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Boiling point: short-term coping with heatwaves in the UK is not enough

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Abstract

In July 2022, a national emergency was declared in the United Kingdom (UK) following the Met Office's first-ever red extreme heat warning. As temperatures reached 40.3 °C, thousands of excess deaths were recorded. Based on 38 expert interviews and 4 focus groups with key decision-makers and stakeholders working on the frontline of the 2022 UK heatwaves, we found that the country is not prepared for extreme heat because: (1) policies and planning prioritise coping over resilience; (2) insufficient preventative actions were taken; and (3) a range of barriers hinder effective short and longer-term measures. We argue that whilst the UK coped with the heatwaves in 2022, it lacks the resilience needed to deal with persistent and prolonged heat events.

1. Introduction

Heat is an invisible risk. Felt but not seen. It can negatively affect people's health, livelihoods, and impact infrastructure, economies, society, and the natural environment. There are around 490 000 heat-related deaths worldwide in total each year [1] and single extreme heat events can lead to thousands of deaths annually [2]. In Europe, heatwaves led to an additional 70 000 deaths in 2003 [3] and more than 60 000 excess deaths over the period June–September in 2022 [4], making heat risk a top concern for the region [5]. Since 2015, between 44% and 54% of summer heat-related mortality in Europe has been attributed to climate change [6]. There are a range of widespread impacts from extreme heat [7, 8], with those related to health including increased risks of heat stress/stroke, dehydration, deterioration of chronic illness conditions, and heightened mental health problems, widely covered in the literature [9–11]. Alongside this, pressure on healthcare services, increases in anti-social behaviour and domestic violence, GDP loss through reduced work productivity, and compounding risks such as water scarcity, wildfires, habitat destruction, and air pollution [12–14] can all increase. Heat risks, in turn, are not felt equally and vulnerable groups are often worst affected and least able to adapt with less access to cooling facilities [7].

Heat is the most immediate and direct impact to human health posed by a warming climate [12] and extreme heat events have impacted populations on every continent [15, 16]. The Intergovernmental Panel on Climate Change (IPCC) warns that without substantial action to limit climate change, heatwaves will increase in frequency, severity, and duration [16]. Global populations exposed to deadly heat stress are predicted to increase due to ageing populations, prevalence of chronic diseases, growing urbanisation and the increased frequency, duration and severity of heatwaves [5]. This will have significant implications on water availability, food production, and building design. Most populations now live in cities, which amplifies heat risks due to 'urban heat island' (UHI) effects [17] and has led to a 5% increase in demand for cooling in some regions [18].

Heat is a relatively new risk for countries like the UK, but this is becoming a stark reality. Between 1998 and 2022 [19], the UK reported over 50 000

heat-related deaths. In July 2022, the UK recorded temperatures of 40 °C for the first time [20] following the Met Office's first-ever red extreme heat warning. Over 50% of UK homes are already prone to overheating [21], and this is projected to increase to 90% under a 2 °C scenario, and major UK cities, such as London and Manchester, are experiencing peak temperatures of 5 °C warmer than surrounding areas [22]. UK climate projections suggest that heat-related deaths could also increase by 580% (10 889 deaths per year) by 2050 [23], and economic losses from heat exposure could increase to £720–950 million per year. The third UK Climate Change Risk Assessment (CCRA3) in 2021 stated that heatwaves are likely to become more frequent, intense, and prolonged in the UK, with estimates that the number of heatwave days in the UK could increase by up to 50% by 2100 [24]. In response, the UK Government changed the status of heat risk on the National Risk Register to its highest level ('significant')[25] yet in spite of this, the Government's third National Adaptation Programme (NAP3), published in 2023 [26] adopted a siloed approach by only addressing overheating in buildings.

However, what heat resilience means can vary from engineering efforts focused on reducing heat impacts (e.g. installing air conditioning); social and/or behavioural understandings aimed at preparing for and responding to extreme heat events (e.g. remote working); to socio-ecological practices designed to highlight and work with the interdependencies between people and nature (e.g. green and blue infrastructure) [27]. Such distinctions span everything from incremental to transformative changes. Whereas the former focuses on coping—tweaking systems, capacities, and behaviours to maintain the status quo, the latter seeks to change the system itself. Coping alone is rarely enough.

For countries, like England and the UK, which have little historical or cultural experience of extreme heat, but where the risk is increasing in frequency and severity, the apparatus for managing that risk is still emerging. A better understanding is needed about existing resilience strategies in use and the challenges experienced when implementing them. Even the viability of setups in countries with longer histories of heat management, such as India, require renewed scrutiny as IPCC assessments project that new temperature thresholds will be crossed by 2050 [28]. The UK Climate Change Committee's (CCC) 2025 assessment of the UK's progress on adaptation to the impacts of climate change concludes this is inadequate, piecemeal and disjointed [29]. It was unable to evaluate the delivery and implementation of action aimed at managing urban heat risk and ensuring buildings do not overheat, and highlighted that there were limited policies and plans for these. The country therefore relies on short-term coping mechanisms and lacks a longer-term strategic approach.

This paper presents insights from research which seeks to understand the immediate experiences, reflections and decision-making processes of the 2022 UK heatwaves from practitioners and policy makers, including first responders, making the links between emergency response, disaster management and climate adaptation. First responders are specialists, including law enforcement, emergency medical services, fire and rescue, local authorities, and community support teams (e.g. British Red Cross), who are often the first on the scene during a crisis. Not only are they relied upon to help others during heat stress events, their job can expose them directly to heat risks, but they are also responsible for implementing policy-into-action.

2. Methods

The data collection was undertaken in two phases: Phase 1 consisted of semi-structured interviews, while Phase 2 consisted of online focus groups (see supplementary material 1 for further details of the methodology including a full list of interview and focus group questions of the study). For Phase 1, a total of 38 semi-structured interviews were conducted between October and December 2022, as close to summer 2022 as possible to capture experiences and insights in the immediate aftermath of the 2022 heatwaves. These were conducted online, using a video-conferencing platform, with audio data recorded and transcribed verbatim. Questions covered (i) decision-making processes during heatwaves and 2022 summer, (ii) decision-making around heatwave management and response in the UK, and (iii) system mapping to capture stakeholder knowledge, perceptions, and beliefs for evidence-based decision-making, as well as being a useful tool to visualise qualitative and subjective concepts that emerge from the data (see supplementary material 1). Interviewees represented England-wide ($N = 9$), London ($N = 12$), Manchester ($N = 8$) and the Yorkshire and Humber region ($N = 9$), which included individuals with a range of roles (table 1) across government and agencies ($N = 18$), first responders ($N = 9$), utilities ($N = 4$), civil society ($N = 7$). Interviewees were approached due to their role in responding to extreme heat events and in particular the 2022 UK summer heatwaves at the England-level as well as regional (Yorkshire and Humber) and city (London and Manchester) levels, all of which were affected by the heatwaves in different ways, reflecting the myriad of ways these climate risks will affect the country in the future. An in depth set of additional interviewee quotes are provided in supplementary material 1.

Table 1. Number of interviewees per location and stakeholder type for Phase 1.

	Government and agencies	First responder	Utilities	Civil society	Total
England	7	1	0	1	**9**
London	6	4	0	2	**12**
Yorkshire & Humber	2	2	3	2	**9**
Manchester	3	2	1	2	**8**
Total	**18**	**9**	**4**	**7**	**38**

Table 2. Sample characteristics for focus groups for Phase 2.

	Government and agencies	First responder	Utilities	Civil society	Total
England	3	0	0	1	**4**
London	5	2	0	0	**7**
Yorkshire & Humber	1	1	2	2	**6**
Manchester	2	1	0	1	**4**
Total	**11**	**4**	**2**	**4**	**21**

For Phase 2, four focus groups (table 2) were carried out in November 2022 online via a video-conferencing platform, each lasting 90 min and were recorded. Each focus group represented one of the regions corresponding with the interview samples (i.e. England, London, Yorkshire & Humber and Manchester). Focus group discussions explored (i) UK policy responses to heatwaves, (ii) synergies between adaptation and mitigation in heatwave responses, and (iii) validation of system map outputs. A total of 21 focus group participants were recruited to represent a range of sectors in each region, covering government and agencies, first responders, utilities, and civil society (table 2). A number of the interviewees ($N = 14$) from Phase 1 also took part in the focus groups making a total of 21 focus group participants.

Participants were asked a series of questions relating to (i) decision-making processes and experiences during the 2022 summer heatwaves, (ii) exacerbators and compounders of heat risk, and (iii) opportunities and challenges. Thematic analysis was conducted on both the semi-structured interviews and the focus group data, following Brown and Clarke's phases of analysis (2006) [30]. Following transcription of the data and familiarisation with the dataset, initial open and relational coding was conducted in parallel by two researchers, these were then compared, discussed and where necessary combined or split to allow a consistent interpretation. Following this, core themes bringing together groups of codes were identified, reviewed and analysed, producing the overarching themes presented and discussed in this paper.

The data presented in this paper derives from discussions with a diverse sample of interviewees and focus group participants across our stakeholder categories, which enabled representativeness of a broad spectrum of perspectives, behaviours, and experiences. By including individuals from across these sectors, we provide a comprehensive understanding of the experiences and decision-making processes that occurred during the 2022 summer heatwaves. Furthermore, we found no significant variation in opinions within each stakeholder type or location, suggesting homogeneity in responses, which allowed us to confidently group participant responses. Data saturation was also observed after approximately two-thirds of the interviews took place, further confirming the adequacy of our sample and enhancing both the validity and depth of our data.

2.1. Systems maps

In parallel, we co-developed a system map with stakeholders to represent their collective knowledge of the impacts and exacerbating factors of the heatwaves, the actions taken to reduce risk and address gaps, and the interactions between these elements. System maps are visual depictions of a system or a complex problem showing all relevant components and their relationships in one single frame; they often indicate the causal connections and may include complex feedback loops and weighted connections. The weights of connections represent the relative importance of exacerbators and impacts based on the stakeholders' knowledge and experience.

During the semi-structured interviews, a preliminary map was developed using the factors identified in the evidence review [7, 8] (figure 1) and shared with participants. The factors within each category (i.e. impacts, exacerbators, and responses to reduce

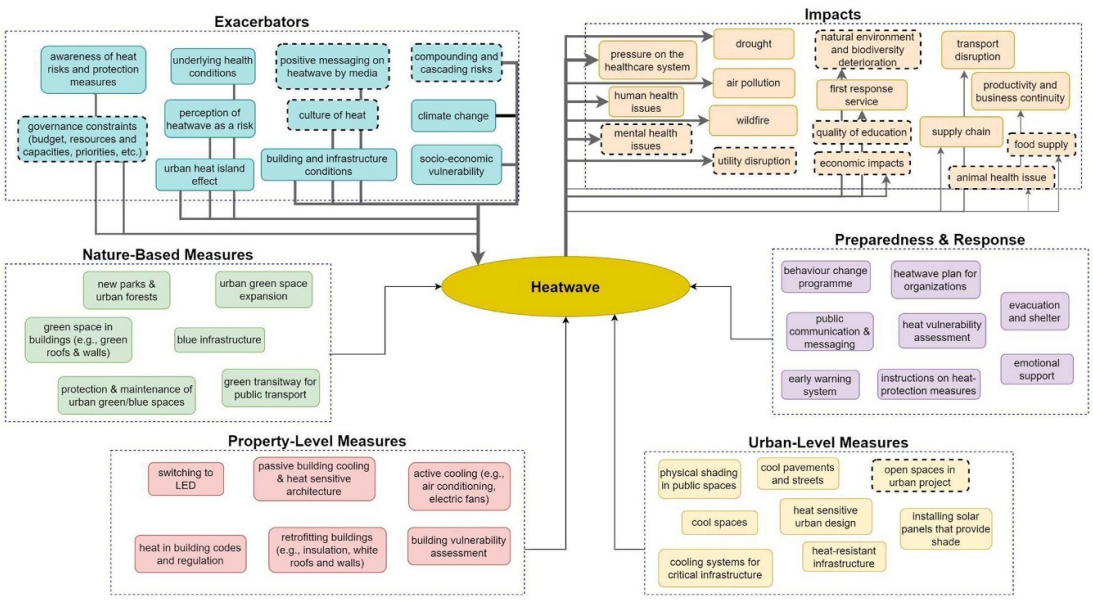

Figure 1. 'Impacts' and 'exacerbators' of heatwaves in the UK in 2022, along with heat risk reduction responses needed, based on an assessment of literature [7, 8], input by interviewees (Phase 1) and further validated and completed by focus group participants (Phase 2). Dashed boxes are factors added by participants. The strength of the connections between exacerbators/impacts and heatwave show the average weights assigned by participants to each connection.

future heatwave risk) were sense-checked with participants, and any missing factors were added to the map. After finalizing the factors, participants were asked to rate the connections between them on a scale from 1 to 5, where 1 indicated 'very low' and 5 indicated 'very high'. Each connection was rated independently rather than in comparison with each other; therefore, participants were allowed to assign the same rating to multiple connections (see supplementary material 1 for more details on the system mapping methodology, including the prompt questions).

A complete list of factors (categorized into 'impacts', 'exacerbators', 'action taken/strengths' and 'lack of action/gaps') and their relationships, as collected through the co-production process, can be found in figure 2.

3. Results and discussion

3.1. Management and experiences of the heatwaves

The CCC makes it clear that the UK is not prepared to manage extreme heat [31]. To capture a broad range of knowledge on drivers, impacts, effective responses, and gaps in systemic response, we interviewed stakeholders from various sectors, geographical locations, and governance levels. As shown in figure 1, heat risk is a complex system of interacting drivers and impacts, which requires diverse, system-level responses [23, 24], highlighting a major challenge of how heat risk is governed: (i) fragmentation exists between public bodies over responsibilities, priorities, and funding; (ii) a lack of coordination exists in how heat is managed nationally, regionally, and locally and/or integration between these scales; and (iii) heat planning centres primarily around health. In England, the Adverse Weather and Health Plan (AWHP) is the main policy framework for responding to heat risks and aims to 'build awareness… promote preparedness and resilience at the individual and community level, and mobilise action to reduce health risks for all' [32]. Emphasis on building resilience is also echoed in NAP3 and CCRA3.

The systems map depicted in figure 2 was co-developed with participants during interviews (Phase 1), and individual maps were subsequently combined to present a comprehensive overview. This map highlights the primary impacts and exacerbating factors of extreme heatwaves experience in summer 2022, alongside actions taken, action gaps, and their interconnections (see methodology details). The size of each node reflects each factor's influence within the system, indicating its relative importance. For example, 'health issues', followed by 'wildfire' and 'drought', emerged as the most significant impacts as perceived by stakeholders, either caused directly by heatwave or indirectly through other impacts of heatwave. Similarly, 'socio-economic & spatial vulnerability', followed by 'heat-vulnerable buildings' and 'lack of adaptive behaviour and perception of heat risk' were identified as the major exacerbators, affecting various components of the heat risk system.

As figure 2 shows, physical and mental health issues were the primary concern identified by first responders from the heatwaves, echoing findings from the US and Canada [33, 34]. Concern was split between health risks faced by the public and risks experienced by first responders. For the public,

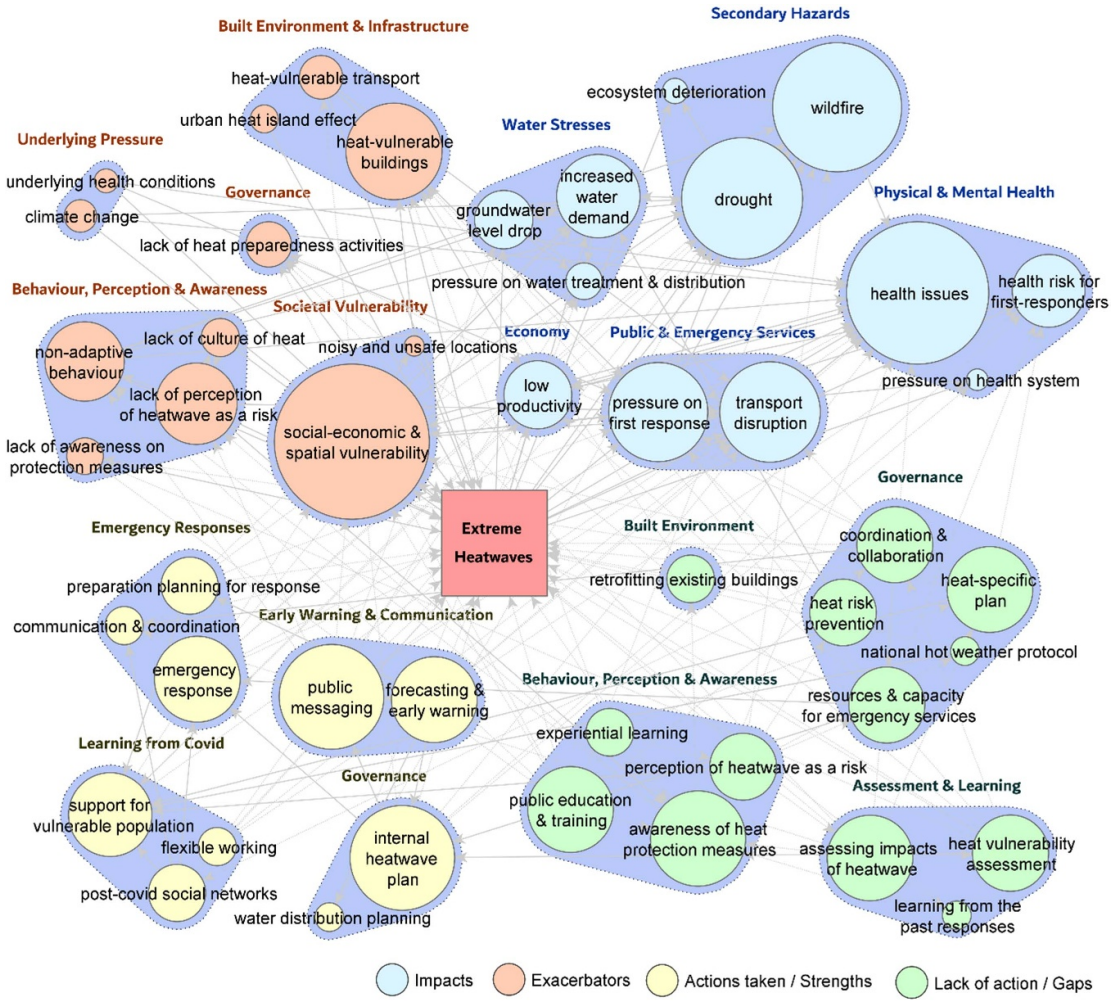

Figure 2. An aggregated system map of heat risk in the UK, drawing from perceptions and experiences of local stakeholders involved in responding to heatwaves during the 2022 summer (based on interview discussions, Phase 1). Node size reflects each factor's influence within the system, indicating its relative importance.

increases in mortality rates (2985 all-cause excess deaths associated with the five heat episodes during summer 2022 [35]); hospital admissions related to major (chronic illnesses) and minor (heat stroke) conditions, and instances of mental health crises were recorded. For first responders, these impacts also included carrying out routine duties such as entering (overheated) properties and wearing protective clothing, in addition to the risk of heat exposure and exhaustion from working long shifts.

The connections depicted among the factors in figure 2 reveal a distinction made by first responders between health-related impacts driven directly by heatwaves (direct connection from 'extreme heatwaves' to 'physical and mental health') and risks exacerbated by the consequences of the heatwaves (input from other nodes such as 'wildfire', 'pressure on first response', 'water/air pollution', and 'transport disruption' to 'physical and mental health'). For example, the capacity for the healthcare sector to cope with the increased number of hospital admissions led to resources and delivery being reallocated. Relatedly, the after-effects of wildfire exposure (skin burns, smoke insulation) impeded response times, service provision, and health outcomes. These findings contribute to existing research [3, 4, 7, 19, 23, 36], which primarily highlights the rise in hospital admissions (distinguishing the affected population group) and increased mortality during periods of extreme heat. Our research (as shown in figure 2) offers new insights into how heat risks can cascade (un)predictably throughout a system due to interdependencies between health and other sectors and repercussions of heatwaves on water usage, work productivity, and the natural environment.

While there are many studies mapping urban socio-economic vulnerability to heat risk, our research uncovers some previously unexamined aspects [37, 38]. Low-income households can face increased risks from living in smaller flats and/or older buildings prone to overheating, which are often located in densely populated areas exposed to UHI effects and may be near non-fireproof buildings at-risk from wildfires (e.g. Grenfell fire and cladding

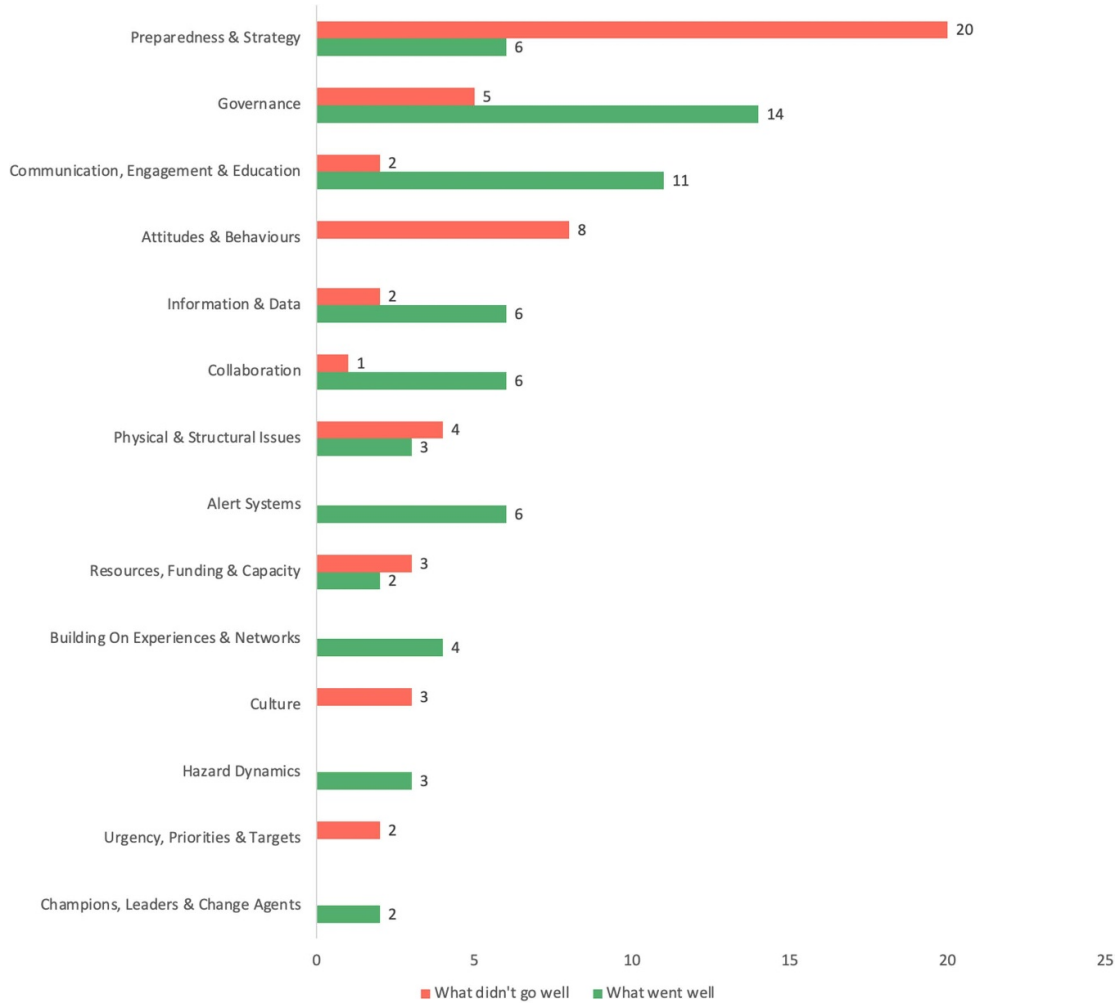

Figure 3. Mentions in the qualitative data organised by issue-theme in response to questions about 'what went well' (green bars, total number of coded responses = 63) and 'what did not go well' (red bars, total number of coded responses = 50) during the summer 2022 heatwaves.

[39]). Where, and even how, someone lives can help explain why the same risk is felt differently, particularly when people living with chronic health conditions are unable to leave their (overheating) homes. The multifaceted and interconnected nature of the impacts and exacerbators of heatwaves in the UK underscore the importance of formulating and implementing comprehensive strategies to develop resilience to these challenges.

3.2. Does the UK have the capacity to cope in the long-term with intensifying and frequent heat risks?

Despite the difficulties posed by the 2022 heatwaves, decision-makers and first responders felt the UK coped well during the events. That is, the institutions, plans, and key actors dealt with, and overcame, the challenges faced (figure 3); coping, in this sense, was underpinned by three interrelated strands: (1) clear communication to the right people ahead of time to put plans into action; (2) rollout of emergency plans to define who was responsible for which actions; and (3) flexible working practices over how to implement those actions. These findings align with the recommendations of Vandermolen *et al* [40] who suggest how to extend the reach and effectiveness of heat risk messaging through diversifying communication channels and refining content. Actions taken in response to heatwaves—and those perceived by participants as effective (evidenced by their positive impacts on both impacts and exacerbating factors)—are coping and response actions aimed at minimizing short-term damages (figures 2 and 3).

A dominant challenge was a lack of preparedness and strategic approach in response to the heatwaves, echoing the CCC's 2025 assessment of the UK's progress on climate adaptation, which highlighted a glaring gap in planning and policy action on heat risk [29]. Whilst there was a strong sense that immediate, rapid responses to the heatwaves enabled a level of coping in the short-term, a lack of longer-term preparedness was highlighted. First responders explained the importance of two communication pathways: expert-to-decision-maker and expert-to-public. The

former required the Met Office to identify the risk, relay it to the UK Health Security Agency (UKHSA) to issue a red alert (extreme heat warning), before cascading the alert to first responder organisations to activate response protocols. In the latter, the media played a key role in amplifying the seriousness and urgency of the alert to the public, directing them to resources on how to remain safe, like the 'Beat the Heat' guidance [41].

High-level information provision and warning alerts were seen to have reached the right people ahead of time to put plans into action, particularly in England where the UKHSA predominantly operates. Respondents felt that public messaging was well received, understood, and actionable by communities, with credible data and visuals effectively shared between key organisations to move from alert to response. In addition to governance, two-thirds of respondents agreed that streamlined communication channels increased buy-in, heightened awareness, and accelerated immediate action. But, it was felt, the short-lead time between heatwave predictions and response efforts put pressure on key stakeholders.

Governance processes and clear decision pathways reduced resistance and time in prioritising vulnerable groups and ensuring appropriate resources reach them effectively. First responders, when reflecting on how well emergency planning or risk governance worked, felt that pre-prepared strategies clarified decision-making pathways, minimised impulsive responses, and helped prioritise vulnerable groups. Clear awareness of roles and responsibilities among key stakeholders streamlined messaging and minimised overlapping and redundant efforts. The volume of calls to emergency services increased considerably in July 2022, with the London Fire Brigade receiving 2496 calls during the heatwaves [27], which normally would have put strain on the system. This was resolved as dispatchers who '*prioritised things like…. they did not respond to anyone with an automatic fire alarm. If no one called in a fire, they did not attend. So they did a form of triage*' (Responder 5—Interview). Networks developed during the covid-19 pandemic, ensured familiarity, continuity, and coordination to save time, resources, and duplication of effort.

Flexibility in executing actions was also a key strength highlighted by first-responders. '*We altered some of the times that people were working. So we let them start earlier… did not set targets… basically let them have more time to do work at a slower pace, or have more breaks*' (Civil 7—Interview). But even these measures have limits. Emergency repairs and/or life-saving incidents can require first-responders to endure the heat outdoors or enter overheated buildings, so breaking the work into smaller batches was a method welcomed to reduce prolonged heat exposure (Policy Official 10—Interview).

In short, the UK has the capacity and resources to cope with short-lived, infrequent, heatwaves. But the short lead-time between prediction of a heatwave and response can put pressure on organisations to mobilise staff and resources. While manageable with sufficient recovery time between events, this raises questions about how such systems and processes will cope in the future.

3.3. Duration and intensity: difference between coping and resilience

A key theme in the data was that first responders felt they coped well with the heatwaves; however, had prolonged events of higher temperature extremes, and/or shorter recovery periods occurred between the first and second heatwaves, things would have unravelled. The UK experienced five heat events during the summer of 2022, with temperatures exceeding 40 °C only once. While the UK did 'okay' in 2022, at what point is 'okay' not enough? This may suggest that the UK is already reaching its capacity for managing heat risks, a concern given the longer and more intense heatwaves experienced in Europe. This is particularly worrying considering analysis of UK policy on heat risk has been unable to assess the design and implementation of action to manage and respond to this risk [29], and that such limited action is often siloed and limited to health implications [42].

We also found issues not widely documented in existing literature related to attitudes and behavioural challenges that could have been addressed more effectively [10]. Current literature tends to emphasize the provision of outdoor or personal cooling solutions, with less attention given to how people access and use them and participants in our study reported low uptake of cooling facilities. Other issues included antisocial behaviour during the heat, people not conserving water, and the strain on staff while fulfilling their duties in the heat. In addition, deeper systemic issues were identified, including poor decision making, misuse of resources, buildings and infrastructure unfit for extreme heat, and limited organisational capacity or funding. Cultural factors such as resistance to change and organisational inflexibility were also seen as significant barriers to effective heat response. Linked to this, when asked about strategic approaches to heat risk in the UK, participants highlighted problems balancing short- and longer-term responses and that in order to build long-term resilience and adaptation, efforts must focus on addressing the root causes of heat risk (i.e. exacerbating factors in the system maps) rather than solely responding to symptoms (i.e. impacts in the system maps). This shift requires a systemic mindset and approach to fully understand and address the underlying drivers and effects of heat risk.

This distinction between short-term coping mechanisms and long-term resilience are important components of responding to, and preparing for,

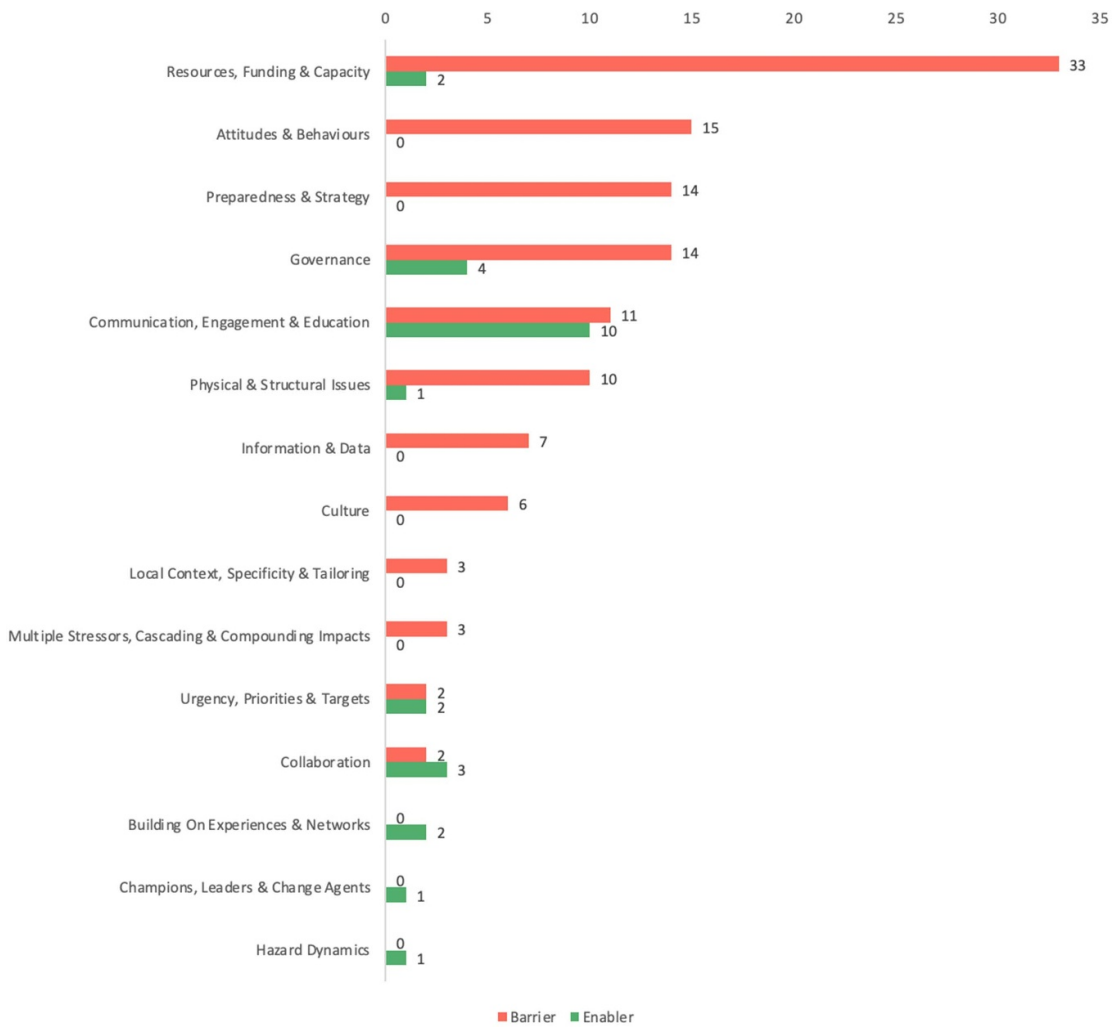

Figure 4. Participant responses about barriers and enablers to heat resilience, following the UK's summer 2022 heatwaves.

heat risks. Our research, however, suggests there is an over-emphasis and reliance on short-term coping mechanisms in the UK. This becomes problematic when already stretched resources across emergency and non-emergency services are put under increasing pressure when dealing with extreme heat events and any compounding and/or concurrent risks that may exacerbate its impacts. Not addressing this can lead to uncoordinated approaches, poorly focused solutions, and a lack of integration across other policy issues that fail to reduce inequalities and impacts of heat risks.

3.4. Is the UK resilient to heat risk?

Although first responders and decision-makers felt the UK had coped with the 2022 heatwaves, only 8% reported that the overall response had been adequate ($n = 3$ out of 38) (figure 4) reflecting assessments of UK action and policy on heat risk [29, 36]. This paradox is explained by a distinction between coping and resilience. Reflecting on this, the quote that '*as a one-off we are fine [but]… if this becomes a long-term issue we will not be*' (Responder 5—Interview) captures how the UK can cope if heatwaves are '*short, sharp, shocks*'; however, if the frequency increases and/or the time between them decreases the UK will struggle. Several concerns underpinned this assessment: (1) a lack of funding and resources to support effective heatwave planning and preparation; (2) insufficient capacity to prepare, and implement, heatwave plans; and (3) attitudinal and behavioural challenges that impede and/or worsen response effectiveness.

For first responders, funding and resources were the most frequently cited barrier ($n = 33/120$ coded responses). First, staffing: '*most local authority services are Monday to Friday, 9am-5pm, [which] does not account for the fact that it can be very hot in the evenings and over weekends*' (Civil 2—Interview). Reallocating staff, at short notice, in traditionally unsocial hours was difficult and encountered limits when insufficient numbers of trained staff were available and/or there was no overtime budget. Second, funding is too often focused on reactive measures rather than preventative ones. Vulnerable people, with chronic illnesses and mobility issues may struggle to access green spaces or visit cooling facilities, a barrier highlighted in

Vasconcelos *et al* [43] study on the mobility patterns of older people during hot days in Barcelona. Tackling the overheating of buildings, including hospitals and providing cooling centres, via installing air-conditioning, can help reduce dependence on First Responder services but access to air-conditioned spaces is far from ubiquitous, especially in northern latitudes (Bedi *et al* [44]).

40% of first responders told us that inadequate planning and preparedness had also been a key problem. '*Disaster exhaustion*' (Policy Official 17—Interview) where '*we lurch from one crisis to another*' (Civil 1—Interview) made it difficult to recover and think clearly about near and long-term planning, and as a result, slow and poor decision-making impeded effective responses. Added to this, silo-thinking meant heatwave responses were fragmented. '*We can do the emergency stuff… but getting [that] embedded so it is business-as-usual… we are not there yet*' (Policy Official 13—Interview). Asymmetry in operational procedures was another concern. Whereas a heat alert system exists for health, '*there is no formal national fire risk warning system in the UK*' (Policy Official 2—Interview), which made it difficult to know where and when to deploy first responders (reactive) and identify where to focus long-term plans to manage future hotspots (proactive). A study of wildfire risk management in Italy [45] similarly found a highly fragmented institutional structure, where wildfire policy responsibilities were increasingly allocated to disparate organisations at a variety of scales.

A lack of understanding and/or knowledge about the risks posed from heat, for first responders, was a major concern. '*The trouble with the UK is we are not used to [heatwaves]… preparation cannot be done after one summer… we need to change people's mindsets*' (Responder 5—Interview). Inconsistent and sometimes inappropriate news coverage has often emphasised the benefits of hot weather—such as ideal beach conditions—while downplaying serious risks like heat stroke. Reports have also overlooked the dangers of risky activities, such as barbecues in wooded areas or failing to stay hydrated, as well as the increased strain on water resources, evidenced through the introduction of hosepipe bans. This imbalance underlines the urgent need for a cultural shift in how heat risk is perceived as the UK does not have a 'culture of heat' [46]. This goes beyond the public, to include the support and equipment given to first responders: '*we need to look at what our firefighters are wearing in the summer. We had 18 people who overheated…*' and were admitted to hospital (Responder 5—Interview).

The UK has not developed the resilience needed to manage persistent and prolonged heatwaves [7, 29, 42]. Planning and preparation, funding, and understanding remain rooted in emergency response framings that prioritise immediate, reactive, decisions over the longer-term institutional and cultural adjustments to withstand and quickly recover from heat. As Guleria and Gupta (2024) [47] argue, despite the increase in severity and duration of heat waves combined with other environmental interactions, countries have failed to develop proactive associated risk perceptions; preparedness and lethargic emphasis on mitigation measures have made the problem worse.

4. Conclusion

The research presented in this Letter highlights the significant health and operational challenges posed by heatwaves, particularly during the 2022 summer heat episodes in the UK. First responders identified health risks to both the public and themselves, including increased mortality, hospital admissions, and mental health crises. While the immediate response to these events was considered largely effective, with clear communication and flexible strategies, concerns were raised about long-term preparedness. This validates and reflects stronger concerns regarding the UK's national approach to managing and preparing for heat risk across sectors [29, 48].

The data reveal a distinction between coping and resilience in responding to heatwaves. While first responders effectively managed responses to the 2022 heatwaves, their views were that prolonged or more frequent extreme heat events could have overwhelmed current systems. An over-reliance on short-term responses was considered to be problematic as it could lead to uncoordinated efforts, increased pressure on resources and failure to reduce heat-related inequalities and impacts. There is a need to shift focus towards long-term resilience by addressing the root causes of heat risk, including inadequate infrastructure and governance issues.

While first responders and decision-makers felt the UK coped with the 2022 heatwaves, only 8% considered the response adequate. If the UK's 2022 heatwaves had not been short-lived and/or no break existed between the events, the capacity of stakeholders to manage multiple, concurring, crises would have reached boiling point. The distinction between coping and resilience highlights concerns about the UK's ability to manage frequent or prolonged heat events. First-responders were clear that 'coping' alone is not enough. Resilience is needed on an institutional and individual level, especially as heat events become more intense, frequent, and longer-lasting [19, 21, 24]. Key issues highlighted include a lack of funding, insufficient capacity for planning and preparation, and inadequate staffing for extended hours. Fragmented responses, cultural resistance to heat risks, and poor long-term planning undermine resilience, reflecting findings from recent literature on this issue [7, 8, 29, 42, 46]. The UK's focus remains on reactive measures rather than proactive strategies,

limiting its ability to effectively manage future, more frequent heatwaves and their compounded risks.

Health as a central tenet for framing heat management in England [23, 32], in turn, may help explain the focus on 'coping' as efforts are designed to minimise immediate risks (heat stress, stroke, etc) via behavioural changes even if such advice is inconsistently embraced [49, 50]. Our research, by contrast, echoes the urgent need to address infrastructural problems that exacerbate heat risk (overheating in buildings) [27], but most importantly, highlights that transformational change requires us to tackle gaps in our understanding over the role governance [51, 52] and institutional capacity play in successful responses to heat risks.

Determining how heat risks should be managed, and how resilience should be built in response to those risks, is far from easy. A major strength of qualitative research [53] is its commitment to fully explore the complexities, messiness, and nuances [54] that shape why heat risk responses vary between places, people, and professions. Limitations, however, centre around how generalisable and reproducible the findings are and how to separate results from interpretation. To increase the rigour and robustness of our research [55], we triangulated different data points, quoted verbatim extracts, and provided supplementary materials of the raw data to ensure transparency in how conclusions were reached.

Future research is urgently needed that draws together qualitative and quantitative insights to: (i) identify where capacity issues and/or tipping points exist in heat management practices (and how to resolve them); (ii) develop a holistic approach that captures both coping (immediate, low-impact) responses and resilience (longer-term, complex) measures; (iii) assess and enhance literature on recommendations and best practices for heat risk management across sectors in the UK and (iii) tackle the interdependencies between key stakeholders to avoid displacing the problem from one part of the system to another.

Data availability statement

The data that support the findings of this study are openly available at the following URL/DOI: www.lse.ac.uk/granthaminstitute/publication/turning-up-the-heat/.

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Ethical statement

The research presented in this paper involved human participants and was approved by the LSE Ethics Committee in 2022.

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