Flood risk, vulnerability and environmental justice: evidence and evaluation of inequality in a UK context.

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Abstract

Flooding has only relatively recently been considered as an environmental justice issue. In this paper we focus on flooding as a distinct form of environmental risk and examine some of the key evidence and analysis that is needed to underpin an environmental justice framing of flood risk and flood impacts. We review and examine the UK situation and the body of existing research literature on flooding to fill out our understanding of the patterns of social inequality that exist in relation to both flood risk exposure and vulnerability to the diverse impacts of flooding. We then consider the various ways in which judgments might be made about the injustice or justice of these inequalities and the ways in which they are being sustained or responded to by current flood policy and practice. We conclude that there is both evidence of significant inequalities and grounds on which claims of injustice might be made, but that further work is needed to investigate each of these. The case for pursuing the framing of flooding as an environmental justice issue is also made.

Introduction

Environmental justice has become increasingly used as a frame for evaluating relations between people and environment, as well as a political focus for grassroots activism, and, at times, a policy principle. Whilst there has been much of value in making justice more explicit in addressing environmental concerns, the environmental justice frame has tended to be understood in rather specific ways (Capek 1993; Walker and Bulkeley

2006), its emergence initially in a US context giving it a particular inflection and focus on questions of race and ethnicity and their relationship to burdens of pollution and technological risk (Bullard 1999). Over recent years however the environmental justice frame has evolved beyond its origins and initial scope (Sze and London 2008; Walker 2009b). It has been applied to a far wider array of environmental concerns and social distinctions (including poverty, age, gender and disability) and moved into new places and political contexts, in the process interacting with a diversity of ways of viewing what is at stake.

In this paper we focus on flooding as a distinct form of environmental risk. Until Hurricane Katrina in 2006, flooding had not been positioned as an issue of environmental justice (despite the existence of a substantial body of research documenting inequalities in vulnerability to flooding, as we shall note). It took the devastating but highly uneven impacts of Hurricane Katrina on the City of New Orleans for the substantial community of environmental justice academics and activists in the US to turn their attention to a risk that was 'natural' rather than technological in origin (Colten 2007; Morse 2008; Stivers 2007; Sze 2006) – although an environmental justice perspective has to inherently challenge this natural/technological distinction (Smith 2006). A small but growing body of literature is now framing flood risks in the US and elsewhere as a question of environmental inequality and injustice (e.g. Bullard and Wright 2009; Dixon and Ramutsindela 2006; Ueland and Warf 2006).

Our contribution to this literature is to consider the UK situation and to examine some of the key evidence and analysis that is needed to underpin an environmental justice framing of flood risk and flood impacts. Whilst there is no one universally accepted definition of environmental justice (Holifield 2001; Ikeme 2003) or agreed menu for

analysis, there are two key questions that are central to most perspectives (either explicitly or implicitly) and that are at the core of the claims-making that is typically involved. The first question is to ask what patterns of social inequality exist in relation to the environmental good or bad that is at issue, a distributional question that seeks to reveal patterns of unevenness and difference. The second question is to evaluate these patterns in the light of what is expected to be a just and fair situation, in respect of, for example, how the inequalities are being produced, who is responsible for them, how relevant decisions have been made and how government policy and practice is enacted. Whilst some environmental justice analysis has tended to focus only on revealing patterns of distribution, it has been strongly argued by Pulido (1996), Faber (2008), Schlosberg (2007) and others, that focusing on matters of process and production is also necessary. This is in part because to move from a description of a pattern of difference and inequality, to the making of a normative claim of injustice – moving from ‘is’ to ‘ought’ (Proctor 2001) - needs to involve an assessment of how these patterns are produced and sustained. As Harvey (1996: 5) argues it is necessary to recognise that there can be ‘*the just production of just geographical differences*’ such that not all patterns of difference and inequality are also cases of injustice.

In moving through these key questions we review and examine the UK situation and the body of existing research literature on UK flood experience that can be used to begin to fill out our understanding and analysis - including research that we have undertaken for the Environment Agency and a recent project on the impacts of a major flood in the City of Hull in 2007 (Whittle et al 2010, Walker et al 2010). Whilst flooding has not been systematically examined as an environmental justice issue in the UK, there is a limited body of work that has analysed patterns of social distribution and fairness in flood management, and a more substantial literature focused on questions of vulnerability to

flooding. This literature provides a useful foundation, although as we shall see there are currently many gaps in evidence and analysis, particularly related to the second of our two key questions.

That there is relevant literature to draw on at all emphasizes that issues of social difference and inequality were not ‘discovered’ only once flooding had become part of environmental justice discourse. There is a stream of work on flooding and other forms of ‘natural’ hazard that has long focused on questions of vulnerability and that seeks to understand the processes which mean that poor and marginalised communities are often more severely affected in a myriad of ways than others (Alwang et al. 2001; Cutter et al. 2003; Pelling 1999; Pelling 2003; Wisner et al. 2004). Scholars have also drawn attention to other dimensions of inequality, most notably the ways in which women are often more severely affected than men by floods, droughts and other extreme weather events (Enarson & Morrow 1998; Enarson & Fordham 2001). Much of this work has been focused on the developing world¹ but in Europe and North America the vulnerability perspective has also become important (Green 2004), shaping research trajectories and influencing disaster management practices and strategies (McEntire 2006; Twigger-Ross and Scrase 2006; Wisner 2001), including in relation to climate change (Dolan and Walker 2004). In part for this reason we consider within our discussion what specifically can be gained by using environmental justice concepts and ideas to think about flooding and flood risks. Is this simply a repackaging, a way of reframing well recognised problems, or is there an additionality and value that extends over and above established approaches?

¹ This area of research is evolving with the advent of concerns about climate justice and the unequal impact of climate change. While this work has some parallels with analyses of inequalities in the experience (and likely experience) of climate impacts within the UK, we note that there are significant differences in the experience of flooding in the global south.

We start the paper by reviewing evidence of various forms of inequality in exposure to and impacts from flooding in the UK , before then moving on to consider how this evidence might be evaluated in order to inform judgements about the justice or injustice of current patterns and processes.

Uneven patterns of flood risk and exposure?

Spatial Patterns of Flood Risk

One of the key emphases and contributions of environmental justice research has been to examine and evaluate patterns in the spatiality or geography of risk or potential harm (Walker 2009a). Until environmental justice activists and academics began to reveal the environmental quality and risk burdens faced by different social groups – as demarcated spatially – there was little systematic evidence about patterns of inequality in environmental terms (in contrast to say patterns of income or health inequality). Taking this core approach into a focus on flooding we find an immediate relevance and commonality. The risk of flooding is focused primarily on particular spaces in proximity to rivers, coastlines and other water bodies. It is therefore pertinent to ask who is living within such ‘at risk’ spaces - a broad and even profile of the population or particular types of people with particular social characteristics?.

Several studies of patterns in who is at risk from coastal and river flooding in England, Wales and Scotland have recently been completed (Fielding and Burningham 2005; Walker et al. 2007; Walker et al. 2003; Werrity et al. 2007). Each of these take a similar

form, focusing on identifying patterns of distributional inequality. Geographical Information System (GIS) and statistical methods are used to relate the spaces indicated on official Environment Agency maps as being at flood risk (from river and coastal sources, not pluvial) with social data from the census. The concern has predominantly been with patterns of social class and deprivation. Different methods for how populations are allocated as being inside or outside of the floodplain are explored by Fielding and Burningham (2005), demonstrating some of the dependencies of outcomes on the methodological choices that are made, and the uncertainties that exist within such analyses.

Walker et al (2007) have undertaken the most developed and involved analysis and this contains some striking evidence. In England there are 3.3 million people that live within the Environmental Agency specified zone delineating a 1% or greater annual probability of flooding from rivers or 0.5% or greater from the sea. Divide this population across ten deprivation categories (or deciles) from the 10% most deprived areas in England to the 10% least deprived, and a profile of flood risk against level of social deprivation is produced. Figure 1 shows the resulting profile for all flood risk areas, which suggest a strong social regressive gradient such that if you are highly deprived you are more likely to live in a flood risk area, than others who much less deprived.

[Figure 1 HERE Percentage of total population for all types of flooding by deprivation decile]

This suggests that a general claim of inequality in flood risk exposure could be established. However, when the data are disaggregated into river and sea flooding zones, it becomes clear that the overall profile of the association with deprivation observed in the aggregated data is entirely created by the pattern within the sea flooding zones – itself a lesson in how descriptive claims of association are dependent upon how categories are delineated and aggregations performed.

Looking at the profile across the deciles in Figure 2 for river flooding this is very flat, with little variation from most to least deprived. However for sea flooding, in Figure 3, the profile is very different with a strong concentration towards the most deprived deciles, which is even more accentuated than when both types of flooding were combined. There is a strong and clear relationship such that people in the two most deprived deciles (1 and 2) are 122% more likely than others to be living within the sea flood zone than the rest of the population – the total population at risk in deciles 1 and 2 is approximately 725,000, compared to only 87,000 in deciles 9 and 10, the least deprived.

[Figure 2 HERE Percentage of total population for river flooding by deprivation decile]

[Figure 3 HERE Percentage of total population for sea flooding by deprivation decile]

In a further regional analysis they showed that the coastal flood risk population in the most deprived deciles is concentrated in two regions, London and Yorkshire and Humberside, but the relative bias towards the most deprived remains in place pretty consistently across each of the standard regions of England (Walker et al 2007).

Through this research we therefore know something of the overall aggregate patterns of distribution of exposure to flood risk in terms of its relationship to deprivation and some striking patterns of inequality are revealed. The evidence base is limited however, as analysis has not been undertaken for other social categories, such as ethnicity or age which potentially could also display distinct and unequal spatial patterning.

Patterns of Vulnerability to Flood Impacts

While the core EJ approach of focusing on patterns of social-spatial distribution is revealing it is also limiting in various ways. The lens is primarily a geographical one, looking for variation that is expressed in explicitly spatial terms rather than in other ways. People are understood and represented statistically and in aggregates rather than in more qualitative or nuanced ways; and crucially the analysis undertaken reveals patterns of proximity to or potential exposure to risk, but doesn't tell us anything about variation in how the impacts of risk might actually be experienced. This is an issue for all forms of risk – e.g. for a given degree of exposure to pollution different people/bodies in practice may be more or less harmed – but is particularly relevant for flooding where a substantial body of research has focused on social vulnerability to flood impacts as a core concept, including specifically in relation to flood experience in the UK (Green, 2004; Thrush *et al.* 2005a).

In terms of differences in vulnerability the literature typically approaches this – as with environmental justice analysis – in terms of how demographic, socioeconomic and cultural groups of various forms are more or less vulnerable (Wisner *et al.* 2003; Enarson and Morrow 1998; Blaikie *et al.* 1994; O'Brien and Mileti, 1992; Perry and

Lindell 1991). Whilst the following discussion takes this approach we need to recognize that thinking about the uneven impacts of flooding in terms of distinct population groups is problematic in several ways. Some of these categories intersect in complex ways (for instance disabled people are disproportionately likely to be poor, as are members of minority ethnic groups women and older people); not all within them are equally vulnerable and vulnerability is a dynamic rather than a static quality (people can move in and out of vulnerability). Thus while talk of 'vulnerable groups' often provides a useful shorthand to focus on the uneven impacts of floods, this framing needs to be used with some caution.

Beginning with examining vulnerability in relation to social deprivation or social class, we can identify find various forms of inequality at work. Fielding et al (2005) have demonstrated that awareness of flood risk and knowledge of how best to respond in the event of a flood varies by socio-economic group, with those in groups C2, D and E having lower awareness of risk than those in higher socio-economic groups. Poor people are more likely to occupy housing which is least resilient to the ingress of water - for instance mobile homes and caravans which are particularly at risk from storms and flooding - and less able to afford products and which can be installed to protect homes against some sorts of flood (see Environment Agency 2009). Defending the home in this way is also rarely available to those in privately rented accommodation.

Research by the Association of British Insurers found that 50% of households in the lowest income decile in the UK do not have contents insurance, often because other household costs leave no margin for "voluntary" charges such as insurance premiums (ABI 2002). Areas with high crime rates (which are likely to correlate with areas classified as deprived) will also have high insurance premiums, so insurance is even

more likely to be unaffordable for residents (Ketteridge and Fordham 1998). This means that they will have limited financial resources acting as a 'buffer' to flood impacts (Green 1993) and far more difficulty financing recovery, repair and replacement of losses, unless other forms of assistance are available (Whittle et al 2010).

Social capital has been found to play an important role in building community resilience and capacity to cope during and after flood events, and this can be lacking in deprived areas. Research has found that people in the most deprived areas are considerably less likely to be trusting of their neighbours, and less likely to feel that neighbours looked out for each other (Coulthard, Walker & Morgan 2002). This relationship is not straightforward though as the same research found that people in the most deprived areas were more likely to speak to their neighbours daily and that there was little variation in the likelihood of people knowing their neighbours. Local networks may also be stronger in some poor neighbourhoods than in areas with more transient populations (e.g. new housing estates populated by commuters).

In terms of health impacts, research shows that the impact of flooding varies with pre-existing health status, which is often worse in deprived neighbourhoods. These impacts range from the immediate risk of injury, through diverse symptoms associated with the proximity of flood water and living in damp accommodation (exacerbation of asthma, skin rashes, gastroenteritis (Ohl & Tapsell 2000) to longer term psychological problems including panic attacks, agoraphobia, depression, tiredness, stresses and anxiety (Thrush *et al.* 2005b; Few *et al.* 2004; Hajat *et al.* 2003; Tapsell *et al.* 1999). Emotional trauma is associated not only with the flood event but with the process of evacuation and recovery; making repairs, cleaning up, and dealing with builders and insurance claims have all been reported as being stressful (Ohl and Tapsell 2000, Thrush *et al.* 2005b).

Those who suffer the greatest losses and inconvenience, often those on lower incomes and without insurance, are likely to be most susceptible to such adverse psychological health effects.

In combination these different interactions between flooding and socio-economic or deprivation status build up a picture that suggests that deprived or poorer households are likely to experience the impacts of flooding more severely than others. They are typically less prepared, less able to access financial resources to aid recovery and more susceptible to a range of health impacts than those that are better off. As noted earlier, though, we do have to treat such generalisations with caution. Not all deprived neighbourhoods are the same and deprivation is not the only relevant social differentiator. The impacts of flooding also vary along other lines of social difference meaning that some people within deprived communities may be more vulnerable than others, and that greater vulnerability may also be found independent of the effects of poverty or class.

Age is particularly relevant. The impact of flooding on health varies significantly with age (RPA/FHRC 2003; Tapsell *et al.* 2002). Infirm older people and those of seventy-five years or more are more likely to be adversely affected by the cold, damp conditions caused by flooding (Tapsell *et al.* 2002 Tapsell and Tunstall 2001; Tapsell *et al.* 1999). Older people may also have many of the characteristics that increase psychological vulnerability (fewer resources, living alone, reduced social networks and so on) - although their life experiences can also act as mechanisms to reduce rather than exacerbate psychological distress after a disaster (e.g. Ngo 2001). Older people may be the most affected by the loss of memorabilia collected over a lifetime (Tapsell *et al.* 1999, Thrush *et al.* 2005b), they are also over-represented amongst residents of

bungalows, ground floor flats and mobile homes, property types that tend to involve a greater degree of damage to possessions due to a shortage of dry storage space (Tapsell *et al.* 1999; Ketteridge and Fordham 1998). At the other end of the age spectrum, research in Hull with children has shown that they can experience distinct physical health symptoms (predominantly exacerbation of asthma) and stress, related both to their own situation and the pressures on adults around them (Walker, M *et al* 2010) and various forms of loss - the immediate loss of tangible things such as toys, games and photographs, but also in the extended aftermath of the flood the loss of space, privacy, special events and time with family and friends.

There is currently little research on how the impacts of flooding may vary between members of different ethnic groups in the UK . A study of the impacts of flood on an Asian community in Banbury found that adverse effects were exacerbated by several factors including language and economic difficulties and a lack of knowledge of the system for protection and recovery (Tapsell *et al*, 1999). Cultural differences may make social support networks more difficult to access, despite the presence of large and extended family systems: women may be chaperoned or even confined to the home; hidden feelings lead to increased stress, and to feelings of neglect and isolation (Tapsell *et al*, 1999). While the Environment Agency disseminates flood information in different languages and formats, minority ethnic groups have reported difficulties in accessing appropriate information, services and support (Tapsell *et al*, 1999). One year after severe floods in Banbury, a follow-up study of the Asian population found little knowledge of flood alleviation or flood warden schemes amongst non-English speakers, nor even an awareness of Asian flood wardens in the area (Tapsell, 2000). Language barriers and a sense of isolation from the wider community can have serious implications for receiving flood warnings as well as for post-disaster support. On the other hand some

minority ethnic communities appear to have stronger and more highly organized networks for the dissemination of information and support.

There is also a gender dimension to the health impact of floods as women tend to carry the physical and emotional burden of caring for sick household members (Tapsell *et al.* 1999) as well as experiencing particular physical and psychological flood-related health problems themselves (RPA/FHRC 2003; Tapsell and Tunstall 2001; Tapsell *et al.* 2003). Women are also over-represented in the 75+age group who are often those hardest hit by health impacts (see Tapsell and Tunstall 2001). The stress associated with experience of flooding is often cited as a source of problems in personal relationships (Whittle *et al.* 2010; Tapsell *et al.* (2002)) including marital separations (Ketteridge and Fordham (1998)) and domestic violence (Clemens and Hietala 1999). Women are most likely to be the adult who stays in the temporary accommodation during the day while men go back to work. Responsibility falls on them to cope with the stress of the flood and with their children's anxieties and distress (Ketteridge and Fordham 1998). It is women who bear the major responsibility for getting the home 'back to normal' and have less chance to 'escape' the post-event disruption by going to work. Those who do work, however, often face the double burden of managing both a job and the task of putting their home to rights. Women are more involved in the work of recovery, obtaining relief and 'rebuilding' the home, yet have to deal with male-dominated emergency services, authorities and institutions that are not always sympathetic to their needs (Enarson, 2000; Tapsell *et al.* 2002; Tapsell and Tunstall 2001; Fordham and Ketteridge, 1998; Tapsell *et al.* 1999).

Summary

Looking across the range of material that we have reviewed we have identified a limited body of evidence of inequalities in patterns of exposure to flood risk (related only to social deprivation), and a richer and more complex body of evidence on unequal patterns of vulnerability to flood impacts. Whilst there are gaps in this evidence and limitations to its breadth and provenance, it is possible to conclude (at least in a preliminary way) that inequalities do exist in how different social groups are exposed to and experience the impacts of flooding in the UK. In arriving at an overall picture the two separate forms of evidence we have reviewed also need to be combined. The greater vulnerability of deprived communities to flood impacts can be added to the pattern of disproportionate inequality in exposure to coastal flood risk (across England), to conclude that deprived coastal communities are both more exposed and more vulnerable to flood risk. Within such communities there will be those that are especially vulnerable and burdened, such as older people, children and women. Even where patterns of exposure to flood risk appear to be more evenly distributed across the socio-economic gradient – as is the case for river flooding in England – particularly vulnerable people will still be likely to experience the impacts of flooding more severely than others.

Such observations provide an essential foundation for an environmental justice analysis but take us only so far. We now need to add to this by moving from a concern with revealing inequality, to a more evaluative and normative concern for determining justice.

From Inequality to Injustice

Whilst arguably much of the literature we have reviewed could be framed within established hazard and disaster perspectives on vulnerability, perhaps the most

distinctive feature of the environmental justice frame is the profile of the word 'justice'. This is significant for a number of reasons. First it shifts the focus away from only seeing people and communities as potentially vulnerable victims, towards them being conceived as citizens with rights to be asserted, achieved and protected. If flooding is a matter of justice, then it is necessary to ask whether the patterns of inequality and vulnerability that exist are just or fair ones, rather than to treat them simply as 'given', or as problems to be managed. Second a focus on justice can help in understanding *why* patterns of inequality exist and in making connections between different forms of social and environmental inequality and injustice. Systematic and structural processes of bias and discrimination, differences in access and power between social groups and inequities in policy and decision-making processes, which are all part of understanding the production of environmental injustice (Faber 2008; Schlosberg 2007), do not only relate to flooding, but also to many other environmental, social and economic dimensions of everyday life. Third, an environmental justice frame enables and promotes analysis across multiple scales. Environmental justice claims are often strategically made at different scales (Kurtz 2002; Towers 2000), with for example claims at a local scale interlinked to other locales, and to wider patterns at regional, national or global levels. For flooding and its current and future relationship to global climate change this movement across scales might be particularly significant.

In order to consider how an environmental justice frame can be applied to flooding in the UK we therefore need to move into the territory of these three points, getting beyond the description of patterns of inequality towards considering how normative judgements about justice or fairness might be made in relation to flooding in the UK.

Explaining Inequalities

An initial fundamental question is how the patterns of inequality in flood risk exposure and vulnerability discussed in the previous sector can be explained. Through what processes are they being produced? In some respects it can be argued that they are simply a mirror of wider inequalities in UK society. Floods, through this line of reasoning, provide a window onto, or an exacerbation of, existing patterns of, for example: gender inequality (that lead women to take a disproportionate responsibility for the home and bringing up children); health inequality (that mean poorer people systematically suffer more ill-health than others) and social fragmentation (which means that family and community support networks are weak and older people in particular can become socially isolated). This does not diminish the significance of inequalities in flood vulnerabilities, but means in normative or prescriptive terms any justice analysis has to become part of a wider set of judgements about the status of social inequalities in the UK (Barry 2005; Dorling 2010). On the other hand, some dimensions of the inequalities we reviewed earlier are more flood specific – patterns of flood exposure, access to insurance - and thereby need a more specific analysis.

Finding an explanation for why there is such a striking bias in the numbers of deprived people living within the coastal floodplain in England involves reaching into historic patterns of urban development as well as engaging with land use planning policies. Whilst a systematic analysis remains to be completed, three factors are likely to have contributed. First, the UK has a series of old industrial ports which developed with a largely working class population living nearby, including, for example, the ports of London, Hull and Liverpool. Some of these port cities have a large part of their urban area within the coastal flood plain. Second within such cities and other coastal towns the

strategies of housing developers, reflected also in land prices, have meant that poorer quality housing tended to be built on lower lying land, sometimes originally marshland which was reclaimed for development. Better quality housing, as was often the case across Victorian and Edwardian Britain, was often to be found on more elevated land (Daunton 2000). Third, there are a series of seaside resort towns around the coast which had their heyday in the first half of the 20th century, providing holiday destinations for the mass of the British public. Many of these resorts have since declined (Agarwal and Brunt 2006), faced with competition from destinations abroad, and have suffered with a range of social problems and serious deprivation.

If these three factors provide the core of explanation, they provide nothing like the claims of overt and unjust racial discrimination in housing policy that structured the social morphology of New Orleans and its most flood-prone areas. On the other hand the housing market in the UK has not been free of claims of unfairness and lack of transparency in how it operates (Burke 1981; Holmes 2003) and there are undoubtedly different degrees of choice available to people of different incomes (and household tenures) as to where they live. It is also relevant to ask whether land use planning processes have sufficiently or equitably directed new housing development away from flood-prone areas. There has long been criticism of planning authorities for continuing to allow new development on floodplains (White and Howe 2002) and it remains an open question whether or not there has been any historic bias towards positioning and permitting lower income housing in floodplain areas. On a number of grounds therefore an assertion of injustice in the production of patterns of exposure to flood risk might be constructed.

In terms of the substantial inequalities in flood risk insurance cover these could be simply explained in terms of general income inequalities, but the arrangements that exist in the UK for obtaining insurance cover also need to be scrutinised. The UK system relies upon private insurance with companies able to set premiums in accordance with levels of assessed risk. Whilst the government has negotiated agreements with the insurance industry such that insurance cover is still provided in high flood risk areas (ABI 2008; Priest et al. 2005), premiums can be extremely high, ratcheting up as floods occur and claims are made. This market based and individualised approach to flood insurance contrasts with that established in France and a number of other countries, where disaster risk is socialized, shared amongst all insurance holders with a standard premium applied regardless of location (OECD 2002). Thus in France those people living in a flood risk area pay no more for their home insurance than others, making insurance cover far more affordable and accessible than in the UK. This arrangement was negotiated between the government and the insurance industry in France in the early 1980s under a principle of solidarity and collective risk sharing. Hence inequalities in insurance cover in the UK can be explained as a matter not only income differentials, but also political choice, a thereby a specific matter of justice for those that are most vulnerable to flood impacts.

Justice in UK Flood Management

Such choices regarding how aspects of policy are applied, moves us into a whole host of questions about fairness and justice in flood management. These include, for example, questions about how decisions to invest in flood protection are made, how emergency plans are developed and resourced, how awareness and preparedness initiatives are targeted and communicated, and how well in these respects issues of inequality and

differential vulnerabilities are recognised. Each of these questions were asked about the Hurricane Katrina experience in New Orleans (Burby 2006; Burns and Thomas 2006; Cigler 2007), but they are just as pertinent to ask about flood management in other contexts such as the UK.

Johnson et al (2007) have tackled certain of these questions in a careful analysis of fairness in flood risk management policy in the UK. They explore the complexities involved in differentiating between what they call 'natural' and 'imposed' injustices, through taking various alternative principles of justice drawn from the social justice literature, applying these to flood risk management (see Table 1), and then evaluating UK policy in this light. With a focus both on the ways in which resource allocation decisions are taken and resources are consequently distributed, they show how flood management strategies which appear to be *'most technically and economically effective fall far short of being fair from either a vulnerability or equality perspective'* (ibid: 1). In particular they argue that priority given to cost-benefit analysis in the process of making decisions about investment in structural flood defences does not provide for procedural equality, given that economic efficiency considerations strongly dominate over equality principles. Current processes also fail to target those most vulnerable to flooding or to adequately assist those areas that under cost benefit analysis will never justify large capital intensive schemes. Their analysis therefore provides a number of grounds for challenging the justice of current flood risk management.

[Table 1 here]

In terms of aspects not covered by Johnson et al (2007), particularly those related to the flood recovery phase, evidence is rather more fragmentary. Research undertaken in

Hull (Whittle et al 2010) has shown that in many ways the local response to the major flood in 2007, did very directly seek to recognise differences in vulnerability across a City that is one of the most deprived in the UK. A survey of all flooded households undertaken by the City Council, allocated these to different categories depending on a set of vulnerability indicators, with support over subsequent months then tailored accordingly. A pre-existing system of local wardens also provided some very effective neighbourhood-level support for flooded households, including particularly for older people who were less able to self-help. In more general terms, however, this research identified a significant 'recovery gap' in flood management policy with a lack of clear provision for coordinated and properly resourced support during the recovery phase. As a result flooded residents have to step in to coordinate the actions of the different private and public sector organizations involved. As well as such project management being challenging, time-consuming and stressful, some people have far more resources and skills to undertake these tasks than others, a concern that has been echoed in the key government report on the 2007 floods (Pitt 2007).

Flooding and Climate Justice

To widen the scope of discussion still further, we can consider justice and flooding in the UK in terms of its relationship to climate change. One of the key parameters of claims of injustice can be who is responsible for the creation of an environmental disbenefit (Walker 2009a), particularly where there is a disconnection between those people that are benefiting from an activity and those that are suffering its consequences. With the risks from waste and industrial pollution this disconnect can be self evident. With flooding however the assignment of responsibility for risk is less straightforward, with floods often seen as caused by natural processes rather than human actions. Whilst this

can be fundamentally challenged on the grounds that floods only become risks because of the ways in which society is spatially and socially organized (Smith 2006; Wisner et al. 2004), climate change also introduces further matters of responsibility into the mix. If climate change means that flooding becomes more severe and or more likely in the UK – as is generally predicted (Evans et al. 2004) – then issues of climate justice become potentially relevant, particularly for coastal populations. With sea level rise and more extreme storm events, these populations will arguably be particularly vulnerable (in UK terms) to the impacts of climate change. As discussed earlier there is a disproportionate concentration of deprived populations in the coastal flood risk areas in England, which itself has implications for the scale of impact of any major coastal flood event in the future. In addition though it can be argued that in relative terms this is part of the population that is, per capita, least responsible for carbon emissions in the UK - as shown by various estimates (Brand and Boardman 2008; Kerkof et al. 2009) - but that is most at risk and least able to protect themselves from one of the most severe potential impacts of climate change. This form of ‘triple injustice’ does not at all equate with the global scale rifts between those producing and suffering the consequences of climate change (Roberts and Parks 2007; Oxfam International 2008), but does mirror them to some degree, and constitute the basis for making judgments both about the ethics of climate mitigation within the UK and the form of societal response needed to climate impacts.

Conclusion

We have sought in this paper to demonstrate the key parameters involved in considering flooding within an environmental justice frame, and have worked through these in the context of the UK. We have moved from considering evidence of inequalities in flood

exposure, flood impacts and vulnerability, through to a discussion of some of the basis on which evaluations of justice or injustice in relation to these patterns of inequality and in relation to the practices of flood management might be made. In various respects our analysis has been necessarily rather preliminary due to limitations in the evidence base and the need to cover a lot of fairly complex and diverse ground. We can, however, make two key conclusions. First that there is evidence of significant inequalities in patterns of exposure to flood risk and the experience of flood impacts in the UK, in relation to deprivation and poverty but also dimensions of age and gender. Second, there are various bases on which reasoned claims of injustice might be made in respect of the processes producing patterns of inequality, the workings of flood management and the consequences of climate change for flood risk. There is not evidence of inequality and injustice on anything like the scale and severity of New Orleans and Hurricane Katrina, which was catalytic in bringing flooding within an environmental justice frame in the US (Bullard and Wright 2009), but this does not diminish the value of utilising the frame or continuing to explore flood issues in the UK in these terms.

As something of an overview and preliminary analysis there is much that remains to be investigated and analysed further. For example, further analysis of inequalities in flood exposure and how these have been created, of the ways in which different patterns of difference in vulnerability intersect, of the justice of different aspects of flood management policy and how this works in practice would each be productive. We are convinced that pursuing work in such directions, and taking forward the evaluation of flooding as an environmental justice issue worthwhile. As argued earlier, whilst the flooding literature has not been entirely ignorant of issues of differentials in vulnerability and flood impact, the environmental justice frame adds distinctive qualities in being purposefully evaluative of such differentials, and of how those that are vulnerable should

be protected and supported. In the context of a future in which climate change could add significantly to the risks posed by flooding in the UK, pursuing a justice agenda will become all the more important.

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Figure 1: Percentage of total population within flood risk zone for all types of flooding by deprivation decile (Source: Walker et al 2007)

Figure 2: Percentage of total population within flood risk zone for river flooding by deprivation decile (Source: Walker et al 2007)

Figure 3: Percentage of total population within flood risk zone for sea flooding by deprivation decile (Source Walker et al 2007)

Table 1: Collective Choice Fairness Principles for Flood Risk Management (Source: adapted from Johnson et al 2007)

Justice principle (type)	Rule/criteria	Meaning for flood risk management	Potential implications for flood risk management
Equality (procedural)	All citizens to be treated equally	Every citizen should have the equal opportunity to have their flood risk managed	A greater focus on vulnerability reduction and state-sponsored self-help adaptations for those citizens for whom economic analysis will never justify large-scale capital expenditure in managing their flood risk
Maximin rule (distributive)	Options chosen to be those that best favour the worst-off	Resources should be targeted to the most vulnerable	Need to identify, and target assistance at, the most vulnerable members of society. This will require a range of adaptation options which are not necessarily focused on protecting areas of highest asset value
Maximise utility (distributive)	Options chosen to be those that secure the greatest risk reduction per unit of resource input	Assistance should be provided to those members of society to which the benefits offer the greatest gain to society	This is the current appraisal process in England and Wales. The greatest risk reduction, for the neediest, may be provided, for example, by state-assisted self-help