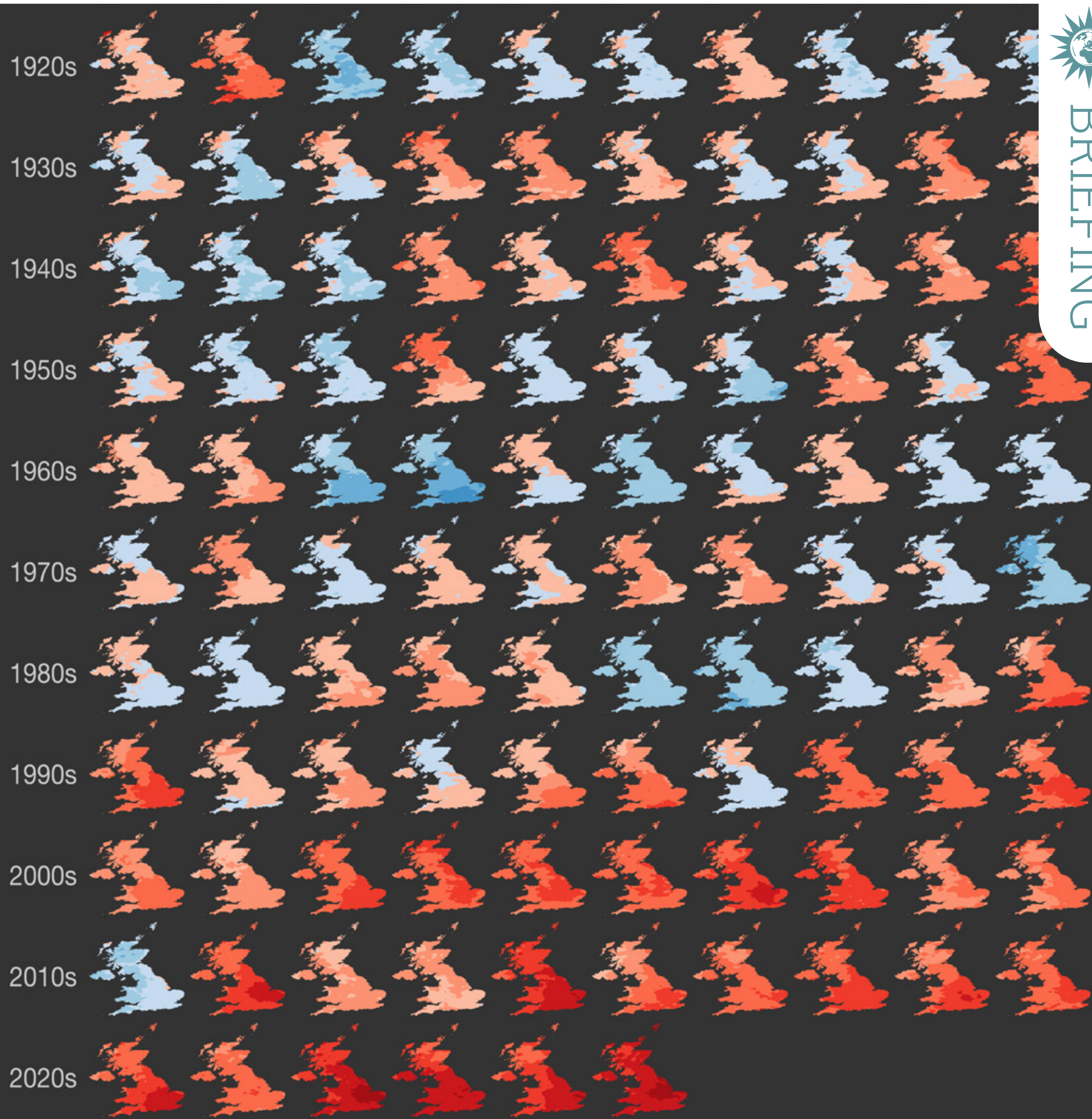
BRIEFING



environmental investigation agency

CLIMATE

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UK COOLING POLICY IN A WARMING WORLD

Aerial view of London in the summer 2022 heatwave.

EXECUTIVE SUMMARY

The UK is warming faster than the global average and is increasingly exposed to dangerous heat. More frequent and intense heatwaves are already causing thousands of excess deaths each year, while overheating affects a growing proportion of homes, workplaces and public buildings.

As the Climate Change Committee's Fourth Independent Assessment of UK Climate Risk makes clear, improving cooling is now essential for climate resilience and adaptation.

However, the UK lacks a coherent national approach to cooling. Existing policies addressing overheating, building design, public health and climate adaptation remain fragmented, while cooling has received limited attention within successive National Adaptation Programmes. Without intervention, rising temperatures are likely to drive a rapid expansion of air conditioning, increasing electricity demand, greenhouse gas emissions and social inequalities.

A National Cooling Action Plan which addresses both adaptation and mitigation is urgently needed. While active cooling will play an important role in protecting health, an overreliance on conventional air conditioning risks locking the UK into decades of additional emissions from energy use and fluorinated greenhouse gases (F-gases). The Climate Change Committee's recent emphasis on expanding cooling is not yet matched by clear ambition to accelerate the phase-out of hydrofluorocarbon (HFC) refrigerants, despite their significant contribution to climate change.

A sustainable cooling pathway is available. International experience demonstrates that cooling demand can be reduced through passive building design, climate-resilient urban planning, highly efficient equipment and a rapid transition away from HFC refrigerants towards natural refrigerant alternatives. These measures can simultaneously improve resilience, reduce emissions, lower energy costs and protect vulnerable communities.

The UK has committed to developing a National Cooling Action Plan under the Global Cooling Pledge and has a unique opportunity to align adaptation, net-zero and public health objectives. Rather than allowing air conditioning to become the default response to rising temperatures, the Government should develop a comprehensive and strategic National Cooling Action Plan which prioritises passive cooling, accelerates the transition away from fluorinated gases, supports workforce development and ensures equitable access to cooling.

Without a coordinated strategy, the UK risks replacing one climate challenge with another. With a strategy, it can build a cooler, healthier and more resilient future while remaining on track to meet its climate commitments.

EIA urges the UK Government to publish a National Cooling Action Plan which addresses five key priority objectives.

1. Address the equity gap – ensure cooling does not drive further fuel poverty

Cooling should be recognised as a public health and equity issue, with priority support for low-income households, older people and heat-vulnerable communities.

An overreliance on air-conditioning will create a 'cooling poverty' divide, with those who can afford it staying comfortable, while those that cannot suffering increased heat. The UK's strategy must seek to avoid furthering the equity gap in the UK and prioritise the protection of vulnerable people and communities, including ensuring access to cooling shelters and community cool spaces.

2. Avoid active cooling – reduce cooling demand through passive measures

New buildings should be required to incorporate passive cooling measures, while retrofit programmes must be accelerated for homes at risk of overheating. Urban greening, shading and nature-based cooling solutions should be expanded and reliance on air conditioning should not become the default adaptation response.

3. Reduce the impact of air-conditioning emissions, including F-gases

Where active cooling is needed, the UK needs to ensure that the most efficient F-gas-free equipment is used. The UK F-gas regulation must be urgently reviewed to accelerate the HFC phase-out, align with the EU framework and implement bans on F-gases in cooling equipment to ensure the transition to natural refrigerants. District cooling and integrated heating and cooling networks should be expanded, along with temperature management standards in commercial and public buildings.

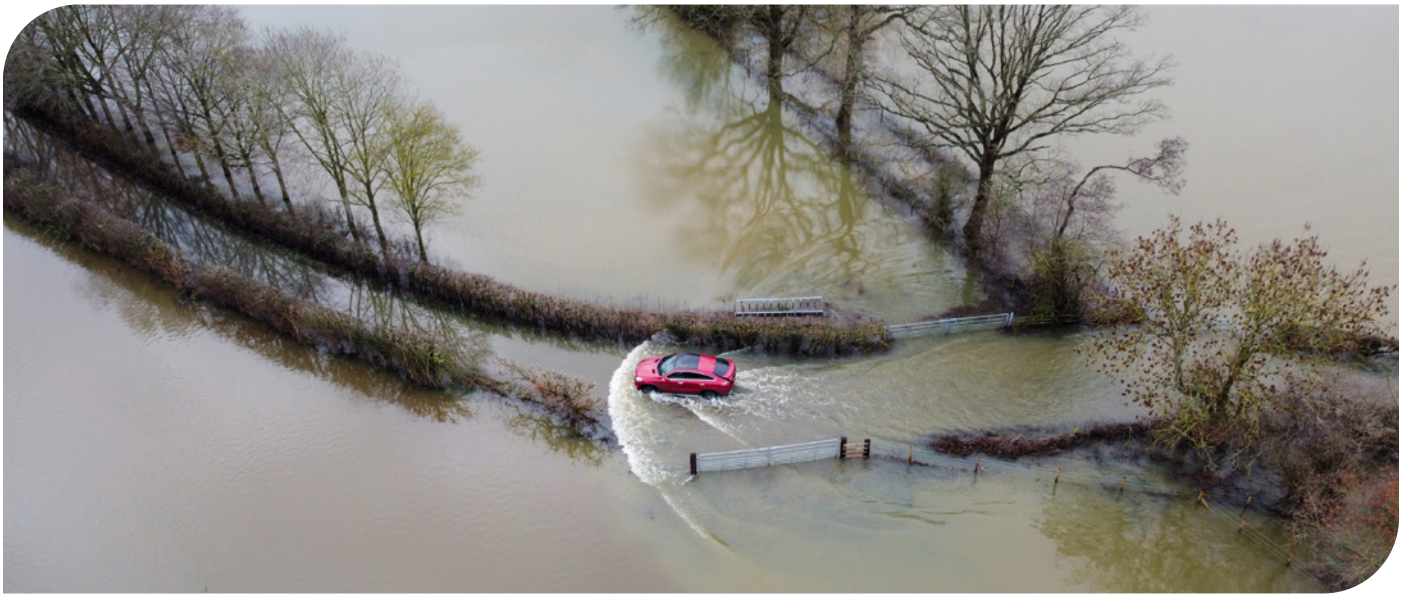
4. Prepare the workforce

A skilled workforce should be developed through mandatory training and certification for natural refrigerant technologies, alongside expanded programmes for cooling, heat pumps and passive design. This is essential to address existing labour shortages across the sector.

5. Enhance public awareness and behavioural change

Heat must be treated as a major public health risk, supported by stronger communication of risks and needs to adapt behaviour. Heat resilience should be embedded across workplaces, schools and community planning to improve preparedness and reduce harm.

Front cover: Temperature changes across the UK, based on Met Office data. **© Professor Ed Hawkins (National Centre for Atmospheric Science, University of Reading)**



INTRODUCTION

The UK has warmed by approximately 0.25°C per decade since the 1980s and is warming faster than the global average.[1] Last year, 2025, was the hottest on record, with more than 40,000 hectares burnt across the country in the most destructive wildfire season ever.[2] As climate change intensifies, scientists predict warmer, wetter winters and hotter, drier summers with more extreme weather events over all parts of the UK.[3]

This shift is occurring in a country whose buildings, institutions and public culture are largely unprepared for heat. UK homes have historically been designed to retain heat in winter, while largely neglecting summer cooling. As a result, more than half of homes already face overheating risks, rising to more than 90 per cent by 2050 under a 2°C warming scenario.[4]

The consequences are already visible. Recent European analyses highlight the UK as experiencing among the highest levels of heat-related mortality during extreme heat events, such as the 2022 heatwaves.[5] These impacts are exacerbated not only by physical vulnerability, but by social and behavioural factors – including a lack of public awareness of heat as a serious health risk and cultural norms which downplay or even celebrate hot weather.[6]

Without targeted policy intervention, the UK risks a rapid and unplanned expansion of active cooling, particularly air conditioning. This would drive higher energy demand, increase greenhouse gas (GHG) emissions and deepen social inequalities as access to cooling is uneven.[7] Cooling is not simply a matter of comfort; it is a public health, energy and social justice issue.

Given that people spend the majority of their time indoors, buildings represent a critical line of defence against extreme heat. Well-designed, climate-resilient buildings and urban environments can reduce heat exposure at low energy cost. However, vulnerability is not evenly distributed; lower-income households, often living in dense urban areas and poorly adapted housing, face greater exposure to overheating and have fewer resources to respond.[8]

Cooling plays a fundamental role in protecting people but is also critical for many other aspects of our lives. Cooling protects medicines and vaccines, reduces food waste through better cold chains and enables data centres and connectivity. The use of refrigerants also supports the transition to lower-carbon heating through heat pumps. In fact, cooling connects in some way with every single UN Sustainable Development Goal.[9]

In this context, the UK must urgently develop a coherent cooling strategy which prioritises passive design, protects vulnerable populations and avoids locking in high-emission cooling pathways, ensuring resilience in a warming world.

This briefing examines UK policy on climate change risk and cooling in the context of the UK Climate Change Committee's recently published Fourth Independent Assessment UK Climate Risk, A Well Adapted UK, and the Seventh Carbon Budget.

UK POLICY ON CLIMATE CHANGE RISK AND COOLING

Under the UK Climate Change Act (CCA 2008), every five years the Secretary of State must provide Parliament with an assessment of the risks to the UK of the current and predicted impact of climate change, taking into account the advice of the Climate Change Committee (CCC).[10] The assessment is the basis for the UK Government and the devolved administrations in Scotland, Wales and Northern Ireland to create National Adaptation Plans and Programmes.

The first UK Climate Change Risk Assessment (CCRA-1) was published in 2012 and identified heat risks, including health risks, overheating in homes, schools and hospitals, Urban Heat Island effects and the risk of higher energy demand from cooling.[11] Since this time, which included two further Government risk assessments (CCRA-2 in 2017 and CCRA-3 in 2022), a patchwork of policies, Government-led research and recommendations with implications for cooling have emerged. These include Heatwave Plans (which combined in 2023 with the Cold Weather Plans to become the Adverse Weather and Health Plan), revisions of Building Regulations (e.g. in 2021 to include passive cooling measures in new residential buildings) and the Heat and Buildings Strategy (2021).[12]

Heat risk was identified as one of eight priority risk areas in the third UK Climate Change Risk Assessment (CCRA-3) in 2022; however the Third National Adaptation Programme (NAP3), which set out the actions to adapt to the impacts of climate change from 2023-28 based on CCRA-3, largely ignored cooling.[13]

CCRA4-IA – the Fourth Independent Assessment of UK Climate Risk

In May 2026, the CCC published its fourth Independent Assessment of UK Climate Risk, *A Well-Adapted UK* (CCRA4-IA).[14] Released with the headline "*British way of life under threat from heat, flooding and drought*", the 823-page report sets out priority climate risks and quantitative targets for adaptation outcomes, with recommendations for Government action. Underpinning the report is the CCRA4-IA Technical Report, led by the Met Office,[15] as well as multiple projects focused on understanding cost-effective adaptation and supporting cross-cutting and economics work.[16]

The report is based on the need for the UK to prepare "at a minimum" for the weather extremes expected if global warming levels reaches 2°C above preindustrial levels by 2050, while not ruling out the potential for reaching 4°C by the end of the century.

Increasingly extreme and frequent heatwaves are identified as the greatest risk to health in the UK from climate change. Annual heat-related excess deaths in heatwave periods already range from 1,400-3,000 each year and are estimated to rise to 3,000-10,000 each year by 2050 in a 2°C scenario. Thus 'protecting from heat' is one of the three identified critical priorities, along with flood protection and a more secure water supply to address risks of extreme heat, flooding, drought and wildfires.[17]

To protect from heat, the CCRA4-IA recommends the Government to:

- invest in cooling for key public services, e.g. hospitals, schools, prisons and care homes
- set maximum temperature regulations for workplaces to protect workers' safety
- accelerate the uptake of cooling for the most vulnerable (e.g. low-income pensioners), building on existing incentive schemes.

While passive cooling measures are considered for new buildings, CCRA4-IA states that "we need to plan for more active cooling (such as air conditioning)" and seems to take for granted that "Households and businesses will and should increasingly install cooling for their own comfort and productivity."

Although the CCC urges that increases in active cooling must be aligned with the transition to low-carbon heating systems (e.g. heat pumps), the report fails to acknowledge the climate impact of a potential increase in the super pollutant fluorinated gases (F-gases) used as refrigerants in heat pumps and air-conditioning.[18]

Urban Heat Islands

The Urban Heat Island (UHI) effect makes urban areas much more susceptible to overheating than rural areas, primarily due to heat-absorbing materials such as concrete and the lack of vegetation and water bodies that provide cooling effects.

With rising temperatures, an ageing population and increasing urbanisation, UHI impacts are expected to worsen, causing a significant increase in the cooling load of buildings and encouraging more use of air-conditioning. Air conditioning moves heat from inside to the outside environment, thereby generating waste heat in the urban canopy, further exacerbating the UHI intensity.[19] Studies have also demonstrated that heat rejection from air conditioning systems can have a significant detrimental effect on building energy performance, which further contributes to energy poverty risks and climate change.[20]

Long-term mapping of surface temperatures between 2003-20 found that the centre of London could be up to 10°C warmer than surrounding rural areas.[21]

COOLING AND F-GASES

F-gases are potent fluorine-containing synthetic greenhouse gases which are used in a variety of industries. The most ubiquitous F-gases are hydrofluorocarbons (HFCs), which are used primarily as refrigerants in cooling applications. F-gases have global warming potential (GWP) hundreds or thousands of times worse than carbon dioxide, making their phase-out a vital component of net zero ambitions. Almost 80 per cent of F-gas emissions are due to leakage of HFCs from refrigeration, air-conditioning and heat pump equipment.[22]

The 2014 EU F-Gas Regulation, which passed into UK law after Brexit, requires a 79 per cent cut in the use of HFCs between 2015-30. By 2022, implementation of the legislation had reduced F-gas emissions by 49 per cent compared to 1990 levels, to 7.6 $MtCO_2e$, less than two per cent of UK emissions.[23]

However, the UK is now lagging behind its European neighbours. In 2024, the EU revised the F-Gas Regulation, legislating a complete phase-out of HFCs by 2050 and a suite of measures aimed at supporting implementation.[24] In the UK, however, despite an assessment report published in December 2022 and consultations in 2025, a recent proposal to reform the HFC phase-down schedule has been delayed to beyond 2027.[25] According to Defra, the UK intends to respond to the consultation with an outline of next steps later in 2026.

In its Seventh Carbon Budget, the CCC estimated that F-gas emissions need to be reduced by half by 2030 and 73 per cent by 2040, relative to 2022 levels.[26] Thus an acceleration of the HFC phase-out is needed now, at precisely the time the CCC is also advocating an increased uptake of active cooling. An unconstrained increase in air conditioning without clear measures to avoid the uptake of HFC-containing technologies risks the UK's climate targets and will lock-in systems that will increase global warming and extreme heat for decades to come.

Similarly, it is critical that the UK's efforts to decarbonise heating and adapt to climate change do not simultaneously lock in additional HFC consumption and emissions. While heat pumps were responsible for just six per cent of F-gas emissions in 2021,[27] the UK's Heat and Building Strategy aims to roll-out 600,000 hydronic heat pump systems per year by 2028.

An aligned strategy involving complementary demand reduction measures to support the transition to alternative sustainable refrigerants will be essential. There are low-GWP alternatives to HFCs for air-conditioning and heat pump applications – natural refrigerants (non-fluorinated refrigerants such as propane, carbon-dioxide and ammonia) which have been widely used in refrigeration and could be increasingly used in space cooling and heating.[28]

An ambitious revision of the UK's F-gas Regulation is therefore an urgent priority. In addition to an accelerated phase-out, the regulation must contain a comprehensive package of measures designed to ensure an effective and just transition to non-fluorinated alternatives to HFCs, extended producer responsibility, quota allocation fees and training and certification. This holistic approach is essential to ensuring effective delivery of F-gas emission reductions and would also result insignificant cost savings due to energy efficiency gains.[29]

Prohibitions on a broad range of cooling equipment containing F-gases will be critical to signpost the manufacturing industry and end users, driving green innovation and enabling timely investment decisions.

In the EU, this approach has resulted in numerous new propane models coming to the European market and an increase in market share of propane heat pumps from just three per cent in 2021 to 38 per cent in 2024, in anticipation of upcoming bans.[30] Matching EU bans would also support domestic manufacturing by aligning production with export markets.

Alternative refrigerants for clean cooling – HFOs are not a sustainable solution

The F-gas industry is heavily promoting synthetic hydrofluoroolefins (HFOs) as the next generation of 'climate-friendly' refrigerants. These fourth generation F-gases, which have low direct Global Warming Potentials (GWP), are used either as single component refrigerants (e.g. HFO-1234yf in mobile air-conditioning) or in refrigerant blends, where they are mixed with high-GWP refrigerants to produce lower-GWP alternatives (e.g. fluorochemical companies are heavily promoting 'low' or 'lower'-GWP options of R-452A (GWP 1952), R-449A (GWP 1280) and R-513A (GWP 573).[31]

However, while the direct GWPs of HFOs are low, their production is a source of emissions of ozone-depleting and/or high-GWP fluorinated gases, including CFCs, HCFCs and HFCs which are used as feedstocks or produced as unwanted by-products.[32] Some HFOs also form small amounts of similar climate-damaging and ozone-depleting substances when they break down in the atmosphere.[33]

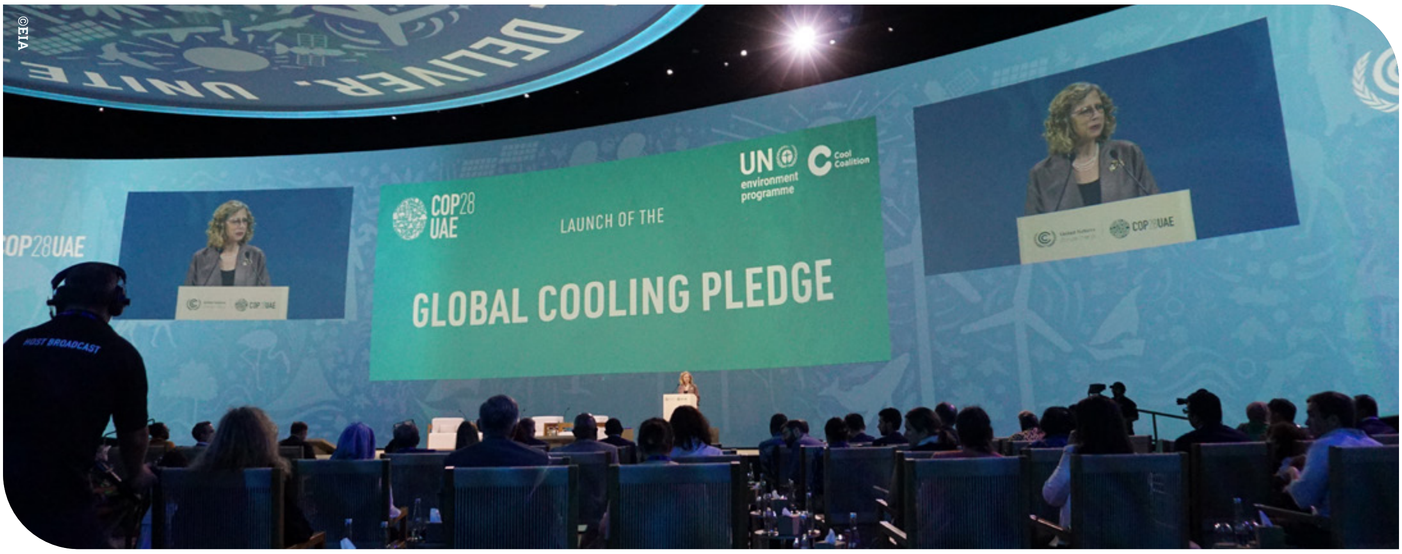
In addition, many HFOs are per- and polyfluoroalkyl substances (PFAS).[34] There is growing concern about the ultra-short chain PFAS trifluoroacetic acid (TFA), which is formed during the atmospheric breakdown of some F-gases, including many HFOs.[35] For example, HFO-1234yf is by far the most widely used HFO and degrades entirely into TFA. TFA is now found in increasing concentrations in our food, bodies, water and in remote locations such as the Arctic.[36] F-gases are already a major source of TFA in the environment and the transition from HFCs to HFOs is increasing the amount of TFA being formed from F-gases.[37]

TFA is very persistent and very mobile, meaning that once it is emitted it will remain in the environment for a very long time[38] and remediation is known to be technically challenging and very costly.[39] The impacts are TFA on people and ecosystems are not yet well understood: its toxicity at the levels seen in the environment appears to be low; however concentrations are increasing and there are many gaps in the evidence.[40] Worryingly, the European Chemical Agency (ECHA) recently concluded that TFA should be classified as toxic to reproduction (Category 1B).[41]

It is clear that HFOs are not a sustainable replacement for HFCs. Furthermore, they are typically the patented products of large multinational chemical companies, they are expensive and they are produced in only a small number of countries (mainly the US and China).[42]

In contrast, natural refrigerants, such as CO_2, hydrocarbons, ammonia and water, are sustainable and future-proof. Natural refrigerant systems are already available for many heating and cooling applications.[43] Indeed, as we decarbonise both cooling and heating, natural refrigerants have valuable properties which are well suited to the UK's climate. For example, a convenience store in Denmark has covered 100 per cent of its heating demand using waste heat from its CO_2 refrigeration system. Over two years of operation, the store exported 36 MWh of surplus heat to its city's district network.[44]

The UK should follow and strengthen the approach taken within the EU F-gas Regulation, setting prohibitions on all F-gases in new equipment at the earliest dates possible to avoid a phase-in of HFOs. The properties of natural refrigerants (such as flammability and toxicity) require a well-trained workforce to ensure that cooling equipment is installed correctly and can be safely used, therefore measures to ensure a well prepared workforce and updated safety standards will also be critical.



A SUSTAINABLE COOLING PATHWAY – THE 2025 GLOBAL COOLING WATCH REPORT

Globally, emissions from cooling reached 4.1 GtCO_2e in 2022, more than seven per cent of global GHG emissions. About one-third of the emissions are direct emissions from refrigerant leakage and two-thirds are indirect emissions from energy use.[45] As the world gets hotter, the global stock of cooling equipment is expected to triple by 2050 and emissions could reach 7.2 GtCO_2e.[46]

At the same time, more than one billion people face high risks from inadequate cooling, underscoring the urgent need for reliable, affordable and sustainable access to cooling, to protect health, livelihoods and food security.

A number of initiatives have emerged in response to this global crisis, including the UNEP Cool Coalition launched in 2019 and the Global Cooling Pledge at COP28 in 2023.[47] The Global Cooling Watch report is produced by UNEP to provide data and recommendations to track progress and guide action towards sustainable cooling.[48]

The Global Cooling Watch experts recognise that "*... societies cannot simply "air condition their way out" of escalating heat risks. Instead, adaptation and mitigation must be addressed together, with systemic approaches that integrate passive and active cooling solutions at the national and subnational levels.*"

According to the 2025 Global Cooling Watch report, "The free degrees: How sustainable, passive-first cooling can save lives, money and food", the 2050 cooling equipment stock could be cut by about 40 per cent and cooling-related emissions reduced to 2.6 Gt CO_2e, or 64 per cent below business-as-usual (BAU). Combined with rapid decarbonisation of the global power sector, remaining cooling emissions could fall to just 0.2 Gt CO_2e, or 97 per cent below BAU levels.

To achieve this, the report sets out a four-step process to guide design and implementation which will enable GHG emissions from cooling to be cut to near-zero in 2050, while at the same time increasing access to cooling and resulting in trillions in economic savings:

1) minimise cooling loads (e.g. through passive building design)

2) use low-energy cooling (e.g. through fans in place of air conditioning)

3) maximise the energy efficiency of new and existing equipment (e.g. through variable-speed compressors and improved control and maintenance)

4) implement a rapid phase-down of HFC refrigerants.[49]

The UK should use this moment to implement a similar joined-up strategy to establish sustainable pathways to cooling.

CONCLUSIONS AND RECOMMENDATIONS – THE NEED FOR A UK NATIONAL ACTION PLAN

As the UK rapidly warms, the UK Government must jointly address adaptation and mitigation, with a whole-of-government approach, in order to avoid unintended consequences and maximise opportunities.

Without such a strategic approach, air-conditioning running on HFC super pollutants will become the default solution for cooling in the UK, locking in massive additional direct and indirect greenhouse gas emissions, exacerbating current energy poverty and potentially creating a new 'cooling poverty' divide.

The UK was one of the first countries to sign up to the Global Cooling Pledge at COP28 but is yet to publish a National Cooling Action Plan, one of the pledge's major commitments which is required by 2026.[50] The Government has confirmed it is aiming publish a "cooling outlook document" in 2026, which it describes as a "consolidated view of cooling across sectors" and "a framework for bringing together existing relevant polices".[51]

However, as the UK rapidly warms, EIA is concerned that a 'framework' is unlikely to meet the urgent challenge of protecting the UK from heat while avoiding a costly surge in climate-wrecking air-conditioning. A comprehensive and strategic action plan is needed.

Key elements of a National Cooling Action Plan

As stated by the CCC, "The UK was built for a climate that no longer exists today and will be increasingly distant in years to come." The challenge is immense, but the upcoming CRAA-4, the revision of the F-gas Regulation and the UK's PFAS Plan[52] present a unique opportunity for the UK Government to develop a comprehensive cooling action plan which aligns UK resilience to climate change with the UK's ambitious net-zero commitments, while simultaneously preventing a surge in PFAS emissions from the uptake of HFOs.

There is a clear need for a whole-of-government approach and, in particular, enhanced coordination and communication between DESNZ, which leads on net-zero and climate resilience, and Defra, which leads on F-gases and PFAS, which are inextricably linked to the wider issue of cooling.

Following the avoid-improve-shift decarbonisation framework, EIA recommends that the following elements are included in the UK's national cooling action plan.

Address the equity gap – cooling as the new fuel poverty

An over-reliance on air-conditioning will create a 'cooling poverty' divide, with those who can afford it staying comfortable, while those who cannot, particularly in urban communities, suffering increased heat.[53] The UK's strategy must acknowledge this at the outset, seeking to avoid extending the equity gap in the UK and prioritising the protection of vulnerable people and communities.[54] The UK should protect people by setting maximum temperatures in schools, hospitals, workplaces and other public buildings. Access to cooling shelters and community cool spaces should be expanded, ensuring adaptation policies do not exacerbate inequality.

Avoid active cooling – reduce cooling demand through passive measures

Through passive design and retrofitting, buildings and other infrastructure can be designed to reduce cooling demand, for example, through external shading, cool roofs, solar control glass and increased ventilation.[55] The Government should ban or restrict unitary air-conditioning in new builds and ensure passive cooling measures are prioritised.

The Government should support incorporating climate resilience and mitigation into urban planning and encourage community-led solutions to expanding green infrastructure, nature-based solutions and cool spaces, which have enormous co-benefits in terms of mental and physical health.

Reduce the impact of air-conditioning emissions, including F-gases

Where active cooling is needed, the UK needs to ensure that the most efficient F-gas free equipment is used, through mandatory energy efficiency standards and bans on F-gases in cooling equipment via the F-gas Regulation.

Expanding district heating networks and incorporating cooling within them would enable broad and energy efficient access. Recently introduced subsidies for heat pumps under the Boiler Upgrade Scheme should be revisited to prioritise F-gas free heating and cooling models.[56]

Highly efficient fans can avoid air-conditioning altogether, or hybrid systems, combining low-energy fans and/or evaporative coolers with air-conditioning can greatly reduce the energy used.[57]

In addition to maximum temperatures in workplaces, the Government should set minimum temperatures limits for air-conditioning in public and commercial buildings to avoid over-air conditioning (as has been done in Greece, Italy, Portugal and Spain).[58] Studies demonstrate that increasing the cooling setpoint even by just 1°C will significantly reduce cooling energy demand.[59]

Similarly, studies in the food refrigeration sector have shown that raising the set-point temperature of the frozen food cold chain from -18°C to -15°C can save energy and reduce emissions, while having limited negative impacts on the food itself.[60]

Prepare the workforce

Training on natural refrigerant technologies in air-conditioning and heat pumps and passive cooling technologies will be critical to ensuring that the workforce is well prepared for both cooling and heating decarbonisation.

Supporting the HFC phase-out through the establishment of mandatory certification and training on natural refrigerants is urgently needed and should be included in a Net Zero skills action plan, which the CCC recommends as a key action in order to "identify and address barriers to enable growth of the workforces needed to deliver the Net Zero transition."[61]

The Government also needs to encourage an increase in skilled installers able to address the expected roll out of heating and cooling technologies. Research from DESNZ in 2023 found that two-thirds of the heating and cooling workforce were aged over 45, with two-fifths of those surveyed planning to leave the sector in the next decade.[62]

Enhance public awareness and behavioural change

In addition to driving low carbon cooling, more attention needs to be given to the role of heat-risk communication and behavioural adaptation.[63] In the UK, heat is still often framed by the media and perceived by many as 'good weather'. Moreover, recent studies suggest that despite rising awareness, behavioural adaptation remains limited.[64]

Heat must be recognised as a health risk and communications need to better relay the need to adapt behaviour, for example by modifying activities, wearing lighter clothes, staying in the shade and staying hydrated. In the workplace, measures such as flexible working, remote working and relaxed dress codes can improve working environments. Heat resilience should also be embedded across schools and community planning to improve preparedness and reduce harm.

"The UK was built for a climate that no longer exists today and will be increasingly distant in years to come."

CCRA4-IA (2026)

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