
REPORT

CLIMATE CHANGE AND SOCIAL JUSTICE: AN EVIDENCE REVIEW

Ian Preston, Nick Banks, Katy Hargreaves, Aleksandra Kazmierczak,
Karen Lucas, Ruth Mayne, Clare Downing and Roger Street

This report assesses current research into the social justice aspects of the impacts of climate change in the UK, and of policy and practice to mitigate and adapt to those impacts.

The social justice implications of climate change are not well understood in the UK context. To support the development of socially just responses to climate change this review draws together current research and thinking in this emerging field.

The report:

- begins by exploring the theoretical basis of climate justice developing a 'conceptual model' which maps the climate justice space;
- analyses evidence from the perspective of two dimensions of justice: 'distributional' and 'procedural';
- considers direct and indirect impacts of climate change on UK populations and the policy and practice of adaptation to those impacts;
- examines aspects of UK policy to mitigate climate change by bringing down carbon emissions identifying where the costs and benefits of these policies fall;
- considers the implications of the social justice perspective for policy and practice; and
- identifies evidence gaps where further work is needed.

CONTENTS

Executive summary	03
1 Introduction	09
2 Theory of climate justice and a conceptual framework	12
3 Social justice and climate change impacts	22
4 Social justice and adaptation policy and practice	33
5 Social justice and mitigation policy and practice	44
6 Discussion, conclusions and policy implications	56
7 Research gaps and recommendations for further research	63
Notes	69
References	70
Appendix 1: Research questions	77
Appendix 2: Rapid Evidence Assessment methodology	78
Acknowledgements	80
About the authors	81
List of figures	
1 Scoping the interface between climate change and social justice research	16
2 Map of the search process	79

EXECUTIVE SUMMARY

The social justice implications of climate change are not well understood in the UK context. To address this and thereby support the development of socially just responses to climate change, JRF have commissioned a review of the research exploring aspects of climate justice.

Investigating climate justice

The review used a Rapid Evidence Assessment (REA) method, sifting thousands of studies to identify around 70 high quality texts for detailed analysis. It shows that climate justice remains underdeveloped as a research topic and that the social justice aspects of adaptation are particularly sparsely researched where the tendency is to focus on emergency preparedness rather than wider resilience. The literature was analysed from the perspective of two dimensions of justice: 'distributional' (i.e. who is affected by climate change and who benefits from, and pays for, adaptation and mitigation policy) and 'procedural' (i.e. whose voice is heard in decisions), allowing discussion of the implications for policy and identification of evidence gaps.

What is climate justice?

We found no commonly agreed definition of climate justice so a working definition drawn from the literature was used to help structure the scope of the review: climate justice is about ensuring, both collectively and individually, that we have the ability to prepare for, respond to and recover from climate change impacts and the policies to mitigate or adapt to them by taking account of existing and projected vulnerabilities, resources and capabilities.

Why is climate justice needed?

There are three main rationales for climate justice – ethical, legal and pragmatic. Ethical rationales are generally of two types: one rooted in

human rights, using moral constructs of ‘right’ and ‘wrong’ and a second ‘consequentialist’ perspective where justice is judged by whether the action delivers the best outcome as agreed by common consent, such as the most benefit to the greatest number. Legally, climate justice is embedded in various international legal frameworks, including the 1992 United Nations Framework Convention on Climate Change, which commits governments to reduce greenhouse gases and considers equity in the ‘common but differentiated responsibility’ of signatory states in doing so, with developed countries expected to take a lead. A pragmatic basis for social justice in climate change policy is also argued: populations are more likely to support climate change policy if it is fair. Some go further, seeing climate change policy as an opportunity to create a fairer society.

Dimensions of climate injustice

The review identifies five different forms of climate injustice in the UK context. It highlights how lower income and other disadvantaged groups contribute the least to causing climate change; they are likely to be most negatively impacted by its effects; they pay, as a proportion of income, the most towards implementation of certain policy responses and benefit least from those policies. We also find that vulnerable and disadvantaged groups are less able to participate in decision-making around policy responses, thereby suffering a fifth ‘procedural’ injustice.

Roots of climate injustice

Injustice is in part due to the differential social impacts of climate change and uneven patterns of social vulnerability. Vulnerability to the impacts of climate change, such as flooding or heatwaves, is influenced by a mix of personal, environmental and social factors. Personal factors are individual characteristics, such as disability or age. Environmental factors are features of the physical environment, such as the elevation of housing or the ability of the natural environment to enhance or offset exposure. Social factors include aspects such as the strength of people’s social networks and levels of income. These factors affect the degree to which events, such as flooding, impact on individual welfare. When viewed in this way it is clear that vulnerability is not innate to some groups. Rather, it is determined by a mix of economic circumstances, social and cultural practices (such as the degree to which elderly people are kept close to the family unit), alongside institutional practices and service provision (such as referral networks established between social and health services to identify and support vulnerable households). This systems perspective suggests the need for policy responses which are cross sectoral and also highlights the need for highly granular localised assessments of vulnerability.

Climate injustice is also found when examining the distribution of costs and benefits of policies to address climate change: lower income groups tend to pay proportionally more for policy and to benefit less from measures introduced, for example through domestic energy policy, despite also contributing least to the problem through their carbon emissions.

Distribution of vulnerability to climate change impacts

Factors causing vulnerability to direct climate change impacts are at their most acute among particular groups, typically the elderly, lower income groups and tenants. For example, older people are at most risk of extremes of heat and cold. Socio-economic and geographical factors also interact to create spatial distributions of vulnerability. For example, lower income groups are disproportionately impacted by coastal flooding by virtue of living in poorer quality housing in coastal locations. At more local scales, disadvantaged groups tend to live in urban areas with the least green space creating greater vulnerability to pluvial flooding and heatwaves. Tenants are more vulnerable than owner-occupiers because they have less ability to prepare for and to recover from climate events because they cannot modify their homes.

The effects of climate change on other countries may also indirectly affect the UK, with social justice implications. For example, disruptions to food supply chains could have disproportionate health impacts on lower income groups as particular food groups become unaffordable. Increases in migration to the UK may also place additional pressure on services and create greater competition for particular kinds of employment, again impacting some socio-economic groups more than others. However, evidence to date suggests that climatic impacts tend to cause internal migration, usually to urban areas, rather than to overseas destinations. In addition, climate justice would also suggest the need for greater solidarity with other countries suffering climate change impacts rather than a narrow protectionist focus in responses.

Social capital and vulnerability

Social networks can influence vulnerability in complex ways. Well networked neighbourhoods have been shown to respond better in emergency situations and social isolation can increase vulnerability. However, social networks may not always mitigate risk; networks around elderly people have in some instances been found to downplay the significance of climate impacts on welfare which can serve to increase vulnerability. These varying and nuanced influences of social capital have implications for adaptation policy, particularly for engagement strategies.

Definitions of vulnerability in policy

Definitions of vulnerability can vary among practitioners and policy-makers and this may have profound influences on responses. Policy developed using definitions which fail to recognise that vulnerability is not an inherent property of particular groups but rather an outcome of the interaction of vulnerability factors, such as low income, with systems of provision and governance, are likely to miss opportunities and be less effective.

Social justice of adaptation responses

The research to assess the justice of adaptation responses is still very new, with limited analysis to date on this. Although the review indicates that UK policies are referencing at least some principles of social justice, they

often do not consider the full range of aspects which affect vulnerability of different people and places and nor do they necessarily deal with how to deliver equitable responses. The National Adaptation Programme, for example, describes the need to target vulnerable groups and to develop their resilience but does not consider the creation of inequitable adaptive response nor how the costs of adaptation policies are distributed. In addition to national frameworks there are a number of local initiatives which are beginning to address questions of climate justice in adaptive planning. Collectively these projects should offer valuable lessons in delivery of socially just adaptation.

The distribution of emissions

The review highlights the inequitable distribution of carbon emissions and that the wealthiest 10 per cent of households are responsible for 16 per cent of UK household and personal transport emissions while the poorest 10 per cent are responsible for just 5 per cent. The difference is particularly large when emissions from private transport and aviation are included. The highest income decile emits 10 times more carbon from international aviation than the lowest and 7-8 times more from personal transport. As yet little consideration has been given to how responsibility for emissions might inform responsibility for mitigation responses.

The equity of carbon mitigation policy for domestic energy

Much of the cost of the UK's domestic sustainable energy policies is paid for through levies on energy bills. As lower income households spend proportionately more of their income on these bills than higher income households, they pay more for mitigation policy as a proportion of their income. To understand whether this is unjust we report work examining the effects of the different compensatory mechanisms associated with each policy. This shows that some policies are fairer than others. However, overall, higher income households benefit more from current government policy than lower income groups: by 2020 the richest 10 per cent of households should see an average reduction of 12 per cent on their energy bills while the poorest 10 per cent are only expected to see a reduction of 7 per cent. So everyone is expected to gain under current policies, but the lowest income groups gain least. And some groups are hit particularly hard: low-income households with electric heating and high energy use will be disproportionately impacted.

The equity of transport policy

For those who own a car, policies to mitigate emissions from transport via use of fuel duty and vehicle excise duty (VED) also appear somewhat regressive. The cost of fuel and VED represents 8.1 per cent of the budget of the poorest 10 per cent of car owners but only 5.8 per cent of the 10 per cent with the highest incomes. Lower income groups also appear to benefit less from spending on transport because they travel less overall, with lower car ownership and because they tend to use buses rather than trains which receive greater public subsidy.

Mitigation and adaptation policy as levers for social justice

The construction of physical and institutional infrastructure delivering long-term and fairly distributed resilience to climate change impacts, so called ‘transformational’ adaptation, could be an opportunity for new economic activity and a fairer society if managed to achieve socially just outcomes. A key consideration will lie in adequately resourcing local authorities and equipping them with the powers and procedures to incorporate social justice into their planning and practice. The economic benefits of mitigation activity also promise positive social justice outcomes if fairly distributed.

Procedural justice issues in adaptation and mitigation

National policies including the National Policy Planning Framework and the National Heatwave Plan have little to say on involving vulnerable communities in the decisions that affect them. Also the policy-making process itself, although in theory open to all via consultation and lobbying procedures is, in practice, dominated by expert groups and practitioners. However, the review identifies principles for greater participation of vulnerable groups and gives some examples of where this is being addressed though changes to procedures at the local level.

General policy implications

Our review identifies a wide range of policy implications:

- At present climate change policy and policy seeking to tackle social vulnerability, poverty and disadvantage are largely developed and conducted separately. There is a need for mainstreaming adaptation and mitigation policy into the activities of agencies working to reduce material deprivation and for climate justice issues to become more closely aligned with other core government agendas such as green growth and health and wellbeing. The tools and procedures for doing this need development.
- Climate change policies should use broader definitions of ‘vulnerability’, understanding it as multi-dimensional and not just related to socio-economic factors or location. Broader definitions will encourage policy that works cross sectorally.
- Policy must also move beyond emergency planning and set about building the institutions and infrastructure needed to create enduring resilience across all social groups – through transformational adaptation. This could be seen as an opportunity to create a fairer society and also as a stimulus to economic activity.
- Changes to both governance and the policy design process are needed so that those most impacted by climate change and climate change policy have a greater influence in decision-making. This will require new procedures and tools for engaging communities and capturing their voices in more collaborative planning processes.
- The rebalancing of planning powers to local levels presents opportunities for tackling climate change and social justice issues. However, local authorities must be sufficiently resourced for this purpose and their activities coordinated within national frameworks to ensure best practices

are shared and synergies from working at higher levels of governance are supported, e.g. at regional levels.

- These compounding effects and interactions strongly argue for integrated policy solutions achieved by mainstreaming social justice considerations into climate change policy and vice versa.

Conclusion

The review describes multiple ways in which lower income and vulnerable groups are disproportionately impacted by climate change and associated policy. However, it also indicates that it is possible to achieve carbon reduction targets in a socially just way and that concrete examples of adaptation and mitigation practice are beginning to emerge at the local level which address social justice questions. To have social justice integrated in climate change policy is not only a moral imperative. Without this, achieving resilience and mitigation targets will be much harder because the transformation of our society that is needed cannot be achieved without the political and social acceptance that results from fair policy. Furthermore, developing socially just responses to climate change, both in terms of adaptation and mitigation, is an opportunity to put in place governance, systems and infrastructure that will create a more resilient and fairer society as a whole.

1 INTRODUCTION

The objectives of the review were to analyse the existing literature on climate change and social justice and identify key themes and findings, covering the social justice implications of both direct and indirect impacts of climate change, and of adaptation and mitigation responses to climate change.

In addition, the review sought to:

- Identify issues, emerging questions and evidence gaps.
- Understand more about the capabilities and vulnerabilities of affected UK populations.
- Understand more about the scale at which drivers, impacts and solutions operate by comparing national, regional, local and community level impacts and responses.
- Understand more about stakeholders' roles in enabling responses to climate change.
- Identify international learning, including examples of socially just adaptation and mitigation policies in other developed countries.

We are primarily concerned with climate justice in the UK but have used studies and case histories from other countries where there are transferable lessons. To meet the objectives we developed a series of research questions reproduced in Appendix 1: Research questions. These were used to define the search terms, interrogate the evidence and as headings to structure the report. Details of the methodology, research questions and the final papers selected for review are reported in the appendices.

Summary of approach

The study used a variety of methods to gather and review evidence:

- a review of the literature using a Rapid Evidence Assessment methodology;

- a stakeholder workshop; and
- internal workshops and discussions.

The Rapid Evidence Assessment (REA) method was used because it offers a systematic and documented process of searching for evidence, setting exclusion and inclusion criteria and data extraction from the materials found. For further detail of the method used, see Appendix 2.

Exploratory workshop

In addition to literature searching, a stakeholder workshop was conducted with a mix of around 25 academics, local authority officers, national government, consultants, NGOs and others working in the Climate Change and Social Justice space. These individuals were selected using the professional networks of JRF and the organisations undertaking the study. The workshop gathered feedback on the review's initial findings and sought to capture the latest thinking on key issues and evidence gaps.

Search, data extraction and analysis

The analysis was split between four areas of inquiry: a) theory of social justice as applied to climate change; b) social justice and climate change impacts; c) social justice and adaptive response to impacts; and d) social justice and climate change mitigation. This allowed a partitioning of the climate justice space although there is often significant overlap between the areas. In particular, impacts and adaptation are often considered together. Each area was allocated to a research lead who had responsibility for judging the quality of the studies and selecting and reviewing the best based on their expert judgement and using formal criteria developed for this project.

Distribution of studies in the evidence base

Studies in the evidence base were categorised into four general types based on the study's main focus and distributed as follows: impacts (19 per cent), adaptation (20 per cent), mitigation (34 per cent) and 'crosscutting' (11 per cent). Often studies covered aspects of more than one of these types, particularly impacts and adaptation. 'Crosscutting' literature comprised studies which were generally more theoretical in nature, exploring the principles of climate justice, and were useful in setting the conceptual framework. Most studies were of primary evidence but a handful were themselves evidence reviews. Primary characteristics of the 68 chosen studies are as follows: 40 per cent of our studies were peer-reviewed journal articles; the remainder were 'grey' literature i.e. studies produced by government, academics, business and industry, but not controlled by commercial publishers (for example, reports by NGOs). This split reflects the relative youth of climate justice as an academic field of enquiry. In terms of our coverage of forms of social justice, 54 per cent considered 'distributional' aspects alone, 17 per cent considered both distributional and procedural aspects and a further 10 per cent considered procedural aspects alone, with only a handful considering intergenerational aspects.

Many of our studies explored more than one aspect of vulnerability – for example geographical location and income group. When assessing the

pooled coverage of forms of vulnerability across all studies in the evidence base it is clear that some forms received more coverage than others. By far the largest single area of coverage was income level and socio-economic group (24 per cent). This was followed by age-related vulnerability at 12 per cent, and levels of social capital 11 per cent. Vulnerability as a function of geographical location in the UK received 9 per cent of coverage, and vulnerability to UK populations as a function of geographical location external to the UK a further 9 per cent. Fuel poverty was covered in 6 per cent of studies. This left a long tail of aspects of vulnerability not considered so extensively: cultural aspects, gender, tenure, ethnicity, disability and health, quality of housing and the built environment. Collectively these aspects constituted the remaining 29 per cent of coverage. More detail on the coverage of the evidence base and of the climate justice literature in general is found in the accompanying technical report available from the Centre for Sustainable Energy.

Caveats and study limitations

The study was designed as a rapid evidence assessment, requiring a systematic approach to literature searching and a particular emphasis on evaluation of peer reviewed work conferring a measure of confidence in the quality of the study. However, much useful material is also available in grey literatures (principally conference proceedings and reports). This is particularly the case for work in adaptation, which is a relatively new field and consequently has yet to develop a mature literature with widely recognised high quality journals. Efforts were made to gather as much relevant grey literature material as possible; however, it is more difficult to access grey literatures by definition and consequently, the emphasis on peer reviewed material in this study means that peer reviewed work in adaptation appears to be underrepresented.

Plan of the report

The report begins by describing the theoretical basis of climate justice as an issue and develops a conceptual map of the field identifying the key areas of enquiry. It then examines the evidence in three principle research domains:

- 1** Social justice aspects of the impacts of climate change. We were interested in both 'direct' impacts, those impacts on people resulting from direct exposure to climate events such as flooding, and 'indirect' impacts, those impacts on UK populations resulting from climate change events overseas such as food shortages.
- 2** Social justice implications of adaptive responses to climate change impacts. This area is concerned both with who pays the cost and who benefits from adaptation activity and also how the process of adaptive response is organised.
- 3** Social justice implications of climate change mitigation activity. This is concerned with understanding how the costs and benefits of policy and practice aimed at reducing carbon emissions is distributed across the population and, as for adaptation, how the process of developing and implementing mitigation responses is organised.

The final section draws conclusions for policy-makers and identifies evidence gaps.

2 THEORY OF CLIMATE JUSTICE AND A CONCEPTUAL FRAMEWORK

Social justice has been a core philosophical concern since Plato and Aristotle. Here we review some of the key ideas from this body of social justice theory and apply them to climate change issues. This allows us to build a conceptual framework for thinking about the meanings and discourses of climate justice.

Why climate justice?

There are various justifications in the literature for ensuring a just approach to climate change mitigation and adaptation. These can be described as ethical, pragmatic and legal.

Ethically, there is question of fairness regarding who may feel the consequences of climate change. In this respect, present climate change policy must address a quadruple injustice whereby certain groups, usually in lower income brackets, are impacted most by climate change; contribute the least to causing it; pay, as a proportion of income, the most towards implementation of particular policy responses and benefit least from those policies (Preston *et al.*, 2013a). A further injustice could be added to this list: in general, lower income groups are also less able to participate in decision-making around mitigation and adaptation responses, thereby suffering a fifth 'procedural' injustice.

Pragmatically, over and above the basic ethical considerations, people are more likely to accept climate change mitigation and adaptation policies if they reflect a fair balance of responsibility, capability, and need (Gross, 2007). In addition, wider participation and fair process can help with management of conflict and help to build consensus (Aylett, 2010). Buell

and Mayne (2011) also find that just approaches to climate change actions have strategic and practical advantages because they are better at ensuring political support, mobilising hidden assets and generating wider socio-economic benefits than approaches based solely on narrow economic or financial criteria through achieving the greatest output at the least financial cost.

Finally, climate justice is embedded in international legal frameworks. Principles of fairness and equity are embedded in the 'common and differentiated responsibility' principles of the United Nations Framework Convention on Climate Change and in the provisions of the Kyoto Protocol (Soltau, 2008) in particular considering the role of individual states in reducing greenhouse gas emissions. The UN High Commissioner for Refugees identifies individual rights and how persons have the right to a secure, healthy and ecologically sound environment, and enabling rights. In the European context, the Aarhus Convention also lays out rights to access to information, public participation in decision-making and access to justice in environmental matters.¹ However, while there has been considerable discussion at the international level about a fair and equitable sharing of burdens and benefits associated with climate change, this discussion has only recently started within the UK (Bulkeley and Fuller, 2012).

General definitions and concepts of justice

We find no single overarching and agreed definition of social justice; however, there is general agreement that it is the product of discourse, argued reasoning and negotiation and its conceptualisations may vary greatly according to historical, geographical and cultural context. Various categories have been described as follows.

Categories of social justice and equity

The overall assessment of precisely what constitutes social justice in relation to any particular issue will depend in part on the underlying ethical origins upon which they have been based. Judgements are usually based on two broad paradigms of moral philosophy: a) 'moral' or 'rights based'; and b) 'consequentialist' (Ikeme, 2003).

'Moral' or 'rights based' approaches give primacy to human rights, duties, obligations, responsibilities, fairness of procedures, etc., rather than to the consequences or outcomes of people's actions (ibid). Kantian theories, for example, emphasise the importance of duty (Stern, 2013). Aristotelian and Asian approaches tend to value ethics, which focus on human stewardship of nature. A commitment to holistic understandings of the role of human activities within nature are also relevant in this respect (ibid).

In contrast, 'consequentialist' approaches give primacy to goals, outcomes and the interests of society as a whole (Ikeme, 2003). In these approaches society identifies and agrees overall societal goals, for example the maximisation of total welfare, and then actions and policies are judged in terms of how they contribute to these goals. Utilitarianism is a key example of consequentialist approaches, i.e. that the greatest happiness of the greatest number should be the guiding principle of conduct. Utilitarianism might either be: a) classical, which focuses on the sum of individual welfare (i.e. economic efficiency); or b) pluralist, which focuses on the distribution, as well as the sum, of individual welfare (Ikeme, 2003).

The two main forms of social justice described within the literature are distributive and procedural (which are considered further below). However,

Ikeme (2003) also distinguishes between different types of preventive justice, retributive and corrective justice in national environmental law. Preventive justice seeks to prevent future harm or injustice, retributive justice imposes sanctions or other punitive measures for past harm or injustice, and corrective justice requires the actors responsible for the harm or injustice to remedy it.

Distributive justice

Distributive justice is largely concerned with how resources, benefits and burdens are allocated between or within countries or between generations (Ikeme, 2003). This can be based on an assessment of responsibilities, rights or needs, ability, capacity and economic efficiency. Different forms of distributive justice include horizontal and vertical equity. Horizontal equity can be based on 'just deserts' whereby allocations are proportionate to the weight of the injustice or 'total equality' (the bottom 10 per cent of the population should receive 10 per cent of the wealth). Vertical equity describes the allocation of resources according to need or ability, i.e. the greater the need the more resource is allocated or the greater the ability to pay then the greater the responsibility to do so (Soltau, 2008). Ikeme (2003) identifies several different sub-categories of distributive justice including, among others:

- The 'total equality' approach, where everyone has exactly the same share of burdens and benefits.
- The 'minimum standard' or 'basic need' approach, which is concerned only with the poor in the society and argues that nobody's income should fall below a certain minimum level.
- The 'meritocratic justice' approach, which allows for continued inequalities providing any differential is accounted for by differences in effort and hard work.

The total equality and basic needs approaches are concerned with outcomes and hence consequentialist, whereas the meritocratic approach is rights based as, once the initial allocation is made, future differences in outcomes are not considered inequitable.

Procedural justice

Procedural justice is largely concerned with the fairness and transparency of the processes used to make decisions about societal goals, i.e. 'who decides' and 'who participates' in decision-making processes. Rights-based approaches emphasise a number of key principles or criteria for ensuring procedural justice including people's rights to: participate in decision-making processes and have their voice heard; be treated with respect; be provided with adequate information; and to get redress if they are adversely affected by decisions (Gross, 2007; Aylett, 2010).

Hobbes and Rawls emphasise the role of social contracts, and how the negotiation of contracts should be made between different actors, institutions and nation states in order to ensure that fairness ensues in the allocation of resources. Sen's 'capabilities approach', which focuses on human agency and the ability to act, is also relevant here. Specifically, he explicitly recognises that not all actors and communities are equally capable of negotiation and some may require additional support in this respect (Ebi, 2009).

Some argue that distributive and procedural justice should not be considered as concepts that are independent of each other. If a group is

not recognised and cannot participate in planning and decision-making, its interests are unlikely to inform, and be served by, related plans and decisions (Bulkeley *et al.*, 2012).

The interface between climate change and social justice

It is therefore important to acknowledge the long-standing philosophical and research tradition in social justice when framing the climate justice research agenda. This not only helps us to avoid ‘reinventing the wheel’ in terms of what constitutes fairness and justice but also helps to embrace climate justice within an already robust research and policy arena. In relation to the UK, Childs provides the following definition for climate justice:

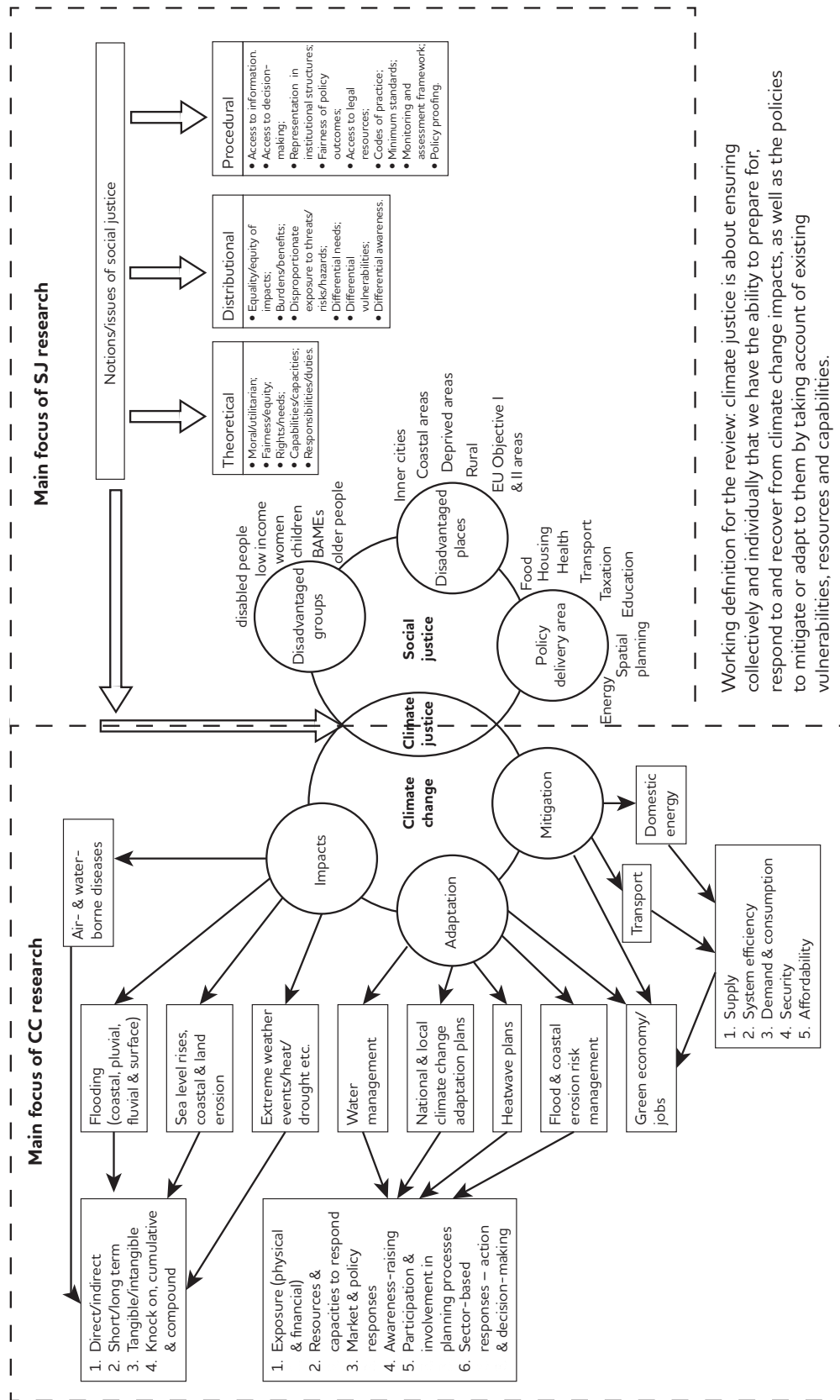
By ‘just’ we mean: some chance of a safe climate for future generations; an equal distribution of the remaining global carbon budget between countries; and a transition in the UK in which the costs are distributed progressively, and where everyone’s essential needs for housing, transport and energy use are met.
– Childs, 2011

Figure 1 shows a conceptual framework developed to help illustrate the interface between current climate change and social justice research. The right hand side of the diagram identifies the principal population groups, geographical locations and policy areas that have been the main focus for social justice research and policy activity in the UK to date. It also outlines the major issue or notions of justice that have been discussed within the literature. The left hand side of the diagram identifies the main focus of UK climate change research and policy to date.

As the diagram makes clear, our area of enquiry is where the two domains overlap and interact. The primary use of the conceptual framework has been in identifying the range of climate change issues and the social justice perspectives that can be applied to them. This has allowed us to develop and refine the search terms, to map the evidence as it has accumulated and to identify gaps in the evidence also. We have not sought to develop new conceptual frameworks which describe, for example, the creation of resilience, vulnerability or climate injustice. For this we have used existing models, principally the work of Lindley *et al.* (2011).

Our assessment of the coverage of climate justice suggests a very limited interface within current UK research and policy. We find that although some inferences could be drawn from across the literatures about what the climate justice domain should look like, this was far from conclusive, most often implicitly rather explicitly stated and usually unsupported by robust empirical evidence. For example, we find no currently shared conceptual framework that considers how to allocate rights and responsibilities for climate adaptation and mitigation in a socially just way in the UK. However, some work has begun to map out the theoretical space. For example, Bulkeley *et al.* (2012) have used the responsibilities and rights criteria in relation to both distributional and procedural justice to assess the approaches of low carbon communities.

Figure 1: Scoping the interface between climate change and social justice research



Theories of climate justice

The major justice issues facing the climate change debate include the unequal distribution of impacts, distribution of responsibility, and distribution of the costs and benefits of policies and responses to climate change. Benzie (2012) describes the 'quadruple injustice of climate change'. Steele *et al.* (2012) ask six key questions relating to climate justice, as posed in work by O'Neill for the Joseph Rowntree Foundation (JRF)²:

- Who has responsibility for and benefits from greenhouse gas (GHG) emissions?
- What is the distribution of the welfare impacts of climate change?
- What is the distribution of the costs and burdens of mitigation policies?
- What is the distribution of the costs and burdens of adaptation policies?
- Who has voice and power in the formation of responses to climate change?
- Are decision-making processes designed to distribute power in proportion to stakes?

Steele *et al.*'s (2012) list of questions suggest a further area of injustice: those groups disproportionately affected by climate change impacts and policy may also have the least voice in decision-making around it. These dimensions may become more or less salient at different spatial scales, for example international, national, regional, local, neighbourhood, and over different time periods, for example, historical, immediate, long-term. The future effects of climate change raise particular concerns about the future and intergenerational justice, as the consequences of decisions or inaction today may affect the habitability of the planet for future generations.

Our review shows that the majority of the theoretical literature on climate justice to date has tended to consider the distribution of responsibility for emissions and benefits between nations (e.g. rich/poor; post-industrial/developing; South/North). There has been very little consideration of distributive climate justice within nations including within the UK. Instead, debate and action on climate justice in the UK has predominantly centred on the issue of fuel poverty, although Friends of the Earth, JRF, Oxfam and the InCLuESEV academic research cluster have attempted to widen the discussion.

Walker (2010) finds that in relation to understanding the distributional impacts of policy, UK government distributional impact analysis tools are variable – strong in health and transport, but weaker in environmental, strategic and sustainability assessment methods, although the Centre for Sustainable Energy's (CSE) assessments of household carbon emissions and modelling of policy impacts has helped to close this gap. There also appears to be little analysis of the implications for climate justice linked to privatisation and localism agendas in the UK (Preston *et al.*, 2013a). A more established field of research concerns the distribution of the impacts of extreme weather events in relation to vulnerable or disadvantaged groups; however, a considerable proportion of this research has not been carried out in the context of climate change but has instead concerned individual heatwaves or flood events.

Overall, this review indicates that there appears to be a lack of awareness or shared understanding in the UK about: a) what climate justice is; and b) how to allocate rights and responsibilities for carbon mitigation and adaptation in a just way between different actors (government, local authorities, business, community groups, householders). This seems particularly important given the implications of the redistribution of roles

The major justice issues facing the climate change debate include the unequal distribution of impacts, distribution of responsibility, and distribution of the costs and benefits of policies and responses to climate change.

and responsibilities for mitigation and adaptation associated with the wider reorganisation of service delivery from public to private and third sector provision as a result of current government policy.

Factors underpinning unjust distributions of impacts

Climate injustice in relation to the distribution of impacts from climate change and adaptive response is affected by a range of factors:

- Individual and internal factors: personal physical and mental capabilities and capacities, household composition and size, income, age, ethnicity, gender, health, education, awareness, sense of responsibility and agency to act, attitudes and personal values.
- Both physical and social structural factors: physical location, geography, housing tenure, access to services and resources, technological systems, infrastructures, markets, social structures, power relations, societal norms, political and institutional structures.

Different vulnerability factors may 'convert' hazards and opportunities into negative or positive impacts on welfare, creating the conditions for an inequitable distribution of climate change hazards (Lindley *et al.*, 2011).

Climate injustices related to the mitigation of climate change are mainly linked to a range of factors which are implicated in the unequal distribution of the costs of mitigation policy and unequal access to the benefits of mitigation, such as the creation of green jobs or the locational consequences of changing energy infrastructure. Climate injustice is expressed through procedural and distributional inequities. These concepts are elaborated further below.

Procedural aspects of climate justice

There appears to be little research in the UK examining the extent to which principles of social justice are applied to mitigation or adaptation policy either nationally or locally. However, some work has been done. Research for Friends of the Earth (Stephens *et al.*, 2001) suggests the following five potential procedural causes of climate injustice in the UK:

- 1 Government and legal failure to protect people and places.
- 2 The private sector externalising the costs of climate change impacts.
- 3 Lack of consideration of the distributional effects of mitigation and adaptation policies and programmes.
- 4 Inadequately designed tools and procedures at the implementation stage.
- 5 Inadequate access to tools by vulnerable population sectors and disadvantaged communities.

Walker (2010) focuses on the third of these, arguing that more systematic use of impact assessment procedures to understand distributional implications of climate change policy could enable more inclusive stakeholder participation and thereby contribute to procedural justice, although this might also exacerbate conflict. Sheppard *et al.* (2011) argue that there is a lack of simple, salient information about climate change at the local level, or processes to engage the public in visioning, decision-making and planning in the UK. Costello *et al.* (2009) suggests that framing such information in relation to health rather than a 'green' or environmental issue would increase engagement in climate change issues.

In relation to low carbon communities, Pickering (2011) lays out the following seven ingredients for ensuring inclusion and diversity in community

Transition Initiatives in the UK: i) listening–consulting; ii) meeting basic needs; iii) accessibility; iv) building bridges; v) celebration; vi) exporting rank/privilege; vii) embedding diversity. These are useful criteria but do not fully integrate wider learning from the community development, participation and empowerment literature. Nor do they address how local actors involved in Transition Initiatives can scale up activities and/or address structural barriers that constrain action on climate mitigation and adaptation.

Sze *et al.* (2009) offer some more specific guidelines for involving under-represented populations based on their experience of developing Climate Change Action Plans with environmental justice communities in the US. Some of these principles could usefully be transferred elsewhere, most notably:

- To ensure that minority groups are involved in strategy drafting process.
- To set up Advisory Committees with minority group representation to scrutinise the drafting process.
- To design bespoke outreach programmes to engage with disadvantaged populations and secure their views.
- To employ people from within these communities to engage with local residents through active engagement processes, such as workshops and bespoke community event programmes.
- To use the correct type of language for engaging these audiences (i.e. a public health rather than climate change focus).
- To have legal mechanisms in place at the start of the process for recourse to justice.

EVALOC focus groups and shared learning workshops with a number of low carbon communities in the UK have recently explored the roles and capacities of different local actors (whether local authority, social enterprise and/or not for profit), and some of the different delivery mechanisms used and needed to enable disadvantaged households and communities to benefit from carbon reduction policies. The research indicates that partnership approaches can help increase the scale and reach of domestic carbon reduction by combining the strengths of different local actors, although these benefits depend on the respective capacities of local actors and are not automatic. It also indicates that the area-wide delivery of physical measures can provide an efficient and fair way of reducing domestic carbon emissions but that this needs to be complemented by participatory behavioural (social learning) interventions (Mayne *et al.*, 2013).

Gross (2007) has outlined some very useful procedural criteria for consulting communities in relation to wind energy in Australia. A key research finding was that different sections of a community are likely to be influenced by different aspects of justice, namely by outcome fairness, outcome favourability and process fairness. Based on this finding, a community fairness framework was developed which has potential application in community consultation.

Distributive aspects of climate justice

The international literature outlines a series of principles for ensuring a just approach to climate change mitigation and adaptation and the distribution of impacts. These criteria have been applied in the international arena to nation states, but many are also relevant to the national arena. The key 'rights based' or 'moral' criteria that have been proposed at international level for ensuring a just distribution of responsibilities, benefits and burdens for climate change mitigation, and to a lesser extent adaptation, include:

- Rights – e.g. to a certain level of emissions, to sustainable development (Stern, 2013); to be protected from harmful effects of climate change; to benefit from climate change policy/technologies (Ikeme, 2003; Claussen and McNeilly, 2000); to protect national /sovereign interest (Soltau, 2008).
- Duties/responsibilities – e.g. to mitigate (Ikeme, 2003), which is primarily expressed as the ‘polluter pays’ principle (i.e. those most responsible for climate change have to make the largest emission cuts). This concept has been extended to include historical emissions in international climate change discussions, which might be difficult to apply within a single nation. There is also a debate about rich countries’ responsibilities to financially assist poor countries or transfer technology.
- Capabilities (Soltau, 2008) including ability to pay (Caney, 2010; Cazorla and Toman, 2000) or the ‘opportunity’ to mitigate and adapt (Claussen and McNeilly, 2000).

In contrast, ‘consequentialist’ approaches emphasise that just solutions need to be economically *efficient* in order to minimise burdens on those who pay the costs, while maximising total welfare across the globe (Stern, 2013; Ikeme, 2003). Economically efficient approaches will therefore emphasise the need to focus emission reduction where it is most cost effective and where the greatest opportunity for emission reduction exists (*ibid.*). However, to ensure fairness and ensure that no country (or group) suffers a net loss of welfare, winners would need to compensate losers. They would also need to take into account specific circumstances, for example energy producing regions that may be disproportionately impacted by emissions reductions and so should therefore be allowed higher carbon quotas or longer transition periods (Stern, 2013).

In the international arena, different actors have tended to propose or emphasise different fairness criteria for allocating burdens and benefits from climate change mitigation and adaptation, often linked to their own national interests, with poorer southern hemisphere countries tending to emphasise ‘rights based’ approaches and richer northern hemisphere countries tending towards more ‘consequentialist’ and ‘efficiency’ approaches. It has therefore been difficult to reach an agreement on what would be considered a ‘fair approach’. A number of hybrid proposals or ‘moral compromises’ have, therefore, been developed which seek to balance and operationalise ‘rights’ and ‘efficiency’ approaches to carbon mitigation and adaptation in the international arena (Caney, 2010; Claussen and McNeilly, 2000; Cazorla and Toman, 2000).

Structural issues influencing procedural justice

It is also important to take into account the structural constraints that can prevent people from participating in or benefiting from decision-making processes, policies or interventions when allocating rights and responsibilities for carbon mitigation. Bulkeley and Fuller (2012) argue that discussions over responsibilities and rights, internationally or in the UK, are usually undertaken in the climate change arena without explicit recognition of the structural inequalities that underpin these issues. These inequalities include ‘the structural conditions that create vulnerability and produce uneven landscapes of greenhouse gas emissions’ and the basis upon which exclusion and inclusion from decision-making is currently structured. This would require a consideration of issues such as capability and agency which shape people’s ability to participate in, and benefit fairly from, decision-making processes, policy and practical interventions.

Direct versus indirect impacts on climate justice

In the context of discussions about impacts of climate change on UK populations, impacts are often distinguished as being direct or indirect. Direct impacts are climate change events directly impinging on UK populations while indirect impacts are the impacts of climate change globally that are transmitted to the UK through trade, investment, political instability or flows of people. One potential conclusion of this approach is that justice could be achieved and social vulnerability avoided through insulation of the UK from other parts of the world. However, it has also been argued that this framing of the climate change issue significantly underplays the need for solidarity, empathy, and recognition of interdependence that sits at the heart of cosmopolitan notions of climate justice (pers. comm., Adger). The opportunity exists to reframe the debate on global dimensions of climate justice towards issues of global solidarity. The work of Peter Singer and other philosophers who emphasise global responsibility for each individual's actions takes this line (Singer, 2011). The arguments for rising empathy with those who do not share citizenship, enhanced by social media and knowledge of the world, also represents a new framing of the global justice dimensions of climate change.

The next three sections of the report present evidence for understanding the social justice implications of climate change from three main perspectives: impacts, adaptation and mitigation policy, and practice.

3 SOCIAL JUSTICE AND CLIMATE CHANGE IMPACTS

Climate change is affecting every aspect of our society and economy. Here we consider literature exploring the interactions between social justice and climate change impacts, particularly focusing on how vulnerability to various impacts is created, maintained and distributed across geographical, social, demographic and economic dimensions.

Climate change impacts

Human-induced climate change is now commonly accepted. The IPCC Fifth Assessment Report (2013) states: 'Human influence on the climate system is clear. This is evident from the increasing greenhouse gas concentrations in the atmosphere, positive radiative forcing, observed warming, and understanding of the climate system' (p. 10). And, 'Continued emissions of greenhouse gases will cause further warming and changes in all components of the climate system. Limiting climate change will require substantial and sustained reductions of greenhouse gas emissions' (p. 14).

The Intergovernmental Panel on Climate Change's (IPCC) latest report makes clear that global warming is set to continue over the next century. Climate change is likely to be experienced in multiple ways but primarily as climate variability, which will be seen as a slow rise in average surface temperatures, increases in the intensity and frequency of extreme weather events in the UK and worldwide (Defra, 2012), sea level rise, changes in rainfall patterns and increased desertification. Clearly such profound changes to the climate will have multiple impacts on human society, disrupting agriculture and fisheries, creating places which are uninhabitable and influencing every facet of the world economy and society. Consequently there is an imperative to act now to protect society or face the consequences, recognising, in addition, that there is an unarguable economic case for doing so (Stern, 2006).

Since the 1970s, average temperatures for Central England have risen by nearly 1°C and the last decade was the warmest on record (Defra, 2012). The latest projections for the UK show increases in summer and winter temperatures, increases in winter rainfall, and decreases in summer rainfall, with more days of heavy rainfall and rising sea levels (Defra, 2012). Climate change may increase the intensity and frequency of extreme weather events such as floods and heatwaves in the UK (Lindley *et al.*, 2011). While there are potential opportunities that can be gained from the changing climate, these are far outweighed by the risks (Defra, 2012).

The heatwaves, drought, coastal erosion and flooding caused by intense rainfall, sea level rise and storm surges occurring in the UK are referred to in this report as direct impacts of climate change. Such climate events result in impacts that are either tangible, for example, loss of property, or intangible, such as effects on mental health. They may occur immediately following the event or have longer-term implications, for example, blighting of areas at risk of flooding.

In addition to these direct impacts, the effects of climate change overseas are also likely to have an impact on the UK – these are referred to as ‘indirect impacts’. According to Foresight’s *International Dimensions of Climate Change* (2011b), the consequences for the UK of climate change occurring in other parts of the world could be as important as the direct climate impacts. A wide range of potential threats are identified, including disruption to: vital infrastructure serving global markets; energy supplies and transmission; global food production and trade networks; the extraction of vital raw materials; and communications networks and data centres. Climate change will also create a growing threat of protectionist responses from countries adversely affected by climate change (Foresight, 2011b).

In addition, both extreme weather events and gradual changes in climate resulting in, for example, desertification may result in outmigration from the affected zones, leading to the change of worldwide migration streams (Black *et al.*, 2011a). Conflict abroad, spurred by low availability of resources due to the changing climate, can also cause population movement which might bring a range of infectious diseases into this country (Grynszpan *et al.*, 2010). The Foresight report suggests that the UK needs to give careful consideration to the implications of climate change for human health, society, business, food and energy security, advocacy and flow of finance, resources and commodities (Foresight, 2011b).

The research community has been posing questions about the nature of the interactions between the processes of environmental, social and economic change and what they mean for the vulnerability of some parts of society (Walker *et al.*, 2006). Further, how can we respond to the complex ecological, economic and social problems we face, now and in the future? What policies need to be developed and who needs to be involved to ensure that a liveable and socially just world can be achieved and sustained (Johnson *et al.*, 2010)? While some case studies and examples exist that show that environmental sustainability and relieving poverty and social injustice are not conflicting aims (NEF, 2008), there is a further need for mainstreaming such approaches in order to respond to the climate change challenge in a socially just manner.

The following sections present the findings from the literature review on the interactions between social justice and climate change impacts and how climate change may reduce or exacerbate social injustice. The report then goes on to discuss the research, policy and advocacy gaps identified through this review.

Social justice implications of direct impacts of climate change

Climate change will directly affect human health, housing and livelihoods in the UK (NEF, 2008). The extreme weather events associated with climate change, such as heatwaves or flooding, pose direct risks to lives and health. The heatwave experienced in Europe in August 2003 is estimated to have caused over 70,000 additional deaths (Robine *et al.*, 2008). In England, where peak temperatures reached 38.5°C (Poumadere *et al.*, 2005), in the hottest period of August 2003 there were 17 per cent (2,091) more deaths than expected, given the average for the same period in the previous five years; a 42 per cent increase in deaths was noted in London (Johnson *et al.*, 2005). The Environment Agency estimates that over 5 million people in England and Wales live and work in properties that are at risk of flooding from rivers or the sea (Environment Agency, 2009a and 2009b). According to Houston *et al.* (2011), 5 per cent of the urban population are at risk of pluvial flooding (caused predominantly by intense rainfall which is projected to increase under the changing climate); and by 2050, 3.2 million people in urban areas could be at risk from pluvial flooding as a result of climate change and population growth.

Climate change will also affect vital systems, such as growing food and energy supplies (NEF, 2008). It is recognised that climate change may have a wider range of indirect effects on health, aggravating existing public health problems related to water availability, nutrition, mental health and well-being, displacement and migration, and health equity. Further, climate change may exacerbate health risks associated with the condition of buildings overheating (especially on top floors), indoor air pollution, flooding damage (particularly basement flats), and water and biological contamination in the indoor environment (Vardoulakis and Heaviside, 2012). Another set of impacts having social consequences is associated with damage to property due to flooding and coastal erosion (Defra 2012), causing homelessness for individuals and housing blight for neighbourhoods. There are also some potential benefits of climate change, for example, a projected reduction in winter mortality and morbidity (Defra, 2012).

The impacts of climate change have been recognised in governmental reports. The Marmot Review (2010), focusing on health, emphasises the implications of the changing climate and the need for responses. The UK Climate Change Risk Assessment (CCRA, Defra, 2012), which underpins the UK National Adaptation Programme (NAP), published in 2013, indicates significant consequences for the health and well-being of the UK population. It specifies that the most socially vulnerable may be the most affected, and that there are implications for public health, the continuity of health and social care services, and the resilience of local emergency services. However, the CCRA has been criticised for under-estimating the social nature of risk due to its sector-based approach (Benzie, 2012). Further, the scope of the CCRA was limited to impacts within the UK, although as recent evidence suggests, indirect impacts on the UK resulting from climate change elsewhere in the world may be as significant, if not more so, than direct impacts at home (Foresight, 2011). In particular, of the indirect impacts identified in the Foresight report, health, security and migration impacts may affect some groups in society more than others (Benzie, 2012). A recent report by PricewaterhouseCoopers (PwC) for Defra, published alongside the NAP, indicates that food and energy security may be particularly pressing concerns going forward (PwC, 2013).

Increased risks to vulnerable groups

Some individuals and groups are more prone to harm and losses in well-being associated with climate change than others, or in other words they are more vulnerable to climate change impacts. Lindley *et al.* (2011) draw on existing research (explored more below) to identify a range of personal, environmental and social factors which may affect the way in which river flooding and heatwaves may produce different welfare effects. They highlight critical factors in understanding vulnerability related to:

- sensitivity, or personal biophysical characteristics such as age and health, which affect the likelihood that a heatwave or flood event will have negative welfare impacts (older people, babies/young children and those with ill health being more vulnerable);
- enhanced exposure, or the aspects of the physical environment, such as the availability of green space or housing characteristics, which tend to accentuate or mitigate the severity of heatwave or flood events (for example, green spaces may reduce heat or flood impacts due to their ability to absorb water and provide shade);
- ability to prepare – the factors that enable an individual or community to prepare for climate change impacts (such as insurance, income and knowledge);
- ability to respond – the factors that enable individuals and communities to immediately respond to extreme weather events, such as income, insurance, personal mobility, fear of crime, community networks, availability of public spaces, local knowledge and personal autonomy; and
- ability to recover – the factors that enable individuals and communities to recover from climate related events, such as income, insurance, housing mobility, social networks, knowledge, availability of hospital and GP services (Lindley *et al.*, 2011).

Impacts are likely to be most acute where high socio-spatial vulnerability coincides with high likely exposure to the hazard (such as flooding or heatwaves) – the research suggests these communities will face climate disadvantage. The varied combination of factors experienced by different communities creates the conditions for an inequitable distribution of climate change hazards. Lindley *et al.* use the above factors to create a socio-spatial index of vulnerability across the UK to identify where vulnerability and exposure are likely to coincide, providing an understanding of how vulnerability differs across the UK in the face of river/coastal flooding and heat (Lindley *et al.*, 2011).

There is a considerable consensus in the literature about who is the most vulnerable or the most likely to be affected by currently occurring climatic impacts (Zsomboky *et al.*, 2011; Lindley *et al.*, 2011). Older people are the group that is consistently listed as vulnerable or heavily affected by flooding (Whittle *et al.*, 2010; Vardoulakis and Heaviside, 2012; Werritty *et al.*, 2007). Older people are also most at risk from both heat and cold, due to their reduced heat-regulating mechanisms related to physiological factors (impaired thermoregulation, reduced cardiovascular fitness or kidney functions), restricted mobility and cognitive capacity (Hajat *et al.*, 2007; Kovats and Ebi, 2006; McGehin and Mirabelli, 2001; Vardoulakis and Heaviside, 2012). Future changes in climate are likely to lead to more risks to the ageing society from flooding, an increase in heat-related deaths, but also in a proportionally smaller decrease in cold-related impacts among older people (Vardoulakis and Heaviside, 2012). In addition, Oven *et al.* (2012) found that in the UK many areas experiencing the most rapidly changing

The varied combination of factors experienced by different communities creates the conditions for an inequitable distribution of climate change hazards.

hazards coincided with the places where the proportion of older people was projected to increase, thus potentially further increasing the risks to older populations. This is partly associated with the continuing retirement migration to the coast, which is one area likely to be particularly affected by the changing climate (Oven *et al.*, 2012; see also the section on Spatial distribution of impacts).

People on low incomes are another significant group that may be significantly affected by future changes in climate. Alongside the disproportionate exposure of these groups to coastal flooding (Walker *et al.*, 2006) and a slightly higher exposure of disadvantaged groups to pluvial flood risk (Houston *et al.*, 2011), climate change is likely to exacerbate water poverty (where a household needs to spend more than 3 per cent of its income on water charges; Fitch and Price, 2002) due to projected decreases in summer rainfall in most of the UK. Snell and Bradshaw (2009) observe that water poverty affects disproportionately those in receipt of welfare benefits, single occupancy households, households with no workers, and those on the lowest incomes. Climate change, combined with population growth, will further reduce the availability of water for domestic use by putting pressure on water supply, and is likely to be associated with an increase in water prices (Benzie *et al.*, 2011). Water affordability is already a big problem in the south-west of England where bills are higher than anywhere else in the UK (Benzie *et al.*, 2011) and in Wales (Snell and Bradshaw, 2009), and this trend is likely to continue.

A particular vulnerable group, overlapping with the low-income group, are tenants in either social or private rented housing, who are likely to be more affected by flooding than owner-occupiers. This is associated with their limited ability to prepare by retrofitting flood resilience measures to the properties they occupy, and the prolonged recovery stage and additional stress of dealing with frequently unsympathetic or uncooperative landlords in the aftermath of flooding (Walker *et al.*, 2006). For example Whittle *et al.* (2010) report that during flood recovery in Hull, private landlords were reluctant to carry out the necessary repairs; they charged their tenants full rent to live in flood damaged houses during the recovery phase despite the fact that the landlord was also claiming money from insurance companies and did not alleviate the extra electricity cost for the use of dehumidifiers. Tenants also had little say in what repairs were completed and when. As a result, tenants suffer from more pronounced lasting intangible impacts associated with physical and mental health than owner-occupiers (Walker *et al.*, 2006; Whittle *et al.*, 2010). In theory, social housing tenants have slightly more protection from poor workmanship and obstructive landlords due to standardised procedures for repairing homes across the sector (Whittle *et al.*, 2010).

Tenants are also usually less aware of flooding and are less likely to have insurance (Tunstall *et al.*, 2007). Thus, climate change increasing the probability and severity of flooding combined with the recession and the expiry of the insurance agreement between the Government and the Association of the British Insurers may have disastrous consequences for those who are not able to afford their home and who may be pushed out to uninsurable accommodation at risk of flooding (O'Neill and O'Neill, 2012).

Residents of particular types of housing are also likely to be more vulnerable than others to particular climate impacts. Climate change may disproportionately affect those living on top floors of poorly insulated apartments (due to overheating) and in basement flats (in areas at risk of flooding), (Vardoulakis and Heaviside, 2012).

Spatial distribution of impacts

There are social justice implications associated with the geographical distribution of climate risks and vulnerable groups, as the location affects their exposure to different climate risks. For example, Houston *et al.* (2011) and Lindley *et al.* (2011) observed a North-South divide in the UK associated with patterns of flood disadvantage, as the northern locations in the UK tend to have higher levels of deprivation as well as having wetter climates. On the other hand, Snell and Bradshaw (2009) and Benzie *et al.* (2011) draw attention to the water poverty issues in the South linked to the mismatch between supply and demand for water and potential water scarcity.

Both flooding and water scarcity may become limiting factors for economic development of some areas, as strategic investments and growth become associated with risks and adaptation costs (for example, providing water supply infrastructure from other regions) exceeding the feasibility of development. The potential withdrawal of investors from some regions may affect the availability of employment and increase the levels of deprivation in areas at risk of negative climate change impacts, thus further exacerbating social injustice.

The majority of extremely socially vulnerable neighbourhoods are in the UK's large urban centres (Lindley *et al.*, 2011). The disproportionate effect of climate- and weather-related events on urban residents is shown by higher heat mortality rates than in rural settings (Hajat *et al.*, 2007; Vardoulakis and Heaviside, 2012), with the Urban Heat Island effect a particular concern. The increasing proportion of people living in cities suggests that they will continue to be among the most vulnerable locations. It is in cities where wealth disparities are at their greatest and where cultural diversity on the one hand enriches society but on the other hand is potentially associated with prejudice, communication problems and cultural barriers, which may lead to Black and Ethnic Minority (BEM) communities and immigrants being disproportionately affected by climate events. In addition, the environmental characteristics of urban areas may further exacerbate the effects of climate change; more deprived communities and those with a higher percentage of communities from BEM groups tend to live in the least green areas (CABE, 2010). In addition, in some cities, such as London, a considerable proportion of the social infrastructure supporting vulnerable groups (i.e. hospitals, schools) is located within flood risk areas (GLA, 2009). This may further increase exposure of vulnerable groups in cities to flooding.

Another area likely to be disproportionately affected by climate change in the future is the coast, which is subject to erosion, sea level rise, coastal flooding and storm surges. Most coastal areas around the country experience higher than average deprivation (Zsomboky *et al.*, 2011); in England, there is a positive correlation between the exposure to coastal flooding and the level of deprivation (Walker *et al.*, 2006). Also Lindley *et al.* (2011) identified a notable coastal component in social vulnerability to climate impacts. The vulnerability of coastal populations is associated with economic decline of former coastal resorts, which are characterised by high reliance on seasonal employment and low incomes. The vulnerability is exacerbated by a high proportion of renters and a high percentage of older people in coastal populations due to the continuing trend of people retiring to the coast (Oven *et al.*, 2012). In coastal areas the availability of cheap housing means that many residents do not want to, or are not able to afford to, move elsewhere; if they do, new people on low incomes arrive, thus creating a cycle of deprivation that is difficult to break (Zsomboky *et al.*, 2011).

The majority of extremely socially vulnerable neighbourhoods are in the UK's large urban centres

Settlements may also become easily isolated through damage to infrastructure supporting them, in particular poor transport infrastructure, which is already causing isolation of some areas when access routes are affected (Zsomboky *et al.*, 2011). Thus, as climate change impacts become more pronounced, coastal populations may require special attention in terms of development of adaptation measures. In the long term, it is likely that people living in some coastal areas may have to relocate. While this has not been explicitly explored in the UK context, Curtis and Schneider (2011) investigated migration scenarios in the US caused by sea level rise. They found significant social justice implications: in the affected areas, if the wealthier population was to be dislocated away from the coast, but stayed within the area, over time the lower income population could be pushed out by rising rent and property prices (gentrification); and if the wealthier population were to be dislocated and move out of the area, the remaining local area population would be disadvantaged and the area's vulnerability would increase as a result of change in the population composition through selective outmigration. Moreover, other areas may have to absorb the evacuees from the coast, who, as shown in the example of Hurricane Katrina, may come from largely economically and socially disadvantaged places and suffer from emotional and physical stress, be uninsured and already in poor health. This is likely to put a strain on the resources and services in receiving areas (including the availability and affordability of housing, seats in classrooms, and job opportunities), and possibly create new forms of disadvantage as well as affecting social interactions between different socio-economic groups (Curtis and Schneider, 2011). Thus, as a result of the increase of the proportion of disadvantaged groups in their population, places away from the coast may potentially themselves become more vulnerable to climate change impacts.

Climate impacts, communities and social cohesion

Social cohesion escapes easy definition, but it can be summarised as the degree of solidarity or togetherness experienced by a social group. Social cohesion develops out of positive interaction and contacts between and across sections of society encouraging common values, strong norms and attitudes that include trust, a sense of belonging and the willingness to participate and help (Chan *et al.*, 2006). These are all features of a community with high levels of social capital. Thus social cohesion can be seen as a constituent of social capital. The literature on the creation of social cohesion emphasises that this can support a reduction of disparities and inequalities (thus directly relating to the distributional aspect of social justice) as well as the strengthening of social relations and interactions (Hudson *et al.*, 2007).

The literature offers interesting insights into the associations between community cohesion and vulnerability to climate impacts. Neighbours have been identified as the main source of information about flooding and flood warnings (Werritty *et al.*, 2007), thus cohesive communities, understood as those with higher levels of interactions and ties between people living in the same area, are more likely to share information about climate impacts. Consequently, social networks are generally seen as a factor increasing the resilience of communities and reducing the vulnerability of individuals. This was borne out in the 1995 heatwave in Chicago, where Latino communities in the disadvantaged neighbourhoods suffered much lower death rates compared to African American and white communities due to the presence of dense family, intergenerational and social ties, which resulted in better access to care and resources by the frailest members of the community

The literature offers interesting insights into the associations between community cohesion and vulnerability to climate impacts.

(Klinenberg, 1999). However, people may actually underestimate their vulnerability and the risks from the changing climate if this perception is perpetuated by the people in their network. Such was the case of the older people interviewed by Wolf *et al.* (2010) who did not see themselves as vulnerable to high temperatures. Their social contacts did not generally challenge their perceptions relating to resilience and independence (Wolf *et al.*, 2010). Thus, in the future, isolated and insular communities relying on their own knowledge may potentially be more vulnerable to the risks of the changing climate but social networks in themselves cannot automatically be assumed to reduce vulnerability.

Social cohesion can also be undermined by climate events. Whittle *et al.* (2010), based on research in Hull, observed that in the event of flooding, communities initially pulled together; yet, in the longer term conflicts emerged over the quality of assistance received and people were concerned about the future of the neighbourhood due to owner-occupiers moving out and being replaced by tenants. According to Tunstall *et al.* (2007), more disadvantaged groups, including older people and tenants, were the least likely to be helped by their neighbours in the event of flooding; this may be due to being less connected into local support networks and being simply overlooked. This may mean that in the future these groups will continue to be among the most affected by climate-related events. Other research has also suggested that low-income neighbourhoods may, in some circumstances, have lower social capital (i.e. networks or connections among individuals, and the norms of reciprocity and trustworthiness that arise from them), although the relationship between deprivation and social capital is not straightforward (Walker *et al.*, 2006). Where places face a combination of low social capital and a greater likelihood to be exposed to flooding, an increased frequency of flood events in future is likely to affect them more than other communities.

Indirect effects of climate change impacts

The social justice implications of the indirect impacts of climate change (the impacts of climate change that occur overseas yet affect the communities in the UK) are less well researched in comparison to the direct impacts. The majority of the publications included in the review also stop short of assessing the impacts on social justice, instead presenting the general impacts in the UK. For example, in relation to energy security, the 2011 Foresight report, *International Dimensions of Climate Change*, gathered evidence indicating that the availability and price of electricity could be influenced by: rising sea levels and thawing permafrost affecting the infrastructure for energy transportation; and by increases in drought frequency over Southern Europe and the Mediterranean reducing the water availability for cooling of nuclear power stations providing electricity for the UK (Foresight, 2011b). Yet, no implications for social justice were discussed in the publications concerned with indirect impacts. The issues of energy pricing are covered in more detail under the mitigation theme.

Indirect impacts on food

The Foresight *International Dimensions of Climate Change* report (2011b) projects the possibility of negative climate impacts (particularly high temperatures and reduced water availability) on security of supply of food beyond the 2040s, potentially affecting the prices of produce imported to the UK. Healthy food (fruit, vegetables, fish) is often expensive, thus further

increases in the prices of healthy products may negatively affect the diets and, consequently health, of less affluent groups (Vardoulakis and Heaviside, 2012). While no research on the impacts of climate change on food availability for the different groups in the population, and consequently their diets, has been identified in the UK context, Edwards *et al.* (2011) looked into the interrelations between climate change, food production and availability, and health in Australia. As a result of droughts and the limited supply of food, the cost of fruit and vegetables increased the most in comparison to those of other consumer goods and services paid by urban consumers for a market basket considered in the consumer price index. About 43 per cent of the vegetables and 88 per cent of fruit consumed in the UK is imported (Defra, 2011a). Thus, the likely increase in prices of fruit and vegetables with a changing climate may cause a shift to less healthy, but cheaper foods; pre-prepared foods also may be chosen to save money, using less energy and water in food preparation. The diets of the groups on the lowest incomes may worsen, increasing the health gap between the wealthy and those experiencing poverty; the authors quote evidence confirming the strong link between poverty, food insecurity, and obesity in developed countries (Edwards *et al.*, 2011).

Migration to the UK as a result of climate change

The social justice implications of international migration caused by climate change impacts overseas have been researched to some extent but remain uncertain. First of all, the literature does not reach consensus on the projected international movement of people. It is acknowledged that climate change may contribute to population movement (Vardoulakis and Heaviside, 2012) and that climate change will tend to hit developing countries hardest. Therefore, where migrants are forced to move out of their countries, then most of the migration will tend to occur from the developing world to the developed (Grynszpan *et al.*, 2010) with some authors speculating that there could be an influx of environmental migrants into the UK (Kendle, 2010). However, others disagree and so it is not clear that climate change will cause mass international migration. Others argue that: there is limited data on the interactions between the environmental and other drivers of migration (Black *et al.*, 2011b); people in affected areas may not want to move or be able to do so (Grynszpan *et al.*, 2010); migration occurs mainly within short distances (Perch-Nielsen *et al.*, 2008); following an extreme weather event people tend to return as soon as possible if the situation allows it (Grynszpan *et al.*, 2010); and the evidence does not suggest that climate change will create large migrant flows to the UK (pers. comm., Adger, 2013, and COIN, 2013). Rather, it is argued, climate change will tend to displace populations internally, principally from rural areas to cities (Foresight, 2011b).

However, incremental environmental degradation, such as desertification, may lead to a need for income diversification and more significant population movements (Grynszpan *et al.*, 2010). This may lead to an increase in chain migration, whereby prospective migrants overseas learn of opportunities in the UK, are provided with transportation, and have initial accommodation and employment arranged through relationships with previous migrants. This is particularly valid for an already occurring process of family reunions and bringing spouses from abroad. Spouses are the largest single category of migrant settlement in the UK, in particular among communities from South East Asia (Charsley *et al.*, 2012).

Social and economic effects of increased migration

Yet, even if migration to the UK increases, its impacts on social justice are difficult to determine. The first set of possible issues is associated with the well-being of the actual migrants. 'Climate refugees' are inadequately covered by international law and do not have the same protection as political refugees. Research from other countries suggests that they could be mistreated by officials (Harper, 2011) and, due to having limited financial resources, may find themselves in a disadvantageous position upon entering the destination country (Grynszpan *et al.*, 2010). Further, the process of displacement, migration and acculturation is associated with psychological and psychosocial problems, such as major depression and post-traumatic stress disorder (Grynszpan *et al.*, 2010). The mental stress of migrants could be further exacerbated by intolerance in the receiving country (Kendle, 2010; Johnson *et al.*, 2010).

An influx of migrants with few resources may also put additional pressure on welfare and housing services, and have a wider impact on communities in the UK (Kendle, 2010). The links between immigration, social cohesion and social capital have been investigated through a JRF programme (see, for example, Zetter *et al.*, 2006). Hudson *et al.*, 2007 suggest that in areas stretched for housing and jobs, the arrival of new immigrants may cause inter-racial tensions.

According to Foresight's *International Dimensions of Climate Change* (2011b), there may also be a transmission of climate-change-driven unrest overseas to the UK (for example through diaspora communities) which may exacerbate the scale, frequency and disruptive impact of protests, placing pressure on policing and the judicial system. This may also have a negative impact on perceptions of some social groups and overall community cohesion, thus potentially further reducing the resilience of UK communities in the face of future climate impacts. It could, conversely, also increase awareness of the issues by bringing first-hand experience of climate impacts to the fore.

In addition, climate-induced migration may result in changes to the proportion and composition of minority ethnic groups in the UK and additional pressures may be placed on the UK population to support relatives remaining abroad (Grynszpan *et al.*, 2010). The likelihood and extent to which this is likely to happen and have a significant impact on the UK population is however difficult to determine based on the current evidence.

Increased long-distance movement of people may result in outbreaks of diseases previously not encountered in the UK (Vardoulakis and Heaviside, 2012); also, many of the particularly vulnerable areas of the world have a higher rate of endemic disease, and immigrants from those areas may enter the UK with pre-existing disease (tuberculosis, HIV) or have higher risk factors for developing the condition after they have settled in the UK. The new disease patterns may affect different groups to a varying extent, resulting in new health inequalities. However, some of these differences in risk factors are associated with lifestyle choices and public health conditions in the originating country, and may disappear after the first generation (Grynszpan *et al.*, 2010).

Positive outcomes of environmental migration for social justice in the UK are also possible. Harper (2011) argues that in the context of the ageing Western society, the skilled workers in environmentally challenged zones may find it easier to relocate, than under circumstances without perceived demographic deficits in working age populations. Further, skilled workers may choose the temperate climes of Europe over Asian cities where the environmental conditions may become prohibitive to economic growth or

uncomfortable for living. Thus, environmental immigration could contribute young, skilled people to the UK population (Grynszpan *et al.*, 2010), boosting the economy and increasing fiscal contribution. Moreover, as almost half of overseas-born immigrants to the UK emigrate again within 5 years, the UK's old-age dependency may be lowered if these migrants do not age in the UK (Harper, 2011). Whether this will remain true in a climate-changed scenario in which sustainable existence has become more difficult in countries of origin should be considered. The migration of skilled workers is also likely to leave behind vulnerable older people in environmentally challenged zones, thus changing the economic balance between nations and resulting in potentially exacerbated international environmental injustice (Grynszpan *et al.*, 2010; Kendle, 2010).

Conclusion

In conclusion, the review of impacts has found evidence of multiple ways in which disadvantaged groups are disproportionately affected by climate change. The degree to which this translates into greater vulnerability and a reduction in welfare is a function of often complex interactions between socio-economic factors and the systems of care and provision. Although indirect effects of climate change for the UK are thought to be potentially as severe as direct effects, the evidence for their social impacts is much more sparse and the findings more tentative. We should also note that the whole framing of direct and indirect impacts on UK populations is problematic from a social justice perspective. As Adger (*pers. comm.*, 2013) has argued, framing impacts in this way can encourage a 'barbarians at the gate' narrative (Bettini, 2013) which encourages the notion that the UK could, or should, isolate itself from other populations impacted by climate change. It also reduces attention to the rights of climate migrants and the injustices they are suffering by undermining a sense of solidarity with non-UK populations.

4 SOCIAL JUSTICE AND ADAPTATION POLICY AND PRACTICE

Adaptation is not simply a technical response, but has many aspects that need to take account of existing and changing social values, expectations and priorities as well as changing environmental conditions and human behaviours and responses.

Broadly defined, adaptation is 'a response to actual or projected climate change, including variability and extremes, that is intended to moderate harm or exploit beneficial opportunities' (IPCC, 2007). An adaptation response can be in the form of adjustments to plans, policies and programmes by national government, local authorities, communities and frontline delivery organisations, and/or in the form of individual and community responses to climate change, such as relocation or migration.

Social justice and vulnerability for adaptive response

Socially just adaptation is only just beginning to be considered as a concept in the UK and it will take time to embed into policy and practice (Brisley *et al.*, 2012). Brisley *et al.* suggest it requires, first, an understanding of which groups are most vulnerable to climate change impacts and, second, adaptation to ensure that their needs are met. It also encompasses the equity of responses, who pays and who benefits from action (Brisley *et al.*, 2012).

Adaptation responses are implicitly intended to reduce vulnerability (for people, places or systems) in the context of 'harm', which would suggest an element of social justice is embedded within them. However, different disciplines and professions use the concept of vulnerability differently, which generates problems in the development of responses. This is evident in the imprecise definitions of vulnerability in the majority of adaptation literature which often discusses vulnerable people and/or climate hazards in

general (Smith and Brown, 2012). So better definitions of vulnerability for adaptive response are needed to support action. In the field of international development, it is increasingly being recognised that integrating adaptation and development efforts, especially at the international level, and targeting responses towards social vulnerability determinants is critical in light of the impacts of climate change (Mitchell and Tanner, 2008).

Linking adaptation with social vulnerability

To date, in the UK, the link between social vulnerability and adaptation policy and practice has been limited by the policy focus on key industrial sectors (e.g. energy, water, waste, health, etc.) and on their related climate impacts (Defra, 2012). This results in a primary consideration of the functioning of these sectors and physical/technological responses. This technical focus tends to underplay or even ignore the social consequences of climate change or human responses and thus minimises consideration of inter-related social vulnerabilities. In addition, it tends to ignore issues that fall between or outside specific sectors and interdependencies.

As such, adaptation policies and practice responses tend to be single-sector based and associated with particular organisations within that sector or in the context of a single-issue policy remit. For example, the Environment Agency's procedures for flood warnings only cover immediate flood risk and do not identify the specific needs of vulnerable people and longer term effects (Thrush *et al.*, 2005). The current fragmented institutional arrangements for spatial planning and climate change, whereby responsibility is split between four government departments – Cabinet Office, DECC, Defra and DCLG (Henderson, 2010) – illustrates the complexity of the issue and the institutional barriers to change that remain.

A lack of a coordinated response to adaptation policy and practice development means that social and environmental policies have been addressed separately by different government departments and agencies and by different levels of government (national and local). In addition, in local authorities adaptation is usually led by climate change/sustainability departments and there is less evidence that socially just adaptation is built into the plans and strategies of other council departments such as social services, other health, housing and social care bodies, or voluntary and community-sector bodies who have contact with relevant at-risk groups. In local authority adaptation planning, social justice is not evident as a priority and is definitely not an embedded characteristic (Brisley *et al.*, 2012). This is further hampered by the limited tradition of social justice, environmental and community organisations working together (Johnson *et al.*, 2010). Furthermore, policies, programmes and practice focus on addressing 'existing' concerns, opportunities and deficiencies. This often means that even when they do look to address 'projected climate changes' they often do so without considering 'future social vulnerability' or at most have an extremely limited consideration of this.

Socially just adaptation policy and plan development

There is limited published evidence on whether existing adaptation policies at the national and local level are equitable or fair and the newly emerging research in this area is sparse. Many of these policies are still in development or are only just emerging and their social justice consequences are as yet

hard to assess. The National Adaptation Programme (NAP) was published in July 2013. NAP's Objective 13 is: 'to minimise the impacts of climate change on vulnerable groups in society by strengthening their resilience to better prepare for, respond to and recover from future climate risk' (page 50, Defra, 2013). The NAP also refers to, 'a growing appreciation of how the impacts from climate change and extreme weather events could disproportionately affect the most vulnerable in society, such as older people, low-income groups and those with multiple health problems' (ibid.). However, the NAP does not draw on any socio-spatial analysis of vulnerability in relation to different hazards or actions needed and nor does it look more broadly at social justice considerations: it does not consider, for example, who pays for and who benefits from policies such as flood risk management. However, the NAP does recognise the importance of assisting local agencies to develop granular maps of local vulnerability and signposts agencies to resources to help with this.

Most UK and national policies make reference to some principles of social justice; for example, Defra's Sustainability Strategy, the Environment Agency Flood Protection Strategy, the Climate Change Strategy for Wales Adaptation Delivery Plan and the National Planning Policy Framework. Generally, however, they do not consider the whole range of aspects that can contribute to social vulnerability. For example, social isolation and the breakdown of social networks that can occur as a result of climate change events and the differential capabilities of different social groups and communities to respond to such crises are not considered. Neither are other aspects of social justice accounted for, including the extent to which communities are involved in taking the adaptation decisions that affect them nor levels of social capital that may affect capacity to adapt to climate change (Walker *et al.*, 2006).

National policy frameworks will be important in setting the context for action and to provide safety nets for more vulnerable groups. However, national policy needs to take more account of social justice. For example, the proposed move towards an increasingly individualistic, risk-based market approach to flood insurance over the long term (where insurance premiums are proportionate to the individual household's level of risk) as opposed to a solidaristic approach (where those at lower risk contribute to support those at higher risk) poses questions about intergenerational justice. The short-term proposal to introduce Flood Re in the Water Bill with Parliament (a measure by which a small amount of premiums from all households will be pooled and used to ensure that flood insurance remains affordable to high-risk homes) is welcome and does provide a more collective response³. However, it is only expected to last 25 years before fully market-based pricing is adopted. In the longer term this may mean some homes at greatest risk become unaffordable to insure, leading to potential housing blight if climate change increases the frequency and severity of flooding (O'Neill and O'Neill 2012).

Preparedness for socially just adaptation responses

There is some evidence to show the nature of the risks from climate change (Defra, 2012) and, from the social perspective, which areas may be most vulnerable to flooding and heat disadvantage (e.g. Lindley *et al.*, 2011) but what is missing is the application of evidence joining the two to create targeted policy responses. Specifically, there is a gap in understanding exactly which people and places are vulnerable to which risks at a local scale and what should be done in response, both in terms of emergency and long-

There is a gap in understanding exactly which people and places are vulnerable to which risks at a local scale and what should be done in response,

term strategic adaptation policy and national and local planning to ensure resilience. There is also a need to clarify where national policy needs to intervene due to market failures or insufficient capacity or ability to address social vulnerability through local service provision. The next section offers evidence for four areas of climate change impact where this relationship has begun to be assessed and where adaptation responses are beginning to be developed. It considers the social justice implications, namely: heatwaves, water scarcity and drought, flooding and coastal erosion. The review found evidence in other important areas to be lacking. For example, literature on the social justice implications of potential food scarcity, housing relocation and climate migration were insufficiently detailed or not UK focused.

Fair adaptation responses to heatwaves

JRF research suggests that 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 (Benzie *et al.*, 2011). Policy responses to heatwaves are led by the Department of Health. To address the risks posed by high temperatures, the Department working through Public Health England now publish, an annual National Heatwave Plan. The Plan 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. It focuses on emergency responses once a heatwave is forecast, although more recent editions recognise the need for more proactive, coordinated and long-term planning across agencies to reduce vulnerability in order to:

- protect people and infrastructure from the effects of severe hot weather and thus reduce excess summer illness and death; and
- adapt to and reduce the impacts of climate change, including through 'greening the built environment, building design (e.g. increasing shading around and insulation of buildings), increasing energy efficiency (e.g. reducing carbon emissions); and transport policies' (page 9, DoH, 2013)

The most recent Heatwave Plan represents a more balanced perspective on the underlying causes of vulnerability than earlier editions but still does not fully recognise the range of social processes that will affect who is impacted by heatwaves. For example, as noted earlier, older people's perception that they are not vulnerable to heat risk may act as a barrier to adaptation and existing social networks could exacerbate the vulnerability of elderly people to heatwaves (Wolf *et al.*, 2010). So the evidence suggests that policies aimed at preventing heat morbidity and mortality should adopt a multi-pronged communication approach. This would include the provision of advice for the whole population, ensuring that it reaches independent elderly people, who may not perceive that advice is relevant to them, in combination with tailored messages for specific groups of vulnerable people. The evidence also suggests that some community ties (bridging networks, e.g. with community health professionals) tend to increase resilience to climate impacts (Johnson *et al.*, 2010; Tunstall *et al.*, 2007) whereas social bonding networks (friends and family) can reduce resilience (Wolf *et al.*, 2010). Thus, the development of adaptation measures should also consider issues associated with community cohesion and social capital, which currently are absent from the policy landscape (Wolf *et al.*, 2010).

The review also suggests that if one objective of socially just adaptation is to protect those who are most vulnerable, the responsibility for this

protection should rest primarily with welfare agencies and housing providers that are already working with these disadvantaged groups. One specific element of this is the opportunity to improve the resilience of vulnerable people in rented accommodation by working with landlords to improve the building fabric, for example, adding external shading (DoH, 2013; Gupta and Gregg, 2012). The movement of public health into local government offers an opportunity to better link up these agendas.

At the local level more also needs to be done to identify those who are most vulnerable by joining together disparate (separately owned) data such as temperature mapping and modelling, housing tenure patterns, quality of housing stock and vulnerable individuals (elderly, disabled, children, etc.). In addition there needs to be further work on social networks, particularly the influence social capital has on how vulnerable people respond to heatwave warnings. This would ensure that heatwave warnings in the future are designed and communicated in a way that improves the resilience of vulnerable people. Islington Council has begun to explore this avenue in more detail (see below).

Fair adaptation responses to water scarcity and drought

The UK is projected to become significantly drier in coming decades (Defra, 2012). In response to the risk of water scarcity and drought in some areas of the UK, water companies are moving away from flat rate fees to new charging models that bill customers according to water usage linked to compulsory metering. Although this regime may be considered 'fair' (you pay for what you use), it does not necessarily result in socially just pricing for vulnerable customers, and specifically, could create affordability problems for low-income households, particularly for those with higher needs.

As part of Defra's PREPARE research programme, case studies have been developed covering differential impacts of water scarcity responses on vulnerable users. This explores the approaches of four of the water companies to metering: Thames Water (considered as being in 'serious water stress'), Anglian Water, South West Water and United Utilities. The adaptation objective is to use water meters to incentivise water efficiency and reduce household demand – effective charging regimes are a potentially important adaptation measure. The work outlines the range of proposed initiatives to address this, focusing on issues of affordability and ability to pay, water efficiency and vulnerability (Patrick *et al.*, 2013). Schemes such as South West Water's WaterSure, which caps water bills for qualifying households, and WaterCare, which provides advice, repairs and practical help to improve water efficiency for households in debt, may help to support vulnerable households with affordability alongside improvements to water efficiency. However, there remain questions about eligibility for such schemes, with some groups, including unmetered households, missing out (Benzie *et al.*, 2011).

The issue of ensuring socially just water pricing in the future has been recognised in the new Water Companies (Social Tariffs) Bill (2013). This is a good example of where an adaptation measure (installation of meters to encourage water reduction) has been directly linked to a social vulnerability issue (affordability problems for low-income households). In addition, the development of an appropriate policy response is being investigated within the Water Supply industry and the legislation preparation will allow the regulator (OFWAT) to enforce socially just pricing in future.

Other potential impacts of drought have received less coverage. For instance the potential for subsidence, which can cause structural damage to properties has been less of a focus in the literature. There is a small amount

of work on preparation for wildfires, but while there is a link to social aspects the plans are not detailed enough to provide information on whether any vulnerable groups may be disproportionately affected.

Fair adaptation responses to flooding

It is generally held that solutions to flooding should yield equitable outcomes in terms of risk reduction for all members of society. National policies for flood defences and flood insurance are an important part of managing risk. Defra's PREPARE programmes examines differential impacts of adaptation policy to flooding on low-income households. This concludes that flooding impacts upon low-income groups more than the better off, and key adaptation policy alternatives addressing flooding can disadvantage the same groups by offering them weaker protection from floods and poorer ability to recover assets lost due to flooding. Economic vulnerability is one key factor in explaining these outcomes. Other factors, such as age, language and other skills, disabilities, and the extent of social networks, interact with economic vulnerability and can either mitigate or aggravate outcomes (Patrick *et al.*, 2013).

The ability to recover after a flood can be more difficult for people in poverty due to lower financial reserves or access to credit, insufficient insurance or no insurance at all, the cost of temporary housing, loss of possessions and the potential for increased transport costs associated with relocation of evacuation. Thus solutions that support financial inclusion may be important for people's ability to deal with flooding. National policies on affordable flood insurance will also be important in relation to safety nets, as will wider public service provision in relation to access to temporary housing or relocation in the event of emergencies. When designing post-flood adaptation responses, the support structures for vulnerable people need to take into consideration the increased likelihood of repeat flooding in the long term (Defra, 2012) and the likely slower recovery time of vulnerable people. The failure to achieve flood resilient reinstatement when houses are repaired after floods is an ongoing concern.

In the longer term, spatial planning solutions will be needed to ensure that development does not increase vulnerability to flooding and to develop flood resilience. The most recent national assessment of preparedness for flooding and water scarcity by the Adaptation Sub-Committee (ASC) of the Committee on Climate Change (2012) highlights that continued development in the floodplain remains a problem in terms of increasing vulnerability and that around 10 per cent of critical infrastructure (power stations, water treatment works) and emergency services are currently located in the floodplain. The report found that development in the floodplain increased by 12 per cent (210,000 properties), compared to 7 per cent in the rest of England over the previous ten years. One in five of these properties were built in areas of the floodplain at greatest risk of flooding. Simultaneously, funding for flood defences from both public and private sources has been decreasing: 12 per cent lower for the current spending period compared with the previous period after inflation while the Environment Agency estimated that funding needed to increase by £20 million a year on top of inflation to keep pace with climate change. The report suggests that increasing investment and ensuring more careful planning of new housing in the floodplain could reduce the risk of flooding by almost four times what it would have been in 2035 without action (ASC, 2012).

This and other reports also recognise that the public must take responsibility for managing some of the risk through improved readiness and timely response to flood warnings (Wilby and Keenan, 2012), and taking

precautions such as installing property-level protection measures to deal with flooding where appropriate. The ASC found that take-up of measures to protect individual properties from flooding is 20–35 times lower than the rate required to safeguard all properties that could benefit (ASC, 2012).

Ability to prepare for flooding and respond to warnings are partly a function of social capital. In this respect the Environment Agency has done some work to look at how its flood warnings are acted upon (Thrush *et al.*, 2005). The authors found that it is necessary to identify ‘vulnerable groups’ as part of disaster management and mitigation policies. The evidence also shows that common responses to hazard warnings include: denial and disbelief, tendency to act with the normal routine, strong attachment to a locality and high levels of anxiety which may paralyse action and reduce clarity of thought so that people respond in ways that ‘experts’ find unexpected. However, members of the at-risk public are also far from ignorant or illogical in understanding and reacting to risk and may also be experts themselves as a result of their contextualised local knowledge. These factors need to be taken into consideration when designing flood warnings.

Negotiating with landlords, insurers and builders following flooding was repeatedly reported in the literature as a major source of stress for homeowners (Whittle *et al.*, 2010; Defra and EA, 2004; Werritty *et al.*, 2007). Thus, an ‘Ethic of care’ should be developed for the insurance and construction industry, especially to alleviate the stress for the most vulnerable people (older people, lone parents), who are at a higher risk of being treated in a dismissive way by workmen (Whittle *et al.*, 2010). For example, the ways the insurance claims are dealt with could be improved (Tunstall *et al.*, 2007).

Developing fair adaptation responses in coastal locations

Current policy on planning in coastal locations is set out in the National Strategy: ‘Making Space for Water’ (Defra, 2005) and the revised National Planning Policy Framework (NPPF) (DCLG, 2012), backed by funding guidance (Environment Agency, 2011). These documents state how planning at the coast should be carried out and suggest that coastal planning authorities may designate any part of their endangered coast as a coastal change management area where risks of coastal flooding or erosion over a planning horizon of 50 years need to be taken into account. Any development which is likely to increase vulnerability to others on the same coast can be refused or forced to move, or possibly may have to pay for any specific additional damage caused. In addition, coastal planning authorities have powers to make provision in planning for relocation of property or infrastructure in the event of managed realignment of the coast.

It is unclear how these new institutional arrangements will develop in practice, including those addressing aspects of social vulnerability. However, there is concern that some provisions may have inequitable outcomes. For example, there is no longer any guarantee of coastal protection nor compensation in the event of property value blight, or even actual property loss, should cliff erosion claim its victims. It has been suggested that dialogue between coastal scientists, climate change scientists, and the coastal community interests is essential for ensuring equitable outcomes and that community engagement may be initiated through a guided conversation where everyone listens as much as they talk (Schmidt *et al.*, 2013). The evidence suggests that conventional public hearings and set piece representation systematically discriminate against those who are likely to be losers and that engagement should involve a wide array of community organisations, schools, churches, marginalised/vulnerable groups, and

businesses and residents living right by the coast. It also suggests that socially fair ways of financing the future coastline are more likely to be proposed following this trusting conversational process. A good example of this is in the Netherlands where there is a comprehensive approach building future coastal risk into both research and planning, along with detailed discussions with communities and individuals (Schmidt *et al.*, 2013).

Developing community resilience

There are some common links between planning for wildfires and planning for flooding or heatwaves, in particular, the need for coordination of multiple agencies to deal with an emergency and the role of communities themselves in developing their own resilience. The role of Local Resilience Forums (LRFs) are important here as a route to establish community engagement and action. LRFs are multi-agency partnerships made up of representatives from local public services, including the emergency services, local authorities, the NHS, the Environment Agency and others. They aim to plan and prepare for localised incidents and catastrophic emergencies and work to identify potential risks and produce emergency plans to either prevent or mitigate the impact of any incident on their local communities. Twigger-Ross *et al.* (2011) suggest several aspects are important for enabling community resilience in the context of flooding – lessons which may apply more broadly to resilience to other climate impacts:

- Supporting local people to engage with resilience by working with existing social networks for community resilience planning, e.g. informal networks between neighbours, neighbourhood watch, networks through schools such as PTA and pupil networks.
- Being prepared for community resilience plans to look different in different areas, recognising that imposed solutions, plans or processes are less likely to be effective.
- Improving communication between the LRF and local communities by encouraging appropriate community representation on the LRF so that links between people at a local level and the level of the resilience forum are developed. While the LRF operates at the Police Area level, many hazards and risks threaten only very localised populations.
- Awareness that building trust is a key principle in the development of effective governance and strong networks. This involves regular, personal contact between agents. Face-to-face contact appears to be a particularly effective, and possibly an essential, way to build trust.

Alongside this, the Localism Act 2011 introduces statutory Neighbourhood Planning in England. It enables communities to draw up a Neighbourhood Plan for their area and is intended to give communities more of a say in the development of their local area (within certain limits and parameters). The Act also made provisions for the 'Right to Challenge' whereby community groups can take over public services that they believe can be run differently. These provisions provide an opportunity to address both distributional and procedural impacts by allowing community groups to have more control and influence over the delivery of adaptation and mitigation measures in their area.

Fairer adaptation to indirect effects on food supply

Our review of impacts highlighted the possibility of disruptions to food supplies and/or price increases for particular food groups (such as fruit and vegetables), with consequent disproportionate health impacts on lower income groups least able to accommodate price increases. One means

of tackling this is to create the opportunity for more home-grown food and particularly to open this possibility to lower-income groups. Indeed improving local food environments across the social gradient is one of the actions recommended by the Marmot Review (2010). Approximately 33 per cent of the UK population are already growing or intending to grow their own vegetables (TNS, 2009). However, the supply of growing land is currently not adequate to accommodate this: in 2008 there were 100,000 people on local authority allotment waiting lists (Campbell and Campbell, 2009). The 'meanwhile use' of land, or temporary use of underused land for food growing should be promoted to provide space for food growing, as it provides multiple benefits to the land owners, community groups utilising the land and the general public (SQW, 2010). In particular, the use of disused land for food growing in disadvantaged neighbourhoods where fresh and healthy food may not be available ('food deserts' – Marmot, 2010) can improve the well-being of vulnerable groups.

Communicating climate risk

Communicating risk is an important part of preparing for climate impacts and needs to address the differential vulnerability and consider appropriate approaches for different groups. Our evidence suggests that some of the more vulnerable groups – specifically older people and those on low incomes – tend to see climate change and flooding as a low risk (Whitmarsh, 2008; Walker *et al.*, 2006), possibly due to the perception of daily concerns such as lack of money as more pressing issues (Zsamboky *et al.*, 2011). Older people were also found to be less willing or able to respond to flood warnings (Vardoulakis and Heaviside, 2012). Other groups that have been recommended for improved communication of risks include those living in urban areas, who are likely to be more heavily affected by high temperatures (Vardoulakis and Heaviside, 2012; Hajat *et al.*, 2007); and social and private tenants, as they tend to be less aware of flood risks (Tunstall *et al.*, 2007). The lack of effective communication of climate change impacts leads to low levels of awareness and understanding of the risk in communities and also low levels of preparedness for the impacts (Zsamboky *et al.*, 2011). Thus, identification of climate risks and communication of these to those affected is crucial (Johnson *et al.*, 2010). The communication should be sensitive to the concerns about blighting of the areas branded as 'at risk' (Zsamboky *et al.*, 2011).

Socially just adaptation delivery

What is needed for socially just adaptation delivery at the local and community level is the consideration of a specific impact relative to a specific type of vulnerability, combined with future climate and social vulnerability projections to develop tailored solutions. Once this process begins to show results it should inform how national policy is being implemented and how local knowledge could be funnelled back into the policy development process. Since adaptation planning at the local and community levels is in its infancy, many actions have only recently started and as a result reports of their outcomes have not yet been published. A few examples are provided below of emerging practice. These kinds of projects should be monitored to see how they are informing adaptation outcomes.

Kent County Council

Kent County Council has ongoing work looking at addressing social vulnerability in Kent, including the Coastal Communities 2150 initiative

(CC2150) which is an INTERREG IVA funded cross-border project designed to bring coastal communities across the 2-Seas area together in an effort to understand and prepare for climate-driven coastal change. The project aims to:

- support coastal communities in developing their own responses to environmental change;
- increase awareness, understanding and support planning for the long-term effects of climate change; and
- widen partnership and stakeholder working both locally, regionally, and internationally in the area of climate change adaptation (www.kent.gov.uk/CC2150 or www.cc2150.co.uk).

This echoes the recommendations for more socially just adaptation of coastal areas made by Zsamboky *et al.* (2011). Kent County Council has also developed a tool for monitoring the impacts of severe weather (SWIMS). It produces organisational level reports following extreme weather events, based on inputs from across all partners and 75 services. It provides a summary of true impacts, opportunities and total financial costs of events, as well as any media reports and weather data, and can be used to inform future planning across the Kent county partners to support risk management and business continuity. The tool has been funded by Climate Ready and supported by the LGA through Climate Local and is due to be rolled out to other local authorities and climate change partnerships in 2014, hosted by Climate UK. The tool was developed because there was no coordinated system and a particular gap around financial impacts. It will be important to see how far the costs of social impacts can be understood from this tool.

Leeds City Council

Leeds City Council, along with other Core Cities, is running a project that identifies and maps vulnerable residents and services in Leeds and identifies susceptibility to climate change related events. This information will be used to help target its emergency response to severe weather events and assist service providers with strategic planning and risk reduction. The tool uses a broad definition of vulnerability (drawing on Lindley *et al.*, 2011) and uses data on vulnerability from the Adaptation Sub-Committee (ASC) of the Committee on Climate Change, the Fire Service, NHS admissions, plus data on climate variables including EA flood data and information on drainage, the built environment, transport infrastructure, along with UKCIP09 data. There are access level agreements to facilitate data sharing.

Islington Borough Council

Islington Borough Council has on-going work to develop resilience through its Climate Resilience Islington South Project (CRISP). This Defra-funded project has explored the attitudes, knowledge, adaptive capacity, barriers, and opportunities for climate resilience by examining community perspectives in Islington. The area is vulnerable to the urban heat island (UHI) effect, has a significant volume of high-rise housing, has areas at risk of flooding, and has high rates of respiratory disease. The project surveyed 450 older vulnerable households in the area. It found that although many suffered from poor health and long-term illnesses, which could be exacerbated by hot weather, most did not take the problems associated with heatwaves as seriously as they did those of cold weather. This was largely due to a lack of receptivity rather than a lack of information. People were resigned to the problems of extreme weather, believing they could do little about it. While many people

were well placed to deal with heat, a small but significant minority of around 10–15 per cent of people were genuinely socially isolated and likely to be particularly vulnerable. This group had little social contact (seeing people once a week or less), poor support networks, and a very limited relationship with their neighbours. They were also not taking many of the necessary steps for heatwave resilience (i.e. drinking water). The report highlights the importance of considering social isolation in responses to climate change (Kolm Murray *et al.*, 2013).

London Climate Change Partnership and Greater London Association

The AnyTown project is funded by Defra and managed by the London Climate Change Partnership (LCCP) and Greater London Association (GLA) and is investigating the effects of interdependencies on resilience. The scenario is based on a generic town with a population of 50,000 people. It looks at the effects of electricity or water failure on the entire town and considers in a holistic way how the decisions that are made have both expected and unexpected implications for different areas, such as vulnerable groups, communications routes, social networks and coordination of response agencies. It aims to develop a model that can be scaled up and down to use in other urban settings. The project's first report is clear that the only way in which response to a serious climatic event can be understood is via systems thinking: 'therefore having knowledge of causal chains will help predict and prevent secondary effects. Further, the ongoing development of "smart" infrastructures makes them increasingly operationally interdependent' (London Resilience Team, 2013). This conclusion is aligned with the need for vulnerability to be treated as multi-dimensional and requiring cross sectoral working and coordination.

Conclusion

Work at the local and community level is beginning to fill some of the gaps in evidence needed to inform local adaptation responses in the short and medium term. For example, evidence reported here considers the most appropriate messaging and delivery mechanisms for flooding and heatwave warnings and how data from multiple disciplines and service providers can be organised and shared. However, there remains the immense challenge of improving the long-term resilience of communities, housing stocks, business developments and amenity areas. The challenge is to design dwellings and cityscapes that permanently reduce people's vulnerability to multiple hazards, including heatwave, flood, fire and poor air quality, and, in doing so, develop infrastructure and systems that create a fairer, more sustainable society. Where possible, this 'transformational adaptation' approach should also harmonise with natural processes to deliver other benefits, including habitat creation, river restoration and lower carbon emissions. However, there is also the danger that policies for improving food and energy security could work in tension with policies designed to manage land use in ways that reduce flood risk. Such conflicts are likely to have complex, multi-scale dimensions that merit further research to help bridging organisations integrate long-term adaptation planning responses across different tiers of governance.

5 SOCIAL JUSTICE AND MITIGATION POLICY AND PRACTICE

The social implications of policy delivering the urgent and radical emissions reductions needed to avoid dangerous climate change and the consequences of a failure to do this are important matters of climate justice.

The Stern Review recommended that CO₂ emission reductions of 80 per cent 'below current levels' by 2050 would be required to help stabilise emissions and prevent the need for large investments in adaptation and responses to climate change effects (Stern, 2006). The reduction target was adopted by the UK government as a minimum to achieve by 2050, reflected in the legally binding UK Climate Change Act 2008. In addition to this, the Government has statutory targets to eradicate fuel poverty where reasonably practicable by 2016 (Warm Homes and Energy Conservation Act, 2000); and more recently published a strategy for Energy Security which has paved the way for electricity market reform (Energy Bill, 2013).

Beyond the national policy framework for emissions reductions and fuel poverty, the dominant policy response for energy has been a liberalisation of the market, with increasing private sector (energy supplier) delivery of policy goals. With respect to transport, planning and investment has been driven by the need to support road transport (SDC, 2011). Far less attention has been directed at the social and equity implications of low carbon policy objectives and decarbonisation infrastructures: the spatial and temporal complexity of injustice associated with whole energy systems that transcend territorial boundaries; the responsibilities, needs and capabilities of different actors across these systems; and the social, political-economic and material processes driving the experience of energy injustice and vulnerability (Bickerstaff *et al.*, 2013).

The UK's energy and transport policies are growing in significance to society as they are developed to meet the challenges of climate change, energy security and rising energy costs. UK domestic energy policy is among

the most complex in the world. Despite the clear rationale for much deeper cuts to household carbon emissions through a more ambitious housing retrofit programme, the extent to which it can be achieved is questionable due to the radical change in policy emphasis that is required. At present, the majority of financial and administrative investment in the transition to a low carbon economy is focused on support for renewables (through the Renewables Obligation – RO – and Feed-in Tariffs with Contracts for Difference) and encouraging carbon savings among our largest emitters (through the EU-wide Emissions Trading Scheme – EU ETS).

Despite the fixed nature of many of the policies to support large scale infrastructure deployment, there are a number of changes to the UK energy system that provide the opportunity to cultivate a radical transformation in people's relationship with energy and raise questions about social equity. For example, every household in the UK will potentially receive a smart meter which could inform their energy use and support demand reduction. The network operators are deploying new approaches to managing and upgrading their distribution networks, which increasingly include active demand management among those connected to their wires, and the Green Deal has been launched, which provides a new financing mechanism that could enable a householder to install energy-saving measures with no upfront costs. Ensuring these policies are implemented in a fair way becomes increasingly important as they provide opportunities to householders to change behaviours, implement measures to reduce their emissions but also, importantly, drive up the cost of energy and fuel. Consequently there is a question of whether the costs and benefits of energy policies are equally shared. These policies have different implications for social justice, both distributional and procedural.

There are a number of changes to the UK energy system that provide the opportunity to cultivate a radical transformation in people's relationship with energy and raise questions about social equity.

Energy vulnerability and fuel poverty: the terms of debate

Fuel poverty is a central issue in climate change policy as carbon reduction policies can both exacerbate or ameliorate the problem. It is also a public health issue. The Marmot Review into the health impacts of cold homes and fuel poverty (Geddis *et al.*, 2011) carried out by the Marmot Review Team from University College London reported that excess winter deaths are almost three times higher in the coldest quarter of housing than in the warmest quarter. Therefore, improving the thermal performance of our buildings provides an opportunity to both reduce cold-related ill health and excess winter deaths as well as potentially mitigating climate change via carbon reductions. Furthermore, if measures are chosen for their ability to deliver both winter warmth and summer cooling then mitigation could also address some of the risk identified in the Climate Change Risk Assessment, i.e. risks of summer mortality and morbidity, overheating in hospitals and other buildings – providing potential links between adaptation and mitigation.

The term 'fuel poverty' is defined in legislation, in the Warm Homes and Energy Conservation Act 2000, as a 'member of a household living on a lower income in a home which cannot be kept warm at reasonable cost'. The 2001 UK Fuel Poverty Strategy was produced as a result of the Act, and this set targets of eliminating fuel poverty in vulnerable households by 2010 and for eliminating fuel poverty by 2016 (BERR, 2001). It adopted a 10 per cent income definition, whereby: '... a fuel poor household is one which needs to spend more than 10 per cent of its income on all fuel use and to heat its

home to an adequate standard of warmth. This is generally defined as 21°C in the living room and 18°C in the other occupied rooms – the temperatures recommended by the World Health Organisation’.

Fuel poverty as defined by the 10 per cent definition is primarily determined by four household factors: occupancy, income, energy prices and the energy efficiency of the dwelling. Under the 10 per cent definition a ‘vulnerable’ household included elderly or disabled people, children or the long-term sick. Subsequent to the Government’s failure to achieve its 2010 statutory targets, Professor Sir John Hills of the London School of Economics was commissioned to undertake a review by DECC to examine the problem from first principles, setting out the causes and impacts of fuel poverty and assessing whether the current definition and indicator of fuel poverty (set out in the Act and the first fuel poverty strategy, published in 2001) were fit for purpose.

The review (Hills, 2012) proposed a new ‘low income high cost’ (LIHC) method whereby ‘a person is to be regarded as living “in fuel poverty” if he is a member of a household living on a lower income in a home which cannot be kept warm at reasonable cost.’ Low income is defined as being in income poverty with high cost being a ‘required energy’ spend that is above the median of all households. The new proposed definition also includes an estimate of the total number of people in fuel poverty and the ‘fuel poverty gap’ – the total amount of money that would be required to remove people from fuel poverty.

Fuel poverty definitions and policy development for justice

Both the number of households deemed fuel poor and the impact of Government policies on fuel poverty is highly dependent on the definition used. Some 2.8 million vulnerable households and 3.5 million households in total across England were fuel poor in 2010 under the old definition (or 4 million and 4.75 million across the UK) (DECC, 2013b). Under the LIHC definition, 2.7m households were fuel poor in England in 2010 (DECC, 2013b).

The existing 10 per cent definition is particularly sensitive to fuel prices and has been criticised by the Hills Review for the delivery of headline figures that do not reflect the real energy experience of householders or the aims of the Warm Homes Energy Conservation Act (WHECA). However, under the proposed Hills Definition the headcount becomes entirely decoupled from fuel prices. For example, based on the Hills Definition, fuel poverty would only decrease marginally over time based on current Government policy – i.e. falling from 2.5 million in 2011 to 2.4 million in 2020.

The insensitivity of the headcount of fuel poor households to fuel prices is driven by the use of the median value for fuel costs which ensures that a similar proportion of households will fall above or below the threshold for high cost over time. However, a further issue with the use of the median to define fuel poverty is that it excludes low-income households living in small dwellings (with relatively low fuel costs) from fuel poverty. The fact that these households are small in size (floor area) no way diminishes the fact that the *experienced* fuel costs may be high and the householder may feel cold.

England no longer has any state-funded support for energy efficiency in low-income households and energy policy is now delivered by the private sector to meet climate change targets. The Energy Company Obligation (ECO) includes a social aspect to protect consumers from the distributional impacts of these policies; however, as highlighted by the Fuel Poverty Advisory Group, these policies are in no way sufficient to meet the required reductions in fuel poverty (FPAG, 2013). While the Hills Definition does

include the ‘fuel poverty gap’ which is responsive to fuel prices, there are concerns that a static headcount will reduce political and public pressure for further action and therefore further Government inaction on fuel poverty. Notably, Wales, Northern Ireland and Scotland have all rejected the LHC definition.

In terms of future fuel poverty policy in England, DECC’s Framework for Future Fuel Poverty Action aims to mitigate the increasing cost of energy bills through greater home energy efficiency measures for fuel poor households (DECC, 2013a) but the details of the proposals for delivery remain to be seen including how far carbon reduction, fuel poverty and public health agendas can be tackled together. As the strategy is developed it will also need to be seen against the backdrop of welfare reform which is likely to substantially increase poverty, with around 8 million households, including some of the most vulnerable in society, likely to be affected by the Welfare Reform Act 2012, many of whom will be fuel poor (Keohane and Shorthouse, 2012).

New definitions of energy vulnerability

Commentators have recommended focusing on energy vulnerability, rather than fuel poverty, when considering the justice implications of energy and carbon reduction policy, because this captures a wider range of dynamic influencing factors, such as: personal physical attributes (Walker *et al.*, 2011); circumstances such as low income, large family, or home-based working; housing characteristics; the nature and cost of energy supply; and the functioning of technologies in the home. Responses can then also address energy resilience at a community or social group level, rather than solely focusing on households and individuals. The analysis presented in a study for the Fuel Poverty Advisory Group (Preston *et al.*, 2013b) shows that the current policy target groups exclude 9 out of the 16 indicators of energy consumer vulnerability.

Encouragingly, the energy regulator Ofgem has led the way in seeking to create a more coherent definition and understanding of energy vulnerability in its strategy for vulnerable consumers. The approach is aligned with recommendations that the definition should be multi-dimensional and dynamic. Ofgem’s approach has drawn on the characteristics of vulnerability as defined in British Standard (BS) 18477 relating to consumer treatment (Ofgem, 2012).

Carbon emissions vulnerability and poverty

A growing body of work indicates that both direct and indirect emissions⁴ are higher among the richest households in the UK (e.g. Preston *et al.*, 2013a). Gough *et al.* (2011) show that all categories of per capita emissions rise with income, for example, domestic energy and housing, transport, food, consumables and private services. Similarly, Preston *et al.* (2013a) find that the wealthiest 10 per cent of households are responsible for 16 per cent of UK household energy and personal transport emissions, while the poorest 10 per cent are responsible for just 5 per cent. In terms of domestic energy, emissions among the wealthiest households are about twice those of the lowest income households.

Alongside people’s incomes, the two other key variables explaining this trend are household composition, partly reflecting economies of scale in consumption and emissions in larger households, and employment status. However, emissions represent a far higher proportion of income for

lower income households. This is particularly true for domestic energy, housing and food related emissions. Gough *et al.* (2011) identifies these as 'necessary' expenditure which therefore have a lower elasticity of demand. In other words, these emissions are partly unavoidable for lower income households and must be maintained to meet basic needs, which suggests that any form of direct carbon taxation could be regressive without adequate compensation.

Distribution of emissions and policy costs in domestic energy

Overall UK domestic energy policy has been shown to be regressive as much of the costs are paid through levies on consumers' energy bills. Lower-income households thus pay more towards implementation as a proportion of their income and also stand to benefit less from the policies themselves (Croft *et al.*, 2012; Preston *et al.*, 2013a). If we consider who benefits from and who pays for current climate change and energy policies, the impacts again appear skewed. While the average annual household energy bill in 2020 with Government policies applied appears (at £1,180) to be lower, by some £105 (or 8 per cent) on average, than the 'no policy' 2020 energy bill, higher-income households tend to benefit more than lower-income households. The richest 10 per cent of households see an average reduction of 12 per cent (£182) while the poorest 10 per cent see an average reduction of 7 per cent (£69) compared to the 2020 'no policy' energy bill.

This suggests therefore that the overall impact of Government policies is both positive and regressive, in that low-income households stand to benefit but to a lesser extent than higher-income households. However, this impact depends largely on whether a household is expected to benefit directly from policies, for example receiving financial support for installing energy efficiency measures or renewables in the home. Households not benefiting directly – some 55 per cent of households in the analysis by Preston *et al.* (2013a) – may expect to see an increase in household energy bills in 2020 of around £50 on average as a result of current policy. So individual policies can be more or less regressive depending on how they are designed and how effective the compensating mechanisms are. For example, on average, across all consumers, the Renewables Obligation appears to be adding the most to energy bills in 2020. The Warm Homes Discount and CERT appear progressive overall, with the costs of policies falling more heavily on higher-income households, while lower-income households stand to gain.

The Green Deal and Energy Company Obligation (ECO) are expected to add around £25 to the average energy bill in 2020, while the Feed-in Tariff (FIT) appears to offer a net saving of over £30 on average across the population as a whole. However, these overall average impacts mask significant variation in the impact on different households. The Green Deal, ECO and FIT all have both costs and benefits associated with them. The impact on an individual household therefore varies substantially, depending on whether or not the household benefits from the policy by taking up measures. Households taking up measures under the Green Deal (some 14 per cent of households in this modelling scenario) are expected to see an average reduction in their annual energy bill in 2020 of over £130. Households benefiting from FIT (12 per cent in this model) see an average saving of £359 on their 2020 energy bill, while the remaining 88 per cent of the population pay for the policy at an average cost of £10 on their 2020 energy bill.

The Warm Homes Discount shows a progressive pattern of impacts due to the highly effective targeting of this policy, which uses data on benefits provided by DWP. The policy is scheduled to run until the next

Overall UK domestic energy policy has been shown to be regressive as much of the costs are paid through levies on consumers' energy bills.

comprehensive spending review in 2015. Government analysis currently assumes that this will continue and this analysis supports this (i.e. it should continue until all target households have been given energy efficiency measures that deliver long-term sustainable savings). The target group could arguably be expanded beyond low-income pensioners on the guarantee component of pensioner's credit to include particularly customers with long-term limiting illnesses who may also be considered vulnerable. People living just above the benefit line will neither benefit from ECO affordable warmth funding nor be able to afford the relatively high interest rates associated with the Green Deal. The Eco Easterside partnership in Middlesbrough demonstrates how grant money can be used to provide energy efficiency measures to this group of people in an effective and equitable way (Mayne *et al.*, 2013).

Despite the overall distribution of emissions there remains a significant group of low-income households with high domestic energy use (1.7 million), particularly those that use electricity to heat their homes (1 million of the 1.7 million). This group is at high risk of negative impacts from domestic energy policy as electricity carries a far higher proportion of the domestic energy related policy costs, yet they are less likely to live in homes that are suitable for measures (White *et al.*, 2011). In addition, low-income households are more likely to use electricity to heat their homes when compared to higher-income households.

Overall then, there is a triple injustice to carbon reduction policies applied through energy bills; the lowest income households pay proportionately more and benefit less from policies while also being responsible for the least emissions. The current suite of Government policies fails to take account of the needs of a group of vulnerable customers (i.e. those on low incomes without a choice to change the fuel they use). These householders typically contribute more to the costs of other people's benefits (insulation and solar photovoltaic panels) and the required investment for large scale infrastructure. They also contribute to our existing climate change targets via their lower overall direct and indirect emissions. A fair set of climate change policies would assess their needs and provide a suitable intervention, for example, developing a programme of affordable low carbon district heating for high and low rise developments that use electricity for heating.

Distribution of emissions and policy costs in transport

The inequality in emissions from private road travel and international aviation is an important reason for the difference in emissions across the income spectrum: international aviation emissions of households in the highest income decile are more than ten times that of the lowest income decile, while emissions from private vehicle travel are around 7–8 times higher. Commentators have begun to raise questions around rights and responsibilities for emissions in relation to flying; in other words, do people have a right to travel by air and if so how far and how often?

Spatial planning's role in the current distributional impacts of our car dependent society has been heavily criticised. Much transport policy has been based on detailed analysis of existing trends, extrapolation of future needs and planning to meet these needs, the so called 'predict and provide' approach. The 1998 Transport White Paper recognised that this approach does not work for road transport and moved to 'management of existing roads before building new ones'. Over time, land use patterns have changed to reflect car use. Shops and services have moved to car-accessible locations. Journey patterns have become more diffuse and journeys have

become longer. Society is becoming hard-wired to increasing levels of car dependency (SDC, 2011).

Those on low incomes are less likely to travel by car than wealthier households and are more reliant on bus services, with half of the poorest fifth of the population not having a car, rising to more than two-thirds of job seekers (SDC, 2011). The locations of housing and jobs which are available to those on low incomes are often less well served by public transport, with many lower skill entry level jobs located away from town or city centres; accessibility issues which are compounded by cuts to bus services which serve more isolated estates. People living in rural areas now see car ownership as a necessity and around 90 per cent of households have at least one car (SDC, 2011). This results in a significant additional burden of expenditure for low-income households in rural areas. In addition, lower-income households are more likely to suffer negative health consequences of road transport, with children of the lowest socioeconomic groups up to 28 times more likely to be killed on the roads than those of the top socioeconomic group.

The Sustainable Development Commission (SDC) (2011) also found that lower-income households both contribute more to the costs of delivering transport and receive less of the benefit. For example, the richest 10 per cent of the population effectively receive four times as much public spending on transport as the poorest 10 per cent. The poorest of society therefore also face a triple injustice in relation to the UK's car-centred traffic policy: they travel less, their health is affected more, and they pay more than their fair share to the cost of the infrastructure.

Who pays and who benefits from current transport policy

A recent IFS report (Johnson *et al.*, 2012) shows that motoring taxation is, on average, mildly progressive. For the 10 per cent of households with the lowest incomes, fuel duty and VED account for 3.6 per cent of total expenditure, whereas they account for at least 5.9 per cent in the case of higher-income households. But there is no such thing as an 'average' household; either a household runs at least one car or it runs none. As discussed previously, those on the lowest incomes are less likely to run a car (in the lowest income band around 50 per cent of households run at least one car). Among households that incur the considerable cost of having a car, current motoring taxation is regressive. The cost of fuel and VED represents 8.1 per cent of the budget of the poorest 10 per cent of car owners, but only 5.8 per cent of the 10 per cent with the highest incomes.

Recent analysis by Reed and Horton (2010) illustrates that the Government's spending on transport, unlike that for education, housing and health, is strongly biased towards higher income groups. So the richest 10 per cent of households effectively receive almost four times as much benefit as those in the poorest 10 per cent. This is primarily due to two factors: poorer households travel less and tend to use buses, while richer households travel much further and tend to use private cars and the train, and a larger proportion of public spending on transport goes to road and rail travel than to bus services.

How do we achieve socially just mitigation?

Delivering a socially just carbon reduction strategy

The Climate Change Act 2008 was in part a success for campaigners including Friends of the Earth, who helped to make the case for a statutory

framework for emissions reduction in the UK. Climate change also raises wider fairness questions about building public consensus to achieve a low carbon transition and that debate is at present limited. For example, there is little discussion of the justice implications of the energy mix overall (e.g. nuclear vs renewables vs fossil fuels), whereas there has been much more focus on issues like the location and siting of particular energy schemes, especially windfarms (Bickerstaff *et al.*, 2013).

Childs' research (2011) suggests that it might be theoretically possible to get close to the UK's carbon reduction targets in a socially just way. The paper outlines various policy options for mitigating carbon in the main sectors – housing, non-domestic buildings, transport, aviation, waste, heavy industry, energy supply (except for nuclear, which the paper excludes on the grounds of intergenerational justice and the risks of proliferation). However, he warns that to achieve this without negative social justice impacts will require a determined effort by policy-makers to reduce existing inequalities and achieving majority public support for the changes would also require, in his own words, 'herculean effort'.

Fairness in decision-making

At the national level, the process of transport, energy and housing policy development in the UK typically takes the form of an impact assessment for a new policy which is then published and consulted upon. However, the impact assessment process contains no formal or set assessment of the distributional consequences (Walker, 2010). The consultation process is open to all, including the public, but typically only gains responses from organisations and experts that work in this area. At present it is not designed to ensure that the voices of those affected are heard.

It has been suggested that a more systematic approach to the assessment of policy impacts and a broader conception of environmental governance is needed, wherein the state is not the only key player in policy-making (Walker, 2010). This would identify and assess impacts on particular groups or communities and examine alternatives, mitigation, negotiated agreements or compensation measures. However, bringing attention to issues of distributional impacts and inequality also risks further conflict around environmental decisions as revealed inequalities may become politicised.

Previous studies that examine procedural justice have typically examined the concept in relation to community level renewable developments and carbon reduction schemes (Cowell *et al.*, 2012; Bulkeley *et al.*, 2012). Bell and Rowe (2012) identify a number of important principles which should be applied in decisions around climate change. In particular the research suggests applying the principle of proportionality to ensure greater fairness in decision-making; in other words, the more that anyone has at stake in a decision, the more power they should have in making that decision. The assumption that every citizen has an equal right to participate, as principles of democracy imply, is contentious in an arena known for the complex and often expert-driven nature of the policy process (Aylett, 2010). In addition, living in a disadvantaged community can create further obstacles to recognition and participation in planning and decision-making processes (Bulkeley *et al.*, 2012).

Stimulating a change in policy design

Despite the centralised view of policy-making, many commentators feel that 'individuals are the driving force' for action on climate change. Although the government is said to have more power than individuals, pressure from concerned citizens or campaign groups is often seen as the decisive factor

that can spur the government to action. For example, bottom up pressure from organisations like Friends of the Earth was essential to the success of the Climate Change Act. In addition, while individual-level behavioural change is valued in itself, it is also often seen as a mechanism for provoking government and business into responding to climate change. Community groups also clearly have a role here as collective action increases individuals' sense of agency (Cox *et al.*, 2010). The need for bottom up pressure in policy-making suggests the need to develop a wider understanding of the rationale for a social impact assessment of policy among grassroots organisations.

The role for localism

The Government's localism agenda provides a number of opportunities for community groups to influence the deployment of mitigation measures in their area. There are a growing number of low carbon community groups (LCCG) that are actively engaging householders and stimulating behaviour change, with an increasing emphasis on the potential to increase the uptake of mitigation policies, e.g. the Green Deal. However, LCCGs have an uneven spread and capacity, and are typically led by wealthier householders irrespective of the demographics of their community. Low income communities who are less able to develop neighbourhood plans or run services are therefore suffering a further social injustice, except in cases where local authorities or other organisations are actively addressing fuel poverty through area wide energy efficiency programmes, e.g. as in Kirklees or Middlesbrough. Living in a disadvantaged community can hinder involvement in the planning and decision-making processes (Bulkeley *et al.*, 2012). We therefore need to better understand the potential to build social capital in low-income communities through the development of LCCGs and the role of partnership working between community groups and local authorities in ensuring equitable approaches.

Further risks from the localism agenda are the transfer of responsibilities from government to communities without an adequate transfer of budget or assessment of their capabilities, reinforcing problems with existing inequalities. There is already evidence that the combination of funding cuts and withdrawal of statutory obligations on local authorities is contributing to 'load shedding' in many local authorities (LGIU, 2012). As local authority delivery roles can be important in addressing fuel poverty, for example through the coordinated delivery of area-based free energy efficiency measures, this could exacerbate existing inequalities. More needs to be done to understand the financial support necessary to enable local authorities to play these process roles, including the support required to empower disadvantaged communities to participate in and benefit from projects.

Tackling climate change and fuel poverty together

The delivery of mitigation measures does have the potential to tackle both climate change and fuel poverty simultaneously by reducing the long-term demand for energy and, as such, both cost and emissions. However, there are several factors that complicate this seemingly straightforward combination. The first is the extent of under-heating (Hirsch *et al.*, 2011) in low-income households which often results in a significant proportion of households' theoretical energy savings being taken as comfort: as a result of the home being better insulated and more energy efficient, the same or a similar amount of energy is used by the householder as before the measure to increase internal temperatures so as to become more comfortable (Ürge-Vorsatz and Tirado Herrero, 2012). This should not act as a rationale

The delivery of mitigation measures does have the potential to tackle both climate change and fuel poverty simultaneously.

for inaction. If we are to achieve the necessary emissions reductions we will need to improve the whole of the housing stock and we should do this in an equitable and fair way. A second factor is the nature of the old '10 per cent' definition whereby an increase in energy prices leads directly to more households becoming fuel poor, whereas the new LIHC definition is totally insensitive to fuel prices, i.e. the headcount is static. Although the 'fuel poverty gap', i.e. the reduction in required spending which would take a household out of fuel poverty is linked to fuel cost, the headcount of fuel poor is not. However the new indicator's insensitivity to prices should not be a rationale for inaction and further legislation is required to ensure the previous statutory target on elimination of fuel poverty is replaced.

Policy design for tackling fuel poverty and climate change

Stockton and Campbell (2011) describe how advocates of fuel poverty would define energy as a social necessity, in other words as a social need which includes protection for the most vulnerable of society. However, as energy suppliers are now the principle agent of energy policy delivery in the UK there are several potential conflicts of interest in the delivery of fuel poverty objectives. In particular, energy suppliers are likely to frame energy as a commodity, with generating a profit at the core of its identity. As such, energy suppliers are naturally seeking to recover their costs fully while delivering policies as cheaply as possible (Stockton and Campbell, 2011).

There are two potential solutions to the conflict between energy and fuel poverty policies. First, carbon reduction policies should be funded more equitably with the costs either being collected from those that benefit directly (via a Green Deal charge), or collected at a higher rate from those that emit the most (wealthier householders). If income taxation were used as a funding source then this would naturally raise more funds from wealthier householders, although there are options for restructuring the collection of policy costs from bills. Second, policies should be designed to provide strategic support to households. In other words the measures should be tailored to deliver technologies to those in most need; the hardest hit by the costs of policies are typically low-income householders who use electricity to heat their home and do not benefit from existing policies (Preston *et al.*, 2013b).

Climate change adaptation and mitigation policy should also be brought closer together with public health policies to ensure that measures to respond to climate change do not perpetuate or increase health inequalities but instead work for joint goals that reduce social vulnerability (Grynszpan *et al.*, 2010).

Designing better transport policy

SDC's study (SDC, 2011) into fairness in 'a car-dependent society' highlights the need to move away from the previous system of 'predict and provide' for all powered transport. The paper (SDC, 2011) sets out a simple solution for transport policy which turns current thinking on its head in two respects. First, it recognises the importance of behaviour change. The key opportunity for policy-makers over the next period will be to reduce the demand for road travel through innovative use of ICT, a modal shift to active travel and public transport. Second, it challenges the view that transport is purely an issue for travellers: it refocuses attention on the systems and infrastructure that create and constrain our travel choices rather than on the decision-making of the individual traveller. The paper also talks about the need for better spatial planning and further provision of public transport. Both of these could be influenced via the Localism Act, under the right to challenge

and neighbourhood plans. In addition there is scope to tighten regulations to increase the efficiency of existing transport including the carbon efficiency of private cars.

Lessons can be learned from Freiburg. In the late 1960s concerns about the growing pressure on the city's land use and biodiversity, the consideration of a new nuclear power plant and concerns about acid rain created a strong political will to increase environmental protection and quality of life. Freiburg has since led the way in reducing car dependency and promoting walking and cycling by providing high quality public transport and through making cycling and walking easy and pleasurable. Over the last three decades, bicycle trips have tripled, public transport usage doubled, and the share of trips by cars declined from 38 per cent to 32 per cent. Since 1990, motorisation rates have levelled off and per-capita CO₂ emissions from transport have fallen – despite strong economic growth (Buehler and Pucher, 2011).

Personal carbon trading

The application of personal carbon allowances (PCAs) or domestic tradable permits have been proposed as a progressive method of cutting emissions and redistributing wealth. In 2008, Defra commissioned a series of studies to scope the feasibility of a domestic system of PCAs. This suggested that despite the overall progressiveness of an equal-per-adult carbon allowance allocation system, a significant number of low-income households would be made worse off. The findings of one of these studies were investigated further for the IPPR and concluded that a PCA allocation system is on the whole progressive, even without any financial compensation to 'low income' households but that around 70 per cent of income deciles 1, 2 and 3 experienced a surplus of allowances under all allowance allocation scenarios modelled. This kind of policy must also consider the procedural justice issue of take-up rates of eligible benefits, or, in this case, allowances. For example, Thumin and White (2008) found that 28 per cent of the lowest income decile were not claiming any of the five key income-related benefits available. When this is also taken into account, the analysis suggest that 15 per cent of the lowest three income deciles, and 10 per cent of the lowest decile, experience a deficit in allowances under all allocation systems modelled and are not in receipt of benefits. This suggests around 250,000 of the poorest 10 per cent of households and 1 million of the poorest 30 per cent may be at risk of suffering a deficit in carbon allowances under the PCT systems modelled and would be difficult to identify and target with compensatory measures.

Positive implications of mitigation activity

The UK economy is currently emerging from recession and green jobs have been heralded as a way of both stimulating growth and tackling environmental targets. However, as highlighted by Bird *et al.* (2010), the agenda has the potential to deliver more than just new jobs and reductions in greenhouse gas emissions. It could also have a vital role in tackling inequality by improving the employment prospects of people who often lose out in the labour market. There are, therefore, potential positive distributional impacts of climate change policies via green jobs and economic growth. Studies have shown an opportunity for the stimulation of 150,000 jobs (Preston *et al.*, 2013a) through the implementation of domestic energy measures and for inclusive approaches to enable opportunities to be shared (NEF, 2008). However, as yet it is unclear where job losses linked to shifts in energy systems may fall, who will benefit from job creation in the new emerging

growth areas and whether this will benefit more disadvantaged people or places.

Conclusion

This review of evidence on the fairness of mitigation of climate change, through policy measures designed to create greater energy and fuel efficiency and increase the penetration of low carbon sources of energy to reduce carbon emissions, has found that a number of clear inequities result. Our analysis of the distribution of carbon emissions shows that lower-income groups emit the least, yet our analysis of how mitigation policy is paid for finds that low-income groups pay proportionally the most towards it because it is paid for out of fuel bills. The distribution of benefits of various mitigation policies is found to be regressive in some instances and progressive in others. To prevent even deeper inequities it is vital that all compensatory policies such as ECO and the Warm Homes Discount are well targeted and that the intended audiences are properly engaged. Issues of engagement, whereby many eligible households fail to take advantage of subsidy and measures available to them, raises further issues of procedural justice. So overall we can say that low-income groups experience a triple injustice from current mitigation policy but that there are clear opportunities for aligning social justice objectives with mitigating climate change.

6 DISCUSSION, CONCLUSIONS AND POLICY IMPLICATIONS

The review has gathered evidence that lower income and other disadvantaged groups: contribute the least to causing climate change; are likely to be most negatively impacted by its effects; and pay, as a proportion of income, the most towards implementation of adaptation and mitigation policy responses while often benefiting least from those same policies.

There is also evidence that vulnerable and disadvantaged groups are less able to participate in decision-making around policy responses and in determining practise, thereby suffering a fifth 'procedural' injustice. Some conclusions and recommendations for policy and for further research are described below.

General implications

Integrating solutions using a systems approach

Spatial planning has the potential to get the right development in the right place in a fair and transparent way and to bring responses to climate change together in a local area (Henderson, 2010). However, in order to achieve climate justice, an approach is required that tackles climate change impacts and social vulnerability together (Walker *et al.*, 2006). At present, policies targeting the underlying causes of vulnerability on the one hand, and policies related to climate change adaptation on the other, are largely separate. Our evidence suggests that there is a need for mainstreaming climate change adaptation and mitigation policy, both at local and national level, into activities of agencies working to reduce social exclusion and material

deprivation and to address health and well-being (Lindley *et al.*, 2011). And vice versa – the environmental solutions to climate impacts need to give greater consideration to the social implications: for example, investment in coastal defences should be linked to wider area regeneration (Zsomboky *et al.*, 2011). This approach needs to understand adaptation and mitigation responses as interventions having impacts across multiple interacting systems – healthcare, welfare, housing markets, spatial development and flood risk management. In contrast, a sectoral approach will miss opportunities and develop partial accounts of vulnerability and resilience leading to ineffective policy. In short, a systems approach leads towards the ‘climate just’ city (Steele *et al.*, 2012) or community.

Regulating the built environment for just adaptation and mitigation

At the moment there is little policy regulating preparation for climate change through interventions in the built environment. Examples of built environment policy which pay attention to social justice considerations include the affordable warmth component of the Energy Companies Obligation (ECO) and promotion of green spaces which help to alleviate the high temperatures in cities and can also address environmental justice issues associated with the lower access to green spaces among those experiencing poverty or BME groups (CABE, 2010). This has been highlighted in the CCRA (Defra, 2012) and the Heatwave Plan for England (DoH, 2013). However, at the moment in the UK there are no standards relating to reducing the risk of overheating in building regulations (Zero Carbon Hub and NHBC Foundation, 2010). Policy to address fuel poverty is a good example of where there are clear synergies to be had by bringing together resources from public health, mitigation and adaptation activity. For example, vulnerability and health equity analyses should be combined with cost-benefit analyses carried out prior to climate change adaptation and mitigation interventions in the built and indoor environment (Vardoulakis and Heaviside, 2012). Some of the measures reducing the risk of overheating, such as wall or roof insulation (Porritt *et al.*, 2010), will also help keep people’s homes warm and may reduce winter deaths. Thus, retrofitting the homes of vulnerable people to reduce exposure to low temperatures in winter may also reduce the risk of overheating. Works commissioned with ECO funding could be optimised to address the risk of overheating as well as energy efficiency.

Just adaptation and mitigation for tenants

The increasing numbers of people renting rather than owning a home and the increased vulnerability of tenants to climate change impacts, such as flooding, calls for a requirement for social and private landlords to provide climate change adaptation measures. Currently, the Decent Homes Standard for social housing, which has provided a mechanism for regulation, does not adequately take into consideration the need to adapt to the changing climate (CSE, 2011), meaning that social housing tenants may not be living in homes adequately adapted to climate change. Also, the rescinding of the requirement for energy efficient ‘consequential improvements’ for existing domestic buildings in the 2013 building regulations further reduces opportunities to increase resilience of tenant groups (and homeowners). However, new homes are still expected to be ‘zero carbon’ by 2016 so this will assist the small number of tenants (and homeowners) moving into new property at this time.

New methodologies and evaluation criteria for policy design

The conception and design of policies in the UK needs to undergo a radical transformation. The assessment of distributional impacts should be at the heart of policy design, as should the involvement of those people that the policies themselves impact upon. We need to develop a far better understanding of the tools needed to address the procedural justice deficiencies in the existing policy-making framework to help people understand the issues, discuss necessary measures and inform changes. In terms of policy evaluation, much more needs to be done to ensure the full range of impacts across health, economic and social aspects are considered. For example, Werritty *et al.* (2007) recommend that intangible social impacts of flooding, such as impacts on mental health, should be incorporated to a greater degree in option appraisal guidance for relevant local authorities, alongside the standard cost-benefit approach. However, currently there is only a minimal consideration of the distributive social impacts of flooding in the Flood and Coastal Erosion Resilience Partnership Funding Policy (Defra, 2011b). There is also a need to develop long running (approximately 30-year) evaluation criteria or metrics that can be used to assess and monitor whether or not policies and practice will provide support for disadvantaged people over the longer term and even inter-generationally. A standard methodology should be developed.

We need to develop a far better understanding of the tools needed to address the procedural justice deficiencies in the existing policy-making framework.

The importance of local approaches

There is presently an onus on local communities to help themselves to be better prepared to climate change, but the lack of clarity on actions needed may be leading to apathy (Zsomboky *et al.*, 2011). Communities could be better engaged by providing them with a forum where people can share their experiences in a way that enables them to learn from and support each other, and where key stakeholders can engage with them (Thrush *et al.*, 2005; Whittle *et al.*, 2010). Werritty *et al.* (2007) also recommend that local authorities, in partnership with public agencies, mobilise communities in flood risk areas to assist in disseminating warnings, rendering emergency assistance and helping with installing flood resistance measures. Where these schemes result in tangible local benefits local communities are more likely to be engaged (Whitmarsh, 2008). It is also important to ensure that households are able to develop their own strategies of flood management and resilience unhindered by the limitations of insurance rules or a lack of knowledge in the construction industry on property-level flood resilience measures (Whittle *et al.*, 2010).

Our review of mitigation also suggests that financial incentives are only one factor affecting whether low-income and vulnerable households can take up energy efficiency measures. The delivery mechanisms are also important: the means of engaging householders; tendering for and recommending installers; coordinating and delivering the installation of energy efficiency or renewable measures; providing basic energy advice and behaviour change programmes and advice on benefits, fuel tariffs, health issues and so on. Local authorities, and also community groups, play important roles here. Essentially these are issues of procedural justice. We need to know more about which are the most effective and equitable mechanisms for enabling low-income and vulnerable people to benefit from energy efficiency measures and other interventions to address climate change.

Sharing good practice and encouraging commitment

Within the UK Government and the Devolved Administrations, mitigation has remained an objective while climate change adaptation has risen up the

agenda. In general, however, this is not reflected within local government due to public funding cuts and a focus on immediate priorities. It is recommended that more work is done nationally and locally to share good practice and encourage commitment and action by local authorities and other local delivery agencies. A key problem is the lack of relevant and accessible information. That is not to say that there is no data, frameworks or tools, but they are often not accessible, available or known to the people who need to use them. Several recent initiatives are beginning to directly address this, including the Local Government Association's 'Climate Local', Climate UK's work networking with the nine Climate Change Partnerships across the UK, and JRF's 'ClimateJust' website which will produce resources targeted at practitioners working with vulnerable groups (as referenced in the National Adaptation Programme). These initiatives will support local learning, providing evidence of what is already happening so that Local Authorities and community bodies can share knowledge and put it into practice.

Adaptation policy implications

Focus on vulnerable groups

There is an urgent need for development of tailored policy responses for groups who are vulnerable to the impacts of climate change (Lindley *et al.*, 2011). For example, targeted information and advice on flooding for vulnerable groups should be developed in collaboration with local authorities and trusted agencies and organisations that work with particular social groups and have local knowledge (Johnson *et al.*, 2010; Walker *et al.*, 2006; Werritty *et al.*, 2007). Communities should be consulted on their preferred options for flood alleviation schemes from the earliest stage, using informal approaches to individual households at risk and 'plain English' (Werritty *et al.*, 2007). There is a need for targeted information on flood warning systems (Werritty *et al.*, 2007) and advice on where to go for help in the event of flooding (Whittle *et al.*, 2010). Policies aiming to support public health responses to rising temperatures should focus on older people and other vulnerable populations, such as those with pre-existing illnesses (Vardoulakis and Heaviside, 2012). Specific interventions should also be developed for people in nursing and care homes (Hajat *et al.*, 2007). Currently, there are also no policies or practices that provide a specific focus on reducing the vulnerability of disadvantaged coastal communities to climate change (Zsamboky *et al.*, 2011), and this gap should be addressed. Alongside this work to assist particular groups there needs to be equal attention paid to how existing arrangements and systems create vulnerability among these groups. Policy can then be developed to build longer-term resilience and reduce vulnerability across the whole of society.

Effective, targeted communication of risks and advice

There continues to be a widespread belief among the general public that climate change is an uncertain and distant problem rather than a direct, personal risk (Whitmarsh, 2008). Communication of climate change risk is particularly important in the case of vulnerable individuals. Wolf *et al.* (2010) suggests that unless those at risk are able to identify themselves as such and feel able to take action, merely disseminating information about preventive strategies has limited value. Therefore there is an urgent need to develop effective communication strategies which draw on insights from disciplines such as social marketing.

Localism vs higher-level approaches

A number of studies indicate regional differences in the distribution of climate risk to vulnerable populations (Oven *et al.*, 2012; Walker *et al.*, 2006; Hajat *et al.*, 2007; Houston *et al.*, 2011; Lindley *et al.*, 2011). However, the relationship between socio-spatial parameters and climate risk is not straightforward, with highly local factors being very influential. This suggests that locally specific information on vulnerability and impacts needs to be used to identify the problems and ensure successful and socially just climate change adaptation. Local authorities have a very important role to play in climate change adaptation, not least in developing highly granular maps of vulnerability, but this may be difficult to achieve due to lack of powers, funding, capacity and skills, in particular in the light of the funding cuts in public services (Houston *et al.*, 2011; Zsomboky *et al.*, 2011). However, there is also clearly a need for coordination and decision-making at higher levels including sub regional or regional levels. For example, climate change impacts may force relocation of populations from some areas, and this requires planning at a scale greater than an individual local authority. Thus, Zsomboky *et al.* (2011) argue that the devolution of responsibility for climate change adaptation to local levels may not always be optimal. We conclude that the allocation of responsibility for adaptation requires further discussion, in particular in the context of local authorities' current responsibilities for flood management and health protection.

Examples of longer-term planning

There is policy paucity in terms of long-term preparedness for climate change impacts. Key areas needing more attention are to prepare and to build public consensus for action, including dealing with politically controversial issues like community dislocation, increases in migration and ensuring delivery mechanisms that support adaptation action, such as in relation to food growing. There is a need for discussion about the social acceptability of adaptation measures. For example, in the case of sea level rise, coastal erosion and coastal flooding we need to give voice and power to those most affected. This is particularly important for communities living in areas where the only feasible response is to move away. No plans currently exist for the relocation of coastal communities that will be affected by coastal flooding and sea level rise (Zsomboky *et al.*, 2011). There is a need to develop logistical and financial frameworks for future relocation that would minimise the stress for those affected and the strain on systems and resources in potential destination areas.

Regarding the indirect impacts of climate change, there is a need to prepare for the possibility of increased migration from the countries affected by the changing climate. Grynszpan *et al.* (2010) emphasise that UK health services may need to adapt to new population needs, providing psychological support and respecting cultural differences, but also prepare for the potential increase in some diseases or the appearance of new ones. Other sectors, such as housing, social care and education, may also need to take into account the potential changing composition of British society under the changing climate. The current reliance on imported food, the threat of climate change reducing the supply of food produced overseas, and the potential impact of climate change on agricultural land in the UK (droughts being the major threats: Defra, 2011a) raise questions about the longer term food security of the country. Agriculture may need to be prioritised in the national economy and the promotion of locally grown seasonal food is another solution.

Mitigation policy implications

Measures for domestic energy

Preston *et al.*'s analysis (2013a) shows that the current raft of Government energy and climate change policies is likely to reduce emissions, but this reduction is not certain and not necessarily within the scale required to meet the climate change targets of an 80 per cent reduction on 1990 levels by 2050. It also indicates that current approaches to emissions reduction lead to a triple injustice whereby households on the lowest incomes pay proportionately more and benefit less from current approaches than those on the highest incomes while also being responsible for lower emissions.

The analysis calls for improving current policy design in a number of ways. These include reconciling fuel poverty and climate change policy and, where appropriate, integrating policy from other domains such as healthcare. As energy suppliers are now the principle agent of energy policy delivery in the UK there are several potential conflicts of interest in the delivery of fuel poverty objectives. In particular, energy suppliers are likely to frame energy as a commodity, with generating a profit at the core of its identity. As such, energy suppliers are naturally seeking to recover their costs fully while delivering policies as cheaply as possible. However, the Home Heating Cost Reduction Obligation (HHCRO) offering for affordable warmth needs to better consider the needs of the householder if it is to achieve its objective of delivering affordable warmth, rather than cherry picking easy-to-replace broken gas boilers. For as long as UK carbon and energy policy is paid for out of energy bills, well targeted and effective compensatory policies need to be put in place, otherwise inequity will result. Otherwise domestic energy policy should be paid for from general taxation. More specifically, our review suggests tariff support for vulnerable groups by extending the Warm Homes Discount to include customers with long-term limiting illnesses and creating additional drivers to stimulate the take-up of energy efficiency measures. Such measures are: introducing mandatory standards for rented homes before 2018; council tax rebates for those who improve their homes; subsidised interest rates for Green Deal loans; and variations to stamp duty based on property energy efficiency.

Deep carbon reductions delivered fairly

To achieve maximum reductions of carbon emissions from the consumption of energy in the home we need a more radical approach to reducing carbon emissions long term. Preston *et al.* (2013a) identified an alternative scenario for maximum abatement which could deliver a 60 per cent emissions reduction on 1990 carbon emissions by 2030. This is significantly higher than the projected reduction from current Government policies. The alternative retrofit scenario also provides synergies with other research (Ürge-Vorsatz and Tirado Herrero, 2012) that suggests the optimum approach to reducing emissions and tackling energy poverty simultaneously is offered by the improved energy efficiency of all buildings to high standards. The maximum abatement scenario is designed to address one of the core distributional impacts associated with energy policy: it ensures that low-income households benefit, and wealthier households who are responsible for a greater share of emissions contribute more towards the costs of addressing them. Under this scenario, low-income households receive free measures funded by income taxation which means they have lower reductions in income when compared to wealthy households, providing an overall progressive outcome for the deployment of measures.

Current approaches to emissions reduction lead to a triple injustice whereby households on the lowest incomes pay proportionately more and benefit less from current approaches than those on the highest incomes while also being responsible for lower emissions.

Measures for transport

The distributional impacts associated with road transport (fuel duty and vehicle excise duty) are similar to those for domestic energy but less severe. Increasing fuel duty is progressive overall because most low-income households do not have a car, but there is concern about the impact on low-income motorists, particularly in rural areas. The Green Fiscal Commission (GFC, 2010) states that the issue could be addressed through appropriate recycling of the revenues and by the adoption by rural motorists of fuel-efficient cars and driving methods. Work by Dresner *et al.*, (2012) has shown that carbon taxation can be used to compensate low-income households through the benefits system. The level of vehicle excise duty applied to high performance and inefficient cars has been criticised heavily in the past. A recent report (Leunig, 2012) proposes replacing the existing annual taxation regime with a one-off first registration charge for new cars. More expensive and less efficient new cars purchased by higher income households would therefore carry a higher share of the raised revenues. The government has set an ambitious vision for almost every car and van to be a zero emission vehicle by 2050, with the UK at the forefront of ultra-low emission vehicle (ULEV) development, manufacture and use. It is their belief that the use of ULEVs will contribute to economic growth and will help reduce greenhouse gas emissions and air pollution on our roads. Through the Office for Low Emission Vehicles (OLEV) they are providing over £400 million to advance ULEV technology and encourage people to buy and drive ULEVs. However, the impact of this funding on reducing carbon emissions is unclear with the current uptake of electric vehicles remaining relatively low. The alternative options for modal shift and spatial planning offer a different outlook for a future society which may have wider social benefits.

7 RESEARCH GAPS AND RECOMMENDATIONS FOR FURTHER RESEARCH

Overall, our review would suggest that the current landscape for climate change and social justice in the UK is still in its infancy and there is very little empirical research available with which to assess the social and distributional effects of climate change impacts or with which to evaluate those measures that are designed to mitigate these impacts or adapt to them.

The review also suggests that we need to consider the social equity impacts and outcomes of climate change in a more holistic way, as there are many interactions between different sectoral responses to climate change impacts (such as water and energy security, domestic energy and transport) and their tendency to have cumulative effects on the same vulnerable population groups and areas. Suggestions for further research are offered below.

Broad areas of research which are currently underdeveloped

There are a number of broad areas where the review has been largely silent due to a lack of research effort in the space. Nonetheless they are judged critical for future directions (pers. comm., Adger, 2013). These are: a) issues around the natural world; b) issues around inter-temporal and inter-

generational dimensions; and c) issues around the role of place and identity. These are elaborated further below.

Justice for the planet and the non-human world

Just stewardship of the environment and the non-human world is an important and often missed dimension of climate justice. Part of this argument is the lack of voice and representation of the environment in societal decision-making, and the impossibility of representation (O'Neill, 2001). These dimensions of justice also incorporate significant issues of access to nature and how it is socially constrained, as well as issues of motivations for conservation and perceiving the links between the natural world and human action. Hence climate justice needs to account for the natural world and impacts on it, not in trade-off with social justice, but in linking the two dimensions (pers. comm., Adger, 2013).

Justice and time

Similarly, time related dimensions of climate justice need to be embedded in all discussions of the issue. Much literature on both climate risks and energy policy tends to focus on trade-offs between justice now and justice in the future – cheap and affordable energy in the present from nuclear power is portrayed as pushing risks and costs onto future generations. But in this area there is scope to draw on evidence that solutions that are progressive and reduce social inequality in the present have additional positive spillovers on future society. It is suggested that these positive benefits occur both from improvements in procedural justice in the present and also create greater equity longer term. This area has not been significantly explored in the arena of climate justice (pers. comm., Adger, 2013).

Place, community and identity as elements of justice

A third area that expands the scope of the climate justice debate is the recognition that justice is embedded in culture, community and place. Issues of justice and culture at the community, rather than individual level, are difficult to measure but tangible. Hence a major cost of flood impacts is the loss of community and solidarity at the collective level as well as loss of sense of place for individuals. These issues of place attachment and community are an emerging agenda for climate justice, drawing on a long tradition in hazards. There are good reasons to incorporate these collective aspects of justice into policy and planning, related to the role of community in establishing trust in collective action, as well as to the moral reasons for recognising how lives are embedded in place and community. These issues are manifest also in the role of community action in promoting low carbon transitions, as recognised by the Transitions Network and others, and the academic literature on promoting environmental citizenship (Wolf *et al.*, 2009).

More specific research gaps

Based on our analysis of the research coverage, our assessment of the current and emerging policy context and the review of the evidence in this study we identify a number of further key gaps in the evidence.

A better understanding of vulnerability

Generally, the social dimensions of climate vulnerability and the implications of this for adaptation policies and plans are poorly understood. This is

because climate change adaptation literature has rarely, if ever, been directly aligned with the issue of social justice in the UK. There is clearly a need to improve our understanding of the social dimensions of vulnerability to climate change. The research gap is for improved data, guidance and analysis at a detailed level to determine the social dimensions of vulnerability to climate change and the implications of this for adaptation and mitigation policies and practices (Lindley *et al.*, 2012).

Social cohesion and social capital, vulnerability and resilience

More research is needed into the role of social capital in enabling climate change adaptation. The evidence on heat mortality in North America (e.g. Semenza *et al.*, 1996; Semenza *et al.*, 1999) implies that belonging to a strong social network can have a protective effect against heat illness and mortality. However, there has been little in-depth analysis of the role of social networks in European heat, although the available studies suggest that the influence of social networks may be quite complex. Wolf *et al.*'s (2010) work suggests that social networks are not necessarily supporting adaptation among vulnerable groups. There is also a need to be aware that vulnerable groups and individual households exist within communities that might be described as having high levels of resilience as a whole. Care must be taken that these households are not overlooked.

Similarly, the research focused on flood impacts usually considers the characteristics of households and individuals in assessing their vulnerability to flooding, which are not sufficient to explain the differences in the severity of impacts experienced between people and locations (Tunstall *et al.*, 2007). Further investigation in the UK context would be welcome on how neighbourhoods as a whole are affected by flooding, the role of social cohesion in supporting communities in their response to flooding, and the conditions under which community resilience is increased rather than damaged by flood events (Tunstall *et al.*, 2007; Walker *et al.*, 2006). Moving away from adaptation policy that focuses primarily on emergency response to adaptation policy for longer term solutions that actively builds community resilience and removes vulnerability will require further understanding of the critical factors underlying resilient communities.

Identifying vulnerable groups locally

Current work on mapping vulnerability is not at a fine enough resolution to identify households and individuals that are vulnerable (Lindley *et al.*, 2011). In the current financial climate with many service providers needing to cut budgets, having a method that provides a rapid and targeted list of vulnerable people would significantly improve efficiency and reduce costs. This would be a valuable tool for both emergency response and long-term adaptation planning. Hence joining together separately owned sources of data such as temperature mapping and modelling, housing tenure patterns, quality of housing stock and vulnerable individuals (elderly, disabled, children, etc.) will be needed. This raises the challenges of harmonising data from disparate sources, issues of ownership and data protection. In addition it is likely that the data will only go so far and that additional contextual local knowledge may be needed to reach the household level. The evidence reviewed here finds that social processes and social capital can be important factors in resilience and vulnerability but these indicators are not easily quantified or mapped. Methods to do this are needed.

Responses of BME groups, younger people and private renters

While several publications considered minority ethnicity as an aspect of vulnerability, there is a paucity of studies investigating the actual effects of climate change on Black and Minority Ethnic (BME) groups. Their perceptions and responses need to be investigated more thoroughly as they may be inadequately considered in current flood management policy and practice (Walker *et al.*, 2006). Also, our understanding of the needs and experiences of children in the event of flooding is incomplete (Walker *et al.*, 2006). Whittle *et al.* (2010) recommend more research into the impacts of flooding upon private renters.

Longer term impacts on differentiated social groups

There is also still insufficient understanding of the intangible and longer term effects of climate-related events on people's well-being. This includes issues such as the mental health effects of flooding. The longer-term flood impacts at the neighbourhood or community level are also poorly documented (Werritty *et al.*, 2007); for instance, in relation to how flooding affects housing markets and house prices, and overall development and investment rates (Zsamboky *et al.*, 2011).

Compounded impacts and community response

There is also relatively little research on combined or multiple impacts of climate change. For example, Lindley *et al.* (2011) investigated the vulnerability of neighbourhoods to the simultaneous impacts of heat and flood and found that about two-thirds of the most extremely socially vulnerable neighbourhoods in the UK have joint climate-related social vulnerability in relation to heat and flood. The ability of communities to cope with multiple risks and the potential compounding effects requires more research.

Impacts from effects on business and economic activity

An important under-researched area is the effects of climate-related impacts, such as flooding, on local businesses (Defra and EA, 2004; Walker *et al.*, 2006). For example, in coastal zones, climate change is likely to negatively affect the fishing industry and tourism, on which many locations rely. Reduced fish stocks and visitor numbers may cause a loss of income and employment, which combined with wider climate change impacts may result in migration away from coastal zones, or the need for relocation of coastal communities (Zsamboky *et al.*, 2011). Little research has so far been conducted on the knock-on effects of climate change impacts on local economies and the social consequences.

Indirect impacts on differentiated social groups

There is a greater evidence gap in relation to the indirect impacts of climate change. There are virtually no publications that link the analysis of climate change impacts overseas with their social justice implications in the UK; the issues of migration, and food and energy security and their social repercussions require more consideration. This is an emerging area for research and could cover both indirect impacts and potential adaptation responses that might be needed to support the well-being of vulnerable groups.

Hazard warnings for vulnerable people

Thrush *et al.* (2005) have shown that communicating the right information in the right way is critical to ensuring that vulnerable people react appropriately

to hazard warnings. It has also been shown (Wolf *et al.*, 2010) that social networks can both increase and decrease the resilience of vulnerable people. Hence further work is needed to determine how vulnerable individuals respond to warnings, the way the messages are delivered and the information that is communicated to ensure that warnings are reaching the vulnerable people they are designed to protect.

Local engagement

There is an urgent need for meaningful information and effective public processes at the local level to build awareness, capacity, and agency on climate change, and support planning and decision-making. Disadvantaged communities may need support in drawing up local Climate Change Action Plans.

It would be useful to develop a framework similar to that outlined in Sheppard *et al.* (2011) to engage local communities in decisions on climate change. Mandates are also needed to ensure an assessment of the distributional effects of policies and programmes across different disadvantaged population groups living within these areas.

Projecting climate vulnerability

Many studies concentrate on current climate impacts and current vulnerability, and more research is needed into the future interplay between social justice and climate hazard, using modelling and future scenario approaches (see, for example, Owen *et al.*, 2012; Curtis and Schneider, 2011; Vardoulakis and Heaviside, 2012).

Evaluating the fairness of energy related mitigation policies

Currently, domestic energy and transport mitigation policies in the UK are generally regressive and more research is needed to establish a methodology to evaluate their differential impacts and fairness, identifying vulnerable groups and addressing inequities in current domestic energy policy. Beyond this, policy development needs to address the issues of both procedural and distributional justice. Following the analysis of the literature, the main issues that need to be addressed with respect to mitigation policy are:

- the links between energy security and social justice;
- the potential combined distributional impacts of increasing energy costs to fund UK energy policies and the transition to universal credit via welfare reform;
- the cross benefits of low efficiency buildings with high thermal mass and their potential for lower internal temperatures in summer;
- the potential to protect low-income households whose heating fuel is electricity from the future impacts of energy policy costs;
- the potential for medium- to large-scale district heating schemes to lower emissions, reduce fuel costs and provide opportunities for community ownership and management of energy infrastructure; and
- the extent to which fuel tariff structures can be altered to address the regressive impacts of Government policy.

Justice analysis of alternative transport policy

To date, UK transport policy has been centred on car use and road provision. Taxation from road transport is not principally spent on alternative modes of transport or offsetting the distributional impacts associated with road use. There is therefore arguably more space and also need for a more radical approach to future transport policy that moves away from primarily

increasing fleet efficiency and switching to electric vehicles. It has been argued that a more socially just, equitable and forward-looking solution would focus on an increase in shifting different modes of transport (e.g. from car to bus) and improved access to all destinations by affordable public transport. We therefore need to gain a better understanding of the potential impacts of a more radical approach to transport policy and associated spatial planning. In particular, what are the opportunities to address the distributional inequities found in current road transport and the roles of communities in a policy's design and deployment? Is there a fair level of emissions from flying and do people have a right to travel by plane?

NOTES

- 1 www.ec.europa.eu/environment/aarhus/
- 2 This echoes ideas outlined by John O'Neill in a presentation for JRF at a Climate Justice conference in Scotland, September 2012.
- 3 <http://www.jrf.org.uk/blog/2014/02/somerset-floods-insurance>
- 4 Direct GHG emissions are emissions from sources that are owned or controlled by the householder, i.e. fuel use in the home, electricity usage in the home and its offsite emissions, and transport which does not relate to business usage. Indirect GHG emissions are emissions that are a consequence of the activities of the householder, but occur at sources owned or controlled by another entity.

REFERENCES

- Adaptation Sub-Committee (ASC) (2012) *Climate change – is the UK preparing for flooding and water scarcity? Progress Report*. London: Committee on Climate Change
- Aylett, A. (2010) 'Conflict, Collaboration and Climate Change: Participatory Democracy and Urban Environmental Struggles in Durban, South Africa'. *International Journal of Urban and Regional Research*, 34(3), pp. 478–95
- Bell, D. and Rowe, F. (2012) *Are climate policies made fairly?* York: Joseph Rowntree Foundation
- Benzie, M. (2012) 'Social Justice and Adaptation in the UK', paper presented to Symposium: the Governance of Adaptation, Amsterdam, 23 March 2012
- Benzie, M., Harvey, A., Burningham, K., Hodgson, N. and Siddiqi, A. (2011) *Vulnerability to heatwaves and drought: case studies of adaptation to climate change in south-west England*. York: Joseph Rowntree Foundation
- Bettini, G. (2013) 'Climate Barbarians at the Gate? A critique of apocalyptic narratives on "climate refugees"'. *Geoforum*, 45, pp. 63–72
- Bickerstaff, K., Walker, G. and Bulkeley, H. (eds.) (2013) *Energy Justice in a Changing Climate: Social equity and low-carbon energy*. London: Zed Books
- Bird, J., Lawton, K. and Purnell, K. (2010) *Green and Decent Jobs: The case for local action*. London: Institute for Public Policy Research
- Black, R., Bennett, S.R.G., Thomas, S.M. and Beddington, J.R. (2011a) 'Migration as adaptation'. *Nature*, 478 (7370), pp. 447–9
- Black, R., Adger, W.N., Arnell, N.W., Dercon, S., Geddes, A. and Thomas, D. (2011b) 'The effect of environmental change on human migration'. *Global Environmental Change*, 21(1), S3–S11
- Brisley, R., Welstead, J., Hindle, R. and Paavola, J. (2012) *Socially just adaptation to climate change*. York: Joseph Rowntree Foundation
- Buell, B. and Mayne, R. (2011) 'Bringing Social Equity into Low-carbon Investment: why it matters and emerging lessons', proceedings of the Energy and People: Futures, complexity and challenges conference, Oxford, 20–21 September 2011
- Buehler, R. and Pucher, J. (2011) 'Sustainable Transport in Freiburg: Lessons from Germany's Environmental Capital'. *International Journal of Sustainable Transportation*, 5, pp. 43–70
- Bulkeley, H. and Fuller, S. (2012) *Low carbon communities and social justice*. York: Joseph Rowntree Foundation
- Bulkeley, H., Edwards, G. and Fuller, S. (2012) 'Towards Climate Justice in the City? Examining the Politics, Practice and Implications of Urban Climate Responses in Global Cities', paper given to the Sixth Urban Research and Knowledge Symposium, Barcelona, 8–10 October 2012
- Campbell, M. and Campbell, I. (2009) *A survey of allotment waiting lists in England*. West Kirby and Corby: Transition Town West Kirkby and NSLAG
- Caney, S. (2010) 'Climate change and the duties of the advantaged'. *Critical Review of International Social and Political Philosophy*, 13(1), pp. 203–28
- Cazorla, M. and Toman, M. (2000) 'International Equity and Climate Change Policy'. Resources for the Future, Climate Issue Brief No. 27
- Centre for Sustainable Energy (CSE) (2011) *Costing an enhanced decent homes standard*. Bristol: CSE
- Chan, J., To, H.P. and Chan, E. (2006) 'Reconsidering social cohesion: developing a definition and analytical framework for empirical research'. *Social Indicators Research*, 75, pp. 273–302
- Charsley, K., Storer-Church, B., Benson, M. and van Hear, N. (2012) 'Marriage-related migration to the UK'. *International Migration Review*, 46(4), pp. 861–90

- Childs, M. (2011) *Just transition: is a just transition to a low-carbon economy possible within safe global carbon limits?* London: Friends of the Earth
- Claussen, E. and McNeilly, L. (2000) *Equity and Global Climate Change: The Complex Elements of Global Fairness*. Arlington, VA: Pew Centre on Global Climate Change
- Climate Outreach and Information Network (COIN) (2013) *Mythbuster: migration and climate*. Available at: <http://climatemigration.org.uk/wp-content/uploads/2013/06/Myth_buster_climate_migration_displacement.pdf> accessed 25 November 2013
- Commission for Architecture and the Built Environment (CABE) (2010) *Urban Green Nation: Building the evidence base*. London: CABE
- Costello, A., Abbas, M., Allen, A., Ball, S., Bell, S., Bellamy, R., Friel, S., Grace, N., Johnson, A., Kett, M., Lee, M., Levy, C., Maslin, M., McCoy, D., McGuire, B., Montgomery, H., Napier, D., Pagel, C., Patel, J., de Oliveira, J.A.P., Redclift, N., Rees, H., Rogger, D., Scott, J., Stephenson, J., Twigg, J., Wolff, J. and Patterson, C. (2009) 'Managing the health effects of climate change'. *The Lancet*, 373 (9676), pp. 1693–733
- Cowell, R., Bristow, G. and Munday, M. (2012) *Wind energy and justice for disadvantaged communities*. York: Joseph Rowntree Foundation
- Cox, J., Giorgi, S., Drayson, R. and King, G. (2010) *The Big Green Challenge. Final Evaluation Report*. Executive Summary for NESTA, Brook Lyndhurst
- Croft, D., Preston, I., Guertler, P. and Carrington, J. (2012) *Impact of energy policy on consumer bills*. London: Association for the Conservation of Energy
- Curtis, K.J. and Schneider, A. (2011) 'Understanding the demographic implications of climate change: estimates of localized population predictions under future scenarios of sea-level rise'. *Population and Environment*, 33(1), pp. 28–54
- Department for Business Enterprise and Regulatory Reform (BERR) (2001) *The UK Fuel Poverty Strategy*. London: BERR. Available at: <<http://webarchive.nationalarchives.gov.uk/+http://www.berr.gov.uk/files/file16495.pdf>> accessed 17 December 2013
- Department for Communities and Local Government (DCLG) (2012) *National Planning Policy Framework*. London: DCLG
- Department of Energy and Climate Change (DECC) (2013a) *Fuel Poverty: a Framework for Future Action*. London: DECC. Available at: <https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/211180/FuelPovFramework.pdf> accessed 17 December 2013
- Department of Energy and Climate Change (DECC) (2013b) *Fuel Poverty: a Framework for Future Action – Analytical Annex*. London: DECC. Available at: <https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/211137/fuel_poverty_strategic_framework_analytical_annex.pdf> accessed 17 December 2013
- Department for Environment, Food and Rural Affairs (Defra) (2005) *Making space for water*. London: Defra
- Department for Environment, Food and Rural Affairs (Defra) (2011a) *Basic horticultural statistics 2011*. London: Defra
- Department for Environment, Food and Rural Affairs (Defra) (2011b) *Flood risk and insurance: A roadmap to 2013 and beyond*. Final report of the flood insurance working groups PB13684. London: Defra
- Department for Environment, Food and Rural Affairs (Defra) (2012) *UK Climate Change Risk Assessment: Government Report*. PB13698. London: Defra
- Department for Environment, Food and Rural Affairs (Defra) (2013) *The national adaptation programme: Making the country resilient to a changing climate*. PB13942. London: Defra
- Department for Environment, Food and Rural Affairs (Defra) and the Environment Agency (EA) (2004) *The Appraisal of Human related Intangible Impacts of Flooding*. Research and Development Technical Report FD2005/TR. London: Defra
- Department of Health (DH) (2013) *Heatwave Plan for England*. London: DH

-
- Dresner, S., Preston, I., Ekins, P., White, V. and Brown, J. (2012) *Designing Carbon Taxation to Protect Low-Income Households*. York: Joseph Rowntree Foundation
- Ebi, K.L. (2009) 'Facilitating climate justice through community-based adaptation in the health sector'. *Environmental Justice*, 2(4), pp. 191–5
- Edwards, F., Dixon, J., Friel, S., Hall, G., Larsen, K., Locke, S., Wood, B., Lawrence, M., Harrigan, I. and Hogan, A. (2011) 'Climate change adaptation at the intersection of food and health'. *Asia-Pacific Journal of Public Health*, 23(2 SUPPL), pp. 91S–104S
- Environment Agency (2009a) *Flooding in England: A national assessment of flood risk*. London: The Environment Agency
- Environment Agency (2009b) *Flooding in Wales: A national assessment of flood risk*. London: The Environment Agency
- Environment Agency (2011) *Flood and Coastal Resilience Partnership Funding – an introductory guide*. Available at: <https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/182524/flood-coastal-resilience-intro-guide.pdf> accessed 15 January 2014
- Fitch, M. and Price, H. (2002) *Water Poverty in England and Wales*. London: Chartered Institute of Environmental Health and Centre for Utility Consumer Law
- Foresight (2011a) *Migration and Global Environmental Change*. Available at: <<http://www.bis.gov.uk/foresight/migration>> accessed 25 November 2013
- Foresight (2011b) *International Dimensions of Climate Change*. Final Project Report. London: The Government Office for Science
- Fuel Poverty Advisory Group (FPAG) (2013) *Tenth Annual Report 2011–12*. London: FPAG
- Geddis, I., Bloomer, E., Allen, J. and Goldblatt, P. (2011) *The Health Impacts of Cold Homes and Fuel Poverty*. The Marmot Review Team. London: Friends of the Earth
- Gough, I., Abdallah, S., Johnson, V., Ryan-Collins, J. and Smith, C. (2011) *The distribution of total greenhouse gas emissions by households in the UK, and some implications for social policy*. London: Centre for Analysis of Social Exclusion
- Greater London Authority (GLA) (2009) *London Regional Flood Risk Appraisal*. London: GLA
- Green Fiscal Commission (GFC) (2010) *Achieving Fairness in Carbon Emissions Reduction: The Distributional Effects of Green Fiscal Reform*. Briefing Paper. London: GFC
- Gross, C. (2007) 'Community perspectives of wind energy in Australia: The application of a justice and community fairness framework to increase social acceptance'. *Energy Policy*, 35(5), pp. 2727–36
- Grynszpan, D., Murray, V., Kreis, I., Zenner, D., Vardoulakis, S., Caldin, H., Morgan, D., Heaviside, C. and Heymann, D. (2010) *International Dimensions of Climate Change The Implications for the UK's Health Sector of the International Dimensions of Climate Change, 2010 to 2100*. Report submitted to Foresight. London: Government Office for Science
- Gupta, R. and Gregg, M. (2012) 'Using UK climate change projections to adapt existing English homes for a warming climate'. *Building and Environment*, 55, pp. 20–42
- Hajat, S., Kovats, R.S. and Lachowycz, K. (2007) 'Heat-related and cold-related deaths in England and Wales: who is at risk?'. *Occupational and Environmental Medicine*, 64, pp. 93–100
- Harper, S. (2011) *PD7: Environment, migration and the demographic deficit. Review commissioned as part of the UK Government's Foresight Project, Migration and Global Environmental Change*. London: Foresight
- Henderson, K. (2010) 'Briefing: Adapting to a changing climate'. *Proceedings of the Institution of Civil Engineers: Urban Design and Planning*, 163(2), pp. 53–8
- Hills, J. (2012) *Getting the measure of fuel poverty: Final Report of the Fuel Poverty Review*. CASE report 72. London: CASE
- Hirsch, D., Preston, I. and White, V. (2011) *Understanding fuel expenditure: Fuel poverty and spending on fuel*. York: Consumer Focus and Joseph Rowntree Foundation

- Houston, D., Werritty, A., Bassett, D., Geddes, A., Hoolachan, A. and McMillan, M. (2011) *Pluvial (rain-related) flooding in urban areas: the invisible hazard*. York: Joseph Rowntree Foundation
- Hudson, M., Phillips, J., Ray, K. and Barnes, H. (2007) *Social cohesion in diverse communities*. York: Joseph Rowntree Foundation
- Ikeme, J. (2003) 'Equity, environmental justice and sustainability: Incomplete approaches in climate change politics'. *Global Environmental Change*, 13(3), pp. 195–206
- Intergovernmental Panel on Climate Change (IPCC) Working Group (2007) *Fourth Assessment Report of the Intergovernmental Panel on Climate Change: Climate Change 2007: Impacts, Adaptation and Vulnerability*. Cambridge: Cambridge University Press
- Intergovernmental Panel on Climate Change (IPCC) Working Group (2013) *Fifth Assessment Report of the Intergovernmental Panel on Climate Change: Summary for Policymakers*. Bern: IPCC
- Johnson, V., Simms, A., Walker, P. and Ryan-Collins, J. (2010) *Bridging the gap between climate change, resource scarcity and social justice*. London: Carnegie UK Trust
- Johnson, P., Leicester, A. and Stoye, G. (2012) *Fuel for thought: The what, why and how of motoring taxation*. London: Institute for Fiscal Studies
- Johnson, H., Kovats, R.S., McGregor, G., Stedman, J., Gibbs, M., Walton, H., Black, E. (2005). 'The impact of the 2003 heat wave on mortality and hospital admissions in England'. *Health statistics quarterly / Office for National Statistics*, (25), 6–11.
- Kendle, T. (2010) *Creating a climate for social justice: A guide for civil society organisations on tackling climate change and resource scarcity*. London: Carnegie UK Trust
- Keohane, N. and Shorthouse, R. (2012) *Sink or Swim. The Impact of Universal Credit*. London: Social Marketing Foundation.
- Kolm Murray, J., Smith, A. and Clarke, C. (2013) *Individual and community resilience to extreme weather events amongst older people in south Islington: attitudes, barriers and adaptive capacity*. London: North London Cares
- Kovats, R.S. and Ebi, K.L. (2006) 'Heatwaves and public health in Europe'. *European Journal of Public Health*, 16(6), pp. 592–9
- Klinenberg, E. (1999) 'Denaturalizing disaster: A social autopsy of the 1995 Chicago heat wave'. *Theory and Society*, 28(2), pp. 239–95
- Leunig, T. (2012) *Cutting emissions and making cars cheaper to run: a new approach to vehicle excise duty*. London: Centre Forum
- Local Government Information Unit (LGIU) (2012) *Requirements on Local Authorities: household energy efficiency*. London: LGIU
- Lindley, S., O'Neill, J., Kandeh, J., Lawson, N., Christian, R. and O'Neill M. (2011) *Climate change, justice and vulnerability*. York: Joseph Rowntree Foundation
- London Resilience Team (2013) *Anytown: Final Report*. London: GLA
- Mayne, R., Hamilton, J. and Lucas, K. (2013) *Roles and change strategies of low carbon communities*. EVALOC Working Paper. Oxford: Environmental Change Institute
- Marmot, M. (2010) *Fair society, healthy lives*. The Marmot Review. London: Institute of Health Equity
- McGeehin, M.A. and Mirabelli, M. (2001) 'The Potential Impacts of Climate Variability and Change on Temperature-Related Morbidity and Mortality in the United States'. *Environmental Health Perspectives*, 109(2 SUPPL), pp. 185–9
- Mitchell, T. and Tanner, T. (2008) 'Defining a future research agenda a pro-poor adaptation'. *IDS Bulletin*, 39(4), pp. 130–2
- New Economics Foundation (NEF) (2008) *Tackling climate change, reducing poverty*. First report of the Roundtable on Climate Change and Poverty in the UK. London: NEF

- Office of Gas and Electricity Markets (Ofgem) (2012) *Proposals for a new Consumer Vulnerability Strategy*. London: Ofgem
- O'Neill, J. (2001) 'Representing people, representing nature, representing the world'. *Environment and Planning C: Government and Policy*, 19, pp. 483–500
- O'Neill, J. and O'Neill, M. (2012) *Social justice and the future of flood insurance*. York: Joseph Rowntree Foundation
- Oven, K.J., Curtis, S.E., Reaney, S., Riva, M., Stewart, M.G., Ohlemüller, R., Dunn, C.E., Nodwell, S., Dominelli, L. and Holden, R. (2012) 'Climate change and health and social care: Defining future hazard, vulnerability and risk for infrastructure systems supporting older people's health care in England'. *Applied Geography*, 33(1), pp. 16–24
- Patrick, P., Paavola, J., Dale, N., Sibille, R., Kent, N. and LeCornu, E. (2013) *PREPARE – Understanding the equity and distributional impacts of climate risks and adaptation options*. Ricardo-AEA/R/ED58163/PREPARE R5/Issue 1.1. Leeds: Ricardo-AEA for Defra
- Perch-Nielsen, S.L., Baettig, M.B. and Imboden, D. (2008) 'Exploring the link between climate change and migration'. *Climatic Change*, 91(3–4), pp. 375–93
- Pickering, C. (2011) *7 Ingredients for a just, fair and inclusive Transition*. Totnes: Transition Network Guide
- Porritt, S.M., Shao, L., Cropper, P.C. and Goodier, C.I. (2010) 'Building orientation and occupancy patterns and their effect on interventions to reduce overheating in dwellings during heatwaves', proceedings of Institute of Energy and Sustainable Development 1st Annual PhD Conference, Leicester, 21 May 2010
- Poumadère, M., Mays, C., Le Mer, S. and Blong, R. (2005). *The 2003 Heat Wave in France: Dangerous Climate Change Here and Now*. *Risk Analysis*, 25(6), 1483–94.
- Preston, I., White, V. and Thumim, J.B. (2013a) *Fair and effective or unjust and weak? Implications of the distribution of emissions for domestic energy policy*. York: Joseph Rowntree Foundation
- Preston, I., Croft, D., White, W. and Sturtevant, E. (2013b) *The hardest hit, going beyond the mean*, Bristol: Centre for Sustainable Energy
- PricewaterhouseCoopers (PwC) (2013) *International threats and opportunities of climate change for the UK*. London: PwC
- Reed, H. and Horton, T. (2010) 'The distributional impact of the 2010 Spending Review'. *Radical Statistics*, 103, pp. 13–24
- Robine, J-M., Cheung, S.L.K., Le Roy, S., Van Oyen, H., Griffiths, C., Michel, J-P. and Herrmann, F.R. (2008) 'Death toll exceeded 70,000 in Europe during the summer of 2003'. *Comptes Rendus Biologies*, 331(2), pp. 171–8
- Schmidt, L., Prista, P., Saraiva, T., O'Riordan, T. and Gomes, C. (2013) 'Adapting governance for coastal change in Portugal'. *Land Use Policy*, 31, pp. 314–25
- Semenza, J.C., McCullough, J.E., Flanders, W.D., McGeehin, M.A. and Lumpkin, J.R. (1999) 'Excess hospital admissions during the July 1995 heatwave in Chicago'. *American Journal of Preventive Medicine*, 16, pp. 269–77
- Semenza, J.C., Rubin, C.H., Falter, K.H., Selanikio, J.D., Flanders, W.D., Howe, H.L. and Wilhelm, J.L. (1996) 'Heat-related deaths during the July 1995 heatwave in Chicago'. *The New England Journal of Medicine*, 335, pp. 84–90
- Sheppard, S.R.J., Shaw, A., Flanders, D., Burch, S., Wiek, A., Carmichael, J., Robinson, J. and Cohen, S. (2011) 'Future visioning of local climate change: A framework for community engagement and planning with scenarios and visualisation'. *Futures*, 43 (4), pp. 400–12
- Singer, P. (2011) 'Changing Values for a Just and Sustainable World', in D. Held, A. Fane-Hervey and M. Theros, eds., *The Governance of Climate Change*. Cambridge: Polity Press
- Smith, P. and Brown, I. (2012) 'Climate science: Why should we care about adaptation in Scotland?', presentation to the Climate Justice Conference: Delivering Socially Just Adaptation in Scotland. Edinburgh, 13 September 2012. Available at: <<http://bit.ly/1b4nhme>> accessed 26 November 2013

-
- Snell, C. and Bradshaw, J. (2009) *Water Affordability in England and Wales*. Report prepared for the Consumer Council for Water. Birmingham: CCWater
- Soltau, F. (2008) *Fairness in International Climate Change Law and Policy*. New York: Cambridge University Press
- SQW (2010) *Meanwhile Use: Business Case and Learning Points*. London: SQW
- Steele, W., Maccallum, D., Byrne, J. and Houston, D. (2012) 'Planning the Climate-just City', *International Planning Studies*, 17(1), pp. 67–83
- Stephens, C., Bullock, S. and Scott, A. (2001) *Environmental justice: rights and means to a healthy environment for all*. Special Briefing Paper, Economic and Social Research Council (ESRC) Global Environmental Change Programme. Brighton: ESRC Global Environmental Change Programme, University of Sussex
- Stern, N. (2013) *Ethics, equity and the economics of climate change*. Working papers 1 and 2. London: Grantham Research Institute
- Stern, N. (2006) *The Stern Review: Report on the Economics of Climate Change*. Cambridge: Cambridge University Press
- Stockton, H. and Campbell, R. (2011) *Time to reconsider UK energy and fuel poverty policies?* York: Joseph Rowntree Foundation
- Sustainable Development Commission (SDC) (2011) *Fairness in a Car-dependent Society*. London: SRC
- Sze, J., Gambirazzio, G., Karner, A., Rowan, D., London, J. and Niemeier, D. (2009) 'Best in show? Climate and environmental justice policy in California'. *Environmental Justice*, 2(4), pp. 179–84
- Thrush, D., Burningham, K. and Fielding, J. (2005) *Flood Warning for Vulnerable Groups: A review of the literature*. Defra/EA Flood and coastal erosion risk management research and development programme. Bristol: Environment Agency
- Thumin, J. and White, V. (2008) *Distributional Impacts of Personal Carbon Trading*. London: Defra
- TNS (2009) *Public attitudes and behaviours towards the environment – tracker survey*. London: Defra
- Tunstall, S., Tapsell, S. and Fernandez-Bilbao, A. (2007) 'Vulnerability and flooding: a re-analysis of FHRC data'. Country Report England and Wales. Report T11-07-10 of FLOODsite Integrated Project
- Twigger-Ross, C., Coates, T., Deeming, H., Orr, P., Ramsden M. and Stafford, J. (2011) *Community Resilience Research: Final Report on Theoretical research and analysis of Case Studies report – Appendix, Evidence Review and Case Study*. Report to the Cabinet Office and Defence Science and Technology Laboratory. London: Collingwood Environmental Planning Ltd
- Ürge-Vorsatz, D. and Tirado Herrero, S. (2012) 'Building synergies between climate change mitigation and energy poverty alleviation'. *Energy Policy*, 49, pp. 83–90
- Vardoulakis, S. and Heaviside, C. (eds.) (2012) *Health Effects of Climate Change in the UK 2012: Current evidence, recommendations and research gaps*. London: Health Protection Agency
- Walker, G. (2010) 'Environmental justice, impact assessment and the politics of knowledge: The implications of assessing the social distribution of environmental outcomes'. *Environmental Impact Assessment Review*, 30(5), pp. 312–18
- Walker, G., Burningham, K., Fielding, J., Smith, G., Thrush, D. and Fay, H. (2006) *Addressing Environmental Inequalities: Flood Risk*. Science Report SC020061/SR1. Bristol: Environment Agency
- Walker, G., Day, R., Bulkeley, H., Bickerstaff, K., Bouzarovski, S. and Fuller, S. (2011) 'Submission to PRASEG and FPEEG Inquiry: Social Justice in the Low Carbon Transition'. InCluESEV
- Werritty, A., Houston, D., Ball, T., Tavendale, A. and Black, A. (2007) *Exploring the social impacts of flood risk and flooding in Scotland*. Edinburgh: Scottish Executive Social Research
- White, V., Preston, I. and Roberts, S. (2011) *Who benefits, who pays? Assessing the distributional impacts of different policy*. Report to Ofgem. Bristol: Centre for Sustainable Energy

-
- Whitmarsh, L. (2008) 'Are flood victims more concerned about climate change than other people? The role of direct experience in risk perception and behavioural response'. *Journal of Risk Research*, 11(3), pp. 351–74
- Whittle, R., Medd, W., Deeming, H., Kashefi, E., Mort, M., Twigger Ross, C., Walker, G. and Watson, N. (2010) *After the Rain – learning the lessons from flood recovery in Hull*. Final project report for 'Flood, Vulnerability and Urban Resilience: a real-time study of local recovery following the floods of June 2007 in Hull'. Lancaster: Lancaster University
- Wilby, R.L. and Keenan, R. (2012) 'Adapting to flood risk under climate change'. *Progress in Physical Geography*, 36(3), pp. 348–78.
- Wolf, J., Adger, W.N., Lorenzoni, I., Abrahamson, V. and Raine, R. (2010) 'Social capital, individual responses to heat waves and climate change adaptation: An empirical study of two UK cities'. *Global Environmental Change*, 20(1), pp. 44–52
- Wolf, J., Brown, K. and Conway, D. (2009) 'Ecological citizenship and climate change: perceptions and practice'. *Environmental Politics*, 18(4), 503–21
- Zero Carbon Hub and NHBC Foundation (2010) *Carbon compliance for tomorrow's new homes. A review of the modelling tool and assumptions. Topic 3: future climate change*. Available at: <http://www.zerocarbonhub.org/sites/default/files/resources/reports/Carbon_Compliance_Topic_3_Future_Climate_Change.pdf> accessed 15 January 2014
- Zetter, R., Griffiths, D., Sigona, N., Flynn, D., Pasha, T. and Beynon, R. (2006) *Immigration, social cohesion and social capital. What are the links?* York: Joseph Rowntree Foundation
- Zsomboky, M., Fernandez-Bilbao, A., Smith, D., Knight, J. and Allan, J. (2011) *Impacts of climate change on disadvantaged UK coastal communities*. York: Joseph Rowntree Foundation

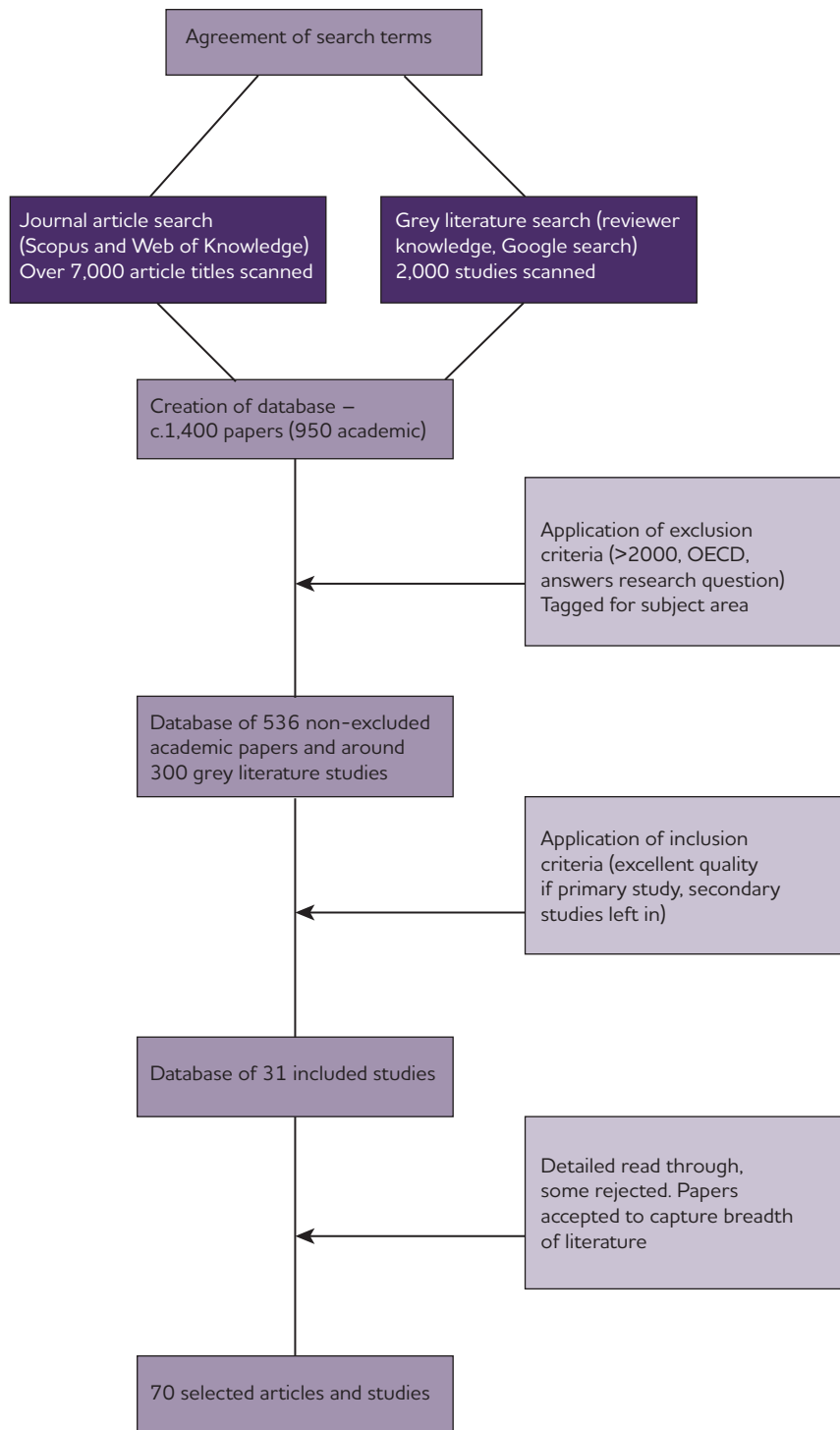
APPENDIX 1: RESEARCH QUESTIONS

Impacts	1. What is the interaction between the direct effects of climate change (including flooding, heatwaves, drought and coastal erosion) and social vulnerability?
	2. What are the likely indirect effects of climate change and the social consequences for the UK and social justice questions arising?
	3. How could the direct and indirect effects of climate change exacerbate existing poverty and disadvantage or create new forms of poverty and disadvantage?
Adaptation	1. What do we know about the interaction between adaptation policy and practice responses and vulnerability?
	2. Which elements of existing adaptation policies/practice appear socially just/unjust?
	3. What do we know about the relationship between social vulnerability and our preparedness for different potential impacts (e.g. heatwaves, drought, water management, flood risk, flood insurance, coastal erosion)?
	4. How can we support the development of more effective and socially just adaptation policy and practice responses, which can also build community resilience? e.g. Would stronger national commitments to fairness in adaptation policy help?
	5. How can the costs of delivering climate adaptation policy be met in a just way?
Mitigation	1. What do we know about the interaction between carbon emissions reductions and issues of social vulnerability, equality, poverty and disadvantage?
	2. What do we know about how to achieve socially just mitigation and are there socially just solutions that might be highlighted in the move towards a low carbon economy (e.g. relating to job creation, new technology and infrastructure, and in the way policies are funded)?
	3. How far it is possible to tackle both climate change and fuel poverty at the same time?
	4. Which elements of existing mitigation policies/practice appear just/unjust?
	5. How can the costs of delivering carbon reduction policy be met in a just way?
	6. Are there alternative models for mitigation policy which are both practical and achievable?

APPENDIX 2: RAPID EVIDENCE ASSESSMENT METHODOLOGY

The process for generating a list of 'included' papers followed a REA methodology: a set of search terms were developed and a search strategy used which aimed to balance comprehensive searching in the space without generating thousands of irrelevant search hits. Research leads were also encouraged to source high quality papers and studies that they were aware of through their own expert knowledge. Scanning around 9,000 search returns generated a long list of around 1,400 studies and papers. Material was then assessed for whether it answered JRF research questions and whether it was published after 2000. Material surviving these filters was then categorised into types based on a) the study approach (e.g. qualitative study versus modelling study) and b) the subject area (e.g. adaptation or impacts) and allocated out based on subject area for an assessment of quality. Only high quality studies were finally selected to be included in the long list of 'included' studies. In order to assist with judgements of the quality of the study a set of criteria were developed for studies of different types – i.e. low, medium and high quality criteria for, e.g., empirical studies using a qualitative methodology were identified. Further details of the quality criteria are included in the methodology. Each lead selected between 15-20 studies from this long list of 'included' studies for detailed analysis using a Proforma tool. Their analysis was then presented for discussion by the rest of the team to identify themes, linkages and new insights. The search strategy is mapped below:

Figure 2: Map of the search process



ACKNOWLEDGEMENTS

The review has benefitted greatly from the thoughtful contributions of our two peer reviewers, Professor Neil Adger and Dr Karen Bickerstaff, both of the University of Exeter. We also acknowledge the valuable insights gathered at our workshop where researchers, practitioners and representatives from local and national government were able to discuss the climate change and social justice space, and comment on our early findings and methods.

ABOUT THE AUTHORS

Ian Preston is a senior analyst at the Centre for Sustainable Energy (CSE) specialising in fuel poverty issues. Ian sits on the government's fuel poverty methodology group and also leads CSE's modelling and analysis of the distributional aspects of government energy policy.

Dr Nick Banks is a senior research project manager at CSE, leading on a number of evidence reviews in the energy and climate change space and specialising in behavioural aspects of energy use in domestic and non-domestic settings.

Katy Hargreaves has now finished her internship with the Research and Analysis team at CSE after successfully providing support for the search phases of the work.

Dr Aleksandra Kazmierczak is a Research Fellow at the School of Environment, Education and Development at the University of Manchester. Her work focuses on the themes of climate change impacts and adaptation in cities and green infrastructure.

Dr Karen Lucas is now Associate Professor of Transport Geography at the Institute of Transport Studies (ITS), University of Leeds. During this review Karen was a Senior Research Fellow of the Transport Studies Unit (TSU), University of Oxford. Her research focuses on understanding the dynamic links between transport poverty and social disadvantage in different geographical contexts.

Ruth Mayne is a Senior Researcher at Lower Carbon Futures, the energy research programme at the Environmental Change Institute, University of Oxford. Her current research explores the effectiveness of communities in changing local energy behaviours.

Clare Downing is an adaptation science specialist at UKCIP, University of Oxford and is involved in evaluating the science and process of adaptation through applied research. Her current role focuses on assessing the status of adaptation in European Countries.

Roger Street is the Director Adaptation Science, UKCIP at the Environmental Change Institute, University of Oxford. Roger leads the programme's work aimed at supporting society in adapting to climate change.

The Joseph Rowntree Foundation has supported this project as part of its programme of research and innovative development projects, which it hopes will be of value to policy-makers, practitioners and service users. The facts presented and views expressed in this report are, however, those of the authors and not necessarily those of JRF.

A CIP catalogue record for this report is available from the British Library.

All rights reserved. Reproduction of this report by photocopying or electronic means for non-commercial purposes is permitted. Otherwise, no part of this report may be reproduced, adapted, stored in a retrieval system or transmitted by any means, electronic, mechanical, photocopying, or otherwise without the prior written permission of the Joseph Rowntree Foundation.

© Centre for Sustainable Energy 2014
First published 2014 by the
Joseph Rowntree Foundation
ISBN: 978 1 909 586079 (pdf)
Project managed and typeset by
Cambridge Publishing Management Limited

Joseph Rowntree Foundation
The Homestead
40 Water End
York YO30 6WP
www.jrf.org.uk