

Weather and Climate Change

Climate

See accompanying 'climate' videos in Glow:
<http://tinyurl.com/zbqlvvh>

Climate

Using climate as a context for learning offers many opportunities for connections to be made across curriculum areas.

At a local level, the climate we live in has an impact on many areas of our lives including the type of work we do, the clothes we wear, our leisure pursuits, the type of houses we live in and the crops we can grow. Our climate also has an impact on our landscape and culture, including our language, music and festivals. Climate is a truly global phenomenon and provides opportunities for fascinating comparisons with other peoples, locations, cultures and lifestyles around the world.

Within the experiences and outcomes, children and young people are also encouraged to develop a curiosity about and understanding of nature and the environment and learn about their place in the living, physical and material world.

Reflective questions

- How can we enable learners to appreciate their culture and heritage and engage with other cultures and traditions around the world?
- How can we encourage children and young people to learn how to locate, explore and link features and places locally and further afield?



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About climate

Weather is the term used to describe the fluctuating state of the atmosphere around us. The term climate refers to the average or typical weather conditions observed over long periods of time for a given area. The World Meteorological Organisation standard is to use a period of 30 years to measure climate.

Climates can vary over time and place and the climate for any given location may change gradually over decades and centuries.

The factors influencing these changes are complex and relate to the interaction between the five elements of the Earth's climate system. These include: the atmosphere, the ocean, the biosphere, the cryosphere (ice and snow) and the geosphere (rock and soil).

The climate can also be further influenced by human activity – such as when greenhouse gases are emitted into the atmosphere.

Reflective questions

- How can we enable learners to locate, explore and link features and places locally and further afield?
- How can we develop learners' curiosity about and understanding of the environment and their place in the living, material and physical world?



Scottish climate

Scotland has a temperate climate with four seasons: spring, summer, autumn and winter.

In Scotland we are often frustrated by the ever-changing weather conditions but the positive side is that our temperate climate tends to produce milder and safer climatic conditions than other climate zones where hurricanes and severe floods and droughts can be regular occurrences.



Download: PowerPoint presentation illustrating Scottish climate

<https://education.gov.scot/improvement/Documents/WCC/PCCscottishclimate.pdf>

Gulf Stream

Scotland's climate is warmed by the Gulf Stream. This is a current of warm water that moves from the Gulf of Mexico across the Atlantic Ocean towards Great Britain and is just one part of a huge global oceanic circulation. The Gulf Stream warms the air above it and protects us from extremes of temperature that affect other regions on the same northerly latitude as Scotland - such as Hudson's Bay in North America where the sea freezes in winter.

Temperatures

Average maximum temperatures in Scotland vary between 5°C in winter and 20°C-25°C in summer. The coldest ever recorded temperature of -27.2°C was recorded at Altnaharra in the Highlands in 1995 while the highest recorded temperature of 32.9°C was recorded in Greycrook in the Scottish Borders in 2003.

Rainfall

Rainfall totals vary enormously across Scotland with the western highlands being one of the wettest places in Europe with an average annual rainfall of 4577mm. The east coast tends to be much drier with some parts receiving only 550mm of rain - putting it on a par with Morocco, Sydney and Barcelona.

Recently published research from the Institute of Physics shows that although overall Scotland is not much wetter than it was 63 years ago, the way it rains has changed. When it rains it is much more intense.

Annual average sunshine totals vary from as little as 711-1140 hours in the highlands and the north-west, up to 1471-1540 hours on the extreme eastern and south-western coasts.

Reflective questions

- How can we make effective use of outdoor learning approaches to engage children and young people in learning about climate and its impacts on our lifestyles, culture and natural heritage?
- How can we actively engage learners in measuring and recording weather data to improve

mathematics and numeracy skills?

- How can we use weather and climate issues to connect our learning to people and places

Climates around the world

World climates

Climates around the world vary greatly and do not easily fit into precise climatic categories. Large variations in climate occur across relatively small distances. However, it is useful to split different weather types into a number of categories according to describable weather patterns. Climate zones can be categorised in a number of different ways but commonly used climate zones include: temperate, polar, arid, mediterranean, tropical and mountainous.



A number of different factors affect the climate in each zone. These include:

- Latitude - areas closest to the equator are generally warmer. This is because the Sun's rays are most intense when they strike the Earth's surface at right angles, ie when the sun is directly overhead. At the polar regions, solar radiation strikes the Earth at a much shallower angle. This 'projection effect' at the Poles means that solar radiation is cast over a greater surface area. This is the main reason why polar regions are colder.
- Wind direction - winds blowing from warmer climates will increase temperatures whilst ice sheets and glaciers have very cold air above them and wind blowing away from these will be especially cold.
- Mountains - these can impact on levels of rainfall.
- Aspect - slopes facing the sun are warmest. South-facing slopes in the northern hemisphere are usually warm but slopes facing north in the southern hemisphere are warmest.
- Closeness to the sea - this is because the sea cannot warm up or cool down as much as or as quickly as land. Therefore coastal areas don't experience extremes in temperature but areas well away from the influences of the sea can experience extreme temperature variations.

Reflective question

- How could we use our international school links to promote learning about climates around the world and how this impacts on cultures, lifestyles and biodiversity?

Climates around the world

Temperate

Temperate climate zones lie between the tropics and the polar circles. Countries with temperate climates include the UK, New Zealand, eastern Asia and southern Chile as well as much of northwest Europe and coastal areas of North America.

In these regions the changes between summer and winter are not extreme but temperate climates can have very unpredictable weather.

Temperate zones cover about 7% of the world's land surface but are by far the most popular areas in which to live - providing a home to around four-tenths of the Earth's population. This is largely due to the mildness of the climate, the plentiful supply of rain and generally very fertile soils.

The majority of the land in temperate zones has been cleared of its natural forest vegetation to make way for more intensive farming methods. Deciduous trees such as the oak and the beech are the most common types of tree found in these regions. These have formed a protective mechanism against the effects of cold winters by shedding their leaves.



Climates around the world

Polar

Polar climates are located in the high latitudes of the world and are marked by a permanent covering of snow and ice throughout the year. The north polar regions include the Arctic Ocean, the Greenland continent and much of Northern Canada and Northern Siberia while the vast mountainous Antarctic continent dominates the southern polar region.

The high latitude of the polar regions means that the sun's warming effect is diminished and this results in the temperatures rarely reaching above freezing. In winter, the polar regions are covered in darkness and temperatures can fall as low as -80°C in the Antarctic and -50°C in the Arctic. The summer temperatures can reach 10°C in the Antarctic and up to 30°C in some areas of the Arctic.

The average annual rainfall in polar regions is very low - often less than 250 mm. This makes these regions as dry as the hot deserts of the sub-tropics.



Climates around the world

Arid

Arid climates are normally hot and very dry, so they have a severe lack of water. Deserts fall into this category. The Sahara Desert along with Saudi Arabia and large parts of Iran and Iraq all have arid climates. The Atacama Desert in South America is one of the driest places on earth and some parts of this desert haven't seen any rain for at least 400 years. And the Gobi Desert in Northern China is characterised by harsh conditions and temperature extremes which can push most living organisms to their limits.

There are two seasons in arid climates - winter and summer. The desert's dryness means there is no humidity and so the skies are clear.

They have big daily and seasonal temperature ranges, with high daytime temperatures in summer up to a very hot 50°C, and low night-time temperatures in winter down to a freezing cold 0°C or in the Gobi much lower.

When rains do fall, they can cause flash floods. Very strong winds can create desert sand or dust storms.



Climates around the world

Tropical

The zone known as the Tropics lies between the Tropic of Cancer at 23.5° N latitude and the Tropic of Capricorn at 23.5° S latitude. Tropical climates are often associated with the rich variety of plants, insects and animals found in jungles and rain forests.

Much of the equatorial belt within the tropical climate zone experiences hot and humid weather. There is abundant sunshine but heavy rainfall, and thunderstorms can occur almost every day. Areas with tropical climates include the Amazon Basin in Brazil, the Congo Basin in West Africa, Malaysia, southern Vietnam and Indonesia.

Temperatures

Temperatures in the tropics rarely exceed 35°C because a large proportion of the sun's heat is used up in evaporation and rain formation. A daytime maximum of 32°C is common, with night-time temperatures falling to about 22°C. Temperatures in the tropics remain constantly high throughout the year, with as little as 2°C separating the highest noon temperature from the lowest throughout the year.

Seasons

The seasons, as far as they exist, are distinguished by changes in rainfall and cloud cover rather than by periods of hot or cooler weather. On the equator there tend to be two wet and two dry seasons but as you move away from the equator the two rainy seasons merge into one, and the climate becomes more monsoonal, with one wet season and one dry season.



Climates around the world

Mountain

Mountains have a significant effect on weather and climate at both a local and a global level. Mountains create their own climate no matter where they are located and tend to be much wetter than their surrounding areas.

In the western highlands of Scotland, for example, the average annual rainfall is 4577 millimetres, while on the east coast of Scotland, rainfall can be as low as 550 millimetres. This is because the Grampian and Cairngorm mountain ranges force moist air to rise and condense and fall as precipitation.



Sub-climates

The climates on mountains can vary greatly depending on altitude and aspect. For every 1000 metres you climb it is usually 6°C colder and high mountain ranges may be split into several sub-climate zones.

For instance, mountains in tropical climates may have foothills covered in rainforests but their upper slopes may be covered in pine forests. Above the tree line you may find alpine plants which can withstand the harsh conditions.

The highest slopes and peaks may be bare rock and covered in snow and ice. Examples of these types of mountain climates can be found in the Himalayas, the Rocky Mountains and the Andes. In Africa, only Mount Kenya, Kilimanjaro and the Rwenzori range are high enough to carry permanent snow.

Global impact

Mountain ranges on the Earth can dramatically influence global climate too. The Rocky Mountains that stretch along the western side of North America, for example, deflect air to the north, which cools in the polar latitudes before returning south. The colder north-westerly wind influences the climates of the Canadian and United States interiors, and winter temperatures can be very low.

How climate affects our lives

Climate has a big effect on the food we eat, the energy we use, homes we live in, work we do (and how we travel to work), our culture and heritage and the way we spend our spare time. It can even affect our health, from sunburn to allergies to respiratory illnesses.

In Scotland

The bright, warm and sunny summer months can encourage people to take more exercise and eat more healthily. However, in winter many vulnerable and elderly people in Scotland often spend much of the winter indoors to avoid the cold, snow and ice. Céilidh music and dancing was traditionally practised indoors during the winter months. Many thousands of people jet off for holidays each year in search of sun and warmth and to escape the changeable and wet climate of Scotland.



Rest of the world

- In Spain, the hot midday sun can make it difficult to work. People tend to start work earlier in the morning while it is still cool then have a big lunch and a siesta in the afternoon.
- In Toronto, Canada, miles of walkways underneath the city allow people to stay warm and get on with their lives during the severe winter months. This walkway, named PATH, links public transport, shops, offices, sports and entertainment centres.
- The tropical climate in Cambodia encourages tremendous biodiversity. This has many benefits but there are also drawbacks such as poisonous snakes and insects. People living in remote forest areas build their houses on stilts to avoid uninvited guests. Diseases such as malaria and yellow fever are prevalent in warmer climates.

Reflective questions

- How can we develop in learners an understanding of the interdependence between people, the environment, and the impacts of actions, both local and global?
- How can we motivate learners to appreciate and celebrate the diversity of Scotland's history, culture and heritage and engage with other cultures and traditions around the world?