Climate change and health

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Contents

Aim

Aims of this report

- To build understanding of what climate change is
- Outline the changes predicted to different aspects of the climate
- Consider how these climate changes will impact health
- To consider local populations most vulnerable to these impacts and possible mitigating actions
- To provide intelligence to inform emergency planning and mitigating actions about climate change which can feed into town and city planning.

Climate change refers to long term shifts in temperatures and weather patterns.[1] Since the 1800s the major driver of these changes has been human activity, due to the burning of fossil fuels like coal, oil and gas. This has released large amounts of greenhouse gases into the environment, at a greater level than can be absorbed, resulting in the build-up of these gases in the atmosphere (see Greenhouse gas emissions section).

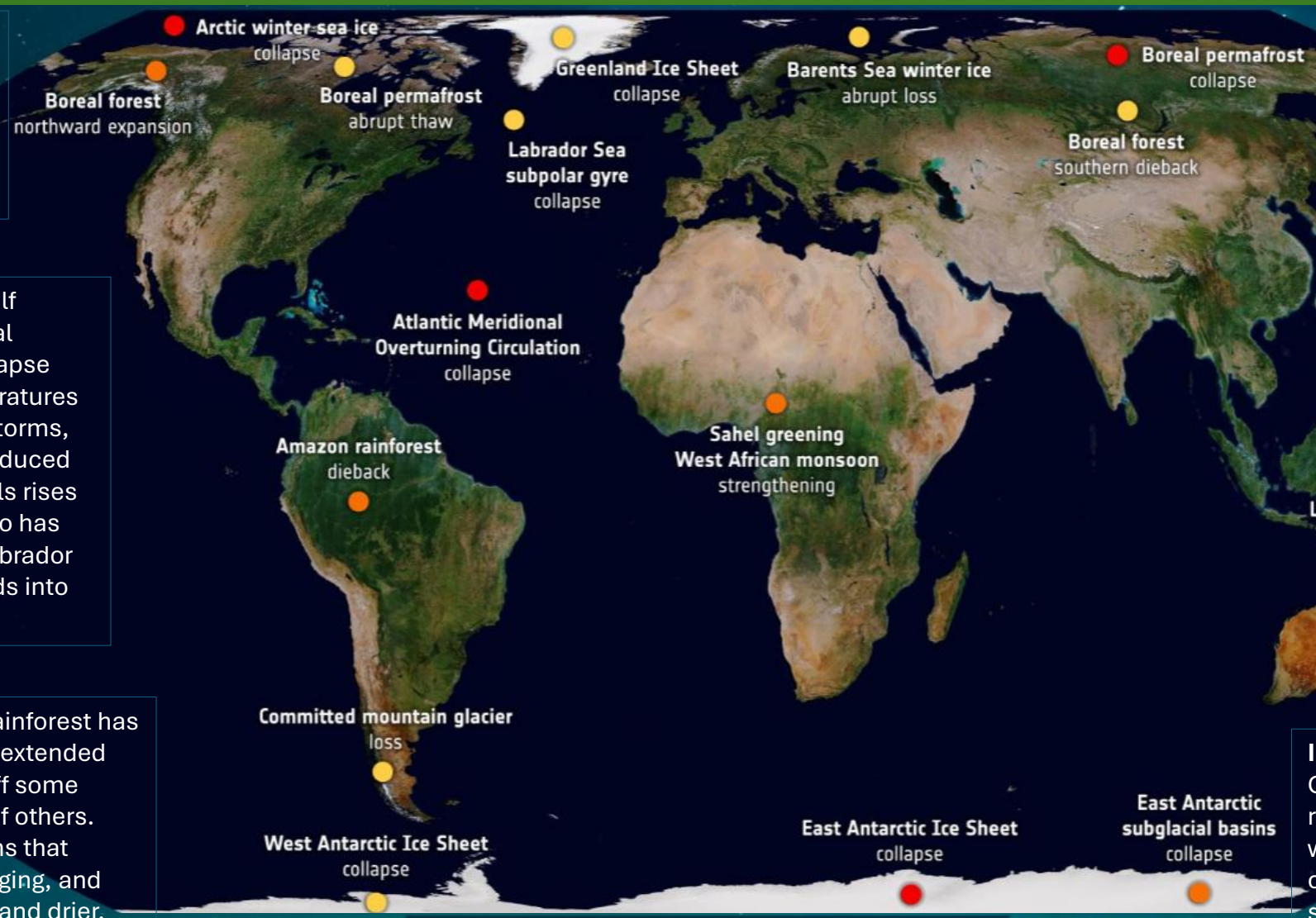
Climate change science is still a developing field and with new evidence being collected all the time. Data and evidence in this report are correct at the time of collation (summer 2025), however, please be aware that some findings may be quickly superseded. Modelling has been conducted to estimate the impacts of climate change which have been included in this report where possible. These models do have levels of uncertainty, and it is not always clear how many of these include the impacts of predicted tipping points (see following slide). Tipping points are critical thresholds that once exceeded can result in irreversible consequences or reinforcing loops. Therefore, all models and data need to be considered with a level of uncertainty as it may be that some tipping points have a compounding impact on other areas of climate change.

Climate change tipping points

Ice retreat: melting of artic sea ice is a reinforcing loop and contributes to broader changes in Arctic conditions. It also has large impacts on wildlife.

Ocean current collapse: Gulf Stream (or Atlantic Meridional Overturning Circulation) collapse would result in colder temperatures in Europe with more winter storms, weaker monsoons in Asia, reduced rainfall in Africa and sea levels rises around the Atlantic.[4] This also has links to the North Atlantic/Labrador Sea subpolar gyre which feeds into the Gulf Stream process.

Forest dieback: The Amazon rainforest has been impacted by drought and extended dry seasons which has killed off some trees and reduced the growth of others. Extensive deforestation it means that precipitation patterns are changing, and the forest is becoming warmer and drier. This could lead to increased fires and a change from a forest to a savannah, releasing large amounts of carbon and stopping the forest from being a carbon sink for the planet.



Permafrost: permafrost covers around a quarter of the land in the Northern hemisphere and holds around twice as much carbon as currently exists in the atmosphere.[2] As this melts it will release greenhouse gases and recent reports suggest that it is already becoming a source of CO2 emissions.[3]

Coral reef die-off: is predicted at global temperature increases of 2°C, leading to a major loss of habitat.

Icesheets: once the melting of the Greenland and Antarctic ice sheets reaches a threshold amount this would accelerate, leading to a collapse in the ice sheet and substantial sea level rises. Some increases in sea levels are already guaranteed, and studies are now suggesting that some of the Antarctic ice sheets may have already passed the tipping point.[2]

The global legislation

- The Intergovernmental Panel on Climate Change (IPCC) was established in 1988 and produced it's first report in 1990. This report concluded that temperatures were rising, and human emissions were likely to blame.
- The first COP (Conference of the Parties) of the United Nations Climate Change Conference (UNCCC) was held in Germany in 1995, and these meetings are now held annually.
- The Paris Agreement, 2015 (COP21), is the major international treaty on climate change. The long-term goals are:

    - To limit greenhouse gas emissions from human activity to the same levels that trees, soil and oceans absorb naturally (net zero) between 2050 and 2100
    - Each country to set its own emission-reduction targets and review every 5 years
    - To keep the global temperature increase below 2°C above pre-industrial levels and aim for 1.5°C
    - Provide finance to developing countries to mitigate climate change and increase abilities to adapt to climate change
    - To periodically assess the collective progress towards achieving these goals

- The most recent COP29 was held in Azerbaijan in 2024. Agreements included:
    - An aspirational goal of $1.3trillion per year to support developing countries to respond and adapt to climate change, which resulted in an agreed target of £300 billion per year from developed countries by 2035.
    - Technical rules for international carbon markets under the Paris Agreement were also finalised.
- The next COP will be COP30 in Belem, Brazil in November 2025

When will countries aim to achieve net zero	
Already done	Bhutan, the Comoros, Gabon, Guyana, Madagascar, Niue, Panama, Suriname
2030	The Maldives
2035	Finland
2040	Austria, Iceland
2045	Nepal
2050	Argentina, Australia, **Brazil, Canada,** Chile, Colombia, Costa Rica, **Japan**, **the EU,** New Zealand, Singapore, South Africa, South Korea, the UAE, the UK, **USA**
2060	**China, Indonesia,** Kazakhstan, **Russia,** Saudi Arabia
2070	**India**
95% target	Netherlands, Norway
Other target	Kenya, Paraguay, the Philippines
No target	Bolivia, the Cayman Islands, Egypt, **Iran**, Libya, Mexico, Syria

Bold = Top 10 largest emitters of greenhouse gases
Quality of net zero plans vary between countries and subject to national politics

Source: The Eco Experts, Climate Action Tracker, World Resources Institute

The national and local legislation

- National legislation in the UK comes under the Climate Change Act (2008). It includes:
  - Setting out that the UK will become net zero by 2050
  - Carbon budgeting (restrictions on the total amount of greenhouse gases that can be emitted over a 5 year period)
  - It established a Climate Change Committee – an independent body to provide advice to government
  - The development of a National Adaptation Programme to manage the effects of unavoidable climate change.
- There is also supplementary legislation and policies covering a range of areas of government since including:
  - Net Zero Strategy (Build Back Greener)
  - Powering Up Britain: Net Zero Growth plan
  - Green Finance Strategy
  - Transport decarbonisation plan
  - Carbon Budget Delivery Plan
  - Energy Bill

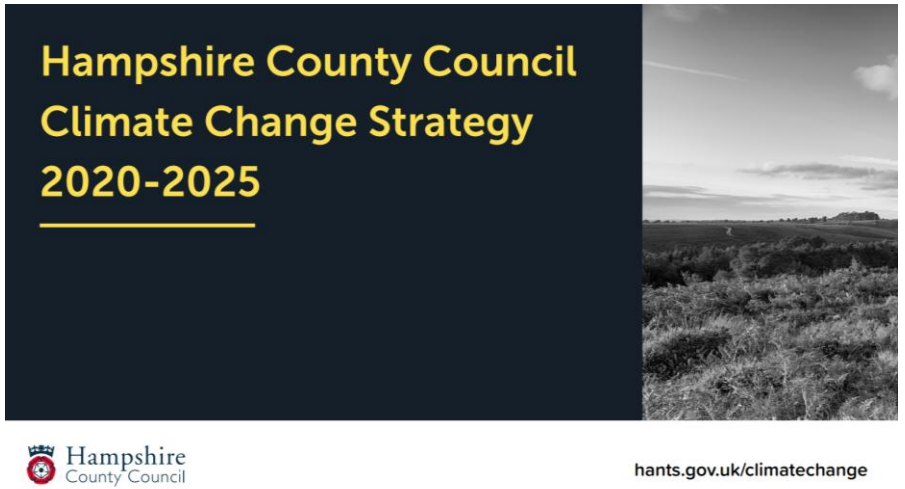
Climate Change Committee

Department for Energy Security & Net Zero

Hampshire County Council

- Hampshire County Council declared a climate emergency in 2019, and set two targets:
  - 2050 carbon neutrality
  - Preparing to be resilient to the impacts of a 2°C temperature rise

- The key principles of the council climate change strategy include:
  1. Carbon hierarchy to avoid, reduce, replace and offset emissions
  2. Co-benefits to be prioritised
  3. Actions to be proportionate, affordable and equitable
  4. Opportunities to accelerate where appropriate
  5. Receiving support from national government in funding and policy
  6. Development of innovation and digital solutions



Greenhouse gas emissions – Key messages

- Greenhouse gases have always been present in the atmosphere, however, burning fossil fuels has resulted in an increase of greenhouse gases. Currently levels are higher than at any point in the last 2 million years. This is leading to increased temperatures and changes to the climate.

- The largest emitters are higher income countries, and this pattern continues at local level with areas of greater affluence showing higher levels of greenhouse gas emissions per capita.

- The largest sources of global emissions are energy use by industry, agriculture, energy use in buildings and energy use in transport

- The largest sources of emissions deemed to be within the scope of influence of Hampshire County Council are transport and domestic

- Emissions are still increasing which adds to the concentrations of greenhouses gases in the environment which means that even if all emissions stopped there would still be changes to the climate due to the emissions that have already taken place. But by reducing emissions we can try to reduce these impacts.

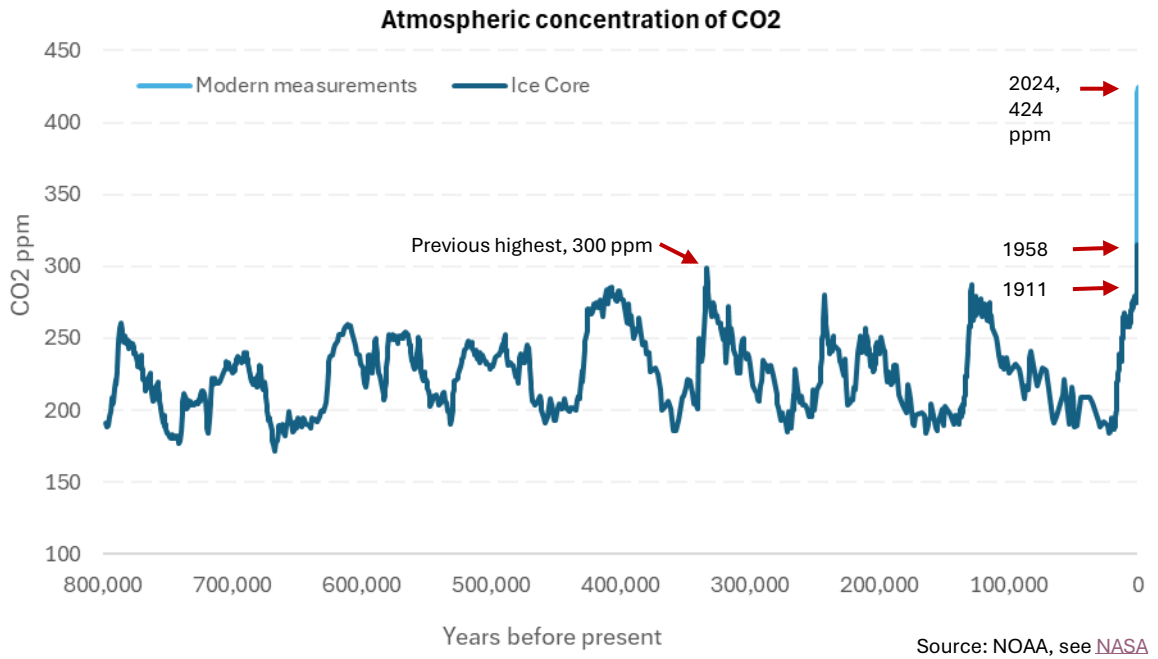
- Actions to reduce carbon emissions include using greener methods of transport and improving the energy performance of homes by increasing insulation and energy efficient heating.

Increasing greenhouse gases is causing the climate to change

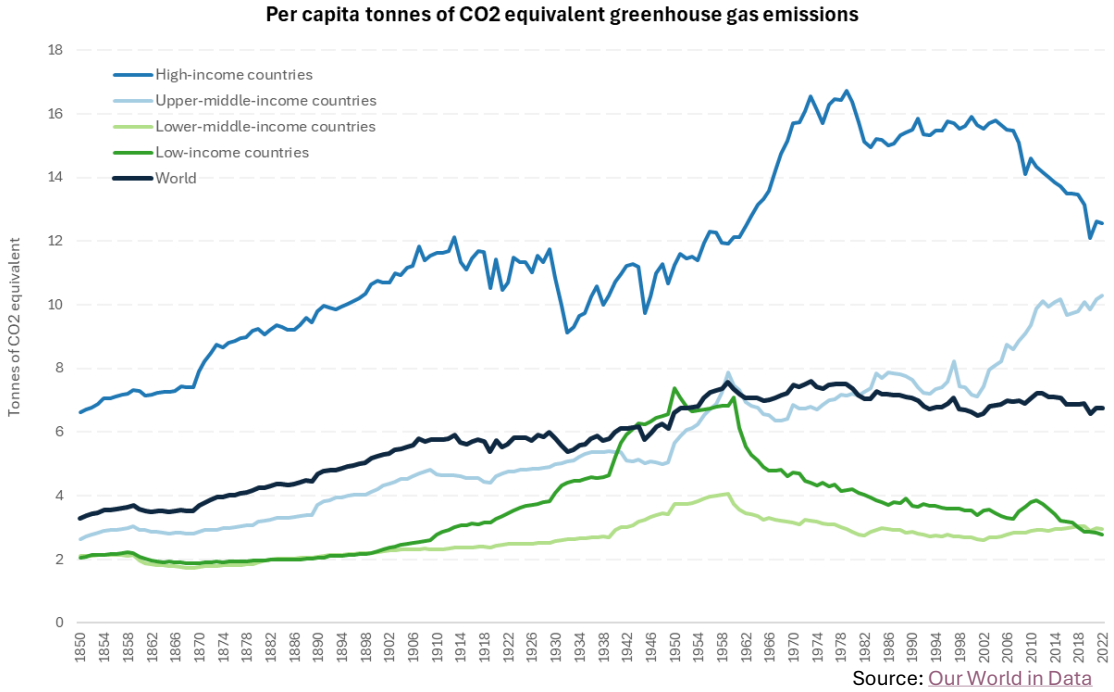
Climate change refers to long-term shifts in global temperatures and weather patterns. These shifts can be the result of natural impacts, for example changes in the sun's activity or large volcanic eruptions, however, since the 1800s, human activities have been the main driver of climate change. This is mainly due to the burning of fossil fuels like coal, oil and gas.

Burning these fossil fuels generates greenhouse gas emissions. These act like a blanket wrapped around the Earth, trapping the sun's heat and raising temperatures. The concentration of carbon dioxide levels in the atmosphere have shown a sharp increase since 1900 and greenhouse gases are now warming the world faster than at any time in at least the last two thousand years. The last time atmospheric carbon dioxide amounts were this high was around 2 million years ago, during the Mid-Pliocene Warm Period, when global surface temperature was 2.5 - 4°C warmer than during the pre-industrial era. Sea levels were at least 16 feet higher than in 1900 and possibly as much as 82 feet higher.[1]

The main types of greenhouse gases are carbon dioxide, methane and nitrous oxide. In 2022, carbon dioxide emissions made up the greatest proportion (around 75% of emissions), followed by methane (19%) and nitrous oxide (6%).[2] However, both methane and nitrous oxide are much stronger greenhouse gases than carbon dioxide and contribute more to global warming per tonne.



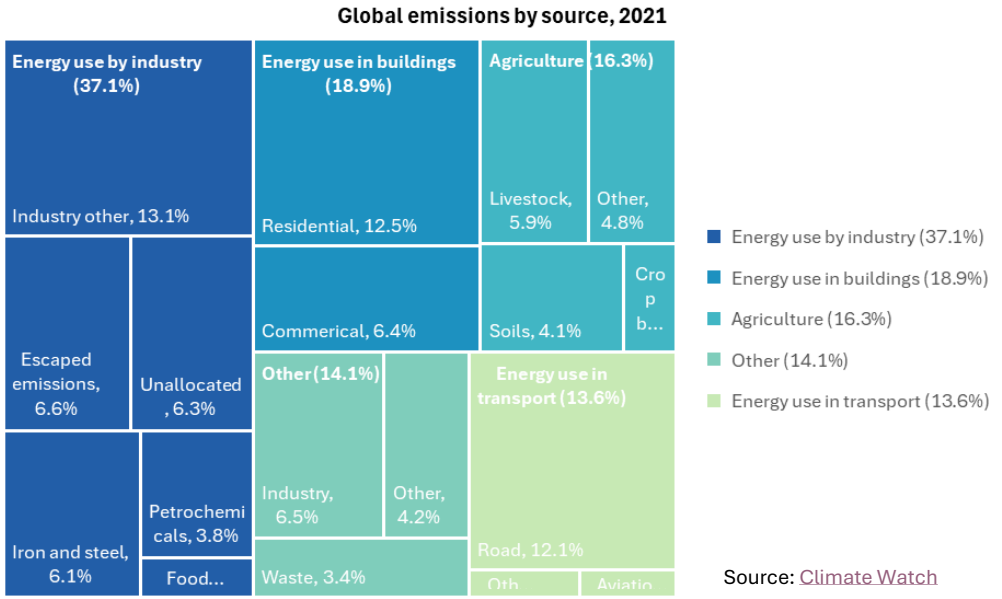
Source: NOAA, see NASA



Source: Our World in Data

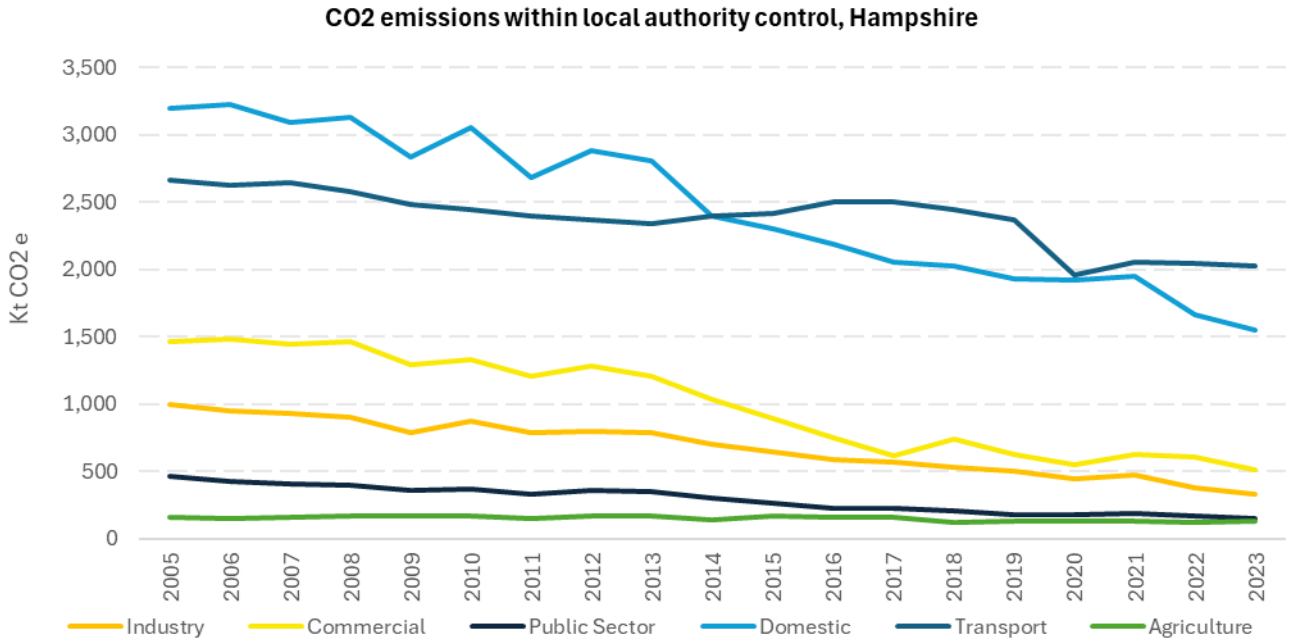
The levels of emissions of greenhouse gases has not been evenly split around the world. Higher income countries have contributed the most to the climate crisis – they show long term higher rates of CO2 emissions than lower income countries.

The largest global source of emissions was energy use by industry, followed by energy use in buildings and then agriculture.

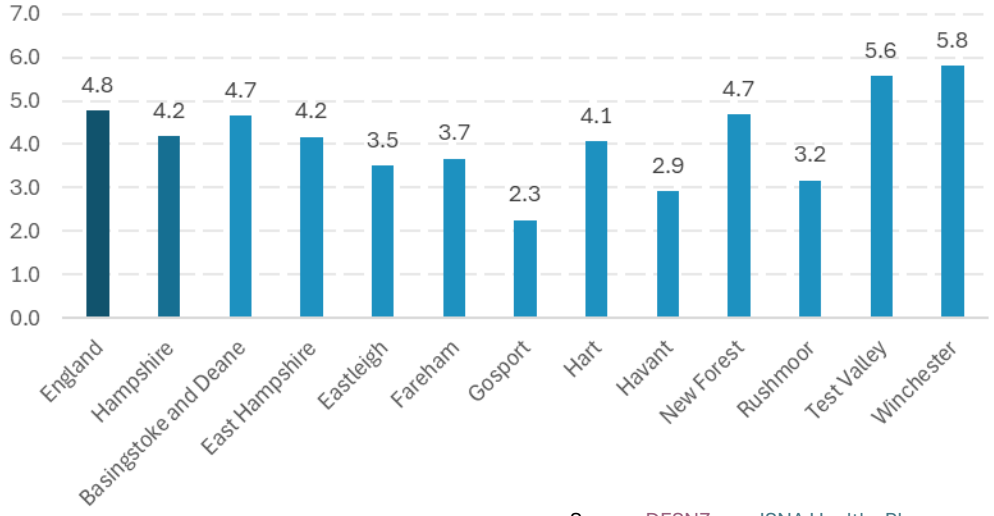


Source: Climate Watch

Local greenhouse gas emissions



Source: DESNZ, see JSNA Healthy Places



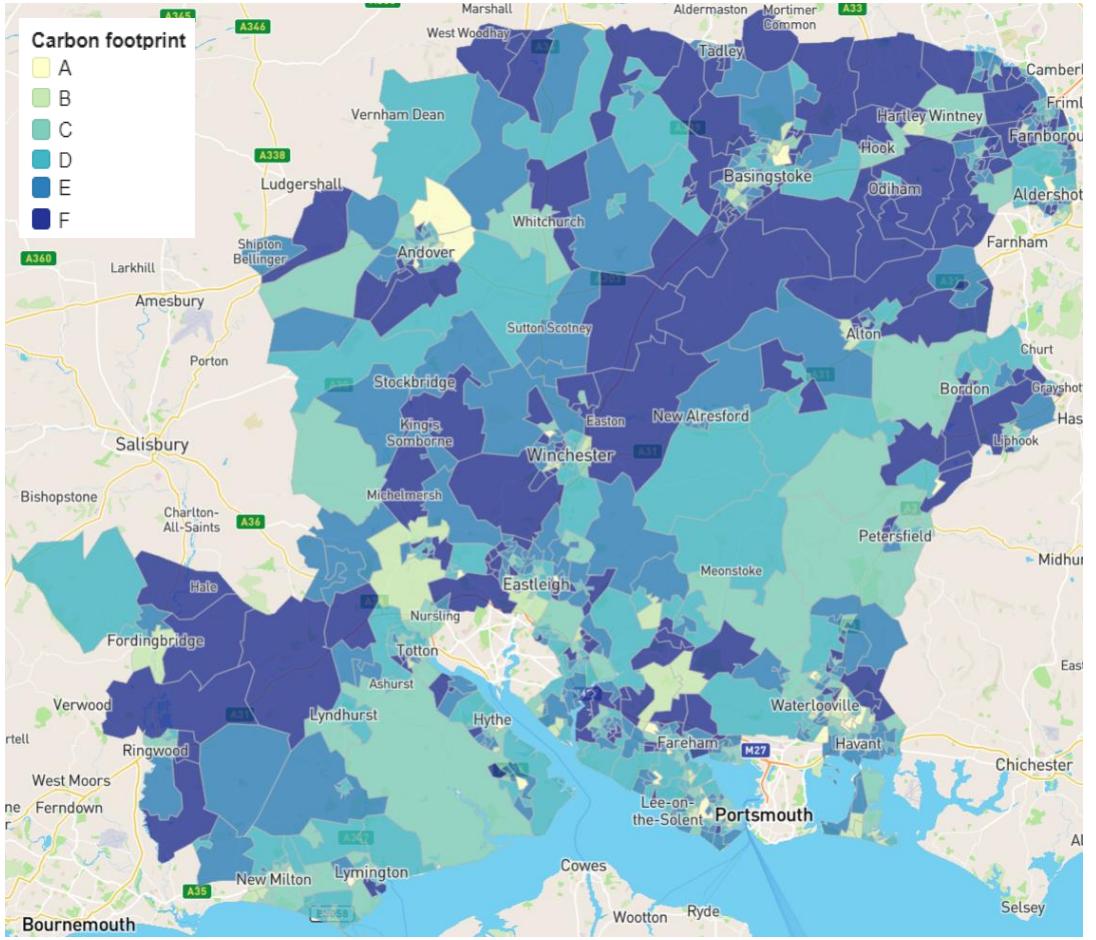
Source: DESNZ, see JSNA Healthy Places

Greenhouse gas emissions per capita are lower in the districts with higher rates of deprivation in Hampshire: Gosport, Havant and Rushmoor. Additionally, the Neighbourhood carbon footprint, shows that wealthier neighbourhoods and areas with older populations, and possibly older housing stock with lower energy efficiency, have worse carbon footprints than areas of higher deprivation.

The levels of emissions produced by each sector in Hampshire shows a different pattern to that shown globally. This data shows the CO2 emissions that are deemed to be within the scope of local authority influence and the highest categories are transport and domestic.

However, a global pattern that does continue in Hampshire is higher levels of emissions made by areas of higher affluence.

Neighbourhood carbon footprint (A = lowest)



Source: Friends of the Earth

Heat – Key messages

- Increased temperatures due to climate change have already begun. 2024 was the hottest year on record and according to some estimates the average global temperatures were 1.6°C above pre-industrial levels. This is the first year to break the 1.5°C target set out by the Paris Agreement.

- Various models have been developed by the IPCC and others which predict the amount of global warming based on different scenarios of fossil fuel use in the future, ranging from a 1.5°C increase in global temperature to a 4°C increase in global temperature

- Temperatures in the UK and in Hampshire are also expected to rise, resulting in:
    - Increased heat waves
    - Longer heat waves
    - Higher average summer temperatures
    - Warmer winters

- High temperatures have significant impacts on the body, especially for older or younger people, or those with long term conditions such as heart or lung conditions, diabetes, kidney disease, Parkinson's disease, dementia or severe mental illness. Those with disabilities or other mobility problems will also be especially impacted.

- Additionally, those people with increased exposure (outdoor working, accommodation that can't be adapted to the heat, for example high rise flats) will also be at risk during heatwaves.

- Increased temperatures will result in increased hospital admissions and deaths during hot weather, however, there will also be an impact of fewer admissions and deaths due to cold weather.

- Areas in Hampshire where people who are most at risk live include areas where older people are living in areas of greater deprivation, e.g. Aldershot town, New Milton and Lymington in the New Forest, Romsey, Gosport town centre, Waterlooville and Hayling Island.

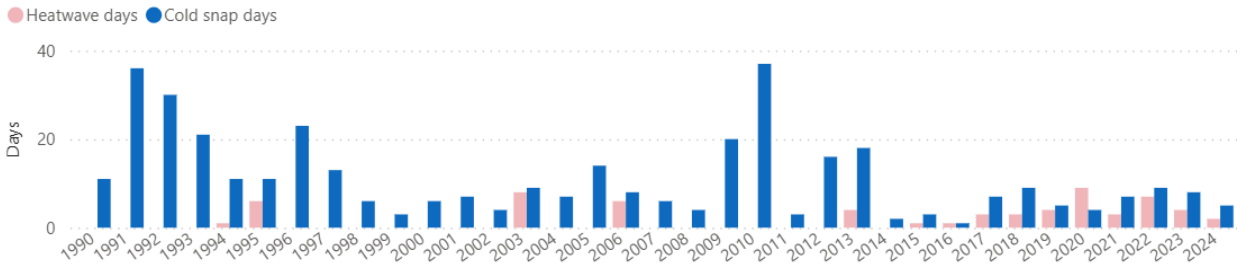
- Mitigating actions include changes to building and town planning to incorporate additional green spaces and tree cover, increased ventilation and reflective surfaces.

Climate change includes rising global temperatures

The changes to the climate from increased greenhouse gases are already being seen. Global temperatures are increasing and 2024 was the warmest year recorded (since 1850), with average global temperatures between 1.29°C and 1.60°C higher than the late 19th century average.[1,2] All 10 of the worlds warmest years have occurred since 2010.[3] Global warming is not even across the world, with certain areas showing greater increases in temperatures than others, e.g. the Arctic is warming faster than most other regions.

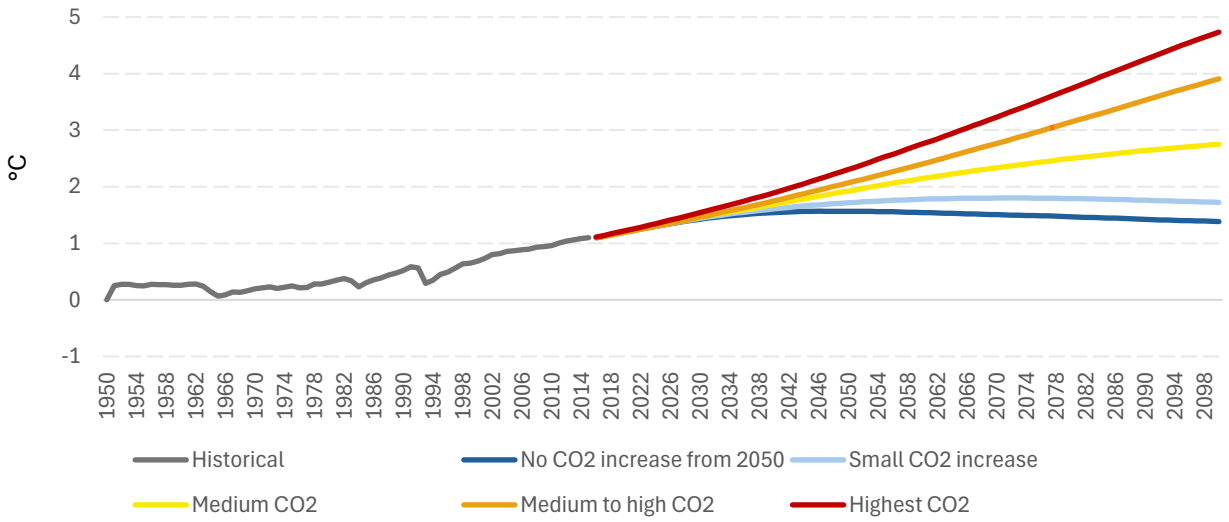
In the UK, all the 10 warmest years have occurred since 2002, with temperatures higher than 40°C recorded for the first time in 2022. Temperatures in Hampshire have shown changes since 1997, with an increase in the number of heatwaves and a smaller number of cold snaps.

Hampshire heatwave and cold snap days



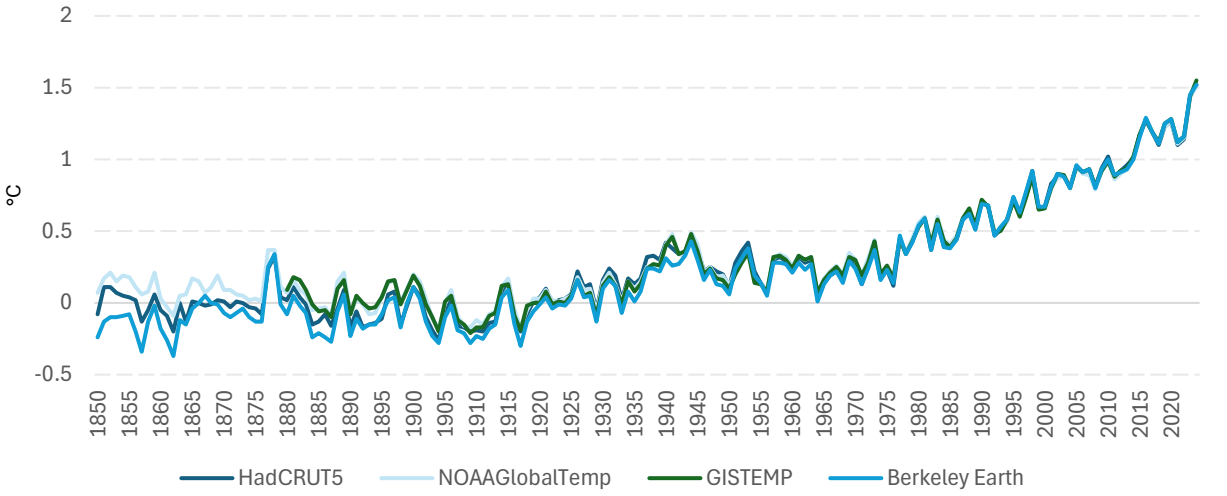
Source: CEDA, see JSNA Healthy Places

Projected global mean temperature increase (°C)



Source: IPCC WG1, 2021 via CEDA

Difference in global mean temperature from average 1850-1900 (°C)



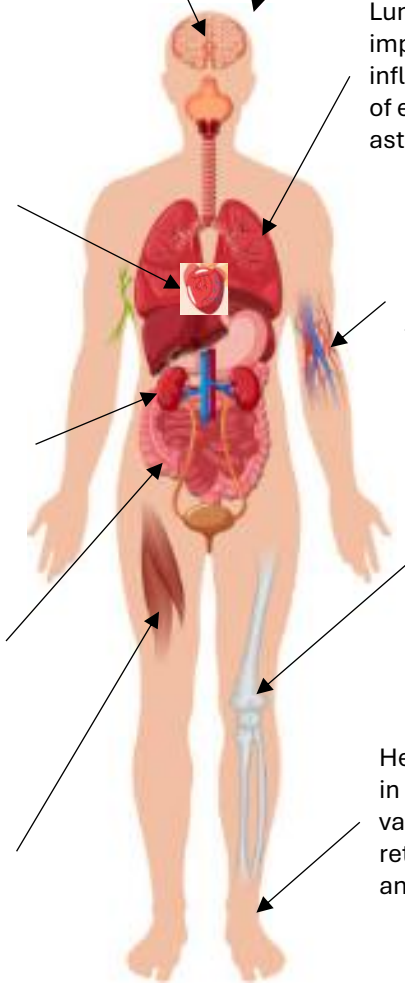
Source: Various studies via Met Office climate change dashboard

Predicting how the climate and temperatures will continue to change depends on many variables, especially the amount of fossil fuels used in the future. The IPCC has developed several scenarios of Global Warming Levels (GWL) which show different levels of temperature increase, however, in all scenarios the temperature increases will continue to increase to around 2050. In the UK it is predicted that there will be hotter drier summers, warmer wetter winters and increasing extreme weather events.

Predicted changes in Hampshire[4]	1981-2000	1.5°C GWL	2°C GWL	4°C GWL
Average summer day	16.1°C	17.5°C	18.3°C	20.6°C
Hottest summer day	29.4°C	32.3°C	33.0°C	36.7°C
Days per summer above 25°C	15 days	30 days	37 days	71 days
Days per summer above 30°C	1 day	4 days	6 days	21 days
Days per summer above 35°C	0 days	0 days	1 day	4 days
Nights per summer above 20°C	0 nights	0 nights	0 nights	4 nights

High temperatures can have serious impacts on health

Impacts of heat on the body[1,2,3,4]



Brain: Dizziness and fainting, headaches, confusion, loss of consciousness, seizures, worsening of mental health conditions due to discomfort and potential sleep disturbances

Immune system: Heat can suppress immune function making the body more susceptible to infections

Lungs: Lung function can be impacted, causing inflammation and exacerbation of existing conditions like asthma or COPD

Heart: Heat can put strain on the heart by increased heart rate, blood pressure drops, increased risk to those with existing heart conditions

Skin: Increased risk of sunburn, plus increased blood flow to the skin can lead to heat rash

Kidneys: Dehydration can lower kidney function increasing risk of kidney injury

Inflammation: Increased temperatures can lead to an increase inflammatory markers, aggravating chronic conditions

Digestive system: Heat stroke can result in nausea, vomiting and damage to intestines

Heat oedema: mainly in the ankles due to vasodilation and retention of water and salts

Muscles: Heat cramps caused by dehydration and loss of electrolytes

Groups of the population most vulnerable to increased heat:[5]

- Older age: those over 65 years old, or those living on their own and who are socially isolated, or those living in a care home
- Babies or children aged 5 years and under who may find it difficult to control their temperature
- Chronic and severe illness: including heart or lung conditions, diabetes, kidney disease, Parkinson's disease, dementia or severe mental illness. Also, those with disabilities or other mobility problems
- Environmental factors and overexposure: living in flats especially on higher floors or other accommodation that is difficult to adapt, being homeless, those taking part in activities or jobs that are in hot places, outdoors or include high levels of physical exertion. An estimated 80% of UK homes overheat in the summer.[8]

The Heat Index[7]

Government guidance suggests that the most vulnerable people struggle to cool themselves once temperature reaches 26°C. The heat index combines temperature and humidity and provides a 'feels like' measure for temperature.

Humidity levels in the UK during summer vary between around 60-95% which means that increased heatwaves and rising temperatures due to climate change will lead to increased risks to health.

Heat Index	Warning	Health impact
<26	Safe	No adverse effects due to heat
27 to 32	Caution	Fatigue possible with prolonged exposure or physical activity
33 to 40	Extreme caution	Heat stroke, heat cramps or heat exhaustion possible with prolonged exposure or physical activity
41 to 51	Danger	Heat cramps or heat exhaustion likely and heat stroke possible with prolonged exposure or physical activity
52 to 92	Extreme danger	Heat stroke highly likely
>93	Beyond threshold	Heat too high for humans

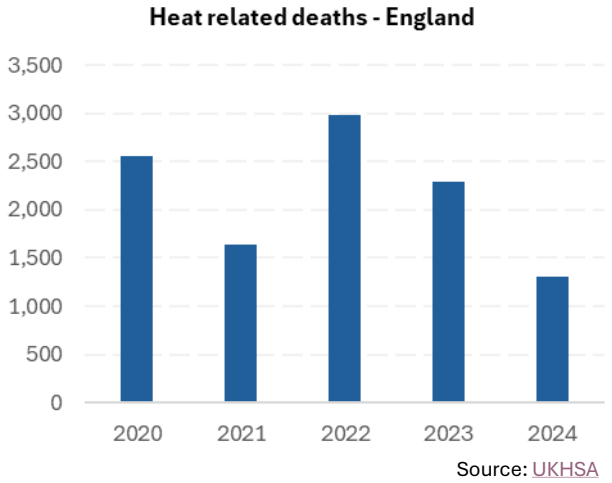
Temperature (°C) \ Relative humidity (%)	40	45	50	55	60	65	70	75	80	85	90	95	100
23	22	22	22	23	23	23	23	24	24	24	24	24	25
24	23	23	24	24	24	24	25	25	25	25	25	26	26
25	24	25	25	25	25	25	26	26	26	27	27	27	28
26	25	26	26	26	26	27	27	27	28	28	29	29	30
27	27	27	27	27	28	28	29	29	30	30	31	31	32
28	28	28	28	29	29	30	30	31	32	32	33	34	36
29	29	29	30	30	31	31	32	33	34	35	36	39	48
30	30	31	31	32	32	33	34	35	36	38	43	53	60
31	31	32	33	33	34	35	36	38	39	47	57	61	63
32	33	33	34	35	36	38	39	41	50	59	62	64	67
33	34	35	36	37	39	40	42	53	60	63	65	68	71
34	36	37	39	40	41	43	54	61	63	66	69	72	74
35	37	39	40	42	44	55	61	64	67	70	73	76	78
36	39	41	43	45	55	61	64	67	70	73	77	80	83
37	41	43	45	54	61	64	68	71	74	77	80	84	87
38	43	46	51	61	64	68	71	74	78	81	85	88	91
39	46	49	60	64	67	71	75	78	82	85	89	92	95
40	48	59	63	67	71	74	78	82	86	89	93	96	100
41	54	62	66	70	74	78	82	86	90	93	97	101	105
42	60	65	69	73	78	82	86	90	94	98	102	105	109
43	63	68	72	77	81	85	90	94	98	102	107	110	114
44	66	71	76	80	85	89	94	98	102	107	111	115	119
45	69	74	79	84	89	93	98	102	107	111	116	120	124

Impact of rising temperatures on mortality and hospital admissions

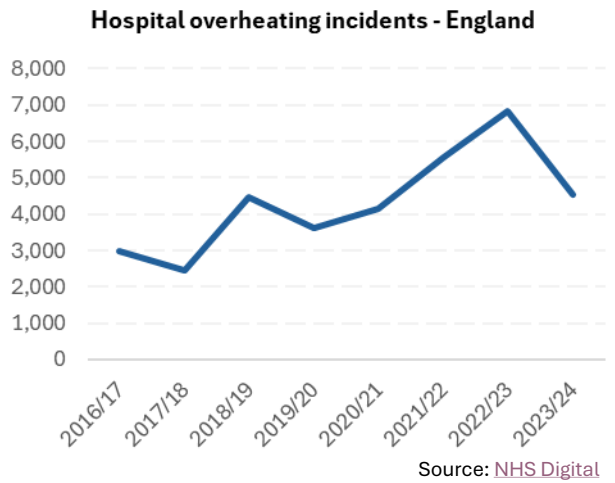
It has been estimated that globally extreme heat results in greater loss of life than floods, earthquakes and hurricanes combined, accounting for around 500,000 lives per year.[5] There an estimated 2,000 heat related deaths in England each year[2] and around 12,000 heat related hospital admissions.[1] This is still much lower than the estimated annual cold related deaths of 13,400 per year[8] and the significant pressures placed on the NHS during the winter months due to increased admissions.

UKHSA provide annual heat related mortality reports which reported that in 2024[2]:

- The South East of England had the highest number of heat-related deaths at 259 and other reports have suggested that the relative mortality risk in the South East increases from around 22°C.[3]
- 72 of these deaths occurred across Hampshire and the Isle of Wight.
- The highest number of deaths occurred in those aged 85 and over, followed by those aged 75 to 84 years. This is supported by findings from other reports which stated that risk is higher for those aged 70 and over. [4]
- There was no significant difference in mortality rate between men and women.
- The highest numbers of deaths occurred in care homes (496), hospitals (473) and in own homes (358). There was no significant heat associated mortality for those who died in hospices.
- The leading causes of death was circulatory diseases (440), followed by dementia (229) and cancer (201). These findings were supported by other research and are identified as risk factors in the Adverse Weather and Health Plan.[9]
- Other research has identified socioenvironmental factors that increase mortality risk including: ethnic minority groups, those living in more deprived areas, those with higher alcohol intake, and those with higher BMI.[10]
- Due to lower rates of death after heat waves data suggests that deaths among vulnerable individuals are 'brought forward' to within the heat-periods.[4]



Source: UKHSA



Source: NHS Digital

Building models to investigate how climate change will impact mortality and hospital admissions in the UK is very challenging due to the number of variables that will change:

- Firstly, the change in temperature and number and intensity of heat waves will change depending on the emissions scenario. Weather will still also vary from year to year, with cold snaps and cooler summers still possible.
- Secondly, the population will age and factors such as increasing obesity may change the health of the population.
- Additionally, as the climate warms there will be fewer cold days, leading to fewer winter related hospital admissions and deaths. In many models this factor has not been included.

Some reports estimate there will be at least 10,000 deaths per year by 2050[7] or 30,000 deaths per year by the 2070s due to the increased heat and ageing population.[6] One model that looked at hospital admissions between 2010 and 2018 and adjusted for the fewer cold days reported that the net change in admissions was an increase of 8,000 per year (12,000 heat related admissions but also around 4,000 fewer cold related admissions).[1]

Overheating in hospital buildings is another consideration during heatwaves. It has been estimated that 90% of hospital buildings are vulnerable to overheating and that buildings are at risk of high indoor temperatures even during summers without heatwaves.[11] NHS data shows that in 2023/24 there were 4,551 overheating incidents in hospitals in England, down from a high of 6,822 the previous year.[12]

Impact of heatwaves on air pollution

Air quality has improved significantly since the 1980s and is still improving gradually.[1] The proportion of deaths attributable to particulate air pollution has declined from 7.1% in 2018 to 5.8% in 2022 in England and from 7.4% to 5.8% in Hampshire.[2] However, air pollution has negative impacts on health throughout the life course and new evidence is still emerging. There are also groups of people who are particularly at risk of poor health impacts from air pollution including children, pregnant women, and those with respiratory or cardiovascular conditions.[1,6]

The impact of climate change on air pollution is uncertain and may depend on the season[1]:

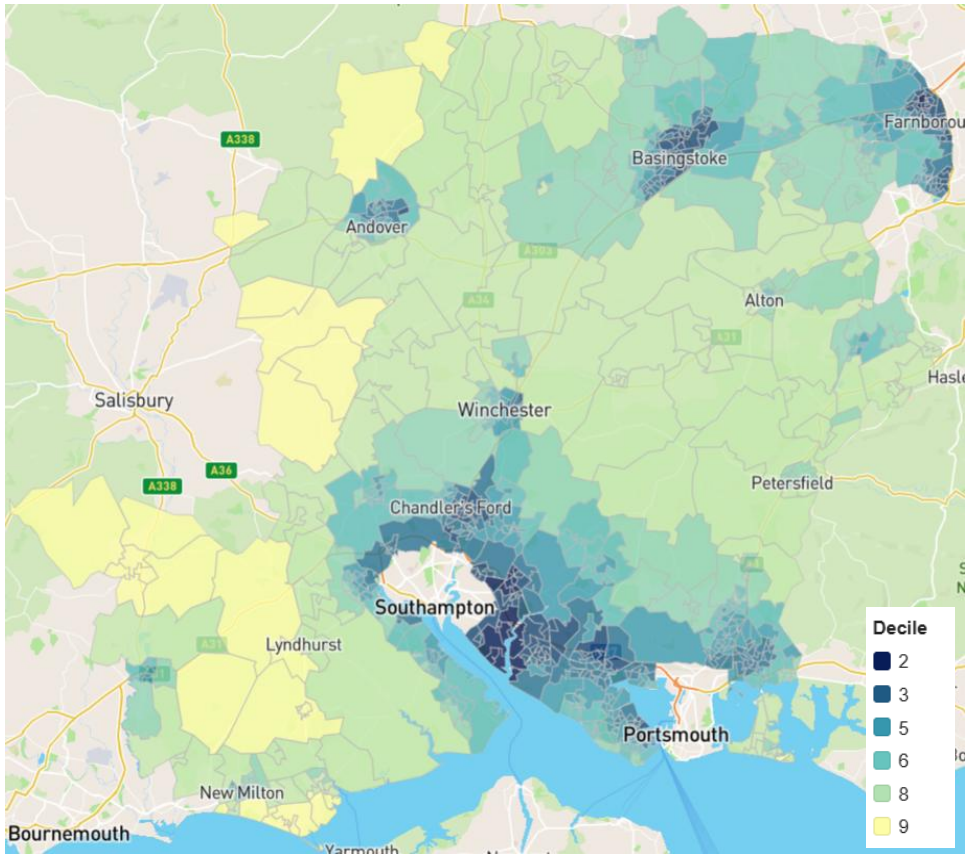
- Summer: worse air quality due to increased high-pressure stagnation events, increases in emissions from some sources, e.g. nitrogen oxides from soils, and increased wildfires due to increased heatwaves.
- Winter: improved air quality due to wet deposition of pollution and increased atmospheric mixing due to wetter stormier weather.

There are different forms of air pollution and different sources, the main ones are[7]:

- Particulate Matter: either naturally occurring, e.g. sea spray or dust, or man made, e.g. soot, ash, tyres, break wear
- NO2: road transport, especially diesel light duty vehicles (vans), gas boilers, industrial processes
- SO2: industrial and domestic combustion and electricity generation using coal or oil

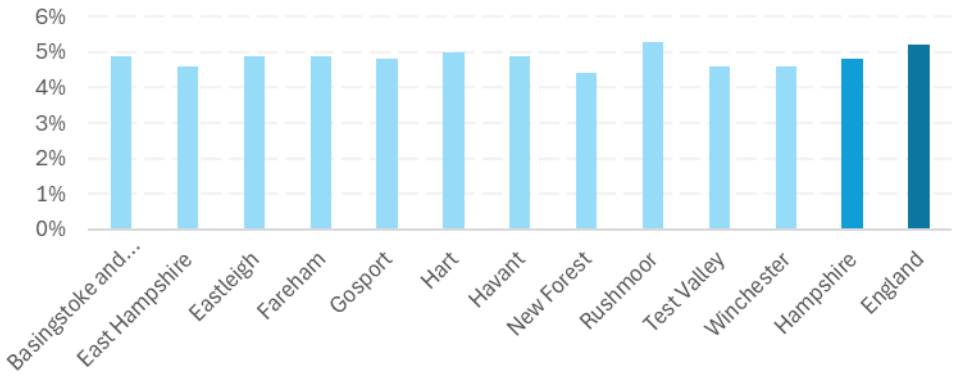
There are many different pieces of legislation and guidelines relating to air pollution, most of which focus on reducing air pollution by reducing 24hour or annual mean levels of different pollutants.[3,4] These many rules are confusing as they are not consistent and because air pollution is very challenging to measure. All the country wide data available is modelled, the lowest geography by square km,[5] however, even within a km there can be a lot of variation and interventions like traffic calming measures may shift air pollution to other areas, which may not be identified in this type of data.

Air quality, all pollutants, 2024 (1 = worst air quality)



Source: AHAH, see JSNA Healthy Places

Deaths attributable to particulate air pollution, 2023



Source: Fingertips, DHSC

Across Hampshire the areas that experience greater impact from poor air quality are those more urban areas: towards the east in Rushmoor, the town centre of Basingstoke, and then towards the south of the district around Hedge End and Fareham. The more rural areas in Test Valley and the New Forest especially have lower levels of air pollution and also a lower proportion of deaths attributable to air pollution.

Local areas of vulnerability to increased heat

This map shows a heat vulnerability index which includes variables to identify areas where greater numbers of people most at risk from heat waves are living (darker colours on map). Factors include:

- **Sensitivity**: older people (aged 75+) and younger people (aged under 5), and those with ill-health or disabilities.
- **Ability to prepare**: unemployment, low-income, older people in deprivation, tenure (social / private renters), language barriers, internet speeds.
- **Ability to respond**: unemployment, low-income, older people in deprivation, language barriers, internet speeds, single pensioner households, those with ill-health or disabilities, lack of private transport, high crime, built up areas and lack of green space, lack of domestic gardens.
- **Ability to recover**: unemployment, low-income, older people in deprivation, language barriers, internet speeds, single pensioner households, those with ill-health or disabilities, lack of private transport, distance to GP and hospital.
- **Enhanced exposure**: built up area (urban heat island effect), lack of gardens, green space, household overcrowding, high-rise homes, homelessness.

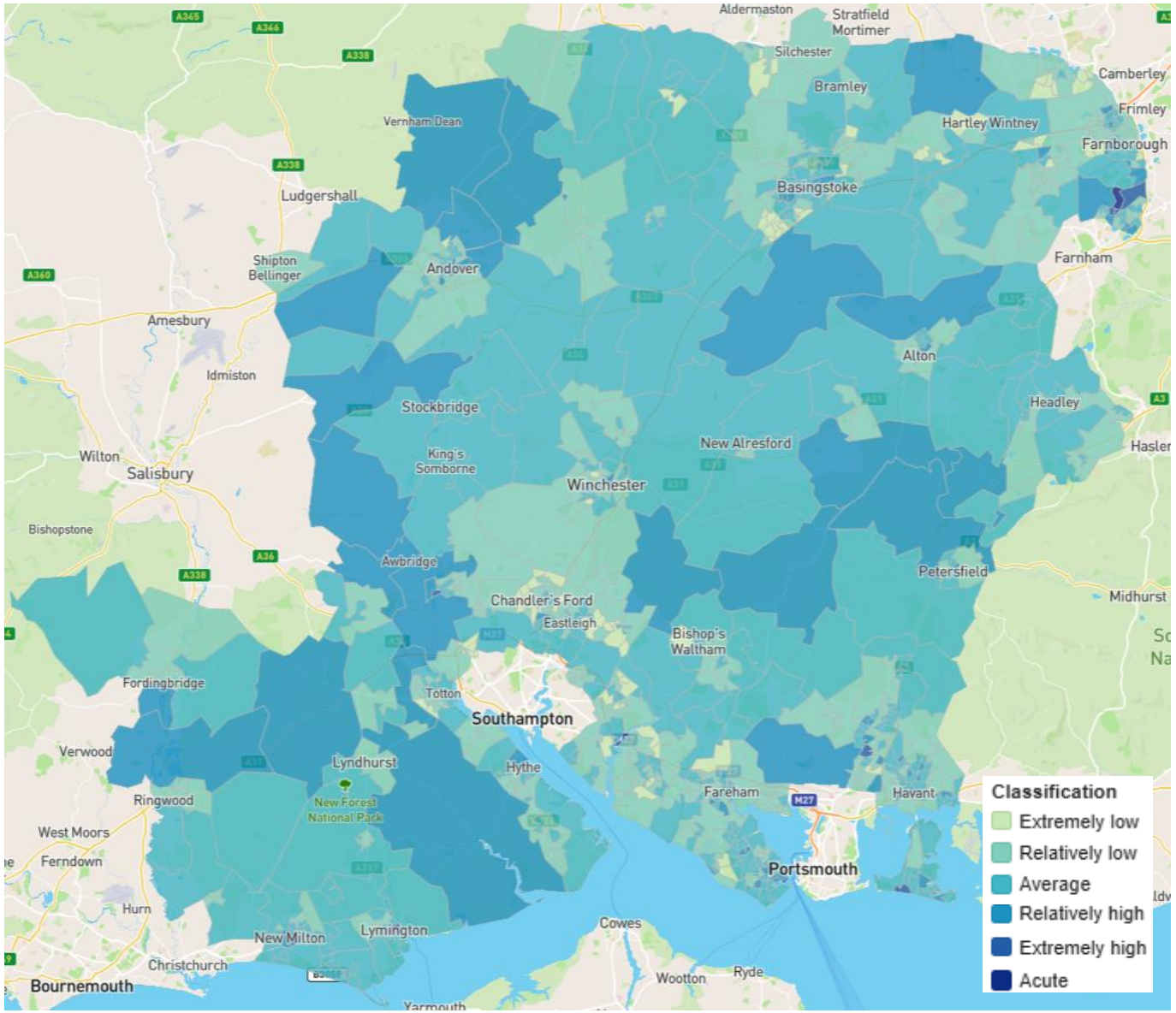
In Hampshire, the areas most vulnerable to heatwaves (classed as acute or extremely high) included:

- Aldershot in Rushmoor,
- Gosport town centre,
- Waterlooville and south Hayling in Havant,
- Lymington and New Milton in the New Forest,
- Romsey town in Test Valley.

Additionally other areas with relatively high risk included many rural areas where there is a larger population of older people.

The population in Hampshire is ageing and the number of people aged 75 and over is projected to increase by 43% between 2023 and 2043, whereas the total population is expected to increase by 5%.[1] The New Forest is currently the area with the highest numbers of people aged 75+ (30,300) and although the percentage increase is lower than other areas in Hampshire (41%) it will remain the area with the highest numbers in 2043 (42,800). The areas with the highest increases in 75+ people are East Hampshire (53%), Gosport (52%) and Winchester (51%). Increasing vulnerability to heat waves will be found in areas of higher proportions of older people, especially where is there is increased deprivation and ill-health.

Heat Vulnerability Index, 2022 (Acute = most vulnerable)



Source: Climate Just, see JSNA Healthy Places

What actions can we take to mitigate increasing temperatures?

Housing in the UK has been built to keep houses warm in winter and much of the recent regulations have been designed around keeping homes warm. However, with the increasing heat waves and high temperatures in the summer new regulations are needed to make sure that homes can also been kept cooler in summer. Overall research has found that currently 20% of homes overheat in current summer temperatures[3], specifically:

- a higher proportion of homes in the most deprived quintile are likely to overheat compared with the least deprived quintile (48% to 17%)
- Socially rented homes are most at risk of overheating (66%), compared with 55% of private rented and 17% of owner occupied
- 60% of homes with young children overheat
- Almost half of ethnic minority households overheat
- Overheating is more common in flats, small homes, overcrowded homes and those areas which experience the urban heat island effect.

One of the main solutions to increasing temperatures is air conditioning. However, this increases energy use and studies have suggested that it can make cities hotter by more than 2ºC by pumping out hot air from buildings into the streets.[1] Air conditioning could be reserved for those places most in need, for example, hospitals, care homes, nurseries, public transport, or public cooling centres.

There are also many low carbon alternatives to air conditioning that could be implemented first. These can be grouped under different approaches:

Changing city design:

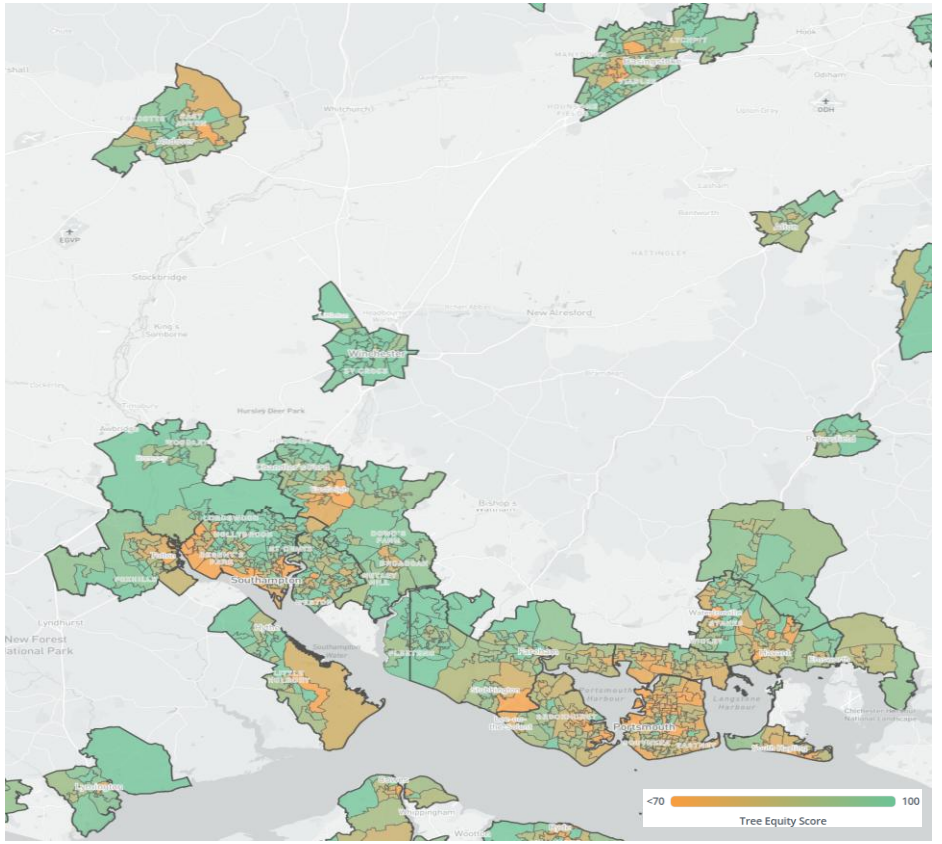
- Increasing tree cover and green spaces in cities
- Introducing water cooling methods, e.g. fountains, splash pads and spray parks[2]
- Reducing car usage

Adapting buildings:

- Reflective surfaces, e.g. window films
- Lighter colours on walls and roofs
- Improving ventilation
- External shading through trees, awnings, external blinds and shutters

Other aspects such as improving workers rights can also mitigate against the worse aspects of heat waves. For example, by introducing an upper limit for temperatures in offices and factories, and protection for those working outside, such as obligations to provide water, sun protection and rearranged hours to avoid the hottest part of the day. Additionally timely heat alerts from local authorities can allow people to plan better for heat waves.

Tree Equity Score (higher number = greater tree cover)



Source: Tree Equity Score UK

Tree Equity UK have mapped tree cover across the UK and other aspects which make people more vulnerable to the impacts of low tree cover including air pollution, proportions of children and older people, heat severity, and employment, health and income deprivation to create tree equity scores for urban areas. The map shows the urban areas of Hampshire with the lower scores (orange areas) being those with higher need for more trees.

In Hampshire, the areas most in need of additional tree cover were: South Ham and Houndmills in Basingstoke, around Picket Twenty and Walworth Business Park in Andover, around Blackfield and in Totton in the New Forest, Eastleigh town centre and towards Barton Park Industrial Estate, Solent Airport in Fareham , Gosport town centre, Havant town centre and areas of Leigh Park and Waterlooville.

Extreme climate events – Key messages

- Extreme events include heatwaves, droughts, storms, wildfires, flooding and landslides. There is increasing evidence to suggest that climate change is increasing the frequency and intensity of all these events. Not all countries will experience all types of extreme events, with some countries being particularly vulnerable to specific events.

- Whilst the data globally is showing an increase in these events, the pattern in the UK is less clear and predictions for the future differ. The changes that are most likely are an increase in heatwaves (as previously discussed) and an increase in frequency and intensity of winter storms.

- Extreme events have varying impacts on health including:
    - Physical injury
    - Trauma and mental health distress
    - Damage to homes and infrastructure / service access
    - Increasing food insecurity
    - Change in ecosystem including increasing airborne, waterborne or vector borne diseases

- Those groups that are the most vulnerable are those with reduced resources to prepare or recover from events, or those with existing medical conditions which would be exacerbated.

- Areas of Hampshire that would be the most vulnerable are those areas around the coast vulnerable to storm surges or rural areas where there would be increased risk of wildfires, e.g. the New Forest.

- Mitigating actions include improving early warning systems, improved management of forests and water supplies, and additional storm defences, especially coastal.

Increased heat is driving sea surface temperature rises and extreme climate events

Oceans cover 70% of the planet and form a vital part of the climate system by moderating the climate and slowing the impacts of global warming. The oceans soak up heat in the atmosphere and it is estimated that 90% of global warming is occurring in the ocean and the top few meters of the ocean can hold as much energy as the entire atmosphere.

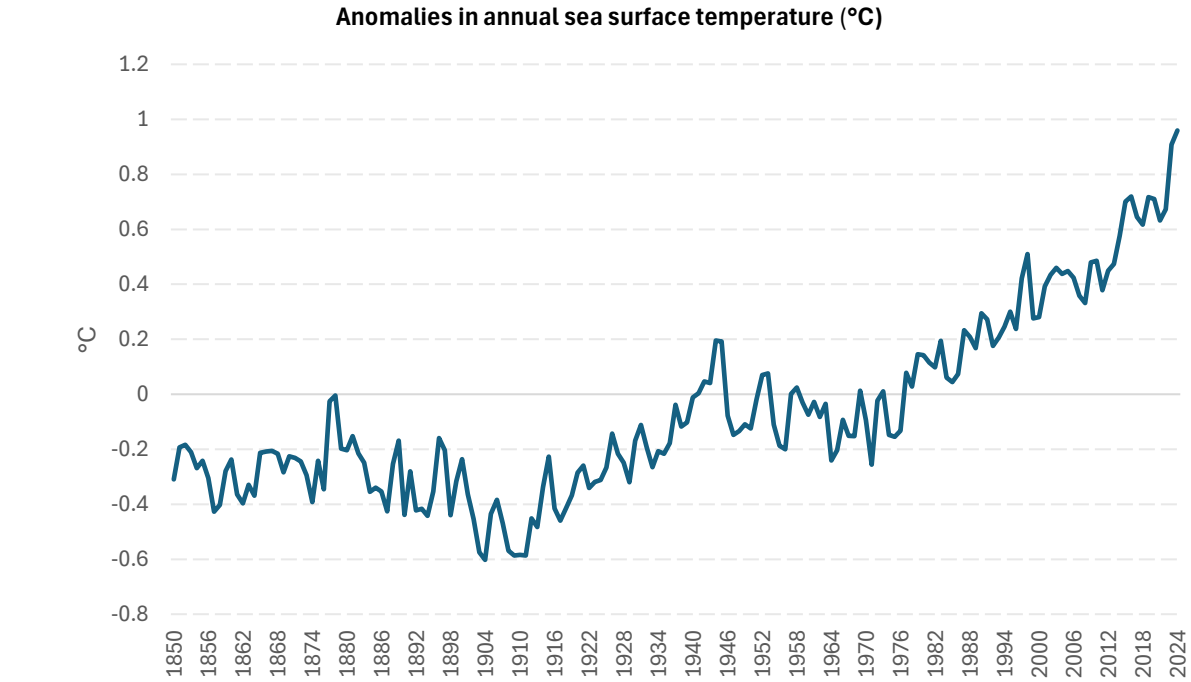
Heat stored in the ocean causes the water to expand which is responsible for an estimated third to half of global sea level rise. Much of the energy is stored at the surface of the ocean, between 0 to 700 meters, however the most warming is occurring in the top few meters of the ocean. This warming is happening throughout the oceans, however, regional fast warming hot spots include parts of the North Atlantic, the Indian Ocean, and the Arctic and Southern Oceans where warmer temperatures are contributing to ice sheets and glaciers melting.

Sea surface temperature patterns influence the climate system, by affecting atmospheric circulation. Changes to the circulation can influence weather patterns resulting in shifts in rainfall which cause some regions to experience intense rainstorms and flooding whilst exacerbating drought conditions and wildfires in other regions.[1,2,3]

Storms: Rising ocean temperatures are connected to other weather extremes, e.g. more intense hurricanes, rainfall and snowstorms. Storms may be more frequent, more intense and last longer. Warmer temperatures in the ocean intensify small storms cells into larger storm systems.[6]

Melting icecaps: Rising temperatures are increasing sea levels due mainly to thermal expansion, however melting ice caps results in more heat absorption, disruption of ocean current, and the loss of habitat.

Coral bleaching: Warming of 1.5°C will kill off 70-90% of coral reefs.[4] Increased heat causes stress to corals, resulting in them ejecting the algae and lose their color, giving rise to the term coral bleaching.

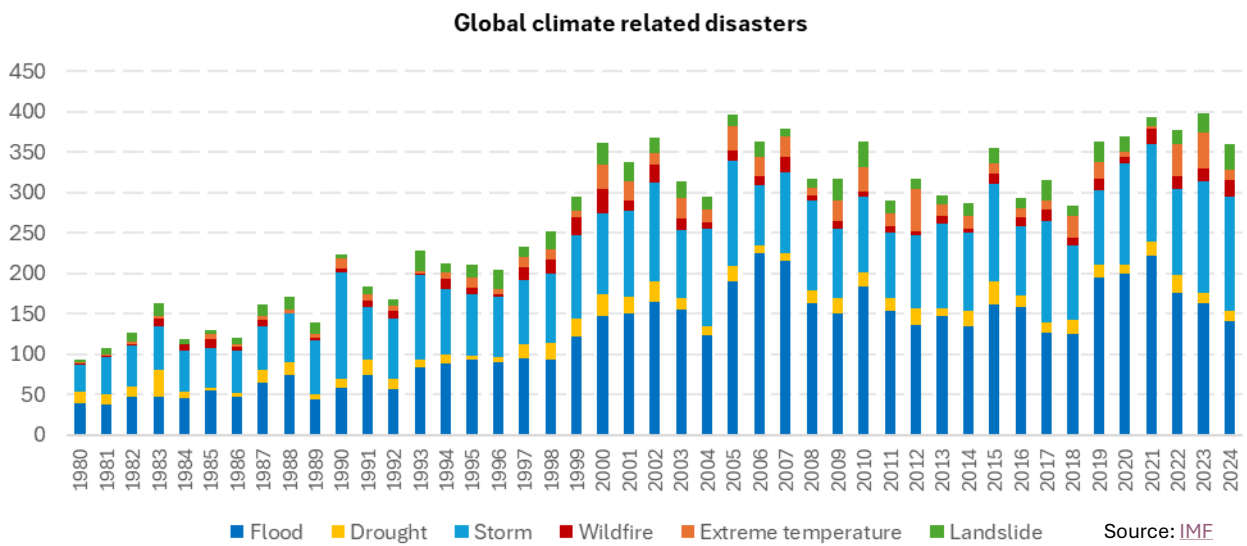


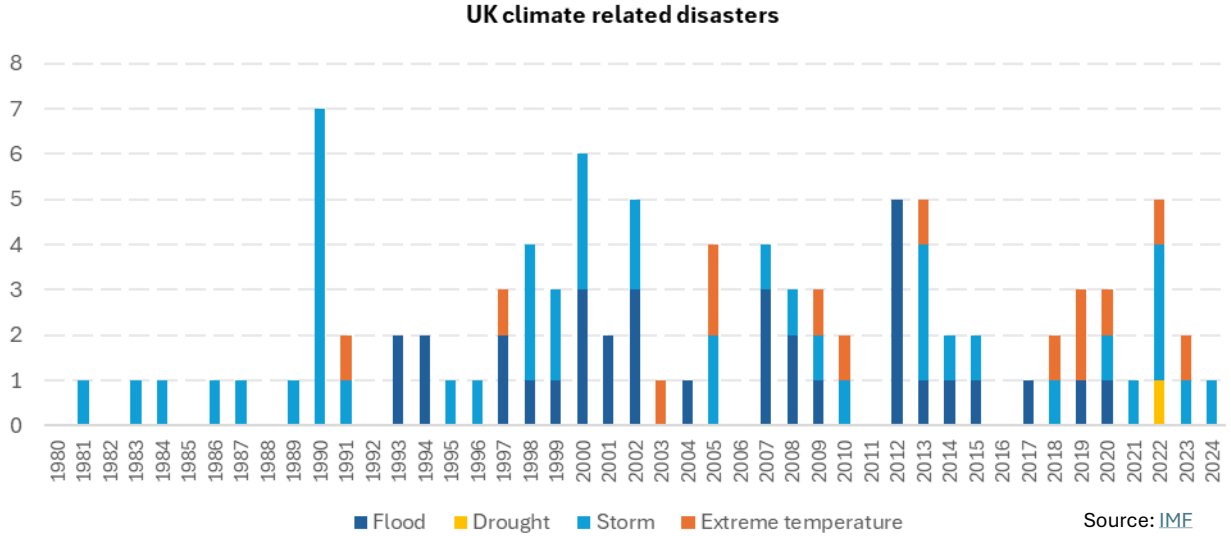
Source: Climate Copernicus

Ocean acidification: The pH of the ocean is now around 8.1, representing a 25 percent increase in acidity over roughly 250 years. Increased acid in the ocean impacts marine life, especially those animals that build shells like corals, clams and oysters.[5]

Changing habitats: due to higher temperatures, lower oxygen, resulting in shrinking habitats for some species and migration of other species into different areas of the oceans. This will disrupt existing ecosystems and also the economies based on fishing.

Patterns of increased extreme events are clear at a global level but less clear locally



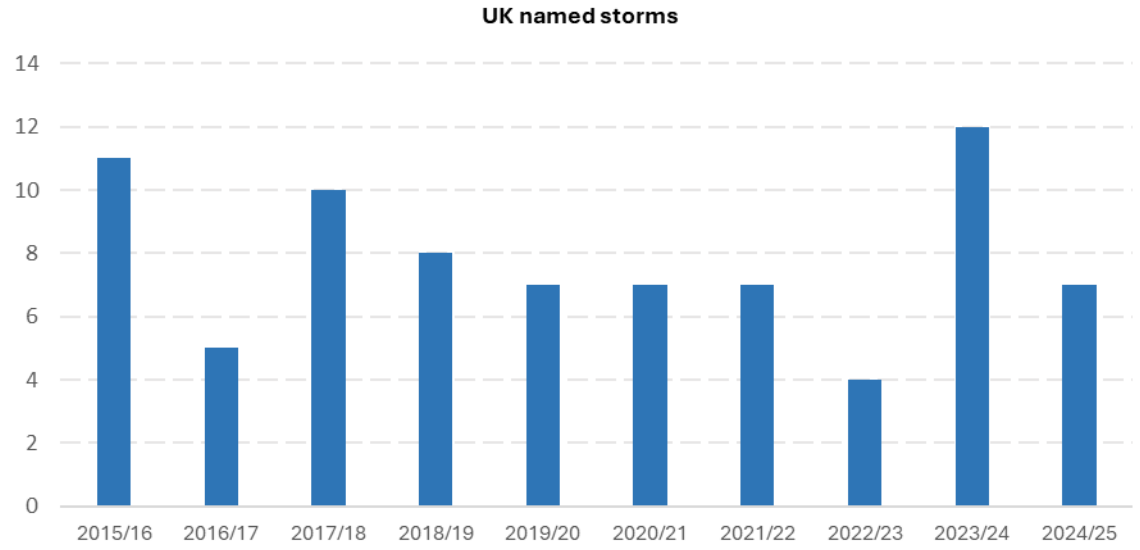


Recent evidence from NASA suggests a rise in the intensity of extreme events.[3] Attribution science is a growing area and refers to studies whether human influence on the climate contributed to extreme events by making them more likely or more severe. There is increasing evidence of a human contribution to extreme events, including 150 studies relating to weather events around the world which have suggested:

- Extreme heat: human influence indicated in almost all studies
- Drought: human influence shown in around half of studies
- Extreme rainfall: Human influence shown in an increasing number of studies
- Tropical storms: human influence here is more complex – suggestion that there is an increase in intensity and flooding surges, but a possible decrease in the frequency of storms.

It is predicted that the global frequency of tropical storms will either decrease or remain unchanged, whilst there will be increases in the maximum wind speeds, proportion of Category 4 and 5 storms, and rates of precipitation for tropical storms.

There is less pattern of extreme events shown for the UK. There is no obvious trend in UK named storms (storms that have the potential to cause disruption or damage which could result in an amber or red warning) due to how these naturally vary year-to-year and decade-to-decade. For the UK, most climate projections suggest that winter windstorms will increase slightly in number and intensity over the UK. However, this has medium confidence because a few climate models indicate differently.



Source: Met Office Storm Centre, see JSNA Healthy Places

Health impacts of extreme weather

Globally there are challenges of extreme events in specific places, e.g. landslides in China, wildfires in California or drought in Africa or South America. The extreme events that are most likely to impact the UK and Hampshire are storms, droughts, wildfires, heatwaves and flooding. Heatwaves and flooding health impacts are covered in greater depth in different sections of the report, however, the risks to health and the groups most affected by extreme events overlap.

		Direct impacts	Indirect impacts	Groups most at risk	Mitigating actions
Storms: As previously outlined the frequency and intensity of storms are likely to increase due to climate change. In Hampshire this could increase the frequency of named storms and the damage caused by these storms. Areas most at risk would be those areas by the coast.		- Physical injury - Trauma, including longer lasting mental health conditions - Damage to homes	- Damage to infrastructure resulting in reduced access to services[2]	- Older people and those with disabilities or health conditions - Those who are socially isolated, homeless or on low incomes	- Storm defences on the coast - Early warning systems - Emergency plans
Drought: The risk of drought in England is medium to high[6], and periods of prolonged hot dry weather are predicted to increase - increasing the likelihood of drought. This would result in reduced water availability for crop production and increase local food insecurity. There are 4 types of drought: - Meteorological – lack of rain - Hydrological – reduced levels in rivers, lakes, etc. - Agricultural – lack of water available for crops - Socioeconomic – lack of water impacting economic activities like industry		- Psychological distress and worsening mental health[1] - Airborne and dust related diseases - Water related diseases such as E-coli and algal bloom - Increased risk of wildfires	- Increased food insecurity - Ecosystem impacts including biodiversity loss and changes in breeding conditions for vectors.[2,3]	- Those with respiratory conditions or other existing health conditions - Those working outdoors - Older people and the very young - Homeless people[7]	- Improved water management over the longer term - Short term measures such as temporary use bands, like hosepipe bans
Wildfires: The risk of wildfires increases during times of drought and high temperatures. Globally wildfire season is starting earlier and lasting longer than 35 years ago.[5] Wildfires are predicted to increase in the UK and the areas most at risk in Hampshire are rural areas, especially the New Forest where there are a higher number of wildfires and fires in the open.[4] Although research has suggested that wildfires are becoming increasingly common in urban green spaces during heatwaves.[8]		- Physical injury - Trauma, including longer lasting mental health conditions - Damage to homes - Smoke presents increased health risks, especially for those with respiratory/cardiovascular conditions.[1]	- Damage to infrastructure resulting in reduced access to services	- Those with respiratory or other existing health or mobility conditions - Older people - Those living in mobile homes - Those in more rural areas, e.g. the New Forest	- Forest management - Ensure good access for emergency vehicles - Fire safety education

Flooding – Key messages

- Flooding can be caused by:
  - Rising sea levels and coastal storm surges
  - Flash or surface water flooding after intense rainfall
  - River flooding after intense or prolonged rainfall
  - Rising ground water levels.

- Climate change is increasing the risks of rising sea levels and intense rainfall whilst other human activity (such as building on flood plains) exacerbates the risks of flooding in other areas.

- In Hampshire there is predicted to be an increase in the amount of rain falling on the wettest days in both summer and winter, however, overall summers are expected to be drier with winters showing increased precipitation rates.

- There are a high number of residential properties at risk of flooding from river and sea floods in small areas of the New Forest, Basingstoke, Havant and Hart. However, there are additional areas that may be more vulnerable to negative impacts the negative impacts of floods due to reduced resources.

- The health impacts of floods are those that occur immediately such as injury and risk of drowning, and those which have longer lasting impacts including trauma, loss of housing, access to services and respiratory diseases.

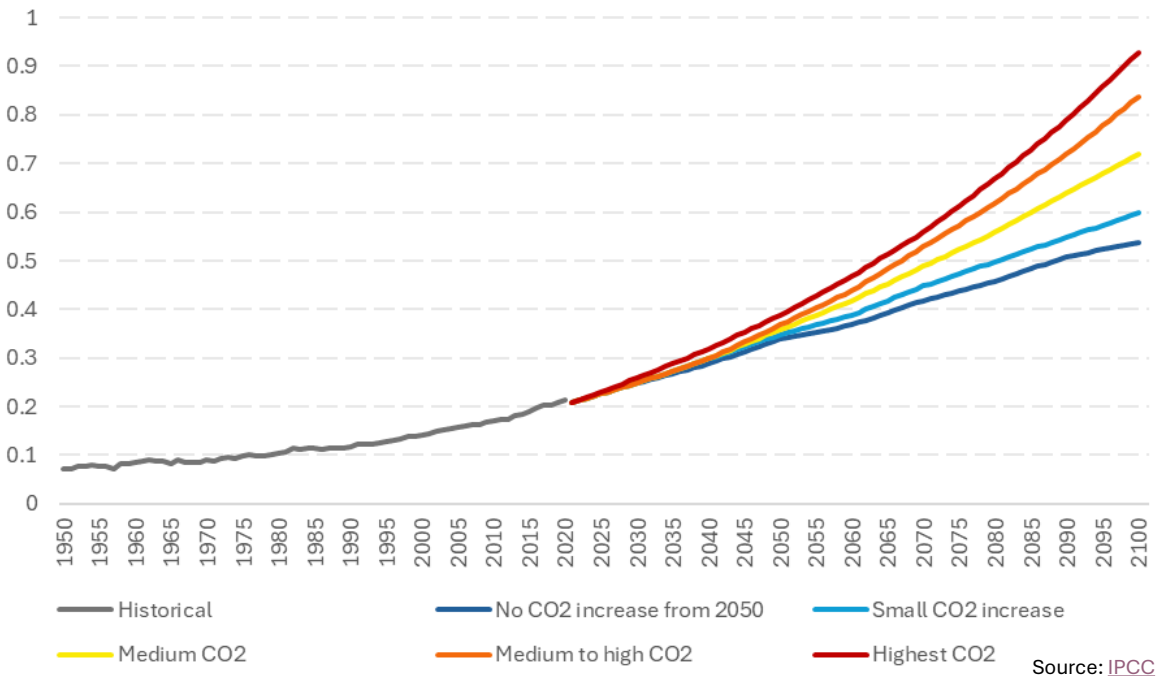
- Mitigating actions include those within the environment such as flood defences, drainage systems, increases to green spaces and increased tree planting, and also those around planning which include early warning systems, community networks and detailed emergency planning, especially for the most vulnerable groups.

Ocean levels are rising and are predicted to rise further, especially under high CO2 emission scenarios

Climate change is the primary driver of global sea level rise.[3] Sea level rise is caused by two factors: additional water from melting ice sheets and glaciers and the expansion of seawater as it gets warmer. Global sea levels have increased by around 10cm since 1993[1], or around 25 cm since 1880.[2] The rate of global sea level rise is increasing and even if global emissions are significantly reduced sea levels would continue rising to 30cm above 2000 levels by 2100.[2] In 2024 there was an unexpectedly fast rising of global sea levels.[3]

Higher sea levels mean that land is lost to erosion, and in urban settings homes and infrastructure are threatened. Additionally, flooding and storm surges are more frequent, higher and reach further inland causing increased damage. Low lying countries and island nations, e.g. Bangladesh, China, India, the Netherlands, Pacific Islands, and the Maldives, are especially at risk from higher sea levels. This accounts for approximately 900 million people and therefore there could be significant population displacement and economic losses as rising sea levels threaten current ways of living.[3]

Global mean sea level change relative to 1900 (m)

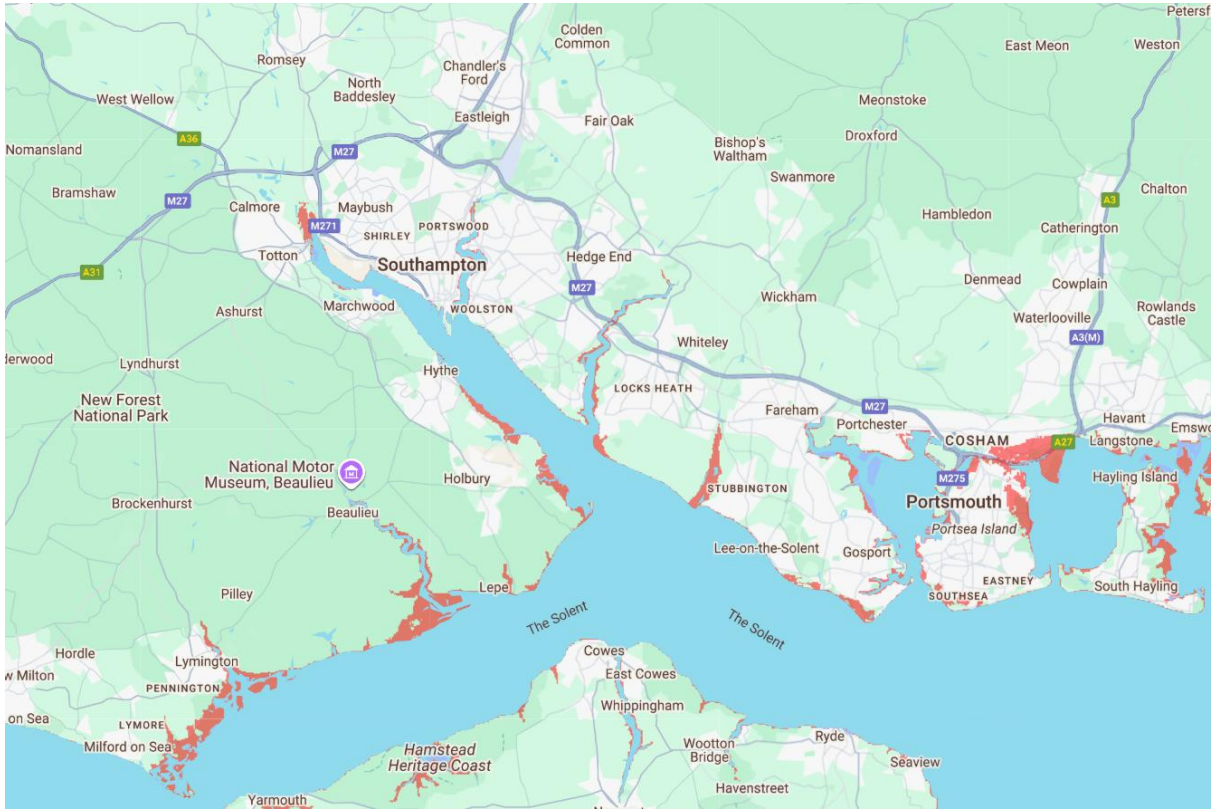


Source: IPCC

In the UK sea levels have increased by around 12-16cm since 1900, with higher increases in the south of England.[4] The rate of the rise in sea levels is now increasing and is now 3-5mm per year.[5] Areas that are especially at risk from rising sea levels in England are: the Somerset levels, Pevensey levels in East Sussex, Dungeness and areas around Margate in Kent, the Isle of Sheppey, the Norfolk Broads, the Wash and surrounding areas in Lincolnshire and areas around the River Humber.[6]

This map looks at sea level only rises in 2050 if the current trajectory of climate change continues according to IPCC 2021 consensus. Therefore, this map doesn't include risks from rainfall or storm flooding and shows that at the current projections in Hampshire there will be areas below sea level in Hayling Island, Gosport, Fareham and the New Forest. When annual flooding levels are included in the estimate larger areas of Hampshire would be below the sea level. Other estimates suggest that sea level in Hampshire is expected to increase between 29 to 47cm by the 2050s.[7]

Land below sea level rise, 2050



Source: Climate Central

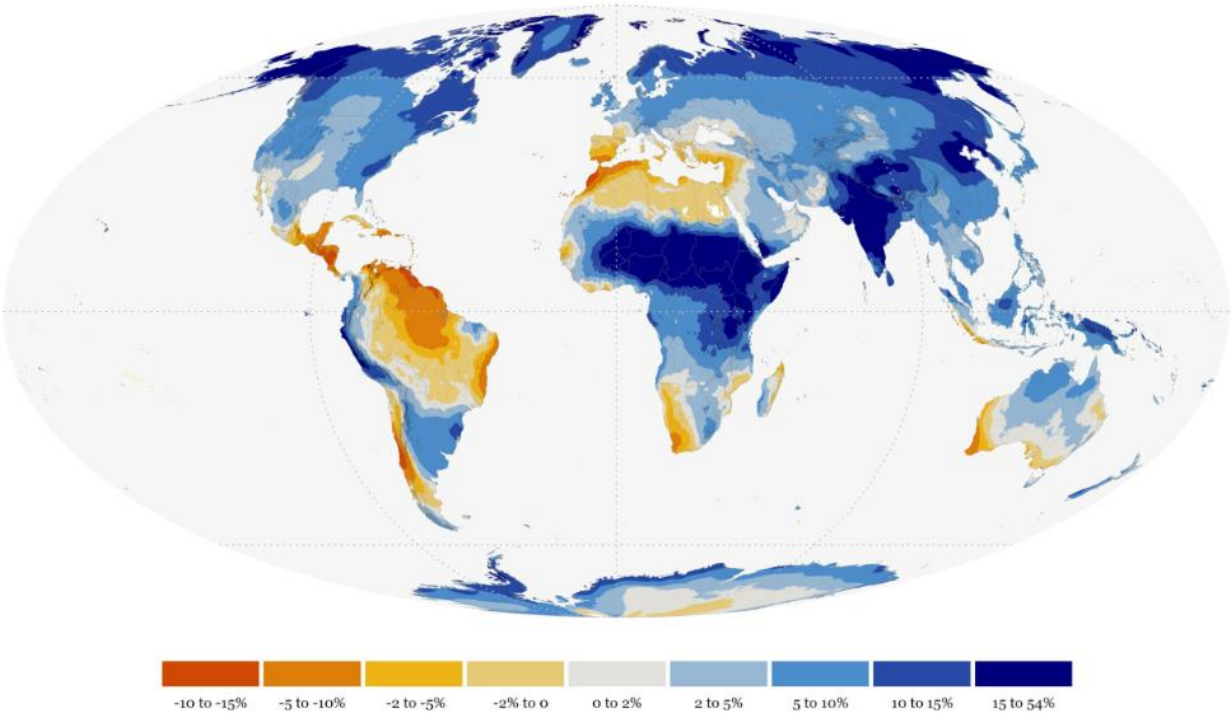
Rainfall is becoming more frequent and more intense

The higher global temperatures due to climate change also impact on rainfall. Higher temperatures result in increasing evaporation[1], and warmer air can hold more moisture, an estimated 7% for every 1ºC of temperature rise.[2] This means that rainfall becomes more frequent and more intense.[3] These trends are likely to increase as climate change increases although the impact will be felt differently in different areas of the globe, see map below.

There are four main types of flooding:

- Coastal – increasing risk due to rising sea levels resulting in higher storm surges
- River (fluvial) – when the amount of water exceeds the river capacity because of heavy or prolonged rain. Most common in low-lying areas around rivers and on flood plains.
- Surface (pluvial) – when heavy and intense rainfall overwhelms drainage systems. Most common in urban areas with impermeable surfaces and water cannot drain away effectively.
- Groundwater – when the water level under the ground rises and emerges onto the surface due to heavy and prolonged rain.

Annual percent of precipitation change, 2050[9]



Human activity across the globe has increased flooding risks: building on floodplains which increases river flooding, urbanisation which results in reduced drainage, and increased surface water flooding. Additionally, factors like deforestation, agriculture or dams and other infrastructure have changed the natural flow of the water.[4,5] Already there has been alterations in the level of rain - the autumn and winter storm rainfall in the UK in 2023/24 was about 20% higher than baseline which has been attributed to climate change.[10]

In the UK, the amount of rain is expected to increase as is the intensity of rainstorms, although the levels of the increase differs between different models. High-impact rain days are those which lead to severe weather warnings, and these are expected to increase. Currently the number of days in England and Wales with intense and prolonged rainfall that could lead to river flooding is around 7 days per year. However, with an increase of 2ºC in global warming this would increase to 9 days, and with 2ºC in global warming it would increase to 11 days.[8]

Below are estimated levels of rain for Hampshire which also show increases in rainfall, especially under a 4ºC global warming scenario. However, as this is from an alternative model there are differences from the UK predictions.

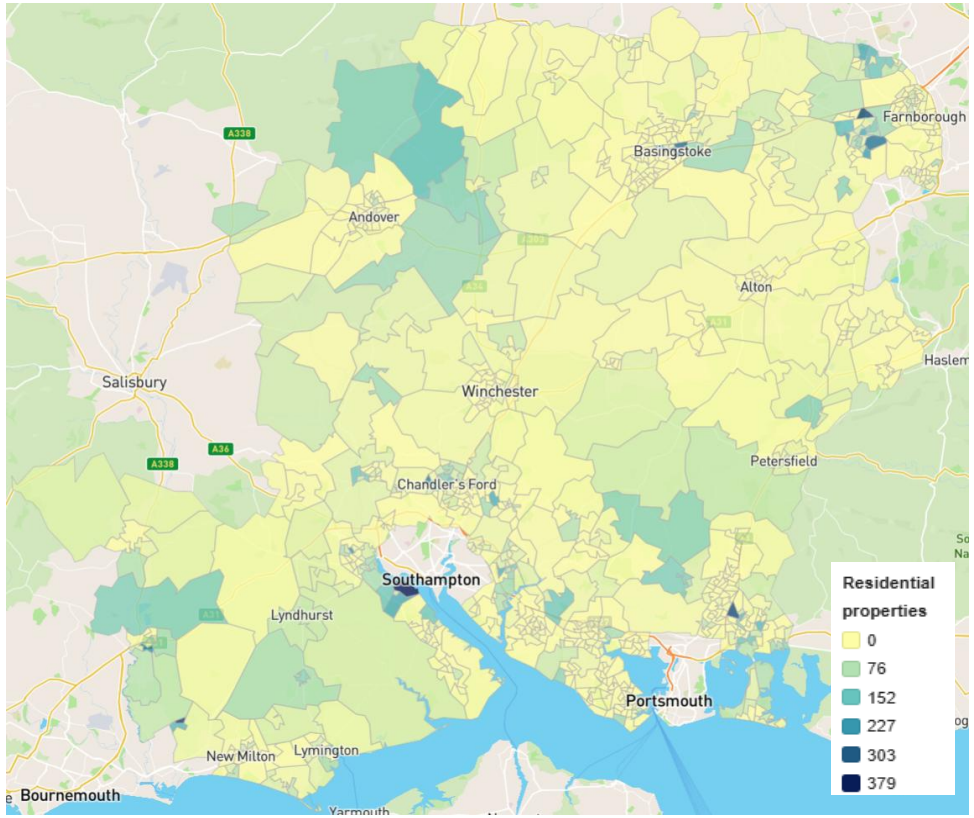
Predicted changes in Hampshire[6,7]	Baseline	2°C GWL	4°C GWL
Rainy days per month (>1mm rain)	1991-2019		
- Summer	8 days	7 days	6 days
- Winter	12 days	11 days	12 days
Wettest day			
- Summer	44mm	55mm	66mm
- Winter	49mm	47mm	61mm
Precipitation rate	1981-2000		
- Summer	1.69mm/day	-14%	-34%
- Winter	2.65mm/day	+10%	+23%

There are areas across Hampshire that are more likely to experience floods and poorer outcomes to flooding

Across Hampshire there is a varying risk of floods from different sources. Climate Central have developed maps which show sea level rise flooding (see previous slide) with additional options for flooding of different intensities. These flooding options increase the size of the area around the coast in Hampshire that are at risk of flooding, however, these models don't include areas of high risk of flooding that are inland.

The Environment Agency (see below) has developed estimates of numbers of residential properties that are at medium or high risk of flooding from rivers or seas. This shows areas with high numbers of homes at high risk in: Marchwood and Bransgore in the New Forest, Leigh Park in Havant, Eastrop and Bourne Valley in Basingstoke and Deane, and areas around Fleet in Hart. However, these estimates don't include risks from surface or ground water flooding.

Residential properties at medium or high risk of flooding, 2024



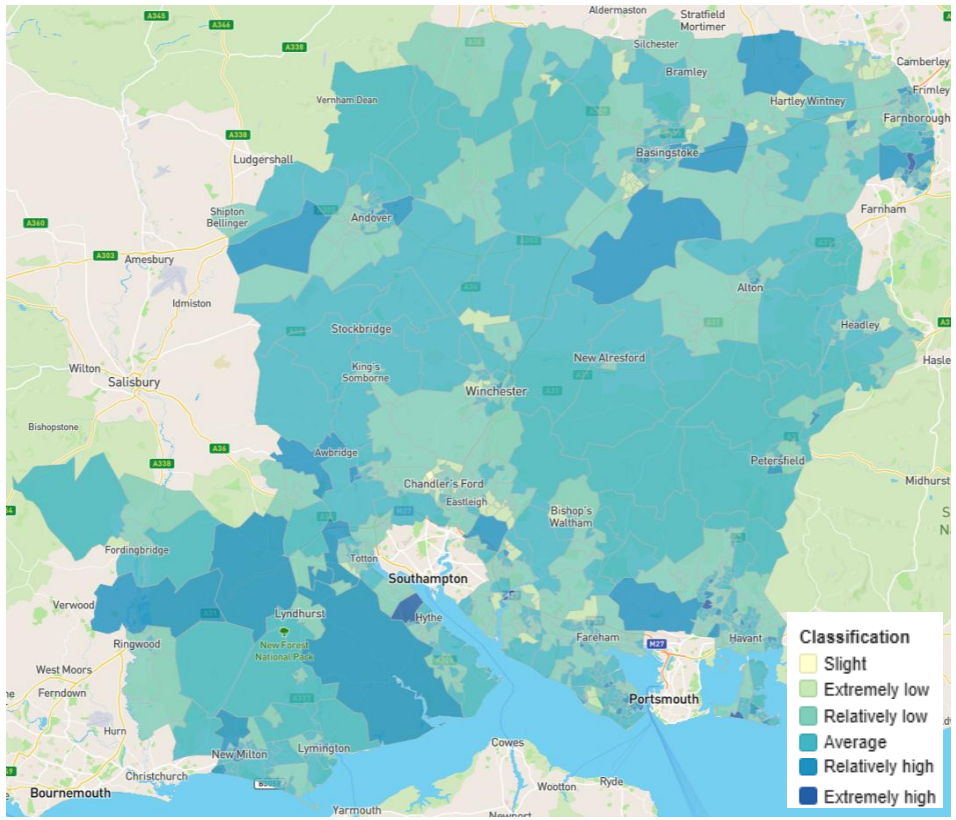
Source: Environment Agency, see JSNA Healthy Places

Health risks from flooding can also be exacerbated by other factors in a person's life. Climate Just have developed a flood vulnerability index as an overall measure (see below) which is made up of sub-indices:

- Enhanced exposure: physical environment, housing characteristics
- Sensitivity: age, health
- Ability to prepare: income tenure, language, internet availability, local knowledge
- Ability to respond: income, language, internet availability, social networks, mobility, crime
- Ability to recover: income, language, internet, social networks, mobility, pharmacy access, house prices

The areas which are most vulnerable if they were to experience a flood in Hampshire are: Dibden in the New Forest, Gosport town centre, Hayling Island, Waterlooville and Aldershot.

Flood vulnerability index, 2022 (Extremely high = most vulnerable)



Source: Climate Just, see JSNA Healthy Places

Health impacts of flooding and mitigating actions

Direct impacts[1,2]

- Physical injury, hypothermia and drowning. Around one third of those who drown are in vehicles at the time[3]
- Trauma, including longer lasting mental health conditions. Studies have suggested that those living in homes in the UK which have been affected by floods, storms or other weather damage are 50% more likely to experience depression or anxiety[4]
- Damage to homes
- Skin and gastrointestinal infections from contamination

Indirect impacts[1,2]

- Damage to infrastructure resulting in reduced access to services, including GP services, hospitals, pharmacies, dentists and care homes. Under a 2°C warming scenario flooding to services is set to increase by 13% to care homes, 4% to hospitals and 12% to GP surgeries by the 2050s[8]
- Respiratory diseases from mould and damp
- Rodent-borne diseases
- Carbon monoxide poisoning
- Under-nutrition or malnutrition as people eat less and may have reduced access to cooking healthy food[5]

Groups most at risk[1,2]

- Older people and those with disabilities or health conditions including obesity, which may make evacuating more difficult
- Those with reduced access to the internet or other technology who may not receive alerts
- Children who may find the disruption more challenging leading to mental or behavioural problems
- Those who are socially isolated, homeless or on low incomes
- Those with pre-existing mental health conditions may be more at risk of the psychological impacts of flooding
- Those with language barriers
- University students who may not be signed up to alerts and be less familiar with the local area
- People receiving medical interventions at home who would find it hard to evacuate, e.g. dialysis

Mitigating actions[6,7]

The built and natural environment:

- Property flood resilience of homes and businesses including resistance (keeping water out) and recoverability (adapting the property to reduce the damage from water)
- Flood defences, like levees and seawalls
- Improving drainage systems and keeping them clear of debris
- Increasing green spaces, parks and trees in cities and reducing impermeable surfaces
- Increasing space along rivers to accommodate safer flooding
- Reducing building on flood plains and buying out properties in high-risk areas

Planning and awareness:

- Developing early flood warning alerts and strengthening communication of risk and advice so that households can develop their own flood plans
- Understanding where vulnerable groups are and ensuring these groups are included in emergency plans, and where possible moved from high-risk locations, e.g. ground floor flats
- Supporting community networks and engagement with communities
- Ensuring emergency plans include backup GP / Pharmacy
- Promoting flood insurance
- Improved mapping and modelling to include all types of flooding

Other impacts of climate change – Key messages

- Climate change is already resulting in changes to the seasons: earlier springs, longer summers and earlier autumns. This trend is predicted to continue.

- These changes have large impacts on wildlife and biodiversity as it is changing when plants develop and how animals behave.

- Therefore, through these changes to seasons and extreme weather events climate change is already having large impacts on global agriculture.

- As the UK imports around 45% of food it is heavily reliant on the global food supply chain.

- Food cost inflation due to climate change is expected to increase and those areas in Hampshire which will be most impacted will be those places which already experience food insecurity, for example: Leigh Park in Havant, areas of Aldershot and Farnborough, Andover, Gosport town centre and South and West Ham, Popley and Buckskin in Basingstoke.

- Changes to the seasons and the climate will also impact the infectious diseases present in the UK. Currently the evidence is strongest for the impact on vector borne diseases including increases in the risk of Lyme disease and tick-borne encephalitis. Additionally, as the UK warms there is the risk of disease carrying mosquitoes to become established here, including those which carry dengue, chikungunya, zika, and the West Nile virus.

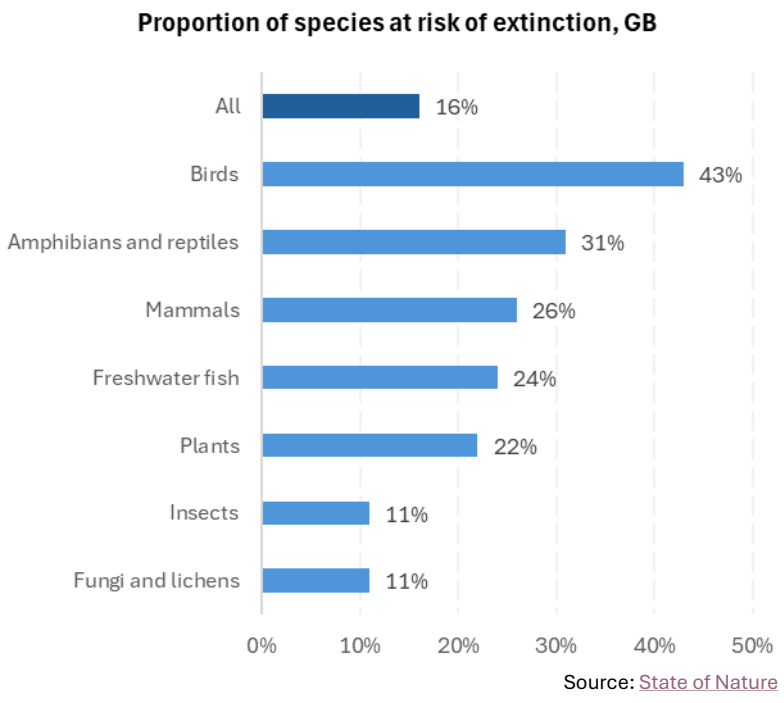
Climate change impact on seasons and wildlife

Climate change is resulting in changes in seasons. Earlier springs, longer summers and earlier autumns have been reported across the northern hemisphere with larger effects shown in areas further north.[1] Summers have become longer by about 20 days over the last 70 years, with all other seasons becoming shorter. This trend is predicted to continue under climate change, with summer lasting almost 6 months by 2100 and winter being only 2 months.[2]

The UK is now experiencing different weather patterns meaning that the climate can be considered different to that of a few decades ago.[3] As well as higher temperatures, increased rainfall, fewer cold snaps and increased extreme events the change to the seasons has also been apparent more locally. 2024 showed an earlier spring and longer leaf-on or lawn-cutting season compared with a baseline period of 1999-2023.

Early spring and autumn has large impact on UK wildlife[4,5]:
- Plants flowering earlier before pollinators are ready
- Fruits and nuts ripening earlier meaning that they are less available in autumn when animals are building up fat reserves
- Changes in migration patterns for birds which no longer coincide with food sources
- Spawning of amphibians before food is available

There are many factors which lead to biodiversity loss. The factors above outline how climate change has an impact on biodiversity, and it is expected to be an increasing cause of biodiversity loss over the next decades.[8] It can also create pathways for new species, invasive species, that are not native to an area. These species compete with native species for resources and can carry new diseases, e.g. grey squirrels, which can impact native species.[9] This change in species is already being observed in the seas around the UK with new species arriving, e.g. octopus and blue fin tuna, and native species moving further north, e.g. cod.[10]



Source: State of Nature

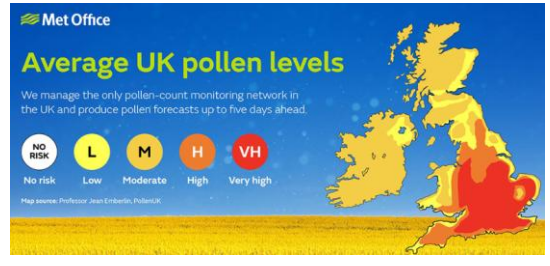
It has been estimated that 16% of species in Great Britain are at risk of extinction[12], although this varies between species. The extinction of different species would have different impacts on the food web, for example the extinction of pollinators would have a catastrophic impact on food for wildlife and humans. Overall, there has been a 13% decrease of invertebrates between 1970 and 2020, however this varied across species[13]:


Pollinating insects decline of 18%


Predators of crop pests decline of 34%

There are some habitats in Hampshire which are particularly vulnerable to changes in the climate, especially drought:[6,7]
- Chalk streams, e.g. the Test and the Itchen, across Test Valley, Eastleigh and Winchester.
- Woodland, especially shallow rooted, for example beech trees in chalky soils on the South Downs in East Hampshire and Winchester
- Heathlands are especially vulnerable to fire damage, e.g. the New Forest

Health impacts of changes to seasons and longer summers:
- Hay fever: Almost 1 in 4 people in UK suffer from hay fever[14] and this number is increasing year on year. A longer summer period would also mean a longer pollen season and an increase the concentration of pollen in the air.[15]
- Longer time period with a risk of heat stroke
- Increased insect bites, see slide 29 for more details
- Food insecurity, see slide 28 for more details.



Climate change, agriculture and food insecurity

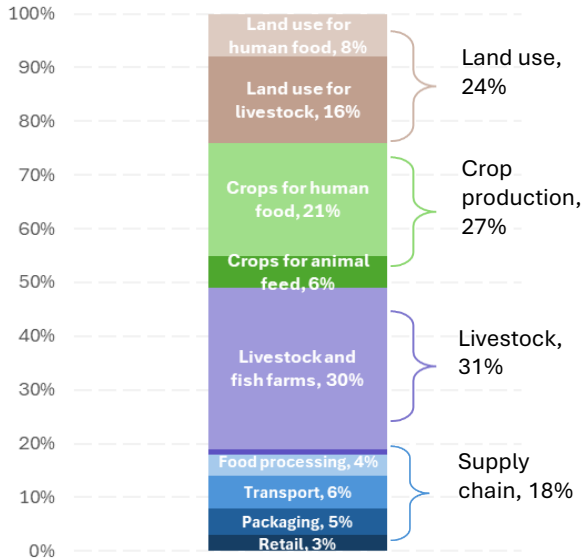
Impact of agriculture on climate change

- Agriculture accounted for around 16.3% of global emissions in 2021[1], see slide 8.
- As the population grows the amount of food needed will also increase.
- Land use changes, e.g. from rainforest to grazing land, can have a double impact on climate change by producing more emissions and reducing carbon absorption.
- Data shows that meat and dairy products result in much higher emissions per 100g of protein than other foods, e.g. beef 25kgCO_2 equivalent compared with 8.4kg for cheese, 4.3kg for chicken and 0.36kg for peas.[2]
- Changing diet by reducing meat and dairy consumption, and by switching to local food sources, is a mitigating action.

Impact of climate change on agriculture

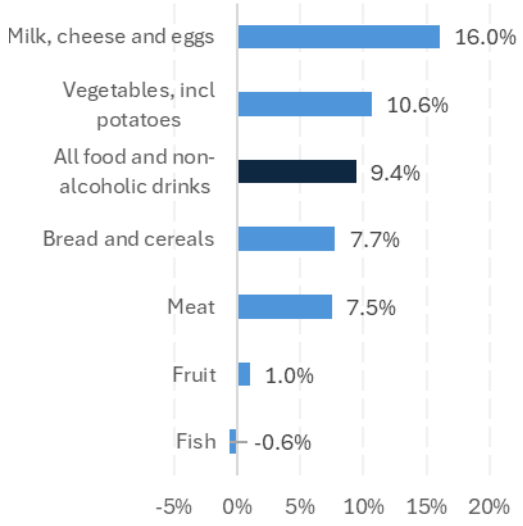
- Climate change will have large impacts on the production and availability of food globally, especially considering the increase in climate change related disasters, changes to the seasons, and the impact on wildlife including pollinators.
- Climate change will have impacts on all stages of the food system, including production, processing, transport, storing and retailing.[6]
- UK imports around 45% of food, the bulk of which comes from the EU, 25%, and therefore food availability in the UK is heavily reliant on the global supply chain.[3,4]
- The impacts of climate change differ depending on the type of extreme event (flooding or heatwave for example) and the type of food being produced. For example, in recent years there have been large impacts on olive oil production in Spain and other European countries, orange production in Florida, rice yield in China,[8] potato, wheat, barley, and other vegetable production in the UK.[9]
- Healthy food has been shown to be twice as expensive per calorie as non-healthy food, and therefore when prices increase low-income households may be more likely to cut back on healthy food which will have impacts on health.[7]

Global greenhouse gas emissions from food production, 2018



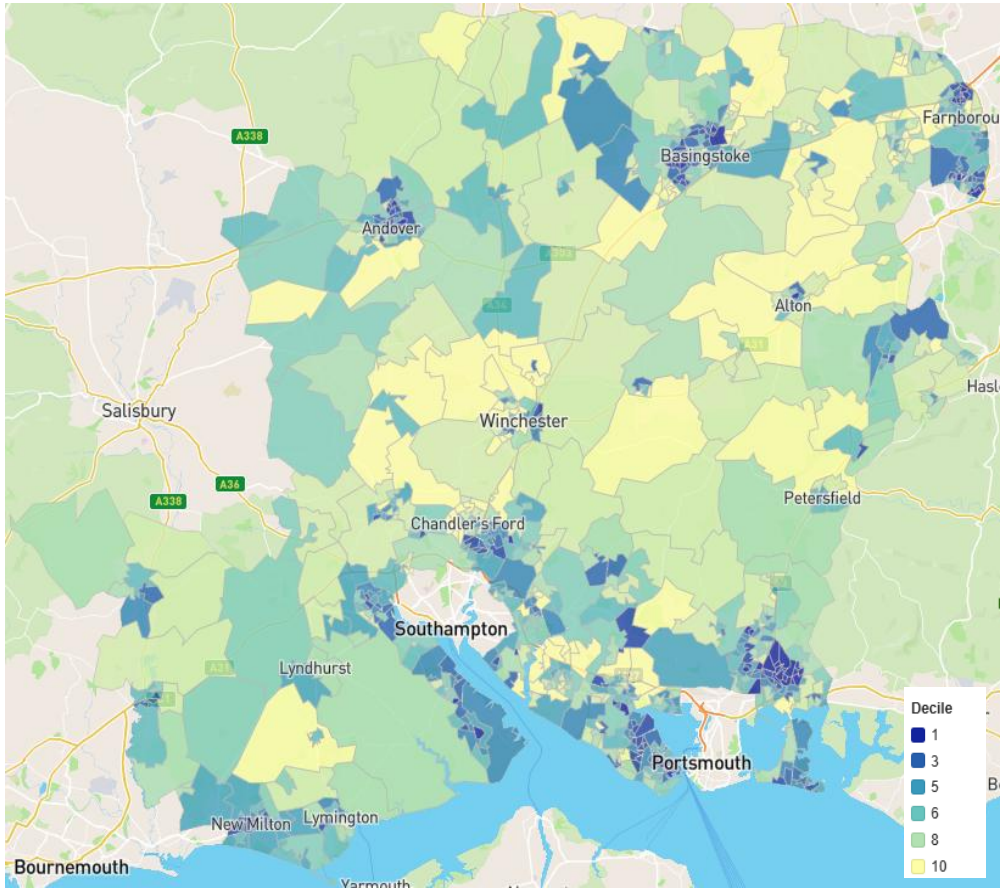
Source: Our World in Data

Change in real terms prices Aug 2021 - Aug 2024



Source: DEFRA

Food Insecurity Index, 2022 (1 = most vulnerable)



Source: Southampton University, see JSNA Healthy Places

Climate related inflation due to heatwaves and droughts internationally and in the UK could drive up the cost of food by 34% by 2050.[5] Those areas that are currently experiencing the greatest food insecurity, e.g. Leigh Park in Havant, areas of Aldershot and Farnborough, Andover, Gosport town centre and South and West Ham, Popley and Buckskin in Basingstoke, are also areas of higher deprivation, and are most likely to experience increasing food insecurity as food prices increase. Groups that are most likely to experience food insecurity are: long term unemployed, people with health conditions, people with food intolerances, young people aged 16-24, larger households of 5 or more people, households with children under 16, and people who are Asian / Asian British.[3]

Climate change impact on infectious diseases

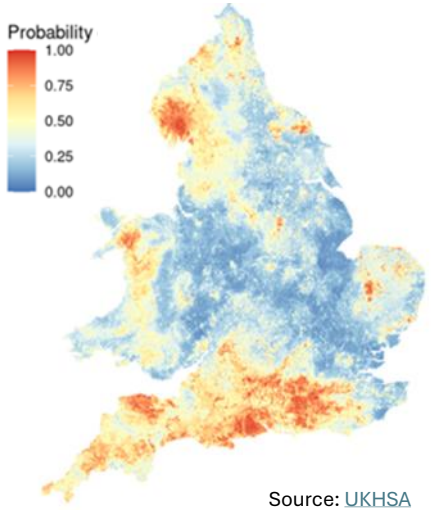
Infectious diseases can be spread in different ways:

1. Spread from person to person through close contact
2. Through contaminated food, water or surfaces
3. Spread via a living vector, e.g. a mosquito

The evidence for the impact of climate change spread from person to person or via contaminated food, water or surfaces is limited overall. For some viruses the evidence suggests that other factors such as human behaviour or immunity are more important in transmission than climate change, e.g. flu or adenovirus. For bacteria and parasites there is some evidence suggesting a possible increase due to higher temperatures, e.g. salmonellosis, or during flooding, e.g. leptospirosis, however this is limited.[2]

In the UK the threat from vector-borne diseases is on the rise, due to factors like growing global travel and trade (movement of infected people and invasive vectors), changes in land use (increase human exposure to vectors) and climate change.[3] The climate can influence vector transmission by limiting the areas in which vectors or the pathogens can reproduce and thrive. Therefore, changes in the climate will change the areas of the world that are habitable for them. Globally climate change may also increase the risk of pandemics by bringing people in closer contact with wildlife due to habitat loss and therefore increasing the risk of cross species transmission.[1]

Predicted tick presence



Source: UKHSA

Mosquitoes

Currently, there is no transmission of infectious diseases from mosquitoes to humans within UK. There have been increasing numbers of cases detected in the UK, for example there have been 70 cases of Chikungunya in the first 6 months of 2025, however all of these have been linked to travel.[5]

The main mosquito species causing concern are:

- Aedes albopictus (Asian Tiger mosquito): which can transmit dengue, chikungunya and zika viruses is not yet established in UK. Modelling suggests that the area around London is already a suitable climate, and most of England will be suitable by the 2040s. Therefore, it is a risk that dengue could be endemic in London by the 2060s[4] and of Chikungunya transmissions in the UK in the later part of the century.[3]

- Culex, including Culex modestus : which can carry the West Nile virus and these are already established in coastal parts of south-east England. Currently temperatures are too low for transmission cycles to be established but will increase as the climate warms towards the second half of the century.[4]

Ticks

Lyme disease and tick-borne encephalitis are the main infectious diseases which are of concern in the UK. Both are already spread within the UK and transmission is predicted to increase as the climate warms.[4]

- Lyme disease: there is no local data for Lyme disease however, nationally it is estimated that is present in 4% of ticks.[4] There are around 1,500 laboratory-confirmed cases of Lyme disease each year, although it is estimated that 1,000-2,000 more people are diagnosed based on clinical assessment. There is a higher estimated prevalence in southern England - 9.8 per 100,000[4] than nationally (1.9[6]).
- Tick-borne encephalitis: there is limited data about prevalence and far fewer cases of this disease (only 3 confirmed[7]). There were two cases reported in Hampshire – one in the New Forest in 2019 and the other in Test Valley in 2020.[4] Some areas have used deer antibody testing to estimate the possible prevalence of the disease and the New Forest appears to be an area with increased risk.[3]

Conclusions

- There is a lot of data available about the different aspects of climate change, however, not all data is broken down to local levels.

- There are also lots of climate models, however, these models rely on assumptions about the future that may not be accurate. For example, in the most general terms the level of greenhouse gases in the atmosphere and how this predicts the level of global warming or more specifically for the UK that it will continue to warm, with hotter drier summers and wetter warmer winters. However, if the Gulf Stream collapses then this is predicted to result in colder temperatures in norther Europe, including the UK. Factors like this introduce large scale uncertainties into the predictions.

- There have already been significant impacts to climate globally and more locally in the UK. These impacts are far reaching across many aspects of life, including heatwaves and hospitalisations, floods and storm damage to properties and global food supply chains leading to food insecurity.

- In UK, the extreme events most likely are heat waves, flooding and storms. Although there are some individual mitigating actions that can be taken most actions rely on society making changes, e.g. flood defences, or better designs for housing and cities.

- Those people that will be the most vulnerable to climate change impacts are those with reduced resources to prepare, existing health conditions or living in areas which are expected to experience more extreme events. There are many areas of vulnerability to different impacts of climate change across Hampshire, those areas which have multiple vulnerabilities include:
  - Basingstoke town centre (including Buckskin & Worting, South & West Ham, and Popley)
  - Gosport town and Lee-on-Solent
  - Leigh Park and Hayling Island
  - Aldershot and Farnborough

- There are new data and predictions becoming available all the time and this is an area of study which is changing quickly. The Met Office has developed local authority level predictions for the first time this year and hopefully will go on to develop more detailed breakdowns in future.

Areas of Hampshire most at risk from different aspects of climate change

	Heatwaves (Acute or relatively high in overall index)	Air pollution (Worst two air quality quintiles)	Flood (Extremely high in overall index or 250+ homes per LSOA)	Storms (Coastal or high elevation areas)	Drought (Habitats that are most vulnerable)	Wildfires (6 or more per MSOA)	Infectious diseases	Food insecurity (Highest risk of insecurity decile)
Basingstoke and Deane		Basingstoke Central	Basingstoke Central			Old Basing & the Candovers	Rural areas	Popley, South and West Ham, Buckskin and Worting
East Hampshire				Petersfield North & East Meon, Four Marks & Tisted	Woodlands on South Downs National Park	Bordon Camp	Rural areas	Alton Westbrook and Eastbrook
Eastleigh		Hamble, Bursledon, Hedge End, Chandlers Ford, Boyatt Wood		Hamble and Netley	River Itchen			Bishopstoke, Lowford
Fareham		Fareham town, Common, Warsash and Sarisbury Green		Hill Head, Titchfield		Titchfield & Titchfield Common		Fareham Fort
Gosport	Gosport Town	Gosport Town	Gosport Town	Lee-on-Solent, Anglesey		Lee-on-Solent		Gosport Town
Hart			Fleet North, Elvetham Heath & Ancells Farm, Crookham East			Yateley West & Eversley, Blackwater, Frogmore & Minley	Rural areas	
Havant	Waterlooville central, South Hayling	Havant town centre, Leigh Park	Waterlooville central, South Hayling, Barncroft & Warren Park	Hayling Island				Leigh Park and West Leigh, Barncroft & Warren Park, Stockheath Common, parts of Waterlooville, Cowplain West
New Forest	Lymington Town, New Milton East	Totton	Marchwood & Dibden, Bransgore & Burley	Coastal areas, especially Barton on Sea, Milton on Sea, and Marchwood	Woodlands and heathlands in national park	Lymington Town & Boldre, Fordingbridge, Rockbourne & Woodgreen	Woodlands and heathlands in national park	Holbury South, Langdown & Dibden Purlieu
Rushmoor	Aldershot Town, Aldershot Rowhill	East Aldershot, Cherrywood in Farnborough	Aldershot Town					Aldershot Park, Town and Rowhill, Farnborough Town and Cherrywood area
Test Valley	Romsey Town	Picket Piece in Andover	Valley Park in Chandlers Ford		River Test	Chilworth, Nursling & Rownhams	Rural areas	Andover Newbury Road, Andover South East
Winchester		Winchester city centre and Winnall			Woodlands on South Downs National Park, River Itchen		Rural areas	

Further reading

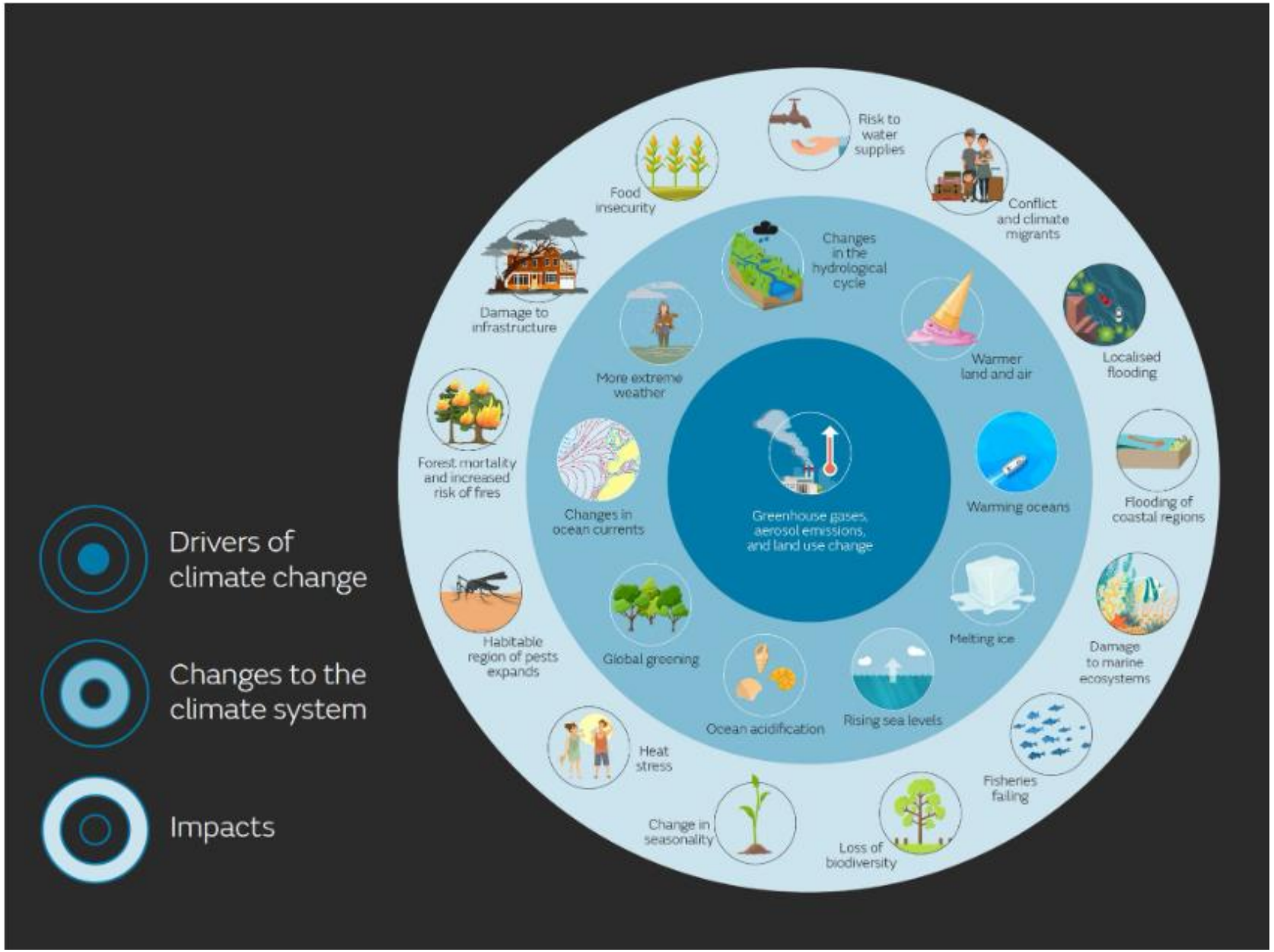
IPCC reports: https://www.ipcc.ch/reports/

Climate change: health effects in the UK, UKHSA: https://www.gov.uk/government/publications/climate-change-health-effects-in-the-uk

Met Office climate dashboard: https://climate.metoffice.cloud/dashboard.html https://climatedataportal.metoffice.gov.uk/

Met Office local authority report generator: https://www.arcgis.com/apps/dashboards/506ff7d53c884badb0d8fd36d6280a91

Local climate adaption tool: https://www.lcat.uk/



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Our World in Data - https://ourworldindata.org/co2-and-greenhouse-gas-emissions
Climate Watch - https://www.climatewatchdata.org/key-visualizations?visualization=4

Local greenhouse gas emissions:

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JSNA - https://app.powerbi.com/view?r=eyJrIjoiM2RlMmI2ODktOGY4Ny00Y2E3LTg4YzMtMTkwM2I0OGQ1NmZlIiwidCI6IjNmODFkOGI1LWVlMDctNGMxNy04NjljLTFkYjQzOTAxOGQ5YiIsImMiOjh9
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8. Lyme disease: is a bacterial infection spread by ticks which can result initially in rashes, joint stiffness, headaches, and fever initially followed by long term tiredness, aches, loss of energy and fatigue.
9. Tick-borne encephalitis: is a viral infection initially in fever, tiredness, headache, aches and pains and longer term impacts to the central nervous system including confusions and altered mental state, weakness or loss of movement in face or limbs, seizures, meningitis (infection of protective membranes in brain and spinal cord), or encephalitis (swelling of the brain).
10. Dengue fever: is a virus which causes fever, headache, muscle and joint pain, sickness, rash, swollen glands. Severe dengue is uncommon but can include bleeding, low blood pressure and low blood platelets.
11. Chikungunya: is a virus which causes fever, joint pain and swelling, headache and rash. Some joint pain can continue for years after infection.
12. Zika: is a virus which can cause fever, headache, red sores, rash, muscle and joint pain and swelling. It can also cause problems in pregnancy including premature birth, miscarriage, problems with the baby's brain, hearing and eyesight, microcephaly (a birth defect where the baby's head is very small).
13. West Nile virus: causes no symptoms in around 80% of people but for 20% develop fever, headache, vomiting, rash, and in rare cases encephalitis, meningitis, confusion or seizures.

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