



Grantham  
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on Climate Change  
and the Environment

# Protecting UK workers' health and incomes in a warming world

Policy insight

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## About the authors

This policy insight was led by Elizabeth JZ Robinson (Director of the Grantham Research Institute), Shouro Dasgupta (Researcher at CMCC and Visiting Senior Fellow at the Grantham Research Institute), Candice Howarth (Visiting Professor in Practice at the Grantham Research Institute), and Alice Bian (Policy Fellow at the Grantham Research Institute), and co-authored by the following stakeholders who were present at an expert roundtable that took place in May 2025: Jennifer Bird (Grantham Institute, Imperial College London); Clare Eglin (University of Portsmouth); Mike Freely (Heat Stress Global); Simon N Gosling (University of Nottingham); Kristen Guida (Greater London Authority); Simon Hodder (Loughborough University); Sarah Holliday (Wellcome Trust); Emma Howard Boyd (Chair of the London Climate Resilience Review and Visiting Professor in Practice at the Grantham Research Institute); Katie Johnson (CMCC); Juman Kubba (International Transport Workers' Federation); Andrew Mackenzie (The Physiological Society); Noor Saghir (International Institute for Environment and Development); Bob Ward (Grantham Research Institute); Ivan Williams Jimenez (Institution of Occupational Safety and Health); and Yanxi Zhou (Carbon Capture and Storage Association).

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# Summary

The UK's 10 warmest years on record have occurred since 2002, and heatwaves are likely to become more frequent and more severe until at least 2050, regardless of action taken globally to reduce greenhouse gas emissions. Heatwaves affect workers' health, labour productivity and labour supply, with largely negative implications for individual incomes, company profits and the economy more broadly.

The UK has a limited history of dealing with extreme high temperatures and there is no statutory maximum working temperature. New measures are required to protect workers' health, the introduction of which would likely also positively impact firm profitability and economic growth.

We conducted a 2,000-person survey with workers after the period of elevated temperatures in summer 2024 to gain insights into how workers were affected. This was followed by an expert roundtable with stakeholders from employment unions, local government, national government agencies, academia, the private sector, the charitable sector and chartered professional bodies in the UK. The aim was for the roundtable to co-create evidence-based, practical next steps for better protecting workers against the effects of high temperatures, informed by the survey results and the roundtable participants' insights.

## Insights from the survey of workers into heat-health impacts in summer 2024

- The changing climate and insufficient adaptation have resulted in the UK labour force increasingly working in warmer conditions.
- A unique dataset collected just after a sustained period of high temperatures in July 2024 clearly shows that workers across the UK felt the negative effects on their health.
- Workers with more secure employment contracts were more able to adapt to the heat.
- Many employers were sensitive to the changing needs of their workers and implemented adaptation measures such as flexible working hours.
- However, adaptation and worker protections were insufficient, particularly for 'gig economy' workers.
- Where early warnings were issued prior to the high temperatures in 2024, they appear to have been effective in inducing adaptive behaviours.

## Practical next steps

The survey results indicate there is clear scope for interventions such as government regulation of maximum working temperatures; and enhanced and better-targeted early warning systems, building on existing UK Health Security Agency alert protocols. Participants at the expert roundtable highlighted the following practical next steps that stakeholders, including labour unions, academics and government agencies, can take to protect workers from the negative health and income effects of rising temperatures:

- Improve and quantify the evidence base for how heat stress affects occupational health and injuries, including the mental health and gendered impacts.
- Quantify the full range of economic costs to the labour force caused by high temperatures to demonstrate the urgency of the challenge for employers and government. Broaden the scope of the investigation to address heat combined with humidity and pollution and the effect of heat on sleep patterns.
- Increase the rollout and effectiveness of early warning systems to improve short-term adaptation measures and coping strategies, as part of a suite of longer-term planning and

preparation that includes increased community resilience, protection of particularly vulnerable workers, and improved messaging.

- Increase engagement with communities, workers, businesses and policymakers, to improve the likelihood of cost-effective and health-protecting adaptations being implemented.
- Align an approach to extreme heat with the health, economic, and climate change agendas of various government ministries and departments; and work closely with the UK Health and Safety Executive and the UK Health Security Agency.

# 1. Introduction

Worldwide, the changing climate is affecting workers' health, with largely negative implications for people's incomes, company profits and overall economic growth, as the consequent impacts reduce productivity and labour supply. There is limited understanding of how and to what extent workers are able to adapt to extremes of heat, and whether workers, unions, employers and governments fully understand the impact of heatwaves on livelihoods, health, productivity and economic output.

In this policy insight we focus specifically on how increasing heat is affecting workers in the UK. The UK has a limited history of dealing with extreme high temperatures and, unlike in many other European countries, there is no statutory maximum working temperature (EEA, 2022). Nevertheless, as became strikingly clear during the 2022 heatwave, when temperatures in the UK reached an unprecedented 40°C, the country's climate is changing. Average UK temperatures are now 1.24°C above the 1961–90 average (Kendon et al. 2025), and it is projected that the population will be increasingly exposed to prolonged and intense periods of extreme heat.

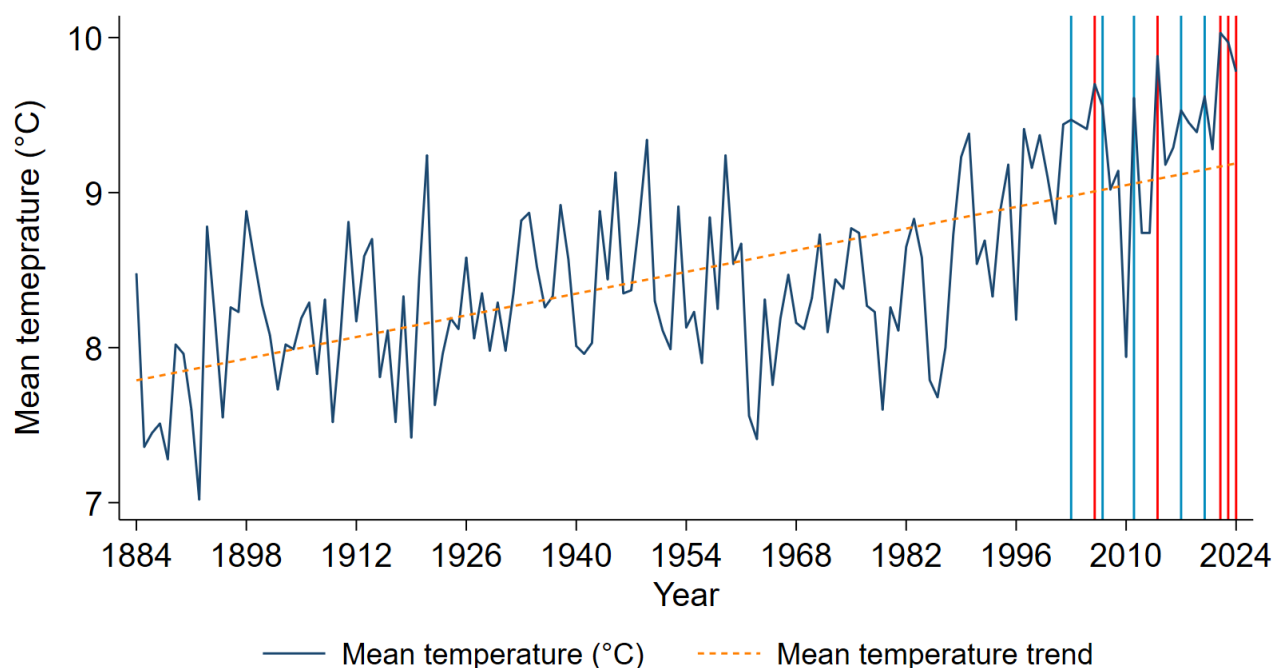
This policy insight provides evidence-based and co-created next steps for key stakeholders, including employers, workers, worker representatives and government, to ensure workers are protected from extreme heat. Worker protections may also improve firm profitability and economic growth more broadly, but currently there is insufficient evidence to explore potential synergies and trade-offs. The insight combines findings from a survey of 2,000 workers in the UK and an expert roundtable. The survey investigated workers' perceptions of the impacts of heat on their health and productivity and was undertaken by the Grantham Research Institute and the Euro-Mediterranean Center on Climate Change (CMCC) after the UK had experienced several periods of prolonged elevated heat during the summer of 2024. The roundtable of experts, convened by the Grantham Research Institute in May 2025, focused on the practical, policy and regulatory implications of the survey's findings alongside priorities for next steps. It included representatives from unions, local government, national government agencies, academia, the private sector, the charitable sector and chartered professional bodies.

## **Context: warming in the UK**

The UK's 10 warmest years on record have occurred since 2002 (see Figure 1.1). Heatwaves are likely to become more frequent and more severe until at least 2050, due to the changing climate, regardless of any success in achieving global net zero targets (Robinson et al., 2024). World Weather Attribution (2022) reported that the UK's 2022 heatwave would have been extremely unlikely without climate change, and its super rapid analysis suggests that the UK's June 2025 heatwave was 2–4°C hotter than it would have been without climate change (World Weather Attribution, 2025).

The UK did not experience any heatwaves in 2024, as per the Met Office's definition: a period of at least three consecutive days with maximum daily temperatures meeting or exceeding the heatwave temperature threshold, which varies by county (Met Office, n.d.). However, there was a period of elevated heat, with a mean temperature of 14.8°C during July 2024, 0.4°C higher than the long-term (1961–90) July average, and in some parts of the country temperatures reached over 30°C towards the end of the month (see Figure 1.2).

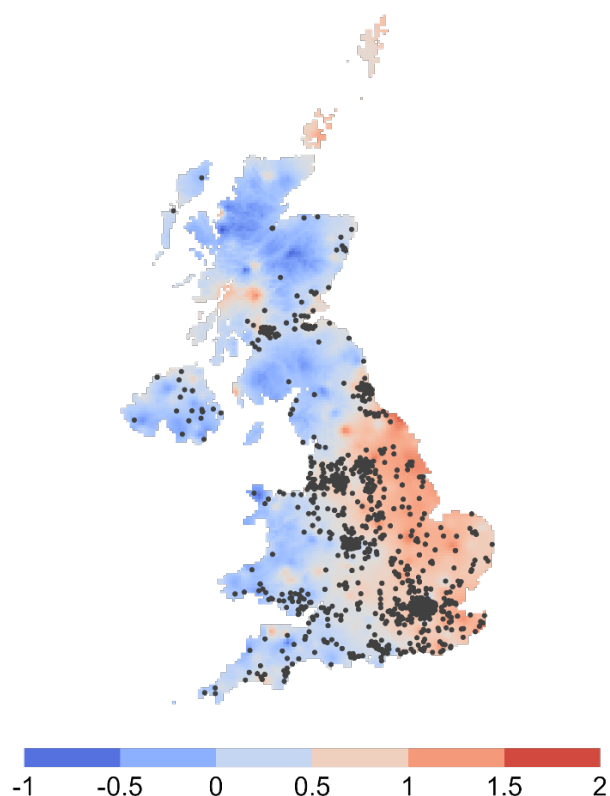
Figure 1.1. Annual mean temperature for the UK, 1884–2024



Notes: Red vertical lines: top five warmest years; blue vertical lines: sixth to tenth warmest years.

Source: Authors' calculations based on HadUK data.

Figure 1.2. Temperature anomaly from the 1961–90 long-term July average (°C)



Notes: Blue to red shading shows the temperatures at the end of July 2024; dots indicate the location of respondents. HadUK-Grid is interpolated to a 1km x 1km grid, informed by land surface observations across the UK.

Source: Authors' calculations based on HadUK data.

## 2. Findings from the worker perception survey

Of the 2,000 survey respondents, 75.3% said they were employed, 9.4% self-employed, 3.1% unemployed, and 1.3% were working in the 'gig economy'; 47% were female; and 86.1% worked in the services sector, 7.2% in manufacturing, and 1.3% in agriculture, forestry and fishing, mining and quarrying. These numbers align closely with the UK Labour Force Survey (LFS), and both sectorally and geographically are nationally representative across the four nations.

Almost 77% of the respondents reported working in areas where the temperature anomaly was 0.5°C above the long-term average for July during 1961–90, and a further 8.4% were located where the temperature anomaly was greater than 1°C (see Figure 1.2).

The survey questions covered workers' experiences of the recent hot weather conditions, focusing on their health and wellbeing; how the heat had affected, if at all, their working patterns; and whether they were able to adapt to the heat.

### Many workers experienced symptoms of heat stress

Just under a third of survey respondents said they felt that the period of elevated heat in late July 2024 had harmed their health, identifying health effects that were predominantly symptoms of heat stroke or heat exhaustion, such as headaches or dizziness. Respondents wrote, for example: "I got heat rashes on my face and hands"; "I felt unwell and overheated at times"; "mental health: agitation, irritability, discomfort, feeling unaccomplished due to being unable to concentrate"; "the worst consequence of the heat is the inability to sleep".

Those working evening or night shifts were more likely to report negative health impacts than those working day shifts (39.7%, 36.2% and 29%, respectively). This result could be linked to increased sleep disruption, given both the warmer days and warmer nights.

Respondents who were self-employed were less likely to report that their health had been harmed than those who were employed or part of the gig economy. A plausible explanation for this is that the self-employed have the most agency over their working hours and conditions.

The survey results also suggest that the high temperatures had a greater negative effect on women compared with men; workers with existing health conditions; workers who were unable to adapt their working conditions; and workers who did not have salaried contracts. Workers who felt less empowered to protect themselves from the heat were more likely to report their health as having been harmed.

### Workers reported various heat adaptation measures

Respondents reported adaptation strategies that were either initiated by individual workers (referred to as 'autonomous adaptation') or introduced by employers, whether before or after the period of high temperatures started.

Examples of autonomous adaptations included starting work earlier or later (around 16% of respondents), finishing work earlier or later (around 13%), and working fewer or more hours (around 7%). Around 13% of workers took more rest breaks while some took fewer; and almost a third of workers reported drinking water or other fluids more often. Workers with more secure employment contracts reported having greater capacity to be flexible during hot days.

Where workers reported that their employers had implemented changes to the work environment, such as by installing air conditioning, increasing ventilation or increasing access to shaded areas, or if they had provided greater access to fluids for workers to stay hydrated, increased the

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<sup>1</sup> Defined by the Chartered Institute of Personnel and Development as "participants who trade their time and skills through online platforms (websites or apps), providing a service to a third party as a form of paid employment" (Cockett, 2023).



frequency of rest breaks or reduced the duration of outdoor work, our empirical analysis suggests that workers' working hours were reduced less than where employers had not made adjustments.

The effectiveness of autonomous adaptations varied across different worker groups. Those with secure employment contracts, access to flexible working arrangements and supportive employers demonstrated greater capacity for adaptation. Conversely, workers on precarious contracts, those in the gig economy and those in physically demanding roles faced significant barriers to adaptation.

Workers who were paid by the hour, on commission or a piece-rate were more likely than those paid a salary to reduce their hours worked during the heat episode. While this might appear counterintuitive, these workers may have been choosing to protect their health over their income. In contrast, salaried workers have the option to reduce their productivity during periods of high temperatures without a loss of income. Overall, our analysis shows that a 1°C positive temperature anomaly from the long-term average was associated with an increase in the probability of a worker reducing their hours by 9.9% and their effort by 9.5%.

Workers who adapted autonomously (such as by changing their shift patterns or working locations) reduced their working hours less than those who did not adapt (Robinson et al., 2025). Workers in high-exposure sectors, such as construction, and those with physically demanding work were more likely to adapt during very hot days.

Some workers expressed dissatisfaction with their workspaces during the period of elevated temperatures. For example, one respondent from Southeast England working in the waste management industry wrote that their "company offers no sun cream or water to help with hot weather", writing further that, "full [personal protective equipment including] double thick trousers and long sleeve polos [had to] be worn; no cooler clothing is offered even if it matches safety standards". Another respondent working in a school wrote: "My main work area is a classroom with windows I cannot reach even with a pole. Ventilation is poor. There are supposedly temperature-health and safety requirements for me as a worker but none to protect the children in my classroom." Others felt well-protected. One worker in the human resources management sector mentioned that they were "able to switch to working from home"; and another in the retail sector that they were "fairly comfortable at work as they had adequate air conditioning in the building".

Overall, the evidence suggests that where employers adapted their workplaces, or enabled workers to adapt in the workplace, such as by taking more rest breaks, fewer working hours were lost to increased heat. Adaptation in this way could provide a win-win for workers (health and incomes are protected) and employers (productivity is maintained and the long-term health of the workforce is supported).

### **Mitigating impacts on 'gig workers'**

The survey responses included only a small number of gig economy workers, those engaging in more flexible, short-term work, often providing services for companies that use digital platforms, during periods of extreme heat (Greater London Authority, n.d.), because they are only a small share of the workforce. As such, we cannot draw any specific conclusions regarding these workers. However, it is important to consider how to protect gig workers on hot days, especially those working in highly exposed sectors such as food delivery, or those undertaking physically demanding work, and who may have to choose between protecting their health and protecting their income. Parametric insurance, which offers pre-specified payouts based on a specific trigger event in a specific location (in this case, a period of extreme heat), may be one adaptation option, but this has implications for companies that rely on gig workers, because workers would be able to receive insurance in exchange for not taking on tasks. More broadly, measures are needed to ensure that these workers are not having to make this choice between their health and their income. These measures could include employers providing paid breaks, access to cooling shelters, or access to cooling technologies such as cooling vests.

### **Adaptation is partially effective in reducing the economic costs of increased heat**

A 1°C positive temperature anomaly is estimated to have reduced the number of hours worked among the UK labour force by 106.6 million hours in 2024. A wider rollout of adaptation strategies such as heat alerts or empowering workers by allowing them flexible working hours and locations where feasible, could reduce this loss by between 41 and 50 million working hours (Robinson et al., 2025), but these adjustments are not possible for all workers.

### **Early warning systems have been effective in the UK**

Rigorous econometric analysis shows that the provision of heat alerts from the Met Office, employers, or the media, prior to the elevated heat episodes in summer 2024 made it less likely that workers reported reducing their working hours due to heat stress (Robinson et al., 2025). Workers who received alerts in advance of the hot period had a higher probability of adopting at least one adaptation strategy than those who did not receive an alert. Alerts were found to be more effective in protecting worker health in highly heat-exposed sectors and where work is more physically demanding.

### 3. Practical next steps informed by the roundtable

In May 2025, LSE's Grantham Research Institute and the Global School of Sustainability hosted an expert roundtable to discuss the findings of their survey of how workers are affected by heat in the workplace. The roundtable included stakeholders from employment unions, local government, national government agencies, academia, the private sector, the charitable sector, and chartered professional bodies in the UK. The aim was for the roundtable to co-create evidence-based, practical next steps for better protecting workers against the effects of high temperatures, informed by the survey results and the roundtable participants' insights.

#### **Improve and quantify the evidence base with respect to how heat stress affects occupational health and injuries**

The current evidence base for heat stress-induced occupational health and injuries is inadequate for effective regulatory development and workplace protection strategies. The London Climate Resilience Review has identified a lack of evidence on the impact of heat stress on the labour force, particularly for small and medium-sized enterprises (SMEs) (Howard Boyd et al., 2024). There is considerable scope to learn from research, experience and pilots in other countries, including in Europe. In Italy, for example, there is a heat-health warning system to protect outdoor workers from occupational injuries caused by high temperatures.

Investing in heat-health surveillance, whether by government agencies or employers, especially for vulnerable groups such as informal, seasonal outdoor workers, is an important step. Investing in occupational health capacity and occupational health and safety expertise will be increasingly essential to safeguard workers from climate-related risks such as heat stress. More generally, high temperatures are likely to increase the risk of human error, but this is not sufficiently understood by decision makers or addressed in the literature.

Funding of more nuanced and context-specific understanding of physiological limits linked to heat stress can provide important evidence to better and more cost-effectively protect workers' health. Combining such evidence with better quantification of the impacts of occupational injuries on productivity can provide the economic impetus needed to justify substantial investments in heat protection measures and to develop evidence-based workplace heat standards.

Robust quantification also enables targeted prevention strategies and evidence for insurance and compensation claims for workers. A comprehensive assessment, that could be carried out by academics working with trade unions and occupational health experts, would include the impacts of heat on mental health and impacts differentiated by gender and age.

#### **Quantify the full range of economic costs of heat on the labour force to demonstrate the urgency of the challenge to employers and government**

There is still insufficient understanding of how productivity is affected by heat, the resulting impact on incomes and wages, and on sectoral output and gross domestic product (GDP). More comprehensive quantification of the economic costs of heat on worker productivity can demonstrate the urgency of the challenge and the economic and health benefits from action, thereby providing incentives for employers and government to implement a broad range of adaptations. Multi-disciplinary teams could determine the broader costs of heat at the individual and community levels, such as its effects on people's physical and mental health, sleep, and how children are affected by heat in the classroom. This could provide greater impetus for action from local, regional and national government, especially if key stakeholders, that might include workers and teachers, are involved in evidence gathering and analysis. Quantifying the costs of increased pressures put on the health system and public health in general would help align investments in adaptation with the UK Government's health impacts prevention agenda.

Evidence is also needed on the medium- and long-term impacts of heat, such as on unemployment rates, wages, labour mobility between sectors and labour force participation. The sectoral impacts of labour productivity loss are particularly useful for policymakers, such as those in the UK's Department for Work and Pensions.

An initial focal area could be the economic and fiscal impacts of productivity loss in the UK's public sector organisations, which are often housed in old buildings that are not suited to current climatic conditions. Ensuring that primary and secondary school classrooms are better adapted to hot weather conditions was also highlighted by roundtable participants as being an important area of focus for government agencies.

### **Increase the rollout and effectiveness of early warning systems to improve short-term adaptations and coping strategies, as part of a suite of longer-term planning and preparation**

Early warning systems are an essential part of adaptation planning and have been shown to be successful in helping to prevent avoidable occupational injuries and mortality. They can also contribute towards triggering appropriate regulatory responses, for example to prevent certain types of occupational activities such as outdoor work on high-risk days, or to prompt the allowance of mandatory breaks at certain intervals. However, a wider rollout of such systems is needed to improve their effectiveness as our survey suggests that they still fail to reach substantial sections of the workforce in the UK. This could require greater amplification and tailoring of government messaging by employers.

Early warning systems can enable workers to protect themselves by preparing for periods of high heat stress; they can also prompt employers to adjust production schedules. But they need to be implemented in conjunction with proactive efforts to improve adaptation and adaptive capacity for workers in anticipation of the increasing frequency of periods of elevated and more intense heat in the UK. Better communication by employers of risks and improved messaging to vulnerable workers more broadly should complement any government-led early warning system, with action and guidance for workers linked to the communication strategy. One actionable next step could be the development of best practice, for example by communication specialists working with employers and trade unions, on how to develop and deliver practical messaging to individual workers. Protocols could involve providing information including heat alerts and recommended actions directly to individuals.

Complementary actions and strategies are also needed, such as parametric insurance and 'sick pay', that can enable workers to prioritise their safety and health without a loss of income, particularly people working in the gig economy and those paid per unit of output.

### **Increase engagement between communities, workers, unions (including through union negotiations and collective bargaining agreements), businesses and policymakers, to increase the likelihood of cost-effective and health-protecting adaptation measures being implemented**

At the community scale, increased efforts are needed to raise awareness and expand community resilience to protect vulnerable workers when early warning systems are triggered. There are several entry points for local and national government to engage with local communities, including through All-Party Parliamentary Groups (APPG) and, in London, the Greater London Authority.

Political lobbying undertaken by labour unions could advocate for policy changes in worker protection, such as advancing the development of a climate protection law for workers and raising the political salience of heat risks.

### **Box 3.1. The case for legislated temperature thresholds**

There was considerable support among the roundtable participants for a maximum working temperature, though there was some caution expressed over whether this would in practice protect workers. Discussions about a maximum working temperature are likely to be more constructive if they are based on rigorous empirical evidence that provides sectoral-level guidance on what constitutes safe working conditions under high heat stress. Indeed, although many European countries are introducing such regulations (EEA, 2024), these may be too general and insufficient to address the intensifying risks posed by climate change. Discussions should also cover whether there are likely economic gains from implementing a maximum working temperature because worker health and therefore productivity is protected, or losses because adaptation costs outweigh productivity and health gains.

There are arguments, too, against legislating for a maximum working temperature. For example, the UK's Health and Safety Executive has said that "No meaningful upper limit can be imposed because in many indoor workplaces high temperatures are not seasonal but created by work activity, for example in bakeries or foundries" (HSE, n.d.).

While a maximum temperature law would cover the whole country, there is increasing consensus that climate adaptation should be local and inclusive, backed by funding and integrated into planning, with a focus on vulnerable groups and informed by learning from the experience of local place-based adaptation. Efforts to increase worker empowerment could also be integrated into such an approach.

Developing more effective legislation and enforcement is only part of the story. Voluntary guidelines and standards, workplace information and training, awareness campaigns, and industry good practice can also help create safer working environments. Employer risk assessments should be frequently updated to account for evolving environmental conditions, particularly periods of temperature extremes.

More broadly, there is scope to consider how working practices, such as work/rest cycles and flexible shift patterns, could be amended, particularly where high temperatures are typically part of existing working conditions, such as in bakeries and foundries. Where workers are involved in labour-intensive physical activity and working outdoors they need to be provided with appropriate control measures and protections.

Because climate risk management responsibilities lie in different government departments, including the Department for Environment, Food and Rural Affairs (Defra) and the Treasury, it is important to target the political cycle, such as the UK Spending Review, when making recommendations. However, arguably the political decision-making in climate adaptation work should be led by the Cabinet Office, given its much broader scope relevant to dealing with heat risk and the economy, rather than Defra.

Further, there is scope to better align an approach to extreme heat with the health, economic, and climate change agendas of various government ministries and departments; and to work closely with the UK Health and Safety Executive and the UK Health Security Agency.

Strengthening collective bargaining agreements could be an effective way to protect workers from heat stress. Evidence from Cambodia shows that workers whose unions negotiated with employers over heat mitigation experienced fewer minutes at unsafe temperatures than those who did not have such representation (Parsons et al., 2024).

### **More needs to be done to improve community resilience to protect vulnerable workers when early warnings are issued**

Such efforts could include awareness programmes, that could be created by multidisciplinary teams including trade unions, occupational health experts, and employers, that are designed to influence worker behaviour and self-protective actions against heat stress, including identifying early health symptoms such as dizziness and excessive sweating, to enable early intervention before serious illness develops.

Improved evidence is also needed on the links between poor working conditions and lack of employment standards, particularly whether workers in such conditions are affected more by heat stress than those who have better conditions.

## 4. Conclusions and further study

There is increasing evidence, including from our survey, that workplaces and working practices in the UK are not well-adapted to current weather and climate conditions, and conditions will only worsen over at least the next 30 years as the planet continues to warm. Whether or not the UK follows the lead of an increasing number of European countries and applies a maximum working temperature, more evidence on the costs and benefits of effective adaptation strategies can empower workers, encourage employers to implement adaptation measures, and support government in designing and implementing legislation to protect both workers' health and employers' profits.

We have focused in this insight on the implications of the UK's labour force having to work in increasingly hot conditions without sufficient adaptation, which is harming their health. However, solutions are likely to be more effective if heat is not considered in isolation; for example, heat and air pollution and heat and humidity are particularly harmful combinations for workers and should be explored in future studies.

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