Chapter 2: Climate Change

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Key findings

The health effects of climate change

- Climate change is the single greatest threat to human health. Nationally and internationally, there are diverse initiatives and plans aiming to mitigate the societal impacts of climate change, as well as meeting net zero targets. Cambridgeshire County Council, Peterborough City Council, Cambridgeshire and Peterborough Combined Authority, and the Integrated Care System all have climate change strategies. It is vital that robust plans are put in place and enacted to mitigate the health impacts of climate change. At a local level, excessive heat, flooding, and vector-borne disease are likely to have the largest impacts on health.
- Heat
    - Excessive heat is associated with increased risk of morbidity and mortality, adverse pregnancy outcomes, and poorer mental health.
    - Without additional adaptation or global decarbonisation, UK deaths related to heat could increase nearly 6-fold from a 2007 to 2018 baseline average estimate of 1,602 deaths per year, to 10,889 annual deaths in the 2050s.
    - The greatest driver of both heat and cold related deaths in the UK is the vulnerability of older adults to extreme temperatures. This is due to a range of factors including older adults having more co-morbid health conditions and being more dependent on caregivers and intact medical delivery systems.
    - Other, people at greater risk of excess heat will be those living in urban areas, south-facing and top-floor flats, and homes with little shading or windows only on one side of the property or with restricted opening. Approximately 20% of homes are estimated to be at risk of overheating.
    - The ICC report recommends a range of adaptation strategies, such as modifying the built environment and infrastructure, expanding green infrastructure, and promoting adaptive behaviours and increasing the resilience of key infrastructure such as workplaces, hospitals, schools, care homes.
- Flooding
    - Flooding is a threat to life as well as to health and wellbeing. Health impacts and mortality may results from drowning, physical injury through contact with flood waters, associated motor vehicle collisions, hypothermia, and wider risks associated with flood recovery such as carbon monoxide poisoning. Flooding carries long term mental health impacts for those affected.
    - The social costs of flooding include the direct impacts on health (including treatment costs), and the indirect health impacts (such as days of work lost), as well as damage to property and possessions.
    - The frequency and magnitude of flooding events is projected to increase in the UK, with associated harmful impact on human health. In the UK approximately 6.1 million people currently live in flood prone areas, with additional populations at-risk coastal flooding due to sea-level rise.
    - Based on current locations and not allowing for future development, nearly 1 in 10 homes and 1 in 4 agricultural and industrial production facilities could face river flooding by the end of the century. Communities, farms, and industry in the areas of Wisbech, Whittlesey, Huntingdon, St Ives and the eastern edge of Peterborough face the highest risk. The region may also face tidal flooding from storm surges, particularly at high tide if the Ouse and/or Nene rivers are already in flood.

- Vector-borne disease

  - Vector-borne diseases are caused by infections with parasites, viruses and bacteria which are transmitted to humans and animals by blood-feeding arthropods (vectors), such as mosquitoes, ticks, midges, sand-flies and fleas.
  - Risk of vector-borne diseases is increasing due to changes in climate and land use, alongside international travel and transport routes. In particular, warmer temperatures in England may increase the distribution of tick species (e.g., those that cause Lyme disease) and could lead to introduction and establishment of invasive species of mosquito (e.g., those that cause dengue, chikungunya and Zika).
- Other health impacts of climate change include wildfires, aeroallergens, food and agriculture disruption, drought, and solar radiation.

Climate change and the built environment

- Local authorities and partners can control and influence carbon emissions through a wide array of measures, ranging from those in their direct control (buildings, operations, travel), through procurement and commissioning, and wider influences such as engaging and involving local communities in climate-related initiatives.
- Local data on Energy Performance Certificates (EPC) show that from 2008 to 2017, EPCs remained relatively constant. However, since 2017, there have been notable improvement in the proportion of EPCs scoring A-C.
- The Healthy Streets approach, developed by Lucy Saunders and championed by the Mayor of London, has built a significant body of evidence regarding what makes a healthy street. This evidence includes consideration for climate change. Work is currently underway spatially mapping the determinants of Healthy Streets across Cambridgeshire and Peterborough.
- There are numerous opportunities for the built environment to mitigate its impact on climate change, as well as associated health impacts. These may include nature-based solutions (e.g., expanding or creating new forests, building green roofs or walls), infrastructure to support active transport, or emergency preparedness and planning that includes likely climate-related health impacts.

Sustainable healthcare

- Healthcare services account for a substantial proportion of national carbon emissions; around 3.5% of all road travel in England is related to the NHS. As such, reform of healthcare services to reduce carbon emissions is critical to achieving net zero ambitions.
- The most impactful way to reduce carbon emissions from healthcare services is reducing the need for those healthcare services. In the same way that reducing the purchase of plastic bottles is preferable to reducing plastic emissions through production processes and recycling, prevention of healthcare need is better than reducing carbon emissions associated with addressing need. For every person not requiring healthcare during a given episode, all emissions associated with this episode are avoided. In turn, lower carbon emissions lead to fewer health impacts of climate change, thus creating cycle of positive reinforcement.

One Health

- One Health is a multidisciplinary approach to improving health outcomes that recognises the interplay between human health, animal health, and environmental health. One Health seeks to identify and implement win-win-win solutions to complex problems at the human-animal-environment interface.
- In 2019 the British Veterinary Association published a report summarising a range of UK-based case studies exemplifying a One Health approach addressing a range of topics such as mental health and wellbeing, antimicrobial resistance, non-communicable diseases, among others. This resource could be used to support local One Health initiatives.

Recommendations

2.1	Local plans should include policies that account for the current and likely future impacts of climate change. Specifically, local plans should include policies on risk of excessive heat, flooding, and vector borne disease. Other policies may include wildfires, aeroallergens, food and agriculture, drought, and solar radiation.
2.2	System partners should consider the carbon emission reductions and health co-benefits of increasing the proportion of plant-based products in food provision, procurement and catering policies.
2.3	System partners should develop a consistent, integrated approach to monitoring the carbon emissions associated with their activities.
2.4	Health and care providers should ensure that appropriate EPRR plans are integrated into their clinical delivery strategies to account for the major local risks posed by extreme weather (e.g., ambulance routes impacted by flooding, or hospital care delivery in excessive heat)
2.5	The integrated care system should make explicit consideration for the likely future impact of climate change in its estates strategy and work to reduce this impact through mitigation and adaptation.
2.6	The integrated care system should ensure appropriate EPRR plans are in place and kept up-to-date for the major local risks posed to human health by climate change (i.e., major flooding and excessive heat)

1. The health effects of climate change

1.1. Overview of the health impacts of climate change

Most of the information in this chapter has been taken from the UK Health Security Agency (UKHSA) "Health Effects of Climate Change in the UK: state of the evidence 2023" and the Cambridgeshire and Peterborough Independent Commission on Climate Change (C&P ICC) "Fairness, nature and communities: addressing climate change in Cambridgeshire and Peterborough October 2021".[1,2]

1.1.1. UKHSA's Health Effects of Climate Change in the UK Report

The UKHSA report outlines the changes to the climate and the associated health impacts for the UK population, the C&PICC report sets out a series of recommendations for action locally and nationally on climate change for all sectors.

Climate change is an emerging reality with the UK expected to have warmer wetter winters, drier summers. Although the summers will become drier rainfall is likely to be in heavier events. Cold snaps and cooler summers or winters will be less common as climate change progresses. Currently the UK climate is warmer, wetter and sunnier than typically during the 20th century.

If health considerations are embedded in decarbonisation strategies there is the potential to generate a range of health benefits, e.g. through improved air quality, food, housing, transport, green space, improved mental and physical health and reducing health inequalities.

The UKHSA report outlines the evidence on climate change and health outcomes, the report states the evidence is strongest for: adverse impacts due to heat and cold; flooding; and vector-borne disease. The evidence is less strong for other aspects of climate change and health.

In summary:

- Heat and cold-related deaths are both projected to increase, although cold impacts will dominate until late century, largely due to an ageing and growing population
- Increased risk of flooding will mean that people, properties, and infrastructure that were not previously at risk will become at risk
- The UK will become more suitable for the survival of vectors of public health importance e.g. the Aedes albopictus mosquito. Transmission of dengue and chikungunya, and West Nile virus may be possible in the latter half of the century or sooner
- Food imports and prices, particularly for fruits and vegetables, will be more volatile due to high UK dependence upon foods from particularly climate-vulnerable countries
- Some risks that are not currently considered threats to health in the UK will emerge, including increased exposure to wildfires

Figure 1: Health effects of climate change
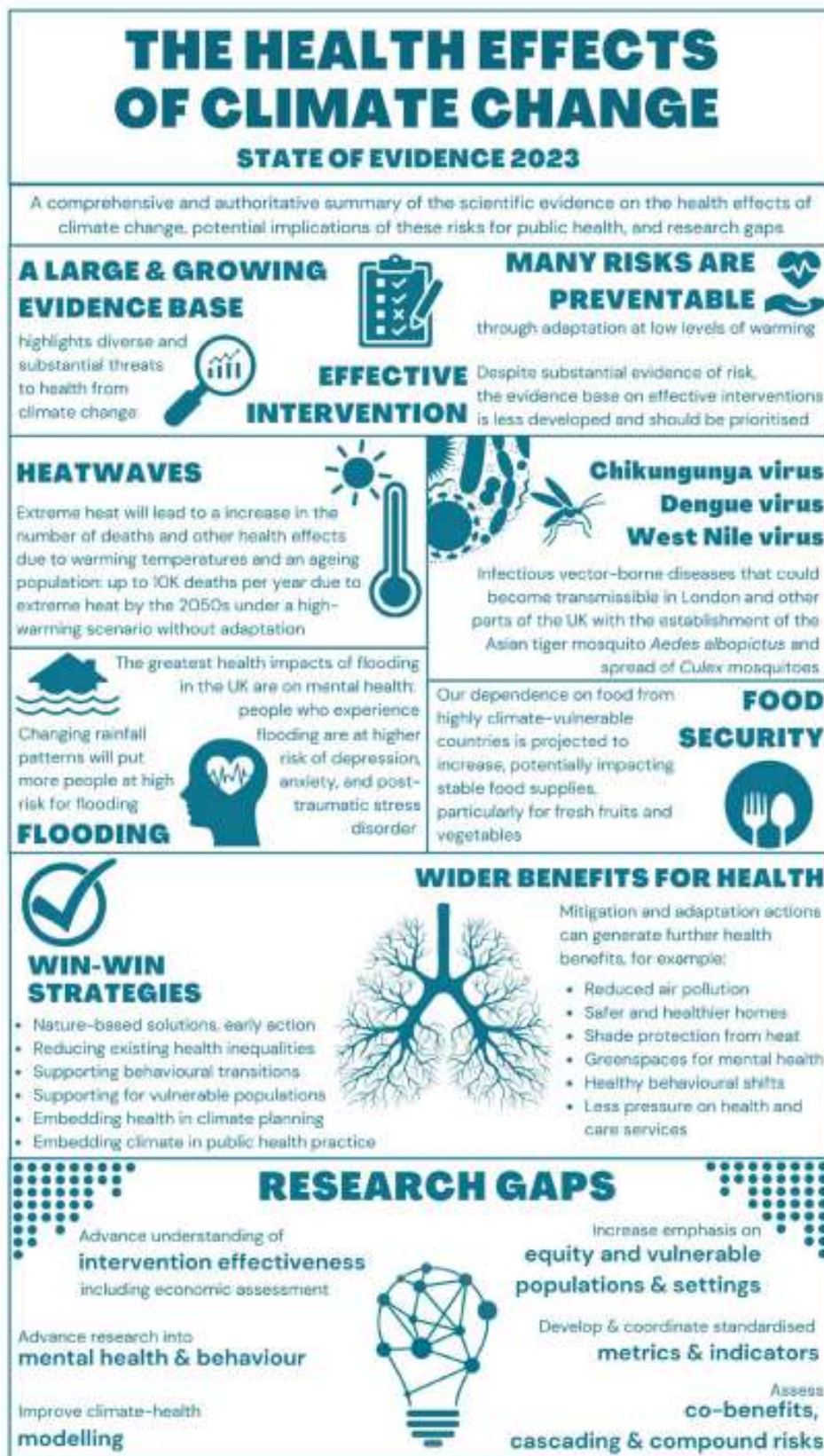
With an optimistic low-warming scenario, temperatures are likely to peak mid-century, this means that current working age adults will be in their vulnerable retirement years and those who will be adults in the 2050s to 2080s will face the greatest burden of adaptation.

The health threats from climate change are therefore high for current working age adults, particularly acute for current children and young people, and unknown but potentially severe for their children and grandchildren.

The health risks from climate change that evolve over the next century are dependent on the level and rate of global warming. For example:

- flood risk is projected to increase more steeply under a high-warming scenario, with the number of people in the UK significantly at risk of flooding projected to increase by 61% by 2050 under a modest warming scenario (+2°C) and 118% in a high warming scenario (+4°C) compared with current risk. Sea-level rises are highly sensitive to the level of warming, with approximately one metre difference in projected sea-level rise between the low and high warming scenarios
- There is likely to be increases in the importation and transmission of resistant organisms with the potential to increase the prevalence of resistant infections. Higher and more rapid warming will accelerate risks such as the likely emergence mosquitoes into the UK which carry disease heightening the risk of Vector Borne Diseases including dengue, chikungunya, and West Nile virus. Under a high warming scenario, most of England will become suitable for the establishment of new domestic mosquitoes by the 2040s and 2050s

The distribution of these effects is not universal with some areas of the UK more at risk that others. Vector borne disease, wildfires and drought are likely to emerge first in the southern regions of the UK, whilst other risks such as sea level rise and flooding will be greatest in coastal areas, low lying areas and floodplains. Urban areas may be affected by extreme heat impacts due to the urban heat island effect. Aeroallergen risk will be highly localised across the country, first emerging in the Midlands.

The effects are also not evenly distributed by age or health status with older adults (over 65 years) and people with pre-existing health conditions being at greatest risk from rising temperatures. Climate risks to health will map onto existing gradients in health and inequality, with those less able to control their environment, adapt their behaviours, or respond to new risks being more vulnerable. This includes children, people with disabilities, people experiencing homelessness, and people in certain settings such as prisons, schools and social care, which aligns with the NHS CORE20PLUS priorities.

1.1.2. Cambridgeshire and Peterborough Independent Commission on Climate Change - Report findings and recommendations

The C&P ICC report outlines the risks to the UK from climate change and acknowledges that they will be particularly acute in Cambridgeshire and Peterborough, specifically:
- the risk of flooding,
- very high summer temperatures,
- water shortages, and
- damage to the natural carbon stores in the deep peat of the Fens.

The report acknowledges that action taken can deliver benefits and opportunities, including new jobs in low carbon industries, safer and more comfortable homes and workplaces with lower energy bills, better air quality and more greenspace and access to nature, improving our health and well-being.

What causes climate change

Burning fossil fuels – coal, oil and gas, cutting down rainforests and farming livestock all release greenhouse gases into the atmosphere. The largest contributor to global climate change, accounting for over 75 per cent of global greenhouse gas emissions and nearly 90 per cent of all carbon dioxide emissions is from burning fossil fuels.

Figure 2: Greenhouse gases
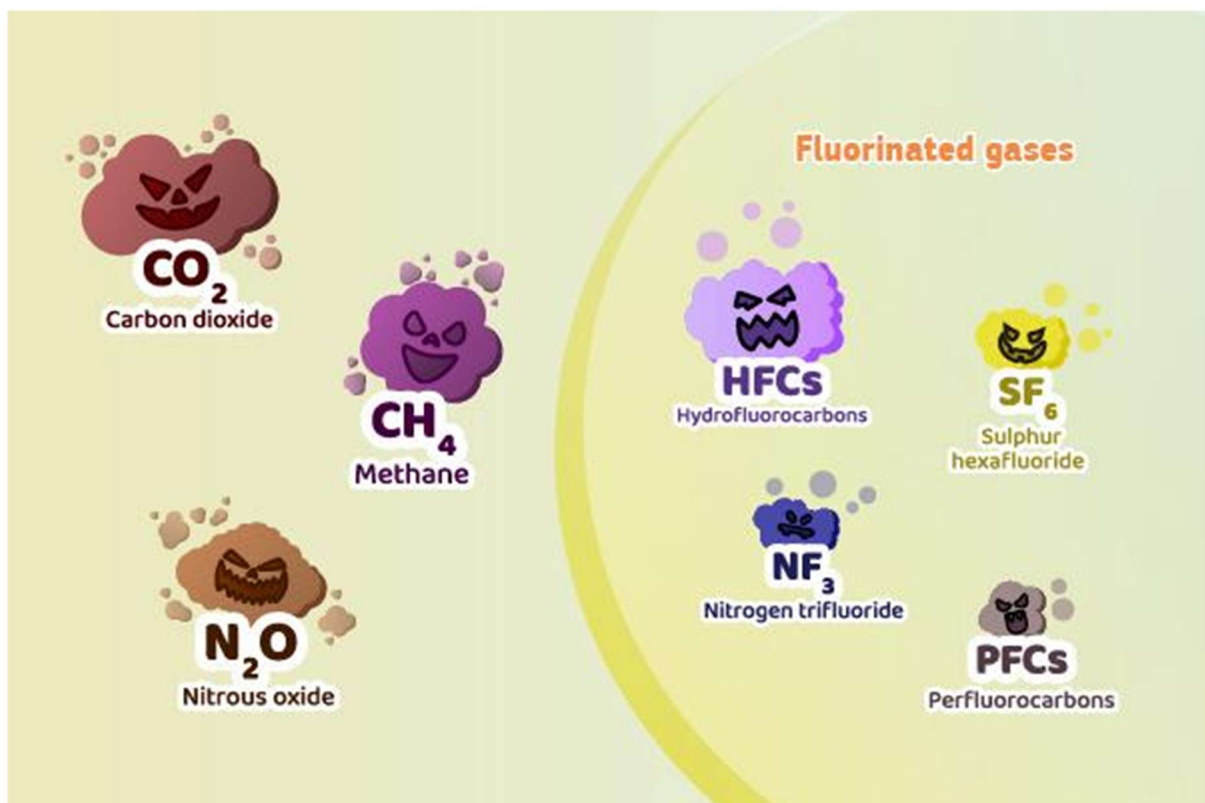
Source: European Commission[3]

As these greenhouse gas emissions blanket the Earth, they trap the sun's heat, leading to global warming and climate change. The world is now warming faster than

at any point in recorded history. Warmer temperatures over time are changing weather patterns and disrupting the usual balance of nature. According to the European Commission 2011-2020 was the warmest decade recorded, with global average temperature reaching 1.1°C above pre-industrial levels in 2019. Human-induced global warming is presently increasing at a rate of 0.2°C per decade. An increase of 2°C compared to the temperature in pre-industrial times is associated with serious negative impacts on to the natural environment and human health and wellbeing.

The sources of emissions in CPCA
Transport
Emissions from surface transport are high: $2.7tCO_2$ per capita in the C&PCA area compared to $1.9tCO_2$ per capita in the UK. Some of these emissions are due to traffic travelling through the CPCA area, e.g. the A14, A1(M) and M11, although this is not enough to explain the relatively high level of transport emissions overall:

- across the CPCA area car ownership is high and mileage is high;
- the proportion of ultra-low emission vehicles is low, but similar to the UK;
- emissions are low in the urban areas of Cambridge and Peterborough, (which have better transport networks providing alternatives to the car and more compact geography with denser provision of services.)

Buildings
Emissions from buildings are not high compared to the UK, but make up large share of total emissions. Energy use in dwellings accounts for nearly a quarter of overall emissions:

- Energy Performance Certificate data shows a rating of energy efficiency for domestic dwellings, in C&P the ratings are slightly better than across the UK, however, most residential buildings are rated "D" or below
- Most buildings are heated through the use of fossil fuels. The number of installations of low-carbon heating, under the Renewable Heat Incentive scheme, amounts to 0.5% of the housing stock. With a projected increase in population in the C&P Area the amount of new build is also projected to be high. By 2050 new build could account for as much as 40% of the housing stock, which means that ensuring high standards for new construction will be particularly important
- Industrial and commercial sector emissions make up a lower share of emissions (27%) than across the UK

The following actions recommended in the report could have direct health benefits:

- the rollout of electric vehicle charging infrastructure, which provides a 'right to charge' for residents, workers and visitors to the region. This should start with bringing those districts with low provision up towards the levels of the best;
- a transition towards zero emission bus and taxi fleets by 2030
- measures to reduce car miles driven, including improvements to public transport, trials of on-demand electric buses and infrastructure for walking and cycling
- exclusion of diesel vans and trucks from urban centres by 2030
- home retrofit will need to be rolled out across the building stock. Every building will need a renovation plan (a green building passport), starting, by 2025, with buildings currently below EPC "C"

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- Major new developments (>1000 homes) should be connected to neighbouring towns and transport hubs through shared, public transport and/or safe cycling routes
- public transport, walking and cycling for commuting, and Councils to take a lead in respect of their own employees
- CPCA, with relevant authorities, to explore options to improve cycling infrastructure both within urban areas, and to encourage the use of e-bikes for longer trips to and from market towns and cities
- Alternatives to road investment to be prioritised for appraisal and investment – from active travel and public transport options, to opportunities for light rail and bus rapid transit or options to enhance rail connections.
- All new buildings are net zero ready by 2023 at the latest and designed for a changing climate
- Adopt a net zero ready standard for new homes (requiring "world-leading" energy efficiency and low-carbon heating in new homes) by 2023, and adopt a similar standard for non-domestic buildings
- All new residential and non-residential developments with parking provision should be equipped with charging points
- All planning applications to require over-heating calculations and mitigation measures, and testing against climate projections to 2050
- All new build must have effective ventilation in use and safeguard indoor air quality
- New developments to be sited to minimise emissions implications, including through making them attractive for walking and cycling, and access to wider transport infrastructure
- All new build must have access to green space and nature

1.2. Heat

1.2.1. National Evidence

Without adaptation, heat and cold-related deaths are projected to increase in the UK due to a combination of climate change and sociodemographic factors. Mortality risk due to heat and cold increases with age. Although it is expected that there will be fewer very cold days in the UK, mortality due to moderate cold is projected to increase because we have an ageing population. Deaths related to heat (with no additional adaptation and limited global decarbonisation) could increase nearly 6-fold from a 2007 to 2018 baseline average estimate of 1,602 deaths per year, to 10,889 in the 2050s.[1]

Both heat and cold related deaths are expected to rise until the second half of the century when cold-related deaths would begin to fall. In the first half of the century, cold-related deaths will continue to dominate, despite increasing heat risks, with heat-related mortality increasing over time.

Figure 3: Increase in UK hottest daytime temperatures, 1960-2019

Figure 1.2: Increase in hottest daytime temperatures, 1960 - 2019

o: non-significant trends

Trend (°C decade⁻¹)
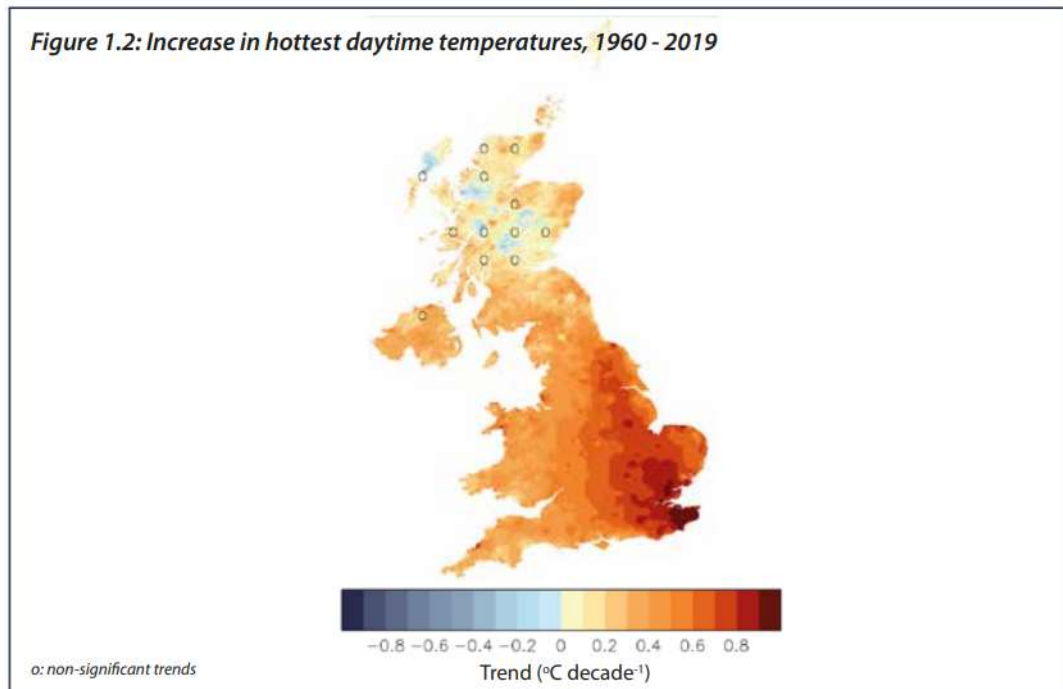
Source: Christidis et al. (2020)[4]

The greatest driver of both heat and cold related deaths in the UK is the vulnerability of older adults to extreme temperatures. Temperatures that may cause inconvenience for most healthy adults can pose a significant health risk to individuals with chronic health conditions and older adults, as many adults over 60 may have difficultly to prepare for and respond, and survive climate change events, specifically older adults may:[1]

- Have complex medical conditions which impact physical, sensory, and cognitive abilities to care for themselves and respond to climate disasters, and make them more sensitive to climate hazards such as excess heat which can worsen pre-existing conditions
- Depend on caregivers and intact medical delivery systems, which can be fragmented during climate disasters
- Are subject to the normal aging processes that create less muscle and body tone, which can limit agility and mobility, and the body is less able to compensate for the effects of certain environmental hazards such as air pollution
- Have cognitive impairments which impair the ability to assess risks, plan responses, and execute protective behaviours
- Have compromised immune systems making them more prone to severe illness from insect and waterborne diseases
- Depend on medications and life-sustaining equipment that may be unavailable or require intact power supplies that may not be readily available at temporary shelters

- Have other "social determinants of health" such as economic insecurity or live in poorer housing which can exacerbate the impact of climate induced disasters and are considered to be "threat multipliers"

Evidence of substantial variation in geographical and social vulnerability to heat and cold highlights the extent to which there is scope for interventions to be targeted to improve the resilience of places and communities, to protect people most likely to be adversely affected by extreme temperatures.

There is a relationship between the direct effects of temperature on morbidity outcomes e.g. emergency hospital admissions and accident and emergency attendances for cardiac, respiratory, cerebrovascular, and psychiatric conditions. High ambient temperatures are also associated with effects on mental health (including increased suicide risk), however knowledge gaps remain, and the associations are more difficult to ascertain.

The prevalence of common mental disorders has risen by around one-fifth in both men and women in England between 1993 and 2014, this prevalence is unequal across different ethnicity, deprivation, and employment statuses, mental health considerations are important from an equity perspective and will need to be understood in the context of climate change.

Those at greater risk to excess heat will be those people living in:

- urban areas
- south-facing top-floor flats
- homes with little shading or windows only on one side of the property or restricted opening (which may limit ventilation)

1.2.2. Local Impacts

Maximum summer temperatures in Cambridgeshire and Peterborough are likely to be above 36°C in 1 year out of 20 by the mid-century, however temperatures in some locations will be higher than average, however there is uncertainty associated with these projections, and real temperatures may be significantly higher.[2]

Summers are likely to be drier and winters milder, with the potential to be much wetter. In general, rainfall will be lower from May to September, but higher and more intense from November to March. The most severe risks facing the region up to the end of the of the century will be related to more extreme summer temperatures and changes on the character of seasonal and annual precipitation.

Hotter and drier summers will increase the stress on water resources, impacting people, farming, industry, biodiversity and the quality of the natural environment.

Using national evidence, the ICCC suggests that around 20% of homes experience overheating in the current climate. The issue is not addressed in current building standards, nationally though there are plans to do so.[2] Guidance in Greater Cambridge recommends that thermal modelling be undertaken to understand the performance of proposed new developments, with buildings designed and built to meet CIBSE's latest overheating standards, and consideration given to future climate scenarios. References to further guidance include that provided by the Good Homes Alliance.

It is estimated that somewhere between 2% and 5% of UK domestic buildings have some form of portable or fixed cooling system and by 2050, it is expected that 5% to 32% of English households will have air conditioning. However, there are concerns around resilience of these units during power cuts, as well as waste heat from such systems adding to the urban heat island effect. Air conditioning can increase household energy spending by 35% to 42%, which may drive some households into summertime energy poverty, and potentially exacerbate inequalities

The ICC report recommends the following solutions/interventions to protect human health from heat and cold, this includes behavioural changes, national heat and cold alert systems, improvement to housing including energy efficiency measures and shading, and increasing availability of greenspace, specifically:[2]

- longer-term planned adaptation of key infrastructure, including interventions in the built and natural environment, such as retrofit to buildings, or landscape management interventions. Longer term planned adaptation of key infrastructure that may be at risk from heat can also help in protecting health during heatwaves as well as improving the resilience of hospitals and healthcare centres to hot weather
- External shutters on windows can be effective in protecting against heat-health impacts in heatwaves
- Energy efficiency adaptations such as wall, floor and loft insulation, triple glazing, and draught reduction can keep buildings warmer in winter. However, concerns have been raised about their potential to increase summer overheating if not implemented carefully with appropriate provision of ventilation or used together with other measures (such as shading, shutters or additional ventilation)
- Altering the reflectiveness of buildings and infrastructure such as roofs, pavements and roads (so that they reflect sunlight rather than absorb it) can reduce urban temperatures, reflective 'cool' roofs could potentially offset 18% of seasonal heat-related mortality associated with the urban heat island (25% during heatwaves) corresponding to 7% of all heat-related mortality, with no worsening of cold-related health effects in winter and benefits increasing with climate change
- Green infrastructure such as trees, parks and gardens are generally cooler than surrounding more built-up areas. Shading provided by street trees is critical for improving thermal comfort in urban areas

- Adaptive behaviours and increasing the resilience of key infrastructure such as workplaces, hospitals, schools, care homes, and other health and care centres can improve adaptation to high temperatures. This includes
  - avoiding sun exposure during the middle of the day
  - avoiding extreme physical exertion
  - checking ambient room temperatures
  - closing curtains or blinds in sunny buildings
  - ventilating during cooler times at night
  - ensuring access to cool liquids
  - looking out for vulnerable community members
- Some adaptation actions may be more difficult for some populations to achieve, e.g. those in prisons or custodial facilities (who may not be able to follow general advice and guidance to move somewhere cooler, open windows, or take a cold shower on demand).
- Raise awareness amongst the public and healthcare workforce on what the risks are, and what actions can be taken to protect people during heatwaves, and to improve resilience of health and care settings to hot weather, including adaptation measures in nursing and residential homes. One global review finds higher suicide risk with heat, and increased risk of mental health-related hospital admissions and emergency department attendance during periods of higher temperature. In addition, the study recommends that as the evidence evolves, plans for public health response to hot weather should consider including mental health impacts.
- Transport systems may be detrimentally affected by heat, potentially leading to subsequent impacts on accessing health and social care, education or work. Overheated transport could lead to a loss of workdays as heat-vulnerable individuals, such as older people or pregnant women may not be able to travel.
- Educational settings may also see risks during hot weather. The Department for Education (DfE) advises schools to remain open during heatwaves and for staff to take measures to safeguard children. The Environmental Audit Committee (EAC) recommended that the DfE should issue guidance for head teachers about safe temperatures in schools and relaxing the school uniform policy as appropriate during hot weather. Although specific guidance on safe indoor temperatures in schools is not currently available, the DfE have produced advice on relaxing uniform policies to allow pupils and staff to wear clothing to help them keep cool.

1.3. Flooding

1.3.1. National Evidence

The frequency and magnitude of flooding events is projected to increase in the UK, with associated harmful impact on human health. In the UK approximately 6.1 million people currently live in flood prone areas, with additional populations at-risk coastal flooding due to sea-level rise.[1]

Nature-based solutions such as river and wetland restoration. are frequently associated with health co-benefits, including thermal regulation, improved air and water quality, and benefits for mental health, however, the potential disbenefits from some measures, such as wetland restoration may increase vector habitats and therefore vector borne disease so also need to be considered.

Flooding from rivers has been the dominant source for the current burden of health and social costs, but a greater number of properties are at risk from surface water flooding. Coastal flooding is the most dangerous in terms of impacts, due to the risk of a catastrophic event that could cause a large number of fatalities.

Flooding is a threat to life as well as to health and wellbeing. Deaths may occur from drowning and physical injury through contact with flood waters. Mortality attributable to flooding can also include car accidents and falling into fast flowing water, hypothermia, and injuries or death associated with cleaning up after a flood (including CO poisoning), in addition other there are other risks to people, communities and buildings from flooding which include:[1]

- long-term and severe impacts on mental health from flooding, displacement, and being affected by flooding, solastalgia
- damage to property:
    - structural damage and the costs of rebuilding or repair
    - upheaval and financial implications of cleaning up
- distress and financial implications of displacement from home
- loss of and damage to possessions and burden on household costs
- disrupted access to employment, education, and wider facilities
- disrupted access to health and social care services
- illness from biological and/or chemical contaminants arising from floods
- illness from infections or other disorders arising from floods
- risk of carbon monoxide poisoning in the clean-up phase due to inappropriate use of generators
- damage to agriculture or livestock, leading to loss of food supplies

The social costs of flooding include the direct impacts on health (including treatment costs), and the indirect health impacts (such as days of work lost), as well as damage to property and possessions.

Long-term mental health impacts are likely to be the greatest burden of ill health in the UK due to flooding. There is also evidence that children's mental health is severely affected by flooding and the subsequent loss of familiar surroundings and friends, as well as witnessing the stress and strain affecting adults.

1.3.2. Local Impacts

The ICC Report concludes that by the end of the century, based on current locations and not allowing for future development, nearly 1 in 10 homes and 1 in 4 agricultural and industrial production facilities could face river flooding. Communities, farms, and

industry in the areas of Wisbech, Whittlesey, Huntingdon, St Ives and the eastern edge of Peterborough face the highest risk.[2]

An increase in short periods of intense rainfall, will lead to surface water flooding from runoff in urban and paved areas are also likely to impact a significantly higher proportion of the built environment. The area may face tidal flooding from storm surges, particularly at high tide if the Ouse and/or Nene rivers are already in flood.

Figure 4: Land projected to be below annual flood level in 2050
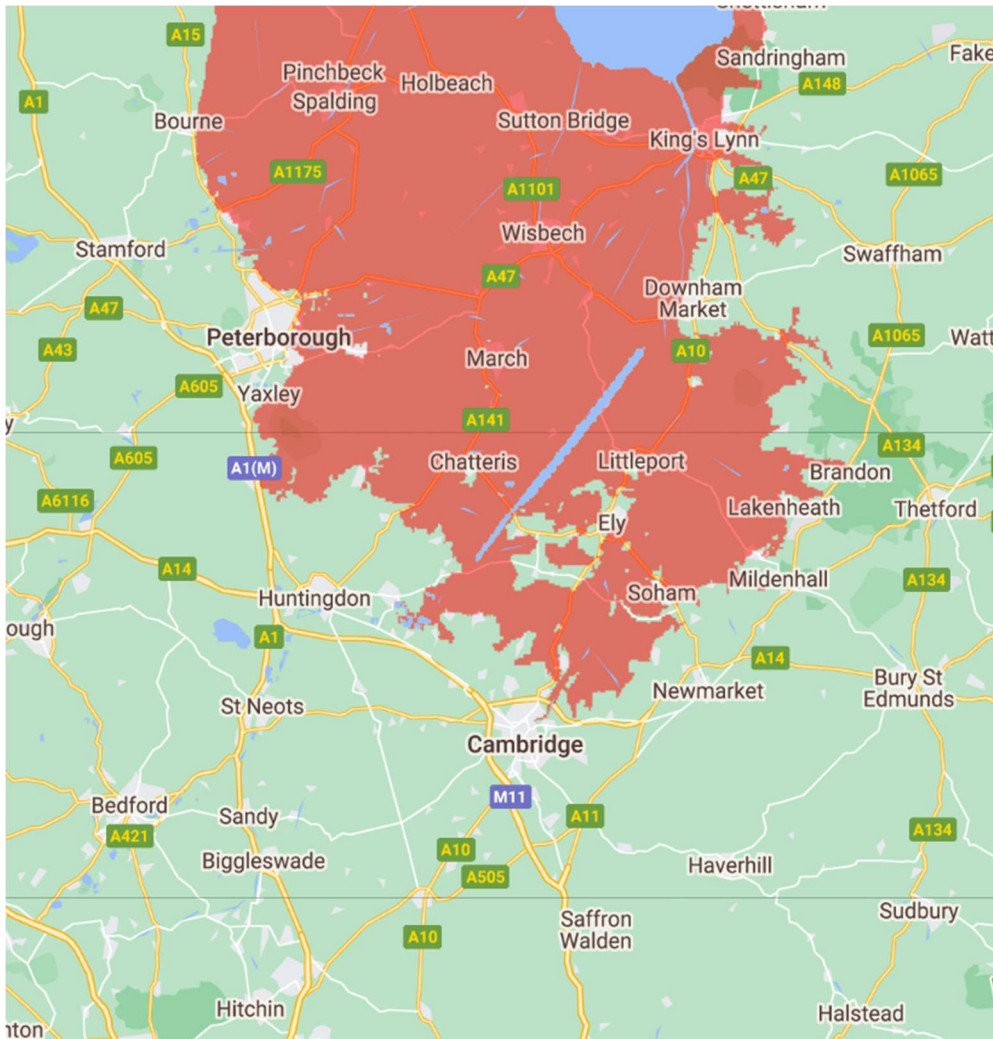
Source: Climate Central[5]

The table below summarizes the work carried out by Rözer and Surminski, they found that across England and Wales 120,000 new homes have been built in areas of flood risk, in addition it shows that a disproportionate number have been built in struggling or declining neighbourhoods.[6] Their analysis suggests that pattern is similar to the CPCA area. The analysis did not look at any resilience measures which might have been engineered into these building to reduce flood risk. Neighbourhood types are based on definitions developed by Patias, Rowe and Cavazzi. The category "ageing manual labour" reflects areas transitioning from blue collar families to and older striving type; the category "increasing struggling" reflects areas transitioning from council renting to struggling home-owners.

Table 1: Location of new build homes in CPCA area (2008-18)

	Total	Built for neighbourhood types: "ageing manual labour" or "increasing struggling"
New Build Homes	41995	6790
New Build Homes in Flood Risk Zones	2689	542
Proportion of New Build Homes built in Flood Risk Zones	6.4%	8.0%

Source: Rözer & Surminski (2021), ICCC Report[2,6]

UKHSA Recommends[1]

- Identifying and supporting those people at highest risk from flooding to reduce associated health impacts, including planning for targeted support of vulnerable people (such as those with chronic illness), places (including prisons, schools, social care facilities), and spaces (those located in or near floodplains)

Additionally, UKHSA recommends:[1]

- ensure that flood emergency plans are coordinated with relevant local partners and public health agencies are involved in flood recovery
- ensure local flood planning has robust measures to identify individuals at risk, with consideration of the various types of barriers to warnings and evacuation, and the range of health and social needs. Improve planning to identify at risk individuals for flood events
- improve the targeted advice for high-risk persons on how they should prepare for flooding
- invest in information systems to support health surveillance of flood impacts on mortality, injuries and mental health, including:
  - improved carbon monoxide poisoning surveillance
  - record health status at baseline, during and after floods on various health outcomes, including deaths and injuries.
  - development of clear definitions for deaths from flooding, including immediate and delayed causes
  - development of clear definitions for the attribution of injuries to flooding, including complete information on the causes and types
  - a comprehensive information system needs to record factors that are known to effect health, including population displacement (timing, duration and places) and support for flood recovery
  - realise co-benefits of flood risk management; for example, nature-based solutions such as implementing green infrastructure also has potential positive benefits for physical and mental health
  - promote measures to ensure the continuity of the NHS services and health care facilities including residential care homes during floods

The ICCC report concludes that the key climate change risks related to flooding facing the region are:[2]

- large parts of the area are vulnerable to flooding – nearly 40% of the land is below sea level and much of the Fens is in flood zone 3.6
- Nearly 1 in 10 homes and nearly 1 in 4 agricultural and industrial production facilities may face flooding risk from rivers by the end of the century
- The region may face tidal flooding from storm surges, particularly at high tide if the Ouse and/or Nene rivers are already in flood

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Lived experience of climate change in a local Traveller community

Gypsy, Roma, and Traveller communities experience substantial health inequalities, both in terms of access and outcomes. The reasons for this are complex but largely stem from discrimination, complex healthcare systems, and disproportionate negative impacts of the wider determinants of health. Life expectancy in Gypsy, Roma, and Traveller communities is 10-25 years shorter than in the general UK population. Rates of physical and mental ill-health are also dramatically higher.[7]

Traveller sites are some of the most exposed forms of accommodation, making them particularly vulnerable to the impacts of climate change. Specifically, high risk of floods in winter and excessive heat in summer. Below is the lived experience of a resident of a privately-owned traveller site in Cambridgeshire. The resident's name has been changed and site details redacted to preserve anonymity.

Jackie has lived in a static home on a privately-owned traveller site in Cambridgeshire for the past 15 years. The site is in a rural location, with nearby agricultural land. Since she moved in, she has noticed that the summers are becoming warmer and the winters are becoming wetter. In summer, she reports that the plots become so hot they have needed to buy wide umbrellas to create shaded areas and large electric fans to try to keep the indoor temperature cooler. Each year, this gets worse.

Even more problematic than the heat in summer is the flooding the rest of the year. "*The moment it rains, we get flooding.*" Jackie reports a nearby dyke frequently overflowing, with water cascading down the adjacent road and flooding the site. She speaks of her home becoming regularly flooded and struggling with constant dampness. This has led to deterioration in her health. "*I was never sick until I moved into this place*" (having previously lived in a flat). She now has asthma and COPD, and suffers from multiple chest infections each year, often requiring hospital admissions. She reports respiratory issues are very common in the community. A member of her family living on-site suffered from recurrent chest infections and died, less than one year old.

In addition to her physical health, her mental health has also suffered; anxiety of damage to her home and belongings, concern over her own and her family's health and wellbeing, and a recurrent issue with dead rats washing into the site at times of substantial flooding.

Jackie worries about the children on site. When the site becomes flooded, she is *"too afraid to let the kids out"* for fear of them drowning. She speaks of a family member living at a site in another part of the country which also suffered from severe flooding. Tragically, two of this family member's children drowned during a severe flood. Jackie lives in fear of this happening and is frustrated that adequate action has not been taken to prevent this. *"They're quick enough to take the kids off of you but when you write to them to tell them about an issue, nothing gets done. It's a danger waiting to happen."* In contrast, residents of other traveller sites report no issues with flooding at all, attributing this to having had adequate drainage solutions installed many years previously.

Jackie also reports issues with lack of lighting, leading the site to become excessively dark in winter months, exacerbating the danger of a flooded site. Additionally, there have been recent issues around visible sparks from damaged nearby electrical lines. She is concerned that this may get into the flood water. Overall, Jackie is acutely aware of the real impact of a changing climate and the impact this leads to in the local environment.

1.4. Vector-Borne Disease

Vector-borne diseases (VBDs) are caused by infections with parasites, viruses and bacteria which are transmitted to humans and animals by blood-feeding arthropods (vectors), such as mosquitoes, ticks, midges, sand-flies and fleas.[1]

Land use changes, including those intended to mitigate the effects of climate change and increase biodiversity, can create or destroy vector habitats, and urbanisation of rural greenspace or greening of cities can bring people into close or more frequent contact with vectors.

Weather and climate are drivers of tick and mosquito (the vectors which carry disease) presence, distribution and seasonality. Warmer temperatures are changing the geographical range and seasonal duration of vector activity leading. Weather and climate also affect the pathogens carried by these vectors, as well their habitats.

Tick Borne Disease

An increase in warming the UK has the potential to increase the distribution of several tick species of public health importance, including Ixodes ricinus, (the tick which can transmit Lyme disease (Lyme borreliosis)) and tick-borne encephalitis (TBE). Although the risk of TBE is currently very low, Lyme disease incidence is already increasing in the UK and there have been a small number of TBE detections in the UK since 2019. Increases in these 2 infections are the most likely emergent tick-borne risks in the UK.

Mosquito Borne Disease

Warming temperatures has the potential to introduce and establish invasive mosquito species in the UK, particularly Aedes albopictus (an aggressive daytime biting mosquito species that can transmit arboviruses of public health concern, including dengue, chikungunya and Zika).

Climate modelling suggests that the area around London already has a suitable climate for Ae. albopictus survival, and most of England will become suitable for its establishment by the 2040s and 2050s.

Climate change will also increase the risk of West Nile virus (WNV) in the UK (to date there have been no cases of this infection acquired in the UK). The virus is carried by Culex mosquitoes (including Culex modestus, which is now established in coastal parts of south-east England). Currently UK temperatures are too low for WNV transmission cycles to be established, projected warming will increase the risks of WNV outbreaks, with epidemics possible by the second half of the century and south-east England is the area most at risk.

Effect of wetlands on native mosquitoes[1]
The fenland habitats of Cambridgeshire at Woodwalton Fen typify UK mosquito diversity. The mosquito species diversity and abundance were studied to compare how 6 specific wetland types (wet woodland, fen and ditch habitat, reedbed, flooded grassland, grassland and pasture or arable farmland), all typical of lowland UK wetland habitats, contributed to varying diversity of mosquito species. This work highlighted the variability and focal nature of mosquito species diversity and abundance, as all these traps were placed in different parts of the same wetland system, at various stages from open grassland, through various (permanently and transiently flooded) wet habitats through to wet woodland. These species lay eggs in dry summer habitats subject to late summer rains, or human-directed flooding. All these species are notable nuisance biting species, and yet all are specifically responsive to extreme rainfall events, particularly after drought periods. The summer seasonality of the rest of the mosquitoes are dictated by temperatures. In general, many of the remaining species in permanent water habitats tend to occur at lower densities, likely kept in control by a raft of predators. This controlling factor, along with the decreased variability in water levels, reduces the opportunity for boom-and-bust densities, witnessed by the floodwater mosquito species

It is difficult to attribute changes in the distribution and abundance of VBDs directly to climate change. This is particularly challenging for tick-borne disease systems where climate can impact upon the vector directly, as well as indirectly affecting hosts, habitats and human behaviour. It is therefore difficult to ascertain linear relationships between increased temperature and cases of tick-borne infections, such as LB. The relationship is further complicated by human interventions in wildlife management and land-use practices, including those intended to mitigate the effects of climate change, as well as tick-borne infections that have transmission cycles involving wildlife hosts. Increased temperatures will undoubtedly impact on the survival ability of non-native ticks, such as Hy. marginatum, and interact in complex ways with emerging tick-borne viruses. For mosquito-borne diseases, there are available studies and data on climate predictions of non-native mosquito survival and abundance and the extrinsic incubation of viruses in mosquitoes. Very hot summers have been implicated in the transmission of mosquito-borne arbovirus outbreaks previously. Mosquitoes can quickly adapt to their surroundings and, provided humans continue to provide routes of dispersal into new areas, then warmer temperatures will continue to favour the establishment and spread of invasive mosquitoes.

Adaptation solutions, such as land use change for flood alleviation and water storage, are likely to impact upon native mosquito populations, and household water storage is likely to provide increased habitat for invasive mosquitoes. Furthermore, extreme weather events such as droughts and flooding are likely to impact upon mosquito populations, more so than tick populations

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1.5.Other health impacts

1.5.1.Wildfires

Wildfires are seasonal with grassfires occurring most commonly in the early spring (usually April), albeit small and short in duration, they are common in the UK. The 2022 summer heatwave, led to an unprecedented number of wildfires in urban locations, especially in and around London.[1]

The main components of wildfire smoke are particulate matter, and gases such as carbon dioxide, carbon monoxide, nitrogen oxides (NOX) and volatile organic compounds (VOCs) such as acrolein, formaldehyde and benzene.

They can lead to a range of health impacts, including injuries, respiratory and cardiovascular effects from smoke exposure, harmful mental health effects and can negatively impact health services. Exposure is also linked to negative impacts on both acute and chronic mental health conditions, including post-traumatic stress disorder (PTSD), anxiety, suicide, depression to more generalised feelings of stress, fear, and uncertainty both during and after fire-related disasters. However, the understanding of the mental health impacts of exposure to wildfire smoke is in its infancy and current evidence is inconsistent and limited.

A prolonged wildfire could have considerable adverse impacts on health services and demand, both during and after the event, including increased attendance at hospital and/or GP surgeries for health problems leading to an additional demand on health care, increased use of medication, and potential increased burdens on mental health services. Such impacts may require additional services and interventions to help mitigate and support these affected people. For example, the need for agile and responsive mental health services.

The predicted warmer and wetter winters may encourage plant growth and therefore provide fuel for wildfires when plants have dried out. Predicted warmer spring and autumn periods are likely to extend the fire season into late summer and autumn, and the hotter and drier summers could increase by two fold the number of days with very high fire danger and 3- to 4-fold by the 2080s. Such changes are expected to be most marked during the summer and in the South and East of England, but increases would be experienced across the UK.

The major health impacts of wildfires are short-term risk of harm due to the fire, medium-term increase in ambient air pollution, and longer-term impact on mental health. The health impacts of wildfires disproportionately impact certain groups of people. Older adults, those with physical or mental disability, or who otherwise have reduced mobility may be less able to participate in rapid evacuation and access urgent healthcare. Increases in air pollution particularly impact children, older adults, and people with co-morbid cardiorespiratory health conditions. The longer-term mental health impact of wildfires may affect each of these groups more, due to their increased short- and medium-term risk exposure. Physical and mental health

problems after a wildfire are often long-term with increased demand on mental health services at least 2 years post-wildfire events.
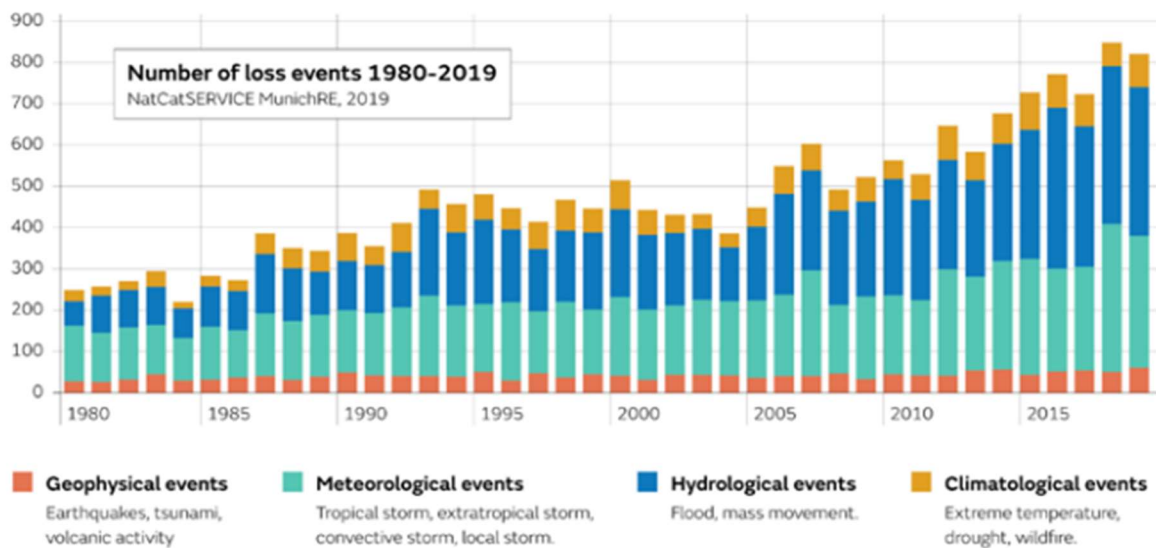
Wildfires also disproportionately affect people of lower socioeconomic status. This is already a potential issue in the UK, such as in Wales where the majority of wildfires occur in the South Wales Valleys, which are areas often with the lowest socio-economic status. Some of the causes of the disproportionate effects relate to those on lower incomes are less likely to have house insurance, less able to afford tree/garden maintenance. Research from the USA shows that lower socioeconomic neighbourhoods are more densely populated and often suffer from lack of resources, inadequate infrastructure and fewer options for evacuation or shelter during wildfires. Additionally, socio-economic disparities limit access to healthcare, leaving marginalised individuals more vulnerable to the health risks associated with air pollution.[8–10]

Not only do these communities live in neighbourhoods more vulnerable to air pollution, but also perform jobs with longer times outdoors, like bus drivers, construction and agricultural workers, that expose them more to polluting elements than others.[9]

Locally according to Cambridgeshire Fire and Rescue Extreme the 19th July 2022 was the busiest day on record. They sent fire engines to 139 incidents in a 24-hour period. At the peak, they used 24 appliances simultaneously whilst maintaining cover for further fire calls. their top 10 busiest days on record have all occurred over the last five years and all have been weather-related incidents, either hot weather or widespread flooding.

The Met Office highlights in their 2020 report the rise in the likelihood of extreme weather events and the frequency in which these events occur.[11] Wildfire risk Wildfires in the UK have been increasing in frequency over recent years and they could be five times more likely to occur by 2100. This is coupled with an increased likelihood that summers such as the ones we experienced in 2020 and 2022 will be every other year by 2050. This graph from Munich RE shows events causing loss are becoming more frequent. The changing climate will have a direct impact on the volume and intensity of emergencies experienced within Cambridgeshire.

Figure 5: Extreme events leading to loss, 1980-2019

Number of loss events 1980-2019
NatCatSERVICE MunichRE, 2019

Geophysical events
Earthquakes, tsunami, volcanic activity

Meteorological events
Tropical storm, extratropical storm, convective storm, local storm.

Hydrological events
Flood, mass movement.

Climatological events
Extreme temperature, drought, wildfire.

Source: Met Office[11]

UKHSA recommends:[1]

- Education and awareness raising for public health professionals as the role of public health and the wider health care system in helping manage the risk from wildfires is significant:
  - raising public awareness
  - strengthening the health service response
  - working with responders to get timely messages out to affected communities
  - working with land managers and planners to reduce the risk of fire
- Include wildfire risk in future spatial planning
- Public health guidance and climate adaptation strategies need to help communities prepare for, respond and recover from wildfires
- As wildfires can occur concurrently with other hazards such as heat and drought wildfire risk prevention is considered as part of an all-hazards approach.

1.5.2. Aeroallergens

Aeroallergens are airborne particles that cause or exacerbate allergic conditions, they include pollen and fungal spores. They commonly trigger hay fever and exacerbate asthma affecting about 11% of the UK population. Seasonal allergic rhinitis (AR) (more commonly referred to as hay fever) affects about 20% of people in the UK, with 10% to 15% of children and 26% of adults affected. The symptoms can negatively affect individuals' sleep, performance at school and work. In addition, AR has substantial financial costs to society.[1]

There is significant potential for a changing climate to shift the start-date, duration, and severity of the pollen seasons and therefore associated health risks as climate

change will impact the atmospheric transportation of pollen grains, including allergenic pollen from the continent.

This impact on pollens is likely to be mixed and will vary considerably across the UK for different species and the level of warming:

- In future decades, the first high pollen day is likely to occur earlier for alder, oak and grass pollen, while alder and birch pollen seasons are expected to continue to increase in severity in the Midlands and further north and west over the next 2 decades.
- Trees in the south and the east of the UK are likely to become stressed due to increased frequency and severity of heat and drought, this is expected to reduce pollen output and the duration of the pollen season.
- Grass and nettle family pollen seasons are not expected to increase or decrease over time. It is likely that pollen potency will increase, and this will enhance the season for hay fever sufferers in most years, although this may decline from the 2030s and with higher levels of warming.

The implications for health include:

- Earlier and prolonged pollen seasons may increase population exposure to airborne spores and extend the allergy season, with hay fever and allergy sufferers suffering symptoms earlier and for longer periods of the year. (These trends will be highly variable by region and species; therefore, aeroallergen forecasting, preparedness, and response will need to be highly localised).
- It's possible that where temperatures reach levels high enough to cause pollen-producing species to wither or die, it will result in reduced aeroallergen exposure resulting in fewer hay fever and allergy symptoms. This is most likely in the south and west regions of England and at higher levels of warming.

1.5.3. Food and Agriculture

The UK is already reliant on imports for a range of foods that align with a healthy diet. As the climate warms and impacts are felt, it is likely to mean that food imports and prices will be more volatile. This may further constrain consumption of healthy foods and prevent people from meeting dietary recommendations.[1]

Many healthy foods are associated with lower greenhouse gas emissions, e.g. red meat typically generates more greenhouse gas emissions than many plant-based foods, so there are substantial potential co-benefits to health from switching to a healthier diet.

Climate change is likely to lead to a disruption to the supply of foods required for a healthy diet due to effects on crop and livestock production through extreme weather events, reduced availability of ground and surface water, changes in soil quality and exposure to contaminants. This may give rise to risks to health due to the ability to consume a healthy diet.

Positive yield changes are projected for nuts and seeds, but there are declines for vegetables, starchy roots and legumes in some regions.

To meet the UK government dietary requirements by 2050, 52% of legumes and 47% of fruit would be imported from climate-vulnerable countries. Supply of vegetables, fruit and legumes is projected to fall short of what would be needed to meet UK dietary recommendations.

The UK's food supply appears to be relatively climate-stable albeit with a low level of self-sufficiency, particularly in relation to plant-based foods. However, dependence on climate-vulnerable food-producing countries is projected to increase in the future as more food is sourced from abroad resulting in potential shortfalls.

The UK reliance on imported food has increased, with nearly half of the UK's food imported, with greater reliance of imported food groups such as fruit and vegetables.

The UK's dependence on imported food is expected to continue to increase, particularly for some plant- based foods, unless domestic production is increased. In the event of limited supplies of healthy foods, there is a risk that that saturated fat, sugars and salt could make up a greater proportion of diets, adversely impacting the proportion of the UK population meeting the government dietary recommendations.

Figure 6: Simplified framework of climate change impacts on the UK food system
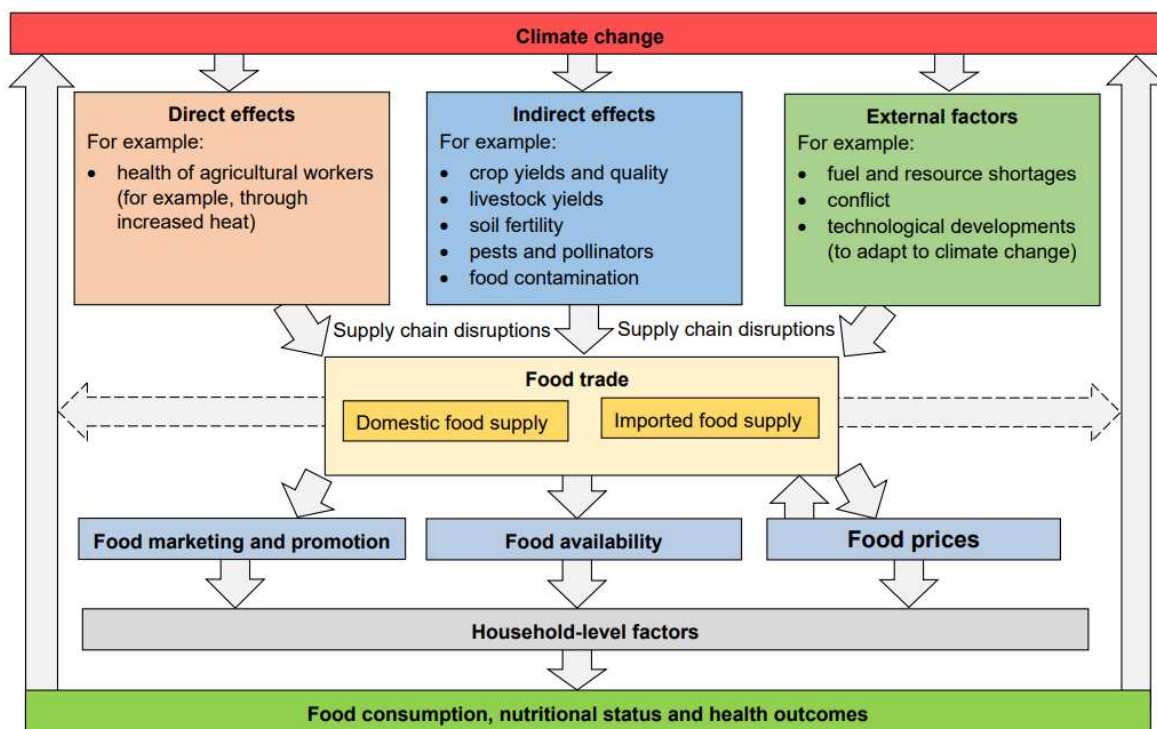
Source: UKHSA[1]

Promoting adherence to dietary recommendations will be important to improve resilience to climate change. Whilst not promoted in isolation of other measures, successful promotion of adherence to dietary guidelines combined with a

commitment to increasing domestic production of fruits and vegetables (including legumes) could be pivotal for food system transformations.

1.5.4. Drought

Health effects due to drought are harder to identify and are poorly understood. They can impact health directly as they may affect water quality and quantity, and compromise crop yields, with implications for food supply and nutrition. They can also influence VBD by influencing vector habitat.[1]

Drought has been linked to biodiversity loss, wildfires, increased concentrations of certain allergens and harmful mental health impacts (such as distress caused by loss of livelihood through damage to crops or livestock).

Many effects are indirect, and there is a delay in health impacts, which are also often compounded by other concurrent weather-related events e.g. heatwaves or wildfires. It is therefore difficult to quantitatively attribute morbidity and mortality specifically to drought.

The ICCC report concludes that the key climate change risks related to water supply facing the region is that the East of England is a water-stressed region, with growing water demand. With changes in the character of summer precipitation and increased summer temperatures, the region may experience seasonally lower river and aquifer levels than in past years.[2]

1.5.5. Solar Radiation

Solar radiation includes visible light, invisible light in the form of heat we feel from the sun (infrared), and ultraviolet radiation (UVR). Exposure to sunlight is required for vitamin D production which is necessary for healthy bones and immune system. Exposure to sunlight:[1]

- has positive effects on mental health,
- reduces the risk of myopia in schoolchildren and young adults
- can contribute to lower blood pressure.

However, over-exposure to UVR can lead to sunburn, premature skin aging and increased risk of skin cancers including non-melanoma skin cancers and malignant melanoma.

Although UVR can be impacted by ozone concentration, cloud cover and air pollution (all of which may be altered by climate change) the UV Index (a sunburn risk communication tool) has changed little and remained nearly constant since the 1920s.

The impact of climate change on sunlight exposure in the UK is difficult to predict since sunlight exposure is highly dependent on people's lifestyle, behaviour and age.

Demographics and behaviours are likely to be stronger drivers of health outcomes than climate change.

Improving public awareness of the risks and benefits of sun exposure is critical to protect health. Most of the current public health guidance and information is focused on sun protection, but there are increasing numbers of the UK population who do not receive enough sun exposure.

2. Climate change and the built environment

2.1. How can the built environment mitigate and adapt to the health impacts of climate change?

2.1.1. Role Of Local Authorities in Climate Change and Health Outcomes

Figure 7: Local authority control and influence over emissions and preparing for a changing climate

Key local authority powers and duties relate to:

- an overarching role to support the economic, health and social wellbeing of communities;
- planning powers over buildings and transport;
- enforcement of building regulations;
- powers to ensure that buildings meet basic energy efficiency standards;
- duties to prevent homelessness and prevent hazards in housing;
- duties to manage risks including climate change risks such as flooding;
- duties and powers to protect the environment, wildlife and heritage;
- duties to collect and dispose of waste;
- borrowing and investment powers.

Figure B1.3: How local authorities control and influence emissions

A. Direct control: buildings, operations, travel

B. Procurement and commissioning & commercialisation

C. Place Shaping: using powers to control development and transport

D. Showcasing: innovating, piloting, demonstrating and sharing good practice, scaling and replicating

E. Partnerships: leading, bringing people & organisations together, co-ordinating & supporting others; joining others' partnerships

F. Involving, Engaging & Communicating: translating global & national climate change targets for local relevance; with stakeholders to raise awareness, involving people & ideas for local solutions
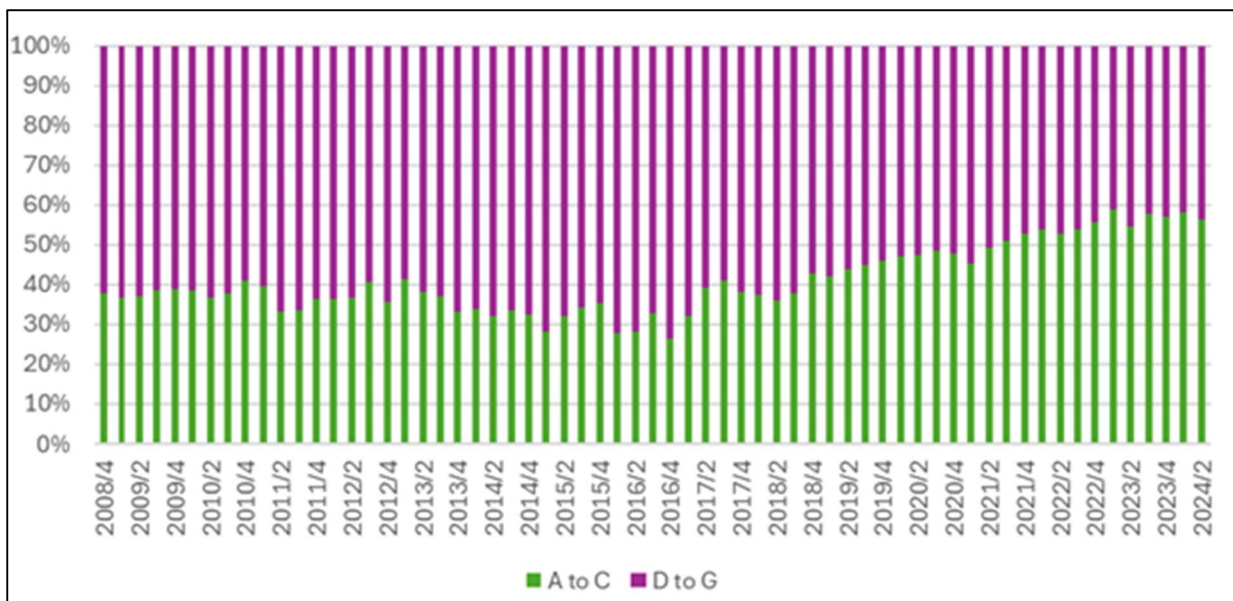
The ICC assessment confirms that there are significant co-benefits in these areas in addressing climate change and health, but they can be difficult to quantify.[2] Some measures can offset some, if not all, the costs of achieving emission reduction targets. However, the extent that these co-benefits accrue depends on how climate policies are designed and enacted. An expert advisory group to Cambridgeshire County Council on health issues advises that the biggest driver of health outcomes in the UK is economic inequality, therefore policies to reduce emissions and prepare for climate change embed fairness and do not place burdens on those least able to pay.

2.1.2. Housing stock variation – Energy Performance of Buildings Certificates

An Energy Performance Certificate (EPC) is a measure of a property's energy efficiency.[13] EPCs were introduced by the UK Government in 2008 and measure a building from A (very efficient) to G (inefficient). An EPC is valid for 10 years and is required whenever a building is bought, sold, or rented. It is a legal requirement that all rental properties score E or higher; a score of F or G mandates the landlord to either immediately improve the building's energy efficiency or to register a reasonable exemption prior to starting a new tenancy. Figure 8 shows the proportion of EPCs across Cambridgeshire and Peterborough scoring high (A-C) or low (D-G), 2008 to 2024. From 2008 to 2017, EPCs remained relatively constant. However, since 2017, there have been notable improvement in the proportion of EPCs scoring A-C.

Figure 8: EPCs across Cambridgeshire and Peterborough, 2008-2024

EPCs are one tool in monitoring the energy performance of buildings. EPCs can be cross-compared against other sources of data for more granular insight into home energy efficiencies. These other sources of data include the age of homes, heating systems and fuel used, ratings on the "decent homes" scale, complaints of poor housing conditions, and east and affordability to heat, cool, ventilate and keep a home free of damp and mould. This data could be used to highlight specific areas and types of homes most needing action to make them safe, comfortable and affordable to live in.

2.1.3. Healthy streets

A significant body of evidence exists regarding what makes a healthy street. Perhaps the most well-known in the UK is the 'Healthy Streets Approach', developed by Lucy Saunders and championed by the Mayor of London. The approach "puts people and their health at the centre of decisions about how public spaces are designed, managed, and used" based on 10 interrelated indicators that focus on the experience of people using streets.

These 10 indicators are:

- **People choose to walk and cycle**
- Everyone feels welcome
- Easy to cross
- People feel safe
- **Shade and shelter**
- Places to stop and rest
- **Not too noisy**
- Things to see and do
- **People feel relaxed**
- **Clean air**

With relation to Climate Change however the following points through 1 to 5 below are most relevant

1. **People choose to walk and cycle:** Walking, cycling, and using public transport should be the most attractive ways to travel as they are the healthiest modes of transport, for both individual and community. Active travel increases physical activity, resulting in improved physical and mental health for the individual, whilst reduced car use supports overall community health through improving air quality, reducing noise pollution, reducing road traffic accidents, and increasing opportunities to improve the beauty of the area through removing the need for large highways and parking. To encourage active and public transport, places should: be attractive; have wide enough pavements for pedestrians and wheelchairs to pass each other; have frequent, affordable buses, accessible bus stops, and bus lanes; limit the amount and speed of traffic; have segregated bike lanes and convenient,

secure bike parking; and implement driving disincentives such as parking charges.

2. **Not too noisy:** Motorised vehicles are a primary source of noise pollution in urban areas, which can be detrimental to the physical and mental health of users and residents. To combat this, places should: limit the amount and speed of driving; schedule times of waste collections and deliveries for less-sensitive times; and use road surfaces that minimise noise.

3. **Shade and shelter:** High winds, heavy rain, high temperatures, and sun exposure can have a significant effect on people's ability to travel actively, and can compromise the physical and mental health of those who still need or want to engage in active travel. To tackle this, places should: provide attractive shade that is easy to find, particularly in seating areas, e.g., trees; provide attractive rain shelters that are easy to find, e.g., awnings, bus stops; and minimise buildings that create unpleasant microclimates, e.g., urban heat island effect, Venturi effect.

4. **Clean air:** Improving air quality benefits the health of everyone in the area, particularly of deprived communities who are more exposed to air pollution. To improve air quality, places should: discourage car use through financial disincentives such as clean air zones and parking charges; discourage car use through physical disincentives such as pedestrianised zones, one way systems, and traffic calming measures; encourage active transport through providing bike lanes and secure cycle parking; incentivise the use of zero emissions vehicles where active 3 transport is not possible; incentivise consolidation of deliveries/waste collection at local businesses; deliver campaigns to discourage vehicle idling; and increase the number of trees and presence of other vegetation.

5. **People feel relaxed:** People are more likely to walk or cycle if they feel relaxed and find it enjoyable. To facilitate this, places should: be clean and well-maintained; be appropriately peaceful or lively to suit the area and population; limit the amount and speed of traffic; have wide pavements; be easy to navigate; and have adequate planting and drainage. When people feel relaxed

These two further points though not direct considerations are connected to one another and to future proofing for climate change.

- **Places to stop and rest**: A lack of resting places can limit the ability of some people to use the high street due to being unable to walk or stand for extended periods of times. To provide for these people, places should: provide seats every 200-500 metres that are in attractive areas away from the flow of pedestrians and are designed for the needs of all users, using materials that provide comfort at all times of year (i.e., low thermal conductivity).

- **People feel safe:** People will be less willing to walk, cycle, or use public transport if they feel unsafe on a street. To increase the safety of the area, places should: limit the amount and speed of traffic; segregate pedestrian and cycle routes from vehicles; have a visible police presence; have adequate street lighting; have no areas that are neglected; have buildings with windows

that overlook the pavement; have safe cycle parking; and be clean and free of litter.

In order to implement such changes to improve health across Cambridgeshire and Peterborough, it will be necessary to map out high streets across the region and rate each high street based on the presence of elements that support each of these Healthy Streets indicators. A healthy streets project is being undertaken at the moment. Using data tools such as the ArcGIS pavement mapping system and the Ordnance Survey High Streets and Green Space mapping tools, as well as Google Street View.

Other sources such as, findings from the World Health Organisation's Urban Planning for Resilience and Health may be taken into account in future placemaking to ensure that places are resilient to the changing climate and the hazardous weather events that this may bring.[15]

> *"Cities, resilience, environment and health, public health and its relationship with urban planning, risk governance, and the natural and built environment in cities have become more relevant than ever. Climate change, rapid and/or inadequately planned urbanization and environmental degradation have left many cities more vulnerable to disasters, many of which are triggered or associated with changing climate and environment conditions. The COVID-19 pandemic has highlighted for governments and citizens the links between health and urban environments – especially housing, public space, basic services and infrastructure, and transport. The recent United Nations Intergovernmental Panel on Climate Change report gives new urgency to both the need for preventive action and the requirement to prepare for increased frequency and significance of climate and related natural events."*

In addition, cities increasingly face local emergencies resulting from industrial accidents and system failures, indicating the high degree of interdependencies that especially large cities have. Inadequate planning has thus been recognized as a relevant disaster risk factor, affecting urban hazards, exposure and the level of vulnerability (UNDRR, 2021). Cities need to understand the features and processes that make them vulnerable to crises and environmental emergencies – and their associated health impacts – and to recognize the most effective policies and actions to reduce risk, be better prepared and become more resilient. The Protecting environments and health by building urban resilience project led by the European Centre for Environment and Health of the WHO Regional Office for Europe aims to support local authorities and decisionmakers to reflect on local preparedness needs and to build resilience.

The project team compiled evidence and local-level experiences and lessons learned related to:

- reducing health risks posed by local hazards from disasters and emergencies;
- mitigating local vulnerability to these hazards; and

- local priorities and actions for improving preparedness, resilience (and health) through urban planning and design, as well as urban infrastructure management.

The project's exploration of how cities can utilize urban and infrastructural interventions, available data and local indicators and assessments to reduce local disaster risks and increase preparedness and resilience is a contribution to urban resilience and local coping capacities. It is also a central component of the broader objective of sustainable, equitable and healthy urban development.

2.1.4. Association between climate change mitigation and health outcomes

Actions to reduce carbon emissions will benefit health by preventing some of the predicted adverse health impacts from climate change. These actions will also have other positive impacts on health or co-benefits.

Figure 9: Measures to help achieve net zero that have implications for human health
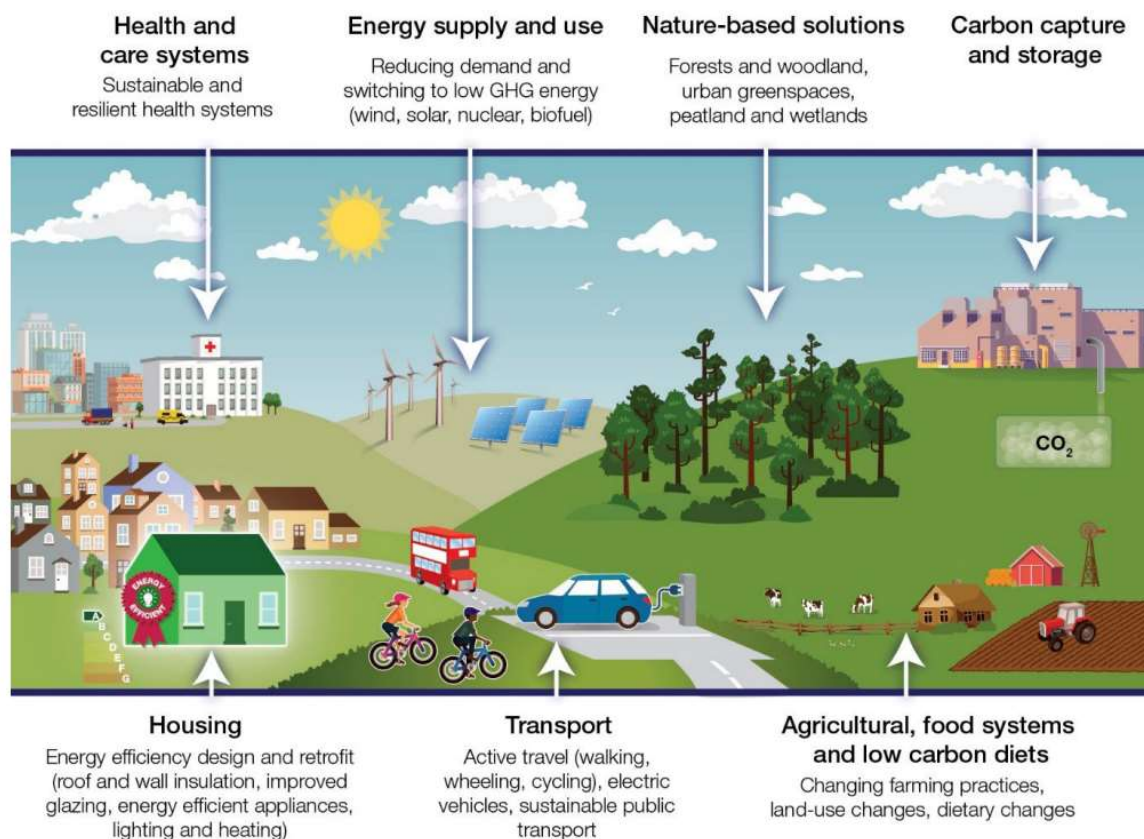
Source: UKHSA[1]

Transport is currently the largest contributing sector to UK Green House Gas emissions and is therefore a key area to focus decarbonisation actions. Actions to shift journeys from vehicles towards active travel (walking or cycling) can have major health co-benefits.

Active travel also has other co-benefits such as reducing ambient air pollution and improving physical and mental health. Moving from internal combustion engines to electric vehicles can benefit health by reducing exposure to vehicle exhaust air pollution (there will still be some particulate matter emissions from tyre and brake wear).

The UK housing stock is relatively poorly insulated compared to other countries in northern Europe, and improvements in thermal efficiency and airtightness could substantially reduce heating demand and GHG emissions. Improving thermal insulation could help reduce cold-related mortality and morbidity, but such improvements should be accompanied by adequate ventilation to avoid increasing build-up of indoor air pollutants or overheating in summertime. Interventions to upgrade the UK housing stock which are designed and implemented to integrate multiple health considerations represent one of the greatest opportunities for health co-benefits from decarbonisation.

The food sector currently contributes approximately one third of global GHG emissions. Reducing intake of foods with a high emission 'footprint' and increasing intake of plant-based foods will help reduce emissions and can be associated with nutritional health benefits.

Nature-based solutions e.g. expanding or creating new forests, building green roofs or walls, can help reduce temperatures and can have positive impacts on ecosystems, biodiversity and human health. Urban greenspace can provide a local cooling effect (offsetting the Urban Heat Island Effect), trees provide shade and can improve thermal comfort, as well as positively impacting health and well-being, particularly mental health.

The health and social care sector can make important contributions to decarbonisation:

- Vehicles could be switched to electric without impacting the delivery of care (there may be some operational challenges for vehicles such as ambulances that need to be operational at all times)
- Anaesthetic gases and inhalers are an important source of health sector emissions due to their widespread use and the types of gases used. Action to switch to low-carbon alternatives and reducing inappropriate prescribing and waste can also help reduce emissions

There may also be negative health impacts related to implementation of solutions infrastructure. For example:

- onshore wind power has been shown to reduce quality of life through noise annoyance and sleep disturbance for those who live close to turbines, however, these health risks are likely to be much lower than those associated with the burning of fossil fuels
- the promotion of EVs could be associated with social inequality, as they are more expensive to purchase

- eliminating nitric oxide (NO) from vehicle exhaust will be localised roadside increases in O3, from reduced consumption of O3 through chemical reaction with NO

In terms of costs and benefits of key policies, a reduction in air pollution following existing government policies and government net zero commitments could lead to total benefits of £383 billion (including value of life years gained, reduction in diseases, fewer hospital admissions, and improved productivity) between 2018 and 2134.

For active travellers, concentrations of air pollutants were often lower than those experienced by car commuters, but consideration should be given to provide options for walking and cycling routes separated from roads carrying motorised transport. This would also reduce the time waiting at busy road junctions, and would potentially reduce the risk of road accidents caused in a shared space between active travel and motorised transport.

Walking and cycling are the least carbon-intensive ways to travel. However, walking currently accounts for only 5% of the total distance travelled in England while journeys under 2 miles made up approximately 25% of all car trips in England, and journeys below 5 miles made up 49% of all trips in towns and cities in England in 2021. If those trips could be walked or cycled, it would help to reduce GHG emissions from cars, and promoting active travel can lead to increased road safety, thus developed travel plans should consider ways to ensure safe walking and cycling.

There is a large number of cold-related mortality and morbidity in the UK. The evidence suggests that energy efficiency and heating interventions that improve home warmth may improve the health of some population groups, especially those with existing respiratory and other chronic diseases, with benefits for disease symptoms, improved mental well-being, reduced health service contacts, and fewer days of absence from school and work. However, improved insulation levels may also have unintended consequences for health; in the absence of adequate purpose-provided ventilation, an increase in airtightness can result in greater accumulation of indoor-sourced air pollutants, including radon, volatile organic compounds (VOCs) and internally generated PM2.5

Increasing the density of trees in urban spaces could potentially lead to enhanced allergenic pollen loads if the tree species are not chosen carefully. Birch (Betula) is the main cause of tree pollen allergy in the UK, although other species contribute as well. Urban trees could have a negative impact on health by producing VOCs, which can contribute to forming ground-level Ozone.

Adaptation and net zero may be viewed as speaking to different areas (adaptation versus mitigation). As warming of 1.1°C has already occurred at the global mean scale, with 1.5°C over land, some effects of climate change will be unavoidable, and adaptation needs to be considered. The level of climate change that we will need to adapt to is dependent on how successful mitigation policies are. For protecting

health in the face of a changing climate, adaptation needs to be considered alongside mitigation, and should not be viewed as one or the other – it has been perceived that moving to adaptation may is seen a take emphasis away from mitigation, but this should not be the case, and both are important for protecting health. Therefore, it is important to identify and prioritise net zero actions that have adaptation benefits to maximise health co-benefits of actions.

The UKHSA Climate Change and Health report concludes that net zero health systems should seek to also strengthen resilience through adaptation where possible and reduce the environmental impact of healthcare by for example opting for low carbon treatments and technologies and use digital appointments to reduce staff and patient travel, where appropriate. The 'NHS Net Zero Building Standard' provides technical guidance to support the development of sustainable, resilient, and energy efficient buildings that meet the needs of patients now and in the future.

The health community can raise awareness of the significant health threats from climate change, and offer solutions informed by evidence to avoid the worst impacts and highlight the health opportunities of climate actions. As health professionals are some of the most trusted members of society, they may use every opportunity to talk to patients and their families about ways they can improve their health which also have a positive impact on the environment, such as active travel and changes in diet, using the Make Every Contact Count (MECC) approach, as highlighted in the 'Climate and health: applying All Our Health' guidelines 2022.

COP26 health programme commitments should be worked towards, including building sustainable, low carbon and resilient health systems, driving stronger domestic action to improve the resilience and sustainability of health and social care systems, raising the voice of health professionals as advocates for stronger ambition on climate change, and promoting stronger action-oriented adaptation and health research (for example through the Adaptation Research Alliance).

Table 2: Climate change mitigation strategies and their associated impacts and considerations for health

Climate Change mitigation	Health Outcome co-benefit	Local opportunity	Health consideration/unintended disbenefit	Mitigation strategy for disbenefit
Increases in active Travel	Reduces ambient air pollution, thus improving physical and mental health	Influence: • LCWIP • Local Plans • Active Travel investment	• Conflict between road users and cyclists/pedestrian • Exposure by cyclists/pedestrian to vehicle emissions	Provide options segregation of walking and cycling routes from motorised transport. (also reduces time waiting at road junctions, and would potentially reduce the risk of road accidents in shared spaces between active travel and motorised transport)

Improvements to thermal insulation in the Housing Stock	Reduction in cold related mortality and morbidity	TBC	Indoor pollution Overheating Increased risk of indoor viral transmission	Building in sufficient ventilation
Food and Diet	Reducing consumption of food with high emission footprint by increasing plant based food uptake gives nutritional health benefits	Implementation of the Health and Wellbeing & Integrated Care Strategy actions	N/A	N/A
Nature based solutions	Expanding or creating new forests, building green roofs or walls, can help reduce temperatures and can have positive impacts on human health.	Implementation of the Health and Wellbeing & Integrated Care Strategy actions	Increasing the density of trees in urban spaces could potentially lead to enhanced allergenic pollen loads if the tree species are not chosen carefully	N/A
Infrastructure – Renewable energy production	Increase in Energy from Renewable sources – less air pollution leading to improved respiratory health outcomes	TBC	Reduced quality of life through noise annoyance and sleep disturbance for those who live close to turbines	None - these health risks are likely to be much lower than those associated with the burning of fossil fuels.
Infrastructure – EV charging	promotion of EVs could be associated with social inequality – concentrating fossil fuel vehicles in less affordable areas	TBC	TBC	TBC

# 3.Sustainable healthcare

3.1.Healthcare and climate change

Around 3.5% of all road travel in England is related to the NHS and makes up 14% of NHS emissions.[16] Reducing these emissions will require:

- a combination of reducing unnecessary journeys
- enabling more active travel by patients and staff
- transition to zero emission vehicles

Many NHS vehicles can be switched to electric without impacting delivery of care, however ambulances which must be operational at all times are more challenging to convert with currently available zero-emission technology. COVID-19 rapidly accelerated the implementation of virtual wards and video consultations, which are generally associated with a much lower footprint since travel is not required. Digital care can also provide better access to patients with limited mobility or living in remote areas, but the full health, health equity and sustainability implications of the shift still needs to be evaluated.

The single largest contributor is the supply chain, on-site and point-of-use emission associated with medicines accounting for around 25% of total NHSE emissions. Major sources include anaesthetic gases and inhalers due to their widespread use and the high global warming potential of the gases used. To reduce emissions associated with medication, a combination of reducing the amount of medication prescribed, switching from high to low carbon alternatives and improvements in production and waste process is required. Low-carbon alternatives to anaesthetic gases exist and are clinically appropriate in many cases.

**Figure 10: Sources of carbon emissions by proportion of NHS England Carbon Footprint Plus**
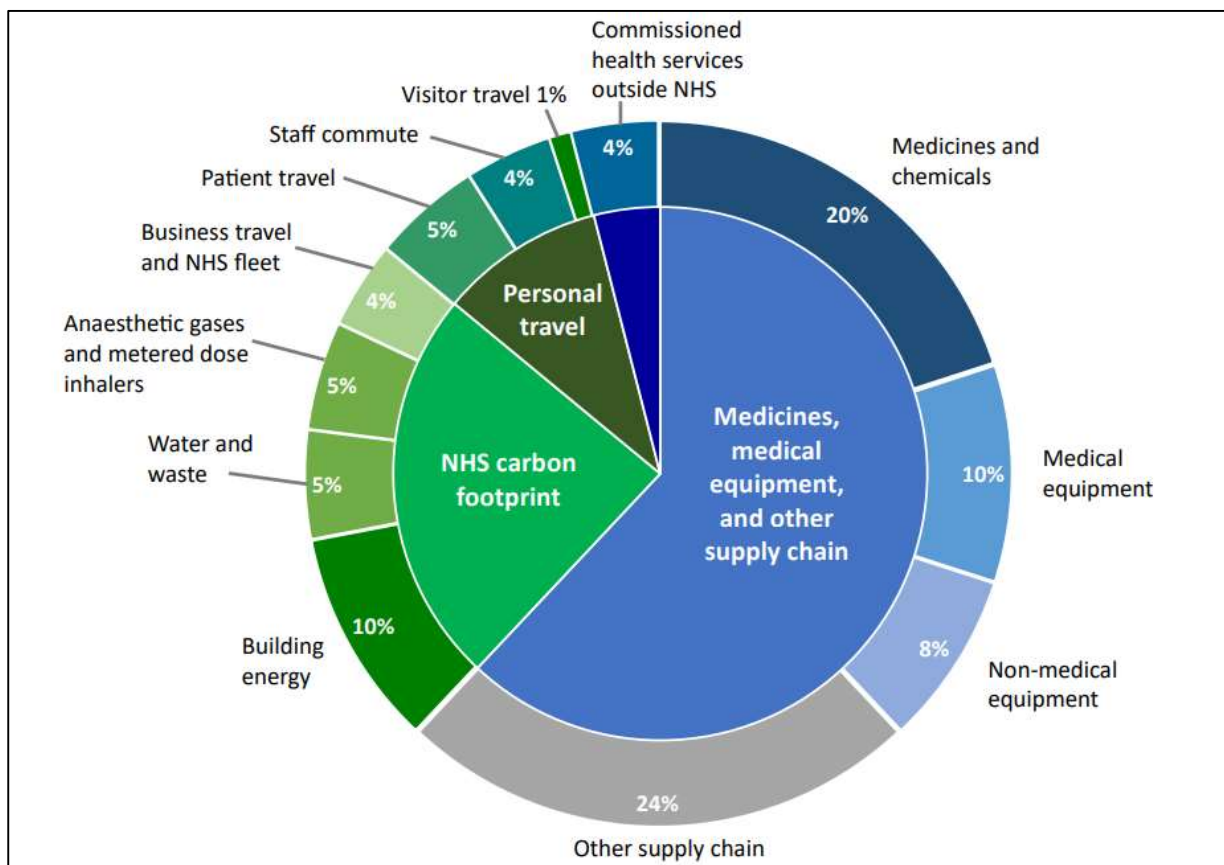
Source: NHS England[16]

3.2. Prevention as carbon footprint reduction

The most impactful way to reduce carbon emissions from healthcare services is reducing the need for those healthcare services. In the same way that reducing the purchase of plastic bottles is preferable to reducing plastic emissions through production processes and recycling, prevention of healthcare need is better than reducing carbon emissions associated with addressing need. For every person not requiring healthcare during a given episode, all emissions associated with this episode are avoided. In turn, lower carbon emissions lead to fewer health impacts of climate change, thus creating cycle of positive reinforcement (Figure 11). Switching

to "green health" prescribing using the established link between spending time in greenspace and health can reduce the need for traditional health care by tackling physical inactivity, mental health issues and health inequalities will help reduce carbon emissions.

Figure 11: Positive reinforcement cycle of prevention and sustainable healthcare
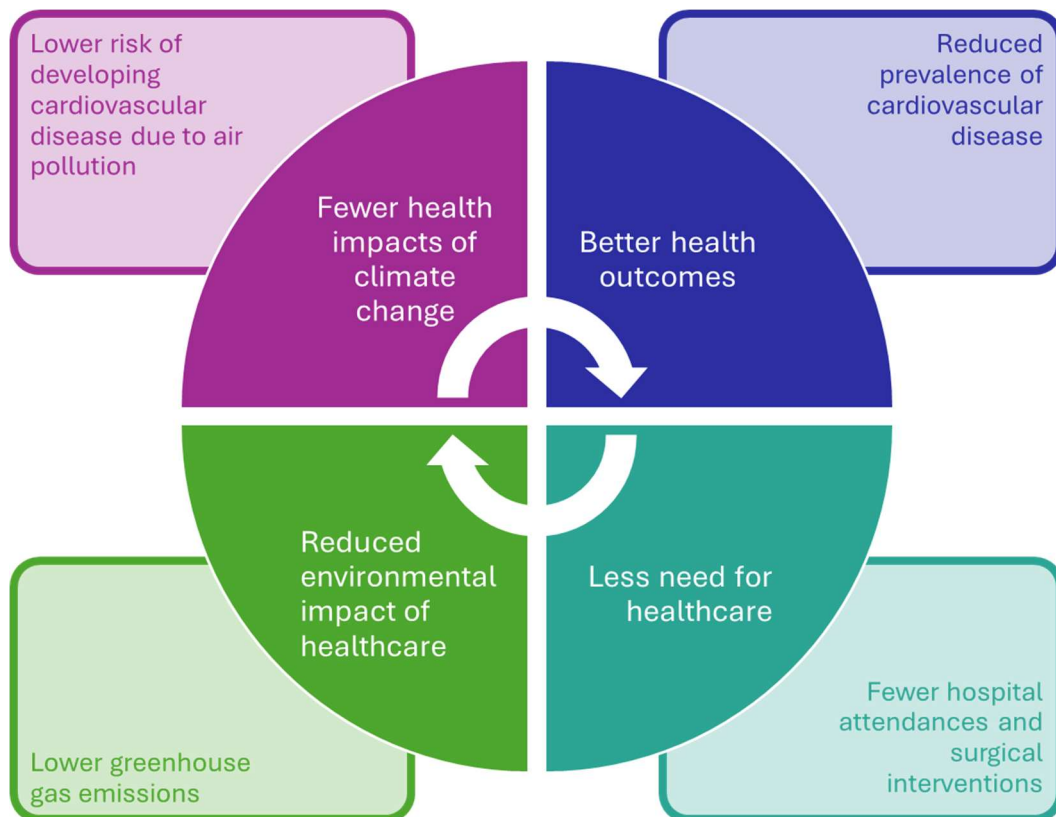
Carbon footprint reduction through preventative healthcare

Thistlemoor Medical Practice is a general practice in Peterborough, serving an inner-city population of close to 30,000. In 2023, data was used to identify the 400 highest intensity users, who on average attended A&E more than 20 times per year and GP clinic more than twice per week. These patients were contacted through text messages and phone calls and were offered 1-to-1 consultations aimed at prioritising their wellbeing. Patients received a supportive consultation with a clinician that resulted in a range of possible interventions including, referral to a social prescriber, stop smoking clinic, NHS health check, weight management services, health trainer, or provision of screening advice. Patients with social or financial issues were signposted to ancillary community service providers through appropriate channels. The programme achieved a reduction in A&E attendances of 30% and reduction in GP clinic attendances of 75%.

The Sustainable Healthcare Coalition carbon footprint calculator (May 2024 version) was applied to provide indicative estimates of the carbon emission avoidance with reduction in healthcare usage.[17] Modelled for a population of 290 patients over a 6 month period, this preventative healthcare led to a total

avoidance of 34.92 tonnes of CO_2 emissions, equivalent to 0.12 tonnes CO_2 emissions avoided per patient. The sources of emissions avoided were equally split between patient travel (33%), GP appointments (33%), and A&E attendances (34%). Although these calculations include many assumptions, they reflect the substantial carbon emission reduction that can be achieved through prevention.

4.One Health

4.1.What is One Health?

One Health is a multidisciplinary approach to improving health outcomes that recognises the interplay between human health, animal health, and environmental health. One Health seeks to identify and implement win-win-win solutions to complex problems at the human-animal-environment interface. The World Health Organisation identifies the following areas as of particular relevance to a One Health approach:[18]

- food safety
- control of zoonotic diseases (diseases that can be transmitted from animals to humans, such as Leptospirosis from rodents or Lyme disease from ticks)
- laboratory services
- neglected tropical diseases
- environmental health
- antimicrobial resistance (microorganisms such as bacteria, fungi, or viruses developing resistance to antimicrobial medicines, such as methicillin resistant staphylococcus aureus [MRSA] which can cause life-threatening infections)

In the UK, One Health has featured most prominently in work to combat antimicrobial resistance and infectious disease risks. In 2023, the UK Government published the Biological Security Strategy, aiming to improve preparedness for future pandemics, as well as mitigating risks from biological incidents and attacks.[19,20] This strategy emphasises a One Health and climate-focussed approach to biological security, especially around infectious diseases and antimicrobial resistance. Beyond the benefits to health, there is also emerging evidence at an international scale that a One Health approach also has cross-sector economic benefits.[21]

Despite a growing theoretical evidence base alongside national and international support, guidance on the practicalities of implementing a One Health approach in local settings is currently lacking.[21] However, in 2019 the British Veterinary Association published a report summarising a range of UK-based case studies exemplifying a One Health approach addressing a range of topics such as mental health and wellbeing, antimicrobial resistance, non-communicable diseases, among others.[22] One example described in this report is the MyPlace project, a partnership between the Wildlife Trust for Lancashire, Manchester and North Merseyside and Lancashire and South Cumbria NHS Foundation Trust. The MyPlace project uses social prescribing of local nature-based activities to support adults with low mental wellbeing.[23] An evaluation by the University of Essex found that 95% of participants

with low wellbeing scores at referral reported improvement by 6 weeks, with further improvement over an additional 6 weeks. This mental wellbeing improvement was statistically significant and was greatest for those with lowest wellbeing scores at the beginning of the programme.[24]

4.2. How can the local built environment support a One Health approach?

A One Health lens can be a useful tool to proactively consider the diverse and sometimes unintended impacts of built environment interventions. For example, planting of trees and expanding greenspace may mitigate warmer temperatures but could also drive up local housing prices, impacting affordability and exacerbating inequalities. Likewise, local blue spaces such as a village pond may provide benefits to locals' sense of tranquillity and mental wellbeing but could also serve as a reservoir for mosquitos, and thus increase risk of mosquito-borne diseases.[25] To consider the multi-faceted impacts of an interventions, diverse perspectives should be sought that cover human, animal, and environmental impacts.

One Health requires cross-disciplinary communication and collaboration, recognising system-wide strengths, weaknesses, opportunities, and threats. A 2018 review of One Health networks across Africa, Asia, and Europe found that almost a third lacked activities aiming to improve environmental health, focusing only on human and animal health. The review also identified that many One Health networks lacked clarity over monitoring and evaluation strategies, raising concerns around the logistical implementation of One Health principles.[26] Therefore, local One Health projects should seek to bring together diverse stakeholder perspectives covering human, animal, and environmental health with the aim of creating shared goals and initiatives, with robust accountability mechanisms.

5. Local climate change strategies/action plans

5.1. Cambridgeshire County Council

The Cambridgeshire County Council in recognition of the scale of this threat, through a unanimously supported motion declared a Climate and Environment Emergency in May 2019.

In 2021 the Joint Administration of the Council committed to putting climate change and biodiversity at the heart of the Council's work and to be more ambitious than ever before about the work needed to tackle the climate and environmental crises.

The Councils Climate Change and Environment Strategy 2022 acknowledges that Climate Change is a very real challenge for our communities, businesses and nature. The Council states that it is our responsibility to act now. We must: reduce the contribution the county is making towards Climate Change, improve our

resilience to the climate change that has already happened, and reduce our impact on the natural environment.

The strategy is made up of three key documents:
Part 1 - Climate Change and Environment Strategy 2022
Part 2 - Technical Report
Part 3 - Action Plan

The Council has also identified the contributions the Council and Cambridgeshire as a region make to greenhouse gas emissions and they are detailed in the Carbon footprint report.

The Councils priority areas are:
1. Communication and engagement with Businesses and our communities
2. New economic models and sustainable finance
3. Energy efficient, low carbon buildings
4. Low carbon transport – prioritising walking, cycling and public transport, and supporting the uptake of electric vehicles
5. Waste and Pollution - Reducing waste, minimising pollution, and rethinking how we deal with the waste we produce
6. Green spaces, restoring natural habitats and Beneficial land management
7. Peatland - developing understanding of the scale of the challenge and opportunities for management best practice
8. Water management, availability and flood risk, to improve water quality while improving resilience to flooding and droughts
9. Resilience of our services, Infrastructure and supporting vulnerable people

Why does the climate and environmental crisis matter for Cambridgeshire, and for the Council?
Impacts of inaction for people and health
- Damage to homes, assets & places
- Poorer health, either directly or indirectly through disruption, and issues like poor air quality
- Reduced food, energy and water security
- Fewer green spaces and natural environments for people to access and use
- Different communities will be able to cope differently with extreme weather events, Cambridgeshire is low lying, which can exacerbate economic, social and health inequalities
- Increased risk of severe flooding of homes and businesses
- Communities will be affected, and people will be permanently or temporarily displaced from their homes
- An increased burden placed on future generations to deal with the impact

Impacts of inaction on the economy
- Increased cost of living
- Damage to local infrastructure, buildings and assets
- Disrupted livelihoods from extreme weather events
- Higher future costs of adaptation

- Transport and industry disruption which result in supply chain issues and risks to food supply and higher costs due to scarcity
- Agricultural disruption/loss of valuable farmland to rising water levels
- Increased need for public services
- Lower economic growth, with impacts on areas like employment
- Poorer health and damage to infrastructure could mean disruption to employment and reduced productivity for businesses
- Civil unrest as living costs and access to resources reduce with greater wealth disparity

The Strategy outlines a number of actions, actions specifically relevant to health outcomes are:

38 Corporate Through our Public Health, Social Care and Emergency Planning recovery functions, find ways to help manage the impacts on vulnerable people of severe weather or temperatures, including care homes, to prevent the vulnerable in our communities becoming more susceptible to the impacts of climate change.

44 Natural Environment Work with the Local Nature Partnership on the 'Doubling Nature' project and Future Parks Project, and promote the benefits of blue/green infrastructure for their adaptation benefits to communities

52 Transport Work with the Districts, CPCA and GCP to improve air quality by: - Strengthening collaboration within existing partnerships to tackle air quality challenges - Developing a shared vision for air quality improvement approaches that maximise the air quality, carbon, and wider environmental benefits - Tackle poor air quality around schools, using Regulation 3 applications for new Schools, and through developing a pilot for a "no car zone" around a Cambridge School.

54 Lobbying
Collaborate with the Districts and CPCA to lobby government to:
- *To incorporate stronger mitigation, adaptation and natural capital requirements into building regulations and the National Planning Policy Frameworks.*
- *To ensure that all nationally significant infrastructure projects assess their climate impacts using both national and local carbon budgets*
- *Improve and extend initiatives and funding schemes for projects to deliver carbon reductions, air quality improvements, adaptation and natural capital improvements, shaping the format of these schemes to enable appropriate funding regimes that provide certainty and longevity to enable business investments*
- *develop and promote policies to ensure public transport and active transport is more competitive and attractive than the private car*
- *deliver improvements in legislation around riparian watercourses and drainage provision for new developments*
- *Enable Councils to collect a wider range of materials, especially those that are currently difficult to dispose of, through provision of funding for the additional costs of doing so*
- *To stimulate the development of UK based infrastructure to sort and reprocess waste to reduce reliance on overseas outlets.*

5.2.Peterborough City Council

In July 2019, Peterborough City Council declared a climate emergency. The Council has committed to make the council's activities net-zero carbon by 2030, and to also help Peterborough become a net-zero carbon city by 2030.

The Council recognises that reducing carbon emissions will bring a number of other vital benefits for the city including reducing fuel poverty, improving physical and mental health, improving air quality, stimulating our economy and providing jobs to the local area.

The Council has committed to:
- Make the council's activities net-zero carbon by 2030 and to support the city to achieve the same.
- Ensure political and chief officer leadership to embed this priority into work, ensuring all decisions are in line with net-zero carbon by 2030.
- Set up a Climate Change Partnership group proactively involving young people.
- Review budget proposals and ascertain environmental impact.
- Use planning powers to deliver net-zero carbon new developments and communities and increase tree planting.
- Achieve 100% clean energy across the council's full range of functions by 2030 and explore renewable generation and storage.
- Replace all council vehicles with low carbon vehicles including the mayor's car, provide electric vehicle infrastructure and encourage alternatives to private car use across the city.
- Increase the efficiency of buildings, which will help to address fuel poverty.
- Engage with residents, businesses and communities to raise awareness, share best practice and keep everyone updated.
- Call on the UK Government to provide the powers, resources and help with funding to make this possible, and ask local MPs to do likewise.

The Council Climate Change Action Plan details where the council's current emissions come from, incorporates existing plans to reduce emissions, and the areas to focus on to achieve targets.
The action plan outlines a number of actions, actions specifically relevant to health outcomes are:
14 Support and promote car sharing, active travel and use of public transport to staff and councillors.
25 Promote licences to cultivate. These allow local residents and community groups to tend to planted areas of council-owned land.

5.3. Cambridgeshire and Peterborough Combined Authority (CPCA)

The CPCAs action plan outlines a number of actions, actions which are specifically relevant to health outcomes are:

Reducing Inequalities
- *Residents supported to upgrade their homes heating and insulation through a £6.5m scheme starting in 2022, with extra support for those on low incomes*
- *Funding for at least 20 communities to take their own local action to reach Net Zero emissions*
- *Improving access to electric vehicle charging, with more public sites for when home charging isn't an option*
- *Growth in 'cleantech' jobs in the northern part of the region as businesses grow around the University of Peterborough*

Health and skills
- *Retrofitting care homes through a £2m project so they protect our most vulnerable residents from extreme weather*
- *Taking forward a green plan to make health and social care services climate resilient and improve health outcomes*
- *Funding new training and learning opportunities for the workforce for the changing economy*
- *£2.5m on nature schemes will improve local access to nature and greenspace*

Climate and nature
- *£1m fund to delivering nature-based solutions to climate problems (that also help restore biodiversity)*
- *Link climate action with local nature recovery*
- *£1.5m funding for local demonstration projects on biodiversity and chalk streams to show how different benefits can be combined*
- *An ambition for a 20% increase in biodiversity from new developments*

Innovation
- *Linking businesses with expertise on new climate-friendly technologies*
- *Helping local businesses develop the capacity to thrive in a low carbon economy*
- *Helping our agricultural sector adapt to the more variable and extreme weather*
- *Linking cleantech businesses with large organisations, such as the NHS, to drive local innovation*

Infrastructure
- *Putting plans in place to ensure our energy systems generate and deliver renewable energy*

- *More investment in a transport system that provides great walking, cycling, and low carbon public transport. Support the shift to electric vehicles*
- *Investing in new infrastructure to maintain water supplies and biodiversity*
- *Improving our flood resilience and helping local communities take action*

Finance
- *Setting up a decarbonisation fund to help businesses and residents make changes*
- *Establishing a nature fund to encourage more investment in nature-based solutions*
- *Help maximise take-up of available grants and support across Cambridgeshire and Peterborough*
- *Working with the finance sector to identify affordable ways to deliver climate action*

5.4. Integrated Care System (ICS)

The Cambridgeshire and Peterborough ICS Green Plan acknowledges that *there is now undisputed evidence of the impacts of climate change upon both the environment and human health. A range of organisations from The World Health Organisation (WHO) to the British Medical Association view climate change as the greatest threat to global health of the 21st century. The urgency to act on climate change is reflected in various pieces of guidance and legislation. The Paris Agreement 2015 has created a plan to avoid the dangerous impacts of climate change by limiting global warming to well below 2°C above pre-industrial levels. The UK's Climate Change Act 2008 (since amended in 2019), has established a national target to achieve net-zero carbon emissions by 2050. As the UK's largest public sector employer and contributor of approximately 4.4% of the nation's carbon emissions, the NHS has acknowledged its responsibility in this agenda.*

The organisation has committed to achieving a net-zero health service for its direct emissions by 2040, and for its indirect emissions by 2045 - five years earlier than the national target. As part of this commitment, NHS England and Improvement (NHSE&I) has made it mandatory for all Trusts and Integrated Care Systems (ICSs) to produce a board-approved Green Plan which establishes a sustainability strategy for the next three years. This Green Plan is the response of Cambridgeshire & Peterborough Integrated Care System (ICS) to this call, establishing a system-level strategy for sustainability. Firstly, it presents the ICS's system level carbon footprint data and outlines the System's commitment to sustainability. It then summarises the ICS Trusts' carbon hotspots and the sustainability strategies employed to address them. It also describes how we are building an integrated approach with local authorities, the Cambridgeshire & Peterborough Combined Authority (CPCA) and wider partners across C&P
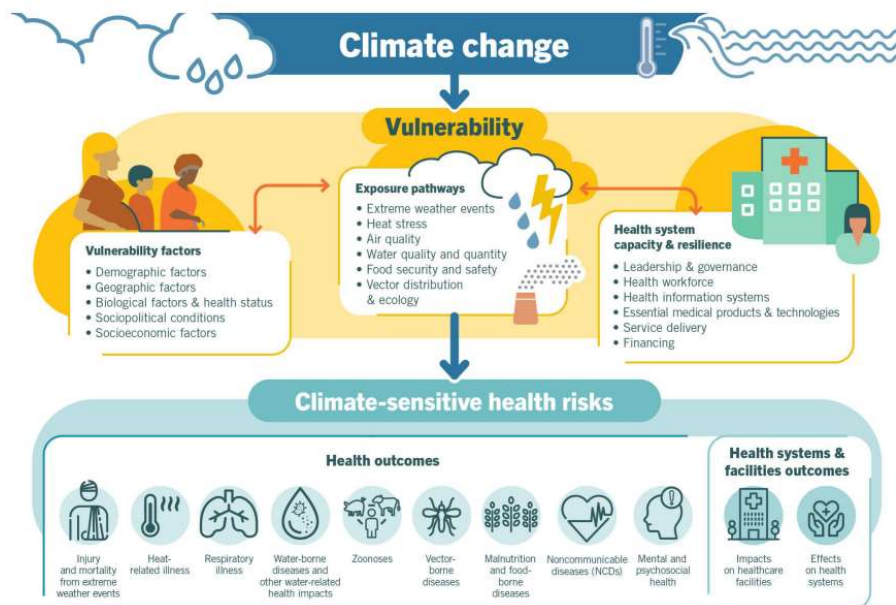
Fig: An overview of climate-sensitive health risks, their exposure pathways and vulnerability factors. (WHO: Climate change and health (who.int))

ICS Targets

In line with the series of national and local drivers outlined above, the Trusts of Cambridgeshire & Peterborough ICS will aim to achieve the following targets:

Carbon Reduction

- Achieve a 100% reduction of direct carbon dioxide equivalent (CO2e) emissions by 2040. A 47% reduction (from a 2019 baseline) will be achieved by 2032 at the latest.
- Achieve a 100% reduction of indirect CO2e emissions by 2045. An 73% reduction (from a 2019 baseline) will be achieved by 2039 at the latest.

Air Pollution (the impacts of air quality on health are covered in chapter 3)

- Convert 90% of the fleet to low, ultra-low and zero-emission vehicles by 2028.
- Cut air pollution emissions from business mileage and fleet by 20% by March 2024.

As an ICS, our goal is to put sustainability at the core of our strategies and decision-making, and to strengthen organisational approaches to carbon reduction, through collaborative working, at system level, sharing of best practice and adoption of innovation. We will be working with our partners to define success measures and a shared framework for tracking our progress against each of the green plan strategic objectives and workstreams.
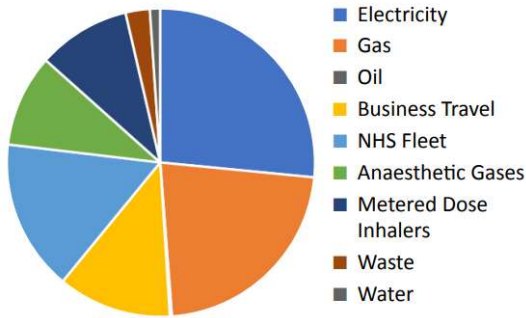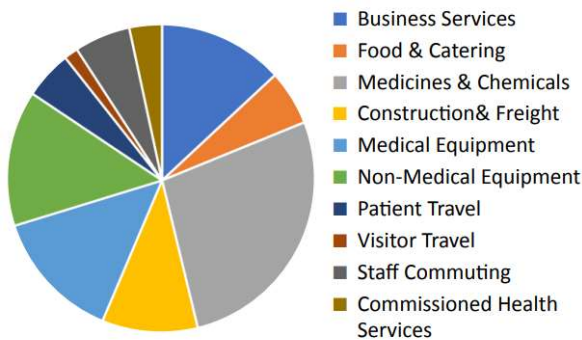
Figure 3: C&P ICS Carbon Footprint

- Electricity
- Gas
- Oil
- Business Travel
- NHS Fleet
- Anaesthetic Gases
- Metered Dose Inhalers
- Waste
- Water

Figure 4: C&P ICS Carbon Footprint Plus

- Business Services
- Food & Catering
- Medicines & Chemicals
- Construction& Freight
- Medical Equipment
- Non-Medical Equipment
- Patient Travel
- Visitor Travel
- Staff Commuting
- Commissioned Health Services

These graphs show Cambridgeshire & Peterborough ICS's Carbon Footprint (Figure 3) and Carbon Footprint Plus (Figure 4) emissions from 2019-20. The footprints are broken down into several categories, each of which is listed to the right of the graphs and represented by a colour.

The order by which these categories are listed corresponds to the order by which they appear in a clockwise sequence within the graphs. For example, in Figure 4, the first listed category of 'Electricity', represented by a medium blue, corresponds to the first wedge from the top of the graph. The second listed category of 'Gas' corresponds to the orange wedge as found in clockwise direction after the 'Electricity' wedge.

System Priorities		No.	Workstream	Vision	Strategic Objective
Circular Economy	Anchor Institution & Adaption	1	Workforce & Leadership	A knowledgeable and motivated workforce that understands sustainability and feels empowered to act on the issue in the workplace and independently.	Promote, increase awareness of and embed sustainability within the ICS through integrated training programmes, strategic processes, and voluntary opportunities.
		2	Estates & Facilities	An ICS that minimises its climate impact by decarbonising its built environment and being prepared for future extreme climatic events.	Construct and retrofit buildings to the latest standards and pursue renewable energy solutions through partnerships to maximise efficiency and resilience. Identify opportunities to provide green space and plant trees.
		3	Research & Innovation	An ICS with strong partnerships with business and academia to enable investment into and rollout of technologies and innovations.	Leverage the strengths of C&P innovation and research networks to help assess, test and implement innovative products and practices, that can support delivery of our green plan targets.
		4	Active & Sustainable Travel	A workforce and patient base that is inspired and incentivised to use sustainable modes of transport where possible.	Align with and promote an active and public travel strategy for staff and patients to reduce carbon emissions from travel and improve health.
		5	Supply Chain, Procurement & Waste	An ICS that drives emission reductions throughout the wider supply chain with a circular economy approach to procurement and waste.	Reduce emissions from the supply chain through the implementation of holistic procurement practices and more sustainable utilisation of consumables across healthcare service delivery
		6	Sustainable Models of Care	An ICS that adopts sustainable healthcare practices, minimises preventable ill health, and supports people to manage their health and wellbeing through person-centred care.	Create forums for knowledge sharing and best practice, optimising medicines prescribed, reducing the use of clinical gasses, maximising digital healthcare solutions, and promote personalised care, population health management and social prescribing.

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