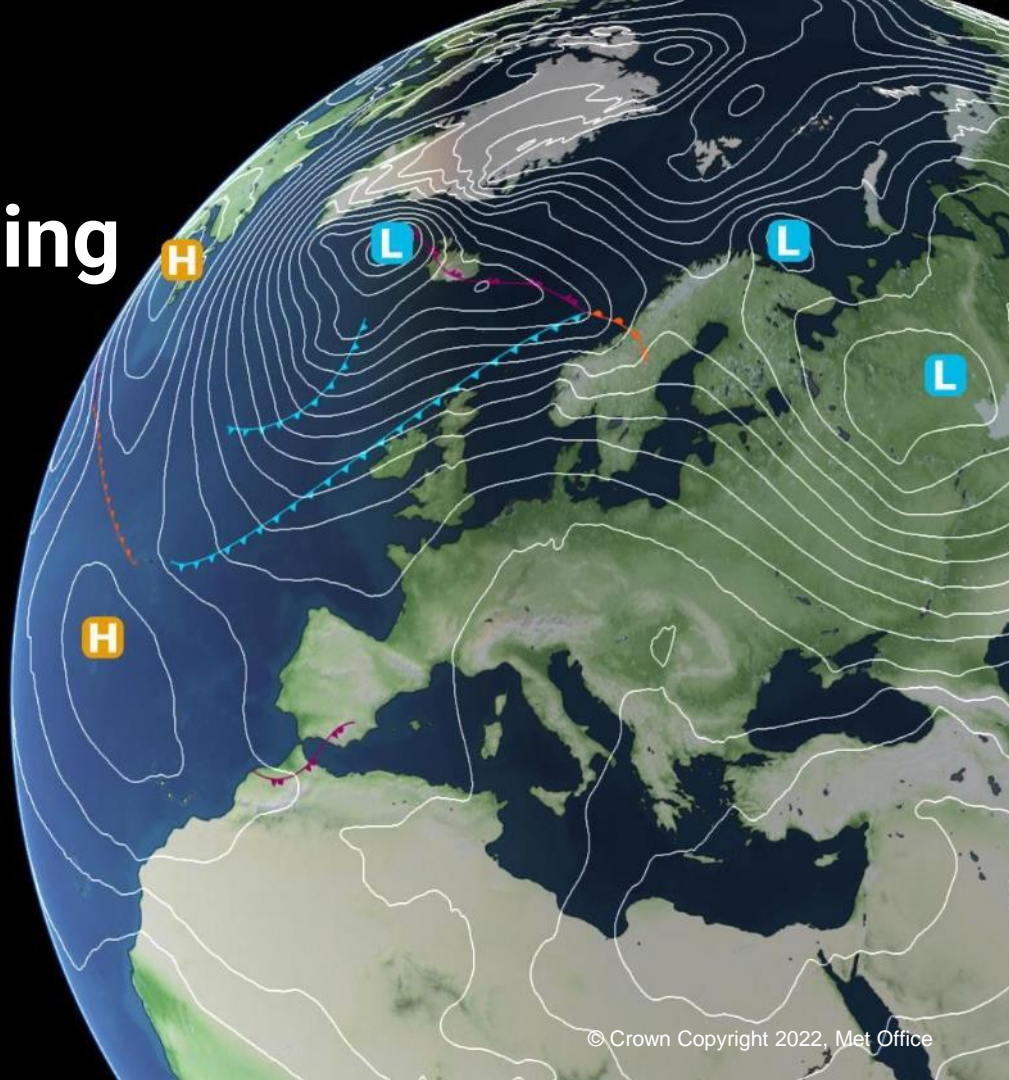


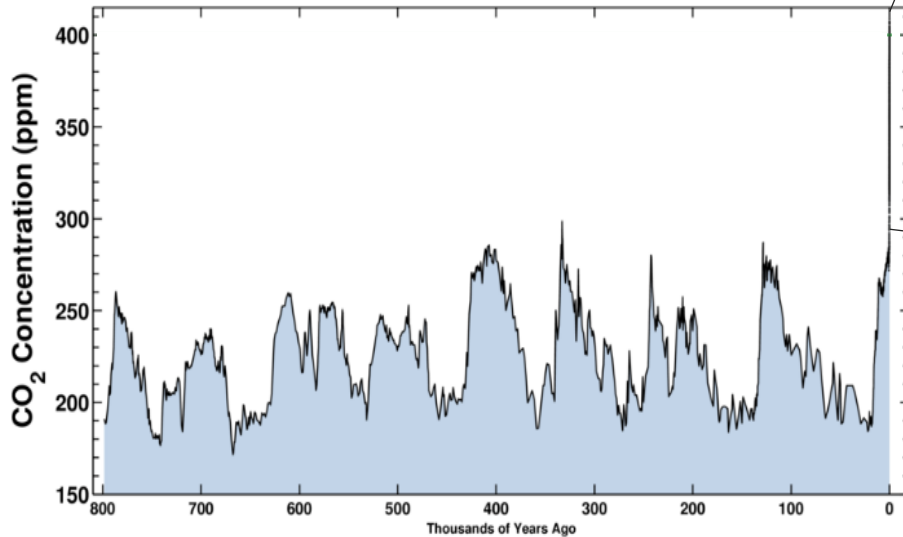
# SWF in London - adapting for a changing climate

Mark Rogers, Met Office Advisor

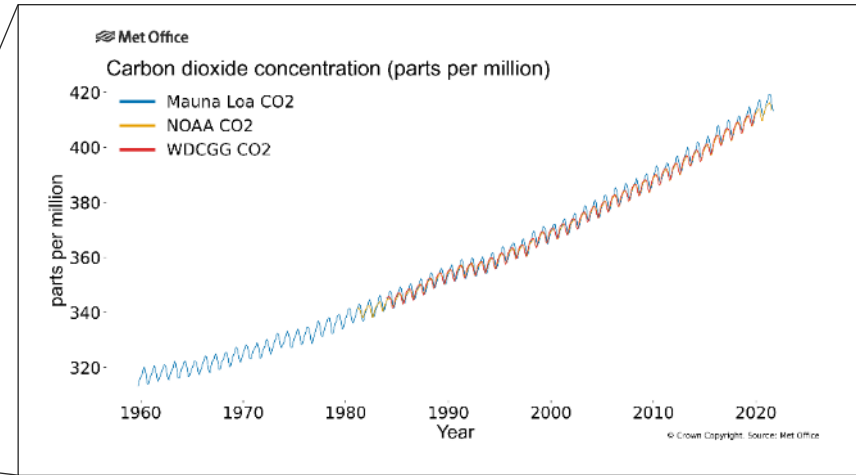


# Climate Observations

## Current levels of atmospheric CO<sub>2</sub> are unprecedented in 2 million years or more



Source: <https://scripps.ucsd.edu/programs/keelingcurve/>



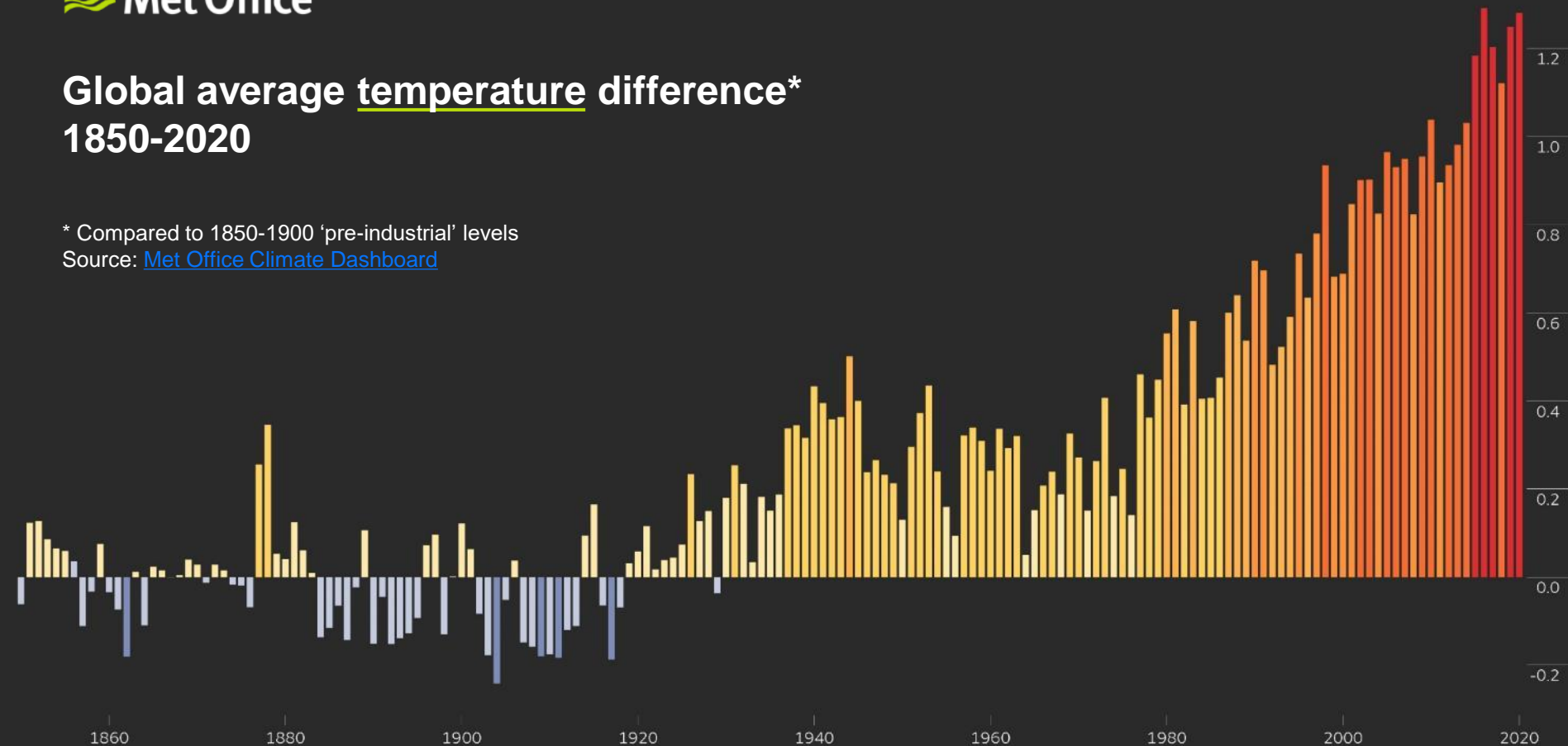
Since the Industrial Revolution in the 18<sup>th</sup> century, the concentration of CO<sub>2</sub> in the atmosphere has risen by more than 45%, to over 400 parts per million (ppm).

Records of Earth's climate, preserved in air bubbles trapped in Antarctic ice, show that the current level of CO<sub>2</sub> is higher than at any time in at least the last 2 million years.

# Global average temperature difference\* 1850-2020

\* Compared to 1850-1900 'pre-industrial' levels

Source: [Met Office Climate Dashboard](#)



# What is the difference between climate variability and change?

**Climate variability** looks at changes that occur within smaller timeframes e.g. months, seasons or a year – variations in the mean state, beyond individual weather events

**Climate change** refers to a large-scale, long-term shift in the planet's weather patterns and average temperatures – a significant change in the mean state.

 Met Office

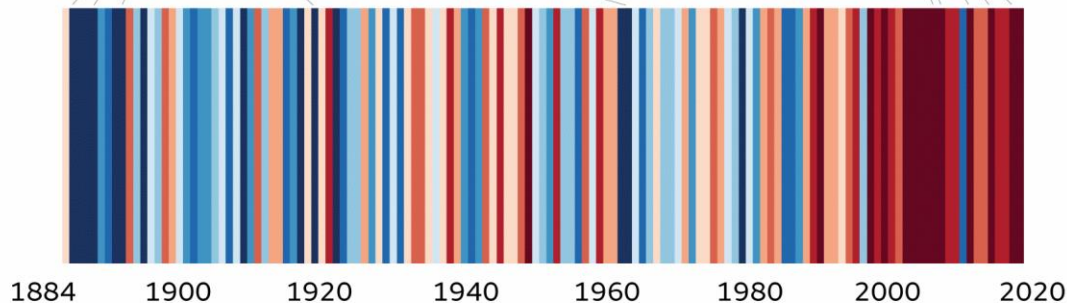
## UK annual temperature

5 coolest years

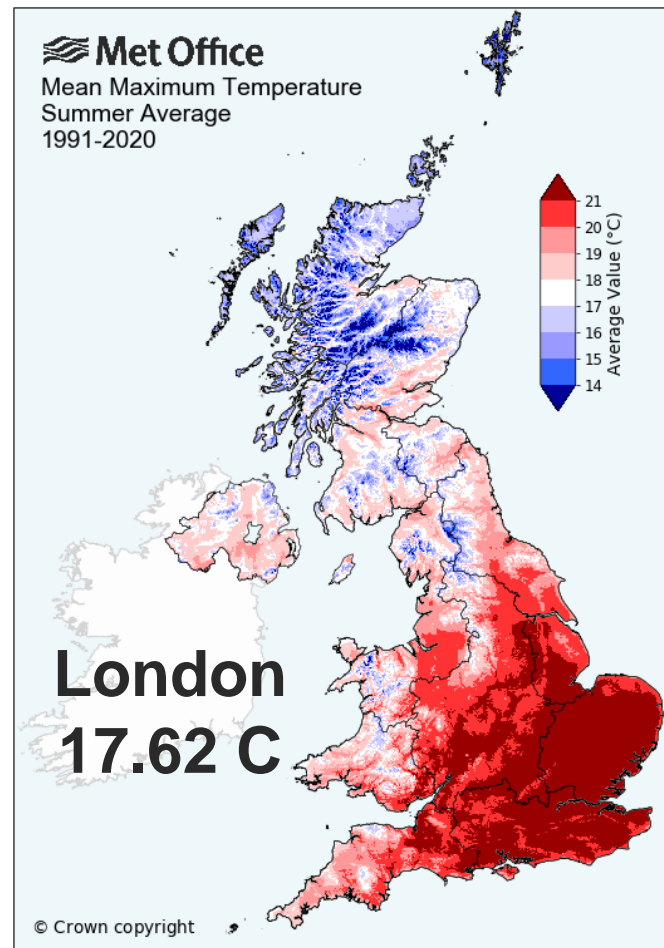
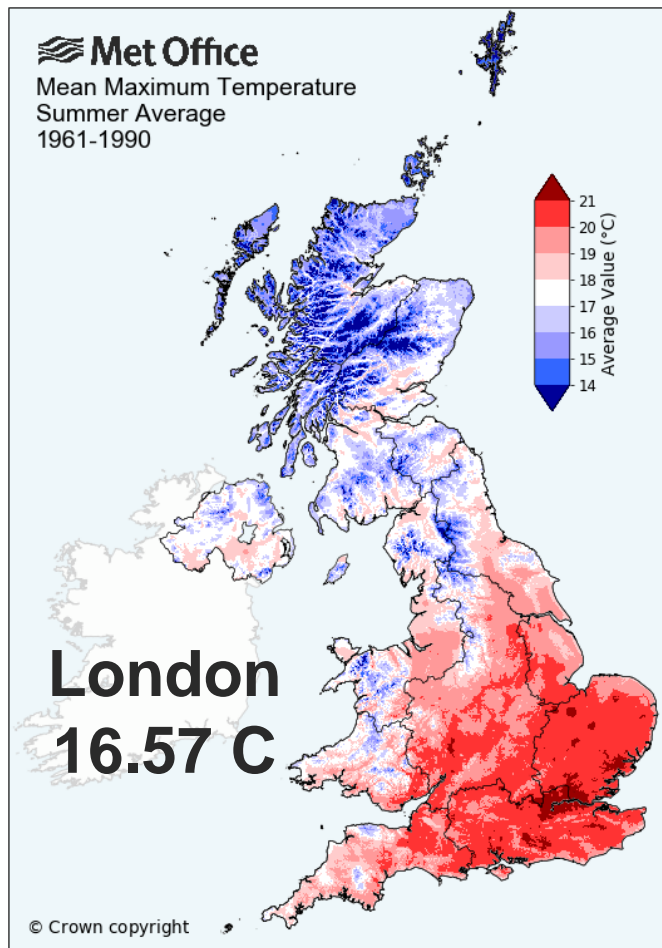
1892, 1888, 1885, 1963, 1919

5 warmest years

2014, 2006, 2011, 2007, 2017



# Observed Changes – Summer Temperatures



# UK Climate Projections 2018 (UKCP18)

## How will the seasons change?

### Summers



**HOTTER**

### Winters



**MILDER**



**DRIER**



**WETTER**

Year-to-year variations mean we'll still see some cold dry winters and cool wet summers, but they will become less likely.

Projections for average annual warming over the UK give a range of 1°C to 4°C for the lowest and highest emission scenarios.

## How will extremes change?



Maximum temperature of a summer's day could increase by as much as 10°C in some places

Rainfall is expected to be more intense, increasing the risk of flash flooding

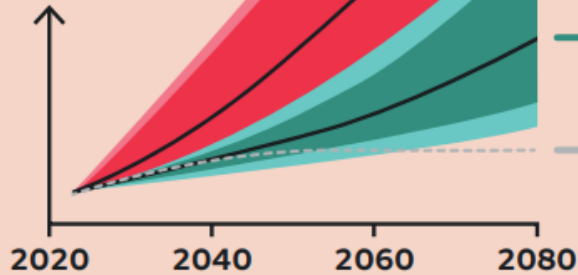




**HIGH EMISSIONS SCENARIO**

**MEDIUM EMISSIONS SCENARIO**

Mean change  
in variable  
e.g. temperature



**RCP 8.5**  
**90<sup>TH</sup> PERCENTILE**  
90% chance of being  
less than this result.





**RCP 4.5**  
**50<sup>TH</sup> PERCENTILE**  
50% chance of being  
less than this result.

**RCP 2.6**  
RCP2.6 is not the focus of this City Pack, because, although the world aims to limit warming with emission reductions like those or even greater than RCP2.6, it is good practice to consider the risks if this is not achieved.

The projections are provided as a 'range':

- The first number in the range, is the median (50<sup>th</sup> percentile) result from RCP 4.5 (MEDIUM emission scenario).
- The second number in the range is from RCP 8.5 (HIGH emission scenario) and shows a more extreme result (90<sup>th</sup> percentile, except for summer rainfall rate which uses the 10<sup>th</sup> percentile, representing drought conditions).

# Future Summer changes

	2030s	2050s	2080s	
 Summer Average Air Temperature (°C)	<b>+1.1</b> to <b>+2.3</b>	<b>+1.9</b> to <b>+3.9</b>	<b>+3.0</b> to <b>+7.3</b>	
	Summer Maximum Air Temperature (°C)	<b>+1.2</b> to <b>+2.8</b>	<b>+2.0</b> to <b>+4.6</b>	<b>+3.4</b> to <b>+8.5</b>
 Summer Precipitation Rate (%)	<b>-4</b> to <b>-29</b>	<b>-12</b> to <b>-44</b>	<b>-20</b> to <b>-63</b>	




Hot summers are expected to become more common. By 2050, every other summer may be as hot as the record breaking summer of 2018.



Although the trend is for drier summers in the future, there may be increases in the intensity of heavy summer rainfall events.

# Future Winter Changes

		2030s	2050s	2080s	
	Winter Average Air Temperature (°C)	<b>+0.8</b> to <b>+1.7</b>	<b>+1.3</b> to <b>+2.8</b>	<b>+1.8</b> to <b>+4.9</b>	↑
	Winter Minimum Air Temperature (°C)	<b>+0.8</b> to <b>+1.9</b>	<b>+1.3</b> to <b>+3.1</b>	<b>+2.0</b> to <b>+5.5</b>	↑
	Winter Precipitation Rate (%)	<b>+7</b> to <b>+20</b>	<b>+9</b> to <b>+28</b>	<b>+14</b> to <b>+49</b>	↑



Increased risk of winter river and groundwater flooding



Decrease in hazards from cold weather although cold spells are still likely

## **Local (2.2km) suggests significant increases in hourly precipitation extremes.**

### **Future increases in extreme hourly rainfall intensity**

The rainfall associated with an event that occurs typically once every 2 years increases by 25%, by 2070s.

### **Changes in the type of rainfall**

By 2070s, projections suggest that...

... rain in winter will come from frontal rain events of higher intensity

... rain in summer will come from short lived high intensity showers.

# Adaptation

## Adaption is essential to address the locked-in effects of climate change

Adaption is needed to manage risks from:



### On-going impacts

Those we are already experiencing



### Committed impacts

Those that would occur even if emissions stopped today



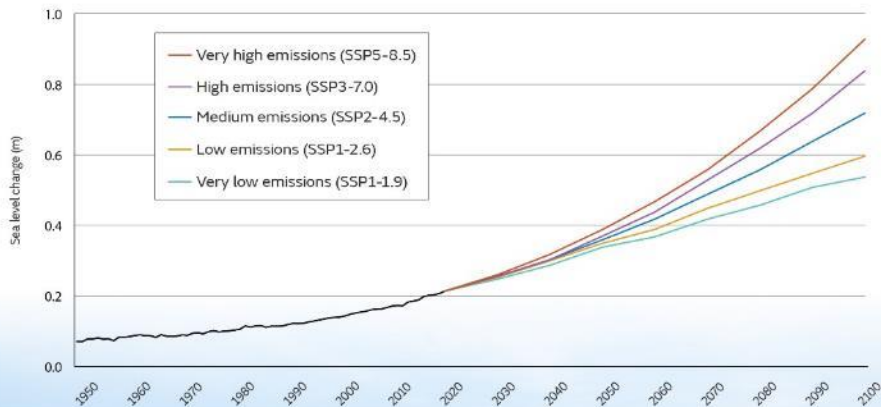
### Future warming

Planning for all possible outcomes including long-term, worst-case scenarios

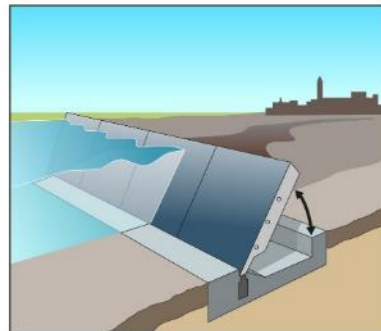
**It is not possible to eliminate all climate risks and the faster emissions are reduced, the less likely that limits to adaption are reached.**

## Adapting to climate change is essential

Global mean sea level change relative to 1900



## Other examples of adaptation



Flood protection



Reinforced rail network



Sustainable buildings



Water management

# Using UKCP



# How to find the information you need

**New to climate  
projections?**

See [Using climate projections for risk assessment](#) on UKCP18 website

**Looking for headline  
messages?**

See [Key results](#) on UKCP18 website

**Carrying out  
detailed analysis?**

Select strand(s) of land projections based on task from UKCP User Interface/CEDA Archive

Increasing level of technical expertise

## INTRODUCTION

This City Pack provides high level, non-technical summaries of climate change projections for an individual city or town. It uses scientific research to provide robust climate information to help decision makers plan for the future, enabling cities and towns to become more resilient to climate change.

Urban areas experience unique challenges from climate change. For example, urban environments contain surfaces which don't soak up and store rainfall, such as tarmac and paving, which might increase flood risk. Urban areas are also affected by the urban heat island effect, which results in higher urban temperatures compared with surrounding rural areas.



[https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/research/spf/london-city-pack\\_august-2022.pdf](https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/research/spf/london-city-pack_august-2022.pdf)

# What will climate change look like near me?

## How could the climate change near you?

Enter a full UK postcode to find out

The interface features a search bar with the text 'SE10 0DX' and a magnifying glass icon. To the left of the search bar are icons for a sun, a water drop, and a cloud. To the right are icons for a wind turbine, a cloud, and a water drop.

### Hottest day

#### Your local area

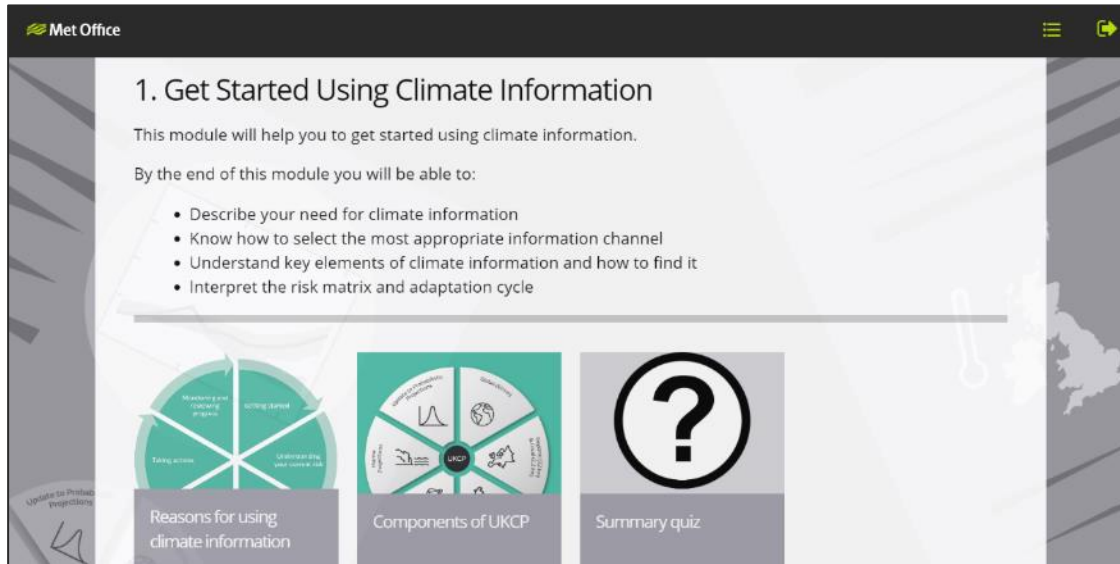
Use buttons to change season



The hottest summer day in the 30 years from 1991 to 2019 near you was **36.8C**. If global average temperatures increase 2C above pre-industrial levels, the hottest summer day could be about **38.3C**. If global temperatures rise by 4C, it could be about **42.5C**.

<https://www.bbc.co.uk/news/resources/idt-d6338d9f-8789-4bc2-b6d7-3691c0e7d138>

E-learning - Please contact us [here](#) on the Met Office website and we'll get you started, please put "UKCP e-learning registration" as the subject



The screenshot shows a web interface for an e-learning module. At the top left is the Met Office logo. The main heading is "1. Get Started Using Climate Information". Below this is a sub-heading: "This module will help you to get started using climate information." A bullet point states: "By the end of this module you will be able to:" followed by a list of four objectives: "Describe your need for climate information", "Know how to select the most appropriate information channel", "Understand key elements of climate information and how to find it", and "Interpret the risk matrix and adaptation cycle". Below the text are three interactive tiles: "Reasons for using climate information" (with a circular diagram), "Components of UKCP" (with a circular diagram), and "Summary quiz" (with a question mark icon). The interface also includes a navigation menu and a home button in the top right corner.

# Explore our Climate data

## Latest updates

25/11/22 - [Understanding Climate Data](#) page added

25/10/22 - [Sea level data units issue closed](#) (QA complete)



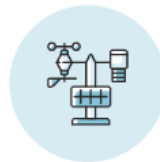
Precipitation



Temperature



Sea Level



Observations (past)



Projections (future)



Socioeconomic data - UK SSPs

We would like your help to further develop our site. We are very keen to hear about any additional climate data you would find particularly useful, this will help us prioritise which further datasets we release. To provide feedback on the beta site, please contact our Climate Data Portal team at [channelpartners@metoffice.gov.uk](mailto:channelpartners@metoffice.gov.uk)

This portal is in Beta, this means that we are making changes to the portal based on user feedback. These changes may include datasets being removed, or new datasets included.

<https://climate-themetoffice.hub.arcgis.com/>