



THIS REPORT COMES WITH A

HEALTH WARNING

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The Climate Coalition

The Climate Coalition is the UK's largest group of people dedicated to action on climate change and limiting its impact on everything we love in the UK and around the world, including the world's poorest countries. The coalition is a group of over 100 organisations, including WWF, National Trust, RSPB, Christian Aid, CAFOD, The Women's Institute, and Oxfam, with a combined supporter base of 22 million. Together we want a future where the UK no longer contributes to climate change within a generation. Find out more at theclimatecoalition.org

Priestley International Centre for Climate

The Priestley International Centre for Climate brings together world leading expertise from across disciplines to deliver research that underpins robust and timely climate solutions.

Based at the University of Leeds, the Priestley Centre aims to provide international solutions to the global challenge of climate change through new interdisciplinary research partnerships that better link our physical, technological, economic, and social understanding of climate change with strategies for mitigation and adaptation. Find out more at climate.leeds.ac.uk

The UK Health Alliance on Climate Change

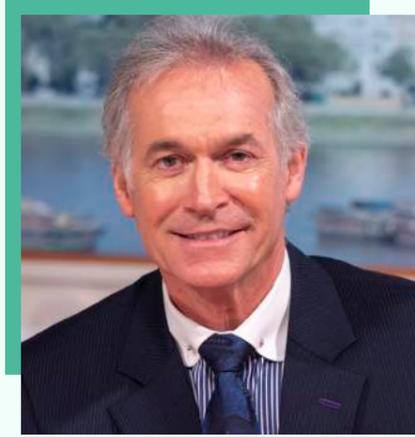
The UK Health Alliance on Climate Change brings together doctors, nurses and other health professionals to advocate for responses to climate change that protect and promote public health. Its members include many Medical Royal Colleges, the Royal College of Nursing, Faculties of Health, the British Medical Association, the British Medical Journal, and The Lancet. Find out more at ukhealthalliance.org

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Foreword

Dr Hilary Jones, GP, TV presenter, and medical broadcaster

We're living through a pandemic. But ahead of us lies a potentially bigger public health crisis: the climate and nature crisis.

Millions of Britons face heightened risk to their health as we are forced to deal with major flooding events and extreme heat.

Our elderly parents and grandparents, as well as people with pre-existing health conditions such as diabetes or heart disease will face heightened risk of mortality with higher temperatures.

And the 1.8 million of us already living in areas of significant flood risk are a ticking time bomb when it comes to mental health issues, with flood victims as much as nine times more likely to suffer mental health problems, including post-traumatic stress disorder - often many years after seeing their homes flooded.

It's going to be a tragic and avoidable health burden on families, support services, and will heap potentially unsustainable pressure on the NHS.

But by acting today and transforming as quickly as possible to a net zero economy, we can help in the global effort to limit climate change and bring immediate co-benefits such as reduced air pollution. Adaptation will also have a central role in reducing climate impacts and hence health effects.

It'll require leadership across the economy: creating cleaner and more energy efficient homes, greener public transport, and more renewable energy generation.

We can also make changes ourselves, including using our cars less and eating a balanced diet with more fruit and vegetables.

These changes won't just benefit the health of the most vulnerable. All of us will reap the benefits from exercising more, eating better and breathing cleaner air from cutting the use of fossil fuels in our energy system, homes, and transport sectors.

The climate crisis can sometimes feel distant from our daily lives. But it's already costing lives here in Britain today.

My simple message today is this: a net zero economy will be better for our health. So the sooner we get there the better.



Introduction

Dr Fiona Godlee, editor in chief of The BMJ

During the past year the international community has been grappling with a terrible health crisis on a scale not seen for generations. The impact of the Covid-19 pandemic has been devastating. Lives have been lost, social and economic systems have been upended, and inequalities brought glaringly to the fore.

But there is another crisis unfolding, far more devastating in its impacts on human health and survival: the climate crisis. Its impacts in global heating and extreme weather events are already being felt around the world and are disproportionately affecting the most vulnerable. We must act urgently and equitably.

The UK's National Health Service (NHS) is seen worldwide as a beacon of equitable access to healthcare. The NHS in England is now taking a lead on tackling the climate emergency, by committing to eliminate the majority of its carbon emissions by 2032, and to reach net-zero by 2040 at the latest. This requires the active engagement of healthcare providers and professionals, to see tackling climate change as a priority, bringing fundamental change to what we do and how we do it. Clinical pathways must be carefully redesigned, travel to and from hospitals and clinics reduced, and the focus shifted from managing illness to investing in prevention and population health. We hope that other countries' health systems will follow.

Health professionals can and must be part of a wider change, advocating for action across sectors, including energy, housing, transport and agriculture, and calling for visionary leadership from governments to transform the world's economies.

The things we do to tackle the climate emergency will have vital benefits for our health and well being: from removing polluting vehicles from our roads and increasing the amount of active travel on foot or bicycle, to making our homes and buildings safer and more efficient, and eating a healthier, more plant-based diet. This is our opportunity to create a healthier and more equal society.

We must seize this moment to tackle climate change and avert this century's greatest public health crisis.

Climate change is posing a health issue to millions of people across the UK. The effects on health can be characterised as direct (e.g. flooding or extreme heat); indirect via ecosystems (e.g. air pollution or infectious diseases); and indirect via societal systems (e.g. declining labour productivity, increasing migration).



Flooding is one of the UK's biggest climate threats. Around 1.8 million people in the UK are living in areas at significant risk of flooding – a number which could increase by over 40%, to 2.6 million, in as little as 17 years¹. As well as the immediate risk of death and injury, floods are also deeply traumatic for those affected, leading to a heightened risk of mental health issues².

Almost 1 in 3 people have reported suffering from Post Traumatic Stress Disorder (PTSD) after having their house flooded³. And overall, flood victims have been found to be as much as four times, on average, more likely to suffer mental health issues including depression, anxiety or PTSD than those unaffected by flooding⁴⁵

On top of the risks to health from flooding, just under 12 million people in the UK are vulnerable to summer heatwaves⁶. The series of UK heatwaves in 2018, which led to 8,500 heat-related deaths, were made 30 times more likely due to man-made greenhouse gas emissions⁷.

SUMMARY

The elderly⁸ or people with pre-existing health conditions such as diabetes or heart disease are particularly vulnerable. In the UK, there are 7.6 million people, many of them over 65, living with heart and circulatory diseases in the UK and 3.9 million people are currently diagnosed with diabetes.

The heatwaves the UK experienced in 2020 were notable for particularly warm temperatures at night. 16 'tropical nights' were recorded - where the temperature remains above 20°C. These conditions used to be rare in the UK and are particularly harmful to health⁹¹⁰. In the UK, heat related mortality in persons older than 65 years increased by 21% between 2004 and 2018¹¹.

The severe health issues related to climate change are a reminder of the need to rapidly reduce our greenhouse gas emissions and reach a zero carbon economy. It is only through successful global action to reduce emissions we will stop climate change – and we must reduce our emissions as our contribution.

Adaptation will have a central role in reducing climate impacts and hence health effects. The co-benefits for our health in tackling climate change will include cleaner air, improved wellbeing, and a reduction in the pressure being placed on the NHS. If, for example, just a quarter of the population in England cycled regularly and there was widespread use of electric bikes, all-cause mortality (total deaths from any cause) could fall by 11%¹².

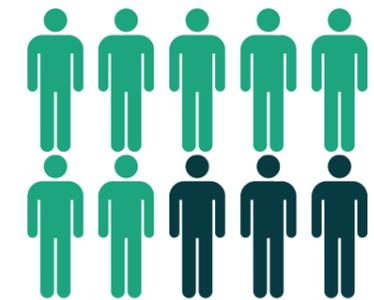
In 2019, transport accounted for a third (34%) of all carbon dioxide emissions, the majority arising from road travel¹³. In England, 56% of car journeys are under 5 miles¹⁴. All of this points very clearly towards active travel (like walking and cycling) being a ready-made - and essential - climate and health improvement solution.

THE TIME IS NOW

for a cleaner, greener world
that works for everyone

55%

A majority of British adults (**55%**) believe that climate change poses a great deal of or fairly high risk to public health, according to respondents to a YouGov survey of British adults in January 2021¹⁵.



Just three in ten people believe the UK is doing enough to tackle climate change domestically, the survey also found.

65%

And two-thirds of the British public (**65%**) now say the Government should do more to try and combat climate change, up from a little over half (57%) in 2017.

Climate change and the UK: the latest science

Dr Jenny Armstrong, Dr Ben Rabb and Bianca van Bavel, Priestley International Centre for Climate and Yorkshire Integrated Catchment Solutions Programme (iCASP), University of Leeds

2020 - Another year of climate extremes

It was the joint hottest year on record globally (in a tie with 2016 and 2019) at 1.2°C above the 1850-1900 pre-industrial period¹⁶. This is despite La Niña – a natural cycle where a large portion of the Pacific Ocean enters a relatively cool period – having a cooling effect on global temperature¹⁷. In Europe, it was the outright warmest¹⁸.

2020 was the third warmest year on record in the UK. Winter 2019 – 2020 was particularly warm, and wet, with three named storms delivering widespread flooding damage and disruption. Together, storms Ciara, Dennis and Jorge contributed to the wettest February on record^{19,20}.

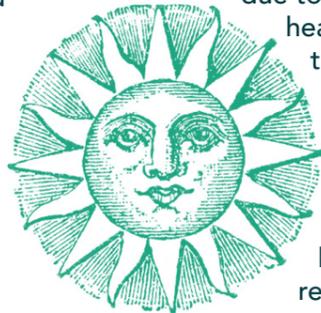
This was followed by a remarkably sunny and dry April and May. England in particular had its driest May on record and, by some margin, it was the sunniest spring²¹. By early June, increased public demand and low rainfall meant some areas were concerned about water shortages, particularly in areas such as north-west England which are more reliant on surface water supplies, making them naturally less resilient to exceptionally low rainfall²².

Summer in the UK was more unsettled – with some areas receiving well above average rainfall – replenishing river levels and reservoirs as well as delivering 3 notable heatwaves in June and August²³. The heatwaves were notable for particularly warm temperatures at night. 16 'tropical nights' were recorded – where the temperature remains above 20 degrees. These conditions used to be rare in the UK and are particularly harmful to health^{24,25}.

Autumn saw the wettest day on record in the UK on Saturday October 3rd – with widespread heavy rain following Storm Alex²⁶.

Temperature and extreme heat

2,556 deaths occurred because of the three UK heatwaves in 2020 – nearly three times the figures from events in 2019 and 2018. How Covid-19 exacerbated this impact is still subject to ongoing investigation²⁷.



These deadly heatwaves are much more likely due to climate change. The series of UK heatwaves in 2018 were made 30 times more likely due to man-made greenhouse gas emissions²⁸. Indeed, every major heatwave analysed so far in Europe in recent years (2003, 2010, 2015, 2017, 2018 and 2019) was made more likely and more intense due to human-induced climate change²⁹. The remarkable Arctic heatwave - which saw temperatures of 38°C in Siberia during June 2020 - would have been 'almost impossible' without climate change³⁰.

City dwellers are more exposed to extreme heat due to the Urban Heat Island effect (UHI) - caused by a combination of factors: buildings, narrow roads, reduced vegetation, air pollution, traffic, domestic energy use and industrial processes. It can lead to city temperatures being up to 5 °C warmer than surrounding areas and is most pronounced at night when the impact of heat on health and wellbeing is greatest³¹.

By 2050, the annual number of heat-related deaths in the UK could increase by

250%

Average and extreme temperatures in the UK are rising^{32,33,34}. If global emissions continue to go up as they are (a scenario referred to as 'RCP8.5'), average temperatures in and around UK cities could increase by up to 0.45 to 0.81°C per decade between now and 2080. Night time temperatures will increase most in urban areas with the biggest cities - London, Manchester, Birmingham and Leeds – seeing the greatest increase in UHI intensity³⁵.

Risks to health from exposure to high temperatures include heat stroke, heat stress, heat exhaustion, dehydration, acute kidney injury, deteriorating heart disease, and death³⁶. In our society, people over the age of 65 and persons with chronic diseases or health conditions are among the most vulnerable to extreme heat – and vulnerability is growing due to an aging population and poor health^{37,38,39}.

In the UK, heat related mortality in persons older than 65 years increased by 21% between 2004 and 2018⁴⁰. The Office for National Statistics estimates that in 50 years from now there will be an additional 7.5 million people aged 65 years and over in the UK⁴¹. Without climate action, by 2050, the annual number of heat-related deaths in the UK could increase by around 250% compared to today⁴².

Extreme heat and humidity can affect people's lives in other ways too - for example reducing their capacity to work and be productive⁴³. This can have subsequent impacts on the health, wellbeing and livelihoods of individuals and communities⁴⁴.

We know the health impacts of extreme temperature and heat are tied to the quality and coverage of social care that older and vulnerable persons have access to in our society⁴⁵. However, the management of increasing vulnerabilities and compounded risks posed by extreme temperatures and heatwaves will require holistic responses outside just the health sector. Responses such as developing policies, plans, and guidance that consider vulnerabilities to extreme heat across, and between, other at-risk sectors including transport, energy, water, food, agriculture, building and infrastructure. For example, developing new legislation on building standards that factor overheating into their designs, or having regulations that introduce maximum safe working temperatures⁴⁶.

Precipitation and flooding

The increasing impacts of flooding is the number one climate change risk in the UK⁴⁷. Around 1.8 million people in the UK are living in areas at significant risk of flooding – a number which could increase by over 40% to 2.6 million by the 2050s^{48,49}.

There has been a long-term trend of increased high river flows over the last five decades. This is most noticeable in the North and West of the UK as well as parts of Southern England and East Anglia⁵⁰. Indeed, it's likely that human greenhouse gas emissions have already increased flood risk in the UK and we will continue to experience more frequent and severe events^{51,52}.

More intense rainfall is expected as a warmer atmosphere holds more moisture. For approximately every 1 degree of warming, the atmosphere will hold an extra 6 - 7% of moisture and could result in a similar increase in rainfall⁵³. This is known as the Clausius–Clapeyron relation after the 19th-century German physicist Rudolf Clausius and 19th-century French engineer Émile Clapeyron^{54,55}.

This relationship may be underestimated – with changes in rainfall intensities reflecting a 12%–14% increase in moisture per degree. A phenomenon known as “Super-Clausius–Clapeyron Scaling”, where increased rainfall is driven by both more powerful storms and higher moisture⁵⁶. In the UK, we're going to see more heavy rain from convective thunderstorms leading to surface water flooding, affecting communities often away from flood plains⁵⁷.

The experience of more frequent and extreme flood events in the UK is having, and will continue to have, significant impacts on our physical and mental health. Such impacts range from death due to drowning, injuries, vector-borne and water-borne diseases.

For example, warmer temperatures will raise the risk of insects and ticks spreading disease such as malaria, West Nile fever, dengue fever, Chikungunya fever, leishmaniasis, Lyme disease and tick-borne Encephalitis^{58,59}. Standing water caused by flooding can create breeding grounds for these diseases as well as water borne diseases such as typhoid fever, cholera, leptospirosis and hepatitis A⁶⁰.

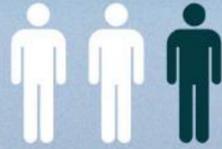
Flooding also results in enduring impacts on mental health associated with experiences of trauma, disruption, and displacement^{61,62,63,64}. Extreme flood events also impact the wider health system with disruptions to accessing and delivering health services⁶⁵.

Across the UK, there are 1.63 million people living in coastal communities that are at risk of being exposed to, and affected by a 1 metre rise in sea level⁶⁶. In London, there is expected to be between 30cm and 1.15 metres of sea level rise by 2100⁶⁷. These changes increase the risk of coastal erosion, flooding, and saltwater intrusion into freshwater sources. These risks threaten to impact people's and communities' health, including impacts to livelihood security, water quality and supply, the availability of safe drinking water, soil quality and supply, crop yields, as well as disease vector ecology⁶⁸.

Existing social and economic inequalities mean that some of the health impacts of sea level rise will be exacerbated for certain communities and individuals. For example, UK coastal areas with a disproportionate number of older people and poorer-quality homes - both more likely to experience more severe impacts than in other areas⁶⁹. Intangible losses, relocation, displacement, and indirect impacts on culture and community cohesion will also affect the health and wellbeing of people and communities in the UK^{70,71}. The full extent of these impacts is still unknown and will be difficult to measure and predict^{72,73}.



FLOODING



One in three suffer mental health issues after flooding

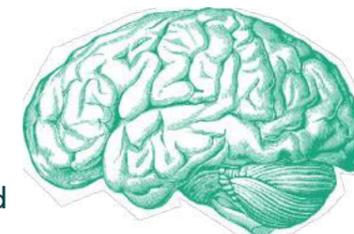


More than 17,000 homes were flooded in the North of England in the Winter of 2015/16 and more than 1,000 during floods in Yorkshire last winter⁷⁴. Just a few months ago, hundreds of families in Bedfordshire had their Christmas ruined after heavy rainfall during Storm Bella caused flooding and an emergency evacuation of homes⁷⁵.

As well as the immediate risk of death and injury, disease outbreaks such as gastroenteritis, and water quality issues, and loss and damage to people's homes, floods are also deeply traumatic for those affected, leading to a heightened risk of mental health issues^{76,77}.

Over 1 in 3 people have reported suffering from Post Traumatic Stress Disorder (PTSD) after having their house flooded⁷⁸. And overall, flood victims have been found to be as much as four times, on average, more likely to suffer mental health issues including depression, anxiety or PTSD than those unaffected by flooding^{79,80}. Flooding has also been associated with cases of carbon monoxide poisoning in the post-flood clean-up phase⁸¹.

The burden on NHS support services caring for the UK's increased number of flood victims is likely to be a long term one. A quarter of people who have been flooded still live with mental health issues at least two years after the event⁸². Research has found people affected by flooding experience stress, sleep problems, panic attacks, nightmares, anger, mood swings, and increased use of alcohol, prescription drugs or antidepressants many years after flood events⁸³.



Following flood events, families are often displaced, lives, school and work are disrupted and it can be a long period of delay in resolving insurance claims and re-establishing home life in existing or new homes. For the NHS, flood events can interrupt health services and disrupt other essential infrastructure on which health services depend⁸⁴.

"If people already think flooding is a big problem, it is likely with climate change to become more frequent and more intense," said Dr Joana Cruz, associate lecturer at the Department of Environment and Geography, University of York, and lead author of a study on mental health and flooding.

The UK Committee on Climate Change (CCC) warned in January 2021, that much more work is needed to make homes more resilient to flood waters, deal with properties overheating, and ensure people get help in dealing with the mental health impact of having their home flooded⁸⁵.

It is a mental health toll that falls disproportionately on poorer families in the UK. Low income households are eight times more likely to live in tidal floodplains than more affluent households⁸⁶. As well as the risk of new mental health issues developing, those with pre-existing conditions or vulnerable individuals including the elderly face a higher risk of developing anxiety and traumatic stress⁸⁷.

"It is not just the prevalence, but the time it lasts in the population. Some people were getting anxious when it rains two years after being flooded. If flooding becomes more frequent and intense it will affect people more often and it'll be the same people being affected repeatedly,"

- Dr Cruz.



"Floods cost homeowners around £30,000"

On average, floods cost homeowners around £30,000⁸⁸, a cost many find unaffordable even before the current Covid-19 pandemic and economic downturn.

Researchers have drawn parallels with Covid-19 which has left the more vulnerable sections of society, including the elderly, fearful. **"It is difficult to understand what it means to live with vulnerability when you are not vulnerable yourself. It is difficult to understand why someone may be fearful of rain,"** writes Gabrielle Powell, researching the topic at the University of Reading⁸⁹.





The prevalence of probable depression amongst people whose homes were flooded was 20%, prevalence of anxiety 28% and prevalence of Post Traumatic Stress Disorder 36%⁹⁰.

20%
Depression

28%
Anxiety

36%
PTSD

“

I got really scared
and my heart started
going really fast.

I kept all my
memories under my
bed and it all got
ruined.

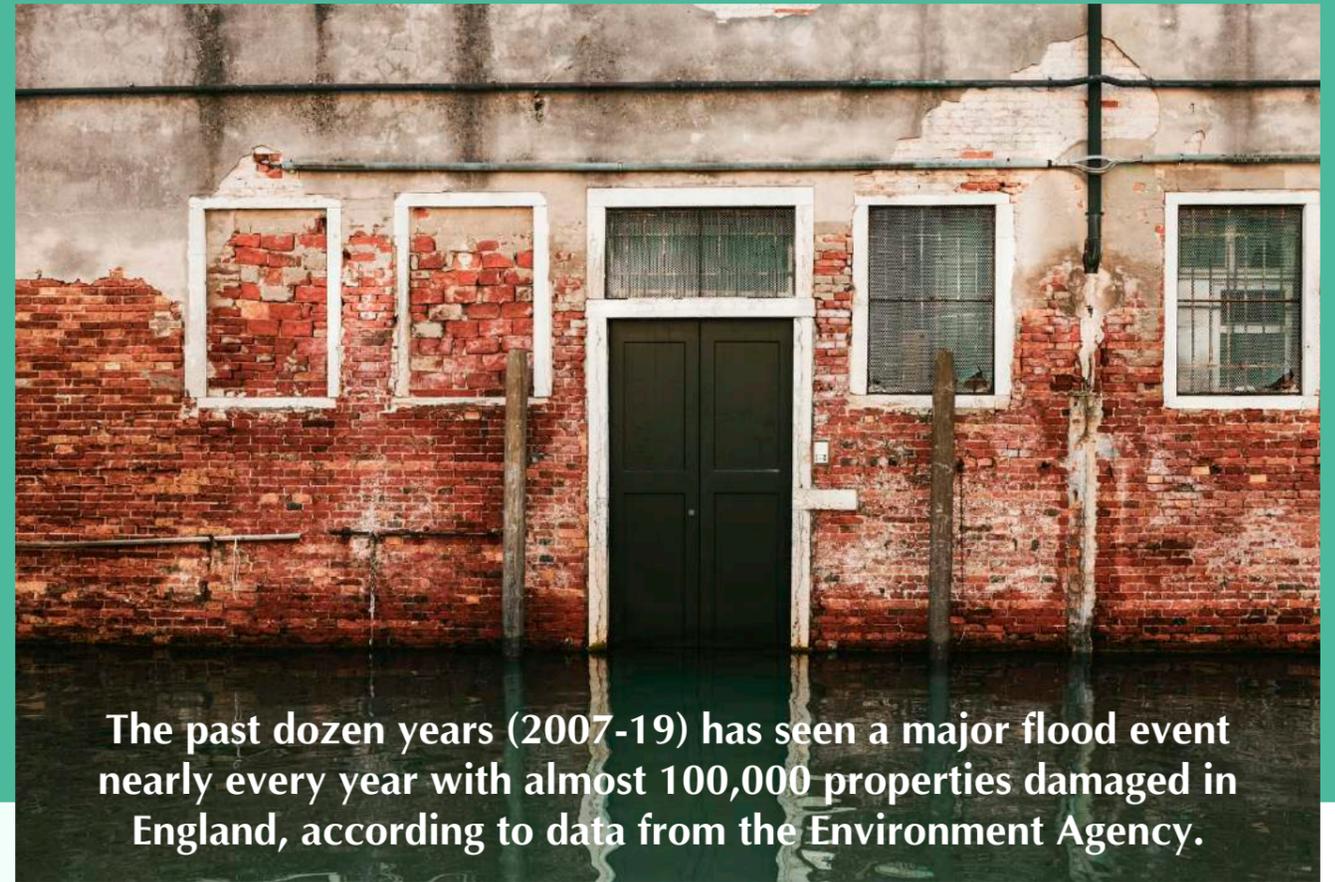
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- Young children talking to researchers from Lancaster University and Save the Children looking at young people's experiences of UK floods⁹¹.

**More than 600 schools in London
are at risk**



from a 1 in 30 year flood event⁹².



The past dozen years (2007-19) has seen a major flood event nearly every year with almost 100,000 properties damaged in England, according to data from the Environment Agency.

Infectious disease:

The UK is at risk of the spread of infectious diseases like Dengue Fever, Lyme disease and West Nile fever - which is already present in some European countries - and from an increase in cholera infections from warming seawaters in Europe⁹³. The vectors of these diseases are mosquitoes, sand flies and ticks. Higher temperatures will increase the suitability of the UK's climate for invasive species (i.e. species from outside the UK) and increase the risk that they may spread disease.



The UK already harbours mosquito species believed to be able to transmit West Nile virus. Higher temperatures will increase their ability to spread the virus, should it be introduced. In 2016, the UK reported its first detection of the non-native mosquito *Aedes albopictus*, which is a known vector for dengue and chikungunya virus⁹⁴. In 2012, dengue fever returned to Europe with cases in Madeira and each year there are local cases of either dengue and/or chikungunya viruses across the Mediterranean Basin⁹⁵.

Lyme disease:

The most immediate worry for the UK is the rising incidence of Lyme disease, with an estimated 2,000 to 3,000 new cases each year in England and Wales. It is not just a forest, woodland or open country problem either, as there has been an increasing trend towards issues being reported in parks, gardens and urban greenspace.

The former England rugby captain Matt Dawson had to have heart surgery after contracting Lyme disease after being bitten while in a West-London park⁹⁶. Incidence of Lyme disease may continue to increase and climate warming may enable it to spread to higher altitudes^{97,98}. Public Health England also recorded the first UK-acquired case of a rare life-threatening illness - babesiosis - spread by tick last summer⁹⁹.

**2000-3000
New cases each year**



The mental health toll from flooding

Dr Lisa Page, Clinical Senior Lecturer in Medication Education and Psychiatry, and Honorary Consultant Liaison Psychiatrist

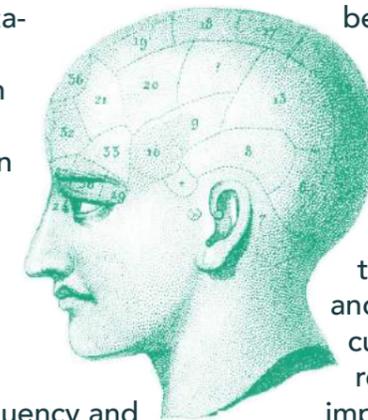
The impacts of climate change and our mental and physical health are intrinsically linked¹⁰⁰. An increase in the scale and frequency of climate-related weather events, from heatwaves to flooding, will undoubtedly have a major and increasingly adverse effect on mental and physical health in the UK and globally¹⁰¹. As well as new episodes of mental ill-health triggered by climatic events, the burden of these health impacts will fall most heavily on people with pre-existing psychiatric conditions¹⁰².

In the aftermath of flooding, caused by extreme weather events, mental health conditions such as psychological distress, anxiety, depression, and post-traumatic stress disorder (PTSD) are commonly observed in those affected¹⁰³. A 2020 meta-analysis of 17 studies found the occurrence of such conditions in people affected by flooding to be almost four times higher than in the general population; the prevalence of PTSD amongst flood victims being roughly 30%¹⁰⁴.

Given that climatic projections point toward an increase in frequency and severity of extreme weather events¹⁰⁵, this is a concerning prospect for the health of those living in flood-prone areas and for our health service, which faces an increasing burden of climate-related physical and mental health conditions.

Flooding incidents, driven by the climate crisis, will compound existing health inequalities as those from poorer households are eight times more likely to be affected¹⁰⁶, but more likely to be uninsured for related losses¹⁰⁷. The link between financial difficulties such as those that a flooded household would face and deteriorating mental health is well established¹⁰⁸.

Not only does this point towards our need to urgently and effectively tackle the threat of climate change, and to build resilience against its current and future impacts, but it also reminds us to consider the broader impacts of climate change. Instead of considering the harm our environment faces in isolation, we must see the climate crisis threatening our whole health - environmental, physical, and mental.



EXTREME HEAT

12 million facing health risk

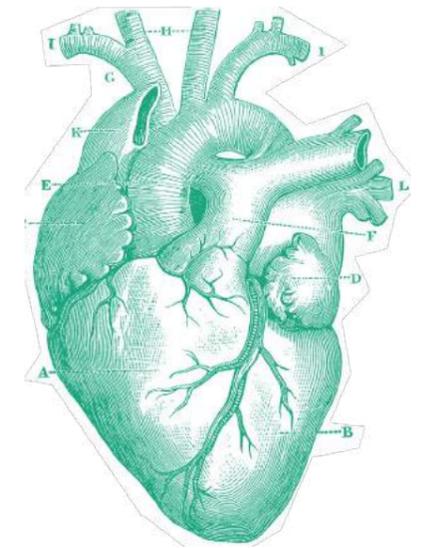


The UK is considered to be among the most vulnerable countries in the world to the health effects of heat, based on population factors, including aging, prevalence of chronic disease and rate of urbanisation, with deaths projected to double to 5,000 a year by the 2050s^{109,110}. The 2020 heatwaves in the UK were estimated to have led to more than 2,500 deaths^{111,112}.

Awareness among the UK population of the health risks posed by extreme heat was still inadequate, warned the most recent Lancet Countdown report, which said the public needed to be urgently prepared for the health impacts of climate change¹¹³.

Temperatures above 35°C are already becoming increasingly common in the southeast of the UK and temperatures above 30°C will be more common in many areas in the north by 2100¹¹⁴.

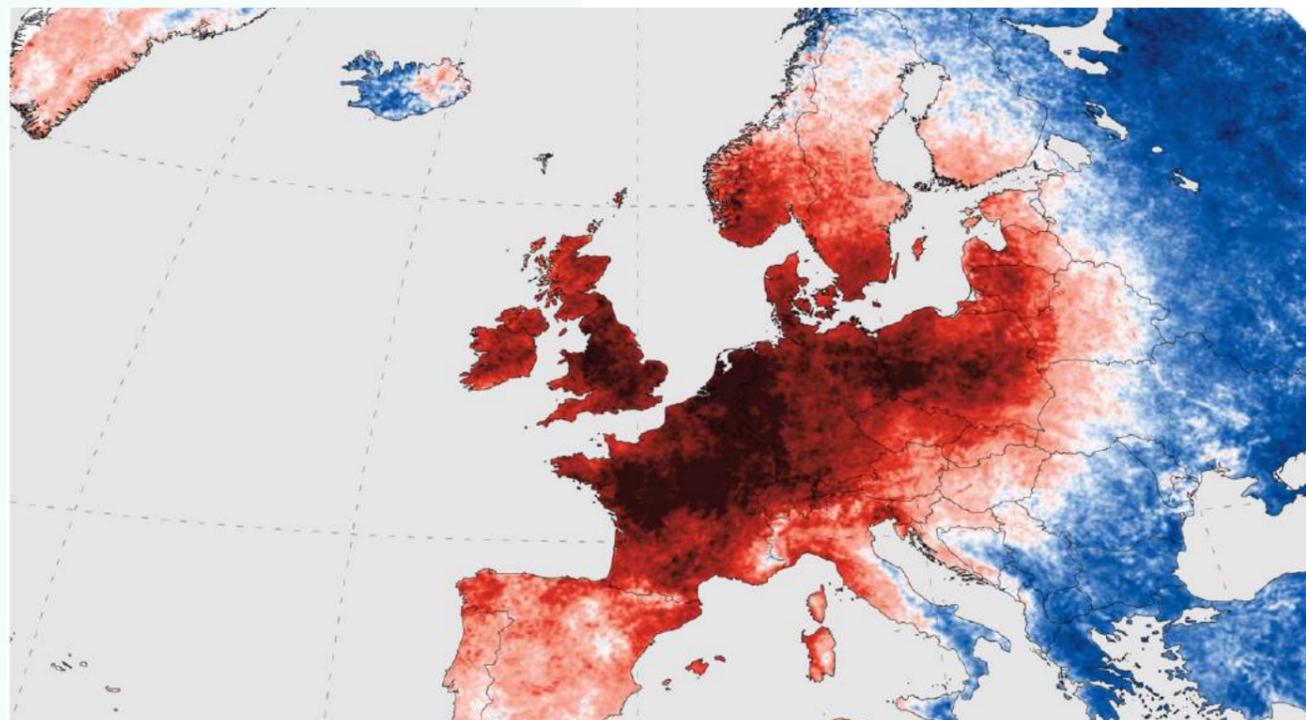
Throughout 2020, there were 16 "tropical nights", which occur when night time temperatures stay above 20°C¹¹⁵. These conditions used to be rare in the UK and are particularly harmful to health^{116,117}. In the UK, heat-related mortality in persons older than 65 years increased by 21% between 2004 and 2018¹¹⁸.



The UK government's climate change advisors have said heat-related fatalities in England, which are projected to increase with climate change, will bring economic costs of between £323 million and £9.9 billion a year by the 2050s¹¹⁹.

In the UK, there are currently 410,000 residents in care homes, with that projected to increase to almost 500,000 by 2025 and 600,000 by 2035. This will create a large vulnerable group of older people over the age of 75, unless action is taken to consider heat risks in the UK's care sector¹²⁰. There are, for example, no current requirements to ensure the regulation of temperatures in hospitals and care homes during heatwaves¹²¹

Increases in temperature have also been associated with increased rates of suicide. A UK study found that above 18°C, each 1°C increase in temperature is associated with a 3.8% increase in the incidence of suicide, and a 5% increase in the incidence of more violent methods of suicide¹²².



40%

Climate change may lead to greater pollen release in the UK. Seasonal allergies in the UK^{123,134}, including hayfever have been increasing with reports that as many as **40% of children in the UK may be suffering from hay fever**¹²⁵.



2/3

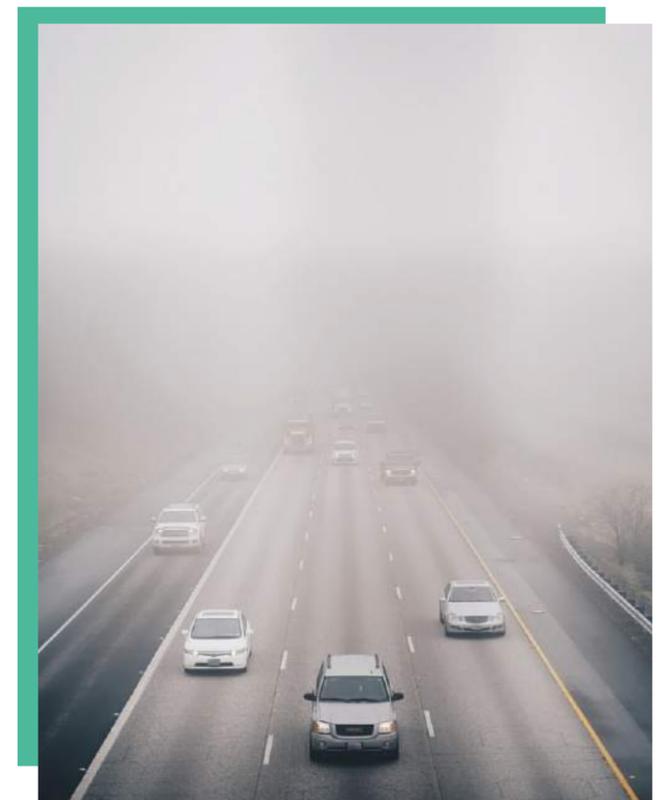
Two-thirds of flats in London could experience overheating by the 2030s. For every 1°C increase in temperature over 20C, ambulance call outs for the NHS increase by 1%¹²⁶.

Heatwaves exacerbate the urban heat island effects, amplifying temperatures in built environments, and resulting in poorer air quality due to the creation of ozone that negatively impacts health. It is likely that heat-related mortality will be higher in more densely populated cities and those areas with limited access to health care, high pollution levels, fewer greener spaces and existing inequalities. **Around 90% of the UK population will live in urban areas in the UK by 2050**, cities including Birmingham, London and Manchester have been found to be as much as 5°C warmer than surrounding rural areas.

90%



Toxic air pollution is a public health crisis, especially for children¹²⁷, and is adversely affected by emissions from transport, industry and agriculture, which can be reduced by regulations and moves towards renewable sources of energy. Extreme air pollution episodes are also associated with stagnation events and heatwaves¹²⁸. In a landmark case in December 2020, a coroner ruled that air pollution was a cause of the death of nine-year-old Ella Kissi-Debrah, London, was due to her exposure to nitrogen dioxide and particulate matter (PM) pollution, mainly from traffic emissions¹²⁹.





Thunderstorm Asthma:

Heatwaves and extreme heat can create the ideal conditions for thunderstorms. The thunderstorms stir up pollen lying on the ground with gusts of wind, increasing the risk for asthma sufferers. The main growing season in summer months are the peak season for pollen on the ground and also when thunderstorms are most likely. The asthma peaks could bring increased pressure on the NHS and hospital and medical services¹³⁰. More than 5 million people in the UK are currently receiving treatment for asthma: 1.1 million children (1 in 11) and 4.3 million adults (1 in 12)¹³¹

How and why the UK is particularly vulnerable to the negative health effects of extreme heat

Professor Elizabeth Robinson and Dr Claudia Di Napoli, Reading University

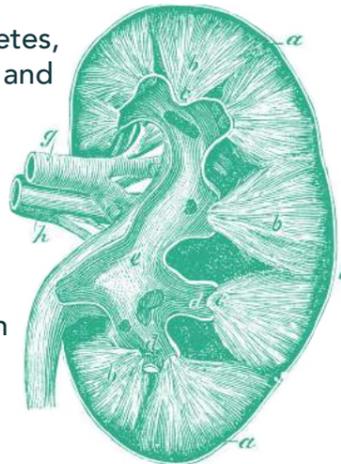
The UK, in common with countries across the globe, has been witnessing an increase in temperatures over time. Between 2009 and 2018, it has been on average 0.3°C warmer than the average from 1981 to 2010; and the top ten warmest years the country has ever experienced have all occurred since 2002¹³².

Warmer summers and more extreme temperatures potentially expose populations in affected areas to heat-related disorders such as dehydration and sunstroke, and ultimately death¹³³. The worst impacts of temperature on human wellbeing occur during heatwaves, unusual extended periods of hot weather, which have been affecting the UK with increasing frequency, duration and severity since the late 19th century¹³⁴.

Health disorders and excess mortality that tend to be observed during heatwaves are caused by heat load, referred to as heat stress, which makes it more difficult for our bodies to maintain their core temperature within the range of optimal physiological performance during a prolonged exposure to extremely hot conditions¹³⁵.

The impacts of climate change on human health may not be as immediately visible in the UK as they are in some other countries, but the UK is, perhaps surprisingly, particularly vulnerable to extremes of heat¹³⁶. This is predominantly due to the proportion of people with certain pre-existing conditions, demographics, and the high rate of urbanisation and low rate of air conditioning¹³⁷.

Those with pre-existing conditions such as diabetes, coronary heart disease, and chronic kidney disease, are also particularly vulnerable to heat and heatwaves. People with diabetes may have an impaired ability for blood vessels in the skin to dilate, be brought to the surface and dissipate heat amongst types 1 and 2; poor glucose control with consequent impaired sweating responses amongst type 2; and vascular impairments amongst type 1¹³⁸.



Cardiovascular diseases, including coronary heart disease, have been shown to reduce tolerance to heat, largely due to factors such as decreased sweating mechanisms and ineffectual elevations in skin blood flow (Cui and Sinoway, 2014)¹³⁹. Therefore, risk amongst these groups is likely to be greater during heatwaves. Diabetes prevalence is increasing in the UK. 3.9 million people are currently diagnosed with diabetes in the UK, and this is predicted to increase to more than 5 million by 2025.

Older people tend to have more chronic diseases, have a weaker thermoregulation response than the general population, and are less able to protect themselves from heat stress. In the UK, the proportion of people over the age of 65 has increased from around 11% of the population in 1950 to around 18% of the population in 2018; an increase in absolute terms from 5.3 million to 11.9 million people. 7.6 million people, many of them over 65, are living with heart and circulatory diseases in the UK, which cause more than a quarter of all deaths in the UK.

Around 84% of the UK population is currently urban. This proportion has been increasing, and is predicted to increase further to over 90% by 2030. Cities tend to be warmer than the surroundings due to what is referred to as the "urban heat island" effect. Exacerbating this in the UK, houses, with relatively large windows and a lack of overhanging eaves, tend also not to be designed and built to aid cooling during hot spells; and only around 3% of households in the UK have air conditioning.



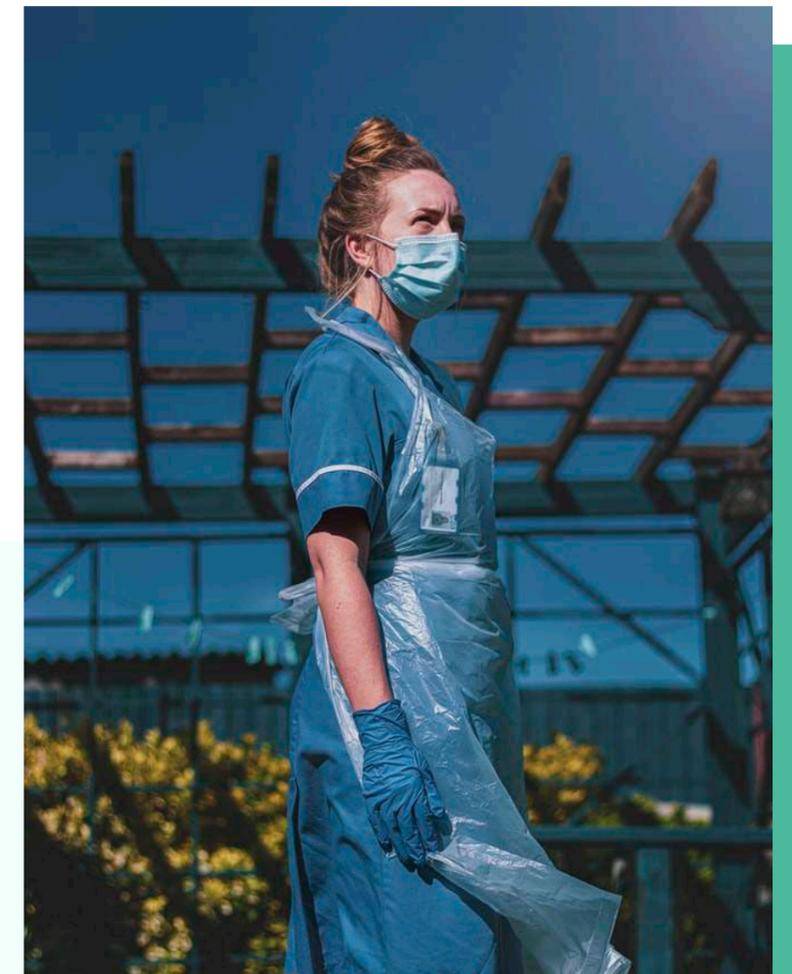
HOW CAN WE SAFEGUARD THE NHS AND OUR HEALTH?



The severe health issues related to climate change are a reminder of the need to rapidly reduce our greenhouse gas emissions and reach a zero carbon economy. It is only through successful global action to reduce emissions that we will stop climate change – and we must reduce our emissions as our contribution.



Adaptation will have a central role in reducing climate impacts and hence health effects. But the co-benefits for our health in tackling climate change are **“potentially a virtuous circle,”** said Professor Lora Fleming, from the European Centre for Environment and Human Health, University of Exeter Medical School.



Housing:

Improved energy efficiency measures in the housing sectors will help meet climate targets and reduce heat loss and improve ventilation in homes. The necessary solutions like retrofitting housing will also bring benefits in terms of job creation. The effects of poorly insulated homes are estimated to cost the NHS at least £1.4 billion per year¹⁴⁰.

Transport:

Greener transport policies focused on delivering electric vehicles, better public transport, improved active travel including walking and cycling options, and remote working will reduce emissions as well as benefiting air and noise pollution. Active travel will also improve public health. Estimates for England, in which a quarter of the population cycles regularly and there is widespread use of electric bikes, suggest all-cause mortality could fall by 11%¹⁴¹. Active transport may increase the population's physical activity and decrease air pollution, thus reducing the burden of conditions such as some cancers, diabetes, heart disease, and dementia¹⁴². A combination of more fuel efficient vehicles and "active travel" (i.e. walking and cycling) in urban areas could lead to a net savings to the UK's NHS and social security costs in excess of £15 billion by 2030¹⁴³.

Food & Agriculture:

Increases in the consumption of fruits and vegetables and a shift away from diets high in meat and dairy, which have higher greenhouse gas emissions, would bring health benefits. Any dietary shift will need to protect vulnerable groups who might already be at risk from micronutrient deficiencies. Replacing half of UK meat and dairy consumption with a combination of fruits, vegetables, and cereals could reduce dietary emissions by 19% and avert roughly 37,000 premature deaths from cardiovascular disease and cancer a year¹⁴⁴.



Poorly insulated homes cost the NHS

£1.4
billion a year

NHS & Social Security savings of potentially

£15
billion by 2030

Greener diets could avert roughly

37
thousand deaths

Energy/Power Generation:

While much of the public debate focuses on its contribution to global warming via greenhouse gas emissions, energy supply systems also account for substantial shares of other environmental impacts, such as air and water pollution and land use¹⁴⁵. Decarbonising energy production and switching to renewables including wind and solar, would reduce harmful air pollutants, including fine particulate matter¹⁴⁶. Air pollution from coal power plants in the UK are responsible for an estimated £3.1 billion per year in added health costs through conditions like lung cancer and chronic bronchitis¹⁴⁷. The associated burden of air pollution from the country's power sector is responsible for approximately 3,800 premature deaths each year due to respiratory disease alone¹⁴⁸. An additional 7,500 premature deaths occur each year due to air pollution from the UK's transport sector¹⁴⁹.

While the NHS has taken a lead in responding to the urgent need for action by committing to net zero, there is still a need for integrated policies across the whole economy from agriculture to housing to help deliver the UK's net zero target and protect our public health, the NHS, and the most vulnerable.

Coal air pollution is estimated to cost

£3.1
billion in healthcare and cause over

3800
premature deaths each year.

"We rely on green and blue spaces for relaxation, physical activity and building social relationships. A growing body of research is exploring how nature-based interventions can be integrated into mental health care. While it can be difficult to establish specific causal relationships, this work suggests that natural spaces can have positive effects on how we think and feel and making them accessible should be part of any policy on public mental health."

- Dr Jacob Krzanowski, Royal College of Psychiatrists Associate Registrar for Sustainability and Associate for the Centre for Sustainable Healthcare

A photograph of a stag with large antlers grazing in a grassy field under large trees. The stag is in the foreground, facing left, with its head down. The background shows a line of trees with green and some autumn-colored leaves. The lighting is soft, suggesting late afternoon or early morning.

Nature-based solutions:

Having equitable access to nature-rich green and blue space has positive linked health outcomes¹⁵⁰. The UK's parks and green spaces provide an estimated £34.2 billion of health and wellbeing benefits and save the NHS around £111 million each year¹⁵¹. It is estimated that if everyone in England had good access to greenspace, £2.1 billion in health costs could be saved annually.

The Royal Society for the Protection of Birds (RSPB) Recovering Together 2 report notes that deprived groups gain the most health benefit. Meanwhile, socioeconomic inequalities in health are lower in greener communities¹⁵². However, the same report goes on to state that the most economically deprived areas have the least access to greenspace.

An urban green infrastructure investment appraisal commissioned by the National Trust has estimated that £5.5 billion capital investment in urban green and blue spaces would deliver £200 billion in physical health and wellbeing benefits over a 30-year period to the most disadvantaged communities¹⁵³.



Air pollution:

The UK saw an estimated 17,700 deaths linked to ambient fine particulate air pollution (PM2.5) in 2018. The UK has committed to phasing out coal, but the burning of coal in power plants, industry and households was responsible for almost 3,100 of these deaths in 2018¹⁵⁴.

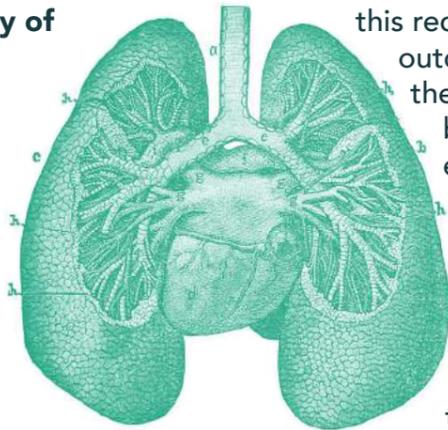
Health 'co-benefits' of climate action: why the low-carbon economy is also good for your health

Dr James Milner, Centre on Climate Change and Planetary Health, London School of Hygiene & Tropical Medicine

Climate change will have substantial and largely negative effects on health. We can prevent, or at least limit, these detrimental effects by reducing our emissions of greenhouse gases (GHGs) but encouraging people to act now for benefits that may occur in the future can be challenging.

Perhaps a more persuasive argument for climate action can be made using research showing that many climate mitigation actions also have more immediate benefits for people's health. These are often referred to as health 'co-benefits' of climate change mitigation (though it is important to note that they are not always beneficial for health). Although the literature in this field is still developing, many of the main principles are well understood.

Moving to a low-carbon economy can affect people's health through various pathways, one of which is by reducing exposure to harmful pollutants. Air pollution generated by burning fossil fuels to produce electricity contributes to thousands of deaths each year and decarbonising electricity production will therefore also reduce the burden of air pollution-related ill health.



Changes in power generation to achieve an 80% reduction in GHG emissions could reduce fine particulate air pollution (PM2.5) concentrations in the UK by more than 40% and save hundreds of thousands of life years (Williams et al., 2018)¹⁵⁵.

People are also exposed to air pollutants and other hazards in their homes, though this receives much less attention than outdoor air pollution. Reducing the energy demand of housing by improving home energy efficiency, for instance through improved insulation, has the potential to affect indoor pollution exposures because of its effect on ventilation.

There is however a delicate trade-off for health – reducing home ventilation will protect people against harmful outdoor air pollutants and make homes warmer in the winter but may also increase levels of pollutants generated inside the home (Milner et al., 2014)¹⁵⁶. It is important that home energy efficiency interventions are carefully designed and implemented to ensure the net balance for health remains positive.



Another important pathway by which climate mitigation actions can improve health is by promoting behaviours that are already known to be healthy. The transport sector is a key target for reducing GHG emissions, commonly through switching to cleaner (e.g. electric) vehicles, reducing travel distances, and increasing active travel (walking and cycling).

Switching to low carbon vehicles and reducing travel distances will reduce GHG emissions and air pollution but the greatest health benefits will be achieved through policies aimed at increasing walking and cycling, especially in cities. If a quarter of the population in England cycled regularly (including extensive use of electric bikes) all-cause mortality could fall by 11% (Woodcock et al., 2018)¹⁵⁷.

Similarly, diets in the UK and elsewhere commonly contain too much red and processed meat and not enough fruits and vegetables. Large benefits could be achieved by switching to more plant-based diets – if average UK diets met nutritional guidelines set out by the World Health Organization (including less meat and more fruits and vegetables) dietary GHG emissions could be reduced by around 17% and almost 7 million years of life lost prematurely would be saved over 30 years.^{158,159} (Green et al., 2015; Milner et al., 2015)

Future research on the health effects of climate action will need to better understand the effects of mitigation on health inequalities and care will be required to ensure that these actions are carried out in ways that do not reinforce existing inequities or embed adverse consequences into the future.

But the main message is clear – the low carbon economy can improve our health. The faster we act, the faster we can realise the benefits.



The co-benefits of active travel on health and the climate

By Mrs Scarlett McNally BSc MB BChir FRCS(Tr&Orth) MA MBA FAcadMEd
Consultant Orthopaedic Surgeon, and Council Member of the UK Health Alliance on Climate Change

E Exercise is a miracle cure for health¹⁶⁰, and it should be recognised as the same for the climate.

Moderate exercise for the minimum recommended time of 22 minutes a day¹⁶¹ reduces the risk of:

Dementia, Depression and Stroke by

30%

Breast and Bowel Cancer by

25%

and Diabetes by

45%¹⁶²

Yet a quarter of the UK population exercise for less than 30 minutes each week¹⁶³.

Our sedentary lives are seriously damaging our health¹⁶⁴, and physical inactivity is the fourth leading cause of death in the UK¹⁶⁵.

The best forms of exercise are those that easily become part of our daily lives¹⁶⁶ and, from a climate perspective, those that also reduce emissions. In 2019 transport accounted for just over a third (34%) of all carbon dioxide emissions, the majority arising from road travel¹⁶⁷. In England, 56% of car journeys are under 5 miles¹⁶⁸.

All of this points very clearly towards active travel (like walking and cycling) being a ready-made - and essential - climate and health improvement solution.

To get people out of polluting vehicles when possible requires more investment in active travel infrastructure, practical facilities and community support. During the pandemic schemes such as London's 'Streetspace' initiative¹⁶⁹ have successfully driven behaviour change.



As people have been able to try walking and cycling with less traffic, attitudes towards the 'danger' of active travel are changing. Pre-Covid, 62% of UK adults thought it was too dangerous to cycle on UK roads¹⁷⁰, but the DfT's 2020 National Travel Attitudes Study found that 38% of people are cycling more, and 39% are walking more than they were before. More importantly, 94% said they would continue to cycle and walk more once travel restrictions were removed¹⁷¹.

If we do remain more active as a society, the potential to improve health will not only be realised through our activity, and a reduction in travel related carbon emissions.

Air pollution contributes to 40,000 premature deaths each year¹⁷², and is caused in large part by the emission of other compounds from the exhausts, tyres, and brakes of motor vehicles¹⁷³. Despite this, studies have consistently shown that cyclists and pedestrians are exposed to lower levels of pollution than those travelling in cars¹⁷⁴.

The health benefits of active travel outweigh the risks (from pollution and road traffic collisions) by a factor of 10:1¹⁷⁵, the economic benefits of investment in walking and cycling in the UK outweigh the costs by 19:1¹⁷⁶, and the climate benefits of a healthier, more active population are abundantly clear.



In October 2020, NHS England set out a commitment to become the world's first net zero health system¹⁷⁷. "It is not enough for the NHS to treat the problems caused by air pollution and climate change, from asthma to heart attacks and strokes. We need to play our part in tackling them at source," said NHS CEO Simon Stevens.

It plans to reduce the greenhouse gas emissions produced by its services, buildings, and vehicles by 80% by 2032 at the latest and eliminate them entirely by 2040. It has said it will reduce 'net zero' emissions for all those that it has influence on including its supply chain and the travel of staff and patients by 2045.

With more than 1.5 million employees, England's National Health Service (NHS England) is the largest single employer in Europe and the largest single-payer health-care system in the world, with an annual budget of £134 billion. It currently contributes 4-5% of the country's total greenhouse gas emissions.

The NHS has already reduced the delivery of care emissions by 57% and emissions from its supply chain and broader responsibilities by 22% compared with 1990 levels. It is now working to develop plans for reducing direct emissions including its onsite use of fossil fuels and plans to road test a zero emissions emergency ambulance by next year. It will also look at new ways of delivering care, using low carbon alternatives throughout its supply chains and training staff in energy conservation.

The NHS has already reduced the delivery of care emissions by

57%

NHS England plans to reduce its greenhouse gas emissions

80%

by 2032 and then entirely by 2040

NHS England commits to net zero

As part of its net zero target the NHS has committed to only purchasing renewable energy from April 2021. If the NHS committed to only purchasing low carbon electricity from new, rather than existing projects it

could, it has been argued, help support local community energy projects creating multi-societal benefits. Surplus income from such projects, for example, could be used to set up projects tackling energy poverty and improve the health of local people, in turn reducing the cost to the NHS of treating health problems¹⁷⁸.

These projects are already happening. The University Hospitals of North Midlands NHS Trust (UHNM) is working with the charity 'Beat the Cold' to install solar photovoltaic (PV) panels on hospital roofs. As well as reducing the carbon footprint of the NHS, the income from the energy generated will be used to assist vulnerable patients suffering from conditions which are exacerbated by the cold, following their discharge from hospital¹⁷⁹.

"We are already seeing the impacts of flooding in our region. We have heard the impact this is having on people's wellbeing and we have seen the disruption affect our places. We need to work together to further reduce this risk while helping people who have been affected and reducing the likelihood that this type of risk will disrupt our health and care services in the future."

"Delivering a Net Zero NHS will require a huge change across all aspects of health and care – from our buildings and estates to the inhalers we prescribe. This latter issue illustrates the complexity of making these changes as we need to take into account patient safety and preferences while changing the behaviour of a large number of prescribers."

"Our ambition is to be global leaders in responding to the climate emergency. What this means is we need to develop a healthy, equitable and sustainable society which will reduce the need for health and care, while also ensuring the health and care we provide is as environmentally sustainable as possible."

- Frank Swinton & Yannish Naik, Climate Change leads at West Yorkshire and Harrogate Health and Care Partnership

What is the role of health professionals in averting a climate crisis?

Nicky Philpott, Director, UK Health Alliance on Climate Change

Climate change threatens to undermine the foundations of health and wellbeing in the UK and around the world. Health professionals have a duty to protect and promote public health in the face of threats beyond the clinic – and have done so repeatedly. Many actions to limit climate change also directly improve health by ensuring cleaner air, more active populations, healthier diets, and more resilient health systems.

Nevertheless, in stark opposition to the medical ethics of ‘first, do no harm’, health care systems themselves are currently making us sick as major contributors of greenhouse gas emissions. In the UK the health sector accounts for about 5.4% of our total emissions – and, globally, if healthcare were a country it would be the fifth largest emitter on the planet¹⁸⁰.

As the NHS explores just how to decarbonise across the UK with ambitious plans and targets¹⁸¹, health professionals hold the answer to many of the sticky questions. What does net-zero gastroenterology look like? Nephrology? Psychiatry? What does this look like in primary care and social care? Many of these questions can only be answered by practitioners themselves.



Health professionals also need to use their trusted voice in other ways. As we increasingly connect the harms done to the planet with damage to human health, they need to tell some hard truths about what’s making their patients ill. Routine asthma checks need to consider exposure to air pollution, and go further, asking why air pollution exists and what actions we can all do about it. It may feel like we’re straying into uncomfortable territory, but we’re already there. Across the world health professionals are being asked one question. Why? Why is my health worse on hot days? Why are we having more heatwaves? We need to figure out how to explain the climate-health link to patients, and to health professionals who haven’t already made the connection.

Lastly, health voices need to unite in advocating to political decision makers, and stand shoulder to shoulder with those making tough choices about how to rapidly decarbonise systems. The compelling health case can help to ensure that the UK government is using its special role as COP26 host to make progress towards existing climate commitments, and to set ambitious new targets. Crucially, only by joining the conversation can the health community ensure that investment to recover from this pandemic will not make us ill, but, in the face of the bigger health threat on the horizon, will improve health and resilience for all.



UK HEALTH ALLIANCE ON CLIMATE CHANGE





Our calls to action

The UK is facing a health crisis. The negative health impacts of global warming are clear and continue to worsen year on year. Reducing greenhouse gas emissions and adaptation measures have the potential to improve public health today and in the future.

This is a global as well as UK crisis. The UK must not only reduce its own emissions but also work to achieve global action on tackling the climate crisis to safeguard everyone's health.

There are steps individuals, communities, and governments can take today to reduce global warming that will have immediate health benefits.

In response to the Covid-19 pandemic and resulting economic fallout, The Climate Coalition produced a plan for a Green and Fair Recovery ahead of the crucial climate talks in November 2021 (COP26). Outlined below are some of those necessary steps to get the UK on track to net-zero emissions.

CONCLUSION



Green Homes

Build on the Green Homes Grant by implementing the Conservative Manifesto commitment to invest **£9.2 billion** in energy efficiency, and provide a further **£5.8 billion** to support heat pumps deployment, during this Parliament. Create a 10 year infrastructure programme to make every home in the UK highly energy efficient and **install 10 million heat pumps**. This should be delivered in a way that is sensitive to historic and listed buildings. This can **support over 300,000 jobs**, reduce energy bills, tackle fuel poverty, reduce NHS costs and slash carbon emissions.

Renewables

Fully decarbonising our power system as quickly as possible is vital for achieving the UK's climate targets across a range of sectors. In addition to committing to a phaseout date for domestic fossil fuel extraction across the UK, the Government must guarantee that an additional **20GW of offshore wind** will be contracted through a regular pipeline of auctions over the next 4 years, in order to get on track to meeting its **40GW by 2030** target. This must be supported by a new process for marine strategic spatial planning to ensure that any energy development is compatible with ecological recovery. Support for community energy, onshore wind and solar should also be significantly boosted, and all renewables development needs to happen **in harmony with nature**.

Zero Carbon Transport

The UK government must build a zero carbon transport system fit for the 21st century which can **boost productivity, create jobs, support levelling up, and clean up the air** we breathe. Announce the phase out of new fossil fuel cars and vans by **2030** and significantly increase investment in walking & cycling infrastructure, public transport provision and the electrification of buses and trains.

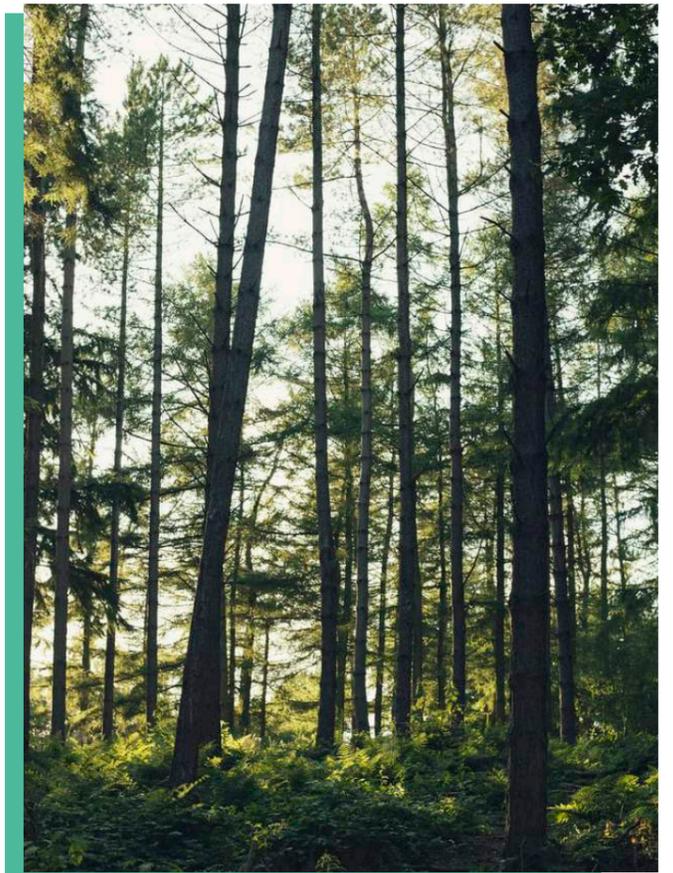


UK Nature Protection

Nature is a front line defence against climate impacts, including floods, and natural biodiverse ecosystems are more carbon rich and more resilient to climate impacts. Furthermore equitable access to high quality natural environments is good for both physical health and mental wellbeing. Governments across the UK should put **ambitious nature restoration targets** in law. In England, delivery should include designating **30% of land and sea** to be strongly protected and well managed for nature **by 2030** and the creation of ambitious Nature Recovery Networks. Governments across the UK should increase native woodland cover, restore peatlands, wetlands and oceans and **create more green space** where people live; governments must also end burning of unsustainable bio-energy and **help farming** across the UK to be net-zero and nature friendly by supporting agro-ecological food production and agro-forestry and introducing measures to significantly **reduce pesticide and fertiliser application**.

Support impacted communities

The UK must **show global leadership** to ensure there is an urgent and significant scale up of financial support to poor and vulnerable countries and communities on the frontline of the climate crisis. This means providing new and **additional finance** for climate action in developing countries, not just the allocation from the aid budget that the UK has already made. This is needed because of the scale of the **impacts vulnerable communities face** on top of existing poverty and development challenges. Urgent attention is also needed to address the neglect of **gender equality** and to ensure significantly more climate finance reaches women, who are on the frontlines of the climate crisis. The UK must retain its commitment to **supporting developing countries** to adapt to climate change by continuing to **spend 50%** of UK climate finance on adaptation and by championing a new global adaptation finance goal. The Government must also lead international efforts to establish new and additional sources of **finance for loss and damage**.



Protect and restore ecosystems globally

The UK must be at the forefront of efforts to **halt and rapidly reverse the decline** of biodiversity and nature globally, given nature's vital role in limiting catastrophic climate change and ensuring our **future generations'** ability to produce food, to have enough water, to remain healthy, and to thrive. The UK can lead the way by pushing for an ambitious and **comprehensive Global Biodiversity Framework** to restore habitats and species, supported by action plans, at COP15 of the Convention on Biological Diversity and at the final round of negotiations for a Global Ocean Treaty in 2021, and by introducing due **diligence legislation** to ensure commodities are only imported to the UK that are produced sustainably and **do not drive deforestation**, conversion of other ecosystems or human rights abuses.

SHOW THE LOVE

Show the Love is the UK's biggest conversation about climate change, an annual celebration of everything that we love and want to protect from its worst effects. Every February since 2015, organisations, institutions, and millions of people have harnessed the power of green hearts to show they care about climate change. Every single one of us can be part of this movement.

The Show the Love campaign aims to get people talking about how the things we love are affected by climate change - and the actions we can take to protect them. Start by having conversations about the findings in this report. Talk about your own experiences of being affected by increasingly extreme weather. Talk about what and who you care about, and how they will be affected by climate change. Help make climate change a part of the national conversation. A cleaner, greener future is within reach - together we need to grasp and embrace the solutions and get our climate back in balance.



Show the Love 2021 will build on the momentum of the last six years, and encourage everyone to take actions to tackle the climate crisis. Green hearts will kick off conversations about the things we love and the future we want for the next generation and the ones that come after. From Women's Institutes crafters to Premier League Football clubs, from local businesses to primary school classes, we can all Show the Love, and we can all use our voices to call for change.

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