Vulnerability to heatwaves and drought: adaptation to climate change

Findings
Informing change

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This study explores what it means to be vulnerable to climate change. It considers how early examples of climate change adaptation may have an impact on or protect vulnerable groups in society. The case studies considered in this study look at heatwave planning and 'differential water charging' – rising prices depending on water usage levels.

Key points

- Assessments of who is 'vulnerable' to climate change are highly complex. Vulnerability is generally understood as a combination of someone's exposure and sensitivity to climate hazards (e.g. heatwaves) as well as their ability to adapt.
- Social vulnerability differs for heatwaves and drought:
  - People who live in poorly constructed homes in 'urban heat islands' (where built environments retain heat), work in hot conditions, suffer ill health, are older or very young, receive low incomes and/or are disconnected from social networks are more likely to be vulnerable to high temperatures.
  - Low-income households unable to reduce their water use are more vulnerable to differential water charging, particularly those who do not qualify for support schemes.

  There are likely to be strong links between some existing forms of social disadvantage and vulnerability to climate change.
- Water companies are moving away from flat rate fees to new charging models that bill customers according to water usage. This could create affordability problems for low-income households. Schemes to support vulnerable households may help to improve water efficiency while providing affordable water to all.
- The Department of Health's *Heatwave Plan* details how the health and care sectors should respond to heatwaves. But it is difficult for local decision-makers to identify all who are vulnerable to high temperatures, which may limit the effectiveness of planned responses. A national cross-sectoral strategy is needed.
- The authors conclude that decision-makers need to consider how vulnerability will change over time in order to prepare strategically and build resilience to climate change in advance, to achieve adaptation that is socially just.

The research
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Introduction

This research aimed to improve understanding of how adaptation to climate change relates to vulnerability, what this means in practice, and how social vulnerability to climate change is currently understood. It explored two case studies of climate change adaptation in the south-west of England, focusing on affordable water efficiency and heatwave planning. Its objective is to begin to explore how climate change adaptation can contribute to social justice and sustainable development.

Affordable water efficiency

The UK is projected to become significantly drier in coming decades. The south-west region already has the country's fastest-growing population and expects housing demand to increase by a third in the next 20 years. Tourism, with over 20 million visits a year, is also projected to increase, partly as a result of changes to the region's climate. The combined impacts of these factors will place major strain on water resources in the south-west. The region needs to manage water more efficiently to be sustainable.

One way to incentivise greater efficiency is to charge people for the amount of water they use. Improving efficiency through changes to water-charging is an 'adaptation' to climate change: it helps to reduce drought risk. Householders currently pay a standard water charge (weighted by property value, irrespective of usage) or, if they have a water meter, a flat rate for each unit of water consumed. However, water rates vary by region. Bills in the south-west are higher than anywhere else in the country, and water affordability is already a problem. There is thus a tension between the dual objectives of maintaining water supply at affordable prices and improving efficiency. This was recognised in the government-commissioned independent *Walker Review on Charging and Metering for Water and Sewerage Services* (Department for Environment, Food and Rural Affairs, 2009).

South West Water is trialling a new water-pricing structure: the rising block tariff (RBT). RBTs have three 'blocks', with higher charges as use increases:

- essential use – cheap water for everyday drinking, washing and cleaning;
- standard block – standard-priced water as a safety net for households exceeding 'essential use';
- premium block – expensive water for households consuming more than they need.

This approach is called 'differential water charging', based on consumption. RBTs offer a potential solution to the challenge of balancing efficiency with affordability; in theory, households get what they need, cheaply, and can choose whether to consume more expensive water.

However, people are vulnerable under differential water charging if they have an insufficient supply of affordable water to meet their needs. Two factors might make someone vulnerable:

- ability to pay – largely determined by income;
- ability to reduce water use – which depends on household size, medical needs, ability to invest in water-efficient devices and factors such as tenure (tenants are restricted in how they can alter appliances, for example).

Vulnerability under differential water charging is thus predominantly related to poverty. Additionally, water needs vary among households depending on the number of people and their age, medical condition and susceptibility to heat stress. Differential water pricing may therefore cause new affordability problems for households that are unable to reduce their water use.

Current schemes to protect vulnerable households in the south-west from water affordability problems include:

- WaterSure: capped water bills for qualifying households, which must have a meter, be receiving benefits and have three or more children or a medical condition entailing high water use;
- WaterCare: advice, repairs and practical help to improve water efficiency for households in debt.

Not all households are eligible, and drop-out rates can be high because of complex renewal processes. Ineligible households include many low-income single-occupancy households and unmetered customers.

Vulnerability to high temperatures

Climate change is expected to increase the frequency, duration and intensity of heatwaves in the UK. Impacts of high temperatures are felt most in urban areas, particularly neighbourhoods prone to the 'urban heat island' effect where the built environment retains more heat than in surrounding, more rural areas. As the UK becomes more urbanised, this increases society's exposure to high temperatures.

The UK does not have a history of significant impacts from high temperatures; the threat is relatively new and poorly understood. The impacts of heatwaves have been most closely studied as a result of the devastating effects of the

2003 heatwave across Europe, during which over 30,000 premature deaths occurred.

Partly in response to this event, the Department of Health launched an annual national *Heatwave Plan* – the only formal policy document addressing the risks posed by high temperatures in the UK. It outlines the nature of the threat, and details the responsibilities of health and social care services and other bodies in responding to severe hot weather. The *Heatwave Plan* focuses on emergency responses once a heatwave is forecast, although more recent editions recognise the need for more proactive planning to reduce vulnerability. The Department of Health recognises physiological and health-related factors representing vulnerability to high temperatures, such as age, medical conditions, use of certain medicines or unhealthy lifestyles.

This research suggests that people's vulnerability to extreme heat is more complex, as an outcome of the following contextual factors and social processes:

- exposure to high temperatures at home, at work or in local communities because of the design and fabric of their housing or urban environment, or type of employment;
- sensitivity to heat stress, influenced by their respiratory, physical or mental health, age or relative acclimatisation to heat;
- capacity to adapt to circumstances in order to anticipate, escape or treat heat stress – e.g. ability to pay for air-conditioning, physical access to local cool outdoor spaces, or type of housing tenure (council tenants, some private tenants and care home residents may not have options to adapt their accommodation);
- self-perception of vulnerability, willingness to act to avoid heat stress, and awareness of heat stress and how to prevent it;
- social networks and their 'visibility' or connection with the outside world (e.g. with social services);
- transience, lack of local knowledge or inflexibility, which may reduce people's chances of receiving support during heatwaves.

Heat vulnerability appears to have a very strong social dimension. Many of the factors overlap and occur within disadvantaged communities.

While temperature can be mapped and modelled within urban environments, the extent to which people are vulnerable to heat stress is difficult to assess without detailed local knowledge. Research is underway to better assess vulnerability to climate change impacts (including extreme heat), but methods are complex and are not yet being used by local decision-makers who need to implement the *Heatwave Plan*.

What does 'adaptation' to climate change mean in practice?

Adaptations like those mentioned above are rarely defined as such or seen as linked to climate change. This is no surprise, as it is difficult to link ground-level initiatives to 'abstract' climate change. It is considered good practice to 'mainstream' measures to reduce climate change vulnerability within existing sectoral initiatives, for example to tackle water affordability or reduce health inequalities. The danger, however, is that current policy responses underestimate the potential magnifying effect of climate change on existing problems such as drought and heat stress. The effect of climate change might render current approaches inadequate in the near future.

How is social vulnerability to climate change understood?

Vulnerability to water charging (to help combat drought) can be characterised as 'uni-dimensional', in that it mainly focuses on one aspect, namely affordability. Water providers tend to have a strong understanding of this kind of vulnerability and are trialling approaches to reduce it (within a closely regulated sector, where responsibilities are clearly articulated and understood).

This research found that there is less agreement over vulnerability to high temperatures. But it is important to recognise the very real social aspects of vulnerability and use them to inform heatwave planning and society's wider, strategic response to the problems posed by climate change and high temperatures.

There may also be links between vulnerability to drought and vulnerab ility to high temperatures. Understanding of vulnerability to both hazards draws attention to the ways in which people on low incomes, in particular locations, with particular medical conditions or mobility restrictions may be hardest hit and least protected. Not only might some of the same people be expected to suffer most in heatwaves and struggle to afford sufficient water, at times both of these situations may impact upon the same groups concurrently.

Conclusions

Protecting vulnerable people from differential water charging

Water metering and differential rates of charging linked to levels of usage are not inherently regressive. Existing support schemes provide some assistance to households defined as 'vulnerable' to water charging, although some customer groups are not currently eligible. However, water metering *without support schemes* may create new affordability problems for those who cannot easily reduce their water consumption. Rising block tariffs provide everyone, irrespective of income, with the chance of lower water bills and therefore fail to address the needs of priority groups.

There is a long-term risk that climate change and water-charging will create 'water poverty' (households that spend 3 per cent or more of their income on water) and conflict among water users, based on ability to pay. This risk has not received significant attention. However, the water industry, regulatory bodies and consumer organisations are aware of 'social vulnerability' (chiefly affordability) and take such issues seriously.

The authors recommend that climate change vulnerability needs to be addressed in future policy on water management.

Equipping decision-makers to protect those vulnerable to heat stress

The Department of Health's *Heatwave Plan* offers a clear structure for implementing responses during a heatwave. It represents an opportunity to support vulnerable groups, particularly in emergencies. However, improvements are needed. The *Heatwave Plan* is very much a health sector document, which limits engagement by the broader range of agencies and service providers who could improve and support preparedness for heatwaves. Those involved in health, emergency planning and other relevant local agencies have a varied understanding of vulnerability to heat. The tendency is to (over)rely on individual physiological factors that make people vulnerable. This does not explicitly recognise wider social processes and broader factors relating to identity, place and tenure that may cause vulnerability.

Limited data, tools and methodologies are available to local decision-makers to help them identify vulnerable people, to target responses. Those with a greater understanding of how to identify vulnerable people, including the research community, non-governmental organisations, social services, spatial planners, public health and climate change/ sustainability teams, may not be sufficiently informing local responses to heat risks.

Generally, *preparedness* for heatwaves does not appear to be mainstreamed into central and local government plans, especially outside the health sector. A longer-term, more holistic, cross-disciplinary 'heat strategy' may be needed at national level, focusing on preventative measures rather than emergency response planning, to engage a broader set of providers and agencies.

Social justice and sustainable development

The results of the research suggest that an explicit consideration of social justice issues, coupled with clearly defined roles for key agencies and more effective working by the many stakeholders involved across sectors and organisations, is likely to improve outcomes for vulnerable people.

When properly conceived, 'sustainable development' provides the framework to achieve 'just adaptation' – i.e. responses that are socially just. This includes prevention as well as recovery from hazards. The key message from this study is that adaptation initiatives must build resilience among those most vulnerable to climate change in order to contribute to the goals of achieving social justice and sustainable development.

About the project

A literature review explored the concepts 'vulnerability' and 'resilience' and their relation to social justice. The empirical research comprised two case studies, with interviews with national, regional and local stakeholders involved in implementing the *Heatwave Plan* and differential water pricing in the south-west, and reviews of key policy documents (e.g. the *Heatwave Plan*, Walker Review) and academic and 'grey literature' (documents produced by government agencies, academic institutions etc that are not commercially published) on vulnerability, water pricing and heatwaves.

For further information

The full report, **Vulnerability to heatwaves and drought: adaptation to climate change** by Magnus Benzie, Alex Harvey, Kate Burningham, Nikki Hodgson and Ayesha Siddiqi, is published by the Joseph Rowntree Foundation. It is available as a free download from www.jrf.org.uk

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