



# Flood risk perceptions and the UK media: Moving beyond “once in a lifetime” to “Be Prepared” reporting



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## ABSTRACT

In the winter 2015/2016 a series of storms resulted in widespread flooding in northern England, damaging hundreds of properties, disrupting transport and causing public disdain. The flooding was widely covered in the media. This article develops a methodological framework to conceptualise factors influencing risk perception related to flood events, discusses the media's role as amplifier or attenuator of risks, and demonstrates how understanding risk perception can influence the deployment of effective policies to modify and reinforce more accurate risk perception to increase individual and community resilience and create a two-way dialogue between those risk and authorities. Given that climate change induced increased flood risk is a reality and the evidence that this is not yet understood by the public, nor addressed by the media, we suggest an urgent shift from the status quo media coverage based on blame to one of “Be Prepared”. Furthermore, we suggest risk communication be based on better understanding of how at-risk communities perceive risk.

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## 1. Introduction

In the winter 2015/2016 a series of storms caused widespread flooding in Cumbria, Lancashire and Yorkshire in the north-west and northeast England, damaging hundreds of residential and business properties, disrupting transport and causing public disdain. Floods are the most disruptive natural hazard posing widespread risk in the UK, and their intensity and frequency are expected to increase in the changing future climate which will leave a growing number of people at risk from flooding (CCC, 2016; Evans et al., 2004; HM Government, 2016; Thorne, 2014).

The government's flood risk management approach allocates resources on the basis of a cost benefit analysis, which leaves many areas outside of the densely populated Thames River basin under-served. This approach creates “various institutional risks such as delivery failure, scandal, and associated reputational damage, which have repeatedly plagued recent flood-risk management efforts in England” (Porter and Demeritt, 2012: page 2362). National government is often blamed for failing to manage flood risk (Rothstein et al., 2006) because although concepts of localism are emergent in studies of spatial inequity (Begg et al., 2015) and engrained in planning (Porter and Demeritt, 2012) the scale of recent floods places renewed emphasis on action by the National government (Smith et al., 2016). This highlights that to better prepare the public flood risk research is needed on new themes such as the socio-cultural dimensions of risk perceptions, trust in political entities, community resilience and societal behaviour, using cognitive-psychological approaches to understand them (Botzen

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et al., 2009; Butler et al., 2016; Grothmann and Reusswig, 2006; Harries, 2008; Healy, 2001; Joffe and O'Connor, 2013; Kellens et al., 2011; Renn, 2004; Wachinger et al., 2013).

German sociologist Ulrich Beck (1992) suggested that the risks we face have become incalculable and unpredictable to such an extent that we live in a risk society. To mitigate, adapt and manage these risks, it is crucial to adopt a holistic trans-disciplinary approach not only to understand risk probabilities but also to conceptualise cognitive-psychological underpinnings of how people perceive risks (Metzner-Szigeth, 2009; Rose, 1998). As Beck put it: “scientific rationality without social rationality remains empty, but social rationality without scientific rationality remains blind” (Beck, 1992: page 30).

Most experts refer to risk as the probability of an adverse event times its consequences (Wilson and Crouch, 1982). Contemporary usage of the term ‘risk’ implies precision of calculation, objectivity and control (Joffe, 1999). However, such positivist definitions fail to acknowledge the complexity and subjectivity of risks. As the concept of ‘risk’ is a human construct, we cannot speak of ‘real’ or ‘objective’ risk as the concept of risk itself is of a subjective nature (Rausand, 2011). Risk also evokes different emotional responses in different people and has different meanings to different people (Šotić and Rajić, 2015).

Beck (1992) argued that risk is a dynamic concept based on causal interpretations, and thus initially exists only in terms of the (scientific or non-scientific) knowledge about it. The understanding of risks is thus subjective and the definition of risk is not consciously formulated in people’s mind-sets a priori: it is influenced by, and results from, a culturally formed interplay between institutional and individual subjectivities (Gabe, 2004). Similarly, the term perception relates to internal cognitive processes that occur when people are confronted with risks. However, the validity of conceptualising risk perception solely in terms of individual cognition has been questioned (Joffe and O'Connor, 2013). It is argued that merely focusing on responses to risk as mechanical information-processing within the individual mind omits “inter-subjective aspects of knowledge”, as responses to risks develop in, and through, interaction with others (Joffe, 2003; Kahan et al., 2010). This makes the mass media and the political and institutional entities in charge of assessing, communicating and managing risks, key social and political actors in influencing the way the public perceives risks, or what has been termed “cultural relativism” (Beck, 1992).

In light of Beck’s theory of risk and media, the media have heuristic potential to influence and alter our perceptions of risk and the way we respond to risk, as the media is embedded in, and shapes, our sociocultural constellation. Mental models that individuals use to judge risks are internalised through social and cultural learning and constantly moderated, i.e. reinforced, modified, amplified, or attenuated by media reports, peer influences, and other communication processes (Morgan et al., 2001). This potential of the media to shape risk perception and to drive agendas and policy development has been documented in the literature (Escobar and Demeritt, 2014; Kasperson et al., 1988; McCombs, 2005; Happer and Philo, 2013). There is also evidence that the preoccupation of UK media coverage on *major* floods (and not on all floods) attenuates the salience of flood risk (Gavin et al., 2011).

Understanding flood risk perception and factors influencing it has important social and political implications as the level of awareness of flood risk directly influences people’s actions before and during a flood (Grothmann and Reusswig, 2006). Key factors influencing risk perception include: 1) previous (or direct) experience of events; 2) information provided by the mass media or communication channels (or indirect experience), and; 3) trust in authorities and flood defence measures (Wachinger et al., 2013). Understanding risk perceptions allows us to predict, at least to some extent, people’s response to natural disasters such as floods. Second, it enables policy-makers and institutional entities to deliver and deploy effective strategies that are in line with public expectations and that are accepted by the broader community. Third, it enables the creation of inclusive two-way dialogue between the public and government on the main issues and risks at stake, leading to an increase in preparedness and effective responses in such events.

By analysing reporting of the winter floods 2015/2016, this article helps to better understand the dynamics of the interplay between public and institutional responses to flood events, how these responses influence risk perception and the role of the media as a social moderator of flood risk. This article contributes to the literature by providing insights into how different factors, including media coverage, influence people’s post-event perceptions. We provide recommendations on how “the risk perception paradox” (Wachinger et al., 2013) can be addressed to increase preparedness to flooding events and to manage public and political responses. In what follows we first outline the methodology and the framework used to analyse to what extent different factors influenced risk perception. We then report our findings on the influence of different factors on risk perception and how media reporting moderated risk perception. We end by critically analysing the findings and their policy implications and conclude with the recommendations and future research needs.

## 2. Methods and data analysis

We adapted Wachinger et al.’s (2013) framework to conceptualise the factors that influenced risk perceptions in the winter 2015/2016 flood events (Fig. 1). The framework visualises the media as a filter and highlights the media’s ability to amplify, reinforce, modify and attenuate risk perception by selectively conveying and shaping information. *Political and institutional responses* were added to the framework because they are also recognised to influence risk perception (Butler et al., 2016). Using this framework, we analysed to what extent the media reported on these factors and whether and how the media might influence risk perception. In the discussion section we explore the interaction between risk perception and effective policies and communication and individual and community preparedness.

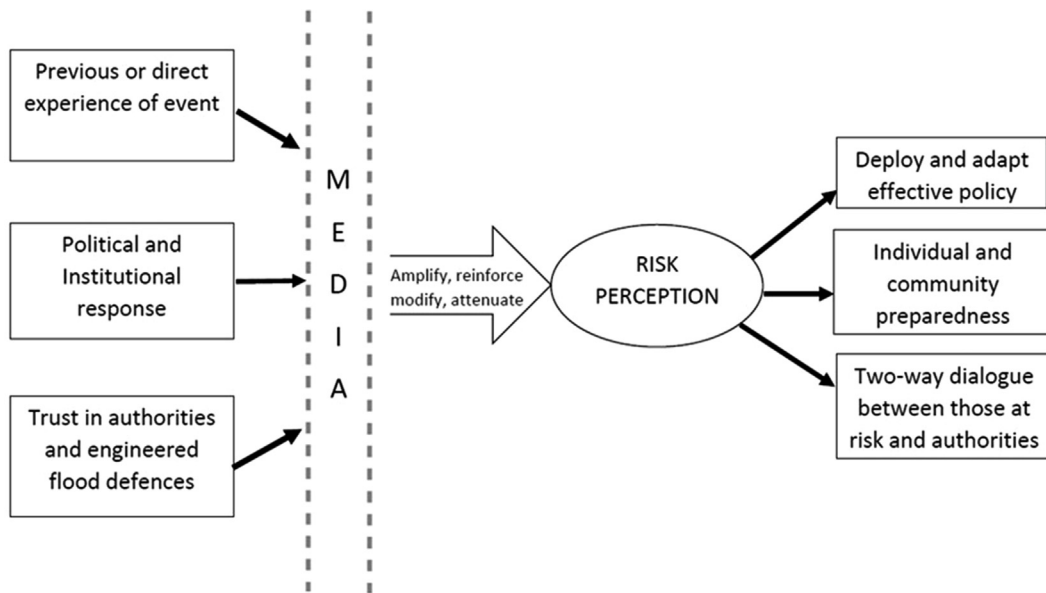


Fig. 1. Framework on the media's influence on risk perception, adapted from Wachinger et al. (2013).

We collected UK National tabloid and broadsheet newspaper articles on the 2015/2016 winter floods; tabloids for their high circulation rate and broadsheet newspapers for their ability to influence agenda setting (Escobar and Demeritt, 2014). The articles were collected from Nexis® using News Search for the period from December 4, 2015 through to February 2, 2016. Search terms used were “flood” and “flooding”. To obtain a manageable sized sample we restricted our search to newspaper articles with a minimum of 500 words, the smallest word search possible, as we did not want to unnecessarily bias the sample. Of the 87 newspaper articles returned 30 were repeats. After removing them and articles not relevant to floods in the UK (e.g. those covering US floods or a flood of migrants), we obtained a final sample size of 43, of which 26 were broadsheets and 17 tabloids. An article published on January 2, 2016 (a broadsheet) was found later in April 2016 and was added to the dataset, which increased the final number of newspaper articles to 44.

We conducted content analysis of the media articles using NVivo 10. This software has a large range of tools for handling rich data records and information (Richards, 1999) and has potential to increase accuracy of qualitative studies (Bazeley and Kristi, 2013). Using an inductive approach each news article was examined in detail and text was coded. A code is an abstract representation of a phenomenon (Corbin and Strauss, 2008) or, more prosaically, a way of identifying themes in a text (Bernard and Ryan, 2010). We used axial coding to capture recurring themes (Glaser and Strauss, 1967) including themes we a priori thought might be important, such as legitimacy, credibility and salience (Cash et al., 2003), emotions, including blame, which has been identified as reoccurring feature in disaster coverage in British newspapers (Hall, 2011; Pantti and Wahl-Jorgensen, 2011), and other themes found to play a role in influencing risk perception in UK newspaper disaster coverage, such as “climate change” and “community resilience” (Escobar and Demeritt, 2014; Gavin et al., 2011). We also coded for “Political and Institutional entities”, “Affected Population” and “Media” to identify the key actors involved and for two types of time stamps. Articles were coded for either “Storm Desmond” or “Storm Frank” to identify the flood event and each event was coded for disaster phase, i.e. preparedness, response and recovery.

The conceptualisation and organisation of codes were revisited as the project developed to ensure a rounded perspective. A sample of articles coded by the first author was re-coded by the second author, compared and new codes were added to the coding set. While the rate of occurrence of different codes provided first insights into salient topics, qualitative analysis was conducted using a constructivist grounded theory approach to explore their meaning and framing (Fairclough, 1992). Analysing the coding's frequency in temporal specificity, allowed us to better understand the temporal dynamics of risk perceptions from the preparedness through the recovery phase. To contextualise and illustrate key findings we provide quotes.

### 3. Results

Our findings show that the media reported on: (1) the factors of interest, i.e., previous or direct experience, political and institutional response and trust in authorities and engineered flood defences; and (2) how risk perception feeds through to effective policy and preparedness. Although previous experience has been found to increase personal preparedness and community resilience and to lead to well-organised relief efforts (Plapp and Werner, 2006), we find that direct experience did not increase personal preparedness because of the obstruction of this feedback loop by high profile engineered flood defence schemes in the very towns and cities affected by flooding in winter 2015/2016. Second, we found that the political response

to the floods was different from the public response; communities blamed political and institutional entities and these entities blamed climate change. Third, we found that the language used by political and institutional entities decreased people's trust and obstructed two-way dialogue on flood risk management. In what follows we will explain and substantiate these key findings in more detail.

### 3.1. Previous or direct experience of (flooding) events

Existing literature (Burningham et al., 2008; Plapp and Werner, 2006) has demonstrated how previous or direct experience of flood events influences (upwards or downwards) risk perception. Our results suggest that previous or direct experience of flood events can influence risk perception in two ways. First, based on media reporting, we found that residents' direct experience of flooding aided the response phase, with well-organised volunteers in place and a strong sense of community resilience, which eased the relief efforts.

"... People who had lost almost everything but had salvaged a kettle and a few teabags were on the streets offering their neighbours a hot drink. It was inspiring to witness such solidarity, and my thanks go to all those whose generosity of spirit made this terrible experience a little more bearable for those around them." *The Guardian*, December 9, 2015

Similarly, in Yorkshire, where Todmorden and Hebden Bridge residents have suffered from repeated flooding since 2012, community resilience was strong and the response phase well-organised.

"All over the valley, those lucky enough to live on high ground were out in force, Marigolds on, mops and brushes in hand, eager to help with the relief effort. In Hebden Bridge, a crisis centre set up in the town hall received far more offers of help than cries for help." *The Guardian*, December 27, 2015

"(In Todmorden) An impromptu soup kitchen had been set up, with volunteers ladling out bowls of hot homemade soup and veggie curry to anyone who wanted it in a room lit by portable camping lamps." *The Guardian*, December 27, 2015

Second, we found that direct experience does not always increase risk perception. The floods in Cumbria show that despite major flood events in 2005, 2008, 2009 and 2015/16, many residents felt safe relying on engineered flood defences and their level of personal preparedness was low. For instance, a Keswick (Cumbria) resident noted that "In 2009 we were told it was a once in 100 years event" (*The Guardian*, December 28, 2015). The problem with reporting flood risk probability in this way is that residents can construe this to mean that there would only be one devastating flood every 100 years. Engineered flood defences have been found to reduce risk perceptions in other studies (Terpstra, 2009). Moreover, in the preparedness phase political and institutional entities claimed that engineered flood defences would significantly reduce risks to the extent that future floods would be very unlikely. The failure of these defences thus left people feeling "helpless" and "abandoned" (*The Times*, December 7, 2015).

### 3.2. Political and institutional response

Members of the public perceive the causes and implications of natural hazards such as floods differently than political and institutional entities (Butler et al., 2016). We found that political and institutional entities actively sought to create a sense of security and in so doing diminished risk perception in the preparedness phase, by presenting newly constructed, or reinforced, engineered flood defences as panaceas, and by referring to past floods as "once in a lifetime" events. After the floods had occurred, residents were left with a feeling of mistrust in political and institutional entities and their empty promises. Emotions of despair and disappointment were replaced by anger towards political and institutional entities.

In the media coverage, politicians' initial reactions were to highlight the unprecedented nature of the floods, implying that predicting and calculating the extent of the floods *ex ante* was beyond their power. For example, Rory Steward MP said:

"We have had more rain than has ever happened in this month. Rivers here which haven't flooded in this way for 75 years are 15 feet up. I'm afraid that is the fundamental problem here. We are spending an enormous amount of money on flood defences. In the end what is beating us is this relentless rain." *Mail Online*, December 29, 2015

Politicians explained the unprecedented nature of the floods as an outcome of climate change. This was perceived in the media as an excuse for inaction:

"Locally too, the words "climate change" can be politically expedient. Indeed, as Cumbria is left considering the aftermath of the floods [...] politicians and officials have been quick to blame climate change. It is, frankly, a cheap way to abdicate any responsibility for the devastating effect of flooding." *The Daily Telegraph*, December 17, 2015

The media criticised politicians for using terms such as unprecedented and "once in a lifetime" as excuses for failed engineered flood defences:

"Unprecedented, it turned out, was government shorthand for not having thought of something it might have done before." *The Guardian*, December 7, 2015

“The worst in a lifetime”, the government would have done well to make sure just whose lifetime it was referring to: a human or a ferret.” *The Guardian*, December 7, 2015

“They (residents of Cumbria) might also feel less inclined to believe the “once in a lifetime” mantra that usually accompanies weather of the sort witnessed last weekend: unless the lifetime in question is that of a goldfish.” *The Independent*, December 9, 2015

Furthermore, assurances on engineered flood defences came back to haunt the Environment Agency (EA). In January 2015 for example, a spokesman of the EA had stated that:

“You can never say never to flooding happening, but what we can say is Carlisle is a well-protected city”. *The Times*, December 7, 2015

Similar assurances were made in other cities, such as Cockermouth:

“A new flood defence scheme designed to last 100 years opened in 2013 to protect the town (Cockermouth) from a similar deluge. The 115-metre-long barrier along the Cocker can be raised one metre, and a government minister said it would ‘give residents peace of mind for the future’.” *The Guardian*, December 6, 2015

### 3.3. *Trust in authorities and engineered flood defences*

The shift in the language from the preparedness phase, i.e. well prepared, to the recovery phase, i.e. unprecedented and climate change, created mistrust among the affected population. Indeed political and institutional entities were blamed for the flooding, i.e. because of reduced investment or decisions taken. The prominent blaming of political and institutional entities and the very limited blaming of existing engineered flood defences can be explained. First, although the City of York had a flood barrier in place, the EA decided to lift the barrier to avoid the possible shutdown of electrical works. This decision caused widespread disdain and mistrust towards political decisions and flood response effectiveness.

“We have never had to worry about flooding because the barrier was there to protect these homes. They made the decision to raise the barrier and that’s why all this has happened.” York resident. *Express Online*, December 28, 2015

“We have all this engineering progress and we still get flooded. If the gate had stayed closed, this would not have happened.” York resident. *Independent*, December 28, 2015

Second, residents in Cumbria and Yorkshire did not blame the existing flood barriers, as they reduced flood damage. Instead, they blamed politicians because although new investments had enhanced engineered flood defences, these were inadequate for scale of threat.

“I dread to think what it would have been like without the flood defences, but it’s still not adequate is it?” Carlisle resident. *The Times*, December 7, 2015

“New defences in Cockermouth had also been overtopped this weekend, but had ensured that there was only about 3 ft of water in its high street, not the 8–9 ft there would have been without the defences.” Environment Agency. *The Times*, December 7, 2015

Third, we find that affected populations did not blame climate change as a cause of flooding events but rather the inadequacy of flood risk management policy and investments, for instance a Carlisle resident commented:

“Something is wrong somewhere – *they* have spent £38 million and it has not worked.” *The Times*, December 7, 2015 (our emphasis).

In general residents do not take responsibility for their personal or community flood risk – an exception is a story about Pickering, North Yorkshire – rather, there is evidence that they wholly deferred the responsibility for flood risk management to political and institutional entities. When floods happen and their unrealistic expectations are not met, political and institutional entities are found to have been deficient in the prevention phase. Furthermore, the focus on community and volunteer response in the recovery phase draws attention to this perception of deficiency.

## 4. Discussion

Using evidence from this study and the literature we discuss risk perception in relation to previous flood experience, response of authorities, and trust in authorities and engineered flood defences and what this means for prevention and preparedness. Thereafter, we examine the current and potential role of the media to attenuate, amplify, modify or reinforce flood risk perception.

Previous flood experience can increase risk perception (Burningham et al., 2008; Grothmann and Reusswig, 2006; Plapp and Werner, 2006) as personal exposure can personalise the risk and demonstrate future risk potential (Wachinger et al., 2013). On the other hand, and as found in this study, the connection between flood experience and increased risk perception

can be broken. [Harries \(2008\)](#) reports that 60% of residents at risk of flooding in England and Wales claim to be aware of living in flood risk areas, yet only 39% of those with direct experience of flooding have taken action to reduce their risk exposure. Regionally in northwest England, [Kazmierczak and Bichard \(2010\)](#) found that perceived risk of future flooding did not depend on past experiences. This counter intuitive result may come about as people perceive natural hazards as cyclical phenomena, which means even people with direct experience believe that they will not experience a comparable event during their lifetime ([Renn, 2008](#)). One reason why people perceive their situation this way could be related to what [Giddens \(1991\)](#) refers to as ontological security. It has been defined as “the feeling of existential safety and meaningfulness that results from a belief in the continuity of one’s identity and existence” ([Harries, 2013, p.55](#)). In social representation theory, people’s representation of the world consists of peripheral elements that cluster around a central core ([Abric, 1984](#)). Any threat to the core elements of this figurative system causes anxiety and threatens ontological security ([Wilkinson, 2001](#)). The response to new information about flood risks, namely, unfamiliar information and past experiences, are assimilated so to prevent impacts on the core ([Harries, 2013](#)). Intense negative emotions like fear and anxiety have been found to be counterproductive for risk protection behaviour ([Witte and Allen, 2000](#)). Therefore, although some residents had direct experience of floods, precautionary preparedness and prevention behaviour might have been suppressed and replaced with blaming political and institutional entities, in order not to threaten ontological security.

Previous experience may also have been overwhelmed by the nature of the 2015/16 winter floods which were much worse than previous floods in the affected regions. Preparedness levels may have been low because as [Kates \(1962: page 92\)](#) explains, there is an “inability of individuals to conceptualise floods that have never occurred”. Similarly, availability heuristics (see e.g. [Kahneman et al., 1982](#); [Taylor et al., 2014](#)) suggest that residents who have experienced minor flood events may underestimate the likelihood of a future major event ([Kahneman et al., 1982](#); [Scanlon, 1990](#)). So although residents might have been prepared to protect themselves from floods like those experienced in the past, or had the ability to recover quickly, they were unable to imagine the severity of the floods that occurred in the winter 2015/2016.

As many of the articles wrote about community resilience, such as food sharing initiatives and pop-up crisis centres, it is important to distinguish between levels of preparedness, which relate to the behaviour of residents before the occurrence of the flood event, and levels of resilience, which define how people respond to a flood event. It is especially important to highlight the asymmetric relationship of the two: while high preparedness levels can potentially influence the level of resilience, our study finds that high resilience does not imply high preparedness. Little was written directly on residents’ preparedness levels, e.g. sandbagging, subscribing to the EA’s emergency warning systems, however, there were indirect stories about preparedness, with residents noting that the floods were unexpected, with some residents even stating that they “have never had to worry about flooding”. Our findings are thus consistent with the “risk perception paradox” described by [Wachinger et al. \(2013\)](#), according to which, high risk perception does not necessarily lead to personal preparedness and risk mitigation/prevention behaviour. To understand this paradox, we provide some cognitive-psychological explanations and their interaction with engineered flood defences.

Media reporting linked investment in flood barriers and flood walls to reduced (*attenuated*) perception of risks; a link that was easily made as engineered flood defences in the areas affected by the winter floods had recently been reinforced. As [White \(1945\)](#) argued, public over reliance on structural flood protection works can actually increase, not decrease, flood damage by encouraging building in at risk areas as well as foregoing household flood prevention measures; the so called “levee effect”. Engineered flood defences are very visible in the landscape, bolstering trust and decreasing risk perception ([Grothmann and Reusswig, 2006](#); [Kazmierczak and Bichard, 2010](#); [NAO, 2001](#); [Siegrist et al., 2005](#); [Terpstra, 2009](#)) and potentially reducing household prevention and preparedness ([Armas et al., 2015](#)). For these reasons, people may not have seen the need to take protective measures themselves ([NAO, 2001](#); [Paton, 2008](#)). This response should be particularly worrisome for the national government as in many cases engineered flood defences may in fact be providing downstream and not in situ flood risk reduction. Trust in engineered flood defences can thus lead to potentially serious adverse consequences because of underestimation of risk ([Kasperson et al., 1988](#)). In psychological terms this may be evidence of cognitive dissonance ([Festinger, 1957](#)). This is where individuals confronted with new information, i.e. flooding despite new investment in engineered flood defences, which conflicts with existing beliefs, i.e. reduced flood risk perception gained from new found security, leads to mental stress, which in this case we found was relieved through blaming political and institutional entities.

Finally, we found that political and institutional responses to flood events had implications for people’s risk perception. In stressing the protection provided by engineered flood defences, politicians strengthened residents’ feelings of safety and decreased their risk perception. We believe this led to unrealistic expectations that damage from floods can be prevented. Incorrect risk perceptions were not corrected by politicians after the floods but rather were strengthened by them referring to the floods as “once in a lifetime”. Whether this choice reflected sensitivity during the response phase, or expediency, the outcome is the same; perceptions of those at risk continue to be skewed. Second, by referring to the winter floods 2015/2016 as “unprecedented”, which implies unpredictability and incalculability of risks, residents’ ontological security was challenged as engineered flood defences seemed no longer effective to withstand nature’s unpredictability.

Political and institutional entities linked the unprecedented nature of floods to climate change. Research does in fact report that flooding intensity in the UK is expected to increase in changing climate ([Evans et al., 2004](#)) and that winter precipitation has already increased in northern England over the last decades ([Jenkins et al., 2008](#)). Although the increase in precipitation has been perceived by the UK public ([Taylor et al., 2014](#)), UK flood victims nevertheless do not link flood events to climate change ([Kazmierczak and Bichard, 2010](#); [Lorenzoni et al., 2007](#); [Hopkins and Warburton, 2015](#)). Meanwhile, in southern England, [Whitmarsh \(2008: page 368\)](#) found that “flood victims view climate change and flooding as largely sep-

arate issues” and that flood victims and non-victims do not significantly differ in their views about uncertainty and scepticism regarding climate change. An outcome is that climate change risks may not be viewed as personally relevant (Lorenzoni et al., 2007) or may be assimilated so as to not threaten ontological security (Harries, 2013). What we can say is that the floods of 2015/16 did not act as a learning event but rather climate change was perceived as an excuse for government inaction.

The media is not a passive player in reporting on flooding. There is evidence that: small floods are not covered (Gavin et al., 2011); simple narratives, such as dredging as a solution in Somerset, are favoured (Smith et al., 2016); scientific information, for example on climate change, is discussed in ways that lead to confusion or disengagement (Happer and Philo, 2013); and stories are polarised into those on political and institutional failures or community resilience. Nevertheless, understanding risk perception is a pillar to: formulate better policy; enable preparedness; and shape effective two-way dialogue, i.e. the right hand side of Fig. 1 and in this there is a central role for different types of communication.

A first step is to raise awareness of flood risk, i.e. *amplify* risk perception. The winter 2015/16 floods may act as a threshold event rather than yet another “focusing event” (Kingdon, 1995) coming as they have after the winter 2013/14 floods in rural Somerset and the widespread summer floods of 2007 which inundated communities in Scotland, Yorkshire, Gloucestershire, Oxfordshire, Herefordshire, Worcestershire, Bedfordshire, The Midlands and South Wales. The frequency of such floods means they can no longer so easily be brushed off as ‘one offs’ but perhaps will *reinforce* risk perception. Further, widespread flood risk vulnerability has captured national government’s attention. Policy interest is evident in the latest review of flood risk policy (HM Government, 2016) and new £15 million funding for NFM.<sup>1</sup> An essential first step to *modify* current ‘faulty’ risk perception could be familiarising the public with climate change projections and hydrological modelling, which suggest increasing frequency and intensity of flood events. However, messages will need to present climate information in new (Taylor et al., 2015) including finding more meaningful language, e.g. 1 in 100 year flood risk messages are confusing to the public (HM Government, 2016).

Communications need to more fully address the type of risk. For instance there is a general disagreement between experts and lay people on what constitutes future risk and the public is unable to differentiate long-term risk from familiar risks (Slovic et al., 1979). Better communication and education (Renn and Levine, 1988) could aim to *modify* risk perceptions, i.e. to accept the permanency of the long-term flood risk and with it the paradigm shift to accept and adapt to a risk society (Beck, 1992). This shift likely requires the government to do more to *reinforce* changed circumstances the public. For example effectively communicating the current knowledge base; we suggest key messages from the Committee on Climate Change, an independent body providing evidence-based advice to the UK and Devolved Governments and Parliaments, are, not yet perceived by the public. The report notes:

“Significant and increasing investment will be required over time to address the projected increase in flood risk associated with climate change. Even then, *flood defences will provide limited and diminishing standards of protection* as sea levels rise and patterns of rainfall intensify. *Other communities, where the economic justification for investment in flood defences is less strong, face the prospect of growing and unmanaged flood risk*” (CCC, 2016: page 64 – our emphasis).

Contrast these key messages with this expectation from a Keswick (Cumbria) resident:

“Given where we are, by a river, the question is what the future is going to be? What is the government going to do about the defences?” The Guardian, December 28, 2015.

More effective communication could focus on the desired outcomes. In our review it seems clear that as well as improved understanding of the nature of the risks the public needs to be empowered to take action to reduce personal risk and enhance local community preparedness (Lamond and Proverbs, 2009; Thielen et al., 2007). This crucial need for preparedness is not instead of, but in parallel with, a need for new or reinforced engineered flood defences in many places (HM Government, 2016; Pitt, 2007). To become prepared residents require evidence on what they can do, that is the effectiveness of various “low-tech” prevention measures, e.g. non-return valves on drains and pipes, air brick covers and “low-tech” preparedness measures, e.g. moving items upstairs and switching off electricity (Kreibich et al., 2011; Thielen et al., 2007). Furthermore, in some flood prone areas, communities could be supported to self-organise to experiment with natural flood management or different funding models for flood risk management. For example, the city of Sheffield is piloting self-financed sustainable flood risk management strategies (HM Government, 2016) that have been driven by the River Stewardship Company, a social enterprise company. Furthermore, where these messages are communicated matters. For instance, few people will read the 141 page National Flood Resilience Review (HM Government, 2016). Key messages from such reviews need to be distilled for TV, radio, print, social media and peer networks in ways that acknowledge risk perception patterns (Renn, 2004). Other communication outlets that bypass the mainstream media, such as national, regional or local public information campaigns (Lamond and Proverbs, 2009) or art including plays and film<sup>2</sup>, might also be effective in raising (*amplifying*) general awareness of flood risk.

It is important to find ways to communicate with the public that do not increase fear but rather perceptions of safety. Changing individual and community behaviour through calls for action to raise risk awareness need also empower personal

<sup>1</sup> See Guardian, 25 November 2016, <https://www.theguardian.com/environment/2016/nov/25/government-commits-15m-to-natural-flood-management>.

<sup>2</sup> For example Professor Stephen Bottoms solo performance “Too Much of Water” or Geoff Brokate and Paula Sutherland’s short film “Calder” both about the 2015/16 floods and both with multiple showings, see <http://multi-story-shipleigh.co.uk/?cat=24> and <https://vimeo.com/162076350>, respectively.

risk reduction and local community preparedness (Lamond and Proverbs, 2009; Thielen et al., 2007). Authorities could adopt holistic transdisciplinary approaches that include both scientific and cognitive-psychological knowledge (Beck, 1992; Renn, 2004; Rose, 1998) to ensure that risk policy is neither purely science-based nor purely value-based (Renn, 2004). Politicians and institutional entities need to learn how to integrate public views and societal values into the process of risk analysis (Frewer, 2004). It is also key to facilitate communication between affected communities and those involved in flood relief efforts and political and institutional entities to both *modify* and continually *reinforce* risk perception and preparedness. These efforts may take advantage of local governance innovations, such as community flood wardens, catchment partnerships and networks of pop-up volunteers.

Whereas Wachinger et al. (2013) view information provided by the mass media and communication channels as a source of indirect experience that can influence risk perception, we argue that the media is a filter that often has attenuated risk perception and that efforts need to be made to amplify, reinforce, and modify risk perception in ways that disrupt the “risk perception paradox”. Natural hazards create a “window of opportunity” (Kingdon, 1995) where the media has the potential to contribute to risk education. After a flood event, risk perception can reach high levels, before dropping back (Wachinger et al., 2013). This means that flood coverage is needed (Gavin et al., 2011) even when flood damage is minor, because the media has the potential to deliver indirect experience (Wachinger et al., 2013; Kasperson et al., 1988), to normalise flood risk and a dialogue on the dynamics of a flood from displacing people from their homes and businesses, disruption to transportation links, and raising insurance premiums, which have been shown to increase household uptake of prevention measures (Thielen et al., 2007).

However, we, like others (Hall, 2011; Pantti and Wahl-Jorgensen, 2011), found that stories on blame and demonstrations of community resilience in the response phase were central in the media coverage *attenuating* or at least displacing prevention and preparedness activities. The blame game also showed that political and institutional entities were not above blaming each other, with the EA the specific target of blame for the assurances made about engineered flood defences and actions taken in York. It is unclear how the public will respond to media attention blaming political and institutional entities for inaction, it could lead: to increased risk perception and a search for household level preparedness measures as the “government” in general, or the EA specifically, cannot be trusted to deliver flood risk management; or perversely reduced risk perception as communities perceive that the authorities cannot let it happen again, i.e. analogous to ‘too big to fail’; or a rejection of this media message of constructed conflict by those with direct experience of flood risk and a public wanting solutions (Happer and Philo, 2013). The scarcity of information provided to readers on the long-term nature of flood risk under climate change was glaring. This is a crucial oversight because climate change awareness and stated willingness to adopt domestic flood protection measures are correlated in England and Wales (Bichard and Kazmierczak, 2012).

The specific role(s) of the (mainstream) media in moderating risk perception prior to, during and after flooding remains under researched as does that of the role of social media. Moreover, further analysis on different political and institutional responses to flood events in different geographical areas of the UK, i.e. in heartland political constituencies, as well as in other areas of Europe, would be valuable. Future work could also look at how risk perception and response after a flood event differs for cities and villages where a mix of sustainable flood management approaches are in place compared to those solely reliant on engineered flood defences.

As risk perception and the factors that influence it are subjective and vary for different countries and cultures, our framework should not be considered as a universal framework, but rather as an attempt to depict the media’s influence in forming risk perceptions and in turn shaping policies. In the UK modifying and reinforcing more accurate flood risk perception might combine “Good News” stories that inspire community and personal preparedness and resilience. An example, were stories about Pickering in North Yorkshire and the proactive installation of natural flood management measures supported by the community that were initiated following repeated floods and the acceptance of flood risk. Follow-up stories might be useful describing where affected communities and businesses are at one year on as well as features on innovative practice and partnerships.

## 5. Conclusion

This article developed, extended and tested a framework for analysing how the media can influence risk perception and in turn influence adaptation policy, preparedness and communication. We find that the media filters factors that influence individual risk perceptions, namely, personal or indirect experience, political and institutional response and trust in authorities and engineered flood defences. The media plays a crucial role for its potential to amplify or attenuate risk perception, going forward this role could adapt to modify or reinforce risk perception through creating indirect experience, educating the population on future climate projections and on individual and community preparedness strategies. As risk perception is an important psychological factor that determines preparedness and response to a flood event, it is essential that both the media and political and institutional entities learn from existing knowledge on risk perception when communicating with the public about the projected impacts of climate change on flood risk and on shifting flood risk management policy and funding. There is a need for a two-way dialogue between those at risk and the relevant authorities that includes elements to empower communities to self-organise flood management strategies and preparedness and for government to facilitate and deploy and adapt effective policies.



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## References

- Abric, J.C., 1984. A theoretical and experimental approach to the study of social representations in a situation of interaction. In: Farr, R., Moscovici, S. (Eds.), *Social Representations*. Cambridge University Press, Cambridge, pp. 169–183.
- Armas, I., Ionescu, R., Nenciu Posner, C., 2015. Flood risk perception along the Lower Danube river, Romania. *Nat. Hazards* 79, 1913–1931.
- Bazeley, P., Kristi, J., 2013. *Qualitative Data Analysis with NVivo*. Sage Publications, London.
- Beck, U., 1992. *Risk Society: Towards a New Modernity*. Sage, London.
- Begg, C., Walker, G., Kuhlicke, C., 2015. Localism and flood risk management in England: the creation of new inequalities? *Environ. Planning C: Government Policy* 33 (4), 685–702.
- Bernard, H.R., Ryan, G.W., 2010. *Analysing Qualitative Data: Systematic Approaches*. Sage, Thousand Oaks, CA.
- Richard, E., Kazmierczak, A., 2012. Are homeowners willing to adapt to and mitigate the effects of climate change? *Clim. Change* 112 (3–4), 633–654.
- Botzen, W.J.W., Aerts, J.C.H.J., van den Bergh, J.C.J.M., 2009. Dependence of flood risk perceptions on socioeconomic and objective risk factors. *Water Resour. Res.* 45, 1–15.
- Burningham, K., Fielding, J., Thrush, D., 2008. 'It'll never happen to me': understanding public awareness of local flood risk. *Disasters* 32 (2), 216–238.
- Butler, C., Walker-Springett, K., Adger, W.N., et al., 2016. *Social and Political Dynamics of Flood Risks, Recovery and Response*. The University of Exeter, Exeter. Available online at [http://geography.exeter.ac.uk/media/universityofexeter/schoolofgeography/winterfloods/documents/Butler\\_et\\_al\\_2016\\_Socia\\_Political\\_DynamicsFloods.pdf](http://geography.exeter.ac.uk/media/universityofexeter/schoolofgeography/winterfloods/documents/Butler_et_al_2016_Socia_Political_DynamicsFloods.pdf). Accessed 18 August 2016.
- Cash, D.W. et al., 2003. Knowledge systems for sustainable development. *Proc. Natl. Acad. Sci. U.S.A.* 100, 8086–8091.
- CCC (Committee on Climate Change) (2016). *UK Climate Change Risk Assessment 2017. Synthesis report: priorities for the next five years*. July 2016.
- Corbin, J., Strauss, A.L., 2008. *Basics of Qualitative Research*. Sage, Thousand Oaks, CA.
- Escobar, M.P., Demeritt, D., 2014. Flooding and the framing of risk in British broadsheets, 1985–2010. *Public Understanding Sci.* 23 (4), 454–471.
- Evans, E.R., Ashley, J., Hall, E., et al., 2004. *Foresight Future Flooding, Scientific Summary, vol. 1*. Office of Science and Technology, London.
- Fairclough, N., 1992. Discourse and text: linguistic and intertextual analysis within discourse analysis. *Discourse Soc.* 3 (2), 193–217.
- Festinger, L., 1957. *A Theory of Cognitive Dissonance*. Row Peterson, Evanston, Ill.
- Frewer, L., 2004. The public and effective risk communication. *Toxicol. Lett.* 149, 391–397.
- Gabe, M., 2004. *A Critical Introduction to the Risk Society*. Routledge, London.
- Gavin, N.T., Leonard-Milsom, L., Montgomery, J., 2011. Climate change, flooding and the media in Britain. *Public Understanding Sci.* 20 (3), 422–438.
- Giddens, A., 1991. *Modernity and Self-Identity*. Polity Press, Cambridge.
- Glaser, B., Strauss, A., 1967. *The Discovery of Grounded Theory: Strategies for Qualitative Research*. Aldine de Gruyter, New York.
- Grothmann, T., Reusswig, F., 2006. People at risk of flooding: why some residents take precautionary action while others do not. *Nat. Hazards* 38, 101–120.
- Hall, A., 2011. The rise of blame and recreancy in the United Kingdom: a cultural, political and scientific autopsy of the North Sea flood of 1953. *Environ. Hist.* 17, 379–408.
- Happer, C., Philo, G., 2013. The role of the media in the construction of public belief and social change. *J. Soc. Political Psychol.* 1 (1), 321–336.
- Harries, T., 2008. Feeling secure or being secure? Why it can seem sensible not to protect yourself against a natural hazard. *Health Risk Soc.* 10 (5), 479–490.
- Harries, T., 2013. Responding to flood risk in the UK. In: Joffe, H., Rossetto, T., Adams, J., (Eds.), *Cities at Risk: Living with Perils in the 21st Century. Advances in Natural and Technological Hazards Research*, vol. 33, pp. 45–72.
- Healy, S., 2001. Risk as social process: the end of 'the age of appealing to the facts'? *J. Hazard. Mater.* 86, 39–53.
- HM Government, 2016. *National Flood Resilience Review*. September 2016. Crown copyright 2016.
- Hopkins, J., Warburton, J., 2015. Local perception of infrequent, extreme upland flash flooding: prisoners of experience? *Disasters* 39, 546–569.
- Jenkins, G.J., Perry, M.C., Prior, M.J., 2008. *The Climate of the United Kingdom and Recent Trends*. Met Office Hadley Centre, Exeter.
- Joffe, H., O'Connor, C., 2013. Risk societies and representation of risk: earthquakes and beyond. In: Joffe, H., Rossetto, T., Adams, J. (Eds.), *Cities at Risk: Living With Perils in the 21st Century. Advances in Natural and Technological Hazards Research*, vol. 33, pp. 9–23.
- Joffe, H., 2003. Risk: From perception to social representation. *Br. J. Soc. Psychol.* 42, 55–73.
- Joffe, H., 1999. *Risk and 'The Other'*. Cambridge University Press, Cambridge.
- Kahan, D.M., Jenkins-Smith, H., Braman, D., 2010. Cultural cognition of scientific consensus. *J. Risk Res.* 14 (12), 147–174.
- Kahneman, D., Slovic, P., Tversky, A., 1982. *Judgment Under Uncertainty: Heuristics and Biases*. Cambridge University Press, Cambridge.
- Kasperson, R.E., Renn, O., Slovic, P., et al., 1988. The social amplification of risk: a conceptual framework. *Risk Anal.* 8 (2), 177–187.
- Kates, R.W., 1962. Hazard and choice perception in flood plain management. Research paper No. 78 University of Chicago, Department of Geography.
- Kazmierczak, A., Richard, E., 2010. Investigating homeowners' interest in property-level flood protection. *Int. J. Disaster Resilience Built Environ.* 1 (2), 157–172.
- Kellens, W., Zaalberg, R., Neutens, T., et al., 2011. An analysis of the public perception of flood risk on the Belgian coast. *Risk Anal.* 31 (7), 1055–1068.
- Kingdon, J.W., 1995. *Agendas, Alternatives, and Public Policies*. Longman.
- Kreibich, H., Seifert, I., Thieken, A.H., et al., 2011. Recent changes in flood preparedness of private households and business in Germany. *Reg. Environ. Change* 11, 59–71.
- Lamond, J.E., Proverbs, D.G., 2009. Resilience to flooding: lessons from international comparison. *Urban Des. Planning* 162 (2), 63–70.
- Lorenzoni, I., Nicholson-Cole, S., Whitmarsh, L., 2007. Barriers perceived to engaging with climate change among the UK public and their policy implications. *Global Environ. Change* 17 (3–4), 445–459.
- McCombs, M.E., 2005. A look at agenda-setting: Past, present and future. *J. Stud.* 6, 543–547.
- Metzner-Szigeth, A., 2009. Contradictory approaches? On realism and constructivism in the social sciences research on risk, technology and the environment. *Futures* 41, 156–170.
- Morgan, M.G., Fischhoff, B., Bostrom, A., et al., 2001. *Risk Communication: A Mental Models Approach*. Cambridge University Press, Cambridge, MA.
- NAO, 2001. *Inland Flood Defence: Report by the Controller and Auditor General HC 299, Session 2000–2001, March*, National Audit Office (The Stationery Office, London).
- Pantti, M.K., Wahl-Jørgensen, K., 2011. 'Not an act of God': anger and citizenship in press coverage of British man-made disasters. *Media Culture Soc.* 33 (1), 105–122.
- Paton, D., 2008. Risk communication and natural hazard mitigation: how trust influences its effectiveness. *Int. J. Global Environ. Issues* 8 (1/2), 2–15.
- Pitt, 2007. *The Pitt Review*. Accessible 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](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 14 April 2016).
- Plapp, T., Werner, U., 2006. Understanding risk perception from natural hazards: examples from Germany. In: Ammann, W.J., Dannemann, S., Vulliet, L. (Eds.), *RISK21 – Coping With Risks Due to Natural Hazards in the 21st Century*. Taylor & Francis Group plc, London, pp. 101–108.

- Porter, J., Demeritt, D., 2012. Flood-risk management, mapping, and planning: the institutional politics of decision support in England. *Environ. Planning A* 44, 2359–2378.
- Rausand, M., 2011. *Risk Assessment Theory, Methods, and Applications*. John Wiley & Sons, New Jersey.
- Renn, O., Levine, D., 1988. Trust and credibility in risk communication. In: Jungermann, H., Kasperon, R.E., Wiedemann, P.M. (Eds.), *Risk Communication*. Forschungszentrum, Juelich, p. 51.
- Renn, O., 2004. Perception of Risks. *The Geneva Papers on Risk and Insurance* 29 (1), 102–114.
- Renn, O., 2008. *Risk Governance. Coping With Uncertainty in a Complex World*. Earthscan, London.
- Richards, L., 1999. *Using NVivo in Qualitative Research*. Sage Publications, London.
- Rose, E.A., 1998. Metatheoretical foundations for post-normal risk. *J. Risk Res.* 1 (1), 15–44.
- Rothstein, H., Huber, M., Gaskell, G., 2006. A theory of risk colonization: the spiraling regulatory logics of societal and institutional risk. *Econ. Soc.* 35, 91–112.
- Scanlon, J., 1990. People and warnings: so hard to convince. In: Handmer, J., Penning-Rowsell, E.C. (Eds.), *Hazards and the Communication of Risk*. Aldershot, Hants, England, pp. 233–245.
- Siegrist, M., Gutscher, H., Earle, T.C., 2005. Perception of risk: the influence of general trust, and general confidence. *J. Risk Res.* 8 (2), 145–156.
- Slovic, P., Fischhoff, B., Lichtenstein, S., 1979. Rating the risks. *Environment* 21 (3), 14.
- Smith, A., Porter, J.J., Upham, P., 2016. “We cannot let this happen again”: reversing UK flood policy in response to the Somerset Levels floods, 2014. *J. Environ. Planning Manage.* <http://dx.doi.org/10.1080/09640568.2016.1157458>.
- Šotić, A., Rajić, R., 2015. The review of the definition of risk. *Online J. Appl. Knowl. Manage.* 3 (3), 17–26.
- Taylor, A.L., Bruine de Bruin, W., Dessai, S., 2014. Climate change beliefs and perceptions of weather-related changes in the United Kingdom. *Risk Anal.* 34 (11), 1995–2004.
- Taylor, A.L., Dessai, S., Bruine de Bruin, W., 2015. Communicating uncertainty in seasonal and interannual climate forecasts in Europe. *Philos. Trans. R. Soc. A* 373, 1–16.
- Terpstra, T., 2009. *Flood Preparedness: Thoughts, Feelings and Intentions of the Dutch Public*. Thesis. University of Twente.
- Thieken, A.H., Kreibich, H., Müller, M., et al, 2007. Coping with floods: preparedness, response and recovery of flood-affected residents in Germany in 2002. *Hydrol. Sci. J.* 52 (5), 1016–1037.
- Thorne, C., 2014. Geographies of UK flooding in 2013/4. *Geog. J.* 180 (4), 297–309.
- Wachinger, G., Renn, O., Begg, C., et al, 2013. The risk perception paradox—implications for governance and communication of natural hazards. *Risk Anal.* 33 (6), 1049–1065.
- White, G., 1945. *Human Adjustment to Floods*. University of Chicago, Chicago, IL.
- Whitmarsh, L., 2008. Are flood victims more concerned about climate change than other people? The role of direct experience in risk perception and behavioural response. *J. Risk Res.* 11 (3), 351–374.
- Wilkinson, I., 2001. *Anxiety in a Risk Society*. Routledge, London.
- Wilson, R., Crouch, E., 1982. *Risk/Benefit Analysis*. Ballinger Publishing Co, Cambridge, MA.
- Witte, K., Allen, M., 2000. A meta-analysis of fear appeals: implications for effective public health campaigns. *Health Edu. Behav.* 27 (5), 591–615.