

## INTRODUCTION

The Forest of Dean District Council declared a climate emergency in July 2019 and has committed to becoming carbon neutral by 2030.

The district is a stronghold for nature with one of England’s largest areas of woodland, bounded by the River Wye and the River Severn.









To help quantify the level of climate risks for the Forest of Dean, this climate risk summary uses the 2018 UK Climate Projections (**UKCP18**) to provide an up-to-date assessment of how the climate is expected to change in the future. Across the UK, the UK climate projections predict:

- Increased chance of **warmer, wetter winters** and **hotter, drier summers**.
- Likely **increases in the intensity of short-period rainfall events**, and **increases in flood risk** in all seasons.
- **Record breaking hot summers** and **drought conditions** are expected to become more common.
- **Sea level rise** and **storm surge** is likely to result in **increased flood risk at coastal locations**.

## PRIORITY CHALLENGES FOR THE FOREST OF DEAN

Specific challenges of climate change are likely to include:

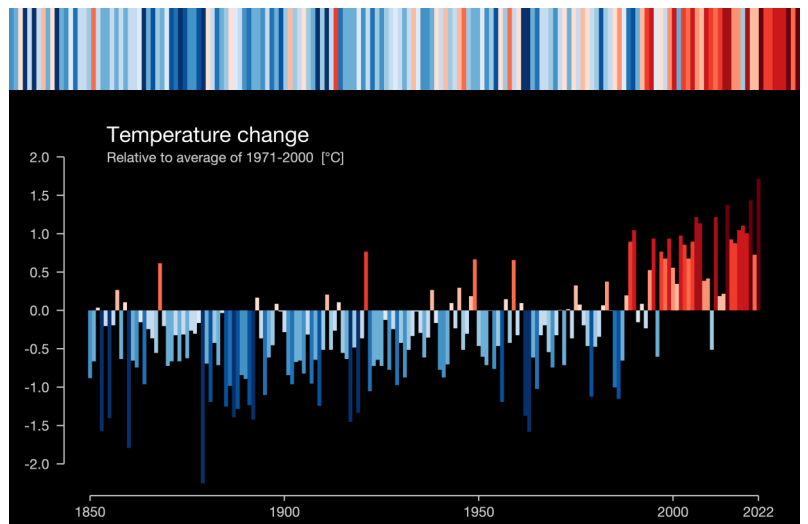
<p><b>HEALTH</b> Increased risk to vulnerable groups and ageing populations health from heat stress.</p> 	<p><b>FLOODING</b> Increased risk of river and surface water flooding from heavy rainfall events and sea level rise.</p> 
<p><b>ENERGY DEMAND</b> Increased energy demand for summer cooling which could raise energy bills during the hottest months of the year.</p> 	<p><b>DRAINAGE</b> Increasing pressures on the urban drainage system due to rainfall intensity causing disruption for urban areas.</p> 
<p><b>INTERNATIONAL RISK</b> Global Impacts may cause disruption to food supply chains, with potential to cause local price rises and supply shortages.</p> 	<p><b>SUBSIDENCE</b> Longer, drier summers and more frequent heat in the future could lead to an increase in subsidence to buildings.</p> 

## HISTORICAL TREND

### How has the Forest of Dean's Climate changed?

The stripes show how temperatures local to The Forest of Dean have changed from 1884 to 2022, with many of the hottest years occurring in the last few decades.

Temperature Difference (°C) Data: Had UK-Grid Concept: Ed Hawkins



## How are climate change values determined?

This risk summary uses the latest Met Office UK Climate Projections (UKCP). More detail can be found on these here ([UKCP18 Science report](#)).

To show the amount of change for your location, this has been presented in the form of a 'middle ground' estimate (the median climate change projection). The amount of change could be higher or lower than this, however.

The results also show climate change estimates depending on two greenhouse gas emission scenarios: medium and high.

## How might greenhouse gases affect the climate change estimates?

Our future climate is determined by ongoing and future greenhouse gas emissions, which are uncertain. This summary has considered two possible greenhouse gas emission scenarios – i.e. two possible climate futures.

These align with those recommended by Climate Leadership Gloucestershire.

### Medium - Global emissions are mitigated to varying levels.

- Under a medium emission scenario we would expect to reach a global temperature rise of between 2°C and 3°C.

### High - Global emissions grow unmitigated.

- Under a high emission scenario we could reach 4.3°C global temperature rise by 2100.



## HEADLINE UKCP18 RESULTS FOR THE FOREST OF DEAN

### RAINFALL

Winter rainfall increase is likely to lead increased river flooding. Summer/autumn rainfall is likely to increase surface water flood risk.



Drought conditions are also likely to increase, especially in summer.

### COLD WEATHER

Cold weather is likely to decrease. Warming will increase average temperatures during winter months.



Despite a warmer winter trend, extreme cold/snow events are still possible.

### HOT WEATHER

Hot weather is likely to increase.

There are implications for buildings (cooling and insulation), wildfire risk and human health.



### HEATWAVE EVENTS

Heatwaves are likely to become more common.



In the future there are likely to be two to four times more heatwaves per year.

## Low-likelihood, high-impact outcomes

Low-probability climate changes outside of the above headline climate projections could still occur and may have a large impact for districts such as the Forest of Dean. For example, a greater increase in sea level rise than conventionally assumed caused by Arctic sea ice loss.

# FOREST OF DEAN: SECTOR CLIMATE RISK INDICATORS

The climate risk indicators below demonstrate potential climatic changes relevant to the district.



## Road melt risk

Days with maximum temps above 25°C

	2050	2070	2100
Medium	29	40	48
High	40	62	76

District road users, during summer, will increasingly experience road melt disruption under both scenarios.



## Heat Stress

Days with shade Wet Bulb Globe Temperature (WBGT) above 25

	2050	2070	2100
Medium	0.7	1.5	2.4
High	1.7	5.5	9.6

Heat stress days will increase, causing issues for the Forest of Dean's vulnerable populations.



## Rail: bad weather days

Days with temperature, rainfall and windspeed beyond thresholds

	2050	2070	2100
Medium	35	43	50
High	44	62	73

Commuters, during summer, will increasingly experience rail disruption under both scenarios.



## Wildfire: Daily Hazard

Days with Met Office fire severity index components above specific thresholds

	2050	2070	2100
Medium	20	24	26
High	23	33	39

The potential for wildfire will increase, causing issues for the Forest of Dean's heathland and grassland.



## Frost days

Days with minimum temps below 0°C

	2050	2070	2100
Medium	29	24	22
High	24	18	15

Warmer winters, with less frost days will have a negative impact on vegetation, soil and on horticulture.



## Record-breaking weather: wettest month

Number of months per year at least as wet as the wettest month between 1981 and 2010

	2050	2070	2100
Medium	0.12	0.16	0.18
High	0.16	0.28	0.33

Under a high scenario, by 2100 a third of months per year will be as wet as the wettest months from 1981-2010.



## Soil Moisture

Average summer soil moisture content (% change from 1981-2010 baseline)

	2050	2070	2100
High	-22	-29	-33

The decrease in soil moisture suggests a need for increased irrigation of crops across the district. Only the high scenario data is available for this indicator.



## Growing Season length

Length between start and end of growing season (Days)

	2050	2070	2100
Medium	272	281	284
High	281	297	303

Local growing season length under both scenarios will increase, causing variability for crop growth and yields.

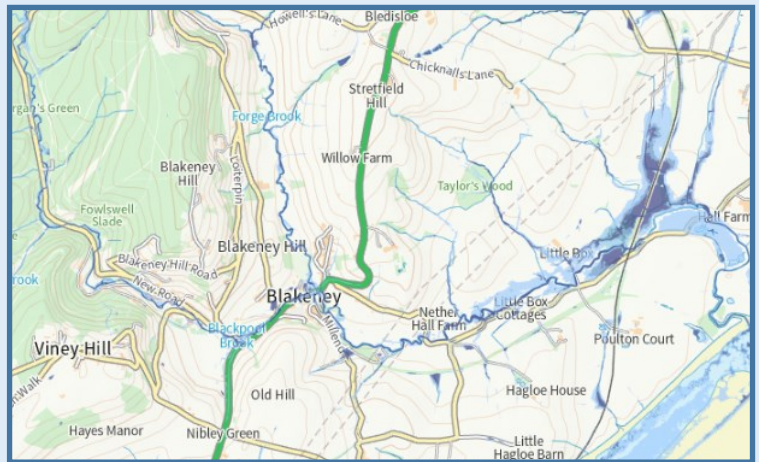
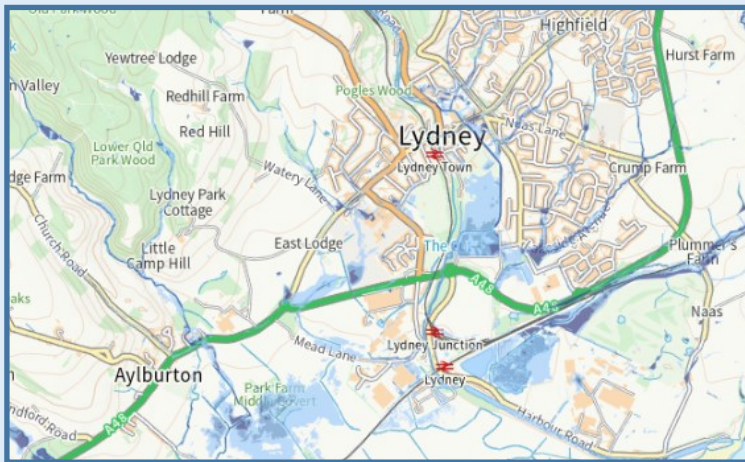
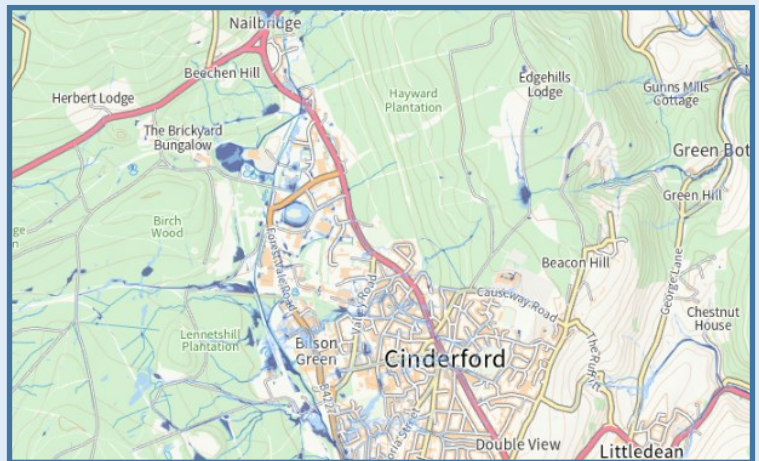
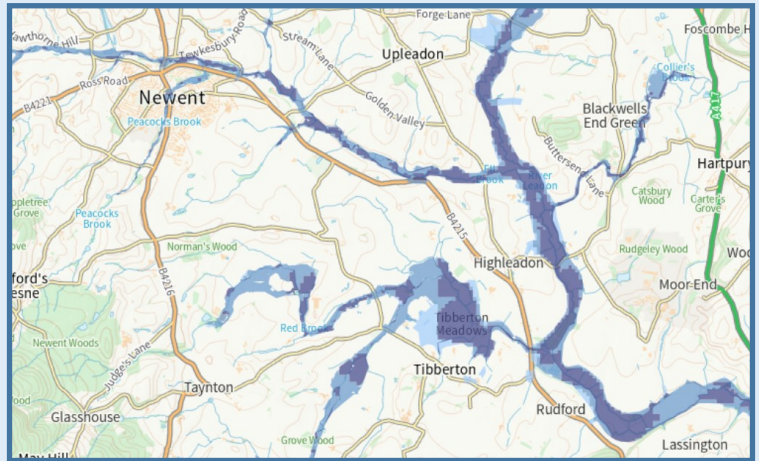
The above indicators were developed during the [UK Climate Resilience Programme](#) - funded by UK Research and Innovation and the Met Office (2023)



# Surface water flooding

Surface water flooding is also known as pluvial flooding.

It occurs when the volume of rainfall exceeds the capacity of drains and surface water sewers and is unable to drain away through drainage systems or soak into the land, and instead flows over the land.



The [Environment Agency's website](#), show increases of between 20% and 40% in rainfall intensity in the 2050s to 2070s and from approximately 20% to 95% in river flood flows in the 2050s to 2080s.

The ranges of change depend on the future time period and the relative magnitude of the flood event. The range also encompasses uncertainty in the projections from the climate models.

Higher increase values are less likely but plausible, and can be used for precautionary purposes.

## APPENDIX: FULL UKCP18 RESULTS

In recognition of Climate Leadership Gloucestershire's adoption of the Climate Change Committees principles for good adaptation policy, we have included headline projections to help the Forest of Dean Adapt to 2°C and assess the risks up to 4°C of warming.

<b>Medium emissions scenario</b>	2050s	2070s	2100
Annual Average temperature (°C change)	+1.3	+1.9	+2.3
Average Summer temperature (°C change)	+1.7	+2.7	+3.2
Average Winter temperature (°C change)	+1.1	+1.5	+1.7
Summer Rainfall (% change)	-14.3	-20.6	-24.1
Winter Rainfall (% change)	+8.0	+12.7	+15.2
Heatwave events (Events/year)	1.9	2.8	3.5
<b>High emissions scenario</b>			
Annual Average temperature (°C change)	+2.0	+3.1	+3.8
Average Summer temperature (°C change)	+2.6	+4.3	+5.2
Average Winter temperature (°C change)	+1.6	+2.5	+2.9
Summer Rainfall (% change)	-19.7	-29.7	-35.8
Winter Rainfall (% change)	+11.9	+20.4	+24.9
Heatwave events (Events/year)	3.0	4.1	4.4

*Median values are given for projection results. Results are calculated as change from the baseline period: 1981-2000.*

## TERMINOLOGY

<b>Adaptation</b>	In human systems, the process of adjustment to actual or expected climate and its effects, in order to moderate harm or exploit beneficial opportunities.
<b>Fluvial flooding</b>	Fluvial flooding occurs when rivers and streams break their banks and water flows out onto the adjacent low-lying areas.
<b>'Locked in' Climate Change</b>	The Intergovernmental Panel on Climate Change (IPCC) has warned that even if effective mitigation for 1.5°C was put in place, damages stemming from climate change are not preventable, as there is a "locked-in" level of warming that is already causing unavoidable consequences.
<b>Mitigation</b>	A human intervention to reduce emissions or enhance the sinks of greenhouse gases.
<b>Scenario</b>	A projection of future emissions, either following assumed future emissions or consistent with a specific increase in global average temperature.
<b>UKCP18</b>	UK Climate Projections 2018