



**Manchester
Metropolitan
University**

O'Hare, Paul and White, I (2017) Beyond 'just' flood risk management: the potential for—and limits to—alleviating flood disadvantage. *Regional Environmental Change*, 18 (2). pp. 385-396. ISSN 1436-378X

Downloaded from: <https://e-space.mmu.ac.uk/619096/>

Version: Accepted Version

Publisher: Springer Verlag

DOI: <https://doi.org/10.1007/s10113-017-1216-3>

Please cite the published version

<https://e-space.mmu.ac.uk>

Beyond ‘just’ flood risk management: the potential for—and limits to—alleviating flood disadvantage

Paul O’Hare¹ & Iain White

Regional Environmental Change, 2017

This is a pre-print version of the article. The definitive, peer-reviewed and edited version of this article is published here: <https://link.springer.com/article/10.1007/s10113-017-1216-3>

Abstract

The threat of flooding poses a considerable challenge for justice. Not only are more citizens becoming exposed to risk, but they are expected to play increasingly active roles in flood risk management. However, until recently, few efforts have charted broader understandings of disadvantage relating to flood risk exposure. Drawing upon social science scholarship that has long been sensitive to concerns related to justice, we deploy and develop the notion of flood disadvantage as a means to assess the challenges to more ‘just’ flood risk management. We contend that the concept of flood disadvantage offers a useful lens to appreciate the constraints of technical approaches to flood risk management, in particular, its limited ability to incorporate complex social elements such as how individuals have differing vulnerabilities and sensitivities to flooding and uneven abilities to engage with risk agendas. The notion highlights the compounding interactions between flooding and other social disadvantages across multiple public policy areas and scales. We argue a fuller acknowledgement of the socio-spatial-temporal dimensions of intersecting disadvantages can help sensitise technical risk analyses that tend to see people and communities as homogeneous entities in a given spatiality. In doing so we can better reveal why some individuals or communities are more vulnerable to disasters or are slower to recover than others. Finally, we outline the challenges in turning more ‘just’ flood risk management from an abstract notion into one that could inform future practice.

Keywords: Flood risk management; Justice; Vulnerability and sensitivity; Flood disadvantage

To cite this article: O’Hare, P. & White, I. (2017) ‘Beyond ‘just’ flood risk management: the potential for—and limits to—alleviating flood disadvantage’, *Regional Environmental Change*, forthcoming

Doi: 10.1007/s10113-017-1216-3

¹ Corresponding author: Paul O’Hare, Manchester Metropolitan University, Room 415, John Dalton East, Manchester, UK. Email: paul.a.ohare@mmu.ac.uk

Introduction

Advances in conceptual understandings of risk have helped disassemble the phenomena, recognising its multifarious and intricately connected elements. Risk and—of particular interest to this paper—flood risk is not solely dependent upon relative spatial proximity to a hazard such as a coastline, a river or flood plain. Rather, sensitivity and vulnerability to hazards are increasingly acknowledged as crucial to understanding risk in a holistic sense, not least as a means to explain why certain communities and individuals are more affected than others (see Krellenberg et al, 2016). Yet while the rapid development of maps, models and tools over the last two decades has greatly aided decision-making, their propensity to abstract and to aggregate means they will inevitably struggle to capture fine-grained differences between affected populations, particularly those that are rooted in more complex societal disadvantage stemming from outside the flood risk arena. This issue has gained more resonance recently, given the gradual transition toward the responsabilisation of actors beyond the state for managing flooding. As part of this agenda, citizens and communities are warned to expect more frequent flooding and are expected to assume greater responsibility for managing their own risk. Clearly, however, the experiences of flooding are very uneven—not just in terms of spatial exposure, but also regarding the ability of people to recover or to meaningfully engage in risk agendas.

Although there is a long legacy of studies concerning the complexity of spatial justice (e.g. Young, 1990; Fainstein, 2011) and an emerging appreciation of the links between flooding and justice (Penning-Rosell and Pa rdoe 2012; Begg et al. 2015; Thaler and Hartmann 2016), other sources of critical research emphasise how predominately technical risk management decision-making frameworks struggle to be reconciled with the political economy within which they reside. For example, Lane (2014) demonstrates how the constructivist tendencies of hydrological modelling do not just represent the world, but how their assumptions and boundaries have hidden transformative influences. Other research highlights the political dimensions of technical practices, such as how they may be used to defend the reputational risk to institutions (Porter and Demeritt 2012; Kuklicke and Demeritt 2016). White and Haughton (2017) further interrogate the shaping influences of tools and methods, such as models, maps and cost-benefit analyses, arguing that their selection and application have a structuring effect that creates and maintains certain ‘hazardscapes’. Put differently, as a corollary of technically oriented approaches becoming the convention for risk management, their limits, boundary effects, contradictions and politics are now receiving more academic attention. This paper is similarly positioned. We contribute to this debate by linking risk management approaches to the broader societal factors and conditions that influence flood risk, in particular, how the vulnerability of people is affected by multiple public policy areas. To this end, we adopt and develop the notion of flood disadvantage (Lindley et al. 2011), arguing how it can better reveal the array of compounding social, demographic and economic contexts that both produce, and are produced by, flooding.

The study of flood disadvantage lies at the intersection between hazard research and a recognition of the divergent capacity of citizens to cope and recover from flooding. This paper outlines how the concept offers a more sophisticated appreciation of how flood risk intersects with wider contextual social factors affecting citizens. Moreover, the paper notes an enduring tension between technical and social dimensions of flooding and of the construction of managerial and political boundaries. It does this in three ways: first, it extends the debate concerning the limits of flood risk management policy and practice by outlining the limited way that social elements (and by extension justice) are treated by technical approaches that tend to aggregate and homogenise populations. Individuals and communities have very distinct vulnerabilities and sensitivities to hazards, and there is unevenness in the ability to engage with,

and respond to, threats such as flooding. Second, it facilitates deeper understandings of complexity debates, emphasising not just how risk is dynamic—it cascades across space and time—but also how it is linked to other fluid socio-economic, demographic and spatial characteristics that are often far removed from hazard exposure. Thirdly, it helps demonstrate how flood risk can exacerbate these other disadvantages, and how disadvantage can itself accentuate flood risk.

In essence, flood disadvantage can be used to demonstrate how the ability to respond to and recover from flood risk is highly uneven, contextual and intertwined with other social disadvantages. Disadvantage in this sense moves far beyond typical vulnerability analyses. Rather, it is produced and reproduced through markets, institutions and decision-making processes spanning an array of policy and practice agendas. Ultimately, it highlights how more integrated and co-ordinated public policy responses can help offset the technical mask and social blindness of much flood risk practice.

Contemporary flood risk and flood risk management

The evolving flood risk challenge

The threat posed by flooding is a growing national and international concern. It is now considered to be one of the most pressing ‘natural’ hazards in Europe (CRED 2009) with a consensus that it will only intensify in coming years (Committee on Climate Change 2015; IPCC 2014). Beyond an increase in the frequency and severity of flooding, there has been an expansion in the number of people exposed as climate change and urbanisation change precipitation patterns and the behaviour of receiving catchments (Zevenbergen et al. 2010). The economic and social consequences of flooding are immense. Data for the period 2000–2016 (EM-DAT, 2016 - disaster profile summary data) suggest that across the continent of Europe, floodingⁱ caused 1747 fatalities and ‘affected’ over 6.5 million people. Direct economic losses in the same period approached \$100 billion. Globally, in the same period, flooding has killed an estimated 94,000 people and ‘affected’ almost 1.5 billion people (ibid.).

It has been noted that flood exposure increases in a cumulative fashion, driving an upward trend in people at risk (White and Howe 2002; Scott et al. 2013). Significantly, communities not presently at substantial risk might have it heightened in the future, not least given changing risk catalysts associated with climate change, urbanisation and demographic change. This issue inevitably links to deeper concerns regarding the links between hazards and intergenerational justice (Stern Review 2007; Cooper and McKenna 2008), demonstrating how flood risk evolves both spatially and temporally.

Considerable research and investment have focused on increasing technical expertise in risk assessing, for example using advanced cartographical and modelling techniques to identify the distribution, or spatiality, of flood exposure. Here, modelling typically depicts the potential for inundation, with hazard maps delineating water depth and return periods into areas of varying exposure, which are usually, though not always, made available to the public in an effort to improve awareness of risk. This scientific knowledge also informs decision-making, most notably through spatial planning and flood risk management schemes. Similarly, effort has been expended to understand the complex factors underlying increased flood risk exposure. Urbanisation, limited infrastructure maintenance, certain riparian and catchment level land management practices and poor planning practice have all been cited as forces driving flood risk (White 2010; Zevenbergen et al. 2010). Efforts to understand these catalysts have fostered new systemic approaches to manage flood risk. These include holistic source-pathway-receptor approaches (Evans et al. 2004), adopting catchment initiatives (European Commission 2007) or co-ordinating schemes that complement hard drainage infrastructure with ‘natural’ measures to slow water movements (White and Alarcon 2009).

The dynamic nature of flood risk management is demonstrated by how academics, consultants and public authorities continuously develop flood risk mapping and modelling. For instance, flood risk assessments and maps are frequently updated or refined often in light of new data generated during and after a flood event. These iterations—we hope—evolve more accurate and precise maps and models. However, this ‘evolution’ also reveals a critical political economy that academic literature is beginning to highlight. Any model or map—like all abstractions of the ‘real world’—contains significant assumptions and uncertainty and so are political in nature (Gustafson 2015; Harley 1989; Hall and Solomatine 2008; Kitchen 2014). However, alterations to models and maps tend to take place in a largely opaque technical manner, and people previously considered ‘safe’ may be re-categorised as ‘at risk’ with little opportunity for discussion. Technical knowledge may also struggle to convey uncertainty and complexity (Bell et al. 2014; Lane 2014), particularly to decision-makers who may demand a ‘false precision’. Consequently, caveated, nuanced and detailed information is often reduced to a simple line on a map or a probabilistic figure (White 2013). Beyond maps and models, other risk management practices have their own calculative rationalities for assigning levels of risk within bounded geographies, such as cost-benefit calculations for territorial units. Assigning an economic lens to costs and benefits in this manner conforms to the apparent preference of many policymakers for economic approaches that provide ‘law-like regularities’ to simplify complexity (O’Neill 2001: 487). Inevitably, there are associated implications for the application of economic tools that aggregate buildings or houses into neat cost-benefit analyses without considering the sensitivities and capabilities of those that inhabit these areas, or indeed of the many other factors that compose the full risk profile of places facing flooding.

Living with risk—responsibility for contemporary flood risk management

Partly in recognition of the expansion and normalisation of flood risk, initiatives that encourage citizens to assess their exposure to flooding and to foster the ability of people to cope and to recover in the wake of flood events are mooted as a key method of contemporary risk management. Additionally, as with other realms of public administration and governance in post-industrial economies, this transition entails significant alterations in the roles envisaged for citizens and communities. The broader scope of this approach means stakeholders are wide and varied, including governments, utility and infrastructure bodies, citizens, technical experts and planners. Societies must now, it is contended, adapt to live with risk, or in other words, become resilient (Adger et al. 2006). Engagement and participatory practices comprise a central dimension of these trends (Coaffee and Lee 2016), forming broader strategies to expand risk management from being under the aegis of the state to be the concern of those exposed to risk. Notably, these alterations have been catalysed by broader trends in public administration, where, for example, notions of resilient citizens highlight how civil engagement can improve preparedness and adaptation (O’Brien et al. 2009; Cabinet Office 2011).

Against this context, the escalating impacts of flooding combined with an increasing appreciation of wider socio-technical contexts have catalysed a discernible shift in the tenor of response to flood risk, usually understood as a transition from flood defence to flood risk management (Johnson et al. 2005; Butler and Pidgeon 2011). Consequently, and given the uncertainty surrounding flood risk, policy in many national contexts advises that complete protection against flooding is impossible. Non-structural measures such as planning policy, insurance programmes or the publication of online risk maps that may engender behavioural change have become integral to flood risk management (European Commission 2007). Flood governance is, therefore, now considered to be a more democratic and co-ordinated exercise, changing methodologies of science and politics to empower people (Jasanoff 2004). In this regard, flood risk management mirrors efforts to promote stakeholder engagement in environmental management (Eden et al. 2006), whilst research emphasises the inter-scalar

dimensions of flood risk management, from institutions to individual citizens (Pahl-Wostl 2009; Thaler and Levin-Keitel 2016).

Initiatives have ‘responsibilised’ citizens and communities who have assumed, or have been charged with assuming, enhanced roles in the management of exposure to flood risk (Johnson and Priest 2008; Thaler and Priest 2014). Particular emphasis is placed on the value of engaging local people with Beyond ‘just’ flood risk management: the potential for - and limits to - alleviating flood disadvantage no professional responsibility for managing flooding (Bracken et al. 2016). Plans are subjected to extensive consultation exercises; whilst in areas where flooding has taken place, groups representing the views of local people (e.g. flood action groups) are established. Consequently, a myriad of new opportunities for civil participation has emerged across all stages of flood risk management: preparation, response, recovery and mitigation (Wehn et al. 2015). These efforts are characterised by partnership building and collaborative efforts, re-articulating those exposed to hazards not as merely vulnerable to flooding, but as agents of flood risk management (O’Hare et al. 2016).

As suggested, participation and engagement are often facilitated through new governance and institutional structures for flood management, including innovative participatory and knowledge co-production techniques (White et al. 2010; Landström et al. 2011; Lane et al. 2011; Thaler and Priest 2014; White et al. 2016). This has been embedded within broader public policies that implore citizens to accept the inevitability of flooding: to ‘live’ with water (Department of Environment, Food and Rural Affairs 2005) or to make ‘room’ for rivers (Ministry of Transport, Public Works and Water Management 2006; Ruimte voor de Rivier 2012). Critically, these efforts bring significant governance challenges (Penning-Rowsell and Johnson 2015). Planning and decision-making authorities rarely correspond with catchments or other administrative jurisdictions, and there are uneasy ‘borders’ between stakeholders with different training, experience and organisational priorities (Bracken et al. 2016). Moreover, in the wake of floods with significant impacts, post-event inquiries tend to isolate the climatic, technical and engineering dimensions of disasters in an effort to explain why flooding occurred. Such efforts, however, have been critiqued for generating unproductive institutional ‘blame games’ that reoccur after each event, with limited substantial change (Haughton and White 2016).

This section has highlighted how flood risk is dynamic and evolves across time, with variable implications across populations and places (Pitt Review 2008; Douglas et al. 2010; Houston et al. 2011). It has also discussed how flood risk has become normalised whilst its range of actors and agencies has expanded beyond the state to include citizens themselves. We further emphasise the political choices imbued in modelling and mapping work where resources may be allocated according to technical parameters which, while an inevitable corollary of decision-making practices, may not be cognisant of how certain communities or individuals are less able to cope with climate extremes than others (Lindley et al. 2011). We contend that recognising the real-world social contexts relating to this uneven distribution of justice can help to soften the technical mask of flood risk management. This is a normative stance, but as this section has emphasised, so is the current situation. Despite the seemingly objective and technical mask of flood risk management, political choices permeate processes, from the methodology selected, to the allocation of resources, and increasingly now to the responsabilisation of citizens.

‘Mapping’ the contours of flood disadvantage

The discussion of the science and practice of flood risk thus far emphasises that it is derived from a multiplicity of complex social and technical drivers, many of which are deeply embedded in society. Moreover, it is apparent that altered contexts of the governance of flood risk have significant implications for the public in terms of who is subjected to future exposure

and how communities and citizens are expected to participate in risk management. This has real implications for people and places, not just given the variegated capacity to respond to a flood event or to cope with living with flood risk, but also as there is an uneven ability to engage with state-led risk discourses.

The term ‘climate disadvantage’ was recently developed in an effort to capture the nuances of risk, illustrating how hazard exposure, social vulnerability and the capacity to respond have intricate geographies (Lindley et al. 2011, p7). Climate disadvantage can be demonstrated through the fusion of a diagnosis of hazard-exposure—in particular ‘heat’ or ‘flood’ exposure—and more deeper assessments of socio-spatial vulnerability. Specifically, climate disadvantage is defined as a function of (a) the likelihood and degree of exposure to a hazard and (b) individual or group vulnerability with regard to such hazards (ibid.). In a more generic sense, the term ‘corrosive disadvantage’ (Wolff and de Shalit 2007) provides a wider perspective to demonstrate how complex social factors compound inequalities and injustices. Such accounts can help us better appreciate how flood disadvantage is contextual, pluralistic and complex. Flood risk is rooted in and correlated with society more generally, rather than unilaterally and discretely related to the outcomes of specific processes such as flood risk management.

In response, studies of both specific disaster events and of longer-term stresses such as climate change have started to isolate the intricate variables that foster vulnerability. Detailed empirical studies demonstrate how certain groups stratified across a variety of economic, ethnic, social and cultural attributes and characteristics, are more exposed to hazards, and additionally, are less able to cope with the effects of those hazards (Bullard 1994; Cutter 1996; Cutter et al. 2003; Smith 2006; Elliott and Pais 2006; Werritty et al. 2007). For example, extreme weather events are likely to have a greater effect on older people, low-income groups and those with multiple health problems (see Tapsell et al. 2002; Fielding and Burningham 2005; Vardoulakis and Heaviside 2012; Defra 2013). More practically, certain people may have limited mobility, meaning they are less able to evacuate from a flooded area or are unable to move possessions away from imminent danger or in the expectation of a flood.

Other particularities of living conditions, including housing tenure and the quality of the physical construction and state of repair of properties, have an influence on an inhabitant’s overall sensitivity to flooding (Thieken et al. 2005; Kazmierczak and Cavan 2011; Houston et al. 2011; Kazmierczak et al. 2015). More broadly, analytical attention has noted how ‘place inequalities’, including economic vitality and growth rates, frames social vulnerabilities, providing a useful reminder that climate change vulnerability is nested within a dynamic landscape of social and economic conditions (Cutter et al. 2003; Walker et al. 2003; Zsomboky et al. 2011; Howe and White 2002). Others have discussed how recurring flooding, whereby the same people and places are seemingly trapped in cycles of flooding or maladaptation, reveals wider societal inequities that transcend mere proximity to hazards (O’Hare et al. 2015).

Elsewhere, research suggests how, despite advances in understanding the nuances of flood risk, policy and practice interventions that attempt to reduce or alleviate flood risk, can compound and redistribute advantage and disadvantage. For example, the funding of flood defences has been critiqued for creating potential ‘winners and losers’ (Penning-Rowsell and Pardoe 2012; see also Johnson et al. 2007). Additionally, policy initiatives can be insensitive to the specific requirements of the most vulnerable in society (England and Knox 2015). Without an appreciation of the varied capacity to cope with flooding, such efforts may further drive social inequity (White and O’Hare 2014; Fainstein 2015) or may even facilitate responses to hazards that ultimately serve the interests of the powerful and privileged (Klein 2007).

At this point, it is worth reiterating that explanations of difference with regard to flood risk (and by extension, injustice) can usefully extend beyond analyses of exposure and the sensitivity of people to flooding. Adding a third dimension, it is proposed that the poor and

powerless have a reduced capacity to respond both to generic flood risk and specific flood events; what has been referred to as ‘triple injustice’ (Walker and Burningham 2011). By exploring this element of justice, we can appreciate some of the limits of current standard risk analysis techniques. For example, even if vulnerability assessments are included, they may not incorporate more contextual social aspects, such as the ability to engage or the hidden effect of other public policy changes. Concern regarding the divergent capacities to respond across society becomes all the more pertinent given the aforementioned neo-liberalisation and individualisation of contemporary flood risk management. As citizens are charged with greater responsibility for managing and implementing their own flood risk management initiatives, there is doubt regarding the readiness and ability—often referred to as the adaptive capacity—of individuals and communities in meeting this challenge (Whittle et al. 2010). For instance, certain sectors of society might lack the resources required to purchase or maintain property level protection and resilience measures (Bichard and Kazmierczak 2012) or to participate in insurance schemes (Priest et al. 2005; O’Neill and O’Neill 2012; O’Hare et al. 2015). Other citizens may simply be less aware of their exposure and vulnerability to flood risk (Fielding 2009) or may be unable to move from areas at significant exposure.

These studies, focused as they are on people and communities, help situate the notion of flood disadvantage against broader contexts. They demonstrate how the technical emphasis on mapping spatial distributions and proximity to hazards has dynamic and potentially hidden redistributive qualities. These social and contextual factors of flood vulnerability and sensitivity are often overlooked in conventional distributional analyses that treat those exposed to flooding as homogeneous entities; aggregations that neglect to account for the variations in ‘at risk’ populations (Walker and Burningham 2011; Preston et al. 2011). Yet clearly, there is an unevenness of exposure, vulnerability, power and engagement, which underwrites flood disadvantage. We acknowledge that this inequity is ever-present. Consequently, there will always be relative disadvantage. However, two key questions are posed: first, to what extent do flood risk practices consider their role in compounding and potentially mitigating this? And second, how can they extend vulnerability and sensitivity research to include more contextual issues and more effectively acknowledge the effect of other public policy arenas?

The notion of flood disadvantage could encourage more nuanced understandings of the effects of flooding to encompass characteristics that may be secondary to flood exposure, yet are often essential to understanding the distribution of flood risk in a broader sense. The diverse range of characteristics that constitute the flood risk profiles of communities, households and individuals creates a complicated milieu. These characteristics frequently intersect, with some individuals rendered disadvantaged due to several distinct, though simultaneously related elements of their circumstances. Policy initiatives in one area will affect vulnerability in another. Conventional risk assessments also overlook the devastating experience of living with the consequences of flooding and flood risk. Flooding and flood risk may clearly exacerbate disadvantage in a broader sense by pushing vulnerable communities into greater precarity in other aspects of their lives.

Despite capturing a broader understanding of the intricate ‘wickedness’ of flood disadvantage, the remainder of the paper elaborates why issues pertaining to the concept have thus far proven removed from policy. It also identifies some potential limits of the concept both in terms of its explanatory potential and as an agenda for practical change.

Justice and decision-making—the context for disadvantage

There is a long history of studies concerning the geographical and spatial dimensions of justice (Young 1990; Fainstein 2011). Related work on environmental justice similarly explains the spatialities of environmental burdens and benefits. It is widely acknowledged that studies of justice must extend beyond articulations of distributive dimensions of justice. More

explanatory and substantive assessments of environmental justice have emerged to provide diagnostic and normative insights that help develop the notion of justice: first, that people have the right to live in a healthy environment, and second, that the most socially and economically disadvantaged lack these conditions (Stephens et al. 2001). In short, it is often the least wealthy and most marginalised people in society that tend to live in areas of poorest quality and are exposed to the most dangerous environmental conditions, or who are least able to deal with environmental threats. There is a further injustice in that those living in the worst environments often possess least responsibility for creating those conditions. For instance, it has been suggested that the poorest communities suffer exposure to the greatest levels of air pollutants, but ironically are least responsible for generating pollution (Mitchell and Dorling 2003).

So, the question of justice regarding flood risk and flood risk management extends beyond an analysis of where and who is exposed to flooding or where flood defence and adaption measures are funded. The broader, often cumulative, factors underwriting how and why certain sectors of society are exposed to flood risk and differentials in their capacity to respond to and recover from flooding are emphasised. Decisions regarding the distribution of environmental injustices therefore stretch far beyond discrete bureaucratic decisions on the use of land or resources or with reference to this specific paper, flood risk management policy and practice. They are, rather, nested within multiple layers of decision-making across the range of social and economic agendas forming the broad landscape of governance.

Extending this broad body of work, scholars have identified the forces generating the conditions for injustice, suggesting that procedural and decision-making dimensions are critical. Much of the decision-making pertaining to public administration is essentially about mediating space and resources. Consequently, it plays a critical role in enabling or mitigating justice (White 2015). Indeed, much of the initial rationale for state intervention in decisions such as planning and development control claimed to improve disadvantaged communities (Fainstein 2011). For instance, early planning policies and laws were purported to realise equity and well-being or to protect against the effects of industrialisation (Robson 1999). Such insights draw attention to the broader landscape against which justice and injustice are realised. Certain sectors of society are exposed to a multiplicity of injustices, some of which are correlated to factors and conditions far beyond a flood event or flood exposure. For instance, distributive dimensions of injustice, such as those readily illustrated by conventional flood hazard maps, are influenced by broader, often intangible, processes such as the machinations of power or the capacities of stakeholders to participate in decision-making processes.

Today, modern articulations of planning decision-making claim to take an interest in themes pertaining to diversity, democracy and quality of life, extending the long-standing concern with disadvantage and equity. Campbell and Marshall (2006: 240) explain this further:

“We regard planning as an activity which is concerned with making choices about good and bad, right and wrong, with and for others, in relation to particular places. It is about making ethical choices over issues which are often highly contested. Planning is therefore profoundly concerned with justice.”

Against this backdrop, the planner—broadly construed—mediates the effects of flooding and of flood risk management, having the remit, expertise and power to change both the outcomes and processes of flood risk management policy.

Theoretically, then, victims of environmental injustice often only have this addressed when they have effective and meaningful access to the decision-making and policy-making processes that govern the distribution of environmental goods and bads. Promoted partly in an effort to alleviate a proposed ‘crisis of legitimacy’ of formal institutions (Habermas 1976), it is suggested that participation brings fresh perspectives to decision-making scenarios, ensures

outcomes are sensitive to the needs of those that must live with their consequences and ultimately democratises processes. Participation has long been a central tenet of formal planning and decision-making systems across the globe (see Ministry of Housing and Local Government 1969; Arnstein 1969). Recently, participatory and collaborative forms of governance have emerged in an effort to embrace previously disengaged stakeholders in decision-making process, including, but not necessarily limited to, the public and civil society. In particular, the discipline of planning incubated the development of a 'communicative' or 'collaborative' paradigm (Sager 1994; Innes 1995; Healey 1997) in an effort to make decisions on land and resources in the context of increasingly fragmented societies. Drawing upon the premise of creating 'ideal speech' situations (Habermas 1984), dialogue and communication are encouraged, whilst planners act as facilitators to enable engagement and co-operation and ultimately to negotiate consensus. It is envisaged that collaborative planning processes can challenge articulations of professionals as technocrats, whilst mutual learning becomes integral to governance.

Other theorists also advocate meaningful stakeholder and public involvement in decision-making and in the development, implementation and enforcement of environmental laws, regulations and policies as key for realising justice (Bullard 1999: 7). Julian Agyeman (2005: 26) identifies three strands of environmental justice to elaborate this relationship. First, 'procedural' justice, referring to the ability of people to be meaningfully involved; second, 'substantive' justice, relating to the right to live in a healthy environment; and third, 'distributive' justice, relating to the equitable distribution of environmental benefits. Elsewhere, a similar interpretation identifies procedural and distributive justice and adds a third dimension, 'justice as recognition', referring to which voices are respected and who is valued in decision-making debates (Walker 2012:10). These justice perspectives help emphasise how political aspects, such as access to decision-making or notions of power, can affect disadvantage.

However, the realisation and efficacy of participation varies considerably. Access to—or conversely, exclusion from—forums of decision-making and the variable capability and enthusiasm of certain sections of society in engaging with decision-making frame the nature, extent and effectiveness of involvement. For example, different authorities have differing perceptions of citizen participation in flood risk management in terms of their roles and influence, whilst not all citizens are able to or have the motivation to participate (see Wehn et al. 2015). Non-participation in decision-making precludes certain communities and individuals from influencing unfair outcomes. Conversely, groups with higher levels of education and better access to resources may be more effective at influencing decisions (Walker 2012). Appreciating these and similar such characteristics—and the correlations and causal relations that govern them—is crucial to understanding the conditions that produce and exacerbate flood risk.

Given these insights, we contend that disadvantages relating to flood risk stretch far beyond the spatial distribution of exposure or the allocation of funds for flood defences toward how power structures, political actors and institutional processes may create and perpetuate injustice. Here, the work of geographers such as David Harvey (1996) and Iris Marion Young (1990) provides a useful reference point to link the spatial dimensions of injustice with the concept of (flood) disadvantage. Such insights call us to expand discussions of their distribution or uncritical assessments of disparity to understand how wider disparities in social conditions are produced and reproduced. By consequence, diagnostic tools that help trace the associations and correlations between these elements become essential.

This section has further reoriented notions of risk and justice beyond spatial exposure to encompass broader distributions of disadvantage. In doing so, we link disadvantage to the means by which society regulates and governs space and resources and processes of

stakeholder involvement in these processes. Core concepts pertaining to environmental justice provide a broader landscape to understand and explain the dimensions of flood disadvantage. We can, therefore, better appreciate how flood disadvantage implies a co-dependency between all of the characteristics that frame vulnerability and sensitivity to flood risk extending far beyond an identification of spatial exposure to hazards.

The constraints of flood disadvantage

We have advocated the concept of flood disadvantage for its ability both to reveal the limits of standard risk analysis practices and to broaden understanding of less visible factors and forces that frame flood vulnerability, sensitivity and the capacity of individuals and communities to respond. Flood disadvantage is rooted in the perspective that populations are pluralistic, and while standard risk analysis can capture parts of this, it certainly does not stretch beyond the contexts of flooding to other public policy arenas or include more nuanced considerations relating to engagement or power. As research further elaborates these insights, we anticipate that our understanding of flood disadvantage will become more sophisticated. More comprehensive recognition of the interdependent and correlated elements that constitute and compound disadvantage could help attune flood risk management policy to the specific threats and needs of those exposed to flood risk.

Despite effort to chart the intersections between social and economic disadvantage and flood risk, the notion has had only a limited influence in flood risk management policy and practice. The first concern relates to how decisions regarding flood risk are taken. Conventional flood risk maps—particularly those published by governmental authorities—rarely, if ever, take account of social dimensions of flood risk such as sensitivity and vulnerability. And even if this was the case, they would struggle to incorporate wider elements of disadvantage beyond the more easily quantifiable elements of individual vulnerability, such as age or disability. They also rarely account for other aspects of risk, such as property type and condition, or the existence of small-scale property level protection or resilience measures, or indeed any of the aforementioned dimensions that compose flood disadvantage outlined earlier.

Similarly, many decisions relating to investment in defences are based on a cost-benefit metric that privileges an aggregated value for money method rather than acknowledging individual contexts. We propose this is due, in part, to the technical dominance of management approaches, such as the efforts of authorities to map and record flood risk and the demands of decision-makers. Current methods of modelling and illustrating flood risk, and by consequence flood risk management decision-making systems, are relatively socially blind, proving to be useful, although limited, diagnostic tools. There is also a temporal dimension to this critique, as the dynamic nature of flood risk intersects with the dynamic nature of disadvantage. Future studies of flood disadvantage could usefully acknowledge and reflect their limited ability to capture this complexity; that is, the fluidity of the characteristics that shape vulnerability and sensitivity to flood risk across time, space and various public policies. It might also assist the appreciation of the temporal dimensions of flood risk; how people can be exposed to greater or less flood disadvantage across time as their individual, familial and wider community circumstances alter.

A related concern regards the relatively limited organisational capacity of flood risk management stakeholders, particularly given the constraints of managerial and public policy boundaries touched upon earlier in the paper. Addressing disadvantage requires a consideration of contexts and circumstances that, from a governance and bureaucratic perspective, fall far beyond the purview of the formal flood risk management practices and policies. Disadvantage in the most generic sense of the term is produced and reproduced through markets, institutions and decision-making processes, spanning an array of policy and practice agendas. Critical studies of flood disadvantage may better reveal the hidden structuring effects and limits of

scientific and managerial flood risk management, demonstrating how people and places may be overlooked by initiatives that are not calibrated to the precise needs of those exposed to flood risk. The pursuit of more ‘just’ flood risk management can usefully, therefore, be linked to social and economic policies that offer the hope to alleviate disadvantage in a broader sense. Perhaps this circumstance may explain the limits of efforts to address flood vulnerability, sensitivity and capacity building if only perceived through the prism of flood risk management. These concerns highlight the complexity and challenges in addressing flood disadvantage. Without significant reform, iterations of flood risk management may not only fail to adequately address flood injustice but given a general blindness to difference and power differentials and a limited ability to influence wider social policy may serve to only perpetuate injustices.

A further challenge regards the difficulty in attaining meaningful citizen involvement in flood risk management. Literature referring to environmental justice advocates community and public involvement as essential to addressing disadvantage. But the trend to reframe vulnerable populations not as flood victims, but as stakeholders or agents in flood risk management, is limited. From a superficial perspective, stakeholder-based flood risk management draws upon the inputs of many actors, each with their own vested interests, adding further complexity and fragmentation to decision-making. Whilst policy and academic literature alike valorises participation, collaboration and co-production in the practice of flood risk management, the realisation of this and the implications of such efforts vary considerably. More critically, analysts of flood risk management, whilst often great proponents of participation and collaboration in the development of plans and strategies, are myopic to power differentials and to the variable willingness and capabilities of communities to participate. For example, not all citizens have the ability or inclination to participate (see Wehn et al. 2015), while policy has often treated the public as instruments of flood risk management, with discrete, prescribed and ultimately limited roles (Lane et al., 2011). Elsewhere, others have urged caution when assuming that local knowledge should be privileged in decision-making interactions (Haughton et al. 2015).

We must, therefore, examine the extent to which different ‘voices’ and groups are represented in decision-making, their variegated capabilities to both deal with risk and to contribute to decision-making and the ways through which participation may be affected by wider societal forces. Modes of participation that are emergent in flood risk management practice and scholarship have been problematized within other disciplines. Critical planning theorists, attuned to the nuances and intricacies of power, have long warned of the challenges and difficulties posed by this very approach to participation, planning and governance. For example, collaborative efforts have been attacked for not taking sufficient account of power dynamics and relations or for overlooking the intricacies of political and professional activity (Tewdwr-Jones and Allmendinger 1998). Some powerful actors could use such processes as a further means to progress their own agendas (Huxley and Yiftachel 2000), not least given the real politick (Alexander 2001) of planning in an essentially uncollaborative world (Brand and Gaffikan 2007). These are critical observations, given the reliance upon the ‘capacity’ of communities and individuals and the increasing emphasis on democratic participation in flood risk management.

Consequently, both participatory decision-making and the pursuit of responsabilisation agendas that fail to appreciate the broader challenges to public engagement in governance may serve to exacerbate rather than ameliorate disadvantage. Community and public involvement must, therefore, be considered against the context of disadvantage that frames the capacity to participate in time-consuming, technical and often frustrating governance processes. Communities that feel abandoned by authorities and overlooked by economic development before a flood, or any other hazard for that matter, are unlikely to embrace governance efforts that promise safety and protection after they and their neighbours have lost their homes and

livelihoods. A corollary of this issue is that certain groups may be more likely to engage, potentially privileging the influence of those in society that are less vulnerable to flood disadvantage. Consequently, the participatory dimensions of efforts to alleviate flood disadvantage requires careful negotiation and advocacy, stretching beyond the rather narrowly defined remit of flood risk management decision-making.

In light of these critiques, and despite the orientation of recent academic work around social vulnerability, studies of flood disadvantage have yet to percolate through to flood risk management practice. We propose that wider notions of vulnerability are overlooked precisely because they open debates beyond technical considerations of flood risk management. Essentially, these are political. Such considerations ask awkward questions about the wider vulnerabilities of citizens and communities, or stray too far into the remit of other policy fields.

Given the heightened roles for citizens and communities within new ensembles of governance we must pay more critical attention to the ability and willingness of people to engage in risk management and, by extension, their ability to address flood disadvantage. Convenient as it is for decision-makers, the homogenising of populations at risk neglect the personal, spatial and temporal vagaries of disadvantage and vulnerability. Moreover, it overlooks the variegated assets and capabilities found within communities across a spatial area and the temporal variations of flood risk. Consequently, we propose that flood disadvantage must be understood as essentially dynamic, as a spectrum rather than a categorisation along which people can move as their circumstances change.

Conclusion

The intricate drivers and effects of flooding have been discussed at length throughout the academic literature. However, only recently have we started to fully appreciate the variegated social impacts of flooding and, by extension, variation in the capacity and ability to respond to flooding. Considerations of disadvantage provide a further understandings of the nuanced implications of flood risk and the contexts that frame sensitivity and vulnerability of people to flooding, particularly those stemming from other public policy and due to personal circumstances. The often devastating consequences of floods are exacerbated by societal, economic and health conditions, pushing already vulnerable people into ever more disadvantage. Moreover, flooding can compound these other conditions of disadvantage. This, therefore, poses a dual challenge for those with responsibility for flood risk management and those with decision-making responsibility in wider public policy fields that intersect exposed populations.

As we gain ever more sophisticated understandings of the correlations between multifarious dimensions of flood disadvantage across scales and stakeholders, integrating these perspectives will be politically challenging, and in some instances, elusive (Thaler and Hartmann 2016). Such insights rarely bring the certainty that policymakers, practitioners and communities crave, exacerbating the ‘wickedness’ of the contemporary challenge of flood risk management. Against this complexity, it is understandable that planners and others responsible for flood risk management have tended to focus their attention on mapping, modelling and addressing flood exposure rather than flood disadvantage. Yet, such approaches can unknowingly compound flood disadvantage rather than taking steps that may positively counter it. Additionally, flood risk management policy and academics increasingly speak of the need for participation, collaboration and coordination across stakeholders and scales, valorizing such activities for democratising flood risk management procedures. However, social scientists have critiqued the capacity of decision-makers to catalyse social and environmental justice through participation and have frequently doubted the sincerity of such efforts within other public policy arenas. The provision of more opportunities to participate

paradoxically can favour those with resources, expertise and time, the very same people who are arguably already well represented in the processes of public decision-making.

Consequently, we acknowledge that ‘Gordian’ questions of power, legitimacy and authority underpin more ‘visible’ notions of the distribution of goods and bads, or the formal, often technocratic and bureaucratic, processes of decision-making. Providing more critical understandings of the contextual, pluralistic and contingent nature of disadvantage will prove to be a vital step in the reorientation of ‘just’ flood risk management from being an abstract notion to one that could alter current and future practice.

References

Agyeman J (2005) Sustainable communities and the challenge of environmental justice. New York University Press, London

Adger N, Paavola J, Huq S, Mace MJ (2006) Fairness in adaptation to climate change. MIT Press, Cambridge, MA

Alexander (2001) The planner-prince: interdependence, rationalities and post-communicative practice. *Planning Theory & Practice* 2(3):311–324. <https://doi.org/10.1080/14649350120096848>

Arnstein S (1969) A ladder of citizen participation. *Am Inst Plan J* 35(4):216–224

Begg C, Walker G, Kuhlicke C (2015) Localism and flood risk management in England: the creation of new inequalities? *Environ Plan C: Gov Policy* 33(4):685–702. <https://doi.org/10.1068/c12216>

Bell J, Saunders MI, Leon JX, Mills M, Kythreotis A, Phinn S, Mumby PJ, Lovelock CE, Hoegh-Guldberg O, Morrison TH (2014) Maps, laws and planning policy: working with biophysical and spatial uncertainty in the case of sea level rise. *Environ Sci Policy* 44:247–257. <https://doi.org/10.1016/j.envsci.2014.07.018>

Bichard E, Kazmierczak A (2012) Are homeowners willing to adapt to and mitigate the effects of climate change? *Clim Chang* 112:633–654. <https://doi.org/10.1007/s10584-011-0257-8>

Bracken LJ, Oughton EA, Donaldson A, Cook B, Forrester J, Spray C, Cinderby S, Passmore D, Bisset N (2016) Flood risk management, an approach to managing cross-border hazards. *Natural Hazards* 82(2):217–240. <https://doi.org/10.1007/s11069-016-2284-2>

Brand & Gaffikan (2007) Collaborative planning in an uncollaborative world. *Plan Theory* 6(3):282–313. <https://doi.org/10.1177/1473095207082036>

Bullard R (1994) Unequal protection: environmental justice and communities of color. Sierra Club Books, San Francisco

Bullard R (1999) Dismantling environmental racism in the USA. *Local Environ* 4(1):5–19. <https://doi.org/10.1080/13549839908725577>

Butler C, Pidgeon N (2011) From 'flood defence' to 'flood risk management': exploring governance, responsibility, and blame. *Environ Plan C* 29(3):533–547. <https://doi.org/10.1068/c09181j>

Cabinet Office (2011) Strategic National Framework on Community Resilience http://www.cabinetoffice.gov.uk/sites/default/files/resources/Strategic-National-Framework-on-Community-Resilience_0.pdf

Campbell H, Marshall R (2006) Towards justice in planning. *Eur Plan Stud* 14(2):239–252. <https://doi.org/10.1080/09654310500418192>

Cooper JAG, McKenna J (2008) Social justice in coastal erosion management: the temporal and spatial dimensions. *Geoforum* 39(1):294–306. <https://doi.org/10.1016/j.geoforum.2007.06.007>

CRED (2009) *Disaster data: A balanced perspective*. CRED crunch, Centre for Research on the epidemiology of disasters (CRED), issue no. 17, Brussels

Coaffee J, Lee P (2016) *Urban resilience: planning for risk, crisis and uncertainty*. Palgrave Macmillan, Basingstoke

Committee on Climate Change (2015) Progress in preparing for climate change: 2015 report to parliament, **June 2015**

Cutter SL (1996) Vulnerability to environmental hazards. *Prog Hum Geogr* 20(4):529–539. <https://doi.org/10.1177/030913259602000407>

Cutter SL, Boruff BJ, Shirley WL (2003) Social vulnerability to environmental hazards. *Soc Sci Q* 84(2):242–261. <https://doi.org/10.1111/1540-6237.8402002>

Department for Environment, Food and Rural Affairs (Defra) (2005) *Making space for water: taking forward a new government strategy for flood and coastal management in England*. Defra, London

Douglas I, Garvin S, Lawson N, Richards J, Tippett J, White I (2010) Urban pluvial flooding: a qualitative case study of cause, effect and nonstructural mitigation. *J Flood Risk Manag* 3:112–125. <https://doi.org/10.1111/j.1753-318X.2010.01061.x>

Eden S, Donaldson A, Walker GP (2006) Green groups and grey areas: scientific boundary work, NGOs and environmental knowledge. *Environ Plan A* 38(6):1061–1076. <https://doi.org/10.1068/a37287>

Elliott JR, Pais J (2006) Race, class, and hurricane Katrina: social differences in human responses to disaster. *Soc Sci Res* 35(2):295–321. <https://doi.org/10.1016/j.ssresearch.2006.02.003>

EM-DAT database (2016) www.emdat.be/database [Accessed 14th July, 2016]

England K, Knox K (2015) *Targeting flood investment and policy to minimise flood disadvantage*. Joseph Rowntree Foundation, York

European Commission (2007) Directive 2007/60/EC of the European Parliament and of the Council of 23 October 2007 on the Assessment and Management of Flood Risks. Available at: <http://eurlex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32007L0060:EN:NOT> (accessed 9th November 2013)

Evans EP, Ashley R, Hall J, Penning-Rowsell E, Saul A, Sayers P, Thorne CR and Watkinson A (2004) Foresight. *Future flooding. Scientific summary: volume 1—future risks and their drivers*, DTI/pub 7183/2k/04/04/NP, URN 04/939 (London: Office of Science and Technology). Available at: www.gov.uk/government/publications/future-flooding

Fainstein S (2011) *The just city*. Cornell University Press, Ithaca, United States

Fainstein S (2015) Resilience and justice. *Int J Urban Reg Res* 39:157–167. <https://doi.org/10.1111/1468-2427.12186>

Fielding JL (2009) Double whammy? Are the most at risk the least aware? A study of environmental justice and awareness of flood risk in England and Wales. In Samuels, P. Et al. (eds) *Flood Risk Management: Research and Practice*, pp. 965–72

Fielding J, Burningham K (2005) Environmental inequality and flood hazard. *Local Environ* 10(4):379–395. <https://doi.org/10.1080/13549830500160875>

Gustafson S (2015) Maps and contradictions: urban political ecology and cartographic expertise in southern Appalachia. *Geoforum* 60:143–152. <https://doi.org/10.1016/j.geoforum.2015.01.017>

Habermas J (1976) *Legitimation crisis*. Heinemann Educational, London

Habermas J (1984) *The theory of communicative action: vol.1—reason and the rationalization of society*. Polity Press, Oxford

Hall J, Solomatine D (2008) A framework for uncertainty analysis in flood risk management decisions. *Int J River Basin Manag* 6(2):85–98. <https://doi.org/10.1080/15715124.2008.9635339>

Harley JB (1989) Deconstructing the map. *Cartographica* 26:1–20. <https://doi.org/10.3138/E635-7827-1757-9T53>

Harvey D (1996) *Justice, nature and the geography of difference*. Blackwell, Oxford

Haughton G, Bankoff G, Coulthard TJ (2015) In search of ‘lost’ knowledge and outsourced expertise in flood risk management. *Trans Inst Br Geogr* 40:375–386. <https://doi.org/10.1111/tran.12082>

Haughton G and White I (2016) Groundhog day: the great floods of 2015, *Town and Country Planning Journal*, March, 134–137

Healey P (1997) *Collaborative planning: shaping places in fragmented societies*. Palgrave, Basingstoke

Houston D, Werritty A, Bassett D, Geddes A, Hoolachan A, McMillan M (2011) Pluvial (rain-related) flooding in urban areas: the invisible hazard. Joseph Rowntree Foundation, York

Howe J, White I (2002) The geography of the autumn 2000 floods in the UK. *Geogr: An Int J* 87(2):116–125. <https://doi.org/10.1016/j.ijdr.2017.01.018>

Huxley M, Yiftachel O (2000) New paradigm or old myopia? Unsettling the communicative turn in planning theory. *J Plan Educ Res* 19(4):333–342. <https://doi.org/10.1177/0739456X0001900402>

Innes J (1995) Planning theory's emerging paradigm: communicative action and interactive practice. *J Plan Educ Res* 14(3):183–189. <https://doi.org/10.1177/0739456X9501400307>

IPCC. (2014) Climate change 2014: impacts, adaptation, and vulnerability. IPCC. Available at: <http://www.Ipcc.Ch/report/ar5/wg2/> (accessed 2nd June 2016)

Jasanoff S (ed) (2004) States of knowledge: the coproduction of science and social order. Routledge, London

Johnson C, Tunstall S, Penning-Rowsell E (2005) Floods as catalysts for policy change: historical lessons from England and Wales. *Int J Water Resour Dev* 21:561–575. <https://doi.org/10.1080/07900620500258133>

Johnson C, Penning-Rowsell E, Parker D (2007) Natural and imposed injustices: the challenges in implementing 'fair' flood risk management policy in England. *Geogr J* 173(4):374–390. <https://doi.org/10.1111/j.1475-4959.2007.00256.x>

Johnson C, Priest S (2008) Flood risk management in England: a changing landscape of risk responsibility? *Int J Water Resour Dev* 24(4):513–525. <https://doi.org/10.1080/07900620801923146>

Kazmierczak A, Cavan G (2011) Surface water flooding risk to urban communities: analysis of vulnerability, hazard and exposure. *Landsc Urban Plan* 103(2):185–197. <https://doi.org/10.1016/j.landurbplan.2011.07.008>

Kazmierczak A, Cavan G, Connelly A, Lindley S (2015) Mapping flood disadvantage in Scotland 2015. The Scottish Government, Edinburgh

Kitchin R (2014) From mathematical to post-representational understandings of cartography. *Progress In Human Geography*, intro to special e-collection, pp 1–7 doi: <https://doi.org/10.1177/0309132514562946>

Klein N (2007) The shock doctrine: the rise of disaster capitalism. Penguin, London

Krellenberg K, Welz J, Link F (2016) Urban vulnerability and the contribution of socio-environmental fragmentation: Theoretical and methodological pathways. *Prog Hum Geogr* 41(4):408–431. <https://doi.org/10.1177/0309132516645959>

Kuklicke C and Demeritt D (2016) Adaptive and risk-based approaches to climate change and the management of uncertainty and institutional risk: the case of future flooding in England. *Global Environ Change* 37 56-68. doi: <https://doi.org/10.1016/j.gloenvcha.2016.01.007>

Landström C, Whatmore SJ, Lane SN, Odoni NA, Ward N, Bradley S (2011) Co-producing flood risk knowledge: redistributing expertise in critical 'participatory modelling'. *Environ Plan A* 43(7):1617–1633. <https://doi.org/10.1068/a43482>

Lane SN (2014) Acting, predicting and intervening in a socio-hydrological world, *Hydrology and Earth Systems Sciences*, 18, 927–952. doi: <https://doi.org/10.5194/hess-18-927-2014>

Lane SN, Odoni N, Landström C, Whatmore SJ, Ward N, Bradley S (2011) Doing flood risk science differently: an experiment in radical scientific method. *Trans Inst Br Geogr* 2011(36):15–36. <https://doi.org/10.1111/j.1475-5661.2010.00410.x>

Lindley S, O'Neill J, Kandeh J, Lawson N, Christian R, O'Neill M (2011) Climate change, justice and vulnerability. Joseph Rowntree Foundation, York [Google Scholar](#)

Mitchell G, Dorling D (2003) An environmental justice analysis of British air quality. *Environ Plan A* 35(5):909–929. <https://doi.org/10.1068/a35240>

Ministry of Housing and Local Government (1969) *People and Planning. Report of the Committee on Public Participation in Planning* [The Skeffington Report]. London: HMSO

Ministry of Transport, Public Works and Water Management (2006) Spatial Planning Key Decision 'Room for the River'. Available at: <http://www.ruimtevoorderivier.nl> (accessed 15th December 2016)

O'Brien K, Hayward B, Berkes F (2009) Rethinking social contracts: building resilience in a changing climate. *Ecol Soc* 14(2):12

O'Hare P, White I, Connelly A (2015) Insurance as maladaptation: Resilience and the 'business as usual' paradox. *Environ Plan C* 1-19. <https://doi.org/10.1177/0263774X15602022>

O'Hare P, White I, Connelly A (2016), Insurance as maladaptation: resilience and the 'business as usual' paradox, *Environ Plan C: Gov Policy* 34(6), pp.1175–1193. <https://doi.org/10.1177/0263774X15602022>

O'Neill J (2001) Representing people, representing nature, representing the world. *Environ Plan C: Gov Policy* 19:483–500. <https://doi.org/10.1068/c12s>

O'Neill J, O'Neill M (2012) Social justice and the future of flood insurance. Joseph Rowntree Foundation, York

Pahl-Wostl (2009) A conceptual framework for analysing adaptive capacity and multi-level learning processes in resource governance regimes. *Glob Environ Chang* 19(3):354–365. <https://doi.org/10.1016/j.gloenvcha.2009.06.001>

Penning-Rowsell E, Johnson C (2015) The ebb and flow of power: British flood risk management and the politics of scale. *Geoforum* 62:131–142. <https://doi.org/10.1016/j.geoforum.2015.03.019>

Penning-Rowsell E, Pardoe J (2012) Who benefits and who loses from flood risk reduction? *Environ Plan C: Gov Policy* 30(3):448–466. <https://doi.org/10.1068/c10208>

Pitt Review (2008) Learning Lessons from the 2007 Floods Available at: http://webarchive.nationalarchives.gov.uk/20100807034701/http://archive.cabinetoffice.gov.uk/pittreview/_/media/assets/www.cabinetoffice.gov.uk/flooding_review/pitt_review_full%20pdf.pdf (accessed 12 July 2013)

Porter J, Demeritt D (2012) Flood risk management, mapping, and planning: the institutional politics of decision support in England. *Environ Plan A*:2539–2378. <https://doi.org/10.1068/a44660>

Preston BL, Yuen EJ, Westaway RM (2011) Putting vulnerability to climate change on the map: a review of approaches, benefits and risks. *Sustain Sci* 6(2):177–202. <https://doi.org/10.1007/s11625-011-0129-1>

Priest SJ, Clark MJ, Treby EJ (2005) Flood insurance: the challenge of the uninsured. *Area* 37(3):295–302. <https://doi.org/10.1111/j.1475-4762.2005.00633.x>

Robson B (1999) Vision and reality: urban social policy. In: Cullingworth JB (ed) *British planning: 50 years of urban and regional policy*. Athlone Press, London, pp 168–183

Ruimte voor de Rivier (2012) Available at: <http://www.ruimtevoorderivier.nl/meta-navigatie/english/publications/> (accessed 15th December 2016)

Sager T (1994) *Communicative planning theory*. Avebury, Aldershot

Scott M, White I, Kuhlicke C, Steinführer A, Sultana P, Thompson P, Minnery J, O’Neill E, Cooper J, Adamson M, Russell E (2013) Living with flood risk. *Plan Theory Pract* 14(1):103–140

Smith N (2006) There’s no such thing as natural disaster. In: *Understanding Katrina: perspectives from the social sciences*. Social Sciences Research Council, Brooklyn [<http://understandingkatrina.ssrc.org/Smith/>]

Stephens, C., Bullock, S. & Scott, A., (2001) *Environmental justice—rights and means to a healthy environment for all*. ESRC

Stern N (2007) *The economics of climate change: the stern review*. Cambridge University press, Cambridge

Tapsell SM, Penning-Rowsell EC, Tunstall SM, Wilson TL (2002) Vulnerability to flooding: health and social dimensions. *Phil Trans R Soc A* 360:1511–1525. <https://doi.org/10.1098/rsta.2002.1013>

Thaler T, Priest S (2014) Partnership funding in flood risk management: new localism debate and policy in England. *Area* 46:418–425. <https://doi.org/10.1111/area.12135>

Thaler T, Hartmann T (2016) Justice and flood risk management: reflecting on different approaches to distribute and allocate flood risk management in Europe. *Nat Hazards* 83(1):129–147. <https://doi.org/10.1007/s11069-016-2305-1>

Thaler T, Levin-Keitel M (2016) Multi-level stakeholder engagement in flood risk management—a question of roles and power: lessons from England. *Environ Sci Policy* 55(1):292–301. <https://doi.org/10.1016/j.envsci.2015.04.007>

Thieken AH, Muller M, Kreibich H, Merz B (2005) Flood damage and influencing factors: new insights from the August 2002 flood in Germany. *Water Resour Res* 41

Tewdwr-Jones M, Allmendinger P (1998) Deconstructing communicative rationality: a critique of Habermasian collaborative planning. *Environ Plan A* 30(11):1975–1989. <https://doi.org/10.1068/a301975>

Vardoulakis S, Heaviside C (2012) Health effects of climate change in the UK 2012. Health Protection Agency, London

Walker G, Fairburn J and Smith G, (2003) Environmental quality and social deprivation. R&D Technical Report E2-067/1/TR. Bristol: Environment Agency

Walker G, Burningham K (2011) Flood risk, vulnerability and environmental justice: evidence and evaluation. *Critical Social Policy* 31(2):216–240. <https://doi.org/10.1177/0261018310396149>

Walker G (2012) Environmental justice: concepts, *evidence and politics*, London: Routledge

Wehn, U., Rusca, M., Evers, J., Lanfranchi, V. (2015) Participation in flood risk management and the potential of citizen observatories: a governance analysis. *Environ Sci Policy* 48, 225–236 doi: <https://doi.org/10.1016/j.envsci.2014.12.017>

Werritty A, Houston D, Ball T, Tavendale, A. and Black, A. (2007) Exploring the social impacts of flood risk and flooding in Scotland. Report for Scottish Executive

White I (2010) *Water and the city: risk, resilience and planning for a sustainable future*. Routledge, London

White I (2013) The more we know, the more we don't know: reflections on a decade of planning, flood risk management and false precision. *Plan Theory Pract* 14(1):106–114. <https://doi.org/10.1080/14649357.2012.761904>

White I (2015) *Environmental planning in context*. Palgrave MacMillan: Basingstoke

White I, Alarcon A (2009) Planning policy, sustainable drainage and surface water management: a case study of Greater Manchester, UK. *Built Environ* 35(4):516–530. <https://doi.org/10.2148/benv.35.4.516>

White I, Haughton G (2017) Risky times: hazard management and the tyranny of the present. *Int J Disaster Risk Reduction* 22:412–419. <https://doi.org/10.1016/j.ijdrr.2017.01.018>

White I, Howe J (2002) Flooding and the role of planning in England and Wales: a critical review. *J Environ Plan Manag* 45(5):735–745. <https://doi.org/10.1080/0964056022000013093>

White I, Kingston R, Barker A (2010) Participatory geographic information systems and public engagement within flood risk management. *J Flood Risk Manag* 3:337–346. <https://doi.org/10.1016/j.envsci.2014.12.017>

White I, O’Hare P (2014) From rhetoric to reality: which resilience, why resilience, and whose resilience in spatial planning? *Environ Plan C: Gov Policy* 32(5):934–950. <https://doi.org/10.1068/c12117>

White I, Connelly A, Garvin S, Lawson N, O’Hare P (2016) Flood resilience technology in Europe: identifying barriers and co-producing best practice. *J Flood Risk Manag*. <https://doi.org/10.1111/jfr3.12239>

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 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

Wolff J, de Shalit A (2007) *Disadvantage*. Oxford University Press, Oxford

Young IM (1990) *Justice and the politics of difference*. Princeton, Princeton University Press

Zevenbergen C, Cashman A, Evelpidou N, Pasche E, Garvin S, Ashley R (2010) *Urban flood management*. CRC Press, London

Zsomboky M, Fernandez-Bilbao A, Smith D, Knight J, Allan J (2011) *Impacts of climate change on disadvantaged UK coastal communities*. Joseph Rowntree Foundation, York

ⁱ In this instance, ‘flood’ is defined by the database as encompassing coastal, riverine, flash and ice jam flooding.