

Heatwave Adaptation for Local Authorities Evidence Map



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Disclaimer

The information in this evidence map is designed to give readers an overview of the currently available research evidence on the topic in question. It is drawn from material accessible to KIT free of charge online and so only presents a sample of the available literature; this means that it may not be representative of the whole body of evidence on the topic. No critical appraisal or quality assessment of articles has been performed on the evidence included in this report

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Heatwave Adaptation

Public Health's Climate Change Working Group aim to identify adaptation and mitigation actions and interventions for consideration across the department, and for joint working with corporate climate change agendas.

Climate change has increased the frequency, intensity, and duration of heatwaves across the UK. Heatwaves pose a significant risk to health and wellbeing, particularly among vulnerable populations.

The Knowledge and Intelligence Team (KIT) were asked to undertake a literature search to inform possible adaptation measures/approaches the council might take to enhance resilience against future heatwaves, specifically looking at care homes and school settings.

This mapping review provides tables of evidence - summarising documents or quotes certain pertinent sections from key documents.

It should be noted that this evidence map may be almost instantly out of date in this rapidly evolving area of interest.

Mapping Review

The articles have been divided into 4 groups:

- **Local Action Plans**
These include guidance and examples of UK and abroad heatwave plans
- **Buildings**
Documents concerning heat waves and buildings; interventions and adaptations to reduce the impact of heat waves
- **Schools**
Technical documents are included but also those that stress passive cooling and behavioural measures to protect children from the impact of heat
- **Care Homes**
Elderly and vulnerable residents, but also the workforce, are vulnerable from excessive heat in residential and care homes. Documents and guidance on how to reduce the risks of hot weather

Who is this evidence map for?

This evidence map has been developed for the Public Health Climate Change working group, to consolidate key information on

Information about this evidence map

The materials used to produce this evidence map have been drawn from information sources available to KIT. No assessment of quality has been incorporated into the process of synthesis.



This evidence map includes:

- **Key Points** to note on the methodology applied to produce this map and its content.



This evidence map does not include:

- Critically appraised evidence
- A summary
- Recommendations

Further information about the methodology and content for this evidence map can be obtained on request by emailing:

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METHODOLOGY

The request was to find high level reports and government documents applicable to local government concerning heatwave response; this dictated the sources searched. The sources searched included:

- Databases – Medline; Embase; Cinahl; Cochrane; Greenfile; NHS Knowledge Hub
- Professional body/organisation websites – Royal Town Planning Institute; Town and Country Planning Association; Local Government Association (and LGiU); Building Research Establishment; Chartered Institute of Building Services Engineers; Housing LIN
- .gov.uk

Search terms used (with truncation for plurals): heatwave; heat wave; extreme heat; school; care home; nursing home; residential home

SUMMARY

The focus of this evidence map was to identify documents which either entirely, or in part, are informative to Local Authorities for their management of heatwaves.

There are some national, overarching documents which should be mentioned:

Published in June 2023 by the Local Government Association, [Accelerating adaptation action: councils preparing for climate](#)¹ change explores local authorities' preparedness for climate adaptation.

[The Adverse weather and health plan](#)² published by UKHSA in April 2023 is a progression from **The Heatwave Plan for England**³ (originally published in 2004, last updated 2022). This is a key national document and does detail local responsibilities:

6.1.3 Local delivery

It is the responsibility of each local area to ensure that preparedness and response plans are drawn up and tested. While not an exhaustive list, these responsibilities include:

- taking a system-wide, strategic approach to protect the health of their population, patients, clients, and workforce during adverse weather events (linking with structures including LRFs, LHRPS, ICSS and others), working together to deliver clearly defined plans that implement
- developing plans of action to reduce exposure to adverse indoor temperatures (either hot or cold)
- developing a specific and detailed plan for how they will protect the most vulnerable people in their local areas in the case of adverse weather events
- ensuring that health and social care providers, and their associated systems, have preparedness plans in place for a variety of adverse weather events
- delivering training and planning for professionals and staff across their services in response to adverse weather
- ensuring that their estates, facilities and other physical infrastructure are prepared for the impacts of a variety of adverse weather events, including:
 - o ensuring the wellbeing of patients, clients and their workforce in these settings Adverse Weather Health Plan
 - o ensuring that service delivery can continue in each of those adverse weather events
- developing a framework and plans for how voluntary, community and third sector organisations will meet all these requirements for the services that they deliver on behalf of health and social care commissioners or systems [Pg33/34]

The Plan is underpinned by guidance and supporting materials for heat, cold and flooding. Guidance contain cards provide support for professionals in specific settings:

- [Supporting vulnerable people before and during hot weather: social care managers, staff, and carers](#)³⁹

- [Supporting vulnerable people before and during hot weather: healthcare professionals](#)
- [Supporting vulnerable people before and during hot weather: people homeless and sleeping rough](#)
- [Looking after children and those in early years settings before and during hot weather: teachers and other educational professionals²⁹](#)

6.1.3.2 Local Authorities

Local authorities must undertake their own local planning, as well as contributing to and taking forward regional plans and other plans as part of LRFs, ICPs and other planning structures. Local authority county councils and unitary authorities are responsible for the delivery and management of adult and children's social care in their local area. As such, local authorities are responsible for developing plans to ensure that these services are resilient in the event of adverse weather that risks the delivery of these services, or the health and safety of their clients. This includes those that may provide services on their behalf. pg.35

Progress in adapting to climate change 2023 – Report to Parliament⁴ published by Climate Change Committee in March 2023 illustrates where progress has been made, but also where data is lacking, and plans and policies are currently falling short. Its sections concerning the Department for Education and care homes may be helpful and are included in those sections of this literature review.

An holistic article is Ollie Jay et al's **Reducing the health effects of hot weather and heat extremes: from personal cooling strategies to green cities⁵**. This considers the thermal environment at the landscape and urban, building, and individual scales, identifying sustainable opportunities to keep people cooler. The recommendations concerning care homes and schools are included in those sections of this summary.

EVIDENCE MAP

The tables below contain a summary of the findings/guidance from key documents identified by the literature search. There are 4 tables: Local heat actions plans, buildings, schools and care homes.

Local Heat Action Plans

Community-level adaptation is fully devolved; guidance comes from the UK Government but planning and actions typically take place at local authority level, often in collaboration with other national or local bodies. The Civil Contingencies Act (2004)⁶ is the legislative basis for the UK's resilience frameworks, setting out the basis for emergency preparedness and local arrangements for civil protection, including roles and responsibilities for local responders.

The table below includes documents which include UK or other countries' local heat action plans or actions.

Citation (year)	Article type	Summary of findings/ Document description/ Relevant excerpts
Climate change as a threat to health and well-being in Europe: focus on heat and infectious diseases (2022) ⁷	Report	<p>Has examples of heat action plans at sub-national level.</p> <p>Lisbon - the social care department of the municipality implements a contingency plan for homeless people whenever alerts for various extreme weather-related events are recorded (EEA, 2020a).</p> <p>Community solidarity and self-help – e.g. Paris holds a register of people vulnerable to heatwaves and encourages solidarity networks to ensure that neighbours look after each other during heatwaves. Similarly, in Bologna, Italy, volunteers and non-governmental organisations assist vulnerable individuals during heatwaves through a payment-free call centre, looking after people at risk and accompanying them to cooling centres or hospitals (ETC/CCA, 2018). pg.28</p> <p>Box 3.4 Examples of subnational heat action plans</p> <p>The city of Kassel in Germany provides the 'heat hotline parasol', a free service that, during the summer months, calls registered citizens to give them information about heat warnings from the German Weather Service and suggest ways to best deal with and adapt to higher temperatures and heat. The hotline provides support to elderly residents and their families in particular. The service is run by volunteers from the elderly committee and is coordinated by the health department of the Kassel region.</p> <p>The municipality of Botkyrka in Sweden experienced a heatwave in 2010 that affected the health and well-being of the residents of nursing homes. Since then, extensive efforts have been made in Botkyrka to reduce the health impacts of heatwaves. Staff of establishments for elderly people have been educated on heatwave threats, and procedures to follow. If necessary, additional staff can be mobilised to ensure further support for safe care. Botkyrka also supports actions aimed at improving indoor thermal comfort and creating 'cool spots' in various areas of the municipality.</p>

		<p>In Belgium, heat health action plans are triggered based on temperature forecasts in rural settings, which leads to an underestimation of heat stress in cities such as Antwerp where the urban heat island (UHI) effect causes twice as many heatwave days as in rural surroundings. A 5-day neighbourhood-level heatwave forecasting system was set up for Antwerp that takes into account the UHI effect. This efficiently targets help to vulnerable people (elderly and children) in locations where it is needed most. Furthermore, a web platform was developed by the city to issue heatwave warnings and advice on action to healthcare workers and other relevant stakeholders.</p> <p>When extremely hot weather is predicted in Tatabánya, Hungary, a heatwave and UV radiation protocol is set in motion. The Hungarian Meteorological Service and the National Public Health Office report warnings of heatwaves or high UV radiation to the local authorities. After that, citizens receive an alert in printed or electronic form, advice about preparing for the forecast heatwave and details of who to contact in case of health problems. A key aspect is that information reaches citizens rapidly and through different channels (local radio, television, the city's home page, social media). Instructions for citizens, public institutions, healthcare organisations and the media are updated every 30 minutes. [pg.28]</p>
<p>Evaluation of the Heatwave Plan for England (2019)⁸</p>	<p>Report</p>	<p>This document considered 5 case studies of local implementation of The Heatwave Plan. Case study sites were purposively selected to include a range of geography and demography, including a mix of urban, rural and regions of the country to account for temperature variation. Local authorities were also recruited to cover a range of potential heat-health risks, such as those attracting a high number of tourists, those engaging in outdoor recreational activities, those with the potential for large numbers engaged in outdoor activities (such as agriculture) and those with high numbers of older people. One London borough was also selected as London has been identified in the literature as a particular risk to health during heat waves. [pg.38]</p> <p>The document is informative about how the 5 case studies managed the following themes: Risk and risk perception; knowledge and perceived usefulness of the HWP; year-round planning and the wider aspects of public health; the alert system and local response to alerts; monitoring and feedback; and challenges to local implementation of the HWP. [pg.44]</p> <p>Some findings:</p> <ul style="list-style-type: none"> • Local case study interviewees suggested that heatwave planning was largely seen as an exercise in emergency preparedness rather than part of year-round public health and environmental planning. • The risk of harm from hot weather was assessed consistently as lower than the risk of harm from other weather-related hazards such as flooding and cold. • The alert system typically formed the backbone of the local implementation of the Plan, and the structure and operation of the alert system tended to be closely aligned to the structure and operation suggested in the national HWP. • Monitoring the effects of the alerts appeared to be routinely absent.

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Urban Heat: Developing the role of community groups in local climate resilience (2017)⁹	Report	<p>This project took place at a time when the heatwave planning and community resilience agendas were somewhat disconnected at the national policy level. The aim was to explore the potential for greater ‘community’, and more specifically, voluntary and community sector (VCS) involvement in local heatwave planning and community resilience. This document may be helpful for best practice in community engagement.</p>
Lambeth’s Heat Wave Action Card (2022)¹⁰	Article	<p>An example of a local heatwave action plan. It sets out various actions based on the heat wave alert level received from the Met Office, including links to UKHSA action Cards.</p>
Portsmouth and Southampton’s Heatwave Plan (2023)¹¹	Plan	<p>Portsmouth and Southampton City Councils joint heatwave plan</p>
Heatwave Planning Guide. Development of heatwave plans in local councils in Victoria (2009)¹²	Guide	<p>This Australian Heatwave Planning Guide is designed to assist local councils in addressing the risks associated with heatwaves at a community level. The guide includes: planning; partnerships; responsibilities of stakeholders; implementation; evaluation; communication.</p>
Institute for Sustainable Futures (Australia)¹³	Website	<p>Many useful links are available from the following page – https://www.uts.edu.au/isf/explore-research/climate-adaptation, e.g. <i>Uncovering community engagement networks for adaptation</i> - analysis of the way people within communities receive and share knowledge seeking to inform better community engagement with climate change adaptation policy. <i>Climate adapted bus shelters</i> - https://www.uts.edu.au/isf/explore-research/projects/climate-adapted-people-shelters</p>
In our hands: behaviour change for climate and environmental goals (2022)¹⁴	Report	<p>This report recognises that Local government is performing a range of roles and activities to deliver behaviour change to meet climate and environmental goals, including:</p> <ul style="list-style-type: none"> • promoting understanding by providing information and running communications campaigns; • organising and implementing specific behaviour change interventions using various levers including incentives; • providing infrastructure and setting rules for how it is used; • engaging residents, with one function of this being to ensure all voices are heard; • working in partnership with community groups, including through providing grants. [pg. 38] <p>However, none of the council examples of behaviour change initiatives concern heatwave adaptation. [pg.39]</p>

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<p>Public health and climate change: How are local authorities preparing for the health impacts of our changing climate? (2019)¹⁵</p>	<p>Article</p>	<p>The authors investigated the role of public health in adapting to climate change through: (i) a content analysis of local authority climate change adaptation strategies in South West England and (ii) semi-structured telephone interviews with local authority public health consultants and sustainability officers and a regional Public Health England representative (n = 11). Climate change adaptation strategies/action plans were identified for 9 of the 13 upper-tier local authorities in the South West. 10 documents from 9 local authorities were included with publication dates ranging from 2006 to 2018.</p> <p>The most commonly included general adaptation actions were to: raise awareness of climate change risks among the public/across the council (7/9) and provide strategic leadership (e.g. influencing cross-council discussions on business planning) (5/9). The most commonly included health-specific actions were: address health impacts of high temperatures (e.g. implementing the Heatwave Plan for England,¹¹ provision of shaded areas and drinking water in urban areas, influencing planning decisions) (5/9) and create a more resilient health system (e.g. improved risk assessment, emergency planning, provision of information and procurement) (5/9). This research makes the following recommendations for local authorities: Consider including health impacts of climate change within Joint Strategic Needs Assessments; Incorporate health impacts of climate change into local emergency planning risk assessments; Identify opportunities for collaboration between Public Health, Sustainability/Environmental and Planning departments. [Box 2, pg.430]</p>
<p>Severe Weather and Natural Hazards Framework (July 2022)¹⁶</p>	<p>Framework</p>	<p>A framework from The London Resilience Partnership. Part 2 – Hazard Specific Impact Information – Extreme Heat. pg.38/9 This table of impacts for Extreme Heat includes possible impacts on Local Authorities responsibilities:</p> <ul style="list-style-type: none"> • Particular concern for vulnerable residents and an increase in demand on frontline social care services. Care home settings to ensure support and monitoring is provided to residents, following health advice. Additional welfare support provided to homeless individuals. • Possible impacts to the road network – infrastructure and congestion requiring repairs, traffic management measures, etc. • Likely to be an increase in activity on / in watercourses such as the Thames by members of the public that could lead to an increase in river safety incidents. Especially if there is an increase in alcohol consumption. • Requirement to provide cool space locations throughout the borough to provide members of the public with a place in the shade out of the sun. <p>Annex 1 – Roles and Capabilities includes Local Authorities. It is a generic list referring to responsibilities for different weathers/hazards. [pg.60/1]</p>
<p>Adapting to climate change: A guide for local councils (2010)¹⁷</p>	<p>Guide</p>	<p>This paper highlights some of the ways that a local council can respond in practical terms to the main climate risks communities may face. The paper also considers opportunities. “This could, for example, be by changing ways of delivering services (e.g. making changes to grounds maintenance or types of planting or outdoor swimming facilities to cater for hotter summers).” [pg.13]</p>

		<p>The paper has top tips and encourages community involvement, and community level plans. Many of the case studies featured are relevant to flooding but some would be applicable to heatwaves also, e.g.</p> <ul style="list-style-type: none"> • Case Study 7: Gloucestershire Village Agent - Village Agents support people aged 50 plus living in rural areas of Gloucestershire, bridging the gap between the local community and the statutory or voluntary organisations able to offer help or support. [pg.39] • Case study 8: Emergency Self Help Plans - Nottinghamshire County Council, has employed a Community Resilience Officer who works within the emergency planning department with a clear remit to help communities identify opportunities to alleviate problems which might occur as a result of climate change.
<p>The Climate Crisis. A Guide for Local Authorities on Planning for Climate Change (2023)¹⁸</p>	<p>Guide</p>	<p>This guide is designed to inform the preparation of strategic and local development plans being prepared by local and combined authorities in the UK. The guide does not cover the full breadth of all the planning policy issues raised by climate change; it focuses on the broad approaches to handling carbon reduction and climate adaptation through the planning system.</p> <p>Principles and Good Practice with regard to overheating are covered on page 52.</p> <ul style="list-style-type: none"> • Urban areas will need significant redesign of the wider built environment to withstand rising temperatures. • Policy should focus on those communities most at risk and seek design solutions that do not impose additional energy costs for those on low incomes. • New buildings should be designed to maintain comfortable temperatures even in extreme heat, through consideration of orientation, shading, internal layout, solar reflection, fenestration, insulation, ventilation and use of features such as green roofs and walls. • Street tree planting and green infrastructure can help to mitigate the urban heat island effect and can deliver multiple other benefits. • Local planning policies should deter the use of cooling systems that further contribute to greenhouse gas emissions (through use of energy and refrigerants).
<p>Vulnerability to heatwaves and drought. Case studies of adaptation to climate change in south-west England (2011)¹⁹</p>	<p>Case studies</p>	<p>The research is informative, through interviews, of people's real-world experience of The Heatwave Plan at local level. The research suggests that a wider variety of departments across organisations need to be involved in heatwave planning and governance if it is to become more effective at identifying and protecting the most vulnerable people in society. In a local authority, this may include social services, housing, child protection, education, climate change and sustainability, spatial planning, emergency services and community groups. The Heatwave Plan may also need to engage other service providers more fully, such as care home staff, and voluntary and community organisations working with vulnerable groups. [pg.66]</p> <p>In conclusion it was found that the Heatwave Plan offers a clear structure for implementing response measures during a heatwave. However, staff in key agencies are not always able to identify or protect people who may be vulnerable to heat stress because of limited resources, the specific health focus of the plan, its 'emergency response' character, the</p>

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		complexities of identifying vulnerable people from a top-down perspective and a general lack of experience in operationalising the plan.
In conversation with Eleni Myrivili, Chief Heat Officer for the City of Athens (2023) ²⁰	Blog-article	<p>Athens' strategy is based around three key pillars- awareness, preparedness and redesign. Heatwaves are categorized and an algorithm has been created that identifies the correlation of heat and its characteristics to health risks and mortality.</p> <p><i>Preparedness</i></p> <p>short-term things that can be done to help people that are the most vulnerable to heat waves:</p> <ul style="list-style-type: none"> • program called "Help at Home" which supports vulnerable people in preparing for extreme heat. • a hotline and a website have been created for advice. The website includes information about the algorithm and is linked to the meteorological website that everyone uses in Athens. • Work with local organisations who support immigrants and refugees in the city to make sure they are receiving support, information and updates. Also working with schools and have set up a network of information dissemination through teachers and school administrators. • opened cooling stations across the city. <p><i>Redesign</i></p> <ul style="list-style-type: none"> • creating three green corridors with funding from the European Investment Bank, and pocket parks. • working with eight other municipalities to use wastewater from an aqueduct that has existed since antiquity to irrigate the new green space in the city. • sewer mining which is a container that can tap into sewage lines below green spaces and turns brown water into safe irrigation water. It is not very expensive and is mobile so can be moved between green spaces
Briefing: Councillors can support and help to build climate resilient communities (2021) ²¹	Briefing	This briefing details several of the challenges for adaptation, and examples of programmes that have been implemented for the major areas of responsibility for UK local authorities – corporate; adult social care; education and children's services; health; housing and planning; leisure and open spaces; transport; waste.
Extreme Heat (2022) ²²	Newsletter	This newsletter highlights initiatives by councils who are directing resources towards heat action plans and dedicated staff roles. Heat action plans can be used to coordinate emergency measures during heatwaves, such as using cool public buildings as heat shelters, alerting the community to health risks through multilingual campaigns, and encouraging residents to check in on their neighbours.

		Longer term mitigation is also essential, including through creating equitable green corridors in cities, developing sustainable planning guidelines, investing in cooler roofs, pavements and road surfaces, and supporting innovative projects such as climate-smart playgrounds and bus shelters.
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Buildings

There is literature concerning heatwaves and buildings in general, but just a few documents are mentioned here as the buildings focus for this review is schools and care homes. Passive cooling measures are advocated in preference to mechanical measures due to mechanical measure having negative climate effects.

Citation (year)	Article type	Summary of findings
Public health advice on preventing health effects of heat (2011) ²³	Guide	Some of the advice may have been updated since this guideline but there are useful chapters - <i>For health authorities, care home managers and employers: standards for occupational safety during heat-waves</i> [pg.23]; <i>For health authorities and city planners: interventions in the built environment for the protection of health from effects of heat</i> [pg.25]; <i>For health authorities: communicating "heat"</i> [pg. 28]
Climate change adaptation in buildings (2014) ²⁴	website	Guidance from the company NBS. Two documents are most relevant – Excess Heat (Parts One and Two). Excess Heat: Part Two (3/8) covers measures available to militate against the effects of overheating for new construction and existing buildings. In summary, shading and insulation measures need to be considered in tandem with energy efficiency, and care needs to be taken to avoid providing summer cooling at the expense of increasing winter heating costs, e.g. solar gain is a benefit in winter. In addition, the relative costs should be weighed against one another (capital costs versus costs in use – how long is the payback period going to be?), and environmental costs should also be considered. For example, active cooling units will not only offset any carbon savings made during the initial building's construction, but they also dump waste heat back into the external environment and can hence increase the urban heat island effect.
Risks to health, wellbeing and productivity from overheating in	Report	This document covers risks for people's health, well-being, and productivity, of overheating in buildings, and does mention risks and effects to pupils in education and older people. The report also covers solutions and has recommendations, chiefly for national government rather than local. There is a case study from Kent County Council (Box 6 - Example of cooling urban design), where they undertook a programme of work in Margate to reduce the risk of flooding and heat stress in an area which is susceptible to both. The project included the installation of sustainable drainage systems to manage water flow along the road, alongside

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buildings (2022) ²⁵		<p>conventional tree planting which provides canopy cover and mitigates against heat stress. The project was funded by EU Interreg funding and the Defra Urban Tree Challenge Fund. The project has demonstrated the importance of involving a range of local stakeholders in delivering a successful project. [pg.18]</p>
<p>KS16: How to Manage Overheating in Buildings (2010)²⁶</p>	<p>Guide</p>	<p><i>This publication can only be downloaded for free by a CIBSE member.</i></p> <p>This publication provides a practical introduction to the subject of overheating for building owners, managers, and users. It explains why overheating may be ‘uncomfortable’ and what factors can cause overheating in offices and other buildings. It also gives guidance on how to minimise the risk of overheating in existing buildings and provides information on practical measures that can be applied including those that provide occupants with the opportunity to reduce individual discomfort.</p> <p>The guidance in this publication is aimed primarily at non airconditioned office buildings, although parts of it could also be applied to air-conditioned offices. Much of the guidance can be applied to other building types with similar occupancy patterns, such as schools and retail buildings. It is also applicable to dwellings.</p>
<p>Global Heat Health Information Network²⁷</p>	<p>website</p>	<p>This website is of particular relevance for worker welfare in heat. There are links to several documents.</p> <p>Key points from the homepage:</p> <ul style="list-style-type: none"> • Heat stress can affect worker safety and health at considerably lower temperatures than for inactive people. • Heat stress impacts productivity and sectoral economies – especially in highly heat vulnerable regions. • For workers and businesses to be able to cope with heat stress, appropriate policies, technological investments and behavioural change are required. • Responses to heat stress in both indoor and outdoor sectors should include technological improvements, skills development, awareness raising and employment standards.
<p>Climate change as a threat to health and well-being in Europe: focus on heat and infectious diseases (2022)⁷</p>	<p>Report</p>	<p>This document contains sections relevant to schools and care homes.</p> <p><i>Urban greening</i> In Paris, the OASIS — 'Openness, Adaptation, Sensitisation, Innovation and Social Ties' programme greens school playgrounds and makes them accessible to local communities, reducing the risks to vulnerable people from heatwaves. The greening of school playgrounds is also done in Flemish Brabant, Belgium. [pg.31]</p> <p><i>Built environment interventions</i> Implementing interventions to reduce the temperatures in public buildings (such as schools or hospitals) that serve vulnerable groups is paramount, especially given the disproportionate exposure of these buildings to the UHI effect (see Section 3.3.2) and the small amount of green space usually available in their proximity (see Section 3.5.2). For example,</p>

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		<p>Bulgaria's national adaptation strategy is specifically aimed at adapting healthcare facilities. The German national adaptation strategy highlights the need to improve building insulation and introduce passive cooling systems in hospitals and other care facilities (see also Box 3.5). Similarly, the Maltese national adaptation strategy aims to safeguard nursing homes and healthcare facilities against higher temperatures and more frequent heatwaves (European Climate and Health Observatory, 2022a).</p>
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Schools

Some of the literature highlights the need for more data and evidence regarding overheating in schools in the UK. Much of the literature found suggests:

- using passive cooling measures e.g. shading, cool roofs, planting,
- involving school communities in the design and implementation of solutions,
- behavioral policies/actions e.g. allowing water bottles on desks, flexibility in school uniform

Other documents are more technical and aimed at architects, planners and building engineers.

Citation (year)	Article type	Summary of findings
Progress in adapting to climate change 2023 – Report to Parliament⁴	Report	<p>This report to parliament has the following updates concerning government initiatives concerning schools:</p> <ul style="list-style-type: none"> • There are some planned and ongoing data collection efforts regarding overheating in other buildings such as schools and prisons, but at present no regular annual monitoring is in place. • The Department for Education (DfE) has completed several wide-ranging pilot studies to help improve evidence. These include monitoring ventilation and temperature in a sample of new and existing schools that had been identified as being at risk of overheating. • The DfE is currently developing an approach to quantifying overheating risk to education services. Developing an indicator on lost education days each year due to extreme weather would be useful. [pg.239] • The DfE is collaborating with a range of partners to develop a climate risk assessment methodology for both flooding and overheating, which will model hazard, exposure and vulnerability specific to education services.
Cooling Schools: Experiences from C40's Cool Cities Network (2020)²⁸	Report	<p>This report provides recommendations and case studies from six cities that are implementing measures to cool their schools - Accra, Barcelona, London, Madrid, Paris and Rio de Janeiro.</p> <p>The recommendations from these cities are:</p> <ul style="list-style-type: none"> • Prioritise schools located in heat-vulnerable areas. • Ensure close collaboration between municipal or regional/national departments for successful planning and implementation of schools' climate adaptation projects. • Secure funding and assign clear roles and responsibilities to professional maintenance partners to keep green infrastructure in schoolyards alive. • Involve the whole school community in the design and implementation of the projects, including students, teachers, parents, neighbours and school staff. • Incorporate passive cooling for school buildings, like shading, cool roofs, wind circulation, green roofs and walls to save energy.

		<ul style="list-style-type: none"> • Promote nature-based solutions as they generate multi-benefits including for cognitive and social development, students' wellbeing, rainwater regulation and more, as well as reducing heat. • Favour low-tech, local, and natural materials for schoolyard designs, like wood, grass, and sand. • Piggyback onto school upgrade and funding opportunities that are already planned to include climate adaptation criteria. • Start with pilot projects that can then be scaled-up across schools city-wide.
<p>Reducing the health effects of hot weather and heat extremes: from personal cooling strategies to green cities (2021)⁵</p>	<p>Article</p>	<p>This paper describes opportunities for implementing more sustainable cooling strategies at the landscape and urban, building, and individual levels and summarises the benefits and limitations of each strategy.</p> <p>Recommended sustainable cooling strategies for schools:</p> <ul style="list-style-type: none"> • In playgrounds, shading ground materials and structures with trees and sails improves children's thermal comfort [79] and decreases surface temperatures; [80] adequate wind flow through appropriate landscape design supports sweat evaporation and evapotranspiration from grass and trees [81] • In classrooms, body cooling can be achieved by reducing radiant influx and improving convective airflow with fans; active hydration policies (e.g., allowing water bottles on desks throughout the day); water spray bottles for self-dousing can be effective but potentially impractical • Flexibility in school uniform dress codes (e.g., taking off ties, opening shirts) should be allowed
<p>Looking after children and those in early years settings during heatwaves: for teachers and professionals (2023)²⁹</p>	<p>Guide</p>	<p>Covers: health risks from heat (heat stress, heat exhaustion, heatstroke); actions to protect children suffering from heat illness; protecting children outdoors; protecting children indoors; school sun policy:</p> <p>Protecting children indoors</p> <ul style="list-style-type: none"> • if it is safe and appropriate, open windows early in the morning to allow stored heat to escape from the building • if possible, close windows during the day when it is hotter outside than inside whilst considering the need to maintain adequate ventilation and air quality • shade sun-facing windows if possible, and close indoor blinds or curtains to keep the heat out • switch off all electrical equipment, including computers, monitors and printers when not in use – do not leave equipment in 'standby mode' as this generates heat • if possible, use classrooms or other spaces which are less likely to overheat, and adjust the layout of teaching spaces to avoid direct sunlight on children • use oscillating mechanical fans to increase air movement if temperatures are below 35°C (above this temperature they may be counterproductive) • consider rearranging school start, finish, and play times to avoid teaching during very hot conditions • encourage children to eat normally and drink plenty of water

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BB 101: Ventilation, thermal comfort and indoor air quality 2018 ³⁰	Guide	<p>This document describes the factors that affect the indoor environment of schools, setting out the regulatory framework for ventilation in schools and gives recommended performance levels for compliance with UK regulations.</p> <p>The document also provides non-statutory guidance on how to design schools to achieve adequate performance for ventilation, indoor air quality and thermal comfort.</p>
How London Schools and Early Years Settings can Adapt to Climate Change (2020) ³¹	Guide	<p>This document explains the risks and effects of climate change for London schools, and provides management answers. The need for an integrated strategy combining appropriate physical design, equipment and facilities operation, and behavioral practices is promoted.</p> <p>The document contains case studies (some cautionary):</p> <p><i>Case study: overheating in new buildings</i> <i>A South West London primary school (school chose to remain anonymous) recently opened a new building, equipped with modern control systems and high levels of insulation and glass. Since its opening, the school has found that the new building overheats more regularly and severely than the old school buildings, and the new operational systems are much more complex and difficult to use than the simple systems they replaced. This experience is not uncommon in London schools. It is important to work with the project delivery team to ensure that potential unintended consequences are considered during the design stages as far as possible, and, as a school, insist that there is sufficient training of automated control systems during the handover period. [pg.24]</i></p>
Passive cooling strategies and honing them with dynamic simulation models (2022) ³²	Article	<p>A passive cooling article intended for architects which advocates performance modelling at the planning stage. The article includes a case study of a primary school.</p> <p><i>Case study – St Sophia’s Primary School, East Ayrshire</i></p> <p>The renovation of St Sophia’s Primary School with architect Hamson Barron Smith was one of the Pathfinder Projects for the ‘Net Zero Public Building Standard’. IES used the dynamic simulation modelling guide to predict the operation of the 1950s school building in order for it to become EnerPHit certified. This is a Passive House standard intended for refurbishments with more flexibility to accommodate common retrofitting challenges. East Ayrshire Council aimed for the refurbishment to achieve high operational energy performance in fabric design and high quality internal environments.</p> <p>Initial observations made during the dynamic simulation modelling revealed that classrooms now show temperatures below 25°C; an improvement from the original analysis. This takes into account the installation of louvred vents in four classrooms, leading to a free area of airflow of 34% when open, and opening any windows in those four classrooms would further benefit passive ventilation.</p>

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		Applying the modelling guide to the school's refit has identified a predicted 71% reduction in energy use each year and is informing the next stage of design to allow the school to reach EnerPHit status while maintaining comfortable summertime temperatures.
Guide to Climate-Smart Playgrounds: Research Findings and Application (2021) ³³	Report	<p>This report has two parts. Part 1 establishes the facts around heat in playgrounds, documenting surface, air and feels like temperatures in public playgrounds across the Cumberland Local Government Area (Australia). Part 2 describes the process, outputs and outcomes of a playground transformation at Memorial Park in Merrylands - Australia's first dedicated UV-smart Cool Playground.</p> <p>Play ground recommendations include:</p> <p>Prioritise interventions that mitigate heat and UV radiation, expand shade where it is absent, the most cost-effective and climateresponsible approach to improve playground microclimate is planting large canopy trees, void dark rubber softfall in unshaded playgrounds, Consider rubber softfall material, avoid synthetic turf in unshaded playgrounds, provide access to drinking water, educate parents and carers.</p>
Heat-Resilient Schoolyards: Relations Between Temperature, Shade, and Physical Activity of Children During Recess (2023) ³⁴	Article	<p>BACKGROUND: Extreme heat may discourage physical activity of children while shade may provide thermal comfort. The authors determined the associations between ambient temperature, shade, and moderate to vigorous physical activity (MVPA) of children during school recess.</p> <p>METHOD(S): Children aged 8-10 (n = 213) wore accelerometers and global positioning system monitors during recess at 3 school parks in Austin, Texas (September-November 2019). Weather data originated from 10 sensors per park. The authors calculated shade from imagery using a geographic information system (GIS) and time-matched physical activity, location, temperature, and shade data. The authors specified piecewise multilevel regression to assess relations between average temperature and percentage of recess time in MVPA and shade.</p> <p>RESULT(S): Temperature ranged 11C to 35C. Each 1C higher temperature was associated with a 0.7 percentage point lower time spent in MVPA, until 33C (91F) when the association changed to a 1.5 lower time (P < .01). Each 1C higher temperature was associated with a 0.3 percentage point higher time spent under shade, until 33C when the association changed to a 3.4 higher time (P < .001). At 33C or above, the direct association between shade and MVPA weakened (P < .05), with no interaction effect above 33 C (P > .05). Children at the park with the most tree canopy spent 6.0 percentage points more time in MVPA (P < .01).</p> <p>CONCLUSION(S): Children engage in less MVPA and seek shade during extreme heat and engage in more MVPA in green schoolyards. With climate change, schools should consider interventions (e.g., organizing shaded play, tree planting) to promote heat safe MVPA.</p>

Care Homes

Overheating in care homes is a risk to both staff working there in very physical jobs, and to aged residents who may be physically vulnerable, have medical conditions which make them at increased risk, or immobile/incapacitated and unable to do any self-cooling measures for themselves. The literature suggests:

- Building adaptations/design measures – sunshades protecting common rooms; heat-reflective glass; energy-efficient cooling and heating systems etc.
- Care of older people that takes account of their circumstances and age – e.g. water-saturated t-shirts; ice towels etc. reflecting their poorer sweating capability; identifying those most at risk and having individualized care plans
- Heat management plans and staff training
- Monitoring of overheating and regular inspection by the sector regulator
- Building regulations and standards for healthcare buildings that address overheating risk would ensure that new and refurbished buildings do not overheat
- Occupational health exposure standards should be developed to protect staff
- Behavioural/operational change – e.g. activity sessions at cooler times of the day;

Citation (year)	Article type	Summary of findings
Reducing the health effects of hot weather and heat extremes: from personal cooling strategies to green cities (2021) ⁵	Article	<p>This paper describes opportunities for implementing more sustainable cooling strategies at the landscape and urban, building, and individual levels and summarises the benefits and limitations of each strategy.</p> <p>Recommended sustainable cooling strategies for aged care homes:</p> <ul style="list-style-type: none"> • Installing rooftop sprinklers, outdoor sunshades protecting common rooms, and heat-reflective window glass, using evaporative coolers, and ensuring adequate natural ventilation, should be prioritised to reduce indoor temperatures • Application of ice towels, reducing clothing coverage, and wearing a cotton t-shirt saturated with water will provide effective body cooling • Fans should only be used with parallel self-dousing at air temperatures above 38°C due to lower sweat rates with advanced age.
Progress in adapting to climate change 2023 – Report to Parliament (2023) ⁴	Report	<p>Regarding health and social care this report has the following to say:</p> <p>Data is unavailable for:</p> <ul style="list-style-type: none"> • the extent to which health and social care services have been disrupted by heatwaves or flooding. • Health and social care facilities with passive cooling measures or flood protection measures, heat management plans, or effective adaptation plans in care homes. [pg265/6] <p>Numerous recommendations are made around health and social care [pg258/9], including:</p> <ul style="list-style-type: none"> • Regular monitoring of overheating, flooding incidences and air quality levels in health and social care settings is needed, which could be built into pre-existing reporting requirements.

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		<ul style="list-style-type: none"> • Building regulations and standards for healthcare buildings that address overheating risk would ensure that new and refurbished buildings do not overheat. • The readiness of health and care providers to manage overheating and other extreme weather should be regularly inspected by the sector regulator.
Heat and Preventable Deaths in the Health and Social care System (2019) ³⁵	Case study	<p>This study concluded that even with the then current heatwave plan, there was a major adaptation gap in the health and social care system. This study has identified additional adaptation options for health and social care organisations, identifying options from other countries that experience extreme heat more routinely. These offer a targeted set of possible options for reducing heat-related mortality in vulnerable groups and have high benefit to cost ratios - it is therefore recommended that further analysis of health and social care options/lessons from other countries would be beneficial. The study also highlights the need for greater early action to address heat and health risks in care homes and hospitals (to avoid lock-in), and action to start iterative adaptation planning for major heat extremes.</p> <p>addin</p>
Operational framework for building climate resilient health systems (2015) ³⁶	Report	<p>This document presents the World Health Organization (WHO) Operational framework for building climate resilient health systems.</p> <p><i>Table 3: Examples of climate-informed health interventions</i> <i>Extreme heat and thermal stress</i></p> <ul style="list-style-type: none"> • Establish occupational health exposure standards • Improve health facility design, energy efficient cooling and heating systems • Ensure public education to promote behaviour change, e.g. in relation to clothing, ventilation, etc. • Develop heat-health action plans, including early warning, public communication, and responses, such as cooling centres for high-risk populations. [pg.30]
Care home overheating audit project: the recommendations (2020) ³⁷	Report	<p>The Greater London Authority did a pilot audit study of one care home with the aim of developing a standardised audit process that would assist the overheating risk mitigation for older people residing in care home settings.</p> <p>The appendix contains a matrix of overheating measures and their evaluation across numerous measures (effectiveness, affordability, feasibility, disruption free, usability, energy demand, health and safety and visual amenity). [Pg.32]</p>
Supporting vulnerable people before and during hot weather:	Guide	<p>Guidance provides advice to people who are in the social care sector on how to reduce the risks of hot weather to health and wellbeing.</p> <p>You can reduce the risks associated with hot weather for those you care for by:</p>

<p>social care managers, staff, and carers (2023)³⁸</p>		<ul style="list-style-type: none"> • having a plan in place for individuals you are responsible for to keep them and the home cool • ensuring all social care staff are familiar with this guidance and your local plans before 1 June each year • knowing who is at higher risk of heat-related illnesses and how to reduce that risk • considering environmental changes that could reduce exposure to heat • ensuring those you care for drink plenty of fluids throughout the day and monitor for signs of dehydration • planning activities for times of the day when it is cooler such as the morning or evening • keeping those you care for out of the sun at the hottest time of the day between 11am and 3pm <p>Includes specific advice on preparing for hot weather, keeping the home environment cool, keeping the people you care for cool, preventing dehydration, protection from the sun and storage of medications.</p>
<p>Care Provision Fit for a Future Climate (2016)³⁹</p>	<p>Report</p>	<p>A plan of action is recommended (Figure 27), integrating both physical and behavioural/practice measures in existing care/extra care homes. Impact should be monitored as progress is made.</p> <p>Includes 4 case studies. Two studies looked at residential care homes and two at extra care schemes, spanning different building types, construction and age.</p> <p>Neither design nor ongoing management and care are deemed sufficient responses on their own -instead a holistic approach considering all these aspects is needed. An overarching need to improve resilience in the care sector is therefore to radically extend both awareness and understanding of heat-related risks for older people among all of those involved in the provision of care. Steps could include local site-specific heatwave plans, training programmes, and including heat-related health vulnerabilities in care plans.</p> <p>Measures that mitigate overheating risk or enhance resilience will need to be tailored to each building's construction and location, and each individual space's orientation and occupancy pattern. Consideration could be given to avoid locating residents with particular vulnerabilities in hotter rooms. Some measures like shutters may also require occupant interaction.</p> <p>Staff and resident training on how to adapt daily routines to support action on overheating can be implemented much sooner, and should include a focus on understanding and managing heating controls, and clarifying responsibilities to make adjustments when needed.</p> <p>The differentiation in recommendations between care and extra care settings is most apparent in management and care practice adaptation. One specific differentiation is in the capability of the occupant. In care homes, often less can be expected of the residents, and more intervention and understanding of conditions, health and impact of heat will be needed from the management and care staff.</p>
<p>Impact of extreme weather events and climate change</p>	<p>Article</p>	<p>The paper states "There is relatively little evidence on impacts of extreme heat in other facilities, such as care homes, though some case studies suggest problems associated with poorly adapted equipment, structural design and care practices^[2, 30], and lack of awareness among designers and managers regarding the need for heat</p>

[for health and social care systems](#) (2017)⁴⁰

management as well as avoiding risks of cold [31, 32]. More research is needed on the extent of such problems, especially since mortality risks during heatwaves are particularly high for older people in care homes [33–36].” [pg.2]

Addressing the need for more integrated planning and preparedness the paper has this:

Local government policies in place are not always effectively implemented on the ground [52, 54, 65, 128]. Sustainable care should be based on interdisciplinary research, co-production, mutualism and localism [129, 130] and local knowledge needs to be integrated more effectively with environmental science on risks such as flooding [4, 131]. Research reports effective approaches using local case studies [54, 132, 133, 106, 134]. Similar emphasis on integrated planning comes from the international literature [71]. In Canada, Critical Systems Heuristics (CSH) was helpful in engaging stakeholders and addressing issues of power relations between collaborating partners [135], and recent research has compared and reviewed reports of a variety of toolkits now available [136]. International literature also emphasises stakeholder engagement and locally adapted frameworks to access critical social infrastructure involving connectedness, collaboration and adaptive response. While our review was not internationally comprehensive, we note examples of research in Canada [131, 137], the USA [138, 139], the UK [120] and Australia [140], with calls for coordinated action to: reduce heat exposure; improve access to cooling; adapt the built environment; enhance surveillance and early warning systems and public awareness communications [141]. Reviews also emphasise the need for a greater attention to equity and inclusivity, drawing attention to the inequalities between socio-demographic groups in exposures to and impacts of extreme weather [142] and the increased care burdens that women are expected to undertake during disasters involving extreme weather events, that may be unsustainable [132]. Collective action at local level must pay attention to inclusive representation of subgroups within communities [143]. [pg28]

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