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Director of Public Health Annual Report 2024/25

Health and climate change

Norfolk County Council
Public Health

Contents

Foreword

Fran Whymark
Cabinet member for Public Health and Wellbeing

I am pleased to introduce the Director of Public Health's 2024/25 annual report. This year the report focuses on the health impacts of climate change in Norfolk and the significant benefits that certain climate actions can bring to people's health and wellbeing.

Norfolk County Council is committed to delivering a sustainable, greener and more inclusive future for the County as set out in Better Together for Norfolk. The County Council is already undertaking substantial work to combat climate change, introducing a Climate Strategy and Action Plan.

Climate change has the potential to impact the health of Norfolk residents. This report examines these impacts while also showcasing local initiatives that support both public health and climate action. It also highlights what each of us can do – whether organisations or individuals – to contribute to this valuable work. My thanks to all of those who seek to improve the health of our local residents.

Photography:
Coastwise

Introduction

Stuart Lines
Director of Public Health

Welcome to my 2024/25 independent annual report on the health of the people of Norfolk. This report focuses on the health impacts of climate change in Norfolk and aims to increase awareness of the benefits to health that taking positive climate change action can have.

Actions to reduce greenhouse gas emissions have the potential to offer substantial benefits to health and wellbeing. For example, encouraging short journeys to be taken by bike or on foot, rather than by car, gets people moving and improves cardiovascular health as well as cutting carbon emissions. These health co-benefits of climate action cover a wide range of activities such as sustainable and healthy diets; accessible, biodiverse green spaces; and energy efficient, healthy housing.

The health impacts of climate change do not fall equally on all, with at-risk individuals, older adults and those living in deprivation more severely affected and less able to respond. Climate change drives health inequalities and addressing it can provide benefits and a more resilient future for us all.

Photography:
Norfolk Wildlife Trust

Section 1:
Why the focus on climate change?

What is climate change?

Climate change refers to long-term shifts in temperatures and weather patterns. Since the industrial revolution, human activities have been the main driver of climate change, primarily due to the burning of fossil fuels like coal, oil and gas, and aided by deforestation and the changing use of land[1]. Burning these fuels releases greenhouse gases like carbon dioxide (CO_2) into the atmosphere, which trap heat and lead to a warming climate. The contribution made by human activity now means that atmospheric CO_2 levels are the highest they have been for around three million years[2].

At the 2015 Paris UN Climate Change Conference, 196 countries committed to limiting the global average temperature increase to 1.5°C above pre-industrial levels[3]. However, 2024 saw unprecedented global temperatures and marked the first year in which the 1.5°C limit was exceeded[4], while current policies put the world on track for a 3.2°C rise by 2100[5].

Addressing climate change is important in part due to its likely direct and indirect impacts on health. Fortunately, there are actions that can be taken to prevent or reduce these impacts and to build resilience through behaviour changes on the part of individuals, communities and organisations – locally, nationally and globally.

Some terms: mitigation, adaptation, and net zero

Mitigation: actions taken to reduce or prevent the causes of climate change, either by reducing greenhouse gas emissions, or absorbing and storing these gases (e.g. in forests).

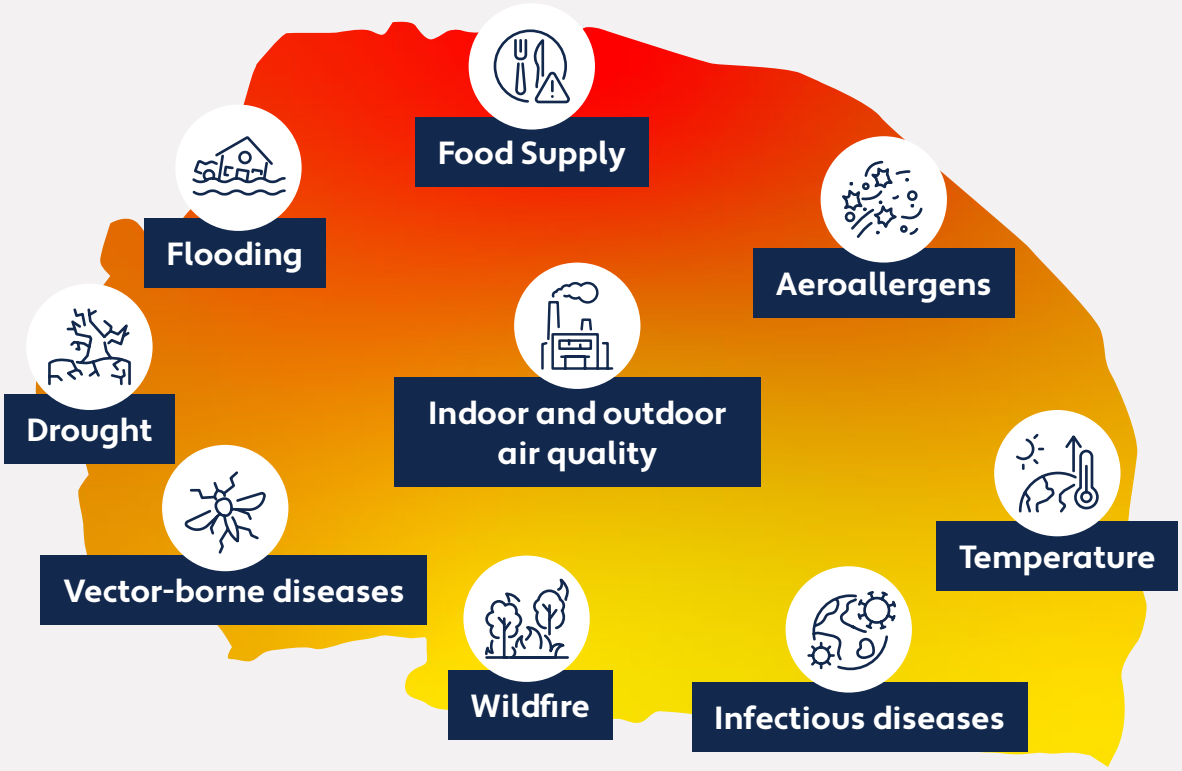
Adaptation: actions taken to adjust to the effects of climate change, such as building flood defences or using drought-resistant crops.

Simply, mitigation tackles the causes of climate change, while adaptation tackles its effects.

Net zero: no longer adding to the total amount of greenhouse gases in the atmosphere.

While efforts to reduce greenhouse gas emissions remain essential to limit climate change, emissions to date mean that a certain level of warming is already inevitable. The climate will change – the question now is by how much and what impact it will have. What is becoming clearer is that climate change will influence Norfolk residents' way of life over the coming years, with few impacts being more profound than those on health and wellbeing. **The UK Health Security Agency's (UKHSA) 2023 report** on the health effects of climate change clearly sets out these direct and indirect risks, highlighting how nearly all determinants of health are affected by climate change. From heatwaves and flooding, to food insecurity and increasing risks of disease, the message from UKHSA is clear: the climate crisis is a health crisis[6].

How could climate change impact health and wellbeing in Norfolk?



Source: Graphic adapted from Health Effects of Climate Change (HECC) in the UK (UKHSA, 2023)

Norfolk's distinctive geography makes the county particularly vulnerable to these changes. The long coastline and low-lying terrain makes Norfolk more susceptible to flooding and coastal erosion, while simultaneously the comparatively warm, dry climate means that risks of drought and heatwaves are higher relative to the rest of the country[7]. Understanding how these risks affect Norfolk will be crucial to enable effective adaptation and preparation for the future.

It is likely that these impacts will not be experienced equally across Norfolk's population; the county's demography and socioeconomic characteristics mean that certain groups may be more impacted by the effects of climate change than others, further worsening existing health inequalities. With pockets of high deprivation in communities across the county[8], as well as an ageing population[9], it is essential that action is taken to minimise the impacts of climate change, particularly upon already vulnerable groups.

However, the need to mitigate and adapt to climate change brings significant opportunities to improve health in Norfolk. Actions that address climate change while at the same time improving health are known as 'co-benefits.' There are numerous ways to bring about positive health co-benefits while reducing greenhouse gas emissions and building climate resilience, particularly in relation to housing, air quality, transport, and green spaces. Individual behaviour changes play an important part. The move towards net zero also creates significant opportunities for Norfolk's economy, with the county particularly well-poised to take advantage of growth in the renewable energy sector, as the county's new Local Growth Plan sets out.

While a lot remains to be done, the UK has already made significant progress. The Climate Change Act 2008 meant that the UK became the first country globally to adopt a law on climate change[10], committing the UK to reach net zero by 2050[11]. In 2022, UK greenhouse gas emissions were 50% lower than 1990 levels[12]. At a local level, **Norfolk County Council's Climate Policy** sets out the Council's commitment to reaching net zero on its estate by 2030, and pledges to use its powers, influence and partnerships to support the UK-wide 2050 net zero target[13]. The accompanying Climate Strategy outlines a series of plans and workstreams to identify how these targets will be achieved through six key themes, including transport, building and planning, and energy. Norfolk's district, city, and borough councils also play an important role in climate action across the county, with all seven having set formal net zero targets.

What strategies and plans are already in place in Norfolk?

- **Norfolk County Council Climate Change Policy and Strategy** – sets out the Council's commitment to reaching net-zero by 2030 and outlines how this will be achieved.
- **Norfolk County Council Environmental Policy** – sets out goals related to issues such as air quality, nature recovery, and land-use management for Norfolk. This is currently being refreshed with a new version expected in 2025.
- **Norfolk's "Together, for our Future" Report** – sets out key changes that Norfolk faces in the future, such as coastal erosion and climate change, and how these can be prepared for.
- **Norfolk's Local Growth Plan** – sets out areas of focus for economic growth, including a vision for Norfolk to become a UK leader in offshore energy production and climate change adaptation.
- **District Authority Climate Commitments and Strategies** – all seven of Norfolk's district, city, and borough councils have set climate commitments for their own estate, with accompanying strategies or action plans.
- **Integrated Care System (ICS) Green Plan** – the Norfolk and Waveney ICS's Green Plan sets out how system partners will work together to cut carbon emissions and enhance resilience. This is currently being refreshed with a new version expected in Summer 2025. The ICS's Green Plan is underpinned by member organisations' own strategies, such as Green Plans for the **East of England Ambulance Service**, **Norfolk and Norwich University Hospital** and **Norfolk Community Health and Care**.
- **Ready to Change ...Ready to Act** – Public Health's Strategic Plan sets out key priorities for improving health outcomes and inequalities in Norfolk and highlights the importance of working with partners towards net zero.

It is important that, as a local system, Norfolk County Council, district councils, the NHS and other partners continue working together to understand and minimise the health impacts of climate change, particularly for Norfolk's most vulnerable residents. This report examines the risks and challenges Norfolk faces, along with the opportunities for improving health outcomes and reducing inequalities through effective climate action. Addressing climate change head-on allows partners to prepare as a system, ensuring that Norfolk is resilient to future impacts and ultimately securing a healthier, more liveable future for all Norfolk residents.

The National Adaptation Programme

The UK Climate Change Act 2008 mandates that a **National Adaptation Programme** is published every five years, setting out the actions that government and other partners will take to adapt to the impacts of climate change[14]. Under the National Adaptation Programme, UKHSA publishes Adverse Weather and Health Plans. The Plans aim to support local and national organisations to prepare and respond to future adverse weather events to protect public health and promote wellbeing. The Plans cover key areas such as heatwaves, cold weather, flooding, and drought, and include strategies for early warning systems, communication, and capacity building[15].

Photography:
Getty Images

Section 2:
The health impacts of climate change

Both at home and across the world, the impact of climate change on health is becoming increasingly visible. These impacts are felt both directly, such as through heat-related illnesses and injuries from extreme weather events, and indirectly, by worsening issues like food insecurity. On a global scale, many of these threats will make certain areas uninhabitable, leading to increased climate-related displacement and migration[16]. The evidence base on climate change's threats to health is growing; the following section sets these out and highlights the potential impact on Norfolk.

Extreme temperatures

The increasing frequency of higher temperatures is a clear sign of the UK's changing climate, with the number of 30°C days tripling in the past decade[17] and 2022 marking England's first 40°C day[18]. This warming trend is evident in East Anglia, where annual temperatures continue to climb above the long-term average (Figure 1). Even if emissions pledges are met, global temperatures will likely still rise 2°C above pre-industrial levels by 2050, increasing the number of summer days in Norfolk above 25°C by a third[19].

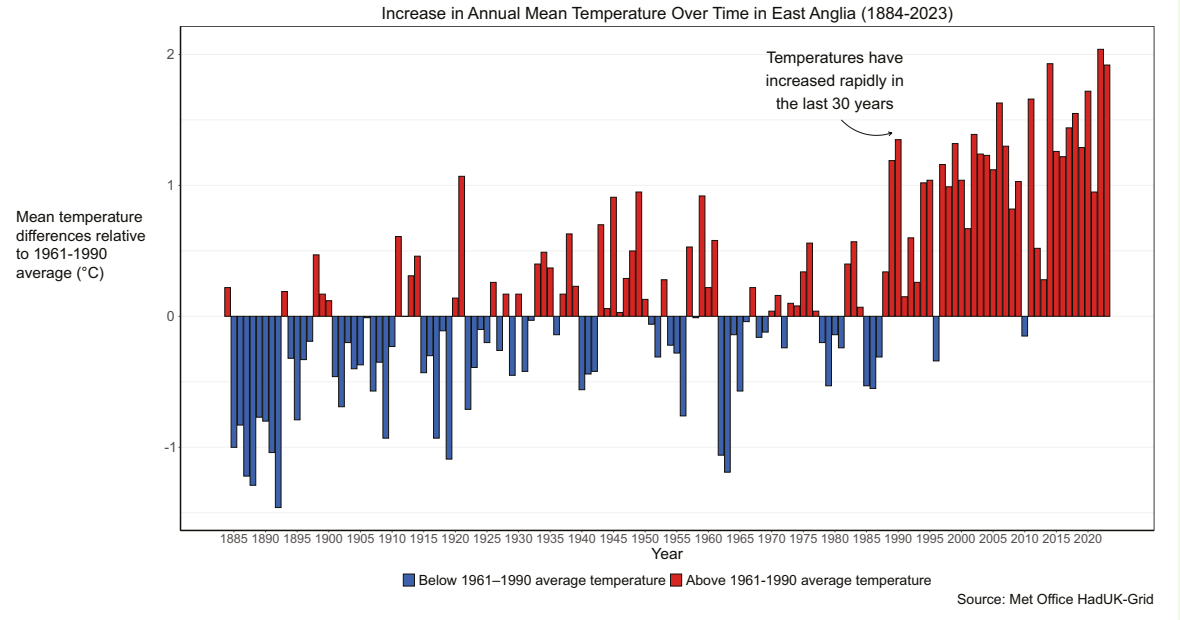


Figure 1: Mean annual temperature anomalies for East Anglia relative to 1961–1990 baseline.

Rising summer temperatures and more frequent heatwaves pose significant health risks. Prolonged exposure to high temperatures can lead to heat-related illnesses such as heat exhaustion and heat stroke and can also worsen existing respiratory and cardiovascular conditions, increasing the risk of heart attacks and symptoms for those with asthma[20]. Hospitals are also likely to become increasingly uncomfortable environments, with 90% of UK hospitals estimated to be at risk of overheating[21]. The 2022 heatwaves highlighted this increasing risk, with 2,985 heat-related excess deaths reported across England, the highest on record[22]. In Norfolk, daily deaths during these heatwaves were 18% higher than the five-year average, with 242 recorded excess deaths (Figure 2)[23].

With climate change projected to increase the frequency and intensity of heatwaves, it is expected that the health risks of extreme heat will worsen without appropriate adaptation[24].

With no adaptations, 2°C of warming, combined with a growing and ageing population, could result in an estimated 3,700 excess deaths annually in the UK by 2030[25].

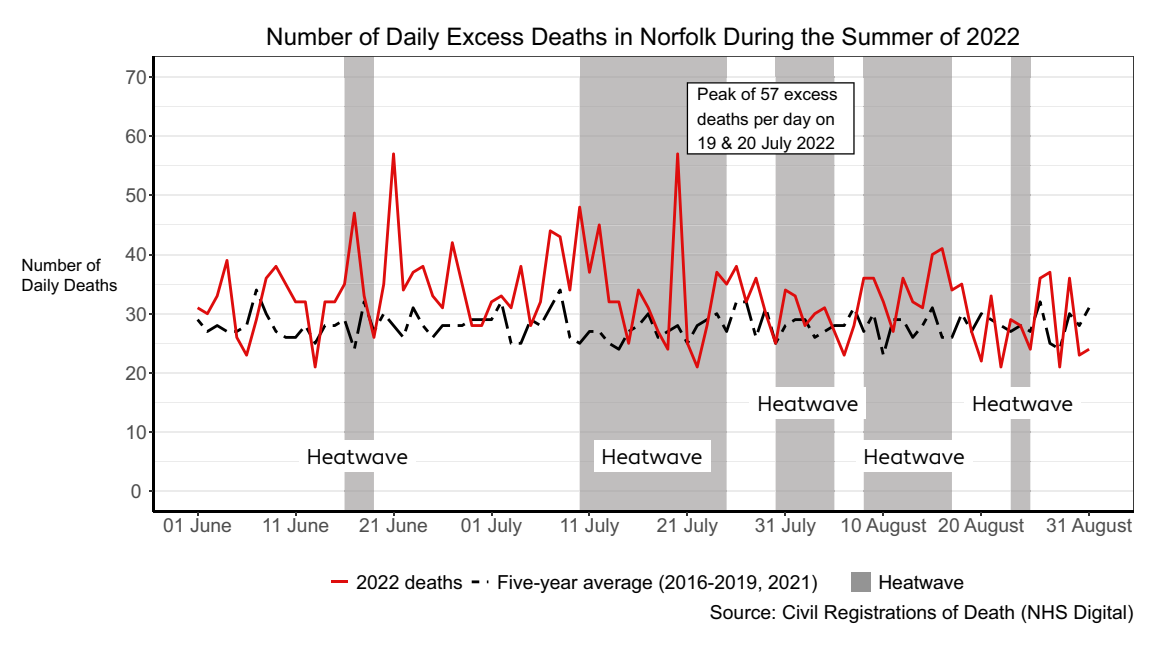


Figure 2: Number of daily death occurrences in Norfolk during the summer of 2022 compared to the five-year average (2016-2019,2021). Grey bars represent periods classified as heatwaves during the summer of 2022 (01 June-31 August).

Rising temperatures and drier summers will also increase wildfire risk. The Met Office's projections indicate that a 2°C increase in global temperatures will double the days in the UK with a very high fire risk and could extend the wildfire season into autumn. In the East of England it's predicted that the number of wildfire risk days will increase by 3-4 times[26]. During the summer of 2022, the joint warmest on record and one of the driest in decades, Norfolk's Fire and Rescue Service responded to 45 wildfires, a 96% increase from 2021 and higher than all previous years since 2013, with the exception of 2018, another hot year which had 54 callouts (Figure 3).[27] Not only are these events a direct risk, but they also contribute to worsened air pollution, aggravating respiratory and cardiovascular issues due to higher levels of particulate matter in the air[28]. As most wildfires are a result of human activity, awareness and changes in behaviour will become increasingly important[29].

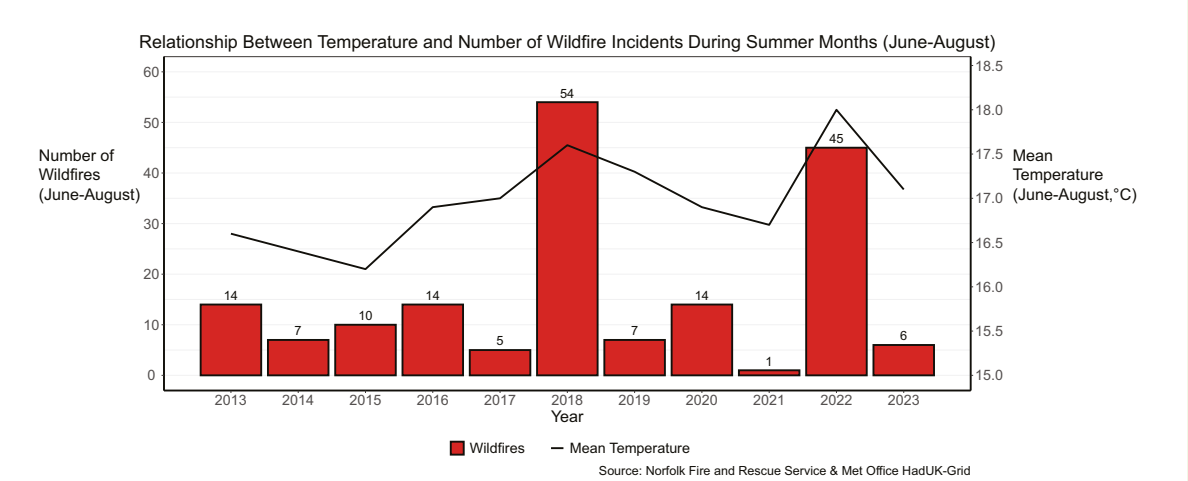


Figure 3: Number of wildfire incident callouts in Norfolk during the summer months from 2012 to 2023 against mean summer temperature. Mean temperature represents the average temperature in East Anglia between June and August of each year.

Photography: Norfolk Fire and Rescue Service

Case Study: Wildfires and Norfolk Fire and Rescue Service

Rising temperatures can lead to prolonged heatwaves, drought and drier conditions, which in turn elevate the risk and extend the duration of wildfire seasons. The summers of 2018 and 2022 were the joint warmest on record and the driest in decades[30], resulting in a significant increase in the frequency and severity of wildfires compared to previous years. In these years, Norfolk Fire and Rescue Service reported 122 wildfires, damaging approximately 133 acres of land and requiring 810 hours to extinguish.

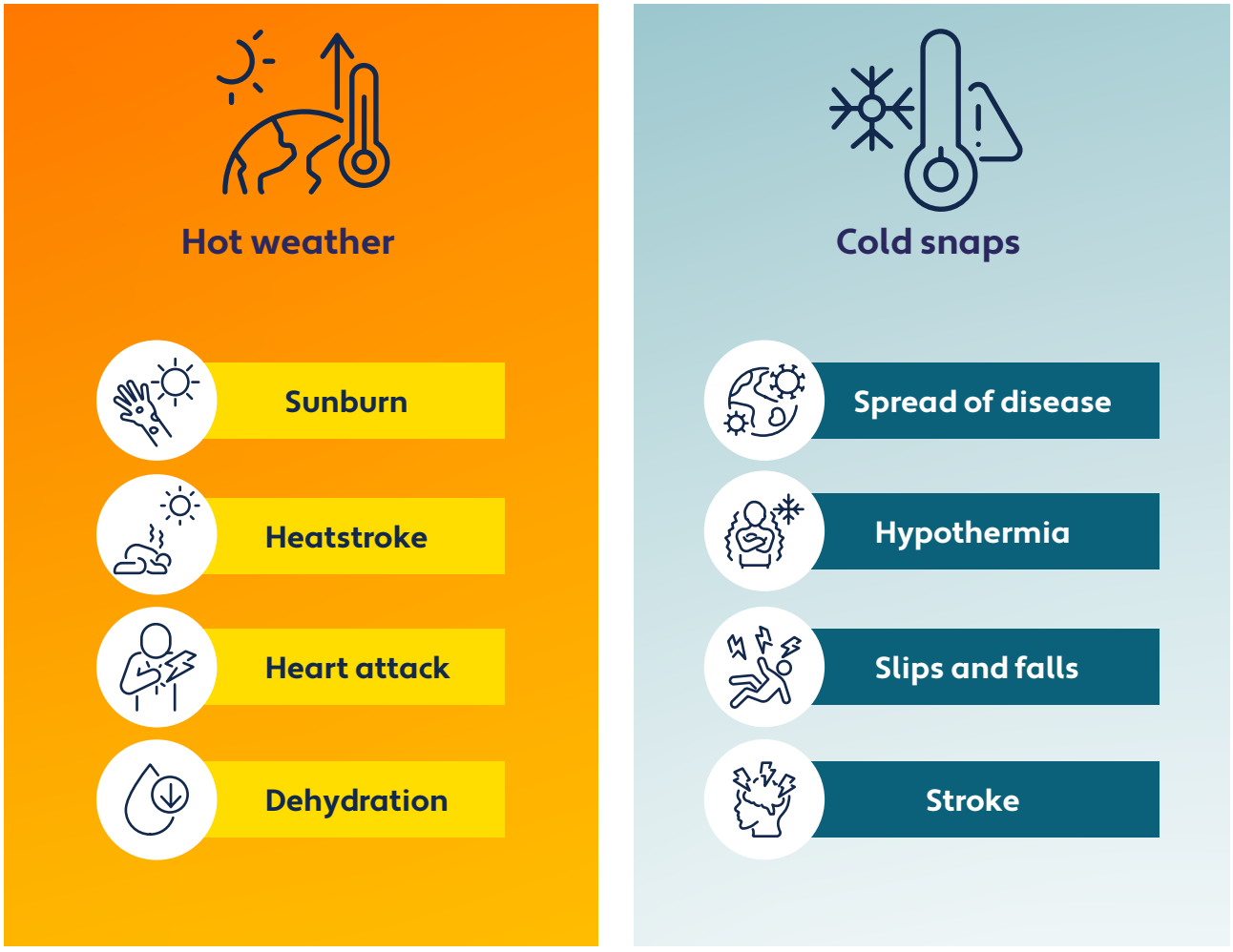
Wildfire smoke poses significant health risks, as it contains various harmful pollutants such as particulate matter. Exposure to this smoke can aggravate respiratory conditions like asthma, increase the risk of cardiovascular problems, and cause irritation to the eyes and throat. Children, pregnant women, and the elderly are particularly vulnerable to smoke exposure.

This growing risk significantly impacts emergency services responding to fires:

"During the unprecedented heat emergency in 2022, our teams at Norfolk Fire and Rescue Service faced a challenge of a scale and intensity we'd never seen before. The extreme heat made already difficult work even harder, putting our crews at serious risk of heat-related illness. We recorded two cases of heat stroke, and numerous staff had to be pulled from operations as they approached exhaustion. The unrelenting demands of continuous work in record-breaking temperatures highlighted just how challenging it is to tackle fires in these conditions and just how much rising temperatures are impacting firefighter safety and wellbeing." – Paul Seaman, Norfolk Fire and Rescue Service Area Manager (Response).

It is also important to consider the effects climate change may have on cold weather and its impacts on health. While winters are projected to be warmer and wetter generally, the incidence of 'cold snaps' will continue, posing significant health risks for vulnerable populations. Cold temperatures increase risks of hypothermia, frostbite, heart attacks, and strokes, while also worsening respiratory conditions and increasing the risk of spreading viral infections. For instance, Norfolk's 2023/24 winter deaths were 10.2% higher than the preceding four months[31]. While overall risk may reduce due to warming winters, projections indicate that the number of cold-related deaths are still set to increase due to our ageing and growing population[32]. As such, cold weather planning remains a priority in Norfolk, working as a system to ensure a coordinated and effective response.

Direct impacts of extreme temperatures on health



The health impacts of extreme temperatures will not be felt equally across the population, with certain groups being more vulnerable. Older adults are particularly at risk due to the likelihood of having pre-existing health conditions and a reduced ability to regulate body temperature, and are consequently the greatest driver of heat- and cold-related deaths[33]. This is particularly relevant to Norfolk given its ageing population, with 24% of the population aged 65+ (compared to 18% nationally)[34], with this projected to rise to 30% by 2043[35]. However, other groups are also vulnerable to extreme temperatures: those with chronic illnesses such as cardiovascular and respiratory diseases and those living in poorer quality housing. Young children are also particularly vulnerable as their bodies are less able to cope with heat. Outdoor workers and those experiencing homelessness are also susceptible due to prolonged exposure. Section 4 explores measures to minimise temperature-related health risks from climate change.

Air quality

Climate change and air pollution are closely intertwined, with Norfolk's increasingly hotter, drier summers having the potential to worsen air quality. Several factors contribute to this. Rising temperatures enhance the formation of ground-level ozone, which not only harms respiratory health but also interacts with other pollutants to amplify their effects[36]. This is not just a concern for urban areas, with ozone concentrations typically being higher in rural areas[37]. Furthermore, prolonged heatwaves make air pollution worse by creating stagnant air conditions which trap pollutants at ground level[38]. As established previously, hotter, drier summers are also expected to increase the frequency of wildfires, which release large amounts of particulate matter (PM_{10} and $PM_{2.5}$) into the air, impacting cardiovascular and respiratory health (PM_{10} and $PM_{2.5}$ refer to two sizes of tiny particles in the air that can be harmful to health).

Climate change is also expected to worsen issues with airborne allergens, with warmer summers increasing pollen production and leading to more frequent and severe allergic reactions[39]. This link between hot weather and worsening air quality is already evident in the UK. Researchers from the National Centre for Atmospheric Science and the University of York observed significant changes in air pollution during the 2022 heatwaves, with levels of ozone reaching twice the World Health Organisation's recommended limit[40]. Among these findings, Weybourne in Norfolk recorded some of the highest ozone levels nationally.

Photography:
Getty Images

Key outdoor air pollutants include fine particulate matter, nitrogen dioxide, and ammonia. The UK has seen a reduction in the emissions of some air pollutants due to tighter regulation (Figure 4). For instance, levels of sulphur dioxide and oxides of nitrogen have declined but decreases in particle emissions from industrial sources have been offset by increases in domestic combustion. Ammonia levels have shown little change and remain high (Figure 4).

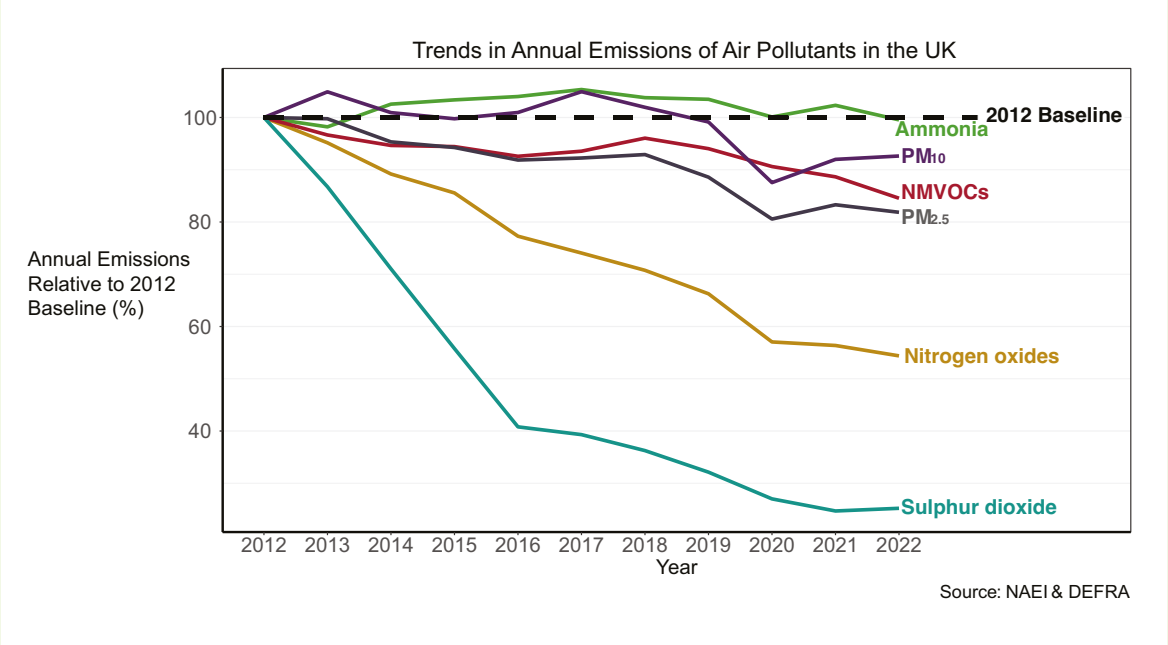


Figure 4: Recent UK trends in annual emissions of air pollutants including PM_{10}, $PM_{2.5}$, nitrogen oxides, ammonia, non-methane volatile organic compounds (NMVOCs), and sulphur dioxide. The dashed line represents the level of annual emissions had they remained constant at 2012 levels[41].

In Norfolk, particulate emissions (both PM_{10}, $PM_{2.5}$) are high in urban areas such as Norwich, King's Lynn and Great Yarmouth, and lower in rural parts of the county (Figure 5, Maps A and B). Similarly, nitrogen dioxide (NO_2) emissions are clearly associated with the county's main urban areas and the network of roads which connect them (Figure 5, Map C). Meanwhile, high ammonia emissions are associated with rural areas where agricultural activity is greater, particularly south and southwest of Norwich (Figure 5, Map D).

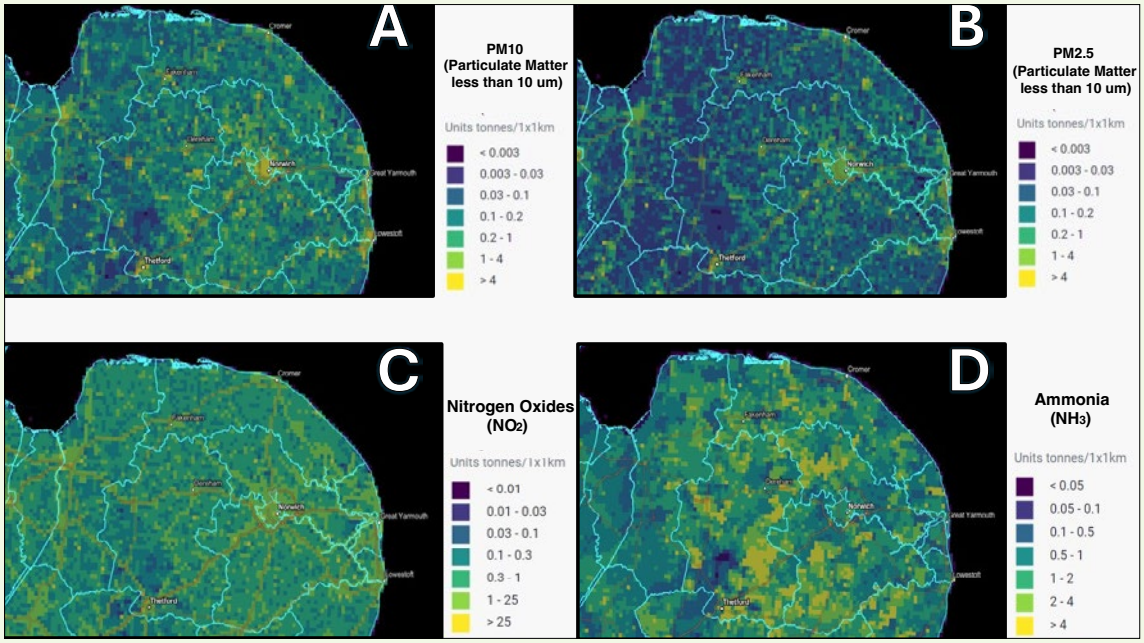
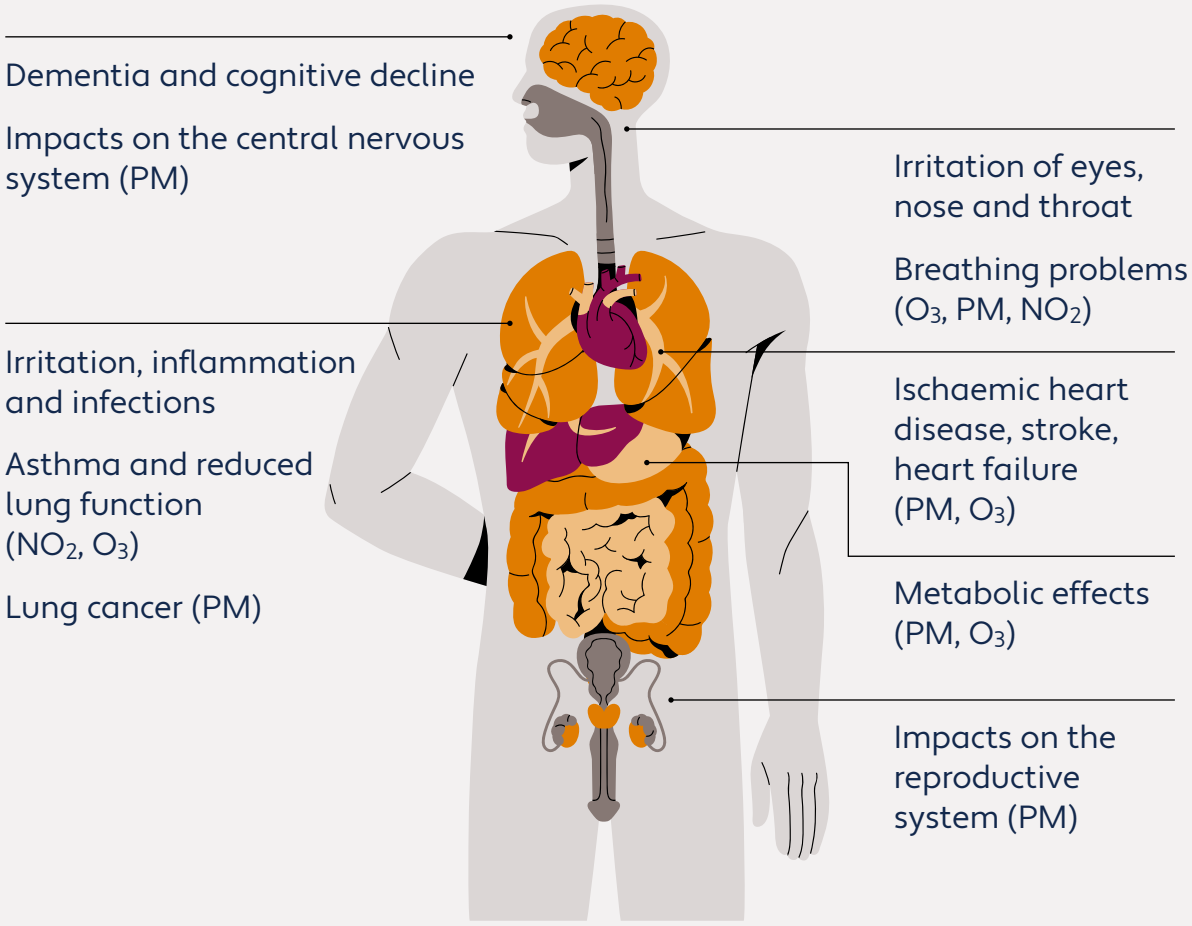


Figure 5: Maps of total emissions from all sectors of PM_{10} (Map A), $PM_{2.5}$ (Map B), nitrogen oxides (NO_2) (Map C) and ammonia (NH_3) (Map D). Data from the **UK National Atmospheric Emissions Inventory for 2021**.

Air pollution is one of the greatest environmental risks to public health in the UK and is associated with an estimated 29,000 to 43,000 deaths per year.[38] Exposure to pollutants such as NO_2 and particulate matter (PM) is known to reduce life expectancy and cause a range of respiratory and cardiovascular health problems such as asthma, chronic obstructive pulmonary disease (COPD), lung cancer, heart disease, and stroke. Exposure has also been linked to an increased risk of cognitive decline, dementia, and other neurodegenerative diseases, as well as impacts on the reproductive system, metabolic effects, and irritation, inflammation and infections.[38]

Health effects of air pollutants

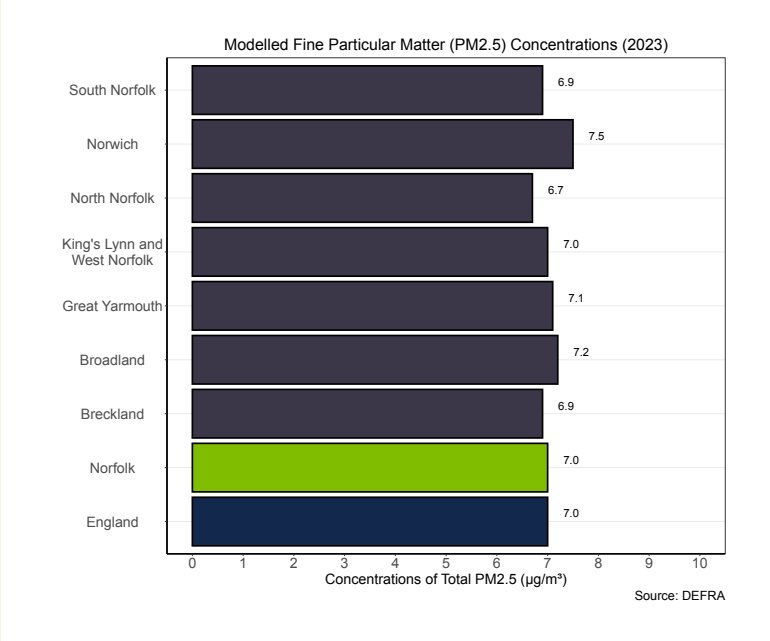


Source: Adapted from **Chief Medical Officer's Annual Report 2022**

In Norfolk, the percentage of early deaths where exposure to fine particulate matter pollution could have been a contributory factor stands at 5.3%, with figures for individual local authorities ranging from 5% (North Norfolk) to 5.6% (Norwich) (**Figure 6B**).

Figure 6A shows the modelled concentrations of $PM_{2.5}$ for Norfolk's local authorities. For individual local authorities, the numbers range from 6.7 µg/m³ (North Norfolk) to 7.5 µg/m³ (Norwich), while the Norfolk and England averages are both 7 µg/m³.

A



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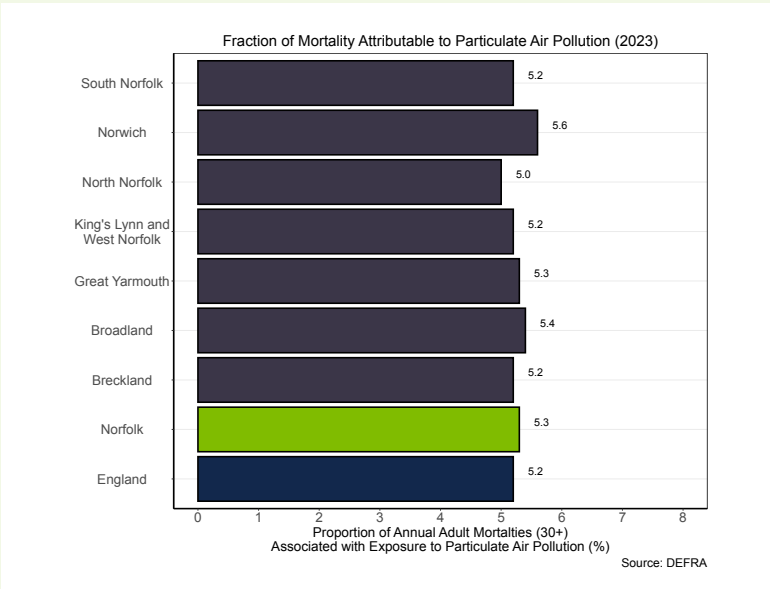


Figure 6: Fine particulate matter ($PM_{2.5}$) concentrations measured in micrograms per cubic meter (µg/m³) (A) and the fraction of annual adult (aged 30+) mortalities attributable to exposure to fine particulate matter (B) in 2023 across Norfolk's local authorities compared to Norfolk and England averages.

The impact of air pollution is not evenly distributed across the population. Those in more deprived areas are more likely to live near busy roads or industrial sites, where pollution levels are higher. Affordable housing is frequently located in these more polluted areas, increasing exposure to poor air quality[43]. Studies of hospital admissions and mortality show increased health risks associated with exposure to air pollution among those living in areas of higher socio-economic deprivation. A 2023 study by UEA's Health Data Interpretation Group examined healthy life expectancy and prevention opportunities in Norfolk, identifying key avoidable risks that contribute to lower life expectancy in areas such as Great Yarmouth, Norwich, and King's Lynn[44]. One of these factors was air pollution.

The study found that for every 1 mcg/m³ reduction in $PM_{2.5}$ levels, life expectancy at age 65 increased by 6-7 months for both men and women.

Photography:
Getty Images

Air pollution is particularly problematic for young people, pregnant women, older people and those with pre-existing health conditions. Children are particularly susceptible to the health effects of air pollution as their lungs and other organs are still developing, and they inhale more air per body weight than adults[45]. Sections 3 and 4 explores actions to improve air quality and promote public health.

Air pollution affects people throughout their lifetime

Pregnancy

- Low birth weight

Children

- Asthma
- Slower development of lung function
- Development problems
- More wheezing and coughs
- Start of atherosclerosis

Adults

- Asthma
- Coronary heart disease
- Stroke
- Lung cancer
- Chronic obstructive pulmonary disease (as chronic bronchitis)
- Diabetes

Elderly

- Asthma
- Accelerated decline in lung function
- Lung cancer
- Diabetes
- Dementia
- Heart attack, heart failure, and strokes

Source: Adapted from Health matters: air pollution (Public Health England)

A focus on wood burners

In recent years, especially during the cost-of-living crisis, log burners have become increasingly popular for home heating. Even though they might have other pre-existing options for heating, more households are installing wood burners as a secondary heating source[46]. However, they pose significant health risks due to their impact on indoor and outdoor air quality.

The domestic burning of fuels such as wood and coal contributes 29% of the UK's total $PM_{2.5}$ emissions, more than both road transport and industrial combustion[47]. Of this, wood burning accounts for 75%.[47] Breathing air containing PM2.5 over a prolonged timeframe can inflame the lining of the lungs and enter the bloodstream, affecting the heart and brain. This exposure is linked to serious health issues, including lung disease, heart disease, dementia, and strokes.

Of the 215,000 properties in Norfolk that had an EPC in the last 10 years, 2,900 are not connected to the gas grid and rely on burning solid fuel for their heating[48]. However, those who have alternative options for heating may wish to consider the health impacts of burning solid fuels, both for themselves and the wider public.

Photography:
Adobe Stock

Flooding and coastal change

Climate change is expected to bring more frequent and intense flooding to Norfolk. Projections suggest that winter rainfall in Norfolk could increase 10-20% by 2100[49], overwhelming rivers and floodplains and leading to flooding across the county. Similarly, whilst summers are expected to be drier overall, the intensity of rain is expected to increase, leading to localised flash flooding[50]. In Norfolk, Suffolk and Essex, climate change, coupled with population growth, could see a 24% increase in people being exposed to flooding by 2050, assuming current levels of adaptation[51]. Given that 106,000 people across Norfolk already live in areas vulnerable to flooding, the increasing risk underscores the importance of continued resilience planning[52]. This risk is not unrealised: over the past 10 years, 1,355 properties in Norfolk have been reported as flooded[53], a number expected to rise. The impacts of flooding were made clear in 2020, the fifth wettest year on record in the UK[54], with Norfolk's Fire and Rescue Service carrying out 537 flood rescues, more than 2019, 2021, and 2022 combined (Figure 7).[27] The annual variation in flood rescue incidents underscores the unpredictable nature of weather events driven by climate change, and has led Norfolk Fire and Rescue Service to recognise flooding as one of six high-impact threats to Norfolk's residents[55].

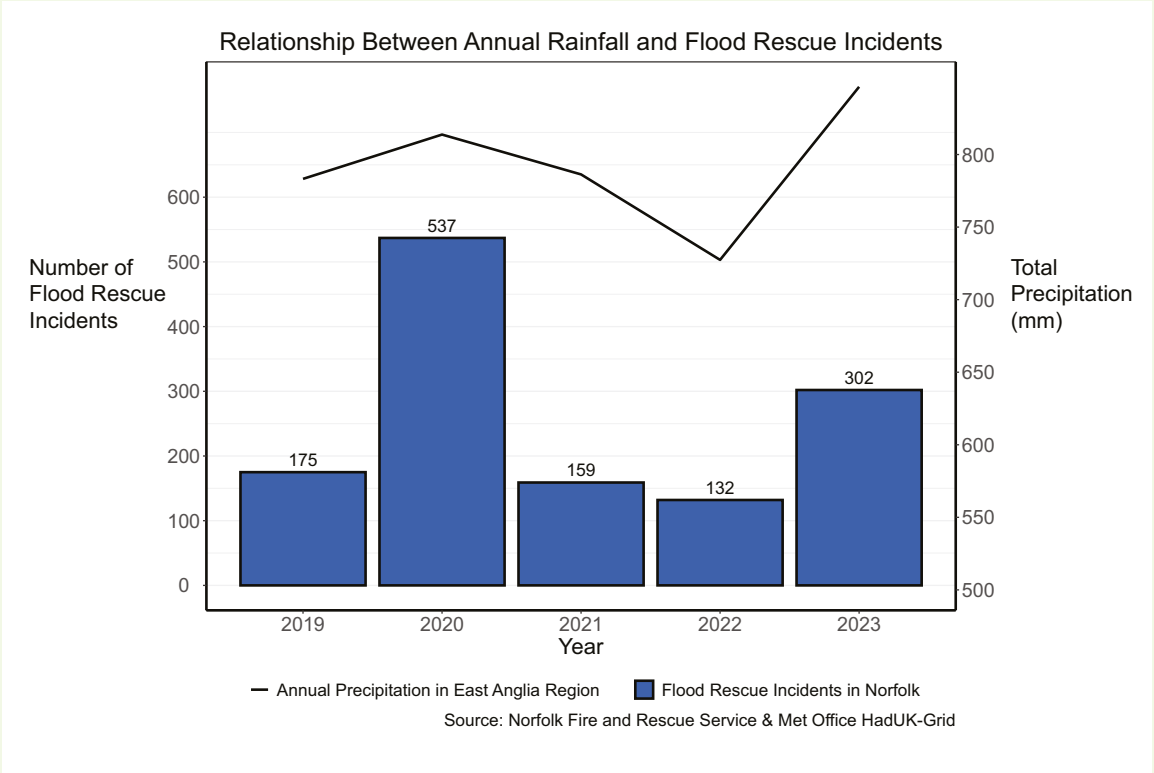


Figure 7: Number of annual flood rescue incident callouts in Norfolk from 2019 to 2023 against annual precipitation in East Anglia.

Current flood risk in Norfolk

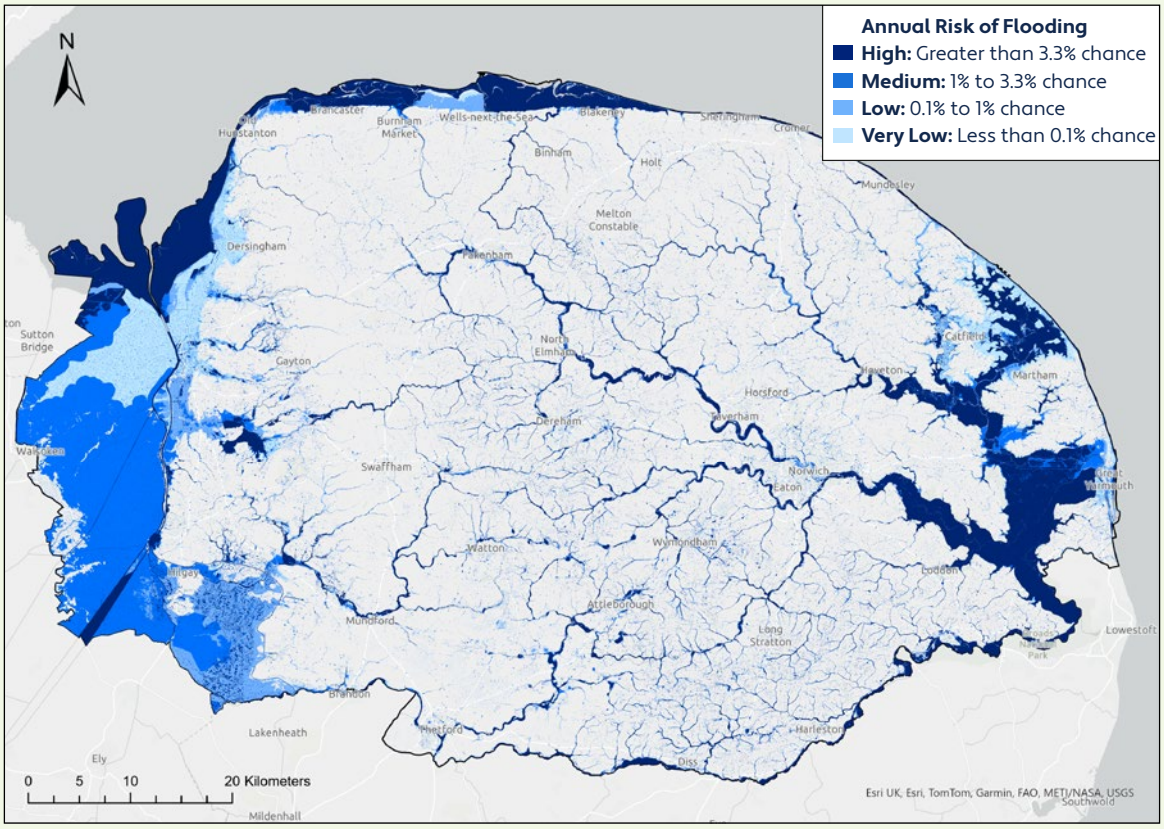


Figure 8: Current flood risk across Norfolk, combining river, sea, and surface water flooding[56]. It is important to note that this map indicates areas at risk based on geographic factors, not areas that experience frequent flooding events.

Other than the immediate risk, there are various indirect impacts of flooding on public health. Flooding can increase disease risk by causing sewage overflows, contaminating water supplies, and leaving stagnant water that can breed mosquitoes, potentially leading to diseases discussed in later sections. Not only does flooding pose a risk to physical health, but those who experience flooding are more likely to suffer from anxiety, depression and post-traumatic stress disorder, as discussed further below. Furthermore, flooding can also impede access to healthcare facilities, heightening risk in emergency situations. In Norfolk, 3 hospitals are in flood risk areas, along with 53 GP surgeries and 28 care homes (see Figure 8 for flood risk areas).[56]

In the UK, low-income households are eight times more likely to live on tidal floodplains[57].

Not only is this exposure to the **risk** of flooding problematic, but low-income households are also less able to cope with and recover from flooding. Only 1 in 3 of the UK's poorest households have contents insurance[58], and with the average cost of flooding reaching £50,000 per home[59], the financial impacts can be significant. This can further deepen economic and health inequalities.

Climate Just's map of flood vulnerability (Figure 9) combines geographical flood risk with social factors like age, health, and income to identify areas where the social impacts of flooding are likely to be most severe. The map suggests that areas around Hunstanton, Great Yarmouth and Norwich are particularly vulnerable and will continue to be so as climate change increases the risk of flooding.

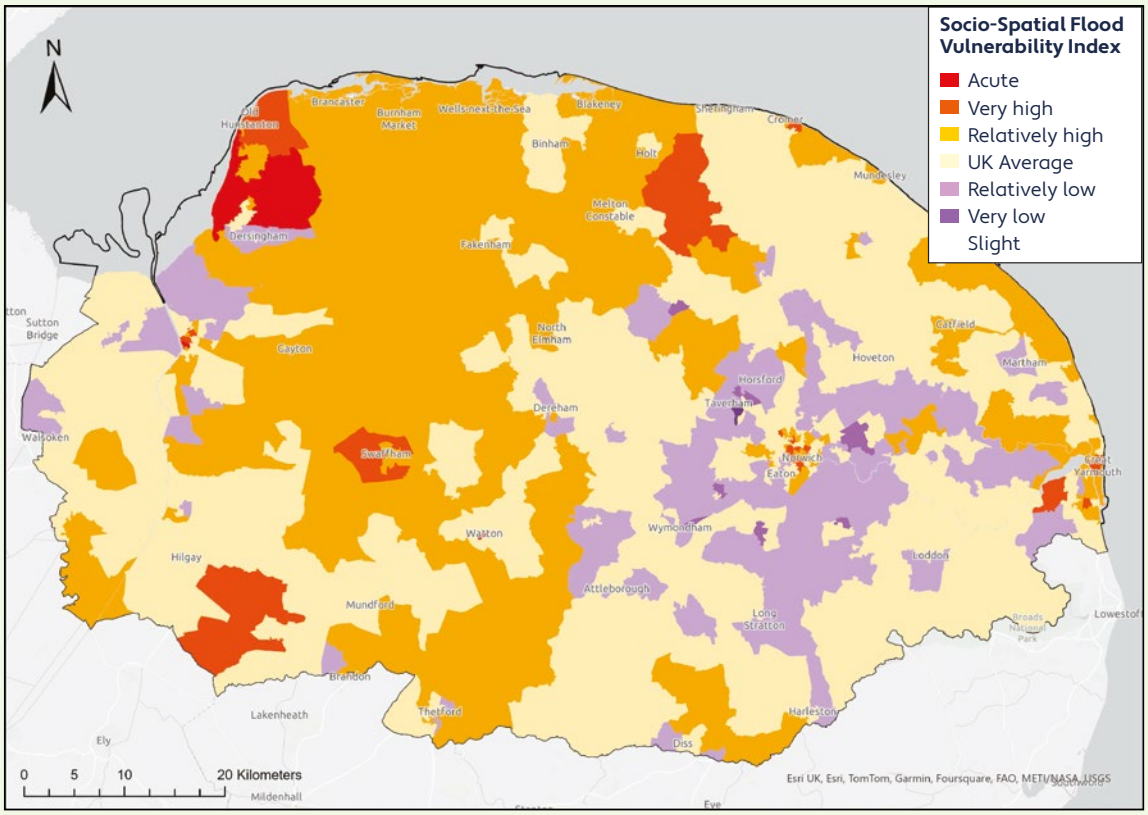


Figure 9: Climate Just's map of social vulnerability in Norfolk with respect to flood-related hazard, highlighting areas where the adverse social impacts of flooding are most pronounced.[52]

Preventing flooding and minimising its impacts could benefit health in Norfolk. In urban areas, Sustainable Drainage Systems (SuDS) offer opportunities to reduce flood risk by using features like rain gardens, permeable pavements, and wetlands to manage rainwater more effectively. Natural flood management measures such as restoring floodplains, installing leaky dams and increasing tree planting also reduce runoff and slow water flow during periods of heavy rainfall, helping to mitigate flooding. Norfolk County Council undertakes a range of flood mitigation work, such as a recent scheme in Besthorpe, near Attleborough, where 16 properties were affected by repeat surface water flooding. The scheme includes an attenuation basin next to the Village Hall that can temporarily store excess rainwater to prevent flooding and which doubles as a parking area in dry weather, and upstream clay bunds (embankments) reduce flows in the adjacent watercourse. The Broadland Futures Initiative is another key scheme in managing long-term flood risk in Norfolk, bringing together key partners such as the Broads Authority, the Environment Agency, and local authorities to develop a framework for flood resilience that accounts for climate change and rising sea levels over the next century.

Climate change will also heighten the risk posed by coastal erosion. While erosion is a natural process, climate change is causing rising sea levels and worsening storms, both of which are increasing erosion rates[60]. It's estimated that over one thousand residential and commercial properties in North Norfolk alone are expected to be lost by 2105[61].

Photography: Coastwise

Coastal erosion poses several direct and indirect health risks to coastal communities. The mental health impacts can be significant, with the threat of losing one's home and livelihood potentially leading to heightened stress, anxiety, and depression. A recent survey undertaken in North Norfolk coastal communities found that 58% of respondents' personal wellbeing is negatively affected by coastal erosion.[61] Erosion can also disrupt transport links along vulnerable parts of the coastline; there are several key roads on the Norfolk coast that are at risk of erosion but are essential links to coastal towns and villages. The loss of these could cut off communities, affecting not only residents' ability to travel themselves, but also hindering emergency services' ability to reach these areas. Potential isolation from healthcare facilities may also worsen non-climate-related health outcomes.

These impacts may also be felt more acutely due to the demography of coastal communities in Norfolk; in some areas 40% of residents are aged 65 or over, compared to only 10% in Norwich and Thetford.[9] Elderly people are particularly vulnerable to coastal erosion due to their reduced mobility and pre-existing health conditions, highlighting the need for effective resilience measures to protect their wellbeing.

Norfolk is likely to face more intense flooding and coastal erosion due to extreme weather conditions, increased winter rainfall, and higher sea levels.

Impact on infrastructure

- Flood damage to properties
- Disrupted health services
- Contaminated water supplies
- Erosion of coastline

Impact on health

- Poor mental health
- Respiratory infections
- Spread of water-borne disease
- Injury

Photography: Coastwise

Case study: Coastwise and Resilient Coasts Projects

Coastwise and Resilient Coasts are two key projects addressing the need to adapt to coastal erosion in Norfolk.

North Norfolk District Council's Coastwise team works with local residents and other stakeholders to co-develop transition plans and practical actions tailored to the needs of communities affected by erosion where defences are not an option. The project, running until March 2027, prioritises community involvement, aiming to prepare coastal communities through practical adaptation actions, planning together and informing national policy development.

Great Yarmouth Borough Council's Resilient Coasts project will create practical tools to help coastal communities plan for their future. The project (in partnership with East Suffolk Council) will involve supporting communities at the highest risk of erosion to discuss and adapt to coastal erosion, while also investigating alternative technology and engineering practices to protect these communities.

These two projects are funded by Defra as part of the £200 million **Flood and Coastal Innovation Programme** which is managed by the Environment Agency. The programme will drive innovation in flood and coastal resilience and adaptation to a changing climate.

Environment Agency

Department for Environment, Food & Rural Affairs

Disease and pests

Rising temperatures are altering environmental conditions in ways that both directly and indirectly influence the spread and severity of diseases[62]. Vector-borne diseases are illnesses spread by organisms such as mosquitoes, ticks and fleas which transfer germs from one host to another[63]. Milder winters and longer breeding seasons are allowing these vectors to survive and reproduce more effectively, increasing the risk of disease transmission to humans and animals[64]. The UK Health Security Agency is working with local authorities and environmental agencies to monitor and address these risks[65], with its Human and Animal Infections and Risk Surveillance group playing a key role in identifying and assessing infection risks across the UK[66].

Lyme disease, the most common vector-borne disease in England and Wales[67], is transmitted by ticks, which are becoming more common due to shifting environmental conditions. Lab-diagnosed cases of Lyme disease increased from 1.6 to 2.0 per 100,000 between 2019 and 2023 in England (Figure 10). Norfolk and the East of England have significantly lower Lyme disease rates compared to the national average (Figure 10). However, Norfolk, with its woodlands and changing environmental conditions, offers increasingly suitable habitats for ticks[68].

Nationally, an estimated 2,000 cases of Lyme disease are treated annually, but many may be identified based on symptoms alone, suggesting possible underreporting[69].

Photography:
Getty Images

Most tick bites do not cause Lyme disease, but increased awareness helps with prevention and early diagnosis[70].

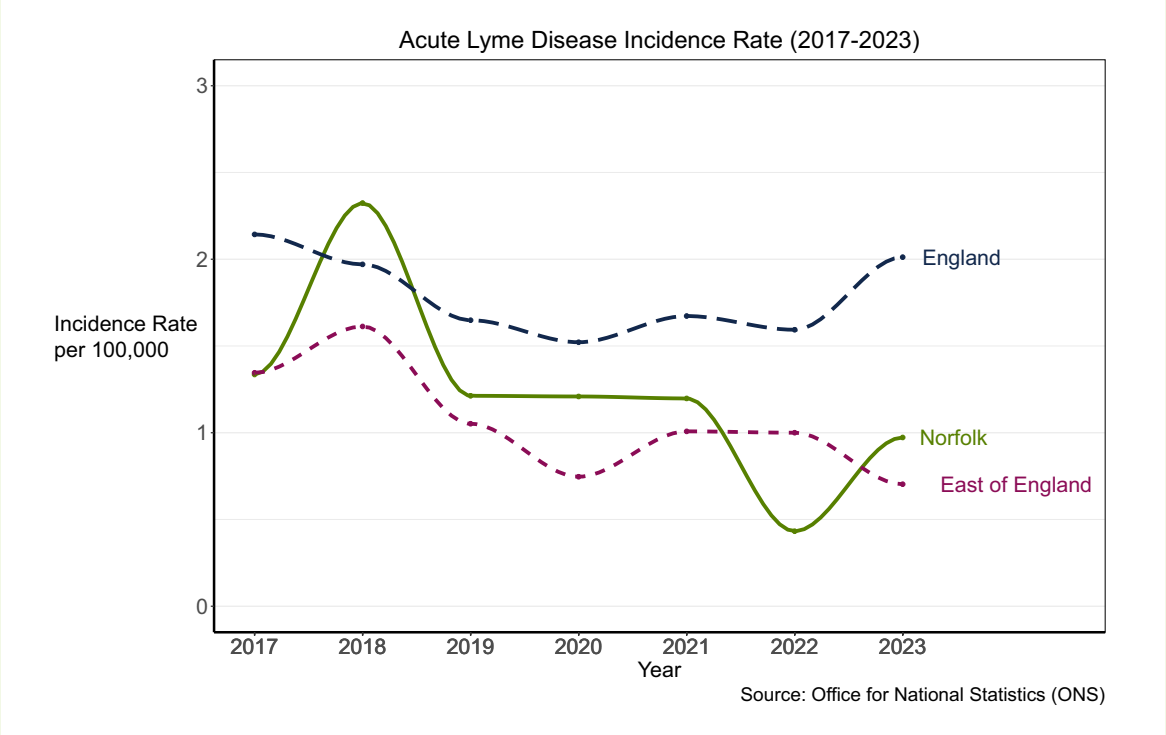
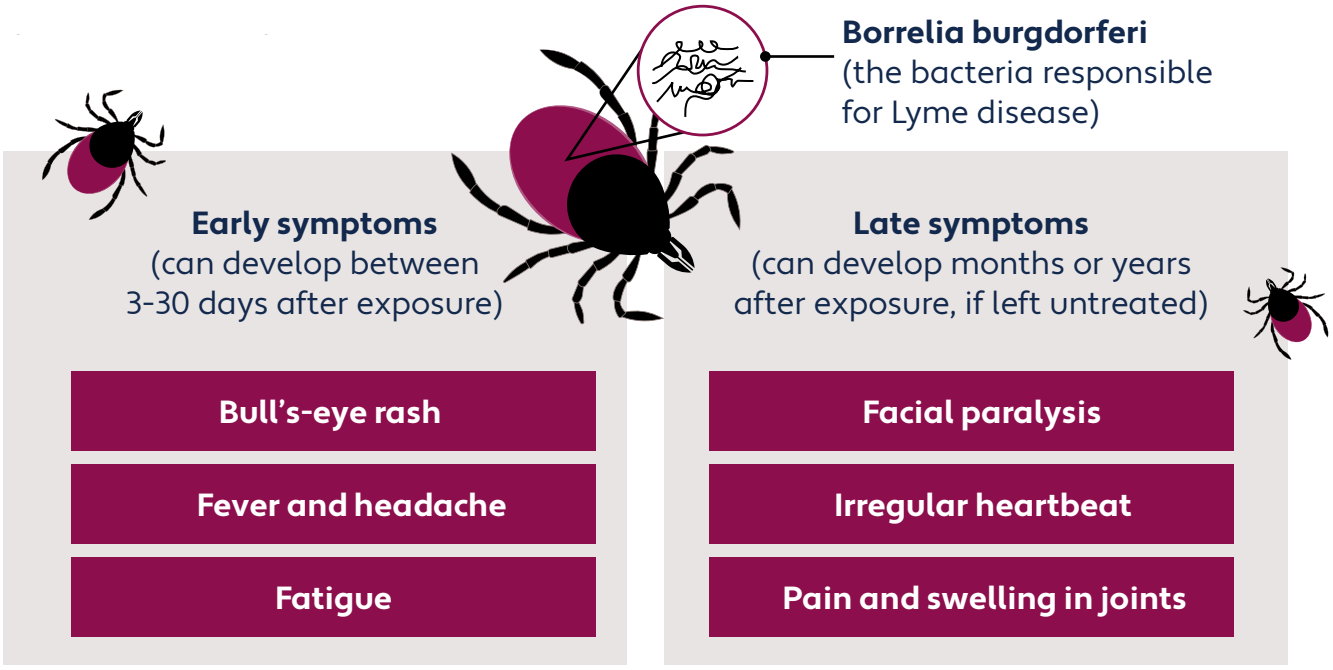


Figure 10: Incidence rates of laboratory-confirmed acute Lyme disease (Borrelia burgdorferi) cases per 100,000 population in Norfolk, East of England and England from 2017 to 2023.

Lyme disease symptoms



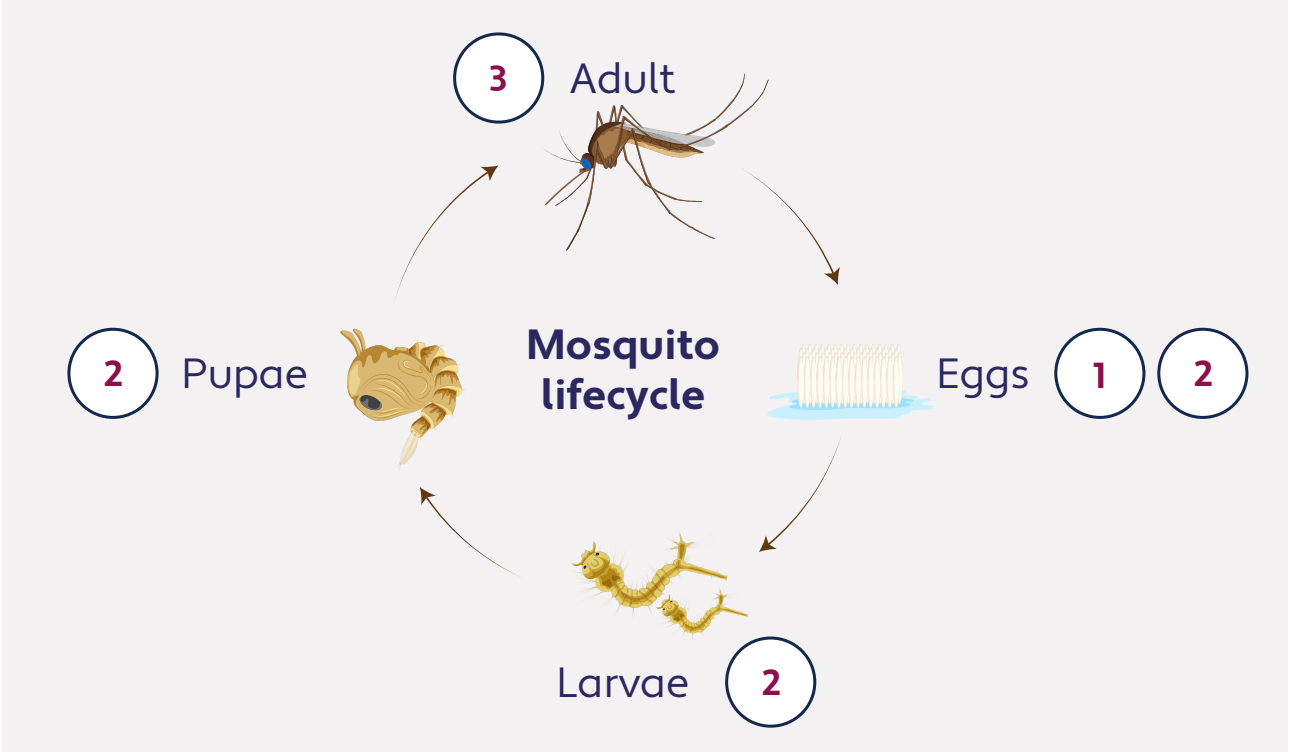
Ticks can also spread tick-borne encephalitis (TBE), a disease affecting the nervous system[71]. Between 2019 and 2023, four cases of TBE were identified in England, including in Thetford Forest[72 73]. The UK Health Security Agency monitors ticks through its Tick Surveillance Scheme and reports the risk of infection to be very low.[72 74]

Rising temperatures can enable the emergence of new threats such as mosquitoes carrying diseases like dengue and West Nile Virus.[67 75 76] As the graphic below shows, the entire lifecycle of mosquitoes could be impacted by climate change, with flooding creating new breeding sites in urban areas, warmer temperatures accelerating their development stages and boosting mosquito numbers, and different climates increasing the suitability of Norfolk as a habitat for certain species.

The Asian tiger mosquito, Aedes albopictus, an invasive species capable of spreading dengue, is potentially an issue due to its ability to thrive in urban environments and bite during the daytime.[77 78] Currently, dengue cases in the UK tend to be linked to international trade and travel.[78] In 2023, 634 dengue cases were reported among returning travellers, highlighting the importance of monitoring.[79] While the UK's climate is not currently suitable for the sustained survival of tiger mosquitoes, rising temperatures due to climate change could make areas of the UK more hospitable to this species in the future. The UK Health Security Agency coordinates national surveillance programmes, including a mosquito surveillance scheme to detect entry of problematic mosquitoes.[78]

The spread of mosquitoes carrying West Nile Virus has been documented across Europe.[80 81 82 83] While the virus, which typically causes mild symptoms, is not currently endemic in the UK, Culex mosquitoes capable of transmitting it are present in some areas, with warming conditions improving their breeding potential.[80 81 84] In Norfolk, the detection of the Aedes vexans mosquito near the River Yare – the first sighting in 90 years – highlights the potential for changes in mosquito populations.[85] The Human and Animal Infection and Risk Surveillance group assesses the risk of these diseases in the UK currently as low to very low and continues to closely monitor emerging threats.[67 80]

Potential impacts of climate change on the lifecycle, distribution and abundance of mosquito species



1

Flooding may produce new mosquito breeding sites in urban areas

Increased flooding may produce stagnant water pools in urban environments, creating ideal breeding sites for certain mosquito species to lay their eggs.

2

Rising temperatures may boost mosquito numbers, elevating the risk of disease transmission

Warmer temperatures may lead to a surge in mosquito populations by accelerating their development stages and enabling adults to reproduce more rapidly. An increase in mosquito numbers would heighten the risk of disease transmission to humans.

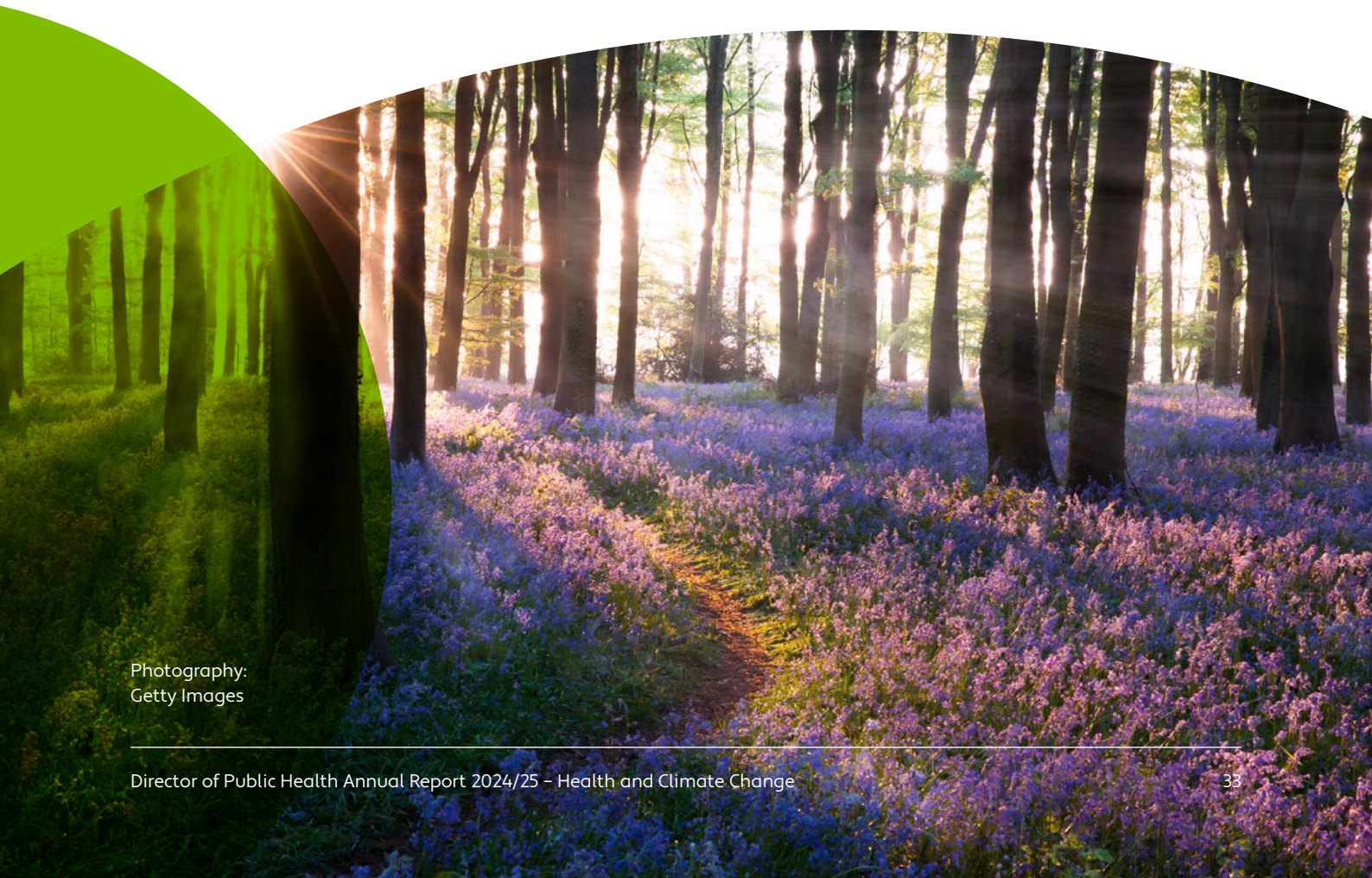
3

Warmer temperatures in Norfolk may bring invasive mosquitoes and new infectious diseases

As temperatures rise, Norfolk will likely become a suitable habitat for invasive mosquitoes and the pathogens they carry. This shift could allow new infectious diseases, such as dengue, to emerge in Norfolk, increasing the risk of illnesses transmitted by mosquitoes.

Climate change also increases the risk of waterborne diseases by creating favourable conditions for other pathogens (disease causing microorganisms) like Salmonella and E.coli, especially during warmer months.[86] [87] [88] Floods and droughts can disrupt ecosystems, creating breeding grounds for vectors and increasing human exposure to pathogens.[81] Indirectly, extreme weather events and rising sea levels contribute to displacement, creating conditions for diseases like leptospirosis, while changes in precipitation and temperature influence the spread of viruses such as influenza and COVID-19.[62]

Workers in outdoor environments, such as forests and agricultural fields, may face increased exposure to disease-carrying vectors.[89] Rising vector-borne diseases could impact productivity in farming and outdoor sectors, with urban areas also at risk from increased standing water due to heavier rainfall.[90] [91] These changes may create new inequalities and deepen existing ones due to differences in exposure.



Photography:
Getty Images

Photography:
Adobe Stock

Case study:
Oak Processionary Moth

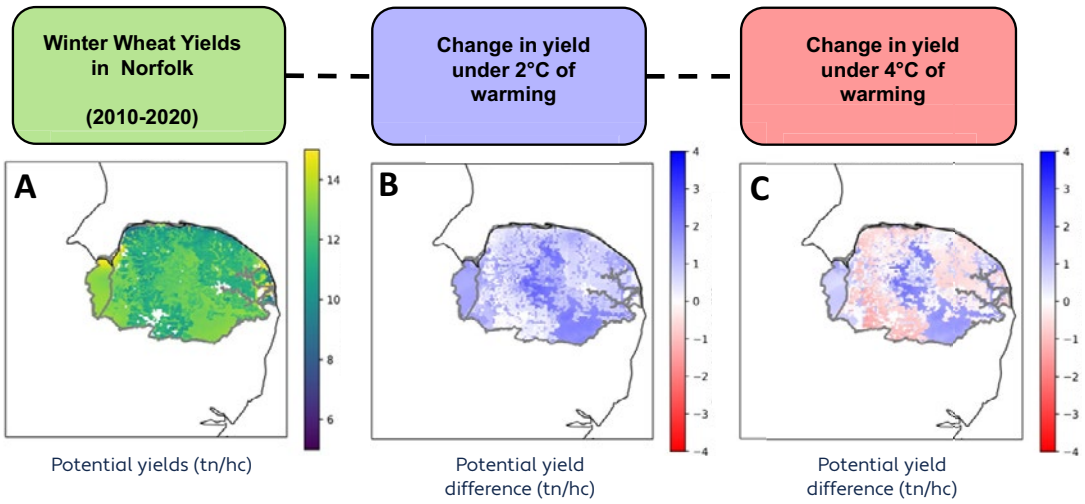
Climate change may increase the presence of various pests within Norfolk. One of particular concern is the Oak Processionary Moth (OPM), (Thaumetopoea processionea), which is native to southern Europe and was accidentally introduced to London in 2006. Since then, populations of the OPM have been gradually migrating northwards.

OPM caterpillars pose a health risk to humans and animals, as their toxic hairs can cause severe allergic reactions including skin rashes, eye irritation, and respiratory issues. As temperatures rise, Norfolk's climate is becoming more hospitable for the species.

Norfolk County Council's arboriculture team are monitoring selected trees along the Norfolk-Suffolk border for the presence of OPM using both visual and pheromone trapping methods. Isolated individual moths have been recorded in Norfolk but no breeding populations have been detected. Given their current northward migration, the team estimates that there will be breeding populations in Norfolk in the next 2-5 years.

Food and agriculture

Climate change is already having significant impacts on the global food system, affecting the availability, quality, and price of food. Whilst these are global issues, Norfolk is not immune from the potential impacts that they may have on health and wellbeing. The increasing frequency of extreme weather events driven by climate change, such as droughts and flooding, will disrupt crop yields and supply chains, and lead to significant price instability and potential food shortages. It is, however, important to note that some projections suggest that climate change will actually increase yields for certain crops.[92] Figure 11 shows that under a 2°C warming scenario (Map B) wheat yields are projected to increase across Norfolk. However, beyond this, under a 4°C warming scenario (Map C), yields are much more variable with decreases likely. Consequently, while a warming UK climate may benefit some crops, it is likely that more frequent extremely hot summers and changing patterns of rainfall will result in an overall negative impact on crop production,[93] increasingly disrupting Norfolk's agricultural system.



Source: Hayman *et al.* (2024) & Tyndall Centre for Climate Change

Figure 11: Maps of water-limited potential yields of winter wheat modelled for Norfolk for the past decade (2010–2020) in tonnes/hectare (Map A) and of change in potential yield under a 2 °C warming scenario (Map B) and a 4 °C warming scenario (Map C).

Unpredictable and extreme weather is already causing fluctuating and unstable food prices. The 2022 heatwaves had significant impacts on agricultural production across Europe, with estimates suggesting that the heat alone caused food inflation to increase by 0.5-1 percentage points.[94] Similarly, between September 2022 and February 2024, England had its wettest 18 months on record, leaving soils waterlogged and delaying crop planting, with UK vegetable production dropping by 5% as a result.[95] These won't be isolated impacts, with the UK's Climate Change Committee predicting that climate change could lead to a 20% rise in global food prices by 2050.[96] Furthermore, in 2023 the UK imported 84% of its fresh fruit and 47% of its fresh vegetables[97]; reliance on imports from climate-vulnerable countries could impact the availability, cost and therefore consumption in the UK, with potential consequences for diet and health. These rising food prices strain household budgets, particularly for already vulnerable groups who may struggle to afford a healthy diet and do not have the disposable income to absorb rising food costs. Food insecurity can lead to a range of health problems, from malnutrition and stunted growth in children to increased susceptibility to illness and disease in adults. The stress of not knowing where the next meal will come from can also contribute to mental health issues, such as anxiety and depression. While serious food shortages are not expected in the UK, it is important to note that climate change will pose significant food security risks globally.[98]

The importance of agriculture to Norfolk's economy means that climate change impacts will be felt particularly acutely in the county. For the past six years, the East of England has led all English regions in total crop output, producing £2.45 billion worth of crops.[99] However, the region's agricultural sector is already grappling with the effects of climate change; the 2023/24 winter saw areas of Norfolk experience semi-permanent flooding[100], while previous years saw high temperatures and low rainfall threaten water supplies. These unpredictable weather patterns mean that annual yields may become increasingly variable; for instance, total crop output in 2023 declined by 12% compared to 2022.[101] These changes could make Norfolk's agricultural livelihoods increasingly precarious.

In Norfolk, 10,500 people are employed in the agricultural and fisheries industries, representing 2.6% of the county's workforce. This proportion is significantly higher than seen in England as a whole (0.9%).[102] Consequently, the impact of climate change on these industries may be more pronounced in Norfolk compared to other parts of the country.

The potential loss of jobs, particularly in isolated rural communities, could have profound health and wellbeing impacts, leading to increased poverty, social isolation and associated health issues such as depression, anxiety and chronic stress.

Photography:
John Innes Centre

Case study:
John Innes Centre Research

The John Innes Centre (JIC) is an independent, internationally renowned research centre in plant science, genetics and microbiology with a long history of making discoveries that unlock solutions to the world's biggest problems. JIC's research is providing solutions to support sustainable agriculture, both globally but here in Norfolk too.

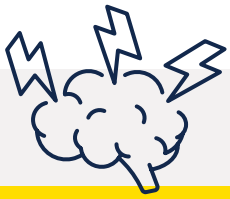
By unlocking the genetic potential of a historic wheat seed collection, researchers are revolutionising crops for the 21st Century, identifying traits to improve heat resilience and slug resistance, helping this crop to thrive in a changing climate and reduce the need for pesticides.

Their research is also unlocking ways to reduce reliance on fertiliser application, which is costly to both farmers and the environment. JIC discoveries are paving the way for more environmentally-friendly farming practices, potentially allowing farmers to use less fertiliser in the future.

Along with their partner The Sainsbury Laboratory, JIC is transforming its existing infrastructure to create a research and innovation hub on the Norwich Research Park at the forefront of tackling climate change, supporting food security and improving human health.

Mental wellbeing

Climate change is increasingly impacting mental wellbeing, with direct and indirect exposure to extreme weather events – such as floods, heatwaves, and wildfires – contributing to mental health issues like post-traumatic stress disorder (PTSD), anxiety and depression.[103]



Trauma
Direct impact of disasters

Flooding
Destruction of homes, displacement, and loss of life

Drought
Water scarcity

Wildfires
Destruction of property and natural habitats

How trauma impacts people's mental wellbeing

Depression
Feelings of sadness and hopelessness may occur due to loss or trauma

Anxiety
Persistent feelings of fear and worry may be triggered by trauma or loss during disasters

PTSD
Severe mental health challenges such as Post Traumatic Stress Disorder may follow disasters

Eco-anxiety
Worry about the future

Rising temperatures

Extreme weather

How eco-anxiety impacts people's mental wellbeing

Sadness, helplessness, and anger
Among 1,000 young people in the UK, 63% reported sadness, 55% feel helpless and 41% felt despair in relation to climate change

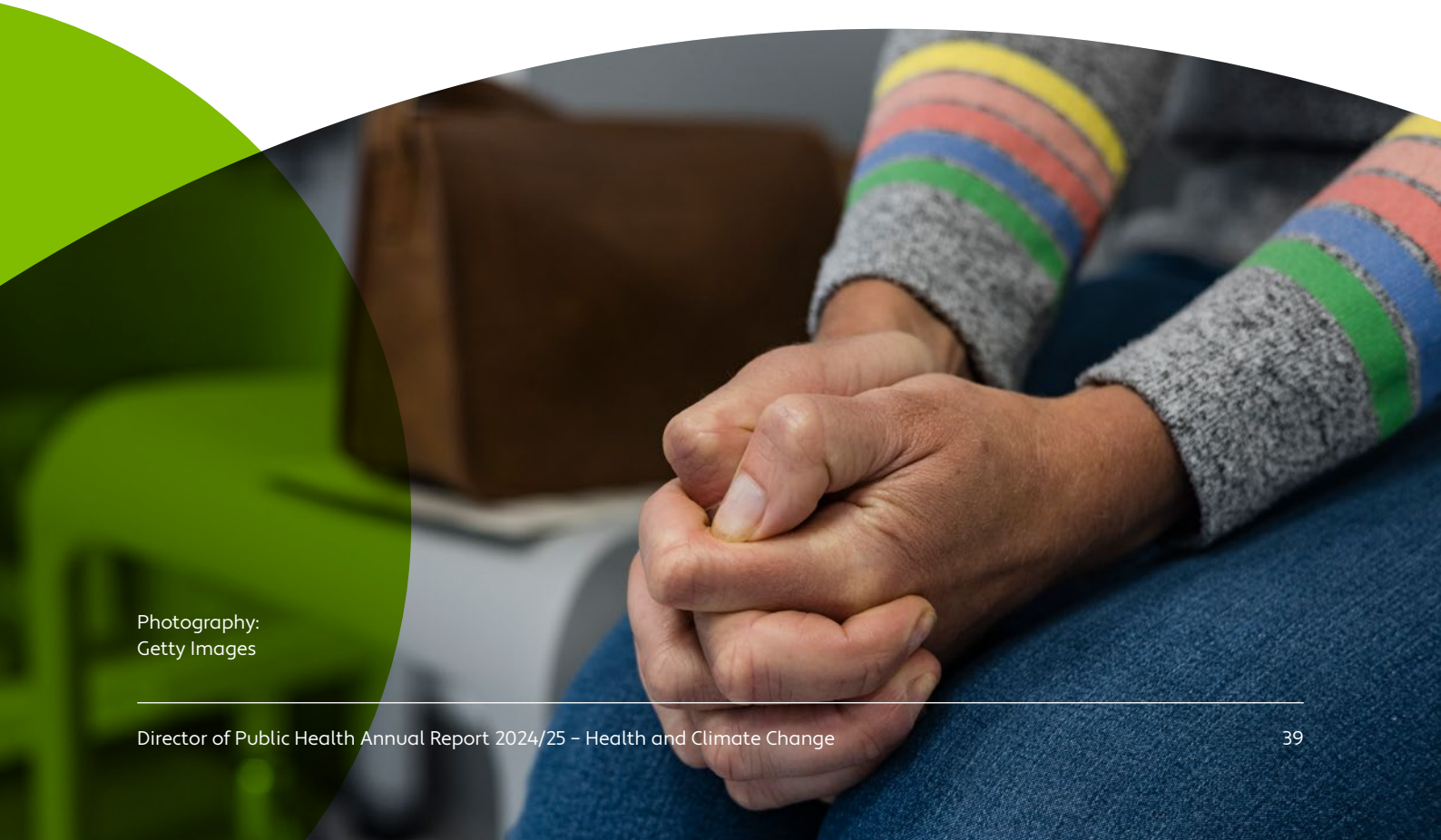
Frightened by the future
Among 1,000 young people in the UK, 49% were found to be very or extremely worried about climate change

Daily life affected
Among 1,000 young people in the UK, 28% said that their worries about climate change affect their daily activities

Frequent and severe extreme weather events can cause damage to homes, personal injuries, and disruptions to livelihoods, often leading to long-term psychological trauma.[104] For example, a study in the south of England (2013-2014) found that individuals whose homes were flooded were 6 times more likely to develop depression, 6.5 times more likely to experience anxiety, and 7 times more likely to suffer from PTSD than those whose homes were not affected.[104] Among affected individuals, 20% developed probable depression, 28% experienced anxiety, and 36% were diagnosed with probable PTSD.[104] Moreover, limited warning before a flood doubled the likelihood of developing depression and PTSD compared to having more than 12 hours' notice.[105] Children are also vulnerable, with post-traumatic stress being the most common consequence of extreme weather events.[106] How individuals perceive climate change responses from authorities plays an important role in shaping their mental wellbeing, trust and resilience.[107]

While extreme weather events pose direct psychological burdens, climate-related mental health issues also affect people who are not directly impacted by such events. Many individuals may experience what has been termed 'eco-anxiety' - a sense of concern, fear, and helplessness about the future, driven by the ongoing and anticipated impacts of climate change.[107] A 2023 study found nearly two-thirds of adults in the UK were worried about climate change, particularly its effect on future generations.[108] A separate study found that among 1,000 young people in the UK, 49% were found to be very or extremely worried, 28% said these concerns affected their lives and many reported sadness (63%), helplessness (55%), and despair (41%).[107]

Eco-anxiety will likely disproportionately impact vulnerable communities, where limited resources heighten climate-related stress.[109] Low income individuals, who have fewer resources to build resilience against climate change, face heightened risks to their mental wellbeing.[110] [111]



Photography:
Getty Images

In Norfolk, local data reflects a rising trend in climate-related anxiety. A 2024 survey of 9,000 Norfolk school children found that approximately 35% of children and young people are worried about climate change either 'A little', 'Quite a lot', or 'A lot' (Figure 12).

This marks a notable increase from 24% in 2015 and highlights growing climate-related worries among young people in the region (Figure 12).[112]

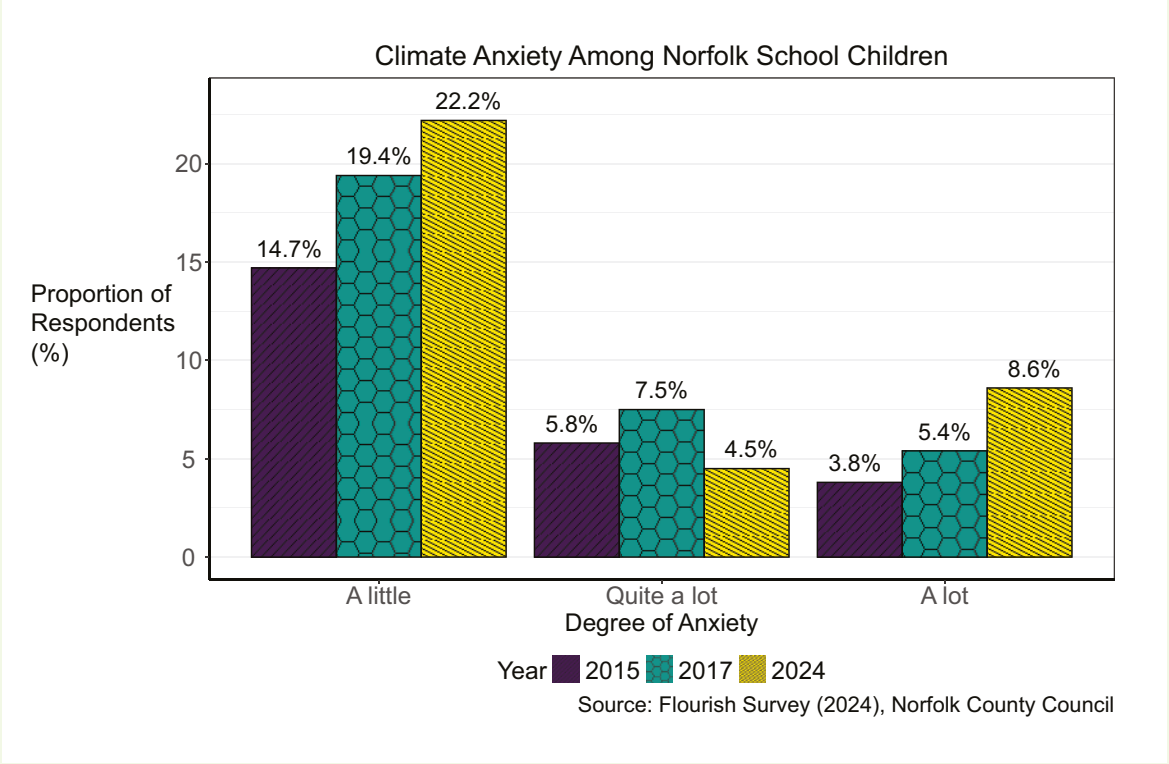


Figure 12: Climate anxiety among Norfolk school children (in school years 7-12) over time. Data obtained from the Norfolk County Council Flourish survey (2024).

Photography:
Getty Images

Case study: sUStain (Norfolk and Waveney Mind)

Norfolk and Waveney Mind's sUStain project supports individuals dealing with climate anxiety through a range of activities, including workshops, co-designed mindfulness programmes, and "Climate Cafes" assisted by volunteers. These spaces allow people to share their feelings about climate change in a supportive environment.

Participants in the project noted the impact that climate change and environmental degradation had on their wellbeing, with nearly 90% expressing feeling nervous, anxious or on edge about these topics. 88% of participants reported that this improved as a result of engaging with the project.

The sUStain project, in partnership with the UEA and the Climate Psychology Alliance, aims to normalise climate distress and promote mental wellbeing. It currently operates in Norwich and at the UEA and has also developed a specific strand of activity in North Norfolk supporting those directly affected by environmental changes such as coastal erosion.

Section 3: The health co-benefits of climate action

To address the impacts of climate change, both **mitigation measures** (e.g. reducing greenhouse gas emissions) and **adaptation measures** (enhancing preparedness and resilience for future changes) are essential. While these strategies primarily target climate-related goals, many also generate additional health co-benefits due to their impact on the wider determinants of health. **Co-benefits refer to the positive secondary outcomes from climate action, with benefits ranging from improving public health and promoting economic growth.** For example, planting more trees helps absorb carbon dioxide from the atmosphere, but it also provides health benefits by offering shade during heatwaves and improving access to green spaces, which is linked to better mental and physical wellbeing. Similarly, as the county's new Local Growth Plan sets out, Norfolk is particularly well-positioned to take advantage of growth in the renewable energy sector, creating growth and jobs across the county. Likewise, the growing demand for home energy efficiency improvements will create numerous well-paid, local jobs.

The following section explores some of the key co-benefits of climate action in Norfolk, demonstrating how efforts to tackle climate change can also improve health outcomes and strengthen Norfolk's economy.

Energy efficient, healthy homes and buildings

The UK's housing stock is among Europe's oldest and least efficient, with 3.5 million homes failing to meet the Decent Homes Standard due to poor insulation, inefficient heating systems, and inadequate ventilation.[113] Energy Performance Certificates rate homes from A (very energy efficient) to G (very energy inefficient). In Norfolk, 57% of houses are rated EPC D or below (worse than the national average of 53%)[48], however a significant number do not have recent EPCs, consequently masking the true number of inefficient homes. As such, the energy used to heat and power homes accounts for 21% of Norfolk's total emissions, the second highest of any category behind transport.[114] Reducing the emissions from housing is therefore a key tool to help Norfolk reach net zero targets.

Not only do they contribute to climate change, but cold, damp homes also have significant adverse health impacts on those living in them, either causing or exacerbating a range of circulatory, respiratory, musculoskeletal and mental health conditions.

Consequently, it is estimated that poor housing costs the NHS £1.4 billion each year.[115] Living in cold homes can increase the risk of blood clots, strokes and heart attacks, and can worsen existing respiratory conditions while increasing the risk of developing new ones. Similarly, Norfolk's predicted wetter winters will exacerbate existing issues with damp and mould. Cold homes also impair the body's immune system and increase the risk of poor mental wellbeing.[116]

Photography:
Getty Images

Preventing mould and damp in your home

Improve ventilation by using extractor fans, opening windows, and ensuring air can circulate freely.

Reduce humidity by avoiding drying clothes indoors, using lids while cooking, and opening windows while showering.

Completely dry any damp or wet surfaces as soon as possible and fix the source of any water problems or leaks.

Maintain a consistent indoor temperature, ideally keeping your home heated between 18-21°C to prevent condensation and mould.

Seek medical advice if you have mould problems and experience symptoms such as coughing, wheezing, or throat irritation.

These impacts are not felt equally across the population. For instance, elderly populations are especially impacted, with many conditions associated with ageing, such as rheumatoid arthritis, being aggravated by living in the cold.[116] Older people may be more at risk, with 74% of Norfolk's bungalows, often preferred by this age group, having an EPC rating of D or below.[48] Children and young people are also particularly affected, with evidence suggesting that living in a cold home affects children's brain and lung development, doubles their risk of developing a respiratory illness, and worsens educational attainment.[116]

Arguably, these impacts are felt strongest by the most disadvantaged residents, with England's poorest households five times more likely to live in substandard homes.[117] In terms of energy efficiency in Norfolk, however, it's the middle range of deprivation scales with the least energy efficient housing; 64% of EPCs in the middle deprivation category are D or below, compared to 44% in the most deprived areas and 49% in the least (Figure 13).[48] This may reflect the fact that people in deprived areas are more likely to live in flats, which are more likely to be energy efficient and also that in many deprived areas there is a greater share of social housing which is subject to tighter regulation.[118] Those renting in the private sector generally live in poorer performing homes compared to social tenants and owner-occupiers.[119]

Those on low incomes are less likely to have the ability to afford higher energy bills. Consequently, an estimated 50,000 Norfolk households live in fuel poverty.[120]

This struggle to maintain a warm home creates a vicious cycle, where the cost of heating competes with other essential needs, further entrenching poverty and health disparities.

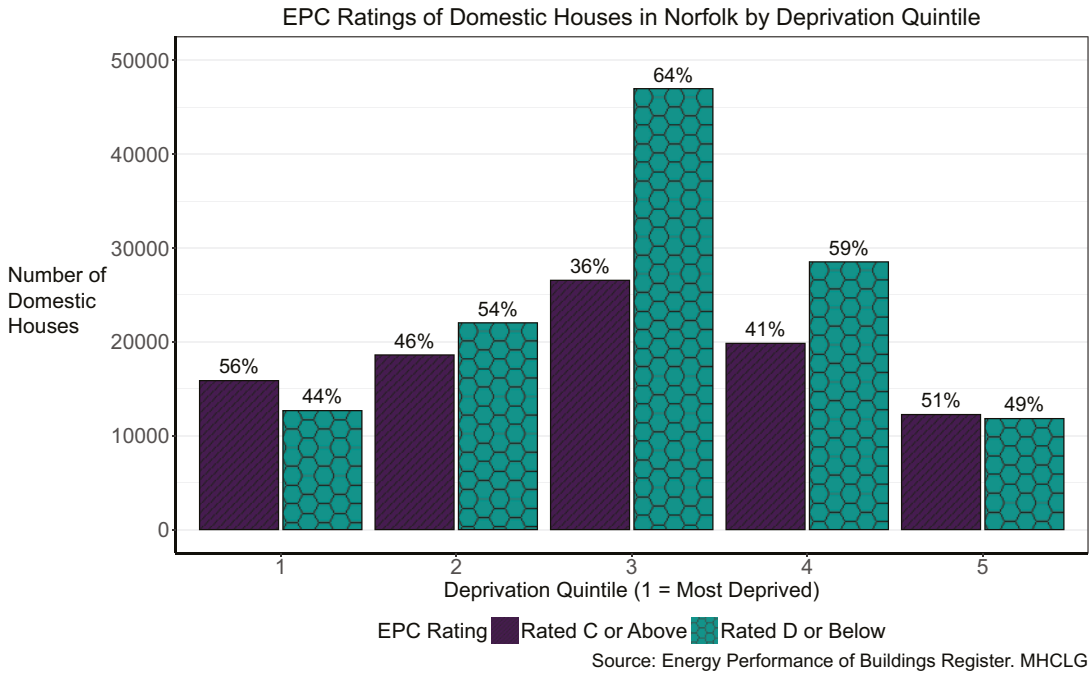


Figure 13: Energy Performance Certificate ratings (EPC) of domestic houses in Norfolk across different deprivation quantiles.

Photography:
Getty Images

Improving the energy efficiency of Norfolk's housing stock clearly has the potential to yield both significant environmental and health benefits. For example, improving insulation helps maintain a warmer, more stable indoor temperature, reducing cold related health issues but also saving money on energy bills. Improved insulation can also help prevent overheating during increasing summer heatwaves[121], which will be especially problematic for dwellings with no ventilation, inadequate shade, or with south-facing windows. Furthermore, stable indoor temperatures and improved ventilation can help reduce damp and mould incidence, which is strongly linked to the development or worsening of asthma and the onset of respiratory infections, particularly in children. However, it is essential that any works are undertaken correctly; insulation without adequate ventilation can potentially worsen damp and mould issues if moist air cannot escape.

What makes a healthy, sustainable home?

Insulation
Effective insulation keeps homes warmer in winter and cooler in summer, reducing energy use and creating a more comfortable and healthier living environment.

Energy
Renewable energy sources like solar panels can cut carbon emissions and lower energy bills.

Shading
External shading such as awnings or tree-cover can keep a home cool during heatwaves.

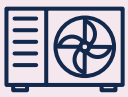
Appliances
Energy-efficient appliances, such as dishwashers, can reduce electricity use, saving energy and money.

Nature
Trees and greenery can improve air quality, provide shading, support biodiversity, and reduce flooding, fostering climate resilience and well-being.

Lighting
Natural lighting and energy-efficient bulbs can reduce electricity use.

Windows
Double-glazing or energy-efficient windows can minimise heat loss in winter, lowering energy use and maintaining comfort.

Water
Water-saving measures such as rainwater harvesting can conserve water and increase resilience to droughts.



Heating
Sustainable heating systems like air source heat pumps can reduce emissions and maintain a constant comfortable temperature.

Waste
Compost food scraps and reduce waste to reduce emissions, save money, and create nutrient-rich soil for gardening.

Food
Growing fruits, vegetables, or herbs can reduce carbon emissions and encourage healthy eating.

Ventilation
Good airflow with mechanical or natural ventilation can prevent damp, mould, and indoor air pollution, protecting respiratory health.

It should therefore be clear that making homes more energy efficient presents a major opportunity to reduce emissions, improve health, and lower household energy costs. However, community conversations from the Norfolk Climate Change Partnership's Norfolk NetZero Communities project have found that trust in grant schemes and traders to deliver energy efficiency work is low. Residents can find out more about opportunities through **Norfolk Warm Homes**, as well as schemes such as the **Great British Insulation Scheme** and **ECO**. **Norfolk County Council's Trusted Trader website** also provides a directory for home upgrades and energy efficiency work.

Photography:
Norfolk Warm Homes Partnership

Case Study: Norfolk Warm Homes partnership

Norfolk Warm Homes is a consortium led by Broadland District Council, working with five other Norfolk district councils. Their purpose is to improve the energy efficiency of homes and reduce energy bills and carbon emissions from Norfolk's housing stock.

Since 2018, the Consortium has delivered grant-funded work for energy efficiency improvements and carbon reduction work, including air source heat pumps. The Consortium has invested over £13 million across the county to help improve energy efficiency in more than 1,200 homes, reducing residents' energy consumption and enhancing the thermal comfort of their homes.

Evaluation of the Consortium's work found significant improvements in beneficiaries' health and wellbeing, with 65% reporting improved mental health and 70% feeling safer in their homes. Testimonies from residents living with chronic pain due to conditions such as arthritis also support this, with one beneficiary saying: "I feel healthier, and our pains are not as bad, having heat does so much for us." [122]

The councils involved in Norfolk Warm Homes are Broadland District Council, Norwich City Council, South Norfolk District Council, North Norfolk District Council, the Borough Council of King's Lynn and West Norfolk, and Breckland District Council. Residents of Great Yarmouth should contact **Great Yarmouth Borough Council.**

Decarbonising transport and promoting active travel

Changing travel habits offers significant benefits for both climate and health. Transport accounts for 26% of Norfolk's greenhouse gas emissions, more than any other sector[114], while poor air quality and sedentary lifestyles are major contributors to ill health. Decarbonising transport, alongside promoting active travel such as walking, wheeling (using a wheelchair or mobility aid), and cycling therefore presents significant opportunities to improve public health whilst tackling climate change.

Shifting from petrol and diesel vehicles to electric vehicles (EVs), or more sustainable modes of transport altogether, is key to cutting emissions. EVs produce zero exhaust emissions, which not only reduces the carbon emissions associated with transport, but also minimises pollutants such as nitrogen dioxide, which is linked to various respiratory and cardiovascular diseases. However, it is worth noting that EVs do not eliminate pollution, because brake, tyre and road wear also produces particulate matter, highlighting the importance of alternative, more sustainable forms of transport. Accessible and efficient public transport is equally important for providing alternatives to car use, especially in Norfolk's rural areas where reliable services support social connectedness and community wellbeing, particularly among older residents.

Norfolk has recently seen a range of projects and initiatives working to reduce air pollution in the county. One of the most notable is Norfolk County Council's work with bus operators to electrify Norfolk's bus network. This has so far seen First Bus roll out 70 electric buses across Norwich – around half their fleet – with early research suggesting that NO_2 levels have dropped significantly following their introduction. The County Council also works closely with local district and borough councils to support the provision of electric vehicle charge points in Norfolk, securing £7.5 million of central government funding to install chargers in rural and tourist locations, as well as areas with insufficient off-street parking.

One of the most effective ways to reduce environmental impacts whilst also improving health and wellbeing is the promotion of active travel.

Regular physical activity can significantly lower the risk of chronic illnesses such as heart disease, strokes, and type 2 diabetes, with research suggesting that walking for 30 minutes or cycling for 20 minutes daily can reduce mortality risk by 10%.[123] Physical activity can also improve mental wellbeing too, with exercise shown to improve symptoms of depression and anxiety.[124]

This is especially important given that nearly a quarter of Norfolk's resident's exercise less than 30 minutes per week.[42]

In 2021, 25% of those in employment in Norfolk worked from home, but among those who commuted only 11% walked and 4% cycled (Figure 14)[125]. While Norfolk's rural nature means that not all journeys can be walked or cycled, the same survey found of those who do commute to work, 21% of people travel less than 2km and a further 19% travel between 2-5km.[126] These are generally considered walkable and cyclable distances respectively, and so there's significant opportunity to support people to commute actively. Safe and effective infrastructure encourages active travel; even simple measures such as reduced speed limits can improve road safety and help lower particulate emissions.[127]

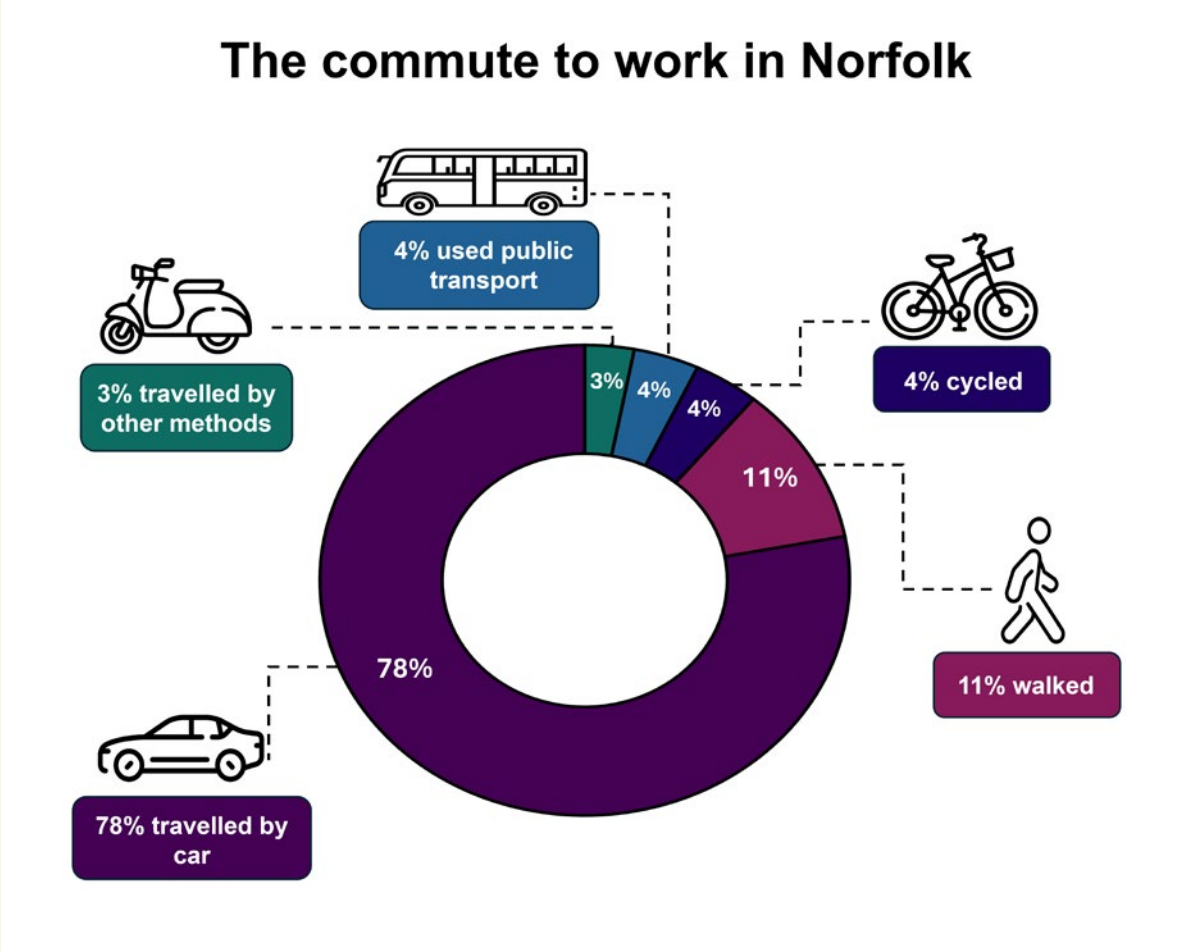


Figure 14: Methods of transport used to travel to work by Norfolk residents in 2021 based on Census 2021 statistical estimates.

Note: Method of transportation in 2021 may have been influenced by the Covid-19 pandemic.

Photography:
Getty Images

Increasing active travel levels is not just good for public health and the environment, but there are also significant economic benefits too. 73% of employees who cycle feel it makes them more productive at work[128], while employees who are also physically active take 27% fewer sick days than their colleagues.[129] Furthermore, people who walk to the high street spend up to 40% more than people who drive[128], and cycle parking delivers five times the retail spend per square metre than the same area of car parking.[130] Evidence also suggests that children who are physically active perform better at school.[131]

Increasing active travel therefore presents a significant opportunity to improve public health and reducing Norfolk's environmental impact. Norfolk County Council's **Walking, wheeling and cycling strategy** sets out the ambitions of the council to create a healthier and greener Norfolk and confirms support for the government's ambition that 50% of journeys in towns and cities are walked, wheeled, and cycled by 2030. The strategy is underpinned by local cycling and walking infrastructure plans which help identify and prioritise infrastructure schemes, such as cycle lanes, to enable increased levels of cycling, walking, and wheeling across the county.

By reducing reliance on fossil-fuel-powered vehicles and encouraging active transport, Norfolk can significantly lower its carbon emissions, improve air quality, and increase the number of physically active residents.

Photography: Beryl

Case study: Beryl

Beryl, in partnership with Norfolk County Council, has been a key player in promoting sustainable travel and shared micromobility in the Greater Norwich area since its launch in 2020. The scheme offers shared bikes, e-bikes, and e-scooters, providing an accessible, eco-friendly alternative to car travel. Between 2020 and January 2025, over 1.8 million Beryl journeys have been made, covering over 5 million kilometres. User feedback shows that 56% of Beryl users have replaced a private vehicle trip with a Beryl trip, and overall the Norwich scheme has led to over 230 tonnes of CO_2 emissions being saved since the scheme began.

Rider feedback indicates that 44% of people are cycling more often since joining Beryl and 35% have reduced their use of cars. Additionally, 13% of riders identify as having a disability, suggesting that these are potentially enabling increased accessibility for people with mobility issues. One of Beryl's successes has been allowing users to integrate the scheme with other sustainable transport modes; user feedback suggests that 31% of riders used Beryl to connect with public transport. Beryl's success has led to the scheme's expansion with new bays in areas such as Hethersett and Wymondham (figures taken from Beryl's 2023 rider report).

1.8
million journeys made

5.0
million kilometres travelled

230
tonnes of carbon emissions prevented

Micromobility: the use of lightweight vehicles such as bicycles or scooters, often electric, especially as part of self-service hire schemes.

Healthy and sustainable diets

A healthy diet focuses on consuming plant-based foods like fruits, vegetables, legumes and whole grains while limiting red and processed meats and other ultra-processed foods.[132] In 2017, unhealthy diets contributed to 11 million deaths globally, primarily from heart disease, cancer and type 2 diabetes, emphasising the role of diet in preventing chronic diseases.[133] Beyond health benefits, more sustainable diets can also reduce greenhouse gas emissions and natural resource consumption.[134 135] The concept of sustainable diet encompasses how food is managed through its lifecycle, from production to consumption and disposal.[136] Sustainable food practices, including sustainable livestock farming, incorporating a higher proportion of plant-based foods into diets, and reducing food waste can significantly lower dietary emissions across the food lifecycle.[135]

Between 1990 and 2022, greenhouse gas emissions from UK agriculture fell by 12%, though emissions from food have decreased at only half the rate of the wider economy since 2006.[137] If this trend continues, food emissions in 2050 will be four times higher than the level needed to meet net zero targets.[135] While some fruits and vegetables have high emissions due to production and transport, most generate less emissions than meat products (Figure 15).[138 139] For instance, beef generates 25 times the emissions of tofu and over 42 times the emissions of peanuts (Figure 15). As such, it's estimated that plant-based diets emit only a quarter of the greenhouse gas emissions of meat-heavy diets.[140] A survey of 1,900 people aged 16-75 in England, Wales and Northern Ireland found 73% of consumers value food with a low environmental impact.[141] However 71% face barriers preventing them from making more sustainable diet choices, with 29% citing the cost of sustainable foods and 16% reporting a lack of understanding of what constitutes sustainable food.[141]

Photography:
Getty Images

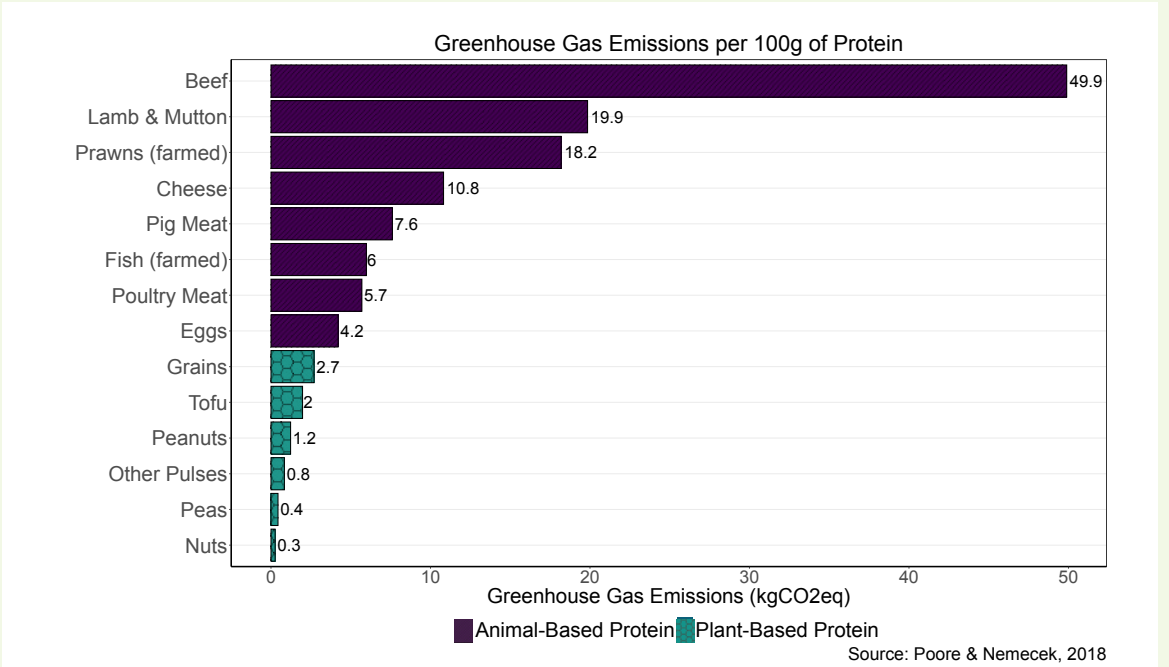


Figure 15: Global average greenhouse gas emissions per 100 grams of protein across different food products. Greenhouse gas emissions are measured in kilograms of carbon dioxide-equivalents ($kgCO_2eq$).

In the UK, meat consumption dropped by 17% between 2008 and 2019.[142] But while reducing meat consumption can lower emissions, livestock farming remains essential to rural economies and national food security.[143] Supporting sustainable livestock practices and supporting farmers transition to lower-emission methods may help to maintain the balance between food production and climate goals.[135] However, more than 84% of farmland in Norfolk grows vegetables and cereals, offering a significant opportunity for Norfolk's agricultural sector to play a key role in promoting sustainable diets and reducing greenhouse gas emissions (Figure 16). Supporting domestic agriculture is especially important given that the UK imports more than two thirds of its food from countries with worse environmental standards.[144]

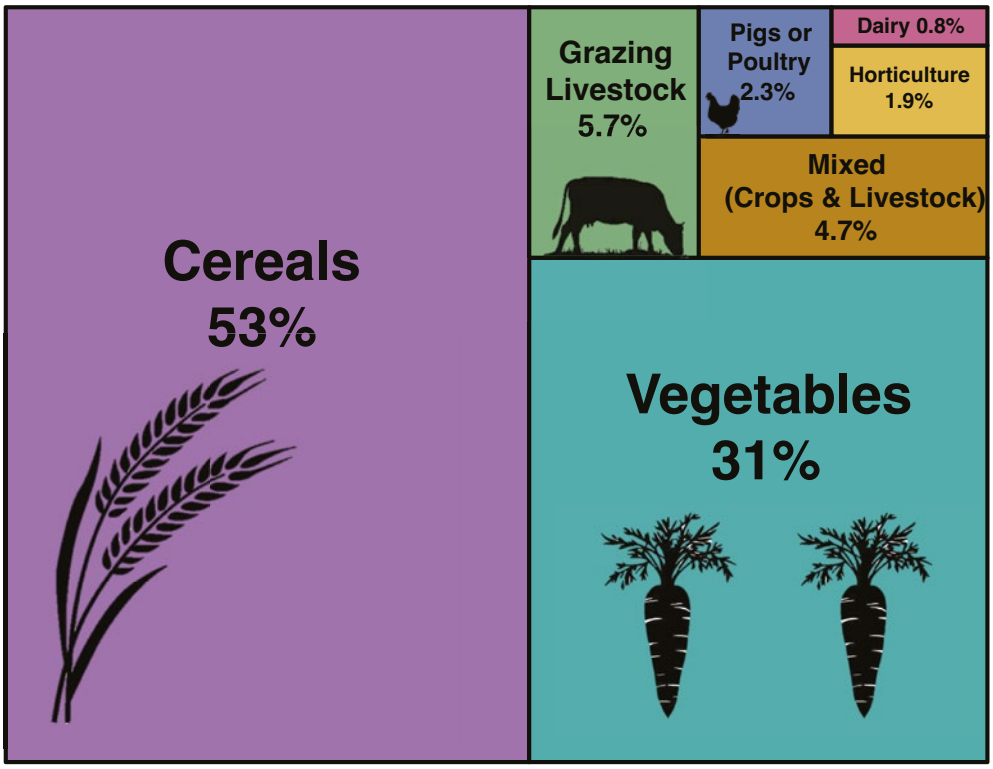


Figure 16: Distribution of farms by type across East of England in 2023. Distribution is based on percentage of farmed area. Agricultural data obtained from DEFRA (2024).

Although low emission diets are affordable in theory, barriers do exist for low-income groups.[135] These barriers can include the higher cost of fresh produce compared to processed foods, lack of knowledge or resources to prepare healthy meals[15], limited time, and limited access to cooking facilities or food shops.[135] In England and Wales approximately 13.8 million people live in areas with low accessibility to food shops[135] and online access to healthy food.[146] This lack of access to sustainable diets can widen health disparities, with low-income and marginalized communities experiencing higher rates of diet-related chronic diseases.[147]

In Norfolk, average annual household CO_2 emissions from food consumption are lower than the national average of 2.72 tonnes (Figure 17). However, 68.2% of annual food emissions from Norfolk relate to the consumption of meat and fish (Figure 17).[148] There are variations between authorities, with South Norfolk having the highest food-related emissions and North Norfolk the lowest (Figure 17). Transitioning to sustainable diets can therefore help to reduce both emissions and the burden of diet-related chronic diseases in Norfolk. An intermediate to high level adherence with national dietary recommendations is associated with 7% reduced risk of death[149], and eating 5-a-day could increase life expectancy at birth by 7-8 months and reduce greenhouse gas emissions.[150] However, there is still a significant gap in achieving a healthy diet among adults in the UK, with only 31% of adults in England and 36% in Norfolk meeting the recommended five portions of fruit and vegetable a day.[42]

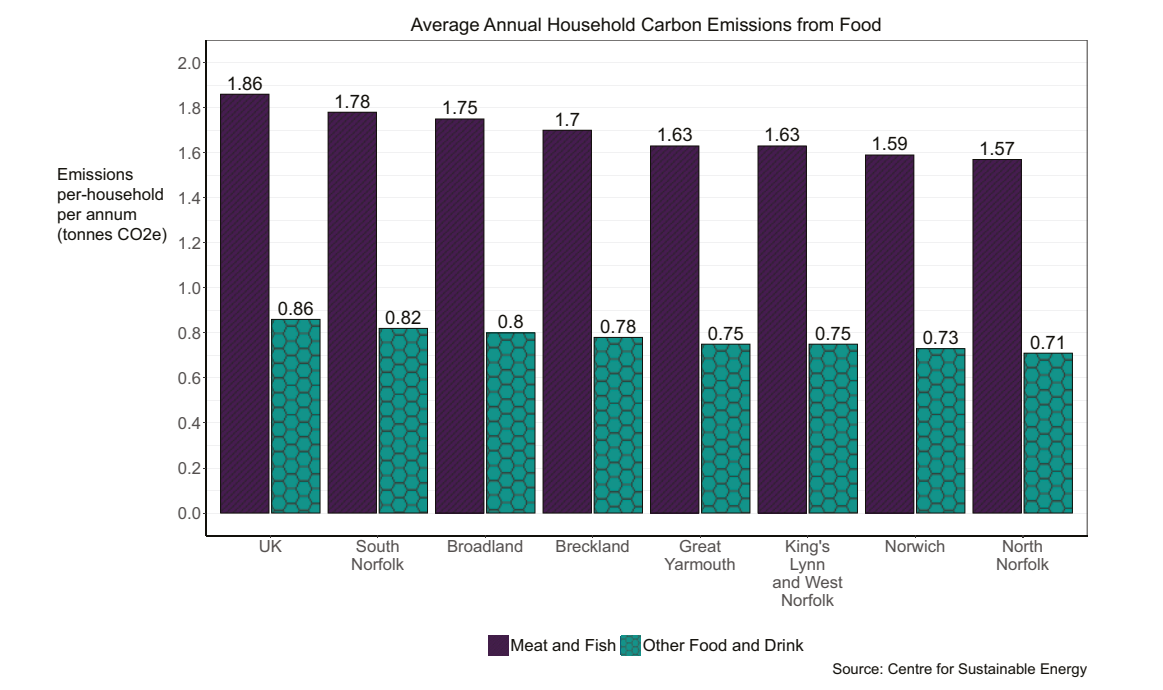


Figure 17: Average annual household carbon emissions from food and drink consumption by residents in the UK and Norfolk districts

Photography:
The Norfolk Master
Composters programme

Case Study:
Master Composter scheme

The Norfolk Master Composters programme, run by Garden Organic and Norfolk County Council, trains volunteers to promote home composting in their communities. Since 2006, the Master Composter scheme has trained 350 volunteers as Master Composters and supports up to 80 active volunteers in the county.

This initiative supports healthy and sustainable diets by promoting the composting of organic waste, reducing the environmental impact of food disposal. By turning food scraps and garden waste into nutrient-rich compost, residents can grow their own fruit and vegetables, promoting plant-based diets and reducing reliance on external food sources. The programme demonstrates how community-led efforts contribute to broader sustainability goals.

Accessible green and blue spaces

Norfolk's abundant green (i.e. parks, forests and gardens) and blue spaces (i.e. rivers, lakes and coastal areas) play an important role in supporting biodiversity, improving residents' health and addressing climate change. With 90 miles of coastline, numerous public parks and the Broads National Park, these spaces absorb carbon dioxide, provide cooling to combat hotter summers, and reduce flood risks by enhancing ground water infiltration and storing rainwater.[151] [152] As climate change intensifies, their importance for mitigation and adaptation will only grow, particularly in urban areas prone to elevated temperatures and flooding.[153]

Recognition is growing regarding the importance of green and blue spaces not only for climate resilience but also for health. Spending time in green and blue spaces has been found to reduce the risk of heart disease, stroke-related death, and low birth weight, while improving mental health and wellbeing.[154] [155] [156] In Wales, a study of over 2.4 million people found that a 10% increase in access to green and blue spaces lowered the likelihood of common mental disorders by 7%.[157] Similarly, a study in London found that a 1% increase in green space coverage was linked to reduced all-cause mortality.[158] Even in urban areas, increased tree canopy cover is associated with improved health outcomes.[159] Green and blue spaces can benefit health by reducing air pollution, aiding stress recovery, promoting physical activity, encouraging social connections and reducing the heat island effect (where urban areas tend to become warmer than rural areas).[160] [161] [162]

Access to green and blue spaces is often unequal, with minority groups and individuals with disabilities facing additional barriers to accessing these spaces.[162] While green spaces are generally accessible year-round, blue spaces tend to attract seasonal visitors, particularly among older populations.[161] Limited access to these spaces can also widen health disparities; communities without them will not experience their benefits and are less likely to engage in physical activity, which helps prevent chronic diseases such as obesity, diabetes, and heart disease.[163] Additionally, these communities may miss out on the mental health benefits provided by regular interaction with nature. Furthermore, limited access also increases vulnerability to climate change impacts such as extreme heat and flooding, as these spaces naturally provide cooling and flood mitigation, compounding existing inequalities. This focus on access is especially important given that studies have found the mental health benefits of green space to be particularly pronounced in deprived areas.[157]

In Norfolk, access to green spaces varies depending on how green space is defined. Under Natural England's 'neighbourhood standard' - which requires a large green area of at least 10 hectares within 1km of home[164] – Norfolk is relatively underserved. While Norwich performs well, with 71% of residents having access to large parks, rural areas often lack public access to nearby private land (Figure 18). Using a broader definition of accessible green space, which includes smaller parks (at least 2 hectares) and footpaths, most of Norfolk's residents are considered to have access.

Under this definition, 79% of residents in Breckland and 94% in Great Yarmouth are estimated to have access, the lowest and highest in Norfolk respectively (Figure 18).

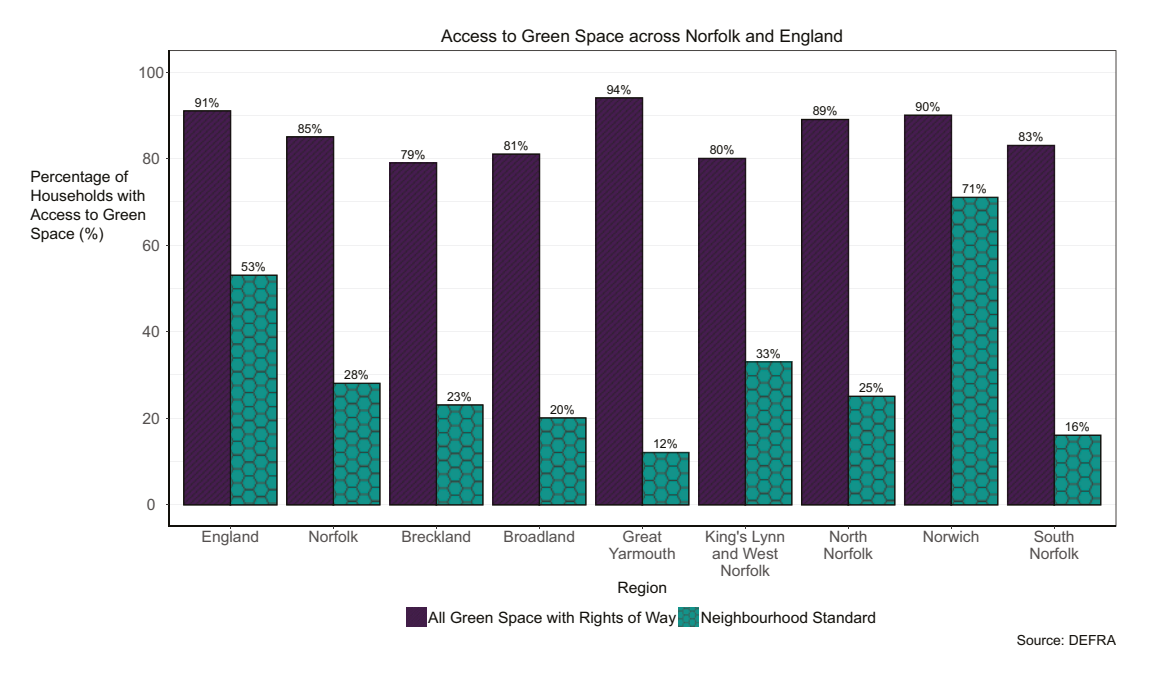


Figure 18: The percentage of households in England and Norfolk with access to green space based on the 'All green space with rights of way' definition and the 'Neighbourhood Standard' definition.

Interestingly, in the most deprived areas of Norfolk, 91% of residents have access to green spaces compared to 80% in the least deprived areas (Figure 19). However, overall access to green spaces in Norfolk remains below the national average across all deprivation quintiles (Figure 19). For instance, under the 'all green space' definition, 91% of England has access, compared to 85% in Norfolk. When applying the 'neighbourhood standard' requiring large green spaces within 1km, only 28% of Norfolk residents meet this standard compared to 53% nationally (Figure 18).

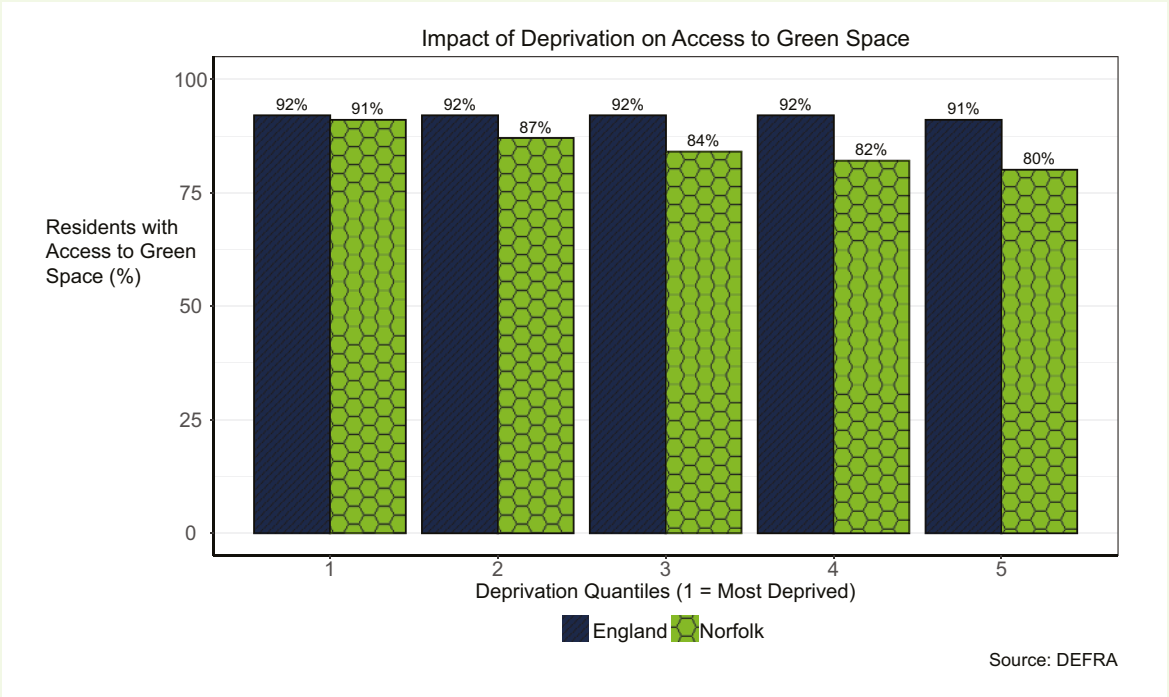


Figure 19: Access to green spaces across deprivation quantiles in Norfolk and England.

Figure 20 illustrates Norfolk's green and blue spaces, with public rights of way shown in purple. These paths create an extensive network across rural Norfolk, however some footpaths, such as those that span only 100 metres without linking to other routes, may offer limited practical use despite being technically accessible. **Norfolk Trails** aims to enhance the connectivity, usability, and accessibility of these paths, making them more enjoyable and accessible to a wider range of people. **Figure 20** also shows different types of green infrastructure across Norfolk, including public parks, local nature reserves, national nature reserves, allotments, and playing fields.

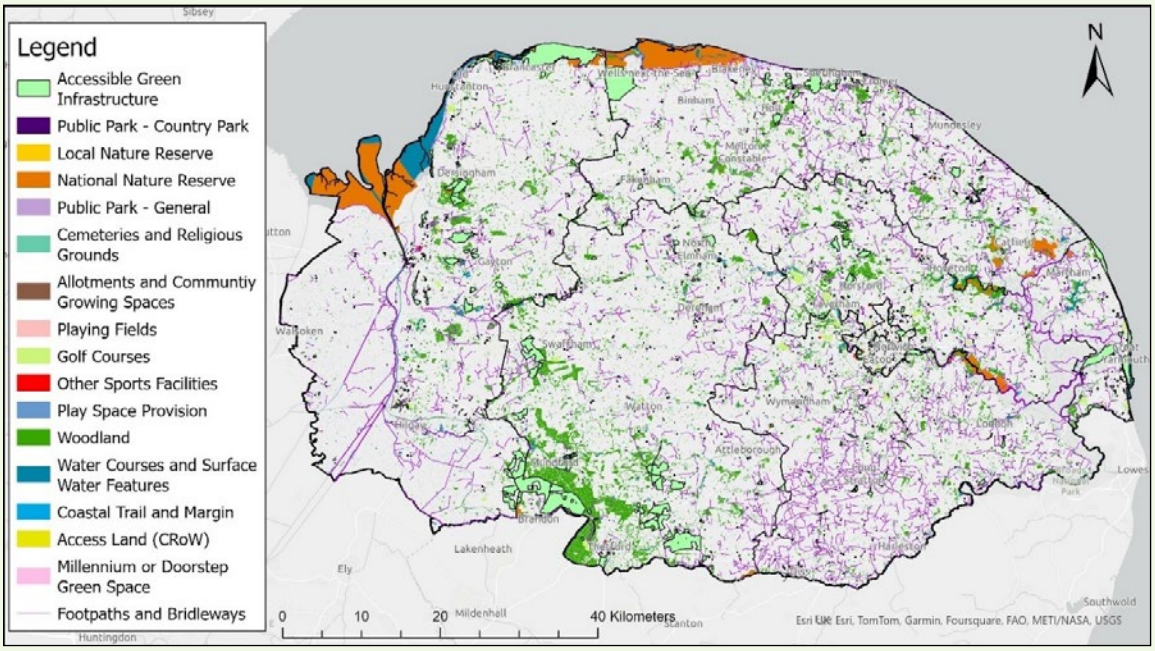


Figure 20: Map showing green infrastructure in Norfolk, highlighting accessible green spaces throughout the region. Map produced by Norfolk Public Health Insight and Analytics using **Natural England data**.

Improving the quantity and quality of Norfolk's green and blue spaces is an opportunity for unlocking the health and environmental benefits discussed throughout this section. Initiatives like Norfolk County Council's 1 Million Trees project are already making significant progress here; having already planted approximately 600,000 trees by the end of the latest planting season, the goal is to plant 150,000 trees per year until the 1 million target is met or exceeded. The County Council has successfully bid for funding through the **Urban Tree Challenge Fund** and the **Local Authority Treescapes Fund** to contribute towards this.

Encouraging and enabling individuals to access green and blue spaces, particularly within disadvantaged communities, could help to improve health. Addressing barriers such as lack of accessibility, transport options, or awareness helps to ensure everyone benefits from the health and wellbeing benefits of time in nature. Norfolk Wildlife Trust's Sweetbriar Marshes project provides an example of how this can be achieved alongside communities. Initiatives like green social prescribing are also particularly important in this regard, where individuals, particularly those with mental health conditions, are encouraged to engage in nature-based activities like gardening, walking, or volunteering in green spaces. There is strong and growing evidence that nature-based social prescribing plays an important, cost-effective role in improving mental and physical health.[165]

Photography:
Norfolk Wildlife Trust

Case study: Sweet Briar Marshes

Sweet Briar Marshes is a unique and significant (90 acre) wild space, located within Norwich's urban boundary and within one of the city's most disadvantaged areas. Norfolk Wildlife Trust (NWT) have a vision to create a place where wildlife is protected and enhanced, while providing opportunities for local communities to connect with nature.

The site plays an important role in providing a cooling effect and alleviating potential flood risk to the city. Planned improvements to the natural functioning of the floodplain will further improve this mitigation and help to make communities more resilient to climate change.

NWT worked with local residents to create a shared vision and design, recognising that a high proportion of people from low-income households spent little time in green and natural spaces and, as a result, missed out on the associated benefits. Over 1,000 people across 50 events provided important insights which influenced the design. This has encouraged many people who traditionally would not have visited to explore, volunteer and enjoy the benefits to physical and mental health and wellbeing from connecting with the natural world.

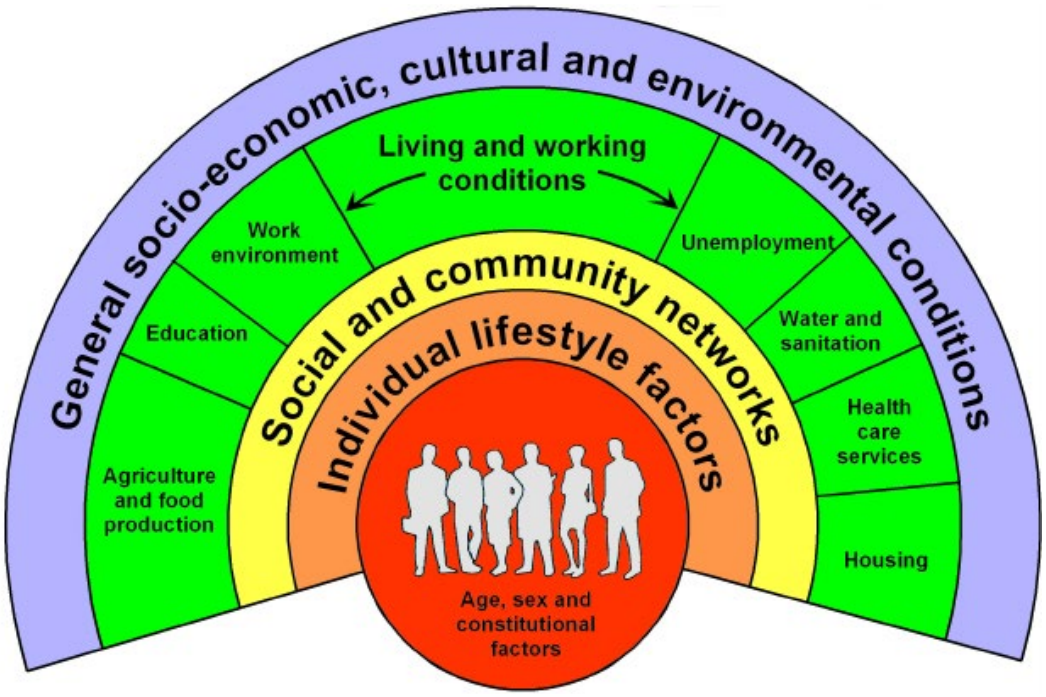
Section 4: What action can we take?

System actions

As climate change continues to pose significant challenges, collaboration across Norfolk's health and care system is vital to enhance resilience against climate change's anticipated public health impacts. Effective climate adaptation – actions that help communities adjust to and prepare for the impacts of a changing climate – is important for reducing risks, building resilience to extreme weather and fostering health and wellbeing in the face of climate-related challenges. Some adaptation actions also double as climate mitigation, meaning they reduce greenhouse gas emissions too, highlighting the multiple benefits of many policies. This section outlines potential actions that could be undertaken collaboratively as a system to improve the health of vulnerable populations and to ensure that Norfolk is well-prepared to meet the ongoing effects of a changing climate.

Many of these actions are underpinned by the wider determinants of health: the various social, economic and environmental factors that influence people's health and wellbeing. Addressing these determinants is crucial for building resilience to climate impacts while also fostering healthier, more equitable communities and driving long-term improvements to public health across Norfolk. The Dahlgren-Whitehead rainbow (Figure 21) highlights the relationship between the individual, their environment and health, and includes:

- General socio-economic, cultural and environmental conditions.
- Living and working conditions (such as agriculture and food production, education, work environment, unemployment, water and sanitation, healthcare services, and housing).
- Social and community networks.
- Individual lifestyle factors.
- Age, sex, and constitutional factors.



Source: Dahlgren and Whitehead, 1991

Figure 21: The Dahlgren-Whitehead rainbow, mapping the relationship between the individual, their environment and health.[166] The rainbow maps the wider determinants of health, such as food, education, work environment, living conditions, and housing (etc).

Below are actions that organisations can take at a system level – some of which are already underway.

Short term actions:

Collaborate with the Norfolk Resilience Forum to ensure that severe weather resilience risk and plans are up to date to reflect the growing climate risk. Effective planning ensures that communities, healthcare facilities, and emergency services can respond quickly and appropriately, preventing avoidable deaths and illnesses.

Plant more trees to provide natural cooling, improve air quality and reduce flooding, while sequestering (capturing and storing) CO_2. Increasing tree canopy cover not only enhances resilience to rising temperatures but also improves residents' quality of life. Norfolk County Council's 1 Million Trees project has already contributed over 600,000 trees towards this.

Integrate climate risk into organisational risk assessments and consider adaptation planning as part of business continuity.

Ensure that organisational staff are aware of climate risks and prevention, mitigation and adaptation measures relevant to their organisations and the people they serve.

Engage with residents to promote resilient and sustainable behaviours, particularly in relation to energy efficiency opportunities in disadvantaged areas. An example is the Norwich Climate Commission's **Our Power** project, which trains trusted community members as 'Neighbourhood Energy Champions', providing energy advice and signposting to their community.

Identify and maintain a register of vulnerable populations to ensure that the most at-risk individuals receive timely support during extreme weather events. Support voluntary, community and social enterprise (VCSE) organisations to ensure that volunteers and staff are ready to provide essential assistance where appropriate.

Implement effective communication strategies to inform residents about climate risks and preventative measures, enabling individuals to take steps to protect themselves during extreme weather events.

Launch public campaigns to raise awareness about the health impacts of climate change and encourage individuals to adopt proactive behaviours that reduce emissions and protect their wellbeing.

Long term actions:

Strategically develop green infrastructure to ensure equitable access across Norfolk. Accessible green infrastructure can improve biodiversity, provide a cooling effect, and reduce flooding, all while providing recreational spaces for residents. Norfolk's forthcoming Local Nature Recovery Strategy and Greater Norwich Green Infrastructure Strategy will play an important role in achieving these objectives.

Ensure that Norfolk has the infrastructure it requires to mitigate and adapt to climate change, working as a system to ensure that the county transitions towards a low-carbon economy and ensuring that local communities benefit.

Ensure that Norfolk's existing core infrastructure is resilient to climate change and that the necessary adaptations for future resilience are clearly identified and understood.

Introduce higher standards for new developments to ensure that communities are more resilient to climate change and extreme weather events, working with planning authorities to include adaptations for both hot and cold weather, such as adequate shade, effective ventilation (e.g. the cross flow of air), and improved insulation.

Ensure that new developments are not located in flood prone areas by utilising available flood risk data, ensuring that communities are resilient and future costs are avoided.

Ensure that new developments are not car dependent by working with planning and highways authorities to create residential areas that encourage walking, cycling and wheeling and are well integrated into existing public transport networks.

Improve existing buildings by implementing a systematic approach to upgrading insulation and incorporating renewable or energy-efficient heating systems, thereby reducing greenhouse gas emissions, lowering energy bills, and improving health and wellbeing.

Prioritise improvements to healthcare and social care facilities to enhance their resilience during extreme weather events, ensuring that they can continue operating effectively.

Integrate sustainability criteria into procurement processes to ensure that goods and services across all sectors have a lower carbon footprint and contribute to enhanced climate resilience.

Promote climate change training for healthcare staff, enhancing their understanding of the health implications of climate change and equipping them to support their patients and communities more effectively.

Work with farmers and the wider agricultural sector to promote sustainable farming practices that enhance climate resilience, improve food security, and benefit public health. Norfolk already boasts numerous examples of sustainable agriculture, such as Wild Ken Hill and the Holkham Estate.

Individual and community actions

While system-level actions are important, individuals also have a powerful role to play. Everyday choices and new habits can collectively make a big difference to support individuals' own health and wellbeing but also to contribute to a more resilient Norfolk. While the actions below might not be suitable for everyone, they offer a variety of ways to make positive changes, helping to build a healthier, more climate-resilient Norfolk for all.

Choose more active, sustainable travel choices such as walking, cycling or wheeling. Public transport and car-sharing also help cut greenhouse gas emissions and reduce air pollution. Becoming more physically active is one of the most powerful ways to improve health.

Eat a healthy and sustainable diet by incorporating more fruit, vegetables and whole grains, while reducing red and processed meats. Growing your own food can reduce your environmental impact and improve your health.

Make your home more climate-resilient by improving energy efficiency, ensuring proper shading and planting trees and greenery in outdoor spaces. Keep your garden as green as possible to reduce flood risk. Energy efficiency upgrades, such as insulation and draught-proofing, help conserve energy, keeping homes warmer in winter and cooler in summer. Larger improvements, like installing solar panels or upgrading heating systems, further reduce energy use, cut carbon emissions, and lower bills. There are various funding options that can make these changes more affordable such as through the **Norfolk Warm Homes** and schemes such as the **Great British Insulation Scheme** and **ECO**. **Norfolk County Council's Trusted Trader website** provides a trusted directory for home upgrades and energy efficiency work.

Maintain diverse gardens or green spaces to support local biodiversity and promote climate resilience. Planting trees and plants provides shade, absorbs CO_2, improves air quality and reduces flooding, making communities more resilient. **Subsidised tree packs** are currently available for Norfolk residents, businesses and community groups.

Support elderly or vulnerable individuals during extreme weather events by ensuring they have adequate heating or cooling, access to essential supplies, and assistance during emergencies.

Understand the risk and prepare for extreme weather if you live in flood-prone or high-risk areas. Being proactive can help minimise damage and ensure the safety of you and your household during floods, storms or heatwaves. For more information visit **Norfolk Prepared.**

Practice water conservation by fixing leaks, using water-saving devices and collecting rainwater. Reducing water use at home helps alleviate pressure on local supplies during droughts.

Look after your mental health by connecting with community support systems, staying informed and getting involved in positive action. Find out more about how to cope with eco-anxiety on the **Natural History Museum website**.

Photography:
Getty Images

Section 5: Conclusions

Climate change and health are closely linked. Norfolk's unique geography and demographics make it particularly vulnerable to climate impacts such as rising temperatures, flooding, and coastal erosion. These changes bring heightened risks of heat-related illnesses, worsening air quality and displacement due to flooding, all of which can disproportionately affect vulnerable populations such as the elderly, children and those living in substandard housing.

Despite these challenges, there are substantial opportunities to improve public health and enhance resilience to climate change. Improving the energy efficiency of homes not only reduces greenhouse gas emissions but also lowers energy bills and improves living conditions by addressing issues like mould, damp, and cold temperatures. Expanding and improving access to green and blue spaces is equally important, as these areas provide urban cooling, flood mitigation, and numerous health benefits by promoting physical activity, reducing stress and improving air quality.

Norfolk's strong agricultural sector also presents an opportunity to become an exemplar for sustainable food systems. Shifting towards plant-based diets and supporting sustainable farming practices can not only reduce emissions but also improve diets and health outcomes. Meanwhile, initiatives like Norfolk's 1 Million Trees illustrate the potential for local action to enhance the environment and improve wellbeing.

The mental health impacts of climate change are increasingly evident, with eco-anxiety and trauma from extreme weather events increasingly affecting residents. Programmes like Norfolk and Waveney Mind's sUStain project demonstrate the value of community-led initiatives in supporting mental health while addressing climate-related stress.

By integrating health considerations into climate strategies, Norfolk can not only mitigate and adapt to climate change, but also build a healthier and more equitable future for its residents.

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40 **How UK's record heatwave affected air pollution**

41 **Emissions of pollutants in the UK** – Summary

42 **Office for Health Improvement and Disparities Public Health Profiles 2024**

43 **Air pollution and climate change**

44 **UEA HDIG Overall Summary of Reports**

45 **Chief Medical Officer's Annual Report 2022 Air Pollution**

46 **Burning in UK Homes and Gardens**

47 **Emissions of air pollutants in the UK** – Particulate matter

48 **Energy Performance of Buildings Data**

49 **Climate change projections over land**

50 **Independent Assessment of UK Climate Risk**

51 **Projections of future flood risk**

52 **Climate Just**

53 Norfolk County Council Flood and Water team (2024)

54 **State of the UK climate**

55 **Community Risk Management Plan**

56 **Public Health Insight** and **Analytics Team** using Environment Agency data

57 **Prepare for flooding to reduce impacts on mental health**

58 **The Resolution Foundation Housing Outlook**

59 **Estimating the economic costs of the 2015 to 2016 winter floods**

60 **National Flood and Coastal Erosion Risk Management Strategy for England**

61 **Coastwise**

62 **Over half of known human pathogenic diseases can be aggravated by climate change**

63 **Best Practices for Preventing Vector-Borne Diseases in Dogs and Humans**

64 **Climatic Conditions:** Conventional and Nanotechnology-Based Methods for the Control of Mosquito Vectors Causing Human Health Issues

65 **Climate and health security:** Looking ahead to 2023

66 **Human Animal Infections and Risk Surveillance group**

67 **HECC 2023 Report:** Chapter 8 Direct and indirect effects of climate change on vectors and vector-borne diseases in the UK

68 **Urban woodland habitat is important for tick presence and density in a city in England**

69 **Diagnosis of Lyme Disease**

70 **What is Lyme disease and why do we need to be tick-aware?**

71 **Tick-borne encephalitis**

72 **HAIRS risk assessment: tick-borne encephalitis**

73 **Tick-borne encephalitis virus detected in ticks in the UK**

74 **Tick awareness and the Tick Surveillance Scheme**

75 **Increasing risk of mosquito-borne diseases in EU/EEA following spread of Aedes species**

76 **West Nile virus: epidemiology, diagnosis and prevention**

77 **Adult Aedes albopictus in winter: implications for mosquito surveillance in southern Europe**

78 **How we monitor invasive mosquitoes and stop them spreading in the UK**

79 **Travel-assoicated infections approaching pre-pandemic levels**

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81 **Climate change impacts on vector-borne diseases in Europe: Risks, predictions and actions**

82 **Impact of climate change on the global circulation of West Nile virus and adaptation responses:** a scoping review

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84 **West Nile virus: epidemiology, diagnosis and prevention**

85 **The mosquito Aedes vexans in England**

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87 **Waterborne Diseases That Are Sensitive to Climate Variability and Climate Change**

88 **Climatic Drivers of Diarrheagenic Escherichia coli Incidence:** A Systematic Review and Meta-analysis

89 **Seroprevalence of vector-borne pathogens in outdoor workers from southern Italy and associated occupational risk factors**

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97 **Food statistics in your pocket**

98 **Impact of climate change and biodiversity loss on food security**

99 **Total Income from Farming in the regions of England in 2023**

100 **BFI EMF Minutes**

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104 **The English national cohort study of flooding and health:** cross-sectional analysis of mental health outcomes at year one

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112 2024 results of FLOURISH survey in Schools, commissioned Norfolk Public Health.

113 **English Housing Survey 2021 to 2022:** housing quality and condition

114 **UK local authority and regional greenhouse gas emissions national statistics, 2005 to 2021**

115 **The cost of poor housing in England**

116 **Left Out in the Cold:** The Hidden Impact of Cold Homes -

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118 **A decent home:** definition and guidance

119 **English Housing Survey 2021 to 2022:** private rented sector

120 **Norfolk Insight:** Deprivation

121 **How do energy efficiency measures affect the risk of summertime overheating and cold discomfort?** Evidence from English homes

122 Evaluation of the Norfolk Warm Homes Programme (2023) – produced by Sirio

123 **Systematic review and meta-analysis of reduction in all-cause mortality from walking and cycling and shape of dose response relationship**

124 **Effectiveness of physical activity interventions for improving depression, anxiety and distress:** an overview of systematic reviews

125 **Census maps**

126 **Distance travelled to work**

127 **The state of the evidence on 20mph speed limits with regards to road safety, active travel and air pollution impacts**

128 **Helping people through the cost of living crisis and growing our economy:** The role of walking, wheeling and cycling

129 **Dame Carol Black's Review of the health of Britain's working age population**

130 **The value of cycling**

131 **The Effects of Physical Activity on Academic Performance in School-Aged Children:** A Systematic Review

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133 **Health effects of dietary risks in 195 countries, 1990–2017:** a systematic analysis for the Global Burden of Disease Study 2017

134 **Health and nutritional aspects of sustainable diet strategies and their association with environmental impacts:** a global modelling analysis with country-level detail

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136 **A healthy, sustainable diet**

137 **2022 UK Greenhouse Gas Emissions, Final Figures**

138 **Evaluating tomato production in open-field and high-tech greenhouse systems**

139 **Reducing food's environmental impacts through producers and consumers**

140 **Vegans, vegetarians, fish-eaters and meat-eaters in the UK show discrepant environmental impacts**

141 **Healthy and Sustainable Diets:** Consumer Poll

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143 **Farming evidence - key statistics (accessible version)**

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145 **Barriers and facilitators to healthy eating in disadvantaged adults living in the UK: a scoping review**

146 **Social and spatial inequalities of contemporary food deserts:** A compound of store and online access to food in the United Kingdom

147 **Health inequalities:** Income deprivation and north/south divides

148 **Impact: Community Carbon Calculator**

149 **Health impacts and environmental footprints of diets that meet the Eatwell Guide recommendations:** analyses of multiple UK studies

150 **Pathways to "5-a-day":** modeling the health impacts and environmental footprints of meeting the target for fruit and vegetable intake in the United Kingdom

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153 **Green infrastructure: The future of urban flood risk management?**

154 **Greenspace and human health:** An umbrella review

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156 **The importance of greenspace for mental health**

157 **Ambient greenness, access to local green spaces, and subsequent mental health:** a 10-year longitudinal dynamic panel study of 2·3 million adults in Wales

158 **Associations between residential greenspace exposure and mortality in 4 645 581 adults living in London, UK:** a longitudinal study

159 **Multiple health benefits of urban tree canopy:** The mounting evidence for a green prescription -

160 **Exploring pathways linking greenspace to health:** Theoretical and methodological guidance -

161 **Health and wellbeing benefits of blue space:** lived experience

162 **Blue space, health and well-being:** A narrative overview and synthesis of potential benefits -

163 **Inequalities in access to green space**

164 **Access to greenspace in England**

165 **Green social prescribing**

166 **The Dahlgren-Whitehead rainbow (1991)**