Earth’s changing climate

We have known about human-induced climate change for at least 150 years. This useful summary looks at the causes and impacts, and how the changing temperature has been measured.

Hotting up

The planet is getting warmer.
- Our satellites have watched as the Arctic sea ice has melted — down by more than a third since the 1980s.
- The shrinking of glaciers all over the world can be seen by comparing modern photographs with those taken over a century ago.
- Tide gauges have recorded rising sea levels for many decades.
- The famous cherry blossom season in Japan is starting earlier in the year, and migration of species through the seasons has changed.
- Corals on the Great Barrier Reef, and across the tropical oceans, have died due to extreme heat.
- Even without thermometers we know that our climate is getting hotter.

Why is the climate changing?

Several natural factors influence Earth’s climate, such as volcanic eruptions, changes to the planet’s orbit around the sun and changing solar activity. These factors have caused Earth’s climate to change in the past, before human activity increased. More recent changes have been much faster. The main reason for the climate getting warmer over the past 200 years is increased emissions of carbon dioxide into the atmosphere. The second is changes in methane emissions. Both carbon dioxide and methane in the atmosphere act as a blanket, trapping heat closer to the planet’s surface, a process known as the ‘greenhouse effect’.

The impacts

Warmer temperatures mean that severe heatwaves are more common, ice melts in the colder regions of the planet, and sea water expands, causing sea levels to rise. Heavy downpours of rain happen more often as a warmer atmosphere contains more moisture. Virtually every country in the world has signed up to the Paris Agreement to try and limit global temperature rise to less than 2°C and avoid some of the worst effects of climate change.

The earliest known temperature measurements are from the seventeenth century, but the widespread use of thermometers to keep track of the weather started in the mid-nineteenth century. Detailed measurements were taken on ocean voyages, and in cities, towns and villages across the world. These measurements show temperatures getting warmer almost everywhere.

Looking back at these historical data, scientists calculate that temperatures averaged across the planet have already warmed by about 1°C since the Industrial Revolution (Figure 1). The Arctic regions have warmed the most and are now more than 2°C hotter.

The impacts of greenhouse gases for over 150 years (Figure 1). In 1861, John Tyndall discovered that carbon dioxide absorbed infrared radiation, which is the cause of the greenhouse effect. In 1896, Svante Arrhenius first calculated how much the planet would warm if the amount of carbon dioxide in the atmosphere increased, and in 1938 Guy Callendar used the available temperature measurements to show that the world was already warming up.

You can download a pdf of this spread to print as a poster and find a presentation on climate change at: www.hoddereducation.co.uk/geographyreviewextras

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