Carbon dioxide is released mainly through burning fossil fuels in power stations to produce energy for homes and factories, and also by cars.

Ozone layer. Area of ozone gas in the upper atmosphere which protects the Earth from radiation damage. Fossil fuels. Energy source from plants and animals that died millions of years ago, e.g. coal, gas and oil.

Glossary

The importance of vegetation

Vegetation absorbs large quantities of carbon dioxide and so reduces the

There are four major greenhouse gases:

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