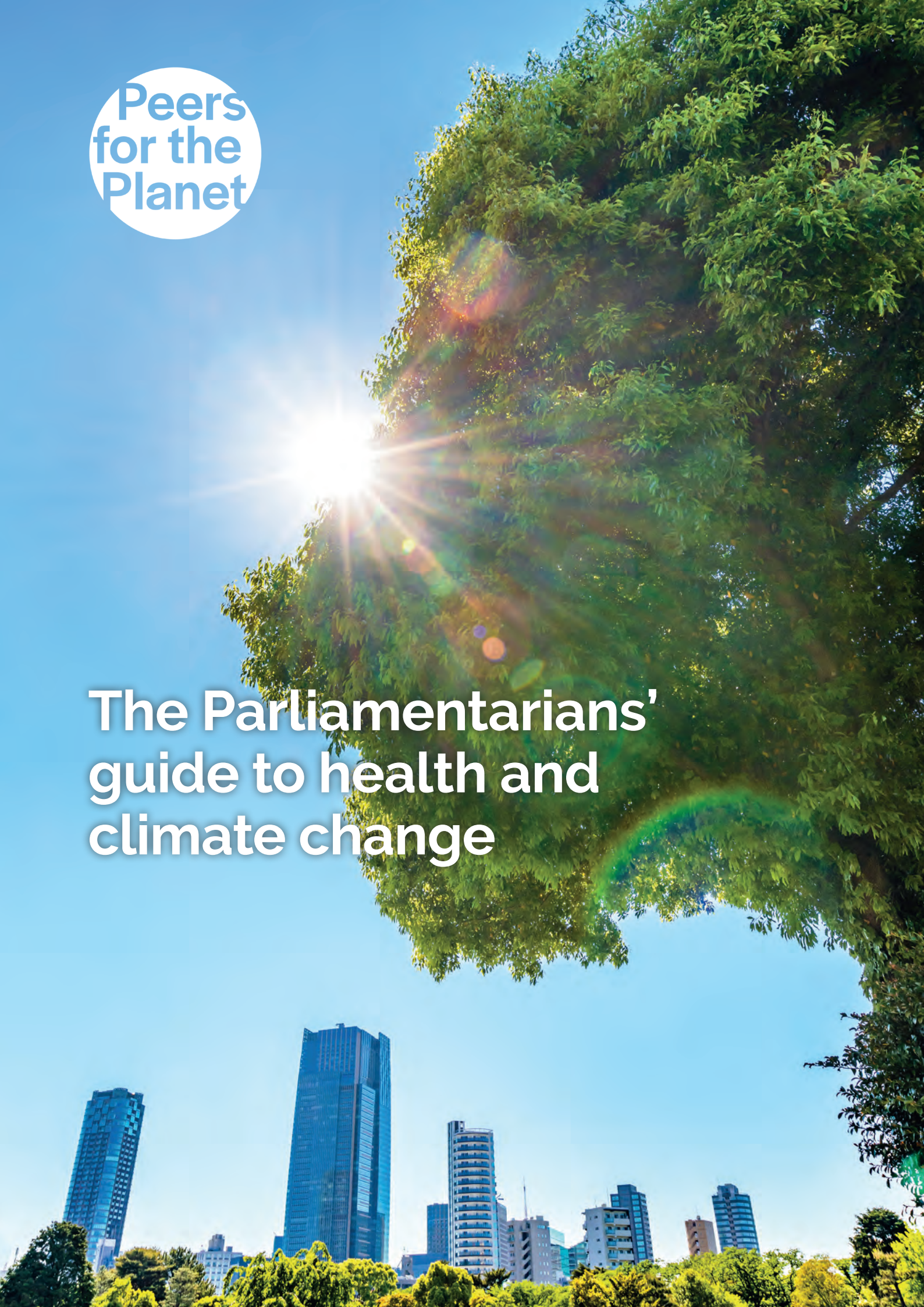
Peers for the Planet

The Parliamentarians' guide to health and climate change




Michael Sobell House
Hal Gray Unit
Cancer Centre
Building

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Professor Baroness Kathy Willis CBE, FRS
Chair of Peers for the Planet

Alan Dangour
Director of Climate and Health, Wellcome Trust

Baroness Rosie Boycott
Vice-Chair of Peers for the Planet

Lord Nigel Crisp KCB
Crossbench Peer

Foreword

Europe is the fastest warming continent, heating up at more than twice the global average rate, and the health impacts in the UK are already very evident. Climate change is no longer a distant or abstract threat.

This practical guide for parliamentarians brings together short articles written by health and environmental experts. They set out the evidence as it is currently understood and suggest practical policy actions to take forward.

Climate change and nature loss affect human health in profound and interconnected ways, and the choices we make today will shape the health and prosperity of generations to come.

Extreme heat, wildfires, pressure on hospitals, lost productivity, storms, flooding and disruption to infrastructure and transport are already affecting people's physical and mental health, livelihoods and daily lives. The risks extend far beyond these immediate impacts, to infectious diseases and air pollution to growing pressures on food and water security and wider economic disruption.

Without action, climate and environmental pressures will deepen existing health and socio-economic inequalities across the UK and around the world.

Underpinning all of these are three actions: cutting greenhouse gases to reduce our impact on climate; adapting to the impacts of climate change that are already unavoidable; and protecting and restoring our natural environment. Nature is one of our greatest assets in meeting these challenges. Healthy ecosystems provide clean air and water, support food production, regulate our climate and create places that sustain our physical and mental wellbeing.

Acting now will strengthen the economy, reduce inequalities and help communities become more resilient to the changes already underway.

We are very grateful to the authors who have put so much time and effort into providing such clear and concise articles. We hope the guide will be well used.

This guide has been developed by Peers for the Planet, a cross-party group in the House of Lords working to drive action on climate and nature. We are grateful to Wellcome, a global charitable foundation working towards a healthier future for everyone, for its generous support and guidance.



Key facts

Impacts

A record **2,877**
heat-related deaths
were recorded in England between May and June 2026. NHS overheating incidents in England have nearly doubled in recent years, costing an estimated
£538 million a year.



Air pollution is associated with
28,000–36,000
deaths in the UK each year,
and costs the UK economy an estimated
£27 billion per year.



Flooding causes
£3.3 billion
in damages annually,
with around 6.3 million homes in England and **10% of UK hospitals** at risk.



Around
1.6 million children
in England live in overheated homes. An estimated **33% of primary schools and 38% of secondary schools** are at high risk of surface-water flooding.



Mental health costs are estimated at
£1,878–£4,136
per adult per flood.
One year after flooding:
20% screened positive for depression,
28% for anxiety and
36% for post-traumatic stress.



Benefits

Green infrastructure can make European cities in summer
1–3°C cooler.
It is also estimated that
2,500 heat-stress-related deaths
could have been avoided across 93 European cities in the 2015 heatwave if they were greener.



The UN estimates coordinated clean-air and climate policies can generate
$15 for every $1 invested.
London's ULEZ has helped **reduce air pollution deaths by 40%** and emergency admissions by 15%.



Property-level flood resilience measures can deliver a
5:1 benefit-cost ratio.
While every £1 spent on flood defences is estimated to prevent £8 in economic damage.



A package of measures to reduce overheating in buildings and streets in the 30% most vulnerable areas of the UK could achieve a
3:1 benefit–cost ratio by the 2050s.



Living near urban green spaces is associated with better long-term physical and mental health.
Higher densities of street trees within
100 metres
of the patient's home are linked to **lower rates of antidepressant prescriptions**.



Summary of priority recommendations

Throughout the guide, our authors identify practical policy actions that could help improve public health, reduce health inequalities and strengthen national resilience to climate impacts. The following recommendations bring together the key cross-cutting priorities for parliamentarians.

1. **Put health at the heart of climate action**
   Make improving health and wellbeing a core objective of climate mitigation and adaptation, with clear health targets embedded in national climate and adaptation plans.

2. **Accelerate action to cut emissions and health risks**
   Recognise that cutting emissions and meeting the UK's international climate commitments remain essential to reducing climate-related health risks, while delivering major benefits for people's health, the economy and the environment.

3. **Make climate resilience a core NHS planning priority**
   The NHS and the government must assess the risks climate change poses to health systems across the UK and develop adequately funded health system adaptation and mitigation plans. This should include embedding climate resilience in NHS investment, estates, service design, emergency preparedness and workforce planning.

4. **Improve public health responses to heat, flooding and extreme weather**
   Strengthen early-warning systems and public health responses to heat, flooding and other extreme weather to reduce health and economic impacts. Develop a coordinated national heat strategy and ensure people receive timely warnings and practical support to stay safe.

5. **Create healthier, climate-resilient places**
   Ensure planning, building and infrastructure decisions take account of climate-related health risks. Upgrade existing buildings, make new buildings fit for a changing climate and expand green and blue infrastructure to reduce the impacts of heat and flooding, and improve health.

6. **Tackle air pollution as a public health emergency**
   Join up climate and air-quality policy to deliver health and economic benefits, and align UK air quality targets with World Health Organization (WHO) guidelines. Strengthen standards for healthy indoor air as well as outdoor air.

7. **Prioritise those most at risk**
   Make reducing health inequalities a central objective of climate adaptation. Prioritise people and communities most exposed to climate risks and least able to adapt, including pregnant women, children, the elderly and those living in poor quality housing.

8. **Build a healthier, more resilient food system**
   Shift demand towards healthier and more sustainable diets and set targets for food-system emissions and dietary outcomes that integrate health, climate and nature goals. Support farmers to produce healthy climate-resilient food. Strengthen national and local preparedness for disruption to food supplies.

9. **Work with nature to protect health**
   Protect and restore nature as a vital part of emissions reduction, climate adaptation and public health. Expand and protect urban tree cover and green spaces, protect soil biodiversity and use well-designed nature-based solutions to reduce heat, manage water and strengthen community resilience.

10. **Strengthen prevention, preparedness and accountability**
    Invest in prevention and community resilience, improve monitoring of climate-related health risks and establish clear accountability for local response and action.



Professor Marina Romanello
Institute for Global Health,
University College London

Introduction

Why climate change is a public health threat to the UK

SUMMARY

Climate change is already a UK public health issue

- Climate change impacts health directly and weakens the systems people rely on for care, food, water, housing and livelihoods.
- Heat, drought, wildfire, flooding and infectious disease risks can occur together, creating compound pressures that are greater than any single hazard.
- Climate change can increase demand for healthcare at the same time as it disrupts buildings, staff, transport, equipment and supply chains.
- Well-designed climate action can improve health immediately through cleaner air, healthier diets, safer places and reduced inequality.

Climate change is eroding the environmental and socio-economic systems that health and wellbeing depend on – including our healthcare, water and sanitation services, food systems, and the economy – claiming lives and harming health worldwide.

The Lancet and the World Health Organization have identified climate change as potentially the greatest global health threat of the 21st century [0.1]. In 2026, the *Lancet Countdown* found that most climate-related health impacts and risks have accelerated over the past decade [0.2].

These are not distant threats: climate change is already causing deaths and affecting the health, wellbeing and prosperity of people across the UK [0.3].

Impacts of heat

One of the most immediate consequences of climate change is increasing heat exposure. In 2023, there were an estimated 710,000 heat-related deaths globally, exceeding those from malaria or HIV. Nearly 72% of those deaths were attributable to human-caused climate change [0.2].

The UK is particularly vulnerable to heat because of its ageing population, high burden of chronic conditions and infrastructure designed for a cooler climate. The UK Health Security Agency (UKHSA) recorded on average 2,000 excess deaths annually during officially declared heatwaves in 2020–2025 [0.4]. Beyond mortality, heat worsens

cardiovascular, respiratory, renal and neurological diseases, contributes to adverse birth outcomes, and negatively affects mental health.

Heat not only increases demand for and costs of healthcare, but can also impair its delivery. The UK Health Alliance on Climate Change highlights that more than 90% of UK healthcare workers reported impaired performance due to heat strain, while overheating in NHS buildings in England nearly doubled between 2016–2017 and 2021–22 [0.5], causing equipment failures, supply chain disruption and productivity losses. These impacts are estimated to cost £538 million a year; a cost that could rise by 144% in the 2030s and 245% by the 2050s [0.3].

Impacts of drought

The increased frequency of heatwaves and droughts have been associated with an additional 127.9 million people experiencing moderate or severe food insecurity globally in 2023 [0.2]. The UK is particularly vulnerable to climate-related food insecurity because more than 40% of the food consumed here is imported [0.3], often from climate-vulnerable countries [0.6].

Hotter, drier conditions are also increasing UK wildfire risk: an attribution study found that the very high fire danger experienced in 2022 was made at least six times more likely by human-caused climate change [0.7]. This increase was ever-present during the summer of 2026; 1,017 wildfires were recorded in England and Wales by early August compared with 869 for the whole of 2025, which was the previous record year for wildfires [0.8]. Wildfires can cause direct injury, expose communities to harmful smoke and have lasting effects on mental health [0.9].

> *Climate change is already causing deaths and affecting the health, wellbeing and prosperity of people across the UK.*

Impacts of flooding and storms

Climate change is increasing the risk of extreme rainfall and flooding in the UK, raising the likelihood of drowning, waterborne disease transmission and respiratory illness associated with damp and mould [0.10]. It also increases the risk of mental illness. For example, people whose homes have been flooded suffer high incidence of depression, anxiety, and post-traumatic stress disorder, with associated economic losses [0.11].

Flooding is also disrupting healthcare systems, transport, logistics, and supply chains. Since 2021, at least 67 NHS sites have been forced to close or relocate because of weather-related flooding [0.3].

Infectious disease

The risk of transmission of several climate-sensitive infectious diseases is increasing in the UK [0.12]. Locally-acquired dengue and chikungunya are increasingly reported in neighbouring countries, including France, Italy and Spain [0.13], and breeding of the transmitting mosquito was found for the first time in the UK in 2026 [0.14]. Food and waterborne pathogens, including *Campylobacter*, *Salmonella* and *Vibrio* species, are sensitive to temperature and rainfall, and the risk of their transmission is projected to increase as the UK climate changes.

Compounding threats

Importantly, these impacts rarely occur in isolation. People are increasingly exposed to multiple compounding climate-related hazards simultaneously. Health systems likewise face multiple concurrent climate change-related pressures, placing additional strain on already overstretched services. The combined impacts of climate change on social, economic, and natural systems are difficult to quantify but represent a substantial threat to health and security in the UK and beyond.

> *Adapting to the climatic changes and warming that can no longer be avoided, and reducing greenhouse gas emissions to prevent a further increase in the threats, is essential to protect public health in the UK.*

The benefits of action

Adapting to the climatic changes and warming that can no longer be avoided, and reducing greenhouse gas emissions to prevent a further increase in the threats, is essential to protect public health in the UK.

Many actions needed to reduce greenhouse gas emissions can also deliver major benefits to public health, including through cleaner air, healthier diets, cities that support improved health and livelihoods, stronger health systems and by helping reduce inequities and the cost of living.

By putting health improvements as a key goal in all climate policies, climate action can deliver transformational gains to public health in the UK.

Policy recommendations

1. **Put health at the heart of all climate change adaptation and mitigation actions**
   Make improving health and wellbeing a core objective of climate change mitigation and adaptation, with measurable targets to reduce health risks and maximise health co-benefits embedded in the UK's *National Adaptation Programme* and *Nationally Determined Contribution*.

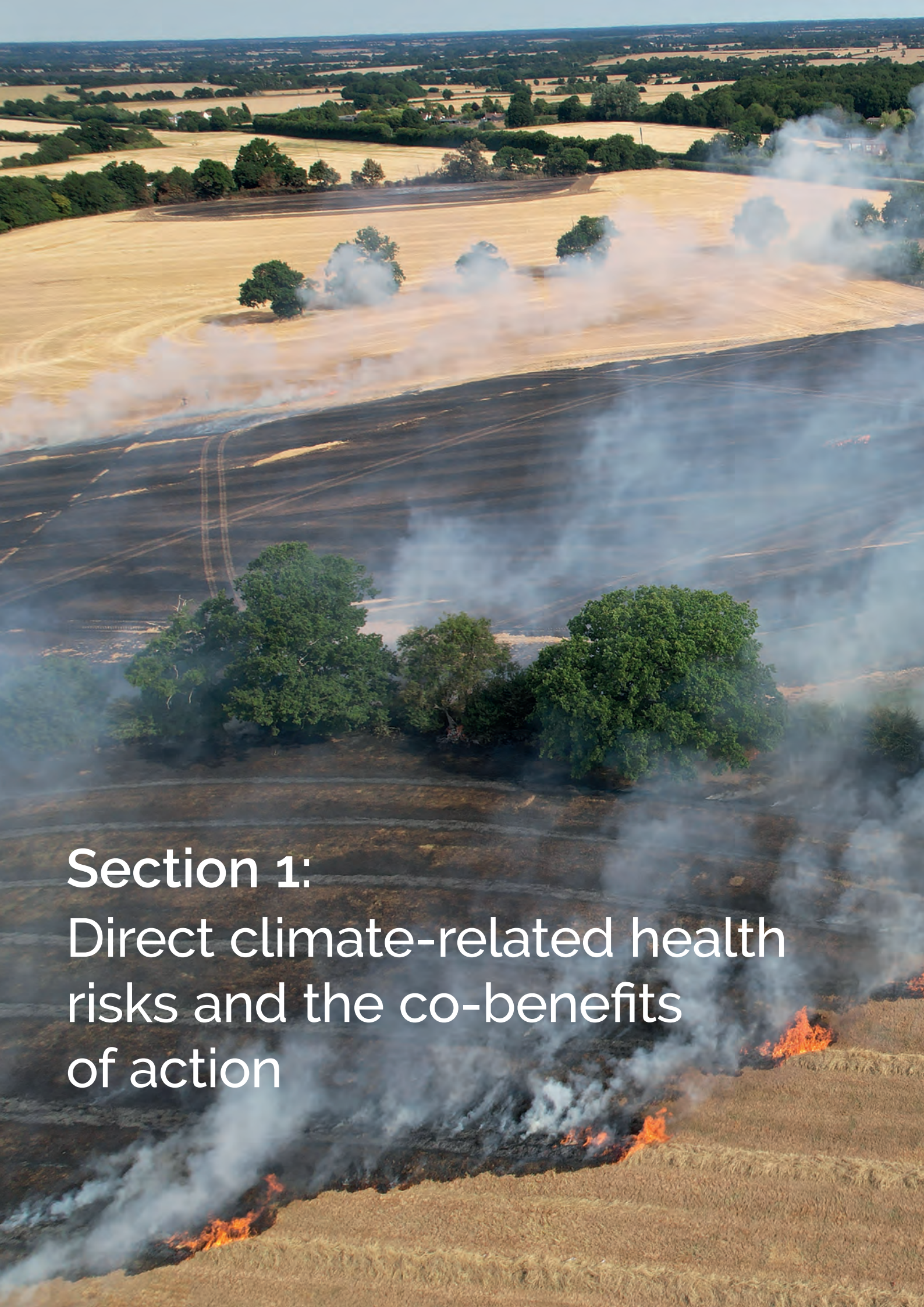
2. **Accelerate emissions reductions to reduce health risks**
   Deliver, and where possible exceed, the UK's commitments under the Climate Change Act to reinforce the UK's leadership and reduce climate-related health risks in the UK and globally.

3. **Strengthen understanding of the impacts of climate change on health**
   Improve research, monitoring and evaluation of climate-related health risks and the effectiveness of the UK's adaptation and mitigation policies in protecting public health.

4. **Develop a 'national health system adaptation plan'**
   Undertake a comprehensive assessment of the risks that climate change poses to the UK's health systems. Use the findings to develop a *national health system adaptation plan* for each of the four nations, and provide adequate, sustained funding for its implementation.

5. **Increase investment in global climate and health action**
   This includes investing in *Overseas Development Assistance* and climate and health initiatives to help reduce cross-border risks to the UK, while strengthening global health security and supporting sustainable development.





Section 1:
Direct climate-related health risks and the co-benefits of action





Professor Shakoor Hajat
Professor of Global Environmental Health, Director NIHR Health Protection Research Unit (HPRU) on Climate Change and Health Security, London School of Hygiene & Tropical Medicine

Chapter 1

Health risks from extreme heat

SUMMARY

Why heat becomes dangerous and how we can prepare

- The body responds to heat by sending more blood to the skin and producing sweat; this increases cardiac demand and can cause dehydration.
- If the body cannot shed heat, injury can progress rapidly from heat strain to organ damage and potentially fatal heatstroke.
- Older people, children, pregnant women, people with health conditions, outdoor workers and socially isolated people face higher risk.
- Harm begins before the most exceptional temperatures, so long-term adaptation matters as well as effective emergency heatwave responses.

Exposure to hot weather poses a serious threat to human health. A typical UK summer may result in around 1,600 heat-related deaths [1.1], rising to almost twice that number in an extreme summer [1.2].

Provisional UK Health Security Agency (UKHSA) figures indicate that the summer of 2026 could have produced England's highest number of heat-associated deaths on record, with 2,877 recorded over 12 days of heatwaves in May and June alone [1.3].

Without stronger mitigation and adaptation, annual heat-related deaths in the UK are projected to rise more than sixfold by the 2050s [1.1].

Health impacts of heat

Human beings respond to heat stress in two main ways: redistributing blood flow to the skin to improve heat transfer and increasing sweat production to remove heat through evaporation. The redistribution of blood flow increases cardiac demand, which can cause problems for people with pre-existing heart conditions.

Sweat production can cause dehydration if fluids are not adequately replenished, potentially leading to acute kidney injury or failure. If body temperature remains high, this can lead to cell, tissue and organ damage [1.4]. Under extreme heat stress, the thermoregulatory capacity of the body can be exceeded; heat-related illness can then progress rapidly to heatstroke, which, if left untreated, can be fatal.

1,600

A typical UK summer may result in around 1,600 heat-related deaths

2,877

deaths recorded over 12 days of heatwaves in May and June 2026 alone

High temperatures have, therefore, been linked with increases in mortality and morbidity risk, including from cardiovascular and respiratory diseases, renal problems, and mental health and neurological outcomes. Despite this, heat stress remains underreported as a risk factor – for example, it is rarely recorded as a contributing factor on death certificates.

Extreme heat impacts in the UK

The health impacts of hot weather are most visible in the UK during extreme heatwave events. During the UK summer of 2022, when recorded temperatures exceeded 40°C for the first time, the UKHSA recorded 2,985 excess deaths across the summer [1.2]. Met Office projections suggest that, under a medium-emissions scenario, a year like 2022 could be considered average by 2060 and considered 'cool' by the end of this century [1.5].

Heat-related harm can also occur during less exceptional weather. Population studies show that adverse effects appear well before the most extreme temperatures. Figure 1 shows the year-round relationship between daily mean temperature and the relative risk of mortality in London, 2015–2024. In this analysis, heat effects become apparent once daily mean temperature rises above around 19°C, with the risk becoming progressively stronger as temperatures rise.

Sensitivity to heat varies between regions, and harmful effects begin at different temperatures depending on the climate each region is accustomed to. For instance, a daily mean temperature of 19°C may raise mortality risk in London, while such a value may not be problematic for many hotter cities due to better adaptation to that temperature.

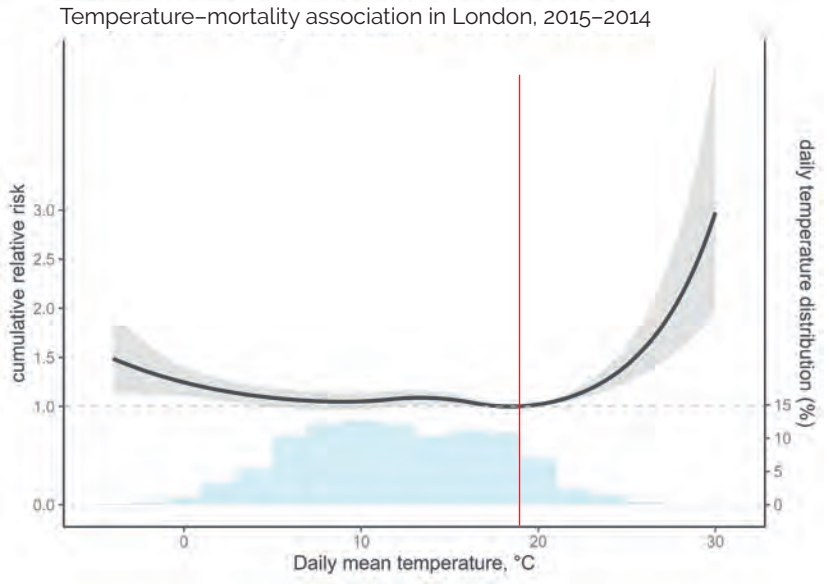


Figure 1: Year-round relationship between daily mean temperature (°C) and the Relative Risk of death in London during years 2015–2024. Impacts up to two weeks following exposure are presented in the figure although heat effects on mortality are known to be mostly immediate – primarily occurring on the day of exposure or up to two days after. Adverse heat effects become apparent above a value of around 19°C in London (red line).


Emergency Ambulance
NHS

Evidence suggests that groups at highest risk of heat strain include older adults; children; pregnant women; people with existing physical and mental health conditions; outdoor workers; and people who are socially isolated, homeless or living in high-rise apartments. Lower productivity on hot days has been estimated to have cost £1.2 billion each year between 1998 and 2021, across Great Britain, with hotter years reaching up to £5.3 billion [1.6].

High humidity can intensify health impacts by reducing the body's ability to cool through sweat evaporation. The UK must also prepare for summers with compound events – for example the co-occurrence of related climate impacts like heatwaves, wildfires and droughts. Together, they have cascading impacts which can strain healthcare systems, infrastructure and other key services [1.7].

The WHO highlights that deaths are not inevitable as 'we know how to protect people: warn communities early, make cities cooler, ensure access to water and shade, check on those most at risk and prepare health systems before temperatures peak.'

The scale of the UK's future health burden and the associated economic costs will therefore depend significantly on how effectively we adapt to rising heat in the years ahead.

Policy recommendations

1. **Improve public health responses to extreme weather events**
   Strengthen and regularly evaluate extreme weather alert systems and public health protection measures, such as the UKHSA Adverse Weather and Health Plan, and ensure they keep pace with a warming climate [1.8].

2. **Improve public advice and support during heatwaves**
   As public awareness of the health risks of hot weather remains low [1.9], strengthen public and workplace health messaging and ensure employers put effective safeguards in place to protect workers. Local authorities should expand access to cooling spaces, with appropriate health support available for those who need it.

3. **Design communities for a warmer climate**
   As many adverse health impacts occur during moderate heat, when acute interventions are less likely [1.10], measures such as green and cool roofs, natural ventilation and permeable paving can reduce Urban Heat Islands [1.11]. Nature-based solutions, including increased tree cover and water bodies, can cool areas, improve air quality and provide wider health and socio-economic benefits [1.12].

4. **Target heat adaptation where vulnerability is greatest**
   Ensure climate adaptation reduces health inequalities by prioritising communities most exposed to heat and with least access to cooling green and blue space. Implement the Climate Change Committee recommendations to invest in cooling for key public services; set maximum temperature regulations for workplaces; and accelerate the uptake of cooling for the most vulnerable [1.13].

5. **Develop a national heat strategy**
   Coordinate a national strategy to bring together health, housing, transport, planning and other sectors to accelerate measures that protect people from rising temperatures.



Professor Stephen T Holgate KBE, CBE
Clinical Professor of Immunopharmacology, University of Southampton and Special Advisor to the Royal College of Physicians (RCP) on Air Quality

Chapter 2

Health risks from air pollution

SUMMARY

Air pollution: the indoor and outdoor risks to our health

- Fine and ultrafine particles can move beyond the lungs and contribute to disease across multiple body systems across a lifetime.
- In addition to outdoor pollution, indoor exposure comes from sources including cooking, gas hobs, wood burning, paints, aerosols, damp and mould.
- Energy efficiency measures can improve health, but greater airtightness without adequate ventilation may worsen indoor air quality.
- Because fossil fuel combustion drives both warming and air pollution, coordinated action would deliver rapid local health benefits.

Air pollution is one of the most significant environmental risks to health, associated with 6.7–8.1 million premature deaths worldwide each year and an estimated 28,000–36,000 in the UK [2.1, 2.2].

Two high-profile UK cases show the consequences for children: outdoor air pollution contributed to the death of Ella Adoo-Kissi-Debrah [2.3], and prolonged indoor exposure to mould caused the respiratory condition that led to Awaab Ishak's death [2.4].

Air pollution is estimated to cost the UK economy over £27 billion annually, rising to £50 billion when associations with dementia and cognitive decline are included [2.2]. Climate change and air pollution also share important sources, particularly fossil-fuel combustion, which warm the climate.

Analysis suggests that coordinated clean air and climate policy would deliver rapid public health and economic benefits, with up to 50% greater benefits than pursuing the policies separately. Any upfront costs of integrating clean air policy could be offset by the economic and health benefits of cleaner air [2.5].

Outdoor air pollution

By the 1990s, the dominant source of air pollution had shifted from burning coal to road transport [2.6]. This was driven by vehicle combustion engines, which produce carbon-rich particulate matter (PM) – a mixture of solid and liquid particles classified by size [2.7] – coarse (PM10), fine (PM2.5) and ultrafine (PM0.1). Principle gaseous pollutants

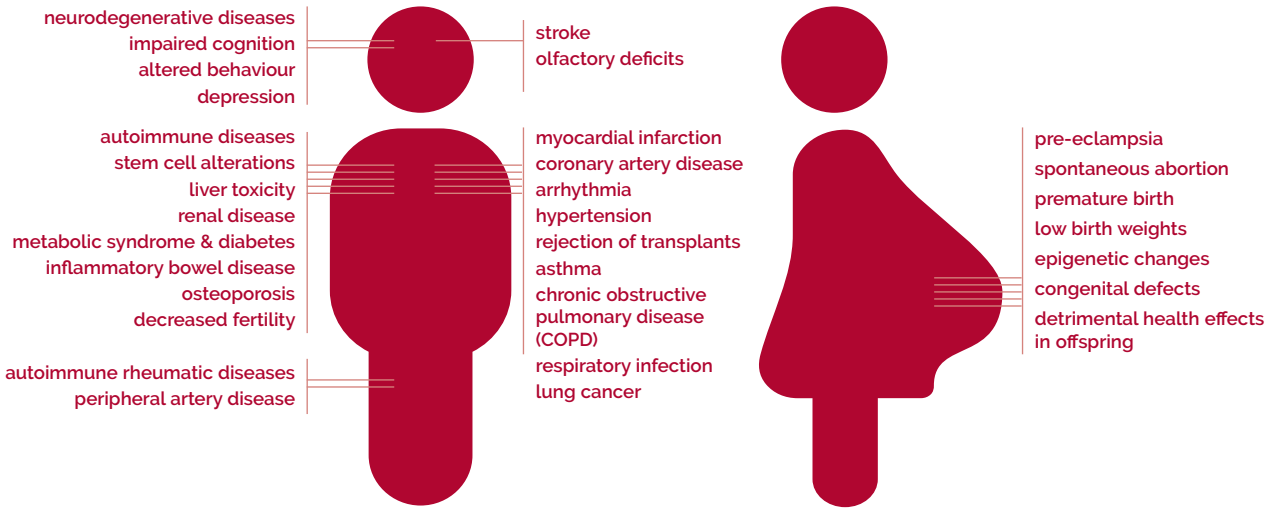


Figure 1: Particulate air pollution reaches almost every organ in the body and the diseases linked to them
(adapted from Prof Mark Miller, University of Edinburgh, with thanks).

include nitrogen dioxide (NO_2), especially from diesel combustion, and non-methane volatile organic compounds (NMVOCs) from multiple sources, including industry.

The first National Air Quality Strategy in 1997 [2.8], together with monitoring through the Automatic Urban and Rural Network [2.9], demonstrates how evidence can drive policy. It led to major reductions in pollutants through stricter vehicle exhaust standards, cleaner fuels, Air Quality Management Areas and Low/Ultra Low Emission Zones [2.10].

The dramatic reduction in vehicle-related air pollution with the ULEZ in London has restored lung growth in children, helped reduce air pollution deaths by 40% and reduced emergency admissions for lung and heart disease by 15% [2.11].

However, ammonia emissions, predominantly from agriculture, and pollution from domestic solid-fuel burning remain stubbornly high [2.12, 2.13].

Indoor air pollution

Because people spend 80–90% of their time indoors, exposure to trapped internally-generated pollutants is a major health concern. Common sources include NMVOCs (from paints and aerosols), $PM_{2.5}$ (from cooking and wood stoves), and NO_2 (from gas hobs). Excess moisture also encourages allergenic dust mites and mould [2.14].

The UK has some of Europe's oldest and least energy-efficient housing stock. Many homes lack adequate ventilation and measures to control sources of indoor pollution [2.15], especially in disadvantaged communities [2.16]. The UK also suffers from a lack of binding limits for indoor pollutants, fragmented oversight and poor enforcement of existing policies.

Health effects

The acute health effects of air pollution are well documented: exposure contributes to cardiovascular and respiratory conditions such as heart disease, stroke, asthma, chronic obstructive pulmonary disease (COPD) and lower respiratory infections [2.2]. Long-term exposure to air pollution is associated with a wide range of non-communicable diseases, increased vulnerability to infection and impaired foetal development [2.17].

Pollutants can trigger the release of inflammatory mediators into the bloodstream, while fine and ultrafine particles can cross the lung membranes and enter the systemic circulation, reaching other organs and causing cellular damage [2.18].

Ultrafine particles inhaled via the nasal cavity may reach the brain through the bloodstream or along nerves which connect the nose with the brain. This exposure is linked with neuroinflammation, and studies associate air pollution with neurogenerative diseases including Alzheimer's and Parkinson's [2.19].



Lifelong exposure to ambient pollutants can promote persistent, low-grade inflammation and accelerated biological ageing [2.20]. This may hasten cellular and organ decline, drive multimorbidity [2.21] and increase cancer risk [2.22]. Exposure during pregnancy is associated with birth complications and interference with organ development [2.23].

The WHO has clear guidelines for particulate matter and other pollutants [2.24]. Yet currently, an estimated 95–97% of the UK population live in areas where outdoor PM2.5 concentrations exceed the WHO guideline [2.7].

The co-benefits of climate and environmental action

Since the primary drivers of air pollution are also the leading causes of climate change, tackling both together is a powerful, interconnected strategy [2.5].

Poorly-designed measures can create unintended consequences if climate and air-quality impacts are not considered together. For example, improving the energy efficiency of buildings through greater air-tightness can reduce ventilation and increase exposure to indoor pollutants unless adequate ventilation is also provided. Similarly, while electric vehicles eliminate tailpipe emissions, they still produce particulate pollution from tyre and brake wear, which should also be addressed through complementary policies such as regulatory emission limits, material restrictions, and weight-based incentives.

A recent United Nations Environment Programme (UNEP) assessment found that integrated climate and clean air action is among the highest-return investments available to governments, with solutions across energy, agriculture and transport potentially generating $15 for every $1 invested through lower healthcare costs, higher productivity and improved quality of life. The 25 solutions identified are estimated to cost 0.7% of global GDP over the next decade, falling to 0.5% by 2100, while benefits could rise from 2.8% of GDP in 2035 to 11.4% by 2100 [2.25].

UK policy should now address indoor and outdoor pollution together and maximise the many health and economic benefits of climate and environmental action.

Policy recommendations

1. **Join up climate and air pollution policy**
   Since climate change and air pollution share the same root causes, joined up and coherent policies are needed, including legally aligning UK air quality targets with the 2021 WHO Global Air Quality Guidelines to further drive down levels of air pollution.

2. **Improve local reporting on air quality and health co-benefits**
   Require national and local climate action plans to formally quantify and report on local air quality and health co-benefits, ensuring that emission-reduction targets are mutually reinforcing rather than conflicting.

3. **Recognise air pollution as a public health emergency**
   Air pollution should be recognised by the government as a critical public health emergency rather than a solely environmental issue. It should be treated with the same urgency as ensuring clean water or safe food.

4. **Launch a national public health campaign on air pollution**
   Improve public understanding of the health risks of poor air quality and the actions people can take to protect themselves and vulnerable groups to help reduce the staggering annual cost to the economy.

5. **Set and enforce standards for healthy indoor air**
   With the 70th anniversary of the 1956 Clean Air Act, it would be an opportune time for the government to mandate a cross-departmental indoor air quality strategy, improve building regulation enforcement and treat indoor spaces with the same rigour as outdoor environments.



Professor Hannah Cloke OBE
Regius Professor of Meteorology and Climate Science, University of Reading

Chapter 3

Health risks from storms and flooding

SUMMARY

Good flood management is good health and economic policy

- In England, 6.3 million homes and businesses are currently in areas at risk of flooding, potentially rising to around 8 million by mid-century, with annual damage costs reaching £4.5 billion.
- Beyond death, injury and infectious disease, flooding can increase skin, respiratory and nervous system conditions, disproportionately affecting older and socially disadvantaged people.
- Nature-based solutions can reduce flood risk, improve air and water quality, strengthen climate resilience and reduce health inequalities.
- Flood resilience can reduce mental health harms, injury and illness, while delivering strong returns: every £1 spent on defences could prevent £8 in damage.

Flooding causes an estimated £3.3 billion in annual damage in the UK [3.1] and storms bring harm through high winds, storm surges and coastal erosion, as well as intense rainfall and flooding that cause loss of life.

Insurers paid out a record £585 million for weather damage in the UK in 2024 (3.2), and by 2050, under a moderate warming scenario, the number of properties at risk could increase by 40% and annual flood damages could rise to £4.5 billion [3.1]. Intense rainfall events are projected to become 15 to 60% heavier [3.3, 3.4].

The UK is not ready. Yet action is not only about avoiding harm. Measures that reduce flood and storm risk also bring lasting benefits for health, nature and public finances.

The gravest risk: death

The most fundamental health consequence of storms and flooding is death [3.5].

Deaths from storms and flooding are often the consequence of a poor understanding of flood dangers, late warnings and evacuation plans that make no provision for people who cannot move themselves. Many deaths occur when people enter floodwater, often underestimating the danger, with men disproportionately likely to take such risks [3.6].



Intense rainfall events in the UK are projected to become 15 to 60% heavier by 2050

In October 2024, flash floods struck Valencia, killing 224 people, with many trapped in cars or basements. Spain's meteorological service raised its red alert hours earlier, but the public alert reached mobile phones only late that evening [3.7].

Beyond deaths, flooding drives a wider burden of illness that falls heavily on older people and socially disadvantaged communities [3.8]. Flooding can significantly increase hospitalisation rates for skin diseases, nervous system conditions and injuries among adults 65 and over. Floodwater contaminated by sewage and debris can cause wound infections, cellulitis and contact dermatitis, and deprived communities more often live in flood-prone, poorly protected housing and face greater barriers to warnings and recovery support [3.9, 3.10, 3.11].

All of these vulnerabilities exist in the UK today and the risks are intensifying. The winter of 2023–2024 was the wettest on record for England and Wales, in a rainfall series stretching back 250 years [3.12]. It brought prolonged and repeated flooding, and climate change made the rainfall around 20% heavier [3.1].

Mental health impacts and wider disruption

People who experience flooding are more likely to suffer depression, anxiety, and post-traumatic stress disorder [3.13, 3.14]. Flood disruption to health services also worsens health outcomes, with access to treatment often disrupted even when people's own homes are not flooded [3.15].

When Storm Desmond flooded an electricity substation in 2015, more than 100,000 people lost power for up to six days, including the Royal Lancaster Infirmary, with wider health services, work and schooling disrupted [3.16]. A storm can do the same without flooding: Storm Arwen in 2021 cut power to around 1 million customers, some for up to thirteen days, with rural communities and older people worst affected [3.17].

For months after a flood, the burdens of insurance disputes, temporary accommodation and economic loss fall hardest on those least able to absorb them. Children face particular burdens: flooding disrupts education, play and community life, with evidence linking flood exposure to lasting harm to developmental trajectories [3.18].

Emerging and compounding risks

Floodwater contaminated by overwhelmed sewer systems, which hold both rainwater and raw sewage, carries pathogens including *E. coli*, *Campylobacter* and *Leptospira* [3.15]. Sewers in England overflowed into rivers a record 3.61 million hours in 2024 [3.19].

Post-flood damp and mould cause respiratory harm, particularly in children and immunocompromised people [3.20]. Carbon monoxide poisoning from portable generators used during power outages is an underreported cause of flood-related death [3.21]. Nearly 4,000 historic landfill sites in England sit in flood-risk areas without defences, where flooding can release chemicals into surface and groundwater sources [3.22].

Increasing temperatures will also change the UK's disease potential due to increased areas of standing water and humidity, including increased risks of mosquito-borne disease [3.23].





In England, 6.3 million homes and businesses are at risk of flooding

Solutions exist and they pay

Nature-based flood management measures, including restoring floodplains, creating wetlands, planting trees and building sustainable drainage systems, can reduce flood risk while delivering wider benefits. The green and blue spaces created support better physical and mental health, cool communities during heatwaves, clean the air and water, and help to narrow health inequalities [3.24].

Property-level flood resilience measures can deliver a benefit-cost ratio of 5:1 [3.1], while every £1 spent on flood defences is estimated to prevent £8 in economic damage [3.25].

Investment in infrastructure must be supported by investment in 'imagination infrastructure': people often fail to act on warnings not because they lack information but because they cannot picture what a flood would look like. Cultivating this imaginative capacity, through local storylines and warnings, is a critical component of preparedness [3.26].

In England, 6.3 million homes and businesses are currently in areas at risk of flooding, potentially rising to around 8 million by mid-century [3.27], yet just 1.5 million properties are registered to receive Environment Agency flood warnings, and that service does not cover surface-water flooding at all [3.28]. The government has begun work on flood warnings, recovery and surface-water forecasting [3.29], but without statutory duties to reach vulnerable residents and help them take action in response, critical gaps remain.

Policy recommendations

1. **Introduce universal, accessible flood warnings**
   Establish statutory minimum standards for flood-warning coverage and accessibility, including non-digital and assisted communication where required. Warnings should be issued as early as possible, even where there is uncertainty.

2. **Account for the full health costs in flooding investment decisions**
   Reform flood-investment appraisal to account for the full health burden of flooding, including physical and mental illness, mortality, disruption to care, and the cumulative impacts of repeated flooding.

3. **Establish minimum standards for post-flood health and care recovery**
   These standards should include a single trusted point of contact for every affected household, continuity of medication and care, proactive mental-health support, and advice on mould, damp and carbon monoxide risks.

4. **Give local bodies clear accountability for flood recovery**
   Local recovery plans should designate a named body responsible for coordinating health services and recovery support beyond the immediate emergency period.

5. **Invest in prevention and community resilience**
   Increase investment in measures that reduce flood risk and protect health, prioritising communities most at risk and least able to prepare and recover. This should include nature-based solutions, resilient infrastructure, property-level protection and community preparedness.



Professor Debra Jackson
Professor of Global Maternal and Child Health, London School of Hygiene and Tropical Medicine

Professor Susannah Mayhew
Professor of Health Policy, Systems and Reproductive Health, London School of Hygiene and Tropical Medicine

Dr Chloe Brimicombe
Climate Scientist, Department of Social Policy and Intervention, University of Oxford

Chapter 4

Maternal and child health-related risks

SUMMARY

Climate risks across pregnancy and childhood

- Pregnancy, the newborn period and childhood are sensitive windows in which environmental exposures can shape lifelong health and development.
- Extreme weather can disrupt maternity and neonatal care as well as housing, schools, early-years settings and local services.
- Overheating, poor air quality and flooding affect not only physical health but also learning, concentration, behaviour and wellbeing.
- Effective protection requires advice and services designed specifically for pregnant women, babies, children and families, not generic public messaging alone.

Pregnant women, newborns and children are particularly vulnerable to climate change because these are sensitive periods for health and development [4.1].

Evidence links extreme heat, poorer air quality, flooding, drought and wildfire smoke with worse maternal, newborn and child health outcomes [4.1, 4.2].

Climate-related impacts are already disrupting maternity services, neonatal care, housing, schools and early years settings.

Impacts on maternal health

Climate change impacts, such as overheating and flooding, pose direct risks to the safe functioning of maternity, neonatal and paediatric units. For example, flooding in St George's Hospital London in 2022 closed the paediatric ward for two days [4.3], and maternity units can reach between 32˚C and 38˚C indoors during heatwaves; the recommended safe temperature is 18˚C [4.4].

Research has found that mothers exposed to heatwaves during pregnancy have increased risk of complications, such as gestational diabetes (28%), pre-eclampsia (16%), low-birth weight babies (29%), pre-term birth (12%) and stillbirth (13%) [4.5, 4.6].

Gestational diabetes, which affects 5% of pregnancies in the UK and can lead to an increased risk of complications such as pre-eclampsia and pre-term birth, could increase in the UK by 27.5% annually due to heatwaves [4.7].

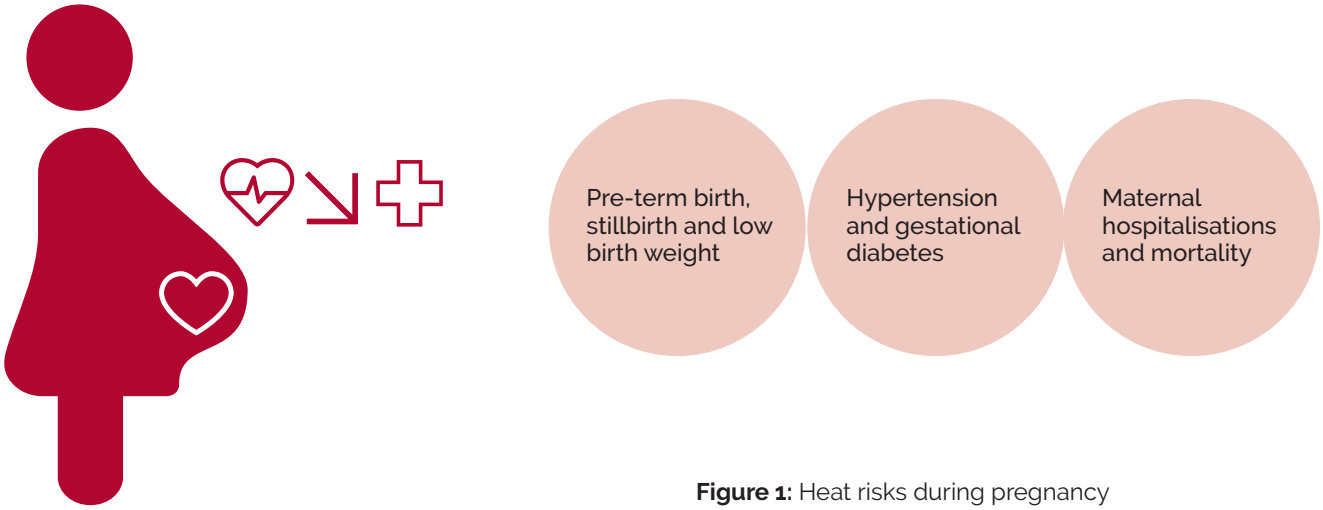


Figure 1: Heat risks during pregnancy

Impacts on child health

Children's development, learning and wellbeing are affected by the environments in which they grow up. With increasing levels of pollen, mould growth and overheating associated with climate change, children are more likely than adults to experience allergies, asthma and other respiratory problems, particularly where housing is already poor quality [4.8]. Evidence links prenatal air pollution exposure with a range of neurodevelopmental outcomes, including cognition, mood, attention and behavioural development [4.9].

According to data from the English Housing survey, 1.6 million children live in overheated homes, and the Chartered Institute of Housing states that more than 70,000 babies are living in overheated homes [4.10]. Heat has also been identified as one of the causes of sudden infant death, which accounts for an estimated 200–300 infant deaths annually in the UK [4.11].

Without adaptation, some teaching spaces could become unusable for learning in the future. Climate risks are already affecting schools: 33% of primary schools and 38% of secondary schools in the UK are at high risk of surface water flooding, while hotter temperatures currently result in an average loss of 6.7 learning days per year [4.12].

During the UK's May–June 2026 heatwaves, classrooms reportedly reached temperatures above 40˚C, posing serious risks to the health of children and staff and their ability to learn. The temperatures of ground surfaces where children play can also reach 60˚C on hard dark surfaces [4.4] during hot weather, whilst students sitting exams on a 32˚C day are 10% less likely to pass than on a 22˚C day [4.5].





Thermal discomfort is also associated with an increased risk of bullying, which affects 25–30% of schoolchildren and can contribute to lasting effects on mental health and wellbeing [4.13]. Research also shows that higher temperatures are linked to increased levels of violence, with violence against women and girls accounting for around 20% of all reported crime in the UK [4.14].

Implications for UK Policy: The time to act is now

The UK has made some progress in developing policies that protect women and children from climate change. However, key gaps remain.

National Adaptation Plans do not identify individual groups that are vulnerable, which can be a challenge to effective policy development, and while the Adverse Weather and Health Plan (AWHP) notes the vulnerability of pregnant women and children, it does not provide any concrete plans or actions for protecting these populations.

> *National and local adaptation plans should explicitly identify pregnant women, newborns and children as priority groups... supported by a coordinated approach to researching and addressing the specific climate-related health needs of women and children.*

Policy recommendations

1. **Make women and children a priority in adaptation planning**
   National and local adaptation plans should explicitly identify pregnant women, newborns and children as priority groups. This should be supported by a coordinated approach to researching and addressing the specific climate-related health needs of women and children.

2. **Legislate to protect women and children from climate risks**
   Existing overheating protections in social housing, alongside flood protections under the Flood and Water Management Act 2010 and The National Planning Policy Framework 2024, should be extended to health, education and early years settings.

3. **Make health services climate-resilient**
   All health systems in the UK should set long-term plans, funding and climate-resilience targets for maternity, neonatal and paediatric services. *Health Care Without Harm* [4.15] provides a useful framework for assessing climate risks and planning mitigation during climate-related crises.

4. **Equip families and health professionals to respond**
   Provide climate-related training for healthcare professionals and integrate targeted advice on how to respond to climate-related health risks into antenatal classes and family planning literature. Government messaging on air pollution and extreme weather should include targeted advice for pregnant women, post-partum women, newborns and children.

5. **Build climate resilience into school environments**
   Build on climate literacy initiatives to improve school-leavers' understanding of climate change, its impacts and associated health risks, including through updates to the national curriculum. Government could also work with the private sector to fund adaptation in schools, nurseries and playgrounds.



Section 2:
Indirect climate-related health risks and the co-benefits of action





Professor Mike Davies
Professor of Building Physics and the Environment, UCL Institute for Environmental Design and Engineering, University College London

Chapter 5

How climate change affects health through the built environment

SUMMARY

Buildings can protect health, or increase risk

- The condition and design of buildings shape exposure to heat, cold, damp, poor air quality and flooding.
- Retrofit should address insulation, low-carbon heating, ventilation, shading and overheating together rather than as separate programmes.
- Passive cooling should be the first line of defence, but active cooling will also be needed in some settings and must be planned equitably.
- Closing the gap between designed and real-world building performance is central to achieving both health and climate benefits.

The impacts of climate change on the built environment are already being experienced, through the places where people live, work, learn and receive care.

For example, over half of UK homes are already at risk of overheating and, in England alone, there are 6.3 million properties in flood risk areas [5.1].

Well-designed built environments can reduce risks while delivering wider socio-economic benefits, including improved public health, reduced pressure on health services, reduced disruption to infrastructure and greater resilience and progress towards net zero.

Key health risks associated with the built environment and their policy relevance in the UK

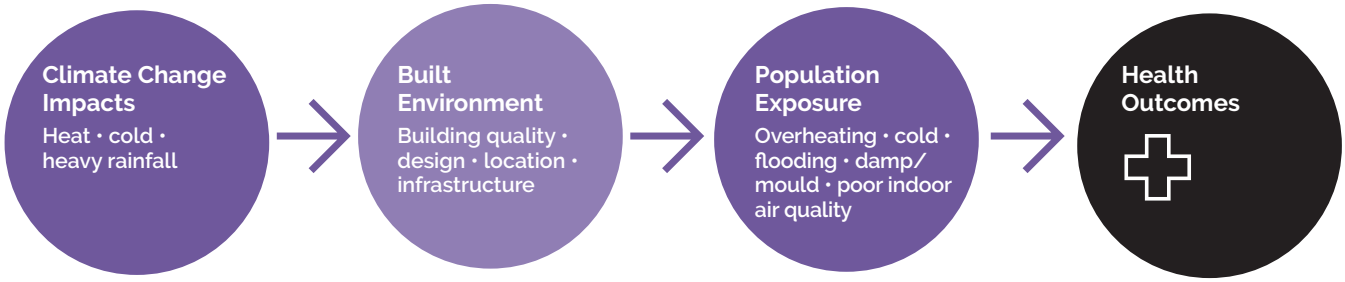
Some key components of how climate impacts affect health through their interaction with the built environment are summarised in Figure 1.

There are several priority areas of concern:

Overheating

Most existing buildings are not designed for higher temperatures. Indoor overheating is therefore a growing problem in homes, schools, hospitals and care settings. Retrofit policy should integrate adaptation measures (such as shading and ventilation) with carbon-reduction measures (such as insulation).

Figure 1: Climate change, the built environment and health.



Cold, damp and energy-inefficient housing

Despite a warming climate, cold and poorly performing homes remain major risk factors for respiratory illness, excess winter deaths and poor mental health. Under a worst-case emissions scenario with population ageing and no further adaptation, annual heat-related deaths could reach around 21,000 in the 2070s. Moderate-cold deaths are projected to peak around mid-century and then decline, but remain high at around 56,000 in the 2070s [5.2]. The condition of the housing stock is therefore central to protection from both heat and cold, fuel affordability and resilience.

Flooding and water-related impacts

More intense heavy rainfall and rising flood risk threaten physical safety, mental health and access to services. Land use, building standards and infrastructure design are therefore directly relevant to health protection. The Climate Change Committee (CCC) recommends that 'planning policy should require that new building development avoids undefended areas at risk of existing and future flooding and coastal erosion as a first principle' [5.1].

Indoor air quality

The potential health benefits of energy efficiency interventions are well established [5.3] but poorly implemented retrofit can also cause harm. For example, energy-efficiency measures that increase airtightness can worsen indoor air quality unless accompanied by improvements in ventilation [5.4].

These risks are not evenly distributed through the population [5.1]. Without targeted policy, climate impacts on the built environment risk widening existing health inequalities. Reliance on air conditioning in a warming climate, for example, may be inequitable if people cannot afford the equipment or electricity to run it [5.5].

Balancing the challenges with opportunity: action and co-benefits

There are substantial and credible opportunities to reduce climate risk while delivering health, economic and social benefits.

If implemented correctly, improving insulation and passive cooling (such as ventilation and shading) can reduce exposure to cold and overheating, while lowering energy demand. Expansion in active cooling must be planned alongside the electrification of heating, and adaptation to higher temperatures in a systemic way, to maximise the cost-effectiveness of relevant investment [5.5].

Research in the care home sector shows that combinations of shading and appropriate window and door opening can cost-effectively reduce heat-related risks to residents across different types of care homes [5.6].

In terms of cost effectiveness more widely, the CCC has noted [5.1] that a combination of both active and passive adaptation measures for buildings and urban streets to reduce overheating risks is beneficial. This includes ventilation, internal shading (blinds), loft insulation and air conditioning. By the 2050s, delivering it to the 30% most vulnerable UK areas could achieve a benefit–cost ratio of 3:1 [5.1].

More generally, embedding health considerations in wider decarbonisation strategies can generate a range of health and health equity benefits, particularly through air quality, housing, transport and green space [5.7].

In summary, climate impacts on the UK built environment represent a substantial health risk. However, there is strong evidence that early, well-designed action can reduce these risks while delivering broader socio-economic benefits.





Policy recommendations

1. **Embed health risks and co-benefits into built-environment decisions**
   Integrating climate-related health risks and opportunities into building, planning and infrastructure decisions can improve resilience, health outcomes and long-term value for money.

2. **Upgrade existing buildings for a changing climate**
   Targeted investment can address climate mitigation and adaptation together, reducing health risks and costs. For example, integrated home upgrades combining energy efficiency, low-carbon heating and measures to reduce overheating can reduce costs and disruption.

3. **Make new buildings fit for the future**
   Planning policy and building regulations should ensure that new buildings are suitable for future climate conditions with respect to the risks of flooding, coastal erosion and overheating.

4. **Strengthen compliance and enforcement of standards for new buildings**
   Ensure building performance is assessed after construction, with clear accountability, transparent information and effective sanctions where climate-related standards are not met.

5. **Government policy should ensure no homes are left behind**
   To avoid widening health inequalities, government policy should ensure the benefits of retrofit are experienced across all homes and public spaces, particularly in vulnerable settings such as social housing and care homes.



Professor Paul Behrens
British Academy Global Professor, Oxford Martin School

Chapter 6

How climate change threatens food security and health

SUMMARY

Food security is a health and climate issue

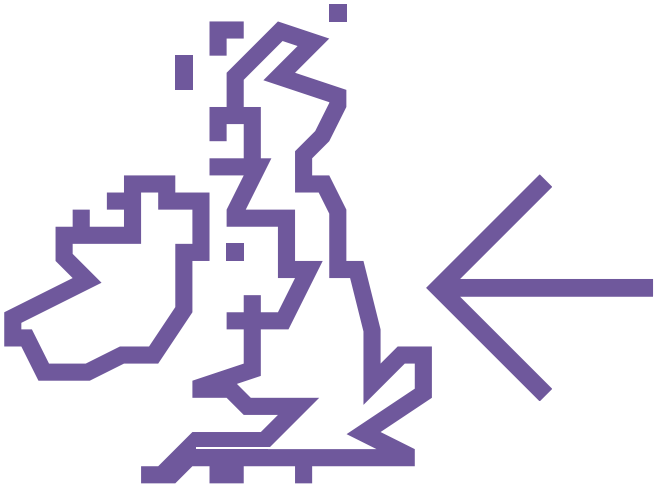
- Climate change affects food availability, price and nutritional quality, while the food system contributes to warming and nature loss.
- Food shocks fall hardest on low-income households with less flexibility to absorb price rises or switch to healthier alternatives.
- More plant-rich diets can reduce chronic disease and food-system emissions while releasing land for nature recovery.
- Public procurement aligned with the Eatwell Guide can improve meals in public institutions while creating dependable demand for British fruit, vegetables and pulses.

A changing climate is straining what the country can grow and afford, while the way we produce and eat food is a major driver of climate change, nature loss and ill health.

The UK imports roughly 40% of its food, with low self-sufficiency in fresh produce: only 53% of vegetables and 16% of fruit are grown here [6.1]. Since 2013, more than half of UK fruit and vegetable imports have come from increasingly water-scarce countries [6.2]. The empty UK supermarket shelves of February 2023, when tomatoes, peppers and salad supplies fell after unusual storms in Spain and North Africa, were a preview of the disruption ahead [6.3].

Domestic production is also exposed. The wet autumn and winter of 2023–2024 cut England's production of wheat by roughly 20% and oilseed rape by 32% year-on-year, and was the second-smallest harvest on record [6.4]. Food prices respond quickly to these shocks: UK food-price inflation peaked at 19.2% in March 2023, the highest in 45 years [6.5].

Food Foundation data indicated that around 6.5 million UK adults and 2.2 million children experienced food insecurity in June 2026 [6.6]. In 2022–23, the poorest 20% of households spent around 14% of their budget on food and non-alcoholic drinks, compared with 8% among the richest 10%. In 2025, around half of low-income households reported cutting back on or skipping meals, while 40% said they had gone hungry in the last 30 days because they could not afford food [6.7].



The UK imports roughly

40%

of its food

In a 2023 survey of UK food-system experts, around 40% judged serious civil unrest (over 30,000 people injured in a year) possible or likely within ten years, rising to 80% over fifty years [6.8].

Recent modelling suggests that climate change could add 1 to 3 percentage points a year to global food-price inflation by 2035 [6.9]. However, that is almost certainly an underestimate, as the analysis considered only rising temperatures, leaving out droughts, floods, storms, pests, diseases, damage to infrastructure and the risk of climate tipping points.

Diet, climate and health are connected

Poor diet is one of the UK's leading modifiable causes of ill health, contributing to an estimated 64,000 deaths a year in England [6.10]. A 2026 estimate attributed £67 billion in healthcare costs, and £298 billion in total health, care, welfare, productivity and human costs, to chronic disease associated with our current food system [6.11].

Climate-driven food insecurity can worsen this burden since disrupted access to food is linked to diabetes, obesity, depression and unhealthy weight gain in pregnancy [6.12].

Higher atmospheric CO_2 also changes the way plants grow and lowers the protein, iron and zinc content of staple crops [6.13]. One global estimate suggested that rising CO_2 alone could place an additional 175 million people at risk of zinc deficiency and 122 million at risk of protein deficiency by 2050 [6.14], with women and young children among those most exposed.

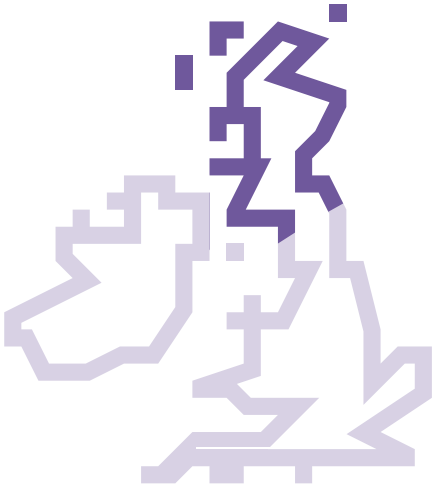
The co-benefits of action are large and well evidenced

Aligning UK diets with the Eatwell Guide (more vegetables, pulses and wholegrains, and less red and processed meat) could prevent tens of thousands of deaths each year [6.15], with a 7% lower risk of death [6.16], while reducing diet-related emissions by at least a quarter [6.17].

More ambitious shifts, of the kind now adopted in Germany, Spain, Denmark and Canada, could deliver further health benefits [6.18]. Germany's 2024 dietary guidelines, for example, now recommend that at least 75% of the diet comes from plant foods and for meat to be limited to 300g a week, explicitly for both health and the environment [6.19].

Modelling suggests that adopting such diets in the UK could free an area almost the size of Scotland for nature recovery [6.20]. Around 85% of UK agricultural land currently produces animal products [6.10]. Some of this spared land could grow protein crops such as legumes for human consumption, and in turn reduce our dependence on fertilizer and the fossil gas used to make it.

The UK has the science, the farmers, the businesses and the public health institutions to lead globally on this agenda. Acting decisively would save lives, save public money, cut emissions and improve both UK food security and the British countryside for generations to come.



Modelling suggests that adopting plant-rich diets in the UK could free an area almost the size of Scotland for nature recovery

32% of the UK's land area

Policy recommendations

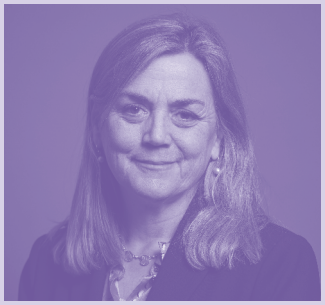
1. **Shift demand towards healthier, sustainable diets**
   Encourage shifts away from foods high in fat, salt and sugar (HFSS) and high meat consumption, while supporting predictable demand for British fruit, vegetables and pulses and improving affordability for consumers. Strengthen restrictions on HFSS advertising to support healthier, more sustainable choices.

2. **Improve dietary guidelines and food-system targets**
   Include sustainability in future dietary guideline revisions and set targets for food-system emissions and dietary outcomes that integrate health, climate and nature goals. Build on the *National Food Strategy* recommendations for food-system transformation, including increasing plant foods.

3. **Shift public food procurement towards healthier, sustainable diets**
   Ensure food served in public institutions aligns with the Eatwell Guide and public procurement standards to improve public health and support UK farmers. Address gaps in compliance and enforcement, which are not routinely monitored [6.21] and are particularly significant in schools [6.22].

4. **Back sustainable farming production**
   Support climate-resilient, plant-rich production by providing farmers with reliable pathways to deliver environmental benefits as land managers, while investing in innovations such as drought-resilient and novel protein crops, greenhouses, and technologies such as precision fermentation.

5. **Build food-system resilience nationally and locally**
   Implement the National Preparedness Commission's *Just in Case* recommendations: strengthen Defra's assessment of food as critical national infrastructure, shift logistics from 'just-in-time' to 'just-in-case', establish a statutory duty on government to feed the public during crises and resource local food resilience committees to map vulnerabilities and coordinate community preparedness.



Professor Baroness Kathy Willis CBE, FRS
Chair of Peers for the Planet; Professor of Biodiversity and Principal of St Edmund Hall, University of Oxford

Chapter 7

How climate-driven changes to nature affect our health

SUMMARY

Climate change is undermining nature's ability to protect us

- Climate change is reducing nature's benefits for human health, including protection against heat stress and physical and mental illness.
- Soil-based organisms and pollinators that support crop health are being impacted by climate change – causing potential food security risks.
- Meanwhile, climate change is expanding the disease-causing potential of UK species, including mosquitoes, ticks and rats.
- Policy priorities include setting urban tree canopy targets, climate and health-smart planting standards, surveillance of climate-sensitive diseases, and agricultural practices that reduce flooding and protect soil biodiversity and pollinators.

Nature is in a period of rapid climate-driven ecological turnover [7.1]. Some species and ecosystems are thriving in the new climate norms; others are in serious decline.

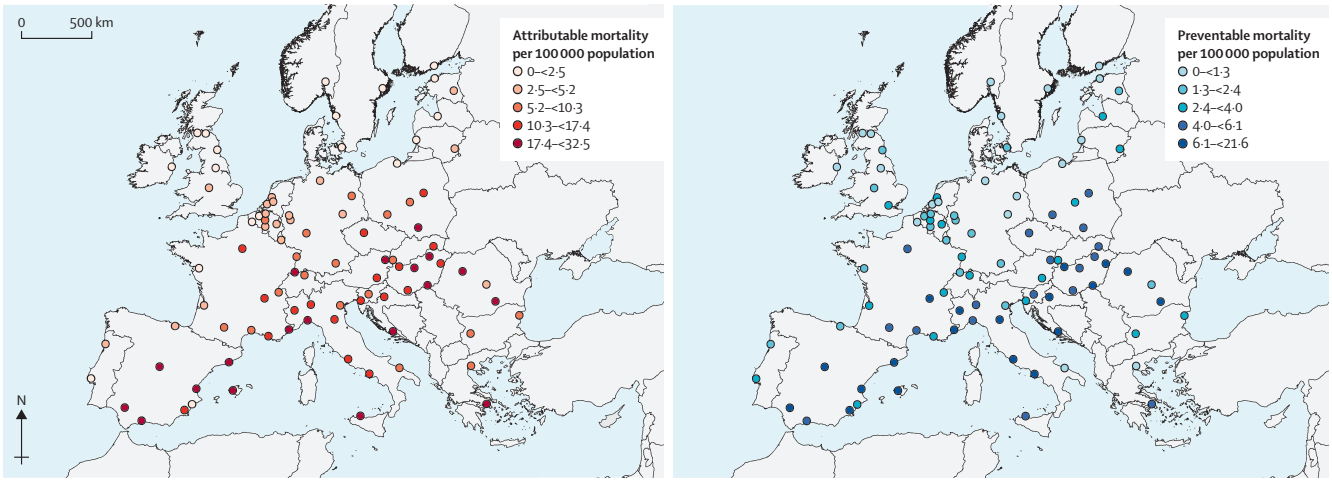
Given that some nature can be harmful for human health, health risks associated with climate-driven ecological turnover need to be regarded as two separate questions: what biodiversity are we losing that is important for human health? And what biodiversity is increasing that poses a threat?

What biodiversity are we losing that is important for human health?

Tree loss and excess heat

With increasing intervals of drought and heat, many common temperate tree species are showing crown dieback and stress-induced mortality. In the UK, these include Silver Birch, English Oak, Norway Maple and non-native species like Robinia. With the death of trees, particularly in cities, come two health issues. First, human heat stress will increase; second, there will be the loss of the physical and mental health benefits obtained from this green infrastructure.

Exposure to excess heat in cities has important health implications, including all-cause and cardiorespiratory mortality, adverse pregnancy outcomes, and mental health problems [7.2]. Trees provide mitigation against this heat stress by providing shade from solar radiation and cooling the air through the process of evapotranspiration. This dual effect of tree-induced cooling in cities can be significant. A recent study of 601 European



A B

Figure 1: Mean mortality attributable to urban heat island effects (A) and mean preventable mortality associated with increasing tree coverage to 30% (B) per 100,000 inhabitants in European cities (from 7.2).

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cities found that areas with green infrastructure were between 1–3°C cooler on average during the summer, and that even with just 16% tree cover, a 1°C drop in urban temperature was possible [7.3].

These tree-related heat differentials across cities could mean a difference between life and death. Data from 2015–2022 heatwaves showed that areas in London with higher tree canopy coverage had reduced excess heat-related deaths by around 16% [7.4]. Another study estimated that during the 2015 heatwave in 93 European cities, if urban green infrastructure coverage had been around 30%, up to 2500 premature deaths from heat-stress could have been avoided [7.2] (Figure 1).

Tree loss and human disease

Loss of street trees may also lead to a worsening of mental and physical health outcomes. Many population-level studies across the world demonstrate that individuals who live closer to urban green infrastructure have better long-term physical (heart disease and stroke) and mental health outcomes (common mental diseases, less anti-depressants prescribed) [7.5, 7.6]. The mental health effect is particularly pronounced for individuals with low socio-economic status. Studies in Germany and London have reported a high density of street trees at 100 m around the home significantly reduced the probability of individuals being prescribed antidepressants [7.7, 7.8].

Also of note is a study in the US that showed a strong association between tree loss and human deaths [7.9]. As street trees died across 15 US states from infestation by the emerald ash borer in a wave-like pattern from east to west between 1990 and 2007, a similar trend in the increase in human deaths from cardiovascular and respiratory diseases was observed. In total, it was estimated that infestation-loss of trees was associated with an additional 15,080 cardiovascular deaths and an additional 6,113 lower-respiratory deaths across the study area [7.9].

Food security impacts of biodiversity loss

Less studied, but as important for human health and food security, is the loss of some types of below-ground biodiversity taxa, and pollinators, which occurs with increased intervals of heavy rainfall, flooding and waterlogged soils [7.10]. Flooding of soils causes ecological turnover in soil communities; some taxa decline, while others, especially anaerobic taxa, increase, altering the balance of soil micro-communities (nematodes, fungi, bacteria). Unfortunately, many of the taxa which are lost are those important for good soil functionality [7.10] and healthy crops [7.11].

Flooding and prolonged rainfall can also lead to loss of pollinators [7.12]. Availability of nesting sites is impacted, especially for ground-nesting bees as their habitat becomes flooded. It also reduces flight capabilities, foraging opportunities [7.13], and causes larvae starvation. The outcome is lower reproductive output and reduced pollination delivery [7.14]. Given that over 75% of the world's crops require pollination, these findings have important implications for food security and associated with this, human health.

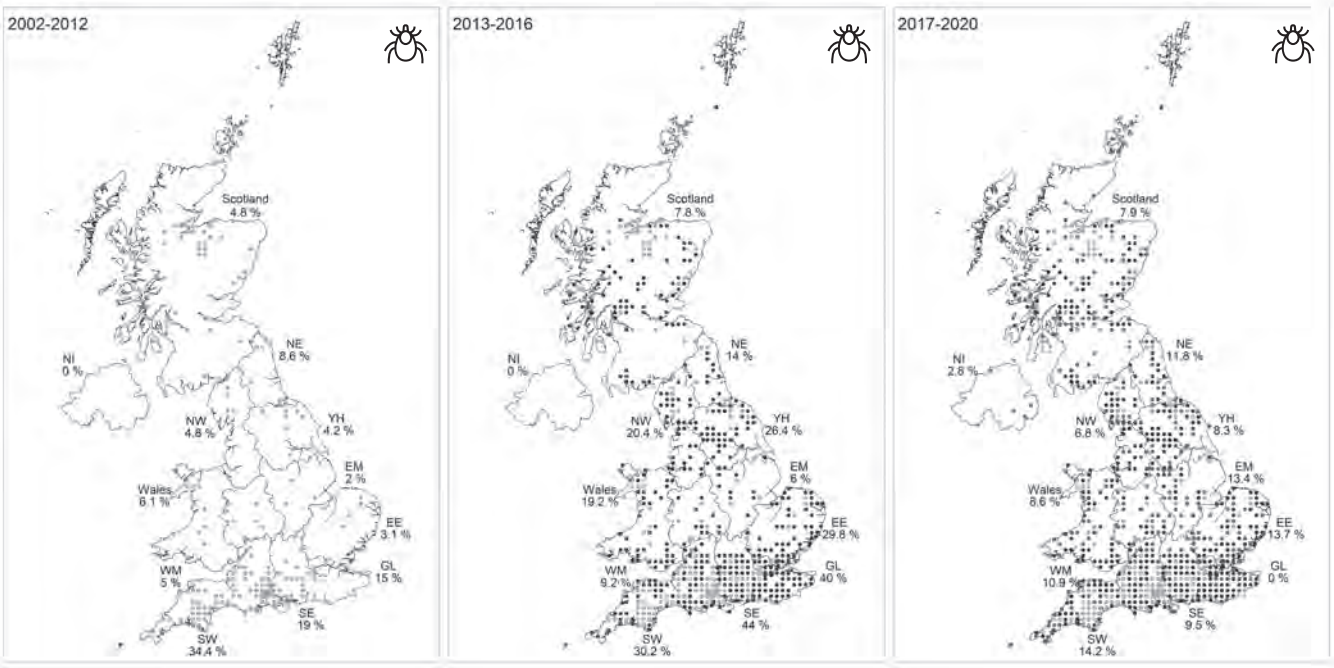


Figure 2: Maps showing expansion of tick (*Ixodes ricinus*) records in each region of the UK. The map on the left shows the percentage of grids recording a tick bite between 2002 and 2012 (light grey), the middle map shows the percentage of new grids covered (dark grey) for 2013–2016 and the map on the right shows the percentage of new grids covered (blue) for 2017–2020 compared to previous years. NI: Northern Ireland, NE: North east, NW: North west, YH: Yorkshire and the Humber, WM: West midlands, EM: East midlands, EE: East England, SW: South west, SE: South east, GL: Greater London. (From 7.16).

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What biodiversity is increasing that poses a threat to human health?

Rats and ticks

Two disease-carrying species that are showing large gains in numbers and distribution in response to warming temperatures and a more humid climate are rats and ticks [7.15, 7.16]. Rats harbour and transmit more than 50 pathogens and parasites including hantavirus. Ticks are vectors of several debilitating diseases, including Lyme disease and tick-borne encephalitis.

A recent study on rat abundances in numerous cities in northern US and Europe showed a significant increase in numbers over the past 17 years, with strong evidence to link this to warming climates [7.15]. Similarly, recent tick surveillance in the UK, between 2013 and 2020, showed a 3.2% UK-wide year-on-year increase in the number of ticks (as recorded in bites on dogs, cats and humans), with the greatest increase occurring in southern England [7.16].

In both cases an associated disease burden should be expected, and in the case of ticks is possibly already occurring. As the number of ticks in the UK has increased in the past decade, so too has the incidence of tick-borne diseases [7.17]. Tick-borne encephalitis was first detected in England in 2019.

Allergenic pollen

Hay fever is another health burden linked to biodiversity that is predicted to get worse with warming temperatures and changing seasons. Each year, one in five people in the UK experiences hay fever (allergic rhinitis) following seasonal exposure to airborne pollen and fungal spores, with symptoms such as asthma, sinusitis, nasal polyps and allergic conjunctivitis commonly worsening from late March to September as pollen counts rise [7.18]. Hay fever is estimated to cost the British economy over £7 billion every year in lost productivity and missed work.

Warming temperatures are now triggering longer allergy seasons and a higher dose of the pollen/spores in the air. For example, a 51-year (1970–2021) dataset from sites across the UK showing the abundance of common hay fever triggering types, including birch and grass pollen, and fungal spores such as *Cladosporium* and *Alternaria*, demonstrates significantly higher concentrations in the air over the past two decades, and that this is starting earlier in the year [7.19].





Mosquitoes

Finally, one group of insects, both native and invasive, that may greatly amplify health risks in the UK in response to warmer and wetter climates, are mosquitoes.

Mosquito-borne diseases have historically been less common in the UK because cooler temperatures slow mosquito development, reduce survival and biting, and shorten the breeding season. As temperatures rise, modelling from the UK indicates that they can survive for longer, reproduce more quickly, and remain active for more of the year. Mosquito densities are also driven by the availability of flooded breeding habitats, and increased flooding in the UK will create larger availability of these [7.20].

Specific mosquitoes in the UK that are a cause for concern include *Culex pipiens/Culex modestus* for their potential to transmit West Nile virus [7.21] and Usutu virus [7.22]. A further concern in the UK is the possible establishment of the invasive Asian tiger mosquito, *Aedes albopictus*, a potential vector of dengue, chikungunya, and Zika. UKHSA modelling indicates that London is already climatically suitable for its establishment, and this could extend across much of England by the 2040s–2050s [7.20].

Policy recommendations

1. **Expand, protect and improve urban tree cover**
   Set local tree cover targets, using 30% as a long-term benchmark, and prioritise planting in areas with high heat exposure, low existing canopy and greater social vulnerability. Adopt smart planting standards, using diverse, heat- and drought-resilient species and avoiding concentrations of highly allergenic trees near public spaces. Protect mature urban trees and require tree inventories, permeable surfaces and drought-period maintenance so that new planting delivers lasting cooling and health benefits.

2. **Protect soil biodiversity and pollinators within agricultural adaptation policy**
   Direct agri-environment payments toward practices that improve soil structure and infiltration, reduce waterlogging, and retain dry refuges and nesting habitat for pollinators, to protect food security and health.

3. **Reduce tick exposure through risk-sensitive green-space design**
   Use local tick-risk mapping to guide path placement, vegetation-edge management, signage and seasonal public advice without restricting access to nature unnecessarily.

4. **Build health safeguards into flood-management and nature-based adaptation schemes**
   Design wetlands, sustainable drainage and water-storage areas to avoid persistent unmanaged standing water near communities while protecting pollinator habitat and wider ecological function.

5. **Improve public reporting and professional monitoring of vectors**
   Provide clear, verified routes for residents and citizen scientists to report unusual mosquitoes, ticks, rats and potential breeding sites, supported by consistent local-authority monitoring.



Section 3:
Economic costs and health systems response





Professor Elizabeth Robinson
Professor of Environmental Economics and Director of the Grantham Research Institute on Climate Change and the Environment, London School of Economics and Political Science

Chapter 8

Economic costs of climate-related health risks

SUMMARY

Economic systems depend on healthy populations

- Climate-health costs include NHS expenditure, lost working time, lower productivity, damaged infrastructure and wider welfare losses.
- The economic value assigned to preventing a death is an appraisal measure of social welfare, not money directly paid by the Exchequer.
- Early warnings and sensible changes to working patterns can protect health while reducing avoidable losses to employers and the economy.
- Adaptation can reduce harm, but it has physical and financial limits; emissions reduction remains essential to contain long-term costs.

Economic systems depend on healthy populations, but climate change is damaging health and therefore reducing productivity and human-capital investment, increasing pressure on health services, and causing illness and loss of life.

Estimating these costs to the UK economy, including the value placed on avoided deaths, is tricky, but possible.

The economic cost of heat-associated deaths

To value an avoided death, government departments use the monetary value of a prevented fatality [8.1] when appraising public health and safety policies. This number is around £2–2.5 million per lost life and can be thought of as the amount society is willing to pay to reduce the risk of a death.

The UK Health Security Agency (UKHSA) estimates that the May and June 2026 heatwaves alone led to 2,877 heat-associated deaths [8.2], which dominate climate-associated loss of life in the UK. Applying a value of £2.45 million per prevented fatality gives an illustrative welfare cost of just over £7bn. This is an appraisal value, not a direct fiscal cost.

The UK currently experiences more cold-associated deaths than heat-associated deaths. As the climate warms, the gap will narrow. However, one projection estimates that cold-related mortality would fall by only 2% by 2050 [8.3], while the UKHSA warns that England could experience around 11,000 heat-related deaths a year by 2050 without greater adaptation [8.4]. At £2.45 million per prevented fatality, that would imply an illustrative welfare cost of around £27 billion per year.



At a global scale, changes in climate-linked hazards due to climate change, air pollution and insufficient access to green spaces could cost

US$47 billion

in 2030 in additional societal costs of mental disorders, increasing to

US$547 billion in 2050

Increasing costs to our health services

Floods, heatwaves and climate-sensitive infectious diseases all increase demand for healthcare. Flooding can also increase costs due to damage, with 10% of the UK's hospitals at risk of flooding [8.5].

One study estimated the economic costs associated with mental health treatment, medication and time off work to be between £1,878 and £4,136 per adult per flood, depending on the severity [8.6].

At a global scale, changes in climate-linked hazards due to climate change, air pollution and insufficient access to green spaces could cost US$47 billion in 2030 in additional societal costs of mental disorders, increasing to US$547 billion in 2050 [8.7]. Analysis has also found that hospitalisations for psychiatric conditions were 9.7% higher during heatwaves than non-heatwave periods [8.8].

Recent data suggest that very hot days in England, defined as those with an average temperature above 23˚C, account for around 1% of total health care expenditure [8.9], or around £1bn. The estimated excess cost, including A&E attendance and prescriptions, is around £33 million per very hot day.

Infectious diseases, many of which are climate sensitive, already cost England around £30 billion per year, including cost to the health service, labour market and households [8.10]. Of particular concern in the future are tick-borne diseases, especially Lyme disease; invasive mosquitoes; and food and water-borne diseases including *Campylobacter* and *Salmonella* infections.

The economic cost of protecting health at work

Increasing frequency and intensity of heatwaves has clear economic costs that are manifested through reduced productivity and hours worked [8.11].

The ONS estimates that productivity losses from hot days, taking into account adaptation, averaged £0.9 billion a year in 2001–2010, and doubled to an average of £1.8 billion per year between 2011 and 2020 [8.12].

These costs are continuing to grow. One week of the UK June 2026 heatwave was estimated to have reduced output by more than £1 billion through lost working hours [8.13, 8.14]. Another assessment suggests that across the June 2026 heatwave, lower productivity cost the country £2.36 billion [8.15].

More broadly, monetised UK climate-health costs, including heat-related mortality, lost productivity and health care, have been estimated at around £6.8 billion annually over the past decade, and could rise to £14.7 billion a year by 2050 [8.16].

Actions that protect health have economic benefits through their potential to reduce loss of lives; reduce productivity losses, incomes and profits; take pressure off health services; and therefore, also enhance longer-term economic growth.



> *Actions that protect health have economic benefits through their potential to reduce loss of lives; reduce productivity losses, incomes and profits; take pressure off health services; and therefore, also enhance longer-term economic growth.*

Policy recommendations

1. **Strengthen early warning systems to reduce economic losses**
   Expand low-cost climate-health warning systems, which have been shown to protect health and reduce economic losses, to help people, communities and businesses prepare for extreme weather, including by adjusting working patterns and putting local protections in place.

2. **Mandate protections to support workers' health and productivity**
   Mandate protections such as flexible working patterns, access to cooling and water breaks, combined with insurance or social protections, such as income replacement schemes and occupational health coverage, during extreme weather. These measures can protect workers' health and productivity while reducing healthcare costs and protecting economic output.

3. **Target support to the most vulnerable to save lives**
   Targeting support to the most vulnerable in our communities is proven to save lives during heatwaves, particularly when combined with local access to cooling spaces, which will reduce pressure on healthcare services and avoid wider economic losses.

4. **Improve the overall health of the population through climate action to unlock multiple economic benefits**
   A healthier UK population through reduced air pollution, more green spaces, access to a healthy and nutritious diet and greater opportunities to walk and cycle and use zero-emissions public transport all contribute to healthy ageing across the life course, supporting economic growth and prosperity.

5. **Recognise adaptation has limits – cutting emissions is still essential**
   Over the longer term there are clear limits to adaptation, emphasising the need for emissions reduction. Emissions reductions explicitly linked to health, in particular reduced air pollution and healthier diets, could deliver an estimated increase in welfare equivalent to 3.3% of GDP [8.17].



Professor Rafael Perera-Salazar
Director Medical Statistics, Oxford University
& BMJ statistical editor

Dr Patrick Fahr
Senior Health Economist, University of Oxford

Chapter 9

How we can strengthen health systems' capacity to respond

SUMMARY

Climate resilience is a core health-service function

- Climate change impacts are increasing demand for care while simultaneously disrupting estates, staff, transport, digital systems, medicines and utilities.
- Many temperature effects are forecastable and persist beyond the hottest day, creating a window for planned staffing and service response.
- Primary and community care are key components of climate resilience because they can absorb demand before it reaches emergency departments.
- Evidence on the health risks of climate change is stronger than evidence on which adaptations work best; evaluation should therefore be funded alongside delivery.

Health-sector discussions about climate change are expanding from a focus on the sector's environmental footprint, to the direct effects of climate impacts on health and care delivery.

Ensuring system resilience in the face of climate change and extreme weather events is central to the delivery of safe, timely and equitable care. The operational and financial consequences are already visible in three key areas.

Increases in demand for healthcare

There is increasing evidence that climate change is driving up the demand for healthcare services, with extreme heat one of the leading drivers of this. A recent study found that on the hottest days and the days thereafter, GP consultations in England rose by around 24% and hospital outpatient appointments by around a third, with older age groups in particular driving this increased demand [9.1].

Emergency hospital admissions show a similar pattern. Admissions for heat-sensitive metabolic conditions, for instance diabetes, rose by around a quarter across all ages, and by two-thirds among people aged over 74 [9.2]. During the June 2026 heatwave, London Ambulance Service recorded the busiest day in its history (higher than at the peak of COVID-19), receiving 8,869 emergency calls and responding to a record 688 of its most serious incidents [9.3].



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8,869 emergency calls

Poor air quality further compounds this issue. A South London study found short-term rises in air pollution, such as heavier road traffic, construction activities or short spikes in air pollution, were associated with a 3% increase in children's respiratory consultations, rising to around 6% when average exposure over the preceding week was considered [9.4]. Thunderstorms, too, have triggered sharp, sudden spikes in asthma across England [9.5].

Disruption to care delivery due to infrastructure challenges

Healthcare delivery relies on safe buildings, utilities, transport, digital systems, medicines and staff. Extreme heat can make clinical spaces unsafe and disrupt equipment and services. NHS estate overheating incidents that triggered a risk assessment rose by 53% from 2016–17 to 2023–24 [9.6].

A survey of clinicians across 140 UK hospitals who worked through the July 2022 heatwave found that 18.5% reported cancellations of planned operations because of the heat. These cancellations were mainly linked to staff shortage, unsafe temperatures in operating theatres and shortages of hospital beds. Temperatures could not be controlled in 41% of operating theatres, and 85% of hospitals had no summer-pressure plan [9.7]. Heat also threatens supporting systems: cooling failures at two data centres serving a major London NHS trust caused a critical IT outage across Guy's, St Thomas' and Evelina hospitals, forcing staff to switch to paper, with reported treatment delays and reduced service delivery [9.6].

Flooding poses a parallel threat: reported flood incidents across the NHS estate more than doubled between 2020–21 and 2023–24, from 176 to 358 [9.6]. Floods can damage facilities, delay access to care and interrupt supply chains, including deliveries of medicines and other essential medical supplies [9.8], with the greatest effects on people already facing barriers to care.

Higher costs for healthcare delivery

Climate change impacts drive up costs through increased healthcare demand, emergency response and damage to facilities. In England, cumulative NHS and social care costs attributable to air pollution over 2017–2025 were estimated at £1.6 billion for outcomes with well-established evidence, such as coronary heart diseases, stroke and lung cancer, rising to £5.56 billion once outcomes with emerging evidence, such as dementia, are included [9.9].

Heat and flooding in England add further pressure. One year after flooding, 20% of people whose homes had been flooded screened positive for signs of depression, 28% for anxiety and 36% for post-traumatic stress [9.10].

Days falling outside the optimal 18–21˚C range, account for 3% of all recorded NHS healthcare costs (around £3 billion annually), with cold days responsible for around 64% of that burden and these costs concentrated in older people. For example, a single day above 23˚C mean daily temperature is estimated to cost £2,485 per 1,000 people aged 85+, against £335 per 1,000 aged under 65 [9.1].


PLEASE USE SEAT BELTS PROVIDED
NO SMOKING
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Solutions available to meet these risks

While we now have a much better understanding of the direct health harms caused by climate change in the UK, there is less evidence on which interventions are most effective in reducing these risks. Although strategies for adapting health services exist, they are not yet being implemented consistently. Four practical priorities can help close this gap.

First, anticipate climate-related demand: The health effects of temperature build over time, with impacts often lagging behind the weather by around two weeks rather than occurring on a single day [9.1]. These events are in principle forecastable and can be planned for. Weather should therefore be treated as a predictable driver of demand, much in the way that seasonal influenza already is.

Second, target action where it can have the greatest impact: The health and financial costs of non-optimal temperature rise significantly with age. Focusing measures on older people could deliver a disproportionate share of the available benefit from intervening across the population.

Third, strengthen community care: Investment in community care is itself a form of climate adaptation. Bringing care closer to where people experience climate impacts can support more integrated and preventive models of care, reduce avoidable pressure on hospitals and align with the NHS's 10-Year Health Plan's mission to shift from hospital to community care [9.11].

Finally, measure what works: The NHS and UKHSA's Fourth Health and Climate Adaptation Report identifies evaluation of healthcare adaptation as a research priority, and notes that a comprehensive assessment of the health-sector costs of extreme weather is still missing [9.7]. Building evaluation into adaptation measures will help identify which approaches deliver the greatest benefits and where further investment is needed.

Policy recommendations

1. **Make climate resilience a core NHS planning priority**
   The DHSC and the NHS should embed climate risk into investment appraisal, estate management, service design, emergency preparedness and workforce planning, with board-level accountability and targets incorporated into NHS planning guidance, Green Plans and integrated care strategies [9.12].

2. **Invest in climate-resilient health estates and infrastructure**
   DHSC should provide long-term funding to adapt all healthcare settings to reduce overheating, improve ventilation and boost flood resilience to lower clinical risk, costs and emissions. New and refurbished buildings should enhance staff conditions and patient comfort, and better resilience planning and robust procurement should help avoid disruptions.

3. **Plan health services around extreme weather**
   The NHS should treat forecast temperature as a planned demand variable, with Weather-Health Alerts triggering surge protocols across general practice and secondary care. Employers should provide clear adverse-weather guidance, enforce occupational protections and plan for surge staffing.

4. **Coordinate support for vulnerable people locally**
   Local plans should coordinate social care, primary care, public health and voluntary groups for system-wide climate resilience. Local partners and agencies should jointly maintain vulnerability registers to combine clinical risk from primary care records with housing quality, fuel poverty and social isolation data, and agree who checks on whom when an alert is issued.

5. **Resilience must be measured by its effect on those at greatest risk**
   Climate action plans should carry an equity impact assessment, and progress should be monitored by age, deprivation and housing quality. Continuity of health and social care access should be an explicit objective of flood and heat response.

Further information





Further information

Peers for the Planet is the House of Lords climate and nature action group. We bring together diverse legislators in the Lords who want to put systemic environmental threats, and associated socio-economic challenges, at the top of the political agenda. We focus on urgent, ambitious but practical action, with an emphasis on fairness and the wellbeing of future generations.

Since launching in 2020, the grouping has spearheaded a step-change in debate on climate change and nature in the House, and secured world-leading policy and legislative changes in areas as diverse as financial markets, pensions, energy, health, skills, research and development, built environment and much more.

Wellcome is a global charitable foundation based in the UK. Its mission is to improve health for everyone by supporting science to solve urgent health challenges. With a planned investment of £16 billion between 2022 and 2032 and total active grant funding for UK organisations of £3.9 billion, Wellcome funds research across disciplines to understand life, health, and wellbeing, and to deliver equitable health solutions.

Our work spans discovery science and targeted programmes in climate and health, infectious disease and mental health. Beyond funding, Wellcome influences policy, engages communities and promotes inclusive practices to ensure that scientific advances benefit society globally. Our Climate and Health programme funds research and advocacy to understand how climate change affects human health and wellbeing and generates evidence for effective, locally relevant climate action that protects lives and drives health equity. Human health and wellbeing in this context means a range of things from improved resilience to extreme heat, to reduced risk of vector-borne infectious diseases, to fewer premature deaths from air pollution. The prosperity, vitality and security of countries is built on the good health and wellbeing of its citizens – and the evidence is now clear that health and wellbeing is being critically endangered by climate change.

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