Met Office

Guide to Climate Science

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What is weather?

Weather is how the atmosphere is behaving on a day to day basis, including temperature, rain and wind. These can change hour by hour, day by day.

The weather affects everyday life. Each day it can affect choices we make about whether to walk or take the car, what clothes we wear and whether outdoor events and pursuits are likely to get glorious sunshine or be rained off.

The weather we experience differs around the world. Even across Britain we experience a wide range of different weather types.

So, while the weather brings different temperatures all over the world every day, over a year we'd expect the global climate to bring an average temperature of between 14 and 15 ℃.

FACT

The Met Office has been forecasting the weather for over 150 years

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How do we make weather forecast?

1) ***First, we have to collect observations***
To make a forecast, we have to understand what the weather is doing now. To do this, we receive millions of observations covering the entire planet.

Observations of the weather are made 24 hours a day, all over the world. As well as taking measurements over land with lots of different types of equipment, we collect information from the ocean's surface using ships and buoys, from high in the atmosphere thanks to satellites and weather balloons, and from deep in the oceans using a network of special instruments called Argo floats.

2) We then use computer models to produce a weather forecast
All this observational information is beamed back to the Met Office headquarters and fed into our supercomputer. This high performance machine, capable of doing more than a 125 trillion calculations a second, takes this information as a starting point to run complex equations built on the fundamental laws of physics.

With more than a million lines of code, the equations form a mathematical model designed to mirror the dynamics of the atmosphere and oceans. By putting current weather observations into the model, the computer generates simulations of what might happen next.

3) Finally, we use our expertise
Output from the supercomputer is then studied by experienced forecasters who look at a range of information to determine the accuracy of the simulations.

Forecasters use their knowledge to compare the predictions of the models against actual observations. If necessary they can amend and add finer points to the forecasts before they are broadcast on television, radio and the internet, and delivered to a broad range of customers.

Met Office FACT

The Met Office issues, on average, a weather forecast every second of every day

What is climate?

The word ‘climate’ is derived from the Ancient Greek ‘klima’, meaning ‘zone’ or ‘region’. Today, many people from the UK travel south to the Mediterranean for their summer holidays as it’s more likely to be hot and sunny there. Variations in weather mean that holidaymakers could still experience damp days but on average, the weather is likely to be better in the Mediterranean during the summer because it’s in a different climate zone.

There are different climate zones because the Sun heats the tropics much more strongly than the poles. This sets up large-scale wind patterns in the atmosphere and ocean currents which try to reduce the imbalance by moving heat (the energy cycle) and water (the water cycle) around the Earth.

What is the difference between weather and climate?
Weather is how the atmosphere is behaving on a day to day basis including temperature, rain and wind. These can change hour by hour, day by day. Climate on the other hand looks at how the weather changes over a long period of time, typically over 30 years but sometimes over hundreds of thousands of years.

Climate is what you expect, weather is what you get

FACT

The Met Office Hadley Centre one of the UK's foremost climate change research centres

Climate zones

There are six major climate zones located throughout the world.

Equatorial
Lying between the Tropic of Cancer in the Northern Hemisphere and the Tropic of Capricorn in the south, equatorial climates are home to most of the world's rainforests where rainfall and humidity are high. Temperatures are not that extreme — generally 25 to 35 ℃ — with not much variation through the year.

Arid
Deserts are found mainly across the subtropical continents. Here, descending air forms large, almost permanent, areas of high pressure leading to cloud-free skies virtually all year round. Annual rainfall is low and, in some deserts, almost non-existent. Because they're so dry, the temperature range in deserts is huge, regularly exceeding 45 ℃ by day in summer and often falling to below freezing overnight in winter.

Mediterranean
The hot, dry summers of the Mediterranean, South Africa and southern Australia are caused by a seasonal shift of the descending air that also creates our deserts. Low summer rainfall is matched by many months of warm, sunny weather. But, at times, dangerously hot spells of weather engulf these regions with fiercely high temperatures of up to 45 ℃. In winter, there is more rain and cooler temperatures, but little frost.

Snow
In the higher northern latitudes, the vast forests of fir and spruce (often called the taiga) and the featureless tundra endure long, hard winters with short, bountiful summers, separated by rapid seasonal changes during spring and autumn. In the northernmost regions, the land is permanently frozen and will not thaw even during the brief summer.

Polar
The Arctic is mostly frozen ocean, and while its climate is moderated by the relatively warm waters of the Atlantic Ocean, winter temperatures can still fall to below -30 ℃. Antarctica is a vast continent of mountains and high plateaux buried under more than 3 km of ice. Temperatures below -80 ℃ have been recorded and the Antarctic i nterior is very dry — drier than many deserts. This is because as the temperature falls so does the atmosphere's capacity to hold water vapour needed to make snow.

Temperate
This classification covers a range of climates from Mediterranean-type climates and humid, subtropical zones to maritime climates influenced by the oceans — like ours in the UK. The UK has a typical maritime climate, where temperatures are quite moderate although hot summer days and cold winter nights still occur. Summers in maritime climates can be hot, warm or cool. In the UK we have what's considered to be a warm summer, whereas in Iceland the season is classified as cool.

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What is the natural greenhouse effect?

The Earth receives heat from the Sun. About half of the Sun's energy is absorbed by the Earth's surface, while around 20% of the energy is absorbed by the atmosphere and 30% is reflected by clouds and the Earth's surface back into space.

As the Earth's surface warms, energy is emitted back into the atmosphere in a similar way that the hob of an electric cooker radiates heat. But if that's all that happened, the Earth's surface would be frozen, with an average temperature of around -18 °C — too cold to support life.

Instead, greenhouse gases in the Earth's atmosphere absorb some of the outgoing energy and return part of it to the Earth's surface. These gases are only a small proportion of the atmosphere but they act like a blanket by trapping some of the heat. The greater the concentration of these greenhouse gases, the more effectively they return energy back to the Earth's surface.

Scientists explained the heat-trapping effects of greenhouse gases more than 150 years ago. We now know that any changes in the amount of greenhouse gases in the atmosphere will affect the Earth's temperature.

What are the main greenhouse gases?

Water vapour (H_2O)
Carbon dioxide (CO_2)
Methane (CH_4)
Nitrous oxide (N_2O)
Ozone (O_3)

What is the enhanced greenhouse effect?

Human activities like burning coal, oil and gas, deforestation and some agricultural practices have released huge quantities of greenhouse gases into the atmosphere.

This increase in greenhouse gases has led to an imbalance in the energy cycle that has affected the water cycle, atmospheric circulation and ocean currents, leading to changes in weather and climate. This is sometimes called the enhanced greenhouse effect.

In fact, the observed rise in atmospheric CO_2 represents only half of that actually released, showing that some CO_2 has been absorbed by our plants and oceans. Without this, it is possible the enhanced greenhouse effect would be even greater.

Observations of temperature, rainfall, humidity, arctic sea-ice, glaciers and sea-level over the last century are consistent with a warming planet. The evidence indicates that it is very likely that most of the warming since the mid-20th century is due to the observed increase in human emissions of greenhouse gases.

Water vapour is a really important greenhouse gas. Unlike other greenhouse gases, such as CO_2 and methane, our activities aren't really influencing its concentration in our atmosphere. However, scientists need to consider water vapour's influence on the climate system as it plays a vital role in how much global temperatures might rise in the future.

The decade from 2000 to 2010 has been the warmest decade in the instrumental record.

What is natural climate variability?

There is strong evidence that the climate change we are experiencing today is very likely due to the greenhouse gases emitted by humankind. However, when we look back thousands or even millions of years, we can see that the climate has changed dramatically in the past, well before humans were around. Some of these changes even caused mass extinctions. What's more, year after year, there are smaller fluctuations in our climate that would happen even if humans weren't around. These fluctuations are often called 'natural climate variability' and are caused by a number of different influences.

Changes in solar activity

Scientists know that the amount of energy the Sun emits varies on a cycle of about 11 years and it is thought that some of the variations in our weather might be linked to this cycle. Most climate scientists agree, however, that the changes we've observed in the solar cycle are not large enough to fully account for the rapid temperature rises over the last 50 years.

Changes in Earth's orbit

The way the Earth moves around the Sun and how it moves on its axis aren't constant through time. There are cycles in Earth's orbit and tilt that can have a dramatic effect on our climate, instigating ice ages or changing seasonality. However, these variations, known as Milankovitch cycles, last tens to hundreds of thousands of years, too long to account for the changes in climate we have experienced over the last 50 years.

Volcanoes

We know volcanoes emit two gases which can have an impact on global temperatures — sulphur dioxide (SO_2) and carbon dioxide (CO_2). They each have very different effects and work on different timescales:

- SO_2 — when this gas is emitted to high altitudes (about 50,000 ft or above) it enters the stratosphere. Here it can form acid droplets that partially scatter and reflect sunlight away from the Earth, cooling the surface. The droplets have a fairly immediate impact and, if there are enough of them they may cool the climate for a few months — or even a year or two — but then the droplets fall out of the stratosphere and things return to normal.
- CO_2 — we know this is a greenhouse gas, so when it is emitted in large enough quantities it can have a warming effect on our climate. But the amount of CO_2 emitted from volcanoes isn't changing much over time and is also very small in comparison to the amount emitted by humankind's activities.

Continued...

Aerosols

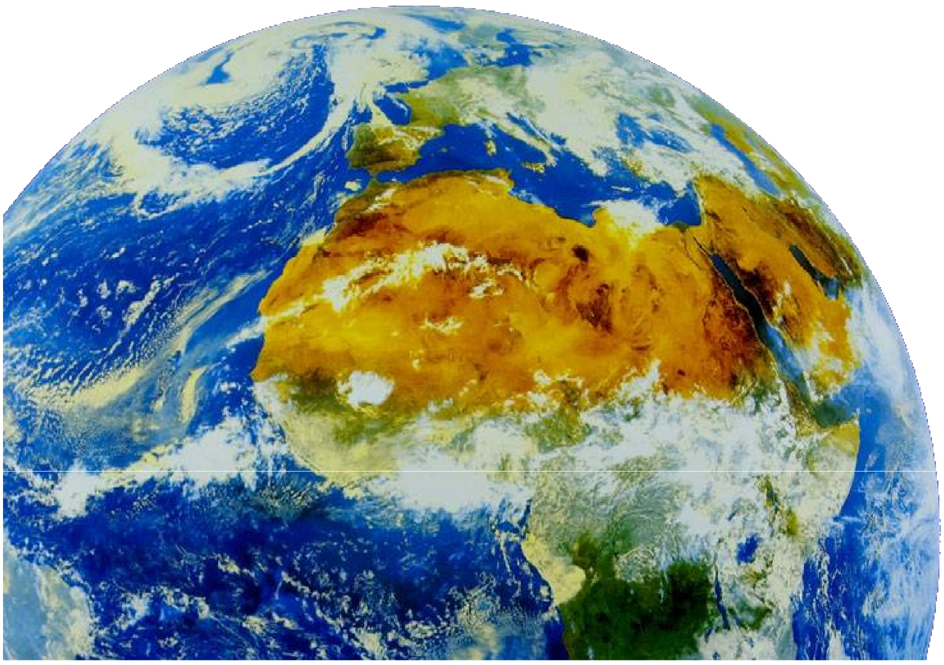
Atmospheric aerosols are microscopic particles emitted from human and natural sources that become suspended in the atmosphere. Aerosols are produced naturally from volcanoes and forest fires, as well as by humans from fossil fuel power stations and other industrial activities.

Many aerosols cool the climate by scattering and absorbing sunlight and also by affecting clouds. In fact, it is likely that some of these man-made pollutants have off-set some of the global warming we might have otherwise experienced. Despite this cooling effect, the net impact of human activities, combining greenhouse gases and aerosols, has been to warm the world's climate.

El Niño and La Niña

In the late 1800s Peruvian fishermen named a seasonal warming of the Pacific Ocean El Niño (Spanish for ‘little boy’). El Niño takes place on average every five years and can last up to 18 months or more.

It occurs when warmer-than-usual ocean water pools off the west coast of South America. During La Niña (Spanish for ‘little girl’) this is reversed and the surface waters in the eastern Pacific are cooler than normal. After the seasons, El Niño and La Niña are the single largest cause of year to year climate variability. Their impacts are felt around the world.



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What causes sea-level rise?

People often talk about sea-level rise being one of the major consequences of climate change. But how can increasing temperatures raise sea-levels around the world?

A warming climate raises sea-levels in two important ways:

- Thermal expansion — as water warms it expands, like liquid in a thermometer. A warming climate will heat the oceans, causing sea-levels to rise.
- Ice-melt — large amounts of water are locked in glaciers and ice-sheets around the world. Warmer weather is causing these to melt. Water from land-based ice flows into the oceans, raising sea-levels. Scientists estimate that if global temperatures continue to rise unchecked, the Greenland ice sheet could melt completely in a few thousand years, pushing up global sea-level by up to seven metres.

What happens on a global scale to sea-levels might differ from that which is experienced more locally. Land movement, such as subsidence or local uplift, and regional variations in ocean currents will mean that some areas could see a relatively lower rise in sea-level than the global average while some regions might face greater sea-level rises.

Sea-levels around the UK have already risen by 10 cm since 1900. If this continues, buildings, infrastructure and ecosystems in coastal areas could be at risk from increased flooding and damage from storms. Scientists are working hard to find out how much more sea-levels could rise.

Does melting sea ice contribute to sea-level rise?

When ice on the land melts it causes sea-levels to rise, but when floating sea ice melts there is no change to sea-level. This is because the ice ‘displaces’ almost the same volume of water whether it’s frozen or liquid.

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How do scientists model climate?

One of the ways we understand how our climate behaves is to use computer models. These models solve complex mathematical equations based on the well-established laws of physics, defining the behaviour of our weather and climate.

However, it is not possible to represent all the detail in the real world in a computer model. For example, most clouds are just too small to be represented in climate models; but scientists can make adjustments to the way the climate models work to replicate the interactions between clouds, weather and climate.

To test how good the models are, scientists see if the models can reproduce the features of our more recent climate, particularly looking at whether the models represent important natural climate variations like El Niño and regional features, such as monsoons.

Two critical factors have helped scientists to improve these models over the years:

Improvements in the science

In the 1970s, most climate models were very simple representations of the atmosphere. Since then, improvements in our knowledge of both the climate system itself and how to model it means that models now include interactions between the atmosphere, oceans and the land surface alongside detailed atmospheric and ocean chemistry. Some of today's models even include the natural cycle of carbon between the air, plants, soil and the oceans with vegetation that can grow and die as the climate changes.

Improvements in computer power

Climate modelling has always made use of the best computers, but has been limited by the available computer power. In the 1970s, the models included very little detail and could only be run for short periods, predicting changes on timescales of months up to a year or so. They were mainly used to understand climate processes rather than to predict the future.

Today, the latest Met Office Hadley Centre model runs on a supercomputer that has the processing power of over 20,000 high-end PCs and climate models can be run to simulate climate over hundreds of years.

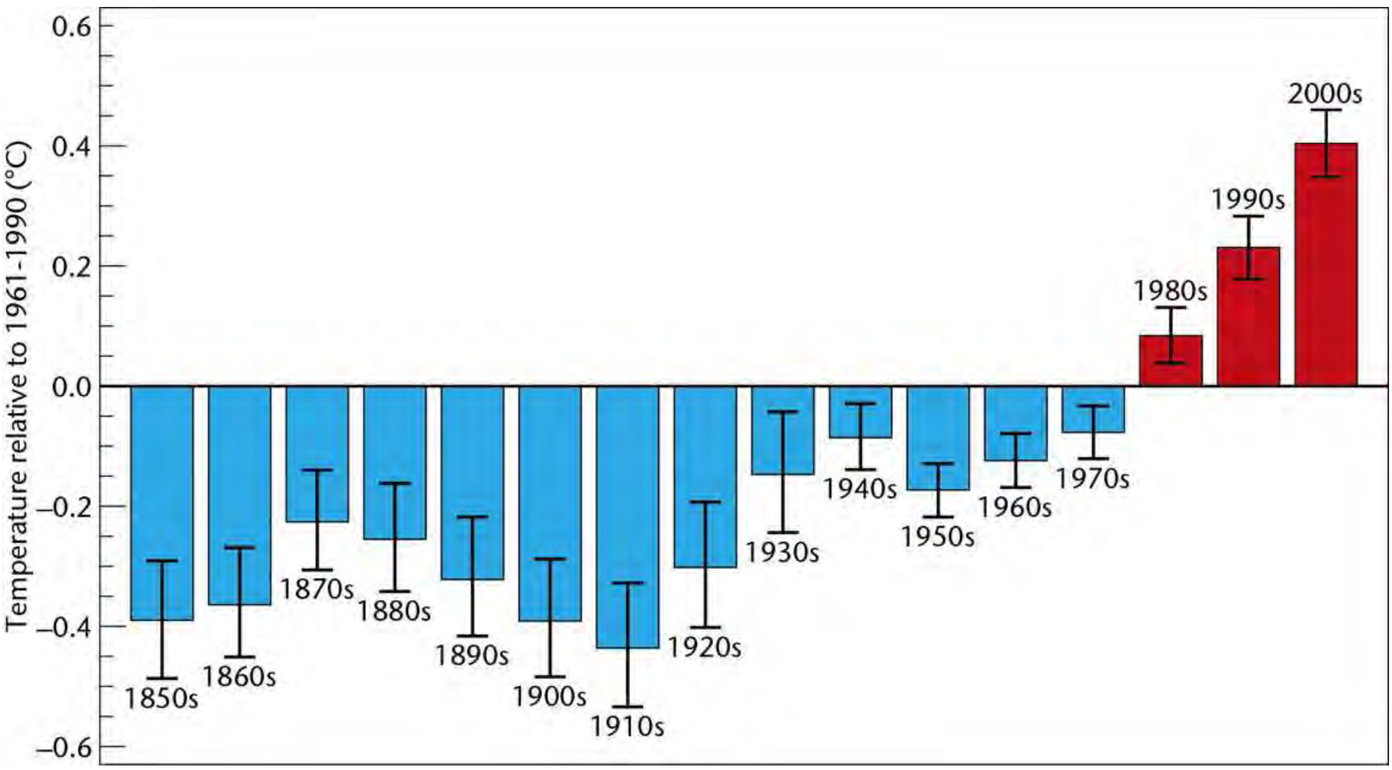
Met Office FACT

The Met Office supercomputer tackles 125 trillion calculations per second

What is climate change?

So far we've found out that climate is usually defined as the weather averaged over a long period of time, often 30 years or more. Climate change refers to a change in the general nature of the weather of a country, region or even of the whole world. Climate change can also mean that extremes of weather, like heatwaves or floods, happen more, or less, frequently.

The Earth's climate has changed many times in response to natural causes. However, since the early 1900s, our climate has changed rapidly and scientists believe this is very likely due to man-made changes in the composition of the atmosphere.



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Has our climate changed before?

By examining rocks, pollen records, tree rings and ice cores, scientists can look back through time and see that our climate has changed many times before.

Ice ages

Over very long periods of time, a cycle has been observed in our climate – that of ice ages. This is a shift in the Earth's climate between glacial ages, when global temperature drops and large areas of the planet become covered in snow and ice, and interglacial ages, which brings less cold conditions, such as those we are experiencing now. The global temperature change between each is about 4 ℃.

There's evidence to show these cycles are triggered by small changes in the Earth's orbit affecting the amount of energy the planet gets from the sun. The full cycle, from glacial age to glacial age, takes about 100,000 years. Evidence suggests the last ice-age ended about 11,000 years ago.

Short-term changes

Over shorter periods of time, we know from many difference sources that there have been smaller changes in regional climates. There is evidence of a period of slightly warmer climate in Europe between the tenth century and thirteenth century known as the Medieval Warm Period. It was followed by a cooler period, known as the Little Ice Age. Most of the information on these periods originates from Europe, and there's not enough evidence to say this was a global climate phenomenon.

Today's global climate

Since the last ice age ended about 11,000 years ago, global average temperatures have been largely steady, averaging about 14 ℃. This stabili ty has allowed complex ecosystems to thrive, supporting a wide range of life on Earth. In the last century, however, our climate has started to change and the evidence points to a change in our climate that's happening quickly, especially when compared to known historical climate cycles.

Met Office FACT

The Met Office Hadley Centre is home to over 150 climate scientists

How do we know the climate is changing?

The widespread deployment of scientific weather instruments over the last century means we can now reliably measure where, and how large, recent changes in climate have been.

- **Increasing temperatures** — global surface temperature records estimate that the Earth has warmed by about 0.75℃ in the last century, mos t of this in the last four decades. Our oceans have also warmed up; in fact they have absorbed more than 80% of the heat added to the climate system.
- **Changes in rainfall** — evidence shows rainfall patterns are changing across the globe. Generally, wet places are becoming wetter and dry areas are becoming drier. There are also changes between seasons in different regions. However, such changes are harder to detect than those in temperature due to the large natural fluctuations in rainfall.
- **Changes in nature** — in the UK, the growing season appears to have lengthened due to spring starting earlier and the delayed onset of autumn/winter. Wildlife experts have noted that many species are changing their behaviour, from butterflies appearing earlier in the year to birds starting to change their migration patterns.
- **Sea-level rise** — since 1900, sea-levels have risen by about 10 cm around the UK and about 17 cm globally, on average. Evidence shows the rate of sea-level rise has increased.
- **Melting glaciers** — glaciers all over the world are retreating. This has been observed in the Alps, Rockies, Andes, Himalayas, Africa and Alaska.
- **Reduction in Arctic sea-ice** — Arctic sea-ice has been declining since the late 1970s, reducing by about 0.6 million km² per decade — an area about the size of Madagascar.
- **Shrinking ice-sheets** — the Greenland and West Antarctic ice-sheets, which between them store the majority of the world's fresh water, have both started to lose mass, causing sea-level rise of about 0.5 mm a year.

How do scientists model climate change?

In the previous weather and climate sections, we looked at how computer models help scientists predict the weather and study our climate. Scientists can use these same models to help them understand the recent changes in our climate and to come up with plausible climate projections for coming centuries.

What are the projections of future climate change?
Scientists use climate models to better understand how global changes such as increasing greenhouse gases or decreasing Arctic sea ice will affect the Earth. The models are used to look hundreds of years into the future, so that we can predict how our climate is likely to change.

It is important to recognise that projections from climate models are never 100% certain. This is because scientists don’t understand everything about how the climate system works, and because simplifications are often required to represent complex processes, such as cloud formation. As a result, different climate models can give different projections.

Climate projections are also based on estimates of what greenhouse gas emissions might be in the years to come. Future emissions depend on things like economic and social growth, technology, how dependent we are on fossil fuels and the changes we make to land cover. This means that the level of future greenhouse gas emissions is one of the major sources of uncertainty in climate prediction.

Despite the uncertainties, models are really useful – they are one of the best ways we can combine our understanding about the complex process influencing our climate. All models show that the Earth will warm in the next century. They broadly agree on the geographical pattern of temperature change, with the greatest warming in the high latitudes of the northern hemisphere and in the Arctic. Projections of changes to rainfall are less certain and climate scientists are constantly working to understand better the possible future changes to our climate.

The impact of a global temperature rise of 4ºC
http://www.metoffice.gov.uk/climate-change/guide/impacts/high-end/map

What could be the impacts of future climate change around the world?

Scientists have already observed changes in many natural and human environments that are more than likely due to a warming planet. As temperatures continue to rise and rainfall patterns change, the possible impacts of climate change will vary widely across the globe.

How people and natural systems are affected will depend not only on the nature and level of climate change, but also on their vulnerability to change and ability to adapt. A lot of research is being done around the world to better understand what the impacts of climate change could be, and some examples are presented below.

Impacts on ecosystems

Climate change may increase the risk of forest fire as temperatures rise and rainfall patterns change. In regions such as the Amazon, additional pressures from human activity, such as deforestation, could affect the ability of the forest to cope with future climate change. Other areas of high biodiversity, such as those in South Africa, may see losses of species as habitat conditions change too quickly for plants and animals to adapt. On the other hand, in certain locations, some animals and plants may benefit and flourish in a changing climate.

Impacts on the developing world

The environmental stresses of climate change will be felt across the globe, but it seems likely that poorer countries will see the most severe effects. This is particularly true for regions that are already more prone to extremes of flood and drought, with a large share of their economy held in climate sensitive sectors, such as farming. Food, water and energy – essential for human survival – are already in short supply in many parts of the world and shortages may worsen as populations grow and weather patterns change.

Impacts on the Greenland Ice Sheet

The Greenland ice sheet covers an area of about 1.7 million km^2 and is the second largest body of ice in the world. As our climate warms, the ice sheet will melt and reduce in size. Scientific research has shown that if global temperatures rise unchecked, then it could melt completely over several thousand years — pushing up global sea-levels by up to 7 metres. By 2100 it is more likely that the Greenland Ice Sheet melt could contribute 1 to 12 cm to global sea-level rise, although the exact amounts are quite uncertain and could be more.

Impacts on health

It is likely that climate change will have both positive and negative impacts on our health and well-being. The possible increases in heatwaves, floods, storms, wildfires and droughts could harm peoples' health around the world, especially in the more vulnerable populations of the young, elderly and poor.

However, as temperatures rise, deaths from cold-related diseases might be expected to reduce, especially in countries like the UK. Patterns of disease may also vary, with some regions seeing a change in the number of outbreaks of diseases like malaria or dengue as the climate zones that support the disease life-cycle are altered by climate change.

Some specialists argue that efforts to reduce our greenhouse gas emissions could lead to healthier lifestyles and environments where we live, go to school and work; although we need to ensure there are no negative, unintended consequences of these efforts.

Met Office

Projections of climate change in the UK

The Met Office Hadley Centre has modelled how the climate of the UK might change over the rest of the 21st century.

It’s important to remember that there are uncertainties in the climate modelling process, so when projections of climate change are presented, there is always a range of possible change rather than a single figure. These projections are based on the available evidence we currently have, so the projections will also change as our understanding improves.

- If global emissions continue on a similar path to today, the annual average temperature rise for the whole of the UK by the end of the century is very likely to be more than 2 °C and less than 5 °C.
- Temperatures are expected to rise across the UK with more warming in summer than in winter. The summer average temperature rise in the South East is very likely to be above 2 °C and below 6.4 °C.
- Climate change could increase the number of intense downpours of summer rainfall, which could lead to flash flooding. Scientists do not yet know whether our summers will be wetter or drier.
- The extreme heatwave of 2003, when average summer temperatures were 2 °C higher than normal, led to more than 2,000 additional deaths in the UK. Summers like 2003, which was an unprecedented event, could become a relatively normal summer by the 2040s.
- Heavier winter precipitation is expected to become more frequent, potentially causing more flooding. Sea-level across the UK is projected to rise between 11 and 76 cm by the end of the century. In the worst case, rises of up to 1.9 m are possible but highly unlikely.

Met Office FACT

The top five warmest years in the UK have occurred since 2002

What could be the impacts of climate change in the UK?

Many aspects of our lives and lifestyles here in the UK could be affected by climate change – both positively and negatively.

Impact on energy

Here in the UK our energy use is affected by the weather and our climate. Because we use more energy keeping warm in winter than we do in summer, the infrastructure we use to supply us with energy is designed to perform best in cold weather conditions.

With warming summers, and increasing use of air conditioning to keep homes and offices comfortable in the summer months, there could be changes in the pattern of energy demand through the year in response to climate change. To minimise the risk of summer power black-outs in the future, energy companies are looking at potential risks to their infrastructure – for example power cables tend to underperform in hot weather – and the availability of river water for cooling power station turbines.

Impact on water

From extreme rainfall to heatwaves, weather has a significant impact on the UK's water industry. With higher temperatures and more droughts a possibility for the future, climate change may increase the pressure on water demand, already very high in some areas of the UK. Water quality could also be affected by rising temperatures and changing rainfall patterns, with declining river flows in summer-time and an increased risk of toxic algal blooms. Flooding of sewerage systems in urban areas could increase due to more heavy rainfall.

Impact on agriculture

Higher year-round temperatures and longer growing seasons could mean that new crops flourish in the UK although warmer temperatures might make it easier for diseases and pests to survive milder UK winters.

An increase in the number or intensity of extreme events could have an impact on UK agriculture. Without irrigation or changes to the varieties grown, droughts could reduce the overall UK crop yield during some years. More heavy rain could lead to increased risk of flooding which can wash nutrients from the soil and lead to water-logging of fields.

Impact on the built environment

Climate change could have a dramatic effect on the way we build houses in the future. Those built today might need to cope with possible extreme summer heat, increased risk of damaging storms and the risk of summer and winter flooding. As temperatures rise there is more chance of soil drying out during spring and summer. Foundations in clay soils could be at particular risk. Designers must ensure that our homes are not just efficient, comfortable and safe in today's climate but remain so throughout their lifetime. This means that houses should be designed using weather information that represents the future climate and not just historical weather observations. Scientists are already working closely with industry experts to ensure our built environment is resilient to climate change.

Continued...

Impact on transport

Extreme weather, including floods, heatwaves and snowstorms, has a major impact on the transport network of the UK. Today, road surfacing can melt and train rails buckle during spells of hot weather. Unless they are replaced with more resilient materials, this could happen more often in the future as heatwaves are projected become more common. On the other hand, heavy snowfall, which has caused significant disruption to all forms of transport around the UK over recent winters, should occur less frequently as temperatures rise. It is important to remember that despite climate change, we will still suffer occasional severe winters, so we will have to continue to prepare for the impacts snow and ice have on our transport network.

Climate change mitigation and adaptation

Many aspects of human society and the natural environment are sensitive to weather and climate. A lot of people, from scientists to politicians to the general public, want to find ways of reducing the negative impacts of climate change and enhancing the positive ones. Most of the possible ways of doing this fall into one of two groups – mitigation or adaptation.

Mitigation

Man-made greenhouse gas emissions are very likely to have been the main cause of the climate change we have seen over the past few decades. If our future emissions are reduced early and rapidly, the extent of future climate change will be lessened – this is often called mitigation.

On the other hand, if greenhouse gas emissions continue at the same rate as today, or increase, it is very likely the climate change we will experience will be at a rate greater than we have had to cope with in the 20th Century.

Adaptation

Our climate will not react straight away to any changes in the emission of greenhouse gases – it will take time for the mitigation decisions we make now to have an effect on global climate. Even if all our emissions stopped today, it is likely that we would experience climate change for at least the next 30-40 years. Altering our behaviour to respond to this climate change is called adaptation. Adaptation means not only protecting against the possible negative impacts of climate change, but also taking advantage of any benefits.

Examples of adaptation may be modifying our buildings so they remain cool during the hotter summers, managing flood risk or animals moving further north or to higher altitude, if they can, to cope with the rising temperatures.

It is really important that governments, businesses and individuals understand that adaptation will be necessary over the next few decades, no matter how hard we try to reduce our emissions on greenhouse gases.