

## Extreme weather in the UK in 2018

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This unit looks at extreme weather events in the UK in 2018. Extreme weather is when a particular event is significantly different from the weather pattern that is expected or average for that time of year. It may be short-lived (over hours or a day) or take place over days, weeks or longer.

This unit looks at:

- the climate of the UK
- two severe weather events in 2018 – the ‘Beast from the East’ and the hot dry summer
- why these events happened and what effects they had
- a comparison of climate data for 1981–2010 and 2018.

### Key vocabulary

**Extreme weather:** when a particular event is significantly different from the usual or average weather pattern expected for that time of year.

**Temperate:** the region lying between the Earth’s poles and the tropics where weather and climate are generally not extreme.

**Air mass:** a large volume (mass) of air in the atmosphere often extending hundreds or thousands of km<sup>2</sup>. Air masses have particular characteristics, e.g. cold/wet/warm/dry, depending on where they originate.

**Jet stream:** very strong winds (up to 320 km/h or 200 miles/h) found 10–15 km (6–9 miles) above the Earth’s surface. Jet streams help to move air masses and weather systems around the globe.

**‘Beast from the East’:** a short period of unusually severe winter weather with very low temperatures and heavy snowfall experienced in the UK between late February and early March 2018.

### Learning outcome

This unit will help you to:

- learn about two major extreme weather events in the UK in 2018
- understand the causes and impacts of these events on local people and the UK as a whole
- compare climate data for 2018 with data for the UK, 1981–2010
- find and compare data for your own local area/region with data for the UK.

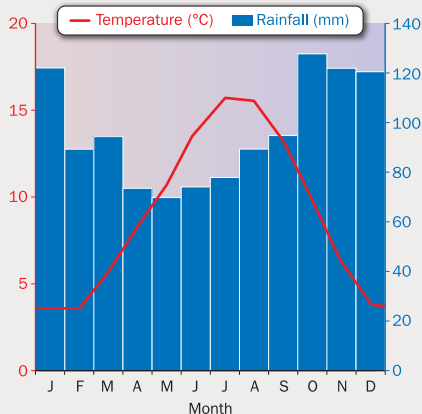
### Relevance to GCSE specifications

<b>AQA</b>	Theme 3.1.1.3 Weather hazards, pages 10–11 <a href="#">Click here</a>
<b>Edexcel A</b>	Topic 2 Weather hazards and climate change, pages 12–13 <a href="#">Click here</a>
<b>Edexcel B</b>	Topic 1, Enquiry question: How are extreme weather events increasingly hazardous for people?, Key ideas 1.4–1.6, page 10 <a href="#">Click here</a>
<b>OCR A</b>	2.3 Environmental threats to our planet, Sections 2.3.1–2.3.6, page 12 <a href="#">Click here</a>
<b>OCR B</b>	Topic 1 Global hazards, 1.1 How can weather be hazardous?, page 6 <a href="#">Click here</a>
<b>Eduqas A</b>	No subject-specific link
<b>Eduqas B</b>	Key idea 2.3 Weather and climate, Enquiry questions 2.3.3 and 2.3.4, page 13 <a href="#">Click here</a>
<b>Cambridge IGCSE</b>	Theme 2, Section 2.4 Weather, page 11 <a href="#">Click here</a>
<b>Edexcel IGCSE</b>	Section B, Topic 3 Hazardous environments, page 14 <a href="#">Click here</a>

# Extreme weather in the UK in 2018

The UK's weather is not usually **extreme** (Figure 1). This is because it is located in the **temperate** zone, between the poles and the tropics. The UK is surrounded by sea. This maritime effect means it is usually not too hot in summer and not too cold in winter. As a result, it has a temperate maritime climate with warm wet summers and cool wet winters.

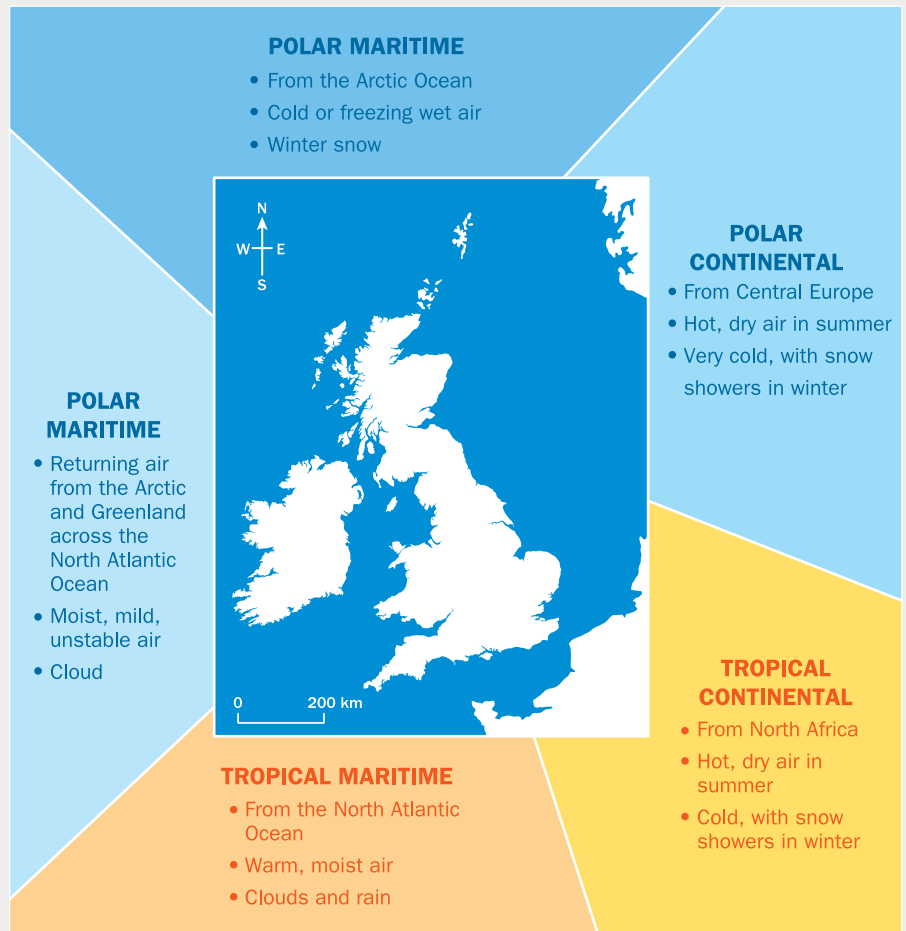
However, the UK is also located where cold air from the Arctic in the north meets warm tropical air from the south (Figure 2). **Air masses** don't mix, and they don't stay in one place. They are moved by strong winds (up to 320 km/h or 200 miles/h) called **jet streams** in the atmosphere between 10 and 15 km (6–9 miles) above the Earth's surface. In the UK, movement to the north or south of the polar jet stream can change our normal weather. This can bring extreme weather events, for



NB Climate data is calculated globally by using data covering a 30-year period. 1981–2010 is the most recent set of data currently available.

**Figure 1** Climate graph for the UK, 1981–2010

Source: Met Office



**Figure 2** Air masses affecting the UK

example heavy rain (or snow), low temperatures, strong winds and major storms.

## The 'Beast from the East'

At the end of February and the beginning of March 2018 the Met Office reported that 'the UK experienced a spell of severe winter weather with very low temperatures and significant snowfalls'. They were concerned enough to issue two red warnings (for only the third time since these warnings began in 2011). A red warning means that 'widespread damage, travel and power disruption and risk to life is likely'.

### Causes

- The polar jet stream which normally brings warmer air to the UK was blocked.
- This caused an area of high pressure over Scandinavia and the Arctic while there was low pressure over the Atlantic Ocean.
- Winds always blow from areas of high pressure to areas of low pressure.
- Freezing temperatures and snow were carried to the UK (and much of Europe) by strong winds from the east – nicknamed the **'Beast from the East'**!

The worst of this weather lasted from 26 February to 3 March:

- Most of the UK was covered by snow – 10–20 cm (4–8 in) in the southern lowland areas and up to 50 cm (20 in) over highland areas (mainly in the north).
- The snow was very dry and light. This led to lots of snow drifting in strong winds.
- Temperatures in many locations were the lowest ever recorded in March. They were below freezing almost everywhere on 26 and 27 February, and down to  $-14^{\circ}\text{C}$  in the Cairngorm mountains of Scotland.
- The strong winds added a windchill factor of  $-10^{\circ}\text{C}$  or more.
- More snow fell when Storm Emma moved to the south of England from Spain. It brought with it freezing rain and flood warnings.

**Impacts**

All of the problems described in the red warnings made by the Met Office came true. Extreme conditions led to many injuries and at least 10 deaths. Some of these were from the 8000 road traffic accidents which occurred over just the first three days. Together with drifting snow, broken-down and abandoned vehicles caused chaos, blocking many of the UK’s roads. Motorists were stranded overnight near Glasgow and Exeter. Glasgow airport was closed and hundreds of flights across the UK were delayed or cancelled. Snow cut off some remote communities, for example in Cumbria and East Lothian, for several days. Some had

essential supplies dropped by helicopter or were eventually reached as snow ploughs managed to clear roads. Most returned to normal within a week – although temperatures stayed very low and snow was slow to melt. However, this was not true for many livestock farmers. For them, the ‘Beast from the East’ brought added problems:

- Sheep farming in highland areas was badly affected – the lambing season was underway. Drifting snow buried ewes and their newborn lambs (Figure 3). Many were suffocated or died from hypothermia.
- With the ground covered in snow, food was scarce. The snow made it almost impossible for farmers to reach animals with food supplies, even on quad bikes or 4x4s.
- Extra feed was needed which was in short supply, expensive to buy and difficult to deliver to farms with roads blocked first by snow and, when it melted, by abandoned vehicles.

- Even where livestock like cows, pigs and poultry were kept under shelter, water supplies failed as pipes froze or burst.
- Cows still had to be milked, but some milk had to be poured away as tankers couldn’t get to farms to collect it.

Hospitals too were badly affected, with staff (and patients) unable to reach them. Some areas provided temporary shelters for the homeless and rough sleepers. Thousands of children had to stay at home as schools were closed. Electricity supplies were cut off as power lines were damaged. The severe weather prevented power companies from making prompt repairs, so some customers were without power for several days.

The ‘Beast from the East’ was the most severe winter weather event in the UK since 2010, although it lasted for a much shorter time. It still resulted in considerable disruption both in the UK and across much of Europe. With temperatures at or



**Figure 3** A sheep and its young lamb suffer in the ‘Beast from the East’  
Source: Shutterstock / Bildagentur Zoonar GmbH



below freezing and widespread snowfall, many countries experienced record low temperatures. In Italy, Rome had its first snow since 2012, whilst Naples had its heaviest snowfall in over 20 years.

## Summer 2018

A second severe weather event hit the UK during the summer months (June, July and August). June and July were the hottest and driest months recorded since records began. Overall, the summer was also the equal warmest, the driest since 2003 and the fourth sunniest ever.

Some locations recorded temperatures over 25°C every day throughout the summer: 30°C was reached on fifteen separate days in July and August. The highest temperature recorded was 35.6°C in Suffolk at the end of July. However, compared to other record-breaking summers, there were no long periods of very high temperatures. The UK was also exceptionally dry during the summer of 2018. Parts of the southeast had almost no recordable rainfall for more than six weeks. Wallingford tied with the 1962 all-time record for no rainfall of 48 consecutive days.

### Impacts

This hot, dry weather had a major impact on the environment in both the short and long term. The first, and most obvious, was on water supplies. Water in rivers, reservoirs and



**Figure 4** The effects of increasingly hot, dry summers – as shown here along part of the River Thames in 2018 – have a major impact both on the environment and on water supplies.

Source: Shutterstock / Alena Veasey

underground aquifers was not being replenished as there was little or no rain (Figure 4). This led to water shortages, hosepipe bans and the threat of water rationing. With no rain and limited water for irrigation, soil became parched and dry, leading to poor crop yields, crop failure, lack of grazing and food for livestock. These are problems which likely to become more common as our climate changes.

The hot dry conditions also resulted in a record-breaking year for wildfires, with almost 80 across the UK. Two of the largest were on Saddleworth Moor (Figure 5) and Winter Hill in northwest England. Fire broke out on Saddleworth Moor on 24 June. It was thought to have been started by a group who lit a bonfire near Stalybridge. Fire services believed they had put it out

later that day. However, this proved not to be the case:

- The peat which forms the moorland was so dry that it was still burning unseen underground. It quickly reignited the surface and by the next day was burning out of control over an area of 800 hectares.
- Strong winds, frequently changing direction, helped the fire spread towards nearby settlements. The emergency services declared it as a major incident.
- Nearby houses were evacuated and schools closed. Smoke drifted as far away as Manchester and Liverpool, affecting air quality.
- Fire and rescue services from Manchester were joined by firefighters from surrounding areas and by over 100 soldiers. Helicopters moved them and their





**Figure 5** The fire on Saddleworth Moor, June 2018  
Source: Alamy / Barbara Cook

equipment and dropped large quantities of water onto the fires from the air.

- The fires were eventually put out by 18 July, helped by the arrival of some rain. Over 18 km<sup>2</sup> was damaged.

Wildfires occur quite often in such areas but this one is thought to have been the largest wildfire in the UK. It could take ten years or more for the area – especially its wildlife – to recover.

**Causes**

As with the ‘Beast from the East’, the strength and position of the polar jet stream was the main cause of the summer heatwave. In this case it became weaker and stayed north of the UK. This allowed an area of high pressure to develop over Europe and the UK. Surface temperatures in the North Atlantic and around the UK’s coast were also higher than usual. This affected the jet stream in similar ways to the summer of 1976 which was the hottest summer recorded.

**Extreme weather in the UK**

The ‘Beast from the East’ and hot dry summer 2018 certainly broke records (Figure 6). However, looking at data for one year in isolation (Figure 7) can give a false impression. To show patterns or trends we need to take the longer view (see Figure 1). Climate is based on the average weather over a 30-year period. A small number of severe weather events over that period have a limited impact on climate statistics.

The UK’s 10 warmest years have all occurred since 2002 (see Figure 6), all of them warmer than any in the 20th century. Looking at data over time clearly shows that in the UK (and globally), temperatures are rising. In the UK our hottest days

	J	F	M	A	M	J	J	A	S	O	N	D
°C	4.1	2.4	3.8	8.4	12.1	14.8	17.3	15.3	12.4	9.6	7.3	5.8
mm	133.3	64.3	104.4	86.3	48.5	35.4	55.3	84.9	104.5	104.4	122.6	119.5

**Figure 7** Climate data for the UK, 2018  
Source: Met Office

- 7th warmest year recorded\* – temperatures in February and March were the only months with lower than average figures.
- The UK’s 10 warmest years have all occurred since 2002 – these were all warmer than any year in the 20th century.
- 2nd sunniest year\*\* (highest = 2003). May was the sunniest month ever.
- The ‘Beast from the East’ was the worst spell of cold weather since 2010. The lowest temperature was –14.2°C (Faversham, Kent).
- On 4.3 days the maximum temperatures were below freezing.
- In London in April temperatures reached 29.1°C – the highest since 1949. May bank holiday was the warmest ever recorded.\*\*\* However, over the year there were no extended periods of very high temperatures.
- June was the 3rd driest in England, while March was the 7th wettest.

Notes:

- \* records started in 1910
- \*\* records started in 1929
- \*\*\* since it began in 1978

**Figure 6** Notable weather and climate events, 2018  
Source: Met Office

were nearly 1°C warmer 1981–2010 than 1961–90, and (despite the ‘Beast from the East’ in 2018) our coldest days are 1.7° C warmer.

## Activities

- 1** Study Figure 1. Describe the pattern of both temperature and precipitation. Refer to specific data/months/seasons in your answer.
- 2 a** ‘The UK has a temperate, maritime climate.’ What does this mean?
- b** Use Figure 2 to explain why weather in the UK is often quite changeable.
- c** What is a jet stream? How might it help cause extreme weather?
- 3 a** Using the headings ‘Social’, ‘Environmental’ and ‘Economic’, describe the effects of the ‘Beast from the East’ and the summer heatwave of 2018. Describe:
  - i** the short-term, immediate effects
  - ii** the longer-term effects.
- b** What effects did these two severe weather events have on where you live? Use Met Office and local news websites to help you answer this question.
- 4 a** Using the data in Figure 7, draw a climate graph for 2018. Label the axes of your graph as in Figure 1, so that you can compare the two graphs.
- b** Calculate:
  - i** the mean (average) monthly temperature (add together the totals for each month and divide by 2)
  - ii** the total precipitation (add the totals for each month).
- 5 a** Compare the UK climate graph (Figure 1) with your graph for 2018 (Activity 4). Describe any similarities and differences.
- b** Give reasons for any differences.
- c** What are the disadvantages of using data from just one year to show climate?
- 6** Construct a table summarising the causes and effects of the ‘Beast from the East’ and the hot dry summer in 2018. Think about the number of columns, e.g. for location and data. Your finished table could be used as a revision guide

## Learning checkpoint

- Extreme weather is when weather is significantly different from the mean (average) or usual weather pattern for the time of year.
- The UK’s weather and climate is closely linked to its location (latitude) and different air masses.
- Jet streams are flows of air found 10–15 km (6–9 miles) above the Earth’s surface. They influence the movement of weather systems and air masses around the globe.
- Weather is the state of the atmosphere at any one time and changes frequently, especially in temperate maritime areas.
- The average weather recorded over a 30-year period is used to show the characteristic climate of a place.

### Glossary task

Write glossary definitions for these terms:

air mass	jet stream
‘Beast from the East’	temperate
extreme weather	

### Remember this case study

To help you remember this case study, make notes under the following headings:

**Main features of the UK’s climate**

**Air masses affecting the UK (location and type of weather)**

**How jet streams work**

**Causes and effects of the ‘Beast from the East’ and the hot dry summer of 2018**

**How to construct, compare and analyse climate graphs for different time periods**

Try to make your notes fit a single sheet of A4.