BRITAIN'S WEATHER IN 2019
MORE OF THE SAME, AGAIN

Paul Homewood

The Global Warming Policy Foundation
Briefing 46

Britain's Weather in 2019: More of the same, again

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Briefing 46, The Global Warming Policy Foundation

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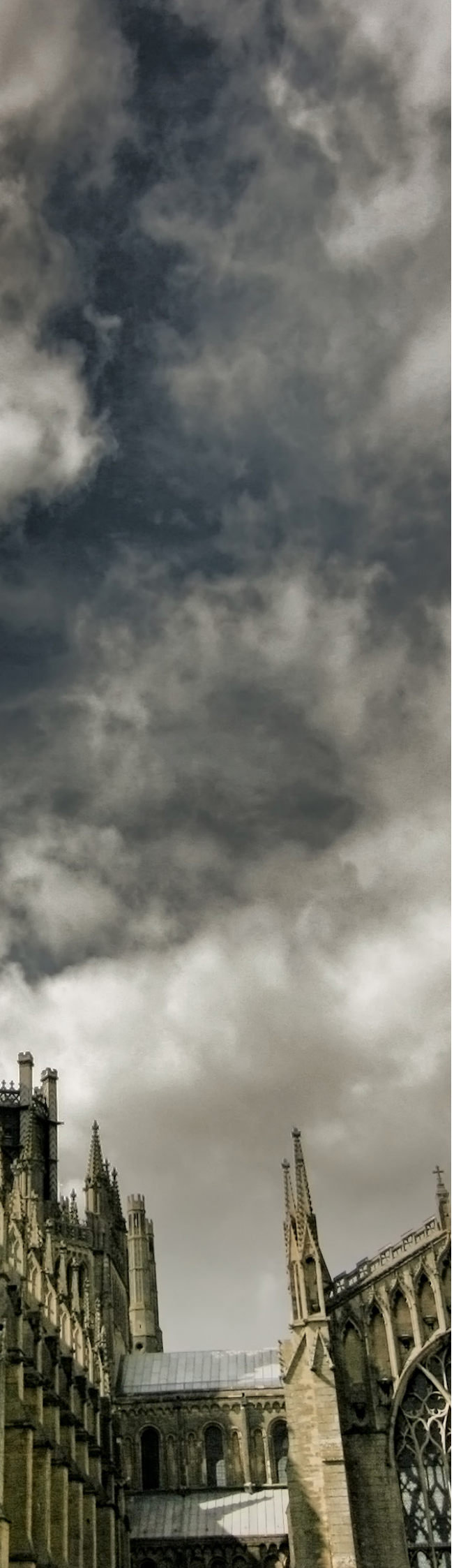
Executive summary

Last year, Parliament declared a climate emergency, whilst the government legally adopted a target of net zero greenhouse gas emissions by 2050. Meanwhile, it is now seemingly commonplace for every bad weather event to be linked to global warming. The Committee on Climate Change, for instance, has claimed that extreme weather events are increasing, the head of the Environment Agency stated that global warming is driving hotter, drier summers, and the Government claims that climate change is making flooding worse.

But where is the actual evidence for any of this? Using official data from the UK Met Office and other sources, this paper examines UK climatic trends and assesses the truth of these claims as far as the UK is concerned. It finds that:

- There was a step up in temperatures between the 1980s and early 2000s, since when temperatures have stabilised. This increase is closely associated with a rise in sea-surface temperatures around the same time, itself connected to the Atlantic Multidecadal Oscillation, a natural cycle, which is currently in its warm phase.
- Seasonal temperatures follow a similar pattern.
- In particular, summer temperatures have still not exceeded those of 1976.
- Based on the Central England Temperature (CET) record of daily temperatures, the heatwaves of 1975 and 1976 were much more intense than anything since. For instance, in 1975 and 1976, there were four and nine days respectively with temperatures over 30°C. Although a record daily high was set in 2019, this was only one of two days over 30°C last year.
- Whilst heatwaves are not becoming more intense, extremely cold days have become much less common. In short, UK temperatures have become less extreme, contrary to common belief, and contrary to the official statements from the Committee on Climate Change and the Environment Agency.
- Although there has been a clearly increasing trend in UK precipitation since the 1970s, this is largely due to increasing totals in Scotland. In the rest of the UK, there appears to be little in the way of long-term change.



- The long-running England & Wales Precipitation series (EWP), which begins in 1766, offers a longer perspective, and shows that the higher levels of rainfall experienced in the last two decades are not unprecedented.
- Seasonal analysis of the EWP shows little by way of trends in winter or summer rainfall since 1900, nor for that matter in spring or autumn. This runs counter to regular claims of 'wetter winters' and 'drier summers'.
- Analysis of the EWP also provides no evidence that rainfall is becoming more extreme, whether on a decadal, monthly or daily basis. There is, however, evidence that extremely dry years have become less common.
- Sea levels have been rising at around 1.4 mm per year, after correcting for vertical land movement. Recent rates of sea-level rise are similar to those in the first half of the 20th century. There is no evidence that sea-level rise has been accelerating.
- There is little long-term data for storms, but limited data from the UK Met Office indicates that storms have not become more frequent or stronger in the last five decades.

In short, although it is slightly warmer than it used to be, the UK climate has actually changed very little. Long-term trends are dwarfed by the natural variability of weather on annual, monthly and daily bases. In particular, there is no evidence that weather has become more extreme. Heatwaves have not become more severe, and nor have droughts. Rainfall data offers no evidence that floods have become worse either.

In summary, this paper finds no evidence of a climate emergency in the UK.

About the author

Paul Homewood had a career as an accountant in industry. He has been writing on climate and energy issues since 2011 and has written several papers for GWPF. This is his third annual review of the UK climate.

1. Introduction

Last year the UK Parliament declared a climate emergency, whilst the government legally adopted a target of zero greenhouse gas emissions by 2050. Meanwhile, it is now seemingly commonplace for every bad weather event to be linked to global warming. The Committee on Climate Change, for instance, has claimed that extreme weather events are increasing, the head of the Environment Agency stated that we are seeing hotter, drier summers, and the government claims that climate change is making flooding worse.

But where is the actual evidence for any of this? Using official data from the UK Met Office and other sources, this paper examines UK climatic trends and assesses the truth of these claims as far as the UK is concerned. It analyses in detail:

- temperature trends
- temperature extremes
- precipitation trends
- precipitation extremes
- flooding in autumn 2019
- sea-level rise
- storms.

2. Temperature trends

According to UK Met Office data, 2019 was the 11th warmest year since 1910 in the UK. Whilst this maintains the run of warmer-than-average years since 2002, it is becoming increasingly clear that UK temperatures have now largely stabilised following the sudden sharp rise in the 1980s and 90s. This can be clearly seen in Figure 1, which shows how the 10-year averages have been steadily declining since peaking in 2008.

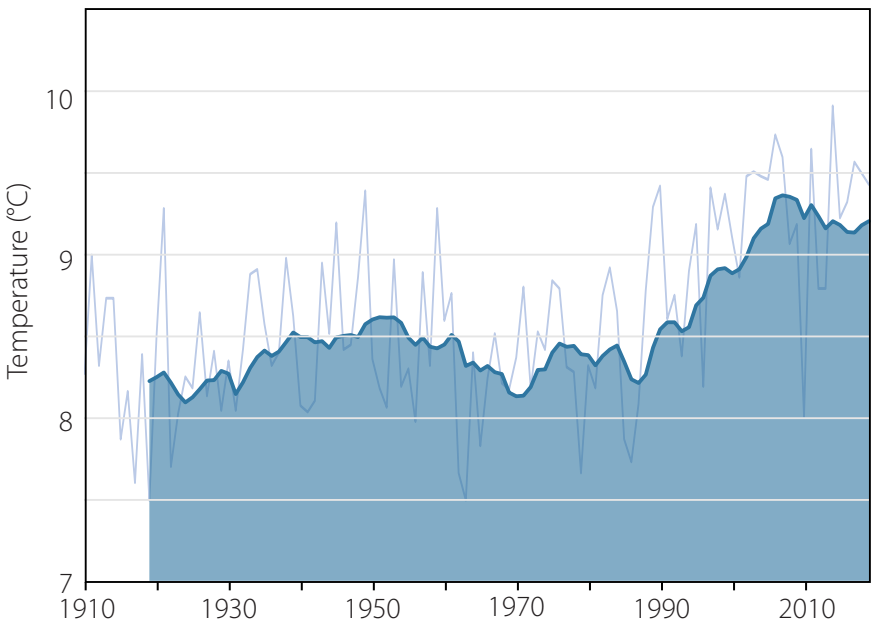


Figure 1: UK temperatures: annual means and running 10-year averages, 1910–2019.

Source: Met Office.[1]

Indeed, as the Met Office has admitted, the decade just ended was cooler than the previous one (Table 1).

Table 1: UK decadal temperature averages.

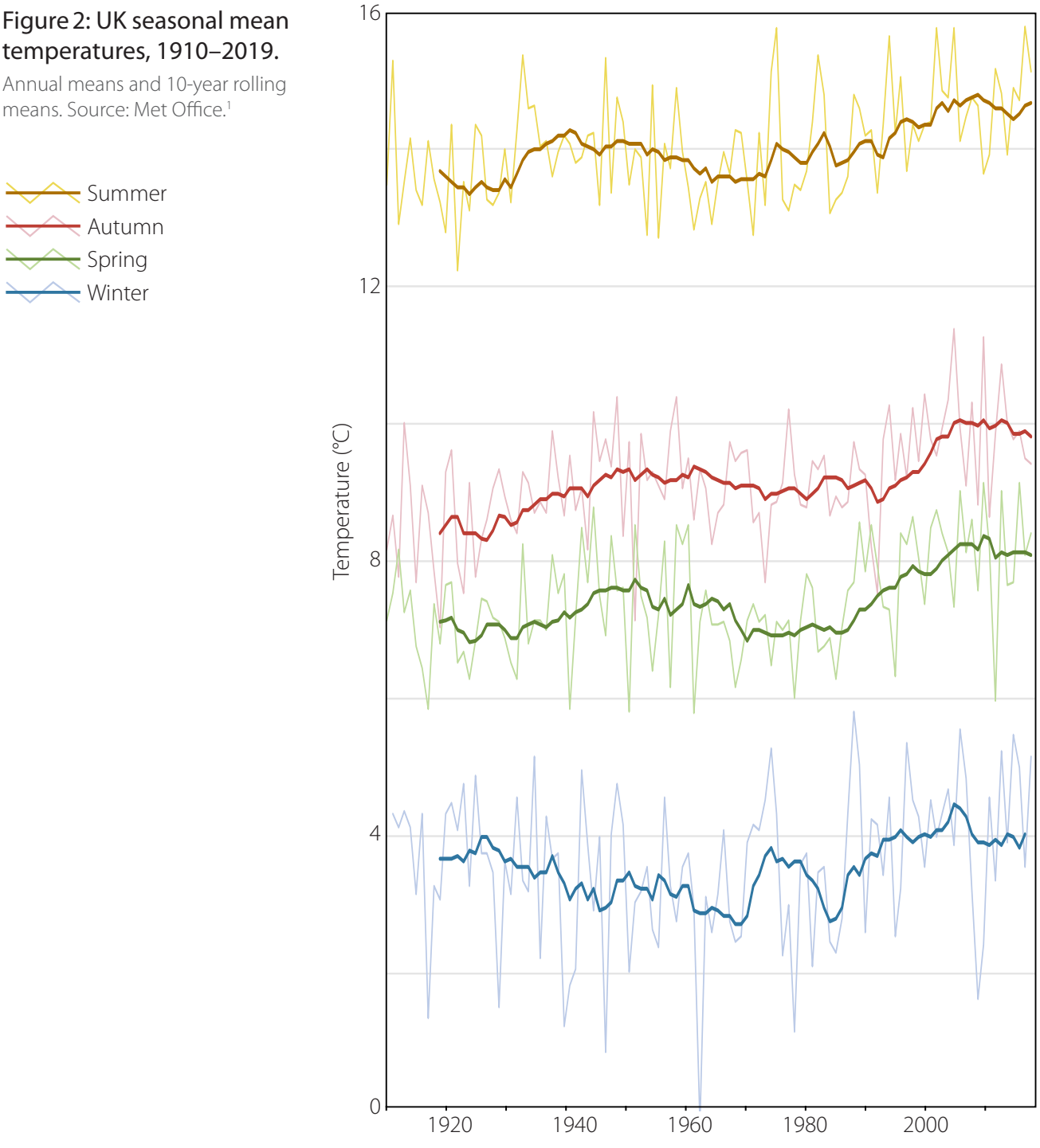
Source: Met Office.[1]

	Temperature average (°C)
2000–2009	9.34
2010–2019	9.21

Seasonal temperature trends follow a similar pattern to the annual ones, with a steady rise during the 1980s and 90s, but little change since (Figure 2). In particular, current winter temperatures appear to be barely higher than in the 1920s.

Figure 2: UK seasonal mean temperatures, 1910–2019.

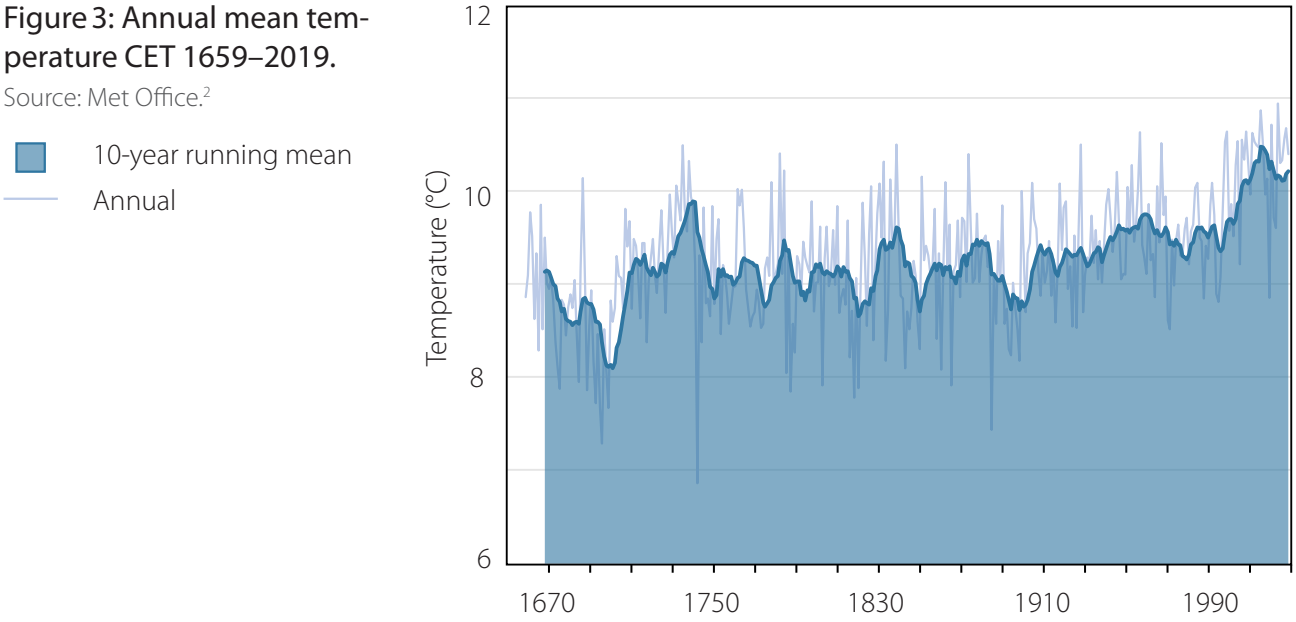
Annual means and 10-year rolling means. Source: Met Office.[1]



The long-running Central England Temperature (CET) series shows the same pattern although, in contrast to the UK series, 2019 only ranks as the 24th warmest year (Figure 3). Notably there were many warmer years prior to 2000, for example 1733, 1779, 1834, 1868, 1921, 1949 and 1959. It appears that the UK climate has changed much less than is commonly believed in the last three centuries. It is also worth noting though that sharp rises, similar to the 1980s and 1990s, have occurred in the past, notably between the 1690s and 1730s.

Figure 3: Annual mean temperature CET 1659–2019.

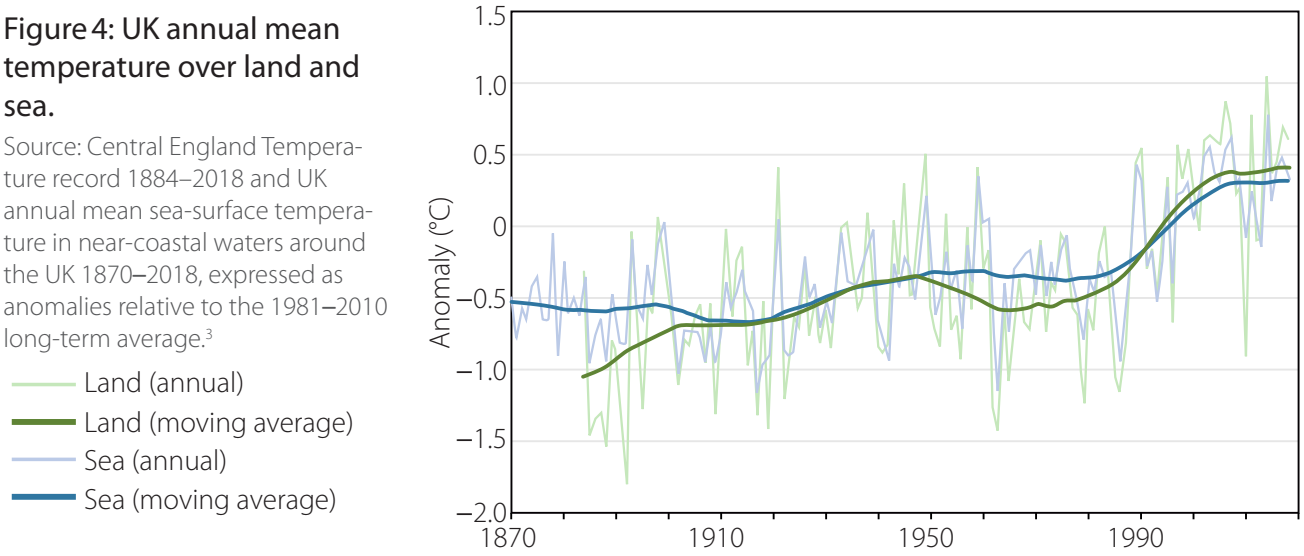
Source: Met Office.[2]



Whilst temperature trends over the last two decades may not be significant in themselves, they do not support the theory that temperatures will rise sharply in decades to come. Figure 4 plots temperature anomalies for both land and near-coastal waters, with sea-surface temperatures (SSTs) showing a very similar rise. The Met Office note that there is a high correlation between land and sea temperatures.

Figure 4: UK annual mean temperature over land and sea.

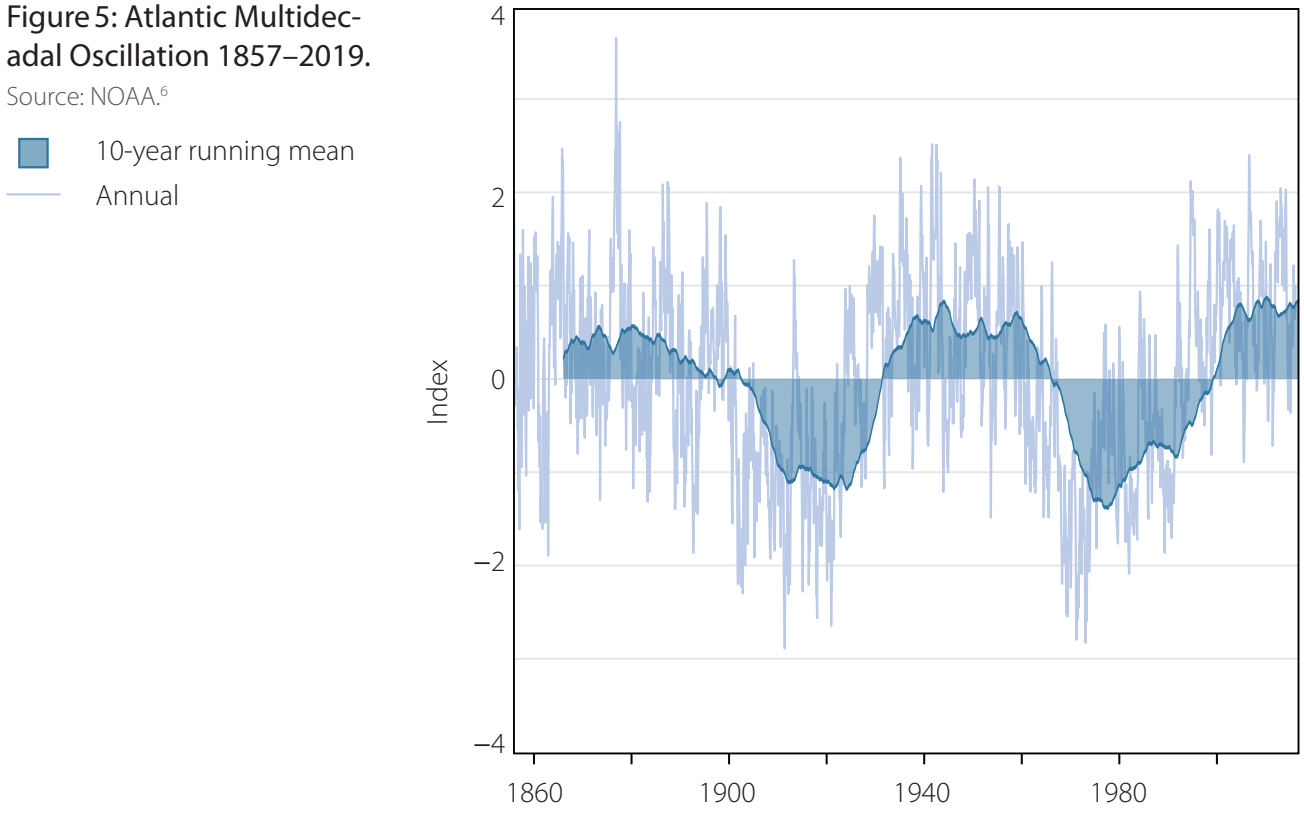
Source: Central England Temperature record 1884–2018 and UK annual mean sea-surface temperature in near-coastal waters around the UK 1870–2018, expressed as anomalies relative to the 1981–2010 long-term average.[3]



It is widely accepted that ocean temperatures regulate land temperatures, rather than the other way round.[4] The rise in both land and sea temperatures, however, broadly follow the switch of the Atlantic Multidecadal Oscillation (AMO) from cold to warm phase, which took place between 1976 and 1998 (Figure 5). Since then, the AMO has remained in its warm phase, which historically can last for between 20 and 40 years.[5] The AMO is a natural cycle, so it is likely that Atlantic Ocean cooling will take place at some stage in the next decade, with a resultant impact on UK temperatures.

The apparent correlation of UK land temperature trends with SSTs shown in Figure 4, and with the AMO, might suggest that temperatures in the UK will remain stable, or even fall slightly, in the next three decades.

Figure 5: Atlantic Multidecadal Oscillation 1857–2019.
Source: NOAA.[6]



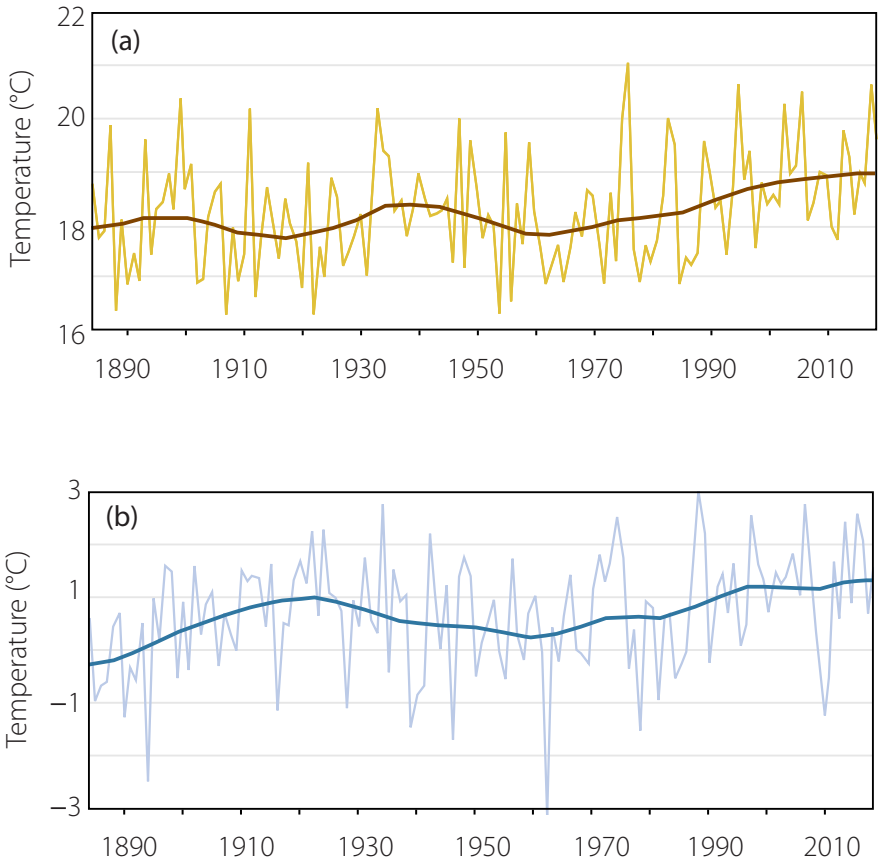
3. Temperature extremes

Measured by daily maximum temperatures, 1976 remains the hottest summer on record in the UK since 1884, when records began, with 1995 the second hottest (Figure 6a). The data does not support the proposition that UK summers are becoming progressively and significantly hotter – the Mediterranean summers we have been promised for many years.[7]

By contrast, extremely cold winters are now a rare event in the UK (Figure 6b). It is worth noting, however, that even in the mildest winters of recent years, seasonal temperatures have not been unprecedented, indicating that this has been a weather phenomenon, and not a climatic one.

Figure 6: UK summer and winter temperature trends 1884–2019.

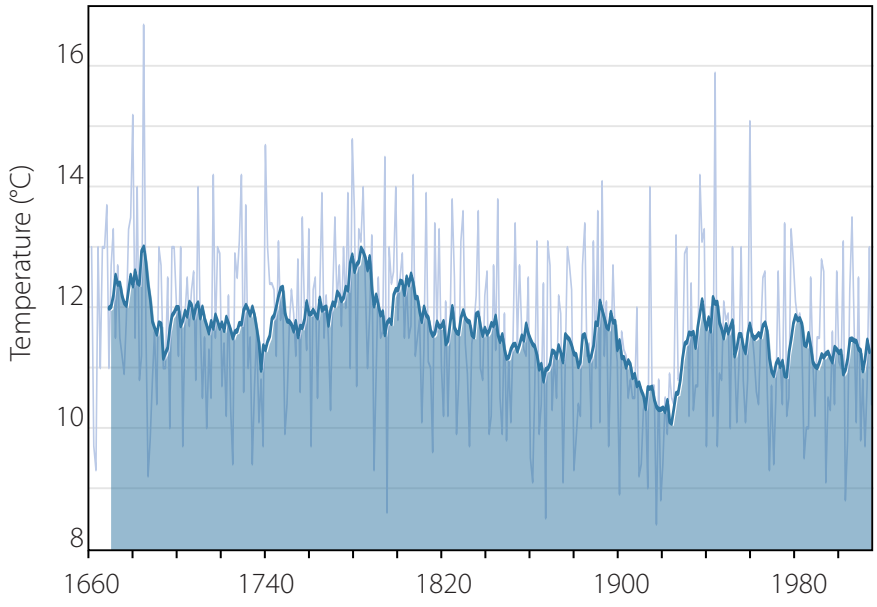
(a) mean maximum summer temperature, (b) mean minimum winter temperature. Bold lines are 10-year running means. Source: Met Office.[1]



The concept of an 'extreme temperature' is, of course, a relative one. London has a warmer climate than Newcastle, but does that mean that London's summer temperatures are more extreme, or Newcastle's winter ones? Obviously not. The true measure of 'extreme temperatures' is the difference between the highest and lowest each year. This measure has been at historically low levels in recent decades, similar to the 1910s (Figure 7). Much of the CET record prior to 1900 exhibits much greater extremes between the two seasons, indicating intensely cold winters, hot summers, or both, in relation to the normal climate at the time.

Figure 7: Difference between average CET summer and winter temperatures, 1660–2019.

Source: Met Office.[2]



Analysis of daily extreme temperatures also shows that hot summer days are not becoming more frequent or warmer, notwithstanding one notably hot day in July 2019, which is the hottest on record in the CET (Figure 8a). Nevertheless, no summer since has matched the intensity of the heatwaves in 1975 and 1976, when there were four and nine days over 30°C respectively. Last summer there were just two.

As with the seasonal averages, exceptionally cold days are virtually a thing of the past (Figure 8b). With the exception of December 2010, there have been no days below –10°C since 1982.

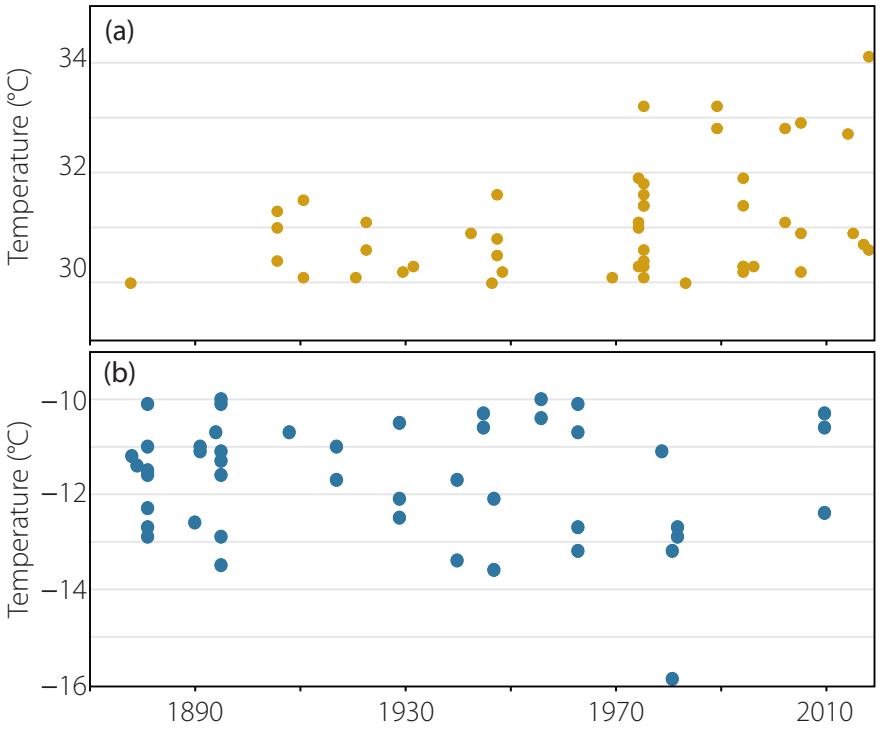


Figure 8: Weather extremes in the Central England Temperature series, 1878–2019.

Distribution of days, (a) over 30°C and (b) below –10°C, in the CET series. Source: Met Office.[2]

4. Precipitation trends

UK precipitation was slightly above average in 2019, and there is an increasing trend since the 1970s (Figure 9).

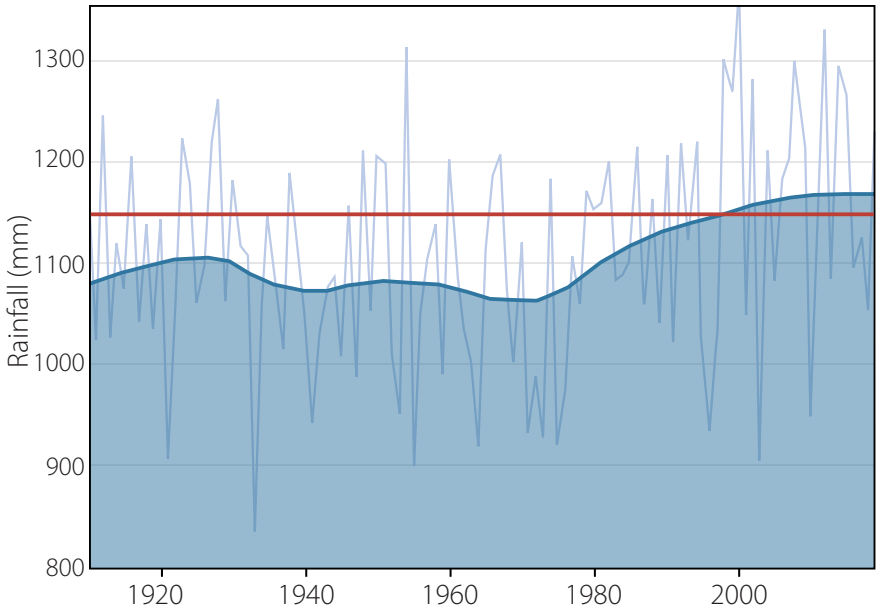


Figure 9: UK annual precipitation, 1862–2019.

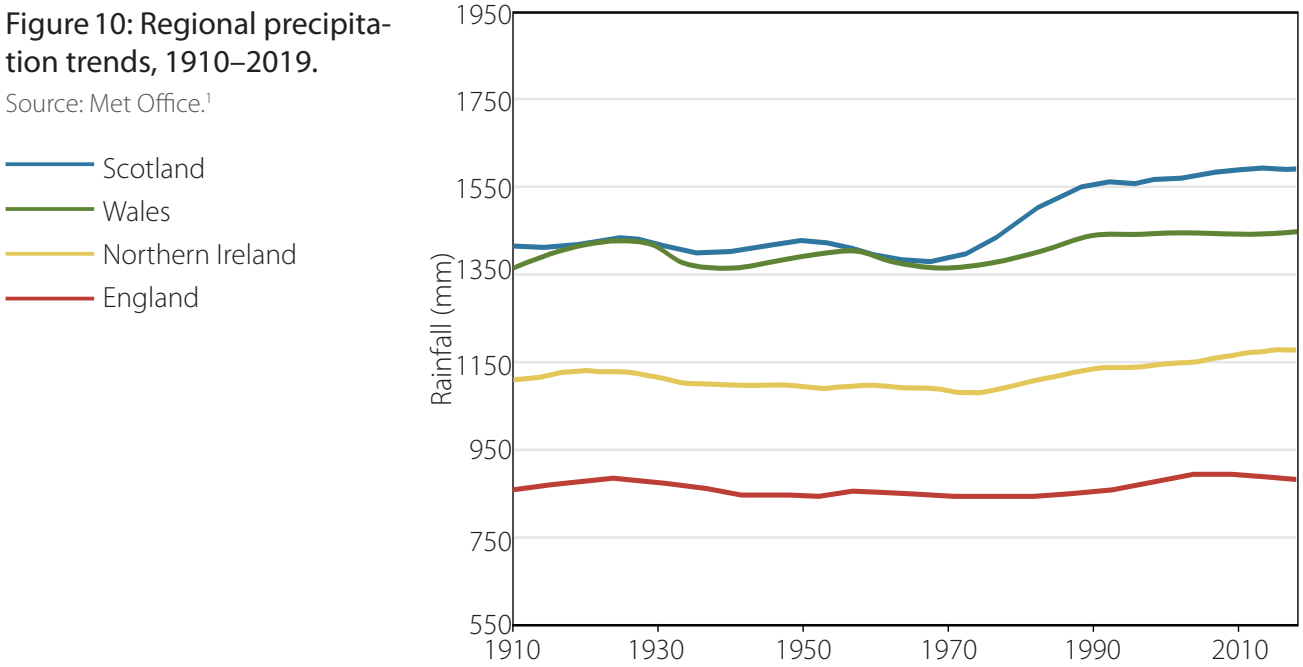
Source: Met Office.[1]

10-year running mean
Annual
1981–2010 mean

However, this increase is mostly confined to Scotland and, to a lesser extent, Northern Ireland. There is little or no long-term increase in either England or Wales (Figure 10). It is noticeable that the two recent very wet years – 2000 and 2012 – were not unprecedented, either in the UK as a whole or in individual nations.

Figure 10: Regional precipitation trends, 1910–2019.

Source: Met Office.[1]



The England & Wales Precipitation Series offers the longest perspective (Figure 11). Again, rainfall in recent years has not been unprecedented, with the two wettest years being 1872 and 1768. The current 10-year average is also not unusually high, and rainfall has been much higher in the past, notably the 1870s and 80s. What is particularly noticeable, however, is the absence of severe drought years in recent decades.

Figure 11: England & Wales annual precipitation, 1766–2019.

Source: Met Office EWP.[8]

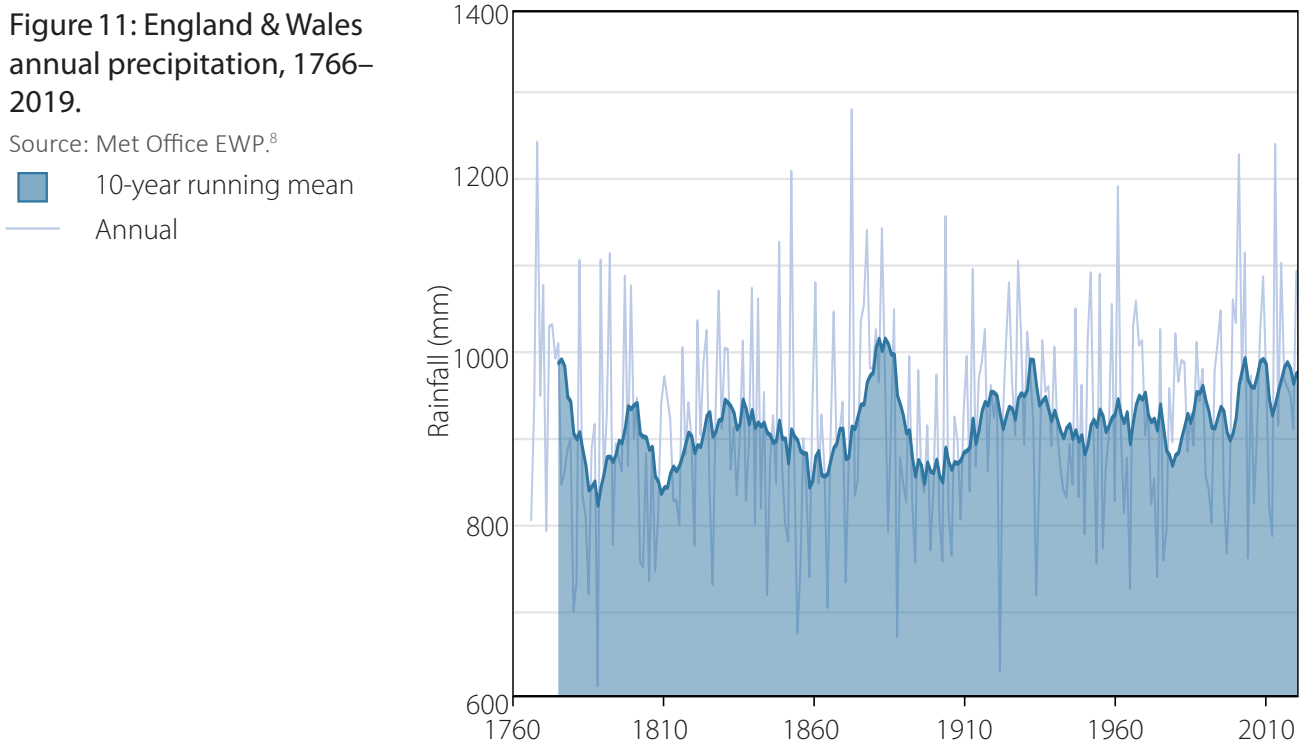


Figure 12 shows the seasonal trends in the England & Wales Precipitation Series.

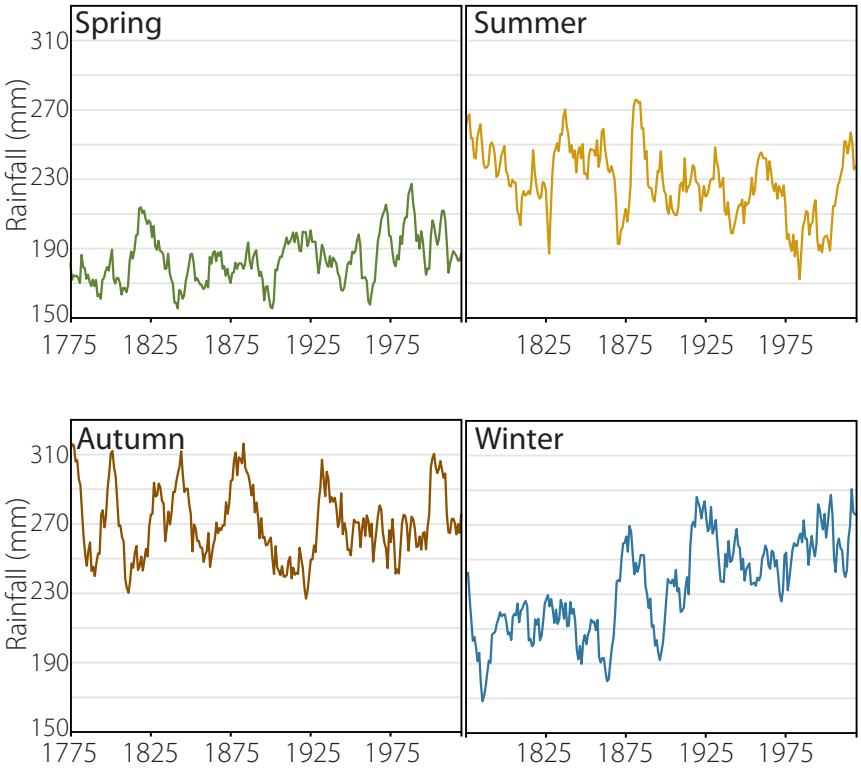


Figure 12: England & Wales precipitation, seasonal trends, 1775–2019.

10-year moving averages. Source: Met Office EWP.[8]

The following points can be highlighted:

- Long-term winter trends have changed little since the 1910s. Winter precipitation appears to have been consistently lower in the early record, till around 1860. However, recent research by Murphy et al. suggests that winter rainfall was systematically underestimated prior to 1870, because of under-catch of snowfall.[9] They find that 'When these factors are accounted for in our reconstructions, the observed trend to wetter winters in EWP is no longer evident.'
- Summer rainfall fell to unprecedentedly low levels during the 1970s, 80s and early 1990s, but has since returned to earlier levels. Again, Murphy et al. query the summer rainfall data prior to 1820, suggesting it may have been overestimated, raising doubts about claims of a trend to drier summers. The current 10-year average is close to the long-term mean.
- There appears to be little trend in either spring or autumn precipitation.

The overall conclusion is that there has been little long-term change in precipitation, either annually or seasonally, except in Scotland. The only significant change in recent decades has been the return to wetter summers, following the unusually dry period of the 1970s to 90s. In particular, there is no evidence to support Met Office claims of drier summers and wetter winters.[10]

5. Precipitation extremes

It is commonly claimed that rainfall is becoming more extreme, and that this is because of climate change. For instance, just a few months ago, Sir James Bevan, head of the Environment Agency, made this very claim in a speech entitled 'It's the climate emergency, stupid'.[11] However, as far as England and Wales are concerned, it is a claim that has no basis in fact. The England & Wales Precipitation Series shows that the wettest decade on record was the 1870s, followed by the 1990s, 1920s and 1910s (Figure 13). The data shows no evidence of a wetter climate. The current decade is averaging 966 mm.

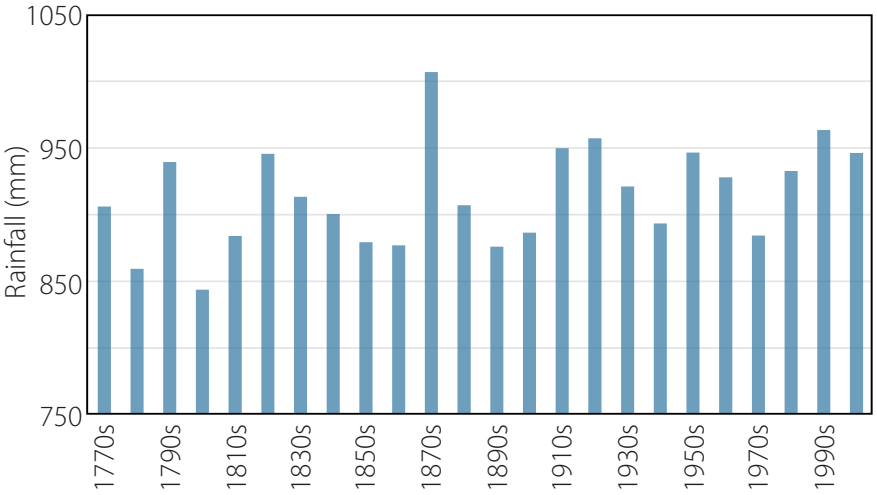


Figure 13: England & Wales decadal precipitation, 1770s–2000s.
Source: Met Office.[8]

In annual terms, the wettest years were 1872 and 1768 (Figure 14a). While wet years appear to come in clusters, recent years have not been unprecedented. There is strong evidence, however, that the driest years have become much less common in recent decades. The last top-20 year was 1973 (Figure 14b).

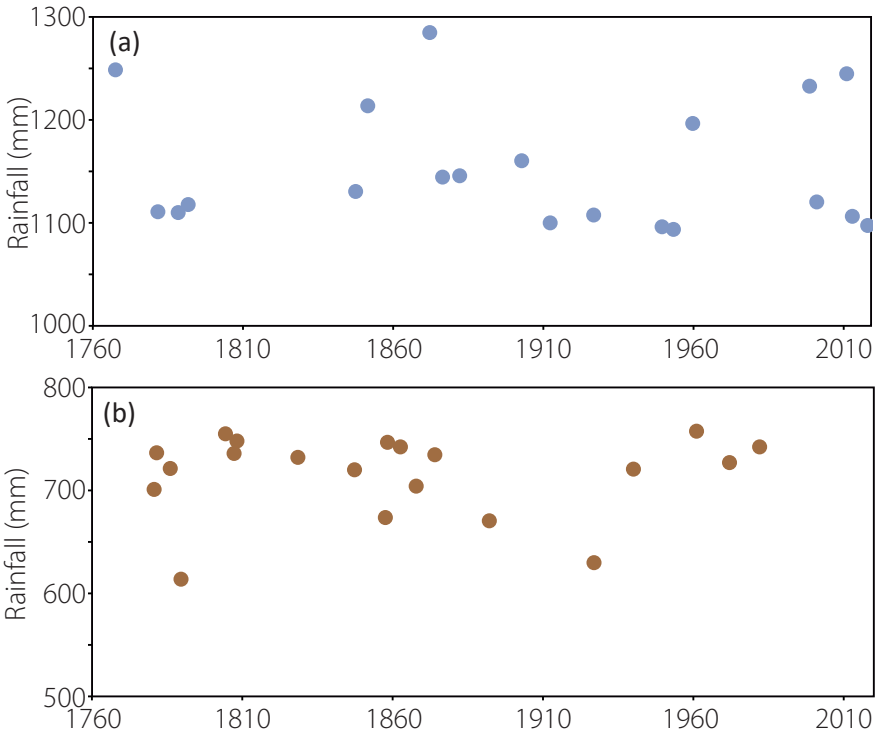
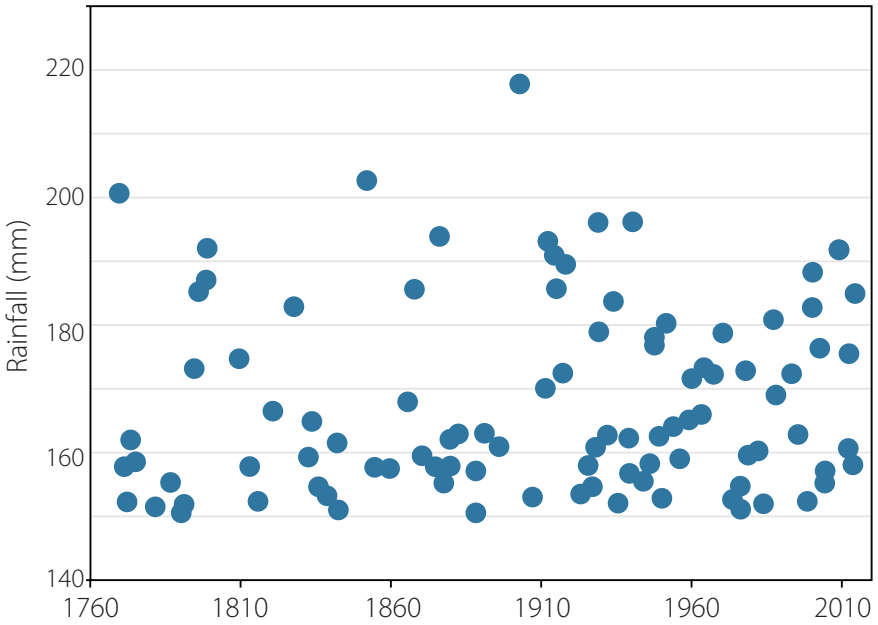


Figure 14: England & Wales Precipitation series, 1760–2019: extremes.
(a) wettest and (b) driest years, 1766–2019. Source: Met Office.[8]

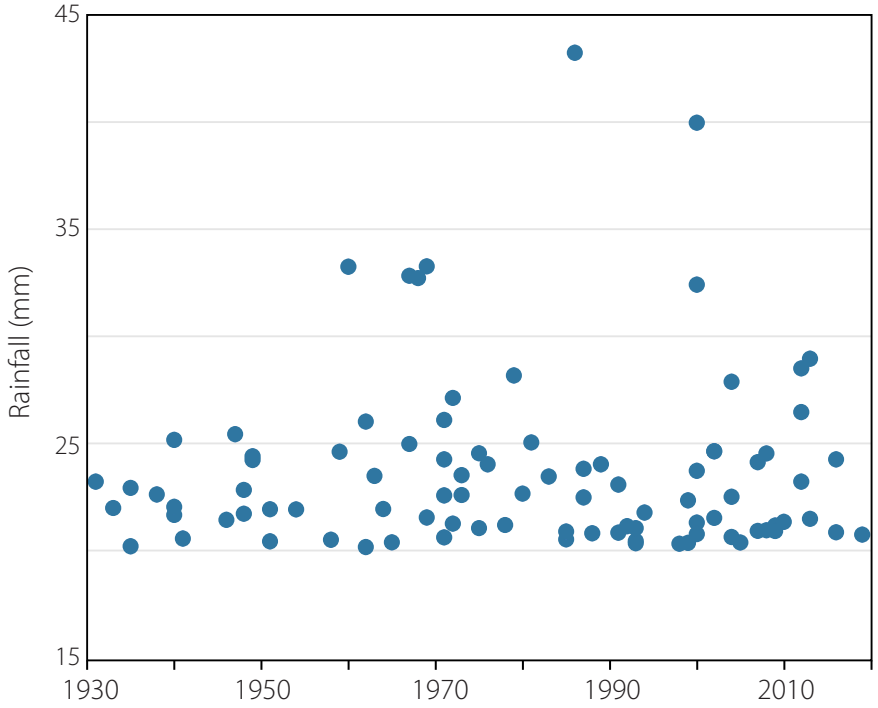
Figure 15 shows all months with more than 150 mm of rainfall. Altogether there have been 98 such events since 1766, 3% of the total, or about four per decade. In the last ten years there have been four such months, in line with the average. By far the wettest month was October 1903, when 218 mm fell. Although extremely wet months appear to have been less common prior to 1900, there is no evidence of any significant change in the distribution since that time. The last occurrence was in January 2014.

Figure 15: England & Wales Precipitation, 1766–2019: months >150 mm.
Source: Met Office.[8]



Daily data for the England & Wales Precipitation Series is only available back to 1931. Figure 16 shows that the wettest day for England and Wales as a whole was in August 1986. During the last decade or so, the incidence of heavy rain days does not appear to be significantly different to earlier periods.

Figure 16: England & Wales Precipitation, 1766–2019: days >20 mm.
Source: Met Office.[8]



Although, as just noted, the England & Wales Precipitation Daily Series only begins in 1931, there are a few individual stations with much longer records. As Figure 17 shows, there is no evidence of daily rainfall becoming more extreme at any of these sites, with the possible exception of Buxton. In all cases, the most extreme days have been in the distant past.

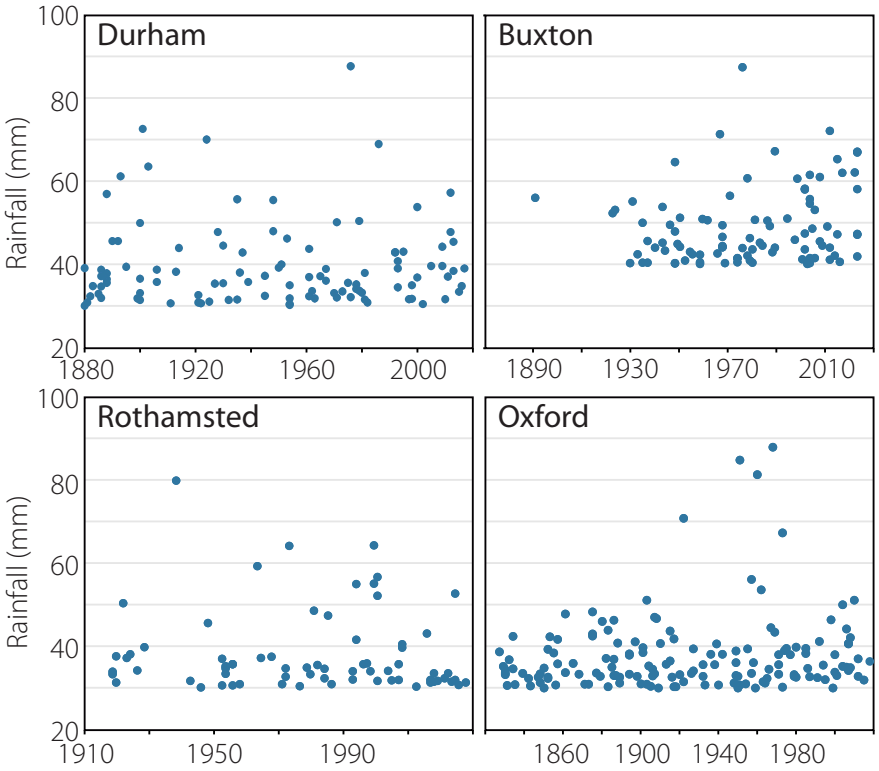


Figure 17: Distribution of wet days in selected UK locations.

Source: Met Office.[12]

And as Figure 18 illustrates, the frequency of heavy rainfall days in the last decade has not been unusually high.

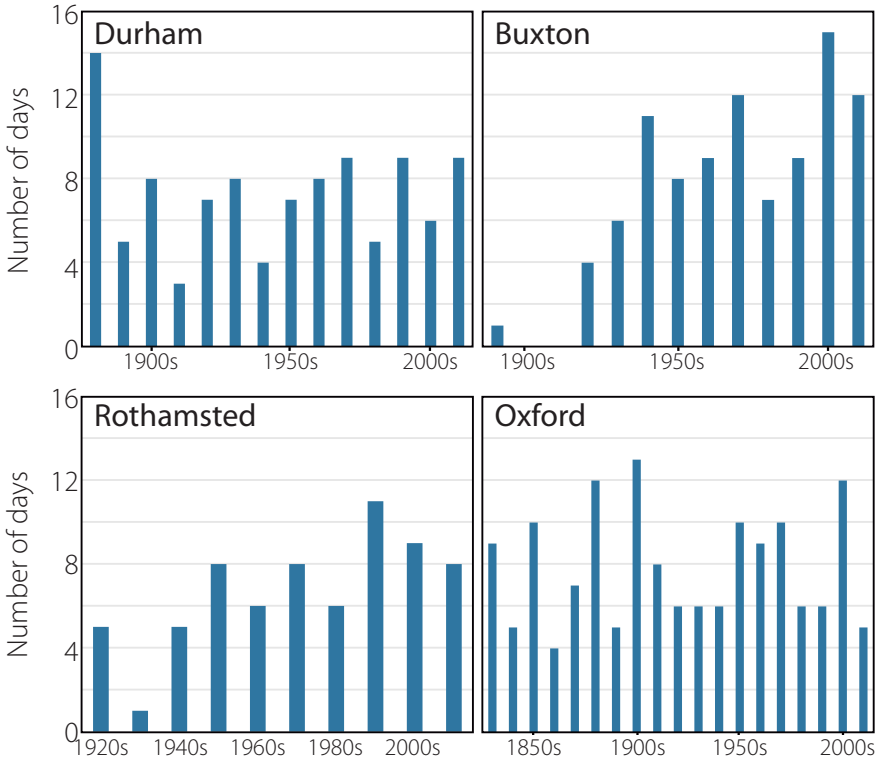


Figure 18: Frequency of heavy rainfall.

Source: Number of days per decade with over 30 mm of rain at selected sites. Source: Met Office.[12]

The England & Wales Precipitation Series is an average across those two countries, and may thus hide regional variations. However, the series also has a monthly regional breakdown, as shown in Figure 19.

Storm Desmond (highlighted in red) is clearly evident in the north-west in December 2015. Other than this though, there is no evidence that extreme rainfall is either becoming more intense, or more common, on a monthly basis in any region.

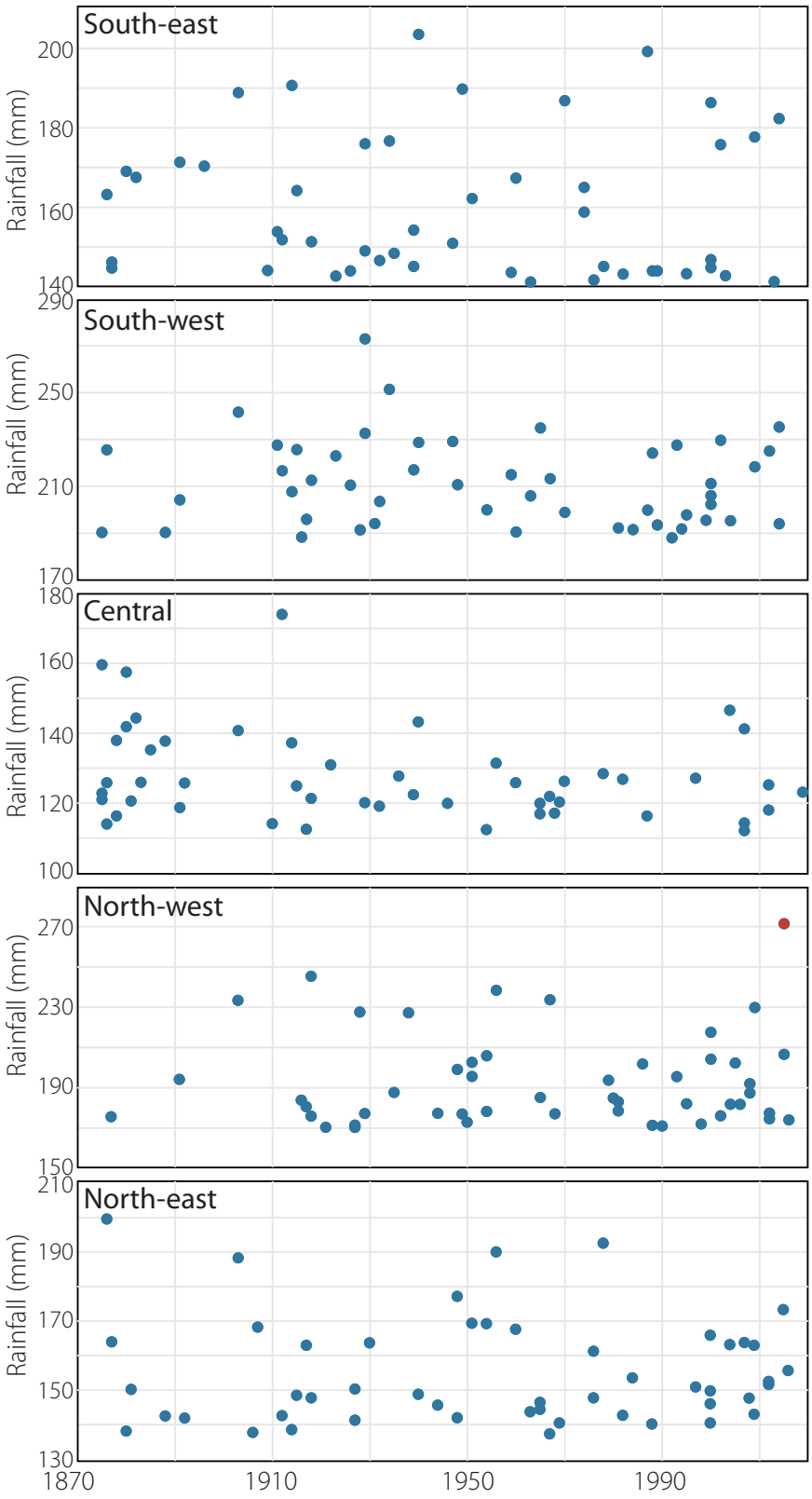


Figure 19: England and Wales regional monthly precipitation, 1873–2018.
Source: Met Office.[8]

6. Autumn floods – case study

The only really notable extreme weather event in 2019 was the flooding in South Yorkshire and Lincolnshire during November. But is there any evidence that the floods were made worse by climate change?

The trigger for the floods was exceptionally heavy rainfall on 7 November. Excluding upland sites, the heaviest rainfall that day was in Sheffield, which recorded 63.8 mm.[13] However, that total was much less than the Sheffield daily record rainfall of 119.2 mm, set in 1973.[14] November rainfall for Sheffield was much higher than average, at 200 mm, but monthly totals of this level are by no means unprecedented in the city (Figure 20).

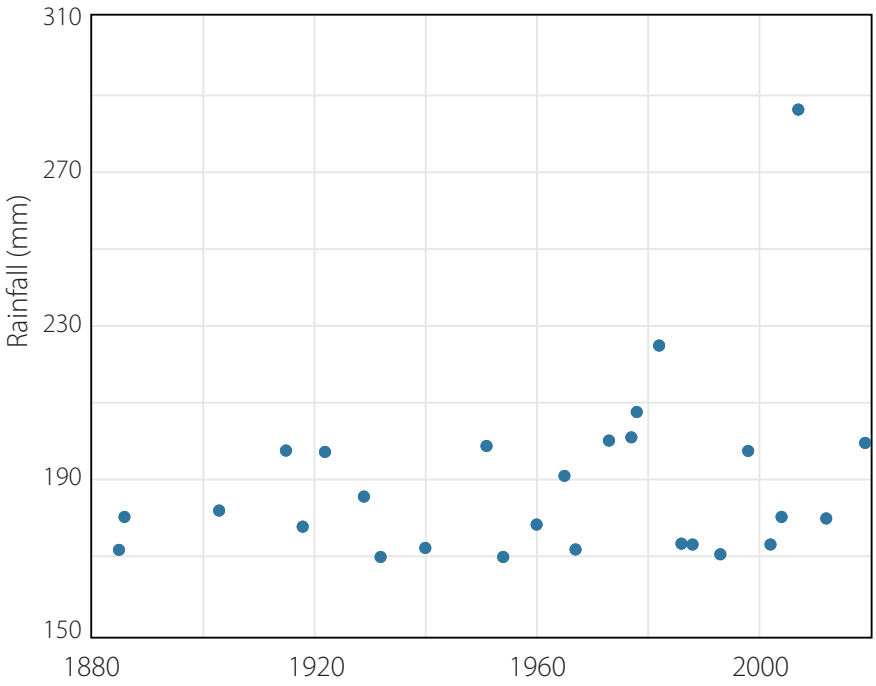


Figure 20: Monthly rain at Sheffield, 1883–2019.
Source: Met Office.[12]

In fact, the root cause of the flooding was not rainfall in November, but instead the fact that the ground was already saturated following above-average rainfall in September and October. As Figure 21 illustrates, autumn rainfall was more than 170% of average across a region consisting of South Yorkshire, Lincolnshire and Nottinghamshire. By contrast, most of the rest of the country had rainfall close to average.

The area affected lies within the Central Region, as defined in the Met Office's UK Regional Precipitation series. Autumn rainfall was 66% above average for the region but, as Figure 22 shows, it was certainly not unprecedented. Indeed the wettest autumn was in 1875.

It is clear from the data that the floods were merely the result of a combination of natural meteorological factors, which affected only that small part of the country.

The rainfall which resulted was not unprecedented, and neither is there any indication whatsoever that such events are becoming more common.

Figure 21: Autumn 2019 rainfall.

Source: Met Office.[15]

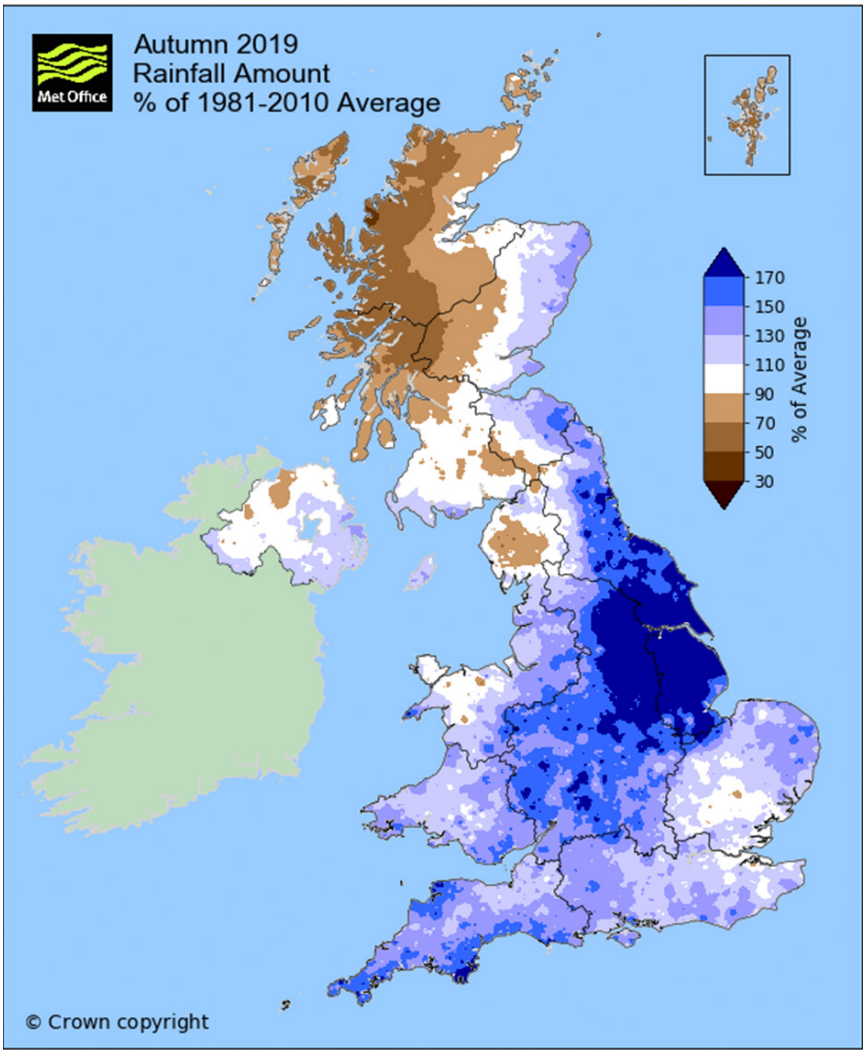
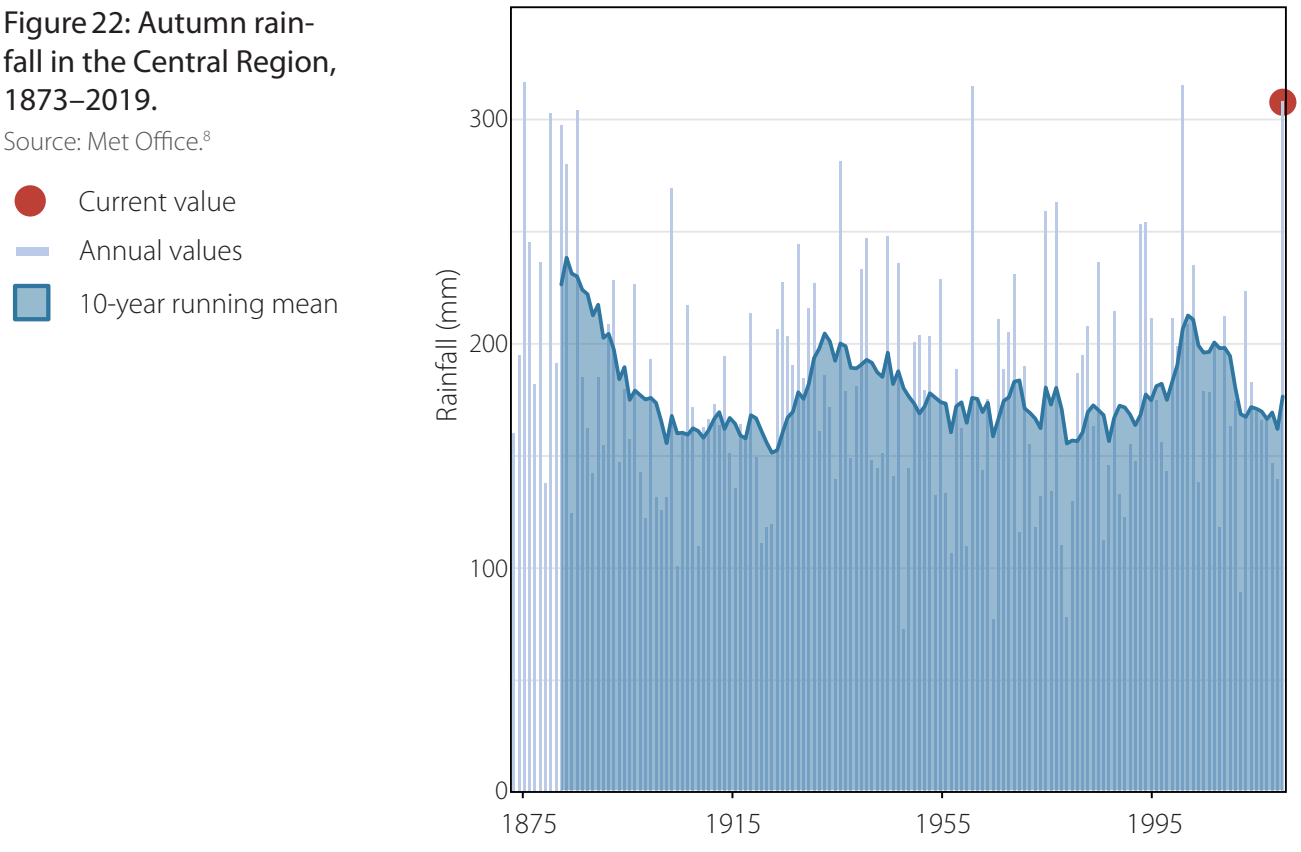


Figure 22: Autumn rainfall in the Central Region, 1873–2019.

Source: Met Office.[8]



7. Sea levels

Any analysis of sea level trends needs to first consider vertical land movement. Generally speaking, the land mass of Scotland and N Ireland is rising, while the rest of the UK is sinking, by as much as 1 mm/year in the extreme south-west (Figure 23).

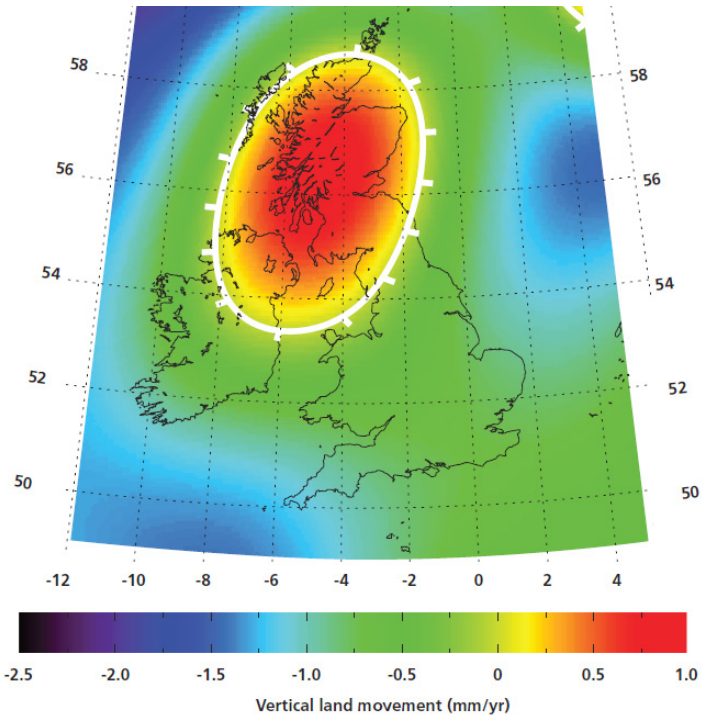


Figure 23: Map of vertical land movement.

Source: UK Climate Projections.[16]

An analysis by Woodworth et al. (2009) estimated a rise in sea levels since 1901 of 1.4 mm/year, after correcting for land movement.[17] This was based on five stations: Aberdeen, North Shields, Sheerness, Newlyn and Liverpool. However, there is a lot of missing data for Aberdeen, Liverpool and Sheerness. Charts provided by the US National Oceanic & Atmospheric Administration (NOAA) (Figure 24) give sea-level trends for North Shields and Newlyn, both of which have very long and largely complete tidal gauge records. Due to late updating of data by NOAA, both series finish in 2018. At neither of these stations is there any evidence of recent acceleration in the rate of rise. Sea-level rise at these stations also appears to be broadly consistent with the Woodworth study.

NOAA also provide graphs that illustrate the variation of sea-level trends, based on overlapping 50-year periods updated every five years (Figure 25). For instance, at Newlyn the linear sea-level trend was 2.16 mm/year between 1966 and 2015. At both Newlyn and North Shields, there is clear evidence of a cyclical pattern, with a rate of rise similar to the present, or higher, until the mid 20th century. There followed a slowdown in the rate of rise, which seems to have come to and end in the 1970s (Figure 26). Sea-level rise in recent years is higher than the 20th century average, but only because the latter includes the slowdown.

Figure 24: Sea level rise at selected UK locations.

Top: North Shields; bottom: Newlyn. Source: NOAA.[18]

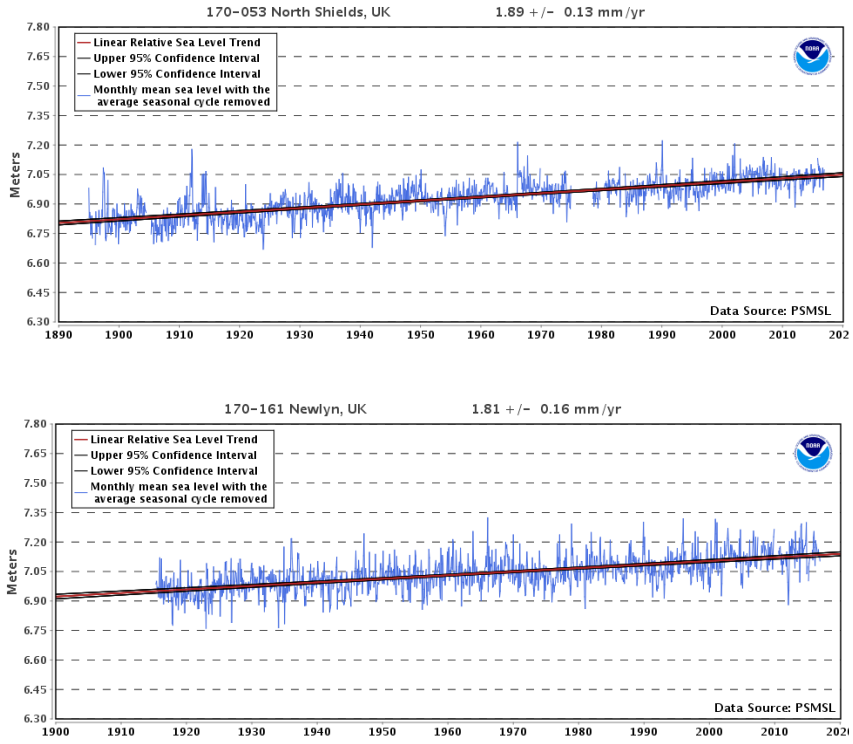
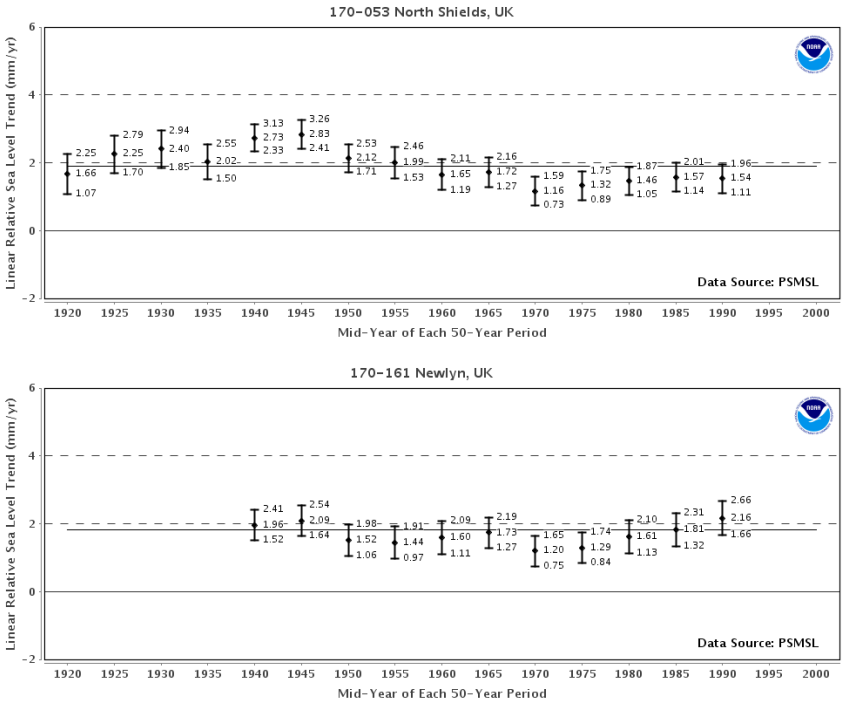


Figure 25: 50-year sea-level trends.

Source: NOAA.[18]



It is important to look at sea-level changes over at least 50 years, as it is well established that trends obtained from tide-gauge records shorter than about 50–60 years are corrupted by interdecadal sea level variation.[19]

The pattern of sea-level rise noted above is also exhibited globally. The Intergovernmental Panel on Climate Change's Fifth Assessment Report stated:

> It is very likely that the mean rate of global averaged sea level rise was 1.7 [1.5 to 1.9] mm/yr between 1901 and 2010 and 3.2

[2.8 to 3.6] mm/yr between 1993 and 2010. Tide gauge and satellite altimeter data are consistent regarding the higher rate during the latter period. It is likely that similarly high rates occurred between 1920 and 1950.[20]

8. Storms

Although there is no established database of storms in the UK, the Met Office have published the data shown in Figure 26. They conclude:

> As a measure of storminess [the figure] counts the number of days each year on which at least 20 stations recorded gusts exceeding 40/50/60 Kt (46/58/69 mph). Most winter storms have widespread effects, so this metric will reasonably capture fairly widespread strong wind events. The metric will consider large-scale storm systems rather than localized convective gusts. There are no compelling trends in max gust speeds recorded by the UK wind network in the last five decades, particularly bearing in mind the year-to-year and decadal variations and relatively short length of this time series.

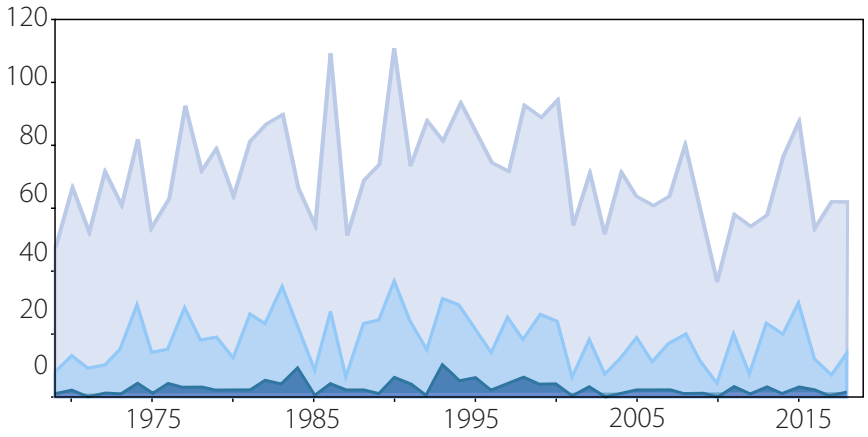


Figure 26: Windy days in the UK, 1965–2018.

Source: Number of days each year that gusts over 40, 50, and 60 Kt have been recorded at 20 or more UK weather stations. Source: Met Office.[3]

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The Global Warming Policy Foundation is an all-party and non-party think tank and a registered educational charity which, while openminded on the contested science of global warming, is deeply concerned about the costs and other implications of many of the policies currently being advocated.

Our main focus is to analyse global warming policies and their economic and other implications. Our aim is to provide the most robust and reliable economic analysis and advice. Above all we seek to inform the media, politicians and the public, in a newsworthy way, on the subject in general and on the misinformation to which they are all too frequently being subjected at the present time.

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