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Investigating resilience, through 'before and after' perspectives on residual risk

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Introduction

Flooding is not generally regarded as being the kind of hazard that is symptomatic of a 'Risk Society' (Beck 1992), in which dangers arise as unintended by-products of technological modernisation and an unquestioning faith in the ability of science to solve social and environmental problems. However, this chapter explores policy change and the results of two research projects conducted with flood-exposed and affected communities, to argue that the recent shift towards the Flood Risk Management (FRM) approach, with its associated shift of responsibility towards the individual, is, indeed, an example of the risk society at work. In short, decades of support for structural solutions, combined with the increasing challenges of climate change, have allowed the expansion of communities into flood-prone areas, thus increasing the risks to individuals when these defences fail. The research results we present here illustrate how the government's policy of 'Making Space for Water' (Department for Food and Rural Affairs 2005) is played out in practice, with consequences for how risk and resilience is experienced by the communities concerned. We conclude by arguing for citizens to be more involved in the decisions that are made around flood risk management and for better support for the process of flood recovery.

From flood defence to flood risk management: policy change from 1940 to the present day

The relationships between exposure, vulnerability and resilience to hazards have been much debated (e.g. Adger 2000, Adger 2006, Birkmann 2006, Hewitt 1997, Pelling 2003a, Wisner *et al.*, 2004). In relation to flooding, these concepts have been used to describe the changing macro- and micro-social and political processes that have guided the human development of floodplains. As far back as 1945, Gilbert White called for a critical examination of the assumptions being made in relation to how 'adjustment measures' were being used to justify floodplain encroachment (White 1945). His concern, even then, was that some floodplains in the US were being used in ways that increased the exposure of communities living in low-lying areas to flood hazards, thereby exacerbating flood risks. Yet floodplain development has continued into the 21st Century; a phenomenon that remains accountable to the legacy of historical decisions, which initiated and then normalised such practice long before White wrote his thesis (Doe 2006). In the UK, this could be argued to have occurred largely because the benefits of using this land have continued to be perceived to outweigh the costs, of either mitigating the most frequent hazards, or of suffering the consequences of the more infrequent extreme events. For a relatively small, densely populated island, part of this benefit/cost equation undoubtedly relates to the fact that floodplains represent such a large proportion of useful and useable land (Kelman 2003).

Johnson *et al* (2005b) identify three phases of flood management within England and Wales, which illustrate a gradual progression of policy priorities since the mid-20th Century. The first phase followed severe fluvial flooding in 1947 and the east-coast storm surge of 1953, which both affected agricultural yields; even if only for a relatively short time (Johnson *et al.* 2005a). This loss of production represented a substantial risk to food security, whose sensitivity to perturbation had already been severely tested during the war years. The first phase of flood control, therefore, ran from the time of war and post-war austerity in the 1940s to the 1980s, with activity during this phase concentrated on land drainage in support of agricultural productivity.

Due to the changing role of global markets, from the 1980s to the 1990s, a reorientation occurred. This second phase refocused attention away from agricultural productivity and toward assuring the nation's wider economic

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security. This shift was designed to enable economic growth and social-welfare improvements to be driven by the urban and commercial development of the nation's floodplain; with hard-engineered measures being used to prevent inundations. Unfortunately, however, it could be said that this was the period that raised the paradox of flood control into sharp relief. Parker (1995) christened a major part of this paradox the 'escalator effect'. This concept was predicated upon the observation that this type of adjustment measure meant that the investment in flood defences led to increased investment in floodplain development, which in turn led to the need for more investment in flood defence; thus 'escalating' risks. By the 1990s this approach was beginning to attract criticism, with increasingly clarion calls being directed at '*engineering hubris, disaster-denial mentality and a willingness to pursue short-term profit in the face of long-term risk*' (Mount 1998) bearing more responsibility than any increase in hazard frequency for the rising flood losses that were being experienced (e.g. Barredo 2009). It was becoming clear, therefore, that White's words had been prophetic, and that there was a need to reconsider society's relationship with floods.

Another influence that was driving this tension was the growing consensus amongst the clear majority of scientists that something was happening to the global climate. By 2007 this consensus was to develop sufficiently for it to represent an understanding (with more than 90% confidence), that human activity had been the dominant cause of observed climate changes in the latter part of the 20th Century (Intergovernmental Panel on Climate Change 2008). It was this growing recognition of climate change that was to foment the development of the climate-model projections (e.g. Hulme *et al.* 2002, Jenkins *et al.* 2009), which were to inform the third phase of flood management; the Flood Risk Management (FRM) approach (Tunstall *et al.* 2004). In fact plans developed through the use of these climate and catchment models serve to epitomise the FRM approach as it is now practiced in the UK, across Europe and in the US (European Commission 2006, Defra 2005, United States Army Corps of Engineers 2009).

The significance of this shift to FRM is that it recognises that not all floods can be prevented. Consequently, it reinforces the need to better understand the ways in which different social and physical interventions can contribute to improving flood resilience² and resistance, through achieving the combined social, economic and environmental goals inhered within the wider sustainable development discourse (Water Directors of the European Union 2004). Flood policy is now orientated toward the communication of risk information to the population, and on working in partnership with both the hazard-exposed and the greater society, toward building resilience across scales; whilst accepting that this resilience **will** be tested. In the UK this approach has been rather euphemistically termed 'Making Space for Water' by the Department for Food and Rural Affairs (Defra 2005).

Despite this change of emphasis away from hard engineering solutions, in England and Wales, expenditure on flood defence is currently higher than at any time in history (Environment Agency, 2009) while the residual risks associated with the range of flood hazards are also recognised as being larger than ever before (Association of British Insurers 2006, Association of British Insurers 2007, Risk Management Solutions 2003). One consequence of this is that FRM approaches now incorporate a shift of responsibility towards individuals, which proposes that, 'where appropriate', individuals, households and social networks should be encouraged to mitigate their own risks autonomously. People are effectively being encouraged to "know" the risks they face and to take personal responsibility for adapting to those risks (Water Directors of the European Union 2004). This is a laudable goal. However, it should be remembered that the prevailing structure, transparency and participatory openness of FRM institutions, and the accent of the policies by which they are bound, cannot be thought of without also considering the legacy of earlier approaches, which had a role in determining the nature of both a population's vulnerability and its capacity for resilience (Wisner 2001). The next section seeks to delineate why this legacy of policy changes means that the public cannot simply be expected to accept such an individualisation of flood risk responsibility on *trust*.

Floods and the Risk Society

In his original *Risk Society* thesis, Beck (1992) suggested that the pervasive effects of globalisation, social reflexivity and the onset of a post-traditional social order have combined to create a society of individuals who regard the

² For a discussion of resilience as a concept that can variously refer to: resistance; bounce-back; adaptation; or transformation, see Whittle *et al.* (2010).

post-industrial world with doubt, reflexivity and anxiety. Beck's work is more often associated with 'technological' rather than 'natural' hazards (Walker *et al.* 2010) and, therefore, floods are not a 'typical' case. However, as we illustrate here, the instrumentalist ways in which floods have been managed across preceding decades has had the unintended consequence of increasing the risks to life and property when flood defences fail. This, together with the increase in extreme weather events which constitute the predicted impact of human-induced climate change, means that floods cannot be understood as purely 'natural' hazards. Viewed in this way the most recent iteration of FRM provides us with a clear example of how Beck's thesis can be applied to certain aspects of flood risk.

The proliferation of floodplain development and the reliance on technical risk-assessment techniques in the construction of defence measures (e.g. benefit/cost analyses) has, in effect, exposed situated and 'trusting', publics to potential harm. To illustrate this point, think about the residents of a new bungalow development on the coast: surely these people should be able to trust that the same authorities who granted planning permission for their homes to be built will also bear the lion's share of the responsibility for preventing those same properties from flooding? And yet flood defences do fail, often with disastrous consequences, as the summer floods that affected the UK in 2007, made only too clear (Pitt 2008) (Plate 1).

<<<Plate 1 here>>>

From this perspective, the threat from flooding can be seen as analogous to the persistent threats from nuclear, chemical and GM technology and the other global threats around which the risk-society thesis is constructed. One could, for example, regard Parker's 'escalator effect' (1995) as one of Beck's 'residual' risks in microcosm; in that it is a vestige of a particular industrial era, when hubris dictated that all flood hazards could be controlled. Use of this lens facilitates an interpretation that the recent policy shift toward greater individual responsibility for personal flood-risk management could leave the public startled at the reflex-like nature of the policy re-orientation. Such an analogy fits well with Beck's own definition; as an example of entry into risk society occurring:

... at the moment when hazards which are now decided and consequently produced by society **undermine and / or cancel the established safety systems of the provident state's existing risk calculations** (Beck 2000: emphasis in original).

Fleshing out this example, policy-makers conferring the new FRM mandate could be perceived as effectively renegeing on the state's historical and socially-deemed responsibility for flood-risk mitigation, at the very time when the global threat of climatic instability is projected to intensify future flood hazards and/or make them more frequent (Alcamo *et al.* 2007, Evans *et al.* 2008). Society, from this perspective, could be seen as being left atomised in the face of uncertain, and perhaps indeterminate, levels of residual risk (i.e. that which remains after the insurance provided by 'established safety systems' is overwhelmed³).

Having set the scene as regards the recent evolution of FRM approaches, the discussion will now move on to investigate how risk-society reflexivity could be said to be exhibited by populations living on particular floodplains in England. This will be done through the interrogation of data from two recent research projects that purposively engaged populations exposed to or affected by surface-water and sea flood hazards.

The two projects took place between 2007 and 2009 and, as the following descriptions illustrate, these were separate studies, which had different aims and methodologies. However, taken together, the projects provide us with an interesting picture of how flood risk is individualised, perceived and managed. Indeed, by exploring the results from both projects, we can follow the ways in which understandings of risk evolve across the hazard cycle, from hazard-exposed populations who have not experienced a flood event (the 'before' project), to those with recent experience of recovering from a major flood (the 'after' project). The following section describes the methodologies of the projects.

³ This does not mean insurance in the sense of private policies provided by the insurance industry, but the insurance inhered within state-funded risk mitigation measures (e.g. seawalls built to a 1:200 standard of protection, wherein the residual risk is defined as that which would be realised if the structure was subjected to, for example, a 1:400 hazard event).

The research projects

The 'Before'

During 2007 a research project (Deeming 2008) was conducted in three English coastal towns (Cleveleys, Mablethorpe and Morecambe). All of these towns had a history of sea flooding, although none had suffered a significant event since at least 1990 (Morecambe). Notwithstanding, ongoing concerns over climate change effects related to storm-surge flooding are increasingly suggestive that more intense and frequent sea flooding may occur in the future (East Lindsay District Council 2005, Lancaster City Council 2007, Morecambe Bay Shoreline Management Plan Partnership 1999); therefore, the aim of the project was to investigate how risk perceptions influenced the levels of community resilience to this low-probability but high-consequence hazard in these towns. The research methods consisted of a survey questionnaire, delivered using a random-systematic approach ($n = 343$). The survey included a relatively unusual proportion of open questions, which were designed to draw unprompted opinions and attitudes from the respondents. For example, two questions the respondents were required to answer in their own words were:

- Can you suggest three things which **you** could do if you got a warning that your street (including your home) was going to be flooded in the **next few hours**?
- What, if anything, do you think could be done in [town name] to help the town cope with flooding in the future?

This first method of collecting information from the public was followed up by a series of focus groups conducted with volunteers recruited from respondents to the initial survey (participants = 24). Analysis of the data took a grounded-theory approach, wherein themes were identified from within the rich datasets, and potential causal relationships behind these themes were hypothesised.

The 'After'

Following the summer floods of 2007, a team from Lancaster University travelled to Hull, where over 8,600 homes were affected and one person died (Coulthard *et al.* 2007b), in order to carry out an 18-month long investigation into what the long-term flood recovery process was like for people (Whittle *et al.* 2010). During the study, the researchers worked with 42 flooded residents using in-depth qualitative techniques designed to capture the recovery process in real time. The methods were based on established techniques that were used successfully in a previous study which investigated the community's recovery from the 2001 Foot and Mouth Disease outbreak in Cumbria (Mort *et al.* 2004). Upon recruitment, the participants gave an initial semi-structured interview which enabled them to tell their story of the floods so far. At this point they were introduced to the weekly diary booklets that they were encouraged to keep throughout the duration of the project. The diaries started with a few simple 'warm up' questions where participants were asked to rate their quality of life, relationships with family and friends, and health using a simple scale ranging from 'very poor' to 'very good'. However, the main section of the diaries was the 'free-text' part, where they were encouraged to write about their lives that week. To complement the diaries and interviews, the participants also met for group discussions at quarterly intervals during the project where they were able to discuss the issues that were facing them as a group.

The final element of the methodology was a project steering group, which comprised local and national organisations with an interest in flood recovery⁴. During the study the diarists engaged directly with the steering group through a series of group discussions and facilitated meetings, resulting in a high level of impact on policy and practice (Whittle *et al.* 2010). For example, the project was used as a case study during the development of the Cabinet Office's Draft Framework on Community Resilience (Cabinet Office 2010).

We now move on to discuss what the projects can teach us about the ways in which the flood risk society could be said to be created, understood and managed.

⁴ The Hull Study had a steering group comprising the following organizations: Association of British Insurers, Humber Primary Care Trust, Cabinet Office, JBA Consulting, Diarist, Middlesex University, Environment Agency, National Flood Forum, Hull City Council, North Bank Forum, Hull Community and Voluntary Services, University of Cumbria, Hull Residents and Tenants Association, Yorkshire & Humber Neighbourhood Resource Centre.

Results and Analysis: Experiencing residual [flood] risk society

'Before'

The research project conducted in the three coastal towns was designed with a focus on a particular sea-flood hazard; storm surge. However, from the first stages of survey analysis it became clear that the population in these towns had a wider breadth of interest. For these people, flood hazards could be differentiated into two main types; storm surge and surface water. Storm-surge flooding, which hadn't been experienced for at least 17 years was perceived as an acute threat, whilst surface-water (i.e. drainage excess) flooding was something that was prevalent and even chronic at the street scale. As a result of this the hazards invoked very different risk perceptions and feelings of personal efficacy and responsibility regarding risk mitigation.

As a useful way to visualise how these exposed publics perceived how different groups of stakeholders quantify (whether personally or within their institutionalised structures) the uncertainties related to the local flooding, Figure 1 applies the concept of the 'certainty trough' to show the perception differentiation between the two hazards. The certainty trough concept was originally devised by MacKenzie (1990), who contended that certainty in relation to the use of scientific knowledge can be conceptualised as forming a trough shape, as the knowledge is produced and then utilised by agents progressively further away from this inception point. MacKenzie illustrated his concept by categorising three groups, through which the knowledge passes: namely; the knowledge producers, the program loyalists, and the alienated.

<<<Figure 1 about here>>>

In Figure 1, the solid line describes the public's apparent perceptions of uncertainty, as it relates to surface-water flooding. Here the perception is that formal actors (e.g. Sir Michael Pitt) and flood policy-makers (e.g. Defra) represent the '*knowledge producers*'. These actors are perceived to be aware of considerable uncertainty in relation to the prediction of surface-water flood hazards, particularly at the local-scale (Bales & Wagner 2009, Pitt 2008). However, when, in this example, the knowledge moves to the Local Planning Authorities (LPAs) (i.e. the '*program loyalists*'), it is apparent that the public perceives that the officers of these institutions justify to themselves that surface-water hazards can be understood with high levels of certainty. The public's perception is that this is what allows the officers to continue to grant planning applications in the towns, without insisting on the implementation of adequate flood mitigation measures. From here the trough is formed, as the knowledge passes to the '*alienated*'. At this final stage the public, who have witnessed chronic flooding at its most localised scale, yet whose 'lay' opinion they feel is rarely sought or considered, perceive the highest uncertainty of all. This perception enhances the feelings of frustration because this is the group that perceives and/or experiences hazards and risks accumulating around them.

Such a situation can result in several responses. The public can (1) philosophically accept their situation; (2) they can seek to blame others for failing to control surface-water effectively or, (3) they can make themselves more resilient. Whilst the first two options are clearly of limited value in relation to resilience-building, the third too should not be considered as being a wholly positive phenomenon. It is true that if a problem is chronic enough and if the person has sufficient perceived self-efficacy – and financial resources – to mitigate the problem (Grothmann & Reusswig 2006) then they can and do install measures such as air-brick covers, sandbags and sump pumps. This is positive, as too is the fact that the data analysis revealed that these actions were often carried out by older people (an oft-cited vulnerable group). However, in this category of uncertainty perception, these actions need to be understood as being undertaken in the sense of (to paraphrase) 'No one else is going to do anything about this so it's down to me!' Whilst the resilience such responses can engender could be regarded positively, it could also be considered as having been attained through rather Machiavellian means. This situation should beg the question; is it ethical to justify such ends (i.e. increased resilience) when, ultimately, the means of achieving it relies, effectively, on the perpetuation of the public's perceptions that risks are being managed ineffectively?

Conversely, the dashed line in Figure 1 relates to low-probability storm-surge flooding. Here, the uncertainties inherent in the production of knowledge, as it relates to the prediction of extreme events and to the designed resistance of sea defence measures, is implicit in a lower perceived initial uncertainty being attributed to the

'knowledge producers'⁵. From here the uncertainty perceptions are lowered, as the knowledge passes to local decision makers; the 'programme loyalists'. This is the point at which decisions are written into local development policy. It is, therefore, here that the sustainability of coastal communities is balanced against the risks of a low-probability hazard. In effect, it appeared that local authorities were perceived to **need** to believe that their communities are defended to the highest standard, in order that investment could be attracted and blight avoided. This interpretation was reinforced by a quote from a local councilor who was interviewed as part of the project:

At the moment ... the Chief Executive and the Leader of the Council both have the attitude that, you know, the sea is there, we're not going to let it come in. We've had hundreds of years of pushing it back, pushing it back, pushing it back, we're holding the line. And they've got to have that story or else the town is so fragile (Interviewee, Mablethorpe, January 2007).

From here, however, the trajectory of the knowledge diverges from the path taken for surface-water flooding. In this illustration, the 'alienated' publics are also attributed as perceiving low uncertainties. This perception allows people to regard the sea with ambivalence. People know the threat is there (e.g. the North Sea floods of 1953 cannot be denied). Therefore, the sea represents a putative threat. However, the fact that these events are rare suggests that this is a 'low-probability threat'. This message is further reinforced by the words and actions of those who are understood to be responsible for community sustainability (e.g. it is implicit in the decades-long practice of granting planning permission for seaside bungalows). The public are, therefore, able to perceive "low probability" as meaning that it is not going to happen to 'them' and that if it did then they would be 'unlucky'. Sea flooding becomes an "Act of God" and sea defences are simultaneously perceived as both impregnable and yet latently vulnerable.

It has been suggested that people with a limited knowledge of certain hazards have a tendency to trust the organisations they deem to be responsible for managing those hazards to mitigate the risks to which they are exposed (Siegrist & Cvetkovich 2000). From a flood-risk perspective, therefore, being able to trust that **someone** is maintaining the standard of sea defences or the drainage infrastructure, or that **someone** will issue warnings in time, allows individuals to perceive that they are exposing themselves to lesser personal risks (Freudenburg 1993). It is this trust that could, in effect, be argued to have produced the perceived division of labour – i.e. the authorities use tax revenue to protect the public, which allows the public to work and pay their taxes in order to sustain the economy – that both cognitively sanctions and perpetuates the risk-taking of those who continue to make the floodplain their home. The public has a vested interest in ignoring even concerted efforts by the responsible authorities in their promotion of the need to build individual resilience to low-probability hazards; regardless of whether such aspirational policy is based on sound science or not. This finding clearly echoes the results from an international research project into social vulnerability:

Most of those surveyed don't feel involved in the decision making processes and tend to delegate responsibility – to agencies in charge of flood prevention and mitigation. Thus, precautionary measures and flood defence are first and foremost regarded as pertaining to public institutions. Such attitudes originate a **vicious circle**. Public authorities feel the increasing pressure from the residents' demands for assistance and, by positively responding to it, further amplify its magnitude and the citizens' tendency not to invest in prevention (Steinführer & Kuhlicke 2009: emphasis in original).

Having identified some specific social risk-related phenomena, illustrated by a hazard-*exposed* population, the discussion will now move on to investigate how a hazard-*affected* population was found to rationalise its experience in terms of how risks were realised relative to how they were previously perceived.

'After'

The 'before' case study clearly shows how a risk society is created in relation to flooding. In particular, we can see how the ways in which people understand and manage risks cannot be separated from the macro-scale policy

⁵ However, consider Muir-Wood *et al.* (2005) for a discussion of whether low uncertainty, as perceived by the 'knowledge producers' in relation to storm-surge hazards, can actually be equated with low risk. Muir-Wood illustrates that whilst flood probabilities are calculable to an extent and, therefore, uncertainties are relatively low, this does not mean that the residual risks associated with an extreme event are reduced at all.

decisions that are made about flooding. The 'after' case study shows these same processes occurring. The Hull flood was a surface water flood and, as a result, there was general agreement from the participants that the city's drainage infrastructure had been found vulnerable. Issues of inadequate maintenance, and failure by local authorities to adequately enforce sustainable drainage management as part of the planning process (and in spite of local protests) were perceived to have exacerbated the consequences. For example:

The thing is I mean, the sewerage system is so ancient isn't it? If you are going round the back of Asda, in that area, to my knowledge there's at least five new building [developments], there's David Wilson Homes, there's Persimmon, there's Wimpy's – I don't know how many, all with these new beautiful properties all being built. They were flooded while they were still being built, there's still caravans outside these properties. I mean we complained when they started to build Kingswood, there was a petition up not to build it because you know the properties, there's nowhere for them to go, the drainage system is so old. They are building another, about six companies, are still building in the same vicinity ('Elizabeth'⁶, resident Group discussion, April 24th 2008).

Such comments revealed very clearly that, for many, far from being considered 'Acts of God' these floods were regarded as resulting from 'social' factors; just as were the surface-water hazards on the coast mentioned above. Importantly, this particular social construction of flood risk can be attributed to one principal factor: namely that the drainage infrastructure in the city had, overall, only ever been required to meet a 'rather vague' industry standard of protection (i.e. 1 in 30 year⁷: Coulthard *et al.* 2007a). Therefore, an event that achieved a calculated 'greater than 1 in 150 year' intensity (as occurred on June 7th 2007), was inevitably going to lead to extensive flooding. The population of Hull had, effectively, been living with a time-bomb of residual flood risk long before those June clouds even formed.

Regardless of this inevitability, however, blame for what had happened led to frustration and anger. Despite the severity of the hazard, physical effects were attributed to inadequate preparation and response by the agencies and organisations. For example:

Five years ago the council had decided that they were going to save money and they reduced the drain cleaning from five teams to one team. Now when you look at cities like Rotherham, places like that, they have 20 teams. Well it doesn't take a brain surgeon to see that we have one team ('James', Group Discussion, Hull, May 1st 2009).

And

We were like sitting ducks in the middle... all the buses kept going past and lorries kept going past and they didn't realise that, as they were going past, it was making it like a tidal wave. So it was swishing, and I thought, 'I don't believe this'. Like – with the council – you would have thought between them and the police they would have the sense... [To close the road]. We've got three main buses that run on that back road. One of them runs every 10 minutes, the other runs every quarter of an hour, so you imagine that every 10 or 15 minutes, what water was getting squished into your house. It was unbelievable. It has been horrendous, really ('Amanda', Resident Interview, 19th December 2007).

However, if we follow residents' experiences beyond that of the original shock and blame and into the longer-term process of recovery, we can see evidence of yet another feature of risk society exhibited by the 'before' research project – namely, the individualisation of risk and its consequences.

Despite the severity of the event itself, the accounts of the diarists showed that most of them were able to deal constructively with their initial situations in ways that enabled them to make a start on the process of recovering their homes. It was what happened next – the struggles with insurers, loss adjusters and builders – that caused real problems for their emotional and mental wellbeing. Indeed, the research shows that the individualised way in which flood recovery is managed, with residents having to deal with as many as 15 different companies and organisations during the repairs to their home, resulted in very mixed experiences for the diarists.

⁶ Diarists' names have been anonymised

⁷ i.e. 1 chance in 30 in *any given year* (assuming that probability is constant and that events are independent from year to year: Pielke Jnr. 1999)

One example of this process was the uncertainty surrounding what would be repaired and how and when these repairs would take place. Even for home owners with full insurance and obvious evidence of water damage there were huge variations in the extent, timing and standards of the work, depending on which insurer the person was with and, in turn, which restoration and building companies were called in. In this way, even neighbours living next door to each other would be treated in completely different ways. These uncertainties were even greater for tenants or those whose homes were affected by 'secondary' flooding – a phenomenon where the water entered below the floorboards, causing structural damage to the home, which was sometimes only detected months later (Whittle *et al.* 2010). In such circumstances, residents had to watch and wait while 'experts' from the building, surveying and insurance industries debated the cause and/or significance of damage to their homes and whether their repairs would be covered by their insurance (e.g. was the damage caused by the flood or by the householder's failure to maintain a damp-proof course?). The fact that different 'experts' advised the implementation of different restoration techniques (sometimes in adjoining properties) only added to householders' perceptions of confusion and frustration; particularly if they found themselves unable to influence an insurance company's acceptance of one expert's opinion over another's.

Figure 2 provides an example of how it felt for one resident to be an individual trapped in the middle of dealing with all these different companies and agencies. This timeline is taken from the self-assessed scores that Caroline gave herself in the front of her diary during a period from 10th December to 5th May 2008 (see methodology section for more details of this self-assessed scoring process).

<<<Figure 2 about here>>>

As Figure 2 illustrates, as well as producing the need to deal with recovery agents, the management of the recovery process was occurring simultaneously with the need to continue everyday life; washing and shopping needed to be done; jobs needed to be held down and dependants needed to be cared for. The 'negotiations'⁸ with flood recovery agents merely added to these pressures. This meant that at times some individuals were laden with more responsibility than they felt able to bear. Importantly, however, the research identified that this tendency toward mental and physical overburden did not mean that these individuals were psychologically weak, inherently 'vulnerable' or in some way incapable of dealing with flood hazards. No. These cases of strain were found to relate much more to the fact that people were being *retraumatised* by the way they perceived themselves to be being dealt with by the formal recovery agents. In effect, people who had 'survived' [their expression] the flood, often found themselves strained by the need to generate the additional tenacity that the experience of flood recovery required of them. The following short diary extract illustrates this issue by showing how one diarist described a single exchange with her insurance company, in which she had complained about the service provided by an insurance company-endorsed loss adjuster:

Day off today after working on previous Saturday. I call insurance department and speak to them regarding my concerns. I get really upset and have trouble explaining without crying as he says he will call loss adjustor for his side of the story! This comment really upsets me as why should I lie? I insist for his address to post my six page letter and all the copies of emails when [name] has said he will pay rent and storage and never has. I feel absolutely exhausted after this call and feel quite shaken ('Laura', Diary entry, Monday 23rd June 2008).

Understanding the distress caused by this individualised and longer-term recovery process is important for several reasons: First, for many people, this is how the reality of 'making space for water' is actually experienced in practice, at least at present. It is one thing to ask people to take more responsibility for managing their flood risk but our data shows that, for those who do not know of – or cannot bear the burden of – such responsibility and make the necessary changes to their homes and lifestyles, the consequences can be severe. Secondly, there are other important longer-term implications of this shift to individual responsibility, which relate to risk and resilience, and we explore these in the following section.

⁸ 'Negotiation' was a phrase that was introduced with some irony by a diarist. He recounted a conversation with a loss adjuster during which he realised that householders were not being compensated in any uniform manner, but instead whatever "deal" they received was in fact open to, negotiation. This is an issue that raises questions about whether those who are less able to negotiate for whatever reason would be disproportionately likely to obtain less in terms of a final compensation payment than perhaps they were due.

Discussion: Understanding risk and resilience

The preceding sections have drawn on data from two research projects to illustrate some of the complexity inherent within the public's multiple understandings of flood risk and responsibility. Whilst Beck's *Risk Society* thesis (1992) might not be immediately considered as applicable, the argument has been laid out in a way that suggests that local flood risks could be understood from a Risk Society perspective, particularly in their terms as drivers of social reflexivity. Using this perspective is not altogether straightforward. It is, for example, true that not everyone is as equally vulnerable to flood hazards as they are to the more traditional of Beck's technological 'icons of destruction' (e.g. nuclear meltdown). In relation to this 'lesser' hazard of flooding some people will inevitably have access to resources (physical, social or financial), sufficient to mitigate their exposure and/or vulnerabilities. However, the experiences of flood-exposed and flood-affected populations reveal some interesting aspects of social reflexivity, which could be suggested to underpin wider public opinions about flood risks and, specifically, who they perceive to be responsible for managing them.

The gradual progression of flood policy in England and Wales over the past century has occurred concurrently to the significant development of many riverside and coastal communities. As a direct result of these policies, the structural defences in all the research sites investigated in this paper are currently regarded as having at least a 1 in 200 standard of sea-flood protection (East Lindsay District Council 2005, Morecambe Bay Shoreline Management Plan Partnership 1999), and in Hull an equivalent main-river hazard protection too (i.e. from the River Humber: Hull City Council 2007). However, due to the legacy of past planning standards and institutional arrangements which could in retrospect be considered inadequate (Environment Food and Rural Affairs Committee 2008), surface-water flood protection standards tend to be lower by almost an order of magnitude.

Yet regardless of what protection standards are designed in⁹, from the perspective of the flood-hazard exposed, physical structures and infrastructure are never 'neutral'. Whether it is a 'nourished' beach, a concrete seawall or a tarmaced-over storm drain, these objectively observable landscape features can act to provide reassurance or concern to these people. Whilst apparently badly-maintained measures (e.g. blocked drains) provide a focus for feelings of blame, reassuring features (e.g. massive seawalls) allow the perception that someone [else] is largely responsible for keeping flood hazards at bay. Surprisingly, the presence of these respective blame and trust-in-authority factors effectively legitimises the household-level investment of emotional and financial capital; in the sense that, to paraphrase, 'someone else is responsible for protecting us'. Thus, houses in at-risk locations continue to be made into homes, and householders' continue to make aspirations for a future *in that place*; without the need to engage with the potentially uncomfortable realisation that they too have responsibility for reducing their own vulnerability.

From this perspective it becomes easier to posit that the shift toward the new FRM paradigm (and its inherent drive toward personal responsibility) could be perceived by this exposed public to be an example of what Beck (1995) would term, the '*organised irresponsibility*' of those who configure FRM's formal institutions. Using this lens, this term could be applied to the process whereby, in acknowledging that floods are too indeterminate to 'know' or to entirely prevent, the FRM authorities have positioned themselves as simultaneously responsible and yet unaccountable. This is a position that allows actors (such as the Environment Agency and Local Authorities), to be perceived as, on the one hand, taking responsibility for the creation of elaborate 'community' development plans, whilst on the other ceding to the populations an increased personal responsibility for coping with the extreme hazards, which would be capable of sundering any householder's home and/or future aspirations over the course of just a few stormy hours.

Turning the perspective from the exposed toward the flood-affected provides different insights, but ones that are just as relevant to those who seek to reduce future flood impacts by attempting to engage the public with their risks. In the first instance, a kind of resilience was engendered in many residents who acquired new skills as a result of having to 'fight' their corner with the various companies and agencies that they were dealing with. However, as described above, there must be major ethical questions around any form of resilience that has its roots in the unnecessary suffering of residents. Certainly, if the experiences outlined above are anything to go by

⁹ Always remembering that a residual risk will remain

then it would be hard to argue that the benefits of such 'resilience' outweigh the cost to the family, individual and community as a whole.

Equally, we can think of the diarists' experiences in the light of Beck's 'safety systems', which allows us to include the consideration of market-based systems, like private insurance. At present, a 'Gentlemen's Agreement' between the Government and the insurance industry means that flood insurance will be provided to households exposed to an annual flood probability of no worse than 1 in 75 years until 2013; dependent on the Government continuing to invest in flood risk reduction and management measures (Association of British Insurers 2008, Huber 2004). In line with this, prior to the flooding, all the Hull project's diarists would have had access to commercial flood insurance. The fact that most of these people did indeed have such cover was not, however, sufficient for many of them to avoid suffering significant and repeated worry over whether their claims would be met, or whether the future cost of maintaining cover – now that they had submitted a flood-related claim – would remain affordable:

We went on the web looking for insurances and... other insurance companies don't particularly want to take you on and the premiums were that high it was unbelievable. So we stuck with the same insurance company and they took us back on and the premium only went up £50 and that wasn't a problem. But the excess has gone up: £5,000 we have to pay on contents and £5,000 on buildings. So if the same thing happened again we've £10,000 to find before we start. And where do we pluck that from? Where do we get that from? We haven't got £10,000. Or do we save anything at all or do we literally just let the whole lot go and say it's all gone and claim what we can and just have everything lesser? ('Leanne', resident Group discussion, July 17th 2008)

Leanne's experience provides an opportunity to use Beck's (1992) 'arbiter of risk' characterisation of the insurance industry as an appropriate lens through which to reflect on this particular 'safety system' on offer in the UK. This is because, given its current structure, problems such as rising premiums or large excesses become the inevitable result of the UK's highly individualised, market-driven insurance system, where risks – and premiums – are calculated on a case-by-case basis, with those perceived to be at higher risk (such as those whose houses have been flooded in the past) paying more. In such an arena, insurance availability increasingly becomes a primary concern for anyone living on the floodplain, as well as for those considering buying, selling or developing property in such a place. From this perspective, the development and sustainability of floodplain life could indeed be said to be increasingly contingent upon insurance industry 'arbitration'. Such a system is in complete contrast to France, where solidarity and mutuality are the guiding principles. In France, compulsory cover for disaster risk has been shared since 1982 amongst all policy holders with an identical additional percentage premium paid on top of the assessed premium for fire insurance (French Disaster Reduction Platform 2007).

If the insurance system stays in its present form in the UK then, taking into account the projected increase in extreme weather events resulting from climate change, it stands to reason that the number of people in Leanne's situation will increase every year. Such a scenario is deeply undesirable given that the availability of affordable insurance is often argued to be one of the most important pillars in building resilience for the future (Clark 1998, Pelling 2003b, Whyley *et al.* 1998) and that the poorest residents will likely be impacted first (Burby *et al.* 2003).

Insurance also has another important impact on risk and resilience, in the form of its relationship to resilient repair. The Hull study showed that the potential mitigation of future risks fell as a secondary priority to an insurance industry, who apparently favoured straightforward restoration over the installation of resilience measures during the repairs (several diarists explained that installing such measures was forbidden by insurance companies as this would have constituted an 'improvement'). For the majority, the insurance 'experience' was one of putting things back as they were, with any incorporation of resilience measures (e.g. concrete floors) resulting more from a particular householder's tenacity or expertise, than because the 'expert' triumvirate of insurer, loss adjuster, and/or contracted builder saw sufficient value in them to insist on their incorporation into the rebuild (see: Association of British Insurers 2009).

However, this willingness to forego resilience measures as too expensive was not all the industry's doing. Whilst the principle behind resilience measures was widely accepted by the diarists, their overriding perceptions were that the efficacy of some of these measures was largely uncertain and that any personal expenditure on them

might not be recognised in any lowering of the cost of insurance premiums. Accordingly, it became relatively easy for some householders to allow pragmatism to shape their view of a future, wherein, even though the hazard has lost its solely-putative status forever, a refurbished house, bearing no physical reminders of risk levels (e.g. raised electrical sockets), can slowly be returned to a status of home (Harries & Borrows 2007). Through this process, the *status quo* could be said to be rebuilt into the very fabric of the newly-dried and refurbished buildings, even if it did not quite resettle into the minds and into the 'new normality'¹⁰ of those living in them.

Conclusion: Moving forward in the [flood] risk society

In this chapter we have argued that the transition to FRM approaches can be viewed as an example of the kind of Risk Society described by Beck (1992). Decades of structural, instrumental approaches to flood defence have resulted in an expansion of homes onto flood plains and exposed coastal areas. We have argued that the creation of such homes, and the engineering structures that contain them, amounts to an unwritten contract which has fostered a belief that science and technology can and should protect us from the dangers that lie on the other side of the flood walls. The large number of severe floods experienced in recent years, however, illustrates that such faith is increasingly misplaced. This has led to a political recognition that escalating expenditure on flood defences is neither financially nor socially sustainable, thus prompting a move to a new approach based on the need to live with flooding through adaptation and resilience. Here, we have argued that a crucial element of this approach involves a shift of responsibility onto individuals. The research results we have described show how this creates a range of ethical and practical challenges for the ways in which risk and resilience are played out, both now and in the future.

So how do we move forward from here? The situation we have described in this chapter is complex and there is little to be gained from attempting to apportion blame to specific individuals or organisations. However, it is possible to suggest a number of potential avenues for change. First, within both studies a particular focus was afforded to the importance of public engagement and to challenging the effectiveness of the *modus operandi* of the recovery organisations and institutions. Regarding the flood-exposed, principal importance was given to the need for iterative engagement processes to be developed, in order that wider introspection can be encouraged on the part of the at-risk publics. Such approaches are also supported by Ronan and Johnston (2005), who promote the idea of 'change-talk'. In a hazards context, this is simply the type of conversation that provokes participants to reconsider their perceptions of what 'safe' really means to them. It effectively provides information that produces a discrepancy between someone's existing understanding of (e.g.) a hazard – as perhaps benign – and the new information that suggests a more malignant presence about which action can and should be taken. However, it is not just the public who need to learn. Effective public engagement allows policy makers and practitioners to benefit from the local knowledge of residents, and an increasing number of research projects point to the importance of creating spaces where residents can get involved in making decisions about their local environment; including those made around flood-risk management (Lane *et al.* in press, Steinführer & Kuhlicke 2009, Whittle *et al.* 2010).

Secondly, if we are serious about making space for water, the Hull study shows that we need to accept that floods will happen and, as a result, we must pay more attention to how people can be supported more effectively during the recovery process. We do not have space here for a full discussion of how to go about this. However, elsewhere we have argued that it is important to address the 'recovery gap', which sees residents trapped in the middle of a very individualising process and having to negotiate themselves through the maze of agencies and companies involved in flood recovery (Whittle *et al.* 2010). We have also proposed that recovery agents, such as the insurance industry, should be considered as more than just market-based businesses. Whether a hazard strikes at the household level or across an entire geographical community, the survivors will need efficient and fair treatment in order that they do not suffer adverse consequences for longer than is necessary. The development of an ethic of care within this particular recovery 'community', through which professional standards could be adhered to throughout the course of any recovery period, should be regarded as vital.

¹⁰ The phrase 'new normality' was used by a respondent severely affected by the 2001 Foot and Mouth Disease disaster in Cumbria (Mort *et al.* 2005)

Finally, it is important to consider how our 'safety systems' could be reshaped in order to promote a fairer, more effective sharing of risk and in order to help build resilience for the future. As we have indicated here, this could include revisiting the terms of insurance in order to ensure the continuation of more affordable, equitable premiums, as well as working with insurers and builders to encourage more resilient repair.

Bibliography

Association of British Insurers. 2006. *Coastal flood risk - Thinking for Tomorrow, Acting Today* (summary report).

Available at: http://www.abi.org.uk/DISPLAY/default.asp?Menu_ID=773&Menu_All=1,773,0&Child_ID=651

[accessed: 7 November 2006]. London: Association of British Insurers.

Association of British Insurers. 2007. *Summer Floods 2007: Learning the Lessons*. London: Association of British Insurers.

Association of British Insurers. 2008. *Revised Statement of Principles on the Provision of Flood Insurance* (Revised

11/07/08). Available at: http://www.abi.org.uk/Document_Vault/FINAL_INDUSTRY_COMMITMENTS.pdf

[accessed: 13 August 2008]. London: Association of British Insurers.

Association of British Insurers. 2009. *Resilient Reinstatement: The costs of flood resilient reinstatement of domestic properties*. London: Association of British Insurers.

Adger, W. N. 2000. Social and ecological resilience: are they related? *Progress in Human Geography*, 24(3), 347-364.

Adger, W. N. 2006. Vulnerability. *Global Environmental Change*, 16(3), 268-281.

Alcamo, J., Moreno, J. M., Nováky, B., Bindi, M., Corobov, R., Devoy, R. J. N., Giannakopoulos, C., Martin, E., Olesen, J. E. & Shvidenko, A. 2007. *Europe*. In *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds., Cambridge: Cambridge University Press, 541-580.

Bales, J. D. & Wagner, C. R. 2009. Sources of uncertainty in flood inundation maps. *Journal of Flood Risk Management*, 2(2), 139-147.

Barredo, J. I. 2009. Normalised flood losses in Europe: 1970–2006. *Natural Hazards and Earth Systems Sciences*, 9, 97-104.

Beck, U. 1992. *Risk Society: Towards a new modernity*. London: Sage.

- Beck, U. 1995. *Ecological politics in the age of risk*. Cambridge: Polity Press.
- Beck, U. 2000. Risk Society Revisited: Theory, Politics and Research Programmes. In, Adam, B. B., U. & van Loon, J. (Eds.) *The Risk Society and Beyond*. London: Sage.
- Birkmann, J. (Ed.) 2006. *Measuring Vulnerability to Natural Hazards*. New York: United Nations University Press.
- Burby, R. J., Steinberg, L. J. & Basolo, V. 2003. The Tenure Trap: The Vulnerability of Renters to Joint Natural and Technological Disasters. *Urban Affairs Review*, 39(1), 32-58.
- Cabinet Office. 2010. *Draft Strategic National Framework on Community Resilience (Consultation Document)*. Cabinet Office, London [accessed 17 May 2010]
- Clark, M. J. 1998. Flood Insurance as a Management Strategy for UK Coastal Resilience. *The Geographical Journal*, 164 (3), 333-343.
- Coulthard, T., Frostick, L., Hardcastle, H., Jones, K., Rogers, D. & Scott, M. 2007a. *The June 2007 floods in Hull Interim Report by the Independent Review Body for Hull City Council*. Hull, UK.
- Coulthard, T., Frostick, L., Hardcastle, H., Jones, K., Rogers, D. & Scott, M. 2007b. *The June 2007 floods in Hull Final Report by the Independent Review Body for Hull City Council*. Hull, UK.
- Deeming, H. 2008. *Increasing resilience to storm surge flooding: risks, social networks and local champions*. PhD Thesis, Division of Geography Lancaster University, UK
- Department for Food and Rural Affairs. 2005. *Making Space for Water: Taking forward a new Government strategy for flood and coastal erosion risk*. London: Department for Food and Rural Affairs.
- European Commission. 2006. Directive of the European Parliament and of The Council on the assessment and management of floods (2007/60/EC Final). Brussels: European Commission
- Environment Food and Rural Affairs Committee. 2008. *Flooding: Fifth Report of Session 2007–08, Volume 1*. Available at: <http://www.publications.parliament.uk/pa/cm200708/cmselect/cmenvfru/49/49.pdf> [accessed: 7 May 2008] London: Environment Food and Rural Affairs Committee.
- East Lindsey District Council. 2005. *East Lindsey Strategic Flood Risk Assessment (Volume 1 & 2)*. East Lindsey District Council Louth, Lincolnshire
- Environment Agency. 2009. *Flooding in England: A National Assessment of Flood Risk*. Bristol: Environment Agency

Evans, E. P., Simm, J.D., Thorne, C.R., Arnell, N.W., Ashley, R.M., Hess, T.M., Lane,, S.N., M., J., Nicholls, R.J., Penning-Rowsell, E.C., Reynard, N.S., Saul, A.J., & Tapsell, S. M., Watkinson, A.R., Wheeler, H.S. 2008. *An update of the Foresight Future Flooding 2004 qualitative risk analysis*. London: Cabinet Office

French Disaster Reduction Platform. 2007. *Insurance and prevention of natural catastrophes, Note by French delegation to UN-ISDR Global Platform for Disaster Risk Reduction*. Geneva, June 2007

Freudenburg, W. R. 1993. Risk and Recreancy: Weber, the Division of Labor, and the Rationality of Risk Perceptions. *Social Forces*, 71(4), 909-932.

Grothmann, T. & Reusswig, F. 2006. People at Risk of Flooding: Why some residents take precautionary action while others do not. *Natural Hazards*, (38), 101-120.

Harries, T. & Borrows, P. 2007. *Can People Learn To Live With Flood Risk?* Department for Food and Rural Affairs, 42nd Flood and Coastal Defence Conference. York, UK

Hewitt, K. 1997. *Regions of Risk: A Geographical Introduction to Disasters*. Harlow: Longman.

Huber, M. 2004. *Reforming the UK flood insurance regime: A breakdown of the Gentleman's Agreement* (Discussion paper 18). Engineering and Physical Sciences Research Council. UK.

Hull City Council. 2007. *Strategic Flood Risk Assessment Halcrow for Hull City Council*. Available at: http://www.hullcc.gov.uk/portal/page?_pageid=221,578325&_dad=portal&_schema=PORTAL [accessed: 2 March 2010]

Hulme, M., Jenkins, G. J., Lu, X., Turnpenny, J. R., Mitchell, T. D., Jones, R. G., Lowe, J., Murphy, J. M., Hassell, D., Boorman, P., McDonald, R. & Hill, S. 2002. *Climate Change Scenarios for the United Kingdom: The UKCIP02 Scientific Report*. Tyndall Centre for Climate Change Research, School of Environmental Sciences, University of East Anglia, UK Norwich, UK

Intergovernmental Panel on Climate Change (Ed.). 2008. *Climate Change 2007: The Physical Science Basis. Summary for Policymakers: Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. [Alley et al. (Drafting Authors)], Cambridge University Press. Cambridge, United Kingdom and New York, NY, USA,

Jenkins, G. J., Murphy, J. M., Sexton, D. S., Lowe, J. A., Jones, P. & Kilsby, C. G. 2009. *United Kingdom Climate Projections: Briefing report* Met Office. Exeter: Hadley Centre.

Johnson, C. L., Tunstall, S. M. & Penning-Rowse, E. C. 2005a. *Crises as catalysts for adaptation: human response to major floods (Report 511)*. Middlesex University: Flood Hazard Research Centre.

Johnson, C. L., Tunstall, S. M. & Penning-Rowse, E. C. 2005b. Floods as Catalysts for Policy Change: Historical Lessons from England and Wales. *International Journal of Water Resources Development*, 21(4), 561-575.

Lancaster City Council. 2007. *Strategic Flood Risk Assessment Lancaster City Council*. Available at: [http://lancaster.gov.uk/Documents/Planning/Background%20Documents/SFRA_September2007_Evidence%20 Base_nyr.pdf](http://lancaster.gov.uk/Documents/Planning/Background%20Documents/SFRA_September2007_Evidence%20Base_nyr.pdf) [accessed: 13 September 2007]

Lane, S., Odoni, N., Landström, C., Whatmore, S. J., Ward, N. & Bradley, S. (in press) Doing flood risk science differently: an experiment in radical scientific method. *Transactions of the Institute of British Geographers*.

Mackenzie, D. (1990) *Inventing Accuracy: A Historical Sociology of Nuclear Missile Guidance*. Cambridge, MA: MIT Press.

Morecambe Bay Shoreline Management Plan Partnership. 1999. *Shoreline management plan sub-cell 11c: River Wyre to Walney Island (Incl. Lune Estuary to Lancaster)*. Morecambe Bay Shoreline Management Plan Partnership.

Mort, M., Convery, I., Bailey, C. & Baxter, J. 2004. *The Health and Social Consequences of the 2001 Foot and Mouth Disease Epidemic in North Cumbria*. Lancaster University, UK . Available at: www.lancs.ac.uk/shm/dhr/research/healthandplace/fmdfinalreport.pdf [accessed: 4 January 2010]

Mort, M., Convery, I., Baxter, J., Bailey, C. 2005. Psychosocial effects of the 2001 foot and mouth disease epidemic in a rural population: qualitative diary based study. *British Medical Journal* doi:10.1136/bmj.38603.375856.68 (published 7 October 2005)

Mount, J. 1998. Levees More Harm than Help. *Engineering News Record*, 240(5), 59.

Muir Wood, R. & Bateman, W. 2005. Uncertainties and constraints on breaching and their implications for flood loss estimation. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences* 363(1831), 1423-1430.

Parker, D. J. 1995. Floodplain development policy in England and Wales. *Applied Geography*, 15(4), 341-363.

Pelling, M. 2003a. *Natural disasters and development in a globalizing world*. London: Routledge.

Pelling, M. 2003b. *The Vulnerability of Cities: Natural Disasters and Social Resilience*. London: Earthscan.

Pielke JR., R. A. 1999. Nine fallacies of floods. *Climatic Change*, 42, 413-438.

Pitt, M. 2008. *Learning lessons from the 2007 floods: An independent review by Sir Michael Pitt: the final report*. London: Cabinet Office.

Risk Management Solutions. 2003. *1953 UK Floods: A 50 year retrospective*. Risk Management Solutions Inc. Available at: <http://www.rms.com/NewsPress/1953%20Floods.pdf> [accessed: 18 May 2005]

Ronan, K. R. & Johnston, D. M. 2005. *Promoting Community Resilience in Disasters: The Role for Schools, Youth and Families*. New York: Springer

Siegrist, M. & Cvetkovich, G. 2000. Perception of Hazards: The Role of Social Trust and Knowledge. *Risk Analysis: An International Journal*, 20(5), 713-720.

Steinführer, A. & Kuhlicke, C. 2009. *Communities at risk: vulnerability, resilience and recommendations for flood risk management* (FLOODsite, T11-07-15). FLOODsite, Centre of Environmental Research, a member of Dresden Flood Research Center. Available at: http://www.floodsite.net/html/partner_area/project_docs/T11_07_15_Vulnerability_resilience_ExecSum_v2_2_p01.pdf 22/06/10 [accessed: 28 June 2010]

Tunstall, S. M., Johnson, C. & Penning-Rowsell, E. 2004. *Flood Hazard Management in England and Wales: From Land Drainage to Flood Risk Management*. World Congress on Natural Disaster Mitigation, 19-21 February 2004 New Delhi, India

United States Army Corps of Engineers. 2009. *USACE National Flood Risk Management Program Guidance US Army Corps of Engineers*. Available at: http://www.iwr.usace.army.mil/nfrmp/docs/USACE_National_Flood_Risk_Management_Guidance_Letter.pdf [accessed: 2 June 2010]

Walker, G. P., Whittle, R., Medd, W. & Watson, N. 2010. *Risk governance and natural hazards* (CapHaz WP2 report D2.1). Available at: http://caphaz-net.org/outcomes-results/CapHaz-Net_WP2_Risk-Governance.pdf [accessed: 5 July 2010]

Water Directors of the European Union. 2004. *Best practices on flood prevention, protection and mitigation*. Water Directors of the European Union.

Whittle, R., Medd, W., Deeming, H., Kashefi, E., Mort, M., Twigger-Ross, C., Walker, G. & Watson, N. (2010) *After the Rain – learning the lessons from flood recovery in Hull, final project report for "Flood, Vulnerability and Urban Resilience: a real-time study of local recovery following the floods of June 2007 in Hull"* Lancaster University, UK

Whyley, C., McCormick, J. & Kempson, E. 1998. *Paying for peace of mind: access to home contents insurance for low-income household*. London: Policies Studies Institute.

Wisner, B., Blaikie, P., Cannon, T. & Davis, I. 2004. *At Risk, Natural Hazards, people's vulnerability and disasters*, 2nd ed., London: Routledge.



Plate 1: An example of the 'stripping out' process endured by many residents in Hull after the 2007 flood: where the affected property has been stripped back to its bare structure in order to facilitate repair (NB. In this image the flooring has already been replaced). Source: © Beccy Whittle

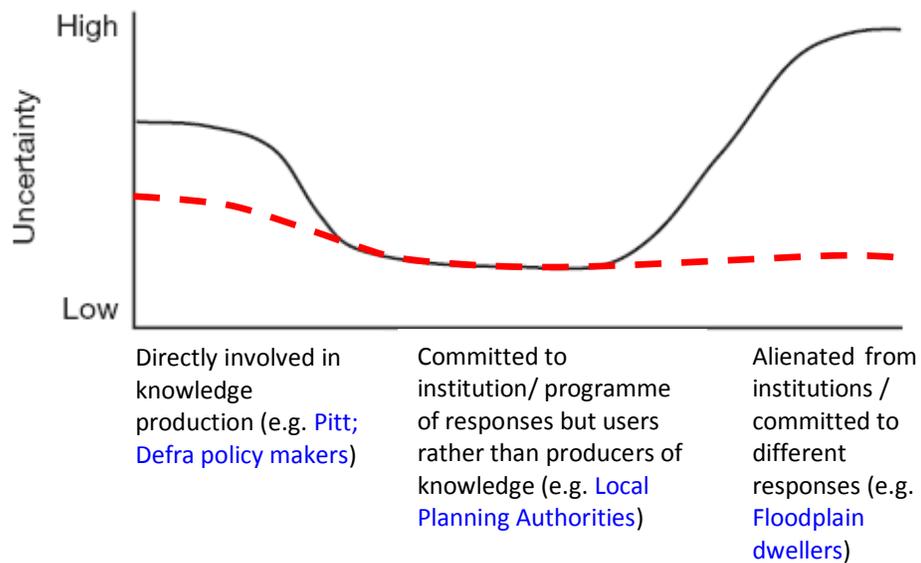


Figure 1: The 'certainty trough' concept applied to the social perceptions of flood-risk management in coastal towns.

- Solid line refers to perceptions of surface water flood risks.
- Dashed line refers to perceptions of sea-flood risks.

Source: Deeming (2008): original concept, MacKenzie (1990)

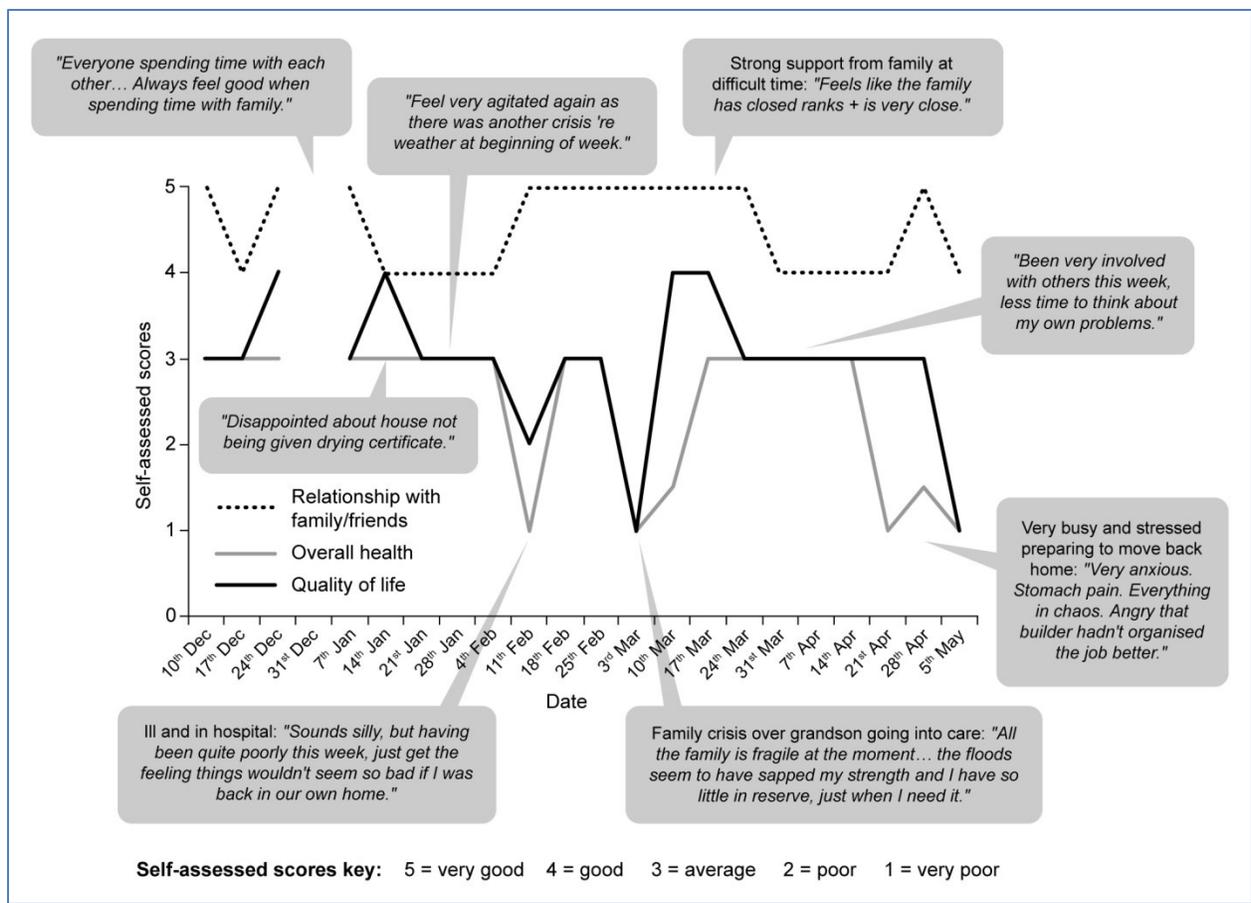


Figure 2: Caroline's timeline; an example of a recovery journey (Whittle *et al.* 2010)