

## UKCP18 Headline Findings

The climate is changing. Even given strenuous efforts to limit the cause of global warming, further climatic changes are inevitable in the future. The UK needs to manage the growing risks from climate change. In order to adapt and build resilience, up-to-date information on climate change is needed to inform decision-making. UKCP18 is the fourth generation of national climate projections for the United Kingdom and will provide users with the most recent scientific evidence on projected climate changes with which to plan for the future.

It is therefore a cornerstone principle of resilience preparation that we plan for a wide range of possible future changes, in parallel with taking actions to reduce the likelihood of the worst scenario becoming reality. So, while we continue to play a leading role in international efforts to keep the global temperature rise to well below 2 °C and pursue efforts to limit it to 1.5 °C (by reducing our own emissions, supporting the developing world to do the same and contributing to global diplomatic and scientific efforts), our adaptation plans should include preparation for worse climate change scenarios.

Here we provide headline findings for both low (RCP2.6) and high (RCP8.5) greenhouse gas emission scenarios. For more information on the new scenarios and how they compare to UKCP09 see the online explainer [‘A guide to Representative Concentration Pathways \(RCPs\)’](#).

### Introduction

- **The UK Climate Projections 2018 (UKCP18) are the first major update to the UK’s national climate change projections for nearly 10 years.** The information available will equip government, business and other interested parties to assess the challenges and opportunities we face from our changing climate.
- **The projections are based on the latest developments in climate science and were subject to an independent peer review, from the commencement of the project, to assess the science and methods that underpin UKCP18.**
- **Building on the learning from UKCP09, user groups for government and wider society, along with the peer review panel, have helped to shape UKCP18, co-designing tools and capabilities to better meet user needs.** For example, (i) changing the format of the data that is provided to the widely-used Ordnance Survey’s coordinate system, (ii) an enhanced user interface that uses the latest web design and (iii) providing datasets that represent UK climate in scenarios of 2 °C and 4 °C of global warming.
- **Like UKCP09, UKCP18 includes estimates of the range of probable outcomes of future climate.** UKCP18 uses newer climate models, additional observations

and more recent views of how emissions may change in the future. These improvements increase our confidence in the ranges of future climate over the UK.

- **UKCP18 adds tools and capabilities, providing new insight compared to the previous projections, thus enhancing capacity for analysing climate risks.** For example, UKCP18 includes projections for the globe, enabling projected climate changes on the UK to be examined in a global context.
- **Climate science is continually advancing.** In 2019, additional projections will be provided, to complement those launched in November 2018, at finer spatial scales comparable to those used for weather forecasting. This high resolution data will provide information on events such as localised heavy summer rainfall, which can result in flash floods and surface water floods.
- **Like UKCP09, products and services will continue to be developed following the launch.** A UKCP18 helpdesk will be available for users to raise queries and provide comment. Feedback will be used to continually evolve and improve products and services to better suit user needs.

## Observations

**In the most recent State of the UK Climate 2017 report, trends show that the UK climate is continuing to warm and that sea levels continue to rise.**

- The average temperature over the most recent decade (2008-2017) has been on average 0.3 °C warmer than the 1981-2010 average and 0.8 °C warmer than the 1961-1990 average. Nine of the ten warmest years have occurred since 2002.
- The longest running instrumental record of temperature in the world, the [Central England Temperature dataset](#), shows that the most recent decade (2008-2017) was around 1 °C warmer than the pre-industrial period (1850-1900). This temperature rise in the UK is consistent with warming that has been observed at a global scale, of around 1 °C since pre-industrial.
- The average hottest day of the year, in the most recent decade (2008-2017), has been on average 0.1 °C warmer than the 1981-2010 average and 0.8 °C warmer than the 1961-1990 average hottest day of 26 °C.
- In the past few decades there has been an increase in annual average rainfall over the UK, particularly in Scotland for which the most recent decade (2008-2017) has been on average 4% wetter than 1981-2010 average.
- Summers in the UK, for the most recent decade (2008-2017), have been on average 17% wetter than 1981-2010 and 20% wetter than the 1961-1990 average.

However, very long-period natural variations are also seen in the longer observational record.

- Total rainfall from extremely wet days (days exceeding the 99<sup>th</sup> percentile of the 1961-1990 rainfall) has increased by around 17% in the most recent decade (2008-2017), for the UK overall. However, changes are largest for Scotland and not significant for most of southern and eastern England.
- Mean sea level around the UK has risen by about 16 cm since the start of the 20<sup>th</sup> century (when corrected for land movement).

## Projections Over Land

**General climate change trends projected over UK land for the 21<sup>st</sup> century are broadly consistent with earlier projections (UKCP09) showing an increased chance of milder, wetter winters and hotter, drier summers along with an increase in the frequency and intensity of extremes.**

- **When we compare the full range of possible outcomes from UKCP09 and UKCP18 there is a great deal of overlap, although users may want to investigate differences.** For example, in the extreme ends of the ranges.
- **By the end of the 21<sup>st</sup> century, all areas of the UK are projected to be warmer, more so in summer than in winter.**
- In UKCP18, the probabilistic projections provide local low, central and high changes across the UK, corresponding to 10%, 50% and 90% probability levels. These local values can be averaged over the UK to give a range of average warming between the 10% and 90% probability levels. By 2070, in the high emission scenario, this range amounts to 0.9 °C to 5.4 °C in summer, and 0.7 °C to 4.2 °C in winter.
- **Hot summers are expected to become more common.** In the recent past (1981-2000) the chance of seeing a summer as hot as 2018 was low (<10%). The chance has already increased due to climate change and is now between 10-25%. With future warming, hot summers by mid-century could become even more common, near to 50%.
- **Rainfall patterns across the UK are not uniform and vary on seasonal and regional scales and will continue to vary in the future.**
- In UKCP18, the probabilistic projections provide local low, central and high changes across the UK, corresponding to 10%, 50% and 90% probability levels. These local values can be averaged over the UK to give a range of average precipitation changes between the 10% and 90% probability levels. By 2070, in the

high emission scenario, this range amounts to -47% to +2% in summer, and -1% to +35% in winter (where a negative change indicates less precipitation and a positive change indicates more precipitation).

- **In addition, UKCP18 enables users to explore projected climate variability and changes for a greater range of metrics using new global and regional climate model outputs.**
- **The global models provide 28 alternative views of the climate in the future and allows users to maintain consistency across their area of interest, as well as looking at a greater number of climate variables.** This enables users to look at global climate impacts, for example, risk assessments on global food supply chains.
- **Regional model projections enable users to look at greater detail over the UK including a greater focus on climate extremes,** for example, localised heavy rainfall for flood risk assessments.

## Marine Projections

**A new set of marine projections show that sea level around the UK will continue to rise to 2100 under all emission pathways.**

- **The pattern of sea level rise is not uniform across the UK.** Sea level rise is less in the north and more in the south, this is mainly due to the movement of land, up and down.
- For London, sea level rise by the end of the century (when compared to 1981-2000), for the low emission scenario is very likely<sup>1</sup> to be in the range 0.29 m to 0.70 m. For a high emission scenario, the range is very likely to be 0.53 m to 1.15 m.
- For Edinburgh, sea level rise by the end of the century (when compared to 1981-2000), for the low emission scenario is very likely to be in the range 0.08 m to 0.49 m. For a high emission scenario this range is very likely to be 0.30 m to 0.90 m.
- **We can continue to expect increases to extreme coastal water levels driven mainly by increases in mean sea level rise, although we cannot rule out additional changes in storm surges.**

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<sup>1</sup> *The IPCC use likelihood to provide a standardised language for describing quantified uncertainty. It can be used to express a probabilistic estimate of the occurrence of a single event or of an outcome (e.g., a climate parameter, observed trend, or projected change lying in a given range). A statement that an outcome is 'very likely' means that the probability of this outcome can range from ≥90% to 100% probability. This implies that all alternative outcomes are 'very unlikely' (0-10%).*

- **UKCP18 includes exploratory estimates of sea level rise out to 2300, which show continued rise beyond 2100.** Sea level rise is a long-term challenge that initial results suggest varies substantially depending on how successful we are at curbing global greenhouse gas emissions in the coming years.
- **UKCP18 sea level rise is projected to be higher than in UKCP09, but this increase has already been factored into current adaptation planning.** Due to the new treatment of land ice contribution to sea level rise, UKCP18 is higher than UKCP09. For example, the upper end of the range of sea level rise in UKCP18, for the high emission scenario for London, is around 25 cm higher than in UKCP09 at 2100. This is not unexpected and has been factored into adaptation planning.

### What does this mean?

**The headline results in the latest set of climate projections are broadly consistent with UKCP09, although there are some differences (e.g. temperature and rainfall) that may be important for climate risk assessments.** The differences between UKCP09 and UKCP18 depend on season, location and greenhouse gas emission scenario. Risk assessments and adaptation decisions should use these new projections but will also need to be regularly reviewed to ensure they take account of the latest scientific understanding, longstanding and emerging vulnerabilities, as well as changing socio-economics for example.

- **Government will make use of UKCP18 to inform its adaptation and mitigation planning and decision-making.**
- **The previous set of projections, UKCP09, were used to assess climate risks for the 2017 [UK Climate Change Risk Assessment](#) and inform how to respond to these risks ([National Adaptation Programme](#)).** UKCP18 will provide the most up-to-date assessment of how climate in the UK is expected to change over the coming century and will be used to inform the next CCRA, due in 2022.
- **UKCP18 will help businesses and individuals to take action to improve resilience.** Web pages have been designed and tested to enable users to access information quickly depending on what people want to use it for, as well as being able to visualise the results. Guidance materials describe the different components of the project in detail and explain how to use them.