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Discussion

Improving resilience to hot weather in the UK: The role of communication, behaviour and social insights in policy interventions

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ABSTRACT

At present, there is little guidance on how to communicate the dangers relating to hot weather events and on how to better prepare for them. Social responses to hot weather risks need to be a priority as populations around the world become more exposed to these under a changing climate. In this commentary, we argue that policy interventions focused on improving resilience to hot weather need to be more closely aligned with broader sustainability challenges and more effectively incorporate communication, behaviour, and social insights. With a particular focus on the UK, we highlight the risks of not taking these into account and outline ways in which policy-making on hot weather events could be improved, by drawing on international best practice and supporting decision-making within a range of relevant institutions across the health, transport and housing sectors.

1. Inadequate responses to hot weather

The year 2018 has been one of warnings on how the world's climate has, is and will likely change in future. For example, the already realised one-degree warming of the Northern Hemisphere has increased the intensity of European heatwaves in the past two decades (Beniston et al., 2017). Further warnings of a changing climate have come in the form of the latest Intergovernmental Panel on Climate Change's special report on the impacts of global warming of 1.5 °C (IPCC et al., 2018) and the UK's Climate Projections update (Met Office, 2018a). Under a changing climate, many parts of the world are expected to experience more frequent hot weather events with significant impacts, including heat-related deaths, productivity loss and transport disruption. The 2003 European heatwave, for example, resulted in 20,000 heat-related deaths across Europe, with 15,000 in France and 2,193 in England (EAC, 2018), and heat-related deaths in the UK are predicted to increase to 7,000 per year by the 2050s (EAC, 2018). The deficits in social, medical and media responsiveness to the 2003 heatwave prompted the French government to establish a National Heat Wave Plan, which includes the dissemination of information on treating heat-related illness, purchasing cooling equipment for hospitals and establishing a hot weather warning system. The plan has been credited with reducing excess deaths in subsequent heat waves (e.g., Fouillet et al., 2008).

Extreme summer heat in 2018 had high impacts across the planet (WMO, 2018), having for example killed 65 people in Japan in a single

week (BBC, 2018), forced thermal power plants throughout Europe to reduce their outputs for want of cooling water that was cold enough (Brown, 2018) and cracked airport runways in Germany (AP, 2018). For urban areas, these risks are exacerbated by the urban heat island effect, where higher temperatures will have considerable impacts on already vulnerable populations (EEA, 2016; EEA, 2017). Across multiple societal services, hot weather events will exacerbate pre-existing systemic strains, including in the provisioning of public services. For example, research in The Netherlands, China and Australia has shown that heatwaves impact on admissions to hospital emergency departments (van Loenhout et al., 2018; Sun et al., 2014; Sam Toloo et al., 2014). Furthermore, in the U.S. a 2018 study by Davis and Novicoff (2018) showed a significant increase in hospital emergency admissions relating to, amongst others, diabetes and pregnancy complications during heatwaves compared to non-heatwave periods. Yet, emergency and health professionals recognise they lack knowledge, understanding and training to deal with the consequences of hot weather events (Hathaway and Maibach, 2018). Moreover, recognition of the risks faced by emergency personnel themselves to hot weather events is lacking (Paterson et al., 2014). We therefore need to consider what an acceptable level of resilience to heatwaves is for whom, who drives the move to resilience, and who pays for it. The way in which resilience is viewed and valued, and in which contexts, particularly needs to be examined and social responses during these climate risks need to be better considered.

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July 2018 was the third warmest July on record in the UK (Met Office, 2018b) and the 2018 summer was a record breaker for England in particular with an average temperature of 17.1 °C (overtaking the 1976 record of 17.01 °C, and compared to the UK's average of 15.8 °C; Met Office, 2018c). Record-breaking temperatures experienced during the 2018 (and 2003) summers are projected to be the norm by the 2040s and premature heat-related deaths will increase by a third by the 2050s (Met Office, 2018b). Despite these threats, the country has limited regulations to safeguard against overheating in buildings or to adapt existing buildings to extreme heat events (CCC, 2017). In the UK, multiple stakeholders are involved in responding to heatwaves, notably the Department of Health and Social Care (DHSC), the Environment Agency, Public Health England, the National Health Service, local government and the Department for Environment, Food and Rural Affairs (Defra) which has responsibility for adaptation, with additional support from Local Resilience Forums, emergency services and the Met Office. Much communication and engagement work emerged from materials produced by the UK's Climate Ready and Climate Local programme, supporting local responses to climate impacts, but these are no longer funded. The UK Environmental Audit Committee (EAC) led an inquiry in 2018 into the risks of heatwaves and submissions unanimously stated that risks of overheating are not adequately addressed in current policy and regulatory frameworks. However, in their recommendations, most of the 31 submissions to the inquiry focused on regulation or infrastructure changes rather than behavioural or social responses. The resulting EAC report sparsely mentions the role of behaviour in building resilience (EAC, 2018). This is problematic as social and individual characteristics, particularly risk perception, can limit climate resilience measures but can also be changed through political and social support (Adger et al., 2009). Misunderstood or incomplete information about relevant behaviours can inhibit or misguide social interactions among those involved in building climate resilience (Moser and Ekstrom, 2010), missing an opportunity to effectively engage stakeholders to minimize impacts to populations at risk and already-stressed public services.

2. Lack of social awareness of hot weather risk

The public is not sufficiently informed or aware of the risks from heat including of hot weather risks outside heatwave periods. The EAC's inquiry concluded that there is a need for 'clear information for the public on the developing threat of heatwaves' (EAC, 2018: 43). This need is further highlighted in the UK's draft New London Plan which outlines temperature thresholds above which heat risks significantly impact the city (Mayor of London, 2017). Nationally, the Heatwave Plan for England (operating 1st June to 15th September each year) outlines actions and guidance to protect the UK population from any heat impacts on health (PHE, 2018a). Nonetheless, there is no detailed guidance on communication and behaviour responses, an omission with significant impacts on thermal comfort, health, wellbeing, productivity, and energy use (Kovats and Osborn, 2016). (In comparison, the Cold Weather Plan for England (PHE, 2018b) operates all year. Its public health communications cover personal actions to keep warm, as well as guidance fuel poverty and infectious diseases.) Additionally, whilst the behavioural sciences have been leveraged to improve the design and execution of public-health and carbon-mitigation interventions (Glanz and Bishop, 2010; Allcott and Mullainathan, 2010), there is a gap in how policy guidance incorporates understanding of societal responses and experiences of hot weather risks. In the UK, people tend to demonstrate feelings of nostalgia when thinking about past, hot summers (Harley, 2003) where positive feelings towards these events can foster perceptions that individuals are safer than they really are (Finucane, 2000). This mismatch of message intent and reception underscores how many efforts to build resilience are impeded by the want of certain fundamental social and behavioural insights. Evoking negative 'affective' experiences of heatwaves, such as bad sunburns or transport

disruption (Bruine de Bruin et al., 2016), may more effectively encourage behaviours to protect against extreme heat (Taylor et al., 2014).

In order to address the lack of attention to social and behavioural responses to hot weather events and to improve resilience to these risks, we facilitated a workshop at London City Hall in May 2018 with the UK London Climate Change Partnership. The workshop brought together individuals and organisations working on increasing resilience to hot weather events in the UK and broader climate change adaptation. The workshop explored how people experience hot temperatures and how this impacts their quality of life, health and well-being; how everyday services are impacted by hot weather events and how resilient they are; what the key priorities should be in improving behavioural responses to hot weather events; and how UK policy and guidance could be improved. The summary findings are incorporated in the discussion below.

3. Understanding the impacts and vulnerabilities related to hot weather

Though hot weather is often associated with positive experiences, it also has negative consequences such as poor sleep, dehydration, sunburn, lower productivity and violent crime. The way in which people experience hot weather varies, in part because *hot* is a subjective assessment that is socially and culturally constructed.

Hot weather events are invisible and can occur with little notice, meaning that people may not be well equipped to deal with them in a timely manner. However, as hot weather becomes more normalised, people's tolerance and resilience are likely to increase – particularly if infrastructure and practices also adapt. Transport, for example, has the dual challenge of looking after the well-being of end-users and staff whilst ensuring service delivery. Trains, buses, and platforms overheat, reducing comfort for both passengers and operators, and train tracks that overheat require lower speed limits, causing delays. For health care, the UK National Health Service may have little slack with which to absorb surges in demand from dehydration, sun burn, heat exhaustion/stroke and asthma. Higher temperatures correspond to increases in violent crime and alcohol consumption, impacting the health care system and law enforcement. And similarly in schools, student (dis) comfort from excessive heat can affect their learning and exam results. Unfortunately, little is known about the resilience of personnel and physical infrastructure within key societal functions and, therefore, about what policies are needed to maintain or improve public services.

Although policies can be seen as restrictive, they can in fact give people greater control by facilitating more actions to manage the heat in personally appropriate ways. For example, government could provide guidance for workplaces to support employees in asserting more control over their working conditions during hot weather events. Interestingly, while there is guidance on *minimum* workplace temperature, there is currently no guidance on *maximum* workplace temperature.

A key aspect of policy-based resilience to hot weather events is flexibility. Heat impacts people in different ways and people have diverse responses to heat, making it complex to craft a one-size-fits-all policy response. Effective behaviour-focused policy and communication is challenging to design in a wide range of policy areas and different mechanisms might be needed to reach different populations.

4. Looking ahead: embedding action on hot weather risks within broader policy debates

Though there is extensive work on behaviour change in the context of sustainable transitions, this is broad and often aimed at emissions reduction/"green" behaviour change; there is little specifically focused on hot weather risks. Whilst it is increasingly challenging to support useful and effective awareness about heat events, it is even more

complex to communicate effectively about how heat risk will change in the future and how it will affect different groups and in what ways. The connection between heat and climate change are often too complex to be portrayed or communicated effectively to the public (Beniston et al., 2017), meaning that heatwave communication often focuses more on resilience rather than the underlying causal factors.

In addition to the challenges around communication, hot weather events are associated with complications on the policy front, as current policies that aim to increase resilience to hot weather often conflict with others. For example, efforts to increase cooling of buildings through the use of air conditioning units lead to higher energy use and concomitant greenhouse gas emissions, with cooling already comprehending 10% of UK electricity use (BRE, 2016) and forecast to be the fastest growing use of energy in buildings globally (IEA, 2018). Better coordinated policy and regulation therefore requires a new definition of over-heating and the integration of this definition with the mix of central government initiatives and broader discussions about sustainability. This definition could fit effectively in initiatives aimed at widening streets, limiting building heights and whitening roofs to address the urban heat island effect which can blunt the impact of hot weather events. Further, local authority plans could feature more drinking fountains and public spaces that serve as walk-in cooldown centres. More coherent and effective communication would ensure alignment between priorities and consideration of potential knock-on and unanticipated impacts of other policy areas such as plastic waste, nature and green spaces, and air quality.

As hot weather events are expected to become more frequent in the UK and globally, we suggest that social responses are prioritised in policy interventions and more effective communication is needed to ensure behavioural changes and better resilience to these risks. Cross-disciplinary and multi-stakeholder collaboration (Howarth and Morse-Jones, 2019) will be instrumental in ensuring the implementation of long-term policy interventions that reflect both social responses to hot weather and the role of social changes in increasing resilience. We outline a series of approaches that must be adopted in order to encourage proactive approaches and increase resilience to heatwaves under a changing climate:

- 1 Design, implement and evaluate methods for informing the public about the hazards they face from hot weather and how to reduce their exposure. People's experience of hot weather varies, and this is often associated with positive memories of past summers (Taylor et al., 2014) leading to careless behaviour, exposing people to the adverse effects of heat. This can affect their health and productivity and places extra pressure on services such as transport and health which are already stretched. In addition, we need to understand why people tend to be reluctant to follow top-down advice, which limits the effectiveness of public health campaigns (Embrace, 2013). Exploring ways to empower people to assess their own risk and put in place their own risk management strategies could be crucial.
- 2 Understand and prioritise social responses and behaviour change in heat-related policies. Whilst we need to ensure we have appropriate regulation and policies in place, we also need to make sure these adequately represent how people respond to hot weather and how their experiences affect their behaviours. By incorporating people's behaviours and responses to hot weather events into broader thinking around building design (e.g. insulated to stay warm in the winter, yet cool in the summer), work practices (adjusting work hours to enable workers to work outside intense heat periods), and health advice (providing more water fountains in public places so people can stay hydrated), policies can better align with societal needs, patterns and vulnerabilities.
- 3 Improve communication on hot weather, about the nature of heatwaves, how they affect different groups within society and how to increase resilience to them. This communication would include in-group interaction where the impacts of the heatwaves are shared

with peers to ensure community support and knowledge of which populations are most at risk. Hot weather affects all people and businesses across society yet we could improve the way in which these talk to each other (Ward, 2018) before, during and after hot weather events. Indeed, this will increase understanding of roles and responsibilities of those responding during a hot weather event (for example emergency services, transport operators etc.) and ensure practices and operations align.

- 4 Learn from best social and behavioural practices from other countries that have been managing the impacts of heatwaves for decades. Mediterranean countries, for example, are used to the hot weather and have adopted simple practices to help them cope with the stress: closing shutters during the hot weather, avoiding being outside or being exposed on the beach during peak heat temperatures, painting buildings white, staying hydrated and avoiding strenuous activities during hot weather.
- 5 Learn from successful implementation of heat-related policies in other countries. Several governing bodies, down to the municipal level, have developed heat action planning. For instance, the western Indian city of Ahmedabad has a heat action plan which combines awareness messaging, a multi-media early warning system for hot weather events, training for medical staff and stocking of emergency rooms ice packs for treating heat-related illness. In the U.S., the state of New York City is conducting work on heat risk mapping to identify the most exposed areas and populations. In certain parts of Australia, green vegetation is used to mitigate the urban heat island effect.
- 6 Support policies and politicians that focus on investing in resilience and communication; particularly approaches that drive investment and adopt a pro-active (rather than reactive) approach. Processes by which heat-related risks are anticipated, understanding of societal vulnerabilities and potential response measures improved, and working closely with those who provide the science that underpins decision-making (e.g. the Met Office) is vital. We need to ensure buildings (especially hospitals and care homes) and infrastructure are better prepared (Carrington, 2018) to withstand hot weather events and that regulation is updated to better reflect this (Carrington, 2017), without which the number of heatwave-related deaths would increase

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