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# Sharing the Pain: Perceptions of Fairness Affect Private and Public Response to Hazards

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Structural causes of vulnerability to hazards are well established in geographical research. But what facilitates individual adaptive behavior? How does the performance of government intervention affect such behavior? Drawing on political economy, environmental psychology, and climate justice perspectives, we explore how perceived fairness of responses to weather-related extreme events affects the public and private distribution of responsibility and action. We focus on flood risk and examine how perceptions of fairness of response by residents in flood-affected areas, along with their prior experience of flooding and perceptions of scope of government responsibility and capacity, affect willingness to take individual adaptive action. We use data from surveys of 356 households affected by a flood event in November 2009 in Cumbria, UK, and Galway, Ireland, to compare perceptions of fairness of responses and private intentions across two political jurisdictions. We find that aspects of fairness are related to willingness to take adaptive action but vary with context, experience, and knowledge of flooding. In Cumbria, where there is greater experience of flooding, willingness to act correlates with procedural justice, risk knowledge, and capacity. Capacity for flood management in Galway is firmly associated with state agencies, whereas in Cumbria it is perceived to result from responsibilities of public and private action. These findings highlight the central role of government action and its perceived fairness in structuring private responses to environmental risks and point to the crucial role of climate justice perspectives in navigating adaptation. *Key Words:* climate risks, fairness, floods, perceptions, political economy.

在地理学研究中, 面对灾害的脆弱性之结构性因素已充分获得确认。但是什麼促进了个人的适应行为? 政府的介入工作如何影响该行为? 我们运用政治经济学, 环境生态学, 以及气候正义之观点, 探讨对于回应极端气候事件的公平性之理解, 如何影响责任与行动的公私分布。我们聚焦洪泛风险, 并检视居住在受洪泛影响的地区居民对于回应的公平性之认知, 以及他们过往的洪泛经验和对于政府责任与能力范围的看法, 如何影响采取个人调适行为的意愿。我们运用英国坎布里亚和爱尔兰高威在 2009 年十一月受到洪泛事件所影响的三百五十六个家户的调研数据, 比较两个政治行政区对于回应的公平性与私人企图之理解。我们发现, 对于公平性的看法, 与采取调适行为的意愿有关, 但却随洪泛的脉络、经验和知识而异。在经历过较多洪泛的坎布里亚中, 行动的意愿, 与程序正义、风险知识和能力相关。高威的洪泛管理能力, 与国家机关稳固相关, 而在坎布里亚中, 则被视来自于公共和私人行为的责任。这些研究发现, 凸显出结构环境风险的私人回应中, 政府行动及其所认知的公平性的核心角色, 并指出气候正义观点在驾驭调适力中的关键要角。 *关键词:* 气候风险, 公平性, 洪泛, 认知, 政治经济学。

En investigación geográfica están bien establecidas las causas estructurales de la vulnerabilidad a los riesgos. Pero, ¿qué es lo que facilita la conducta adaptativa individual? ¿Cómo afecta a esa conducta el desempeño de la intervención gubernamental? Con base en la economía política, psicología ambiental y las perspectivas de justicia climática, exploramos el modo como la legitimidad percibida de respuestas a eventos meteorológicos extremos afecta la distribución de responsabilidad y acción públicas y privadas. Nuestro interés de centra en el riesgo de inundaciones y examinamos la manera como afectan la percepción de legitimidad de la respuesta por los residentes en áreas afectadas por inundaciones—junto con su experiencia anterior sobre inundaciones y las percepciones del alcance de la responsabilidad y capacidad gubernamental—a la disposición individual para adoptar acciones adaptativas. Utilizamos datos de las observaciones hechas en 356 hogares afectados por un evento de inundación ocurrido en noviembre de 2009 en Cumbria, Reino Unido, y en Galway, Irlanda, para comparar las percepciones sobre legitimidad de las respuestas e intenciones privadas dentro de dos jurisdicciones políticas. Hallamos que los aspectos que conciernen a la legitimidad están relacionados con la inclinación a tomar acciones adaptativas, pero varían con el contexto, experiencia y conocimiento sobre inundaciones. En Cambria,

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donde la experiencia sobre inundaciones es mayor, la inclinación a actuar se correlaciona con justicia procedimental, conocimiento del riesgo y capacidad. En Galway, la capacidad de manejo de la inundación está firmemente asociada con las agencias del estado, mientras que en Cambria aquella se percibe como resultado de responsabilidades de la acción pública y privada. Estos hallazgos destacan el papel central de la acción gubernamental y su legitimidad percibida de estructurar las respuestas privadas a los riesgos ambientales y apuntan al papel crucial de las perspectivas de justicia ambiental para orientar la adaptación. *Palabras clave: riesgos climáticos, legitimidad, inundaciones, percepciones, economía política.*

This article examines how people respond to hazards based on their perceptions of how fairly they have been treated in their own experience of those hazards. How and why populations are vulnerable to environmental hazards has been central to geographical research for many decades. Much theory and empirical research convincingly explains how structures in society determine vulnerability, with perspectives on how collective action, agencies, and the state coalesce in constructing and reshaping the distribution of risk. Whereas Hewitt (1983) showed how vulnerability to hazard is created through capital accumulation and processes of underdevelopment, Wisner and colleagues (2004) indicated how vulnerability could be alleviated by intervention and reform. A significant strand of research therefore explicitly focuses on the role of the state, either as an agent of capital on the one hand (as in Klein's [2007] *Shock Doctrine* thesis) or as a neutral agent that seeks to alleviate risk on the other. Studies of events, earthquakes, tsunamis, floods, and wildfire, have shown the explicit role of governments in postdisaster recovery and in promoting adaptive action and how their performance affects actions (Pelling and Dill 2010; Wisner, Gaillard, and Kelman 2012; Roberts 2013).

Hazard management and adaptation research have revealed how populations respond when they have a chance to adapt to risks. Again, geographical insights have contributed significantly to theories, models, and observations of how adaptation works within its social and political context (Pelling 2010; Bassett and Fogelman 2013). The behavioral sciences have focused on individual cognition of risk and on the communication of risks—in different forms and through different means—to groups, communities, and populations (Grothmann and Patt 2005; Terpstra 2011; Kellens, Terpstra, and De Maeyer 2013; De Dominicis et al. 2015). Structural explanations of adaptation and behavioral insights can be combined to demonstrate how and when adaptive action emerges.

To make this integration between structure and agency, this article focuses on fairness as an element of social and environmental justice. Social justice refers

most commonly to process, voice, and outcome beyond civic and legal justice to social and economic relations and even to solidarity and dignity (Dobson 1998; O'Neill 2011). In the environmental arena, environmental justice focuses on underlying drivers of vulnerability, of exposure to harm, processes of decision making, and representation of people and nature (Walker 2011; Schlosberg 2013).

To make the distinction clear, fairness concerns the social acceptability of dimensions of equality and inequality that make up justice dimensions such as procedures and outcomes. Our analysis focuses on fairness and, in particular, on perceptions of fairness, as a social phenomenon. This article draws on theories of environmental justice that describe what processes are within the scope of analysis. It also contributes to those theories by answering the instrumental question of why fairness matters. Fairness matters, we argue, because among other things, it affects intentions, behavior, and the legitimacy of state–society relations.

This focus on fairness draws on new insights into political economies of hazard and risk (e.g., Kearns and Reid-Henry 2009) to describe how the distribution of risk is malleable. These perspectives, we argue, are complemented by political economy and environmental psychology models and methods on the cultural construction of risks. Insights into how natural hazards affect society are critical because environmental risks do not fall from the sky (Ribot 2010). Rather, they are constructed through global economic integration and neoliberal policies, social change, unforeseen technological applications, and land use change (Leichenko and O'Brien 2008). Rising economic inequality by itself alters the distribution of risk and of social solidarity. Wealthy groups can, and increasingly do, invest in insulating themselves against the burden of pollution risk and hazard (Adger 2002), with significant implications for solidarity-based insurance and other policies.

This article seeks, therefore, to contribute to the broad areas of risk governance and hazard through analyzing perceptions of government performance at

moments of crisis and in its aftermath and examining the role of those perceptions in creating spaces for action, both individually and collectively into the future. The article proceeds by examining the hypotheses, designs, and methods on these topics from geography, political economy, and environmental psychology. We do so to derive specific hypotheses about the role of experience, fairness of process, and fairness of outcome in determining individuals' willingness to act in adapting to changing environmental risks. The article then outlines our research design, examining contrasting responses across political jurisdictions faced with the same hazard at the same time—close to a natural experiment. We use mixed methods and report principally quantitative results. These show that stated individual responsibility varies by circumstance and is shaped by experience of previous events but is fundamentally driven by perceptions of fairness. We conclude that governments, through anticipating and fulfilling expectations, directly influence and cocreate perceived fairness and their own legitimacy for managing hazards.

### **Governments and People in a Dance of Responsibility**

The key contribution of this article is in examining the effect of perceptions of fairness of government response on individual behavior, with fairness, as discussed earlier, being the social acceptability of unequal outcomes and processes. The specific behavior we examine is the willingness to take action in future in the face of risk. This begs the question: Why is fairness important? There is a long research tradition demonstrating how trust in government is related to fairness (Stirling 2009). Here, though, we argue that perceived fairness actually defines and constructs the perceived performance of government.

The framing of this contribution draws on insights from the research field known as environmental justice. Research in that area over the past decade has expanded considerably from its original focus on the inequities arising from the distribution of environmental risk to cover a wide set of issues, geographies, and spatial scales—from individuals to communities to global considerations (Walker and Burningham 2011; Schlosberg 2013). Geographical insights have been at the forefront of expanding the scope and nature of such analyses, incorporating social and spatial dynamics (Walker 2011). Yet central to all current

perspectives of environmental justice are considerations of distribution of inequality (i.e., patterns of difference and disparity) and how inequalities are negated (including responsibilities and expectations in decision making, policy formulation, and implementation). Distributive justice relates to outcomes in society—namely, who is beneficially or adversely affected by a decision or allocation of resources—and relates to the responsibilities and duties of the winners toward the losers. In the environmental arena, this focus has traditionally been of concern to vulnerability analysis, interested in the distribution of risks and susceptibility to harm at various scales (O'Brien and Leichenko 2003; Adger et al. 2011).

Procedural justice refers to the opportunity of influencing decision-making processes and the means for doing so, which lead to those outcomes and redistribution of risks. Geographical scholarship in this area draws on political ecology traditions to explain structural factors in unequal outcomes and focus on duty and care. Kearns and Reid-Henry (2009) argued that components of justice are interconnected and that inequalities in longevity and health are molded by political processes rather than the fortunes of birth and choice of residence. These raise new possibilities for human–environment relations “as elements on a wider plane of moral and political economy” (Kearns and Reid-Henry 2009, 570). Grove (2014) similarly argued that an alternative approach is necessary to understand the forces that drive creative responses to stress and risk. Grove's study of collective disaster governance in Jamaica shows how predominant neoliberal framings of resistance reinforce vulnerabilities and living with risk, deflecting from addressing persisting structural inequalities.

These political ecology insights resonate with themes from political economy of hazards. In examining narratives of strategies adopted by individuals affected by Hurricane Katrina in New Orleans, Chamlee-Wright and Storr (2010) argued that “in a post-disaster context, the expectations that people have about the behavior of their neighbors and their governments can profoundly affect the recovery strategies that they adopt” (258). Individuals' decisions are influenced by their expectations of the capacity of government to act, as well as policies that governments intend to pursue. Citizen behavior is thus linked to perceptions and expectations of government's capabilities, intentions, and performance. More specifically, individuals will have (1) a positive or negative view about

government's intentions to act and its performance and (2) a positive or negative view about government's capacity and scope to take action.

In this article we set out to explore individuals' willingness to take action in relation to their perceptions of government in terms of fairness as well as to their expectations of what governments should do and could do for their citizens. This latter element, of expectations, is often articulated as the social contract: the agreement between civil communities and the state, defining the rights and responsibilities of these actors to each other, in turn enabling governance by consent of the people (see O'Brien, Hayward, and Berkes 2009). Our hypothesis is that perceived intentions and performance of government are defined by fairness considerations that, allied with individuals' expectations of government capacity, might serve to explain more comprehensively the response of individuals to extreme weather events, such as flooding.

Central to this article, therefore, is an exploration of the effect of perceptions of procedural and distributional fairness and expectations of the social contract on individual behavior. We analyze a set of relationships, building on Chamlee-Wright and Storr (2010), on how perceptions of governments affect individual action, summarized thusly:

Willingness to respond = function of

1. Perceived scope of government responsibility and capacity.
2. Perceived performance of government:
  - a. Perceived fairness of process.
  - b. Perceived fairness of outcome.

This extends political ecology, political economy, and environmental justice insights by analyzing the perceived performance of government as fairness of process and fairness of outcome and attempts to separate out immediate perceptions of the intentions of government and the performance of government. Fairness needs not only to be done but to be seen to be done. Hence a key analytical issue is how individuals perceive fairness. Dietz and Atkinson (2005), for instance, analyzed individual perceptions of environmental and economic justice. They examined the distribution of environmental benefits arising from a policy and the distribution of financial costs arising from the policy. They argued that the distribution of costs and benefits arising from a policy is likely to shape perceptions of that policy. Reflections on justice are not only

circumscribed to individuals; Dietz and Atkinson made the case of how narratives about justice and fairness are extended to "communities of justice," namely, groups of individuals—perceived to be entitled to receiving net benefits from a change in policy—who might reflect interests similar to those manifested at a personal level. Costs and benefits are therefore key in driving perceptions. They also found that individuals relate different aspects of equity (e.g., environmental and economic) when discussing policies, suggesting that these are important components of policy evaluation.

Individual and shared perceptions of injustice are also important influences on behavior. There is evidence that motivations related to perceived injustice often outweigh those related to financial gains (Fehr and Falk 2002; see also Martin et al. 2014), although these relationships vary with the type of risk considered (e.g., Siegrist, Connor, and Keller 2012). On an individual level, in regard to flooding, Grothmann and Reusswig (2006) found that individual response was closely related to the appraisal of future threat based on past experience, perceptions, assessment of personal ability to respond, and the effectiveness and cost of options available. Grothmann and Patt (2005) made a strong case for consideration of sociocognitive variables in understanding adaptive responses (beyond the dominant socioeconomic factors). Indeed, their resulting model of private proactive adaptation to climate change (MPPACC) points to the importance of perceived risk and perceived adaptive capacity at the individual level in guiding behavioral responses. As Grothmann and Patt (2005) themselves highlighted, questions remain about how such a model might apply to actions undertaken by public institutions.

Psychology research continues to uphold key factors that influence responses to flood risks, in terms of both mitigation (Bubeck et al. 2013) and adaptation, in line with those identified by Grothmann and Patt (2005). Some of this research focuses on risk appraisal, including a person's perceived probability of exposure to a threat and perceived severity, which relates to a personal appraisal of the harm to be incurred should the threat occur. Some research focuses on response, including perceived efficacy, the belief in effectiveness of actions to protect oneself or others; perceived self-efficacy, the perceived ability to actually carry out those responses; and the perceived costs of carrying out the identified responses. Risk perception can have a significant bearing on all personal preparedness and risk reduction behavior (Grothmann and Patt 2005), even explaining how

individuals with high risk perception do not prepare for a natural hazard (Wachinger et al. 2013). Experience of a hazard, related to risk perception, can also lead to different behavioral outcomes, often mediated by other contextual factors (Kellens, Terpstra, and De Maeyer 2013). Analysis of UK survey data, for example, indicated that flooding experience was directly related to a greater concern about climate change and a stronger belief of the effectiveness of personal mitigation actions (Spence et al. 2011, although findings from other similar studies have been less clear cut). It is recognized that experience of a hazard can lead individuals to enact measures to protect themselves against hazards, but can also induce a sense of safety, reducing investment in risk mitigation (Dillon, Tinsley, and Burns 2014).

Thus fairness concerns both the process of decision making (procedural justice) and the outcomes of those decisions (distributive justice). These two elements are inextricably linked; issues of representation, access, ability, desire, and means to participate in decision making and relationships of power mold and affect fairness. Hence we explore how concepts and views of justice and fairness can be put to use pragmatically in decision making and policy implementation (see Adger et al. 2013; Sovacool 2013). In doing so, we speak also to the constructive critiques of neoliberal programs and strategies aimed at disaster relief and increasing resilience.

## Context, Design, and Methods

### Flood Management Context and Responses

Flooding represents a major environmental hazard across contemporary northwest Europe, including Ireland and the United Kingdom. The prevalence of flooding is a combination of settlement history on coasts, estuaries, and navigable rivers, accompanied by recent development in flood plains, high population density in flooded areas, and changing land use patterns in the United Kingdom and Ireland that exacerbate the risks. Recent changes in rainfall intensity and extremes (Simpson and Jones 2014) and projected future climatic changes make flooding one of the most costly weather-related hazards across these countries (Kundzewicz et al. 2014).

Our study focuses on households affected by flooding in November 2009 in Cumbria, UK, and Galway, Ireland. The two locations differ significantly in policy contexts and responses (the main actors and processes in this landscape are described in Table 1). In the

United Kingdom, the floods occurred at a time when the social contract around flood risk management was under review. The agreement between the government and the insurance industry with regard to the balance of flood protection and flood coverage was being discussed with the intention for a new distribution of responsibility to be set out, which resulted in the Flood RE agreement (Adger et al. 2013).

Flood policy in the United Kingdom was itself undergoing major revision in 2009. The government was consulting on provisions for the upcoming Flood and Water Management Act of 2010. The Act sought to harmonize flood risk management, encouraged by diverse drivers: “Making Space for Water” strategy (Department for Environment, Food and Rural Affairs 2005); EU Floods Directive; enacting England and Wales flood risk regulations from 2009; as well as the perceived desire to incorporate community-level perceptions (Benson, Lorenzoni, and Cook 2016). At the local level, the Environment Agency and the local authorities manage flood risk on main rivers and consult with local communities on plans for flood defenses—as happened in Keswick and Cocker mouth following the 2009 flood, resulting in construction of new flood risk management structures.

Historically in Ireland responsibility for flood risk management has been diffuse and often disjointed, with multiple state departments, offices, and local authorities playing direct and indirect roles, depending on whether the flooding is fluvial, coastal, or pluvial. The main state agency with national responsibility for flood relief has traditionally been the Office of Public Works (OPW), with statutory authority and responsibility derived from the Arterial Drainage Acts in 1925, 1945, and 1995 (Table 1). Of primary concern to arterial drainage was the improvement of agricultural land with flood relief playing a secondary role. The OPW has also traditionally played a role in procurement of flood defenses and the distribution of humanitarian aid to those suffering hardship as a consequence of flooding. Local authorities have also played a pivotal role in flooding at local levels with functions related to flood prevention and relief, planning, sewerage works, drainage, and emergency response.

In the aftermath of major flooding in Dublin in 2002, the Flood Policy Review Group realigned responsibilities for flood risk management in Ireland, recognizing a number of failures nationally in terms of integrated management and planning. In particular, the report of the Flood Policy Review Group (2004) noted the unclear distribution of responsibilities for

**Table 1.** Responsibilities and responses of flood management agencies and sectors in the United Kingdom and Ireland in 2009 and 2010

Scale	United Kingdom	Ireland
National-level state agencies	<p>National government issues policy guidance for flood risk management and planning policy.</p> <p>Agreement between government and insurance sector on coverage and flood risk management coming to an end with new terms negotiated (FloodRe).</p> <p>The Environment Agency is responsible for flood forecasting and warning and coordination of flood risk management nationally. It also operates its own flood defense infrastructure.</p>	<p>National government issues policy guidance for flood risk management, planning policy, and emergency response.</p> <p>The OPW is the lead state body for the coordination and implementation of government policy on management of flood risk and the European Union Directive on the Assessment and Management of Flood Risks.</p> <p>OPW responsible for the implementation of large flood engineering works.</p> <p>At a national scale, the framework for emergency management establishes approaches to and coordination of emergency management.</p> <p>The Department of Social Protection provides postflood humanitarian aid.</p>
Local-level state agencies	<p>Local government</p> <ul style="list-style-type: none"> <li>- Implement flood management works</li> <li>- Manage planning permission.</li> <li>- Provide emergency shelter after floods, such as opening reception centers in towns.</li> </ul> <p>Police coordinate the emergency response in the local area.</p> <p>Fire and rescue service carry out evacuations.</p> <p>They act to keep floodwaters out of key sites such as electricity substations.</p>	<p>Local government</p> <ul style="list-style-type: none"> <li>- Responsible for operating and maintaining flood forecasting and warning (most have no warning services).</li> <li>- Implement flood management works.</li> <li>- Manage planning permission and development.</li> </ul> <p>Develop and manage emergency response plans at local levels.</p> <p>Together with local authorities An Garda Síochána (police force) and the Health Service Executive are the principal response agencies.</p>
Civil society	<p>At the local level voluntary organizations work with local government on flood risk prevention prior to the event; during the floods they work with responders on aiding evacuation (RNLI); and after the floods provide affected individuals with assistance (food, emotional support, financial and legal advice).</p>	<p>At the local level agencies such as the Red Cross work to distribute postflood humanitarian aid.</p> <p>During emergencies, agencies such as the Civil Defence, Order of Malta Ambulance Corps, and RNLI work with state agencies.</p> <p>Voluntary organizations also act to lobby for change at national and local levels.</p>

Note: OPW = Office of Public Works; RNLI = Royal National Lifeboat Institute.

maintenance in major water courses such as the Shannon and tidal zones, overlapping responsibilities between government departments, restrictive legislation, and a lack of integration of land use planning and development into flood risk management. Following deliberations of the Flood Policy Review Group, realignment of responsibilities resulted in flood risk management becoming more centralized, with the OPW designated as the national lead agency for flood risk management for coastal and fluvial flooding. Local authorities retain responsibility for storm water and road surface drainage, some coastal protection works, and the regulation of planning and development in all areas including in flood plains (Jeffers 2011).

Coincidentally, national guidelines for planning authorities for the incorporation of flood risk identification, assessment, and management into the planning process were released in November 2009. As highlighted by Jeffers (2011), flood risk management in Ireland remains technical in nature, with emphasis on the prevention and elimination of floods.

### Extreme Rainfall and Its Impacts on the United Kingdom and Ireland, November 2009

The analysis in this article is based on extreme flooding that occurred concurrently across Ireland and the United Kingdom in November 2009.

Following a particularly wet summer, a procession of midlatitude cyclones moved across the United Kingdom and Ireland during the autumn of 2009, bringing exceptionally prolonged and heavy rainfall and associated widespread flooding. Subsequent analysis by Lavers et al. (2011) attributed this flooding episode to the presence of an atmospheric river over the United Kingdom and Ireland. Atmospheric rivers draw large moisture streams poleward within the warm sector of extratropical cyclones, leading to heavy rainfall and flooding when large amounts of water vapor are forced to rise over upland areas on making landfall (Dettinger 2011).

Although widespread flooding was experienced in both countries, among the most adversely affected areas were the regions of Cumbria in northwest England and Galway in western Ireland; hence our focus on these locations in this study. Statistical analysis of these flood events reveals their extreme nature. On 19 and 20 November 2009, record-breaking rainfall over the mountainous Lake District of northwest England resulted in exceptionally high flows and lake levels, particularly along the River Derwent in Cumbria. The headwaters of this catchment recorded a new UK twenty-four-hour maximum rainfall of 316.4 mm, and the estimated return period for the flood peak experienced at Camerton in the Derwent catchment has been estimated as 2,100 years (Miller et al. 2013), a magnitude well beyond the lived experience of residents of affected communities at the time.

In Ireland, rainfall totals for November 2009 were the highest on record at most stations throughout the country, even for those dating back over 100 years. In the west of Ireland, two-day rainfall totals in excess of 100 mm were recorded on 18 and 19 November (Walsh 2010). For some rainfall stations in Galway, two-day rainfall totals for 18 and 19 November have been associated with return periods in excess of 100 years, and in Ballinasloe, County Galway, maximum cumulative rainfall totals of between eight and twenty-five days' duration for the month of November 2009 are associated with return periods in excess of 500 years (Walsh 2010). For the River Suck, the flood peak recorded at the Bellagill station is estimated as having a return period in excess of 1,000 years, again well beyond the experience of exposed communities at the time.

In both Cumbria and Galway, these flood events resulted in property loss and economic disruption. In Cumbria, a policeman lost his life in Cockermouth when a bridge collapsed and 2,239 properties were

flooded (1,794 residential and 445 commercial), with 80 percent of businesses in Cockermouth affected (Cumbria Intelligence Observatory 2010; Wainwright and Morris 2010). In Cumbria the towns of Cockermouth and Keswick were worst affected, with hundreds of people displaced and more than 1,300 homes affected. In Cockermouth total economic losses associated with the flood are estimated at £275 million, with property losses alone amounting to £100 million (Wainwright and Morris 2010). Following the flood the most commonly occurring need was for accommodation (24.8 percent of residents). The road network was particularly impacted, with three bridges lost completely and more than twenty roads shut down temporarily. The implications of the floods for the wider community meant that up to 7,000 residents were unable to access medical services, and the local tourist industry experienced losses, with 41 percent of businesses affected by cancellations.

In Galway, the town of Ballinasloe experienced extensive flooding with many residents needing evacuation and shelter. Other areas badly affected were Claregalway, Athenry, and Gort. In the aftermath of flooding, thousands of homes were left without electricity or water. Nationwide, the November 2009 floods cost the Irish insurance industry a record €240 million. In Galway insurance claims from commercial properties amounted to €7.7 million, and home insurance claims totaled €16 million.

## Research Design and Data

We designed a face-to-face survey with residents who had experienced flooding either directly in their home or indirectly by living in a town that had been flooded but whose homes had not been directly flooded. For this study we designate flooded households as those that experienced water inside their place of residence, below ground and in ground-floor-level rooms (in line with Paranjothy et al. 2011) but recognizing the diversity of pathways to negative well-being and trauma associated with such events (Walker et al. 2011). We designated nonflooded households as residents who were not flooded. Hence, nonflooded households were not inundated but experienced social disruption and were aware of flood consequences for nearby neighbors. Flooded areas were determined using maps provided by the Cumbria County Council in England and also by local knowledge of residents in the flooded areas. In Ireland, flooded households were



**Figure 1.** Survey locations in Galway, Ireland, and Cumbria, United Kingdom, August and September 2010. (Color figure available online.)

identified by talking to the community and to individuals in affected neighborhoods.

Surveys were administered approximately eight months after the floods, in the locations highlighted in Figure 1, in Galway (Ballinasloe, Claregalway, Athenry, and Gort) in August 2010 and in Cumbria (Keswick, Cockermouth, Braithwaite, and Workington) in September 2010. The recall period of eight months allowed respondents to answer questions on all aspects of the emergency response and recovery period (cf. Paranjothy et al. 2011) and reduced the emotional stress associated with the events. Flood events have significant negative consequences: cost and disruption of inundation in places of residence; psychological disruption of evacuation and return; negative stigma often attached to flooded areas in the long term; and mental health burdens from these cumulated factors (Tapsell and Tunstall 2008; Walker et al. 2011). The surveys and the impact of recall on answers were the focus of pilot testing in Salins, County Kildare, in June 2010.

The survey used was identical in both jurisdictions apart from response items related to location-specific bodies and authorities. We stratified the sample by

flooded and nonflooded households and sampled a marginally higher proportion of young adults in Galway and a higher sample of older age groups in Cumbria, consistent with age profiles of the two places. In each location the sampling was stratified into flooded and nonflooded households; there was a maximum of one interview per household. Surveys, which took twenty minutes to complete, were carried out at different times of the day and on randomly selected roads; every third house was approached. In Ireland the number of flooded households was slightly lower than in Cumbria, so all flooded households were approached to achieve a comparable sample size. Where respondents were otherwise engaged but willing to participate, a paper survey was left with them and a day was arranged for the team to collect the completed survey. The data from the surveys were entered into Microsoft Excel and open-ended answers were coded by two researchers to ensure interrater reliability.

From the survey responses, questions representing (1) individual willingness to act, (2) risk knowledge and capacity, (3) dimensions of procedural justice, and (4) dimensions of distributional justice were extracted for

**Table 2.** Variables in the study derived from survey questions

Variable	Relevant survey question used to create (composite) variable
Individual willingness to act	Q17h: I feel that individuals have a duty to take on more responsibility if the risk of flooding increases.
Risk knowledge	Each of the following were preceded with "To what extent do you agree or disagree that prior to the November 2009 flood you had information concerning . . ." Q4a: That the area I live in is prone to flooding Q4b: That a flood was about to happen in my area Q4c: What to do in the event of a flood Q4d: What to do after a flood event
Capacity	Q15: Who would you expect to receive help from if a flood were to occur in the future? [list of private and public actors provided]
Fairness in outcome (three dimensions)	Q17b: Everyone in my community received help promptly following the flood. Q17e: I feel resources were distributed to those who needed them the most. Q17f: I feel public authorities did all that they could to help the public after the flood.
Fairness in process (four dimensions)	Q17a: Everyone in my community received the same level of flood protection prior to November 2009. Q17c: I feel that the public authorities listened to people in my community who tried to reduce the likelihood of flooding prior to November 2009. Q17d: The public authorities have made/are going to make changes to reduce the risk of flooding because of action taken by my community. Q17g: Public authorities have listened to our community following the floods.
Other variables	Q7: Have you experienced flooding in the past five years?

further quantitative analysis. Table 2 categorizes each of the individual questionnaire items, giving their wording in the questionnaire and their interpretation as used in this analysis. With the exception of the capacity variable, all responses were measured on a five-point Likert scale (*strongly agree, agree, neither agree nor disagree, disagree, strongly disagree*). Respondents were also afforded the option to indicate the question as not applicable. Where this was the case, the answer was coded as missing.

*Risk knowledge* is a composite variable composed of four items: knowledge and awareness prior to the 2009 flood that the area in which the respondent lived was prone to flooding; knowledge that a flood was about to happen (taken as an indication of flood warning); whether respondents had prior knowledge of what to do during an event; and knowledge of actions after a flood event.

*Capacity* is a composite metric reflecting the responsibilities that individual respondents associated with

public and private actors should a flood event happen again (a list of predetermined answers was developed from open responses in the pilot survey). Table 2 shows the wording of the survey questions from which the composite was derived. For each of the tasks identified, respondents were asked to indicate which of the public and private groups or entities they saw as responsible for the associated task if a flood event were to happen again. Respondents were free to associate responsibility for a task with as many groups as they deemed appropriate; no ranking of importance was sought. For each specific task, individual responses were recoded to a scale of 1 to 5 to represent the degree of association with public or private responsibility. Where a respondent identified entirely private entities as responsible for that task, a value of 1 was given, whereas identification of all public entities as responsible received a 5. A value of 3 represents an equal split in expectations for responsibility. In

creating a composite metric representing individual allocation of capacity between public and private actors, a median score from across each task was derived and used in subsequent analysis.

*Fairness in outcome* is measured by three items including perceptions that individuals received help promptly following the flood, that resources were distributed to those who needed them most, and that in general public authorities did all they could to help the public following the flood.

*Fairness in process* is made up of four dimensions measuring the ability of respondents to voice concerns prior to the flood, whether concerns raised were listened to, whether authorities acted on concerns, and whether decisions taken by authorities prior to the flood resulted in differential exposure to flood events.

For each of the selected questions, summary statistics (mean, variance, and number of valid responses) were derived for each jurisdiction. Differences in responses between Cumbria and Galway were assessed using the nonparametric chi-square ( $\chi^2$ ) test. Statistical significance was assessed at the 0.05 level using the null hypothesis of no difference in response between jurisdictions. To establish the relationship between willingness to act (WTA) and variables representing risk knowledge and capacity, fairness in process and fairness in outcome correlation analysis was undertaken. Correlation coefficients were calculated using Spearman's nonparametric (rank-based) correlation. The significance of correlations was tested at the 0.05 level with the null hypothesis being no correlation between WTA and other variables.

The survey asked respondents to identify the main causes for the flood event through an open-ended question. Responses to this question were diverse and were recoded to reflect perception of the cause of flooding being due to (1) a natural event (extreme weather, heavy rainfall), (2) human factors (poor planning, maintenance, or incorrect use of infrastructure), (3) a combination of both, and (4) don't know. In Galway the majority of respondents (63 percent) perceived that floods were caused by human factors such as lack of dredging of rivers, poor planning, and a lack of maintenance; 19 percent identified combined causes; and the remaining participants indicated natural causes. In Cumbria differentiation of cause between natural and human was less clear cut, with 40 percent indicating natural causes due to excessive rainfall and 34 percent associating flooding with poor maintenance of rivers or poor management of

infrastructure such as flood gates and reservoirs. Although the chi-square test found significant differences in perceived causes of flooding between jurisdictions, no significant correlations were found with WTA in either location. A significant correlation was found between cause of flooding and fairness in process, specifically the ability to voice concerns prior to the flood. Therefore, cause of flooding is not included explicitly in the analysis.

## Results: Perceptions of Action, Perception of Justice

### Differences in Responses Between Jurisdictions

Table 3 provides summary statistics and  $\chi^2$  test results showing differences between jurisdictions in terms of willingness to act, risk knowledge and capacity, and issues of procedural and distributional justice. Figure 2 shows the percentage of respondents who agreed or strongly agreed with items related to willingness to act and risk knowledge, and Figures 3 and 4 do similarly for items related to procedural and distributional fairness, respectively.

In terms of willingness to act, there is a statistically significant difference between jurisdictions. In Cumbria, 56 percent of respondents agreed or strongly agreed that individuals have a duty to take more responsibility if the risk of flooding increases (Figure 2A). In Galway, less than 50 percent agreed or strongly agreed.

### Risk Knowledge and Capacity

In terms of risk knowledge and capacity, the largest differences between jurisdictions are evident in the awareness of prior risk and the provision of warning. From Figure 2B, only 38 percent of respondents in Galway indicated that they were aware that the place in which they lived was prone to flooding in comparison to 73 percent in Cumbria. Large disparities are also evident in terms of warning provided (Figure 2C), with over 50 percent of Cumbrians indicating that they were aware that a flood was about to happen. In Galway only 12 percent of respondents indicated awareness that a flood was about to happen. These figures are consistent with the fact that in Galway, and Ballinasloe in particular, there is less historical experience with floods of the magnitude experienced in 2009. Indeed, we find significant correlations between prior experience of flooding and awareness of prior risk

**Table 3.** Comparison of summary statistics and  $\chi^2$  test results between jurisdictions for each of the variables considered in the survey

Variable	Valid		M		Variance		$\chi^2$
	Cumbria	Galway	Cumbria	Galway	Cumbria	Galway	
Willingness to act	182	171	2.73	2.99	0.97	1.59	<b>25.05</b>
Awareness of prior risk	182	167	2.48	3.39	1.50	1.79	<b>45.12</b>
Warning provided	181	168	3.01	4.08	1.66	1.01	<b>67.28</b>
What to do during a flood	171	166	3.56	4.26	1.31	0.81	<b>37.30</b>
What to do after a flood	171	166	3.60	4.25	1.23	0.75	<b>34.15</b>
Differential exposure	172	163	3.10	2.94	0.88	1.25	<b>21.95</b>
Prompt response postdisaster	179	172	2.29	3.12	0.72	1.38	<b>51.92</b>
Ability to voice concerns	175	161	3.43	3.83	0.88	1.00	<b>25.05</b>
Authorities acted on	181	172	2.55	2.63	0.89	1.08	2.76
Resources distributed fairly	181	170	2.30	2.60	0.65	1.01	<b>14.10</b>
Authorities did all they could	181	173	2.45	3.02	0.88	1.35	<b>28.64</b>
Listened to	181	171	2.40	2.67	0.58	1.01	<b>13.85</b>
Perception of scope of responsibility ("capacity")	180	172	2.913	54.799	0.60	0.13	<b>287.40</b>

Note: Valid represents the number of samples available for analysis (less missing and nonapplicable responses) from the full sample (Cumbria, 182; Galway, 174). Differences in responses between jurisdictions are tested using  $\chi^2$  with significance tested at the 0.05 level. Significant differences are highlighted in bold.

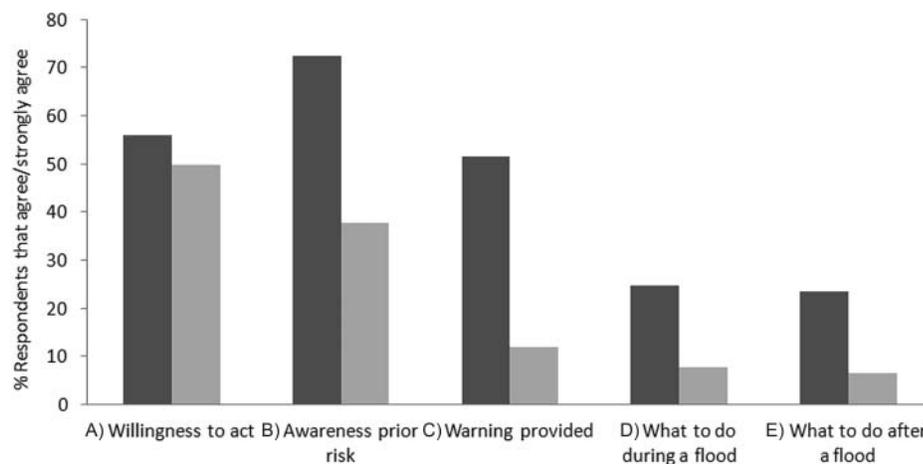
across both jurisdictions, stronger in Cumbria where past flood experience is greatest.

Large differences are also found between jurisdictions in terms of perception of responsibility (our capacity variable). Importantly, in Galway respondents firmly associate capacity for flood risk management with state agencies. A typical response from a Galway resident speaks to faith in planning processes:

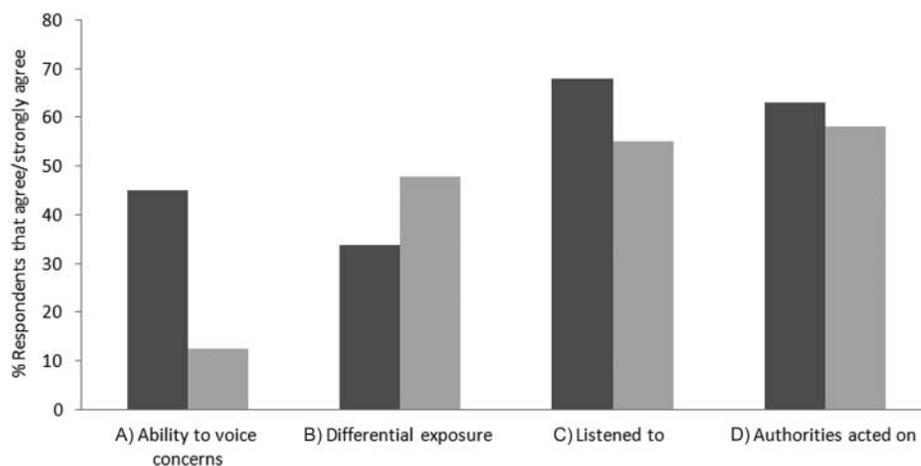
I believe we [buy a] house in good faith. The council provided planning permission for further estates which I

believe lead to these [houses]. I feel if this [flooding] happens again we should be relocated and council and government take responsibility. Also rivers should be deepened and kept below certain levels with continuous monitoring. (Galway Resident 12)

The mean response of 4.8 (in scales from 1 to 5) across all respondents in Galway is higher than Cumbria respondents' mean response of 2.9. Cumbrian respondents see a mix of responsibilities distributed between public and private actors, typified thusly:



**Figure 2.** Differences between each jurisdiction (Cumbria in dark gray, Galway in light gray) in terms of percentage of respondents who agreed or strongly agreed that (A) individuals have a responsibility to act if flood risk increases (willingness to act), (B) they were aware of prior flood risk, (C) they had knowledge that a flood was about to happen, (D) they had knowledge of what to do during a flood event, and (E) they had knowledge of what to do after a flood event.



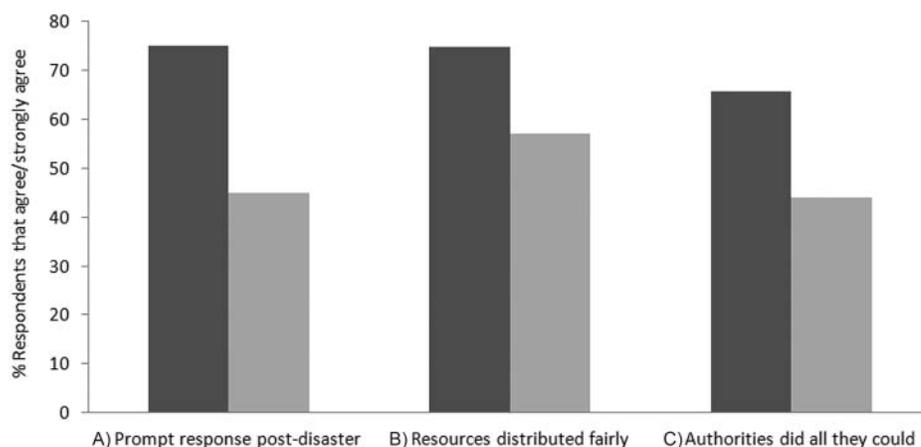
**Figure 3.** Differences between each jurisdiction (Cumbria in dark gray, Galway in light gray) for items representing fairness of process. Plotted are the percentages of respondents who agreed or strongly agreed that (A) they were able to voice concerns prior to flood, (B) decisions made by authorities resulted in differential exposure, (C) authorities listened to communities after the flood, and (D) authorities have acted on concerns of the community after the flood.

A co-ordinated response is required between power companies, town council, county council, insurance companies, and home owners and whoever else is involved. It seems to be the lack of communication between official bodies that causes problems and delays. (Cumbria Resident 49)

#### Fairness in Process

For variables related to fairness in process, the largest differences between jurisdictions are found for ability to voice concerns. In Cumbria, 45 percent of respondents agreed or strongly agreed that authorities listened to individuals who tried to reduce flood risk prior to the 2009 flood. This contrasts with 12 percent

in Galway (Figure 3A). Significant differences were also evident for items of differential exposure and listened to. In relation to the former, Galway respondents were more likely to agree or strongly agree that everyone received the same level of flood protection before the 2009 flood (Figure 3B). In Cumbria, 68 percent of respondents agreed or strongly agreed that authorities listen to the community following the floods; in Galway this number was lower, at 55 percent. Of all of the variables tested, only authorities acted on showed no significant differences between jurisdictions when tested using  $\chi^2$  (this variable reflects the response to the statement, “The public authorities have made or are going to make changes to



**Figure 4.** Differences between each jurisdiction (Cumbria in dark gray, Galway in light gray) for items representing fairness of outcome. Plotted are the percentages of respondents who agreed or strongly agreed that (A) they received help promptly after the flood, (B) resources were distributed fairly, and (C) public authorities did all they could to help the community after the flood.

reduce the risk of flooding because of action taken by the community”). In Galway, 58 percent of respondents agreed or strongly agreed, whereas in Cumbria the comparable figure is 63 percent.

#### *Fairness in Outcome*

In relation to variables representing fairness in outcome, statistically significant differences in responses are evident between jurisdictions for all variables tested. The largest differences are apparent for prompt response postdisaster and authorities did all they could. In Cumbria, 75 percent of respondents agreed or strongly agreed that everyone in their community received help promptly following the flood (Figure 4A). By comparison, 45 percent of respondents in Galway agreed or strongly agreed. In terms of the variable authorities did all they could, again there is a large disparity between jurisdictions and in perceptions. In Galway, 44 percent of respondents agreed or strongly agreed that authorities did indeed do all they could to help the public following the flood. The comparable number among Cumbrian respondents was 66 percent (Figure 4C). For example, a respondent in Galway highlighted issues in distributing assistance:

Sandbags [came] too late from the local authority. It was first come first served for sandbags. They were not given to elderly or sick or their dependents. Civil defence people were too young. The local authority very poor and government was terrible. (Galway Resident 14)

Cumbrian respondents were also more likely to agree or strongly agree that resources were distributed to those who needed them most following the flood (Figure 4B).

#### *Willingness to Adapt*

Table 4 gives results of the correlation analysis examining the relationship between willingness to act and fairness in process, outcome, risk knowledge, and capacity. Only correlations significant at the 0.05 level are shown. Marked differences emerge between jurisdictions. In Cumbria fairness in process and risk knowledge are significantly and positively correlated with willingness to act. For fairness in process, significantly correlated variables include ability to voice concerns, differential exposure, and listened to. Interestingly, both ability to voice concerns and differential exposure relate to procedural issues prior to the flood event. Of the variables representing fairness in process, only authorities acted on shows no significant

**Table 4.** Spearman’s rank correlation coefficients between willingness to take action by individuals and variables representing fairness in process and outcome, risk awareness, and knowledge and perceived scope of government responsibility (“capacity”)

Individual willingness to act (Q17h) correlated with	Cumbria	Galway
<b>Fairness in process</b>		
Ability to voice concerns (Q17c)	0.169	ns
Differential exposure (Q17a)	0.166	ns
Listened to (Q17g)	0.186	ns
Authorities acted on (Q17d)	ns	ns
<b>Fairness in outcome</b>		
Prompt response postdisaster (Q17b)	ns	ns
Authorities did all they could (Q17f)	0.217	0.211
Resources distributed fairly (Q17e)	ns	ns
<b>Risk knowledge and capacity</b>		
Awareness of prior risk (Q4a)	0.221	ns
Warning provided (Q4b)	0.155	ns
What to do during a flood (Q4c)	0.151	ns
What to do after a flood (Q4d)	ns	ns
Perception of government capacity (Q15)	ns	0.155

Note: Only coefficients significant at 0.05 level are reported.

correlation with willingness to act. Of the fairness in outcome variables, only the perception that authorities did all they could emerges as significant. Where respondents feel that authorities did all they could to help the public following the flood, there is a greater tendency for respondents to take on added responsibility in dealing with future flood risk. In Cumbria variables related to risk knowledge also show positive and significant correlation with willingness to act. Awareness of prior risk shows the strongest correlation with willingness to act, followed by warning provided and knowledge of what to do during a flood.

In Galway a rather different picture emerges. Here individual willingness to act is only related to the perception that authorities did all they could. Therefore, also in Galway, similar to Cumbria, when respondents feel that authorities did all they could to help the public following the flood, there is a greater tendency for them as individuals to take on added responsibility in dealing with future flood risk. Interestingly, the perception of government capacity is also positively and significantly correlated with individual willingness to act in Galway. Where the state is perceived to be upholding its part of the social contract in dealing with flood risk, respondents in Galway are more likely to take increased personal responsibility for risk mitigation.

## Discussion

The analysis presented in this article confirms our proposition in terms of the effect of perceptions of government on individual action. This work indicates that willingness by individuals to act is related to elements of distributional and procedural fairness, mediated by political context and personal experience and knowledge of risk. Where governments show they have attempted to fulfill the expectations linked to the social contract (i.e., where authorities did all they could), individuals respond by assuming personal responsibility and willingness to act. This occurs both in Cumbria—where greater experience of flooding also results in correlation between willingness for individual action, perceived fairness in process, risk knowledge, and capacity related to both private and public actors—and in Galway, where that experience is much more limited and recent and where capacity for flood management is largely attributed to public bodies.

The differences between perceptions of fairness are explained by social and political contexts. In effect, perceptions of fairness matter in both the United Kingdom and Ireland but are less important in Ireland. Perceptions of fairness are critical to individual action when there is a relationship of trust between citizens and states; such a relationship was undermined by the social context of financial crisis and general distrust in authorities in Ireland.

Our results therefore highlight the dynamic nature of how and whether individuals come to accept and act on the changing nature of risk. In Ireland the economic recession amplified the effects of floods: The dominance of economic discourse permeates all levels of decision making and contributes to a focus on technological responses to flood risk (Jeffers 2013).

In the United Kingdom, responsibility for flood risk management is being increasingly devolved. Individuals are being asked to take on more responsibility against a backdrop of limited funding. Our findings suggest the need for a reconceptualization of flood risk by policymakers from a predominantly engineering framing to recognize the importance of social dynamics shaping how hazards are experienced and are reacted to, especially if individual households are expected to take on more responsibility in dealing with this risk.

Our findings hence draw into focus the importance of the social dynamics underlying perceptions of flood risks and recovery (Walker et al. 2011). Preparation for hazards, from floods to earthquakes, is

predominantly framed in technological and economic terms—and it is often argued that the direct result is a focus on engineering solutions (Harries and Penning-Rowsell 2011). Perceived government intention and action has, however, been shown to significantly alter how risk management and recovery are perceived (Chamlee-Wright and Storr 2010), and our findings demonstrate that they have a real impact on individuals' decisions to take action themselves.

Fairness and perceptions of fairness are key mechanisms in evolving social contracts: Perceptions of procedural justice shape the legitimacy of government authority and citizens' willingness to cooperate with government policies and decisions (Tyler 2003). Policies around flood risk management evolve significantly following flood events, at least in the United Kingdom, where policy change has followed major events in the past half-century (Penning-Rowsell, Johnson, and Tunstall 2006). At the household level, perceptions around distribution of responsibility also change (Adger et al. 2013) and our results demonstrate that judgments on local authority action are one of the mechanisms that drive such change. Fairness judgments are not just relational measures of how well one is treated compared to another; they are also a reflection of what an individual believes should and could happen (MacCoun 2005).

The social contract implicitly suggests who should do what when societies are in upheaval and their resilience is tested. When authorities underperform relative to expectations, feelings of injustice can emerge with implications for individual behavior. Our findings suggest that fair process by public authorities encourages householders to take action themselves—it is through such sociocognitive processes that the social contract is negotiated at the household level and in the longer term might be reflected in a willingness to accept a more devolved model of responsibility around risk management.

The relationship of trust between authorities and those at risk of flooding in the two countries is manifested in how responsibilities for care, warning, and recovery are acted on. In England there are well-developed systems of flood mapping and warning for people in flood zones; alongside this formalized element of the social contract, civil society in Cumbria has also played a role in flood warning and flood risk management through local flood action groups. We would suggest that it is because of these elements that fairness relates to willingness to act; procedural justice is particularly important in contributing to legitimacy and

people's willingness to accept decisions by institutions (Tyler 2006).

Flood risk management in Ireland sits within a larger socioeconomic context. The 2009 flood event coincided with the impact of the global financial crisis that was severe in Ireland in terms of imposition of austerity and blame of government economic mismanagement (MacCarthaigh 2015). For the public in Ireland, the cause of the financial crisis in 2008 and 2009 was perceived to be power inequalities and concentration of power among elites (including property developers), resulting in citizen disempowerment and a distrust of strategic decision makers (O'Connor 2012). Alongside the impact of fiscal retrenchment, the recession in Ireland has resulted in the prioritizing of an economic framing in public policy, which valorizes particular approaches to risk management, such as technological fixes, and excludes other approaches that focus on the social construction of vulnerability (Jeffers 2013). The ability of communities to contribute to flood management is limited by the dominance of risk as a management framing. The space for citizens to play a role in decisions on flood risk management is limited (Revez 2014) and was comparatively reduced relative to the English context. The combination of economic recession and particular issues around planning control and the power of developers means that in Ireland relationships between citizens and state regarding flood risk management is fragile.

One implication is that perceptions of fairness are not only important instrumentally for intentions and behavior—they contribute fundamentally to well-being (MacCoun 2005). Floods have serious implications for mental health (Tapsell and Tunstall 2008; Carroll et al. 2009), and unfair treatment by authorities can be upsetting. Social psychologists have long shown that unfair process directly leads to individuals feeling that they are perceived to be less important than others who are treated comparatively well and affects solidarity and feelings of belonging. By contrast, when justice criteria are met it can contribute to interpersonal happiness and to community wellness (Prilleltensky 2012). Flood events create divisions in towns long after the water has receded, with individual and community well-being often taking a lot longer to recover. Ultimately the reactions of authorities following extreme events, and whether are judged to be acting fairly, needs to be sensitively managed to have a positive impact on individual and community well-being.

The need for proactive governance is particularly relevant given current and near-term climatic changes. Warmer temperatures are increasing the

intensity and frequency of heavy rainfall events in the midlatitudes, and weather patterns in northwest Europe are changing (Coumou and Rahmstorf 2012). With a changing climate, many places and regions will experience more frequent floods, and some areas will experience floods for the first time in recent history. If populations face new risks outside of their experience, how these are handled by agencies will determine their response. In our study, for example, respondents in Galway are much more critical of authority performance. Repeated experience of floods and shorter return periods will, following our results, lead to a greater acceptance and awareness of risks and perhaps a greater willingness to take action where authorities are perceived to be acting fairly.

There have been, unsurprisingly, several major flooding incidents in both the United Kingdom and Ireland since 2009. Major winter flooding in 2013 and 2014 across the United Kingdom has built the base of evidence on public–private interactions; widespread winter flooding in northern England (Cumbria, Northumberland, Lancashire, Yorkshire, and Durham), Scotland, and Wales and across Ireland in 2015 and 2016 has further tested the robustness of government responses. Thorne (2014) asserted that vociferous public attitudes and associated expectations (reminiscent of the moral hazards effect discussed by Harries and Penning-Rowsell 2011) shaped political reaction to the 2013 and 2014 floods. Many solutions implemented rapidly and for political expediency are not likely to represent a sustainable, proactive, long-term approach to risk reduction and enhancement of resilience of local communities. Although there are mechanisms, processes, and approaches through which this might be enacted, Thorne warned of social feedbacks that might occur through representation of particular interests via mechanisms designed to promote participation in decision making. This, we argue, should be considered in the context of the emerging critiques of top-down capitalist approaches to risk reduction and the call for coproductive, interdisciplinary participatory approaches contributing to developing integrated and sustainable options for flood management involving communities and agencies (McEwen et al. 2014).

## Conclusions

This analysis demonstrates that perceptions of fairness make a difference: Such perceptions structure and create vulnerabilities and they affect behavioral

responses. We have examined, and indeed measured in multiple dimensions, the perceptions of fairness of government interventions in the aftermath of flooding and perceptions of the performance of governments in this regard. We have done so in two localities faced with the same magnitude of hazard and found significant effects of perceptions of fairness but have shown how these interact with expectations and previous experience of flooding.

Ultimately these results suggest that government agencies involved in hazard planning need to seriously engage with deliberative and inclusive planning if they are to maintain legitimacy for interventions and to encourage adaptive behavior. As Hobson and Niemeyer (2011) showed, deliberative planning, when highly inclusive, actually builds the adaptive capacity of communities. Such a positive outcome is dependent on the depth and inclusivity of such processes. The study here provides evidence that perception of fairness in process is central to considerations of individual involvement in risk management and deliberation about risk management processes.

The wider context of this work on flooding, along with all hydro-meteorological hazards, is that of increasing risks over time, with increasing populations in hazardous areas globally, demographic shifts, and climate changes. In Europe and the United States, flood risks, for example, are elevated by anthropogenic climate changes (Pall et al. 2011; Knutson, Zeng, and Wittenberg 2014). Prospective studies suggest flood risks will form a central part of how climate change will occur and be experienced. Hence, expectations of populations that governments will continue to protect vulnerable populations will themselves increase over time. If governments fail to act on flood risk, or do so in ways perceived to be unfair, in both process and outcome, disillusionment and resistance will come to characterize how adaptation to climate change unfolds.

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